

GUIDELINES OF THE AUSTRIAN
INSTITUTE OF CONSTRUCTION
ENGINEERING (OIB)



OIB GUIDELINE

6

Energy
conservation and
thermal
protection

Long-term
renovation strategy



This guideline is based on the results of deliberations of the Provincial Expert Group appointed by the Conference of Directors of Provincial Government Offices with the aim of producing a proposal for harmonising the building regulations. The work undertaken by this group was coordinated by the Austrian Institute of Construction Engineering (OIB) in accordance with the mandate of the Conference of Directors of Provincial Government Offices within the meaning of Section 3(1)(7) of the statutes of the OIB and continued in the Expert Advisory Council for construction engineering guidelines. A resolution was passed on the guideline by the General Assembly of the OIB pursuant to Section 8(12) of the statutes.

Document

on the long-term renovation strategy pursuant to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings in the consolidated version of 30 May 2018

April 2020

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This framework document is based on the results of the deliberations of the Provincial Group of Experts in the Liaison Office of the Austrian Provinces appointed by the Conference of Directors of Provincial Government Offices [Landesamtsdirektorenkonferenz] and of the Expert Advisory Council for construction engineering guidelines – Sub-committee for energy conservation and thermal protection (SVBRL 6) of the Austrian Institute of Construction Engineering (OIB) to coordinate Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (in the version of Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency).

Timetable

In the following list, 'LTRS session' stands for the meetings, coordinated by the OIB, of the experts of the Expert Advisory Council for construction engineering guidelines – Sub-committee for energy conservation and thermal protection (SVBRL 6) and of the Coordination group for the implementation of the EPBD (the authors of this document), which served solely for the preparation and drawing up of the long-term renovation strategy 2020.

- 1 LTRS session: 14 January 2019
- 2 LTRS session: 1 February 2019
- 3 LTRS session: 28 February 2019
- 4 LTRS session: 6 March 2019
- 5 LTRS session: 20 March 2019
- 6 LTRS session: 2 April 2019
- 7 LTRS session: 24 April 2019
- 8 LTRS session: 22 May 2019
- 9 LTRS session: 12. June 2019
- 10 LTRS session: 24 June 2019

Submission of the draft LTRS 2020 to the consultation process: 27 June 2019
Stakeholder observations: until 1 October 2019

- 11 LTRS session: 9 October 2019 (Review of observations received)

Contact forum (consultation process) with all relevant stakeholders: 28 October 2019

- 12 LTRS session: 18 November 2019
- 13 LTRS session: 4 December 2019
- 14 LTRS session: 9 January 2020

Meeting with stakeholders who provided input for the creation of the model: 14 January 2020

- 15 LTRS session: 20 January 2020
- 16 LTRS session: 24 February 2020 (Final decisions taken)_

Submission to the European Commission: 10 March 2020

Preamble

The focus of this document is on aspects of thermal energy renovation and energy efficiency, as well as the use of renewable energy sources in the building sector. However, it goes without saying that all OIB construction and renovation work in Austria must also comply with OIB Guidelines 1 to 5. OIB Guideline 4, for example, has had a dedicated chapter describing the additional requirements for the barrier-free design of buildings since 2007.

Abbreviations

EPBD	Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (as amended by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency)
HDH	Heat demand for heating
HDHW	Heat demand for hot water
EDH	Energy demand for heating
ECH	Energy consumption for heating
l_c	Characteristic length
GFA	Gross floor area
SFB	Single-family building
MFB	Multi-family building
APB	Apartment block
RB	Residential building
NRB	Non-residential building
GHG	Greenhouse gas
BT	Building type

For details on the literature and sources, please refer to Chapter 5. There are no instance-by-instance references, with the main sources being cited in numerous places, although data from the remaining sources have also been used often.

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Grounds

Article 2a of Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings (as amended by Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency) requires Member States to establish a long-term strategy to mobilise investments into the renovation of the national stock of residential and commercial buildings, both public and private.

The strategy must encompass the following (Article 2a(1)):

- (a) *an overview of the national building stock, based, as appropriate, on statistical sampling and expected share of renovated buildings in 2020;*
- (b) *the identification of cost-effective approaches to renovation relevant to the building type and climatic zone, considering potential relevant trigger points, where applicable, in the life-cycle of the building;*
- (c) *policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovation, and to support targeted cost-effective measures and renovation for example by introducing an optional scheme for building renovation passports;*
- (d) *an overview of policies and actions to target the worst performing segments of the national building stock, split-incentive dilemmas and market failures, and an outline of relevant national actions that contribute to the alleviation of energy poverty;*
- (e) *policies and actions to target all public buildings;*
- (f) *an overview of national initiatives to promote smart technologies and well-connected buildings and communities, as well as skills and education in the construction and energy efficiency sectors; and*
- (g) *an evidence-based estimate of expected energy savings and wider benefits, such as those related to health, safety and air quality.*

A first version of the strategy will be published by 30 April 2020 and then updated every three years and submitted to the Commission as part of the National Energy Efficiency Action Plans.

In its long-term renovation strategy, each Member State shall set out a roadmap with measures and domestically established measurable progress indicators, with a view to the long-term 2050 goal of reducing greenhouse gas emissions in the Union by 80-95% compared to 1990, in order to ensure a highly energy-efficient and decarbonised national building stock and in order to facilitate the cost-effective transformation of existing buildings into nearly zero-energy buildings. The roadmap shall include indicative milestones for 2030, 2040 and 2050, and specify how they contribute to achieving the Union's energy efficiency targets in accordance with Directive 2012/27/EU (Article 2a(2)).

To support the mobilisation of investments into the renovation needed to achieve the goals referred to above, Member States shall facilitate access to appropriate mechanisms (Article 2a(3)) for:

- (a) *the aggregation of projects, including by investment platforms or groups, and by consortia of small and medium-sized enterprises, to enable investor access as well as packaged solutions for potential clients;*
- (b) *the reduction of the perceived risk of energy efficiency operations for investors and the private sector;*
- (c) *the use of public funding to leverage additional private-sector investment or address specific market failures;*
- (d) *guiding investments into an energy-efficient public building stock, in line with Eurostat guidance; and*
- (e) *accessible and transparent advisory tools, such as one-stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments.*

1 Article 2a(1) of the EPBD – mandatory elements of the long-term renovation strategy

In this first chapter, the fundamentals of the areas of population and energy are presented. The population data are given in the first section, while the second section gives the most important variables for energy.

Population

One of the most important fundamentals of a long-term renovation strategy is the development of population figures. The following table shows the average annual population from 1990-2017 by province and for Austria as a whole.

Table 1: Average annual population 1990-2017 by province (excerpt)

Year	Burgen-land	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarl-berg	Vienna	Austria
1990	271,133	546,363	1,463,790	1,304,058	476,289	1,170,631	621,280	326,594	1,497,712	7,677,850
1991	272,951	550,042	1,479,187	1,320,567	484,807	1,174,524	628,284	331,930	1,512,599	7,754,891
1992	274,943	555,231	1,495,408	1,337,961	493,732	1,181,085	636,210	336,160	1,529,979	7,840,709
1993	275,958	558,935	1,508,220	1,350,814	501,215	1,185,486	642,893	338,640	1,543,471	7,905,632
1994	276,908	560,216	1,515,446	1,357,804	505,238	1,186,122	647,854	340,471	1,546,059	7,936,118
1995	277,689	561,281	1,520,637	1,360,967	507,454	1,185,830	651,639	341,951	1,540,830	7,948,278
1996	277,703	561,703	1,523,536	1,362,597	509,157	1,185,066	655,528	343,135	1,540,591	7,959,016
1997	277,368	561,280	1,525,554	1,363,843	510,501	1,184,310	659,288	344,354	1,541,543	7,968,041
1998	276,973	560,972	1,528,805	1,365,441	511,107	1,183,702	662,471	345,766	1,541,552	7,976,789
1999	276,486	560,821	1,532,920	1,368,299	512,049	1,183,146	665,773	347,443	1,545,386	7,992,323
2000	276,083	560,129	1,537,266	1,371,579	513,853	1,182,684	669,479	349,257	1,551,236	8,011,566
2001	276,331	559,745	1,542,033	1,375,473	515,949	1,185,275	673,595	351,356	1,562,536	8,042,293
2002	276,497	559,179	1,547,023	1,380,561	516,764	1,188,561	677,060	353,635	1,582,841	8,082,121
2003	276,481	558,319	1,552,896	1,385,088	517,908	1,190,339	680,705	355,621	1,600,888	8,118,245
2004	277,387	558,431	1,562,913	1,391,321	520,745	1,194,368	685,505	358,521	1,620,250	8,169,441
2005	278,466	559,093	1,574,536	1,397,572	523,356	1,198,543	690,668	361,391	1,641,653	8,225,278
2006	279,590	559,453	1,584,525	1,402,281	525,300	1,201,495	695,296	363,389	1,656,619	8,267,948
2007	280,469	559,829	1,592,500	1,405,127	525,826	1,203,132	697,863	364,985	1,665,458	8,295,189
2008	281,891	559,723	1,599,645	1,407,809	526,315	1,204,262	700,562	366,397	1,674,937	8,321,541
2009	283,210	558,813	1,604,581	1,409,126	526,518	1,204,630	702,717	367,590	1,684,298	8,341,483
2010	284,042	557,497	1,607,428	1,410,014	527,114	1,205,514	704,976	368,894	1,695,590	8,361,069
2011	285,006	556,398	1,611,885	1,412,305	528,599	1,207,202	708,429	370,096	1,708,614	8,388,534
2012	286,143	555,751	1,616,161	1,416,387	530,527	1,209,466	712,849	371,697	1,727,330	8,426,311
2013	286,983	555,589	1,621,469	1,421,939	532,902	1,212,502	718,379	373,870	1,753,597	8,477,230
2014	287,791	556,637	1,631,157	1,431,253	536,340	1,217,861	724,878	376,973	1,781,042	8,543,932
2015	289,262	558,612	1,643,001	1,444,122	541,439	1,225,187	732,671	381,000	1,814,225	8,629,519
2016	291,663	561,099	1,661,109	1,460,276	547,639	1,235,582	742,590	386,708	1,853,140	8,739,806
2017	292,160	560,852	1,667,630	1,469,187	550,976	1,238,067	748,186	390,296	1,877,719	8,795,073

Source: Statistics Austria, *Statistik des Bevölkerungsstandes* [Population Statistics]. Published on 17 May 2018.

These data show a massive population growth, which for Austria is approximately 15% on average in the 27 years in question (1990-2017), with peak values of up to around 25% and even the minimum still roughly 3%.

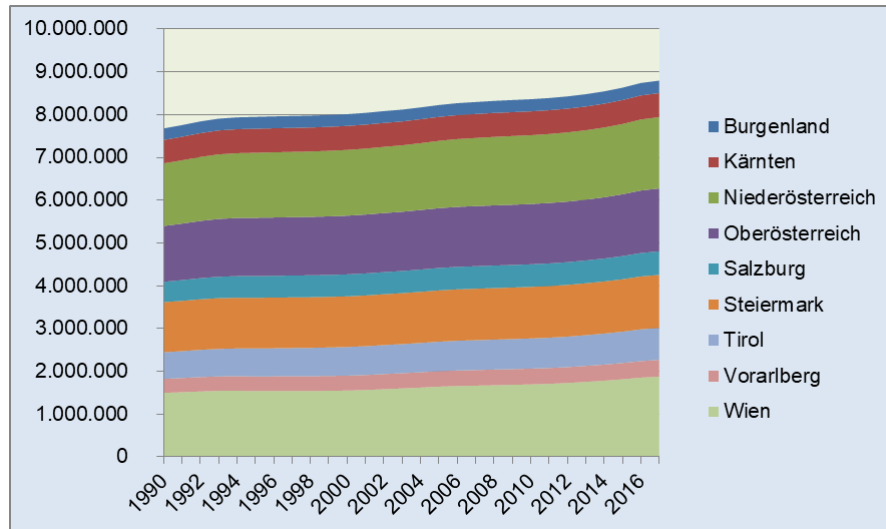


Figure 1: Average annual population 1990-2017 by province

Source: Self-calculation based on the data from Table 1

Burgenland	Burgenland
Kärnten	Carinthia
Niederösterreich	Lower Austria
Oberösterreich	Upper Austria
Salzburg	Salzburg
Steiermark	Styria
Tirol	Tyrol
Vorarlberg	Vorarlberg
Wien	Vienna

As regards the development of the population figures over the next few years, the following scenario, is the basis for all further considerations. It is worth emphasising at this point that this is Statistics Austria’s primary scenario.

Table 2: Extract and summary from *Vorausberechnete Bevölkerungsstruktur 2017-2100* [Predicted population structure 2017-2100] according to the primary scenario, by province

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
2017	292,160	560,852	1,667,630	1,469,187	550,976	1,238,067	748,186	390,296	1,877,719	8,795,073
2018	293,341	560,754	1,673,917	1,477,035	554,210	1,240,772	753,237	393,181	1,897,668	8,844,115
2019	294,709	560,560	1,681,055	1,483,741	557,254	1,242,455	757,369	395,900	1,914,395	8,887,438
2020	296,207	560,569	1,689,435	1,489,986	559,849	1,245,199	761,518	398,299	1,929,067	8,930,129
2021	297,749	560,716	1,698,403	1,496,003	562,201	1,248,488	765,602	400,483	1,942,476	8,972,121

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
2022	299,315	560,881	1,707,447	1,502,017	564,444	1,251,736	769,566	402,577	1,955,293	9,013,276
2023	300,880	561,087	1,716,509	1,507,949	566,599	1,254,985	773,435	404,569	1,967,536	9,053,549
2024	302,460	561,288	1,725,550	1,513,745	568,607	1,258,183	777,179	406,462	1,979,249	9,092,723
2025	304,004	561,489	1,734,541	1,519,430	570,519	1,261,325	780,783	408,244	1,990,392	9,130,727
2026	305,550	561,664	1,743,394	1,524,944	572,296	1,264,365	784,238	409,928	2,000,992	9,167,371
2027	307,083	561,830	1,752,119	1,530,303	573,951	1,267,313	787,543	411,496	2,011,033	9,202,671
2028	308,574	561,936	1,760,658	1,535,406	575,468	1,270,133	790,666	412,955	2,020,562	9,236,358
2029	310,038	562,024	1,769,021	1,540,289	576,833	1,272,841	793,617	414,299	2,029,608	9,268,570
2030	311,466	562,053	1,777,163	1,544,951	578,055	1,275,419	796,400	415,538	2,038,128	9,299,173
2040	322,796	559,002	1,845,898	1,578,517	584,980	1,293,477	817,101	423,899	2,105,214	9,530,884
2050	329,242	551,724	1,896,344	1,594,236	587,411	1,299,841	828,920	427,675	2,158,238	9,673,631

Source: Statistics Austria, *Bevölkerungsprognose 2018* [Population forecast 2018]. Published on 22 November 2018.

These data suggest that the figures will continue to develop in the same manner for the years up to 2050, for Austria approximately 25% on average in the 60 years in question (1990-2050), with peak values of up to around 45%.

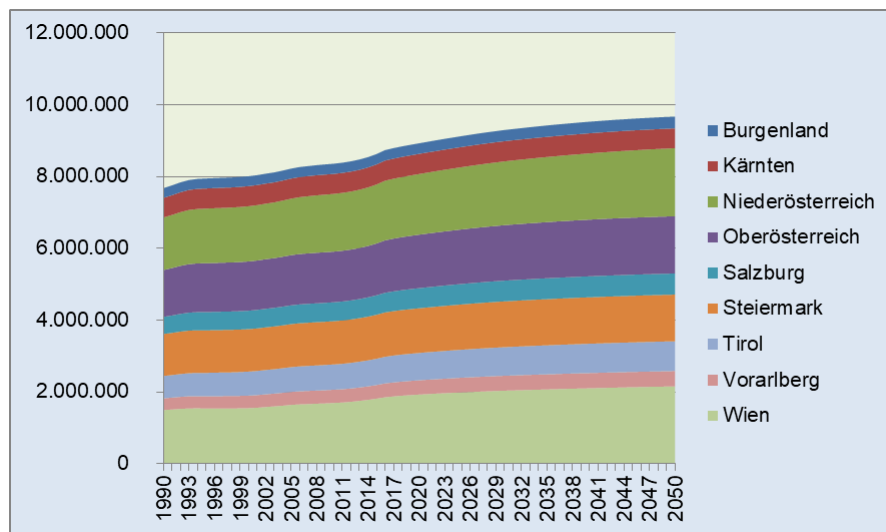


Figure 2: Predicted population structure 2017-2100 according to the primary scenario, by province

Source: Self-calculation based on the data from Table 2

Burgenland	Burgenland
Kärnten	Carinthia
Niederösterreich	Lower Austria
Oberösterreich	Upper Austria
Salzburg	Salzburg
Steiermark	Styria
Tirol	Tyrol

Vorarlberg	Vorarlberg
Wien	Vienna

Energy

Equally significant are the basic energy data. For the following illustration, the major sectors have been summarised from the useful energy analysis.

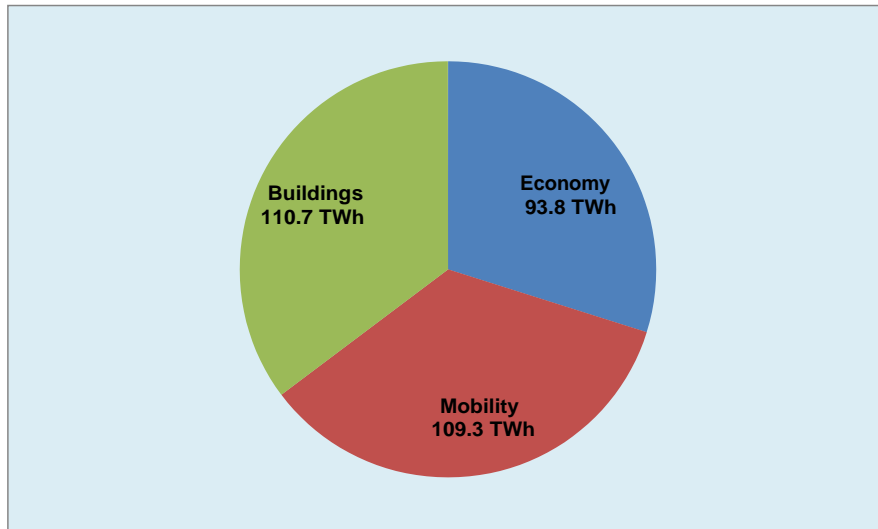


Figure 3: Energy consumption by sector (exactly as per the 2017 useful energy analysis)

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

These data show that the buildings sector is responsible for approximately 35% of energy consumption in Austria.

If minimum contributions in the buildings sector from the areas of transport and production are assigned accordingly to the three largest areas, the following distribution results:

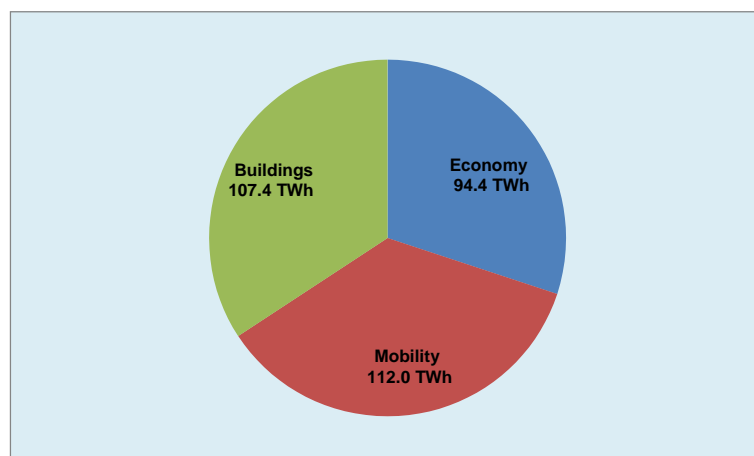


Figure 4: Energy consumption by sector (adapted for the present considerations based on the 2017 useful energy analysis)

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

In both cases, the total is approximately 315 TWh or 1,130 PJ. The shares change only marginally as a result of this reorganisation.

The primary reason for this reorganisation is to achieve conformity with the building models, which essentially include heat (heating, cooling, ventilation and hot water), as well as operation (lighting, household electricity and operating electricity), the latter not least in order to be able to assess existing recoverable heat yields or heat loads to be dissipated.

The following figure shows that, contrary to the trend in social and economic development, the share of the building sector, which is under the competence of the provinces has decreased significantly in comparison with those of the economy and mobility sectors.

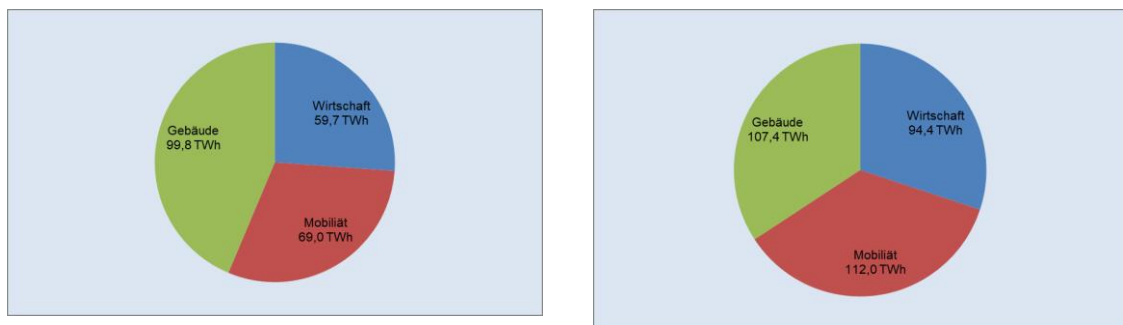


Figure 5: Energy consumption by sector (left: 1993, right: 2017)

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

Gebäude	Buildings
Wirtschaft	Economy
Mobilität	Mobility
TWh	TWh

The almost 110 TWh shown for the buildings sector breaks down into the areas of housing, services and agriculture as follows.

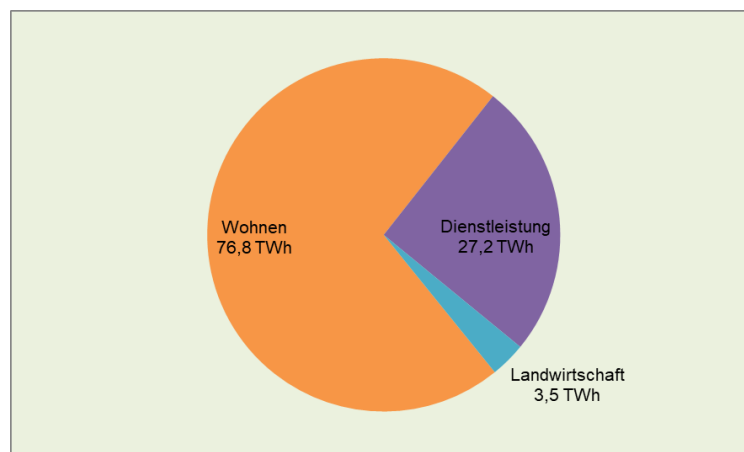


Figure 6: Energy consumption in the buildings sector 2017 (including the housing, services and

agriculture sectors)

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

Wohnen	Housing
Dienstleistung	Services
Landwirtschaft	Agriculture
TWh	TWh

A little more than 70% is in the sphere of housing, with the following graphic summarising the two areas of service and agriculture into a single area of non-housing.

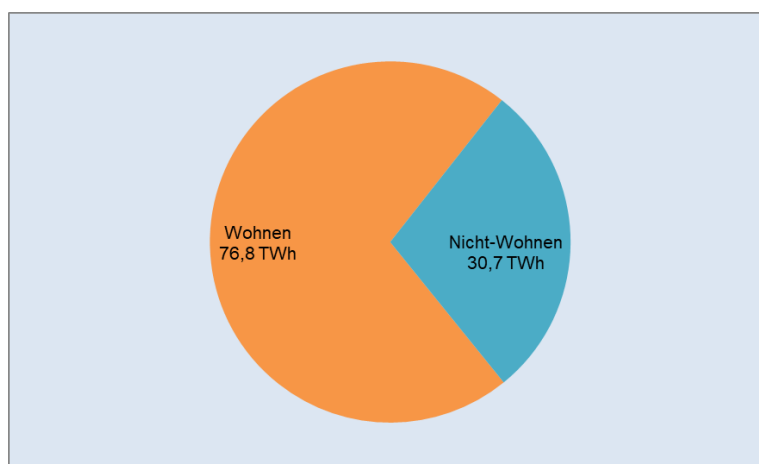


Figure 7: Energy consumption in the buildings sector 2017

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

Wohnen	Housing
Nicht-Wohnen	Non-housing
TWh	TWh

These two areas consist of the following elements:

- heat
 - space heating
 - space cooling
- hot water
- domestic and operating power demand
 - cooking
 - stationary engines
 - lighting
 - computing

If we examine the shares for the area of housing in detail, the following picture emerges:

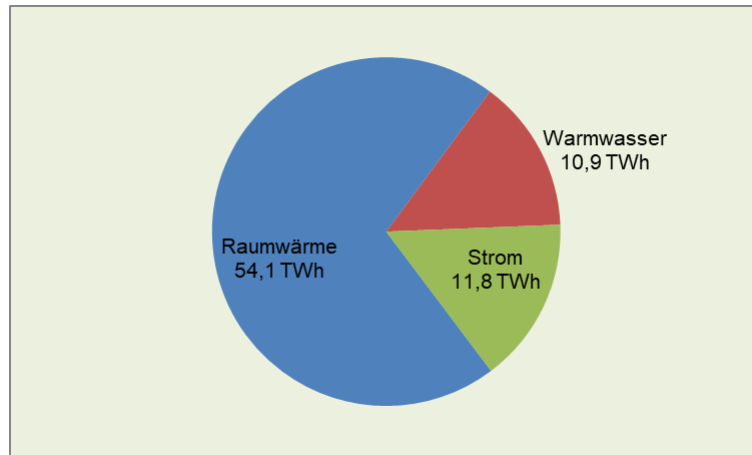


Figure 8: Energy consumption in the housing sector

Source: Useful energy analysis and Energy balance sheets

Raumwärme	Space heating
Warmwasser	Hot water
Strom	Electricity
TWh	TWh

Over the period from 1993 to 2017, the following development emerges:

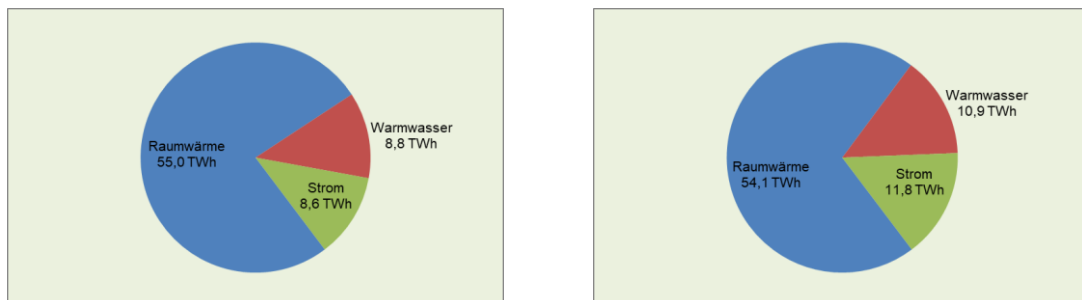


Figure 9: Energy consumption in the housing sector (left: 1993, right: 2017)

Source: Useful energy analysis and Energy balance sheets

Raumwärme	Space heating
Warmwasser	Hot water
Strom	Electricity
TWh	TWh

It can be seen very clearly from this that, while it was possible to keep space heating consumption practically constant, the energy consumption for hot water increased by around 25% and that for electricity by 37.5%.

- **Re energy consumption for space heating in private residences (housing sector):**
 This constancy, despite the demographic development of approximately 15% population growth and a roughly 20% increase in specific useful floor area, is largely attributable to the following parameters:
 - remedial measures, primarily driven by incentives and advice services, as well as the setting

- of the regulatory level of requirements by applying the principles of maximally optimised life cycle costs;
 - the setting of the level of requirements through regulatory measures, as well as incentives for new builds;
 - for the sake of completeness, the effects of climate change on space heating consumption should also be mentioned, although it appears from the various sets of details that have come out that these have not had the impact which the temperature increase might warrant, as is reflected, for example, in brief additional periods of heating;
 - in addition, it can be assumed for this area that the increase in efficiency in building technology systems roughly corresponds to the impact of an increased demand for comfort.
- Re energy consumption for hot water in private residences (housing sector):
If the growth is adjusted for demographic change, this gives an increase of approximately 9%. This is largely attributable to the following parameters:
 - increasing household installation of water heating systems – an increase of almost 20% among residents of category A and B residences;
 - taking this parameter into account, the energy consumption for hot water would be practically constant;
 - it can therefore be assumed for this area that the qualitative growth in building technology systems roughly corresponds to the impact of increased demand for comfort.
- Re electricity consumption in private residences (housing sector):
If the growth is adjusted for demographic change, this gives an increase of approximately 20%. In addition, a distinction must be made in the case of electricity consumption between the narrower sense, i.e. domestic electricity demand (consumption), and the power used essentially for auxiliary energy for space heating, ventilation and hot water. The following parameters can be derived from the detailed results or from the impact of increased demand for comfort:
 - the electricity consumption for auxiliary energy for hot water and space heating drops enormously with increased efficiency;
 - the electricity consumption for ventilation and cooling increases enormously due to higher comfort expectations and to climate change;
 - domestic electricity demand (consumption) increases.

The following figure shows the breakdown of the heat demand (space heating and hot water) of approximately 65 TWh by individual energy carrier, for the purposes of which the splitting of ambient heat into the proportions for solar heat and heat pumps (environmental heat) was based on the proportional progression in the total energy use of all energy carriers.

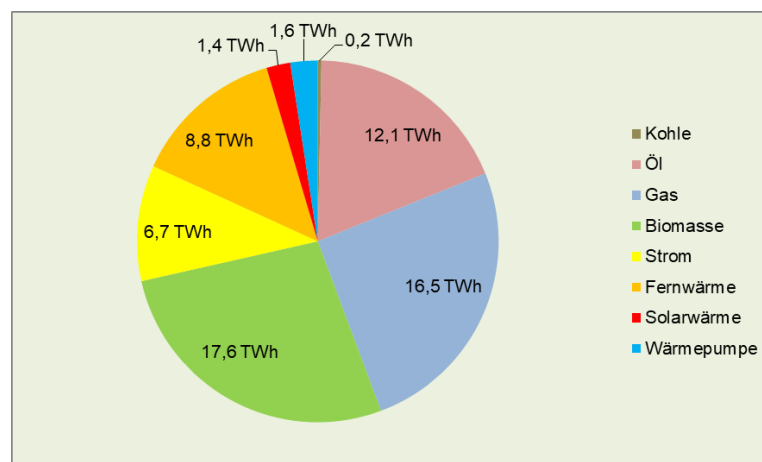


Figure 10: Energy consumption in the housing sector by energy carrier

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance

sheets for Austria] (1970-2017 edition, from Statistics Austria)

TWh	TWh
Kohle	Coal
Öl	Oil
Gas	Gas
Biomasse	Biomass
Strom	Electricity
Fernwärme	District heating
Solarwärme	Solar thermal energy
Wärmepumpe	Heat pump

Since this distribution has a direct impact on the development of GHG emissions, the following figure shows the change over time between 1993 and 2017:

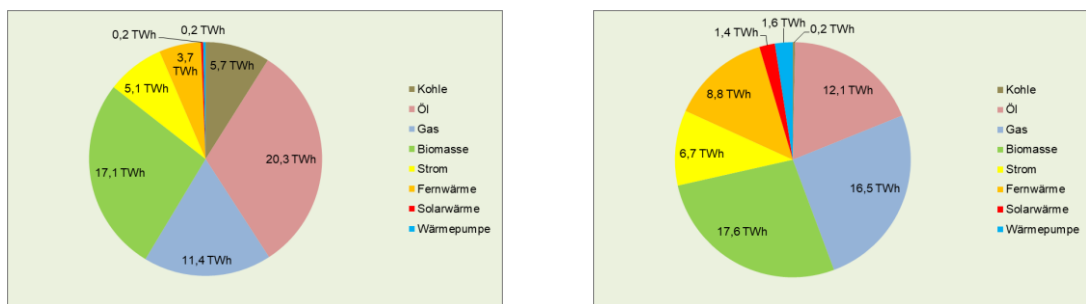


Figure 11: Energy consumption in the housing sector by energy carrier

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

TWh	TWh
Kohle	Coal
Öl	Oil
Gas	Gas
Biomasse	Biomass
Strom	Electricity
Fernwärme	District heating
Solarwärme	Solar thermal energy
Wärmepumpe	Heat pump

From this it can be seen that in the 24 years between 1993 and 2017 a reduction of the proportion of non-renewable energy carriers by around a quarter was achieved.

This development becomes even clearer if we compare non-renewable energy carriers and efficient alternative energy carriers, as in the following figure:

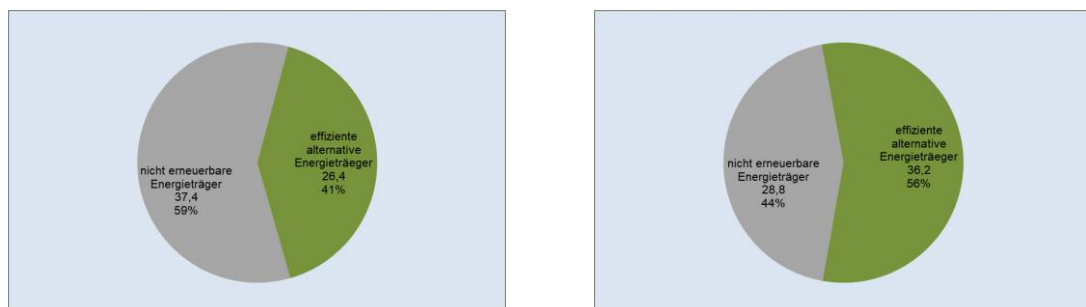


Figure 12: Energy consumption in the housing sector by energy carrier – development from 1993 (left) to 2017 (right)

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

Nicht erneuerbare Energieträger	Non-renewable energy carriers
Effiziente alternative Energieträger	Efficient alternative energy carriers

1.1 Overview of the national building stock and housing stock 2011 (Article 2a(1)(a))

It should be noted at this point that the modelling primarily focuses on the area of housing. There are two reasons for this:

- the data picture for residential buildings is incomparably better in terms of volume, scale and use, as well as age of construction, than that for non-residential buildings;
- the development of GG emissions is significantly more favourable for the whole buildings sector (residential and non-residential) than for residential buildings alone – the reduction in CO₂ emissions for RBs from 1990-2017 is approximately 32%, while the reduction in GG emissions for the buildings sector as a whole for the same period is around 35%.

It is therefore fundamentally safer to use an RB-based forecast/RB-based scenarios.

Housing

In connection with demographic change, the average living space per residence and per person are of great importance.

The following table provides an overview of the development of average living space per residence (2004-2017) and is the basis for further modelling:

Table 3: Average living space per residence

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
2004	118.0 m ²	104.6 m ²	109.9 m ²	102.2 m ²	92.7 m ²	101.5 m ²	96.5 m ²	100.2 m ²	73.6 m ²	96.4 m ²
2005	118.9 m ²	104.1 m ²	110.1 m ²	103.3 m ²	93.3 m ²	102.9 m ²	96.7 m ²	100.7 m ²	73.5 m ²	96.9 m ²
2006	121.3 m ²	104.1 m ²	112.9 m ²	103.9 m ²	93.9 m ²	102.4 m ²	97.3 m ²	100.7 m ²	72.9 m ²	97.4 m ²
2007	120.0 m ²	104.1 m ²	112.1 m ²	105.0 m ²	94.7 m ²	103.1 m ²	99.5 m ²	101.7 m ²	72.8 m ²	97.8 m ²
2008	122.5 m ²	102.8 m ²	111.3 m ²	104.6 m ²	95.5 m ²	104.2 m ²	99.3 m ²	101.0 m ²	73.9 m ²	98.0 m ²
2009	121.6 m ²	105.1 m ²	112.1 m ²	104.6 m ²	93.6 m ²	104.4 m ²	98.4 m ²	101.5 m ²	74.1 m ²	98.2 m ²
2010	122.2 m ²	105.8 m ²	113.0 m ²	106.0 m ²	95.2 m ²	103.6 m ²	98.8 m ²	101.4 m ²	74.4 m ²	98.8 m ²
2011	123.3 m ²	106.0 m ²	113.5 m ²	106.9 m ²	95.4 m ²	103.3 m ²	100.2 m ²	100.8 m ²	73.9 m ²	99.0 m ²
2012	122.7 m ²	105.9 m ²	111.7 m ²	106.7 m ²	95.3 m ²	104.8 m ²	99.2 m ²	101.8 m ²	75.3 m ²	99.1 m ²
2013	126.0 m ²	106.2 m ²	112.6 m ²	108.1 m ²	95.3 m ²	105.5 m ²	98.8 m ²	102.0 m ²	75.3 m ²	99.6 m ²
2014	122.5 m ²	107.3 m ²	113.5 m ²	108.3 m ²	95.1 m ²	105.7 m ²	99.2 m ²	101.0 m ²	75.2 m ²	99.7 m ²
2015	123.5 m ²	106.8 m ²	114.1 m ²	108.2 m ²	95.0 m ²	104.4 m ²	100.2 m ²	101.1 m ²	73.0 m ²	99.2 m ²
2016	123.4 m ²	105.9 m ²	115.1 m ²	107.8 m ²	95.5 m ²	105.1 m ²	98.6 m ²	99.7 m ²	73.7 m ²	99.3 m ²
2017	124.8 m ²	107.1 m ²	115.0 m ²	106.8 m ²	96.3 m ²	105.5 m ²	99.0 m ²	99.6 m ²	74.6 m ²	99.6 m ²

Source: Average living space per residence in m² based on the habitable area of principal

residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

If a linear extrapolation of these values is carried out, the following curves result:

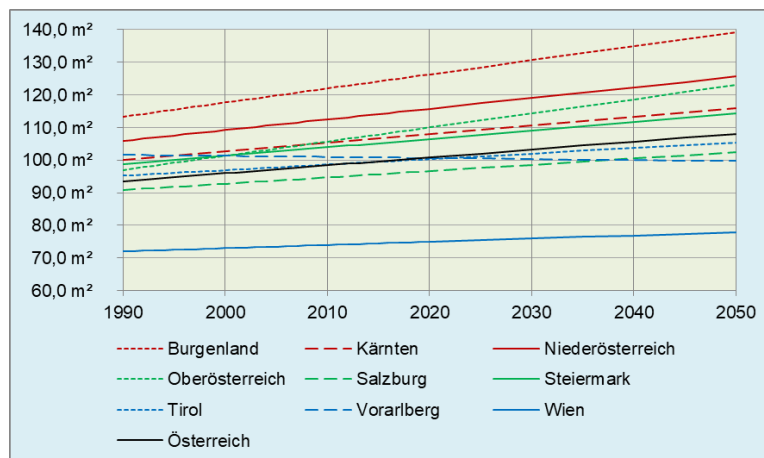


Figure 13: Average living space per residence (linear extrapolation)

Source: Self-calculation based on average living space per residence in m² based on the habitable area of principal residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

Burgenland	Burgenland
Oberösterreich	Upper Austria
Tirol	Tyrol
Österreich	Austria
Kärnten	Carinthia
Salzburg	Salzburg
Vorarlberg	Vorarlberg
Niederösterreich	Lower Austria
Steiermark	Styria
Wien	Vienna

The values of this linear regression are shown in the following table:

Table 4: Average living space per residence

Year	Burgen-land	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarl-berg	Vienna	Austria
1990	113.3 m ²	100.0 m ²	105.9 m ²	97.0 m ²	90.8 m ²	98.7 m ²	95.2 m ²	101.6 m ²	72.0 m ²	93.5 m ²
1991	113.8 m ²	100.3 m ²	106.3 m ²	97.4 m ²	91.0 m ²	98.9 m ²	95.4 m ²	101.6 m ²	72.1 m ²	93.8 m ²
1992	114.2 m ²	100.6 m ²	106.6 m ²	97.9 m ²	91.2 m ²	99.2 m ²	95.6 m ²	101.5 m ²	72.2 m ²	94.0 m ²
1993	114.6 m ²	100.8 m ²	106.9 m ²	98.3 m ²	91.4 m ²	99.4 m ²	95.7 m ²	101.5 m ²	72.3 m ²	94.3 m ²
1994	115.1 m ²	101.1 m ²	107.2 m ²	98.7 m ²	91.6 m ²	99.7 m ²	95.9 m ²	101.5 m ²	72.4 m ²	94.5 m ²
1995	115.5 m ²	101.4 m ²	107.6 m ²	99.2 m ²	91.8 m ²	100.0 m ²	96.1 m ²	101.4 m ²	72.5 m ²	94.8 m ²
1996	115.9 m ²	101.6 m ²	107.9 m ²	99.6 m ²	92.0 m ²	100.2 m ²	96.2 m ²	101.4 m ²	72.6 m ²	95.0 m ²
1997	116.3 m ²	101.9 m ²	108.2 m ²	100.0 m ²	92.2 m ²	100.5 m ²	96.4 m ²	101.4 m ²	72.7 m ²	95.2 m ²
1998	116.8 m ²	102.1 m ²	108.5 m ²	100.5 m ²	92.4 m ²	100.8 m ²	96.6 m ²	101.3 m ²	72.8 m ²	95.5 m ²
1999	117.2 m ²	102.4 m ²	108.9 m ²	100.9 m ²	92.6 m ²	101.0 m ²	96.7 m ²	101.3 m ²	72.9 m ²	95.7 m ²
2000	117.6 m ²	102.7 m ²	109.2 m ²	101.3 m ²	92.7 m ²	101.3 m ²	96.9 m ²	101.3 m ²	73.0 m ²	96.0 m ²

2001	118.1 m ²	102.9 m ²	109.5 m ²	101.8 m ²	92.9 m ²	101.5 m ²	97.1 m ²	101.2 m ²	73.1 m ²	96.2 m ²
2002	118.5 m ²	103.2 m ²	109.9 m ²	102.2 m ²	93.1 m ²	101.8 m ²	97.3 m ²	101.2 m ²	73.2 m ²	96.4 m ²
2003	118.9 m ²	103.5 m ²	110.2 m ²	102.6 m ²	93.3 m ²	102.1 m ²	97.4 m ²	101.2 m ²	73.3 m ²	96.7 m ²
2004	119.4 m ²	103.7 m ²	110.5 m ²	103.1 m ²	93.5 m ²	102.3 m ²	97.6 m ²	101.2 m ²	73.4 m ²	96.9 m ²
2005	119.8 m ²	104.0 m ²	110.8 m ²	103.5 m ²	93.7 m ²	102.6 m ²	97.8 m ²	101.1 m ²	73.5 m ²	97.2 m ²
2006	120.2 m ²	104.2 m ²	111.2 m ²	103.9 m ²	93.9 m ²	102.8 m ²	97.9 m ²	101.1 m ²	73.6 m ²	97.4 m ²
2007	120.7 m ²	104.5 m ²	111.5 m ²	104.4 m ²	94.1 m ²	103.1 m ²	98.1 m ²	101.1 m ²	73.7 m ²	97.7 m ²
2008	121.1 m ²	104.8 m ²	111.8 m ²	104.8 m ²	94.3 m ²	103.4 m ²	98.3 m ²	101.0 m ²	73.8 m ²	97.9 m ²
2009	121.5 m ²	105.0 m ²	112.1 m ²	105.2 m ²	94.5 m ²	103.6 m ²	98.4 m ²	101.0 m ²	73.9 m ²	98.1 m ²
2010	122.0 m ²	105.3 m ²	112.5 m ²	105.7 m ²	94.7 m ²	103.9 m ²	98.6 m ²	101.0 m ²	74.0 m ²	98.4 m ²
2011	122.4 m ²	105.6 m ²	112.8 m ²	106.1 m ²	94.9 m ²	104.2 m ²	98.8 m ²	100.9 m ²	74.1 m ²	98.6 m ²
2012	122.8 m ²	105.8 m ²	113.1 m ²	106.5 m ²	95.1 m ²	104.4 m ²	99.0 m ²	100.9 m ²	74.2 m ²	98.9 m ²
2013	123.3 m ²	106.1 m ²	113.5 m ²	107.0 m ²	95.3 m ²	104.7 m ²	99.1 m ²	100.9 m ²	74.3 m ²	99.1 m ²
2014	123.7 m ²	106.3 m ²	113.8 m ²	107.4 m ²	95.5 m ²	104.9 m ²	99.3 m ²	100.8 m ²	74.4 m ²	99.3 m ²
2015	124.1 m ²	106.6 m ²	114.1 m ²	107.8 m ²	95.6 m ²	105.2 m ²	99.5 m ²	100.8 m ²	74.4 m ²	99.6 m ²
2016	124.6 m ²	106.9 m ²	114.4 m ²	108.3 m ²	95.8 m ²	105.5 m ²	99.6 m ²	100.8 m ²	74.5 m ²	99.8 m ²
2017	125.0 m ²	107.1 m ²	114.8 m ²	108.7 m ²	96.0 m ²	105.7 m ²	99.8 m ²	100.7 m ²	74.6 m ²	100.1 m ²
2018	125.4 m ²	107.4 m ²	115.1 m ²	109.1 m ²	96.2 m ²	106.0 m ²	100.0 m ²	100.7 m ²	74.7 m ²	100.3 m ²
2019	125.9 m ²	107.7 m ²	115.4 m ²	109.6 m ²	96.4 m ²	106.2 m ²	100.2 m ²	100.7 m ²	74.8 m ²	100.6 m ²
2020	126.3 m ²	107.9 m ²	115.7 m ²	110.0 m ²	96.6 m ²	106.5 m ²	100.3 m ²	100.6 m ²	74.9 m ²	100.8 m ²
2025	128.5 m ²	109.2 m ²	117.4 m ²	112.2 m ²	97.6 m ²	107.8 m ²	101.2 m ²	100.5 m ²	75.4 m ²	102.0 m ²
2030	130.6 m ²	110.6 m ²	119.0 m ²	114.3 m ²	98.6 m ²	109.1 m ²	102.0 m ²	100.3 m ²	75.9 m ²	103.2 m ²
2035	132.8 m ²	111.9 m ²	120.7 m ²	116.5 m ²	99.5 m ²	110.4 m ²	102.9 m ²	100.2 m ²	76.4 m ²	104.4 m ²
2040	134.9 m ²	113.2 m ²	122.3 m ²	118.7 m ²	100.5 m ²	111.7 m ²	103.7 m ²	100.0 m ²	76.9 m ²	105.6 m ²
2045	137.1 m ²	114.5 m ²	123.9 m ²	120.8 m ²	101.5 m ²	113.1 m ²	104.6 m ²	99.8 m ²	77.4 m ²	106.8 m ²
2050	139.3 m ²	115.8 m ²	125.6 m ²	123.0 m ²	102.4 m ²	114.4 m ²	105.4 m ²	99.7 m ²	77.9 m ²	108.0 m ²

Source: Self-calculation based on average living space per residence in m² based on the habitable area of principal residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

Similarly, the following table provides an overview of the development of average living space per person (2004-2017) and is the basis for further modelling:

Table 5: Average living space per person

Year	Burgen-land	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarl-berg	Vienna	Austria
2004	46.6 m ²	43.4 m ²	45.1 m ²	41.2 m ²	38.4 m ²	41.5 m ²	38.7 m ²	39.5 m ²	36.9 m ²	41.0 m ²
2005	47.3 m ²	43.5 m ²	45.5 m ²	42.0 m ²	38.9 m ²	42.4 m ²	39.2 m ²	39.9 m ²	36.8 m ²	41.5 m ²
2006	48.4 m ²	43.9 m ²	46.9 m ²	42.5 m ²	39.3 m ²	42.6 m ²	39.7 m ²	40.2 m ²	36.5 m ²	41.9 m ²
2007	48.4 m ²	44.1 m ²	46.8 m ²	43.4 m ²	39.8 m ²	43.1 m ²	40.9 m ²	40.9 m ²	36.5 m ²	42.3 m ²
2008	49.8 m ²	44.0 m ²	46.7 m ²	43.4 m ²	40.4 m ²	43.8 m ²	41.1 m ²	40.9 m ²	37.1 m ²	42.6 m ²
2009	49.8 m ²	45.4 m ²	47.2 m ²	43.7 m ²	39.8 m ²	44.4 m ²	41.1 m ²	41.4 m ²	37.2 m ²	42.9 m ²
2010	50.3 m ²	46.0 m ²	47.9 m ²	44.6 m ²	40.8 m ²	44.4 m ²	41.6 m ²	41.7 m ²	37.3 m ²	43.4 m ²
2011	51.2 m ²	46.4 m ²	48.4 m ²	45.3 m ²	41.0 m ²	44.5 m ²	42.6 m ²	41.8 m ²	37.1 m ²	43.7 m ²
2012	51.1 m ²	46.7 m ²	47.9 m ²	45.5 m ²	41.2 m ²	45.5 m ²	42.4 m ²	42.6 m ²	37.8 m ²	44.0 m ²

2013	52.7 m ²	47.2 m ²	48.5 m ²	46.4 m ²	41.5 m ²	45.9 m ²	42.4 m ²	42.9 m ²	37.7 m ²	44.4 m ²
2014	51.5 m ²	48.0 m ²	49.1 m ²	46.6 m ²	41.6 m ²	46.3 m ²	42.9 m ²	42.8 m ²	37.8 m ²	44.7 m ²
2015	52.3 m ²	48.1 m ²	49.5 m ²	46.9 m ²	41.8 m ²	46.0 m ²	43.6 m ²	43.1 m ²	36.6 m ²	44.6 m ²
2016	52.6 m ²	48.0 m ²	50.0 m ²	46.7 m ²	41.9 m ²	46.4 m ²	43.1 m ²	42.6 m ²	36.6 m ²	44.6 m ²
2017	53.6 m ²	48.8 m ²	50.1 m ²	46.4 m ²	42.3 m ²	46.9 m ²	43.4 m ²	42.7 m ²	36.7 m ²	44.8 m ²

Source: Average living space per person in m² based on the habitable area of principal residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

If a linear extrapolation of these values is carried out, the following curves result:

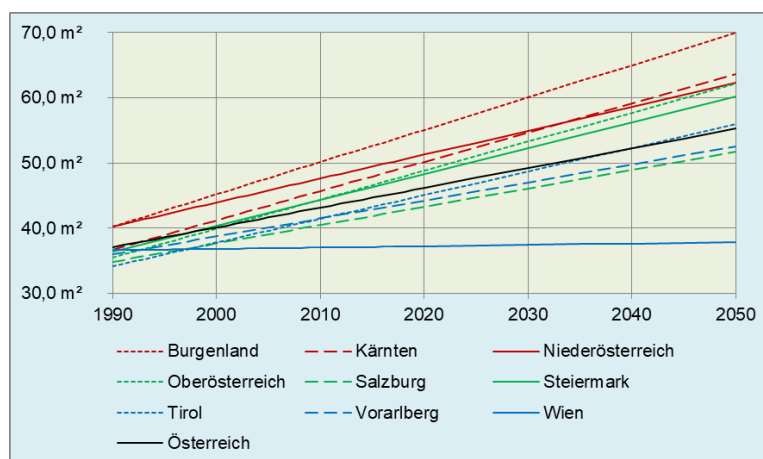


Figure 14: Average living space per person (linear extrapolation)

Source: Self-calculation based on average living space per person in m² based on the habitable area of principal residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

Burgenland	Burgenland
Oberösterreich	Upper Austria
Tirol	Tyrol
Österreich	Austria
Kärnten	Carinthia
Salzburg	Salzburg
Vorarlberg	Vorarlberg
Niederösterreich	Lower Austria
Steiermark	Styria
Wien	Vienna

The values of this linear regression are shown in the following table:

Table 6: Average living space per person

Year	Burgen-land	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarl-berg	Vienna	Austria
1990	40.3 m ²	36.7 m ²	40.3 m ²	35.5 m ²	34.9 m ²	36.5 m ²	34.2 m ²	36.0 m ²	36.6 m ²	37.1 m ²
1991	40.8 m ²	37.2 m ²	40.7 m ²	36.0 m ²	35.1 m ²	36.9 m ²	34.5 m ²	36.3 m ²	36.6 m ²	37.4 m ²

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
1992	41.3 m ²	37.6 m ²	41.0 m ²	36.4 m ²	35.4 m ²	37.3 m ²	34.9 m ²	36.5 m ²	36.7 m ²	37.7 m ²
1993	41.8 m ²	38.1 m ²	41.4 m ²	36.8 m ²	35.7 m ²	37.7 m ²	35.3 m ²	36.8 m ²	36.7 m ²	38.0 m ²
1994	42.2 m ²	38.5 m ²	41.8 m ²	37.3 m ²	36.0 m ²	38.0 m ²	35.6 m ²	37.1 m ²	36.7 m ²	38.3 m ²
1995	42.7 m ²	39.0 m ²	42.1 m ²	37.7 m ²	36.3 m ²	38.4 m ²	36.0 m ²	37.4 m ²	36.7 m ²	38.6 m ²
1996	43.2 m ²	39.4 m ²	42.5 m ²	38.2 m ²	36.6 m ²	38.8 m ²	36.4 m ²	37.7 m ²	36.7 m ²	38.9 m ²
1997	43.7 m ²	39.9 m ²	42.9 m ²	38.6 m ²	36.8 m ²	39.2 m ²	36.7 m ²	37.9 m ²	36.8 m ²	39.2 m ²
1998	44.2 m ²	40.3 m ²	43.2 m ²	39.1 m ²	37.1 m ²	39.6 m ²	37.1 m ²	38.2 m ²	36.8 m ²	39.5 m ²
1999	44.7 m ²	40.8 m ²	43.6 m ²	39.5 m ²	37.4 m ²	40.0 m ²	37.4 m ²	38.5 m ²	36.8 m ²	39.8 m ²
2000	45.2 m ²	41.2 m ²	44.0 m ²	40.0 m ²	37.7 m ²	40.4 m ²	37.8 m ²	38.8 m ²	36.8 m ²	40.1 m ²
2001	45.7 m ²	41.7 m ²	44.3 m ²	40.4 m ²	38.0 m ²	40.8 m ²	38.2 m ²	39.0 m ²	36.8 m ²	40.4 m ²
2002	46.2 m ²	42.1 m ²	44.7 m ²	40.8 m ²	38.2 m ²	41.2 m ²	38.5 m ²	39.3 m ²	36.9 m ²	40.7 m ²
2003	46.7 m ²	42.6 m ²	45.1 m ²	41.3 m ²	38.5 m ²	41.6 m ²	38.9 m ²	39.6 m ²	36.9 m ²	41.0 m ²
2004	47.2 m ²	43.0 m ²	45.4 m ²	41.7 m ²	38.8 m ²	42.0 m ²	39.3 m ²	39.9 m ²	36.9 m ²	41.3 m ²
2005	47.7 m ²	43.5 m ²	45.8 m ²	42.2 m ²	39.1 m ²	42.4 m ²	39.6 m ²	40.1 m ²	36.9 m ²	41.7 m ²
2006	48.2 m ²	43.9 m ²	46.2 m ²	42.6 m ²	39.4 m ²	42.8 m ²	40.0 m ²	40.4 m ²	36.9 m ²	42.0 m ²
2007	48.7 m ²	44.4 m ²	46.5 m ²	43.1 m ²	39.6 m ²	43.2 m ²	40.4 m ²	40.7 m ²	37.0 m ²	42.3 m ²
2008	49.2 m ²	44.8 m ²	46.9 m ²	43.5 m ²	39.9 m ²	43.6 m ²	40.7 m ²	41.0 m ²	37.0 m ²	42.6 m ²
2009	49.7 m ²	45.3 m ²	47.3 m ²	43.9 m ²	40.2 m ²	44.0 m ²	41.1 m ²	41.2 m ²	37.0 m ²	42.9 m ²
2010	50.2 m ²	45.7 m ²	47.6 m ²	44.4 m ²	40.5 m ²	44.4 m ²	41.4 m ²	41.5 m ²	37.0 m ²	43.2 m ²
2011	50.7 m ²	46.2 m ²	48.0 m ²	44.8 m ²	40.8 m ²	44.8 m ²	41.8 m ²	41.8 m ²	37.0 m ²	43.5 m ²
2012	51.2 m ²	46.6 m ²	48.4 m ²	45.3 m ²	41.1 m ²	45.1 m ²	42.2 m ²	42.1 m ²	37.1 m ²	43.8 m ²
2013	51.6 m ²	47.1 m ²	48.7 m ²	45.7 m ²	41.3 m ²	45.5 m ²	42.5 m ²	42.3 m ²	37.1 m ²	44.1 m ²
2014	52.1 m ²	47.5 m ²	49.1 m ²	46.2 m ²	41.6 m ²	45.9 m ²	42.9 m ²	42.6 m ²	37.1 m ²	44.4 m ²
2015	52.6 m ²	48.0 m ²	49.5 m ²	46.6 m ²	41.9 m ²	46.3 m ²	43.3 m ²	42.9 m ²	37.1 m ²	44.7 m ²
2016	53.1 m ²	48.4 m ²	49.8 m ²	47.1 m ²	42.2 m ²	46.7 m ²	43.6 m ²	43.2 m ²	37.1 m ²	45.0 m ²
2017	53.6 m ²	48.9 m ²	50.2 m ²	47.5 m ²	42.5 m ²	47.1 m ²	44.0 m ²	43.4 m ²	37.2 m ²	45.3 m ²
2018	54.1 m ²	49.3 m ²	50.6 m ²	47.9 m ²	42.7 m ²	47.5 m ²	44.3 m ²	43.7 m ²	37.2 m ²	45.6 m ²
2019	54.6 m ²	49.8 m ²	50.9 m ²	48.4 m ²	43.0 m ²	47.9 m ²	44.7 m ²	44.0 m ²	37.2 m ²	45.9 m ²
2020	55.1 m ²	50.2 m ²	51.3 m ²	48.8 m ²	43.3 m ²	48.3 m ²	45.1 m ²	44.3 m ²	37.2 m ²	46.2 m ²
2025	57.6 m ²	52.5 m ²	53.1 m ²	51.1 m ²	44.7 m ²	50.3 m ²	46.9 m ²	45.6 m ²	37.3 m ²	47.7 m ²
2030	60.1 m ²	54.7 m ²	55.0 m ²	53.3 m ²	46.1 m ²	52.3 m ²	48.7 m ²	47.0 m ²	37.4 m ²	49.2 m ²
2035	62.5 m ²	57.0 m ²	56.8 m ²	55.5 m ²	47.5 m ²	54.2 m ²	50.5 m ²	48.4 m ²	37.5 m ²	50.7 m ²
2040	65.0 m ²	59.2 m ²	58.6 m ²	57.7 m ²	48.9 m ²	56.2 m ²	52.3 m ²	49.8 m ²	37.6 m ²	52.3 m ²
2045	67.5 m ²	61.5 m ²	60.5 m ²	59.9 m ²	50.3 m ²	58.2 m ²	54.2 m ²	51.2 m ²	37.7 m ²	53.8 m ²
2050	69.9 m ²	63.7 m ²	62.3 m ²	62.1 m ²	51.7 m ²	60.1 m ²	56.0 m ²	52.5 m ²	37.8 m ²	55.3 m ²

Source: Self-calculation based on average living space per person in m² based on the habitable area of principal residences, by province. Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018.

This results in the following numbers of principal residences:

Table 7: Average numbers of principal residences

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
1990	96,347	200,616	556,821	477,456	182,849	432,674	223,035	115,719	761,717	3,047,234
1991	97,811	203,903	566,050	487,366	187,222	437,651	227,539	118,547	768,669	3,094,758
1992	99,342	207,770	575,645	497,668	191,787	443,635	232,417	121,008	776,877	3,146,149
1993	100,524	211,102	583,973	506,334	195,824	448,822	236,879	122,858	783,100	3,189,416
1994	101,681	213,527	590,163	512,824	198,530	452,580	240,737	124,485	783,786	3,218,313
1995	102,775	215,867	595,567	517,865	200,535	455,966	244,178	125,995	780,511	3,239,259
1996	103,582	217,955	600,071	522,302	202,342	459,150	247,674	127,403	779,768	3,260,247
1997	104,252	219,705	604,218	526,567	204,008	462,314	251,138	128,831	779,630	3,280,663
1998	104,891	221,488	608,845	530,944	205,379	465,514	254,397	130,340	779,015	3,300,813
1999	105,487	223,322	613,812	535,790	206,883	468,713	257,714	131,959	780,334	3,324,014
2000	106,107	224,927	618,869	540,786	208,737	471,929	261,202	133,639	782,669	3,348,865
2001	106,970	226,643	624,096	546,012	210,714	476,352	264,867	135,441	787,748	3,378,843
2002	107,798	228,273	629,415	551,704	212,169	481,054	268,291	137,325	797,356	3,413,385
2003	108,550	229,769	635,096	557,167	213,758	485,142	271,802	139,108	805,813	3,446,205
2004	109,660	231,652	642,486	563,314	216,051	490,146	275,792	141,263	814,919	3,485,283
2005	110,839	233,757	650,562	569,470	218,256	495,217	279,950	143,423	825,037	3,526,511
2006	112,036	235,730	657,989	574,995	220,189	499,785	283,914	145,252	831,908	3,561,798
2007	113,135	237,703	664,597	579,747	221,528	503,802	287,051	146,931	835,694	3,590,188
2008	114,454	239,463	670,871	584,415	222,849	507,597	290,251	148,545	839,795	3,618,240
2009	115,733	240,867	676,224	588,497	224,046	511,058	293,232	150,078	843,832	3,643,567
2010	116,813	242,080	680,694	592,376	225,407	514,725	296,263	151,665	848,830	3,668,853
2011	117,947	243,370	685,841	596,825	227,148	518,726	299,805	153,217	854,688	3,697,567
2012	119,153	244,844	690,910	602,017	229,082	522,969	303,773	154,944	863,382	3,731,074
2013	120,235	246,520	696,420	607,829	231,213	527,543	308,235	156,920	875,835	3,770,750
2014	121,303	248,727	703,823	615,258	233,813	533,135	313,142	159,302	888,857	3,817,360
2015	122,651	251,349	712,180	624,241	237,151	539,605	318,641	162,096	904,722	3,872,636
2016	124,398	254,207	723,293	634,684	240,989	547,457	325,110	165,634	923,419	3,939,191
2017	125,335	255,825	729,390	642,012	243,583	551,823	329,723	168,291	934,950	3,980,932
2018	126,564	257,501	735,392	648,887	246,140	556,284	334,120	170,664	944,161	4,019,713
2019	127,876	259,124	741,775	655,266	248,621	560,283	338,128	172,982	951,756	4,055,811
2020	129,246	260,831	748,717	661,445	250,908	564,756	342,160	175,176	958,320	4,091,559
2025	136,268	269,668	785,084	691,554	261,377	588,217	361,877	185,430	985,046	4,264,521
2026	137,674	271,410	792,328	697,405	263,318	592,825	365,678	187,379	989,546	4,297,563
2030	143,198	278,155	820,694	719,838	270,478	610,726	380,209	194,748	1,004,891	4,422,937
2035	149,622	285,671	853,823	744,943	277,938	631,436	396,748	203,069	1,018,501	4,561,751
2040	155,483	292,420	884,973	767,673	284,821	650,561	412,296	210,977	1,030,310	4,689,514
2045	160,739	298,366	914,019	787,910	291,095	668,003	426,762	218,422	1,040,338	4,805,654
2050	165,356	303,476	940,842	805,544	296,732	683,669	440,058	225,355	1,048,606	4,909,638

Source: Statistics Austria, *Bevölkerungsprognose 2018* [Population forecast 2018]. Published on 22 November 2018.

In order to establish correlations between residences and principal residence numbers, as well as between SFBs, MFBs and APBs, the available data from 2001 and 2011 can be used.

Table 8: Average numbers of principal residences

2001	SFB	MFB	APB	Total
Buildings	1,557,420	142,351	61,196	1,760,967
Residences	1,809,380	791,584	1,134,782	3,735,746
Principal residences	1,636,517	715,958	1,026,368	3,378,843
2011	SFB	MFB	APB	Overall
Buildings	1,727,129	175,910	70,940	1,973,979
Residences	2,012,192	961,237	1,326,620	4,300,049
Principal residences	1,730,263	826,558	1,140,747	3,697,567

Source: Statistics Austria, Census of buildings and residences 2001 (Statistics Austria, *Statistisches Jahrbuch 2007* [Statistical Yearbook 2007]) and Statistics Austria, Register-based statistics as of 31 October 2011 (Statistics Austria, *Statistisches Jahrbuch 2014* [Statistical Yearbook 2014])

In order to establish correlations between residences and principal residence numbers, as well as between SFBs, MFBs and APBs, the available data from 2001 and 2011 can be used.

Table 9: Linear regression of building types and of the relationship between principal residences and residences from 1990-2050

Year	SFBs	MFBs	APBs	[Principal residence/hab]
1990	50.2%	19.9%	29.9%	95.3%
2000	48.6%	21.1%	30.3%	90.9%
2010	47.0%	22.2%	30.8%	86.4%
2020	45.3%	23.4%	31.3%	82.0%
2030	43.7%	24.6%	31.8%	77.5%
2040	42.0%	25.7%	32.2%	73.1%
2050	40.4%	26.9%	32.7%	68.6%

Source: Self-calculated

1.2 Overview of cost-effective approaches to renovation (Article 2a(1)(b))

This section is preceded by a description of how the terms (i) inspection and servicing (maintenance), (ii) repair and corrective maintenance and (iii) refurbishment and renovation are conceptually differentiated in the present document.

- (i) Inspection is understood to mean the regular checking of buildings, building units and technical building systems by expert personnel to ensure that they are fully functional, in relation to their characteristics. A check of this kind is intended to help keep unplanned dysfunctions as rare as possible. The classic, well-known example is probably the regular inspection of heat supply systems, during which any servicing can be carried out at the same time. The principle of business-as-usual costs (i.e. costs that would be incurred in any case) can be seen in action here, since the expert personnel is already in place, the relevant part of the technical building systems is perhaps already open and additional servicing/maintenance

work only results in low additional costs. Sometimes – especially shortly after completion or with a new installation – the purpose of such inspections is not immediately clear, especially since servicing is rarely required in such circumstances. It is precisely for this reason that the establishment of sensible interval periods is of great importance for an optimised risk assessment. Despite this, regular inspection and servicing cannot, from a purely statistical point of view, guarantee that no dysfunction will occur before the end of the expected service life, although it will lower the probability of this. Of course, the reverse can also happen, i.e. functional operation without regular inspection and servicing or far beyond the expected service life, but again with a lower probability.

