

POSSIBILITIES OF EFFICIENCY IN HEATING AND COOLING IN ESTONIA

Assessment of heating and cooling potential of Estonia

Ministry of Economic Affairs and Communications

Tallinn, 2016

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1 Introduction

This assessment has been prepared on the basis of Article 14(1) of Directive 2012/27/EU of the European Parliament and of the Council on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.

The analysis of the efficiency in heating and cooling has been addressed to the European Commission. The analysis aims to provide an overview of the situation of the Estonian heating market and its future prospects.

There are more than 30 power stations in Estonia, most of which produce electricity in cogeneration mode. The Narva power stations – which were designed and built during the Soviet era and which bear the fundamental load of electricity production – are the power stations with the highest installed capacity, which use the condensation process.

In Estonia, 60% of the population uses district heating. This figure is among the highest in the EU. At the same time, the district heating sector must make efforts to reduce the share of expensive and imported fuels in the production portfolio, and the relatively high network losses. The Estonian National Development Plan of the Energy Sector Until 2030, which is still being drafted at the time of preparing this analysis, predicts that in the future the Estonian district heating sector will use local fuel as much as possible, and the sector will operate efficiently without any additional investment support from the state.

Historically, district cooling has not been used in the conditions present in Estonia. However, the pilot district cooling development built in Tartu, which has a capacity of 13 MW, indicates that there is demand for district cooling in the market.

2 Possibilities for efficiency in heating and cooling

2.1 Description of heating and cooling demand

Heat is mainly used for regulating the internal temperature of buildings or as input for keeping the industrial technological processes in operation.¹

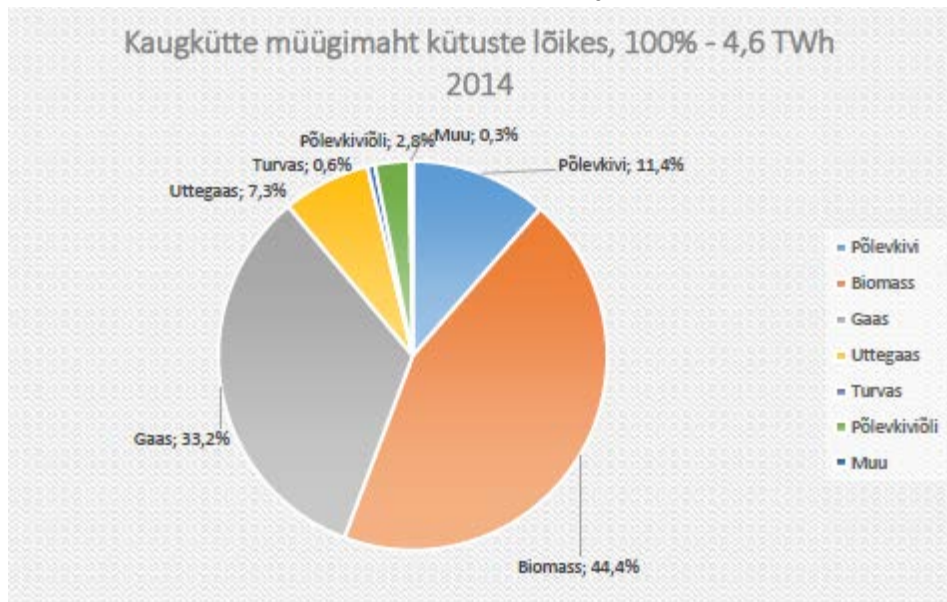
In Estonia, the annual output of heat is about 9 000 GWh, 89% of which reaches the consumers and 11% of which represents losses in the heat networks². The annual volume of consumption of district heating is 4.6 TWh. The following diagram provides an overview of the fuels used for district heating as of 2014.

¹ https://www.mkm.ee/sites/default/files/enmak_2030._eelnou_23.10.2014.pdf

² Webpage of Statistics Estonia at

http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=KE04&ti=SOOJUSE+BILANSS&path=../Database/Majandus/02Energeetika/02Energia_tarbimine_ja_tootmine/01Aastastatistika/&lang=2

District heating sales volume by types of fuel, 100% - 4.6 TWh
2014



Oil shale
Biomass
Gas
Carbonisation gas
Peat
Shale oil
Other

Clockwise from top:

Other; 0.3%

Oil shale; 11.4%

Biomass; 44.4%

Gas; 33.2%

Carbonisation gas; 7.3%

Peat; 0.6%

Shale oil; 2.8%

In eight administrative units (Tallinn, Tartu, Narva, Ahtme, Pärnu, Sillamäe, Kohtla-Järve and Kuressaare), which between them account for most of the population of Estonia, the annual consumption of thermal energy exceeds 80 000 MWh.³

The heating period usually lasts from October to the beginning of May and in this period the consumption is divided as follows:

Month	Share in total consumption, %
January	17.6
February	16.1
March	15.5
April	10.5
May	0.9
June	
July	
August	
September	
October	10.1
November	13
December	16.3

³ <https://energiaklass.wordpress.com/2012/11/12/koostootmisjaama-rajamise-tasuvusest-vaikelinnas/>

Table 1: Annual need for thermal energy – share of heating consumption in the total consumption during the heating period, %

At the moment, a big problem lies in the relatively high heat losses in district heating networks (the average loss is 21%). In many regions, most of the heated buildings are to a large extent totally uninsulated or only partially insulated.⁴

Currently, no district cooling as such is used in Estonia. There is no relevant infrastructure, either. The main customers would be new office and trade buildings, which use cooling as much as heat.

The planned district cooling project in the city of Tartu includes a plan for building a 13 MW cooling installation on the Fortum's property on Turu street and constructing a district cooling network of 1.3 km in the centre of Tartu. The district cooling installation would use both traditional industrial cooling equipment and cold river water for producing cooling. In Estonia, this project would be a pilot project.

District cooling is also useful for the environment, reducing CO₂ emissions by 70% compared to current alternatives. In many existing cooling systems, freons are used for producing cooling. Freons are strong greenhouse gases and cause significant losses in the case of leakage. With the introduction of district cooling this risk will be reduced.^{5 6}

3 Forecast of demand for heating in the next 10 years

Within the next 10 years a decline in consumption has been forecast, as buildings are increasingly being fully insulated. With the reconstruction of the pipelines, the pipeline losses would also decrease. In addition, the duration of the heating period would decrease in relation to temperature regulators and the introduction of heat-recovery ventilation systems.

