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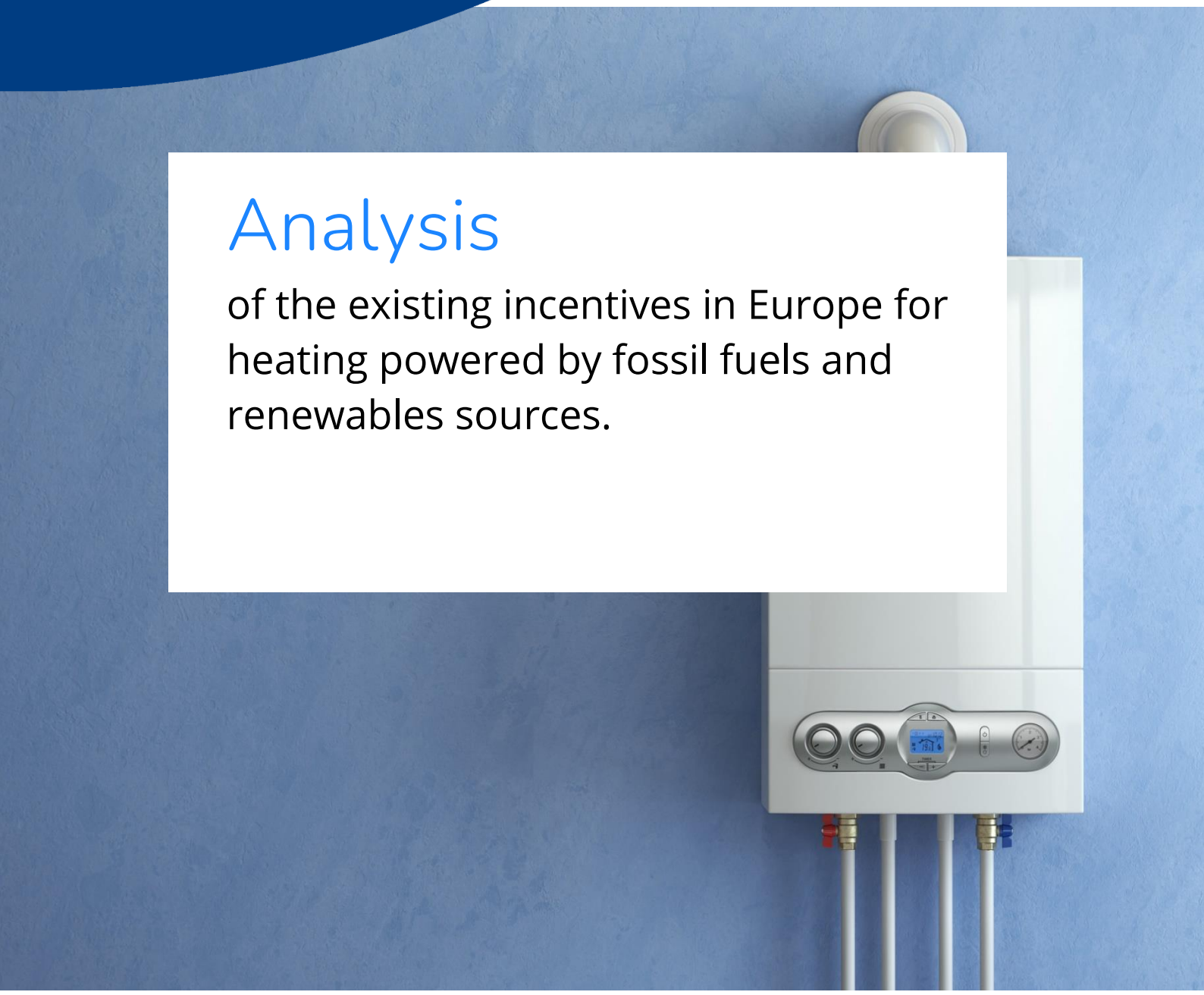
Analysis

of the existing incentives in Europe for heating powered by fossil fuels and renewables sources.



coolproducts
for a cool planet

Analysis of the existing incentives in Europe for heating powered by fossil fuels and renewable sources.

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This work has used the analysis from December 2020
by **Fabio Tognetti** as a starting point.

Several organisations have helped with input and control of information.