- (ii) Repair and corrective maintenance is understood to mean the immediate remedy of an unscheduled dysfunction in order to restore the functional equivalent of a building, building unit or building technology. These measures are generally carried out under a certain time pressure and often do not allow the consideration of alternatives in the light of previous solutions. Examples would include a damaged single window (e.g. after a storm) or broken glass (e.g. by a ball), which can best be repaired using a very similar window or glass. The same is true of an acutely leaky roof (e.g. after a hailstorm), which can easily be repaired by restoration, or a boiler that is not working and that, despite regular inspection and servicing, simply has to be replaced urgently before the end of its expected service life and therefore before any planned replacement date. In all cases urgency is of the essence, and there is probably no time for alternative solutions or even additional measures.
- (iii) Refurbishment and renovation are understood to mean planned changes to the building, building units or building technology which can be planned without the time pressure of a dysfunction that has already occurred and which probably have to be planned at regular intervals. An essential element of such measures is the possibility of considering alternatives in the light of previous solutions. To stick with the examples above: windows that are reaching the end of their service life should not necessarily be replaced by identical windows, but instead by windows with, for example, higher thermal protection and perhaps the possibility of shading. Roofs that are reaching the end of their service life should not necessarily be replaced by identical roofs, but instead by roofs with, for example, higher thermal protection and perhaps the possibility of retrofitting the roof for photovoltaics. A fossil fuel boiler that is reaching the end of its service life should not necessarily just be replaced by a new boiler – consideration should instead be given to replacing it with a highly efficient alternative heating system.

Of course, all these measures have to be undertaken with a view to optimising costs, whereby influencing factors (change in investment costs, change in energy prices, change in capital costs) are supplemented by the volatility of the different lengths of service life and probable or improbable dysfunctions and thus an economic risk assessment. In any case, there are arguments for an extensive refurbishment/major renovation and arguments for an extensive refurbishment/major renovation and reasons for a refurbishment/renovation through individual measures:

Arguments for extensive refurbishment/major renovation/against refurbishment/renovation through individual measures:

If the opportunity is taken to carry out extensive refurbishment/major renovation while the building, the building units and the building technology are still fully functional, the preparation and planning work can be done more or less without any time pressure and – which is a significant benefit – in the event of implementation, the business-as-usual costs are fully minimised. In order to satisfy the principle of cost optimality, the residual values lost would have to be lower than any increased frequency of the aforementioned business-as-usual costs.

Arguments for refurbishment/renovation through individual measures/against extensive refurbishment/major renovation:

If the chosen option is to carry out refurbishment/renovation through individual measures, but with the objective of an extensive refurbishment/major renovation, all residual values for all elements can be fully utilised, but in tandem with the disadvantage of the frequent incurrence of the aforementioned business-as-usual costs.

It is worth observing at this point that it is not only through a process of optimising investment costs (including their financing) plus ongoing costs (energy costs in the narrower sense, plus inspection and servicing) against non-renewable primary energy demand that the principle of cost optimality can be satisfied, but that it can also be based on aspects such as the following:

- After a temporary refurbishment/renovation phase, extensive refurbishments/major renovations allow a long period of completely undisturbed operation. Such considerations may have a role to play, especially in any monetary evaluation of the 'degree of being undisturbed'.
- In contrast, limitations in financing could make of extensive refurbishments/major renovations quite impossible.

However, there may of course also be ecological considerations to take into account which give weight to the idea that something that 'works' should by no means be replaced prematurely, since, from a sustainability point of view, the energy expenditure for producing a completely new element must also be considered.

The sociological aspect, moreover, is probably a very important one: in this connection, preservation aspects (conservation of sites of historic interest, group conservation of listed buildings, etc.) have a prominent role to play and often preclude extensive refurbishment/major renovation. Especially in such cases, it may be necessary to continue to allow systems based on 'high-temperature heaters' (as opposed to the goal of using low and lowest-temperature heaters).

It is assumed in this document that the sole focus of the full-building refurbishments (i.e. buildings that have undergone a major renovation) under consideration was the thermal energy impact. This means that, in contrast to a refurbishment rate that is based on a number of buildings, residences, or the floor areas belonging to them, the refurbishment rate used here is based solely on the energy improvement as a result of refurbishment, specifically in terms of how buildings from the pre-1990 period have been brought into a thermal energy condition that at the very least complies with the requirements for major renovations from OIB Guideline 6 that have been in force since 2007.

If we take the approximately 3 million principal residences in 1990 (Table 7) as the starting point, it can be assumed that since then, the thermal energy condition of the buildings in which these principal residences are located has improved in relation to their thermal-energetic condition by a little over 1.5% a year. This percentage results from the bases of model development for the evidence-based estimate of the expected energy savings in Section 1.7. This rate of 1.5% means an energy saving of approximately 1 TWh/a, less the energy for newly constructed buildings/principal residences.

Without describing the procedure in detail here, it is worth mentioning that an attempt was made in collaboration between federal and provincial authorities to relate the number of equivalent full-building refurbishments to those buildings that were built before 1990 (i.e. believed to be in a condition that would benefit from refurbishment in terms of thermal or energy characteristics), are not subject to conservation as a site of historic interest or under group preservation of listed buildings (i.e. are also in a legally refurbishable condition) and have not yet been refurbished. The refurbishment rate determined in this way is between 4.7% and 5.5%.

In order to make the economic effects a little more transparent, it is worth stating the following numerical considerations

- According to Euroconstruct, Austria spent €5,336,000,000 on refurbishments in the residential buildings sector in 2017;
- According to Table 14 in Chapter 1.7, there was approximately 285 km² of useful floor area in residential buildings in 1990 (those built before this date are regarded as in need of thermal energy refurbishment);
- As stated above, Austria has an 'effective' thermal energy refurbishment rate of approximately 1.5%, which corresponds to around 4.3 km².
- Dividing the €5.4 billion by the 4.3 km² gives a result of approximately €1,250 per m² of useful floor area. If these were only thermal energy refurbishments and if the savings were assumed to

be approximately 200 kWh/m²a and €0.10/kWh, it would take over 60 years for these investments to break even using a linear approach; correspondingly, with assumed savings of only approximately 100 kWh/m²a and €0.10/kWh, this would take over 120 years. It is likely that non-thermal-energy refurbishments were also carried out. If the distribution were roughly 1:1, that would still give a payback period of 30 or 60 years, respectively.

- However, the savings in general for the 285 km² are assuredly not in the region of 200 kWh/m²a and probably not always in the region of 100 kWh/m²a, based on consumption (only the base for hot water is to be taken into account), and the attractiveness of payback periods that are in the range of the service life is probably also rather limited.

The following procedure can be implemented in order to use the trigger points suggested in the EPBD, whereby OIB Guideline 6 (April 2019 edition) now suggests the optional use of renovation certificates and refurbishment plans. Of course, a structure-specific approach must not be based solely on the optimum for the building, but also and above all on the financial possibilities:

It is probably sensible to allocate a good portion of these refurbishment costs to practical maintenance – one hopes that contributions to maintenance will have been put aside over the years of use – and only a small portion to thermal energy improvement. If, for example, only €50 per m² out of approximately €600 per m² is allocated to thermal energy improvement, payback will be achieved in just a few years. The remaining costs are then maintenance costs, without which continued use would not have been possible. Clearly, these costs also include the general business-as-usual costs.

Examples:

- Roofs must be repaired after a period of use. They are replaced beyond the minimum, in such a way that the envelope requirement can be met proportionately.
- Facades must be repaired after a period of use. They are replaced beyond the minimum, in such a way that the envelope requirement can be met proportionately.
- Windows must be replaced after a period of use. They are replaced beyond the minimum, in such a way that the envelope requirement can be met proportionately.
- Basement ceilings and any floors in contact with the earth must be repaired after a period of use. They are replaced beyond the minimum, in such a way that the envelope requirement can be met proportionately.

The situation is similar with building technology:

Technical building systems must be repaired and/or replaced at regular intervals in line with their expected service life. They are to be replaced beyond the basic level of the minimum eco-design requirements in place on the market, in such a way that they satisfy the energy performance and renewable energy requirements.

In order to maintain the current level of refurbishment/renovation work, approximately €5.3 billion in economic output must continue to be spent per year (corresponding to approximately €600 per head or a little over €1,200 per household), especially since there are often motivations for thermal energy improvements that go hand in hand with a multitude of other home improvement options, which of course can also be seen as refurbishment/renovation work. One need only think of the upgrading of existing buildings for the purposes of improving accessibility.

1.3 Overview of policies and actions to stimulate cost-effective deep renovation of buildings (Article 2a(1)(c))

Federal policies and actions

The Austrian Federal Government's *Sanierungsoffensive* [Refurbishment offensive] was launched in 2009 and has established itself as an important and successful incentive for companies and private individuals to reduce energy consumption through measures to refurbish buildings. The subsidy is given in the form of one-off, non-repayable grants.

In recognition of the great importance of architectural heritage for Austria's economic development, the *Sanierungsoffensive* was expanded in 2012 to include a category for listed buildings. The special

criteria allow the promotion of thermal refurbishments while preserving the architectural appearance.

The preliminary results for 2018 indicate that 5,782 private and 180 corporate refurbishment projects were funded, triggering sustainable investments of around €283 million. According to the calculations of Kommunalkredit Public Consulting, these subsidised measures result in annual energy savings of around 111,000 MWh, as well as annual CO₂ savings of over 35,300 tonnes. Private individuals were able to obtain up to €5,000 for replacing a fossil fuelled heating system with a climate-friendly one (*Raus-aus-dem-Öl* [Leave oil behind]). Funding of up to €6,000 was available for the thermal refurbishment of the envelope. Depending on the quality of the refurbishment, companies were able to receive funding of up to 30% of the investment costs.

Raus-aus-dem-Öl and refurbishment cheque for private individuals 2019:

Thanks to the good response to the campaign in 2018, the subsidy offer was continued with a focus on the *Raus-aus-dem-Öl* bonus. In order to make the switch to a climate-friendly heating system even easier, the *Raus-aus-dem-Öl* bonus of 2019 supported the replacement of heating systems regardless of whether the building was simultaneously being refurbished. In this case, it was mandatory to submit a valid energy certificate for the residential building or an energy consultation report from the province in question. The subsidy amounts (up to €5,000 in single-family or dual-family buildings and up to €1,000 in multi-storey apartment blocks) remained essentially unchanged.

Individuals submitting thermal refurbishment measures were able to obtain a grant of up to €6,000, as well as a supplement of up to €3,000 for the use of renewable raw materials.

In order to increase the impact of the funding, the funding criteria were discussed intensively with the provinces and coordinated as far as possible. The switch to online submission made it considerably easier for funding applicants to apply. A cooperation was entered into with the Province of Salzburg for this online submission, so that applicants could apply for both subsidies with a single application.

Thermal building refurbishment for businesses 2019:

Subsidies were given for measures to improve the thermal protection of business buildings over 20 years old. The level of the disbursements was based on the quality of the refurbishment and the reduction in heat demand for heating and amounted to up to 30% of the investment costs.

There was a supplement for the use of insulating materials made from renewable raw materials and for EMAS-certified undertakings.

Further information can be found at <https://www.bmnt.gv.at/service/foerderungen-des-bmnt.html>

Outlook:

The medium and long-term orientation of the federal *Sanierungsoffensive* is an important component in the finalisation of the national energy and climate plan. The goal-oriented alignment of this instrument is intended, as far as possible, to be coordinated with those of the provinces in terms of budget, content and organization with regard to the 2030 goals. The aim is to help achieve goals in an unbureaucratic manner with the lowest possible cost burden for public budgets.

The *klimaaktiv* [Climate active] climate protection initiative:

As part of the *klimaaktiv Bauen&Sanieren* [Build & Refurbish climate-actively] programme, the Federal Ministry for Sustainability and Tourism (BMNT)'s climate protection initiative developed the *klimaaktiv* building standard – across Austria the best-known rating system for the sustainability of buildings with a particular focus on energy efficiency, climate protection and resource efficiency. It is available for residential buildings and service buildings and provides specific help for property developers, planners, builders, housing developers and provincial housing support agencies, as well as for anyone constructing or refurbishing a building. The Federal Government offers *klimaaktiv* quality assurance and advice for the extensive refurbishment of various types of building at a cost-optimal level.

Further information can be found at www.klimaaktiv.at/bauen-sanieren.

Model refurbishment offensive under the climate and energy fund:

Support is given to extensive refurbishment projects for business or public buildings. Measures to improve thermal protection, to promote the use of renewable energy carriers and to increase energy efficiency are funded. For buildings that satisfy the *klimaaktiv* Gold Standard, there is a supplement of 5% of the eligible costs.

Provincial policies and actions

Burgenland

Energy consultation in Burgenland:

Under the slogan *Wohnbau Beratung mit Energie* [Housing Advice with Energy], Burgenland's housing support offers all members of the public a 'one-stop-shop' for free, independent advice for private, residential construction or refurbishment projects. The advisors of the Province of Burgenland are highly experienced and have undergone continuous development and training in the fields of energy, housing and aid measures. The free advice provides comprehensive information about energy-related topics in the fields of the new construction and refurbishment of buildings, heating and air conditioning of buildings, and electricity applications.

Members of the public receive well-founded and coordinated information in the fields of thermal insulation, windows and window installation, heating systems, subsidies, energy saving tips, photovoltaics, storage systems, savings and much more.

A wide variety of brochures and guides are available free of charge for all topics.

The energy consultations last between 1.5 and 2 hours and take place on site, at the offices of the district administration or of the Burgenland Provincial Government or in a local civic centre. Questions that can be answered quickly are often dealt with on the phone (service hotline) or by email.

Members of the public apply online or by phone for a consultation, and work with the consultant to create a cost-optimal and ecologically prudent refurbishment and new-build plan. At the end of the consultation, customers receive a consultation report.

Quality assurance of the consultations:

The energy consultations are continuously evaluated. The training and continuous development of the energy consultants is carried out in accordance with the guidelines of the *ARGE EBA* (*Arbeitsgemeinschaft Energieberater-Ausbildung* [Working Group on Energy Consultant Training]).

Housing support:

Burgenland's housing support was reorganised in September 2018 under Burgenland's Housing Support Act 2018 [*Wohnbauförderungsgesetz 2018*]. The Housing Support Act and associated guidelines have been adapted in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law (*Bundes-Verfassungsgesetz – B-VG*) between the Federal Government and the provinces on reducing the emission of greenhouse gases.

The main focus was on securing high-quality, affordable living space, taking into account spatial planning, climate and ecological aspects, as well as social, economic and ecological sustainability.

The prevention of urban sprawl, reduction of land take, revitalisation of urban centres and structural consolidation were also put on a firmer footing in the Housing Support Act. The aim is also to promote a diversity of dwelling types in order both to enable older people to stay in familiar surroundings and to offer young people affordable living space. Special attention was also given to the achievement of climate protection goals, to energy efficiency and the careful use of resources.

In order to promote new builds, the amount of the subsidised loan is staggered according to income and the energy efficiency of the building. In addition to basic support, bonus amounts may also be awarded for, *inter alia*, construction that limits land consumption. The use of ecological building materials is a prerequisite for receiving support.

In order to promote refurbishment, incentives were created and the level of support increased. The requirement to submit an energy certificate ensures that cost-optimal refurbishment measures are implemented. Particular attention was given to thermal and extensive energy refurbishment. With a corresponding improvement in the thermal quality of the building envelope (refurbishment of window surfaces, the roof or top floor ceiling, facade surfaces, the basement ceiling, as well as energy-relevant heating systems), up to 80% of eligible refurbishment costs can be funded. The use of oil- or coal-fired heaters represents a funding exclusion criterion.

Leaseholders of dwellings receive financial support.

The Burgenland Housing Support Act and associated guidelines are published on the province's website and can be accessed at the following address: www.burgenland.at/wbf

Promotion of alternative energy systems:

A non-repayable grant can be awarded for the establishment of facilities for the renewables-based generation of energy to provide space heating and hot water and to conserve energy and raw resources.

Boiler replacement:

The switch from an oil-fired boiler to a highly efficient alternative heating system in single- and dual-family houses is promoted under the slogan *Machen Sie Schluss mit Ihrem Ölkessel* [Call time on your oil-fired boiler].

Carinthia

Measures under the Carinthian Energy master plan for the private sector

The overarching goal of the Carinthian Energy master plan is the complete decarbonisation of the spheres of heating and electricity.

On-site energy consultation

Independent, product- and company-neutral, quality-verified energy consultation is the key to the implementation of high-quality energy efficiency measures and also an essential trigger for investments in the construction industry (construction and ancillary construction trades). The number of subsidised on-site energy consultations is to be significantly increased – from approximately 2,000 consultations a year currently.

Carinthia's *Energieberater-Netzwerk* [Energy consultants network] (netEB)

Plans for the on-site energy consultation funded by the Province of Carinthia include personal certification. Regular continuous development and a minimum activity level are prerequisites for working within the network. The network offers its members experience-sharing, continuous development, current information, support and advertising.

Thermal building refurbishment

The refurbishment rate is to be increased, with the main aim being to see 'major renovations' carried out. Since private investors such as building and residence owners need to be encouraged to invest, the presentation of the benefits and public relations work are of particular importance. Additional simple funding incentives are to be created, with a simplified procedure and application process.

In many e5 communities, private households will be motivated to undertake refurbishments through awareness-raising measures and additional community funding.

Carinthian housing support

Housing support was reorganised under Carinthia's Housing Support Act 2017 [*Wohnbauförderungsgesetz 2017*] and incentive systems for climate-friendly and ecological measures to achieve climate protection goals were created for the purposes of sustainability and clean energy, in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law between the Federal Government and the provinces on reducing the emission of greenhouse gases.

As far as concerns support for new builds, the level of the subsidised loan is to a large extent dependent on the energy efficiency achieved. Starting from basic support for a maximum of 130 m² of usable living space, the total support amount can be topped up with bonus amounts such as an environmental bonus, redensification bonus, location quality bonus, passive house bonus or a bonus for greening measures designed to prevent summer overheating. There is increased support for the use of ecological building materials and of solar energy. In addition, for first-time buyers of a residential property, the bonus for low-temperature heating and the attainment of the *klimaaktiv* silver quality level also increase the level of support. When it comes to support for owner-occupiers, applicants can choose between a subsidised loan or a non-repayable one-off grant (known as the *Häuslbauerbonus*), which is granted at a higher level for nearly zero-energy buildings or redensification.

With regard to refurbishment, the *Raus aus fossilen Brennstoffen* [Leave fossil fuels behind] incentive scheme once again placed emphasis on reducing CO₂ emissions by increasing support for the switch to energy-efficient building technology systems and lifting the limit on usable living space. This includes the doubling of support for replacing fossil-fuelled heating systems (coal, heating oil, gas) with biofuelled ones. There is additional emphasis on the promotion of solar energy (solar-powered systems, photovoltaic systems), on single-component refurbishment and the use of sustainable building materials, and on extensive energy refurbishment with the additional funding of a refurbishment coach. Furthermore, an insulation offensive was launched in 2020, with increased support for the use of renewable raw materials. As part of a free on-site energy consultation, applicants are offered optimised and comprehensive information, and for the first time the question of the summer suitability of a residential building is also dealt with.

Support is available either in the form of a one-off grant or through the award of a subsidised loan, with a higher level of support for those attaining a *klimaaktiv* quality level in multi-storey apartment blocks.

The improvement and increase in support for the creation of living space in existing properties by converting, extending, or integrating and acquiring vacant existing properties in heavily built-up areas is intended to bolster the use of existing resources and existing infrastructure and facilitate a space-saving way of building through high-quality redensification. Support for the acquisition of properties in town and city centres has been increased. Support takes the form of a low-interest loan with a term of 20 years.

As far as relates to multi-storey apartment blocks, the main aim of Carinthia's Housing Support Act 2017 is to create affordable living space while satisfying sustainability aspects. The incentive schemes that are key to this are being created by making renewable energy sources more available, improving access to climate-friendly forms of mobility such as cycle paths and local public transport networks or providing arrangements for alternative forms of mobility, and by mandatory measures to prevent summer overheating. Residential properties that achieve a *klimaaktiv* standard are given a higher level of support.

The guidelines to Carinthian housing support were published on Department 11's home page at www.wohnbau.ktn.gv.at. Detailed information on the subjects of energy and the environment can be found on Department 8's home page at www.umwelt.ktn.gv.at.

Refurbishment obligation for the ceilings of topmost storeys

One possible measure would be to make it obligatory to refurbish the ceilings of topmost storeys; this would have to be implemented primarily by means of statutory provisions. Such an obligation is conceivable because these measures can be implemented with relatively little financial expenditure and under economic conditions, whereby the obligation would be 'cushioned' by increased support (e.g. 50% of the investment costs).

Optimisation of heating systems

In the past, excessively large boilers were often installed, which led to inefficient operation. The aim is now to use appropriate optimisation measures (especially in respect of regulation, in the technical rather than the legal sense) to achieve an energy efficiency potential of approximately 10% (without involving a boiler or 'major' investments). This is to be made possible by a higher-quality inspection of the heating systems (which must now also be carried out every three years).

Boiler replacement (switch to renewable energy carriers)

When existing oil-fired boilers are replaced, only renewable energy carriers are to be used. As described in *#mission2030*, it should become socially acceptable to move on from the fossil-powered, oil-fired heating stock, starting with older boilers. The aim is that, by 2030, at least half of all oil-fired boilers will have been replaced.

Efficiency measures for the use of electrical energy

In relation to the use of electrical energy, a large number of simple and – in most cases – inexpensive and short-term economic measures are set to save a large amount of energy. These measures include, for example, preventing standby losses, replacing old heating pumps, installing smart meters, optimising lighting or switching to LEDs, and replacing electrical appliances.

Energy accounting (energy measurement and visualisation)

An essential motivational tool for increasing energy efficiency in the private sector is knowledge among the population of what every individual is able to achieve. In order to reach this goal, it is useful to give people a tool for comparing energy consumption in the form of simple and user-friendly software (e.g. a web application). The experience with energy accounting from the *e5* communities should be taken into account. Private energy accounting is an integral element of smart cities.

Legal provisions pursuant to the Carinthian Building Regulations

Under Section 43(12) of the Carinthian Building Regulations [*Kärntner Bauvorschriften – K-BV*) the Provincial Government is required to ensure – except where these requirements are taken care of by the Federal Government, statutory professional interest groups or other third parties – that:

- owners or tenants of buildings or building units are appropriately informed about the various methods and practical processes for improving the overall energy efficiency of a building; information on energy certificates and inspection findings and the financial instruments available to improve the energy performance of buildings must also be provided;
- information is provided about the net benefits, costs and energy efficiency of installations and systems for the use of heat, cooling and electricity from renewable energy sources;
- appropriate instructions and training are available to persons authorised to issue energy certificates; particular attention must be paid to the importance of improving energy performance, taking account of the optimal combination of improvements in energy efficiency, the use of renewable energy sources and the use of district heating and cooling in planning, design, construction and renovation;
- if necessary, guidance is available to professionals involved in the planning, construction and renovation of buildings so that they can properly consider the optimal combination of renewable energy sources, high-efficiency technologies and district heating and cooling in their work;
- regularly updated lists of bodies authorised to issue energy certificates or an accredited testing body (Section 43(5)), as well as of specialists authorised to carry out recurrent inspections of air conditioning systems (Section 50(6)), are available to the public on the home page of the Province of Carinthia.

Measures under the Carinthian Energy master plan for the public sector

Extensive thermal building refurbishment

The aim is to increase the refurbishment rate for public buildings. In order to set a good example for the public at large, when energy refurbishments are carried out, ecological building and insulation

materials should be used as far as possible. Since public institutions do not have the financial means required, alternative funding options such as energy performance contracting models must also be considered in order to give implementation the necessary push.

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),
- building-thermographic images,
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with various target groups (associations, business and commerce, schools, public authorities, etc.) to initiate projects,
- public relations (all media and target groups).

Heating check and accompanying measures (optimisation of heating systems)

The aim is to apply appropriate optimisation measures to heating systems to achieve an energy efficiency potential of approximately 10% (without involving replacing a boiler or 'major' investments). This is to be made possible by high-quality inspections of the heating systems.

Boiler replacement (switch to renewable energy carriers)

The main aim is that, by 2025, 100% of the energy supply for heating purposes (space heating and electricity) will come from renewable energy carriers. To do this it is necessary, as a minimum, for the approximately 500 oil-fired boilers currently still installed to be replaced with boilers powered by renewable energy carriers or with connection to biofuel-powered local heating networks. The necessary investment costs could also be raised through (energy-saving) contracting models, in which case regional building pools should be formed to increase cost efficiency.

The initiatives of the municipalities of Diex and Griffen, which aim to become the first municipalities in Austria to eliminate oil-fired boilers thanks to awareness-raising measures and additional support measures, are good examples.

Efficiency measures for the use of electrical energy

In relation to the use of electrical energy, a large number of simple and – in most cases – inexpensive and short-term economic measures could save a large amount of energy. Essentially, these measures consist of preventing standby losses, replacing old pumps and optimising lighting or switching to LEDs. Numerous measures have already been successfully implemented in this area.

Legal provisions pursuant to the Carinthian Building Regulations for the public sector

Under Section 43(13) of the Carinthian Building Regulations, the province and municipalities must ensure as far as possible that, for buildings which they own, they comply with the recommendations set out in an energy certificate within the certificate's period of validity and that the roofs of buildings that are used for public purposes or mixed public and private purposes are used for installations to generate energy from renewable sources. In addition, Section 43(5b) of the same Regulations requires an energy certificate to be issued for all buildings that are heavily trafficked by the public and in which more than 250 m² of total useful floor area is used by public authorities.

Carinthian School-building Fund

In respect of the refurbishment of school buildings, the guidelines of the Carinthian School-building Fund provide that measures that serve to reduce emissions of greenhouse gases, in particular extensive energy refurbishments, the use of ecologically compatible building materials and low-carbon

or no-carbon building technology systems, as well as innovative climate-relevant systems and the use of renewable energy carriers, must be prioritised for funding (Section 3 of the Carinthian School-building Fund Guidelines).

ökofit [Eco fit] Carinthia regional scheme

This regional scheme supports efficiency consultations. The consulting services range from simple inspection days and energy consultations to support in obtaining various certificates in the energy and environmental sector (the Austrian Ecolabel, ISO 14001, ISO 50001, EMAS, etc.). The maximum duration of a consultation varies from one to twenty days, depending on the consultation service chosen.

Promotion of alternative energy

The Carinthian alternative energy promotion guideline 2019/2020 [*Richtlinie Alternativenergieförderung Kärnten 2019/2020*] is intended to support or enable individual measures to promote the use of renewable energy carriers and increase energy efficiency in the field of non-residential buildings. In this connection, particular attention is to be paid to the ability of public institutions such as municipalities, educational institutions, etc. to act as role models. Funding is provided for the new construction, conversion and modernisation of environmentally and climate-friendly heat generators, photovoltaic systems, electricity storage systems and measures to increase the energy efficiency of installations in the Province of Carinthia.

Lower Austria

The Lower Austrian Energy roadmap 2030 [*NÖ Energiefahrplan 2030*]

The Lower Austrian Provincial Government adopted a comprehensive roadmap – the Lower Austrian Energy roadmap 2030 – back in 2011. It laid down the goals for the restructuring of the energy system along with strategic guidelines for transitioning to a new energy era. The three key points for increasing independence, security of energy supply and protecting the climate are as follows:

- reducing energy consumption through efficiency increases, new technologies and innovations,
- transitioning to renewable energy carriers,
- a resource-conserving lifestyle.

For the buildings sector, a significant reduction in energy consumption and a clear orientation towards a climate-neutral energy supply was decided upon. The increase in energy consumption due to new buildings is to be compensated for by disproportionate savings in existing buildings.

The Lower Austrian Climate and energy roadmap 2020-2030 [*NÖ Klima-und Energiefahrplan 2020-2030*] looking forward to 2050

The Lower Austrian Climate and energy roadmap 2020-2030 was adopted in June 2019 and is the continuation of the Lower Austrian Energy roadmap 2030, by means of which Lower Austria is setting course for a clean, renewable and sustainable energy future.

With ambitious but feasible goals, the aim is to provide guidance and facilitate planning for communities, the economy and everyone in Lower Austria.

Specific goals to be met by 2030 include the following:

- reducing greenhouse gas emissions by 36%,
- generating 2,000 gigawatt hours from photovoltaics and 7,000 gigawatt hours of wind power,
- supplying 30,000 additional households with heat from biomass and renewable gas,
- creating 10,000 new jobs through 'green technologies',
- ensuring that one in five cars on Lower Austrian roads is electrically powered.

Lower Austria is seeking to be free of fossil-produced fuel oil, to rely increasingly on e-mobility, to eliminate the need for coal altogether and thus to continue resolutely along the energy transition path on which it has already set out.

The Lower Austrian Climate and energy programme 2020 [NÖ Klima-und Energieprogramm 2020]

In order to realise the targets of the energy roadmap, the Lower Austrian Provincial Government adopted a comprehensive policy action paper, the Lower Austrian Climate and energy programme 2020. This paper, last updated in 2017, contains 224 specific actions.

The Lower Austrian Climate and energy programme defines the following focuses for the buildings sector:

- greater focusing of subsidies for both residential and non-residential buildings on energy efficiency and the use of renewable energy carriers,
- consistent adaptation of the legal framework for a sustainable building stock,
- bolstering knowledge and awareness of sustainable building and living.

The actions in the buildings sector were collated under the following headings:

- promoting the thermal refurbishment of residential buildings,
- promoting the thermal refurbishment of non-residential buildings (offices, sales outlets, hotels, etc.),
- improving the legal conditions for thermal refurbishment,
- replacing climate-unfriendly heating systems with more sustainable ones,
- promoting efficient energy systems (heating, ventilation, air conditioning, lighting, appliances) in the buildings sector,
- promoting future-proofed new-builds – en route to the positive-energy building,
- promoting climate-friendly building materials (in new builds and refurbishments),
- focusing the training and continuous development of professionals and public authorities on climate protection.

Building Code and Construction Engineering Ordinance – technical bases for building refurbishments

Lower Austrian building legislation implements OIB Guideline 6. This guideline provides the technical basis for cost-effective (cost-optimal) buildings and building renovations. The guideline builds on the OIB Document demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU and subsequently on the OIB Document defining nearly zero-energy buildings and establishing intermediate targets in a national plan pursuant to Article 9(3) of Directive 2010/31/EU.

The guidelines for housing support and, of course, the content of publicly funded consulting services are aligned with this technical basis.

Energy advice for Lower Austria [Energieberatung Niederösterreich]:

Under the slogan *Energieberatung Niederösterreich* [Energy advice for Lower Austria], the Province of Lower Austria offers all citizens a largely free service relating to all energy matters in the field of housing. In addition to extensive information material there is also a hotline for advice and for arranging personal consultations. Interested parties can take advantage of on-site consultations concerning the refurbishment of a building, the conversion of a heating system and the conservation of electricity. Around 80 consultants are currently listed for the consultations. The consultants undergo a detailed selection process and receive regular continuous development. Consultation guides and brochures are available free of charge for all topics.

Consultation services

- Immediate advice
Questions that can be answered quickly can often be dealt with on the phone. A free hotline is available for that purpose. The hotline is staffed by qualified energy consultants.
- Consultation about refurbishments/energy conservation
 - on-site consultation lasting around 1.5 hours,

- condition analysis of the building, assessment of the energy-saving potential,
 - energy-efficiency assessment of the thermal insulation, heating and hot water provision,
 - information about subsidies,
 - refurbishment suggestions for the building envelope and heating,
 - general advice on electricity consumption, mobility and climate protection and the use of renewable energy carriers (e.g. solar thermal collectors, photovoltaic systems, etc.).
- Consultation about new builds
Personal initial consultation on all aspects of construction, energy, mobility, subsidies and further consultation options concerning new builds.
 - Heating check
 - approx. 1.5-hour on site stocktake of heating systems,
 - analysis of the heating system,
 - drawing-up of tips for optimising the heating systems,
 - in the course of the heating check, the building envelope is also examined and refurbishment suggestions are produced.
 - Electricity conservation consultation
 - on-site consultation lasting approximately 1.5 hours analysing appliances that consume electricity,
 - development of replacement recommendations,
 - development of tips on how to use electricity efficiently.

Quality assurance of the consultations

In addition to a detailed selection process for the consultants, consultation services are consistently evaluated. The training and continuous development of the consultants is carried out in accordance with the guidelines of the *ARGE EBA* [Working Group on Energy Consultant Training] of Austria's provinces.

Housing support

Lower Austria's housing support provides financial support for the refurbishment of living space. The support is paid out in the form of an annual grant for the eligible refurbishment amount. Support is contingent upon the submission of an energy certificate; measures that are listed for support in the energy certificate are funded. The requirement to produce an energy certificate ensures that cost-optimal refurbishment measures are implemented. The points system within refurbishment support provides an effective incentive to switch to high-efficiency alternative energy systems.

Lower Austria's housing support/owner-occupied home refurbishment primarily supports thermal and energy-related refurbishment measures, such as thermal protection of the ceiling of the topmost storey, thermal protection of floors and basement ceilings, thermal protection of the walls, facade refurbishment and the replacement of windows and doors. Support is also given for the optimisation of building technology systems, such as connection to high-efficiency district heating, buffer storage, housing ventilation systems, solar-powered systems, heat pump systems, photovoltaic systems, biofuelled heating systems, etc.

The level of the eligible refurbishment amount is determined using a points system and is made up of the sum of the points awarded on the basis of the energy certificate and those awarded on the basis of sustainability. The points system creates an incentive to reduce the heat demand for heating as sustainably as possible. In addition, the support also defines minimum requirements for the individual exterior components.

Points are awarded on the basis of the difference in the heat demand for heating before and after the refurbishment or the achievement of a certain heat demand for heating and also, for heating systems based on renewable systems, on that of sustainability. The use of fossil fuelled heating systems will lead to an exclusion from funding.

Lower Austrian Energy Efficiency Act [*Energieeffizienzgesetz – EEG*]

The Lower Austrian Energy Efficiency Act entered into force as early as 1 May 2012. The Act aims to increase energy efficiency in the Province of Lower Austria. In addition to the main topics of energy conservation and energy efficiency, the Act also covers sustainable procurement.

The Act creates the legal framework for the removal of market obstacles that prevent efficient end use of energy. In addition, it aims to create conditions to promote the market for energy services and thus to improve energy efficiency for end consumers: [NÖ Energieeffizienzgesetz \(EEG\)](#)

The law specifically targets the municipalities and those responsible for other public buildings. The following points are relevant in this regard:

- the introduction of energy accounting,
- the appointment of an energy officer,
- acting as a role model for the public sector,
- the establishment of energy-relevant criteria for procurement.

Since 2013, the municipalities and those responsible for other public buildings have been obliged to appoint energy officers. This energy officer can be a municipality employee, a councillor or an interested member of the public within the municipality. External individuals or technical offices may also be given this role.

The Energy Efficiency Act stipulates that an energy officer must be professionally qualified. This professional qualification is deemed to be in place where an individual can evidence at least 40 hours of training in energy efficiency (in particular concerning the fundamentals of building physics, heating technology, ventilation and air conditioning technology, electrical energy).

For the introduction of mandatory energy accounting, the province provides the free use of an internet-based energy accounting tool. With the help of this application, consumption of energy and resources can be easily recorded and evaluated. The tool also makes it easier for the energy officer to prepare a report on the energy consumption situation, as required by the Energy Efficiency Act. This makes buildings comparable and enables benchmarks to be created.

The e5 scheme for municipalities

The e5 scheme supports municipalities in sustainable climate protection work. The aim is to implement long-term measures and evaluate their effectiveness. Hardly any other initiative can demonstrate a similarly successful, comprehensive and consistent approach at municipal level. With e5, participating municipalities get tools and support to set and achieve their energy and climate protection goals.

Based on quality management systems, the e5 scheme should be understood as a process in which the following steps take place:

- uncovering of weaknesses and identification of potential for improvement,
- instigation of an improvement process,
- building and/or bolstering of structures and processes for the successful implementation of energy projects,
- facilitating the participation of the population in energy policy decisions and activities,
- regular internal and external performance monitoring, as well as local municipal awards.

Impact of e5 on building refurbishment:

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- training courses for employees of the municipalities (energy consultant training, etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),

- building-thermographic images,
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with various target groups (associations, business and commerce, schools, public authorities, etc.) to initiate projects,
- public relations (all media and target groups).

Specifications for province-owned buildings

The specifications for province-owned buildings set out in detail the minimum level of technical provision for province-owned buildings. This applies not only to the stipulations in respect of energy consumption, but also to the technical provision of the building technology systems and control systems.

With regard to the heat demand for heating and the quality of the building envelope, passive house quality is stated as the goal, while the choice of energy carrier is based on the high-efficiency systems under OIB Guideline 6.

Upper Austria

The Upper Austrian energy strategy

The energy policy goals of the Province of Upper Austria were set in 2017 with the adoption of the energy strategy *Energie-Leitregion OÖ 2050* [Upper Austria Energy Leader 2050] (decision of the Provincial Government of 27 February 2017, decision of the Provincial Parliament of 18 May 2017). The vision behind this strategy is to establish Upper Austria as an international lead energy region in respect of an above-average improvement in energy efficiency, in the application of new technologies and as an international technology leader in selected core areas of energy and environmental technology.

Quantitative goals include a continuous improvement of energy-related greenhouse gas emissions, with a reduction in emission intensity (GHG to GRP_{real} [Gross Regional Product_{real}], based on 2014) of 25-33% by 2030 and 70-90% by 2050, a continuous increase in energy efficiency (final energy to BRP_{real}) with a reduction in energy intensity of 1.5-2% per year and an increase in the renewables share of electricity consumption to 80-97% by 2030. For the buildings sector, the goal set was to continuously improve the heat intensity by reducing the energy consumption per m² (climate-adjusted) by 1% per year

Provision of energy consultations

Through its energy agency, the Upper Austrian Energy Saving Association [*Oberösterreichischer Energiesparverband*], the Province of Upper Austria offers a comprehensive and product-independent range of energy advisory services for the refurbishment of buildings for private individuals, businesses and public institutions.

All the details can be found at

www.energiesparverband.at

Energy consultation in relation to refurbishment and renovation for private individuals

Anyone planning the refurbishment of an owner-occupied home or, for example, considering the purchase of a new heating system is entitled to a free, individual energy consultation. In most cases, the consultation takes place on site and takes about 1.5 hours.

Consultation by phone

Many questions that can be answered quickly can be dealt with via the energy savings hotline. A free hotline is provided for this purpose on 0800 205 206, as well as the electronic *Ask an Expert* service.

Energy consultation for businesses

The energy consultation for businesses service supports businesses in reducing their energy costs and thereby increasing their competitiveness. The consultants draw up tailor-made suggestions for all areas relating to the improvement of energy efficiency in buildings. They provide frameworks for decision-making on the use of innovative technologies and renewable energy sources within businesses. Consultation takes place on site in the company/business building and includes up to 3 consultation days.

Energy consultation for public buildings

The free consultation offered by the Province of Upper Austria (e.g. for municipal buildings) includes an on-site consultation and covers all areas relating to the improvement of energy efficiency in buildings and how they can switch to renewable energy. These areas range from reducing operating costs and energy savings, correct user behaviour and procurement, questions about the refurbishment of schools and other public buildings, and lighting projects to specific support in terms of implementation or participation in architectural competitions.

So far, 230 local energy advice days have been organised in cooperation with Upper Austria's municipalities. Energy consultants from the provincial agency carry out energy consultations, usually in a room provided by the municipality.

Municipal and regional energy plans

Energy plans are an important tool for establishing the current energy status and planning the energy future, in particular for implementing specific measures in public buildings. The province's Energy Saving Association advises municipalities and other local authorities on the creation of regional and municipal energy plans. In order to promote the holistic increase in energy efficiency at the local level, the Energy-saving Community [*Energiespargemeinde – E-GEM*] scheme was launched several years ago, which has since been continued in the shape of the Community Energy Scheme [*Gemeinde-Energie-Programm – E-GEP*]. This scheme provides an additional impetus for local holistic energy planning activities. 182 *E-GEM* communities are currently carrying out local energy planning or are implementing their plans.

Advice on social media

In addition to consultations in person, more than 100,000 registered visitors are counted each year on the Upper Austrian Energy Saving Association's internet portals, with more than 300,000 recorded page views.

Quality assurance

In order to improve and further develop the range of advisory services, energy consultations are continuously evaluated. The results of the evaluation play an important part in the continuous development of the energy consultants, as well as in the market-oriented further development of the advisory services. Customers rate the range of services and the advice given by the province's Energy Saving Association as very good; the consultations received an average grade of 1.16 using the Austrian school grading system, where 1 is excellent and 2 is good.

Training and continuous development – *Energy Academy*

The extensive training and continuous development programme of the Province of Upper Austria's Energy Saving Association takes account of the wide range of developments in the field of energy technology. Under the auspices of the *Energy Academy*, a comprehensive continuous development programme is available covering all aspects of energy technology, energy management, energy consulting, construction engineering, renewable energy and energy efficiency. The target market includes energy managers in companies, communities and institutions, construction engineering and building technology systems experts, planners, energy consultants, energy auditors and interested citizens. There are currently over 30 seminars on various topics. www.energyacademy.at

Energy consultant training and continuous development for consultants

Energy consultant training is an essential tool to meet the increasing demand for energy

consultations. For many participants it represents further vocational training; for others it is their entry point into a new field of work. The energy consultant courses run for the province by the Upper Austrian Energy Saving Association are based on the course concept developed by the national Working Group on Energy Consultant Training (ARGE EBA). Since the early 1990s, around 1,000 people have taken part in energy consultant training in Upper Austria.

Housing support

Upper Austria’s housing support is a key measure to stimulate cost-effective deep renovation of buildings. The details are regulated in the province’s Regulations on the refurbishment of residential buildings. According to the report on climate protection measures in the buildings sector pursuant to Article 15a of the Austrian Federal Constitutional Law, Upper Austria has achieved the highest refurbishment rate in the last six years.

Environmental support

With the support for boiler replacement under the province’s environmental support programme, significant incentives to switch from fossil fuels to renewable energy carriers/sources were put in place; see also: <https://www.energiesparverband.at/fileadmin/esv/Broschueren/Heizkesseltausch-Folder.pdf>

Construction law

The Construction Engineering Ordinance Amendment 2017 implemented OIB Guideline 6 and laid down new requirements for energy indicators for major renovations for residential and non-residential buildings.

Salzburg

The Salzburg Provincial Government adopted the Salzburg climate and energy strategy *Salzburg 2050* as early as 2012.

In order to implement this decision of principle, a long-term target path to 2050 was developed, with specific intermediate targets for 2020, 2030 and 2040 – in line with the latest economic knowledge and the corresponding objectives of the European Union – and adopted as the province’s fundamental framework for climate and energy policy objectives.

Klima- und Energiestrategie SALZBURG 2050



Diese Zielsetzungen verstehen sich bilanziell pro Jahr. Das Bezugsjahr für die Treibhausgasreduktion ist 2005 und entspricht dem Bezugsjahr der EU-2020-Vorgaben. Erneuerbare Energieträger sind wie in der Energieträgerklassifikation der Energiebilanzen (Statistik Austria) nach den EU-Vorgaben definiert. Die Treibhausgase entsprechen jenen der Zweiten Verpflichtungsperiode des Kyoto-Protokolls.

Klima- und Energiestrategie SALZBURG 2050	SALZBURG 2050 climate and energy strategy
Minus 30% Treibhausgase	30% reduction in greenhouse gases

50% Anteil erneuerbare Energie Alle Landesgebäude werden zu 100 Prozent durch Fernwärme und/oder erneuerbare Energieträger versorgt.	50% renewables share All province-owned buildings are 100% supplied by district heating and/or renewable energy carriers.
Minus 50% Treibhausgase 65% Anteil erneuerbare Energie Strom in Salzburg wird zu 100 Prozent aus erneuerbaren Energien erzeugt. Warmwasser in Salzburg wird zu 100 Prozent solar aufbereitet.	50% reduction in greenhouse gases 65% renewables share 100% of electricity in Salzburg generated from renewables. 100% of hot water in Salzburg produced solar-thermally.
Minus 75% Treibhausgase 80% Anteil erneuerbare Energie Raumwärme wird zu 100 Prozent aus erneuerbaren Energieträgern oder durch Fernwärme erzeugt.	75% reduction in greenhouse gases 80% renewables share 100% of space heating provided from renewable energy carriers or district heating.
klimateutral energieautonom nachhaltig	Climate-neutral Energy-autonomous Sustainable
Diese Zielsetzungen verstehen sich bilanziell pro Jahr. Das Bezugsjahr für die Treibhausgasreduktion ist 2005 und entspricht dem Bezugsjahr der EU-2020-Vorgaben. Erneuerbare Energieträger sind wie in der Energieträgerklassifikation der Energiebilanzen (Statistik Austria) nach den EU-Vorgaben definiert. Die Treibhausgase entsprechen jenen der Zweiten Verpflichtungsperiode des Kyoto-Protokolls.	These objectives are to be understood as on an annual, balance sheet basis. The reference year for greenhouse gas reduction is 2005, which corresponds to the reference year for the EU-2020 stipulations. Renewable energy carriers are as defined in the energy carrier classification on Statistics Austria's energy balance sheets, which are in accordance with EU specifications. The greenhouse gases correspond to those of the second commitment period under the Kyoto Protocol.

The first important step in this strategy is to achieve the targets for 2020:

- 30% less greenhouse gas emissions than in the reference year, 2005,
- 50% share of total energy consumption from renewable energy carriers/sources.

In order to achieve these ambitious goals, the Provincial Government has adopted the *Masterplan Klima + Energie 2020* [Climate + Energy Master Plan 2020]. It has two pillars:

- 54% Energy and greenhouse gas savings,
- 46% Expansion of renewable energy.

Primary action areas

Energy and greenhouse gas savings

- public transport and cycling,
- replacement of old oil-fired boilers (with renewable energy carriers/sources),
- province-owned buildings/large-volume housing,
- geothermal energy (savings in the district heating network),
- the province as a role model (vehicle fleet, procurement, etc.).

Expansion of renewable energy

- geothermal energy (renewable heat in the district heating network)
- hydropower
- solar initiative (photovoltaics and solar thermal energy)
- wind power.

Services in Salzburg

Energy Consulting Salzburg [*Energieberatung Salzburg*] – Free and independent on-site consultation for new builds and refurbishments

Energy Consulting Salzburg offers all Salzburg households the possibility of free and independent advice for the private residential sector. Over 40 specially trained consultants serve customers quickly and individually on site (1½ hours).

The aim of every consultation is to achieve optimal energy cost savings step by step.

- identify potential for improvement,
- evaluate the planning concept and check for energy efficiency,
- discuss support options,
- definition of quality criteria for soliciting quotations,
- analysis of the energy advantages and disadvantages of different offers.

Customers apply online or by phone for a consultation. They then work with the consultant on site at the property in question to develop a cost-optimal and ecologically prudent refurbishment or new-build plan. At the end of the consultation, customers receive a consultation protocol with a recommendation individually tailored to their needs. Approximately 2,500 consultations are carried out annually.

www.salzburg.gv.at/zeus

Training and continuous development

The training and continuous development of the consultants is carried out in accordance with the guidelines of the *ARGE EBA* [Working Group on Energy Consultant Training] of Austria's provinces.

Salzburg Environmental Service

In addition, the Salzburg Environmental Service provides independent advice on all environmental issues for businesses, communities and institutions.

<https://umweltservicesalzburg.at/>

Salzburg housing support

As part of Salzburg housing support, a supplementary subsidy on top of basic support was created as early as 1993 for energy performance measures that go beyond the applicable minimum requirements in construction law. The measures eligible for support for the purpose of improving energy performance and reducing greenhouse gas emissions have been continually adjusted. The minimum requirements introduced for putting nearly-zero energy construction into practice were implemented in close coordination with construction law.

- Minimum requirements for energy performance for nearly-zero energy residential buildings in accordance with the Salzburg Construction Engineering Ordinance [*Salzburger Bautechnikverordnung – S.BTV*] Provincial Law Gazette (LGBl) No. 55/2016
 - New builds must achieve a thermal protection characteristic value (LEK_T) of ≤ 22 and a primary energy indicator (P_i) of ≤ 40;
 - After major renovations, existing buildings must achieve a thermal protection characteristic value (LEK_T) of ≤ 26 and a primary energy indicator (P_i) of ≤ 68. It is permitted to exceed the minimum requirements for major renovations for technical, functional and economic reasons.
- Minimum requirements for energy performance for residential buildings in accordance with the Salzburg Housing Support Ordinance [*Salzburger Wohnbauförderungsverordnung 2015 – WfV 2015*] Provincial Law Gazette (LGBl) No. 103/2016
 - As a prerequisite for support, new builds must achieve a thermal protection characteristic value (LEK_T) of ≤ 20 and a primary energy indicator (P_i) of ≤ 40;
 - As a prerequisite for support, 'energy-efficient existing buildings' must achieve a thermal protection characteristic value (LEK_T) of ≤ 26 and a primary energy indicator (P_i) of ≤ 68 (minimum energy performance requirements for major renovations).

The reference equipment for a nearly zero-energy building is based on heat supply via a high-efficiency alternative system (biomass heating, heat pump) in accordance with the EPBD, minimum thermal insulation of the building envelope of $LEK_{\tau} = 22$ and photovoltaic equipment with an effective rated output of 14 W per m² of gross floor area.

The LEK_{τ} value requirement guarantees the limitation of the average transmission coefficient for heat of a building depending on its characteristic length (gross volume/building envelope), while the P_i value requirement does likewise for the equivalent transmission coefficient for primary energy and carbon dioxide.

Moreover, energy support from the Province of Salzburg must comply with the stipulations of the province's Energy Efficiency Guideline:

https://www.salzburg.gv.at/bauenwohnen/_Documents/2016_Richtlinie_Energieeffizienz.docx.pdf
[in German]

Refurbishment support

Eligible measures	
1.	Improving the structural thermal protection of the building envelope <ul style="list-style-type: none"> - exterior walls - topmost storey ceiling or sloping roof - basement ceiling, floors or walls in contact with the earth and ceilings in contact with the outside air.
2.	Replacement of windows and/or exterior doors
3.	Installation or modernisation of a heat supply system with associated storage, where the new heat supply is provided through a biomass-fired central heating system (pellets, firewood, wood chips), local or district heating or through an electrically operated heating pump
4.	In combination with a measure as referred to in point 3: the first-time installation of a heat distribution system including radiators
5.	Installation, modernisation or expansion of a solar thermal collector
6.	Installation, modernisation or expansion of a photovoltaic solar installation and installation or expansion of a thermal storage facility
7.	Roof refurbishment including thermal insulation, provided that the measure cannot be funded under point 1.

Energy performance-dependent subsidy system

The support for energy performance improvements in new builds and in refurbishments consists of a basic amount and supplements.

Basic amount in new builds or basic subsidy rate for refurbishment measures

In the case of new builds, the basic amount is a subsidy rate per m² of eligible usable living space or per housing unit. In the case of eligible measures for the refurbishment of the building envelope or the building technology systems, the basic subsidy rate is 15% of the eligible costs. In the case of a major renovation, where the energy performance requirements for energy-efficient existing buildings are met, the basic subsidy rate is 20% of the eligible costs.

Supplements for improved energy performance

The level of the supplementary subsidy for energy performance depends on the sustainability primary energy indicator (N_{i30}). In addition to the primary energy demand and the carbon dioxide emissions for

building air conditioning, this also takes into account the manufacturing of the building materials used to erect the building. The period under consideration for the depreciation of building materials is set at 30 years. Depending on the N_{i30} value, between 0 and 40 supplementary points can be achieved. The higher the number of supplementary points, the higher the supplementary subsidy.

By way of example, in the case of refurbishment measures with 40 supplementary points, the supplement subsidy rate increases by 20%. The total amount of refurbishment support can range from a minimum of 15% to a maximum of 40% of the eligible refurbishment costs.

Public buildings belonging to the municipalities

In accordance with the guidelines for the processing of subsidies from the municipal equalisation fund, supplements for increased energy performance are awarded for the construction and refurbishment of municipal buildings.

https://www.salzburg.gv.at/verwaltung/_Documents/GAF-Richtlinien%201.1.2018.pdf

[in German]

Province-owned constructions

When province-owned buildings are built or refurbished, increased energy performance standards in accordance with the *Energieeffizienz für Landesgebäude* [Energy efficiency for province-owned buildings] specifications must be observed.

Energy accounting

Mandatory online energy accounting for central systems engineering in housing support

In new buildings with an air-conditioned gross floor area of $\geq 2,000 \text{ m}^2$, the central meter data for energy consumption for heating, including heating feed and return temperatures (daily temperature averages if possible) for solar thermal energy yields as well as for water and electricity consumption must be automatically saved on the energy certificate database ZEUS before midnight every night.

Recommendation: Include sub-meters for anti-icing systems, ventilation systems and heating of the supply air in the monitoring.

Mandatory energy accounting for heat pumps and photovoltaic systems as part of the province's energy performance support measures

The meter readings for the total electrical power consumption of the heat pump (excluding heating circulation pump(s)), the heat output from the heat pump and the yields of the photovoltaic (PV) system (in kWh, from the inverter) are to be taken at the end of each month once the system is brought online and stored in the ZEUS energy certificate database for a period of three years.

Additional energy accounting service

Within the ZEUS portal, all individuals and companies are able to conduct free energy accounting projects on the basis of energy certificates, energy consultation reports or even without such a basis.

<https://www.energieaktiv.at/information-und-beratung/energiebuchhaltung/>

Boiler replacement (switch to renewable energy carriers)

The Energy Department supports the replacement of fossil fuel-fired heating systems with high-efficiency alternative systems via investment grants. These are subject to strict quality criteria. The applicable guidelines can be found at: <https://www.energieaktiv.at/information-und-beratung/downloads/>

Central Energy Certificate Database [*Zentrale Energieausweisdatenbank – ZEUS*]

In Salzburg, all energy certificates must be submitted to the province's Central Energy Certificate Database, ZEUS, by the issuer (Section 17a(4) of the Building Control Act [*Baupolizeigesetz*]). These are then automatically checked for compliance with the energy-related provisions of construction and subsidy law.

This planning energy certificate check must be passed as a prerequisite for the confirmation of funding or the issuing of a building permit. Similarly, evidence of a positive completion energy certificate check must be submitted in the construction completion process before any funding is paid out. <https://www.energieausweise.net/>

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- training courses for employees of the municipalities (energy consultant training, etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),
- building-thermographic images,
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).
<https://e5-salzburg.at/>

Styria

The Styrian Provincial Government adopted the *Steiermark 2030* [Styria 2030] climate and energy strategy on 16 November 2017. The strategy defines the strategic framework for how Styria intends to meet international and national obligations in energy and climate policy. The Styrian formula fleshes out the ambitious goals for 2030:

- reducing greenhouse gas emissions by 36%
- raising the share of renewable energy carriers/sources to 40%
- affordable energy and security of supply.

Due to the enormous transformation of the energy supply, the increasingly improved availability of new technologies and the clear EU strategy of decarbonising the economy, Styria needs to be able to respond very dynamically to the changes in the markets. The Styria 2030 climate and energy strategy is supported by those of *Vision 2050*, *Leitzielen 2030* [Key objectives 2030] and the focuses and packages of measures formulated within them across 8 thematic areas. In this case, *Maßnahmenbündel 4 – Gebäude und Siedlungsstrukturen (G)* [Package of measures 4 – Buildings and settlement structures (G)] applies. It was also decided that a new action plan should be drawn up every 3 years in order to implement the objectives.

The *Aktionsplan 2019-2021* [Action plan 2019-2021] was adopted by the Styrian Provincial Government on 8 August 2019 to serve the operational implementation of the Styria 2030 climate and energy strategy. In this three-year programme, 22 implementing measures are described in the Building and settlement structures chapter.

<https://www.technik.steiermark.at/cms/ziel/142705670/DE/>

The climate and energy strategy provides for a substantial increase in the refurbishment rate for existing buildings, as well as an acceleration of the switch to renewable energy carriers for the energy supply of buildings. These strategic objectives are fleshed out in the action plan as follows:

- prepare building-specific refurbishment roadmaps for major refurbishments (based on construction law),
- improvement of the incentive system for energy-related and high-quality major renovations (integration into the subsidy system for residential building refurbishments).

These primary strategies are supplemented by further secondary strategies for a heating switchover, namely:

- promoting biomass and solar-powered systems in the private and small business sector,
- establishing inspections of heating and air conditioning systems and using these to increase the efficiency of systems,
- implementing the switch away from combustion plants for solid and liquid fossil fuels for heat supply in buildings,
- preparing for the switch away from natural gas as the energy carrier for heat supply in buildings
- promoting systems for the provision of renewable heat and heating optimisation as part of energy and housing support.

The following measures are now being implemented:

Measure No	Measure
G-01	Strategically anchor the subject area plan for Energy as a contribution to the local development plan in demo communities
G-02	Develop an integrated thermal atlas of Styria, use it in demo communities and prepare for rollout
G-03	Test existing tools for energy-efficient settlement development in practice in demo communities
G-04	Combine land mobilisation for 'affordable housing' with 'energy-efficient construction'
G-05	Put compensatory measures for new building land designation on a firm legal foundation
G-06	Readjust counterproductive effects of the infill areas in the Styrian Spatial Planning Act [<i>Steiermärkisches Raumordnungsgesetz</i>]
G-07	Design subsidies based on the population density, potential for densification and central location
G-08	Prepare the establishment of a land fund for an active land use policy from a climate and energy policy point of view
G-09	Demonstrate innovative renewable heating and power supply concepts for buildings
G-10	Promote biomass and solar-powered systems in the private and small business sector
G-11	Establish inspections of heating and air conditioning systems and use these to increase the efficiency of systems
G-12	Implement the switch away from combustion plants for solid and liquid fossil fuels for heat supply in buildings
G-13	Prepare for the switch away from natural gas as the energy carrier for heat supply in buildings
G-14	Standardise the implementation of the check for alternatives under the province's Building Regulations Act [<i>Baugesetz</i>] with municipalities and construction experts
G-15	Increase promotion of systems for the provision of renewable heat and heating optimisation as part of energy and housing support

Measure No	Measure
G-16	Promote the use of life-cycle considerations in relation to the building envelope in residential construction
G-17	Promote continuous improvement of the energy certificate database and quality assurance for energy certificates
G-18	Ensure the quality of construction work through higher energy efficiency requirements and by designing construction systems for disassembly
G-19	Prepare building-specific refurbishment roadmaps for major refurbishments
G-20	Improvement of the incentive system for energy-related and high-quality major renovations
G-21	Adapt energy and housing support to the assessment criteria for resource-efficient and climate-friendly infrastructure
G-22	Increase the use of wood and renewable raw materials as building and insulation material for residential/commercial buildings

Services in Styria

The *Ich tu's* [I'm doing it] Energy consultation service provides comprehensive and competent on-site consultations tailored to the specific situation of the customer, and identifies targeted energy saving and refurbishment opportunities. This is intended to help the Styrian population to recognise the real-life energy-saving refurbishment options for their buildings, and in the long term to save on electricity and heating costs. By changing behaviour, purchasing new, energy-efficient appliances, investing in the control or optimisation of heating systems or investing in extensive energy refurbishment or extensive refurbishment of a building, the energy consumption of a household can be reduced. This makes possible immediate savings in CO₂ emissions and a reduction in environmental pollution. The use of renewable energy can also reduce the consumption of fossil fuels and sustainably protect the environment. This is intended to make a significant contribution to the implementation of the Styria 2030 climate and energy strategy. Last but not least, it is also intended to increase value creation in the Styrian regions and make a contribution to securing and increasing employment.

The Province of Styria supports the following consultation services:

Initial consultation

An 'initial consultation' is a consultation in the consultant's office lasting half an hour, which might include, for example, the following services:

- initial information about the subject of energy and climate protection
- information about subsidies
- information about further consultation options.

Consultation about energy conservation

A 'consultation about energy conservation' is a comprehensive on-site consultation documented in a consultation report in accordance with the Province of Styria's template and includes services such as the following:

- identification of energy-saving opportunities (user behaviour, appliances, lighting, building technology systems, heating, hot water provision, mobility, etc.),

- evaluation of potential savings based on existing electricity and heating bills or an estimation based on empirical values,
- tips for reducing heating and electricity costs and/or suggestions for measures to improve the heating and hot water system,
- advice on the use of systems for the use of renewable energy (e.g. solar thermal collectors, pv systems),
- advice on energy-efficient, environmentally friendly mobility,
- climate protection tips.

On-site building check

An 'on-site building check' includes a detailed stocktake of the building, the drawing-up of an overall refurbishment plan in accordance with the Province of Styria's template and a comprehensive consultation about recommended measures and potential subsidies. This includes the following services.

- A survey of the components and all building technology systems equipment, noting any damage and deficiencies from an energy perspective.
- An evaluation of potential savings based on existing electricity and heating bills or an estimation based on empirical values.
- An examination of user behaviour, as well as of the funding applicant's wishes and ideas.
- Advice on funding options for the implementation of the planned measures; on request, assistance in filling out the application forms for the funding in question.
- Development of an overall refurbishment plan according to a given template, which ranges from the stocktake of the building and the optimisation potential of refurbishment measures to the increased use of renewable energy carriers. In addition, construction engineering and building technology systems refurbishment measures tailored to the specific situation are to be elaborated in individual steps. Particular attention is to be paid to a proposal for extensive refurbishment that not only provides for the retrofitted insulation of components, but also takes into account measures to improve the heating and hot water system, as well as other technical options for alternative energy provision (such as solar or photovoltaic systems, comfort ventilation systems with heat recovery, etc.).
- A comprehensive consultation about the overall refurbishment plan that is elaborated.

Energy poverty consultation

An 'energy poverty consultation' is a comprehensive on-site consultation for the target group of low-income households. To be able to take advantage of a free consultation, a household must have an income below the ceiling set for exemption from the television/radio licence fee. Proof is required.

The consultation is documented in a consultation report in accordance with the Province of Styria's template and includes services such as the following:

- identification of energy-saving opportunities (user behaviour, appliances, lighting, building technology systems, heating, hot water provision, mobility, etc.),
- evaluation of potential savings based on existing electricity and heating bills or an estimation based on empirical values,
- tips for reducing heating and electricity costs and/or suggestions for measures to improve the heating and hot water system,
- advice on energy-efficient, environmentally friendly mobility,
- climate protection tips.

Styria's *Energieberater-Netzwerk* [Energy consultants network] (netEB)

Unfortunately, the differences in quality in the performance of energy consultations and production of energy certificates are considerable. For end customers in particular it is difficult to find an independent and competent energy consultant. Although the choice of energy consultants is very large, they are often only specialised in one area of expertise and therefore not adequately trained to give comprehensive advice.

The *Energieberatung Steiermark* [Energy Consulting Styria] network aims to provide clear guidance and improve the quality of energy consultations.

All consultants included in the network are suitably trained and undergo a specified quality control. They are kept up to date on all energy-related subjects thanks to regular continuous development and information sessions.

Quality

In order to raise and ensure the quality of the energy consultations and the issuing of energy certificates, all members agree to the uniform quality guidelines in the network.

In return, the network offers its members experience-sharing, continuous development, current information, support and advertising.

Training and continuous development

The training and continuous development of the consultants is carried out in accordance with the guidelines of the *ARGE EBA* [Working Group on Energy Consultant Training] of Austria's provinces. In Styria, this training has only recently been significantly expanded and improved in collaboration with the Styrian arm of Austria's Economic Development Institute, *WIFI* [*Wirtschaftsförderungsinstitut*].

Refurbishment support

Housing support for building refurbishments is available for residential houses/apartments/residential accommodation/other buildings: <http://www.wohnbau.steiermark.at/cms/ziel/113383994/DE/>

Against the background of the considerable improvement in efficiency (typically > 60%), the specific funding channels are 'extensive energy refurbishment' and 'extensive refurbishment'. Depending on the funding channel, direct grants of up to 30% or non-repayable annuity grants of up to 45% are awarded for a term of up to 15 years. There is a cap on eligible costs.

Minor refurbishment

- for improvements in the thermal quality of individual exterior components (windows/exterior doors, insulation of facade surfaces (exterior walls), the basement ceiling, sloping roofs/walls onto an unheated attic/topmost storey ceiling),
- for (individual) measures in relation to the building technology system (connection to district heating, installation of a biomass heating system, solar-powered system, electrical installation, sanitary installation, various security measures, etc.).

Statutory stipulations for 'minor refurbishment'

The building permit for the construction of the property to be funded must have been at least 30 years old at the time the application for funding was submitted, except in the case of

- connection to high-efficiency district heating
- energy-saving and ecological measures
- alternative energy systems.

Extensive refurbishment

This funding channel too is only approved if the minimum thermal requirements in accordance with the currently valid version of OIB Guideline 6 are complied with. This particularly attractive funding possibility offers funding for refurbishment that goes significantly beyond the necessary maintenance of buildings containing at least three residences.

Like 'extensive energy refurbishment', this funding channel also makes use of the ecological incentive system described above.

Extensive energy refurbishment of buildings

This funding is only granted if at least three elements (building envelope and/or the energy-relevant building technology system) are refurbished together.

For the purposes of the funding, the building envelope includes the following: windows and exterior doors, sloping roofs/walls onto an unheated attic, the ceiling of the topmost storey, exterior walls, the basement ceiling, walls and floors onto the earth.

Energy-relevant building technology systems include heating systems based on renewable energies.

This funding is only approved if the minimum thermal requirements in accordance with the currently valid version of OIB Guideline 6 are complied with.

If these values cannot be achieved, there must be at least a 40% improvement in heat demand for heating compared to the initial value. Stricter requirements also apply to U values.

Architecturally/culturally significant buildings are exempt from the minimum thermal requirements. In these buildings, heat demand for heating savings of at least 30% should be aimed for.

The funding channel is supported by an ecological incentive system: 'eco-points' can be collected on the basis of a list of pre-selected ecological measures; if property owners implement these additional measures, they become eligible to claim for increased refurbishment costs.

Styrian housing support

In conjunction with the Implementing regulation for the Styrian Housing Support Act [*Durchführungsverordnung zum Steiermärkischen Wohnbauförderungsgesetz*] and the guidelines for ecological housing support, an incentive system exists not only for additional ecological, energy-saving measures, but also for addressing social aspects in terms of sustainability and clean energy. Housing support and the implementing regulation have been adapted in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law between the Federal Government and the provinces on reducing the emission of greenhouse gases. Incentive systems for climate-friendly and ecological measures are adapted to achieve climate protection goals.

The guidelines for ecological housing support can be found on the home page of the province's Energy and Housing Department.

https://http://www.wohnbau.steiermark.at/cms/dokumente/12111495_113384013/9b3e116b/2019-04-01_Ökologische%20Richtlinien%20zur%20Wohnbauförderung_gültig.pdf

Optimisation of heating systems

In the past, excessively large boilers were often installed, which led to inefficient operation. The aim is now to use appropriate optimisation measures (especially in respect of regulation, in the technical, not the legal, sense) to achieve an energy efficiency potential (without involving a boiler or 'major' investments). This is to be made possible by a high-quality inspection of the heating systems.

Boiler replacement (switch to renewable energy carriers)

When replacing existing oil-fired boilers, only renewable energy carriers are to be used. It should become socially acceptable (thanks to subsidies) to move on from the fossil-powered, oil-fired heating stock. There are various subsidy schemes to that end:

- promotion of heating optimisation – heat pumps
- promotion of biomass heating systems
- promotion of heating optimisation – biomass
- promotion of heating optimisation – pump replacement
- promotion of connections to district heating.

Energy accounting

In a subsidised apartment block, energy accounting is required from 10 housing units and upwards and is then checked and evaluated.