According to the analysis of various district heating regions, an average decrease of 35% in boiler houses may be expected.⁷

At the moment, the consumption density is less than 1.0 in the following network regions – Palamuse Rural Municipality: Kaarepere (0.2) and Luua (0.5); Iisaku Rural Municipality: Kasevälja (0.4); Kohtla-Järve City: Kukruse (0.6); Otepää: Keskuse Village (0.6); Mustvee City (0.7); Sangaste Rural Municipality: Keeni (0.8); Viljandi Rural Municipality: Vana-Võidu (0.8); Rapla Rural Municipality: Vösa street (0.8); Lääne-Nigula Rural Municipality: Palivere (0.9); Torma (0.9); Viru-Nigula Rural Municipality (0.9); Rae Rural Municipality: Lehmja (0.9); Märjamaa (0.9); Järvakandi (0.9); Võru Rural Municipality: Puiga (0.9); Tabivere Town (0.9); Kuusalu Rural Municipality: Kiiu (0.9); Sauga (0.9).

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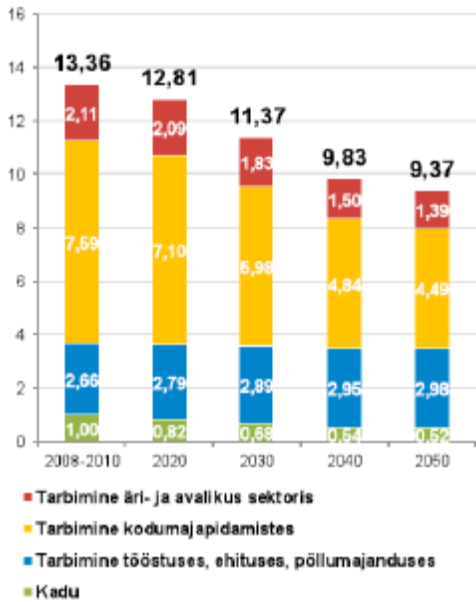
http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaugk%C3%BCtte_energias%C3%A4%C3%A4st.pdf

⁵ http://www.fortumtartu.ee/page.php?lang=1&action=show_page&menu_id=&page_id=248

⁶ <http://lounaestlane.ee/majandus/item/1170-fortum-tahab-hakata-tartus-ka-kulma-tootma>

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http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaugk%C3%BCtte_energias%C3%A4%C3%A4st.pdf



Consumption in the business and public sectors
 Consumption in households
 Consumption in industry, construction, agriculture
 Losses

Figure 1: Forecast of heat consumption (Source: taastuvenergeetika.ee)

4 Existing district heating infrastructure

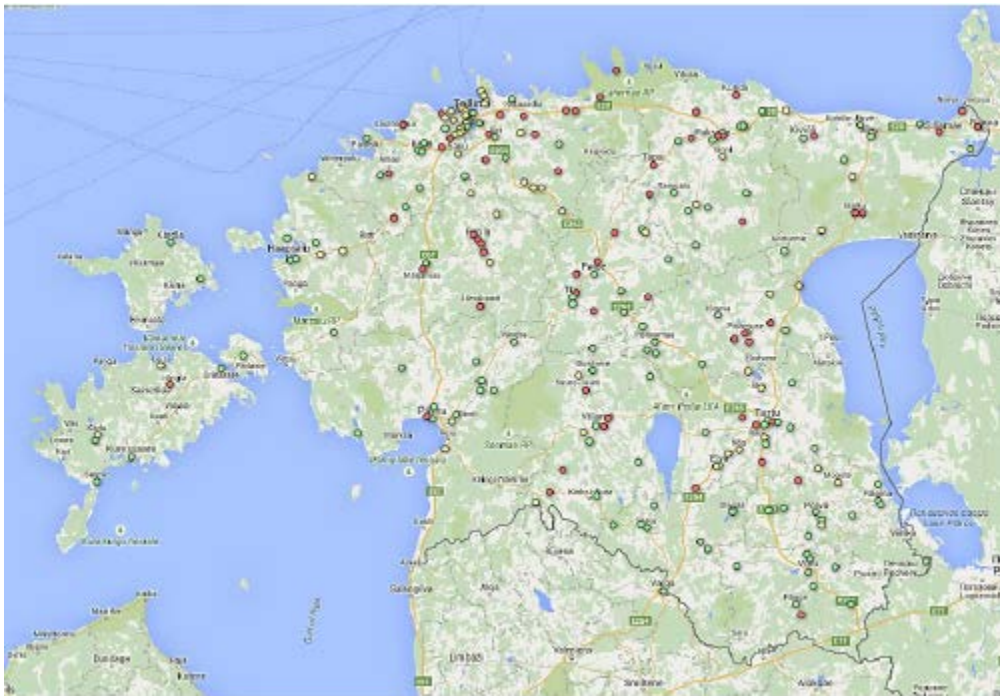


Figure 2: Locations of district heating networks in Estonia (Source: energiatalgud.ee)

The different colours indicate the price: green = 0...74.15 €/MWh; yellow = 74.15...86.67 €/MWh; red = 86.67...109 €/MWh

In Estonia, there are 226 local authorities, of which 151 use district heating. According to the

evaluations, approximately 60% of the population consumes heat produced in this way.⁸

Administrative unit	No. of network areas	Length of pipeline, km	Sales, GWh	Average consumption density, MWh/m
Tallinn	20	444.35	1 784.8	4.2
Ida-Viru County	18	258.77	993.7	2.8
Tartu County	17	176.164	510.9	2.1
Harju County (excl. Tallinn)	39	121.787	297.5	2.6
Pärnu County	13	80.282	212.6	2.4
Järva County	23	71.993	170.2	2.2
Lääne-Viru County	22	62.536	143.4	2.2
Viljandi County	17	24.007	119.5	3.3
Saare County	8	40.913	77.3	1.9
Võru County	9	37.839	69.9	1.8
Valga County	9	19.991	64.6	2.2
Põlva County	15	27.152	52.1	2.4
Rapla County	10	32.405	50.2	1.5
Jõgeva County	17	26.477	47.1	2.1
Hiiu County	2	6.054	8.5	3.4
Estonia	239	1 430.72	4 602.4	2.5

Table 2: district heating data by counties (Source: energiatalgud.ee)

4.1 Potential delivery points for heating

4.1.1 Power plants whose total annual output exceeds 20 GWh

Most of the power plants located in Estonia operate in cogeneration mode. Heat produced in the plants is sold to district heating networks or industrial consumers located near the plants.

