

Implementation of the Energy Efficiency Directive in
Austria

**Analysis of the potential for further development in
the energy services market**

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1. Current state of the energy services market

1.2. Size and maturity of the market

1.2.1. Energy contracting

When speaking of energy contracting, it is helpful to distinguish between 'performance contracting' and 'plant contracting'. These two service provision models both start with the conclusion of a contract, but they are implemented in very different ways.

Performance contracting begins with a detailed analysis at the location in question; possible measures for increasing energy efficiency are drawn up. These potential savings are then realised by the energy service company. This means that the service provider is responsible for the planning, investment and implementation. The savings that are achieved are used to pay for the investments that were made. Following the end of the contract, the cost benefits brought about by the energy savings remain with the customer.

Plant contracting (or 'energy supply contracting') involves the complete outsourcing of responsibility for the supply of useful energy (e.g. for space heating). The installation and operation of a system or plant, including provision of the required energy sources, are set out in a contract between the energy service company and the customer. In this model too, the service provider is responsible for the planning, investment and implementation. Following the end of the contract, the plant becomes the property of the customer (having been the property of the service provider until that point). For the entire duration of the contract, the customer pays a price that is set in advance with a selected reference basis (Austrian Society for Environment and Technology (Österreichische Gesellschaft für Umwelt und Technik – ÖGUT) 2007).

Performance contracting:

Contracting models began to be introduced in Austria roughly at the start of the current century; their development has been very volatile in recent years. There are currently 36 performance contracting projects registered in the contracting database (managed by ÖGUT). This includes projects that have already finished as well as ones that are currently running.

The number of **performance contracting projects** over time is represented in the following Figure 1 (ÖGUT 2013). It shows that the number of projects being carried out rose continually until the year 2010, but was then followed by a marked decline in active projects, extending to the year 2020. One reason for this decline could be the expiry of contracts. However, with the constant figures from 2005 to 2010 and an average contract term of 10 years, this would only explain a decline from around 2015 onwards. Therefore, the major cause is likely to be a reduction in the number of contracts concluded in recent years, or a reduction in contract term lengths.

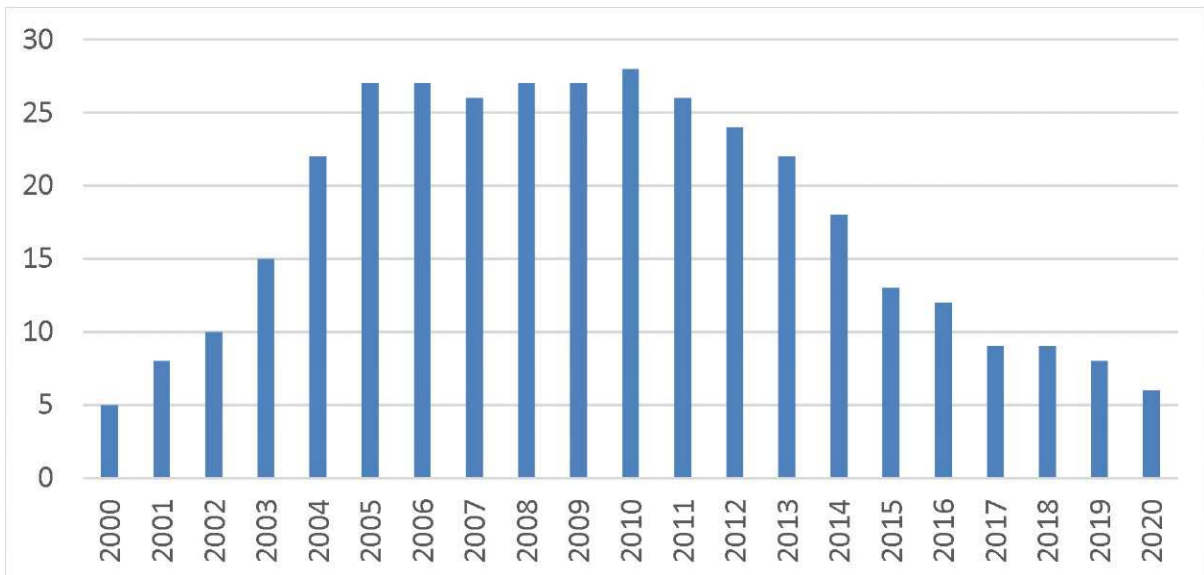


Figure 1: Number of performance contracting projects over time (ÖGUT 2013)

A similar picture can be seen in Figure 2, which shows the financial savings achieved through contracting projects. Here once again we see an initial increase until 2008, directly followed by a continual decline. The year 2008 saw the greatest amount of savings made, at 2.3 million euros; otherwise, the annual cost benefits for the years 2005 to 2013 ranged between 1.6 million (in 2013) and 2 million euros (ÖGUT 2013).

The major difference between this graph and the previous one is the lack of a level plateau. This suggests an additional reduction in the savings per contract in recent years. This could be the result of lower project volumes or of lower potential for savings in the projects.

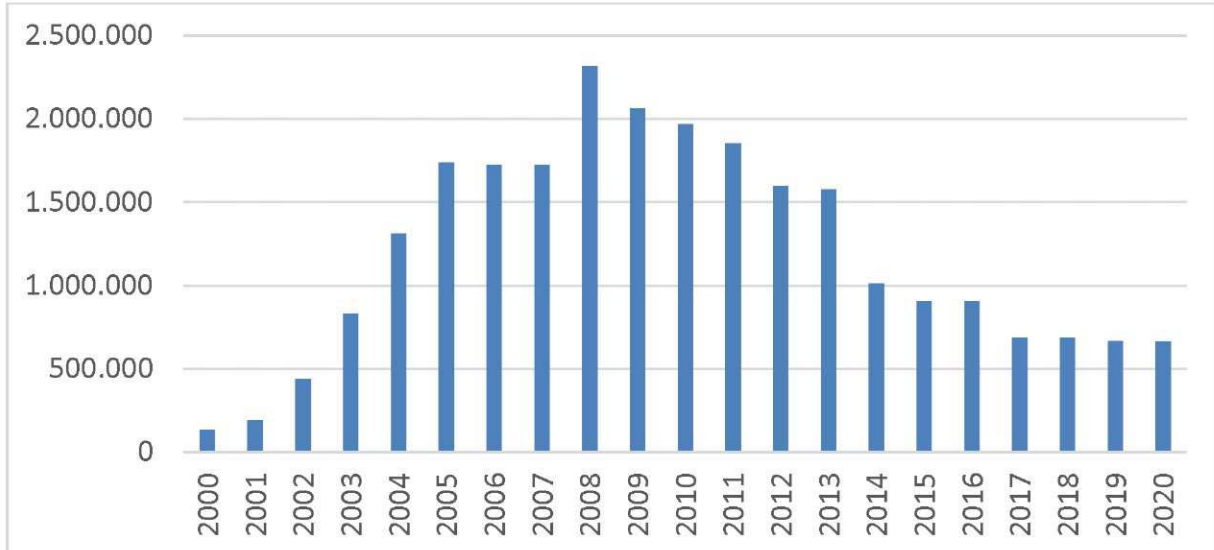


Figure 2: Financial savings (in euros) from performance contracting over time (ÖGUT 2013)

The greatest amount of **savings, at 2.3 million euros** in 2008, stands against an **investment amount of approx. 26.7 million euros**. This results in a 'break-even time' (i.e. the time it takes for the investment to pay for itself) of considerably more than 10.7 years (= investment / annual savings). On the emissions front, these projects were able to save **around 8 225 tonnes of CO₂ per year**.