Further measures

The Province of Styria offers other measures that may be seen as preparation for a cost-effective, deep renovation:

- appropriate instructions and training are made available to persons authorised to issue energy certificates; particular attention must be paid to the importance of improving energy performance, taking account of the optimal combination of improvements in energy efficiency, the use of renewable energy carriers/sources and the use of district heating and cooling in planning, design, construction and renovation;
- if necessary, guidance is made available to professionals involved in the planning, construction and renovation of buildings so that they can properly consider the optimal combination of renewable energy carriers/sources, high-efficiency technologies and district heating and cooling in their work;
- regularly updated lists of bodies authorised to issue energy certificates are made available to the public on the internet home page of the Province of Styria, as well as a list of parties authorised to carry out periodic inspections of combustion and air conditioning systems.

Extensive thermal building refurbishment

The aim is to increase the refurbishment rate for public buildings. In order to set a good example for the public at large, when energy refurbishments are carried out, ecological building and insulation materials should be used as far as possible. Since public institutions do not have the financial means required, alternative funding options such as energy performance contracting models must also be considered in order to give implementation the necessary push.

The e5 scheme for municipalities

The e5 scheme, in which 13 Styrian municipalities currently participate, provides 78 measures for municipalities in 6 areas of action that can be implemented and are evaluated accordingly by means of periodic internal and external audits: <https://www.e5-steiermark.at/%C3%BCber-e5/>

For the specific area of cost-effective, deep renovation measures, there are numerous auditable measures, such as 'stocktake and analysis', 'creation of a refurbishment plan' and 'role model refurbishment measures', which can be undertaken for municipal buildings and facilities.

The Province of Styria subsidises both the e5's programme of activities and the municipalities' e5 membership fee: <http://www.wohnbau.steiermark.at/cms/beitrag/12674570/113383975/>

The subsidy of the municipalities' membership fee amounts to 20-60%, depending on the taxpaying ability per capita.

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),
- building-thermographic images,
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with various target groups (associations, business and commerce, schools, public authorities, etc.) with a view to getting projects off the ground,
- public relations (all media and target groups).

Climate and Energy Model Regions [*Klima- und Energiemodellregionen – KEM*] scheme

Certain regions are developing an implementation plan containing specific measures as part of the

federally funded Climate and Energy Model Regions scheme. Cost-effective, deep renovations can form part of this plan, which has to be submitted to obtain federal funding. The implementation of the plan is examined as part of an audit (KEM-QM). The KEM-QM is not part of the federal funding and is financed by provincial funding that covers 20-60% of the KEM-QM costs. <http://www.wohnbau.steiermark.at/cms/beitrag/12674569/113383975/>

Energy accounting for e5 and KEM municipalities

The Province of Styria provides the e5 municipalities and the Climate and Energy Model Regions with a free tool for energy accounting, thereby making a low-threshold contribution to preparation for cost-effective, deep renovations: <http://www.wohnbau.steiermark.at/cms/beitrag/12674572/113383975/>

Tyrol

Housing support

There are extensive measures and instruments for pursuing the goals of Directive 2010/31/EU within the framework of housing support in Tyrol. Both loans and grants are awarded as financial instruments in the context of housing support. Funding is awarded both for the new construction of buildings and for the refurbishment of existing buildings.

The relevant funding criteria took account of the requirements relating to energy efficiency. For example, in the construction of new buildings, the use of high-efficiency alternative heating and hot water systems is a prerequisite for the granting of housing support funding. In addition, an energy certificate must be submitted for the property for which funding is being sought and a maximum permissible annual heat demand for heating (HDH) per m² of air-conditioned gross floor area (or a given HDH in combination with a given energy performance factor) must be observed for the property.

For support in connection with refurbishments of existing buildings, funding criteria include mandatory compliance with the U values applicable for the relevant parts of the building (walls, roof, windows, etc.). When a heating system or heat supply system is refurbished, the use of high-efficiency alternative systems is also a prerequisite for funding.

Extensive refurbishments are given particular support, on condition that a given heat demand for heating is achieved. For details about the relevant detailed funding types, funding criteria and the current funding guidelines please refer to the home page of the Province of Tyrol – Department of Housing Support: www.tirol.gv.at/wohnbau

Energy advice for energy-efficient construction and refurbishment

The Province of Tyrol founded the association *Energie Tirol* [Energy Tyrol] in 1992 as an independent advice centre for the promotion of environmentally friendly energy technologies and the economical use of energy.

The consultation service is carried out independently of products and companies. Its focus is on energy-saving construction engineering and building technology systems, as well as environmentally friendly heating. A key element of the refurbishment consultations is the development of an individual refurbishment plan.

Through its financial involvement in *Energie Tirol*, the Province of Tyrol supports the provision of comprehensive advice on energy-efficient construction and refurbishment: <http://www.energie-tirol.at>

Training and continuous development

- *Energie Tirol* regularly holds energy consultant courses (basic and continuation courses) on behalf of the Province of Tyrol, and also offers 'updates' on specific topics in addition to the basic training: <https://www.energie-tirol.at/energie-akademie/>
- Provincial e5 scheme for energy-efficient municipalities (European Energy Award): in Tyrol, 50 municipalities are participating in the e5 scheme: <http://www.energie-tirol.at>
- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory

- services),
- provision of training and continuous development for municipality employees (energy consultant training, etc.),
- point of contact for political representatives and employees of the municipalities for information on opportunities for action by municipalities,
- management of energy accounting,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with various target groups (associations, business and commerce, schools, public authorities, etc.) with a view to getting projects off the ground,
- public relations (all media and target groups).

Vorarlberg

Measures for the private sector

Independent, product- and company-neutral, quality-verified energy consultation is the key to the implementation of high-quality energy efficiency measures and also an essential trigger for investments in the construction industry (construction and ancillary construction trades).

Energy hotline

The first point of contact for energy issues relating to construction and living – whether about a new build or refurbishment, a subsidy or energy certificates

Where the energy hotline is designed to help:

- for all energy-related questions about new builds and refurbishment
- for subsidy questions
- for questions about and applications to all other consultation services.

On-site energy consultation

The all-round consultation for all questions that are best answered on site. This consultation is free of charge.

What an energy consultation will help with:

- questions about structural solutions
- questions about building technology systems in existing buildings
- questions about the economic viability of measures.

What you get out of an energy consultation:

- categorisation of your energy consumption to enable you to compare it to others
- knowledge about the most effective savings options
- clarity about how to proceed.

New-builds and subsidies consultation

For builders who are building a house or buying a dwelling and want to optimise energy efficiency, energy costs and subsidies

- Duration of around 2 hours, with small cost contribution required.

Where the new-builds consultation is designed to help:

- questions about structural solutions (floor plan layout, insulation, thermal bridges, etc.),
- questions about the use of renewable energy carriers (heating, solar thermal energy, photovoltaics, electricity storage, etc.),

- questions about the economic viability of measures,
- questions about energy certificates and housing support,
- questions about choice of materials.

Pre-refurbishment consultation

- for detailed questions before starting a refurbishment,
- out-of-the-box thinking and the most attractive refurbishment option included,
- scope max. 20 hours.

Where the pre-refurbishment consultation is designed to help:

- recognising the full potential of a building
- rethinking living space, in particular in an out-of-the-box way
- finding the most attractive option among many.

What private individuals get out of a pre-refurbishment consultation:

- clarity about the use of the building over the next 20 to 30 years
- the optimal refurbishment option
- rough cost estimate and financing overview
- the most solid basis on which to start specific planning.

The *Sanierungslotse* [Refurbishment coaches] project

Objective: Comprehensive advice from initial idea right through to financials

The refurbishment of aging residential buildings is a key factor in achieving the desired energy autonomy under *Vorarlberg 2050*. The project was supported by the province in the development and adaptation phases of its consultation services. In cooperation with the Vorarlberg Energy Institute and the Vorderland-Walgau-Bludenz LEADER region, a tailored consultation service was developed that is aimed directly at owners. Refurbishment coaches help with all questions before and during the refurbishment of a building.

Sequence of events:

- a. free initial conversation
- b. support plan and stocktake
- c. recommendations for actions and subsidies consultation
- d. implementation support
- e. support in subsidy accounting.

Refurbishment coaches are there to provide independent guidance and have no other involvement in the work. They are available to owners for any and all questions relating to building refurbishment. Refurbishment coaches discuss the objectives and possibilities of a project with the owners, develop use plans, clarify legal and assess financial frameworks or advise on specific planning. The refurbishment coaches are also on hand during the implementation of the project: with their advice, knowledge and experience they provide support through all the decisions and implementation steps faced. They suggest which partners and professionals are needed and when. All this support is tailored to the needs of the customer. The refurbishment coaching can be brought to an end after one consultation, but if so desired, it can also extend over an entire refurbishment project to completion and subsidy accounting. The costs of this assistance are individual, as is the advice itself. The initial conversation and the drawing-up of a support plan are free of charge.

Housing support

For new builds and refurbishments, the Province of Vorarlberg's housing support assists members of the public via a low-interest loan and/or a one-off subsidy in order to meet its objective of establishing cost-effective and sustainable residential buildings.

The refurbishment and improvement of existing residential buildings enables them to be brought up to

a sustainable level.

Support for new builds

Support for new builds is provided in the form of a loan. The term is 35 years. There is a choice between an increasing rate (from 0.5% to 3.25%) and a fixed rate (1.75%). The amount of the loan is made up of the basic support and bonuses. These in turn are expressed in euros per m², multiplied by the eligible useful floor area.

Minimum material requirements must be met, such as HFC-free construction materials, PVC-free construction materials in the interior, wood from sustainable sources, render with a maximum 6% plastics content and cement-bound adhesives.

An energy-saving and environmental bonus is paid out for improved building envelope quality, a low total primary energy requirement, low CO₂ emissions, as well as for the use of renewable and ecologically sound construction materials.

Optimised parking spaces for bicycles, preparatory work for e-mobility, the provision of car-sharing spaces and a high building utilisation rate also generate an increase in funding.

The installation of solar thermal collectors, heating systems based on renewable energy carriers and ventilation systems with heat recovery are also supported through outright grants.

Detailed information can be found in the "Overview of support for new builds".

Refurbishment support

The Province of Vorarlberg supports thermal refurbishments and the redensification of residential buildings as part of its housing support.

The basic support is based on the (thermally relevant) surface area of the refurbished components – i.e. the square meterage of wall, window or ceiling. The bonuses are added up as lump sums per m² of usable living space of the refurbished property. The funding amounts increase as component quality goes up and also for total refurbishments, provided three measures in the building envelope or two measures plus the building technology systems are refurbished at the same time.

The installation of solar thermal collectors, heating systems based on renewable energy carriers and ventilation systems with heat recovery are also supported through outright grants.

In order to support owners in the decision-making process to adopt the optimal refurbishment option for residential buildings, participation in refurbishment consultations and refurbishment coaching is supported with attractive one-off grants.

Refurbishment consultation in accordance with the Province of Vorarlberg's Residential Buildings Refurbishment Guideline [*Wohnhaussanierungsrichtlinie*]

These consultations are provided by commercially licensed consultants. The Province of Vorarlberg subsidises consultations for owner-occupied homes, terraced houses and residential accommodation, as well as for multi-dwelling properties comprising up to six housing units, with a one-off grant of 75% of the proven costs, up to a maximum of €1,200 per building or a maximum of €3,000 per building for multi-dwelling properties comprising more than six housing units. Individual dwellings are not given funding.

Refurbishment coaching

If the refurbishment consultant provides assistance up till the point of final invoicing in accordance with the Residential Buildings Refurbishment Guideline, proven costs of 75% are subsidised, up to a maximum of €600 for owner-occupied homes, semi-detached houses and residential accommodation, as well as for terraced houses and multi-dwelling properties comprising up to six housing units, and a maximum of €1,200 for multi-dwelling properties comprising more than six housing units.

Detailed information can be found in the "Overview of support for refurbishments".

Measures for the 'non-private sector'

In cooperation with the Federal Ministry for Sustainability and Tourism, the Province of Vorarlberg promotes consultations and qualifications in the field of energy and the environment.

The Province of Vorarlberg has been active for many years around the issues of efficient energy use, climate protection and sustainable development, with a range of schemes, initiatives and subsidies. Key emphases have been and will continue to be put on the area of awareness-raising/consultation in particular.

The Province of Vorarlberg's 'regional programme', known as *Impuls3*, is intended to provide support for sustainable economic development. For this purpose, efforts are pooled in Vorarlberg and the annual programme is executed in cooperation with the Ministry of the Environment.

Impuls3 is funded by the Ministry of the Environment and the Province of Vorarlberg. The following activities are financed/supported with subsidies from these funds:

- consultations about energy and environmental issues in businesses,
- consultations about energy and environmental issues in municipalities,
- advice about obtaining environmental certificates for tourism firms and schools,
- advice about obtaining the ÖKOPROFIT [ECO-PROFIT] certificate,
- networking and continuous development for the consultants,
- collection and publication of examples of good practice.

Vienna

The City of Vienna's Climate Protection Programme (KLIP II)

The Climate Protection Programme [*Klimaschutzprogramm*], adopted in 1999, was rolled forward from 2009 to 2020. Due to the international framework conditions, the programmes of measures can also be expected to continue beyond 2020. The main objectives for residential construction in terms of energy supply are the prioritisation of district heating as the energy carrier and an increase in the share of renewables.

Targets for energy efficiency improvements (savings targets) have also been defined for the buildings sector.

Smart City Vienna – Framework Strategy 2050

The *Smart City* process aims to define and achieve comprehensive goals for the city and its residents. These goals are assigned and clearly presented in the resources, quality of life and innovation areas of action.

A reduction of one per cent per capita per year in final energy consumption for heating, cooling and hot water is planned for the buildings sector. In the City of Vienna's Energy Report (MA 20), this value is determined on the basis of a base value (average 2008-2012) of 9,562 kWh per person and year.

With a population (2008-2012) of around 1.7 million, this is a savings target of 163,000 MWh/a. The thermal energy refurbishment of residential buildings results in savings of around 5 MWh/a per housing unit.

With a refurbishment rate of around 5,000 housing units/a, an overall contribution of 25,000 MWh/a can therefore be achieved through refurbishment.

In addition, the use of renewable energy carriers, especially for hot water provision, also contributes to the achievement of the *Smart City* goals.

City Energy Efficiency Programme 2030 [*Städtisches Energieeffizienzprogramm 2030 – SEP 2030*]

With reference to overarching strategies such as the *Smart City* framework strategy and international obligations, *SEP 2030* outlines various measures in 6 areas of action. The 'Buildings' area of action, from which relevant contributions to the overall goals of energy efficiency are expected, is crucial to the *wohnfonds_wien* [Vienna Housing Fund]. In terms of implementation, *wohnfonds_wien* (Refurbishment) is addressed in the following measures in these plans:

- prevention of energy consumption through structural redensification, compact construction, especially with existing infrastructure for physically connected energy carriers (district heating),
- quality control of energy certificates via Vienna's independent control system for energy certificates [*wiener unabhängigen kontrollsystem für energieausweise – wuksea*],
- continuation of the refurbishment initiative based on the funds available,
- target group marketing with a focus on subsidies,
- ensuring the quality of the subsidised refurbishment,
- provision of information about adapting building technology systems during/after extensive refurbishments,
- performance of pilot projects in respect of communal energy provision during the refurbishment of residential blocks.

Gründerzeit Districts Masterplan [*Masterplan Gründerzeit*]

In order to direct the ongoing development of the urban structure of the *Gründerzeit* districts of central Vienna in a manner desirable from an urban planning point of view, the *Gründerzeit* Districts Masterplan was developed through a collaborative process.

In addition to structural transformation options, the *Gründerzeit* Districts Masterplan mission statement also identifies qualitative planning criteria in order to safeguard the public interest.

The focus areas include:

- acceptable building densities
- versatile ground floor areas
- attractively designed public spaces
- alternative mobility and parking concepts
- improvement of microclimatic conditions.

In order to implement this mission statement, the existing framework conditions and legal instruments were critically examined and suitable adjustments were proposed.

The aims of the implementation strategy include the following:

- simplifying procedures for revising the land-use plan,
- facilitating effective vegetation for urban climates, e.g. through greening,
- discouraging street-front parking spaces on the ground floor,
- securing contiguous green and open spaces,
- facilitating facade greening in the vicinity of wide pavements.

Refurbishment consultation

The City of Vienna offers free personal consultations to provide detailed answers to questions about extensive refurbishment and potential subsidies.

Information sessions

Wohnfonds_wien regularly organises information sessions for specialists and decision-makers (property owners and managers), especially in connection with new developments in the field of subsidies.

The decision-making process in apartments is supported by participation in tenant and owner general meetings to provide information about funding opportunities.

EU project *Integrated Home Renovation Services = RenoBooster*

Vienna has been provided with an opportunity to develop new consultation services or sources of financing for home refurbishments under the EU-funded *RenoBooster* project. The aim is to promote refurbishment processes by bundling different services at a single point of contact, with a particular focus on private housing. The ultimate objective is to enhance the scope and quality of refurbishments. At the same time, particular emphasis is placed on the involvement of stakeholders from the real estate and construction sectors and from the fields of administration and finance. Refurbishing a house can be a very challenging process.

The project seeks to shed more light on the status quo and current requirements from the perspective of apartment or building owners. Tailored services will then be developed on this basis.

The first refurbishment projects will benefit from newly developed services such as refurbishment support workers, one-stop-shop packages for single-family dwelling refurbishments or special quality assurance services while the project is still running. The legal framework and funding instruments will also be investigated and tailored to future challenges. A web portal is planned as a single channel to enable access to the most important services and information on offer.

Vienna housing support

Housing support funding is intended to make affordable housing possible when new construction projects take place. Subsidies are graduated according to income and family situation. Financial support is primarily given to tenants of apartments or residential buildings. There are also special ecological subsidies for environmentally friendly construction and refurbishment measures.

Information about housing support and related subjects such as heating, new construction and refurbishment can be found at: www.wien.gv.at/wohnen/wohnbaufoerderung/foerderungen/

THEWOSAN – Thermal energy refurbishment of housing [*Thermisch-energetische Wohnhaussanierung*]

There are various funding opportunities in the area of home improvement and refurbishment. Under the auspices of THEWOSAN – the thermal energy refurbishment of housing – structural measures for the thermal refurbishment of the entire building envelope are promoted, such as insulating all external components, eliminating thermal bridges and increasing passive solar heat gains. Measures relating to technical installations are also promoted, such as the conversion or installation of the heating and hot water system with primary energy-efficient and/or lower-CO₂ or renewable energy carriers.

The goal is to significantly reduce both the heat demand for heating and thus also the CO₂ emissions of the building as well as the consumption of fossil fuels. Funding is provided in the form of a non-refundable contribution in the amount of €25-160 per m² of useful floor area, depending on the energy indicators achieved, and of an extra €60 per m² of useful floor area where the passive house standard is reached. The maximum amount of the non-refundable contribution is limited to up to 30% of the total eligible construction costs, depending on the funding class.

Taking account of renewable energy carriers/sources in housing support: It is also one of the prerequisites for receiving support that an appropriate choice of energy carrier be made for the future energy supply. The key guiding principles here are the conservation of the environment and resources and the efficient and economical use of energy.
<http://www.wien.gv.at/stadtentwicklung/energieplanung/foerderungen/wbf.html>

Statutory stipulations for ‘extensive energy refurbishment’

Funding can only be granted if the following minimum thermal requirements in respect of the final energy demand or the energy performance factor (f_{GEE}) are found to be met in the verification procedure.

	Heat demand for heating HDH _{Ref,RK} [kWh/m ² a]	Energy performance factor (f _{GEE})
until 31 December 2018	21 x (1 + 2.5 / c)	[-]
	or	
	25 x (1 + 2.5 / c)	1.05
with effect from 1 January 2019	19 x (1 + 2.5 / c)	[-]
	or	
	25 x (1 + 2.5 / c)	1.00
with effect from 1 January 2021	17 x (1 + 2.5 / c)	[-]
	or	
	25 x (1 + 2.5 / c)	0.95

1.4 Overview of policies and actions to target the worst performing segments of the national building stock, split-incentive dilemmas and market failures, and an outline of relevant national actions that contribute to the alleviation of energy poverty (Article 2a(1)(d))

Federal policies and actions

Federal Energy Efficiency Act [*Bundes-Energieeffizienzgesetz – EEffG*]

The Federal Act on increasing energy efficiency within companies and the Federal Government (Federal Energy Efficiency Act [*Bundes-Energieeffizienzgesetz – EEffG*]) stipulates that at least 40% of all efficiency measures must apply to the field of housing in households. Measures for low-income households must be weighted with a factor of 1.5. Weighting measures put in place for low-income households, as well as specific projects with social institutions and debt advice centres, by a factor of 1.5 is an incentive for obligated undertakings (energy suppliers) to become more active in this area in order to combat energy poverty. Examples of such measures include qualified energy consultations with consultants with social work experience or appliance replacement campaigns. Household measures account for 37.3% of the total savings, with annual savings of 25.4 PJ. Measures put in place in low-income households yielded annual savings of 0.62 PJ.

Provincial policies and actions

Input from Burgenland

Housing support:

Loans for housing refurbishments are offered at attractive rates under Burgenland's housing support programme. Particular attention has been given to thermal and extensive energy refurbishment. If the thermal quality of the building envelope (refurbishment of window surfaces, the roof or top floor ceiling, facade surfaces, the basement ceiling, as well as energy-relevant heating systems) improves according to plan, up to 80% of eligible refurbishment costs can be funded. Refurbishment consultations can also help owners to implement an overall energy plan in stages by refurbishing individual building components in turn.

Free energy consultations:

Free consultations provide members of the public with access to comprehensive information on energy-related topics in the areas of new builds and building refurbishments, heating and air-conditioning systems in buildings and uses of electricity.

Members of the public receive well-founded and coordinated information in the fields of thermal insulation, windows and window installation, heating systems, subsidies, energy saving tips, photovoltaics, storage systems, savings and much more.

A wide variety of brochures and guides on all topics are available free of charge.

The energy consultations last between 1.5 and 2 hours and take place on site, at the offices of the district administration or of the Burgenland Provincial Government or in a local civic centre.

Input from Carinthia

Measures to reduce energy poverty under the Carinthian Energy Master Plan

Helping people help themselves

Many of those affected simply do not know how to save energy and thus costs. The possibilities range from personal behaviour (e.g. ventilation in winter) to free energy advice and changing electricity providers.

Cost-effective refurbishment of residential buildings

In pilot projects, selected residential buildings are to be renovated as cost-effectively as possible without increasing the rent. On the basis of the pilot projects, the province is looking for a broad partnership with the municipalities and property developers to target improvement of living conditions in multi-storey apartment blocks over the next few years. Positive examples that may be mentioned include reconstruction models that have been implemented in Carinthia in the recent past and supported by provincial funds.

Free energy advice and replacement of inefficient household appliances

The financially disadvantaged can register with social welfare organisations and receive a free consultation appointment in which options for saving energy are identified. Inefficient electrical household appliances are also collected here and exchanged free of charge with financial support from energy suppliers.

Regulation by law

For measures in households affected by energy poverty, a higher factor than previously should be provided for in the Federal Energy Efficiency Act [*Bundes-Energieeffizienz-gesetz*].

Input from Lower Austria

Housing support

Lower Austria's housing support programme provides financial support for the refurbishment of living space. The support is paid out in the form of an annual grant for the eligible refurbishment amount. Lower Austria's housing support/owner-occupied home refurbishment programme primarily supports thermal and energy-related refurbishment measures. The level of the eligible refurbishment amount is determined using a points system and is made up of the sum of the points awarded on the basis of the energy certificate and those awarded on the basis of sustainability.

The points system creates an incentive to reduce the heat demand for heating as sustainably as possible. By way of example, 55 points are awarded for a 40% improvement in heat demand for heating, 70 points for a 60% improvement and 90 points for an improvement of over 80%. In this way, the system clearly favours the refurbishment of buildings with a high heat demand for heating.

Free energy consultations for low-income households

A free energy consultation service has been set up for low-income households, in collaboration with social welfare institutions and the municipalities. For these households, no consultation costs are charged. The consultations always take place on site and include recommendations that have been

developed for this target group.

This offer is aimed primarily at recipients of the minimum income benefit or of a heating subsidy.

Input from Upper Austria

Upper Austria's Regulations on the refurbishment of residential buildings [*Wohnhaussanierungs-Verordnungen*] provide for subsidy incentives that reward better refurbishment; in addition, that section of the building stock that is over 20 years old and therefore has a poorer energy standard is targeted with the funding.

Energy consultations described in the previous chapter address themselves in particular to those segments of the building stock with the worst performance record.

Measures to combat energy poverty

Measures such as the Upper Austrian Housing Benefits Ordinance [*Oberösterreichische Wohnbeihilfen-Verordnung*] and the granting of the Upper Austrian heating subsidy will help to reduce energy poverty.

Measures to combat energy poverty are also implemented through special subsidy campaigns, e.g. cooperation with Caritas or targeted individual subsidy campaigns, see: <https://www.energiesparverband.at/energie-sparen/privathaushalte/energiespartipps/energiearmut>

Input from Salzburg

Salzburg Institute for Regional Planning and Housing [*Salzburger Institut für Raumordnung und Wohnen – SIR*] – Refurbishing residential buildings cost-effectively

A prime example – refurbishment of the Strubergasse district

The SIR has documented the 10-year process of revitalising the Strubergasse estate in a brochure published in July 2017 as part of the *Innovativer Wohnbau in Salzburg* [Innovative Housing in Salzburg] series that can be requested from the SIR free of charge.

Starting situation, 2008: The city of Salzburg owns 25 residential buildings in the Lehen district between Ignaz Harrer Strasse in the north and the railway line in the south. The residential buildings in the area were built between 1950 and 1965.

The buildings were in need of refurbishment, and neither the thermal building quality nor the floor plan layout satisfied modern requirements. There was no central heating; individual gas heaters had been installed in some individual homes when a lease changed over; in places there were massive problems with mould.

There were relatively large open spaces and easy passage between the buildings, while the areas along the roads were used as parking spaces. There were no assigned parking spaces, bicycle parking or structurally designed waste collection points. In the western part of the estate there is a spacious public playground with beautiful mature plants.

Between 2008 and 2015, a number of projects were carried out in the Lehen district that will bring about a long-term appreciation in values in this central district: the new 'Stadtwerk Lehen' development was built directly adjacent to it (the northern part of the district features 287 apartments, a kindergarten, the new city gallery and a student residence, while the south houses offices, laboratories and seminar rooms). This provides the opportunity to offer homes in their familiar environment to residents who have to move for a general refurbishment or new construction, while at the same time extending Stadtwerk Lehen's efficient and sustainable energy supply into the Strubergasse estate.

In 2010, a precise stocktake was carried out and the Nuremberg architects Schulze-Darup were commissioned to provide expertise for possible and sensible refurbishment options for the entire district. On the basis of this framework plan and after consulting with residents, the city council

decided to refurbish 14 buildings and demolish 12 others to replace them with new buildings.

The houses to be retained were thermally refurbished and insulated in 2013 (facade, basement ceiling and roof) and received new windows and balconies. The remaining buildings were demolished in stages and replaced with contemporary residential buildings.

A continuous open space concept was drawn up for the entire area and implemented in the spring of 2017. In the course of this, new routes through the estate were created, car parking spaces reorganised and the interior designed as a motor-free area. Private open spaces are intended to be clearly separated from public spaces, while a community garden creates opportunities for growing vegetables and socialising.

Mobility is a big issue, so new bicycle parking facilities (covered and lockable) are being created, a car-share point has been opened and every resident receives a mobility folder created by the city providing extensive information and voucher campaigns. With the last new construction phase south of Strubergasse, this project, the largest and most comprehensive neighbourhood refurbishment in Salzburg, was completed in 2018. A total of 286 homes were refurbished and 350 new homes built.

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=2ahU-KEwjezNyT5JXiAhXipYsKHb7zBk8QFjADegQIABAC&url=https%3A%2F%2Fwww.stadt-salzburg.at%2Fpdf%2Fendfassung_2017_2018_gefoerderter_mietwohnbau_beri.pdf&usg=AOvVaw0lmylutiikAMjZ-S9EJws2

Free energy advice and replacement of inefficient household appliances

The financially disadvantaged can register with social welfare organisations and receive a free consultation appointment in which options for saving energy are identified. Inefficient electrical household appliances are also collected here and exchanged free of charge with financial support from energy suppliers.

Input from Styria

Cost-effective refurbishment of residential buildings

In pilot projects, selected residential buildings are to be renovated as cost-effectively as possible without increasing the rent. On the basis of the pilot projects, the province is looking for a broad partnership with the municipalities and property developers to target improvement of living conditions in multi-storey apartment blocks over the next few years. Positive examples that may be mentioned include reconstruction models that have been implemented in the recent past and supported by provincial funds.

(a) Policies and actions for the worst segments of the building stock

As proposed by the Commission, the year of construction is used to determine the worst building stock, because – in contrast to other data options, such as energy performance – comprehensive data is available in this regard from Statistics Austria. This approach entails a certain lack of clarity, because no account is taken of refurbishments and because older buildings are not necessarily energy-inefficient.

The stipulation is that all buildings built before 1980 are to be counted among the worst buildings. The year 1980 was chosen because the first legal provisions governing the thermal insulation of buildings were put in place in April 1983 (the Styrian Thermal Insulation Ordinance [*Steiermärkische Wärmedämmverordnung*] of 18 April 1983), which means that an increased quality standard for building insulation can therefore be assumed. A tighter restriction to the year 1983 is not possible with the available statistical data.

As of 2011, there were 350,651 buildings in Styria, of which 216,991 were built before 1980. This puts 216,991 buildings (62% of the total building stock) in the worst building stock category.

The policies for segments of poor building stock correspond to the policies for cost-effective deep renovation of buildings (see Section 1.3 in this regard).

The actions for segments of poor building stock correspond to the policies for cost-effective deep renovation of buildings (see Section 1.3 in this regard).

Particular reference is made, however, to the Province of Styria's *extensive refurbishment* funding channel. This is the funding channel with the highest grants (whether direct grants or non-repayable annuity grants). The granting of the support is contingent, among other things, on the building permit's having been issued at least 30 years ago: from today's perspective, therefore, only buildings with building permits from 1989 or earlier are considered for this funding channel, which means that it is aimed specifically at the worst building stock segment.

(b) Policies and actions for the case of split-incentive dilemmas

Approaches to this effect exist at the provincial level in the area of refurbishment subsidies, for example in the case of the extensive refurbishment funding channel (see OIB Guideline 6). The forthcoming amendment to the Styrian Housing Support Act 1993 [*Steiermärkisches Wohnbauförderungsgesetz 1993*], which provides for the discontinuation of the rent reserve when determining eligible investment costs and thus relieves the strain on tenants, is another step in this direction.

(c) Policies and actions for the case of market failures

With regard to market failures – i.e. problems that tend to delay the transformation of the building stock and the tapping of cost-effective energy savings potential – the Commission mentions the following factors: a lack of understanding of energy use and potential savings, limited renovation and construction activity in a post-crisis context, a lack of attractive financing products, limited information on building stock and limited uptake of efficient and smart technologies.

- A lack of understanding of energy use and potential savings

The Province of Styria offers a wide range of information to promote awareness about energy consumption and potential energy savings: <http://www.ich-tus.steiermark.at/cms/beitrag/11634220/72268162>

In addition, Styria's Climate and Energy Strategy 2030 [*Klima-und Energiestrategie 2030*] provides for an expansion of advisory services at municipal level.

- Limited renovation and construction activity in a post-crisis context

Not currently applicable to Styria.

- A lack of attractive financing products

See point 1.3.

- Limited information on building stock

Information about the building stock is available from Statistics Austria, via the register of buildings and dwellings that has existed since 2004, and in Styria in the shape of the energy certificates database.

www.statistik.at

www.energieausweise.net

- Limited uptake of efficient and smart technologies

The Province of Styria advisory services on the subject of energy and climate protection provide information and explanation. This proactively counters a limited uptake of efficient and smart technologies.

(d) Actions to alleviate energy poverty

- The actions taken by the Province of Styria to alleviate energy poverty can be seen at:

<http://www.ich-tus.steiermark.at/cms/beitrag/12641380/130054643/>. Free energy poverty consultations help those on a low income to reduce their energy costs on a lasting basis. To be able to take advantage of a free consultation, a household must have an income below the

ceiling set for exemption from the television/radio licence fee. A free on-site consultation about energy conservation is offered, along with a free energy-saving package (LED lights, kettle, power strip with off switch).

- The City of Graz, for example, offers an energy cost subsidy and a Christmas allowance in connection with its *Sozialcard* [Welfare card] (eligibility prerequisite: exemption from the television/radio licence fee).

Input from Tyrol

Housing support

There are extensive measures and instruments for pursuing the goals of Directive 2010/31/EU within the framework of housing support in Tyrol. Both loans and grants are awarded as financial instruments in the context of housing support. Funding is awarded both for the new construction of buildings and for the refurbishment of existing buildings.

Extensive refurbishments are given particular support as an *Ökobonus* [Eco-bonus]. This is conditional on the achievement of a given heat demand for heating and the level of funding is determined on this basis.

For details about the relevant detailed funding types, funding criteria and the current funding guidelines please refer to the home page of the Province of Tyrol – Department of Housing Support: www.tirol.gv.at/wohnbau

Doppelplus [Double plus] – Special advisory scheme for households at risk of poverty

Eligible households receive free energy advice, as well as simple equipment such as thermometers/moisture meters that can help to save energy quickly and easily. <https://www.doppelplus.tirol/de/home/>

Heating subsidy – Financial support from the Province of Tyrol for low-income households

In addition, there are also funds from social institutions, the Chamber of Labour and the energy supply companies to provide financial support for ‘hardship cases’ where energy bills are high.

Input from Vorarlberg:

Actions

The funding model in Vorarlberg is based on the consideration that the immediate implementation of optimal overall refurbishment plans for residential buildings is not typical of the real world. A subsidised refurbishment consultation is designed to help owners to implement an overall energy plan in stages by refurbishing individual building components in turn. The achievement of objectives may be rewarded with a heat demand for heating bonus.

In order to ensure that even low-income households can finance thermal refurbishments, these are supported by an income bonus. Households that decide to buy an old home instead of a new-build one and thus also bear a certain financial double burden (purchase price plus renovation costs) are to be supported through an additional ‘re-vitalisation bonus’.

Subsidies for switching to renewable energy carriers also help combat ‘energy poverty’ in that they circumvent the expected higher prices for fossil fuels.

Input from Vienna:

Viennese Building Regulations

In the case of extensions and conversions, as well as alterations and corrective maintenance of at least 25% of the building envelope surface for buildings in construction class I that contain no more than two dwellings (with the exception of the buildings referred to in Section 118(4)), the uppermost accessible ceilings of heated spaces in the entire building or the roofs directly above these must be

insulated in such a way that the requirements for new builds in respect of heat-transferring components are met.

Local refurbishment areas

In areas with a high level of energy demand and need for modernisation, *wohnfonds_wien* tasks specialist teams with the development of urban planning and building-specific plans.

The aim is to create incentives for everyone involved to improve the quality of life and housing in densely built-up areas and to perform deep thermal refurbishment of buildings. Dialogue is sought with political, social, economic, cultural and administrative institutions in order to develop joint solutions.

The local refurbishment plans put forward specific proposals for:

- high-quality refurbishments
- improvements in private and semi-public spaces through partial gutting and greening at property level
- an upgrading of public space and solutions for stationary traffic
- maintaining a small-scale mix of uses
- social infrastructure improvements
- the creation of new high-quality homes.

Energy poverty

In Austria, over a million people are at risk of poverty. According to Statistics Austria, about 2.7% of them are unable to heat their homes adequately in winter. This corresponds to approximately 230,000 people or 120,000 households. It is very often the case that monthly electricity and heating costs cannot be paid, and that those affected have no financial means to invest in energy-efficient appliances or other refurbishment measures. For low-income households, energy costs represent a relatively large proportion of their total monthly fixed costs. The reason for this is primarily their low income, but there are also other factors, such as malfunctioning and outdated electrical appliances and heating, or buildings in need of refurbishment, that give rise to high energy costs.

Objectives and project description

The aim of the initiative is to provide families at risk of poverty with effective, quick and uncomplicated help to reduce energy consumption and sustainably reduce energy costs. As part of a free, competent and independent on-site energy consultation, the energy consumption of the household is analysed and the possible individual savings potential identified. The individuals concerned receive customised tips, advice and information sheets on energy-related topics. This is intended to show them how simple actions and behavioural changes can reduce energy consumption on a long-lasting basis. Small 'goodies' (efficient lighting, water saving sets, etc.) and information sheets in multiple languages, that are given out during the consultation, also help to reduce energy costs.

One special innovation in this initiative is that it does not just stop at a situation-specific energy consultation, but also undertakes the support, financing and implementation of customised investment measures on site. The replacement of outdated electrical appliances leads to directly measurable savings in the households concerned. Establishing a district heating connection increases living comfort and creates a healthy, dry living environment.

The target group are recipients of minimum income benefit, or of a basic pension with a Mobilpass [discount pass for those on a low income].

<https://www.wien.gv.at/gesundheit/leistungen/energieunterstuetzung.html>

1.5 Policies and actions to target all public buildings (Article 2a(1)(e))

Federal policies and actions

1. Buildings owned and occupied by the Federal Government

- **Adoption of new energy savings goals for 2021-2030:**

Pursuant to Article 5 of Directive 2012/27/EU and Article 4(b)(4) of Regulation (EU) 2018/1999, 3% of the total floor area of heated and/or cooled buildings owned and occupied by the central government must be renovated each year, to meet at least the minimum energy performance requirements. Austria opted for the alternative approach to implementing Article 5 of Directive 2012/27/EU. This means that other cost-effective measures can be taken to achieve the necessary energy savings for the buildings in question, including measures to change building users' behaviour. The savings goal must be achieved by adopting efficiency measures and must correspond to an annual refurbishment rate of 3%. For the period 2021-2030, work was initially carried out jointly by the energy consultants of the Federal Government and the Monitoring Agency, using the buildings data available at the time; a savings goal of 84.7 GWh was estimated on this basis. This goal will be adjusted as soon as current buildings data are available as a basis for calculating a revised goal. The most important measures that will be used to achieve this savings goal include energy saving contracting, energy management, refurbishment and energy consultations.

- **Action plans:**

The next task is to produce action plans setting out the means by which energy savings goals will be achieved over the period between 2021 and 2030. A large proportion of public buildings in Austria are listed buildings. As was previously the case, an action plan must be drafted for listed buildings that are exempt from the mandatory target. The measures in this plan focus on optimisations that are tailored to listed buildings and repairs, with a view to utilising the thermal potential of existing buildings as effectively as possible. The Federal Government is optimising the framework for maintaining Austria's built environment heritage, for developing it in a contemporary context and for using it appropriately; development of its own properties plays an exemplary role in this respect. An example that can be cited in this respect is the refurbishment of the Austrian Parliament on the basis of the *klimaaktiv* standard for listed buildings. This project will be documented in great detail, and the lessons learned will be promoted in a high-profile campaign. (Federal Government's Built Environment Guidelines, 7.2.)

- **Implementation of #mission2030 and Austria's Integrated National Energy and Climate Plan (NECP) (provisions relating to federal buildings):**

A switch from liquid fossil fuels to renewable energy carriers is to be promoted in buildings that are owned and occupied by the Federal Government; this will support the exemplary role of public authorities. This requirement is also enshrined in the NECP.

- **Incorporation of the Austrian Action Plan for Sustainable Public Procurement (naBe core criteria for the public procurement of sustainable products and services):**

Among other things, the Action Plan contains detailed specifications with reference to Section 95 of the Austrian Federal Procurement Act 2018 (energy efficiency requirements) for lamps, electrical devices, energy efficiency of the building envelope and the ventilation system etc. and lays down a framework for energy-related building management. It also contains specifications for low-pollution construction materials. The Federal Government is obliged to follow this Action Plan according to a decision adopted by the Council of Ministers. The naBe core criteria for structural engineering comply with all the basic criteria of the *klimaaktiv* standard for new builds and the refurbishment of office buildings and educational establishments.

2. Buildings that are owned by Bundesimmobiliengesellschaft mbH (BIG) and occupied by the Federal Government

- **Energy savings goals for 2021-2030:**

Pursuant to Section 16(2) of the Austrian Federal Energy Efficiency Act, the Federal Government must achieve energy savings of 125 GWh over the period 2014-2020 through joint efforts with Bundesimmobiliengesellschaft mbH. This energy savings obligation will be met in part through contracting measures. The new Federal Energy Efficiency Act is likely to contain a new energy savings obligation for the Federal Government and Bundesimmobiliengesellschaft mbH for the period 2021-2030. Particular emphasis will be placed on promoting energy saving contracting measures and energy consultations with a view to achieving this new obligation. These measures must also be outlined in a plan.

3. Buildings that are owned and occupied by the Federal Government and buildings that are owned by Bundesimmobiliengesellschaft m.b.H. (BIG) and occupied by the Federal Government

• Continuation of the Federal Government's energy consultant scheme:

The Federal Government's energy consultant scheme has been running for over 30 years with the aim of optimising energy consumption by Federal Government services. Since 1980, the Federal Government's energy consultants have carried out audits of all Federal Government services to determine whether their energy use is optimal, efficient, environmentally friendly and sustainable. They are based throughout the country within the Austrian Federal Ministry for Digital and Economic Affairs and the Austrian Federal Office of Metrology and Surveying. The tasks assigned to the Federal Government's energy consultants include not only energy consultations but also the issuing of energy certificates pursuant to Section 14(7) of the Federal Energy Efficiency Act and the production of thermal imaging surveys.

• Additional contracting measures by the Federal Government:

The contracts that have been concluded between Federal Government offices and specialist companies with the aim of achieving guaranteed annual energy savings over a term of 10 years will remain in place. Plans exist to expand the scope of the energy saving contracting project to cover more properties over the period between 2021 and 2030. The cooperative association set up by Bundesimmobiliengesellschaft mbH and the Austrian Federal Ministry for Digital and Economic Affairs is one of the largest public contracting clients in Europe. Energy saving contracting involves an external energy service provider (the contractor) optimising a building's energy consumption by means of investments and operational management. The contracting fee is performance-based, and its payment depends on the actual savings achieved. The measures are funded through the energy costs that have been saved. The client benefits from the full energy cost savings after the end of the contract term.

The following key measures are implemented in this connection:

- advice for users on energy-efficient and optimal systems operation,
- installation of energy-efficient pumps,
- installation of more efficient heating controls,
- hydraulic balancing of heating systems,
- optimisation of hot water supply systems,
- insulation of the top storey,
- installation of window seals,
- installation of LED lighting,
- construction of photovoltaic installations.

The Federal Government's energy consultants are responsible for the following monitoring and controlling tasks:

- helping to draft the contracting agreement (billing method, baseline calculation, adjustments etc.),
- including contracting-related annexes for individual properties as part of the tendering documents,
- monitoring specified parameters (room temperature, amounts of air, lighting intensity etc.),
- checking and approving annual bills,

- keeping long-term records,
- participating in annual pool meetings,
- acting as a mediator between the client (the Federal Government), the contractor (a specialist company) and the building owner (e.g.: Bundesimmobiliengesellschaft mbH).

<https://www.bmdw.gv.at/KulturellesErbe/EnergieeinsparungimBundesbereich/Pagen/Bundescontracting.aspx>

<https://www.bmdw.gv.at/KulturellesErbe/EnergieeinsparungimBundesbereich/Pagen/Energieeinsparung.aspx>

- **Climate Change Act (Federal Law Gazette I No 106/2011) and Agreement pursuant to Article 15a of the Federal Constitutional Law between the Federal Government and the provinces on measures in the buildings sector aimed at reducing greenhouse gas emissions (Federal Law Gazette II No 251/2009)**

The Federal Government and Bundesimmobiliengesellschaft mbH submit annual reports on measures to increase energy performance and the share of renewable energy carriers in the buildings sector. The minimum requirements for new builds and refurbishments set out in Article 15a of the Federal Constitutional Law must be taken into account. As part of this reporting procedure, the Federal Government's energy consultants gather reports from the ministries (by the end of May of each year) and check these for plausibility and double counting.

klimaaktiv Construction and Refurbishment

Activities carried out under the programme include the drafting of sets of criteria, quality assurance measures and advice on comprehensive refurbishments and new-build educational establishments. Further details are available at: <https://www.klimaaktiv.at/bauen-sanieren/dienstleistungsgeb/Neue-Brosch-re--Schulbau-mit-Zukunft.html>

Cooperation between *klimaaktiv* and Bundesimmobiliengesellschaft mbH also plays an important role in this connection. The *klimaaktiv* basic criteria serve as a foundation for the *Holistic Building Programme* developed by Bundesimmobiliengesellschaft mbH.

Model example – refurbishment campaign under the Climate and Energy Fund:

Support is given to extensive refurbishment projects for business or public buildings. Measures to improve thermal protection, to promote the use of renewable energy carriers and to increase energy efficiency are funded. For buildings that satisfy the *klimaaktiv* Gold Standard, there is a supplement of 5% of the eligible costs.

Provincial policies and actions

Input from Carinthia

Carinthian Building Regulations

Section 43(13) of the Carinthian Building Regulations states that the province and the municipalities must undertake every effort to ensure that they comply with the recommendations set out in the energy certificates for the buildings they own within the term of validity of these certificates, and that systems for generating energy from renewable sources are installed on the roofs of public-use buildings or public/private-use buildings. In addition, Section 43(5b) of the Carinthian Building Regulations states that an energy certificate must be issued for all buildings in which a total useful floor area of over 250 m² is occupied by the authorities and which are frequently visited by the public.

Carinthian School-building Fund

As regards the refurbishment of school buildings, the guidelines of the Carinthian School Construction Fund stipulate that priority funding should be earmarked for measures aimed at reducing greenhouse gas emissions, in particular comprehensive energy refurbishments, the use of eco-friendly

construction materials and building services systems with zero or low CO₂ emissions, as well as for innovative climate-related systems and the use of renewable energy carriers (Section 3 of the Carinthian School Construction Fund).

Model examples – refurbishment of schools

With the support of the Province of Carinthia and the Austrian Federal Government, the market town of Arnoldstein refurbished its Naturpark School using eco-friendly materials, with a high thermal standard and an accessible design. VS Arnoldstein [*Volksschule/Primary School Arnoldstein*] is the first building in Austria whose operations have been certified to the *klimaaktiv* Gold Standard.

Following completion of the project in 2016, an external company was contracted to carry out energy consumption monitoring (alongside the motivated and highly trained janitor), with a view to optimising operational management as rapidly as possible. By the building's second year of operation, optimisation measures had made it possible to reduce the energy required to supply heating and hot water (by means of block heating) to 68 kWh/m² of useful floor area per year, even though the average indoor air temperature was maintained at 22.15°C during the six-month winter period. Measurements and a user survey (during the transitional period and in summer) confirmed that the building did not overheat even without active cooling.

In addition, the education centres in Guttaring, Ludmannsdorf and Eisenkappel-Vellach have already been refurbished to *klimaaktiv* standards. Additional model refurbishments are being planned and will be implemented in the future.

Input from Lower Austria

Lower Austrian Energy Efficiency Act

The law specifically targets the municipalities and those responsible for other public buildings. The following points are relevant in this regard:

- the introduction of energy accounting
- the appointment of an energy officer
- acting as a role model for the public sector
- the adoption of energy-related criteria for procurement.

Municipalities and competent bodies responsible for other public institutions are obliged to appoint energy officers. In line with the Lower Austrian Energy Efficiency Act, an energy officer must be appropriately qualified. Individuals will be deemed to be appropriately qualified if they can prove that they have completed at least 40 hours of training on the topic of energy efficiency (with a particular focus on the physical properties of buildings, heating technology, ventilation and air-conditioning technology and electrical energy).

The Province of Lower Austria provides free access to an Internet-based energy accounting tool to assist with the mandatory task of energy accounting. This application can be used as a simple means of recording and evaluating energy and resource consumption. It also streamlines the energy consumption reporting process required by the Energy Efficiency Act; this requirement must be fulfilled by the energy officers. This serves as a basis for comparing buildings and establishing benchmarks.

The e5 scheme for municipalities

The programme helps municipalities to implement the provisions of the Energy Efficiency Act, with regard to the following points in particular:

- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and employees of the municipalities for information on municipalities' opportunities for action,
- evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water),
- building-thermographic images,
- initiation of the creation of refurbishment plans for public buildings,

- cooperation and communication with various target groups (associations, business and commerce, schools, public authorities, etc.) to initiate projects,
- public relations (all media and target groups).

Specifications for province-owned buildings

The specifications for province-owned buildings set out in detail the minimum level of technical provision for province-owned buildings. This applies not only to the stipulations in respect of energy consumption, but also to the technical provision of the building technology systems and control systems.

The 'Passivhaus' standard is set as a goal in respect of the energy required to heat the building and the quality of the building envelope, and the choice of energy carrier is based on the high-efficiency systems pursuant to the EPBD.

Municipal Environment Service

The Lower Austrian Energy and Environment Agency operates a fully featured platform for the Lower Austrian municipalities. As well as a procurement service, funding advice and energy consultations, it also offers information on climate action, climate change adaptations and electromobility.

Municipalities wishing to refurbish municipal buildings or replace energy supply systems can request independent and comprehensive consultations. A subsidy is available to cover up to 10 consultant-days and up to 75% of the cost of further services (ranging from detailed concepts and tendering procedures through to planning services).

Input from Upper Austria

The requirements for new builds and refurbishments pursuant to the Upper Austrian Structural Engineering Ordinance also apply to public buildings.

Pursuant to the Upper Austrian Air Pollution Control and Energy Technology Act, energy accounting must be carried out for all public buildings as a basis for determining the strengths and weaknesses of the building stock; the findings must be taken into account when carrying out renovation measures.

Refurbishment measures for buildings owned by the province are carried out on the basis of the low-energy or nearly zero-energy building standard.

Model example

Provincial funding programme for photovoltaic installations on Upper Austrian schools and kindergartens

Measures to increase the use of renewable energy and cut electricity consumption in kindergartens reduce the impact on the environment, improve the energy footprint of public buildings and raise awareness of energy-related topics among children. This can help to cut the running costs of schools and kindergartens, improve the public building stock and make citizens more aware of the need to save energy and electricity. Two programmes launched by the Province of Upper Austria (*PV macht Schule* [Photovoltaics Go To School] and *PV Kindergarten* [Photovoltaics Kindergarten]) have provided funding (up to 75% of costs) for the construction of photovoltaic installations on schools and kindergartens in Upper Austria and raised the profile of energy efficiency in schools and kindergartens. Over 360 schools (around 40% of all primary, secondary and new middle schools in Austria) participated in the Photovoltaics Go To School programme, with photovoltaic installations totalling over 1,200 kWp installed on public buildings. In response to this resounding success, the scope of the programme was subsequently expanded to cover kindergartens, with photovoltaic installations totalling around 700 kWp installed on over 180 kindergartens.

Over 550 schools and kindergartens in total participated in these programmes.

In addition to providing funding for photovoltaic installations on public buildings, the Upper Austrian Energy Saving Association implemented a number of awareness-raising activities targeted at

kindergartens and schools, including the website www.pv-schule.at and a database of all systems, as well as documents and brochures. All participating schools and kindergartens received a 'Sun Box' kit containing the materials needed to demonstrate certain experiments during lessons, and at least one teacher from each school and kindergarten attended a training seminar. Training was provided to over 570 teachers in total.

Input from Salzburg

Energy performance funding – public buildings owned by municipalities

In line with the guidelines on handling funding under the Municipal Equalisation Fund, premiums for energy performance improvements are granted in connection with the construction and refurbishment of buildings owned by municipalities.

Funding system based on energy performance

Energy performance improvements for new builds and refurbishments are funded on the basis of a basic amount and premiums.

Premiums for energy performance improvements

The level of the supplementary subsidy for energy performance depends on the sustainability primary energy indicator (N_{i30}). In addition to the primary energy demand and the carbon dioxide emissions for building air conditioning, the N_{i30} also takes into account the ecological quality of the building materials used to erect the building. The depreciation period under consideration for construction materials is set at 30 years. Depending on the N_{i30} value, between 0 and 30 supplementary points can be achieved. Funding increases by 0.3% of eligible investment costs for each supplementary point.

https://www.salzburg.gv.at/verwaltung/_Documents/GAF-Richtlinien%201.1.2018.pdf

Energy performance funding – buildings owned by the provinces

Higher energy performance standards must be observed when buildings that are owned by the province are constructed or refurbished, in line with the technical specifications on energy efficiency for buildings owned by the province.

Input from Styria

1. Policies to target all public buildings

In November 2017, the Province of Styria published its *Climate and Energy Strategy 2030*, which had previously been adopted by the Styrian Provincial Government.

<https://www.technik.steiermark.at/cms/ziel/142705670/DE/>

An action plan will be published every three years as a basis for implementing the goals set out in the *Climate and Energy Strategy 2030*. The first such action plan was adopted in August 2019.

<https://www.technik.steiermark.at/cms/ziel/142705670/DE/>

The following policies (centring around four main topics) are relevant to the issue of public buildings:

Exemplary role of public buildings

Focal point	Objectives
V1 Policies and processes	Agreeing on a range of different provincial policies and leveraging any associated synergies

Focal point	Objectives
V2 Employees of the provinces	Expanding the range of information and advice available on climate-friendly user behaviour and providing climate-friendly options for employee mobility
V3 Infrastructure and procurement	Promoting climate-neutral public buildings and procuring alternative vehicles and eco-friendly products
V4 Global responsibility	Stepping up participation in transnational partnerships and supporting global projects in the field of sustainable development

In order to act as a credible partner as regards the implementation of climate and energy goals, the Province of Styria should place particular emphasis over the next three years on emissions reductions that it can achieve independently, for example in its own buildings, through public procurement, by granting funding or through the mobility services for which it is directly responsible. The measures necessary to drive forward a coherent climate and energy policy should also be implemented jointly with the municipalities and regions. This will boost by a significant factor the potential of the measures that can be taken by the province itself, and also make these measures easier for citizens to relate to.

A fact that is neglected in many debates on this topic is that climate change will not stop at our borders. Styria should therefore send out a clear signal by engaging in 'climate' partnerships with countries from the Global South.

Section 5.7 of the Climate and Energy Strategy 2030 (Exemplary role of public buildings, Focal Point V3) states that: 'The Province of Styria and the Styrian local authorities own a large number of buildings and vehicles. These should be brought into line with energy-related standards, and their energy consumption and greenhouse gas emissions should be continuously reduced.'

This goal is explained in more detail under V3.1 (Energy-related and climate-neutral optimisation/improvement of existing building infrastructure): 'With a view to ensuring that public buildings comply with the highest possible energy and climate standards, a large number of different measures must be carried out [...]. Particular attention must be paid to [...] improving the building envelope by means of refurbishment measures [...]. The shift away from fossil energy as a basis for generating heat and electricity and the use of sustainable construction materials should be prioritised.'

The action plan, which was last updated in August 2019, defines the following as a measure under V3.1: 'Analyse energy consumption in public buildings and develop an implementation programme for exemplary refurbishments in line with the municipal building passport.' The target refurbishment rate is 2% per year.

2. Measures to target all public buildings

- Pursuant to Section 81(1)(4) and (2) of the Styrian Construction Law in the version published in the Provincial Law Gazette No 63/2018, an energy certificate is required for buildings that serve a public purpose and that have an air-conditioned gross floor area of 250 m² or more. This energy certificate must be displayed in a location that is easily visible to the public, and its validity is limited to a period of 10 years.
- Styria supports the e5 programme and the Climate Energy Model Regions Quality Management [*Klima- und Energie-Modellregionen Qualitätsmanagement, KEM-QM*] programme. Both programmes include measures targeted at public buildings.
<https://www.wohnbau.steiermark.at/cms/beitrag/12674570/113383975/>
- The Styrian Environmental Fund promotes the installation of heating systems that operate on the basis of renewable energies in schools, kindergartens, nursing homes, public sports facilities and

buildings owned by municipalities.

<http://www.wohnbau.steiermark.at/cms/ziel/113383975/DE/>

Input from Tyrol

The Province of Tyrol provides financial support to municipalities by funding specific measures to increase the energy efficiency of municipal buildings.

Energy Tyrol offers free-of-charge energy consultations for municipalities; the scope of these consultations centres around the thermal refurbishment of existing buildings and the use of renewable energy carriers.

Public buildings constitute a major focus of action under the e5 programme.

Energy Tyrol provides training to janitors of public buildings in the municipalities with a view to raising awareness of the need to save energy while managing these buildings.

Policies and measures to target public buildings owned by the Province of Tyrol

The energy certificates issued in 2009/2010 for buildings owned by the Province of Tyrol, the thermal improvement measures developed on the basis of these certificates and the energy saving potentials that could be achieved by implementing these measures serve as a basis for Tyrol's strategy on the renovation of the public buildings it owns.

Accordingly, all the data required to implement thermal refurbishment measures in the area of building maintenance are available for each building in the following categories:

- town halls,
- district offices,
- other official buildings,
- Tyrol vocational schools,
- provincial agricultural schools,
- SEN schools,
- boarding schools.

All the necessary data for the implementation of thermal refurbishment measures in the area of building repairs are therefore available.

More specifically, the planned refurbishment packages include the following energy efficiency measures:

- continuation of the thermal refurbishment measures that commenced prior to 2009 in existing buildings, with the exception of listed buildings or buildings located in protected zones, with a view to lowering the HDH or HDH* (complete thermal insulation, internal insulation, insulation of the top and bottom storeys, replacement or refurbishment of windows),
- replacement of inefficient heating systems (in particular those using fossil energy carriers) with efficient or highly efficient heating systems or connections to district heating systems, using renewable energy carriers wherever possible,
- installation of solar-powered systems for the supply of hot water to public buildings with the corresponding consumption of hot water,
- construction of photovoltaic installations,
- gradual replacement of lighting systems and reduction in energy consumption through a switch to LED technology,
- initiation of awareness-raising measures among users (e.g. the *Meine Klimazone Büro* [My Climate Zone Office] initiative).

Input from Vorarlberg:

Building regulations

In accordance with the Building Code as most recently amended: Section 49d – Exemplary role of

public buildings

(1) The province and the municipalities must play an exemplary role with regard to improvements in the energy performance of buildings and the use of renewable energies.

In accordance with the Structural Engineering Ordinance as most recently amended: Section 40

The following definitions shall apply for the purposes of this subsection:

(c) 'Nearly zero-energy building' means a building that has a very high energy performance, as determined in accordance with Annex I to Directive 2010/31/EU. If possible, the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources. In terms of the energy required to heat the building, primary energy demand and carbon dioxide emissions (CO₂), nearly zero-energy buildings must at least comply with the requirements set out in the OIB Document defining the nearly zero-energy building and specifying intermediate targets for energy performance by 2020 in a National Plan pursuant to Article 9(3) of 2010/31/EU dated 28 March 2014. The OIB Document is available via the Internet on the OIB home page and on the home page of the Province of Vorarlberg:

www.oib.or.at

www.vorarlberg.at

In accordance with the Structural Engineering Ordinance as most recently amended: Section 41b – Nearly zero-energy buildings

(1) New builds that require energy to heat and cool their interior climate must be constructed as nearly zero-energy buildings (Section 40(c)); this requirement does not apply to buildings pursuant to Section 40(5) and buildings for which the cost/benefit analysis over the building's economic lifetime is negative.

(2) Paragraph 1 applies to the following buildings if they were approved under building regulations after 31 December 2018:

- (a) buildings owned by the province,
- (b) buildings owned by the municipality or establishments regulated by provincial law, provided that they are occupied by authorities or public offices.

(3) Paragraph 1 applies to buildings that do not fall under paragraph 2 and were approved under building law after 31 December 2020.

In accordance with the Structural Engineering Ordinance as most recently amended: Section 42* – Energy certificate for buildings that are frequently visited by the public

(1) In the case of buildings in which a total useful (air-conditioned) floor area of over 500 m² is frequently visited by the public, the first two pages of the energy certificate pursuant to Section 4(2)(a) and (b) and Section 4(3)(a) and (b) of the Planning Application Ordinance must be displayed in an easily visible location (e.g. close to the main entrance) if such an energy certificate is available.

(2) In the case of buildings in which a total useful (air-conditioned) floor area of over 500 m² (over 250 m² since 9 July 2015) is used by authorities and public offices and frequently visited by the public, the first two pages of an energy certificate that is no more than 10 years old, pursuant to Section 4(2)(a) and (b) and Section 4(3)(a) and (b) of the Planning Application Ordinance, must be displayed in a location that is easily visible for the public (e.g. close to the main entrance).

In accordance with the Structural Engineering Ordinance as most recently amended: Section 49a – Exemplary role of buildings owned by the province and the municipalities

(1) The province and the municipalities should draw up an inventory of the buildings that they own or occupy that require energy to heat and cool their interior climate, as well as analysing the current energy status of these buildings, documenting their energy performance and monitoring the energy consumed by these buildings during their operation on an ongoing basis (energy monitoring) and leveraging any potential for energy efficiency improvements.

(2) In so far as possible, beneficial and financially reasonable, the province and the municipalities should:

(a) carry out major renovations on the buildings in their ownership that require energy to heat and cool their interior climate; the energy performance requirements specified in Section 41 should be observed in this connection,

(b) make it possible for systems that generate energy from renewable energy sources to be installed on the roofs of the buildings in their ownership.

MissionZeroV – Vorarlberg as the first climate-neutral provincial administration in Austria

The Vorarlberg Provincial Government and the parties within the Provincial Parliament aim to make Vorarlberg the first climate-neutral provincial administration in Austria by 2019.

Through a range of different measures, including the replacement of all existing oil-fired boilers and the use of renewable energies to supply all the electricity used by the province, it plans to reduce the emissions for which it is responsible to the lowest possible level. CO₂ emissions that are unavoidable in the short term are to be compensated for by investments in energy independence projects, e.g. the increased roll-out of solar-powered systems at kindergartens and similar. Christian Gantner, Member of the Provincial Government, is enormously confident about the scheme:

‘Vorarlberg has already achieved the reputation of a pioneer within Europe through its decision to achieve energy independence, and *MissionZeroV* will consolidate and further expand this exemplary and pioneering role.’

Zero fossil fuels in buildings owned by the province by 2040

The following measures will be implemented with a view to ensuring that all of the energy consumed in buildings owned by the province is generated from renewable energies:

- replacement of all existing oil-fired boilers with systems based on renewable energy carriers by the end of 2020,
- construction of new builds as nearly zero-energy buildings (The energy consumption of these buildings will be very low, but must be covered by renewable energy carriers.),
- a step-by-step plan for the energy refurbishment of buildings owned by the province by 2030 (in the form of best-practice refurbishments. The remaining energy consumption must be covered by renewable energy carriers.),
- use of the roofs of buildings owned by the province to accommodate solar and photovoltaic installations,
- exclusive use of electricity from renewable sources to cover the province’s entire energy demand,
- increase in the share of renewable energy carriers as a proportion of the entire final energy demand for heating, cooling and electricity of buildings owned by the province to 90% by 2030.

Several projects are already planned for 2019, including the administrative building at Widnau 12 in Feldkirch and the road maintenance depots in Lauterach and Schruns.

Steps towards climate neutrality

From 2019 onwards, measures must be implemented to compensate for CO₂ emissions that cannot currently be avoided in spite of all CO₂-reduction efforts. In concrete terms, this will involve assessing the financial value of the provincial administration’s remaining CO₂ emissions at prices that are internationally regarded as appropriate for producing an adequate steering effect. These extra sums will be used to implement energy independence projects. Investments in the Sonnenkindergärten project are already planned for 2019.

Sustainable: Construction in the municipalities service package – municipal building passport

This will provide municipalities with legal certainty when tendering out ecological building components, and supervision by the institutes involved will guarantee optimised planning, ecological optimisation and quality-assured construction work, including documentation. For an increase in costs of just 1-3%, the municipalities will obtain a sustainable project which boasts a longer lifespan, lower operating costs and a better user experience.

Since 2011, municipal building passports have been updated and issued as a basis for assessing the eligibility for funding of new builds and refurbished buildings. Buildings are assessed according to four different criteria:

- quality of processes and planning,
- energy and utilities,
- health and comfort,
- construction materials and design.

A total of 1,000 points can be achieved overall. The points awarded for these four criteria and the total number of points are specified in the project documentation for recently constructed buildings.

Flagship project: St Gerold community centre

Owner: Gemeinde St Gerold Immobilienverwaltung

Architect: Cukrowicz Nachbaur Architects, Bregenz

Energy planning: Technisches Büro Werner Cukrowicz, Lauterach

Gross floor area: 759 m²

Volume: 2,890 m³

Heat demand for heating: 9 kWh/(m²_{GFA}.a)

Special features:

- design based on prefabricated timber structural elements
- heat pump with geothermal probes
- controlled ventilation with heat recovery.

Net construction costs: around €1.9 million

Completion: 2008

Address: Faschinastraße 100, 6722 St Gerold

Architecture:

The design of the new St Gerold community centre forms a contrast to an Alpine landscape dominated by tradition. As the first four-storey timber building in Vorarlberg (incorporating a lift mechanism built from laminated wood), it was constructed from local timber by Austrian companies to a fully ecological design. Two storeys are visible from the street. The village shop is located on the ground floor, and a wooden staircase provides access to the municipal offices. The municipality's kindergarden and the childcare facility for the valley are built into the slope and look out over the surrounding landscape. The building's exterior and interior appearance is dominated by the use of silver fir. Timber from forests within the municipality was used to build most of the structure itself, the facade and the floors and ceilings. The use of local construction materials minimised material flows and grey energy. It also boosted the local economy and strengthened regional identity.

Energy and ecology:

One of the focal points of the Energy Concept was sustainability; the community centre was designed, executed and certified to 'Passivhaus' standard with controlled ventilation of the rooms. Heat is supplied firstly by means of a ground source heat pump, and secondly by recovering the heat lost from the refrigerating units in the village shop. Consumption of energy is extremely low thanks to the use of triple glazing and thermal insulation for the external walls with a thickness of 36.5 cm. All materials were subjected to comprehensive checks for potentially harmful pollutants during the manufacturing process, and their installation was monitored on site. Close attention was paid to the following areas where improvements could be made: primary energy content, CO₂ emissions and

acidification.

Only PVC-free and (H)CFC-free construction materials were used, and sheep's wool and wood-fibre insulation were employed instead of mineral wool. This pilot project, which was implemented under the *Interreg IIIa* programme, is the first public building in Vorarlberg to be certified to passive house standard.

Details of further projects can be found in: Project documentation *Nachhaltig Bauen in der Gemeinde* [Sustainable construction in the municipalities] – Project documentation 2005-2013

Input from Vienna:

Minimum requirements for new public buildings

According to the Agreement pursuant to Article 15a. of the Federal Constitutional Law between the Federal Government and the provinces on measures in the buildings sector aimed at reducing greenhouse gas emissions, the nearly zero-energy building standard must be applied to any public building constructed by the contracting parties from 1 January 2019 onwards, in accordance with Article 9(1)(b) of Directive 2010/31/EU.

- (1) this is without prejudice to the requirement for a maximum permitted externally induced cooling demand of 1.0 kWh/(m³.a) pursuant to OIB Guideline 6 during the construction of public buildings;
- (2) heating and hot water supply systems must be designed as high-efficiency alternative energy systems within the meaning of Article 2(1) sentence 6;
- (3) the contracting parties must adopt rules aimed at optimising user behaviour with a view to further energy savings.