From among the Narva power plants of Eesti Energia AS only the 11th unit of the Balti Power Plant produces heat for the district heating network. Both the Estonian Power Plant and the remaining Balti Power Plant's energy units operate using the condensation process.

The following table indicates the power plants connected to the Estonian electricity system.

Power plant	Installed net capacity, MW	Usable production capacity, MW
Estonian Power Plant	1 355	1 040
Balti Power Plant	322	266
Iru Power Plant	173	173
Kiisa Standby Power Plant*	250	0
Põhja Heat and Power Plant	78	78
Lõuna Heat and Power Plant	7	7
Sillamäe Heat and Power Plant	16	8
Tallinn Power Plant	21	21
Tartu Power Plant	22	22
Pärnu Power Plant	20	20
Enefit	11	11
Industrial and small co-generation plants	62	50

⁸ http://ec.europa.eu/energy/sites/ener/files/documents/article7_et_estonia.pdf

Hydropower plants	8	4
Wind power plants	307	0
Solar power plants	0.7	0
Microproducers	3.7	0
Total	2 656	1 700

Thus, at the time of preparing the analysis, we can proceed from the knowledge that it is not possible to get additional heat for district heating from the existing power plants unless technical adaptations are made. Technically, it is possible to also get heat also from the power plants using the condensation process, but the efficiency of producing electricity and the amount of electricity produced will decrease correspondingly.

4.1.2 Waste incineration plants

Iru Power Plant – as at 2013, a modern and efficient waste incineration unit producing heat and electricity from mixed municipal waste. Its electricity production capacity is 17 MW and its heat production capacity is 50 MW. Annually, 220 000 tons of mixed municipal waste are incinerated.⁹ The heat is directed to the district heating network of AS Tallinna Küte.

4.1.3 Existing cogeneration plants

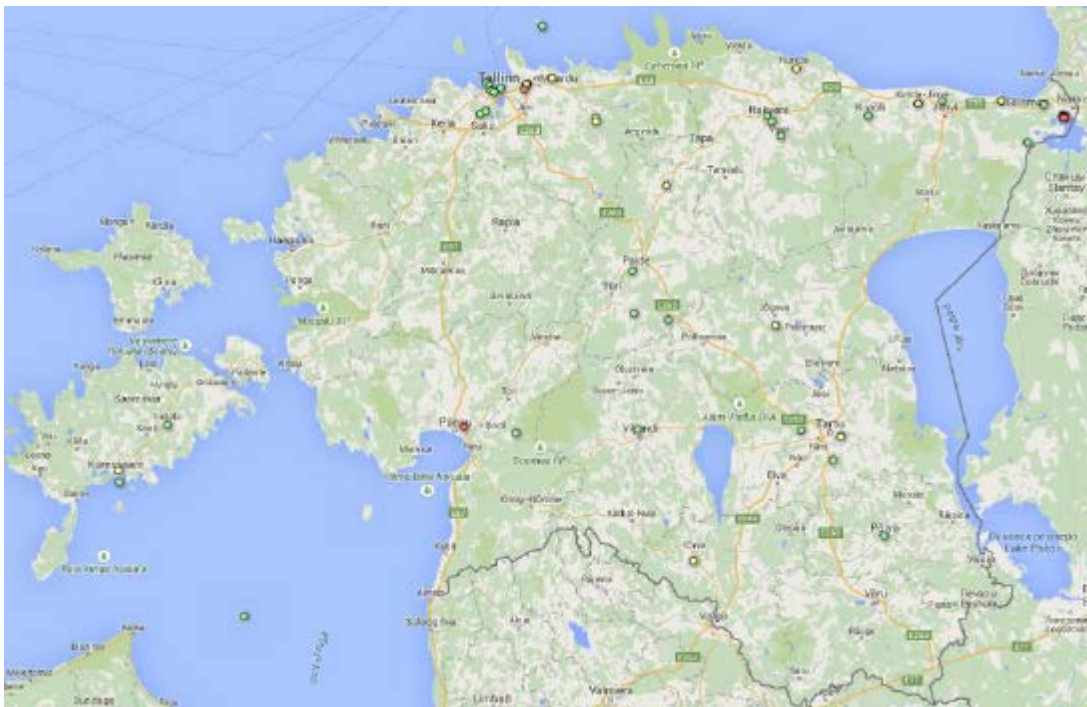


Figure 3: existing cogeneration plants (Source: energiatalgud.ee)

The different colours indicate capacity: green = 0–1.9 MW; yellow = 1.9–20 MW; red = 20–195 MW

The following table contains the list of operational cogeneration plants with their heat (MW_s) and electrical capacity (MW_e).

Location	Name of equipment	Capacity	
		MW _s	MW _e
Tallinn	Tallinn Heat and Power Plant	50	21.5