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ABSTRACT

The purpose of the report is to list and summarize the economic promotion schemes for fossil fuel and for renewable energy domestic heating systems in force in the EU-27 states as of 30 June 2021, evaluate the emissions of the supported technologies, and their affordability for a one-earner-couple with two children.

The analysis shows that most EU governments pay millions of euros in subsidies to have new gas boilers installed in our homes, despite evidence that this is slowing down the uptake of renewable heat and undermining Europe's 2030 climate goals.

Only seven countries in the EU have so far stopped the flood of public money going into subsidizing the installation of fossil fuel heating systems as part of their climate or fiscal plans. These include Croatia, Estonia, Ireland, Lithuania, Luxembourg, Malta and the Netherlands. Outside of the EU, they are joined by Norway - see table 1.

At least 16 out of 27 EU governments still incentivise the purchase and/or installation of new gas boilers through various tax reductions, loans and grants, which range between €200 and €2,500 and are supposedly aimed at greening our homes. Some tax schemes are aimed at creating jobs, but at the same time supports fossil heating. More to that, in 8 countries oil boilers are still subsidised and in Belgium and Hungary support schemes for coal heating appear to be still in place. Finally, 14 governments are supporting hybrid solutions that combine both fossil and renewable heating.

Most countries support in one way or another the installation of renewable energy for heating in the form of heat pumps and solar heating. These subsides make the shift to renewables more affordable, but to very different degrees. And still the investment is higher when installing air source heat pumps compared to gas boilers in all countries except Italy and United Kingdom – see Fig. D. In Belgium it is nearly 10 times as expensive to invest in an air source heat pump – in the other countries it is 2-5 times more expensive.

The renewable heating support schemes are very different, both in the form of support levels, and in the availability. Some schemes are only open for a short time and have quite limited budgets. The existing diversity of schemes creates huge differences from country to country for the considered standard household that intends to switch to renewable heating.

The analysis of the climate emissions related to the different heating technologies in this report indicates that already today in all members states ground-source heat pumps working on grid electricity emit considerably less GHG than gas boilers. It is also the case for all other HP types in all considered countries but two. The uptake of natural and low-GWP refrigerants in HP and renewables in the electricity mix are expected to further improve the climate performance of all heat pumps in the next years.

The report serves as basis for the maps of the website coolproducts.eu where figures are combined with climate emissions related to the different technologies, and incentives schemes' performances are evaluated.

Table1 gives an overview while the national support schemes are explained in more detail in the next part of the report.

European overview table

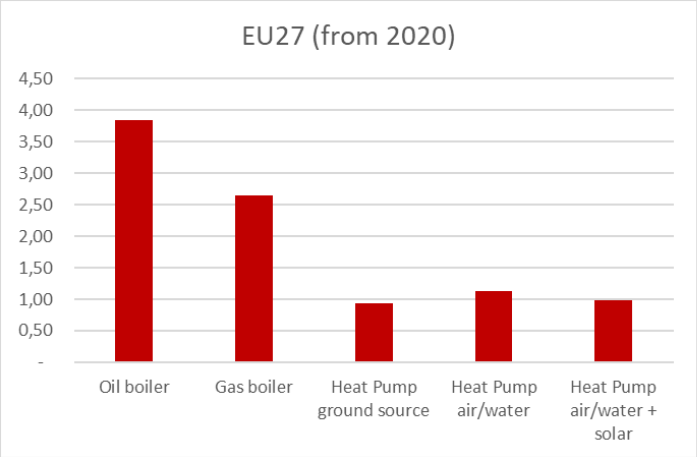
The incentives have been assessed both based on type (soft loans, grants or tax reduction schemes), and the incentivized technologies. The following table summarizes the result of the analysis.