Minimum requirements for the refurbishment of public buildings

According to the Agreement pursuant to Article 15a. of the Federal Constitutional Law between the Federal Government and the provinces on measures in the buildings sector aimed at reducing greenhouse gas emissions, special financial incentives are provided for comprehensive energy refurbishments of residential houses, provided that the mandatory energy-related targets set out in the table below are observed:

	Energy required to heat buildings HDH _{Ref,RK} [kWh/m ² a]	Energy performance factor (f _{GEE})
from 2017	21 x (1 + 2.5 / c)	[-]
	or	
	25 x (1 + 2.5 / c)	1.05

Refurbishment of public buildings by the City of Vienna

The Vienna Municipal Department of Building and Facility Management (MA 34) has already been incorporating energy-related considerations into its building development concepts for many years. Energy refurbishment measures are typically carried out as part of refurbishments that are due to be implemented in any case.

The energy indicators calculated on an annual basis are used to identify potential efficiency gains that could be achieved by means of non-investment measures, e.g. efficient operational management or training of operating personnel.

At district level, refurbishments are carried out as part of contracting projects, often but not exclusively in schools.

Refurbishment of Vienna kindergartens

Refurbishments of building envelopes and heating systems were carried out at various locations throughout the programme period, in some cases on the basis of an energy contracting scheme. Around 11 contracting projects and around 31 refurbishment projects (building envelope or heating systems) have been implemented to date. Total savings during the period between 2006 and 2014 amounted to 5,501 MWh.

Refurbishment of road construction and road administration buildings

A 'Support Point Concept' was developed in 2006. One of its main goals is to reduce the number of occupied support points from the current thirteen to a total of six. This will make it possible not only to increase efficiency and leverage synergies, but also to construct new, state-of-the-art buildings to replace the extremely outdated and obsolete buildings that are currently in operation.

Refurbishment of Vienna's schools

The School Refurbishment Package provides for the following thermal improvements to the building envelope of public compulsory schools in Vienna with a view to reducing the amount of energy required to heat these buildings:

- replacement of windows and entrances,
- installation of a full thermal protection facade,
- insulation of the top storey,
- modernisation of the heating systems.

The following building technology improvements were carried out in 189 schools over the period between 2008 and 2014 as part of the School Refurbishment Package: replacement of radiator valves with thermostatic valves, replacement of all radiators, replacement of controls, replacement of pumps, insulation of pipes, replacement of hot water supply system, replacement of conduits. Total savings for the period between 2006 and 2014 amounted to 32.4 GWh.

Model example: school in Vienna singled out by the European Commission for an eco award

The Vienna Municipal Department for Building and Facility Management (MA 34) tackled the eco-friendly refurbishment of the administrative building on Schlagergasse by means of 53 EU-wide calls for proposals. The building, owned by the Vienna Municipal Department for Building and Facility Management (MA 34) and located at 1090 Vienna, Schlagergasse 8, was constructed in 1918. It has now been comprehensively refurbished by the Vienna Municipal Department for Building and Facility Management (MA 34) and converted into a modern office building used by the Vienna Municipal Department for Youth and Families (MA 11). The refurbishment made it possible to achieve significant energy efficiency gains, with final energy demand down by 75%. The general refurbishment included the following measures: lift installation and loft extension, incorporating an accessible design and fire protection measures, facade insulation, replacement of doors and windows, external solar protection, use of eco-friendly construction materials, replacement of heating system with a gas-condensing boiler, chimney refurbishment, installation of a ventilation system in the loft to prevent overheating in the summer and to ventilate interior rooms, and replacement of all high-voltage and low-voltage systems.

These improvements reduced final energy demand by 75%. This was well below the targets that apply to refurbishments under the agreement between the Federal Government and the provinces concerning measures in the buildings sector aimed at reducing greenhouse gas emissions.

Key project data:

Gross floor area: 1,183.94 m² (before refurbishment)

1,499.26 m² (after refurbishment)

Number of offices: 24

Average energy demand to heat the building after completion of the project, in kWh/m².a:

21.54 kWh/m².a (for comparison, before refurbishment: 151.24 kWh/m².a)

Total project costs: €2.4 million

1.6 Overview of national initiatives to promote smart technologies and well-connected buildings and communities, as well as skills and education in the construction and energy efficiency sectors (Article 2a(1)(f))

Federal policies and actions

Federal Energy Efficiency Act [*Bundes-Energieeffizienzgesetz – EEffG*]

The Federal Act on increasing energy efficiency within companies and the Federal Government (Federal Energy Efficiency Act [*Bundes-Energieeffizienzgesetz – EEffG*]) lays down both qualification requirements for energy auditors and energy consultants and stipulations for the implementation of energy audits (Section 17 EEffG). Under the Federal Energy Efficiency Act, qualification to perform energy audits requires training in energy efficiency, as well as multiple years of professional activity in the field of energy efficiency (Section 17 EEffG). External energy auditors must also enrol in a publicly accessible register that is managed by the National Energy Efficiency Monitoring Centre. The register can also be found on the website of the National Energy Efficiency Monitoring Centre: <https://www.monitoringstelle.at/index.php?id=708>

Individuals who conduct internal energy audits must also satisfy the qualification requirements under Section 17 of the Federal Energy Efficiency Act, but need not be entered in the register.

Publications

Technical Guide

74 demonstration buildings (new builds and refurbishments) as results of the *Haus der Zukunft* [House of the Future] and *Stadt der Zukunft* [City of the Future] research programmes
<https://nachhaltigwirtschaften.at/de/hdz/projekte/demonstrationsgebäude-2017.php>

Concrete as an energy store

Thermal component activation – planning guidelines for single-family buildings and terraced houses
https://nachhaltigwirtschaften.at/de/sdz/publikationen/planungsleitfaden-energiespeicher-beton_broschuere.php

Refurbishment with passive house technology from the master builder

Planning documents – manual and seminars

<https://nachhaltigwirtschaften.at/de/hdz/projekte/sanierung-mit-passivhaustechnologie-vom-baumeister-abgesicherte-planungsunterlagen-handbuch-und-seminare.php>

Renovation with Innovation

The opportunities of intelligent refurbishment

<https://nachhaltigwirtschaften.at/de/hdz/news/2013/20130517-renovation-with-innovation-die-chancen-intelligenter-sanierung.php>

Cooperative refurbishment

Development of models for the involvement of owners and residents in sustainable building refurbishments in apartment blocks

<https://nachhaltigwirtschaften.at/de/hdz/projekte/kooperative-sanierung.php>

Energieeffizienz am Baudenkmal [Energy efficiency in monuments] guideline

Presentation of the possibilities and limits of thermal optimisation on monuments

https://bda.gv.at/fileadmin/Medien/bda.gv.at/SERVICE_RECHT_DOWNLOAD/Richtlinie_Energieeffizienz_am_Baudenkmal.pdf

City of the Future projects – EnerPHit green concept – modernisation of a Gründerzeit building using an aerogel insulation plaster

In this demonstration project, a comprehensive modernisation of the *Gründerzeit* era building stock is carried out as an example for the defining constraints of a regional protection zone. The use of

aerogel high-performance insulation plaster enables *Gründerzeit* era facades to be insulated as part of a highly efficient, extensive refurbishment while the appearance of the facades is maintained.

Contact: Helga BRUN estate agents and property managers

[BONSEI! Optimal use of existing buildings through energy-efficient refurbishment!](#)

The goal of the *BONSEI!* project is to promote energy-efficient and socially acceptable redensification in privately owned urban residential buildings and, at the same time, to create a methodological basis for more resource-efficient urban regions. The results contribute to the design of a new type of service intended to offer impartial initial advice for private densification projects.

Contact: Research Studios Austria Forschungsgesellschaft mbH – Research Studio iSPACE, Dr Thomas Prinz

[SaLÜH! Refurbishment of multifamily buildings containing small apartments – Cost-effective technical solutions for ventilation, heating and hot water](#)

Innovative ventilation and heating concepts are being investigated for the refurbishment of multifamily buildings containing small apartments, while space-saving heating and domestic hot water micro-heat pumps with outside or exhaust air as the heat source are also being developed for this purpose, which can optionally be integrated into the existing parapet or a lightweight wooden curtain wall.

Contact: University of Innsbruck – *Arbeitsbereich für Energieeffizientes Bauen* [Energy-Efficient Construction Section], Fabian Ochs

[FiTNeS – Facade-integrated modular split heat pump for new builds and refurbishments](#)

The aim of *FitNeS* is the development of modular split heat pumps with very compact facade-integrated outdoor units for use in home heating and domestic hot water. The aim is to make possible modular construction with a high degree of prefabrication, while at the same time giving special consideration to the architectural design and to an attractive appearance. One of the main development goals is minimising noise emissions through optimised flow control.

Contact: University of Innsbruck – *Arbeitsbereich für Energieeffizientes Bauen* [Energy-Efficient Construction Section], Fabian Ochs

[SPACE4free – Refurbishment of *Gründerzeit* cellars into apartments with a high degree of comfort and minimal energy consumption](#)

The goal is the planning of durable, no-harm homes with a high degree of comfort and minimal energy consumption in the underground areas of damp-infested cellars of *Gründerzeit* buildings. A comfortable room climate is created through the use of innovative ventilation controls. At the same time, suitability for different types of use is ensured. A planning tool makes it possible to scale up findings and apply them to a wide variety of planning situations.

Contact: *Technische Universität Wien, Institut für Hochbau und Technologie, Forschungsbereich für Bauphysik und Schallschutz* [Vienna University of Technology, Institute of Building Construction and Technology, Research Centre for Building Physics and Sound Protection]

[THERM-opti-BALKON: Thermally optimised balcony refurbishment](#)

Cantilevered balconies represent a particular problem in the thermal refurbishment of buildings. The aim of the project was to create the basis for the development of a practical and inexpensive mounting system that allows the thermally decoupled reconstruction of balconies in the course of a refurbishment, thereby significantly improving the efficiency of a thermal insulation measure.

Contact: DI Nikolaus Fleischhacker, University of Innsbruck, *Institut für Konstruktion und Materialwissenschaften – Arbeitsbereich Massivbau und Brückenbau* [Institute for Construction and Material Sciences – Solid Structures and Bridge Construction]

[THERM-opti-BALKON-P2: Thermally optimised balcony refurbishment, Phase 2: On site testing facility](#)

Cantilevered balconies represent a particular problem in the thermal refurbishment of buildings. The *THERM-opti-BALKON* system is currently being used to research a related approach under laboratory conditions. Phase 2 is intended to create an on-site testing facility under real conditions as a technology demonstrator. The key object of investigation is the long-term behaviour of the *THERM-opti-BALKON* system.

Contact: DI Nikolaus Fleischhacker, University of Innsbruck, *Institut für Konstruktion und Materialwissenschaften – Arbeitsbereich Massivbau und Brückenbau* [Institute for Construction and Material Sciences – Solid Structures and Bridge Construction]

[Lightyard – From an inner courtyard to a lightyard](#)

An investigation is being conducted into whether the intelligent arrangement of different materials facilitates optimal solutions, in terms of daylight technology, for the refurbishment of inner courtyards. This offers a realistic possibility of increasing the daylight exposure of lower floors by more than a factor of 10. In addition, a calculation tool is being designed for the creation of optimised solutions for inner courtyards. Technical criteria relating to lighting, economics and construction are taken into account.

Contact: Mag. Wilfried Pohl, Bartenbach GmbH

[Vienna University of Technology's plus-energy office block](#)

The 1970s 'Chemistry Tower' underwent extensive refurbishment as a research project. In an integrated planning process, an interdisciplinary team of experts developed innovative concepts and technologies for maximum energy efficiency in office construction.

Contact: Alexander David, Institut für Hochbau und Technologie, Forschungsbereich für Bauphysik und Schallschutz [Institute of Building Construction and Technology, Research Centre for Building Physics and Sound Protection]

[VIG-SYS-RENO – Examining window systems with innovative glazings – especially vacuum insulating glazings – for building renovation](#)

- exploration of the use of new, innovative, high-performance thermal insulation vacuum (insulating) glass (VG) for highly efficient window systems, especially for renovating existing buildings, by evaluating the availability and quality of VG in the global marketplace
- thermal simulations and design-engineering optimisation concepts for complete systems
- studies on typical applications and determination of the market potential
- determination of the energy-saving potential for individual buildings and urban districts

Contact: Ulrich Pont, Vienna University of Technology, *Institut für Architekturwissenschaften – Abt. Bauphysik und Bauökologie (BPI)* [Institute for Architectural Sciences – Department of Building Physics and Building Ecology]

[House of the Future Projects – Gründerzeit mit Zukunft \(GdZ\) \[Gründerzeit buildings with a future\] – Innovative modernisation of Gründerzeit buildings](#)

The goal of this flagship project is to promote the ecological modernisation of *Gründerzeit* buildings using innovative technical and organisational solutions:

[e80^3 buildings](#)

Contact: Dipl.-Ing. Walter Hüttler, e7 Energie Markt Analyse GmbH

[e80^3 buildings – Refurbishment concepts for a plus-energy building with prefabricated active roof and facade elements, integrated building technology systems and network integration](#)

The project pursues the goal of the high-efficiency refurbishment of existing buildings and estates in urban areas. The main focus is on buildings constructed between 1950 and 1980.

Contact: Dr Karl Höfler, AEE Intec – Institute for Sustainable Technologies

[SchulRen+ Innovative concepts for refurbishing schools to the plus-energy level](#)

Using a specific school as an example (Franz Jonas Europaschule, Deublergasse, Vienna 21), a technical feasibility study examined innovative concepts for refurbishing schools to the plus-energy level. The aim was to develop refurbishment concepts that combine future-oriented energy concepts with solutions that can be implemented in building technology and architectural terms, and that have a high replication potential for buildings of the same type and age.

Contact: Florian Dubisch, AIT Austrian Institute of Technology – Energy Department

IEA Technology Collaboration Programmes

[Solar Heating and Cooling \(SHC\)](#)

<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/shc/>

[Energy in Buildings and Communities \(EBC\)](#)

<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/ebc/>

IEA SHC Task 50 – Advanced lighting solutions for retrofitting buildings

The refurbishment of buildings in the non-residential sector with energy-efficient daylight and artificial lighting solutions has enormous potential for reducing final electrical energy consumption. However, the relevant technologies must be made available to the parties involved in the refurbishment process (investors, industry, consultants, planners). Therefore, system solutions for daylight and artificial light were examined, planning processes evaluated, simple assessment and evaluation tools created, and case studies evaluated as best practice examples. With the collective processing of results in the Lighting Retrofit Advisor, stakeholders had access to a comprehensive decision-making aid in the refurbishment process.

<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/shc/iea-shc-task-50.php>

- Concluded in 2017
- Email: David.Geisler-Moroder@bartenbach.com

IEA SHC Task 59/EBC Annex 76 – Deep renovation of historic buildings

The aim of *IEA SHC Task 59/EBC Annex 76* is the documentation of international best practice examples (knowledge base), the development of a multidisciplinary planning process and the development of holistic refurbishment solutions for historic buildings. In addition to leading on *Subtask A (Knowledge base)*, Austria will also be involved in the discovery and further development of innovative technological and organisational solutions that have been applied in national demonstration projects and tested in practice.

<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/shc/iea-shc-task-59.php>

- Ongoing: September 2017-February 2021
- Email: walter.huettler@e-sieben.at

IEA EBC Annex 75

For cost-effective building renovation strategies at district level for the conversion of existing buildings to low and nearly zero-energy buildings with low greenhouse gas emissions, it is important to know which strategies are the most cost-effective in reducing the buildings' emissions and primary energy consumption. In particular, it is important to find the right balance between energy efficiency measures and measures relating to the use of renewable energy carriers. This issue is being explored in this project.

<https://nachhaltigwirtschaften.at/de/iea/technologieprogramme/ebc/iea-ebc-annex-75.php>

- Ongoing: November 2017-October 2021
- Email: d.venus@aee.at

Skills and training

klimaaktiv Training coordination – learn about climate-friendly energy transition

The Federal Ministry for Sustainability and Tourism uses *klimaaktiv* Training coordination to qualify specialists for a climate-friendly energy system. *klimaaktiv* Training coordination works with training providers to put together the continuous development services that are needed. In 2017 alone, around 1,500 people took part in training courses in the fields of construction and renovation, energy and technical building systems, green IT, energy saving, energy management and consulting, and environmentally friendly mobility. There are also an e-learning platform and an app for a climate-friendly lifestyle.

<https://www.klimaaktiv.at/bildung.html>

Smart Readiness Indicators

The Federal Ministry for Transport, Innovation and Technology (BMVIT) commissioned the Austrian Research Promotion Agency (FFG) to carry out a project entitled *SRI Austria – Smart Readiness Indikator: Bewertungsschema und Chancen für intelligente Gebäude* [SRI Austria – Smart Readiness Indicator: Evaluation framework and opportunities for intelligent buildings] for a term of 15 months (1 July 2018 – 31 October 2019).

Starting situation/Motivation

Under its *Clean Energy for All Europeans* package from 2016, the European Commission aims to create links in the building sector between intelligent technologies and a high proportion of renewable energy sources, in an energy-efficient way. The evaluation of *smart readiness* by means of an indicator is also intended to help make buildings fit for future requirements in relation to renewable energy networks and the needs of users.

In 2016, the Commission therefore submitted a proposal to amend the existing EPBD (Directive 2010/31/EU) and introduced a 'smartness indicator'. A consortium centred on the Flemish Institute for Technological Research NV (VITO) is currently preparing a proposal for the Commission on how 'smartness' should be calculated. However, implementation/specification is the responsibility of individual Member States.

Contents and objectives

The preparation of a national specification of the 'Smart Readiness Indicator' (SRI) for Austria is part of this project. The proposal for an SRI for Austria is being drawn up in consultation with the *IEA EBC Annex 67* project on Energy-flexible buildings, the responsible individuals at DG Energy, the VITO consortium and national stakeholders.

Methodical approach

Austrian technology providers, energy service providers, experts and other relevant stakeholders are being asked for their opinions and questioned about the potential of smart technologies; a technology screening, an impact analysis and a classification of possible technologies and services are being carried out, and the influence of these on the national regulatory picture – and the reciprocal influence of the regulatory landscape – are being examined. The consortium itself possesses relevant knowledge of technology developments related to the topic of smart buildings.

The technology screening and the impact analysis are supplemented by research in studies of smart grids and intelligent heating networks and heating supply in buildings, as well as targeted master's theses. Various technologies and services related to 'smartness' in buildings are being listed and evaluated.

Research is being collated on the current status of the discussion on an 'intelligence factor' for buildings at EU and national level. In addition, interesting business models that already use intelligent building technology or that exist in the field of digitisation of the energy system are being examined.

Expected outcomes

The main result will be a basis for decision-making and support for the national political implementation of an SRI Austria and possible integration into the process of issuing and using energy certificates. The present project conceives of an Austria-specific 'Smart Readiness Indicator' as an evaluation framework for intelligent buildings on an EU basis and undertakes to produce a rating of the technology according to the requirements of the buildings market.

Participants in the project

Project Management: AEE – Institute for Sustainable Technologies (AEE INTEC)

Partners in project/collaboration: 17&4 Organisationsberatung GmbH, the University of Applied Sciences Technikum Wien, Technologieplattform Smart Grids Austria.

Provincial policies and actions







In the course of research projects that have been running for some time, some Model Regions in Austria have been focusing on smart buildings and smart grids, testing smart grid technology developments in field trials. These are listed and briefly described in the respective sections from the individual provinces below. This is supplemented by a list of all projects funded by the Smart Cities Initiative in each province.

Burgenland

Smart City Oberwart

Oberwart is becoming a Smart City as part of a group of over 10 project partners, under the title *Loadshift Oberwart*. The aim of this project is to develop and operate an innovative, cross-building and integrated energy management system for electricity and heat. Buildings are to be connected to one another via existing networks. The energy comes from systems that have been or are still to be installed in the urban area. Both public institutions and businesses in the city are involved in this plan. With this research project, unique in Austria, the city is becoming an exemplar of intelligent and efficient energy supply.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Burgenland:

Typ	Projektname	Förderwerber	Call
	Empower Citizens – smarte Modernisierung im (öko-)sozialen Wohnbau Pinkafeld	TBH Ingenieur GmbH	7
	Hybride Netzeinspeisung Neusiedl am See	Forschung Burgenland GmbH	9
	IrON Eisenstadt – Multifunktionale Energienetzwerke zur Versorgung von Stadtgebieten	Forschung Burgenland GmbH	8
	KlimaEntLaster go Smart Cities	Energy Changes Projektentwicklung GmbH	10
	LOADSHIFT Oberwart	Stadtgemeinde Oberwart	3
	Micro Grid Güssing	Europäisches Zentrum für Erneuerbare Energie Güssing GmbH	3
	P2X Realisierung Neusiedl/See	4ward Energy Research GmbH	10
	Urbaner Speichercluster Südburgenland	Energie Kompass GmbH	8

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
Empower Citizens – smarte Modernisierung im (öko-)sozialen Wohnbau Pinkafeld	Empower Citizens – smarte Modernisierung im (öko-)sozialen Wohnbau Pinkafeld
Hybride Netzeinspeisung Neusiedl am See	Hybride Netzeinspeisung Neusiedl am See
IrON Eisenstadt – Multifunktionale Energienetzwerke zur Versorgung von Stadtgebieten	IrON Eisenstadt – Multifunktionale Energienetzwerke zur Versorgung von Stadtgebieten
LOADSHIFT Oberwart	LOADSHIFT Oberwart
Micro Grid Güssing	Micro Grid Güssing
P2X Realisierung Neusiedl/See	P2X Realisierung Neusiedl/See
Urbaner Speichercluster Südburgenland	Urbaner Speichercluster Südburgenland
Stadtgemeinde Oberwart	Municipality of Oberwart

Carinthia

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy

Consultant Training]

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Special seminars cover topics ranging from special energy applications to the contents of an energy consultation for businesses. For more information, please visit: <http://www.arge-eba.or.at>

Energy-Efficient Construction and Refurbishment training

The interdisciplinary training offered by the Province of Carinthia is aimed at all those who want to actively promote the implementation of energy efficiency measures in Carinthia's buildings sector and the increased use of renewable energy carriers. Specifically targeted are all persons involved in planning/consultation or operation in the fields of construction engineering and building technology systems, building management, property management, funding agencies, provincial and municipal administration, expertise and energy certificate calculation.

Smart City Villach

In the *Smart City Villach* pilot project, the first tangible digitisation measures are being implemented in the city centre. Intelligent sensors are improving traffic and lighting management. *A1 Smart Lighting* is intelligent lighting management designed to reduce energy and servicing costs. This makes it possible to use light only where it is really necessary. In addition, servicing costs are optimised through intelligent information on outages. *A1 City Parking* is a service that analyses and optimises the parking situation in the city. Sensors detect free parking spaces in certain streets. In future it will be possible to access this information via apps on a smartphone. *A1 Smart Traffic* collects traffic data from the city and analyses movement flows at entrances and exits. Vehicle numbers are counted in real time with guaranteed anonymity through the use of ultrasound. Smart services allow cities to save energy, optimise public and private transport and ensure safety and quality of life for their citizens. These services are based on networking cities with ultra-fast broadband technologies. The A1 fibre optic network is the technical backbone of Austria's digitisation and forms the technical basis for Villach's digital future.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Carinthia:

	 Einstiegsprojekt	 Umsetzungsprojekt	 Begleitmaßnahme
	€CO2 City Klagenfurt	Landeshauptstadt Klagenfurt	1
	Smart Living in Klagenfurt Harbach	Magistrat der Landeshauptstadt Klagenfurt – Abteilung Umweltschutz	8
	Smarte Abwärmenutzung in Klagenfurt	Magistrat der Landeshauptstadt Klagenfurt - Abteilung Umweltschutz	6
	smartWOLF	Rosegger KEG	10
	Vision 2050 Villach	Stadt Villach	1
	Vision Step I Villach	Stadt Villach	2

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Smarte Abwärmenutzung in Klagenfurt	Smarte Abwärmenutzung in Klagenfurt
Landeshauptstadt Klagenfurt	Provincial Capital of Klagenfurt

Magistrat der Landeshauptstadt Klagenfurt – Abteilung Umweltschutz	Offices of the Provincial Capital of Klagenfurt – Environmental Protection Department
Magistrat der Landeshauptstadt Klagenfurt – Abteilung Umweltschutz	Offices of the Provincial Capital of Klagenfurt – Environmental Protection Department
Stadt Villach	City of Villach

Lower Austria

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

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The Lower Austrian Energy and Environment Agency offers regular training courses for qualification as an energy consultant.

Amstetten Smart City Life 2030 – Future Hub

Amstetten has a clear vision of using the neighbourhood development planned for the Austrian Railways station area, which is to become vacant, as an opportunity for a big step towards becoming a zero-emissions city. In the medium term, an 'anergy network' [low-heat network] and the efficient use of new types of renewable energy components, as well as initiatives to change mobility behaviour, should help to reduce the city's CO₂ footprint. The main aim of the project is to develop technological and socially innovative standards and indicators for neighbourhood development in the testbed of the depot, through a number of workshops with stakeholders, and to implement them as examples within the *FutureHub* (collaborative work and learning). Furthermore, a New urban governance prototype/procedure will be used as an innovative control instrument. On the basis of the results, binding agreements will be drawn up between stakeholders for future neighbourhood development and a plan for subsequent impact monitoring will be developed. The *AMSL 2030 – FutureHub* project aims to develop a holistic, integrated Smart City concept in the Amstetten testbed, that:

- provides and tests a coordination and control format, as well as instruments and indicator sets for sustainable, long-term district and city development (City Lab, a welfare economy-based, holistic set of indicators for impact monitoring);
- creates a future-oriented, urban, collaborative work and education centre, as well as organisational models/rules for its operation (collaborative planning and construction & a sociocratic organisational model for self-administration/operation);
- develops implementation tools for an innovative energy system for the entire district that facilitates a reduction in primary energy demand and the establishment of a new business area for Amstetten's municipal utility company (nearly zero-energy/anergy network);
- provides a complete, modern (multimodal) solution for mobility, including an effective incentive system for its users and thus aims to bring about a sustainable change in mobility behaviour in the neighbourhood.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Lower Austria:

Typ	Projektname	Förderwerber	Call
	aIBOX- Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment	StoreMe GmbH	10
	Amstetten Smart City Life 2030 – Future Hub	Stadt AMSTETTEN & Austrian Institute of Technology Center for Innovation Systems & Policy	9
	Amstetten2020+	Stadtgemeinde Amstetten	1
	Green Smart City Schwechat	Green City LAB - Österreichisches Institut für nachhaltige Lebensräume	7
	IndustryHUB Tulln	Stadtgemeinde Tulln	6
	KlimaEntLaster go Smart Cities	Energy Changes Projektentwicklung GmbH	10
	Klosterneuburg Energy	Stadtgemeinde Klosterneuburg	1
	SKYFARM :: Revitalisierung des Ruthner Turms zu einem Forschungslabor für Vertical Farming	vertical farm institute	10
	Smart & GreenLivingLab St. Pölten	Stadt St. Pölten	7
	Smart City Ebreichsdorf	Technische Universität Wien - Department für Raumplanung	6
	Smart Pönten II	Stadt St. Pölten	9
	Smart Water City	Universität Innsbruck - Institut für Infrastruktur	10
	Smart-Region Stadt-Umland Süd Wien	NÖ Energie- und Umweltagentur GmbH	4
	Smarte Speicherstadt Neulengbach	Stadtgemeinde Neulengbach	8
	SmartSuburb Perchtoldsdorf u. Brunn a. Geb.	ConPlusUltra GmbH	1
	Urban Cool Down – kühle Orte für wachsende Stadtquartiere	MK Landschaftsarchitektur, Ingenieurbüro für Landschaftsplanung und Landschaftsarchitektur	7
	Way2Smart Korneuburg	IBO - Österreichisches Institut für Bauen und Ökologie GmbH	5

Typ	Type
Projektname	Project name
Förderwerber	Applicant
aIBOX-Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment	aIBOX-Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment
SKYFARM: Revitalisierung des Ruthner Turms zu einem Forschungslabor für Vertical Farming	SKYFARM: Revitalisierung des Ruthner Turms zu einem Forschungslabor für Vertical Farming
Smart-Region Stadt-Umland Süd Wien	Smart-Region Stadt-Umland Süd Wien
Smarte Speicherstadt Neulengbach	Smarte Speicherstadt Neulengbach
Urban Cool Down – kühle Orte für wachsende Stadtquartiere	Urban Cool Down – kühle Orte für wachsende Stadtquartiere
Stadtgemeinde Amstetten	Municipality of Amstetten

Green City LAB – Österreichisches Institut für nachhaltige Lebensräume	Green City LAB – Austria's institute for sustainable living space
Stadtgemeinde Tulin	Municipality of Tulin
Stadtgemeinde Klosterneuburg	Municipality of Klosterneuburg
Stadt St. Pölten	City of St Pölten
Technische Universität Wien – Department für Raumplanung	Vienna University of Technology – Department of Spatial Planning
Universität Innsbruck – Institut für Infrastruktur	University of Innsbruck – Institute for Infrastructure
Stadtgemeinde Neulengbach	Municipality of Neulengbach
MK Landschaftsarchitektur, Ingenieurbüro für Landschaftsplanung und Landschaftsarchitektur	MK Landschaftsarchitektur, Engineering office for landscape planning and landscape architecture

Upper Austria

Following the revision of the Electricity Industry and Organisation Act [*Elektrizitätswirtschafts- und -organisationsgesetz*], community renewable power plants can now be installed and operated on a building.

The Province of Upper Austria promotes e.g. the establishment of intelligent charging stations.

There is a wide range of information and advice available in Upper Austria in relation to promoting intelligent technologies and well-connected building, see e.g.

https://www.energiesparverband.at/fileadmin/esv/Broschueren/Smart_Homes.pdf

<https://www.energiesparverband.at/veranstaltungen/veranstaltungsueckblick/intelligente-gebaeudeleittechnik-fuer-betriebsgebaeude>

<https://www.energiesparverband.at/veranstaltungen/veranstaltungsueckblick/konferenz-smarte-e-mobilitaet-1>

<https://www.energiesparverband.at/veranstaltungen/veranstaltungsueckblick/smart-homes-gebaeudeautomation-und-energieeffizienz>

To promote skills and training in the fields of construction and energy efficiency, Upper Austria has an Energy Academy, which offers over 30 seminars and courses in the fields of construction and energy efficiency, as well as renewable energy.


www.energyacademy.at

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<http://www.arge-eba.or.at>

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Upper Austria:

 Einstiegsprojekt
  Umsetzungsprojekt
  Begleitmaßnahme

Typ	Projektname	Förderwerber	Call
	Energietransformationen im Wärmesystem – FutureDHSystem Linz	Energieinstitut an der Johannes Kepler Universität Linz	6
	KlimaEntLaster go Smart Cities	Energy Changes Projektentwicklung GmbH	10
	Kooperatives Entwicklungskonzept Region Gmunden BEMORE	Technologiezentrum Salzkammergut GmbH	3
	Linz2050	AIT Austrian Institute of Technology GmbH – Energy Department	1
	Local Energy Community in der Stadtgemeinde Steyr	4ward Energy Research GmbH	10
	SCHALTwerk Kremsmünster 2030	AIT - Austrian Institute of Technology	10
	SINN Cities – Soziale Innovationen in Smart Cities	Österreichisches Institut für nachhaltige Entwicklung (ÖIN)	7
	Smart Marchtrenk	Energieinstitut an der Johannes Kepler Universität Linz GmbH	1
	Smart Regau	Riedenhof Gesellschaft m.b.H.	4

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Energietransformationen im Wärmesystem – FutureDHSystem Linz	Energietransformationen im Wärmesystem – FutureDHSystem Linz
Kooperatives Entwicklungskonzept Region Gmunden BEMORE	Kooperatives Entwicklungskonzept Region Gmunden BEMORE
Local Energy Community in der Stadtgemeinde Steyr	Local Energy Community in der Stadtgemeinde Steyr
SCHALTwerk Kremsmünster 2030	SCHALTwerk Kremsmünster 2030
SINN Cities – Soziale Innovationen in Smart Cities	SINN Cities – Soziale Innovationen in Smart Cities
Energieinstitut an der Johannes Kepler Universität Linz GmbH	Energieinstitut an der Johannes Kepler Universität Linz GmbH
Österreichisches Institut für nachhaltige Entwicklung (ÖIN)	Austria’s Institute for Sustainable Development (ÖIN)

Salzburg

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

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<http://www.arge-eba.or.at>

Salzburg housing research

In the Province of Salzburg, the instrument of housing research offers the possibility of supporting the further development and re-orientation of housing policy by means of the housing subsidy.

Research, development and innovation can influence, improve and further develop the living environment in Salzburg in a variety of ways.

The objectives of Salzburg housing research are as follows:

- research into housing and residential building problems that are specific to the Province of Salzburg,
- the project-related application of existing research results (model housing),
- participation in other housing research projects.

<https://www.salzburg.gv.at/themen/bauen-wohnen/wohnen/wohnbauforschung>

Smart Grids Model Region Salzburg

The motto for the Smart Grids Model Region Salzburg is, 'The whole is more than the sum of its parts', and the project aims to show, through extensive research and demonstration activities, how intelligent energy networks may look in the future. The *Rosa Zukunft* residential complex in the Taxham district is a smart grid-optimised residential complex. In the building, environmentally friendly energy sources such as photovoltaics and combined heat and power plants are linked by an intelligent energy management system to storage units and controllable appliances such as a heat pump and charging stations for electric cars.




Experiments are being made with the future of energy in the Smart Grids model community in Köstendorf, in Salzburg's Flachgau region. In one district, every second household is being equipped with a photovoltaic system and electric cars. The components of a smart grid, such as controllable charging stations, inverters and a local network transformer, are designed to help balance supply and demand in such a way that smooth operation is ensured. Here, residents can either use the electricity from their own photovoltaic system or feed it into the power grid. They can thus consume and produce energy – the 'prosumer' is part of the energy supply here.











Smart City Salzburg – Smart District Gnigl

In the *Smart City Salzburg* master plan, the energy optimisation of housing estates was seen as just as important as the City of Salzburg's model role as owner of properties and facilities. The planned refurbishment of the Gnigl kindergarten was re-thought in the larger context. Now, with the establishment of the Gnigl educational campus, a comprehensive new concept for a kindergarten, elementary school, clubhouse and urban apartment building is being realised. This therefore gives the city a specific project that has great potential for development along smart city lines. The new education campus is to be built as a flagship energy project and act as a stimulus for the entire district. It is expected that excess heat will be produced, which opens up the possibility of establishing a local block heating network, taking into account further local waste heat potential (e.g. from the Flöckner bakery). The restructuring offers opportunities for innovative local mobility solutions and the establishment of a central location for mobility services.

In summary, the goals of the present project are the optimisation of the planned Gnigl educational campus new build, and the resulting re-design of the Smart District Gnigl district.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Salzburg:

 Einstiegsprojekt
  Umsetzungsprojekt
  Begleitmaßnahme

Typ	Projektname	Förderwerber	Call
	grünOase – Integrierte Analyse und Bewertung von grünen Stadtoasen	Universität Salzburg – Interfakultärer Fachbereich für Geoinformatik	8
	Smart City Salzburg	Stadt Salzburg	1
	Smart City Salzburg – Stromeffizienz bei öffentlichen Gebäuden	Stadt Salzburg, 6/00 Baudirektion Energiekoordination	3
	Smart District Gnigl	Stadt Salzburg	2
	Smarte Stadtteilsanierung Itzling-Goethesiedlung in Salzburg	AIT Austrian Institute of Technology GmbH	5
	Sonnengarten Limberg Zell am See	SIR - Salzburger Institut für Raumordnung und Wohnen	8
	Wohnen findet Stadt – Hallein DEMO	Wohnen findet Stadt OG	7
	Wohnen findet Stadt – Hallein Sondierung	Paul Schweizer Architekt	5
	ZeCaRe II	ZeCaRe-Konsortium	9
	Zero Carbon Refurbishment – Salzburg	Fachhochschule Salzburg GmbH	7

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
grünOase – Integrierte Analyse und Bewertung von grünen Stadtoasen	grünOase – Integrierte Analyse und Bewertung von grünen Stadtoasen
Smart City Salzburg – Stromeffizienz bei öffentlichen Gebäuden	Smart City Salzburg – Stromeffizienz bei öffentlichen Gebäuden
Smarte Stadtteilsanierung Itzling-Goethesiedlung in Salzburg	Smarte Stadtteilsanierung Itzling-Goethesiedlung in Salzburg
Sonnengarten Limberg Zell am See	Sonnengarten Limberg Zell am See
Wohnen findet Stadt – Hallein DEMO	Wohnen findet Stadt – Hallein DEMO
Wohnen findet Stadt – Hallein Sondierung	Wohnen findet Stadt – Hallein Sondierung
Universität Salzburg – Interfakultärer Fachbereich für Geoinformatik	University of Salzburg – Interfaculty Department of Geoinformatics (Z_GIS)
Stadt Salzburg	City of Salzburg
Stadt Salzburg, 6/00 Baudirektion Energiekoordination	City of Salzburg, 6/00 Construction Directorate for Energy Coordination
SIR – Salzburger Institut für Raumordnung und Wohnen	SIR – Salzburg Institute for Regional Planning and Housing

Styria

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Special seminars cover topics ranging from special energy applications to the contents of an energy consultation for businesses. For more information, please visit:

<http://www.arge-eba.or.at>

Climate and Energy Model Regions [*Klima- und Energiemodellregionen – KEM*]

The Province of Styria promotes climate and energy model regions in the KEM Quality Management process (*KEM-QM*). The level of funding depends on the taxpayer quotas of the participating Styrian municipalities in the respective climate and energy model region and constitutes between 20 and (max.) 60% of the KEM-QM contribution.

Smart Grids Pioneering Region Styria

A cross-border virtual power plant (VPP), which combines network-driven and market-driven approaches, is currently under construction in Styria and Slovenia. The aim is to ensure the secure operation of the distribution network during intensive demand-response activities and to improve the efficiency of technical demand-response solutions for distribution network operations. The project includes the simulation-based validation of the operation of a virtual power plant with regard to network effects, the economic simulation of demand response aggregation and the simulation of suitable business models. Each network section is categorised in real time on a scale from 'non-critical' to 'highly critical'. In addition, the network operator can request switching measures from *hybridVPP*. From this information, *hybridVPP* calculates possible switching variants based on the short-term requirements from network operation and electricity trading and determines the most cost-effective option. Following the technical proof-of-concept at laboratory level, the concept is due to be verified in real network sections in Slovenia and Styria.

Smart City Smart Future Graz – Energy self-sufficient urban building blocks as an international role model

Graz is a fast-growing city with limited areas for settlement. Graz's urban development planning therefore aims to redensify inner-city sites with excellent infrastructure. The aim is to realise energy-efficient, resource-efficient and low-emission urban districts here with the highest quality of life.

Smart City Project Graz Mitte

In the heterogeneous, former industrial area near the central railway station in Graz, a new energy self-sufficient district will be created. In an integrative planning process, energy technologies for the intelligent zero-emissions city are to be demonstrated for the first time.

The scope of the project includes:

- testing new components, such as new solar modules, solar cooling, urban solar power generation, integrated facade technologies, mini-CHP, smart heat grid;
- the implementation of demonstration buildings (science tower, PV pilot plant *Grätzel* cell, power plant and local energy network, buoyancy power plant, as well as residential complexes and commercial areas with innovative technical building systems).

Smart Urban Region Weiz-Gleisdorf

The goal of this project is also the visible pre-empting of the vision of the future in the form of individual demonstration projects, i.e. the public visualisation of visionary total energy solutions in the context of smart cities or smart urban regions, such as renewable forms of energy, energy efficiency and regional energy autonomy. After a broad-based citizen participation process, individual flagship projects were developed and implemented. The integrative planning of these flagship projects with the involvement of the regional stakeholders turned out to be a key success factor in the optimisation of

smartness – thus it was possible, for example, to bring the architects' plans into line with the criteria under the energy vision and the views of the city community. The sub-projects spread across the energy region are connected by means of the energy and transport networks. In-depth studies in the field of e-mobility provided an additional link. An interesting result is the finding that, while individual e-mobility makes a significant contribution to reducing emissions, it does not currently offer any significant advantages in terms of life cycle considerations – despite efficiency advantages compared to conventional vehicles – because of the production of the battery systems. Only the use of green electricity in combination with a high take-up rate for electric cars can be described as 'smart'.

Smart City Hartberg

Hartberg is consistently pursuing its Smart City vision and is already in a position to implement its second demonstration project. Now it is a matter of making the energy supply and energy use system more flexible, namely by means of a passive, cross-energy carrier and cross-network distribution network management system, using an easily replicable approach. The ultimate goal is for the city to act as an energy sponge which can optimally absorb and deliver the energy supply in the urban area and its surroundings. In the Hartberg urban area, the urban energy system is to be converted into a functional energy storage unit that can store large, additional amounts of energy. The focus is on a new technological approach via a central optimiser, which is implemented in parallel to the existing control infrastructure, providing the decentralised producers and consumers involved with recommendations and obtaining information back from them. This means that intervention into the sensitive network control is passive rather than active. Those involved at a decentralised level also receive an economic incentive signal and can decide manually or automatically whether or not to accept the recommendation or the incentive.

Smart City Leoben

The *STELA (Smart Tower Enhancement Leoben Austria)* project deals with the comprehensive thermal and technical refurbishment and, at the same time, fundamental upgrading of districts designed for residential use in the 1970s using the example of a residential complex in Judendorf (Leoben). The ecological and economic thinking behind this is that densely populated forms of settlement close to the town centre conserve resources. The innovative approach within the scope of this project is the thermal renovation of buildings by means of modules attached to their facades. The use of these modules avoids the use of classic insulation materials and creates additional usable space for the residents thanks to the thermal buffer zone. Another smart efficiency aspect is the low-threshold access to e-mobility. Parts of the ground floor are being converted into an 'e-lobby' to give residents direct access to sustainable mobility.




Energy City Graz-Reininghaus (duration: 48 months, 2010-2014)




The aim of the *ECR (Energy City Graz-Reininghaus)* research project was the conception, construction, operation and restructuring of an energy self-sufficient city district. The project included the creation of a superordinate framework plan, as well as a sustainable energy concept based as far as possible on renewable energies and the initiation and scientific support of a number of demonstration projects. The project was funded by the Province of Styria (€210,000) and the Federal Government's *Haus der Zukunft Plus* [House of the Future Plus] funding channel.

Smart City Graz 2020 (duration: 48 months, 2018-2021)

Building on the results of the *Energy City Reininghaus* research project, further measures to implement sustainable development in the Smart City target area Graz West are to be implemented in the period 2018-2021 in a collaboration between the Province of Styria, the City of Graz and Graz University of Technology. The project is funded by the Province of Styria (max. €300,000) and the City of Graz (max. €400,000). Graz University of Technology is also supporting the project with a share of internal funds.
















List of all projects funded by the Smart Cities Initiative under the Climate Fund in Styria:

 Einstiegsprojekt
  Umsetzungsprojekt
  Begleitmaßnahme

Typ	Projektname	Förderwerber	Call
	Arbeiten und Wohnen in Graz Reininghaus	STADTLABOR GRAZ	5
	Città Slow Hartberg	Stadtgemeinde Hartberg	1
	Cool Leibnitz	Stadtgemeinde Leibnitz	9
	FeldBATT	LEA GmbH	9
	green.LAB	GBG Gebäude- und Baumanagement Graz GmbH; Stadt Graz; Technische Universität Graz; Nussmüller Architekten ZT GmbH; GrünstattGrau Forschungs- und Innovations-GmbH; Energie Steiermark AG; StadtLABOR Innovationen für urbane Lebensqualität GmbH	9
	GreeNet Leoben	Green City LAB – Österreichisches Institut für nachhaltige Lebensräume	1
	HEATChannel	Franz Mayr-Melnhof-Saurau Forstmanagement und Entwicklungs GmbH	9
	Hybrid Grids Demo Hartberg	Forschung Burgenland GmbH	4
	I live Graz Vision	Stadt Graz, Stadtbaudirektion	1
	ICT4SmartHeating Graz	JOANNEUM RESEARCH Forschungsgesellschaft mbH	5
	iENERGY 2.0 Weiz-Gleisdorf	Energie Steiermark AG	2
	iENERGY Weiz-Gleisdorf	Energie Steiermark AG	1
	Kooperativer Transformationsprozess Stadtkern Süd in Leibnitz	Stadtgemeinde Leibnitz	10
	LearningLabLeobenOst	Stadtgemeinde Leoben	5
	Living Green City – Waagner-Biro Graz	StadtLABOR GRAZ	6
	Mobility and Smart Working Technology Bruck an der Mur	Montanuniversität Leoben	3
	power@work	LIFE – Zentrum für Klima, Energie und Gesellschaft	8
	Reduktion einer städtischen Wärmeinsel – Jacky_cool_check Graz	JOANNEUM RESEARCH Forschungsgesellschaft mbH	7

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
Arbeiten und Wohnen in Graz Reininghaus	Arbeiten und Wohnen in Graz Reininghaus
StadtLABOR Graz	StadtLABOR Graz

Citta Slow Hartberg	Città Slow Hartberg
Stadtgemeinde Hartberg	Municipality of Hartberg
Cool Leibnitz	Cool Leibnitz
Stadtgemeinde Leibnitz	Municipality of Leibnitz
FeltBATT	FeltBATT
LEA GmBH	LEA GmBH
green.LAB	green.LAB
GBG Gebäude- und Baumanagement Graz GmbH; Stadt Graz; Technische Universität Graz; Nussmüller Architekten ZT GmbH; GrünstattGrau Forschungs- und Innovations-GmbH; Energie Steiermark AG; StadtLABOR Innovationen für urbane Lebensqualität GmbH	GBG Gebäude- und Baumanagement Graz GmbH; City of Graz; Graz University of Technology; Nussmüller Architekten ZT GmbH; GrünstattGrau Forschungs- und Innovations-GmbH; Energie Steiermark AG; StadtLABOR Innovationen für urbane Lebensqualität GmbH
GreeNet Leoben	GreeNet Leoben
Green City LAB – Österreichisches Institut für nachhaltige Lebensräume	Green City LAB – Austria's institute for sustainable living space
HEATChannel	HEATChannel
Franz Mayr-Meinhof-Saurau Forstmanagement und Entwicklungs GmbH	Franz Mayr-Meinhof-Saurau Forstmanagement und Entwicklungs GmbH
Hybrid Grids Demo Hartberg	Hybrid Grids Demo Hartberg
Forschung Burgenland GmbH	Forschung Burgenland GmbH
I live Graz Vision	I live Graz Vision
Stadt Graz, Stadtbaudirektion	City of Graz, Directorate of Urban Planning
ICT4SmartHeating Graz	ICT4SmartHeating Graz
JOANNEUM RESEARCH Forschungsgesellschaft mbH	JOANNEUM RESEARCH Forschungsgesellschaft mbH
iENERGY 2.0 Weiz-Gleisdorf	iENERGY 2.0 Weiz-Gleisdorf
Energie Steiermark AG	Energie Steiermark AG
iENERGY Weiz-Gleisdorf	iENERGY Weiz-Gleisdorf
Kooperativer Transformationsprozess Stadtkern Süd in Leibnitz	Kooperativer Transformationsprozess Stadtkern Süd in Leibnitz
LearningLabLeobenOst	LearningLabLeobenOst
Stadtgemeinde Leoben	Municipality of Leoben
Living Green City – Waagner-Biro Graz	Living Green City – Waagner-Biro Graz
Mobility and Smart Working Technology Bruck an der Mur	Mobility and Smart Working Technology Bruck an der Mur
Montanuniversität Leoben	University of Leoben [Montanuniversität Leoben]
power@work	power@work
LIFE – Zentrum für Klima, Energie und Gesellschaft	LIFE – Institute for Climate, Energy and Society
Reduktion einer städtischen Wärmeinsel – Jacky_cool_check Graz	Reduktion einer städtischen Wärmeinsel – Jacky_cool_check Graz

	Smart City Bruck	Montanuniversität Leoben, Lehrstuhl für Thermoprozesstechnik	1
	Smart City Feldbach	Stadtgemeinde Feldbach	6
	Smart City Frohnleiten	Stadtgemeinde Frohnleiten	6
	Smart City Hartberg	Stadt Hartberg	2
	Smart City Judenburg	FH JOANNEUM Gesellschaft mbH	6
	Smart Exergy Leoben	Verein Energieinstitut an der Johannes Kepler Universität Linz	5
	Smart Food Grid Graz	FH JOANNEUM Gesellschaft mbH	8
	Smart Future Graz	Stadt Graz, Stadtbaudirektion	2
	Smart Mürz	StadtLABORGraz	4
	Smart Satellite City Deutschlandsberg	Verein Energieregion Schilcherland	1
	Smart UP – Reuse & Upcycling Zentrum Graz Süd	Öko-Service Beschäftigungsgesellschaft m.b.H	7
	Smart Urban Industry Weiz	Stadtgemeinde Weiz	5
	SmartAIRea Flughafen Graz	JOANNEUM RESEARCH Forschungsgesellschaft mbH	7
	Smarte Modernisierung Terrassenhaussiedlung Graz – SONTE	Institut für Wohnbauforschung	7
	STELA: Smart Tower Enhancement Leoben Austria	Stadtgemeinde Leoben	3

Smart City Bruck	Smart City Bruck
Montanuniversität Leoben, Lehrstuhl für Thermoprozesstechnik	University of Leoben [Montanuniversität Leoben] – Chair of Energy Network Technology
Smart City Feldbach	Smart City Feldbach
Stadtgemeinde Feldbach	Municipality of Feldbach
Smart City Frohnleiten	Smart City Frohnleiten
Stadtgemeinde Frohnleiten	Municipality of Frohnleiten
Smart City Hartberg	Smart City Hartberg
Stadt Hartberg	City of Hartberg
Smart City Judenburg	Smart City Judenburg
FH JOANNEUM Gesellschaft mbH	FH JOANNEUM Gesellschaft mbH
Smart Exergy Leoben	Smart Exergy Leoben
Verein Energieinstitut an der Johannes Kepler Universität Linz	Energy Institute Club at Johannes Kepler University Linz
Smart Food Grid Graz	Smart Food Grid Graz
FH JOANNEUM Gesellschaft GmbH	FH JOANNEUM Gesellschaft GmbH
Smart Future Graz	Smart Future Graz
Stadt Graz, Stadtbaudirektion	City of Graz, Directorate of Urban Planning
Smart Mürz	Smart Mürz

StadtLABORGraz	StadtLABOR Graz
Smart Satellite City Deutschlandsberg	Smart Satellite City Deutschlandsberg
Verein Energieregion Schilcherland	Energ region Schilcherland association
Smart UP: Reuse and upcycling Zentrum Graz Süd	Smart UP: Reuse and upcycling Zentrum Graz Süd
Öko-Service Beschäftigungsgesellschaft m.b.H	Öko-Service Beschäftigungsgesellschaft m.b.H
Smart Urban Industry Weiz	Smart Urban Industry Weiz
Stadtgemeinde Weiz	Municipality of Weiz
SmartAIRea Flughafen Graz	SmartAIRea Flughafen Graz
JOANNEUM RESEARCH Forschungsgesellschaft mbH	JOANNEUM RESEARCH Forschungsgesellschaft mbH
Smarte Modernisierung Terrassenhaussiedlung Graz - SONTE	Smarte Modernisierung Terrassenhaussiedlung Graz – SONTE
Institut für Wohnbauforschung	Institute for Housing Research
STELA: Smart Tower Enhancement Leoben Austria	STELA: Smart Tower Enhancement Leoben Austria
Stadtgemeinde Leoben	Municipality of Leoben

BET – BioEnergyTrain (since 2016)

BioEnergyTrain (BET) provides a framework for the development of training courses to meet the needs of *engineers of the future*. The basis for this was laid down in the EU's *SET Plan* (Strategic Energy Technology).

Quality assurance of energy certificates (since 2015)

The Energy Agency of Styria organises quality assurance for energy certificates and represents the nerve centre for energy certificate assessors, end customers and all authorities, such as funding bodies, provincial agencies and municipalities.

klimaaktiv Construction and Refurbishment (since 2013)

klimaaktiv is Austria's initiative for active climate protection.

NOEST – Netzwerk Öko-Energie Steiermark [Styrian Green Energy Network] (since 2011)

The Styrian Green Energy Network is a platform and hub for green energy innovation in Styria.

ZEUS – Styria's central energy certificate database

The online database ZEUS is used in Styria to manage energy certificates in accordance with statutory regulations.

EPBD training materials

The main goal of the project was the creation of training materials for those who need to learn how to calculate the energy performance of buildings in accordance with the EPBD.

Tyrol

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

The ARGE-EBA is an organisation of Austria's provinces and their energy agencies that has the aim of maintaining a high-quality level for the training of energy consultants and ensuring the further development of the training courses offered. Energy consultant training consists of a beginner's course (basic course) and a practical advanced course (continuation course). After both courses are completed, the training concludes with an interview panel examination.

Special seminars cover topics ranging from special energy applications to the contents of an energy consultation for businesses. For more information, please visit:

<http://www.arge-eba.or.at>

Energie Tirol holds energy consultant courses on behalf of the Province of Tyrol, and also offers 'updates' on specific topics in addition to the basic training.

<https://www.energie-tirol.at/energie-akademie/>

Smart City Campaign Area Innsbruck

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Tyrol:

Typ	Projektname	Förderwerber	Call
	Active Innsbruck	Stadt Innsbruck, MA III, Amt für Verkehrsplanung, Umwelt; Referat für Umwelttechnik und Abfallwirtschaft	1
	Smart City Campagne-Areal Innsbruck	Innsbrucker Immobilien GmbH & CoKG	8
	Smart Water City	Universität Innsbruck - Institut für Infrastruktur	10
	Südtiroler Siedlung – Smart City Wörgl	Stadtwerke Wörgl, Stadt Wörgl	9
	Wörgl FIT4SET	Stadtgemeinde Wörgl	1

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
Active Innsbruck	Active Innsbruck
Stadt Innsbruck, MA III, Amt für Verkehrsplanung, Umwelt; Referat für Umwelttechnik und Abfallwirtschaft	City of Innsbruck, MA III, Office of Transport Planning, the Environment; Department for Environmental Technology and Waste Management
Smart City Campagne-Areal Innsbruck	Smart City Campagne Area Innsbruck
Innsbrucker Immobilien GmbH & CoKG	Innsbrucker Immobilien GmbH & CoKG
Smart Water City	Smart Water City
Universität Innsbruck - Institut für Infrastruktur	University of Innsbruck – Institute for Infrastructure
Südtiroler Siedlung – Smart City Wörgl	Südtiroler Siedlung – Smart City Wörgl
Stadtwerke Wörgl, Stadt Wörgl	Wörgl public utilities company, City of Wörgl
Wörgl FIT4SET	Wörgl FIT4SET
Stadtgemeinde Wörgl	Municipality of Wörgl

Vorarlberg

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

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<http://www.arge-eba.or.at>

Offers for kindergartens and schools – Learn what Energy Autonomy Vorarlberg is

The next generation has an important role to play in enabling Vorarlberg to achieve its energy autonomy goals. Kindergarten children, schoolchildren and educators alike can actively help shape Vorarlberg's energy autonomy if they are informed about energy and climate protection issues. That is why the Vorarlberg Energy Institute launched the *Energieautonomie begreifen* [Understanding energy autonomy] project, offering a great range of education products for kindergartens and schools on energy autonomy in Vorarlberg, with financial support from the Province of Vorarlberg, Illwerke VKW and Vorarlberger Energienetze GmbH, in cooperation with various partners.

For more information, please visit:

[Learn what Energy Autonomy Vorarlberg is](#)

Smart Grids Pioneering Region Vorarlberg

In Vorarlberg, the focus is on the practical implementation of a first smart grid to economically integrate decentralised generation plants in a 30 kV medium-voltage network in the Great Walser Valley. In rural 30 kV distribution networks here and in the partner demo region Lungau in Salzburg, voltage regulation strategies have been further developed and improved in order to connect as many decentralised energy producers (such as small hydropower plants and photovoltaic systems) as possible, while maintaining the quality of supply. Smart grid technologies make it possible to integrate more decentralised producers into the power grid without the high costs of conventional network expansion with cable reinforcement (*Bytes statt Bagger* – Bytes not diggers).

Smart City Rhine Valley

With its 29 municipalities, Vorarlberg's Rhine Valley is characterised by a polycentric structure. It represents one of Central Europe's most dynamically growing economic areas. Because of the high standard of living, around 65% of Vorarlberg's population live in this region, which means that the province's resource consumption is largely determined by activities in the Rhine Valley. In 2009, the Vorarlberg Provincial Parliament unanimously approved the vision of CO₂-free energy autonomy by 2050, including a quantified path as an energy policy strategy. As a continuation of the province-wide participation process, an action plan up to 2020 was drawn up in interdisciplinary working groups and then unanimously approved by the Provincial Parliament at the end of 2011. Smart City Rhine Valley is characterised by networked activities in a total of four construction projects on the following three levels:

- energy supply of the future
- mobility of the future
- housing of the future.

The resulting construction projects are characterised by an energy and resource-conserving construction method and a CO₂-neutral energy supply that is adapted to the local conditions in each case. The supply of cold and heat in the newly created areas is intended to be met through the use of lake water or groundwater, as well as locally available biomass. With the overall system in mind, a mobility-on-demand system is combined with a social media platform that is intended to support users in adapting their behaviour towards the use of alternative, CO₂-neutral forms of mobility such as public transport, cycling or e-mobility. Some of the residential units will be equipped with an innovative smart home solution.

In conjunction with Illwerke VKW's energy cockpit, not only does this solution allow all consumers to be centrally supported, but the energy flows always remain transparent and guarantee an economical and comfortable view of the future of the home.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Vorarlberg:

Typ	Projektname	Förderwerber	Call
	Smart City Rheintal	Vorarlberger Kraftwerke AG	1
	Smart City Rheintal II	Vorarlberger Kraftwerke AG	2

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
Smart City Rheintal	Smart City Rhine Valley
Vorarlberger Kraftwerke AG	Vorarlberger Kraftwerke AG
Smart City Rheintal II	Smart City Rheintal II

Vienna

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

The ARGE-EBA is an organisation of Austria's provinces and their energy agencies that has the aim of maintaining a high-quality level for the training of energy consultants and ensuring the further development of the training courses offered. Energy consultant training consists of a beginner's course (basic course) and a practical advanced course (continuation course). After both courses are completed, the training concludes with an interview panel examination.


















Special seminars cover topics ranging from special energy applications to the contents of an energy consultation for businesses. For more information, please visit:

<http://www.arge-eba.or.at>

Smart City Demo Vienna Aspern












The Seestadt Aspern lakeside development is not only a unique urban construction project, but also a one-off opportunity to test new technologies and innovative approaches in the field of energy supply. Aspects being researched here include smart users, buildings, grids und ICT. For Smart Buildings, three buildings in Seestadt Aspern were selected with power grid requirements that differed as far as possible from each other: a residential building by the developer EBG comprising 213 rental apartments, a student residence and a school campus with kindergarten and primary school. All these have use-specific differences in their energy use and efficiency. The focus of the research study *Intelligentes Management von Energieverteilnetzen (Integration von dezentralen Energieerzeugern)* [Intelligent management of energy distribution networks (integration of decentralised energy producers)] is on urban low-voltage networks. Here, a system concept is being developed for the automation of the low-voltage distribution network level, together with the infrastructure it requires.

List of all projects funded by the Smart Cities Initiative under the Climate Fund in Vienna:

Typ	Projektname	Förderwerber	Call
	alBOX- Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment	StoreMe GmbH	10
	BiotopeCity is smart – Coca-Cola Areal in Wien	Universität für Bodenkultur Wien - Department für Raum, Landschaft und Infrastruktur, Institut für Landschaftsplanung	7
	BuildyourCity2gether Wien Aspern	United Creations	8
	Gesamtenergetische Optimierung von Stadtgebieten – Greening Aspang Wien	UrbanTransForm Research Consulting e.U.	7
	GRÜNEZukunftSCHULEN	Technische Universität Wien – Forschungsbereich Ökologische Bautechnologien	8
	GUGLE Wien Penzing u. Alsergrund	Universität für Bodenkultur Wien, Institut für konstruktiven Ingenieurbau, Arbeitsgruppe ressourcenorientiertes Bauen	1
	HEAT_re_USE.vienna	AIT Austrian Institute of Technology GmbH	5
	IKT-Integration für Gebäude und Stromnetz Wien-Aspern	Siemens AG Österreich	3
	Innovatives E-Carsharing Konzept als Tool	Caroo Mobility GmbH	10
	Innovatives Hauswirtschaften im Nutzungsgemischten Stadtkern	future.lab - Research Center, Technische Universität Wien	10
	Kollaborative Stadtstrukturen und räumliche Strategien des Teilens und Tauschens – Pocket Mannerhatten	tatwort Nachhaltige Projekte GmbH	7
	LiLa4Green – Begleitendes Living Lab für die Realisierung von grün-blauen Infrastrukturmaßnahmen	AIT Austrian Institute of Technology GmbH	9
	Make your city smart – Wien Aspern	Technische Universität Wien - Continuing Education Center	6
	Mischung: Nordbahnhof	Technische Universität Wien – Institut für Architektur und Entwerfen	8
	Mischung: Possible!	Technische Universität Wien – Institut für Architektur und Entwerfen	5
	Pocket Mannerhatten	tatwort Nachhaltige Projekte GmbH	9
	Smart AirportCity	Denkstätt GmbH	9

Einstiegsprojekt	Entry-level project
Umsetzungsprojekt	Implementation project
Begleitmaßnahme	Flanking measure
Typ	Type
Projektname	Project name
Förderwerber	Applicant
alBOX- Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment	alBOX-Geschäftsmodell- und Dienstleistungspotenziale für flexible Güter- und Informationsflüsse im Paketsegment
StoreMe GmbH	StoreMe GmbH
BiotopeCity is smart – Coca-Cola Areal in Wien	BiotopeCity is smart – Coca-Cola Areal in Wien
Universität für Bodenkultur Wien - Department für	University of Natural Resources and Life Sciences,

Raum, Landschaft und Infrastruktur, Institut für Landschaftsplanung	Vienna (BOKU) – Department of Space, Landscape and Infrastructure, Institute for Landscape Planning
BuildyourCity2gether Wien Aspern	BuildyourCity2gether Wien Aspern
United Creations	United Creations
Gesamtenergetische Optimierung von Stadtgebieten - Greening Aspang Wien	Gesamtenergetische Optimierung von Stadtgebieten – Greening Aspang Wien
UrbanTransForm Research Consulting e.U.	UrbanTransForm Research Consulting e.U.
GRÜNEzukunftSCHULEN	GRÜNEzukunftSCHULEN
Technische Universität Wien – Forschungsbereich Ökologische Bautechnologien	Vienna University of Technology – Research Centre for Ecological Building Technologies
GUGLE Wien Penzing u. Alsergrund	GUGLE Wien Penzing u. Alsergrund
Universität für Bodenkultur Wien, Institut für konstruktiven Ingenieurbau, Arbeitsgruppe ressourcenorientiertes Bauen	University of Natural Resources and Life Sciences, Vienna (BOKU), Institute for Structural Engineering, Resource-oriented Building Working Group
HEAT_re_USE.vienna	HEAT_re_USE.vienna
AIT Austrian Institute of Technology GmbH	AIT Austrian Institute of Technology GmbH
IKT-Integration für Gebäude und Stromnetz Wien-Aspern	IKT-Integration für Gebäude und Stromnetz Wien-Aspern Siemens AG Österreich
Innovatives E-Carsharing Konzept als Tool	Innovatives E-Carsharing Konzept als Tool
Caroo Mobility GmbH	Caroo Mobility GmbH
Innovatives Hauswirtschaften im nutzungsgemischten Stadtkern	Innovatives Hauswirtschaften im nutzungsgemischten Stadtkern
future.lab - Research Center, Technische Universität Wien	future.lab – Research Centre, Vienna University of Technology
Kollaborative Stadtstrukturen und räumliche Strategien des Teilens und Tauschens – Pocket Mannerhatten	Kollaborative Stadtstrukturen und räumliche Strategien des Teilens und Tauschens – Pocket Mannerhatten
tatwort Nachhaltige Projekte GmbH	tatwort Nachhaltige Projekte GmbH
LiLa4Green – Begleitendes Living Lab für die Realisierung von grün-blauen Infrastrukturmaßnahmen	LiLa4Green – Begleitendes Living Lab für die Realisierung von grün-blauen Infrastrukturmaßnahmen
AIT Austrian Institute of Technology GmbH	AIT Austrian Institute of Technology GmbH
Make your city smart – Wien Aspern	Make your city smart – Wien Aspern
Technische Universität Wien - Continuing Education Center	Vienna University of Technology – Continuing Education Centre
Mischung: Nordbahnhof	Mischung: Nordbahnhof
Technische Universität Wien – Institut für Architektur und Entwerfen	Vienna University of Technology, Institute for Architecture and Design
Mischung: Possible!	Mischung: Possible!
Technische Universität Wien – Institut für Architektur und Entwerfen	Vienna University of Technology, Institute for Architecture and Design
Pocket Mannerhatten	Pocket Mannerhatten
tatwort Nachhaltige Projekte GmbH	tatwort Nachhaltige Projekte GmbH
Smart AirportCity	Smart AirportCity
Denkstatt GmbH	Denkstatt GmbH

	Smart Block Step II Wien	BURTSCHER - DURIG ZT GmbH	6
	Smart Cities Demo Aspern	Aspern Smart City Research GmbH & Co KG	4
	Smart Citizens Building Prototype Development and Demonstration Tour 2018	Technische Universität Wien – Continuing Education Center	8
	Smart City im Gemeindebau	Energieinstitut der Wirtschaft GmbH	5
	Smart City Vienna – Liesing Mitte	Magistrat der Stadt Wien – MA 21B	1
	smart city Wien	DI Thomas Madreiter, Municipal Department 18 – Urban Development and Planning	1
	Smart City Wien Laxenburger Straße	ÖBB-Immobilienmanagement GmbH	4
	Smartes Leben am Wasser – Rückgewinnung des Donaufers Wien	S + B Plan und Bau GmbH	7
	Smartes Wohnen für Generationen	Caritas der Erzdiözese Wien - Hilfe in Not	7
	TRANSFORM +	ÖIR GmbH	3
	Tröpferlbad 2.0	Green4Cities GmbH	10
	Urban Cool Down – kühle Orte für wachsende Stadtquartiere	MK Landschaftsarchitektur, Ingenieurbüro für Landschaftsplanung und Landschaftsarchitektur	7
	WOGÉ Demo	Caritas der Erzdiözese Wien – Hilfe in Not (Stadteitarbeit)	9

Smart Block Step II Wien	Smart Block Step II Wien
BURTSCHER - DURIG ZT GmbH	BURTSCHER -DURIG ZT GmbH
Smart Cities Demo Aspern	Smart Cities Demo Aspern
Aspern Smart City Research GmbH & Co KG	Aspern Smart City Research GmbH & Co KG
Smart Citizens Building Prototype Development and Demonstration Tour 2018	Smart Citizens Building Prototype Development and Demonstration Tour 2018
Technische Universität Wien – Continuing Education Center	Vienna University of Technology – Continuing Education Centre
Smart City im Gemeindebau	Smart City im Gemeindebau
Energieinstitut der Wirtschaft GmbH	Energieinstitut der Wirtschaft GmbH
Smart City Vienna – Liesing Mitte	Smart City Vienna – Liesing Mitte
Magistrat der Stadt Wien – MA 21B	Offices of the City of Vienna – MA 21B
smart city Wien	smart city Wien
DI Thomas Madreiter, Municipal Department 18 – Urban Development and Planning	DI Thomas Madreiter, Municipal Department 18 – Urban Development and Planning
Smart City Wien Laxenburger Straße	Smart City Wien Laxenburger Strasse
ÖBB-Immobilienmanagement GmbH	ÖBB-Immobilienmanagement GmbH
SLaW – Smartes Leben am Wasser - Rückgewinnung des Donaufers Wien	SLaW – Smartes Leben am Wasser – Rückgewinnung des Donaufers Wien
S + B Plan und Bau GmbH	S + B Plan und Bau GmbH
Smartes Wohnen für Generationen	Smartes Wohnen für Generationen
Caritas der Erzdiözese Wien - Hilfe in Not	Caritas of the Archdiocese of Vienna – Help the Needy
TRANSFORM +	TRANSFORM + ÖIR GmbH
Tröpferlbad 2.0	Tröpferlbad 2.0

Green4Cities GmbH	Green4Cities GmbH
Urban Cool Down – kühle Orte für wachsende Stadtquartiere	Urban Cool Down – kühle Orte für wachsende Stadtquartiere
MK Landschaftsarchitektur, Ingenieurbüro für Landschaftsplanung und Landschaftsarchitektur	MK Landschaftsarchitektur, Engineering office for landscape planning and landscape architecture
WOGÉ Demo	WOGÉ Demo
Caritas der Erzdiözese Wien – Hilfe in Not (Stadtteilarbeit)	Caritas of the Archdiocese of Vienna – Help the Needy (district work)

Skills and training

Energy Academy

The extensive training and continuous development programme of Upper Austria's Energy Saving Association takes account of the wide range of developments in the field of energy technology. Under the auspices of the *Energy Academy*, a comprehensive continuous development programme is available covering all aspects of energy technology, energy management, energy consulting, construction engineering, renewable energy and energy efficiency. The target market includes energy managers in companies, communities and institutions, construction engineering and building technology systems experts, planners, energy consultants, energy auditors and interested citizens. New training courses are also in preparation.