⁹ <https://www.energia.ee/organisatsioon/iru>

	Iru Heat and Power Plant	340	156
	Iru Heat and Power Plant (waste unit)	50	17
	OÜ Kristiine Keskus	0.7	0.5
	AS Tallinna Vesi	0.86	0.65
	AS Terts	2	1.68
	EE AS Kopli Cogeneration Plant	Total capacity 2.4 MW	
Tartu	Tartu Heat and Power Plant	50	25
	AS Grüne Fee Eesti	2.1	2
Pärnu	Pärnu Heat and Power Plant	50	24
Narva	Balti Heat and Power Plant 11th unit	120	215
	AS Narva Vesi	0.7	0.5
Kohtla-Järve	VKG Põhja Heat and Power Plant	70	44
Jõhvi	VKG Lõuna Heat and Power Plant		
Kiviõli	Kiviõli Keemiatööstus's Heat and Power Plant	20	10 (in operation: 4MW)
Kuressaare	Kuressaare Heat and Power Plant	9.6	2.4
Sillamäe	Sillamäe Heat and Power Plant	94	18
Põlva	AS Eraküte Põlva	1.25	0.9
Paide	Pogi Heat and Power Plant	8.6	2
Viljandi	Viljandi gas engine	2	2
Võhma	Võhma gas engine	0.46	0.2
Rakvere	ES Bioenergia cogeneration plant	10	1
	Adven Eesti ORC-cogeneration plant	5.3	0.99
Aravete	Aravete biogas cogeneration plant	2	2
Kunda	AS Kunda Nordic Tsement	3.3	3.1
	ELME AS	2.8	2.4
Kehra	Horizon Tselluloosi ja Paberi AS	125	10
Jämejala Village	Esro Elekter OÜ	1.7	1.8
Tartumaa	AS Sangla Turvas	7	2.5
	AS Tootsi Turvas	14	5
Helme Rural Municipality	Helme Energia cogeneration plant	15	6.4
Tabasalu	Strantum cogeneration plant	2	2

Table 3: Existing and planned (in green) cogeneration plants^{10 11 12 13 14 15}

5 Heating demand that could be met with efficient cogeneration

According to the analysis¹⁶ made in 2015, the potential locations of cogeneration plants in Estonia would be Viljandi, Võru, Haapsalu, Valga, Keila, Tapa, Jõgeva, Rapla. There is potential for establishing a cogeneration plant using the ORC-technology in Türi, Laagri, Jüri, Saku, Saue, Anija, Haabneeme, Loksa, Loo, Tamsalu and Elva¹⁷.

¹⁰ http://www.peri.ee/projektid.cfm/fuseaction/showreference/reference_ID/2397/referencecategory_ID/13.cfm

¹¹ <http://es-b.ee/?id=20&gid=20&lng=ee&view=page>

¹²

http://www.rakveretarkmaja.ee/uploads/2/0/0/1/20014105/priit_tii_adven_eesti_koostootmisjaama_roll_rakvere_kaugktt.es.pdf

¹³ <https://www.energia.ee/koostootmine>

¹⁴ www.staff.ttu.ee/~asiirde/Loengud/EAS/II_peaev__Seadusandlus_I.ppt

¹⁵ Enerigatalgud.ee

¹⁶ https://www.mkm.ee/sites/default/files/elektri_ja_soojuse_koostootmise_potentsiaal_eestis_2005.pdf

¹⁷ <http://www.energiatalgud.ee/index.php?title=Koostootmine&menu-85>

The ORC-type cogeneration plants with wide load range (10–100%), small maintenance costs and high efficiency (even in the case of partial load) are suitable for small settlements, where the heat consumption is not very high. Areas where the heat capacity required by consumers remains under 10 MW are considered to be suitable (maximum electrical output capacity is 2–2.5 MW)¹⁸.

The potential locations of possible cogeneration plants are:

- New areas of real estate development
- New energy-intensive companies
- Cogeneration plants in bigger buildings (hospitals, building complexes, pools, SPAs, etc.)
- Existing district heating networks¹⁹

Location	Capacity	
	MW _s	MW _e
Keila	4.3	1
Jõgeva	4.3	1
Paldiski	4.3	1
Haabneeme	4.3	1
Tapa	4.3	1
Rapla	4.3	1
Kehra	4.3	1
Haapsalu	8.6	2
Võru	8.6	2
Maardu	10.8	2.5
Valga	1.5	6.5
Viljandi	2.5	10.8

Table 4 - economically feasible new potential cogeneration plants using district heating and related to the industries (Source: 2011 CHP survey ESTIVO, Annex 2)

6 Possibilities for increasing energy efficiency of district heating infrastructure

In order to increase the energy efficiency of district heating infrastructure it would be wise to start with the insulation and renovation of buildings. In this case, it would be possible to get the amount of heat consumed most accurately and only thereafter the renovation of heat pipelines would be started to optimise them. When acting in such sequence, it would be possible to produce heat efficiently according to the level of demand.²⁰

Assuming that, when insulating the buildings, consumers have also renovated the heating nodes and installed thermostatic valves, it would be also possible to reduce the temperature of heat carriers from the current 90/60 °C to 60/40 °C in the future. Reducing the operating temperature would decrease the losses in the heat pipelines by approximately 2%.²¹

¹⁸ <https://energiaklass.wordpress.com/2012/11/12/koostootmisjaama-rajamise-tasuvusest-vaikelinnas/>

¹⁹ www.staff.ttu.ee/~asiirde/Loengud/EAS/II_peaev__Seadusandlus_I.ppt

https://www.mkm.ee/sites/default/files/elektri_ja_soojuse_koostootmise_potentsiaal_eestis_2005.pdf

²⁰ http://www.energiatalgud.ee/img_auth.php/c/cd/Vabam%C3%A4gi,_A._5_auditi_kokkuv%C3%B5te.pdf

²¹

http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaugk%C3%BCtte_energiast_3%4st.pdf

At the time of preparing this analysis, the share of pre-insulated pipes out of the total length of the whole heat network is 30%. Currently, mainly the old Soviet-era pipes – i.e. pipes insulated with glass wool, covered with bitumen sheets and placed in concrete cases – are still used. Replacing an old heat pipeline with pre-insulated pipes and bringing the diameter of pipes into correspondence with actual consumption would have a major positive effect, as the heat loss of pre-insulated pipes is between 52% and 57% smaller than Soviet-era pipes, depending on diameter²².

After the optimisation of the pipes of heat networks and replacing them with pre-insulated pipes with optimum dimensions, the relative heat loss would decrease from 16–18% to 7% in the networks of Mustamäe-Õismäe and City Centre in Tallinn, from 20–22% to 8% in the network of Lasnamäe in Tallinn, from 20% to 9% in the network of Võru, and from 26% to 8% in the network of Kiviõli. The reduction is particularly significant in the places where the four-pipe system is replaced by an optimised two-pipe system, e.g. in the Haiba network the relative heat loss would fall from 26% to 5%.