Number	Country	Coal boilers			Oil boilers, condensating			Gas boilers, condensating			Hybrid Heat Pumps			Air/Air Heat Pumps			Air/Water Heat Pumps			Water/Water + Ground Source Heat Pumps			Biomass			Solar Thermal		
		S	T	L	S	T	L	S	T	L	S	T	L	S	T	L	S	T	L	S	T	L	S	T	L	S	T	L
1	Austria							*		*				x			x			x			x			x		
2	Belgium		x			x	*	x	x	*	x	x		x	x	*	x	x	*	x	x	*	x	x	*	x	x	*
3	Bulgaria									x			x			x			x			x	*	x	x		x	x
4	Croatia																											
5	Cyprus							x			x			x			x			x			x			x		
6	Czechia							x						x			x			x			x			x		
7	Denmark								x			x			x		x	x		x	x						x	
8	Estonia																											
9	Finland								x			x			x		x	x		x	x		x	x			x	
10	France				x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
11	Germany							x			x			x		x	x		x	x		x	x		x	x		x
12	Greece				x			x			x			x	x		x	x		x	x		x	x		x	x	
13	Hungary	x			x			x		x	x		x	x		x	x		x	x		x	x			x		x
14	Ireland													x			x			x						x		
15	Italy					x			x		x	x		x	x		x	x		x	x		x	x		x	x	
16	Latvia						x			x			x			x			x			x			x			x
17	Lithuania														x			x			x			x			x	
18	Luxemburg															x			x			x			x			x
19	Malta																x									x		
20	Netherlands																x			x						x		
21	Norway																x			x			x			x		
22	Poland	x			x			x	x					x	x		x	x		x	x		x	x		x	x	
23	Portugal									x				x		x	x		x	x		x	x		x	x		x
24	Romania							x			x						x			x			x			x		
25	Slovakia							x						x			x			x			x			x		
26	Slovenia							x		x				x		x	x		x	x		x	x		x	x		x
27	Spain							*						x			x			x			x			x		
28	Sweden					x			x			x			x			x			x			x			x	
29	United Kingdom							x		*	x						x		*	x		*	x		*	x		*

Table 1. Summary of incentives *(S = subsidy; T = tax reduction; L = loans; *only at local level – light colour)*

CO_{2e}-emissions from Heating of an Individual House

The greenhouse gas emissions of heating a house depend to a large extent on the chosen form of heating. Comparing emissions of heating solutions shows the huge reductions possible, even when the comparison is between new, efficient oil and gas boilers and new heat pumps + solar. This is shown in the graphs below using EU average climate and CO_2 emissions from today's power production as well as with typical use of refrigerants for heat pumps.



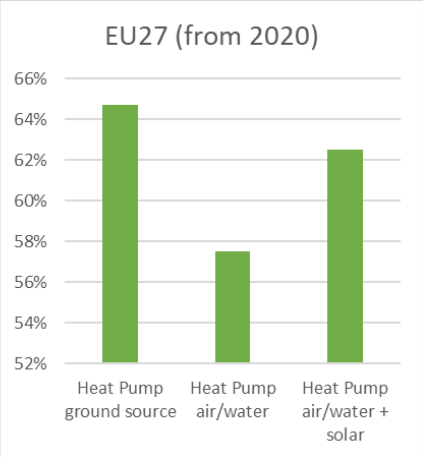


***Fig A** (left) CO_{2e}-emissions in ton/year/family for different heating solutions*
***Fig B** (right) Percentage lower CO_{2e}-emission when choosing to install a renewable energy heating system compared to installing a new gas boiler*

There is a large variation from country to country. The annual heat consumption varies due to different climates and difference in the thermal insulation standard of the buildings. The CO_2-emission from electricity consumption (heat pumps) also differs a lot, depending on the fuel mix and efficiency of power generation. Only in two countries, namely Poland and Estonia, the CO_{2e}-emission is larger from using an air source heat pump with the power mix in 2019 than using an efficient gas boiler. This is due to the high share of coal used for power generation in these countries, but the situation there is expected to improve with the uptake of renewables in the grid and the use of natural and low-GWP refrigerants in the HP.

With the new EU target of 55% reduction of greenhouse gases 1990-2030, there will also be reductions in the emissions in the power sector, which we estimate to be at least 37% from 2019 and probably higher. When this target is reached, and if the transition is with similar emission reductions in all countries, heat pumps will have lower emissions than gas heating in all countries.

The next graph compares emissions based on the 2019 data.