In 2018, the following seminars were newly developed and offered for the first time, e.g. in the *Energy Academy* etc.:

- short training seminar on energy technology – update for construction engineers,
- short training course on construction waterproofing,
- training seminar on facades,
- short training seminar on energy – update for banks,
- training seminar on referral marketing and other digital sales channels,
- training seminar on technology innovations for company buildings,
- training seminar on innovative lighting solutions for businesses,
- short training seminar on biomass cogeneration,
- short training seminar on energy subsidies for municipalities.

For the current education and training program, see:

<https://www.energiesparverband.at/fileadmin/esv/Broschueren/Kursfolder.pdf>

Energy Efficiency Watch

The Energy Efficiency Watch project has been accompanying energy efficiency policies in Europe since 2006. The project records and communicates the progress of energy efficiency policies. This is done through a multi-stakeholder approach involving business, politics (multi-level government approach), science and civil society. One thing that has become clear so far is that a broad political and social understanding of the benefits of energy efficiency is required, not least so that initiatives are not exposed to political fluctuations. In the fourth project phase, which began in 2019, narratives are being developed that highlight and communicate the wider social benefits.

The project is coordinated by EUFORES (the European Forum for Renewable Energy Sources). As Austria's contribution, Upper Austria's Energy Saving Association is working intensively on this project.

The project is supported by the European Commission through the *Horizon 2020* programme.

<http://www.energy-efficiency-watch.org/>

PROSPECT

The *PROSPECT* project, launched in 2017, aims to support decision-makers at the local level in the implementation of sustainable energy projects. As part of the project, a Peer-to-Peer Learning Programme is being implemented for municipalities. The main focus is on experience-sharing and mutual learning about how sustainable energy projects can be financed and implemented. In this project, Upper Austria's Energy Saving Association is working with 9 partners from 7 European countries (the Netherlands, France, Belgium, Greece, Germany, Portugal, Slovakia). The project is supported by the European Commission through the *Horizon 2020* programme.

<https://h2020prospect.eu/learning-programme>

ManagEnergy

The *ManagEnergy* project supports local and regional energy agencies to become key players in the energy transition. The focus is on investments in sustainable energy. International training courses, on-site visits and event series are organised. The project is coordinated by Limerick Institute of Technology in Ireland. As Austria's contribution, Upper Austria's Energy Saving Association is working intensively on this project. The project is supported by the European Commission through the *Horizon 2020* programme.

<https://managenergy.cognita.hr/frontpage>

PUBLENEF

The aim of the *PUBLENEF* project is to support public decision-makers in EU Member States in the implementation of sustainable energy policies, including by giving them information about model solutions and policy approaches from other Member States (national, regional and/or local).

The key elements of the project are as follows:

- experience-sharing – learning from existing energy efficiency measures in other EU countries, regions or cities,
- mobilisation and reinforcement of networks,
- development and improvement of tools for the implementation of energy efficiency policies.

13 partners from 12 European countries (the Netherlands, Greece, Poland, Spain, Croatia, Bulgaria, Austria, Italy, Belgium, France, Ireland, Romania) have worked together with Upper Austria's Energy Saving Association to promote energy efficiency. The project is supported by the European Commission through the *Horizon 2020* programme.

www.publnef-project.eu

SUSTAINCO

SUSTAINCO (Sustainable Energy for Rural Communities), in which Austria was represented through the participation of the Upper Austrian Energy Saving Association and the Energy Agency of Styria, has supported European initiatives towards more efficient buildings. The aim of the project was to build up know-how in the partner countries, selecting and supporting 8 outstanding flagship buildings and 50 further nearly zero-energy buildings in the course of the project. Training seminars and a comprehensive information campaign have also been carried out. The project is supported by the European Commission through the *Intelligent Energy Europe* programme.

<https://ec.europa.eu/energy/intelligent/projects/en/projects/sustainco>

Interreg Project TUNE (Italy-Austria)

The *TUNE – Energy Competence Without Borders* project supports communities in the successful introduction of an energy accounting system. The basis for the development of a local energy-saving strategy is making people aware of their own energy consumption, as well as verifying the success of measures used to save energy or increase the energy efficiency of buildings. In general terms, this also involves harmonising energy accounting in Northern Italy, South Tyrol and Carinthia. As part of the *TUNE* project, the comparability of energy accounting systems is to be increased by introducing uniform benchmarks. The aim is to gather more information about the effectiveness of energy saving

measures. To that end, three two-day training courses have been held, in which students learnt about the rationale for energy accounting and its application, and about further refurbishment possibilities or other investment measures via a contracting system.

Interreg Project NEKTEO (Slovenia-Austria)

As part of the *NEKTEO – Sustainable Energy for Municipalities* project, sustainable and long-lasting activities to increase energy efficiency are implemented in municipalities and the transition to renewable energies is promoted. In this way, climate protection goals can be achieved at regional level. Among other things, 55 energy showcases were set up, in which public buildings with sample refurbishment standards and new builds with at least low energy-standards were also presented. There were also training courses on the topics of energy efficiency in sports facilities and measures to increase the energy efficiency of buildings using planting techniques. Field trips and training courses for schoolchildren also formed part of the *NEKTEO* project. (Duration: February 2017 – January 2020)

Interreg Project MOVE (Slovenia-Austria)

The aim of the *MOVE* project was to contribute to increasing energy efficiency and reducing energy consumption and to promote the use of renewable energy carriers. This is intended to make a significant contribution to the achievement of European, national and regional goals with regard to reducing the CO₂ emissions responsible for the greenhouse effect. As part of the *MOVE* project, a programme of study and subject-specific continuous development for energy-efficient construction were developed. The continuous development training for planners and construction companies was divided into 8 modules and structured around the energy certificate. In all topics, the focus was on practical relevance, with the primary focus of training on the refurbishment of outdated buildings being on residential buildings. (Duration: 2008-2012)

ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung [Working Group on Energy Consultant Training])

The ARGE-EBA is an organisation of Austria's provinces and their energy agencies that has the aim of maintaining a high-quality level for the training of energy consultants and ensuring the further development of the training courses offered. Energy consultant training consists of a beginner's course (basic course) and a practical advanced course (continuation course). After both courses are completed, the training concludes with an interview panel examination.

Special seminars cover topics ranging from special energy applications to the contents of an energy consultation for businesses. For more information, please visit:

<http://www.arge-eba.or.at>

Energy-Efficient Construction and Refurbishment training

The interdisciplinary training offered by the Province of Carinthia is aimed at all those who want to actively promote the implementation of energy efficiency measures in Carinthia's buildings sector and the increased use of renewable energy carriers. Specifically targeted are all persons involved in planning/consultation or operation in the field of construction engineering and building technology systems, building management, property management, funding agencies, provincial and municipal administration, expertise and energy certificate calculation.

European Energy Manager (EUREM)

The 'Qualification as a European Energy Manager' course from the Austrian Economic Chambers (WKO) is a demanding, standardised training course that is integrated with an extremely successful international network of consultants. It supports Austrian businesses in adapting to the new requirements. The qualified 'European Energy Managers' acquire detailed know-how with a high degree of practical relevance in order to be able to implement efficient energy audits and energy management in their own companies, identify energy efficiency measures and achieve significant energy and cost savings. The EUREM certificate obtained through the training is proof, within the framework of the Federal Energy Efficiency Act [EEffG] (Section 17), that an individual has the necessary expertise to be registered as a listed auditor. The theory certificate comprises 10 points for the field of 'Buildings', 14 points for the 'Processes' field and 3 points for the 'Transport' field. Two

further practical points are awarded for the field of 'Processes'.

The following courses from the current range at the Viennese arm of Austria's Economic Development Institute, WIFI [*Wirtschaftsförderungsinstitut*], should also be taken into account:

- **Energy officer training (23.1-28.1.2020)**

<https://www.wifiwien.at/kurs/48225x-ausbildung-zum-energieeffizienzbeauftragten>

This teaches the requirements of an energy management system (e.g. ISO 50001), which enables a company to continuously improve its energy performance through a systematic approach, taking into account the legal requirements and other obligations for the organisation.

- **Waste manager – training as an executive under waste law (20.4.-27.5.2020)**

<https://www.wifiwien.at/kurs/48219x-der-abfallbeauftragte-ausbildung-zum-abfall-rechtlichen-geschaeftsfuehrer>

Training as a waste manager pursuant to Section 11 of the Waste Management Act 2002 [*Abfallwirtschaftsgesetz 2002 – AWG 2002*] This course satisfies the requirements of the Federal Ministry for Sustainability and Tourism. The theoretical fundamentals are taught and then put into practice.

- **Environmental Management Officer – Information session (23.1.2020)**

<https://www.wifiwien.at/kurs/48210x-umweltmanagementbeauftragte-r-umb-modul-1-management-der-fuehrungsprozesse>

Information is presented on the 'Training as an Environmental Management Officer under ISO 14001 and EMAS' course. The content includes the basics and terms of environmental management, procedures for obtaining certification, the costs and benefits of an environmental management system, as well as information on the individual modules of the 'Environmental Management Officer' course.

1.7 Evidence-based estimate of expected energy savings and wider benefits, such as those related to safety and air quality (Article 2a(1)(g))

It should be noted at this point that the modelling primarily focuses on the area of housing. There are two reasons for this:

- the data picture for residential buildings is incomparably better in terms of volume, scale and use, as well as age of construction, than that for non-residential buildings;
- the development of GHG emissions is significantly more favourable for all buildings (residential and non-residential) than for residential buildings alone – the reduction in CO₂ emissions for RBs from 1990-2017 is approximately 32%, while the reduction in GHG emissions for the buildings sector as a whole for the same period is around 35%.

It is therefore fundamentally safer to use an RB-based forecast/RB-based scenarios.

As described in Chapter 1.2, the refurbishment rate instituted here corresponds to the refurbishment rate that covers the model and measurement in terms of energy consumption. These are the 1.5% of the nominal model assumptions – probably more in reality, since the improvement does not always correspond to the assumptions of the model. As part of the model assumptions, the requirements for new builds and refurbishments from OIB Guideline 6 were assumed, while for the pre-1990 housing stock the 61 line was assumed, with an ascending slope of 2.00. This leads to the following progression:

	Existing buildings/New builds		Renovation equivalent	
	HDH	e _{AWZ}	HDH	e _{AWZ}
before 1990	61 x (1 + 2.0 ÷ l _c)	1.25 [*])		
from 1990	30 x (1 + 2.0 ÷ l _c)	1.25	26 x (1 + 2.0 ÷ l _c)	1.25
from 2007	26 x (1 + 2.0 ÷ l _c)	1.50	26 x (1 + 2.0 ÷ l _c) ^{**})	1.50
from 2010	19 x (1 + 2.5 ÷ l _c)	1.50	25 x (1 + 2.0 ÷ l _c)	1.50
from 2012			25 x (1 + 2.0 ÷ l _c)	

from 2015	$16 \times (1 + 3.0 \div \ell_c)$	1.50	$23 \times (1 + 2.3 \div \ell_c)$	1.50
from 2017	$14 \times (1 + 3.0 \div \ell_c)$	1.50	$21 \times (1 + 2.5 \div \ell_c)$	1.50
from 2019	$12 \times (1 + 3.0 \div \ell_c)$	1.50	$19 \times (1 + 2.7 \div \ell_c)$	1.50
from 2021	$10 \times (1 + 3.0 \div \ell_c)$	1.50	$17 \times (1 + 2.9 \div \ell_c)$	1.50
*) ... 10% reduction for incomplete heating				
**) ... stimulated by primary subsidy				

With the help of these values, the energy consumption for heating was estimated according to the general formula $ECH = (HDH + HDHW) \times e_{AWZ}$. The characteristic lengths ℓ_c used for SFBs, MFBs and APBs were taken from the OIB Document of 26 February 2018 demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU.

The following steps are used as the basis for evidence-based estimates of the expected changes in energy consumption, the composition of the energy mix and the GHG emissions that can be derived from them:

1. Development of population figures

Table 10: Population [cap.]

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
1990	271,133	546,363	1,463,790	1,304,058	476,289	1,170,631	621,280	326,594	1,497,712	7,677,850
2000	276,083	560,129	1,537,266	1,371,579	513,853	1,182,684	669,479	349,257	1,551,236	8,011,566
2010	284,042	557,497	1,607,428	1,410,014	527,114	1,205,514	704,976	368,894	1,695,590	8,361,069
2020	296,207	560,569	1,689,435	1,489,986	559,849	1,245,199	761,518	398,299	1,929,067	8,930,129
2030	311,466	562,053	1,777,163	1,544,951	578,055	1,275,419	796,400	415,538	2,038,128	9,299,173
2040	322,796	559,002	1,845,898	1,578,517	584,980	1,293,477	817,101	423,899	2,105,214	9,530,884
2050	329,242	551,724	1,896,344	1,594,236	587,411	1,299,841	828,920	427,675	2,158,238	9,673,631

Sources: Statistics Austria, *Statistik des Bevölkerungsstandes* [Population Statistics]. Published on 17 May 2018.
 Statistics Austria, *Bevölkerungsprognose 2018* [Population forecast 2018]. Published on 22 November 2018.

2. Progression of useful floor area per principal residence [sed.]

Table 11: Useful floor area [m²/sed.]

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
1990	113.3	100.0	105.9	97.0	90.8	98.7	95.2	101.6	72.0	93.5
2000	117.6	102.7	109.2	101.3	92.7	101.3	96.9	101.3	73.0	96.0
2010	122.0	105.3	112.5	105.7	94.7	103.9	98.6	101.0	74.0	98.4
2020	126.3	107.9	115.7	110.0	96.6	106.5	100.3	100.6	74.9	100.8
2030	130.6	110.6	119.0	114.3	98.6	109.1	102.0	100.3	75.9	103.2
2040	134.9	113.2	122.3	118.7	100.5	111.7	103.7	100.0	76.9	105.6
2050	139.3	115.8	125.6	123.0	102.4	114.4	105.4	99.7	77.9	108.0

Source: Average living space per residence in m² based on the habitable area of principal residences, by province. (Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018)

Source: Self-calculation based on average living space per residence in m² based on the habitable area of principal residences, by province. (Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018)

The derivation of the average building sizes for single-family buildings, multifamily buildings and apartment blocks, as well as the housing units located therein, is presented in detail in the OIB Document of 26 February 2018 demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU.

Table 12: Building types

Mean values	SFBs	MFBs	APBs
Useful floor area	117.49 m ²	65.20 m ²	65.59 m ²
Residences	1.17	5.46	17.93
Gross floor area	171.48 m ²	445.06 m ²	1,469.75 m ²

Source: OIB Document demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU, 26 February 2018

3. Progression of useful floor area per person [cap.]

Table 13: Useful floor area [m²/sed.]

Year	Burgenland	Carinthia	Lower Austria	Upper Austria	Salzburg	Styria	Tyrol	Vorarlberg	Vienna	Austria
1990	40.3	36.7	40.3	35.5	34.9	36.5	34.2	36.0	36.6	37.1
2000	45.2	41.2	44.0	40.0	37.7	40.4	37.8	38.8	36.8	40.1
2010	50.2	45.7	47.6	44.4	40.5	44.4	41.4	41.5	37.0	43.2
2020	55.1	50.2	51.3	48.8	43.3	48.3	45.1	44.3	37.2	46.2
2030	60.1	54.7	55.0	53.3	46.1	52.3	48.7	47.0	37.4	49.2
2040	65.0	59.2	58.6	57.7	48.9	56.2	52.3	49.8	37.6	52.3
2050	69.9	63.7	62.3	62.1	51.7	60.1	56.0	52.5	37.8	55.3

Source: Average living space per person in m² based on the habitable area of principal residences, by province (Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018)

Source: Self-calculation based on average living space per person in m² based on the habitable area of principal residences, by province (Statistics Austria, *Mikrozensus* [Microcensus]. Published on 24 May 2018)

4. The assumption of a linear development using the support points for 2001 and 2011 gives the following results. The square metreage values used (after correction with the fixed housing unit numbers) were from the OIB Document of 26 February 2018, demonstrating the cost-optimal nature of the requirements of OIB Guideline 6, and from the national plan pursuant to Article 5 of Directive 2010/31/EU.

Table 14: Principal residences [sed.] and useful floor areas [m²/sed.]

Year	SFBs	MFBs	APBs	SFBs	MFBs	APBs
1990	1,530,863	606,654	909,717	120.0	66.6	67.0
2000	1,627,488	705,706	1,015,671	124.3	69.0	69.4

2010	1,722,842	815,866	1,130,145	128.6	71.4	71.8
2020	1,854,253	957,518	1,279,788	133.0	73.8	74.3
2030	1,931,911	1,086,579	1,404,447	137.5	76.3	76.8
2040	1,971,461	1,206,685	1,511,368	142.1	78.9	79.4
2050	1,983,502	1,320,507	1,605,629	146.8	81.5	82.0

Source: Statistics Austria, Census of buildings and residences 2001 (Statistics Austria, *Statistisches Jahrbuch 2007* [Statistical Yearbook 2007]) and Statistics Austria, Register-based statistics as of 31 October 2011 (Statistics Austria, *Statistisches Jahrbuch 2014* [Statistical Yearbook 2014])

5. The starting point for the basic energy model is the results of the 2017 useful energy analysis:

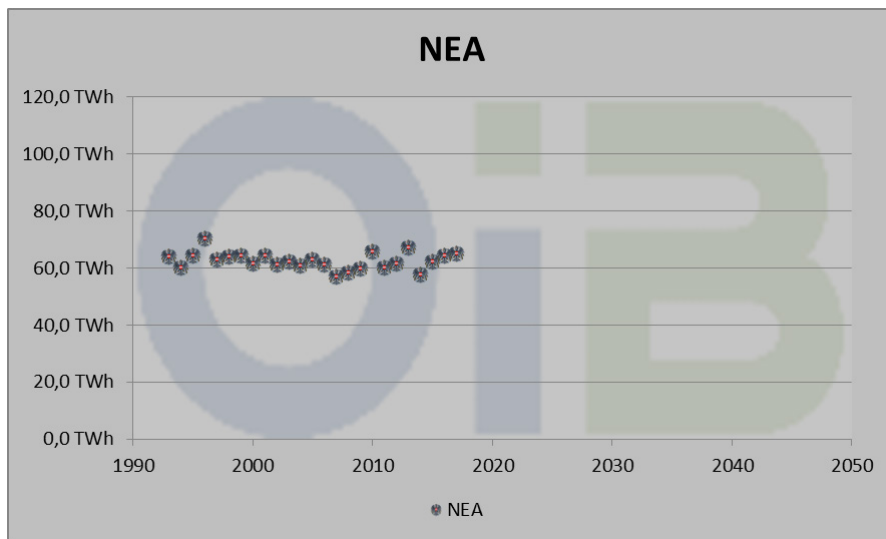


Figure 15: Energy consumption of private residences for space heating and hot water

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

NEA	Useful energy analysis
TWh	TWh

6. As a first step, a fictitious energy consumption forecast is made for the given or underlying demographic development, assuming no stricter requirements for new builds and no thermal energy refurbishment:

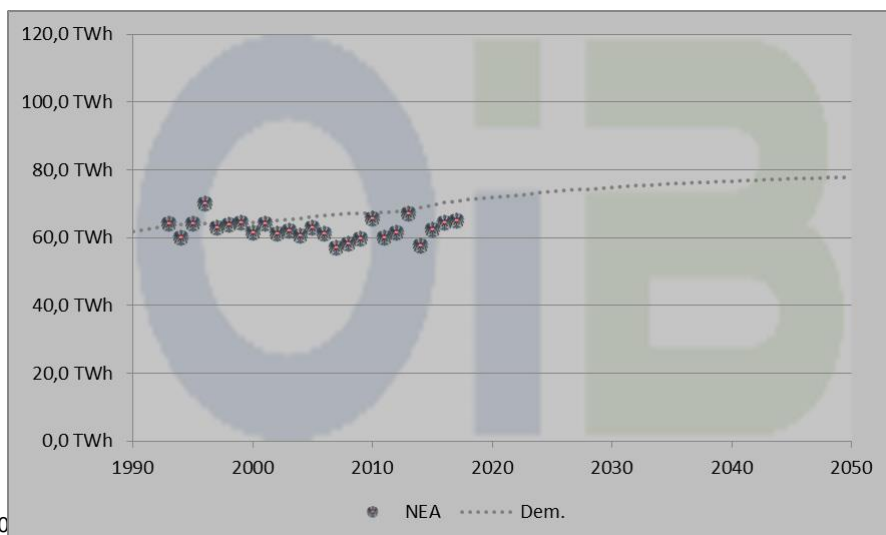


Figure 16: Energy consumption of private residences for space heating and hot water

Source: Self-calculation and *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

NEA	Useful energy analysis
Dem.	Demographic change
TWh	TWh

According to these assumptions, the energy consumption of private households for space heating and hot water would increase by approximately 16 TWh or 26% from 1990 to 2050.

- In the next step, a fictitious energy consumption forecast is made for the given or underlying comfort increase, in the form of an increase in useful floor area

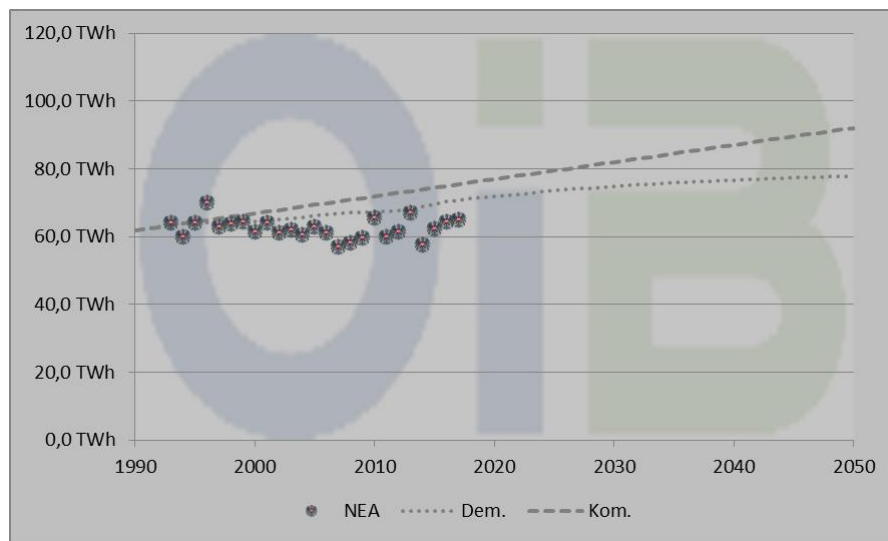


Figure 17: Energy consumption of private residences for space heating and hot water

Source: Self-calculation and *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

NEA	Useful energy analysis
Dem.	Demographic change
Kom.	Comfort change
TWh	TWh

According to these assumptions, the energy consumption of private households for space heating and hot water would increase by approximately 30 TWh or 49% from 1990 to 2050.

- If one looks at the sum of these changes, the following picture emerges:

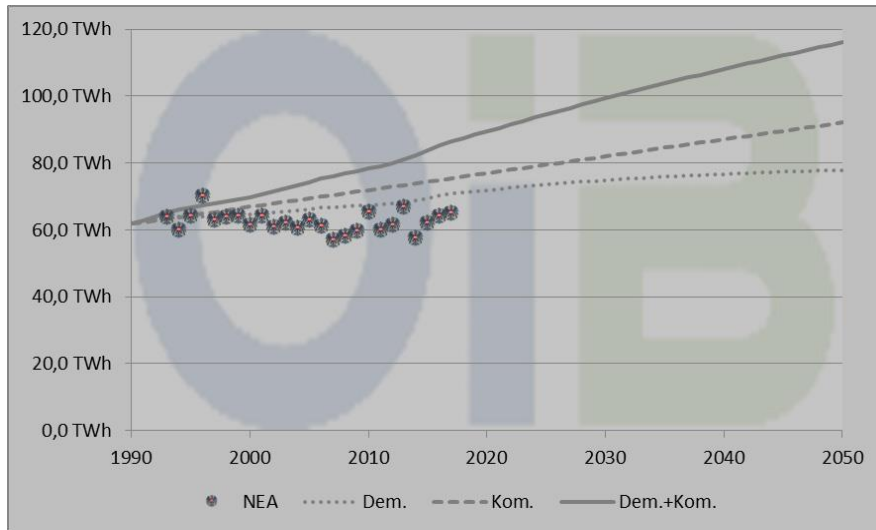


Figure 18: Energy consumption of private residences for space heating and hot water

Source: Self-calculation and *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and *Energiebilanzen für Österreich* [Energy balance sheets for Austria] (1970-2017 edition, from Statistics Austria)

NEA	Useful energy analysis
Dem.	Demographic change
Kom.	Comfort change
TWh	TWh

According to these assumptions, the energy consumption of private households for space heating and hot water would increase by approximately 54 TWh or 88% from 1990 to 2050.

9. If, on the other hand, one looks at the trend resulting from a linear extrapolation, the following picture emerges:

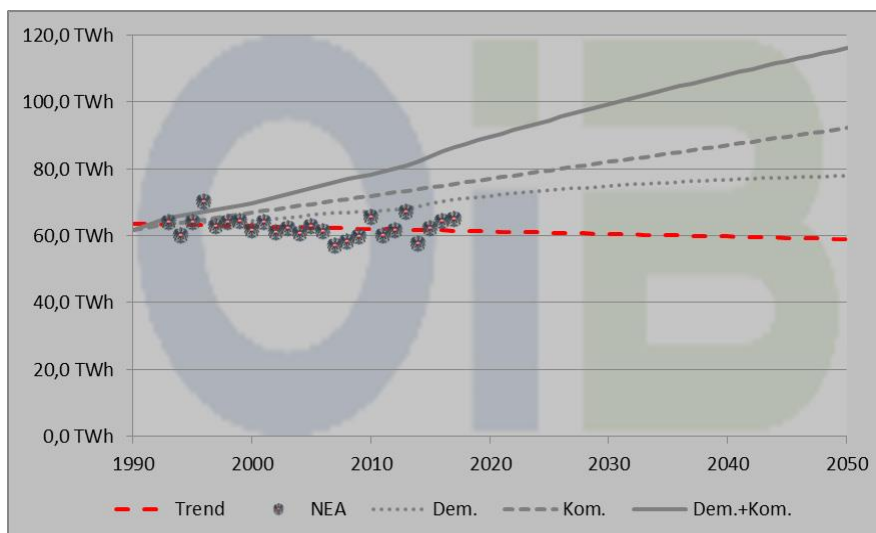


Figure 19: Energy consumption of private residences for space heating and hot water

Source: Self-calculated

NEA	Useful energy analysis
Dem.	Demographic change

Kom.	Comfort change
TWh	TWh
Trend	Trend
Dem.+Kom	Demographic change + comfort change

According to these assumptions, the energy consumption of private households for space heating and hot water would fall by approximately 1.6 TWh or 0.04% from 1990 to 2050.

- In the next step, an energy consumption forecast is made for the given or underlying comfort increase in the shape of the increase in useful floor area and a refurbishment rate equal to the actual refurbishment rate, which has been shaped by the various subsidy and regulatory policy measures:

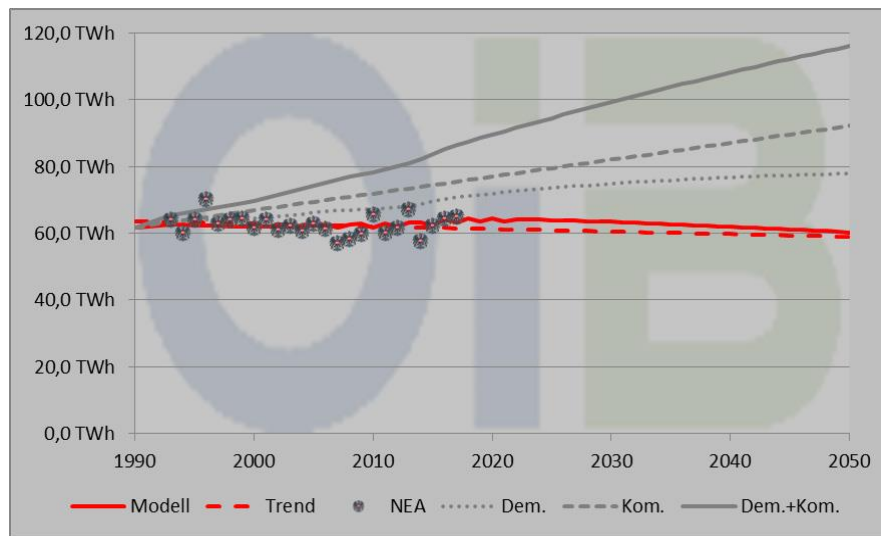


Figure 20: Energy consumption of private residences for space heating and hot water

Source: Self-calculated

NEA	Useful energy analysis
Dem.	Demographic change
Kom.	Comfort change
TWh	TWh
Trend	Trend
Dem.+Kom	Demographic change + comfort change
Modell	Model

According to these assumptions, the energy consumption of private households for space heating and hot water would fall by approximately 4.5 TWh or 0.12% from 1990 to 2050.

On this basis, it makes sense to assume, in the models that follow, that energy consumption will remain constant.

1.7.1 Model A – Linear extrapolation

The first model is a linear continuation of all energy carrier shares (with the exception of natural gas = residual value) and an energy consumption for heating according to the linear trend (Figure 19).

If the model described above is applied to the data for the individual energy carriers and the energy consumption for heating, the following curves result for all energy carriers:

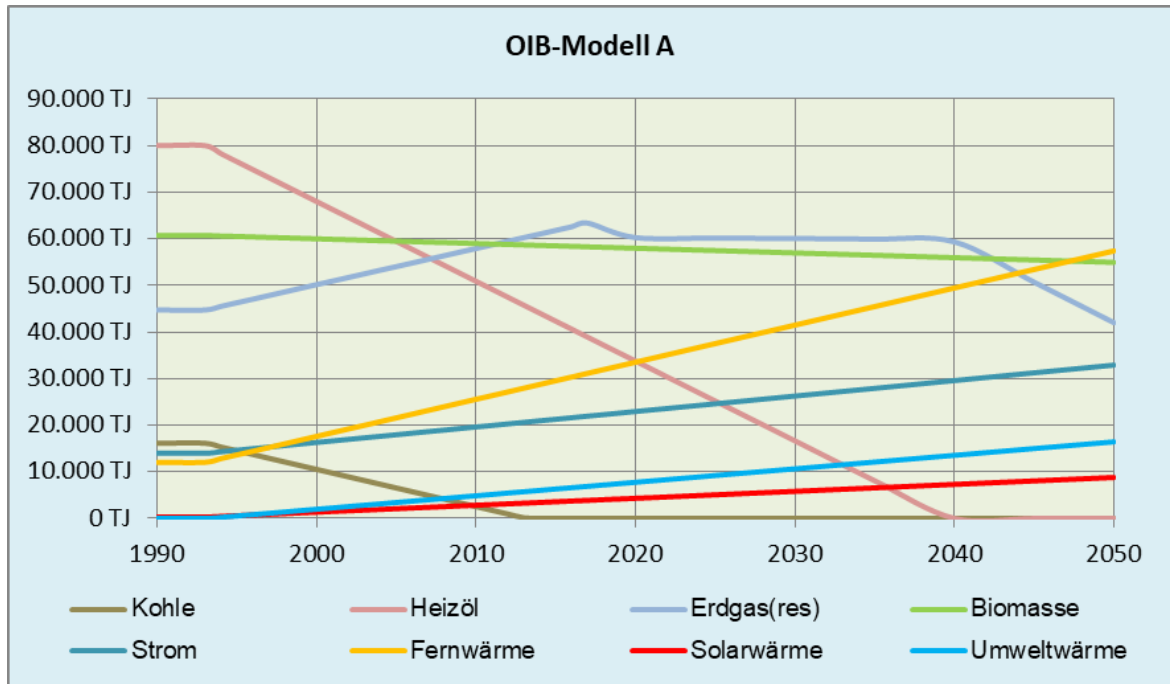


Figure 21: Changes for coal, heating oil, district heating, heat pumps, electricity, biomass, solar thermal energy and natural gas as a residual value for model A

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and self-calculation

OIB-Modell A	OIB model A
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

This gives the following changes for the individual variables:

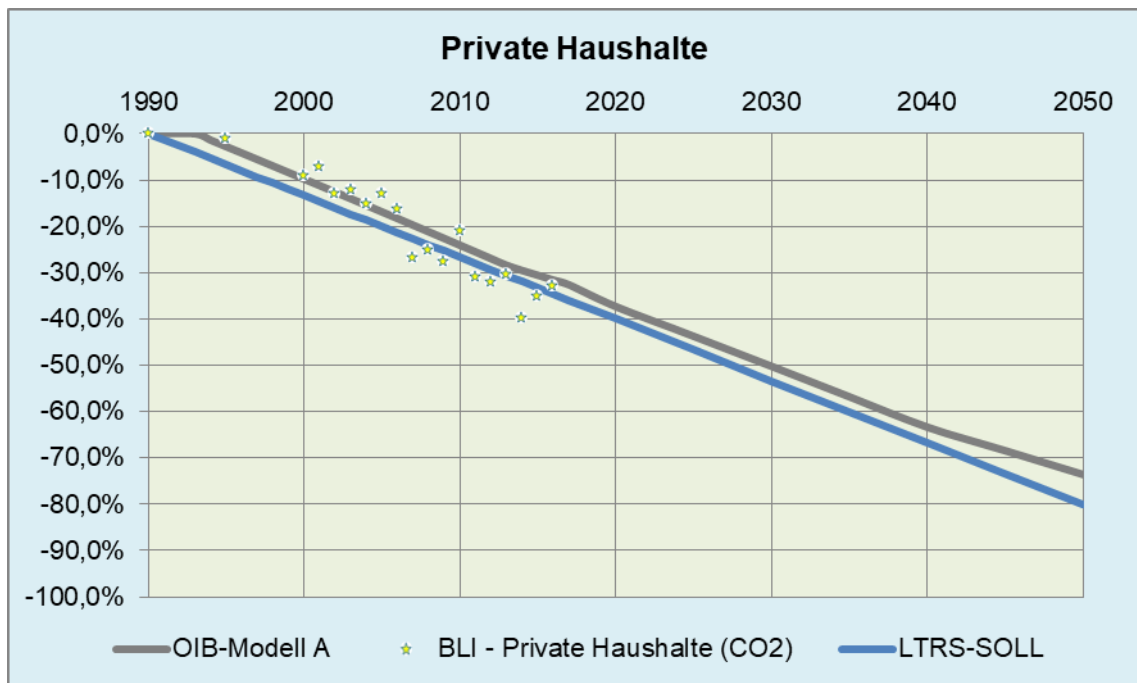
Table 15: Quantities of energy for each energy source for model A

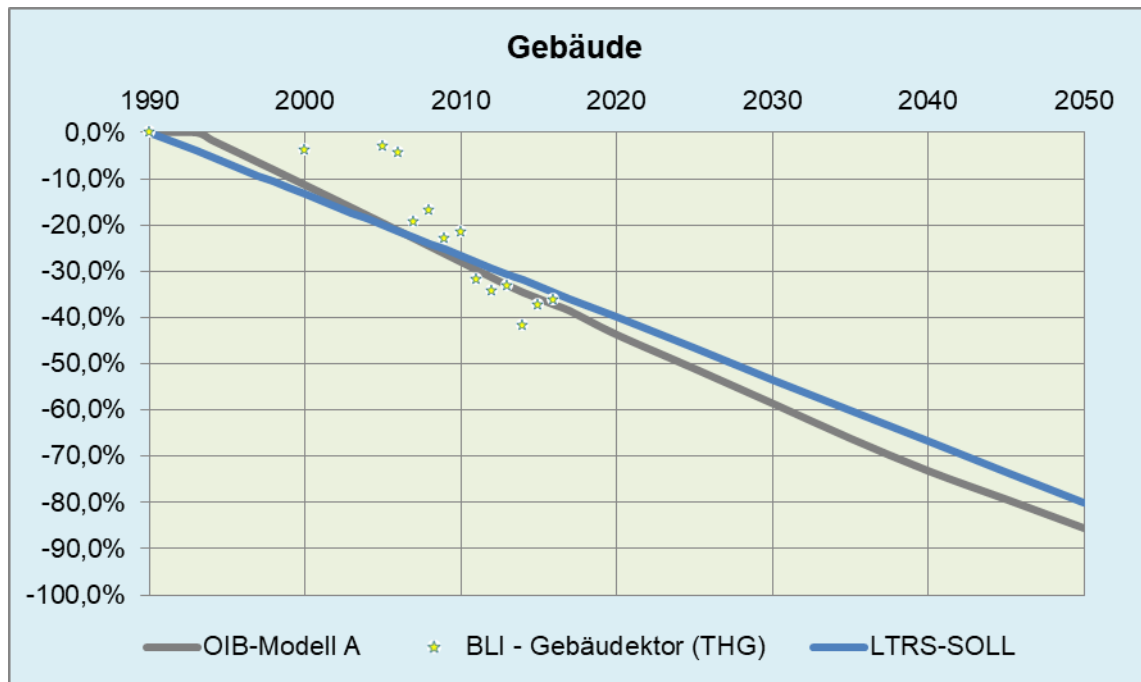
OIB model A	Coal	Heating oil	Natural gas	Electricity	District heating	Environm ental heat (heat pump)	Biomass	Environ mental heat (solar-thermal)
Phase-out	2014	2040						

OIB model A	Coal	Heating oil	Natural gas	Electricity	District heating	Environmental heat (heat pump)	Biomass	Environmental heat (solar-thermal)
Starting point, 1993	20,752 TJ	73,927 TJ	41,827 TJ	16,124 TJ	13,761 TJ	898 TJ	62,310 TJ	717 TJ
1993 -2017	-19,984 TJ	-29,837 TJ	+18,402 TJ	+4,568 TJ	+18,812 TJ	+6,571 TJ	+1,923 TJ	+3,293 TJ
2017 -2030	+0 TJ	-22,255 TJ	-3,321 TJ	+4,314 TJ	+10,347 TJ	+3,759 TJ	-1,314 TJ	+1,939 TJ
2017 -2040	+0 TJ	-38,897 TJ	-4,017 TJ	+7,633 TJ	+18,306 TJ	+6,651 TJ	-2,326 TJ	+3,430 TJ
Growth by 2050	+0 TJ	-38,897 TJ	-21,355 TJ	+10,952 TJ	+26,265 TJ	+9,542 TJ	-3,337 TJ	+4,922 TJ

Source: Self-calculated

Using the conversion factors from OIB Guideline 6 (April 2019 edition), this results in the following changes for greenhouse gas emissions:





Private Haushalte	Private households
OIB-Modell A	OIB model A
BLI – Private Haushalte (CO2)	BLI – Private households (CO ₂)
LTRS-SOLL	LTRS TARGET VALUE

Gebäude	Buildings
OIB-Modell A	OIB model A
BLI – Gebäudektor (THG)	BLI – Buildings sector (GHG)
LTRS-SOLL	LTRS TARGET VALUE

Figure 22: Greenhouse gas emissions for model A

Source: *Bundesländer Luftschadstoff Inventur 1990-2016 (BLI)* [Air pollution inventory of Austria's provinces 1990-2016] from Umweltbundesamt GmbH, and self-calculation

1.7.2 Model B – Linear extrapolation without a reduction in energy consumption for heating

The second model is a linear continuation of all energy carrier shares (with the exception of natural gas = residual value), without a reduction in energy consumption for heating occurring in some provinces, and with an energy consumption for heating according to the linear trend.

If the model described above is applied to the data for the individual energy carriers and the energy consumption for heating, the following curves result for all energy carriers:

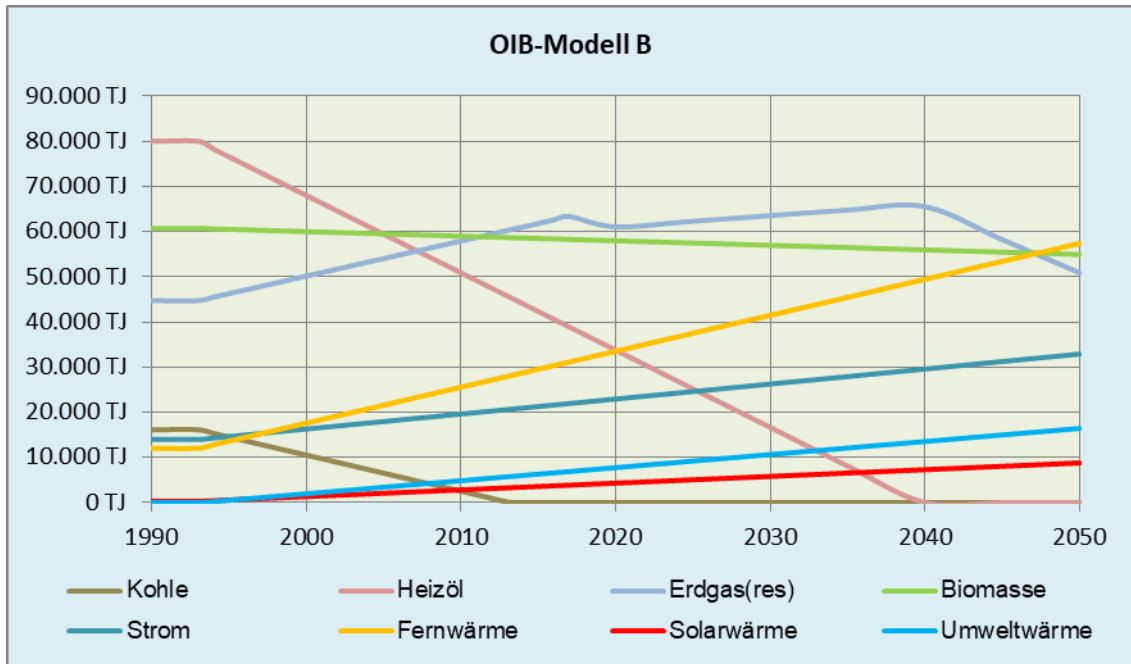


Figure 23: Changes for coal, heating oil, district heating, heat pumps, electricity, biomass, solar thermal energy and natural gas as a residual value for model B

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and self-calculation

OIB-Modell B	OIB model B
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

This gives the following changes for the individual variables:

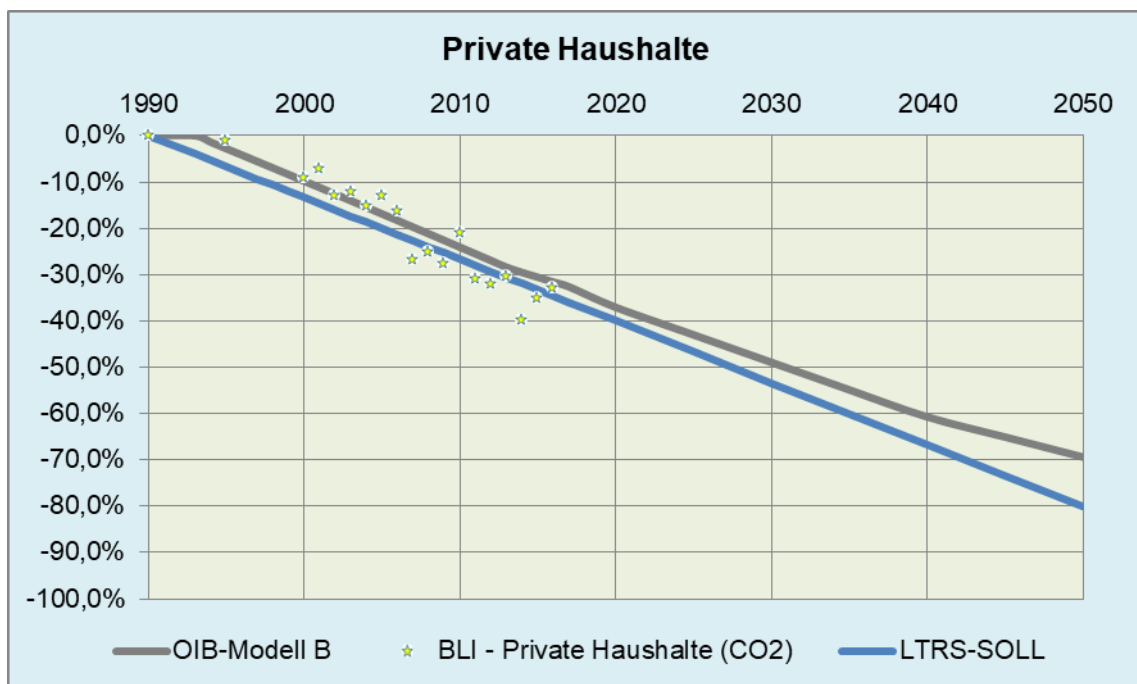
Table 16: Quantities of energy for each energy source for model B

OIB model B	Coal	Heating oil	Natural gas	Electricity	District heating	Environm ental heat (heat pump)	Biomass	Environ mental heat (solar-thermal)
Phase-out	2014	2040						
Starting point	20,752 TJ	73,927 TJ	41,827 TJ	16,124 TJ	13,761 TJ	898 TJ	62,310 TJ	717 TJ

OIB model B	Coal	Heating oil	Natural gas	Electricity	District heating	Environmental heat (heat pump)	Biomass	Environmental heat (solar-thermal)
1993								
1993-2017	-19,984 TJ	-29,837 TJ	+18,402 TJ	+4,568 TJ	+18,812 TJ	+6,571 TJ	+1,923 TJ	+3,293 TJ
2017-2030	+0 TJ	-22,255 TJ	+174 TJ	+4,314 TJ	+10,347 TJ	+3,759 TJ	-1,314 TJ	+1,939 TJ
2017-2040	+0 TJ	-38,897 TJ	+2,166 TJ	+7,633 TJ	+18,306 TJ	+6,651 TJ	-2,326 TJ	+3,430 TJ
Growth by 2050	+0 TJ	-38,897 TJ	-12,484 TJ	+10,952 TJ	+26,265 TJ	+9,542 TJ	-3,337 TJ	+4,922 TJ

Source: Self-calculated

Using the conversion factors from OIB Guideline 6 (April 2019 edition), this results in the following changes for greenhouse gas emissions:



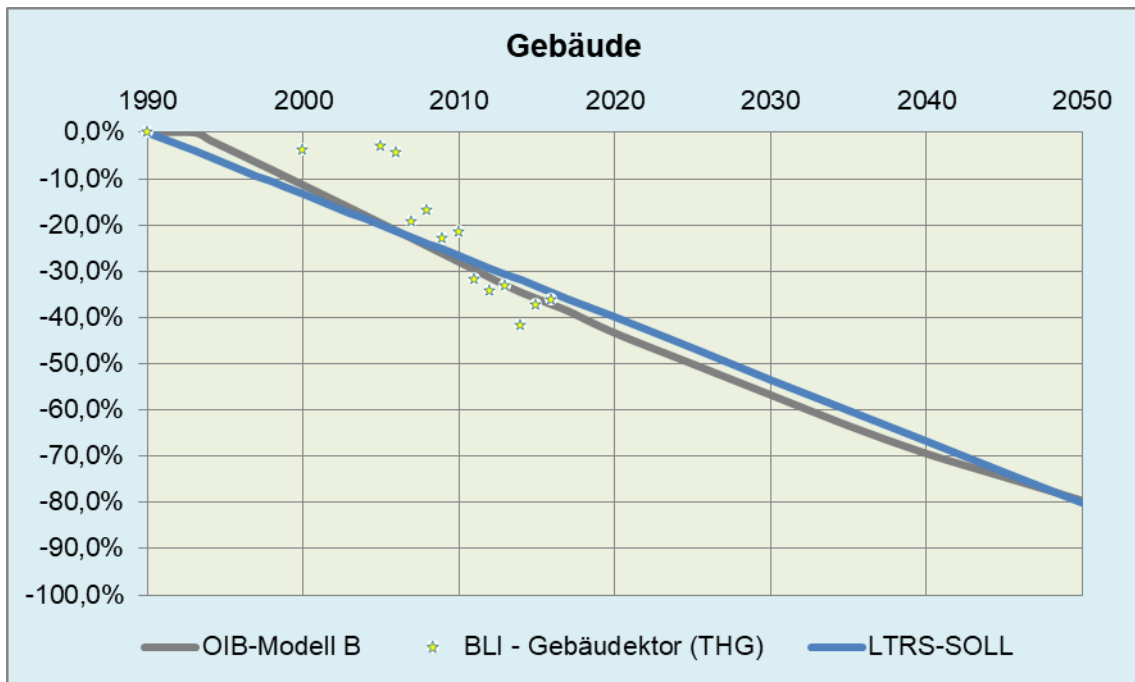


Figure 24: Greenhouse gas emissions for model B

Source: *Bundesländer Luftschadstoff Inventur 1990-2016 (BLI)* [Air pollution inventory of Austria's provinces 1990-2016] from Umweltbundesamt GmbH, and self-calculation

Private Haushalte	Private households
OIB-Modell B	OIB model B
BLI – Private Haushalte (CO ₂)	BLI – Private households (CO ₂)
LTRS-SOLL	LTRS TARGET VALUE

Gebäude	Buildings
OIB-Modell B	OIB model B
BLI – Gebäudektor (THG)	BLI – Buildings sector (GHG)
LTRS-SOLL	LTRS TARGET VALUE

1.7.3 Model C – Like model B but with restrictions on the development of energy carriers

The third model is a linear continuation of all variables, but without a reduction in energy consumption for heating occurring in some provinces and with a halving of the district heating increase and a constant biomass curve.

If the model described above is applied to the data for the individual energy carriers and the energy consumption for heating, the following curves result for all energy carriers:

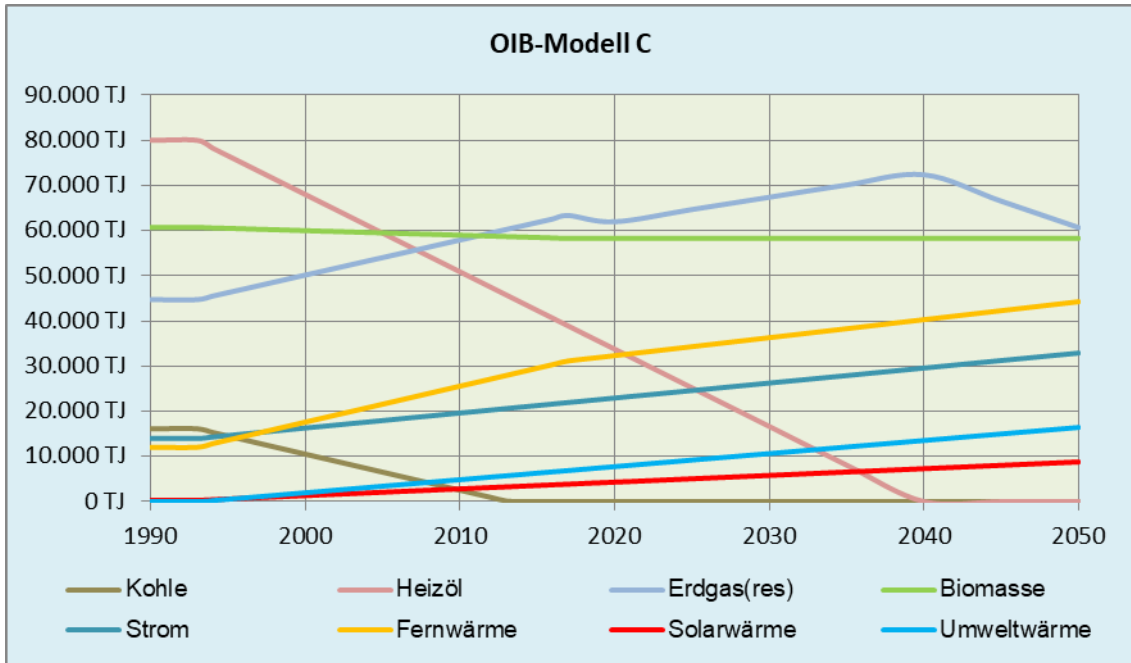


Figure 25: Changes for coal, heating oil, district heating, heat pumps, electricity, biomass, solar thermal energy and natural gas as a residual value for model C

Source: *Nutzenergieanalyse für Österreich* [Useful energy analysis for Austria] (1993-2017 edition, from Statistics Austria) and self-calculation

OIB-Modell C	OIB model C
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

This gives the following changes for the individual variables:

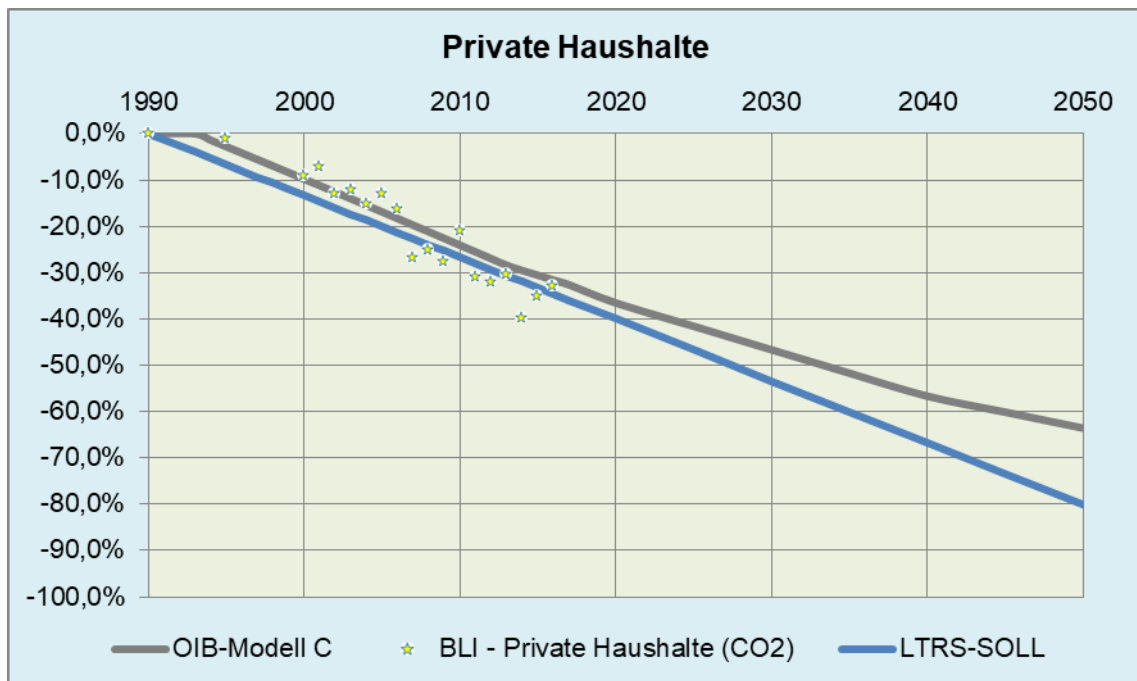
Table 17: Quantities of energy for each energy source for model C

OIB model C	Coal	Heating oil	Natural gas	Electricity	District heating	Environ mental heat (heat pump)	Biomass	Environ mental heat (solar-thermal)
Phase-out	2014	2040						

OIB model C	Coal	Heating oil	Natural gas	Electricity	District heating	Environmental heat (heat pump)	Biomass	Environmental heat (solar-thermal)
Starting point, 1993	20,752 TJ	73,927 TJ	41,827 TJ	16,124 TJ	13,761 TJ	898 TJ	62,310 TJ	717 TJ
1993-2017	-19,984 TJ	-29,837 TJ	+18,402 TJ	+4,568 TJ	+18,812 TJ	+6,571 TJ	+1,923 TJ	+3,293 TJ
2017-2030	+0 TJ	-22,255 TJ	+4,033 TJ	+4,314 TJ	+5,173 TJ	+3,759 TJ	+0 TJ	+1,939 TJ
2017-2040	+0 TJ	-38,897 TJ	+8,993 TJ	+7,633 TJ	+9,153 TJ	+6,651 TJ	+0 TJ	+3,430 TJ
Growth by 2050	+0 TJ	-38,897 TJ	-2,688 TJ	+10,952 TJ	+13,133 TJ	+9,542 TJ	+0 TJ	+4,922 TJ

Source: Self-calculated

Using the conversion factors from OIB Guideline 6 (April 2019 edition), this results in the following changes for greenhouse gas emissions:



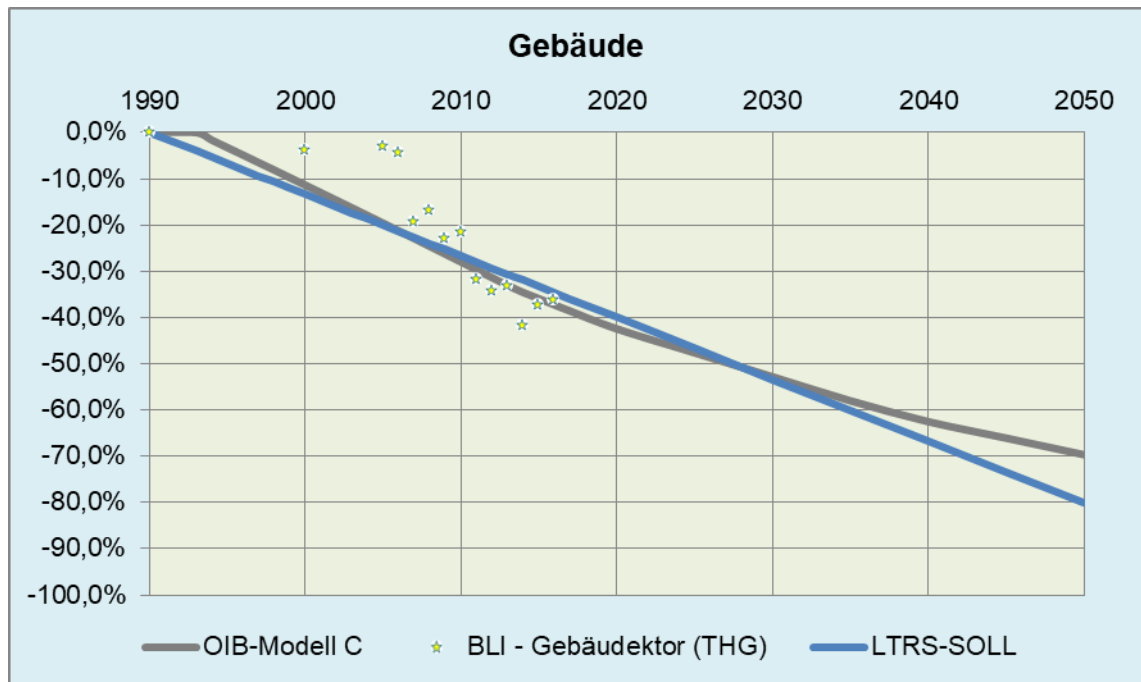


Figure 26: Greenhouse gas emissions for model C

Source: *Bundesländer Luftschadstoff Inventur 1990-2016 (BLI)* [Air pollution inventory of Austria's provinces 1990-2016] from Umweltbundesamt GmbH, and self-calculation

Private Haushalte	Private households
OIB-Modell C	OIB model C
BLI – Private Haushalte (CO ₂)	BLI – Private households (CO ₂)
LTRS-SOLL	LTRS TARGET VALUE

Gebäude	Buildings
OIB-Modell C	OIB model C
BLI – Gebäudektor (THG)	BLI – Buildings sector (GHG)
LTRS-SOLL	LTRS TARGET VALUE

1.7.4 Model D – Provincial experts model

Models A, B and C formed part of the draft and thus formed the basis for the provincial experts model.

In this provincial experts model, the provincial experts were asked, during the consultation process, to provide feedback on the expected future development of the energy mix. Model D results from their synthesis.

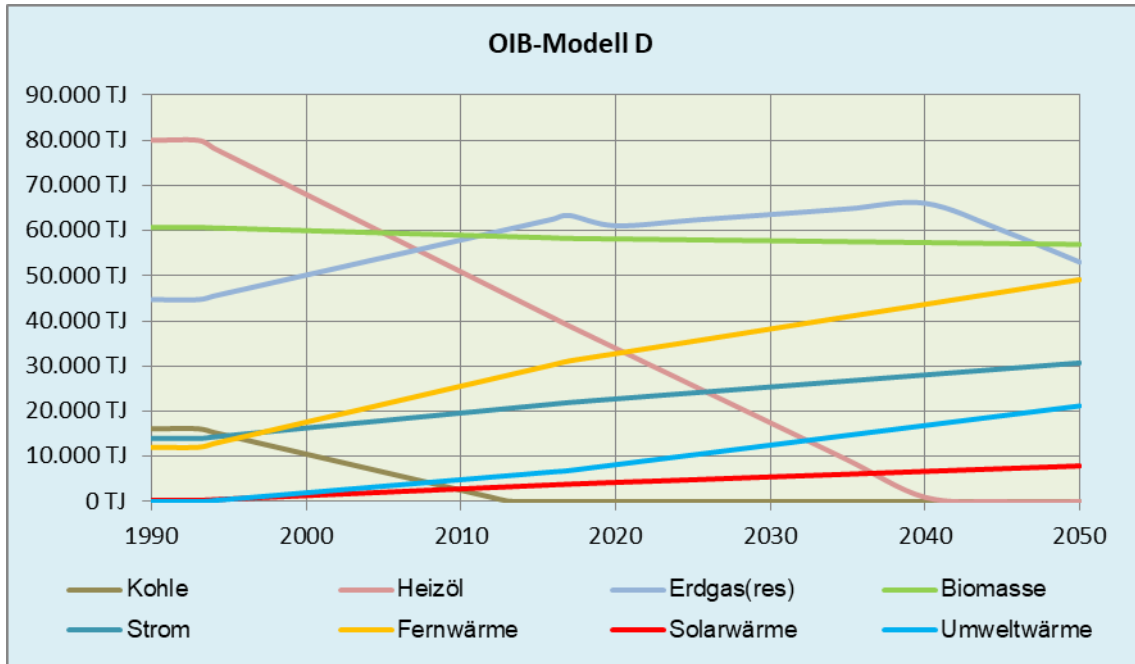


Figure 27: Changes for coal, heating oil, district heating, heat pumps, electricity, biomass, solar thermal energy and natural gas as a residual value for model D

Source: Provincial experts model

OIB-Modell D	OIB model D
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

This gives the following changes for the individual variables:

Table 18: Quantities of energy for each energy source for model D

OIB model D	Coal	Heating oil	Natural gas	Electricity	District heating	Environm ental heat (heat pump)	Biomass	Environ mental heat (solar-thermal)
Phase-out	2014	2040						
Starting point,	20,752 TJ	73,927 TJ	41,827 TJ	16,124 TJ	13,761 TJ	898 TJ	62,310 TJ	717 TJ

OIB model D	Coal	Heating oil	Natural gas	Electricity	District heating	Environmental heat (heat pump)	Biomass	Environmental heat (solar-thermal)
1993								
1993-2017	-19,984 TJ	-29,837 TJ	+18,402 TJ	+4,568 TJ	+18,812 TJ	+6,571 TJ	+1,923 TJ	+3,293 TJ
2017-2030	+0 TJ	-21,440 TJ	+205 TJ	+3,456 TJ	+7,085 TJ	+5,629 TJ	-527 TJ	+1,589 TJ
2017-2040	+0 TJ	-37,932 TJ	+2,698 TJ	+6,114 TJ	+12,535 TJ	+9,959 TJ	-933 TJ	+2,812 TJ
Growth by 2050	+0 TJ	-38,897 TJ	-10,335 TJ	+8,772 TJ	+17,985 TJ	+14,289 TJ	-1,338 TJ	+4,034 TJ

Source: Self-calculated

Using the conversion factors from OIB Guideline 6 (April 2019 edition), this results in the following changes for greenhouse gas emissions:

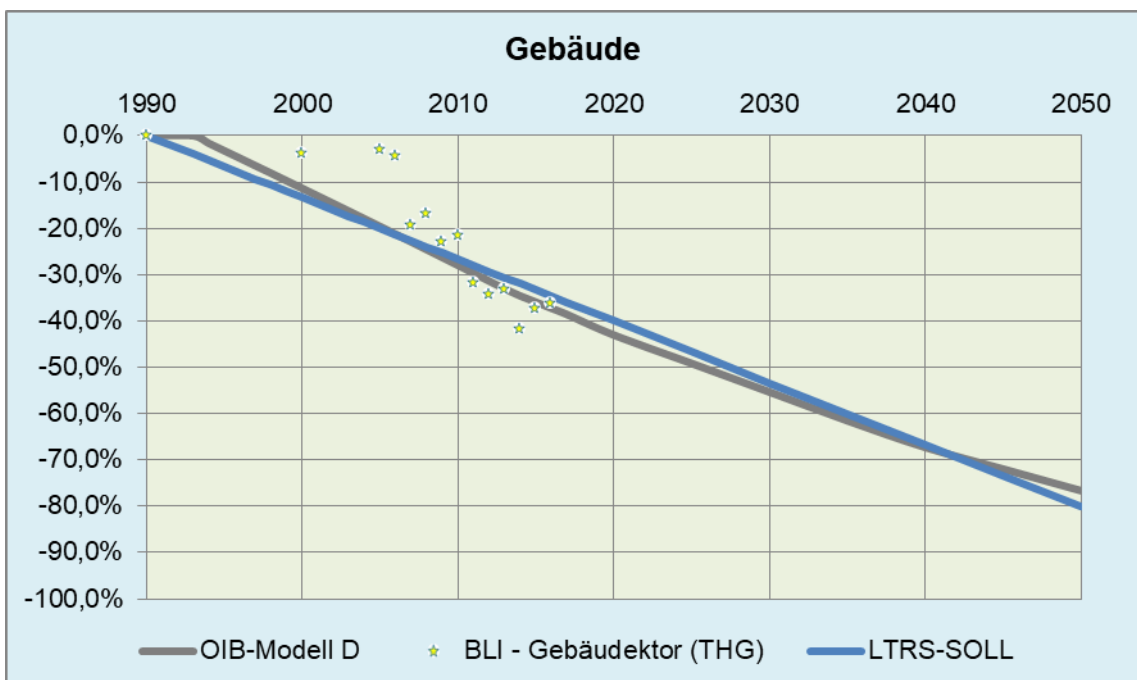
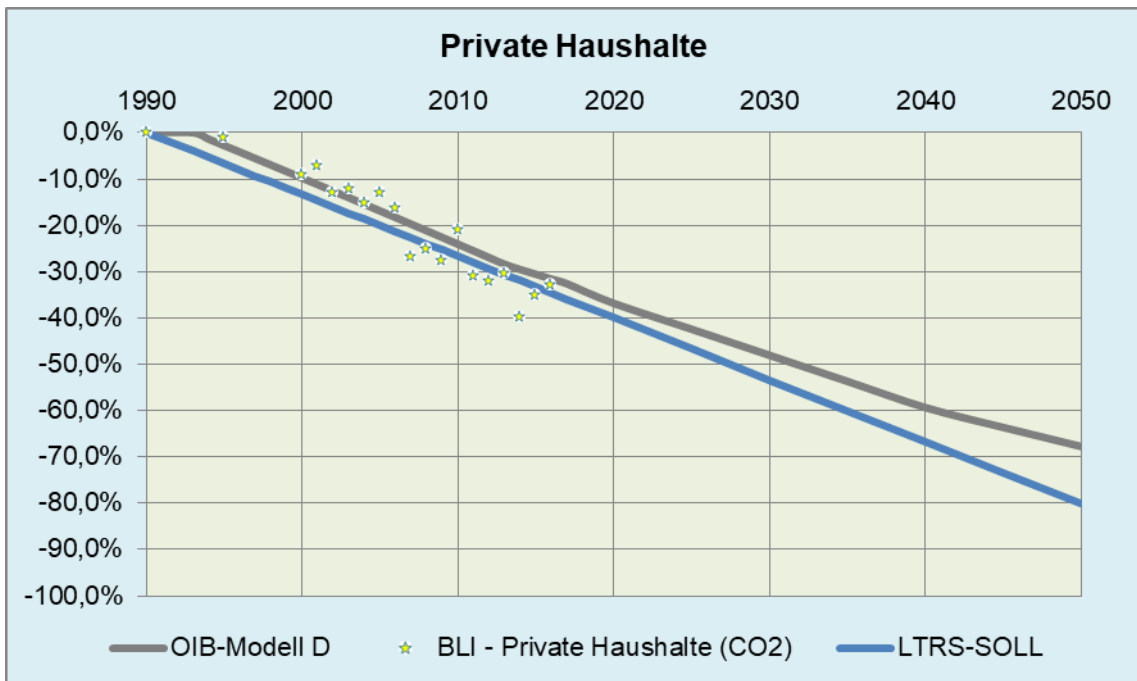


Figure 28: Greenhouse gas emissions for model D

Source: Provincial experts model

Private Haushalte	Private households
OIB-Modell D	OIB model D
BLI – Private Haushalte (CO ₂)	BLI – Private households (CO ₂)
LTRS-SOLL	LTRS TARGET VALUE

Gebäude	Buildings
OIB-Modell D	OIB model D
BLI – Gebäudektor (THG)	BLI – Buildings sector (GHG)
LTRS-SOLL	LTRS TARGET VALUE

1.7.5 Model E – Stakeholder experts model

Models A, B and C formed part of the draft and thus formed the basis for the stakeholder experts model.