The relative heat loss in new optimised district heating networks with good heat insulation would decrease at least 2–3 times compared to the old ones and up to 5–6 times in places where the four-pipe system is replaced by an optimised two-pipe system.²³

In order to increase energy efficiency, changes should also be made in boiler houses – old deteriorated and oversized boiler devices should be replaced and, if possible, it should be switched from expensive fuels (gas, liquid fuel) to cheaper alternatives. Use of local renewable fuel is the most environmentally-friendly solution and would also support the local economy, as a small district heating network would provide additional jobs to local inhabitants. Currently, 407 boilers have been installed in district heating networks. In 121 district heating areas, only light fuel oil, shale oil or natural gas are the fuels used. Energy efficiency could also be increased by phasing-out the production of summer-time household water in district heating networks and introducing accumulation tanks²⁴.

In particular, it should be analysed whether district heating is sustainable in a particular area, and if not, it should be switched to a local solution. Alternative solutions should be analysed and the groundwork for introducing them should be done in cases where the consumption density is less than 1, the sales of heat remain under 1 000 MWh, and the heat pipelines and consumers have not yet been renewed²⁵.

District heating networks should be merged, where possible, in order to increase cogeneration potential²⁶.

7 Strategies, policies and measures to be taken before 2020 and 2030, in order to achieve efficient district heating infrastructure and increase the share of cogeneration

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http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaug%C3%BCtte_energias%C3%A4%C3%A4st.pdf

²³ <http://www.inseneeria.ee/eesti-kaugkütte-soojusvorkude-efektiivsust-saab-23-korda-tosta/>

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http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaug%C3%BCtte_energias%C3%A4%C3%A4st.pdf

²⁵ http://www.energiatalgud.ee/img_auth.php/c/cd/Vabam%C3%A4gi,_A._5_auditi_kokkuv%C3%B5te.pdf

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http://www.energiatalgud.ee/img_auth.php/4/46/Eesti_Arengufond._Kaug%C3%BCtte_energias%C3%A4%C3%A4st.pdf

The main precondition for cogeneration is the existence of demand for heat and mechanical energy.

When planning a cogeneration plant and specifying its location, it is important to also take into account other conditions, most important of which are as follows:

- Favourable conditions for connecting to the heat network
- Vicinity of a substation
- Existence of a plot with the area required for the layout of the cogeneration plant
- In the case of a cogeneration plant using natural gas, the vicinity of a natural gas pipeline with required pressure and throughput
- Necessary access roads and places for turning around in the surroundings of the boiler house, in order to transport liquid and solid fuel

The potential locations for possible cogeneration plants are, in particular, the existing district heating networks and new real estate development areas, old and new energy-intensive companies, and bigger buildings (hospitals, building complexes, pools, SPAs, etc.).²⁷

Obligatory decision on the planning of heating development

The state intends to ensure with the amendment of the District Heating Act for the consumers of district heating as favourable and stable price of thermal energy as possible with a solid and as efficiently arranged heat supply as possible. This means that, while the local government councils are currently advised to adopt a heating development plan in their territory, after the amendment comes into force, it would become obligatory to prepare these development plans in cases where there is a district heating network area with 50 GWh sales volume on the territory of the local government. The councils must adopt a decision on the planning of the heating development by the end of 2017, which is supported by a separate support measure²⁸ (see in addition, Section 7.1 Support).

Estonian National Development Plan of the Energy Sector Until 2020

Preparation and implementation of a national development plan in heating

District heating is widespread in Estonia, although several problems have occurred in the area of development of market relations (coordination of prices, impact on the monopolistic situation of the market, etc.). The relatively high dependence of district heating on natural gas and the large price increase of district heating due to the prices of energy carriers make it necessary to diversify energy sources. At the same time, district heating companies in many areas are not capable of making the necessary investments. In the development plan in heating, the expansion of the means of generating heat and the desired development trends must be specified more clearly.

It would be important to map and analyse the problems in the area of district heating, to initiate and prepare a development plan in heating and to amend the District Heating Act.²⁹

Estonian National Development Plan of the Energy Sector Until 2030 (draft)

The changes introduced in heating must ensure, by 2050, a heating management situation in which

²⁷ Eesti riigi soojus- ja elektrienergia koostootmise potentsiaali hindamine, Estivo, Tallinn (*Assessment of the cogeneration potential of Estonia for thermal and electric energy*)

²⁸ <http://online.le.ee/2014/02/27/valitsus-algatas-kaugkutteseaduse-muutmise/>

²⁹ https://www.mkm.ee/sites/default/files/elfinder/article_files/energiamajanduse_arengukava_2020.pdf

the area of heating is sustainable in the long term and does not need any investments or operational support beyond ordinary business activities.

Heat is produced mainly from local and renewable fuels and fuel-free energy sources. As a result of the energy efficiency investments of buildings and increasing the efficiency of heat generation, the use of fuels for producing heat would decrease by more than 40% by 2050.

Heating undertakings must constantly contribute the most effective and cost-efficient production of heat possible, with the aim of ensuring a competitive end price for the consumer. Building of more favourable production solutions must also be supported by the regulation on district heating.

Increasing of the efficiency of distribution of district heating for the state and heating undertakings continues to be one of the priorities. For this purpose, the state is also planning investment support for the period 2014–2020 in order to reconstruct the heat pipelines.

In the future, local and spot heating would have an increasingly important role in the final consumption of heat, forcing any inefficient district heating areas to increase the efficiency of their production.

Efficient production of heat – switching boilers to other fuels (e.g. wood, straw, peat, etc.), replacing or renovating boilers, transferring to local and spot heating, adapting legislation for the efficient production of thermal energy.

The share of renewable energy should be at least 60%, the share of imported fuels less than 30%, the use of primary energy under 19 TWh, and the health impact caused by fine particles in the atmosphere must be reduced.

Increasing the energy efficiency of the existing building stock – enhancing the reconstruction of apartment buildings, small dwelling houses and non-dwelling houses, implementation of the demolition support for abandoned and decommissioned dwelling houses.