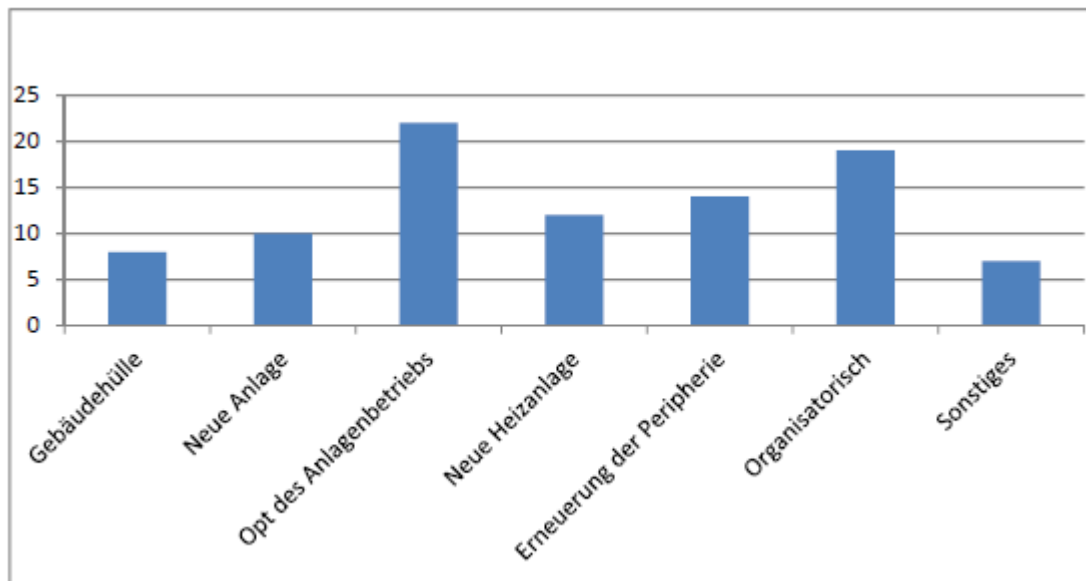


Figure 3: Types of measures carried out (ÖGUT 2013)

Gebäudehülle	Building envelope
Neue Anlage	New system
Opt des Anlagenbetriebs	Optimisation of system operations
Neue Heizanlage	New heating system
Erneuerung der Peripherale	Renovation of peripherals
Organisatorisch	Organisational changes
Sonstiges	Other

Figure 3 shows what types of measures were carried out to achieve the energy savings, and how often these were used by the contractors. It is clear from the chart that the most frequently employed measures were an optimisation of system operations (settings, control parameters, monitoring) and purely organisational measures (runtimes, temperature decreases) (ÖGUT 2013).

Plant contracting

Plant contracting, like performance contracting, increased sharply from the beginning of the 2000s, with a large increase in the number of projects carried out in that decade. One striking difference here compared to the development of performance contracting over time is that a decline in the number projects began later, from around 2014; however, this can again be traced back to the expiry of contract terms (see Figure 4).

Unfortunately, in this area there is no concrete information on energy savings, and very little information on investment and its effects. The information that is available shows reductions in **CO₂ emissions** from 21 projects amounting to **74 478 tonnes per year**, and **investment amounts** from 13 projects of **53 million euros**. Despite the low number of projects providing information, the amounts are substantially higher than those from performance contracting. Here, the measures carried out are not as varied as with performance contracting, because plant contracting generally involves the installation or replacement of an energy system (often a biomass plant) (ÖGUT 2013).

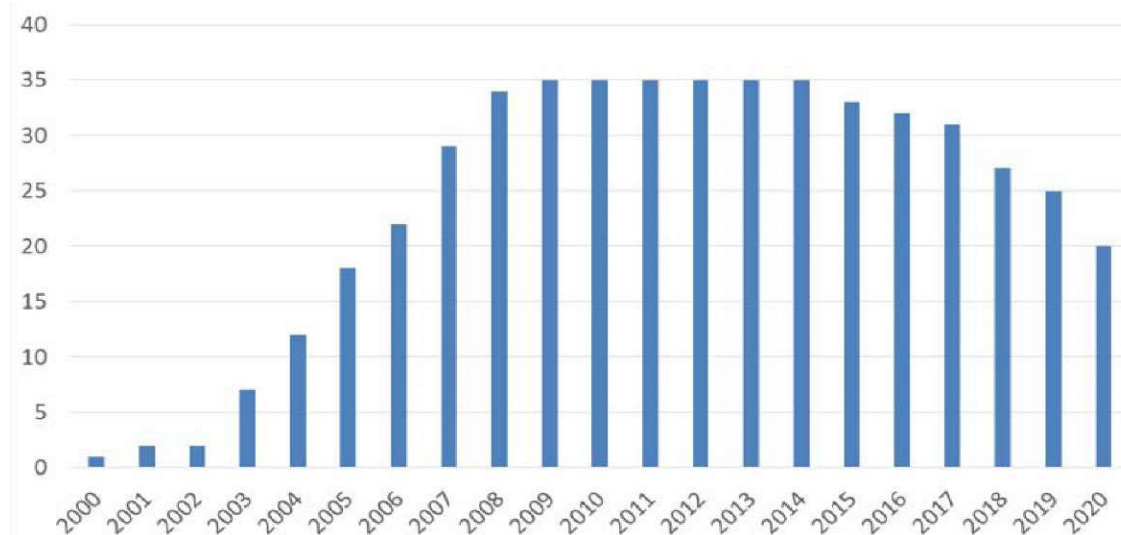


Figure 4: Number of plant contracting projects over time (ÖGUT 2013).

Government contracting

The year 1979 saw the creation of the positions of 'special energy representatives of the federal government' (ESBs or *Energiesonderbeauftragte des Bundes*). Two decisions of the council of ministers dated 11/09/1979 and 14/04/1980 provided the legal basis for this (these decisions were also the source of the title 'special energy representative'). In 2004, these positions were transferred to the Austrian Federal Office for Calibration and Measurement (BEV); as of September 2013 there were 16 people at the BEV designated as ESBs.

The role of ESB originally focused on monitoring activities in relation to the heating systems and 'heating personnel' of federal buildings. During the course of the last few decades, changes have continually been made to the role of ESB in order to adapt to new developments. In this context the 'Government Contracting 500' ('Bundes-Contracting 500') project, initiated through a 2001 decision of the council of ministers, should also be mentioned. The role of ESB now essentially encompasses three large areas:

- Energy management (federal administration energy statistics and accounting of final energy consumption, with reports made to the government departments);
- Advice and support given to the departments (= ministries and subordinate offices) regarding energy management and energy efficiency, particularly in connection with government contracting (= energy-saving service contracts concluded between energy-savings contractors and the departments), and
- Preparing an annual monitoring report for each contracting pool, and issuing energy certificates for federally owned buildings used by the federal government (calculating and issuing for buildings managed by *Burghauptmannschaft Österreich*, an entity managing publicly-owned castles, palaces etc.).