In this model, the stakeholder experts were asked to provide feedback during the consultation process, in particular with the opportunity to state the expected energy mix as input for the expected immediate future development. Model E is the result.

The following stakeholder experts model was received during the consultation process.

- The Austrian Heat Pumps Association (*Wärmepumpe Austria*), 30 September 2019

The following stakeholder experts were invited to the contact forum, where they were reminded that they could submit a stakeholder experts model:

- The Austrian Economic Chambers (WKO)
- The Association of Gas and Heat Supply Companies (FGW)
- The Austrian Renewable Energy Umbrella Association (EEÖ)
- The Association of Austrian Boiler Suppliers (VÖK)
- The Austrian Heat Pumps Association (*Wärmepumpe Austria*)
- The Austrian Federation of Limited-Profit Housing Associations (GBV)
- The Austrian Central Association of Housing and Property (*Zentralverband Haus und Eigentum*)
- Austrian Federal Railways (ÖBB)
- *Österreichs Energie* [umbrella body for the Austrian electricity industry]
- The Austrian Stone and Ceramics Trade Association [*Fachverband Stein und Keramik*]
- Austrian Guild of Timber Construction [*Bundesinnung Holzbau*]
- The Austrian Association of Cities [*Städtebund*]
- The Federal Ministry for Sustainability and Tourism
- The Federal Ministry of Transport, Innovation and Technology
- The Austrian Federal Chancellery
- The Austrian Chamber of Agriculture (LKÖ)
- The Austrian Guild of Construction [*Bundesinnung Bau*]
- *Österreichs E-Wirtschaft* [umbrella body for the Austrian electricity industry]
- The Association of Gas and Heat Supply Companies (FGW)
- The Federal Chamber of Architects and Engineering Consultants [*Bundeskammer der Architekten und Ingenieur Konsulenten*].

The following stakeholder experts model was received by 8 January:

- Federal Ministry for Sustainability and Tourism, 7 January 2020

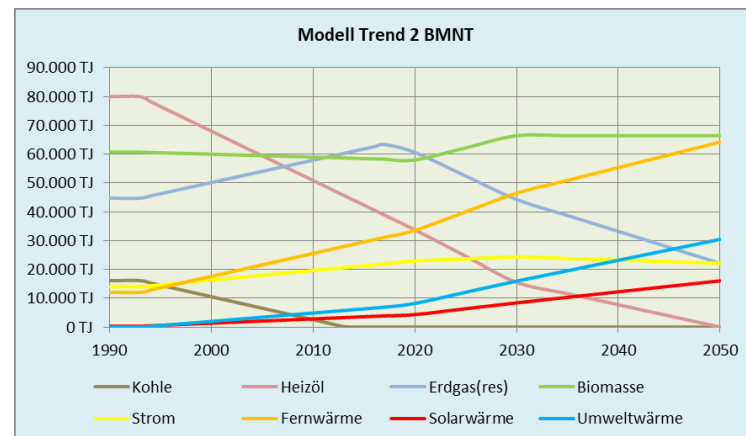
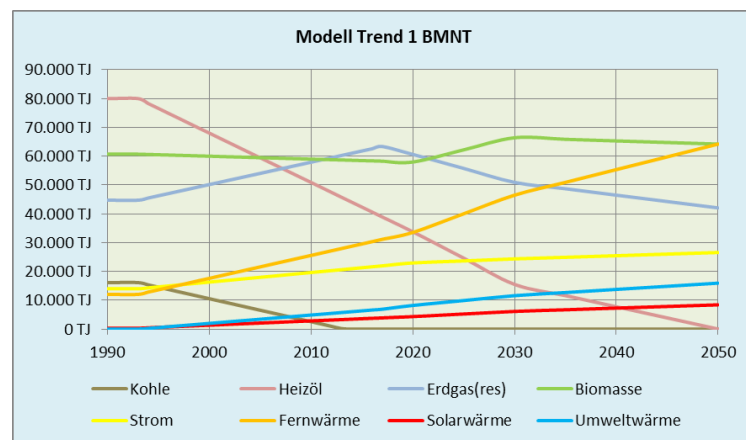
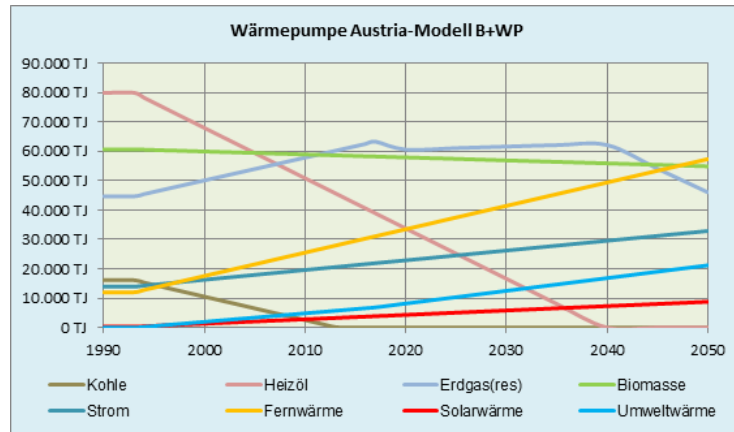


Figure 29: Changes for coal, heating oil, district heating, heat pumps, electricity, biomass, solar thermal energy and natural gas as a residual value for model E

Source: Stakeholder experts model

Wärmepumpe Austria-Modell B+WP	The Austrian Heat Pumps Association (<i>Wärmepumpe Austria</i>) Model B + Heat pumps
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

Modell Trend 1 BMNT	Model Trend 1 Federal Ministry for Sustainability and Tourism (BMNT)
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

Modell Trend 2 BMNT	Model Trend 2 Federal Ministry for Sustainability and Tourism (BMNT)
TJ	TJ
Kohle	Coal
Strom	Electricity
Heizöl	Heating oil
Fernwärme	District heating
Erdgas(res)	Natural gas (residual value)
Solarwärme	Solar thermal energy
Biomasse	Biomass
Umweltwärme	Environmental heat

Brief description of assumptions

Trend 1, Federal Ministry for Sustainability and Tourism

Trend projections were made for all energy sources from 2009. In order to prevent an energy carrier from assuming negative values, a restriction was introduced whereby the use of an energy carrier cannot be reduced by more than 20% per year. It is then ensured that the total use continues to be in line with the trend.

For coal, oil and electricity, trend projections were made at provincial level from 2009. For gas, district heating, other renewables and biomass, trend projections were made at national level from 2009. The electricity use is the result of electricity demand from direct electrical heating and heat pumps. Heat pumps are recorded with a seasonal energy performance ratio (SEPR 3) of 2.8.

Other renewables were calculated by means of a trend projection at the provincial level; restrictions were placed on district heating, especially in Vienna and Carinthia, compared to the previous expansion curves.

Percentages were rounded to whole numbers.

Trend 2, Federal Ministry for Sustainability and Tourism

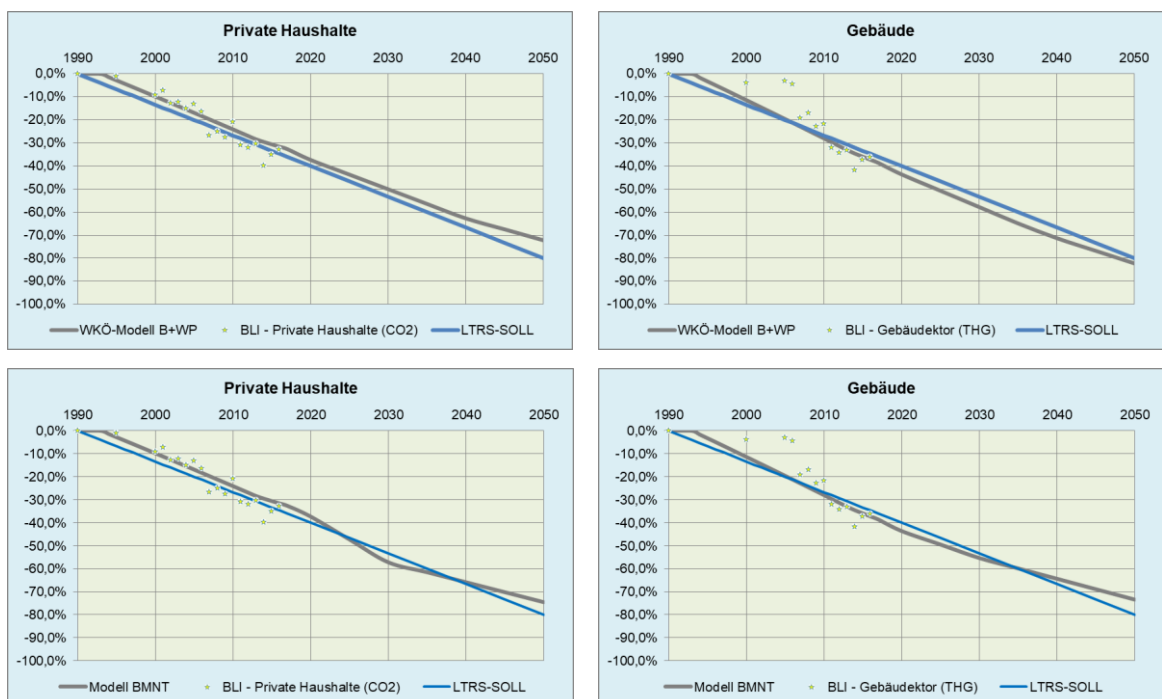
Coal, oil, biomass and district heating follow the trend according to Trend 1, Federal Ministry for Sustainability and Tourism.

Measures are in place to ensure that natural gas will not rise in any province with effect from 2022. In addition, it is assumed that natural gas central heating systems will be withdrawn from the market within 25 years after 2025. The proportion of natural gas central heating systems was estimated at 25% for Vienna and 50% in all the other provinces.

For electricity, trend projections were made at provincial level from 2009. Furthermore, it is assumed that the decline in the use of electricity in direct heating systems cannot exceed 2% per year and per province.

Percentages were rounded to whole numbers so that a more positive development can be seen (rounding of oil, coal and gas).

Using the conversion factors from OIB Guideline 6 (April 2019 edition), this results in the following changes for greenhouse gas emissions:



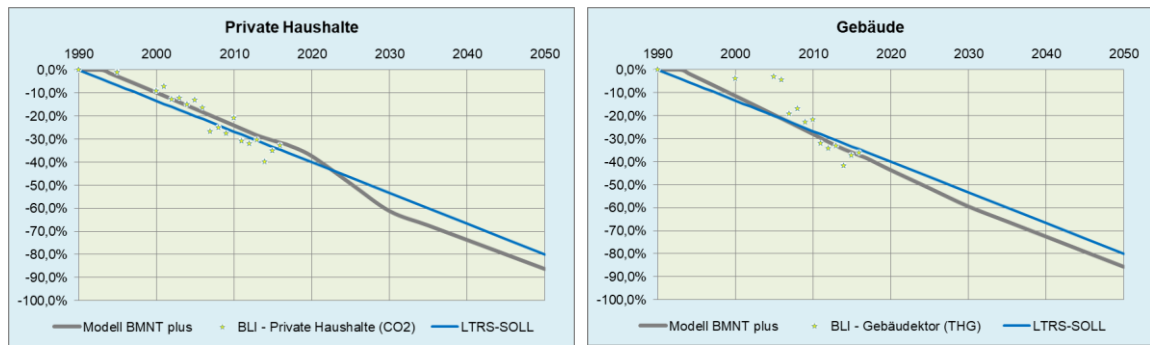


Figure 30: Greenhouse gas emissions for model E

Source: Stakeholder experts model

Private Haushalte	Private households
WKÖ-Modell B + WP	Austrian Economic Chambers (WKO) Model B + heat pumps
BLI – Private Haushalte (CO ₂)	BLI – Private households (CO ₂)
LTRS-SOLL	LTRS TARGET VALUE
Gebäude	Buildings
BLI – Gebäudektor (THG)	BLI – Buildings sector (GHG)
LTRS-SOLL	LTRS TARGET VALUE
Modell BMNT	Federal Ministry for Sustainability and Tourism (BMNT) Model
Modell BMNT plus	BMNT plus model

1.7.6 Conclusion

Models A, B and C formed part of the draft and thus formed the basis for the provincial experts model and the stakeholder experts model.

For all three models it can be stated that a reduction of an order of magnitude of 80% in GHG emissions appears just about achievable and that all model designs based on residential buildings produce less favourable results than would be the case for the buildings sector as a whole.

These are some of the main reasons why these models are to be used as the basis for further modelling and therefore form the basis for a transfer from the residential buildings situation ('private households') to the buildings sector as a whole.

1.7.7 More extensive benefits, for instance in terms of safety and air quality

As already explained in Chapter 1.2 (Overview of cost-effective approaches to renovation), renovations – in fact any measures – are economically highly efficient if they utilise the cost component of 'business-as-usual costs' (for building site equipment, construction coordination, etc.) to reduce the frequent occurrence of these costs, tackling them by means of separate individual measures.

As was also already explained, the multiple occurrence of these business-as-usual costs must be weighed up against any existing residual values in the context of cost optimality considerations. In order to be able to carry out this comparison as holistically as possible, the following areas, which do not involve thermal energy optimisation and certainly not the reduction of GHG emissions, should be included in the consideration of possible necessary or desirable individual measures.

- Improvement of the infrastructure provision of the existing building with regard to mobility issues of its users (retrofitting of parking spaces, charging stations, lifts, etc.).

- Improvement of the fire protection level of the existing building.
- Improvement of the sound insulation level of the existing building (retrofitting of soundproofed windows, retrofitting of improvements to the external sound insulation through changes to the external facade, etc.).
- Modernisation of the building infrastructure of the existing building (new risers of all kinds, new earthing, new lighting in public areas, etc.).
- Improvement of the safety level of the existing building (any redesign of traffic areas or access areas, etc.).
- Improvement of accessibility in accordance with legal aspects other than construction law (ramps, lifts, bathrooms, toilets, etc.).
- Improvement of the air quality of the existing building by means of an air-conditioning system or window ventilation according to requirements. It is worth mentioning at this point that, with the new edition of OIB Guideline 6, April 2019 edition, the residential buildings use profile now assumes 36 m³/h.cap. as fresh air supply (20% more than the previous assumption), but this also derives from the integration of laundry and drying rooms in existing buildings instead of assuming laundry will be done in apartments. This may have a much wider positive impact from an energy and ecological point of view.
- Improvement of comfort, for example with measures against summer overheating, by improvement of the existing building through shading devices and through passive cooling measures (e.g. ventilation cooling).
- Improvement of health via compliance with the minimum standard for natural light in accordance with OIB Guideline 3 for roof extensions, other extensions and conversions.

It is assumed that such aspects have a significant impact, particularly in the case of extensions and conversions.

2 Article 2a(2) EPBD – Roadmap with measures and domestically established measurable progress indicators, with a view to the long-term 2050 goal of reducing greenhouse gas emissions in the Union by 80-95% compared to 1990

Energy efficiency gains for heating, cooling, hot water, ventilation and lighting

Despite population growth of around 14.5% over the past three decades (1990: 7,677,850 → 2017: 8,795,073), Austria has succeeded in maintaining absolute energy consumption for heating, cooling, hot water, ventilation and lighting in the buildings sector at an almost constant level. This means that efficiency gains of around 40% compared to a BaU scenario have already been achieved by means of regulations on thermal and energy improvements and on new builds; these gains should be viewed not only against the aforesaid backdrop of population growth, but also in the context of an increase in per capita land usage of around 22.1% (1990: 37.1 m²/cap → 2017: 45.3 m²/cap).

It should be added that the actual increase in efficiency is even higher, since standards of comfort and hygiene have risen significantly over this period. Examples of this phenomenon include the increase in second home ownership and the reduction in the number of Category C residences (without bathroom/shower and WC) and Category D residences (without water and WC in the residence). Exclusively behavioural influences will not be examined further in this document. Suffice it to say that although total energy consumption for space heating and hot water in the narrower sense of the terms has remained at the same level, specific energy consumption for these purposes has dropped by around 28.6%.

Change in energy carrier mix – share of energy from renewable sources in the buildings sector

The share of high-efficiency alternative technical building systems has risen by around 42.0% over the past few decades (1990: 38.3% → 2017: 54.4%). This can be attributed firstly to new building regulations (it has been obligatory since 2017 to examine alternatives before constructing a new build or before each comprehensive refurbishment/major renovation), and secondly to a funding push in the form of large financial incentives (see Chapters 1.3 and 1.4 for further details).

Reduction in GHG emissions in the buildings sector

As a result of energy efficiency gains (e.g. the drop in specific energy consumption by around 28.6%) and an increase in the share of renewable energy carriers (e.g. the rise in the share of high-efficiency alternative technical building systems by 54.4%), it was possible to reduce GHG emissions in the buildings sector by around 35.1% (1990: 12,862 kt → 2017: 8,347 kt).

Table 19: CO₂ and GHG emissions

	Private households (CO ₂ emissions)	Buildings (GHG emissions)
1990	9,818 kt	12,862 kt
2000	8,920 kt	12,386 kt
2001	9,113 kt	13,592 kt
2010	7,774 kt	10,089 kt
2011	6,792 kt	8,767 kt
2012	6,685 kt	8,450 kt
2013	6,835 kt	8,619 kt
2014	5,903 kt	7,514 kt
2015	6,383 kt	8,085 kt
2016	6,597 kt	8,203 kt
2017	6,724 kt	8,347 kt

Source: *Bundesländer Luftschadstoff Inventur 1990-2016 (BLI)* [Air pollution inventory of Austria's

provinces 1990-2016] from Umweltbundesamt GmbH

The in-depth stakeholder process that was carried out produced five main models in respect of development of the energy carrier mix. The following values are obtained from these main models:

Table 20: CO₂ and GHG emissions

	Private households (CO ₂ emissions)	Buildings (GHG emissions)
2020	6,214 kt	8,149 kt
2030	4,687 kt	5,550 kt
2040	3,465 kt	3,949 kt
2050	2,465 kt	2,639 kt
TARGET*)	2,146 kt	2,572 kt

Source: Averaging of the main models and (*) the mutually agreed goal of an 80% reduction in greenhouse gas emissions (own calculation)

Expenditure on refurbishment

According to Euro-construct, around €5.3 billion (equivalent to around €900 per m² or over €40,000 per capita) was spent on the refurbishment of residential buildings in Austria in 2017, whereby the effective refurbishment rate of 1.5% from Chapter 1.2 was applied to the entire stock of residential buildings.

To maintain a similar refurbishment volume of over 1.4% of GDP, it will be necessary to deploy a range of incentives to encourage the general public to carry out refurbishment measures. This can only be achieved by means of incentives that provide sufficient motivation to carry out a refurbishment, such as financial grants or tax advantages. The provinces are eagerly awaiting developments in this respect on the part of the Federal Government, not least because Austria's Legislative Programme 2020-2024 contains the following new heading: 'Long-term funding campaign by the Federal Government, coordinated with the provinces'. Increasing the (effective) refurbishment rate to 3%, which is one of the stated goals of this legislative programme, would require a range of incentives worth over €10 billion. The funds that will need to be earmarked for these incentives are much higher than the €100 million made available via the Federal Refurbishment Check in recent years.

Potential use of 'green gas'

Many documents refer to the possibility that approximately 20 TWh (72,000 TJ) of 'green gas' will be available by 2050, with a total volume of 5 TWh available as early as 2030. A 'green gas mobilisation strategy' is also scheduled for development in connection with the 'Plan for phasing out fossil energy carriers for space heating', with a view to deriving the greatest possible benefits in terms of climate action. If a constant yearly figure of 2.5 TWh (9,000 TJ) of this volume of green gas is used in the buildings sector from 2030 onwards, as provided for in balance sheet terms in the chapter entitled 'Renewable energy for a clean future' in Austria's Legislative Programme 2020-2024, the following milestones for 2030, 2040 and 2050 can be identified.

Possibility of utilising other measures that increase energy efficiency

It is also conceivable that other measures could be utilised that increase energy efficiency and that achieve somewhere in the ballpark of 2.5 TWh in energy savings.

Possibility of utilising other measures that reduce greenhouse gas emissions

Similarly, it is conceivable that other measures could be utilised that reduce greenhouse gas emissions and that achieve somewhere in the ballpark of 600 kt in GHG reductions.

Possibility of utilising other effects

A reduction in the number of heating degree days may also deliver energy savings.

Possibility of a mix of measures

The most likely variant is a mix of all the variants: the ‘green gas’ that is expected to be available, measures that increase energy efficiency, measures that reduce greenhouse gas emissions and other effects.

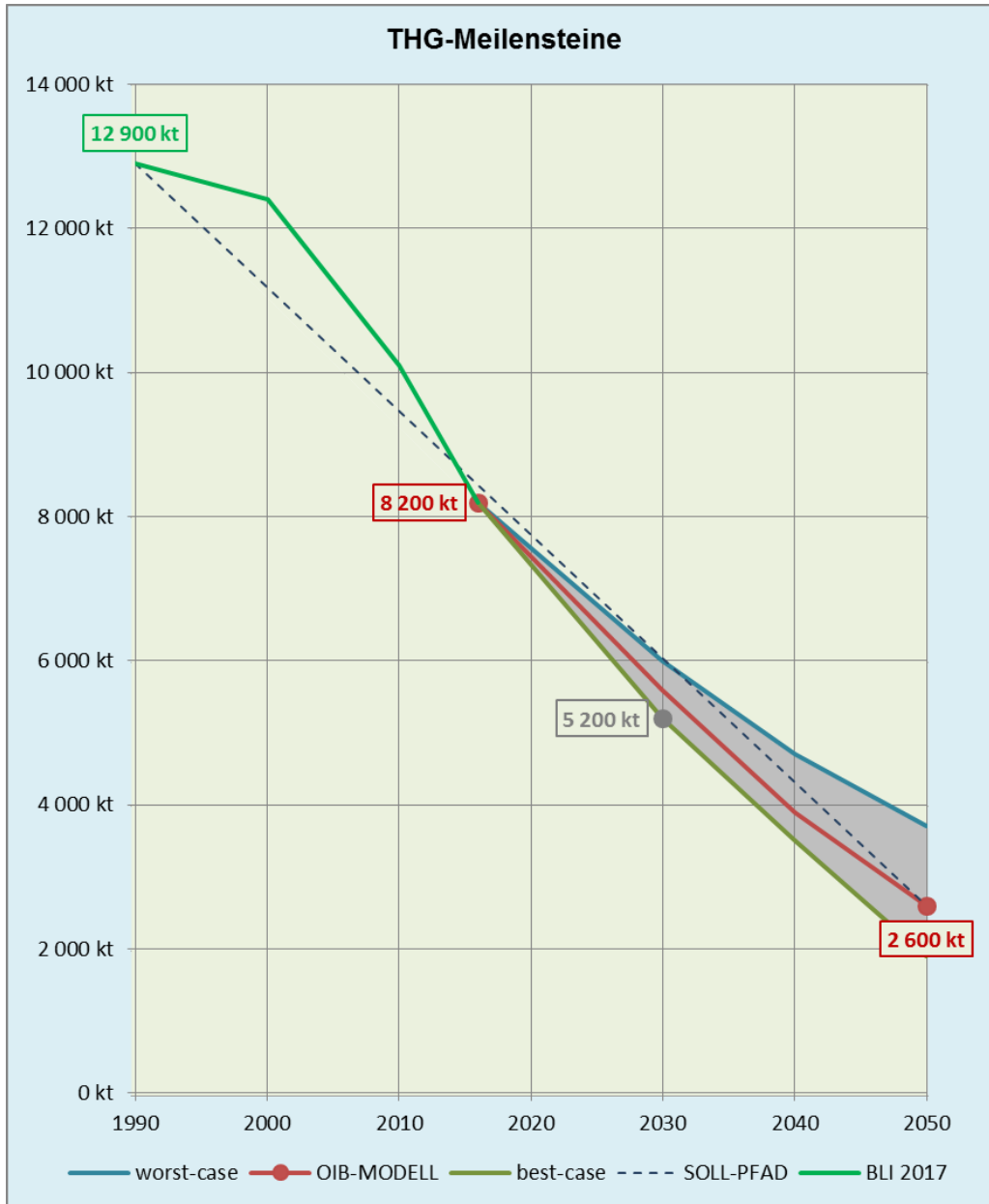


Figure 31: Modifications for coal, heating oil, district heating, heat pump, electricity, biomass, solar heating and natural gas as a residual value for Model D

Source: Model developed by experts employed by the provinces

THG-Meilensteine	GHG milestones
worst- case	Worst case
OIB-MODELL	OIB Model
best-case	Best case

SOLL-PFAD	TARGET PATH
BLI 2017	BLI 2017

Table 21: LTRS milestones in the buildings sector

	MIN.	AVE.	MAX.
2030	6,000 kt	5,600 kt	5,200 kt
2040	4,700 kt	3,900 kt	3,500 kt
2050	3,700 kt	2,600 kt	1,900 kt
TARGET		2,600 kt	

Source: On the basis of Table 20, the experts from the Expert Advisory Council for construction engineering guidelines – Sub-committee for energy conservation and thermal protection (SVBBTRL 6) and the Coordination group for the implementation of the EPBD have rounded the values and ensured that the 3 million tonnes from the NECP are also included in the forecast funnel in the best-case scenario.

Additional measurable progress indicators include the following variables:

- demographic trends,
- specific useful area per person,
- energy consumption for heating, cooling, hot water, ventilation and lighting in the buildings sector,
- energy carrier mix for heating, cooling, hot water, ventilation and lighting in the buildings sector,
- funding volume for new builds and refurbishments to assess the range of incentives.

Accompanying measures as qualitative progress indicators:

- current building regulations (OIB Guideline 6, April 2019 edition and its implementation),
- levels of requirements for new builds and refurbishment/renovation defined by current baseline documents, in particular the OIB Document on verification of cost optimality of the requirements under OIB Guideline 6 or the National Plan pursuant to Article 5 of Directive 2010/31/EU and the OIB Document defining the nearly zero-energy building and specifying intermediate targets in a National Plan pursuant to Article 9(3) of Directive 2010/31/EU,
- methodological basis for determining variables that are relevant to the requirements (normative basis) and their interactions with the European regulations,
- current funding guidelines (including reports by the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology).

Notes on effectiveness:

The effects of almost all legislative and incentive-based measures will not be apparent from the progress indicators for at least two or three years after their introduction.

3 Article 2a(3) EPBD – Obligation to facilitate access to mechanisms to support the mobilisation of investment

3.1. Support for the mobilisation of investments into renovations through the aggregation of projects and investment platforms (e.g. one-stop-shops) (Article 2a(3)(a))

Strategien und Maßnahmen des Bundes

Energy performance contracting – tools and measures for accelerated market development (IEA DSM Implementing Agreement – Task X)

In the context of the IEA's DSM programme, the aim of this task is to analyse and develop tools for the accelerated market development of energy performance contracting and similar energy services. Examples of projects that have already been implemented show that typical savings are in the region of 20-40%, and sometimes even higher. If the measures are combined with a switch to different energy carriers or the use of renewable energy carriers, the CO₂ reductions that can be achieved are significantly higher.

Status: completed

Brief description:

The term 'energy performance contracting' (EPC) refers to an innovative package of services delivered by a specialist company (the contractor or energy service company (ESCO)) with the aim of reducing energy costs in buildings. The contractor is responsible not only for putting in place measures that reduce energy consumption, but also for any operating, maintenance and repair services throughout the entire term of the contract. A unique feature of energy performance contracting is that the contractor's energy-related measures and services should ideally be financed from the savings made. The investment cost to the owner of the building is either minimal or zero. In addition, the contractor warrants to the building owner that a certain level of energy savings will be achieved, or guarantees a fixed price for energy costs, operating costs and servicing.

A total of 10 countries participated in *Task X* during its term between 2001 and 2004: Austria, Finland, France, Greece, Italy, Japan, the Netherlands, Norway, Sweden and the United States. Austria was represented by the Graz Energy Agency.

Activities under the project included identifying the obstacles and opportunities associated with energy performance contracting and proposing a set of concrete measures aimed at broadening the use of energy performance contracting and energy services.

The most important tools include:

- dissemination of targeted information to increase the credibility and acceptance of energy performance contracting,
- demonstration projects,
- accreditation of competent contracting providers,
- quality assurance tools and reduced transaction costs during the project preparation phase.

The outcomes are described in a series of reports:

- summary report,
- final management report,
- country reports,
- workshop documentation with supplementary materials.

In addition, two workshops were organised in Austria by the Austrian project partner Graz Energy Agency as networking opportunities for national experts, contracting providers, energy agencies and stakeholders. Within Austria, the project outcomes were presented at various events held by networks involving contracting providers (Thermoprofit partners) and energy agencies.

Austria (along with Germany) is regarded as a frontrunner in this field within Europe. Austrian

institutions have been in charge of a number of European projects and played a key role in developments at European level. Participating in this collaborative project under the aegis of the IEA provided Austria with an opportunity to leverage its strong competences in the area of EPC even beyond Europe's borders.

The outcomes and experience gained may lead to a more effective design of EPC projects, including the relevant preparations, as well as to the further development of EPC in a wider range of fields and policy instruments to stimulate the market for EPC in the long term.

Energy efficiency contracting platform for SMEs

Objective:

Evaluation of requirements and framework conditions for the launch and operation of an energy efficiency contracting platform for small and medium-sized enterprises (SMEs) in Austria for the cost-efficient identification and realisation of energy efficiency measures.

Brief description:

Environmental projects with public funding (e.g. *Ökoprofit* and *ÖkoBonus* under the *ÖkoBusinessPlan* for Vienna) have shown that ample potential for energy efficiency measures can be identified and realised in SMEs. However, in many cases the companies refrain from implementing the measures because of lack of time, lack of experience and lack of skills in this area, as well as overly high costs of financing. Frequently, it is precisely these measures which account for the largest share of the overall potential in an enterprise.

To make energy efficiency potential attractive for organisations in spite of the investment costs involved, which are sometimes prohibitively high, authorities at the federal as well as the provincial and municipal levels have launched numerous energy performance contracting initiatives over the past few years. Many different EPC-related examples can be cited in the field of public and private services. This type of energy-related service has yet to gain popularity among SMEs, however.

The aim of the project was to develop a concept for an energy performance contracting platform targeted at small and medium-sized enterprises.

The energy performance contracting platform would be used to capture energy efficiency measures identified in the course of publicly funded energy and environmental consultancy visits, but for various reasons never implemented; these measures would be stored in a central database with the approval of the companies concerned. Contractors and external energy service providers would be given access to the information about non-implemented projects in the database so that they could actively contribute to the implementation of outstanding projects. Moreover, projects could be identified from the data via the platform itself, according to certain criteria.

The study led to the drawing up of the required framework conditions and the measures needed for launch of the platform, so as to prepare the ground for the implementation of the platform and pilot projects.

One outcome of the study was clear evidence that there is major interest in such an EPC platform among the target groups. It was also clear that the project is feasible in practical terms and offers attractive project potential for the target groups. The Vienna Municipal Department for Environmental Matters (MA 22) embarked on efforts to run a pilot version of the platform for the Vienna area under the *ÖkoBusinessPlan for Vienna* in 2006.

On the basis of the project outcomes and the fact that the form of financing is not relevant to the main goals pursued by means of the platform concept (increased likelihood that energy efficiency measures will be put in place, increased energy efficiency, reduced emissions), it would seem advisable for the platform to support other forms of implementation in addition to energy performance contracting (guarantee models, conventional realisation by external energy service providers).

This would lead to a higher number of projects that can be translated into reality and expand the range of suppliers using the platform. This should be borne in mind when choosing a name for the

platform at the implementation stage. Likewise, it would make sense to expand the target group to larger companies, in particular because the datasets in the database also include information about measures in those companies.

Project status: completed

Austrian Ecolabel

The Austrian Ecolabel is the only eco-label operated by the Federal Government that certifies ecological services as well as ecological products: www.umweltzeichen.at

The Energy Performance Contracting eco-label stands for:

- consistent terminology in the field of energy performance contracting,
- defined quality requirements and control mechanisms,
- transparent planning and contract design,
- security for contractors and clients,
- guarantees for the savings that have been calculated.

The eco-label is awarded to those EPC providers whose services meet the following requirements:

- evidence of environmental improvement in the form of energy and emission savings,
- compliance with quality standards in the planning and implementation of the EPC measures (i.e. the minimum requirements that apply in terms of project implementation, the contracting agreement and the project documentation),
- use of environmentally friendly products and materials that pose no risk to health,
- ecological requirements that apply to the provider's production site,
- guarantee of projected savings by the contractor.

The environmental benefits achieved are presented to the client or user in the energy certificate as follows:

- energy demand before and after the EPC measure in [kWh/year] and [%],
- emissions before and after the EPC measure in [tCO₂equ/year] and [%],
- emissions reduction in [tCO₂equ/year] and [%].

Once an independent testing centre has confirmed that all the criteria have been met, the Federal Ministry for Sustainability and Tourism [*Bundesministerium für Nachhaltigkeit und Tourismus*, BMNT] can award the eco-label to the company.

Benefits:

- guaranteed compliance with minimum standards,
- evidence that the service is environmentally friendly and meets high quality standards,
- no change in the standard of convenience,
- independent and publicly funded eco-label,
- first label in Europe for energy performance contracting as a service,
- guaranteed delivery of the savings that have been calculated.

The Guideline has been revised and is now entitled *Effiziente Energiedienstleistungen* [Efficient Energy Services]. The Efficient Energy Services Guideline includes not only the requirements for plant and energy performance contracting that were originally laid down, but also new requirements that have been developed more recently, e.g. in relation to operational management contracting, energy consultations or implementation of an energy management system. Quality standards are defined for the implementation of energy efficiency measures that are applied at the design, implementation and documentation stages. The environmental benefit, or in other words the energy-related improvements in the form of CO₂ savings achieved once the energy service provider has implemented the measure, must also be recorded.

The minimum contractual standards laid down in the Guideline will promote transparent business

practices. The eco-label cannot be awarded for cost savings or investments that have an adverse environmental impact or do not reduce the burden on the environment. The project implementation guidelines included in the Guideline can be used by the client as a basis for identifying all energy efficiency measures and the entire potential for energy efficiency improvements. Regular energy consumption checks and supporting inspection measures are intended to provide the client with a guarantee that a high standard of quality will be maintained during the entire term of the contract.

Eco-label Guideline 49 and *klimaaktiv*

Real estate funds can be awarded an eco-label for the first time under Eco-label Guideline 49 – Sustainable Finance Products. The basic criteria of the *klimaaktiv* building standard are cited as minimum criteria for the properties in question.

DECA *Dienstleister Energieeffizienz und Contracting Austria* (DECA)

In 2005, the most notable Austrian energy performance contracting providers joined together under the aegis of the Austrian Society for Environment and Technology [*Österreichische Gesellschaft für Umwelt und Technik, ÖGUT*] to form *Dachverband Energie-Contracting Austria* [Umbrella Association for Energy Contracting in Austria, DECA].

In late 2012, the business platform acquired the status of a separate legal entity (association) and took on a new name – *Dienstleister Energieeffizienz und Contracting Austria* [Service Provider Energy Efficiency and Contracting Austria] – with the aim of targeting all companies that provide high-quality services relating to improvements in energy efficiency and increased use of renewable energies in Austria.

The association's objectives are as follows:

- representing stakeholders' interests in the field of energy efficiency (services) and providing a guarantee,
- acting as a think tank in the field of energy efficiency,
- improving the provision of information to customers and enhancing market transparency.

Further information on DECA and its tasks, objectives and members can be found at: www.deca.at

Since energy performance contracting is a very efficient tool for achieving climate action goals in the public and private sectors, DECA regards itself primarily as a business group for achieving environmental and economic goals.

Provincial policies and actions

Input from Burgenland

Housing support

Loans for housing refurbishments are offered at attractive rates under Burgenland's housing subsidies scheme. Particular attention was given to thermal and extensive energy refurbishment. With a corresponding improvement in the thermal quality of the building envelope (refurbishment of window surfaces, the roof or top floor ceiling, facade surfaces, the basement ceiling, as well as energy-relevant heating systems), up to 80% of eligible refurbishment costs can be funded. In addition, refurbishment consultations can help owners to implement an overall energy plan in stages by refurbishing individual building components in turn.

Free energy consultations

Free consultations provide members of the public with access to comprehensive information on energy-related topics in the areas of new builds and building refurbishments, heating and air-conditioning systems in buildings and uses of electricity.

Members of the public receive well-founded and coordinated information in the fields of thermal

insulation, windows and window installation, heating systems, subsidies, energy saving tips, photovoltaics, storage systems, savings and much more.

A wide variety of brochures and guides on all topics are available free of charge.

The energy consultations last between 1.5 and 2 hours and take place on site, at the offices of the district administration or of the Burgenland Provincial Government or in a local civic centre.

Input from Carinthia

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- assessment of energy consumption in public buildings on the basis of target and limit values (benchmarks for electricity/heating/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).

Input from Lower Austria

Energy advice for Lower Austria

Under the slogan *Energieberatung Niederösterreich* [Energy advice for Lower Austria], the Province of Lower Austria offers all citizens a largely free service relating to all energy matters in the field of housing. In addition to extensive information material there is also a hotline for advice and for arranging personal consultations. Interested parties can request a home-based consultation if they are planning to carry out building renovations, to install a heating system or to reduce their electricity consumption.

The consultations are aimed at improving the quality of refurbishments and increasing the rate of refurbishment. Ways of accessing funding are also explained during consultations.

Impact of the e5 scheme on building refurbishment

The e5 programme also positions the municipality for members of the public as a central hub of information that acts as a first point of contact, offers consultations directly and serves as a broker for third-party consultation services. The e5 programme is also intended to cover cooperation and communication with various target groups (associations, business and commerce, schools, authorities etc.) and PR work at the level of municipalities.

Input from Upper Austria

Investments into energy efficiency and renewable energy carriers or sources in buildings and facilities are key topics for the future that require a great deal of commitment in terms of planning and implementation. Innovative forms of financing such as energy performance contracting support this task and in many cases are the only means by which the projects can be implemented.

Upper Austria was the first Austrian province and one of the first European regions to introduce direct funding for energy performance contracting. Energy performance contracting is a financing and operating model for energy efficiency and renewable energy carriers or sources. A specialist company (the contractor) plans, finances and implements energy investments in a company or a municipality. These investments are refinanced from the energy savings achieved or from the sale of energy.

To date, over 240 energy performance contracting projects have been financed in Upper Austria, with energy investments worth over €70 million. Typical energy performance contracting measures that are often implemented in both enterprises and municipalities include switching to efficient interior lighting, optimising heating control and regulation, eco-heating systems (in particular biomass heating systems), utilising waste heat, energy recovery, thermal insulation measures and street lighting refurbishments.

Upper Austrian Energy Saving Association

Energy Performance Contracting – Streetlight EPC (Triggering the market uptake of energy performance contracting through street lighting refurbishment projects)

At the start of this project, most European regions had not seen energy performance contracting (EPC) develop into a significant market factor. Apart from legal barriers, this can be explained for the most part by a lack of information about the tool and low levels of confidence, as well as a lack of experienced contractors.

Street lighting is a good 'learning and testing ground' for energy performance contracting because of its lower complexity (compared to building-related EPC). The appearance of LED technology on the market provided a useful starting point for this project. It meant that three targets could be achieved at the same time:

- establishing EPC markets, including subsidies for projects with guaranteed savings,
- supporting the market launch of efficient and innovative lighting technologies,
- providing support via municipalities for the switch to efficient lighting (mandatory phasing out of inefficient lighting systems, EU Regulation (EC) No 245/2009).

The aim of the project was to increase the demand for and supply of energy performance contracting projects in the field of street lighting in European regions. In addition to various awareness-raising measures and initial and further training courses, the project included the implementation of over 50 LED street lighting projects.

The *Streetlight EPC* project was coordinated by the Upper Austrian Energy Saving Association, involving a total of 19 partners from across Europe (nine regions, nine cities/municipalities, one European network); it was supported by the European Commission through the Intelligent Energy Europe Programme.

www.streetlight-epc.eu

Input from Salzburg:

Energieaktiv administrative platform

The aim of the *Energieaktiv* administrative platform is to provide networking opportunities for all stakeholders responsible for awarding energy subsidies or involved in an energy project. It provides clients and tradespeople with an opportunity to work together on the design of energy projects. As part of the submission process, the planning declaration submitted by the planner undergoes fully automated checks to ensure that it complies with the funding guidelines and other minimum legal requirements. Spot QA checks are carried out to ensure that the projects are being implemented to the necessary standard of quality.

The customer platform for the energy certificate database (ZEUS) offers an opportunity for private individuals, property management companies, property developers and municipalities to bundle projects and provide project data (energy certificate, energy consultation report, PDF files etc.) to a selected group of users.

Building technology products database

The *get* database contains details of around 5,000 currently available building technology products, together with their performance data, and serves as a quality-controlled basis for calculating the overall energy efficiency of buildings. The data can be used free of charge.

www.produktdatenbank-get.at

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training courses for employees of municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- assessment of energy consumption in public buildings on the basis of target and limit values (benchmarks for electricity/heating/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).

Input from Styria

Within the Province of Styria, a single department is responsible for administering consultations about energy conservation and refurbishment subsidies, resulting in synergies between the two schemes. In addition, eco-funding applications (for the refurbishment of heating systems) are processed at the same time as funding applications for housing refurbishments.

Incentivised by the Refurbishment Campaign for Revitalising Town Centres, municipalities or companies that are majority-owned by a municipality have increasingly been purchasing existing buildings in town centres and refurbishing them using appropriate sources of financing. An application for refurbishment support can be submitted within five years of acquiring a property; alternatively, if it can be proven that it would not be cost-effective to carry out a refurbishment of the existing building, an application for a new-build subsidy can be submitted. In this case, additional funding is provided towards the purchase of the property. Both types of funding applications are handled by the same department. A highly promising one-stop-shop solution that involves closer collaboration between the Federal Government and the Province of Styria has also been launched.

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- assessment of energy consumption in public buildings on the basis of target and limit values (benchmarks for electricity/heating/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).

Input from Tyrol

Provincial e5 scheme for energy-efficient municipalities (European Energy Award)

In Tyrol, 50 municipalities are participating in the e5 scheme: <http://www.energie-tirol.at>

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of initial and further training for employees of municipalities (energy consultant training

- etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- implementation of energy accounting systems,
- assessment of energy consumption in public buildings on the basis of target and limit values (benchmarks for electricity/heating/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).

Input from Vorarlberg:

Impact of the e5 scheme on building refurbishment

- mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services),
- provision of training for employees of the municipalities (energy consultant training etc.),
- point of contact for political representatives and municipality employees with regard to municipalities' options for taking action,
- assessment of energy consumption in public buildings on the basis of target and limit values (benchmarks for electricity/heating/water),
- initiation of the creation of refurbishment plans for public buildings,
- cooperation and communication with a range of different target groups (associations, business and commerce, schools, authorities etc.) with a view to getting projects off the ground,
- engagement in PR work (all media and target groups).

Input from Vienna:

EU project Integrated Home Renovation Services = RenoBooster

Vienna has been provided with an opportunity to develop new consultation services or sources of financing for home refurbishments under the EU-funded *RenoBooster* project.

The aim is to promote refurbishment processes by bundling different services at a single point of contact, with a particular focus on private housing. The ultimate objective is to enhance the scope and quality of refurbishments. At the same time, particular emphasis is placed on the involvement of stakeholders from the real estate and construction sectors and from the fields of administration and finance. Refurbishing a house can be a very challenging process.

The project seeks to shed more light on the status quo and current requirements from the perspective of home or building owners. Tailored services will then be developed on this basis.

The first refurbishment projects will benefit from newly developed services such as refurbishment support workers, one-stop-shop packages for single-family dwelling refurbishments or special quality assurance services while the project is still running. The legal framework and funding instruments will also be investigated and tailored to future challenges. A web portal is planned as a single channel to enable access to the most important services and information on offer.

EU project – Smarter Together

This is an EU-funded urban renewal initiative that will be implemented in the three cities of Vienna, Lyon and Munich. The Simmering District of the City of Vienna is working together with members of the public and a large number of companies to develop smart city solutions. Particular areas of concern include the refurbishment of buildings, energy, mobility and logistics and information and communications technologies. Impetus is provided for positive social change and sustainable urban development. The aim is to work with local populations to transform Simmering and Vienna into innovative, environmentally friendly and attractive places to live in the future.

3.2. Support for the mobilisation of investments into renovations through the reduction of risks for private investors (Article 2a(3)(b))

Participation in European Commission policies and actions

The Commission launched the initiative Smart Finance for Smart Buildings (SFSB) as part of the Clean Energy for all Europeans package. Based on the Investment Plan for Europe, it includes practical solutions to further unlock private financing for energy efficiency and renewable energy carriers and sources in buildings, across three main areas:

Pillar 1 – More effective use of public funds

At EU level, the European Structural and Investment Funds (ESIF) will allocate €18 billion to energy efficiency in the period 2014-2020. Boosting investment in sustainable energy projects is also one of the strategic priorities of the European Fund for Strategic Investments (EFSI). As public finance alone is not enough to make the clean energy transition happen, the SFSB initiative aims to facilitate the deployment of financial instruments across Europe and better target subsidies towards vulnerable consumers or specific market failures. Financial instruments are key to further mobilising private financing for energy efficiency and renewable energy carriers and sources in buildings. As part of the SFSB initiative, the Commission is developing with the European Investment Bank (EIB) a flexible model of guarantee facility to be deployed primarily at national level. This instrument aims to encourage the combination of different public financing strands, with special attention being given to the EFSI and ESIF, to get the best possible results. It will allow financial intermediaries such as commercial banks to develop and deploy attractive financial products for the energy refurbishment of buildings, in particular home refurbishments.

Projects by the European Investment Bank (EIB) in Austria between 2014 and 2020 in the areas of urban development and energy

AFFORDABLE HOUSING HYPO NOE

Promoter – financial intermediary: HYPO NÖ LANDESBANK FÜR NIEDERÖSTERREICH UND WIEN AG

Description:

The project consists of an intermediated framework loan to finance new social housing units to be constructed in Lower Austria. Final beneficiaries of the financing will be non-profit housing development companies. Sub-projects under the framework loan will be carried out in the Province of Lower Austria.

Objectives:

This project will promote bank-intermediated lending towards the social housing sector in Lower Austria.

EIB finance: €150,000,000

Total costs: €300,000,000

Environmental aspects:

Eligible programmes will be located in urban areas and included in local land use planning and development plans for which the relevant strategic environmental assessments (SEA) have been carried out in line with the SEA Directive 2001/42/EC. Relevant EU directives on environmental issues have been transposed into national law (SEA Directive, EIA Directive, Birds and Habitats Directives, Energy Performance of Buildings Directive). Individual structures may require planning permission; this process is already covered by the national environmental regulations. Planning permission will be granted by the competent local building authorities. The project's environmental impacts are likely to be minimal.

AFFORDABLE HOUSING ERSTE BANK

Promoter – financial intermediary: *ERSTE BANK DER ÖSTERREICHISCHEN SPARKASSEN AG*

Description:

The 'framework loan' will finance the construction of social housing in Austria in the period 2018-2023. Final beneficiaries under this operation – intermediated by *Erste Bank* – will be municipalities, not-for-profit and commercial companies/private companies.

Objectives:

The aim is to meet high demand from an increasing number of people who cannot afford adequate housing, especially in the cities. The project will also improve the living conditions of the local population and the attractiveness of urban spaces and related architecture.

EIB finance: €100,000,000

Total costs: €200,000,000

Environmental aspects:

The housing projects to be financed under the project must meet high environmental standards and are to make a significant contribution to improving the urban environment by rehabilitating derelict land and unused sites for urban regeneration purposes. The housing units to be financed must meet the statutory requirements for the energy efficiency of residential buildings (Low-Energy Building Standard). Some of the investments will meet higher energy efficiency standards (Near-Zero Energy Buildings (NZEB)).

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

WIENER WOHNEN REVITALISATION

Promoter – financial intermediary: CITY OF VIENNA – *WIENER WOHNEN*

Description:

Refurbishing of social housing throughout the entire urban area of Vienna, thus upgrading energy efficiency standards.

Objectives:

- enhanced living standards and health conditions for tenants,
- urban renewal and regeneration of the areas concerned,
- better social inclusion of low-income tenants,
- reduction in energy consumption of the housing stock.

EIB finance: €150,000,000

Total costs: €364,000,000

Environmental aspects:

The promoter *Wiener Wohnen* (the housing association for the City of Vienna) is responsible for 220,000 social housing units that accommodate approximately 500,000 people, corresponding to around one quarter of the city's total housing stock and one quarter of the total population. It runs 70 investment projects aimed at refurbishing approximately 8,300 housing units. No new builds are planned, with the exception of a small number of lofts that will be converted into apartments. The interventions relate primarily to energy efficiency measures (50% of investments), which also involve additional work on the associated infrastructure, e.g. safety-related measures, adaptations to make

properties accessible and measures to upgrade communal areas.

The project will significantly contribute to the improvement of the urban environment through refurbishment and upgrading measures involving the city's rental social housing stock. Extensive energy efficiency measures will considerably reduce the housing stock's energy consumption and improve tenants' living conditions. The project will therefore contribute to climate action according to the EIB criteria with a reduction of 10,614 tCO₂ per year, as part of the Second Vienna Climate Action Programme for the period 2010-2020 [*Klimaschutzprogramm (KliP) Wien II 2010-2020*]. The investments also promote urban renewal in the relevant districts of the city.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

WIND FARM BRUCKNEUDORF-HOEFLEIN WEST

Promoter – financial intermediary: *ENERGIEPARK BRUCK/LEITHA GMBH*

Description:

Construction and operation of five wind turbines in Lower Austria and Burgenland with a total output of 17 MW

Objectives:

The development of wind energy supports EU and national targets for the production of energy from renewable energy carriers and sources and contributes to the EIB's renewable energy and energy efficiency objectives. The project furthermore contributes to the EIB's priority objectives for climate action.

EIB finance: €19,000,000

Total costs: €27,000,000

Environmental aspects:

The project relates to five wind turbines in the Provinces of Lower Austria and Burgenland. Two turbines form part of the Bruckneudorf Wind Farm. Three wind turbines belong to the Höflein West Wind Farm. In Austria, it is customary for wind farms to be developed jointly by different local bodies. These latter work together to obtain permits and install the necessary infrastructure such as roads and grid connections, but own and operate their turbines separately. This is also the case in the current project. Both wind farms (Bruckneudorf and Höflein West) are located on agricultural land, in the vicinity of other wind farms and adjacent to Natura 2000 areas. The projects are situated within preferential development zones under the relevant spatial development plans, which are based on strategic environmental assessments (SEA). Wind farms fall under Annex II to the EIA Directive 2011/92/EU. The Member State is therefore responsible for determining, on the basis of the criteria set out in Annex III to the EIA Directive, whether or not an EIA is required for an individual wind farm. In the case of both of the wind farms referred to above, the promoter made use of the option available by law of requesting an EIA procedure without a prior selection decision.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

SIMONSFELD ONSHORE WIND

Promoter – financial intermediary: *WINDKRAFT SIMONSFELD AG*

Description:

Construction and operation of three wind farms in the Province of Lower Austria

Total capacity: 39 MW

Objectives:

The development of wind energy supports EU and national targets for the production of electricity from renewable energies and contributes to the EIB's renewable energy and energy efficiency objectives. The project furthermore contributes to the EIB's priority objectives for climate action.

EIB finance: €48,000,000

Total costs: €65,000,000

Environmental aspects:

The project relates to two new wind farms (Kreuzstetten IV; Dürnkrot II) and one repowering scheme (Hipples II). Dürnkrot is a joint development with a third wind farm comprising nine wind turbines in total, of which four turbines are allocated to this project. Hipples II consists of two wind turbines and replaces the existing Hipples wind farm, which comprises seven smaller-scale wind turbines (4.8 MW in total). Hipples II makes use of existing infrastructure such as access roads and cabling. It is located adjacent to the Kreuzstetten IV scheme.

In 2014, a wind power development plan was drafted by the Lower Austrian Provincial Government. It identifies preferential zones for wind power development on the basis of a strategic environmental assessment (SEA). The three wind farms are located inside preferential development zones as identified by this plan. All wind farms are located in the vicinity of existing wind farms.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

HYPO VORARLBERG MEZZANINE ABS FOR EE & NZEB

Promoter – financial intermediary: *HYPO VORARLBERG*

Description:

The EIB Group, consisting of the European Investment Bank (EIB) and the European Investment Fund (EIF), has provided two guarantees on a €330-million portfolio of Austrian and German loans to SMEs and Mid-Caps, originated by Hypo Vorarlberg Bank AG. With this financial support, Hypo Vorarlberg will expand its lending to households and corporate customers undertaking energy efficiency (EE) related refurbishments or constructing Near-Zero Energy Buildings (NZEB) as well as to SMEs and Mid-Caps. The operation breaks new ground as it is the first EIB transaction with an Austrian bank benefiting from the support of the European Fund for Strategic Investments (EFSI), the core of the Juncker Plan. It also marks the first time that the EIB has participated in a synthetic securitisation in Austria, underlining the EIB Group's firm commitment to widening and diversifying the scope of its cooperation with partners, with a view to maximising its impact on the real economy.

EIB finance: €68,165,667

Environmental aspect:

This transaction is the first synthetic securitisation allowing significant risk transfer for a bank following the standardised approach for capital allocation. Therefore, instead of a single guarantee for the mezzanine tranche, the EIB Group provided two guarantees covering the mezzanine and senior tranches of the transaction. As a result of the regulatory capital relief, Hypo Vorarlberg will expand its lending to households and corporate customers undertaking energy-efficient (EE) related refurbishments or constructing Near-Zero Energy Buildings (NZEBs).

EFFICIENT UTILITY INFRASTRUCTURE KLAGENFURT

Promoter – financial intermediary: *STADTWERKE KLAGENFURT AG*Description:

The project comprises the promoter's investments from 2014 to 2018 in its existing district heat and water grids in the City of Klagenfurt. Investments in the district heating component are related to the refurbishment of the system, its expansion to new clients, and a drive for substantial change of heat supply. The latter comprises the following key measures and is expected to lead to a significant increase in the use of renewable energy carriers and sources (mainly cogeneration-based):

- conversion of a large heavy fuel oil-fired base-load cogeneration plant in the city centre, which is at the end of its lifetime,
- installation of a new oil or gas-fired reserve and peak load heating plant (expected to be around 30 MWth) in the west of the city, including grid connection,
- installation of a grid connection to a new biomass cogeneration plant (around 50 MWth) in the east of the city, which will become the system's base-load heat supplier in future.

Objectives:

Investments relating to the water network (primarily involving the replacement of distribution pipes) will guarantee the efficiency of the distribution system. Further investments in the water treatment system will ensure compliance with the European Drinking Water Standards. In addition, the promoters intend to implement a cross-border project aimed at reducing water losses in the transmission networks.

EIB finance: €30,000,000

Total costs: €72,000,000

Environmental aspects:

The purpose of refurbishing the district heating plant is to curtail significantly the operations of this large heating plant in a city-centre location. On the basis of the impact assessment carried out by the promoter and after consulting external experts, the competent authority (municipality of Klagenfurt) concluded that the planned refurbishment of the district heating plant met the requirements of the Industrial Emissions Directive 2010/75/EU based on the best available technologies for large combustion plants, that no significant negative environmental impacts were to be expected, and that therefore no full EIA was required. The approval includes a requirement to minimise emissions of noise and dust during construction, and to minimise emissions of hazardous substances and noise during operation. It is expected that, after refurbishment, the district heating plant will generate all of its electricity using highly efficient cogeneration techniques in line with Directive 2012/27/EU.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

HYDRO AND WIND POWER IN STYRIAPromoter – financial intermediary: Private companyDescription:

The project is an investment programme that comprises investment schemes involving the production and distribution of electricity in Styria. The electricity generation scheme includes plans to build a 16-MW hydropower plant in the city of Graz and a 39-MW wind farm located in the mountainous region of Deutschlandsberg, together with their grid connection facilities. The electricity distribution element covers extensions and refurbishments of the low- and medium-voltage electricity distribution grid in Styria.

Objectives:

The hydropower and wind power plants financed under the project will contribute to national and EU renewable energy targets. The grid investment programme aims to improve the quality and the reliability of grid infrastructure.

EIB finance: €140,000,000

Total costs: €333,000,000

Environmental aspects:

Overall and in the long term, the project is expected to have a positive environmental impact. It will increase the amount of electricity produced from renewable sources, reduce energy imports (in some cases) and help to reduce greenhouse gas emissions and decrease levels of local air pollution. The project will help Austria and Styria to increase the share of electricity produced using domestic renewable energy sources. The project also includes the first major wind farm to be constructed in Styria, thereby helping to create local jobs.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

ENERGIEPARK BRUCK WIND POWER

Promoter – financial intermediary: *Energiepark Bruck/Leitha GmbH*

Description:

Construction and operation of seven onshore wind farms for a total capacity of 165 MW in the Province of Lower Austria (municipalities of Bad Deutsch-Altenburg-Carnutum, Höflein Ost, Rohrau, Haadfeld, Hof, Seibersdorf and Au)

Promoter: Energiepark Bruck/Leitha GmbH

Objectives: The project supports EU and national energy targets.

EIB finance: €101,000,000

Total costs: €312,000,000

Environmental aspects:

Generally, wind farms generate electricity with significantly lower environmental impacts than conventional power plants based on fossil or nuclear fuels. The wind farms operated under this project are neither within nor immediately adjacent to Natura 2000 areas. They are located on agricultural land and involve only small losses of land.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

ENERGIEPARK BRUCK ONSHORE WIND

Promoter – financial intermediary: *Energiepark Bruck GmbH*

Description:

Construction and operation of two wind farms and a single wind turbine in the Provinces of Lower Austria and Burgenland

Total capacity: 39 MW

Objectives:

The development of wind energy supports EU and national targets for the production of electricity from renewable energy sources and contributes to the EIB's renewable energy and energy efficiency objectives. The project furthermore contributes to the EIB's priority objectives for climate action.

EIB finance: €40,000,000

Total costs: €74,000,000

Environmental aspects:

The project relates to three wind farms in the Provinces of Lower Austria and Burgenland. The wider project area is a relatively sensitive bird sanctuary with several special areas of conservation. The Bruckneudorf project is located in a preferential development zone under the Burgenland Wind Power Development Plan, which is based on a strategic environment assessment. Hof and Seibersdorf had already adopted a decision regarding a change of land use before the drafting of a wind power development plan of this kind for Lower Austria. Both locations are, however, within the preferential development zones of the plan that entered into force at a later date.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

GEMEINSCHAFTSKRAFTWERK INN

Promoter – financial intermediary: *TIWAG-TIROLER WASSERKRAFT AG*

Description: Construction of a new hydropower plant on the Upper Inn river

Objectives:

The project will support EU energy policy, which favours a strong increase in renewable power production, and will help maintain the reliability of the electricity system. The project will to some extent contribute to covering peak demand as well as to regulating the electricity system. The project is in line with the EIB's priority lending objectives related to renewable energy carriers and sources/energy efficiency and complies with the EIB's energy lending criteria.

EIB finance: €150,000,000

Total costs: €472,000,000

Environmental aspects:

The project involves the construction and operation of a new 89-MW hydroelectric plant on the river Inn in the Upper Inn region on the Swiss/Austrian border. It is part of the Inn river hydroelectric power generation cascade, between the existing hydroelectric plants at Pradella-Martina (Switzerland) and Prutz-Imst (Austria). The scheme will be operated as a run-of-river hydroelectric plant with limited water storage; the largest part of it is to be built underground.

It consists of three main elements:

- a 500,000 m³ reservoir and weir system,
- an underground 23 km pressure tunnel,
- an underground powerhouse with new electricity-generating equipment.

The connection to the Austrian high-voltage system will be through the underground transmission cable to the existing substation in the Kaunertal power plant. The project scope also includes a fish pass and a small hydropower plant that will use residual flow to generate electricity. The project

exploits the available water resources of the Upper Inn to generate renewable electricity for supply to the public grid while also managing the flow of water to protect the local ecosystem against water flow peaking. It will generate up to 447 GWh/a of renewable energy for supply to the Austrian electricity grid, replacing alternative fossil-fired generation and thereby avoiding the release of significant amounts of carbon dioxide and other polluting emissions into the atmosphere.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

PRETUL WIND FARM

Promoter – financial intermediary: ÖSTERREICHISCHE BUNDESFORSTE AG

Description:

Construction and operation of a 42-MW wind farm in Styria

Objectives:

The development of wind energy supports EU and national targets for the production of electricity from renewable energy carriers and sources and contributes to the EIB's renewable energy and energy efficiency objectives. The project furthermore contributes to the EIB's priority objectives for climate action.

EIB finance: €37,000,000

Total costs: €52,000,000

Environmental aspects:

The wind farm is located on top of a mountain ridge, adjacent to a protected site under national law (Schwarzriegelmoos). Key areas of concern during authorisation and consultation were not only the project's visual impacts, but also the impacts on the protected capercaillie (a bird species listed in Annex I to EU Directive 79/409/EEC, living on mountain ridges) and on areas adjacent to the site, with a particular focus on any protected areas, on risks to human health when ice is thrown off turbine blades and on negative consequences for an adjacent Alpine hut and for the bat population. All are appropriately mitigated through conditions included in the permit and supplementary commitments made by the promoter.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

WINDLANDKRAFT WIND POWER

Promoter – financial intermediary: WINDLANDKRAFT GMBH

Description:

Construction and operation of three onshore wind farms for a total capacity of 105 MW, located in Lower Austria (municipalities of Leopoldsdorf, Untersiebenbrunn and Engelhartstetten)

Promoter: WindLandKraft GmbH

Objectives:

Contributing to renewable energy and energy efficiency objectives and thereby supporting EU climate action

EIB finance: €34,000,000

Total costs: €177,000,000

Environmental aspects:

This operation comprises four wind farms that are concentrated at two sites in Lower Austria: Leopoldsdorf (LD), Untersiebenbrunn (USB), Untersiebenbrunn Extension (USBCX) and Engelhartstetten (ES). Generally, wind farms generate electricity with significantly lower environmental impacts than conventional power plants based on fossil or nuclear fuels.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

KELAG ENERGY PRODUCTION AND NETWORKS

Promoter – financial intermediary: *KELAG-KÄRNTNER ELEKTRIZITÄTS-AG*

Description:

Investment programme in heating, wind/hydro power production and grid investments between 2014 and 2017 by the regional energy company of Carinthia.

Objectives:

The project will promote the development and modernisation of the electricity distribution and district heating networks of KELAG, as well as adding and restoring renewable energy production. It will enable KELAG to maintain/improve the current levels of network reliability and safety and to add new customer connections.