By 2030, the net area of dwelling houses reconstructed with state aid – apartment buildings: 17 million m², small dwellings: 10.4 million m². The number of households with an improved energy consumption classification should be 320 000 by 2030. Energy saving achieved in buildings reconstructed with the help of subsidies, energy saving in other reconstructed buildings according to energy performance certificate – small dwelling houses 40% = C or D; apartment buildings 50% = C; non-dwelling houses 20% = C³⁰

In order to build a cogeneration plant, a technical and economic analysis must be made for each specific location selected, which would involve the following:

- Preparing a heat load duration curve reflecting the actual situation of the relevant area (consumers);
- Establishing the own-electricity need of the potential combined heat and power producer, preparing an accurate load curve regarding it;
- Reviewing the tendencies of heat and electricity consumption in recent years, using the review to prepare a consumption forecast for the coming years, both regarding the heat consumption and the electricity consumed by the company;
- Reviewing the financial situation of the current heat producer (cash flows, loans, debts, other financial obligations); to decide which assets and obligations are transferred to a new

³⁰ https://www.mkm.ee/sites/default/files/enmak_2030._eelnou_23.10.2014.pdf

heat producer; to decide who would cover the loans, debts and other obligations (if existing) of the previous heat producer;

- Reviewing the options for loans and their terms and conditions;
- Deciding what would happen to the existing equipment and buildings of the previous heat producers, deciding on how to handle the staff working there (redundancy and compensation problems);
- Establishing whether, how and under what conditions could the electricity produced be sold, the necessary reconstruction works in the electrical part (network connection part) and in the heat-related part;
- Choosing the type of fuel to be used, establishing its availability in the coming years, preparing a price forecast for the fuel for the coming years;
- Preparing a price forecast for the potential price of thermal energy, if produced with existing equipment, forecasting the changes in the purchase and sales price of electricity in the relevant area in the coming years;
- Establishing the technical situation of heat networks, deciding whether they need reconstruction (rebuilding) in the coming years, forecasting the amount of investment required for that purpose;
- Deciding how the top load of heat would be covered (additional investments may be required for that) – it would be sensible to design cogeneration devices for covering the basic load only;
- Reviewing, if possible, the background of the local electricity network in the future (privatisation?);
- Performing feasibility studies.³¹

7.1 Support

Renewable energy support – payable for electricity produced from renewable energy sources, from biomass in cogeneration mode or using the high-efficiency cogeneration mode. Biomass shall be considered to be the biodegradable part of products, waste and residue of agriculture (incl. plant and animal substances) and forestry and the industries related to them.

0.0537 €/kWh – electricity produced from renewable energy source, excl. biomass

0.0537 €/kWh – electricity produced from biomass in cogeneration mode (a producer who has started producing electricity from biomass after 31.12.2010 is eligible for support only for electricity produced in cogeneration mode)

0.032 €/kWh – produced in high-efficiency cogeneration mode from waste, within the meaning of the Waste Act, peat or carbonised gas received from oil shale processing

0.032 €/kWh – produced in high-efficiency cogeneration mode with a production device with an electric capacity that does not exceed 10 MW³².

Receipt of support is regulated by the Electricity Market Act, in particular Section 59.

Environmental Investment Centre (EIC) support for preparing or updating development plans in heating

³¹ https://www.mkm.ee/sites/default/files/elektri_ja_soojuse_koostootmise_potentsiaal_eestis_2005.pdf , lk 20-21

³² http://elering.ee/map.php?mod_rewrite=/&cmd=taastuenergia-toetus/

The aim of the support is to use a heating development plan to create preconditions for decreasing the final consumption of energy, including through more efficient production and transfer of thermal energy.

The budget of the application stage is EUR 500 000 and it will last until the end of 2017.

Support is granted to those local governments on whose territory is the network area covering the development plan for heating is located. The maximum share of support in eligible costs per project is up to 90%. The maximum amount of support to one project is EUR 5 000.³³

The support for heating development plans is granted in compliance with the objectives of the Estonian National Development Plan of the Energy Sector Until 2020. The expected result of the support is 200 approved up-to-date development plans in heating, whose implementation would contribute to the more efficient production, distribution and consumption of energy through the introduction of more cost-efficient heating sources.³⁴

The support measure is valid from May 2015.

In addition, EIC, Kredex and PRIA have from time to time offered investment support for cogeneration and local devices. The investment support offered by these authorities might soon become relevant again.

Supporting the investments in district heating systems

From the second quarter of 2016 up to the end of 2020, the EIC will support the renovation of heat pipelines and district heating boiler houses.

The activities under the support measure aim at providing support to local governments or heating undertakings for renovating district heating pipelines or building new ones and for renovating boiler devices or installing new equipment.

As a result of the activities under the measure, district heating boilers with capacity of at least 86 MW have been reconstructed, along with 137.5 km of depreciated inefficient heat pipelines.

The activities under the measure are financed from the resources of the Cohesion Fund. Under this measure, EUR 27 500 000 have been designated for renovating heat pipelines and EUR 43 000 000 for renovating heat generation equipment have been foreseen for supporting the activities.

8 Plans and objectives of development plans in heating of local governments

8.1 Haljala Town

There is no intention of abandoning district heating and, according to the assessment, it is a functional and means of heating in this town, with some development prospects.

³³ <http://www.kik.ee/et/soojusmajanduse-arengukava-koostamine>

³⁴ Soojusmajanduse arengukava koostamise toetamise tingimused (*Terms and conditions for supporting the preparation of development plans in heating*)
<https://www.riigiteataja.ee/akt/106052015011>

Buildings must be made more energy-efficient, which would result in a decrease in consumption of heat, by approximately 17% by 2021 (when compared to 2011). After the renovation of all buildings, the use of heat would decrease by 37% compared to 2011.

Residual heat produced by AS Viru Õlu could be used in a district heating system (calculated average capacity of residual heat at least 300 kW).³⁵

8.2 City of Loksa

Currently shale oil is used but, as the use of this fuel is not sustainable taking into account the price, investments should be made into the building of a boiler house working with local solid biofuels.

In addition, the heat network should be 100% renovated.³⁶

8.3 City of Elva

The technical level of the heating supply system is good. Practically the whole network of Elva's heating pipelines has been renovated.

On the other hand, some older buildings need insulation and balancing of intra-building heating systems.