The ESBs carry out important activities in connection with government contracting (contractor <--> BIG as landlord <--> ESBs in co-operation with the ministry as the client). In our opinion, the legal anchoring of the ESBs and the legal obligation of the users to participate in government contracting are particularly important for the continued positive development and expansion of government contracting. The intention is also to pursue closer interaction in future between the ESBs and the energy advisors of the federal states, as well as institutions in the environmental energy sector.

BIG (the federal real estate company Bundesimmobiliengesellschaft) is a service provider in connection with governmental performance contracting. BIG is the building owner (landlord); but the activities can also take place in buildings with other owners, provided that the federal government is the tenant there (e.g. rented from a local authority).

The programme has been running for approx. 12 years. Currently, 3 million m² out of 10 million m² of usable space is involved. A total of 312 buildings are grouped into various different 'pools'. The average annual energy savings, as a mixed percentage across all the pools, is 20%. Some pools cover heat and electricity, some only heat. Savings of up to 30% are achieved for heat, whereas for electricity the figure is only around 4–5%. This is all achieved through relatively modest measures. The main areas involved in contracting are schools (federal government) and the justice system.

Contracts have a term of 10 years. The contractor also provides all the investment which becomes the property of the client after 10 years. Furthermore, the contractor is responsible for optimal operations management, and is often commissioned to continue providing this after the expiry of the contract because it has proved to be very valuable.

From 1980 up to and including 2012, the efforts of the ESBs have brought about **savings of approx. 674 300 000 euros or 21 245 GWh** through contracting activities and other measures. That is on average approx. *20 million euros or 644 GWh* per year (corresponding to about 2/3 of the annual energy consumption of all federal departments). The Austrian Federal Ministry of Science, Research and Economy (Bundesministerium für Wirtschaft, Forschung und Wirtschaft – BMWFW) works together with the ESBs to discover further energy-saving opportunities with the help of analyses, projects and new strategies. A 'government contracting offensive' started in 2004 and had a clear impact on the statistics.

In terms of energy sources, it should be noted that **district heating and natural gas have almost entirely replaced heating oil and coal. Natural gas supply rose from approx. 11% to approx. 35%** while **district heating supply rose from approx. 18% to approx. 58%**. Solid fuel supply declined from approx. 15% to approx. 0.8%, while heating oil supply was reduced from approx. 53% to around 6% (see Figure 5). Finally, Figure 6 shows the energy savings achieved over time.

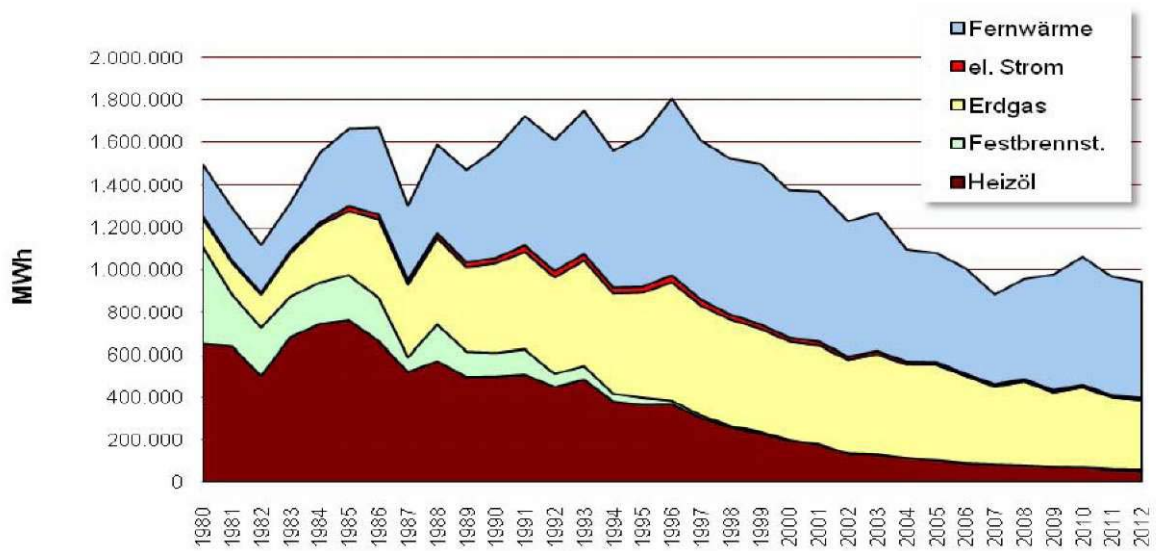
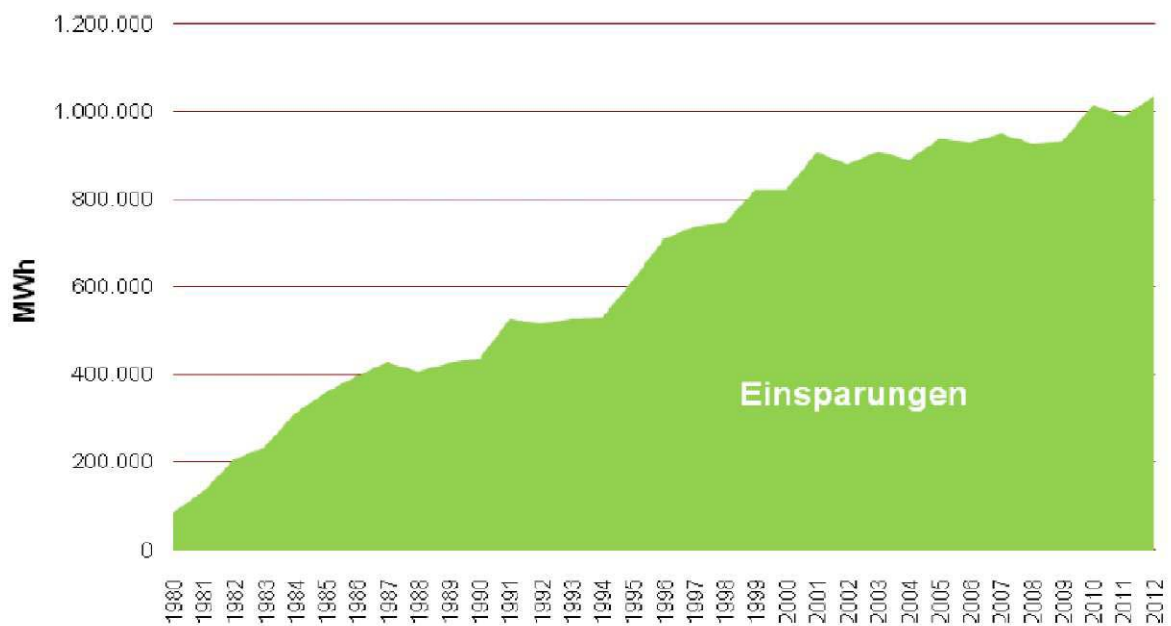


Figure 5: Development of energy source usage 1980–2012 (BMFWF's eGISY)

Fernwärme	el. Strom	Erdgas	Festbrennst.	Heizöl
District heating	Electricity	Natural gas	Solid fuels	Fuel oil



Einsparungen	Savings
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1.2.2. Energy advice

Another type of energy service is providing information and advice on energy. Various funding programmes and methods of providing advice are examined below:

- 'Energy audits' offered by the federal states
- Funding as part of the 'regional programmes of the federal states'
- 'SME energy efficiency check', a funding programme of the Klima- und Energiefond (Climate and Energy Fund)

The 'regional programmes' and 'SME energy efficiency check' are run with the support of the federal government.