EIB finance: €100,000,000

Total costs: €212,000,000

Environmental aspects:

The project is a four-year investment programme (2014-2017) that comprises investment schemes for the production and distribution of electricity and heat. The electricity generation schemes include plans to refurbish or upgrade existing hydropower plants in Carinthia and additionally an 18-MW wind farm in Lower Austria. The electricity distribution element covers extensions and refurbishments of the low- and medium-voltage electricity distribution grid in Carinthia. The district heating element includes network upgrade projects and refurbishments of existing heating networks in the Carinthia region.

URBAN INFRASTRUCTURE GRAZ

Promoter – financial intermediary: *PROVINCIAL CAPITAL OF GRAZ*

Description:

The proposed multi-sector investment programme loan will be the second loan to the City of Graz to finance municipal investments in the period 2014 to 2018. It builds on the Graz Public Transport project that is currently being implemented and that relates to the upgrading and extending of tram infrastructure, rolling stock and buses.

Objectives:

The aim is for the investment programme to be integrated into the city's urban development strategy so that it can contribute significantly to the improvement of the urban environment by upgrading and extending the public urban infrastructure and facilities and adapting them to current requirements.

EIB finance: €90,000,000

Total costs: €180,000,000

Environmental aspects:

The multi-scheme project is expected to make a significant contribution to sustainable urban development. The cross-sectoral municipal infrastructure programmes are likely to deliver key ecological and socioeconomic benefits in terms of urban renewal and development. The publicly funded urban infrastructure investments will form part of detailed concepts and plans for local urban renewal and development. Strategic environmental assessments have been carried out within the framework of urban development plans and serve as a general framework for the investments. The plans provide for extensive public participation with a view to ensuring that the investments meet local needs. Positive net environmental benefits are expected. The upgrading of subsidised housing units will cut energy consumption significantly. The new subsidised housing units that are built will consume less energy and achieve a much higher energy performance. Brownfield sites will be reused as required with a decontamination assessment, which is part of the local preparatory plans. Public-owned school buildings will achieve a high standard of energy efficiency, and if possible, the passive house standard. Appropriate measures will be taken to minimise any environmental impacts such as disturbances during construction work.

OBERVERMUNTWERK

Promoter – financial intermediary: *VORARLBERGER ILLWERKE AG*

Description:

The project comprises two pumped storage systems for hydroelectric power generation and storage, Obervermuntwerk II with 360 MW and Rellswerk with 13 MW, located in Montafon in Vorarlberg, and necessary reinforcements of the substation in Bürs. The investment will add balancing capacity to the German power system and contribute to security of supply.

Objectives:

The project will store electrical energy from the public grid by pumping water from a lower into an upper reservoir at times of reduced electricity demand and low prices. At times of high electricity demand and correspondingly high prices, the water will be released back to the lower reservoir to drive turbines and generate electricity. The project will contribute to covering peak demand as well as to providing ancillary services in the integrated European grid system.

EIB finance: €280,000,000

Total costs: €566,000,000

The project comprises the implementation and operation of two pumped storage schemes (Obervermuntwerk II and Rellswerk for hydroelectric power generation), located in Vorarlberg at an altitude of between 1,700 and 2,000 m, and additional reinforcements in a related substation. The project does not require new water reservoirs. In addition, the project scope includes a new head race tunnel for the existing Obervermuntwerk, replacing the existing above-ground penstock.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO₂e/year absolute (gross) or 20,000 tCO₂e/year relative (net) – both increases and savings.

WIEN ENERGIE WASTE TO ENERGY

Promoter – financial intermediary: *Fernwärme Wien GmbH*

Description:

Revamping and optimisation of the existing 85.2-MWth waste-to-energy plant Spittelau located in Vienna

Objectives:

The project will add environmental and economic value through the improvement of waste-management practices and the diversification and security of fuel and electricity supply in Austria. The technical design suggests that the plant will qualify as a highly efficient combined heat and power (CHP) plant. Owing to the high amount of renewable energy in the fuel and the targeted energy efficiency in the generation of power and heat, the carbon intensity of the project is expected to be lower than that associated with the current operations of the waste-to-energy plant.

EIB finance: €70,000,000

Total costs: €144,000,000

Environmental aspects:

The total maximum throughput capacity of the plant will be 290,000 t/year of municipal solid waste, i.e. 14,000 t/year higher than its current permitted capacity of 276,000 t/year. Revamping the plant will not result in an increase in its environmental load. The plant incorporates best available techniques for emissions abatement, and the emissions to air and water after the reconstruction are forecast to be similar or lower than with the current permitted plant set-up, as are the targeted improvements in energy recovery by the flue gas treatment system. The increased waste throughput will be compensated by the use of bigger lorries, which will avoid an unwanted increase in site traffic.

The project is included in the Carbon Footprint Exercise: Only projects that meet the scope of the Pilot Exercise, as defined in the EIB draft Carbon Footprint Methodologies, are included, provided that estimated emissions exceed the methodology thresholds: over 100,000 tCO_{2e}/year absolute (gross) or 20,000 tCO_{2e}/year relative (net) – both increases and savings.

AUSTRIAN ENERGY EFFICIENCY FL

Promoter – financial intermediary: Austrian banks specialising in the sector of energy efficiency in buildings – ÖSTERREICHISCHEN SPARKASSEN AG as promoter

Description:

Financing of energy efficiency investments in social and private residential buildings as well as in public buildings, provided that the projects either reach specified energy levels or are supported by the Republic of Austria and/or the Austrian provinces through dedicated grants programmes

Objectives:

Climate action through energy efficiency and renewable energy

EIB finance: €50,000,000

Total costs: €270,000,000

Environmental aspects:

This operation is intended to deliver environmental benefits by supporting schemes that reduce energy consumption, increase the use of renewable energies and help to mitigate climate change. The individual schemes to be financed are likely to be small and are expected to have limited negative environmental impacts.

EVN ELECTRICITY NETWORKS

Promoter – financial intermediary: EVN AG

Description:

Selected investments covering the extension of electricity networks in Lower Austria between 2013 and 2016

Objectives:

The project will promote the modernisation and development of electricity distribution networks in Lower Austria. It will enable the promoter to maintain/improve the current levels of network reliability and safety and to cater for demand growth and will assist the integration of renewable distributed generators. The project is therefore eligible for funding under Article 309(c) of the Treaty as a PCI. Financing of the project would contribute to the EIB's lending priority policy on security and diversification of internal supply and development of renewable energy.

EIB finance: €150,000,000

Total costs: Not known

Environmental aspects: Integration of renewable energy into the electricity grid

WIENER WOHNEN ENERGY EFFICIENCY

Promoter – financial intermediary: CITY OF VIENNA – *WIENER WOHNEN*

Description:

The project concerns schemes to be implemented under the Investment Programme 2011-2014 comprising the modernisation and refurbishment of rental social housing with a particular focus on energy efficiency measures.

Objectives:

The project will significantly contribute to the improvement of the urban environment through refurbishment and upgrading measures involving the city's rental social housing stock. Extensive energy efficiency measures will considerably reduce the housing stock's energy consumption and improve tenants' living conditions, as well as creating more sustainable neighbourhoods.

EIB finance: €270,000,000

Total costs: €550,000,000

Environmental aspects:

The project will significantly contribute to the improvement of the urban environment through refurbishment and upgrading measures involving the city's rental social housing stock. Extensive energy efficiency measures will considerably reduce the housing stock's energy consumption and improve tenants' living conditions. It can be estimated that the investment programme will lead to CO₂ reductions of 46,000 t a year, contributing to the second Vienna Climate Change Programme (*KliP Wien II 2010-2020*).

Pillar 2 – Increased support for the creation of project pipelines

Many promoters, including cities, individuals and companies, need help to carry their energy efficiency projects through from idea to implementation. The Commission wishes to guide projects through the funding process and to foster the development of regional or local one-stop-shops that cover the entire customer journey. It has therefore set up bodies to support promoters:

ELENA

European Local Energy Assistance (ELENA), which is managed by the EIB, helps private and public promoters to develop and launch bankable sustainable energy investments (above €30 million),

including in the field of sustainable transport. ELENA covers up to 90% of project development costs.

Austrian ELENA project Vinzenz Group (EERR-VIG)

Location:

The project development services will be delivered and the investment programme implemented at the various locations of the Vinzenz Group's hospitals and other healthcare units in Austria.

Beneficiary:

The beneficiary is *Vinzenz Gruppe Krankenhausbeteiligungs-und Management GmbH*, which is a private company in the sole ownership of a charitable foundation (*Sankt Vinzenz gemeinnützige Privatstiftung der Barmherzigen Schwestern* [Saint Vincent charitable private foundation of the Sisters of Mercy]). Although it is a legal entity governed by private law, the applicant fulfils a public service mission. All of the hospitals and nursing homes operated by the Vinzenz Group are open to the public. The services are financed almost completely by the public health insurance system. Internal procedures and accounts are subject to control by the Court of Auditors of the regions of Upper Austria and Vienna.

Sector: Energy efficiency in buildings

Project development costs: €2,762,760

ELENA contribution: €2,486,484

Project development financed by ELENA:

The current approach to reconstruction, refurbishment and repair work in healthcare facilities is typically driven by maintenance and function patterns. This means that either urgent repairs are carried out or functional considerations lead to more comprehensive reconstruction work in hospitals. Both decisions involve a strong focus on low investment costs and reduced implementation times. Even in the case of larger investment projects, energy efficiency considerations hardly ever play a role in these decisions, since low investment costs continue to be the crucial factor. At present, energy efficiency criteria are not taken into account at the design and implementation stage or when investment decisions are taken in respect of refurbishment and renovation projects in healthcare facilities; instead, functional criteria such as costs and implementation time are used as a basis. Furthermore, the energy efficiency measures that are deemed to have been implemented are frequently rolled back for functional or cost reasons, since there is often a lack of time or money for comprehensive life cycle analyses in the early design phases. In such cases, if adequate consideration is not given to energy efficiency at the investment decision stage, an outstanding opportunity to improve energy efficiency in the respective hospitals is lost. Since it must be ensured that the hospital remains in full operation even during the reconstruction, the energy efficiency measures cannot be implemented all at once, but only gradually over many years. The development of a coherent refurbishment and repair approach incorporating energy efficiency considerations entails significant up-front costs that are difficult to cover from existing budgets.

In addition, the expected benefit (energy cost savings and long-term reduction in maintenance and repair costs) of investing the required up-front costs will be delivered at a relatively late stage in the process, which is perceived as a significant risk from the owner's point of view.

Description of the investment programme:

The Vinzenz Group's investment programme is underpinned on the one hand by continuous maintenance and refurbishment needs, and on the other hand by the Group's Process Strategy 2020, the aim of which is to focus the scope of each individual hospital's services. This includes changes to departmental structures, which in turn entail various types of (re)construction measures. The investment programme is therefore focused firstly on various hospitals, and secondly on a wide set of (re)construction measures and accompanying technical adaptations, such as:

- complete replacement of outdated and inefficient ventilation and air-conditioning systems,
- extension of operating theatres,

- replacement and procurement of new medical technology,
- hygiene improvement measures, e.g. preventing the proliferation of legionella bacteria in drinking water,
- complete overhaul or renewal of building control systems,
- measures to improve steam production,
- replacement of lighting systems,
- changes to internal floor plans, accompanied by adaptations of technical systems.

Annexes:

The majority of the (re)construction measures referred to above will be initiated not with a view to improving energy efficiency, but for the purpose of safeguarding the operational reliability of the hospitals in question. At the same time, however, most of these measures will have a direct impact on energy use. That is why it is important for the most energy-efficient options to be chosen during the implementation phase, with the help of ELENA, so as to result in a considerable decrease in energy consumption.

The investment programme will be implemented at the following hospitals:

- Hospital of the Sisters of Charity, Linz,
- Hospital of the Sisters of Charity, Ried,
- Hospital of the Sisters of Charity, Vienna,
- St Josef Hospital, Vienna,
- Hospital of the Divine Saviour, Vienna,
- Sacred Heart Hospital, Vienna,
- Orthopaedic Hospital Speising, Vienna.

Timeframe: January 2017-December 2019

Total investment volume:

The estimated total investment volume relating to energy efficiency in the hospitals listed above is around €282 million, with €162.5 million earmarked for disbursement over the term of the ELENA project.

Approach to implementing the investment programme:

The Vinzenz Group is very much committed to increasing the efficiency of its buildings and technologies. The aim of the proposed project is therefore to allow the Vinzenz Group to take energy efficiency factors into account as standard criteria whenever it decides that (re)construction measures are to be implemented. The final investment decisions will be taken by the hospital's management board on the basis of recommendations issued by ELENA regarding the energy efficiency measures incorporated into each individual hospital's investment programme.

Expected outcomes:

Full implementation of the investment programme will deliver the following benefits:

- energy efficiency – annual energy savings of 18.3 GWhel and 21.4 GWht, creation of around 1,100 new jobs (FTE),
- improved room climate – the investment programme is expected to lead to an improved indoor climate in hospitals, which will have a positive impact on the health and comfort of users.

Leverage factor: 65

Market replication potential:

The project has a high replication potential, particularly in Austria, but also in other European countries where investments in healthcare system infrastructure do not take account of energy efficiency criteria. Support from ELENA contributes to a significant increase in expenditure on priority energy efficiency activities in urban areas, thereby also contributing to the implementation of regional

and national objectives in these sectors. The project's market replication potential is significant. It uses an innovative concept to implement energy efficiency measures in healthcare facilities. It is expected that lessons learned from carrying out the project will allow other European countries to follow a similar path.

Horizon 2020

Public and private promoters can develop flagship projects for sustainable energy under the Horizon 2020 Programme (H2020). The focus is on small and medium-sized energy investments ranging from €7.5 million to €50 million and covering up to 100% of eligible project development costs.

H2020 projects with Austrian involvement

SEFIPA (Sustainable Energy Financing Platform in Austria)

The Sustainable Energy Financing Platform in Austria (SEFIPA) is designed as an action-oriented platform for collecting, developing, implementing and disseminating innovative ideas with a view to accelerating the financing process. The dominant financing approach for sustainable energy activities in Austria is based on subsidies; by way of contrast, SEFIPA will focus on increasing private sources of funding.

The overall idea behind SEFIPA is to bring together a selected group of experts from the relevant stakeholder groups (public administration, financial sector, business groups, consumer associations, energy suppliers, NGOs) to develop joint solutions for overcoming obstacles that have been identified, with extensive public involvement. These solutions – which will take the form of new financing products, targeted information campaigns and changes to the existing legal framework – will result in genuine and additional investments in sustainable energy (SE).

The main elements of SEFIPA are:

- The Finance Lab: made up of representatives of the stakeholder groups, who hold regular meetings during which criteria for increasing SE investments are developed. The output of the Lab will be at least three new financing instruments and three suggestions for adaptations to the regulatory framework for SE financing.
- The implementation and operation of a crowd-investing platform designed to raise equity capital from a large number of investors (the 'crowd') for SE projects in Austria.
- The structured initiation and implementation of SE investment actions utilising the new financing instruments and regulatory changes: SEFIPA covers the whole spectrum of identification (calls for investment actions, screening of Lab members' portfolios, holding of roadshows etc.), evaluation and implementation of investment actions. The consortium will monitor these actions in order to be able to provide a sound evaluation of the suitability and success of the instruments realised, including their impact.

Coordinator and individual partner: Austrian Society for Environment and Technology [*Österreichische Gesellschaft für Umwelt und Technik, ÖGUT*]

Budget: €476,750

Project term: 1.2.2016-31.1.2019

guarantEE (Energy Efficiency with Performance Guarantees in Private and Public Sector)

Energy Performance Contracting (EPC) is a proven model for modernising mostly public buildings by ESCOs with guaranteed energy and cost savings. Nevertheless, a broad roll-out of EPC has been hindered mainly because of two unsolved problems: the split incentives dilemma and the lack of adequately flexible contract models.

The *guarantEE* project will address prevailing barriers to EPC in a team of 14 experienced partners, covering large parts of Europe in a mix of advanced and emerging ESCO markets.

Drawing on an accurate market analysis, *guarantEE* will develop innovative business and financing

models addressing and overcoming the split incentives dilemma in performance-based ESCO projects. This will be done by fairly sharing costs and benefits between user, building owner and ESCO (triple-win approach), thus opening up new project opportunities. Furthermore, EPC contract variants will be elaborated and tested, addressing the need for enhanced flexibility (e.g. exit clauses, simplified M&V, future energy market needs, storage). The target groups are public and – especially in advanced EPC markets – private sector clients.

The developed models will be applied in 33 pilot projects involving private and public building owners. The project will achieve savings of 78 GWh PE and 18,000 tCO₂ per year and trigger investments of over €11 million.

Particularly in emerging EPC markets, *guarantEE* will support market development by providing standards, an online EPC pre-check, good practice examples, EPC information and project facilitation for mainly municipal customers. Broad dissemination activities, including the European Energy Service Award, will maximise project visibility.

The project will address or consult at least 1,000 building owners and EPC facilitators and will inform at least 2,000 energy sector stakeholders on EPC.

The *guarantEE* project will unlock additional EPC project opportunities, contribute to standardisation, and provide political advice and steps towards a common energy service market in Europe.

Coordinator: *Berliner Energieagentur GmbH*

Total project budget: €1,586,558.20

Austrian partner: Grazer Energieagentur GmbH

Budget in Austria: €126,117.50

Project term: 1.4.2016-31.3.2019

I3CP (Industrial and Infrastructure Investor Confidence Project)

The project will extend the successful standardisation approach of the Investor Confidence Project beyond buildings and into industry and infrastructure. It will utilise a similar approach to the Horizon 2020-funded ICPEU project, which developed a set of standards for building energy efficiency projects. It will produce standardised protocols and associated tools (Project Development Specifications, Index of National Resources and Templates) for energy efficiency projects in industry and infrastructure, in particular for street lighting and district energy. A Europe-wide communications plan will be put in place, and activities will be carried out in five specific countries, building on the work of ICPEU. It will also develop and deliver training courses for project developers and quality assurance providers. Using the ecosystem of project developers and its own networks, the project will engage with project developers to certify projects and programmes as being Investor Ready Energy Efficiency (IREE). It will dedicate technical assistance resources to helping project owners and project developers to adopt IREE. It will also dedicate specific resources to working with financial institutions to help them incorporate IREE into their investment and lending procedures.

Coordinator: EnergyPro (UK)

Total project budget: €1,506,606.25

Austrian partner: Denkstatt GmbH

Budget in Austria: €185,680

Project term: 1.5.2017-31.10.2019

Streetlight EPC (Triggering the market uptake of energy performance contracting through street lighting refurbishment projects)

At the start of this project, many European regions had not seen energy performance contracting play a significant role as a financing tool. Apart from legal barriers, this can be explained for the most part by a lack of information about the tool and low levels of confidence, as well as a lack of experienced contractors.

Street lighting is a good 'learning and testing ground' for energy performance contracting because of its lower complexity (compared to building-related EPC). The appearance of LED technology on the market provided a useful starting point for this project. It meant that three targets could be achieved at the same time:

- establishing EPC as a funding tool with a view to promoting projects that are guaranteed to deliver savings,
- supporting the market launch of efficient and innovative lighting technologies,
- supporting municipalities making the transition to efficient lighting.

The aim of the project was to increase the demand for and supply of energy performance contracting projects in the field of street lighting in European regions and to establish an innovative financing model. In addition to various awareness-raising measures and initial and further training courses, the implementation of LED street lighting projects was also supported under the project.

In the course of the Streetlight EPC project, 63 projects were implemented; of these, 47 were based on various EPC financing models and 16 on other financing or operating models. Of the 63 projects, 42 related to the refurbishment of street lighting and 21 to interior lighting and/or building renovations (e.g. heating systems).

Overall, the Streetlight EPC project resulted in investments worth €29 million. Twelve new ESCOs implemented projects under the Streetlight EPC project, and eight other companies started to offer EPC services (e.g. by taking part in tendering procedures). The projects that have been implemented will result in energy savings of over 28,000 MWh per year and financial savings of over €3.5 million in electricity and maintenance costs.

The Streetlight EPC project was coordinated by the Upper Austrian Energy Saving Association, involving a total of 19 partners from across Europe (nine regions, nine cities/municipalities, one European network).

Project home page: www.streetlight-epc.eu

Coordinator and Austrian partner: Upper Austrian Energy Saving Association

Total project budget: €1,437,399

Project term: 1.4.2014-31.3.2017

This project was funded under the predecessor to the H2020 Programme (CIP-IEE-SP3-IEE – Intelligent Energy-Europe Programme).

ENERFUND (An ENERGY Retrofit FUNDing rating tool)

ENERFUND is a tool that rates and scores deep renovation opportunities, like a credit score used by banks to rate clients. The tool is based on a methodology to be developed and on a set of parameters such as EPC data, number of certified installers, governmental schemes running etc. This provision of a rating for deep renovation opportunities – whether for private establishments or public buildings – can help funding institutes receive targeted loans, give municipalities targeted incentives and enhance the public's trust in retrofitting.

The objectives of the current proposal are:

- to analyse the status quo and the needs of deep renovation stakeholders and the public,
- to build upon the outcomes of previous projects to create a tool for deep renovation financing,
- to measure and document the impact of the tool on deep renovation strategies and financing,
- to provide a powerful tool that will assist EU stakeholders in meeting their obligations in terms of

increasing renovation rates.

The partners, from 12 countries, include two universities that are in charge of project management and the development of the methodology behind the tool, two SMEs with extensive experience in the fields of database management, EPC mapping and the development of online decision-making tools, and 11 ministries, energy agencies, NGOs etc., that are connected with the relevant stakeholder groups throughout Europe and can promote the tool. The expected impact is approximately 45 GWh due to the use of the tool to promote deep renovation of buildings and through our training and dissemination activities. ENERFUND will account for approximately 1% of the current annual renovation rate during the project term. The strategic long-term aim is to provide a unified global tool for promoting not only the deep renovation of buildings, but also all energy-related activities in the buildings sector.

Coordinator: *Technologiko Penepistimo Kyprou* (Cyprus)

Total project budget: €1,539,252.50

Austrian partner: SERA energy&resources e.U.

Budget in Austria: €94,375

Project term: 1.2.2016-30.4.2019

EnRiMa (Energy Efficiency and Risk Management in Public Buildings)

The priority goal of *EnRiMa* is the development of a decision support system (DSS) for operators of energy-efficient buildings and public spaces. Through the integrated management of contradictory objectives such as cost minimisation, compliance with energy, efficiency and emission reduction requirements and risk management, the DSS will allow operators to improve the energy efficiency of buildings in the most cost-efficient way possible, taking into account their comfort and risk tolerance levels. The DSS will be integrated seamlessly into existing ICT systems for the purpose of controlling each location's energy subsystems. This makes it easier for operators to carry out on-site power dispatching operations in real time and to procure electricity from different off-site sources and open positions on the energy markets. The DSS will also allow long-term planning aimed at increasing energy efficiency, in particular on the basis of an analysis of projects involving retrofitting and/or the expansion of subsystems on site, with a view to achieving the upcoming EU targets for reducing CO₂ emissions. A laboratory facility in Biscay (Spain) is responsible for functional testing in connection with the DSS project, while a community centre in North Spain and a university campus in Austria are responsible for validation exercises. These location-based tests make it possible to carry out cost/benefit analyses and to deliver lessons learned for potential DSS users via policy workshops. Based on preliminary market analyses and a usage plan, the DSS will have a major impact once the project has ended, since it will result in the opening up of a market for ICT-based building solutions.

Coordinator: University of Stockholm (Sweden)

Total project budget: €3,485,460

Austrian partner: Centre for Energy and Innovative Technologies, Budget: €266,747
International Institute for Applied Systems Analysis, Budget: €291,305

Project term: 1.10.2010-31.3.2014

This project was funded under the predecessor to the H2020 Programme (FP7-ICT – Specific Programme Cooperation: Information and communication technologies).

Pillar 3 – Change in the perception of risk by funders and investors

There are ever more indications that the risks associated with energy efficiency investments are lower than perceived by the market, and that the likelihood of their failure is lower than for other types of investments. Nevertheless, it is still difficult for banks and investors to gauge the risks associated with energy efficiency investments. In cooperation with the Energy Efficiency Financial Institutions Group

(EEFIG), the Commission has developed a product that is intended to inform financial institutions, investors and promoters about the actual benefits and risks of energy efficiency investments. The De-Risking Energy Efficiency Platform (DEEP) is an EU-wide open-source database with detailed information and analyses for over 10,000 energy efficiency projects in the fields of industry and buildings. It issues energy certificates and helps project developers, funders and investors to estimate the risks and benefits of energy efficiency investments throughout Europe more accurately. The Commission asks all market participants to support this initiative by submitting any available data and energy performance records.

Austrian involvement in the DEEP database

Figures 36 and 37 show the total number of Austrian entries in the database, which is above average on a per-capita basis compared to other countries. The figures show both the number of projects in the database relating specifically to buildings, as well as the overall number of projects relating to buildings and industry. The reason for choosing this approach is that the projects in the database were not assigned to these two categories on the basis of strict criteria; this is apparent from Figure 38, in which the largest contribution to energy efficiency potential is shown for industry-related projects involving 'heating' and for buildings-related projects involving 'industry'. Since DEEP is a database of energy efficiency projects, it can be assumed that the majority of the projects included in the database (including those labelled as industry-related projects) can be assigned to the buildings sector.



Figure 32: Number of Austrian entries in the DEEP project database, divided into buildings-related projects and industry-related projects, with the median payback period and median abatement costs

Österreich	Austria
Bauprojekte	Construction products
Gesamt	Total

Amortisationszeitmedia	Median payback period
Vermeidungskostenmedian	Median abatement costs
IndustrieProjekte	Industry projects
Gesamt	Total
Amortisationszeitmedia	Median payback period
Vermeidungskostenmedian	Median abatement costs

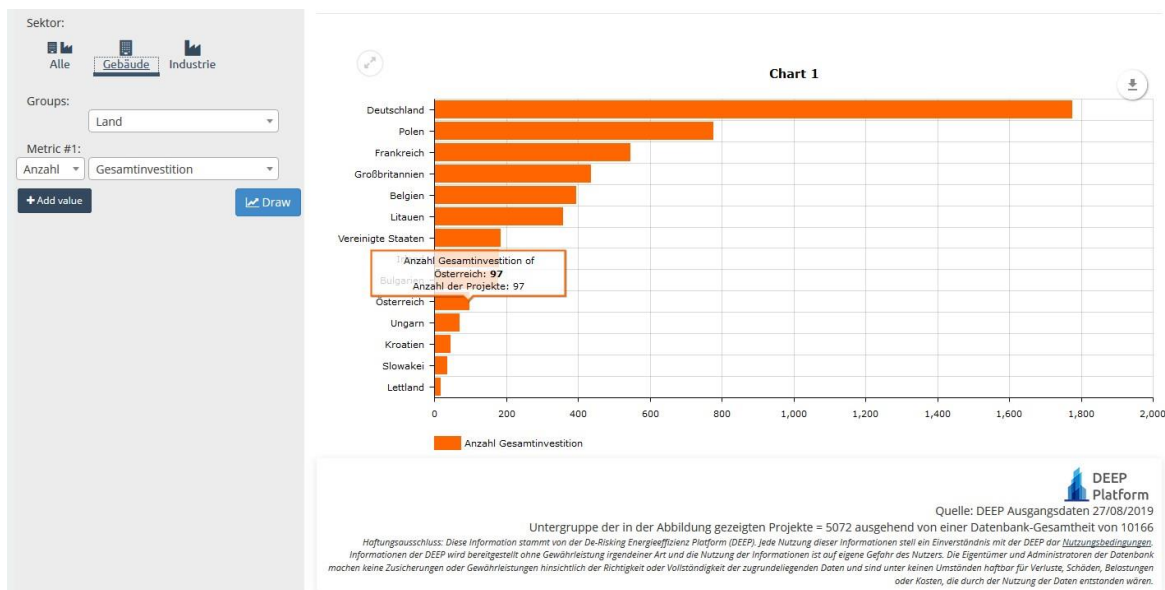
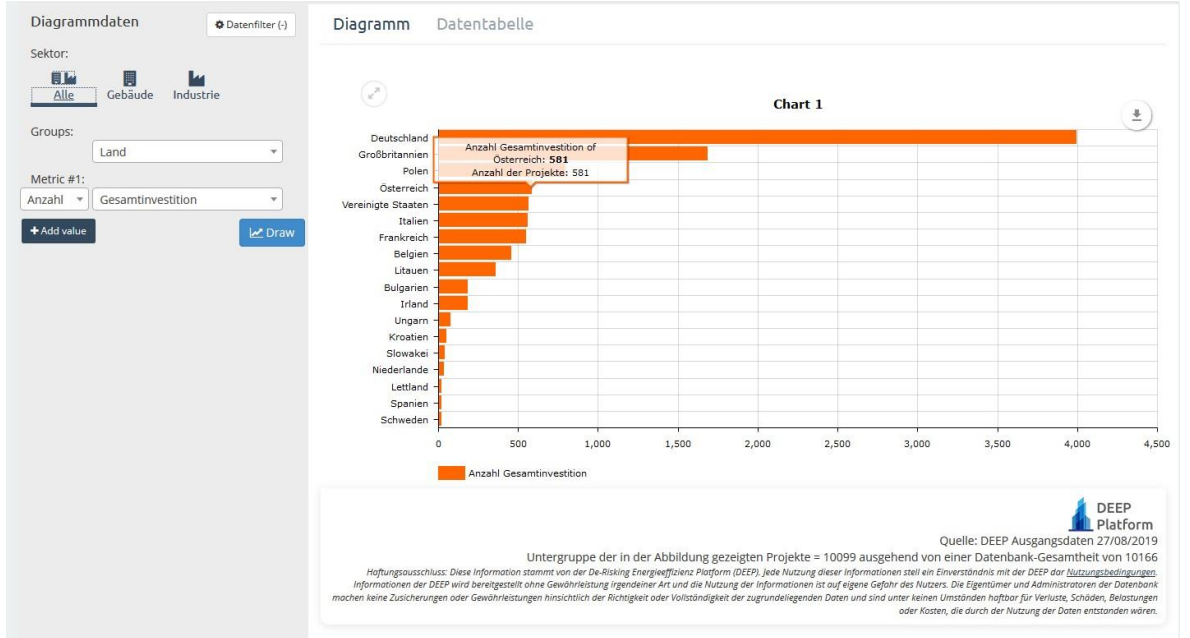
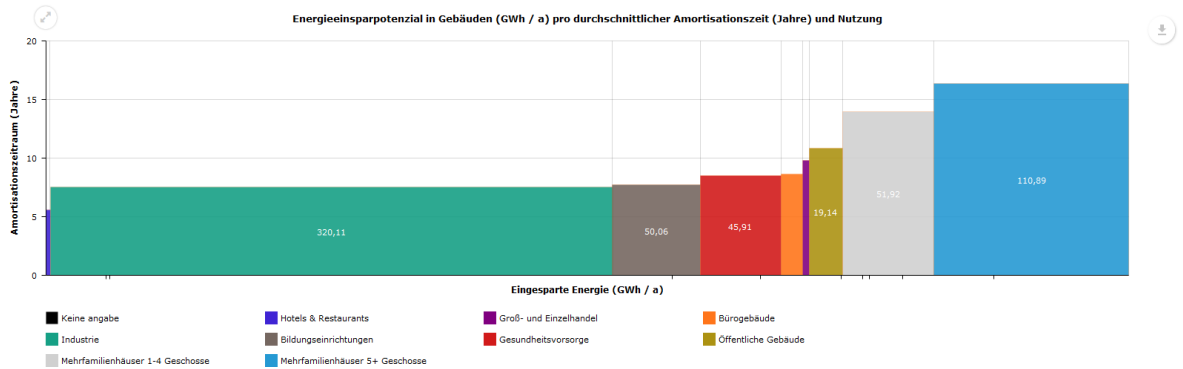


Figure 33: Number of Austrian entries in the DEEP project database in total (top) and for the buildings sector (bottom), compared to other European countries



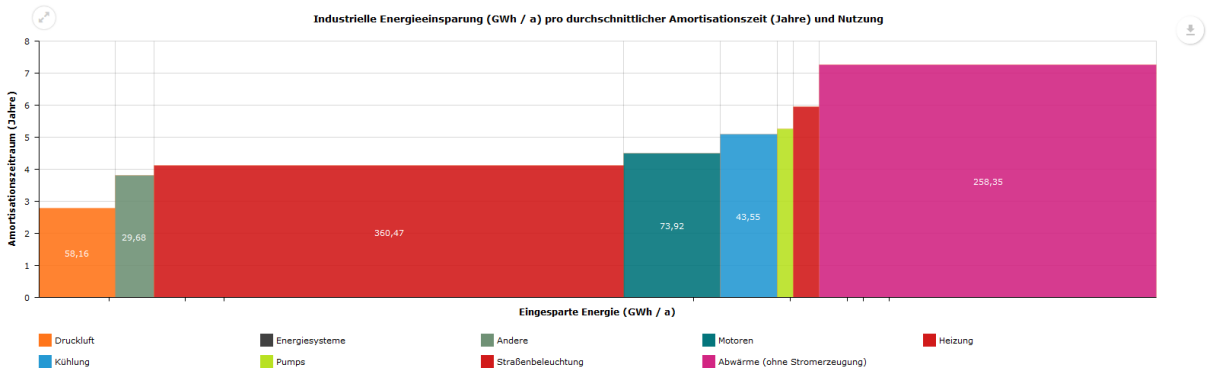
Datum: 29.08.2019
 gefilterte Projekte: 4524
 Land: EU-28
 Art der Maßnahme: All
 Gebäudetyp: All
 Überprüfung: All
 Drucke Factsheet



Datum	Date
Gefilterte Projekte	Filtered projects
Land: Österreich	Country: Austria
Art der Maßnahme	Nature of the measure
Gebäudetyp	Building type
Überprüfung	Check
Drucke Factsheet	Print fact sheet
Energieeinsparpotenzial in Gebäuden (GWh / a) pro durchschnittlicher Amortisationszeit (Jahre) und Nutzung	Energy-saving potential in buildings (GWh/a) per average payback period (years) and use
Amortisationszeitraum (Jahre)	Payback period (years)
Eingesparte Energie (GWh / a)	Energy saved (GWh/a)
Keine angabe	No data
Industrie	Industry
Mehrfamilienhäuser 1-4 Geschosse	Multifamily buildings, 1-4 storeys
Hotels & Restaurants	Hotels & restaurants
Bildungseinrichtungen	Education & training institutions
Mehrfamilienhäuser 5+ Geschosse	Multifamily buildings, 5+ storeys
Groß- und Einzelhandel	Wholesale and retail
Gesundheitsvorsorge	Health care
Bürogebäude	Office buildings
Öffentliche Gebäude	Public buildings



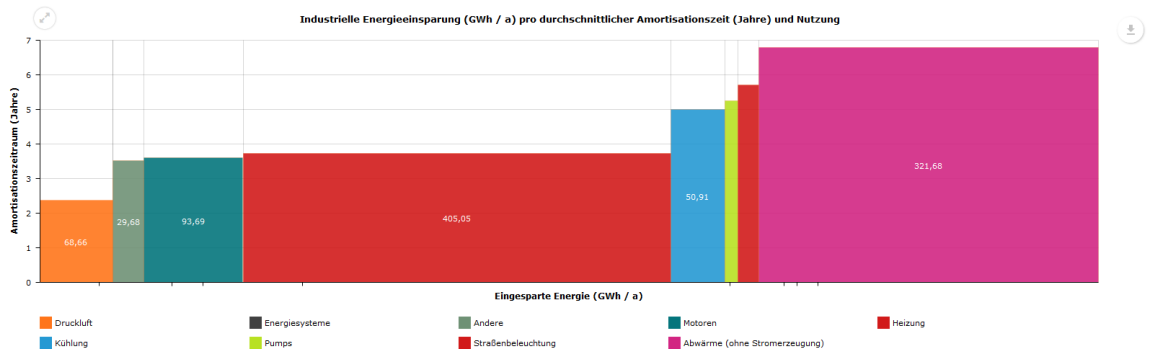
Datum: 29.08.2019
 gefilterte Projekte: 3389
 Land: EU-28
 Art der Maßnahme: All
 Größe der Organisation: All
 Überprüfung: All
 Drucke Factsheet



Datum	Date
gefilterte Projekte	Filtered projects
Land: Österreich	Country: Austria
Art der Maßnahme	Nature of the measure
Gebäudetyp	Building type
Überprüfung	Check
Drucke Factsheet	Print fact sheet
Industrielle Energieeinsparung (GWh / a) pro durchschnittlicher Amortisationszeit (Jahre) und Nutzung	Industrial energy-saving potential (GWh/a) per average payback period (years) and use
Amortisationszeitraum (Jahre)	Payback period (years)
Eingesparte Energie (GWh / a)	Energy saved (GWh/a)
Druckluft	Compressed air
Kühlung	Cooling
Energiesysteme	Energy systems
Pumps	Pumps
Andere	Other
Straßenbeleuchtung	Street lighting
Motoren	Engines
Abwärme (ohne Stromerzeugung)	Waste heat (excluding generation of electricity)
Heizung	Heating



Datum: 29.08.2019
 gefilterte Projekte: 484
 Land: Österreich
 Art der Maßnahme: All
 Größe der Organisation: All
 Überprüfung: All
 ☺ Drucke Factsheet



Datum	Date
gefilterte Projekte	Filtered projects
Land: Österreich	Country: Austria
Art der Maßnahme	Nature of the measure
Gebäudetyp	Building type
Überprüfung	Check
Drucke Factsheet	Print fact sheet
Industrielle Energieeinsparung (GWh / a) pro durchschnittlicher Amortisationszeit (Jahre) und Nutzung	Industrial energy-saving potential (GWh/a) per average payback period (years) and use
Amortisationszeitraum (Jahre)	Payback period (years)
Eingesparte Energie (GWh / a)	Energy saved (GWh/a)
Druckluft	Compressed air
Kühlung	Cooling
Energiesysteme	Energy systems
Pumps	Pumps
Andere	Other
Straßenbeleuchtung	Street lighting
Motoren	Engines

Abwärme (ohne Stromerzeugung)	Waste heat (excluding generation of electricity)
Heizung	Heating

Figure 34: EU-wide energy efficiency potential per average payback period for buildings (top) and industry-related projects (centre), with the latter also shown for Austria (bottom)

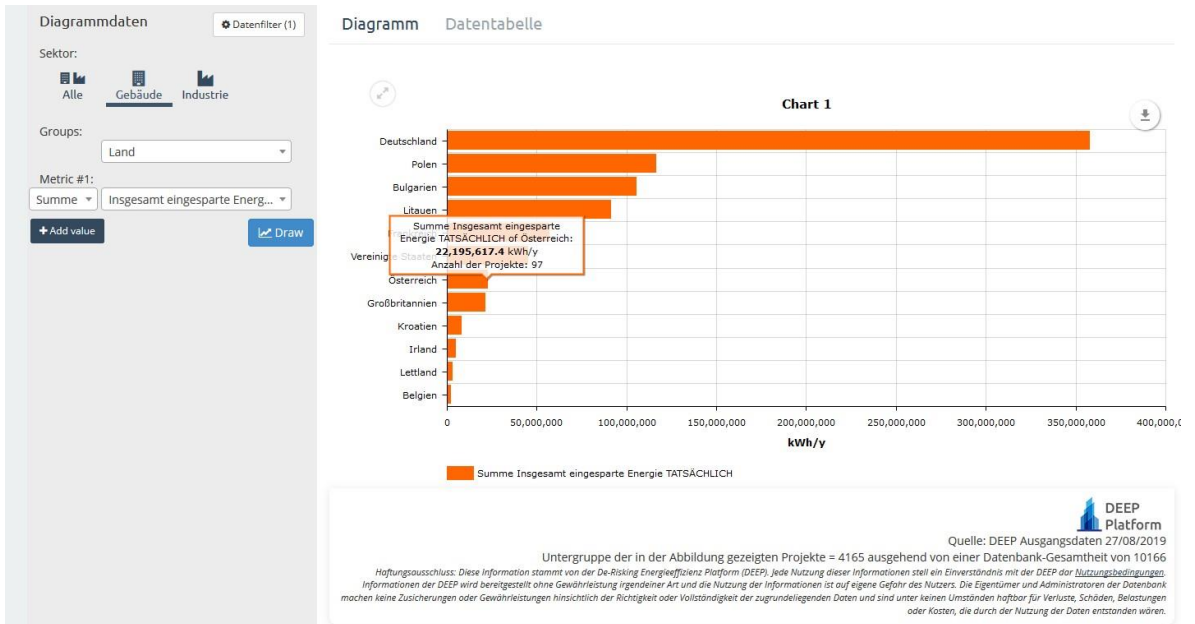
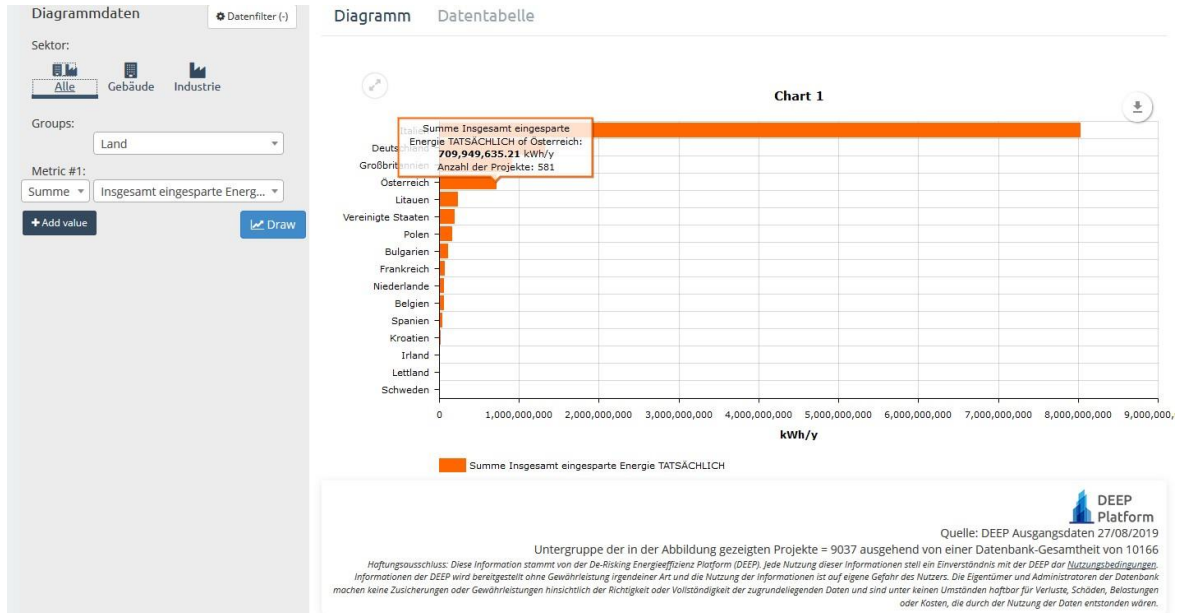


Figure 35: Sum of actual energy savings resulting from the Austrian entries in the DEEP project database as a total (top) and for the buildings sector (bottom), compared to other European countries

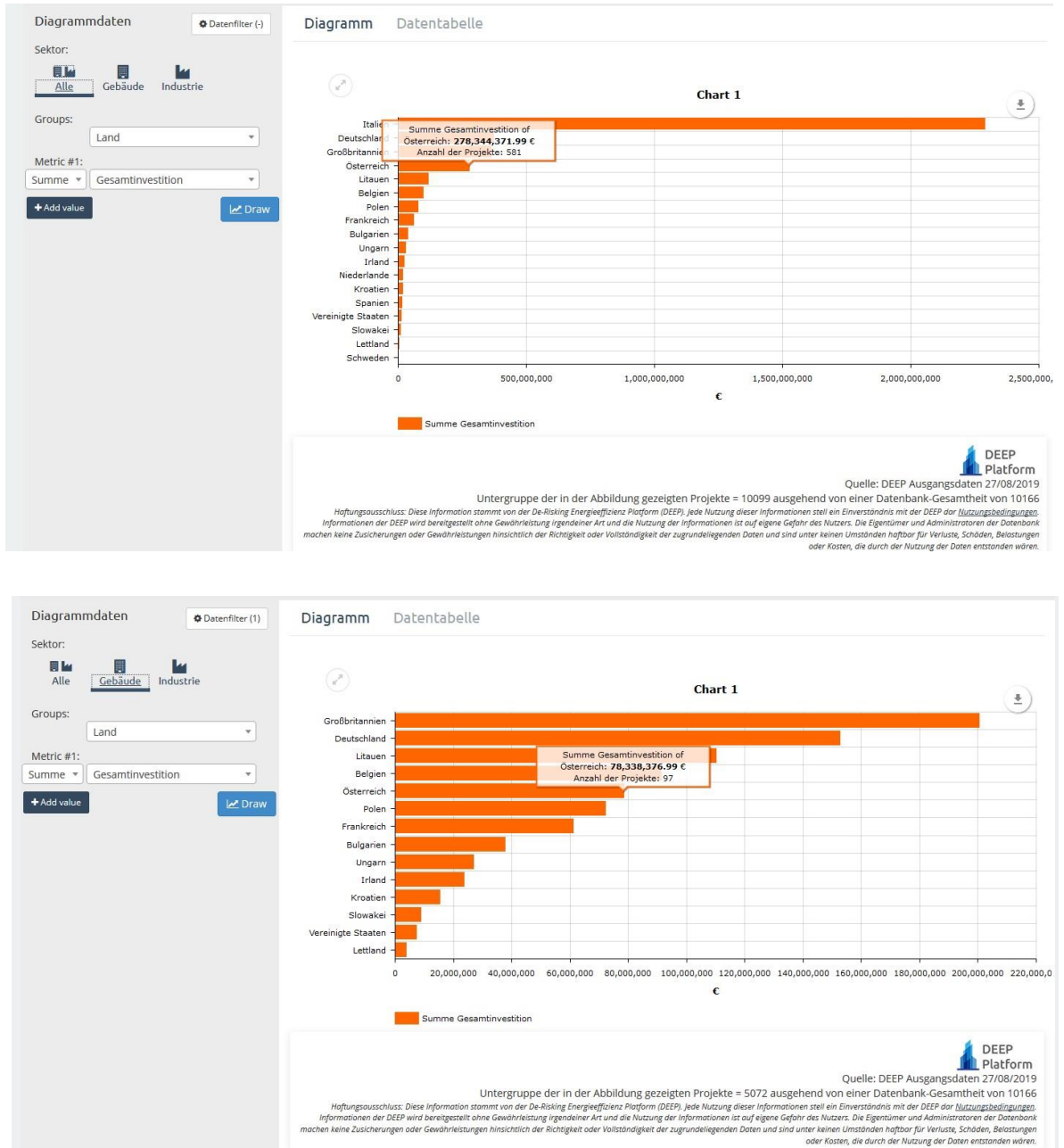


Figure 36: Sum of total investments resulting from the Austrian entries in the DEEP project database as a total (top) and in the buildings sector (bottom), compared to other European countries

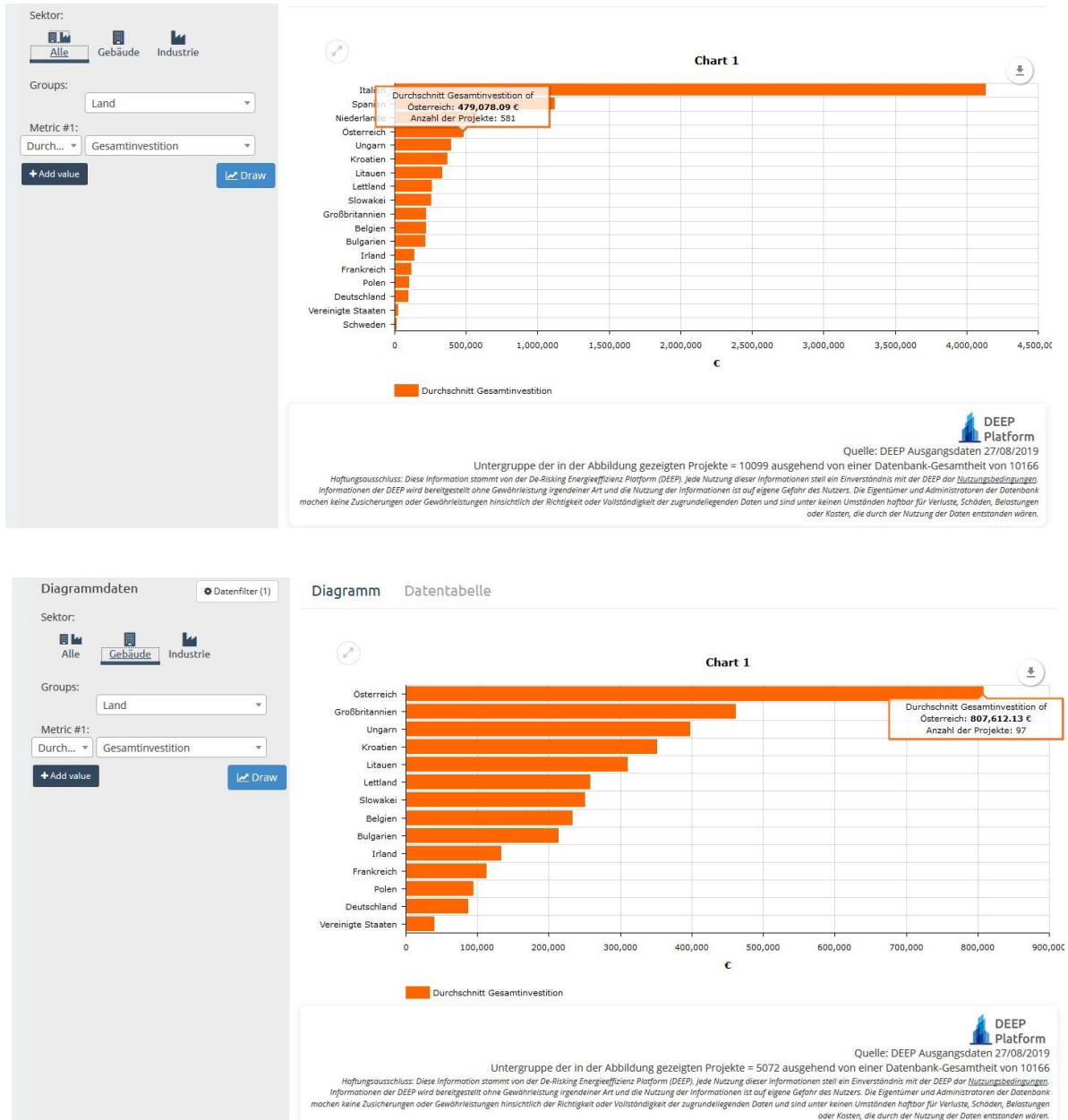


Figure 37: Project average for investments resulting from the Austrian entries in the DEEP project database as a total (top) and in the buildings sector (bottom), compared to other European countries

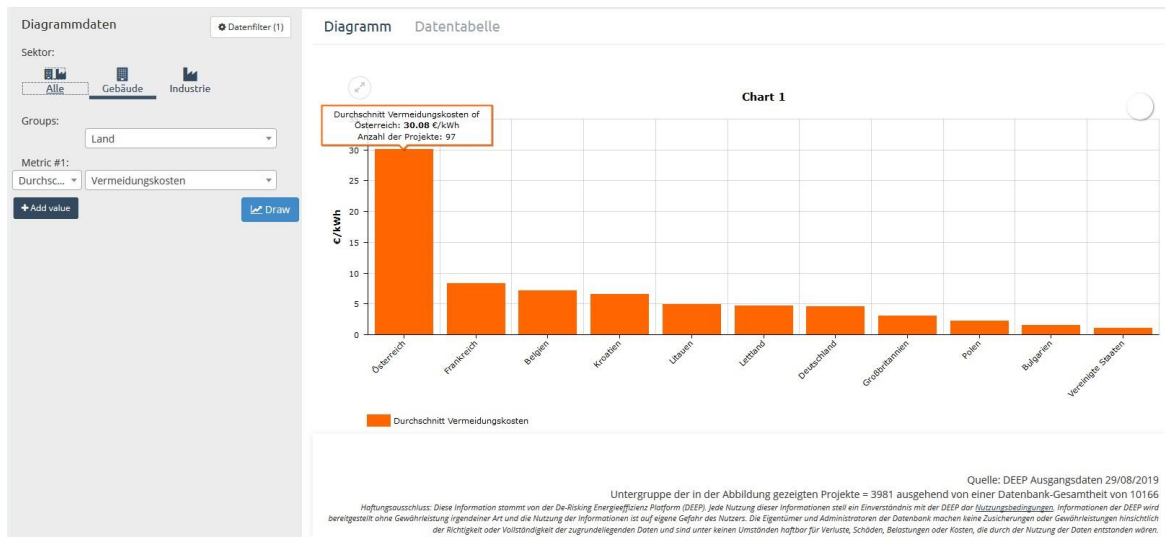
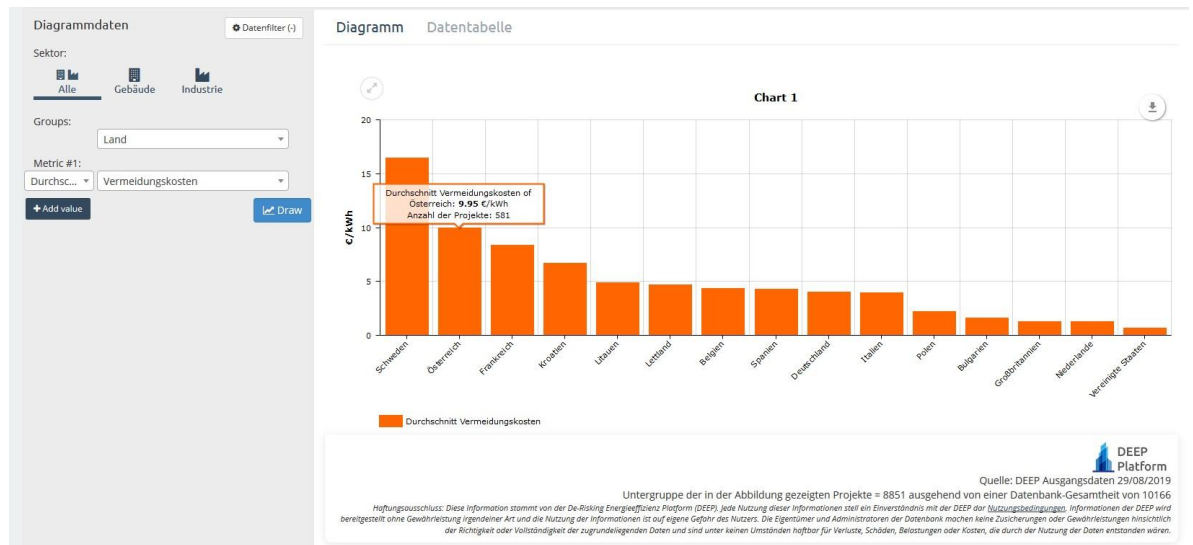


Figure 38: Sum of abatement costs resulting from the Austrian entries in the DEEP project database as a total (top) and in the buildings sector (bottom), compared to other European countries

Figures 39 and 40 both show the total energy savings and total investments actually achieved for the projects implemented in Austria; it is apparent that Austria's performance is again above average when measured against these two benchmarks.

It is also interesting to note that Austria has the highest average level of project investments (Figure 41), at least in the buildings sector. This can be explained by the fact that abatement costs are particularly high in Austria compared to the other EU Member States, both as a project average (Figures 36, 42 and 43). Cost efficiency is a major advantage for private investments into building renovations, since a small amount of funding can result in significant GHG emission savings. Yet once these 'low-hanging fruit' have been picked, as would appear to be the case in countries such as Austria, Germany and France, funding must also be used for more complex renovations likely to deliver a poorer return. Austria acts as a role model in this respect, as can be seen from the high abatement costs apparent from Figures 36, 42 and 43.

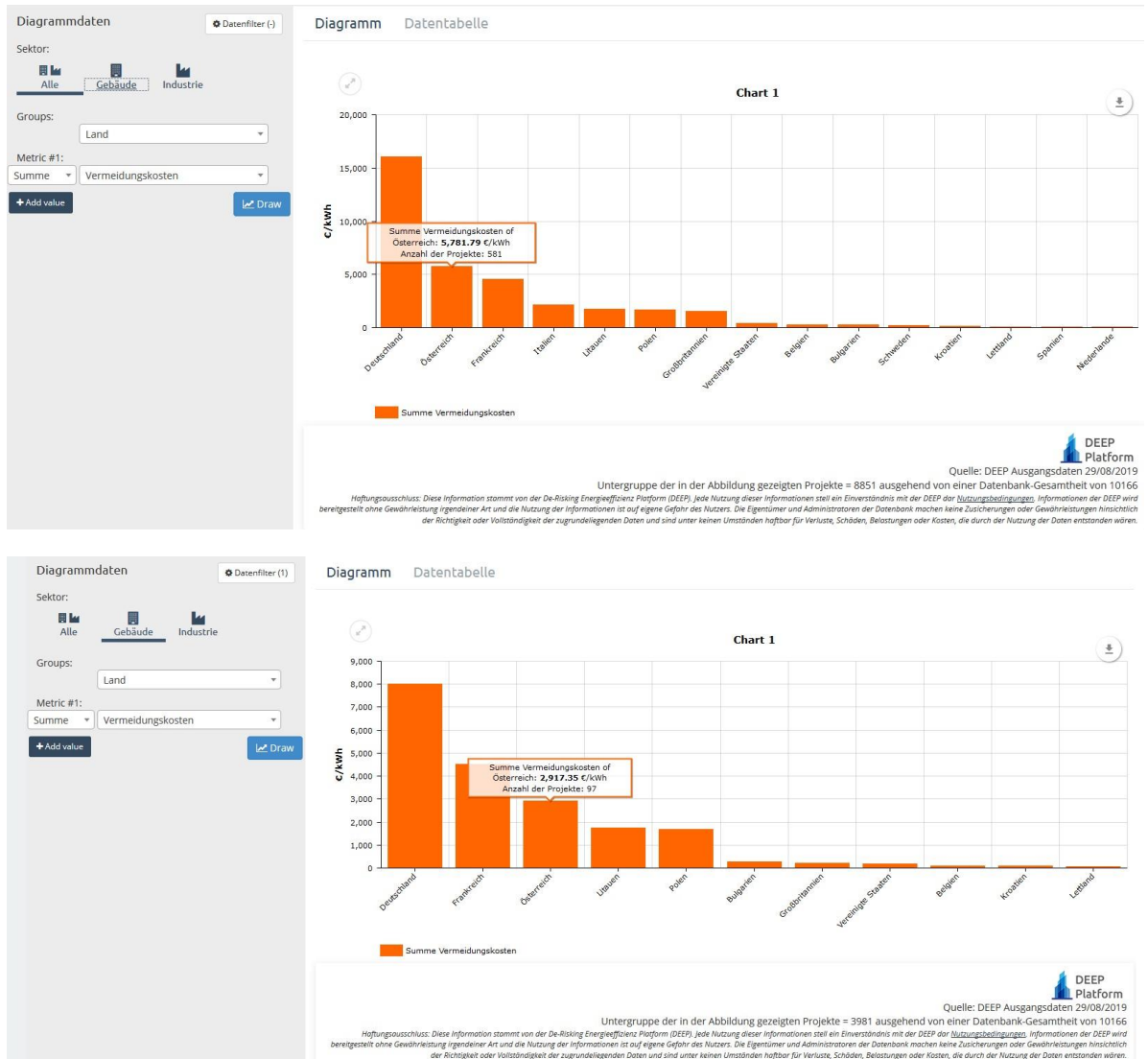


Figure 39: Project average for abatement costs resulting from the Austrian entries in the DEEP project database as a total (top) and in the buildings sector (bottom), compared to other European countries

Federal policies and actions

Kommunalkredit Austria

Kommunalkredit Austria AG (Kommunalkredit) is a specialist bank for infrastructure and energy financing in Europe. It offers consultations, structuring and financing of debt capital and subordinated capital throughout the entire life cycle of an infrastructure project. It focuses in particular on the sectors of energy and environment, transport, social infrastructure, communication and digitalisation and natural resources. The Kommunalkredit Group employs around 250 people. Its headquarters are in Austria (Vienna). One branch is located in Germany (Frankfurt am Main).

In the fiscal year 2018, Kommunalkredit recorded a net income after tax of €14.3 million and an operating result of €23.2 million. It invested approximately €1.202 million in total into infrastructure projects in Europe. This included financing for a broadband network in rural regions of Austria, refinancing for a section of motorway in Poland, a tram line in a Spanish city, and financing for the takeover of the concession for a Serbian airport.

Kommunalkredit is jointly owned by *Gesona Beteiligungsverwaltung* (99.78%) and the Austrian

Association of Municipalities (0.22%).

Upon entry into force of the Austrian Environmental Support Act [*Umweltförderungsgesetz*] in 1993, Kommunalkredit was assigned the task of managing environmental financing for the Republic of Austria and the Environmental and Water Management Fund. Via its subsidiary Kommunalkredit Public Consulting (KPC), it was responsible for the administration of public funding programmes and the implementation of national and international consultancy projects in the fields of environmental financing, sanitary water engineering and contaminated sites. The funding subsidiary was also responsible for administering the Austrian JI/CDM programme (purchase of emission-reduction entitlements to achieve Austria's Kyoto target). In 1998, it changed its name to Kommunalkredit Austria AG.

Kommunalkredit has a 90% stake in KPC. KPC develops, implements and manages public funding programmes in the environmental and energy sectors. In the fiscal year 2018, it assessed over 30,000 environmental and climate protection projects with a total investment volume of over €2.332 million.

In the first half of 2018, Kommunalkredit put in place the structures and conditions for the setting up of funds aimed at investing third-party capital in infrastructure and energy projects by founding the companies Fidelio KA Beteiligung, Fidelio KA Advisory and Fidelio KA Infrastructure Opportunities Fund GP. In the third quarter of 2018, the first close for the first subfund Fidelio KA Infrastructure Debt Fund Europe 1 was completed.

Kommunalkredit has a 45% holding in Kommunalnet E-Government Solutions GmbH (Kommunalnet), which is a digital work and information portal and social network for the Austrian municipalities. At the end of December 2018, Kommunalnet had 14,624 registered users from 2,055 Austrian municipalities and municipal associations. This gave Kommunalnet an exceptionally high market share of 96.0% in the municipality sector, and consequently a unique position in the Austrian market.

Eco-label Guideline 49 and *klimaaktiv*

Real estate funds can be awarded an eco-label for the first time under Eco-label Guideline 49 – Sustainable Finance Products. The basic criteria of the *klimaaktiv* building standard are cited as minimum criteria for the properties in question.

Projects under the Climate and Energy Fund that are administered by the Austrian Research Promotion Agency

Austria's Climate and Energy Fund, which has been in operation for 11 years, is an internationally respected tool for turning the challenges of the energy transition into new opportunities for Austria. The Climate and Energy Fund regards itself as a driving force and incubator for innovations in the field of climate-related and sustainable energy and mobility technologies. It supports ideas, concepts and projects in the areas of research and development, market penetration and awareness raising.

SBM_Ind

Funding: Flagship Region Energy 2. AS

Funding amount: €341,595

Project size: €452,784

Project term: 1.9.2018-31.8.2020

Applicant: University of Leoben – Chair of Energy Network Technology

Brief description:

The main goal of Smart Business Models for Industry (SBMI) is to develop business models that are mutually beneficial for utilities and industrial companies. These will be integrated into a corresponding business process architecture with associated databases, allowing an automated IT algorithm to

operate on the basis of the real-time grid status. The pre-alpha software developed within the framework of the project should act on behalf of the grid and use all relevant input parameters of the grid itself, the utility's database and the necessary parameters from the industrial partner concerning the usage of its flexibility potential. To ensure that all the business models created are within a feasible technical framework, the first part of the project consists of a detailed technical assessment. By means of grid models for all grid-bound energy carriers (electricity, gas and heating), load-flow calculations are carried out and the flexibility options of the industrial partner, such as energy storages, DSM potentials or flexible operation of industrial power plants are included in the consideration. In the second part of the project, a comprehensive review of current business models and the business process architectures in operation at the participating utilities and industrial partners will be carried out and compared against outcomes for other best-practice examples. On the basis of the results of the technical assessment and the findings for the business process architectures that have been examined, a catalogue of requirements will be created to serve as a foundation for the development of business models and the accompanying process architecture, which needs to be realised in the form of an IT algorithm. It is expected that a subsequent energy efficiency project will be initiated to develop and test a prototype in a real-world environment. To ensure general findings which are of use for all utilities and industrial companies (not only the partners directly involved), views from many industries will be considered.

T2LowEx: Transformation of conventional heating grids towards low-temperature heating grids through secondary-side measures

Funding: Energy research and Flagship Region Energy

Funding amount: €736,418

Project size: €996,812

Project term: 1.4.2017-31.3.2020

Applicant: Vienna University of Technology, Institute of Energy Systems and Electrical Drives

Brief description:

District heating currently supplies more than 20% of the total energy delivered in Austria for space heating and domestic hot water purposes, and it is expected that this share will continue to increase in the coming years. However, it is assumed that expansions of district heat supply in Austria will primarily occur in areas in which heat networks already exist to some extent today. This project is therefore aimed at systematically investigating, implementing and evaluating secondary-side/customer-side measures to increase the energy efficiency of existing heating networks, with a particular focus on reducing supply and return temperatures. These latter play a key role in the efficiency of heating distribution and supply, and in the integrability of renewable and low-exergy heat sources (e.g. solar thermal). The quality management programme *qm heizwerke* and feedback from those working in the field around the world make it clear that enormous potential is to be anticipated for temperature reductions in Austrian heating networks. Temperatures in heating networks can however only be reduced if optimisation measures are identified and implemented, particularly in existing secondary-side systems (customer systems). It is therefore necessary to carry out systematic investigations into procedures for identifying and optimising customer systems, and to highlight the ecological potential that can be leveraged in this way and the associated financial savings. In this connection, work under *T2LowEx* is intended to provide systematic answers to the following questions:

- What automated methods can be used to identify potential for optimising customers' existing heating networks and measures for reducing temperatures in these networks?
- Which stakeholders will benefit from the measures and to what extent, and who will bear the costs and to what extent?
- Which tariff and business models will incentivise customers and district heating companies to implement these measures?

This project is innovative because it prioritises the systematic and cost-efficient optimisation of existing customer systems (secondary-side). Building on technical and financial analyses and based

on a stakeholder participation process, tariff and business models will be developed that incentivise both customers and district heating companies to implement these measures. Visits will be made to at least five existing heating networks of different types (including in Vienna, Salzburg, Gleisdorf and Ried) for the purpose of gathering information and analysing planned measures and potential, and at least 50 selected measures will be implemented and evaluated. Networks and heating consumers will also be simulated in comprehensive dynamic models, and the impacts of additional measures under a range of different framework conditions will be evaluated. With reference to existing heating network databases, the outcomes of case studies will be translated to the district heating sector in Austria as a whole, and recommendations will be developed for action at energy policy level.

Workforce-based business model for integrated PV and electromobility infrastructure in urban enterprises

Funding: Smart Cities Demo 8. AS

Funding amount: €176,209

Project size: €235,828

Project term: 1.4.2017-31.3.2018

Applicant: JOANNEUM RESEARCH Forschungsgesellschaft mbH

Brief description:

The aim of this exploratory study was to develop a financing and business model for the establishment and operation of integrated PV and electromobility infrastructure in urban companies or public administrations.