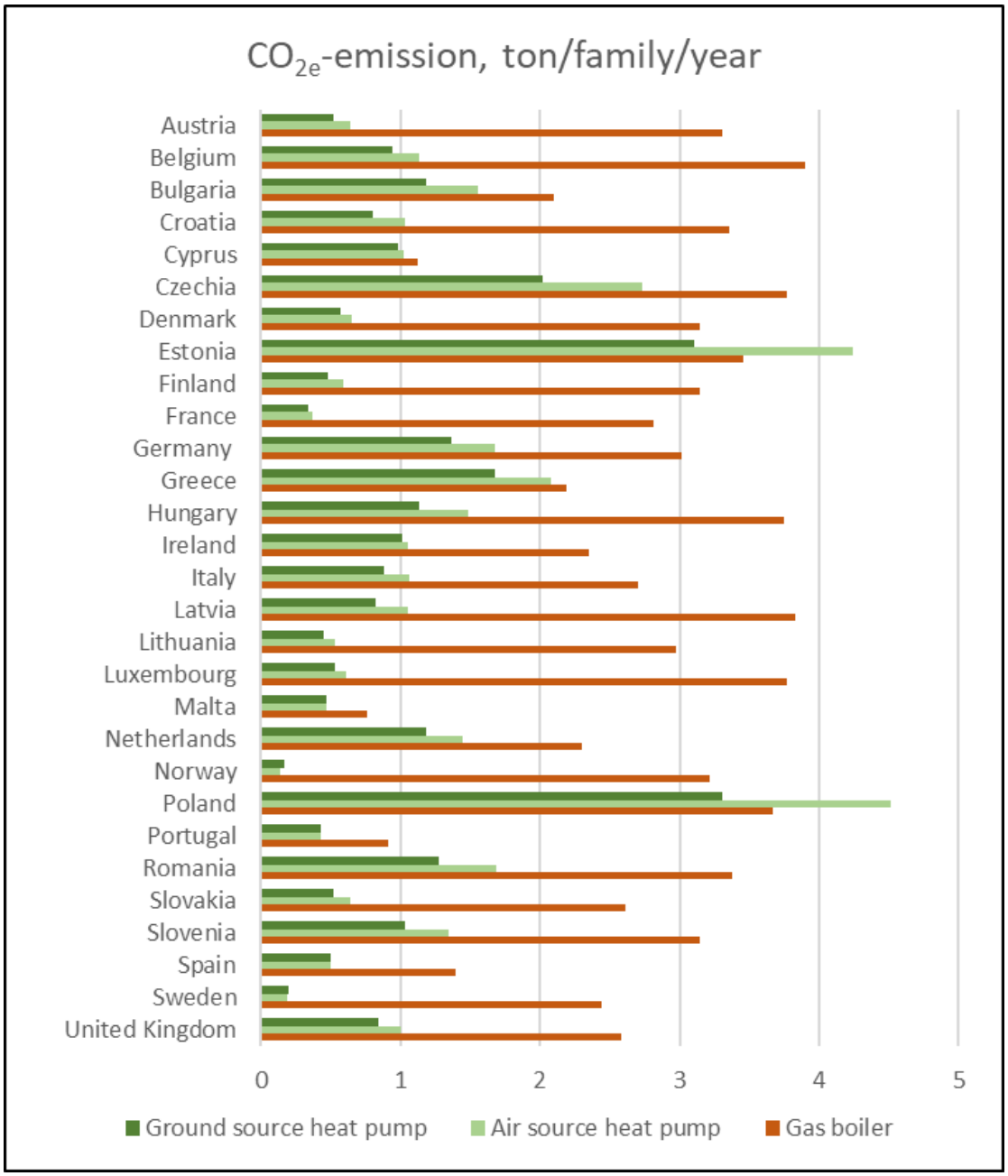


Figure 1 CO2e-emissions in ton/year/family for gas boilers and air source heat pumps.

The graphs above compare greenhouse gas emissions for heating of space and hot water for a 110 m^2 house with a 4-person family with average European climate and average European power supply. In all countries considered, ground-source heat pumps are the lowest emitting technologies.

In the following part of the report are graphs comparing the emissions from heating a similar house with national averages of heat demand and power supply emissions. The national comparisons are also based on solar and heat pump efficiencies according to EU climate zones (warm, average, cold).

In the future, the emissions differences will be larger, as emissions from electricity production is reducing fast and heat pump markets are changing to heat pumps with lower greenhouse effects of refrigerants (in this example refrigerants lost to the atmosphere contribute around 15% of emissions of the heat pumps).