Energy audits offered by the federal states

The following Table 1 lists the responsible advice centres of each of the federal states.

Table 1: Overview of the advice centres of the federal states (Austrian Energy Agency (Österreichische Energieagentur), Klima:aktiv Dachmanagement 2013)

Burgenland	Environmental co-ordination department
	Energie Burgenland
	PanSol
	Europäisches Zentrum für erneuerbare Energie Güssing GmbH (EEE)
Lower Austria	Energieberatung Niederösterreich
	AEE Arbeitsgemeinschaft ERNEUERBARE ENERGIE NÖ-Wien (Renewable Energy Association, Lower Austria / Vienna)
	AGRAR PLUS GesmbH
	Lower Austria Chamber of Labour
	Energy Agency of the Regions
	EVN Energievertrieb GmbH & Co KG
	Municipal authority of the state capital St. Pölten, Environmental protection and market affairs
	Energy and Environment Agency of Lower Austria (formerly 'die umweltberatung')
	Lower Austria Economic Chamber
Upper Austria	OÖ. Energiesparverband (Energy Saving Association of Upper Austria)
	Energie AG Oberösterreich
	Kundenzentrum Linz AG
	Upper Austria Economic Chamber
	OÖ. Gas-Wärme GmbH
Salzburg	Office of the Salzburg state government, department 15
	Salzburg AG
	umweltservicesalzburg
	Energie Tirol

Tyrol	TIWAG - Tiroler Wasserkraftwerke AG
	Service Centre of the Tyrol Economic Chamber
Vorarlberg	Energy Institute Vorarlberg
	Arbeitsgemeinschaft Erneuerbare Energie Vorarlberg (Vorarlberg Renewable Energy Association)
	VKW - Customer Service Centre
Styria	LandesEnergieVerein Steiermark (Styria Energy Association)
	Arbeitsgemeinschaft Erneuerbare Energie (Renewable Energy Association)
	Steirische Wirtschaftsförderung
	Verein Regionalenergie Steiermark (Styria Regional Energy Association)
	Energy Agency Upper Styria
	Energieagentur Stainz (Stainz Energy Agency)
	Technologiezentrum Deutschlandsberg
	Energy officer for the federal state of Styria
	Grazer Energieagentur
	Lokale Energieagentur Oststeiermark (LEA)
	Graz Office of the Environment
	AEE Institute for Sustainable Technologies
	Carinthia
AEE Arbeitsgemeinschaft Erneuerbare Energie (Renewable Energy Association)	
Carinthia Chamber of Labour	
Energie Klagenfurt GmbH	
KELAG - Kärntner Elektrizitäts-Aktiengesellschaft	
Vienna	'die umweltberatung' Vienna
	AEE Arbeitsgemeinschaft ERNEUERBARE ENERGIE NÖ-Wien (Renewable Energy Association, Lower Austria / Vienna)
	Verein für Konsumenteninformation (VKI) (Consumer Information Association)
	WIEN ENERGIE Haus

Regional programmes of the federal states

Within the framework of the regional programmes, there were 20 055 realised measures (implemented in 2 679 businesses) registered in the database of measures in January 2014. These led to investment costs of 967 million euros (Database of measures (Maßnahmendatenbank), regional programmes 2014).

Of these 20 055 implemented **measures, 4 213 showed energy-related effects**. These were implemented by **1 713 businesses through 2 450 participations** (= audits carried out) and led to savings of **391.5 GWh per year** with a financial saving of **18.3 million euros**. This enabled an annual reduction in **CO₂ of 117.4 kilotonnes** to be achieved (Database of measures, regional programmes 2014).

The above figures apply to all audits carried out within the framework of the 'Regional programmes of the federal states' funding programme. The information that follows represents only those energy audits that took place at **small and medium-sized enterprises (SMEs)**. An SME (according to the European Commission, 2003) is an enterprise with fewer than 250 employees and either an annual turnover not exceeding 50 million euros or an annual balance sheet total not exceeding 43 million euros. For the SMEs there were **3 215** energy-related measures that had been implemented by **1 430 businesses** since 2005. Figure 7 shows a continual rise in the number of implemented measures and participating businesses up until 2010. From 2010 onwards we see another decline (cf. developments in contracting, 1.1.1.), for both the measures and the participating businesses (Database of measures, regional programmes 2014).

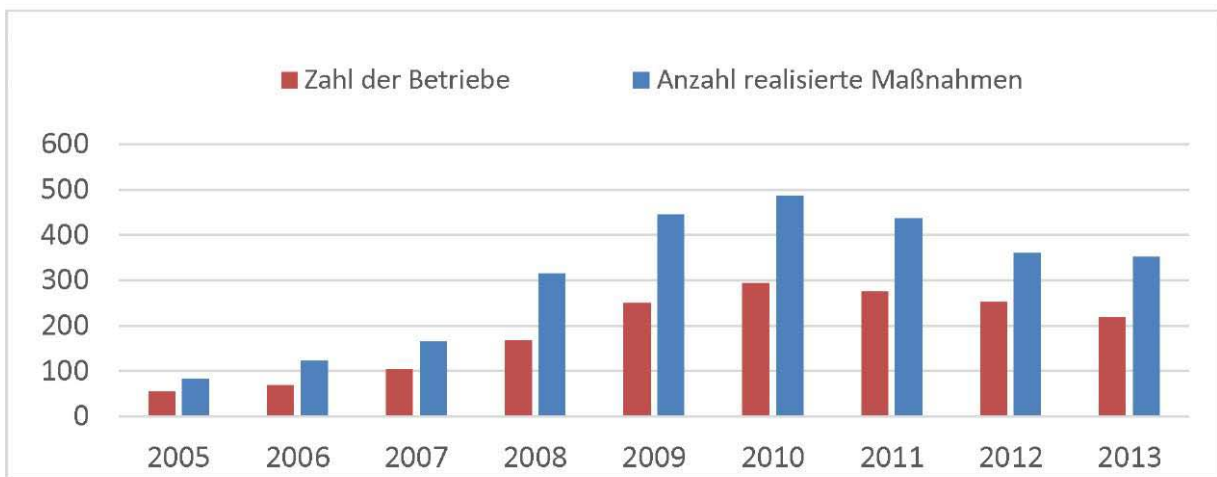


Figure 7: Number of measures realised over time (Database of measures, regional programmes 2014)

Zahl de Betriebe	Number of businesses
Anzahl realisierte Massnahmen	Number of measures implemented

These 3 215 measures led to annual **energy savings amounting to 151.9 GWh**. The development of energy savings over time, shown in Figure 8 below, contains large fluctuations in the savings achieved each year. Particularly noticeable is the increase in energy expenditure in 2008; this was caused by the move from fossil fuels to biomass along with plant expansions (Database of measures, regional programmes 2014).