EnergyLab East: Energy transition in the region of Upper Austria with high renewables use

Funding: Energy Research Programme

Funding amount: €190,951

Project size: €276,649

Project term: 1.7.2016-30.6.2017

Applicant: *Niederösterreichische Energie-und Umweltagentur GmbH*

Brief description:

The project region consists of the Provinces of Vienna, Lower Austria and Burgenland. In this region, almost one quarter of the final energy demand is covered using renewable energy sources. Approximately 57% of all the electricity consumed in the region is generated from local renewable energy facilities. Vienna and the urban areas of Lower Austria are characterised by their high energy consumption and may temporarily use the surplus of energy generated by eco-power plants in Lower Austria and Burgenland. The rural areas in the eastern region have the highest potential for the further development of eco-power production facilities.

All three of the provinces have adopted initiatives such as energy and climate strategies, energy roadmaps or smart city framework strategies in order to lend proactive support to the long-term transformation of the energy system into a decarbonised system. Implementation of these strategies requires further expansion of renewable energy sources such as wind and solar power. In order to cope with the highly volatile nature of wind and solar energy, solutions will need to be found to address the major challenges facing local, regional and supra-regional power grids, as well as daily or seasonal storage systems and demand side integration. The exploratory study *EnergyLab East* provides the first opportunity to establish close cooperation between all three provinces at the level of the provincial energy agencies and the provincial energy providers within the project consortium and between the administrative bodies of the provincial governments within the steering group. The

project will develop energy scenarios across all three provinces – taking into account high population growth in urban regions as well as the likely electrification of the mobility and heating sector – and will investigate the optimum interactions of various energy technologies in keeping with the provisions of the Paris Agreement and the move towards decarbonisation. The joint development, discussion and negotiation of issues relating to expansion planning, network planning, storage, consumption control etc. will take place. A further key aim of this exploratory study is to identify an adequate number of possible flagship projects that are located in a geographically concentrated area of the project region and are suitable for the later implementation of a 'project cluster'. The objective of *EnergyLab East* is to describe the implementation concepts of the various projects comprehensively with regards to their management structures, funding and user participation.

Within a period of nine months, the project will select and prepare several innovative flagship projects in the fields of innovative green power plants and storage systems, power-to-gas, power-to-heat, electromobility, demand side integration etc. that can be implemented during the period between 2018 and 2022. The project therefore also helps to demonstrate Austrian energy technologies at an international level.

MuMü Industrial Axis: Flagship Region Energy 'Industrial Axis Mur-Mürz'

Funding: Energy Research Programme

Funding amount: €199,860

Project size: €249,828

Project term: 1.7.2016-30.6.2017

Applicant: University of Leoben – Chair of Energy Network Technology

Brief description:

The Mur-Mürz Industrial Axis is located in the Province of Styria and links the political subdivisions of Bruck-Mürzzuschlag, Leoben and Murtal. It is one of Austria's most heavily industrialised regions. Large industrial companies (including VOEST, Böhler, Norske-Skog-Bruck, Heinzl-Pöls, Brigl&Bergmeister, Stahl Judenburg, Brauerei Gösser etc.) are currently involved in efforts both to save energy themselves and to establish integrated energy supply systems with the public sector. In line with these framework conditions, the exploratory study that forms the subject of this application is aimed at laying the groundwork for positioning the Mur-Mürz Industrial Axis as a flagship region at global level that serves as a testbed for energy technologies and systems (of Austrian origin if possible), involving the supply of electricity generated entirely from renewable sources and taking into account the interactions between energy-hungry industries, regional energy demands and regional energy potentials. The first stage is to collect and compile all the data available across the project region (description of existing flagship projects, structure of stakeholders and their future energy strategies, guiding principles, regional energy demands, energy as an industrial by-product and regional renewable energy potential); on the basis of these data, a holistic scientific, technical, organisational and economic concept can subsequently be developed. Individual technologies will be combined into whole-system solutions, and more ambitious, scalable cross-system and cross-technology ideas for new flagship projects or for the networking of existing flagship projects will be identified. To ensure that these sustainable regional development projects are ultimately implemented, industrial companies, stakeholders, users, municipalities etc. will be involved both in identifying the problems and in developing, testing, implementing and disseminating the corresponding projects. This interactive process of innovation will be carried out in the real-world environment of stakeholders or users as required (e.g. user observations, field tests), and will be embedded in the necessary Living Lab structures. To make this possible, comprehensive observations will be needed as well as measures to optimise interdisciplinary work, since feasible projects can only be implemented with the involvement of regional stakeholders and target groups. The implementation roadmap that is expected to be available after completion of the exploratory study will not only outline the projects to be implemented, but also contain a five-year schedule and financing plan. In addition, evaluation and monitoring methods will be developed to monitor the impacts of the planned measures. Alongside active participation by the 31 largest regional players (LoS partners), the project will also be supported by three other flagship regions; a selection process

for these regions is currently in progress.

Active impacts on social space for the empowerment of smart modernisation in (eco-)social housing

Funding: Smart Cities Demo 7.AS

Funding amount: €864,927

Project size: €1,324,382

Project term: 2.5.2017-1.5.2020

Applicant: TBH Ingenieur GmbH

Brief description:

The aim of the project is the participatory modernisation of eco-social housing in the small town of Pinkafeld through the implementation of technical innovations, e.g. integrative low-cost energy management, novel building and energy technologies and new financing and business models. Project objectives include not only optimising energy usage, but also increasing user comfort and developing additional benefits in collaboration with residents (e.g. safety, ambient assistant living etc.).

Innovative Performance Monitoring System for Improved Reliability and Optimised Levelised Cost of Electricity

Funding: SOLAR-ERA.NET 3. AS

Funding amount: €180,000

Project size: €300,000

Project term: 1.4.2016-31.3.2019

Applicant: GANTNER Instruments Test & Measurement GmbH

Brief description:

In today's fast-growing global PV market, it is important to seek out reliable information on the quality and operating status of grid-connected PV systems. This is vital not only for investors and owners, but also for efficient operational management and maintenance. Plans therefore exist to develop a new and innovative PV Performance Monitoring System for the first time, which will analyse all relevant performance parameters more reliably and detect changes in the PV system more accurately and – most importantly – in real time. The comprehensive capture of data from sensors and all electrical parameters with an adequately high data resolution (in minute intervals) is necessary to optimise operational management and maintenance and to maximise PV energy production. Instantaneous data processing and calculations require innovative database and analysis solutions and a high-performance platform that can reliably deliver these features and analyses. This real-time web portal will simultaneously calculate and separate out the key performance losses in real time. This makes it possible for current PV performance to be quantified more accurately, for any errors that occur to be detected at an early stage, and for losses to be pinpointed in the power plant system. In turn, this allows – for the first time – the analysis of trends such as the long-term degradation of PV modules. These new algorithms and features make it possible to appraise the quality of PV systems on an automated and more reliable basis, enabling optimised energy production and at the same time impacting significantly on PV project financing as a whole. These parameters will also improve PV production forecasts (day ahead), which is a major contributor to the efficient and successful marketing of PV energy.

Smart Block Step II – Energy, mobility, funding, communication

Funding: Smart Cities Demo 6. AS

Funding amount: €198,300

Project size: €271,456

Project term: 1.4.2016-30.6.2017

Applicant: BURTSCHER – DURIG ZT GmbH

Brief description:

Following a preliminary project, *Smart Block – gemeinsam besser Sanieren* [Smart Block – better refurbishment together], this exploratory study formed the link to a demo project.

Smart Finance for Smart Cities

Funding: Smart Energy Demo – FIT for SET 2. AS

Funding amount: €71,752

Project size: €71,752

Project term: 1.5.2012-28.2.2013

Applicant: New Energy Capital Invest GmbH

Brief description:

New ways of financing major smart cities projects are to be developed and urban demo regions are to be supported in their medium and long-term financial planning. Synergy effects with international projects are to be exploited and experience shared and adapted to the specific situation in Austria. Furthermore, the possibilities for making use of European financial instruments, such as ELENA and JESSICA, in the new Structural Funds period (2014-2020) are presented, as are the synergy effects with other projects and measures.

Città Slow Hartberg meets Smart City

Funding: Smart Energy Demo – FIT for SET 1. AS

Funding amount: €99,700

Project size: €133,390

Project term: 1.4.2011-31.1.2012

Applicant: Municipality of Hartberg

Brief description:

Hartberg's vision for 2020 is based on the local and urban development plan, as well as the philosophy of Città Slow. Below are selected measures from the roadmap that has been developed and that will be continued from 2012 to 2020:

- funding measures and financial incentive systems were instigated for the expansion of district heating;
- financial incentives and guidelines were provided for new builds;
- funding measures are available for photovoltaics;
- co-financing measures were launched for the expansion and optimisation of local public transport;
- financial incentives are available for the renovation of outdated buildings;

- an information campaign is being carried out for green electricity;
- incentives and support measures for changes in user behaviour have been implemented in order to reduce particulate matter levels;
- bulb replacement and energy management is carried out for public lighting;
- car sharing has been initiated and is being promoted;
- active load management has been put in place for heating and electricity networks.

The measures include:

- the development of a real-time city information system for better integration and information for the population, especially regarding environmental, air quality and climate data;
- the implementation of a cross-building energy management system for residential and office purposes in new builds and for listed buildings;
- various intelligent incentive systems for the establishment of sustainable urban mobility, including car sharing.

Smart Suburban Region Perchtoldsdorf & Brunn am Gebirge

Funding: Smart Energy Demo – FIT for SET 1. AS

Funding amount: €99,400

Project size: €176,705

Project term: 1.6.2011-31.3.2012

Applicant: ConPlusUltra GmbH

Brief description:

The *Smart Suburb* project developed a vision for the two participating municipalities, and a technical feasibility study into the implementation of a demonstration project was created. In line with the goals of the *Smart Energy Demo* scheme for a 'zero-emissions city', energy suppliers, energy and mobility service providers and financial institutions were involved in testing new business models within the municipalities for the provision of intelligent solutions (for electricity, heat, mobility, etc.) in order to gain experience and minimise long-term development risks. Under these plans, CO₂ emissions are to be reduced by up to 80% compared to 2010 levels by 2050. It can be seen that emissions from heat generation will decline more than those from electricity generation. Motorised transport will largely be covered by electromobility. Total energy demand will fall from 684 GWh in 2010 to approximately 552 GWh in 2050 thanks to energy efficiency measures (building refurbishments, energy efficiency in households, businesses, etc.). Furthermore, it is becoming apparent that, by 2050, around 379 GWh out of the 552 GWh total could be covered by renewable energy sources (geothermal energy, PV, biomass/biogas, district heating).

iENERGY Weiz-Gleisdorf – Citizens supported by a stakeholder process implement intelligence to upgrade their smart urban region

Funding: Smart Energy Demo – FIT for SET 1. AS

Funding amount: €99,800

Project size: €266,480

Applicant: Energie Steiermark AG

Brief description:

The *iENERGY Weiz-Gleisdorf 2.0 – die Macht einer Vision!* [iENERGY Weiz-Gleisdorf 2.0 – The power of a vision!] project builds on *Energievision 2050* [Energy Vision 2050]. The goal is the visible pre-empting of this vision in the form of individual demonstration projects, i.e. projects making visionary total solutions visible to the public. Sustainable overall solutions arise primarily through

citizen participation – the use of innovative technologies or their integration into intelligent products and services, as well as their user-oriented demonstration, provide important stimuli for people's energy awareness, on a collective and individual level. The roadmap includes short, medium and long-term goals.

The following demo projects illustrate the vision at different levels of impact:

Region level:

- *iEnergy Vision Monitor*: provides the population with current status information with regard to the implementation of the energy vision;
- *iEnergy Origin Scan*: provides information about the real electricity mix in the area where it is consumed;
- *iEnergy Aid Fund*: alternative financing mechanism for renewable energy production and for financing energy efficiency measures.

Demonstration objects (energy autonomy) level:

- 'Business, services' user segment (Weiz IV innovation centre),
- 'Industry' user segment (ELIN engine plant),
- 'Private' user segment (refurbishment of the Gleisdorf retirement home),
- 'Public' user segment (Smart-x estate).

Smart City Linz – A High Level Approach Towards an Integrated Energy Vision 2050, Roadmap 2020 and Action Plan 2015

Funding: Smart Energy Demo – FIT for SET 1. AS

Funding amount: €98,600

Project size: €130,859

Project term: 1.5.2011-31.3.2012

Applicant: *Österreichisches Forschungs-und Prüfzentrum Arsenal Gesellschaft mbH*

Brief description:

The *Linz2050* vision includes a holistic, specific, energy-related goal to enable the corresponding interim goals to be achieved. Scenarios were developed to show which packages of measures Linz can use to achieve the defined energy goals in the planned time periods. With the aid of the scenarios, four strategic key themes (energy efficiency, renewable energies, transport and general conditions) were identified. 13 consolidated fields of action have been defined for these key themes:

- intelligent power usage and distribution,
- awareness-raising and changing behaviour,
- public participation and coordination,
- greening of spatial planning and urban development,
- new incentive, funding and financing models,
- innovative flagship projects and applied research,
- city of smart, intermodal routes (short, fast, intelligent),
- new mobility services and alternative propulsion systems,
- promotion of the use of renewable energies and waste heat,
- unlocking the potential of renewable energy sources,
- urban mining/careful use of raw materials,
- use of energy-efficient products,
- smart industry (products and production processes).

Appropriate proposals, such as the designing of funding models on the basis of efficiency criteria, an

increased expansion of smart grids or the development of the photovoltaic potential in the Linz area, are assigned to these subject areas.

Provincial policies and actions

Input from Carinthia

Carinthian housing support

With regard to refurbishment, the *Raus aus fossilen Brennstoffen* [Leave fossil fuels behind] incentive scheme once again placed emphasis on reducing CO₂ emissions by increasing support for the switch to energy-efficient building technology systems and lifting the limit on usable living space. This includes the doubling of support for replacing fossil-fuelled heating systems (coal, heating oil, gas) with bio-fuelled ones. There is additional emphasis on the promotion of solar energy (solar-powered systems, photovoltaic systems), on single-component refurbishment and the use of sustainable building materials, and on extensive energy refurbishment with the additional funding of a refurbishment coach. Furthermore, an insulation offensive was launched in 2020, with increased support for the use of renewable raw materials. As part of a free on-site energy consultation, applicants are offered optimised and comprehensive information, and for the first time the question of the summer suitability of a residential building is also dealt with. Support is available either in the form of a one-off grant or through the award of a subsidised loan, with a higher level of support for attaining a *klimaaktiv* quality level in multi-storey apartment blocks.

The guidelines can be found at www.wohnbau.ktn.gv.at.

Promotion of alternative energy

The Carinthian alternative energy promotion guideline 2019/2020 [*Richtlinie Alternativenergieförderung Kärnten 2019/2020*] is intended to support or enable individual measures to promote the use of renewable energy carriers and to increase energy efficiency in the field of non-residential buildings.

[\(Carinthian alternative energy promotion guideline 2019/2020\)](#)

In this connection, particular attention is to be paid to the ability of public institutions such as municipalities, educational institutions, etc. to act as role models. Funding is provided for the new construction, conversion and modernisation of environmentally and climate-friendly heat generators, photovoltaic systems, electricity storage systems and for measures to increase the energy efficiency of installations in the Province of Carinthia.

Input from Lower Austria

The risk for investors in energy investment measures is reduced primarily through direct support but also through interest rate subsidies.

Input from Upper Austria:

Upper Austria awards direct grants, and annuity grants or interest rate subsidies on loans that take account of the positive effects of a project's energy efficiency component on the value of an asset. An annuity grant is the granting by the province of energy-related subsidies on the repayment rates (interest and amortisation rates) of a mortgage loan taken out for financing. In addition to the energy efficiency criteria, the grants are mostly linked to social criteria or housing needs, and there are additional incentives, e.g. for the number of people living in the property (children) or the use of green insulating materials.

The level of the annuity grant is based, in the case of Upper Austria, on the following energy efficiency levels:

- Component refurbishment, 20% individual component requirements, 15 years
- Refurbishment level I: 25%
- Refurbishment level II: 30%

- Refurbishment level III: 35%
- Refurbishment to minimum-energy building standard: 40%.

Input from Salzburg:

The Province of Salzburg awards direct grants that take account of the positive effects of the energy efficiency component of a project on the value of an asset. The direct grants amount to between 15% and a maximum of 40% of the eligible costs, depending on the energy performance of the building.

For more information, see: Section 24 of the Salzburg Housing Support Ordinance 2015 [WFV 2015] <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrSbg&Gesetzesnummer=20000946>

Energy Department: <https://www.energieaktiv.at/information-und-beratung/downloads/>

Input from Styria

In order to minimise risk, Commission Recommendation (EU) 2019/786 of 8 May 2019 on building renovation lists a non-exhaustive selection of examples of financing mechanisms.

The Province of Styria awards direct grants, and annuity grants on loans, that take account of the positive effects of the energy efficiency component of a project on the value of an asset.

Depending on the funding channel, direct grants of up to 30% or non-repayable annuity grants of up to 45% are awarded for a term of up to 15 years. There is also an ecological incentives system: 'eco-points' can be collected on the basis of a list of pre-selected ecological measures; if property owners implement these additional measures, they become eligible to claim for increased refurbishment costs.

3.3 Support for the mobilisation of investments through the use of public funding (housing support) (Article 2a(3)(c))

Provincial policies and actions

Input from Burgenland

Housing support:

Burgenland's housing support was reorganised in September 2018 under Burgenland's Housing Support Act 2018 [*Wohnbauförderungsgesetz 2018*]. The Housing Support Act and associated guidelines have been adapted in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law (*Bundes-Verfassungsgesetz – B-VG*) between the Federal Government and the provinces on reducing the emission of greenhouse gases.

The main focus was on securing high-quality, affordable living space, taking into account spatial planning, climate and ecological aspects, as well as social, economic and ecological sustainability.

The prevention of urban sprawl, reduction of land take, revitalisation of urban centres and structural consolidation were also put on a firmer footing in the Housing Support Act. A further objective is to promote a diversity of dwelling types in order both to enable older people to stay in familiar surroundings and to offer young people affordable living space. Special attention was also given to the achievement of climate protection goals, to energy efficiency and the careful use of resources.

In order to promote new builds, the amount of the subsidised loan is staggered according to income and the energy efficiency of the building. In addition to basic support, bonus amounts may also be awarded for, *inter alia*, construction that limits land consumption. The use of ecological building materials is a prerequisite for receiving support.

In order to promote refurbishment, incentives were created and the level of support increased. The requirement to submit an energy certificate ensures that cost-optimal refurbishment measures are

implemented. Particular attention was given to thermal and extensive energy refurbishment. With a corresponding improvement in the thermal quality of the building envelope (refurbishment of window surfaces, the roof or top floor ceiling, facade surfaces, the basement ceiling, as well as energy-relevant heating systems), up to 80% of eligible refurbishment costs can be funded. The use of oil- or coal-fired heaters represents a funding exclusion criterion.

Leaseholders of dwellings receive financial support.

The Burgenland Housing Support Act and associated guidelines are published on the province's website and can be accessed at the following address: www.burgenland.at/wbf

Input from Carinthia

Carinthian housing support

Housing support was reorganised under Carinthia's Housing Support Act 2017 [*Wohnbauförderungsgesetz 2017*] and incentive systems for climate-friendly and ecological measures to achieve climate protection goals were created for the purposes of sustainability and clean energy, in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law between the Federal Government and the provinces on reducing the emission of greenhouse gases.

As far as concerns support for new builds, the level of the subsidised loan is to a large extent dependent on the energy efficiency achieved. Starting from basic support for a maximum of 130 m² of usable living space, the total support amount is increased by bonus amounts such as an environmental bonus, redensification bonus, location quality bonus, passive house bonus or a bonus for greening measures designed to prevent summer overheating.

There is increased support for the use of ecological building materials and of solar energy. In addition, for first-time buyers of a residential property, the bonus for low-temperature heating and attaining the *klimaaktiv* silver quality level also increase the level of support. When it comes to support for owner-occupiers, applicants can choose between a subsidised loan or a non-repayable one-off grant (known as the *Häuslbauerbonus*), which is granted at a higher level for nearly zero-energy buildings or redensification.

With regard to refurbishment, the *Raus aus fossilen Brennstoffen* [Leave fossil fuels behind] incentive scheme once again placed emphasis on reducing CO₂ emissions by increasing support for the switch to energy-efficient building technology systems and lifting the limit on usable living space. This includes the doubling of support for replacing fossil-fuelled heating systems (coal, heating oil, gas) with bio-fuelled ones. Additional emphasis is placed on the promotion of solar energy (solar-powered systems, photovoltaic systems), on single-component refurbishment and the use of sustainable building materials, and on extensive energy refurbishment with the additional funding of a refurbishment coach. Furthermore, an insulation offensive was launched in 2020, with increased support for the use of renewable raw materials. As part of a free on-site energy consultation, applicants are offered optimised and comprehensive information, and for the first time the question of the summer suitability of a residential building is also dealt with. Support is available either in the form of a one-off grant or through the award of a subsidised loan, with a higher level of support for those attaining a *klimaaktiv* quality level in multi-storey apartment blocks.

The improvement and increase in the support for the creation of living space in existing properties by converting, extending, or integrating and acquiring vacant existing properties in heavily built-up areas is intended to bolster the use of existing resources and existing infrastructure and facilitate a space-saving way of building through high-quality redensification. Support for the acquisition of properties in town and city centres has been increased. Support takes the form of a low-interest loan with a term of 20 years.

As far as relates to multi-storey apartment blocks, the main aim of Carinthia's Housing Support Act 2017 is to create affordable living space while satisfying sustainability aspects. The incentive schemes that are key to this are being created by making renewable energy sources more available, improving access to climate-friendly forms of mobility such as cycle paths and local public transport networks or providing arrangements for alternative forms of mobility, and by mandatory measures to prevent summer overheating. Residential properties that achieve a *klimaaktiv* standard are given a higher

level of support.

The guidelines to Carinthian housing support were published on Department 11's home page at www.wohnbau.ktn.gv.at. Detailed information on the subjects of energy and the environment can be found on Department 8's home page at www.umwelt.ktn.gv.at.

Input from Lower Austria

Housing support

Lower Austria's housing support provides financial support for the refurbishment of living space. Lower Austria's housing support primarily supports thermal and energy-related refurbishment measures. The existing funding model supports holistic refurbishments and refurbishments to a high energy level, as well as the switch to renewable energy systems.

The amount of funding granted ensures a high number of refurbishments.

Input from Upper Austria:

Housing support

Upper Austria's housing support is a key measure to stimulate cost-effective deep renovation of buildings. The details are regulated in the province's Regulations on the refurbishment of residential buildings. According to the report on climate protection measures in the buildings sector pursuant to Article 15a of the Austrian Federal Constitutional Law, Upper Austria has achieved the highest refurbishment rate in the last six years.

Environmental support

With the support for boiler replacement under the province's environmental support programme, significant incentives to switch from fossil fuels to renewable energy carriers were put in place; see also: <https://www.energiesparverband.at/fileadmin/esv/Broschueren/Heizkesseltausch-Folder.pdf>

Input from Salzburg:

Salzburg housing support

As part of Salzburg housing support, a supplementary subsidy on top of basic support was created as early as 1993 for energy performance measures that go beyond the applicable minimum requirements in construction law. The measures eligible for support for the purpose of improving energy performance and reducing greenhouse gas emissions have been continually adjusted. Most recently, the minimum energy requirements laid down under the 2017 Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law were implemented with effect from 1 January 2019 via the Housing Support Ordinance.

Energy performance-dependent subsidy system

The subsidy of energy performance improvements in new builds and in refurbishments consists of a basic amount and supplements.

Basic amount in new builds or basic subsidy rate for refurbishment measures

In the case of new builds, the basic amount is a subsidy rate per m² of eligible usable living space or per housing unit. In the case of eligible measures for the refurbishment of the building envelope or the building technology systems, the basic subsidy rate is 15% of the eligible costs. In the case of a major renovation, the basic subsidy rate is 20% of the eligible costs, where the energy performance requirements for energy-efficient existing buildings are met.

Supplements for improved energy performance

The level of the supplementary subsidy for energy performance depends on the sustainability primary energy indicator (N_{i30}). In addition to the primary energy demand and the carbon dioxide emissions for

building air conditioning, the N_{i30} also takes into account the ecological quality of the building materials used to erect the building. The period under consideration for the depreciation of building materials is set at 30 years. Depending on the N_{i30} value, between 0 and 40 supplementary points can be achieved. The higher the number of supplementary points, the higher the supplementary subsidy.

Public buildings belonging to the municipalities

In accordance with the guidelines for the processing of subsidies from the municipal equalisation fund, supplements for increased energy performance are awarded for the construction and refurbishment of municipal buildings.

Boiler replacement (switch to renewable energy carriers)

Salzburg's Energy Department supports the replacement of fossil fuelled heating systems with high-efficiency alternative systems via investment grants. These are subject to strict quality criteria. The applicable guidelines can be found at:

<https://www.energieaktiv.at/information-und-beratung/downloads/>

Input from Styria

Styrian housing support

Housing support was revised under Styria's Housing Support Act [*Wohnbauförderungsgesetz*] in connection with the associated implementing regulation, and incentive systems were created for climate-friendly and ecological measures to achieve climate protection goals in terms of sustainability and clean energy, in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law between the Federal Government and the provinces on reducing the emission of greenhouse gases.

In order to minimise risk, Commission Recommendation (EU) 2019/786 of 8 May 2019 on building renovation lists a non-exhaustive selection of examples of financing mechanisms.

The Province of Styria awards direct grants, and annuity grants on loans, that take account of the positive effects of the energy efficiency component of a project on the value of an asset.

Depending on the funding channel, direct grants of up to 30% or non-repayable annuity grants of up to 45% are awarded for a term of up to 15 years. There is also an ecological incentives system: 'eco-points' can be collected on the basis of a list of pre-selected ecological measures; if property owners implement these additional measures, they become eligible to claim for increased refurbishment costs.

Special funding for the Refurbishment Campaign for Revitalising Town Centres

Incentivised by the Refurbishment Campaign for Revitalising Town Centres, municipalities or companies that are majority-owned by a municipality have increasingly been purchasing existing buildings in town centres and refurbishing them using appropriate sources of financing. Where refurbishment of the existing property would be demonstrably uneconomic, it can be demolished and a subsidised new build can be built on the land in question (apartment block/residential accommodation, first-time buyers' home, group-purchased homes). This should create attractive homes in the immediate vicinity of the infrastructure (shops, kindergartens, schools, etc.).

Rebuilding in connection with the refurbishment of residential buildings

The term 'rebuilding' refers to the at least extensive replacement of an existing building on the same site. A building is considered to be rebuilt if it is not worth preserving as a whole and is replaced by a completely new building or if more than 50% of the building – based on the former useful floor area – is new. The property must be located in a heavily built-up area as stipulated by the Styrian Spatial Planning Act 2010 [*Steiermärkisches Raumordnungsgesetz 2010*].

The maximum subsidised useful floor area must not exceed five times the existing useful floor area. Excluded from this provision are building works that fill in gaps between buildings, as well as those that close a perimeter block development.

Where more than 30 dwellings are to be subsidised, the housing refurbishment desk must be consulted in advance with regard to the question of the number of apartments that can be funded.

The guidelines for ecological housing support are published on the home page of the province's Energy and Housing Department.

<http://www.wohnbau.steiermark.at/cms/ziel/113384013/DE/>

Detailed information on the subjects of energy and the environment can also be found on the website of the province's Energy and Housing Department at:

<http://www.technik.steiermark.at/cms/ziel/58813719/DE/>

Input Tirol

Housing support

There are extensive measures and instruments for pursuing the goals of Directive 2010/31/EU within the framework of housing support in Tyrol. Both loans and grants are awarded as financial instruments in the context of housing support. Funding is awarded both for the new construction of buildings and for the refurbishment of existing buildings.

The relevant funding criteria took account of the requirements relating to energy efficiency. For example, in the construction of new buildings, the use of high-efficiency alternative heating and hot water systems is a prerequisite for the granting of housing support funding. In addition, an energy certificate must be submitted for the property for which funding is being sought and a maximum permissible annual heat demand for heating (HDH) per m² of air-conditioned gross floor area (or a given HDH in combination with a given energy performance factor) must be observed for the property.

For support in connection with refurbishments of existing buildings, funding criteria include mandatory compliance with the U values applicable for the relevant parts of the building (walls, roof, windows, etc.). When a heating system or heat supply system is refurbished, the use of high-efficiency alternative systems is also a prerequisite for funding.

Extensive refurbishments are given particular support, on condition that a given heat demand for heating is achieved. For details about the relevant detailed funding types, funding criteria and the current funding guidelines please refer to the home page of the Province of Tyrol – Department of Housing Support: www.tirol.gv.at/wohnbau

Input from Vorarlberg:

Housing support

Housing support was overhauled via the Housing Support Guideline 2018 [*Wohnbauförderungsrichtlinie 2018*]. Under the Guideline, incentive systems for climate-friendly and ecological measures to achieve climate protection goals were created for the purposes of sustainability and clean energy, in line with the Agreement pursuant to Article 15a of the Austrian Federal Constitutional Law between the Federal Government and the provinces on reducing the emission of greenhouse gases.

For new builds and refurbishments, the Province of Vorarlberg's housing support assists members of the public via a long-term-guaranteed low-interest loan and/or a one-off subsidy in order to meet its objective of establishing cost-effective and sustainable residential buildings.

The refurbishment and improvement of existing residential buildings enables them to be brought up to a sustainable level. Since 2018, owner-occupied multi-dwelling properties have been eligible for property support in the form of a loan to the homeowners' association without personal eligibility requirements being checked.

Support for new builds

Support for new builds is provided in the form of a loan. The term is 35 years. There is a choice between an increasing rate (from 0.5% to 3.25%) and a fixed rate (1.75%). The amount of the loan is made up of the basic support and bonuses. These in turn are expressed in euros per m² and are multiplied by the eligible useful floor area.

Minimum material requirements must be met, such as HFC-free construction materials, PVC-free construction materials in the interior, wood from sustainable sources, render with a maximum 6% plastics content and cement-bound adhesives.

An energy-saving and environmental bonus is paid out for improved building envelope quality, a low total primary energy requirement, low CO₂ emissions, as well as for the use of renewable and ecologically sound construction materials.

Optimised parking spaces for bicycles, preparatory work for e-mobility, the provision of car-sharing spaces and a high building utilisation rate also generate an increase in funding.

The installation of solar thermal collectors, heating systems based on renewable energy carriers and ventilation systems with heat recovery are also supported through outright grants.

Detailed information can be found in the "Overview of support for new builds".

[Overview of support for new builds](#)

Refurbishment support

The Province of Vorarlberg supports thermal refurbishments and the redensification of residential buildings as part of its housing support.

The basic support is based on the (thermally relevant) surface area of the refurbished components – i.e. the square meterage of wall, window or ceiling. The bonuses are added as lump sums per m² of usable living space of the refurbished property. The funding amounts increase as component quality goes up and also for total refurbishments, provided three measures in the building envelope or two measures plus the building technology systems are refurbished at the same time.

The installation of solar thermal collectors, heating systems based on renewable energy carriers and ventilation systems with heat recovery are also supported through outright grants.

In order to support owners in the decision-making process to adopt the optimal refurbishment option for their residential building, participation in refurbishment consultations and refurbishment coaching is supported with attractive one-off grants.

Refurbishment consultation in accordance with the Province of Vorarlberg's Residential Buildings Refurbishment Guideline [*Wohnhaussanierungsrichtlinie*]

These consultations are provided by commercially licensed consultants. The Province of Vorarlberg subsidises consultations for owner-occupied homes, terraced houses and residential accommodation, as well as for multi-dwelling properties comprising up to six housing units, with a one-off grant of 75% of the proven costs, up to a maximum of €1,200 per building or a maximum of €3,000 per building for multi-dwelling properties comprising more than six housing units. Individual dwellings are not given funding.

Refurbishment coaching

If the refurbishment consultant provides assistance up till the point of final invoicing in accordance with the Residential Buildings Refurbishment Guideline, proven costs of 75% are subsidised, up to a maximum of €600 for owner-occupied homes, semi-detached houses and residential accommodation, as well as for terraced houses and multi-dwelling properties comprising up to six housing units, and a maximum of €1,200 for multi-dwelling properties comprising more than six housing units.

Detailed information can be found in the Overview of support for refurbishments.

[Overview of support for refurbishments](#)

Energy subsidies

Heat from renewable energies

The long-term energy policy goal of the Province of Vorarlberg is energy autonomy by 2050. The use of renewable energy carriers has a central role to play here. As part of the 2018/19 energy subsidies scheme, the Province of Vorarlberg is supporting the acquisition of solar thermal collectors, wood-fired heating, heat pumps and ventilation systems with heat recovery in residential buildings.

What is being subsidised?

Heating using renewable energies is subsidised regardless of income. There are no restrictions on the size of the house. The systems in question must be installed as central heating in buildings that act as their occupiers' principal residence all year round.

See also: Subsidy amounts and associated requirements

[Förderhöhen und zugehörige Anforderungen](#)

Input from Vienna:

Vienna housing support

Housing support funding is intended to make affordable housing possible when new construction projects take place. Subsidies are graduated according to income and family situation. Financial support is primarily given to tenants of apartments or residential buildings. There are also special ecological subsidies for environmentally friendly construction and refurbishment measures. Information about housing support and related subjects such as heating, new construction and refurbishment can be found at:

www.wien.gv.at/wohnen/wohnbaufoerderung/foerderungen/

THEWOSAN – Thermal energy refurbishment of housing [Thermisch-energetische Wohnhaussanierung]:

There are various funding opportunities in the area of home improvement and refurbishment. Under the auspices of THEWOSAN – the thermal energy refurbishment of housing – structural measures for the thermal refurbishment of the entire building envelope are promoted, such as insulating all external components, eliminating thermal bridges and increasing passive solar heat gains. Measures relating to technical installations are also promoted, such as the conversion or installation of the heating and hot water system with primary energy-efficient and/or lower-CO₂ or renewable energy carriers. The goal is to significantly reduce both the heat demand for heating and thus also the CO₂ emissions of the building as well as the consumption of fossil fuels. Funding is provided in the form of a non-refundable contribution in the amount of €25-160 per m² of useful floor area, depending on the energy indicators achieved, and of an extra €60 per m² of useful floor area where the passive house standard is reached. The maximum amount of the non-refundable contribution is limited to up to 30% of the total eligible construction costs, depending on the funding class.

Taking account of renewable energy carriers in housing support: It is also one of the prerequisites for receiving support that an appropriate choice of energy carrier be made for the future energy supply. The key guiding principles here are the conservation of the environment and resources and the efficient and economical use of energy.

www.wien.gv.at/stadtentwicklung/energieplanung/foerderungen/wbf.html

Promotion of heat pumps

Heat pumps can help solve energy and environmental problems. The higher the efficiency of a heat pump system, the less electricity is required to operate it and to generate the desired heat. The ambient heat generated by the heat pump comes from regional, renewable resources and does not give rise to any greenhouse gas emissions on site.

Object of funding: Air/water; brine/water; water/water

Target group: Natural and legal persons who make investments in heat pump systems in residential construction in Vienna are eligible to apply.

<https://www.wien.gv.at/amtshelfer/bauen-wohnen/wohnbautechnik/foerderungen/waermepumpefoerderung.html>

Promotion of solar thermal energy:

Solar energy is a renewable energy that can help reduce energy imports, improve the environmental situation and conserve resources. The subsidising of solar thermal systems is intended to create an economic incentive to use solar energy.

Object of funding: Solar-powered systems for the provision of hot water or for partially solar space heating

In the funding programme, a fundamental distinction is made between 'solar thermal systems for single-family or dual-family buildings' and 'solar thermal systems for multifamily buildings of three or more residential units'. There are different funding channels available for each of these two areas.

Target group: Natural and legal persons who make investments in stationary solar thermal systems in Vienna are eligible to apply.

<https://www.wien.gv.at/amtshelfer/bauen-wohnen/wohnbautechnik/foerderungen/solarthermiefoerderung.html>

SUSA – the School Refurbishment Package [*Schulsanierungspaket*]

Over a 10-year period, building stock-preservation measures have been and are still being carried out at 242 general schools. A proportion of the school refurbishment measures cover the energy refurbishment of the buildings. In particular, the Vienna Municipal Department for Building and Facility Management (MA 34), as the specialist department responsible for carrying out refurbishment measures, has updated windows and roofs, provided facades with thermal insulation composite systems, partially insulated the ceilings of topmost storeys and upgraded numerous heating systems, supplying modern, optimised controls, and thus making them state-of-the-art systems. Sustainable effects for the environment and ongoing maintenance have been achieved because the emissions from the heating systems were reduced, as were the heating costs. These measures reduced operating costs and thus took some pressure off local district budgets. The construction projects realised by the Vienna Municipal Department for Building and Facility Management (MA 34) in connection with the School Refurbishment Package thus also make another important contribution to achieving the City of Vienna's climate protection goals. [School Refurbishment Package](#)

Promotion of energy efficiency programmes

The energy efficiency programmes are intended to trigger savings or efficiency increases and to support the implementation of energy-related programmes in Vienna, such as the Smart City Vienna Framework Strategy.

The objects of funding are actions and initiatives with a broad impact and multipliability for the Vienna area. There is no funding for one-off individual measures within a business.

A maximum of three newly submitted energy efficiency programmes are funded each year. An application for funding must be made before work is carried out. The maximum funding amount is 30% of the total costs of the energy efficiency programme in the form of a non-repayable grant and is limited to €60,000 per year and energy efficiency programme. The programme may be implemented up to a maximum of five years after receipt of the complete application.

3.4. Guiding investments into an energy-efficient public building stock, in line with Eurostat guidance (Article 2a(3)(d))

Energy performance contracting scheme

State-of-the-art energy investments at no cost and a resulting long-term cost saving are made possible by the innovative financing and operating model, energy performance contracting. A specialist company (the contractor) plans, implements and finances energy efficiency measures. These investments are repaid by the energy savings achieved or from the sale of electricity and/or heat.

The contractor offers a package of services that can be adapted to individual needs within the municipality or business in question. The term is usually between 5 and 15 years. Upper Austria was the first Austrian province and one of the first European regions to introduce direct funding for energy performance contracting. Energy performance contracting is a financing and operating model for energy efficiency and renewable energy. To date, over 240 energy performance contracting projects have been financed in Upper Austria, with energy investments worth over €70 million.

For examples, please see: <https://http://www.energiesparverband.at/fileadmin/esv/Broschueren/Energie-Contracting.pdf>

CO-MOD – Modular contracting: Increased comfort and efficiency through modular contracting models and energy service provider networks

On average, municipal educational institutions such as schools and kindergartens have a high need for improvements in comfort and increases in energy efficiency. In this connection, *CO-MOD* is intended to develop a flexible, modular concept (with provider networks, various financing options including 'grandparent' contracting and contract modules) that is also capable of handling the individual circumstances of smaller properties.

Brief description:

For some time, the responsibility for meeting this need has lain with energy-savings-guarantee projects, but these are limited to large projects with energy reference costs of over €100,000, especially in the area of final energy efficiency and room comfort conditions.

As part of the *CO-MOD* project, a modular concept was developed that puts forward solutions for implementing measures with improvements in comfort and efficiency, even for smaller investment projects (€20,000-50,000), and that is intended to improve learning conditions in the properties. An essential feature is the involvement of parents and grandparents in the financing of comfort-enhancing measures, in order to close the financing gaps that are currently often present. They act, in a way, as sponsors for the users – in this case their children and grandchildren.

The following questions were raised in connection with market research into how far parents/grandparents and participating stakeholders, such as representatives of the municipalities and heads of educational institutions, acquiesced with this proposal:

- Which measures are to be given priority implementation?
- What factors will play a role in this?
- How and under what circumstances can parents/grandparents be (financially) involved?

Drawing on the findings of the market research, a flexible, modular concept was developed that is capable of taking account of the individual circumstances of even smaller properties.

- Drawing-up and standardisation of technical measures to improve energy and comfort in the areas of 'heat', 'light' and 'air' and of the proof of their performance.
- Service provider: the *CO-MOD* partner network, with partners from various technical business areas, acts as the 'single face to the customer'. Each partner is liable to the customer for their own performance and function. In the individual projects, only those partners who are needed to implement the measures and to ensure smart performance are 'mobilised'.
- Modular financing structure
 - Basic funding via e.g. non-repayable maintenance funds, school and kindergarten funds, needs allocations;
 - Depending on the planned measure, non-repayable grants for energy efficiency or funds from energy supply companies (in connection with measures trading under the Federal

- Energy Efficiency Act [EEffG]), as well as subsidies from the AWS [Austrian Federal development and financing bank], Kommunalkredit Public Consulting and from provinces and municipalities;
- The integration of parents' and grandparents' contributions into the financing of the activities – banks, leasing and non-recourse financing cover the remaining funds.

This project provides the essential foundations for cities and municipalities to close the gap in the energy services portfolio for small properties or low baselines and highlights options for implementing energy efficiency measures with performance guarantees. In so far as there could be said to be a relevant market for this service, the focus is on schools and kindergartens, but it can also apply to municipal administration buildings and offices.

3.5. Accessible and transparent advisory tools, such as one-stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments (Article 2a(3)(e))

Federal policies and actions

klimaaktiv Expert Partners

klimaaktiv Expert Partners are experts who have acquired the necessary knowledge, with specialist qualifications, to apply the current state of the art in energy efficiency and renewable energy in their work. Expert partnerships are tied to an individual and are valid for three years. Proof of refresher training is required after that. *klimaaktiv* Expert Partners (e.g. architects, planners, builders and installers) can be found at:

www.maps.klimaaktiv.at/profis

klimaaktiv Bauen&Sanieren – Consultations

The *klimaaktiv* Bauen&Sanieren scheme is supported in every province across Austria by regional and specialist partners. The decision to develop a building to the *klimaaktiv* standard should be made as early as possible. For that reason, *klimaaktiv* Bauen&Sanieren supports building owners, construction principals and planners in tapping economic energy-saving potential in new or existing buildings and provides advice on the *klimaaktiv* building standards. This enables the quality requirements of the *klimaaktiv* building standard to be interpreted for every property and taken into account in every planning phase. The regional and specialist partners are responsible for the implementation of consultations in the fields of residential buildings and service buildings in accordance with the *klimaaktiv* building standard and for the plausibility checks on *klimaaktiv* buildings.

The regional partners are also available in each province for all questions relating to building declarations and assessments and provide support with regional anchoring and public relations.

For more information, see:

www.klimaaktiv.at/bauen-sanieren/information-beratung/klimaaktiv-team.html

Project: Specifications for a software tool to create a refurbishment roadmap from the energy certificate [Pflichtenheft für ein Software-Tool zur Erstellung eines Sanierungs-Fahrplans aus dem Energieausweis]

Term: 9 months (7.10.2019-30.6.2020)

Description:

The aim of the project, which is co-financed by the Federal Ministry for Sustainability and Tourism and *klimaaktiv*, is the further development and dissemination of an energy consulting tool that is recognised throughout Austria and that will automatically generate a comprehensible report listing cost-optimal recommendations. For on-site energy consultations, computation should be possible via simplified inputting or straight from the energy certificate.

The results of the refurbishment roadmap (including building technology systems) will be presented in

three stages: as data for the existing building, cost-optimal recommendations for a major renovation and in the form of refurbishment steps, in order to attain the cost-optimal variant in the short/medium/long term.

The stipulations for implementation will be made available to all Austrian energy certificate software producers in the form of specifications.

The project is being carried out by the Gerhard Moritz engineering office, with the participation of energy agencies in the provinces, on behalf of the *ARGE EBA (Arbeitsgemeinschaft Energieberater-Ausbildung)* [Working Group on Energy Consultant Training].

Provincial policies and actions

Input from Burgenland

Energy consultation in Burgenland:

Under the slogan *Wohnbau Beratung mit Energie* [Housing Advice with Energy], Burgenland's housing support offers all members of the public a 'one-stop-shop' for free, independent advice for private, residential construction or refurbishment projects.

The Province of Burgenland's advisors are characterised by a number of years of experience and continuous development and training in the fields of energy, housing and aid measures. Free consultations provide members of the public with access to comprehensive information on energy-related topics in the areas of new builds and building refurbishments, heating and air-conditioning systems in buildings and uses of electricity.

Members of the public receive well-founded and coordinated information in the fields of thermal insulation, windows and window installation, heating systems, subsidies, energy saving tips, photovoltaics, storage systems, savings and much more.

A wide variety of brochures and guides are available free of charge for all topics.

The energy consultations last between 1.5 and 2 hours and take place on site, at the offices of the district administration or of the Burgenland Provincial Government or in a local civic centre. Questions that can be answered quickly are often dealt with by phone (service hotline) or email.

Members of the public apply online or by phone for a consultation, and work with the consultant to create a cost-optimal and ecologically prudent refurbishment and new-build plan together. At the end of the consultation, customers receive a consultation report.

Input from Carinthia

Subsidised on-site energy consultation

The Province of Carinthia offers subsidised energy consultations to every household (residential buildings). The product- and company-neutral on-site consultations are performed by specially-trained consultants from Carinthia's Energy consultants network.

www.neteb-kärnten.at

During a consultation, which lasts approximately 2 hours, information is provided on the topics of thermal insulation, window replacement, heating system optimisation/modernisation, the use of solar energy and energy-saving tips for saving electricity. The number of subsidised on-site energy consultations is to be significantly increased – from approximately 2,000 consultations in 2018.

ökofit [Eco fit] Carinthia regional scheme

This regional scheme supports efficiency consultations for businesses. The consulting services range from simple inspection days and energy consultations to support in obtaining various certificates in the energy and environmental sector (the Austrian Ecolabel, ISO 14001, ISO 50001, EMAS, etc.). The maximum duration of a consultation varies from one to twenty days, depending on the consultation

service chosen.

Input from Lower Austria

Energy advice for Lower Austria

Under the slogan *Energieberatung Niederösterreich* [Energy advice for Lower Austria], the Province of Lower Austria offers all citizens a largely free service relating to all energy matters in the field of housing. In addition to a comprehensive website, there is also a hotline for advice and for arranging personal consultations. Interested parties can take advantage of on-site consultations concerning the refurbishment of a building, the conversion of a heating system and the conservation of electricity. Around 80 consultants are currently listed for the consultations. The consultants undergo a detailed selection process and receive regular continuous development. Consultation guides and brochures are available free of charge for all topics.

Consultation services

Immediate advice: Questions that can be answered quickly can often be dealt with on the phone. A free hotline is available for that purpose. The hotline is staffed by qualified energy consultants.

Consultation about refurbishments/energy conservation:

- on-site consultation lasting around 1.5 hours,
- condition analysis of the building, assessment of the energy-saving potential,
- energy-efficiency assessment of the thermal insulation, heating and hot water provision,
- information about subsidies,
- refurbishment suggestions for the building envelope and heating,
- general advice on electricity consumption, mobility and climate protection and the use of renewable energy carriers (e.g. solar thermal collectors, photovoltaic systems, etc.).

Consultation about new builds: Personal initial consultation on all aspects of construction, energy, mobility, subsidies and further consultation options concerning new builds.

Heating check:

- approx. 1.5-hour on site stocktake of heating systems,
- analysis of the heating system,
- drawing-up of tips for optimising the heating systems,
- in the course of the heating check, the building envelope is also examined and refurbishment suggestion are produced.

Electricity conservation consultation:

- on-site consultation lasting around 1.5 hours,
- analysis of appliances that consume electricity,
- development of replacement recommendations,
- drawing-up of tips on how to use electricity efficiently.

Eco-management

Energieberatung Niederösterreich is mainly available to private individuals in their living environment. All other interests, and in particular businesses, are served by *Ökomanagement NÖ* [Eco-management Lower Austria]. *Ökomanagement NÖ* is an initiative that aims to reinforce economically compatible climate and environmental protection in businesses and public institutions. *Ökomanagement NÖ* offers individual consultations with attractive subsidy rates. Subsidised consultations are available to companies of all sizes, as well as to non-profit organisations.

A willingness to implement quantifiable environmental and climate protection measures that go beyond the minimum legal requirements is a prerequisite for participation.

Input from Upper Austria

In addition to the support offered by its various departments, the Province of Upper Austria offers comprehensive and easily accessible advisory tools through its Energy Saving Association, which cover subsidies and financial instruments in particular, as well as technical matters.

Provision of energy consultations

Through its energy agency, the Upper Austrian Energy Saving Association [*Oberösterreichischer Energiesparverband*], the Province of Upper Austria offers a comprehensive and product-independent range of energy advisory services for the refurbishment of buildings for private individuals, businesses and public institutions.

All the details can be found at: www.energiesparverband.at

Energy consultation in relation to refurbishment and renovation for private individuals

Anyone planning the refurbishment of an owner-occupied home or, for example, considering the purchase of a new heating system, is entitled to a free, individual energy consultation. In most cases, the consultation takes place on site and takes about 1.5 hours.

Consultation by phone

Many questions that can be answered quickly can be dealt with via the energy savings hotline. A free hotline is provided for this purpose on 0800 205 206, as well as the electronic *Ask an Expert* service.

Energy consultation for businesses

The energy consultation for businesses services supports businesses in reducing their energy costs and thereby increasing their competitiveness. The consultants draw up tailor-made suggestions for all areas relating to the improvement of energy efficiency in buildings. They provide frameworks for decision-making on the use of innovative technologies and renewable energy sources within businesses. Consultation takes place on site in the company/business building and includes up to 3 consultation days.

Energy consultation for public buildings

The free consultation offered by the Province of Upper Austria (e.g. for municipal buildings) includes an on-site consultation and covers all areas relating to the improvement of energy efficiency in buildings and how they can switch to renewable energy. These areas range from reducing operating costs and energy savings, correct user behaviour and procurement, questions about the refurbishment of schools and other public buildings, and lighting projects to specific support in terms of implementation or participation in architectural competitions.

So far, 230 local energy advice days have been organised in cooperation with Upper Austria's municipalities. Energy consultants from the provincial agency carry out energy consultations, usually in a room provided by the municipality.

Municipal and regional energy plans

Energy plans are an important tool for establishing the current energy status and planning the energy future, in particular for implementing specific measures in public buildings. The province's Energy Saving Association advises municipalities and other local authorities on the creation of regional and municipal energy plans. In order to promote the overall increase in energy efficiency at the local level, the Energy-saving Community [*Energiespargemeinde – E-GEM*] scheme was launched several years ago, which has since been continued in the shape of the Community Energy Scheme [*Gemeinde-Energie-Programm – E-GEP*]. This scheme provides an additional impetus for local holistic energy planning activities. 182 *E-GEM* communities are currently carrying out local energy planning or are implementing their plans.

Advice on social media

In addition to consultations in person, more than 100,000 registered visitors are counted each year on

the Upper Austrian Energy Saving Association's internet portals, with more than 300,000 recorded page views.

Quality assurance

In order to improve and further develop the range of advisory services, energy consultations are continuously evaluated. The results of the evaluation form an important element of the continuous development of the energy consultants, as well as the market-oriented further development of the advisory services. Customers rate the range of services and the advice given by the province's Energy Saving Association as very good; the consultations received an average grade of 1.16 using the Austrian school grading system, where 1 is excellent and 2 is good.

Training and continuous development – *Energy Academy*

The extensive training and continuous development programme of the Province of Upper Austria's Energy Saving Association takes account of the wide range of developments in the field of energy technology. Under the auspices of the *Energy Academy*, a comprehensive continuous development programme is available covering all aspects of energy technology, energy management, energy consulting, construction engineering, renewable energy and energy efficiency. The target market includes energy managers in companies, communities and institutions, construction engineering and building technology systems experts, planners, energy consultants, energy auditors and interested citizens. There are currently over 30 seminars on various topics.

www.energyacademy.at

Energy consultant training and continuous development for consultants

Energy consultant training is an essential tool to meet the increasing demand for energy consultations. For many participants it represents further vocational training; for others it is their entry point into a new field of work. The energy consultant courses run for the province by the Upper Austrian Energy Saving Association are based on the course concept developed by the national Working Group on Energy Consultant Training (ARGE EBA). Since the early 1990s, around 1,000 people have taken part in energy consultant training in Upper Austria.

Input from Salzburg

Energy Consulting Salzburg – Free and independent on-site consultation for new builds and refurbishments

Energy Consulting Salzburg offers all Salzburg households the possibility of free and independent advice for the private residential sector. Over 40 specially trained consultants serve customers quickly and individually on site (1½ hours).

The aim of every consultation is to achieve optimal energy cost savings step by step.

- identify potential for improvement,
- evaluate the planning concept and check for energy efficiency,
- discuss support options,
- definition of quality criteria for soliciting quotations,
- analysis of the energy advantages and disadvantages of different offers.

Customers apply online or by phone for a consultation. They then work with the consultant on site at the property in question to develop a cost-optimal and ecologically prudent refurbishment or new-build plan. At the end of the consultation customers receive a consultation protocol with a recommendation individually tailored to their needs. Approximately 2,500 consultations are carried out annually.

Salzburg Environmental Service

The Salzburg Environmental Service is also available, providing independent advice on all environmental issues for businesses, communities and institutions.

<https://umweltservicesalzburg.at/>

Input from Styria

Immediate advice, no appointment necessary: Many questions that can be answered quickly can often be dealt with on the phone. A free hotline is provided for this purpose, or there is also a personal immediate information service available without an appointment at the information centre for energy and housing

- Output: Recommendations, information on consultation options, information material

Initial consultation: Half-hour personal initial consultation on all aspects of energy, mobility, subsidies and further consultation options

- Output: Recommendations, information on consultation options, information material

Energy poverty consultation:

- comprehensive on-site consultation
- Participants learn all about energy efficiency and the individual savings potential in their household;
- they also get a free energy-saving package,
 - for low-income households.
 - Output: Recommendations, written documentation, information material

Consultation about energy conservation:

- on-site consultation lasting around 1.5 hours,
- identification of energy-saving potentials,
- evaluation of electricity and heating bills,
- suggestions on how to reduce energy costs, mobility and climate protection, and the use of renewable energy carriers (e.g. solar thermal collectors, photovoltaic systems, etc.).
- Output: recommendations, written documentation, information material

On-site building check:

- on-site stocktake lasting 1.5-2 hours,
- refurbishment suggestions for the building envelope and heating,
- refurbishment plan,
- information about subsidies,
- details at: www.ich-tus.at
- Output: refurbishment plan, consultation

New-build or refurbishment consultation:

- energy efficiency assessment of planning, component designs, thermal insulation, heating, hot water provision and funding information,
- condition analysis, refurbishment suggestions, thermal insulation, heating, subsidy advice.
- Output: recommendations, information material

Opinion on support for owner-occupiers:

- verification of the energy certificate,
- energy consultation,
- preparation of the energy consultancy's opinion on owner-occupier support.
- Output: verification of energy certificate; drawing up of an opinion

Rough thermographic analysis, comprehensive analysis:

- thermographic images of buildings (or building units),
- evaluation of 4 to 6 interior and 10 to 20 exterior thermographic images,
- written thermographic report,
- consultation in the advice centre (approx. 1 hour, with a comprehensive analysis).
- Output: Thermographic report

Other services: Lectures and individual energy consultations for municipalities, schools, housing developers, businesses, etc., meter rental (free of charge)

Input from Tyrol:

Energy advice for energy-efficient construction and refurbishment

The Province of Tyrol founded the association *Energie Tirol* [Energy Tyrol] in 1992 as an independent advice centre for the promotion of environmentally friendly energy technologies and the economical use of energy.

The consulting service is carried out independently of products and companies. Its focus is on energy-saving construction engineering and building technology systems, as well as environmentally friendly heating. A key element of the refurbishment consultations is the development of an individual refurbishment plan.

Through its financial involvement in *Energie Tirol*, the Province of Tyrol supports the provision of comprehensive advice on energy-efficient construction and refurbishment.

<http://www.energie-tirol.at>

Training and continuous development

Energie Tirol regularly holds energy consultant courses (basic and continuation courses) on behalf of the Province of Tyrol, and also offers 'updates' on specific topics in addition to the basic training.

<https://www.energie-tirol.at/energie-akademie/>

Input from Vorarlberg:

Measures for the private sector

Independent, product- and company-neutral, quality-verified energy consultation is the key to the implementation of high-quality energy efficiency measures and also an essential trigger for investments in the construction industry (construction and ancillary construction trades).

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Energy hotline

- the first point of contact for energy issues relating to construction and living – whether about a new build or refurbishment, a subsidy or energy certificates.

Where the energy hotline is designed to help:

- for all energy-related questions about new builds and refurbishment,
- for subsidy questions,
- for questions and applications about all other consultation services.

On-site energy consultation

The all-round consultation for all questions that are best answered on site. This consultation is free of charge.

What an energy consultation will help with:

- questions about structural solutions,
- questions about building technology systems in existing buildings,
- questions about the economic viability of measures.

What you get out of an energy consultation:

- categorisation of your energy consumption to enable it to be compared to others,
- knowledge about the most effective savings options,
- clarity about how to proceed.

New-builds and subsidies consultation

- for builders who are building a house or buying a dwelling and want to optimise energy efficiency, energy costs and subsidies,
- duration of around 2 hours, with small cost contribution required.

Where the new-builds consultation is designed to help:

- questions about structural solutions (floor plan layout, insulation, thermal bridges, etc.),
- questions about the use of renewable energy carriers (heating, solar thermal energy, photovoltaics, electricity storage, etc.),
- questions about the economic viability of measures,
- questions about energy certificates and housing support,
- questions about choice of materials.

Pre-refurbishment consultation

- for detailed questions before starting a refurbishment,
- out-of-the-box thinking and the most attractive refurbishment option included,
- scope max. 20 hours.

Where the pre-refurbishment consultation is designed to help:

- recognising the full potential of a building,
- rethinking living space, in particular in an out-of-the-box way,
- finding the most attractive option among many.

What private individuals get out of a pre-refurbishment consultation:

- clarity about the use of the building over the next 20 to 30 years,
- the optimal refurbishment option,
- rough cost estimate and financing overview,
- the most solid basis on which to start specific planning.

Refurbishment consultation in accordance with the Province of Vorarlberg's Residential Buildings Refurbishment Guideline [*Wohnhaussanierungsrichtlinie*]

These consultations are provided by commercially licensed consultants. The Province of Vorarlberg subsidises consultations for owner-occupied homes, terraced houses and residential accommodation, as well as for multi-dwelling properties comprising up to six housing units, with a one-off grant of 75% of the proven costs, up to a maximum of €1,200 per building or a maximum of €3,000 per building for multi-dwelling properties comprising more than six housing units. Individual dwellings are not given funding.

Refurbishment coaching

If the refurbishment consultant provides assistance up till the point of final invoicing in accordance with the Residential Buildings Refurbishment Guideline, proven costs of 75% are subsidised, up to a maximum of €600 for owner-occupied homes, semi-detached houses and residential accommodation, as well as for terraced houses and multi-dwelling properties comprising up to six housing units, and a maximum of €1,200 for multi-dwelling properties comprising more than six housing units.

Detailed information can be found in the Overview of support for refurbishments.

Measures for the 'non-private sector'

Impuls3 is funded by the Ministry of the Environment and the Province of Vorarlberg. The following activities are financed/supported with subsidies from these funds:

- consultations about energy and environmental issues in businesses,
- consultations about energy and environmental issues in municipalities,
- advice about obtaining environmental certificates for tourism firms and schools,

- advice about obtaining the *ÖKOPROFIT* [ECO-PROFIT] certificate,
- networking and continuous development for consultants,
- collection and publication of examples of good practice.

Input from Vienna:

Refurbishment consultation

The City of Vienna offers free personal consultations to provide detailed answers to questions about extensive refurbishment and potential subsidies.

Information sessions

Wohnfonds_wien regularly organises information sessions for specialists and decision-makers (property owners and managers), especially in connection with new developments in the field of subsidies.

The decision-making process in apartments is supported by participation in tenant and owner general meetings to provide information about funding opportunities.

EU project *Integrated Home Renovation Services = RenoBooster*

Vienna has been provided with an opportunity to develop new consultation services or sources of financing for home refurbishments under the EU-funded *RenoBooster* project.

The aim is to promote refurbishment processes by bundling different services at a single point of contact, with a particular focus on private housing. The ultimate objective is to enhance the scope and quality of refurbishments. At the same time, particular emphasis is placed on the involvement of stakeholders from the real estate and construction sectors and from the fields of administration and finance. Refurbishing a house can be a very challenging process.

The project seeks to shed more light on the status quo and current requirements from the perspective of home or building owners. Tailored services will then be developed on this basis.

The first refurbishment projects will benefit from newly developed services such as refurbishment support workers, one-stop-shop packages for single-family building refurbishments or special quality assurance services while the project is still running. The legal framework and funding instruments will also be investigated and tailored to future challenges. A web portal is planned as a single channel to enable access to the most important services and information on offer.

4 Summary

In the present document, scenarios are developed based on the actual trends in the almost complete data sets for the last 3 decades for the following parameters,

- development of population figures,
- the building stock,
- the final energy consumption of the buildings,
- the resultant GHG emissions.

These scenarios attempt to determine, against the background of demographic developments and an appropriate building stock, the final energy consumption and GHG emissions for the next 3 decades.

Pure trend calculations, qualified trend calculations and expert-based trend calculations were used to derive a forecast funnel for GHG emissions for the years 2030, 2040 and 2050. The most important results of this investigative work, resulting from the comprehensive preparations of an OIB working group (composed of the Expert Advisory Council for construction engineering guidelines – Subcommittee for energy conservation and thermal protection (SVBBTRL 6) and the Coordination group for the implementation of the EPBD) and a stakeholder process, are as follows:

- On the basis of the expected final energy consumption and the expected energy carrier mix, it is

possible to achieve a saving of 80% by 2050, as required under the EPBD.

- With maximum effort and in the best-case scenario (in particular the presence of a quantity of approximately 2.5 TWh of green gas), the GHG savings of 3 million tonnes (calculated from the 2017 data basis) envisaged in the NECP can be achieved in 2030.

However, it is a prerequisite for both targets that there should be not only further favourable economic and social development, but also long-term funding campaigns coordinated between the Federal Government and the provinces, sufficient Federal Government funding for the provinces within the framework of future equalisation transfers, and the parallel development of incentive systems for the refurbishment of buildings.

5 Sources

Statistics Austria:

- *EEV Energetischer Endverbrauch, ET Energieträgermix* [Final energy consumption (FEC) and energy mix (EM)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Österreich (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Austria (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Burgenland (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Burgenland (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Kärnten (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Carinthia (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Niederösterreich (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Lower Austria (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Oberösterreich (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Upper Austria (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Salzburg (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Salzburg (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Steiermark (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Styria (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Tirol (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Tyrol (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Vorarlberg (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Vorarlberg (detailed information)]
- *EEV 1993 bis 2017 nach ET und Nutzenergiekategorien für Wien (Detailinformation)* [FEC 1993-2017 by EM and useful energy categories for Vienna (detailed information)]

- *Gesamtenergiebilanz Österreich 1970 bis 2017 (Detailinformation)* [Overall energy balance sheet for Austria, 1970 to 2017 (detailed information)]
- *Energiebilanz Burgenland 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Burgenland, 1988 to 2017 (detailed information)]
- *Energiebilanz Kärnten 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Carinthia, 1988 to 2017 (detailed information)]
- *Energiebilanz Niederösterreich 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Lower Austria, 1988 to 2017 (detailed information)]
- *Energiebilanz Oberösterreich 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Upper Austria, 1988 to 2017 (detailed information)]
- *Energiebilanz Salzburg 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Salzburg, 1988 to 2017 (detailed information)]
- *Energiebilanz Steiermark 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Styria, 1988 to 2017 (detailed information)]
- *Energiebilanz Tirol 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Tyrol, 1988 to 2017 (detailed information)]
- *Energiebilanz Vorarlberg 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Vorarlberg, 1988 to 2017 (detailed information)]
- *Energiebilanz Wien 1988 bis 2017 (Detailinformation)* [Energy balance sheet for Vienna, 1988 to 2017 (detailed information)]

- *Ergebnisse im Überblick: Wohnsituation* [Overview of results: housing situation]
- *Ergebnisse im Überblick: Wohnungsgröße* [Overview of results: dwelling size]

- *Jahresdurchschnittsbevölkerung 1952-2017 nach Bundesland* [Average annual population 1952-2017 by province]
- *Vorausberechnete Bevölkerungsstruktur für Österreich 2017-2100 laut Hauptvariante* [Predicted population structure for Austria 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für das Burgenland 2017-2100 laut Hauptvariante* [Predicted population structure for Burgenland 2017-2100 according to the primary scenario]

- *Vorausberechnete Bevölkerungsstruktur für Kärnten 2017-2100 laut Hauptvariante* [Predicted population structure for Carinthia 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Niederösterreich 2017-2100 laut Hauptvariante* [Predicted population structure for Lower Austria 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Oberösterreich 2017-2100 laut Hauptvariante* [Predicted population structure for Upper Austria 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Salzburg 2017-2100 laut Hauptvariante* [Predicted population structure for Salzburg 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für die Steiermark 2017-2100 laut Hauptvariante* [Predicted population structure for Styria 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Tirol 2017-2100 laut Hauptvariante* [Predicted population structure for Tyrol 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Vorarlberg 2017-2100 laut Hauptvariante* [Predicted population structure for Vorarlberg 2017-2100 according to the primary scenario]
- *Vorausberechnete Bevölkerungsstruktur für Wien 2017-2100 laut Hauptvariante* [Predicted population structure for Vienna 2017-2100 according to the primary scenario]

OIB documents:

- OIB Guidelines 1-6, issued April 2019
- Explanatory comments to OIB Guideline 6, issued April 2019
- OIB Handbook 'Energietechnisches Verhalten von Gebäuden' [Energy behaviour of buildings], issued April 2019
- OIB Document demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU, 28 March 2014
- OIB Document demonstrating the cost-optimal nature of the requirements of OIB Guideline 6 and of the national plan pursuant to Article 5 of Directive 2010/31/EU, 26 February 2018
- OIB Document defining nearly zero-energy buildings and establishing intermediate targets in a national plan pursuant to Article 9(3) of Directive 2010/31/EU (the EPBD), 28 March 2014.
- OIB Document defining nearly zero-energy buildings and establishing intermediate targets in a national plan pursuant to Article 9(3) of Directive 2010/31/EU (the EPBD), 20 February 2018.

Other national documents

- Long-term renovation strategy 2014, can be viewed at https://ec.europa.eu/energy/sites/ener/files/documents/2014_article4_de_austria.pdf
- Long-term renovation strategy 2017, can be viewed at https://ec.europa.eu/energy/sites/ener/files/documents/at_building_renov_2017_de.pdf
- Integrated National Energy and Climate Plan (NECP) – Period 2021-2030, pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, 18 December 2019, can be viewed at https://www.bmlrt.gv.at/umwelt/klimaschutz/klimapolitik_national/nationaler-energie-und-klima-plan.html
- Federal Act on increasing energy efficiency within companies and the Federal Government (Federal Energy Efficiency Act) [*Bundes-Energieeffizienzgesetz – EEffG*], can be viewed at <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20008914>

European directives and regulations:

- Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)
- Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency
- Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on

energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC

- Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

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