See the methodology and sources for the calculation at the annex at the end of the report.

Affordability of Heating Installation – Upfront Costs

The upfront cost remains a major obstacle to switch heating technology, especially for low- and mid-income households. The affordability of changing to renewable energy is very different between the

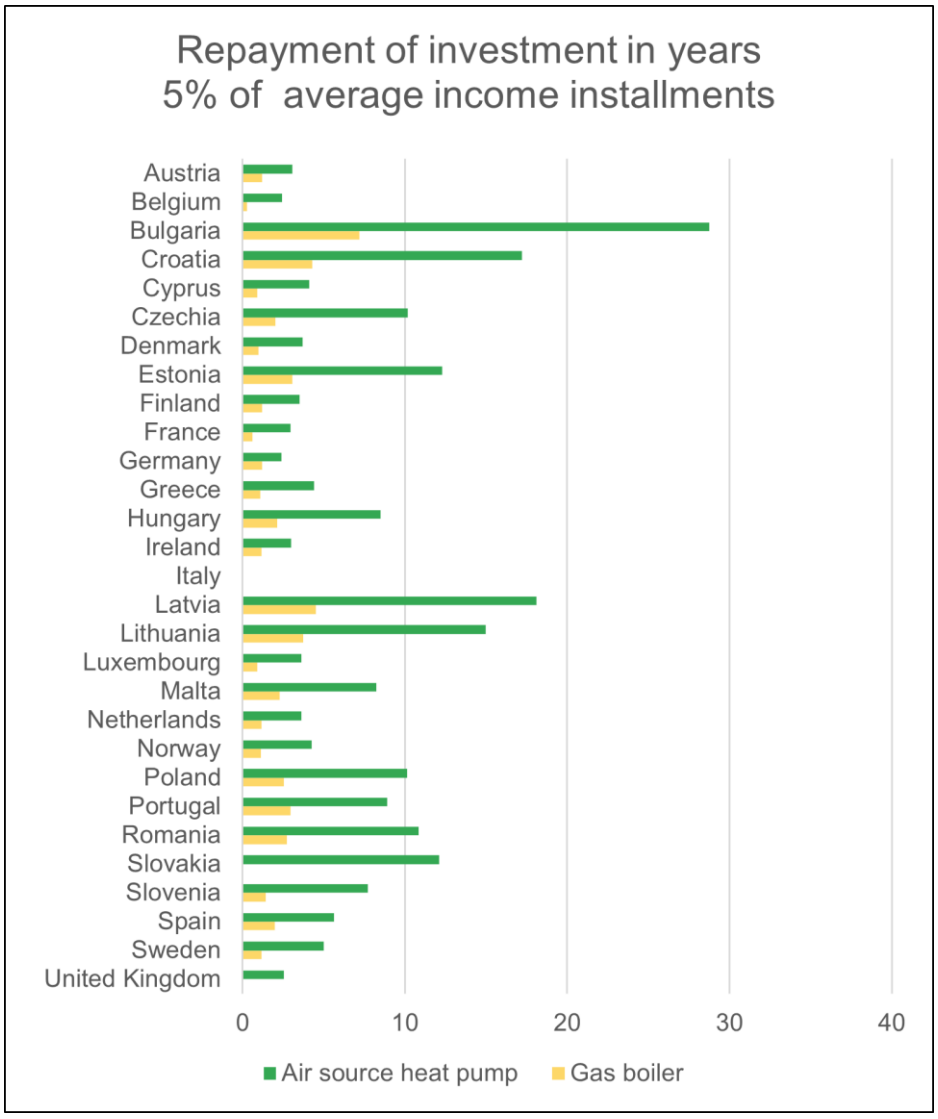


Figure 2 Payback period for investments in air source heat pump and gas boiler with highest generally available subsidies. This comparison does not concern the availability of the solutions, as for instance gas heating is in general not permitted in Norway

EU countries, Norway and the UK. While there are large differences within each country, in this report we just compare families that has one average wage for a full-time employee of each country.

We compare the affordability, by comparing the time to pay for the investments minus subsidies, if the family pays 5% of the income for the investment. We have not included interest rates, nor possible savings on bills.