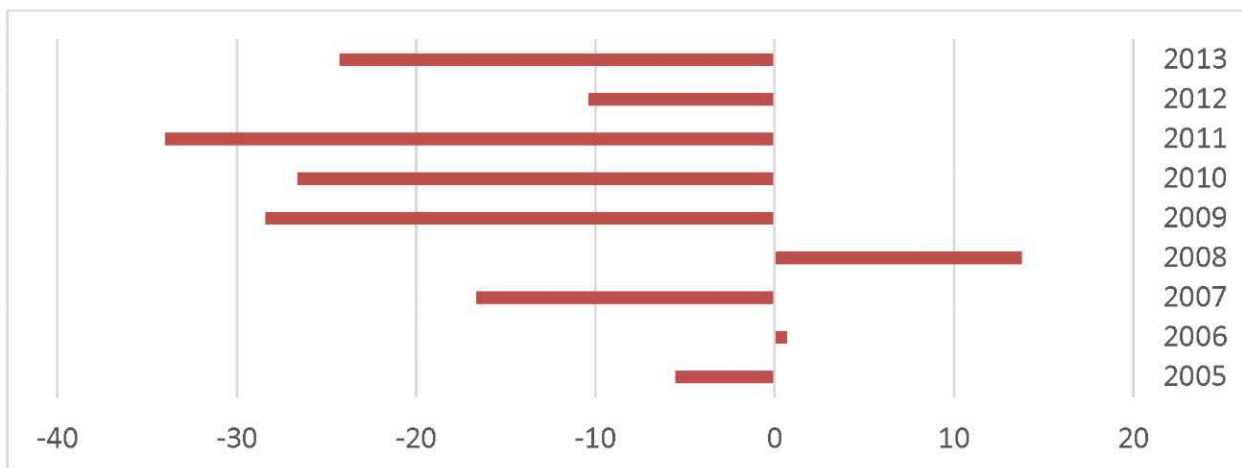


Figure 8: Development of energy savings (in GWh/year) over time (Database of measures, regional programmes 2014)

SME energy efficiency check

The SME energy efficiency check is an additional funding programme for energy audits and SMEs; it is run by the Economic Chamber with support from the Klima- und Energiefond. Energy audits were carried out at more than 3 500 small and medium-sized enterprises (SMEs) as part of this programme (Kapusta 2012).

An evaluation of the first **725 audits** showed that energy savings of **39 GWh** (reduction of 11 228 tonnes of CO₂) could be achieved per year. This led to a cost savings of **3 472 euros per year. Per business**, this amounts to an annual energy saving of **53.8 MWh per year (15.5 tonnes of CO₂)** and a cost reduction of **4 800 euros** (Jandrokovic 2010).

1.2.3. Energy management:

Energy management is another form of energy service provision. The purpose of introducing an energy management system is to continually improve the efficiency of energy usage within a company. Until now DIN EN 16001 has applied on a European level; this is now being replaced by ISO 50001, which is based on EN 16001 but goes further in several aspects (IFM electronic GmbH 2012).

Austria only has just under 70 facilities that are ISO 50001 certified; of these around half are industrial firms. The remaining businesses are service providers or energy suppliers, or come from the public sector.

1.3. Type, size and distribution of energy service companies

1.3.1. Energy contracting

In the contracting sector, there are currently 41 contractors active in the market. These are also responsible for carrying out the total of 79 projects (performance contracting and plant contracting) (Austrian Society for Environment and Technology 2013). Of these 41 market participants, 21 are members of DECA (Dienstleister Energieeffizienz- und Contracting Austria); this is a kind of special interest group for the implementation of the energy transition (away from nuclear power and fossil fuels). In particular, DECA sees itself as a leading voice providing better information on certain topics such as energy efficiency or energy service provision (DECA 2013).

Figure 9 shows the regional distribution, by federal state, of the contractors' locations. Vienna has the most contracting providers, followed by Styria and Lower Austria.

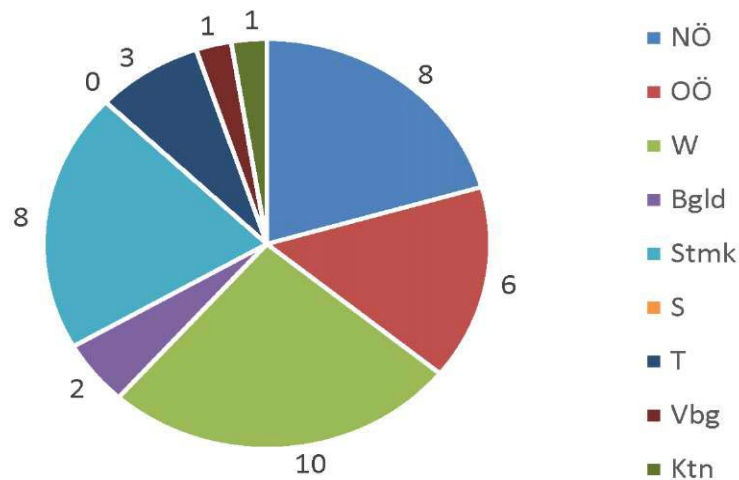


Figure 9: Regional distribution of the contractors
 States of Austria: Lower Austria, Upper Austria, Vienna, Burgenland, Styria, Salzburg, Tyrol, Vorarlberg, Carinthia

Figure 10 shows the contractors categorised by the type of service they provide. The energy service company (EDL) category has the most members, with 13 market operators. There are 10 and 9 contractors respectively in the technical building systems (HT) and energy supply company (EVU) sectors. Engineering offices (TB) and pure consultancy firms (Berat.) are very rarely active in the contracting market, with 5 and 2 firms respectively (Austrian Society for Environment and Technology 2013).

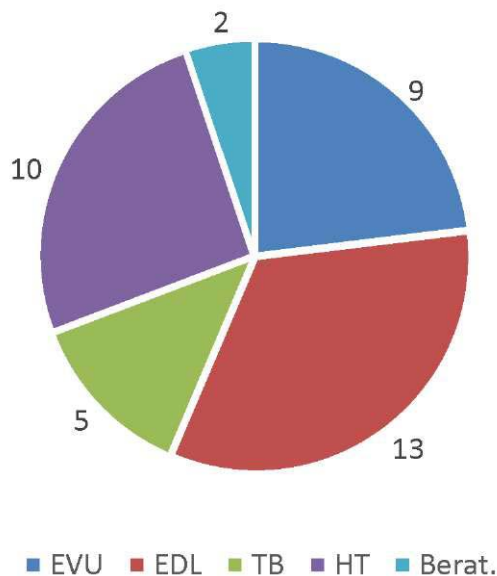


Figure 10: Contractor types (German abbreviations used here)

EDL... Firms focusing on energy services

EVU...Energy supply companies that offer energy services

HT.....Technical building systems firms that offer energy services

TB ...Engineering offices and planners that offer energy services

Berat. Consultancy firms that offer energy services

1.3.2. Energy advice

A total of 669 consultancy firms are registered in the measures database for the 'Regional programmes of the federal states' funding programme. Of these, however, only 388 firms are currently active, with a total of 20 055 measures being carried out as noted in section 1.1.2. Energy-related measures have been implemented under the supervision of approx. 35% of these 388 active firms (Database of measures, regional programmes 2014).