It would be reasonable to join new heat consumers in order to improve the use of capacities.

It would be expedient to organise the production of tap water on the basis of solar collectors and, over a longer timeframe, replacing the devices of Kirde and Central Boiler Houses with a cogeneration plant could be considered.³⁷

8.4 City of Tapa

The continued use of shale oil is not sustainable taking into account the price and it should be switched to solid biofuel. Production of centralised hot water should be considered, especially if a cogeneration plant is built in the city.

In addition, the part of the city where the Defence Forces' infantry unit is located should also join the district heating network.

The energy efficiency of buildings should be increased.³⁸

³⁵ Haljala aleviku soojusmajanduse arengukava aastateks 2013-2020, Tallinn-Haljala, 2012-2013 (*Heating development plan for Haljala Town for 2013-2020*)
<https://www.riigiteataja.ee/aktiis/4030/9201/3087/Haljala%20aleviku%20soojusmajanduse%20arengukava%202013-2020.pdf#>

³⁶ Loksa linna soojusmajanduse arengukava aastateks 2015-2027, Tallinn, 2014-2015 (*Heating development plan for City of Loksa for 2015-2027*)
https://www.riigiteataja.ee/aktiis/4310/1201/5024/soojusmajanduse_arengukava.pdf

³⁷ Elva linna soojusmajanduse arengukava, Elva, 2013 (*Heating development plan for City of Elva*)
<https://www.riigiteataja.ee/aktiis/4080/5201/4099/lisa.pdf#>

³⁸ Tapa linna kaugküttepiirkonna soojusmajanduse arengukava aastateks 2014-2026, Tallinn, 2014 (*Heating development plan for the district heating area of City of Tapa, 2016-2026*)
https://www.riigiteataja.ee/aktiis/4041/0201/4056/maarus_23_Tapa_linna_kaugkuttepiirkonna_soojusmajanduse_arengukava_aastateks_2014-2026.pdf#

8.5 Käärdi Town

In this area, district heating is the most suitable solution; the consumption density of Käärdi Town is 1.88, meaning that this network is sustainable.

In particular, heat pipelines require renovation and the apartment buildings with stove heating located near the boiler house should build a water-based central heating system and join the district heating network.³⁹

8.6 City of Võru

In this city, district heating is an expedient form of heat supply and it should be maintained and developed.

The Võrukivi Boiler House should switch to biofuel and the Võrusoo Boiler House should be equipped with a cogeneration device, especially if new consumers join.

The district heating networks should be reconstructed and the consumers should be provided with automatic heating nodes.⁴⁰

8.7 Aravete Town

The consumption density of this town is 1.57, which indicates among others that the heating network is sustainable.

The heating network requires reconstruction and the houses should be renovated as well in order to decrease energy loss.

It should be taken into account that consumption of heat would decrease and, as a result, the consumption density would also fall. Before reconstruction of the pipeline, the consumers should be reviewed and the feasibility of the investment evaluated.

If possible, new consumers should also join.⁴¹

8.8 Ülenurme Rural Municipality

The natural gas used currently is not sustainable taking into account the price and it should be switched to local solid biofuel.

In addition, heat pipelines should be renovated.⁴²

³⁹ Käärdi kaugküttepiirkonna soojusmajanduse arengukava 2015-2025, A. Vabamägi, 2015 (*Heating development plan for the district heating area of Käärdi, 2015-2025*) <http://www.rongu.ee/pages/files/arengukavad/K%C3%A4rdi%20aleviku%20kaug%C3%BCttepiirkonna%20soojusmajanduse%20arengukava%202015.pdf>

⁴⁰ Võru linna soojusmajanduse arengukava aastani 2020, Võru-Tallinn, 2007-2008 (*Heating development plan for the City of Võru until 2020*) http://www.voru.ee/files/soojusmajanduse_arengukava.pdf

⁴¹ Aravete aleviku kaugküttepiirkonna soojusmajanduse arengukava, Ambla-Tallinn, 2015 (*Heating development plan for the district heating area of Aravete Town*) http://www.ambla.ee/documents/6165445/7160995/Aravete_aleviku_kaug%C3%BCttepiirkonna_soojusmajanduse_arengukava_15_04_2015.pdf/fa78c52e-705c-42f8-aef1-37e8080d303d?version=1.0

⁴² Ülenurme valla soojusmajanduse arengukava aastateks 2015-2027, Tallinn, 2015 (*Heating development plan for Ülenurme Rural Municipality 2015-2027*) <http://www.ylenurme.ee/documents/101034/893352/14-144+%C3%9Clenurme+valla+kaug%C3%BCttepiirko>

8.9 Röpina Rural Municipality

Transfer to domestic biofuel might not bring about a noticeable change in the price, but it would increase the security of supply and should keep the price more stable than when produced with natural gas. In addition, the environmental situation would improve and it would provide jobs to local residents, with more funds remaining in the rural municipality.

The district heating network requires reconstruction and the energy efficiency of buildings should be increased.

If possible, the local boiler houses should be liquidated in the city of Röpina and the consumers affected should be joined to the district heating network.⁴³

8.10 Torma Town

In order to maintain the sustainability of the heat supply, both the boiler house and the district heating network as a whole must be reconstructed.

A district heating area should be established, and the boiler house and consumers should be equipped with functioning heat meters.

If possible, new consumers should also join the district heating network.⁴⁴

8.11 Vaivara Rural Municipality

Firstly, the reconstruction of the network should be completed.

Renewable energy sources should put to use.

Installation of a cogeneration device and joining the Narva heat network would be economically expedient.⁴⁵

8.12 Kohila Rural Municipality

The efficiency of the existing district heating system should be improved. A cheaper and more environmentally friendly fuel should be used and a more flexible district heating should be created.