A comparison of the affordability of investments for a fossil heating alternative (condensing gas boiler) and two renewable alternatives (ground source and air source heat pump) is shown in the previous graph.

For some countries (Italy, Slovakia, UK), the repayment period is 0, as the subsidies can add up to 100%.

For some countries with limited heating demand, the obvious renewable alternative is not a heat pump for a water-based heating system, but air-air heat pumps combined with solar thermal for hot water. This is the case for Cyprus, Malta and parts of Portugal, Spain France, Italy, and Greece.

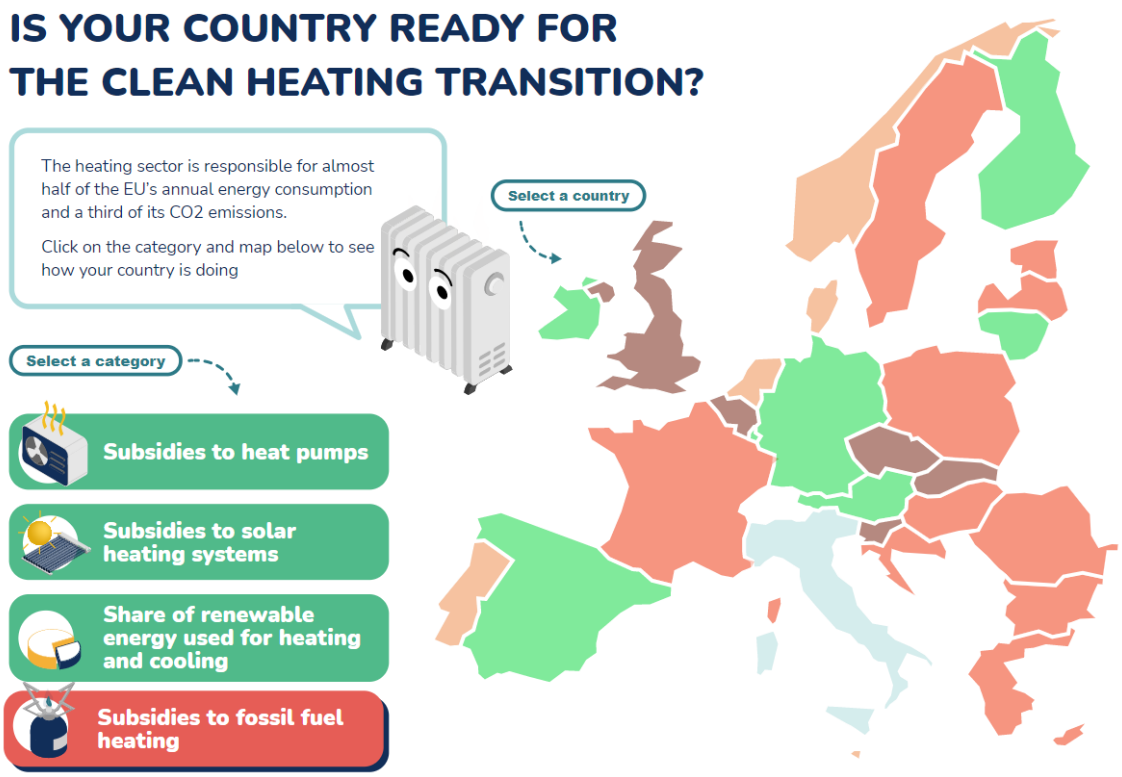


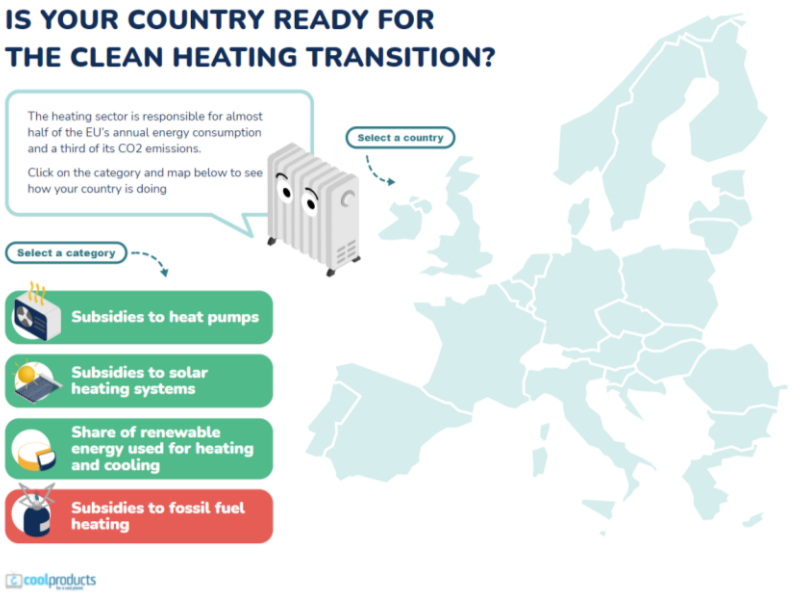
Figure 4 map of countries ranked according their convenience of fossil gas vs renewable heating. Dark colour indicates high renewable payback time