Below, the distribution of consultancy firm size is estimated using the number of audits. Figure 11 also shows how many participations the consultancy firms have performed (= audits carried out). It is clear that the majority of firms have carried out fewer than 50 audits.

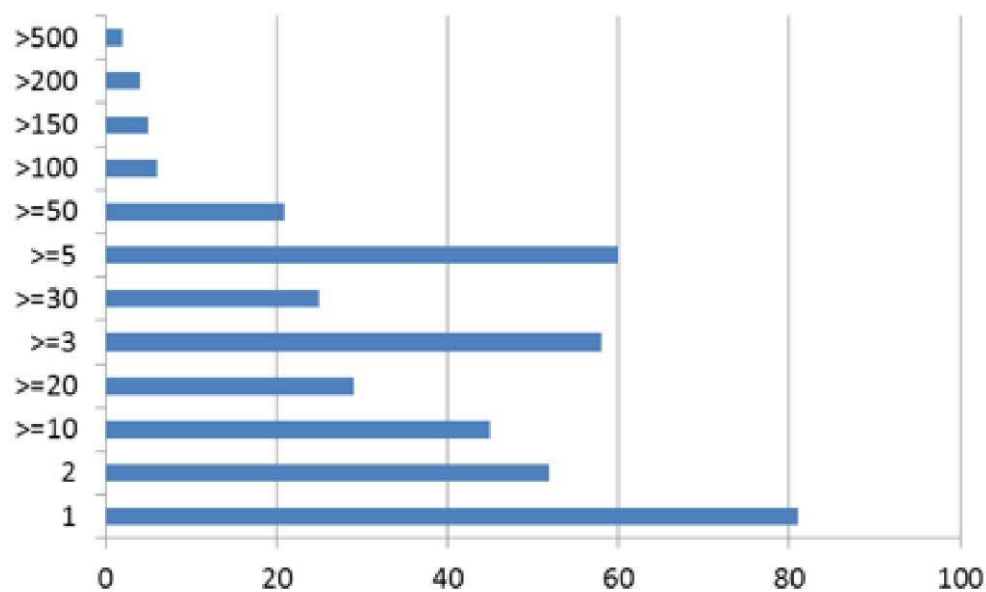


Figure 11: Active consultancy firms grouped by number of participations (Database of measures, regional programmes 2014)

1.3.3. Energy management

In Austria, the just under 70 firms with ISO 50001 certification were certified by the following 10 organisations. Five of these are based in Austria, while the rest are based in Germany (Peglau 2013).

Table 2: Certification organisations (Peglau 2013)

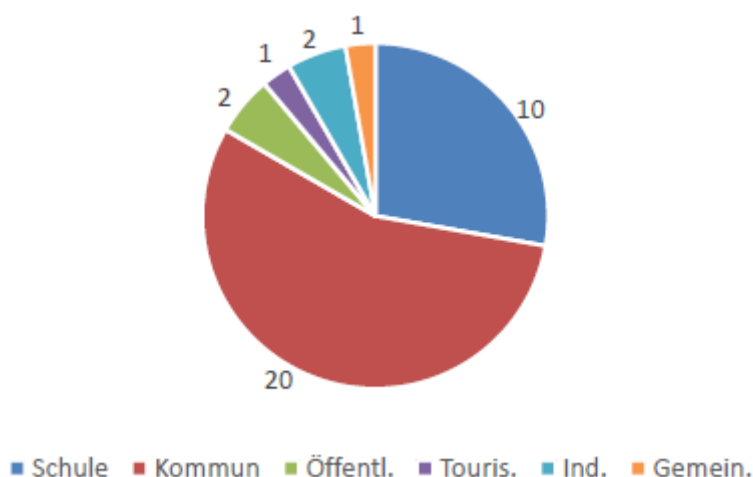
Organisation	Location
TÜV Austria Cert	Vienna
DQS	Frankfurt
LRQA	Vienna
TÜV Süd	Tyrol
QA Austria	Upper Austria
DNV	Germany
SQS	Germany
DNV	Lower Austria
BVC	Germany
Intechnica	Germany

1.4. Market sectors of the energy service companies

The energy service companies are very mixed in terms of the market sectors in which they are active. The individual market sectors also make use of a variety of different service models.

1.4.1. Energy contracting Performance contracting:

With performance contracting, it is local authorities that are most often the client, as shown in Figure 12. This can mean the local authorities themselves, indoor swimming pools owned by the local authorities or the municipal authorities of towns/cities, and other local authority facilities such as administrative departments. Aside from local authorities, schools are also particularly active in this form of service provision.



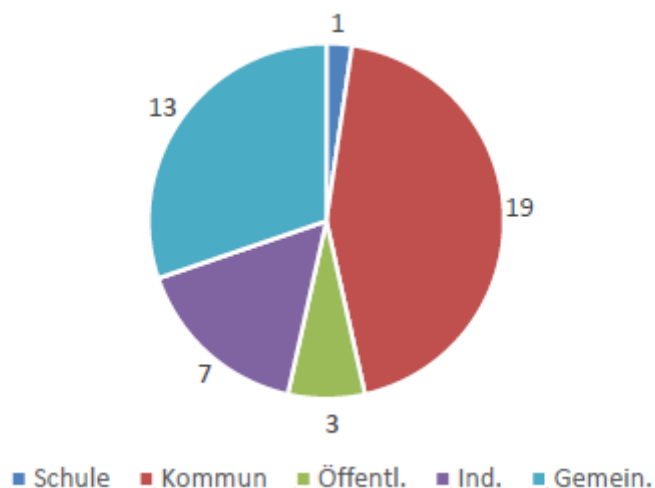
Schule	Kommun	Öffentl.	Touris.	Ind.	Gemein.
School	Local authorities	Public buildings	Tourism	Industrial firms	Charitable housing associations

Figure 12: Distribution of performance contracting clients by market sector

The other sectors are industrial firms, public buildings (includes e.g. Lower Austria Chamber of Agriculture (Landwirtschaftskammer Niederösterreich)), tourism (referring to hotels and eateries), and charitable housing associations.

Plant contracting

When it comes to plant contracting, the same market sectors are represented as with the clients of performance contracting, but with a different weighting (see Figure 13). Here, the local authority sector (including the municipal authorities of towns/cities) is most active once again, followed by charitable associations, who commissioned 13 projects. The remaining sectors (industry, schools, tourism and public buildings), on the other hand, only realised a handful of projects.



Schule	Kommun	Öffentl.	Ind.	Gemein.
School	Local authorities	Public buildings	Industrial firms	Charitable housing associations

Figure 13: Distribution of plant contracting clients by market sector

1.4.2. Energy advice

In the field of energy advice, three different areas were examined:

- Energy audits offered by the federal states
- Regional programmes of the federal states, and
- The SME energy efficiency check.