A set of statistical data should be prepared in order to help analyse and improve the work of the district heating network.

nna+soojusmajanduse+arengukava+31.03.15.pdf/d90e19aa-51b1-4e23-9e9b-de471d10b904

⁴³ Röpina valla energiamajanduse arengukava, Röpina-Tallinn, 2009 (*Development plan in energy sector of Röpina Rural Municipality*)

http://www.revekor.ee/konkurs/Rapina_valla_energiamaajandusearengukava__01_07_2009_Par.pdf

⁴⁴ Torma alevi soojusmajanduse arengukava, Tallinn, 2005 (*Heating development plan for Torma Town*)

http://www.pala.ee/files/menu/2005031608483030torma_arengukava_final.pdf

⁴⁵ Vaivara valla soojusmajandus arengukava 2013-2020, TTÜ, 2013 (*Heating development plan for Vaivara Rural Municipality 2013-2020*)

http://www.google.ee/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCMQFjAAAhUKEwi72rX90drGAhUr83IKHX4TCLo&url=http%3A%2F%2Fdocs.vaivaravald.ee%2Findex.php%3Ffolder%3DDocuments%26download%3DArengukava%25202013-2020.pdf&ei=6QKIVfvBFqvmywP-pqDQCw&usq=AFQjCNF_-z3nFrcnMkQkZ9TqcuisN7Whg&sig2=jdjY8vR9aczoKDaLiNz8-Q&bvm=bv.97653015.d.bGQ

When replacing the heating pipelines, thorough dimensioning calculations should be made, as heat losses are smaller if the diameters of heat pipelines are smaller.

Construction of a cogeneration plant in the rural municipality would not be feasible, as there is no district heating system with an even load.⁴⁶

8.13 City of Türi

In this city, district heating is an expedient form of heat supply and it should be maintained and developed.

The most expedient solution would be to continue with the operation of the two existing district heating networks (Tehnika and Vabriku) separately and, at the same time, renovate the pipelines of both networks.

Consumers should be provided with automatic heating nodes.

Cogeneration in this city is not relevant, as the cost-efficiency of the project would be low.

If possible, the local government should favour and support the use of local fuels where possible.⁴⁷

8.14 Kuusalu Rural Municipality

In this city, district heating is an expedient form of heat supply and it should be maintained and developed.

In Kolga, a 1 MW wood chip boiler should be installed in a depreciated heavy fuel oil boiler house, but it is advisable to use the resource of the existing boilers as a peak load boiler.

Heat networks should be reconstructed and replaced with preinsulated pipes.

In the Kiiu heat network area, consumption should be increased; for this, at least all the consumers of the houses that are joined to the heat network should be recovered.

Consumers should be provided with new heat nodes.

Cogeneration in this rural municipality is not relevant, as the cost-efficiency of the project would be low.⁴⁸

8.15 Palamuse Rural Municipality

⁴⁶ Kohila valla soojusmajanduse arengukava, Tallinn, 2008 (*Heating development plan for Kohila Rural Municipality*)

<http://kohila.kovtp.ee/documents/1123203/1271448/soojamajanduse-arengukava.pdf/539af3e4-6d9c-409b-a11e-df78952498dd>

⁴⁷ Türi linna soojusmajanduse arengukava, Türi-Tallinn, 2005-2006 (*Heating development plan for the City of Türi*)

<http://www.tyri.ee/documents/101289/4668856/SOOJUSMAJANDUSE+ARENGUKAVA2.pdf/affa3f22-ad4a-480c-8d9d-81aeb45fc05b>

⁴⁸ Kuusalu valla soojusmajanduse arengukava, Tallinn, 2004 (*Heating development plan for Kuusalu Rural Municipality*) http://www.kuusalu.ee/file_storage/2318/204429

The main objective is to ensure security of supply for consumers with each type of fuel and energy source in order to ensure the economic and social development of the rural municipality. In Palamuse and Kaarepere, the fuel used continues to be natural gas for now, but in the future the use of local fuel (e.g. waste or products of timber enterprises or biofuels) should also be considered. Local fuel would create a precondition for a situation where any price changes in the global market would not cause problems and where there would be no problems with environmental taxes. At Luua, the use of other fuels should be considered while the current boiler house depreciates. In addition, automatic nodes should be installed in buildings where there are no such nodes yet, and it is also important to renovate the main pipelines of the heating system and choose suitable diameters.⁴⁹

8.16 Peri Village

The main objective is to ensure security of supply for consumers. At the moment the heat energy system uses natural gas as a fuel, but a significant alternative would be the transfer to heat pumps. At the level of the rural municipality government, it is important to start to prepare the Peri Village for separation from the district heating network and to develop the implementation of energy saving measures in order to enhance the transfer.

If district heating continues to be used, heat nodes should be renovated, as it would provide a saving of 8% when heating the building. The boiler house should be reconstructed (possible variant: 1.5 MW gas boiler house with three 0.5 MW gas boilers). A major saving would also be achieved from renovating heat pipelines, as this would decrease heat losses.

Currently it would be most sensible to transition to individual gas boilers, as the related investment would be significantly smaller and the lead time would be shorter compared to the renovation of the district heating system. In addition, it would have many advantages, as the consumers would no longer depend on the heat producer, its rules or changes in the price of heat.⁵⁰

8.17 Otepää Rural Municipality

In order to increase energy efficiency, energy losses in the pipeline should be decreased, a two-pipe system should be introduced, and consumer need for thermal energy should be reduced.

One of the future scenarios could be joining the two district heating areas of AS Otepää Veevärk, with one of the two boiler houses staying in operation.

Alternatively, one of the district heating areas could be supplied with thermal energy by OÜ Eksiiv.

In all scenarios, the district heating pipelines would be replaced. The district heating area of the City of Otepää would be transferred to a two-pipeline system. In addition, the decrease in the thermal energy consumption would be taken into account.⁵¹

⁴⁹ Palamuse valla soojamajanduse arengukava, Tallinn, 2009 (*Heating development plan for Palamuse Rural Municipality*)

https://palamuse.kovtp.ee/documents/824450/1387796/soojamajanduse_arengukava.pdf/c4a20abe-195e-4739-9e71-a93c22546293

⁵⁰ Peri küla soojamajanduse arengukava, Tallinn, 2013 (*Heating development plan for Peri Village*)

http://www.polva.ee/bw_client_files/polva_linn/public/img/File/document.pdf

⁵¹ Otepää valla soojamajanduse arengukava, Tartu-Otepää, 2013 (*Heating development plan for Otepää Rural Municipality*)

<https://www.riigiteataja.ee/aktilisa/4250/7201/3009/arengukava.pdf>