Incentives, emissions and affordability by country

The information in the summary at the beginning of each country paragraph can also be found at the interactive heating map on the Coolproducts website.

https://www.coolproducts.eu/failing-rules/mapping-europes-subsidies-for-fossil-fuel-heating-systems/

At the website you can also find updates and more studies related to heating policies, e.g. a new analysis of Member States' ambition to phase out fossil-fuel heating, July 2021,



Affordability of fossil fuel and RES heating systems

To compare the costs of switching to a different heating system, we have calculated how long it takes for a one-earner-couple with two children to recover the purchase and installation costs, using 5% of their monthly income to repay the investment. The calculation does not take into consideration running costs. This information can be found in the summary at the top of each country.

Colouring of titles

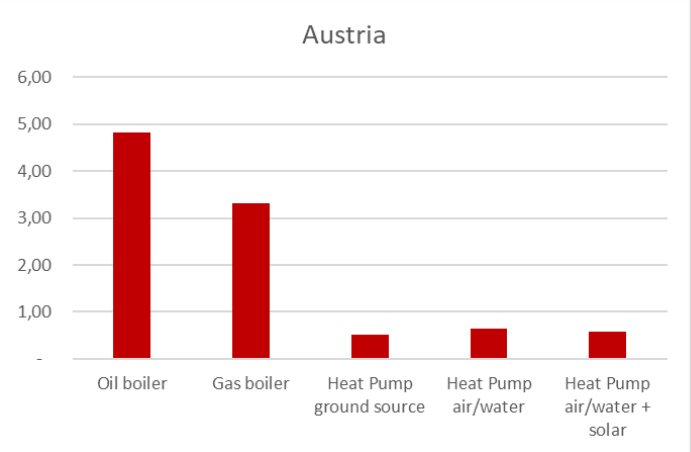
The titles of the paragraphs dedicated to the Countries is coloured green if in that Country there are **only** incentives for renewable sources. They are coloured red if there are also incentives for fossil fuels. Similarly, the titles of the paragraphs dedicated to the single schemes are coloured green if the scheme promotes **only** RES and in red if it promotes fossil fuels.

AUSTRIA

Summary – main support schemes for heating of households

Fossil		Gas boiler	Regional governments are mostly in charge of providing grants and soft loans to gas boilers. Amount and type of subsidy vary depending on the region. Without subsidy, a one-earner-couple with two children could take a little more than 1 year to recover the installation costs.
Heat pumps	Grants	Air/water heat pump	National subsidy schemes fund up to 35% of the installation costs for a heat pump in detached homes, provided that it's replacing an oil boiler. Households can expect a subsidy of about €3,500 to buy a heat pump. A one-earner-couple with two children could take less than 4 years to recover the installation costs. Regional support schemes may also apply.
Solar thermal	Grants	Solar thermal system	National subsidy schemes grant €700 for the installation of a solar thermal system. A one-earner-couple with two children could take 2 years to recover the installation costs. Regional support schemes may also apply.