The 'energy audits offered by the federal states' are primarily for private households. The two funding channels 'regional programmes of the federal states' and 'SME energy efficiency check' focus on commerce and industry, with the former also focusing on service providers such as banks or insurance companies. The 'SME energy efficiency check' concentrates on audits carried out exclusively with SMEs (Database of measures, regional programmes 2014).

1.4.3. Energy management

Of the firms that have installed an ISO 50001 or EN 16001 certified energy management system, the majority are large industrial firms with industrial-scale energy consumption. However, to judge from the low number of certifications for Austrian firms thus far, it would seem that there is a certain reluctance or even aversion towards energy management systems. A possible reason for this could be that major energy consumers already have long-established internal energy-optimisation processes, meaning that potential cost savings are seen as already having been exhausted, whether or not one has certification. It would appear that many firms do not yet see the value of certification that is visible to those outside the company.

2. Potential in the energy services market

2.2. Potential for energy contracting

As described in section 1.1.1, there are currently 79 energy contracting projects registered in the contracting database. This relatively low number suggests that there is still a great deal of untapped potential in this model of service provision.

In the sections that follow, possible areas of potential are suggested and explained with regard to the relevant target markets.

2.2.1. Local authorities

As detailed above, energy contracting is particularly attractive for public buildings. At present, most projects are already carried out in connection with schools, public buildings and local authorities. Although the number of these buildings is limited, they still represent a potential which is worth tapping (public services are responsible for 2.7% of Austria's total energy consumption). A significant factor for public authorities is the financing of investment in buildings and heating systems that plant contracting brings. In 'operations contracting', on the other hand, operational responsibility can be outsourced, ensuring optimal operation and the utilisation of savings potentials, particularly when staffing levels are tight. Public authorities are in any case safe partners offering long-term contracts, which improves the predictability of recouping one's investment.

In Austria there are 2 354 local authorities; so far 39 public sector clients (mostly local authorities) have commissioned contracting projects, as described in section 1.3.1.

So if we assume that there are more than **2 300 local authorities** in Austria that have not yet undertaken such activities, then there is great potential for **contracting projects** (performance or plant contracting) in this area. It does not seem likely that this potential could be exhausted by the providers that are currently active, and so the **number of contractors needs to be increased** and at the same time the **range of options needs to be expanded to include other models of service provision** (Statistics Austria (Statistik Austria) 2014).

In the case of buildings owned by the federal state, **energy monitoring was the major success factor** aside from contracting itself. Commissioning external service providers to carry out the monitoring quickly identified potential for improvement that could be implemented cost-effectively, especially in the areas of operational management and controls. Investment potential was highlighted, with the operator itself making the investment and achieving the savings. This model is therefore an additional option for cases where the owner has sufficient funds for investment but would like for their business to be accompanied and audited in an official manner.

2.2.2 Service companies

Contracting still plays a subordinate role amongst service companies. With 247 903 companies and 1.8 million employees, however, this sector represents a very large market. It is assumed that the energy consumption of **tourism** and **trade** is relatively high compared to the rest of the services sector; in these areas, energy audits have already been carried out at around **530** firms. The potential here is considerable, in light of the remaining **118 614 companies**, for which savings of up to 30% could be expected (Statistics Austria 2012).

2.2.3 Charitable associations

Charitable associations already have some contracting experience to build on, particularly with regard to plant contracting, as the results up to this point have shown (**a total of 14 projects to date in the DECA database**). Therefore a certain amount of interest in this service model can be assumed, and attempts could be made to promote this further.

The **184 housing associations** based in Austria (Austrian Federation of Limited-Profit Housing Associations (Österreichischer Verband gemeinnütziger Bauvereinigungen – GBV) 2014) are still showing reluctance to engage in energy contracting; only a small proportion of charitable associations have commissioned projects thus far. From the contractors' point of view, this sector is highly significant as a potential source of customers, because of the contract security that generally exists for the partner and because of long-term contracts, for example. But according to GBV, contracting is only feasible when the associated investment costs are low, because otherwise the gap between savings and costs is too large. For this reason, plant contracting in particular has tended to take a back seat here (Personal communication, GBV 2014).

2.2.4 Small and medium-sized enterprises (SMEs)

SMEs could consider energy contracting partnerships with private energy service companies in particular, rather than large energy suppliers. However, companies with fewer than 250 employees have so far very rarely opted for this type of energy service provision.

Overall there are 309 982 SMEs in Austria (Statistics Austria 2013, reference year 2011), of which 1 430 (in 'regional programmes') and 3 500 (in the 'SME energy efficiency check') have already carried out energy-related measures. In calculating the potential for the remaining SMEs, businesses with fewer than 10 employees were excluded. This is because the smallest businesses (fewer than 10 employees) tend not to be very energy-intensive, and also because their willingness to enter into long-term contracts is doubtful. This still leaves a figure of 38 482 businesses that have not yet documented any such activities and therefore represent a potential market for contracting projects.

According to Arbeitsgemeinschaft Erneuerbare Energien (Renewable Energy Association – AEE), however, the current very weak demand is due more than anything to a lack of information in the marketplace, and also the limited number of active contractors in this sector (Personal communication, AEE).

2.3. Potential for energy audits

Based on the available data, the energy audits demonstrate the best results compared to the other service provision models. Nevertheless, there is still a wide range of areas where measures could be carried out; these are described below.

2.3.1. Small and medium-sized enterprises (SMEs)

There is significant potential in this area, as SMEs have already had good experiences and results with energy audits ('regional programmes of the federal states' and 'SME energy efficiency check'). Results thus far have shown that the audits carried out as part of the 'regional programmes of the federal states' were able to bring about a reduction of 47 MWh per audit and year. In comparison the 'SME energy efficiency check' achieved a reduction of 54 MWh per audit and year. By extrapolating from the **38 482 businesses** that have not yet undergone an audit (excluding businesses with fewer than 10 employees) a **savings potential of between 13% and 16%** can be calculated.

2.3.2 Private households

Currently, energy audits for private households are offered mainly through the federal states, as described in section 1.1.2. Precise information is currently being gathered as to the extent of this and its effects.

The other audit programmes ('Regional programmes of the federal states' and 'SME energy efficiency check') are not intended for private individuals. But energy audits could play a very important role in bringing about increased awareness and a better understanding of one's own energy usage and the costs associated with this. There is an enormous potential for savings overall; 1.7 million single-family houses with an average heating requirement of 170 kWh/m²/year (Proidl 2009) means that there is plenty of room for improvement in theory. However, comparisons of heating requirement figures against actual energy consumption show under-consumption where the heating requirement is high, and over-consumption where the heating requirement is low; this can be explained by user behaviour and inefficiencies. Ultimately it reduces the potential for savings, as indicated in section 3.

2.3.3 Service companies

Service companies are showing significantly more engagement in the area of energy audits than with energy contracting, as already detailed in section 2.1.2. The funding programme 'Regional programmes of the federal states' has been utilised by a total of 830 service companies (Database of measures, regional programmes, 2014).

This puts the remaining market sector for energy audits at about 247 903 service companies. As with the potential for energy contracting, here too it is trade and the food service industry that seem to be of particular relevance, as these are thought to have above-average energy consumption per employee. The market potential in these areas is **118 614 service companies** (Statistics Austria 2012).

2.3.4 Local authorities

Although audits could also unlock some interesting opportunities for local authorities, realising the savings potential that already exists through performance contracting or plant contracting seems more promising.

2.4. Potential for energy management

The data gathered so far indicates that energy management offers great potential for continual improvement, particularly for major energy consumers. The new Energy Efficiency Directive underlines this with its requirement that in future all large and medium-sized businesses (larger than 50 employees) must either install an energy management system or carry out an energy audit at least every four years. Below, the potential under this service provision model for large, small and medium-sized businesses is explained, as well as for service companies.

2.4.1 Large businesses

There is great potential for an increase in the number of certified energy management systems amongst large businesses (having more than 250 employees). There are 1 091 businesses in total falling into this category. Compared to this figure, only a few large businesses in the energy-intensive sector are ISO 50001 certified (Statistics Austria 2013).

2.4.2 Small and medium-sized enterprises (SMEs)

A certified energy management system could also be of interest to individual SMEs, mostly mid-sized firms (between 50 and 250 employees), due to the positive image that the certification conveys. For smaller firms, the cost of certification will generally be too great.

2.4.3. Service companies

As well as opting for energy contracting and energy audits, services companies could also obtain energy management certification (e.g. ISO 50001). The major incentive here (as with environmental management systems) could be the positive effect on the company's image, rather than any financial savings. However, despite the large number of service companies (247 903), it is likely that only a small number would decide to opt for this.

3. Obstacles and implementation prospects

Various forms of contracting have been in existence for a long time, but the benefits do not always materialise as clearly as the theoretical models would lead you to expect. James Watt (1736–1819) once made the offer 'we will provide you with a steam engine free of charge, and install it and maintain it for five years. We guarantee to you that the coal for the machine will cost less than you presently spend on fodder (energy) for the horses which do the same work. And all that we require of you is that you pay us a third of the money that you save.' *[Translator's note: original wording unknown; this is a translation from German]*. Various different models have been developed since then, most of which have also disappeared again. Contracting has never become the success story that was predicted time after time. Below, key aspects are highlighted from the investigations made as part of this project.

Contracting is a thoroughly risky business for energy suppliers and service providers when it involves the advance financing of plants or renovations. It therefore requires clear framework conditions and well-defined user behaviour in order to provide sufficient confidence that the investment will be recouped. This is generally the case with commercial customers; it is also possible to set out clear framework conditions when dealing with public service provision and local authorities. This is why many contractors target this market. The private consumer is an awkward customer in this context, particularly as he tends to only perceive the partial costs that fall to him, rather than performing a full costs analysis; this means that the basis for savings calculations is often distorted, with actual savings not being represented to their full extent. Moreover, an unpredictable element of user behaviour is often involved, which can be influenced by moods and health circumstances. Therefore private customers represent a high risk of dissatisfaction and failure to recoup the money invested.

Because of the impact of energy consumption on the costs of a business, major energy consumers have long since established internal structures and responsibilities to ensure a cost-effective supply of energy. In these businesses, which make up approx. 2/3 of the energy consumption in industry, the potential for optimisation is regularly examined and monitoring systems and/or energy management systems are already in place. Here, potential financial savings have for the most part been exhausted; further continual improvements can be expected in accordance with break-even times of several years. The price of energy has a significant effect on the break-even time; it sets the limit for what is economically achievable.

When it comes to SMEs, particularly in the services sector, the cost factor of energy is often less significant and so monitoring energy usage to ensure efficiency is less well established. For this reason, there is more potential to achieve cost-effective percentage improvements here; but because of the lower energy intensity (making up only a third of energy usage), it is less significant for national energy consumption overall.

The sector is large and very heterogeneous, ranging from SMEs to service providers such as traders, insurance companies and banks. Energy consumption in these areas is often not considered a major cost factor; awareness of the importance of energy efficiency is lower, despite the fact that the savings potential is significant.

In order to tap into these areas it is therefore essential to increase awareness and provide information, and also to appeal to the firms through advisors and contractors. A large number of advisors is required here, particularly in light of the large number of firms and their varied nature. Ideally the advisor would already have some form of contact with the business i.e. there would already be a foundation of trust. As shown by the development over time of the

funding provided by the regional programmes, their impact has reached a plateau since around 2010. There must still be a very large number of businesses that have not yet been engaged, regardless of the large number that already have been. However, there do seem to be difficulties in appealing to these businesses or convincing them to implement measures. Energy advisors that are already active would therefore have to recognise these areas as potential clients, or more general consultants already active in these areas would have to be trained to handle energy-related aspects.

With respect to plant contracting for private individuals through energy service companies, one obstacle to emerge is the increased expenditure for the operating licence for the plant, which is not necessary to the same extent in cases of private ownership. Moreover, no residential building or renovation subsidies can be claimed. For this reason we often see hybrid forms in practice, with the contractor financing the plant, but transferring it to the private individual with a retention of title. Only after the expiry of the contractual term does the plant change ownership in actuality.

Studies of multi-storey residential buildings as well as single-family houses have shown that the sharp increase in energy consumption that one would expect as the heat requirement increases does not materialise in practice. Rather, the actual energy consumption figures in cases of poor building fabric lie significantly below expectations, because of a reduction of the heated living space and possible adaptations in behaviour. Conversely, rebound effects are well known with regard to renovations and new nearly-zero energy houses and passive houses; they cause the actual energy consumption to be significantly higher than expected. As such, though the market for energy audits in particular is very large, the potential for actual savings should not be overestimated. According to the study of multi-storey residential buildings, the energy saving following renovation is only around 10%; for single-family houses it is up to a third.

However, great potential exists in the operation of heating systems, particularly in connection with optimal operation and the interaction of different heating systems. A recent study by AEE showed that the efficiency of solar energy systems is massively reduced by this kind of interaction with conventional boiler systems. There could be great potential here for system manufacturers/sellers and private service providers, who could offer ongoing care, supervision and monitoring of the system in order to achieve significant savings for individual home owners.

In addition to one-off measures, the optimal operation of energy systems (and the regular monitoring of this) is growing in significance. The players that currently exist seem too few for the market; an expansion in the professionally relevant areas would seem to be necessary. Initial moves in this direction are already underway with a training programme for installers which is intended to demonstrate to craftsmen the opportunities offered by operations contracting. The intention is to look beyond the provision of the system and demonstrate how optimal configuration and optimal operation of the system could be provided, with remote monitoring able to produce lower costs for the user than he could achieve by himself. Other commercial sectors could also be included in an analogous fashion.

Public authorities do not constitute the largest energy consumer, but the renewal of systems and optimisation of operations, particularly in order to save costs, is still significant here. The public sector is, as already mentioned, a safe partner in terms of the predictability and security of recouping one's investment. Positive experiences with contracting models for public lighting are giving providers the confidence to expand into other areas as well.

Finally, attention should be drawn to the fact that the potentials outlined for each individual area cannot simply be totalled up, because although the market can be approached from

different directions, the potential can only be realised once. This applies, for example, to the SMEs and service companies, for whom contracting models, audits and energy management systems could be implemented. It cannot however be assumed that businesses will take up all three methods. In individual cases this might well be the case, with the effects being intensified, but this will not be the norm.

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