CO2e emissions from heating of an individual house



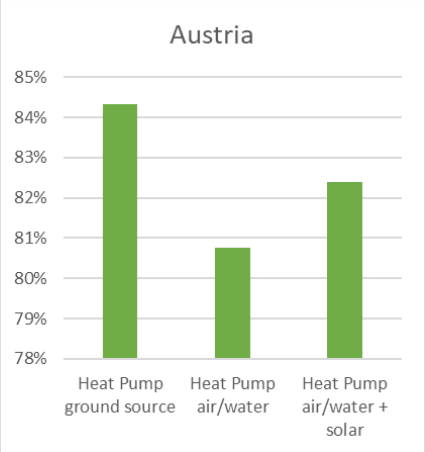


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The Austrian government has set 2025 as the phase out date for gas boilers in new buildings. From 2035 oil heating will be banned in all buildings.

Support Schemes for households' heating

Campaign Out of Oil and Gas (*Raus aus Öl und Gas*)

Type. Central government grant scheme for RES.

Description. *Raus aus Öl und Gas* campaign promotes the replacement of fossil fuel-fired heating systems with sustainable heating systems through a one-off grant (which also covers planning costs with a maximum of 10% of all eligible costs). The interventions promoted are the connection to a

district heating system or, where not possible, the transition to centralized wood heating or to a heat pump. The scheme ends December 21, 2022.

Amount: 5.000 euros for single-family buildings, 5.000-10.000 euros for multi-storey buildings + 1,500 euros pr. living unit (for heat pumps with a refrigerant with a GWP between 1.500 and 2.000, the calculated financing is reduced by 20%.). The maximum amount cannot exceed 35% of the eligible costs.

Sources: https://www.umweltfoerderung.at/privatpersonen/raus-aus-oel-efh-f-private-20212022.html

Promotion of Wood Heating (Förderung von Holzheizungen) - CLOSED

Type. Central government grant scheme for RES.

Description. The campaign financed newly installed pellet and wood chip central heating systems that replace an existing wood heating system, as well as pellet stoves. The financing scheme is exclusively for individuals. The programme is closed.

Amount: the contribution is paid in the form of a non-repayable lump sum: 800 euros for a pellet or wood chip central heating system that replaces an old wood heating system built before 2006, 500 euros for a pellet stove.

Source: https://www.klimafonds.gv.at/ausschreibungen/#private
https://www.klimafonds.gv.at/wp-content/uploads/sites/6/Leitfaden_Holzheizungen_2020.pdf

Promotion of Solar Thermal (Förderung von Solaranlagen)

Type. Central government grant scheme for RES.

Description. The campaign finances newly Solar thermal. The financing is exclusively for private individuals. The call expires March 21, 2022, or when funds are used.

Amount: The contribution is paid in the form of a non-refundable lump sum and amounts to 700 euros

Source: https://www.klimafonds.gv.at/wp-content/uploads/sites/16/Leitfaden_Solaranlagen_2020_2021.pdf
https://www.klimafonds.gv.at/call/solaranlagen-2020-21/

Local incentives in Austria

In Austria, since there are a huge number of local incentives at regional or municipality level, providing a detailed list is very complex. The incentives are generally grants, but in some cases also soft loans. Some incentives promote **gas boilers**. A private website provides a handy updated calculator that considers the various local incentives in Austria. Moreover, the Austrian Global 2000 Association published periodical report about this topic.

Source: https://www.hoval.at/de_AT/Foerder-Rechner
https://www.global2000.at/wohnbaucheck

BELGIUM

Summary – main support schemes for heating of households

Fossil	Grants, tax reduction	Gas boiler	Subsidies to fossil fuel boilers are common in Belgium. In the Brussels region, households can apply for a grant ranging between €700 and €1,200 to install gas boilers. In 2021 there is a bonus of €300-1,000 when replacing oil boilers or oil/gas stoves. A one-earner-couple with two children could take less than a year to recover the installation costs.
Heat pumps	Grants, VAT reduction	Air/water heat pump	In Belgium, subsidy schemes are set by regional governments. In Wallonia, the Primes Habitation scheme covers up to 70% of the installation costs for a heat pump, but generous VAT reductions may also apply. Households can expect an average subsidy of about €5,200. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Solar thermal	Grants, VAT reduction	Solar thermal system	In Belgium, subsidy schemes are set by regional governments. In Wallonia, the Primes Habitation scheme covers up to 70% of the installation costs for a solar thermal system, but generous VAT reductions may also apply. Households can expect an average subsidy of about €3,600. A one-earner-couple with two children could take less than a year to recover the installation costs.

CO2e emissions from heating of an individual house

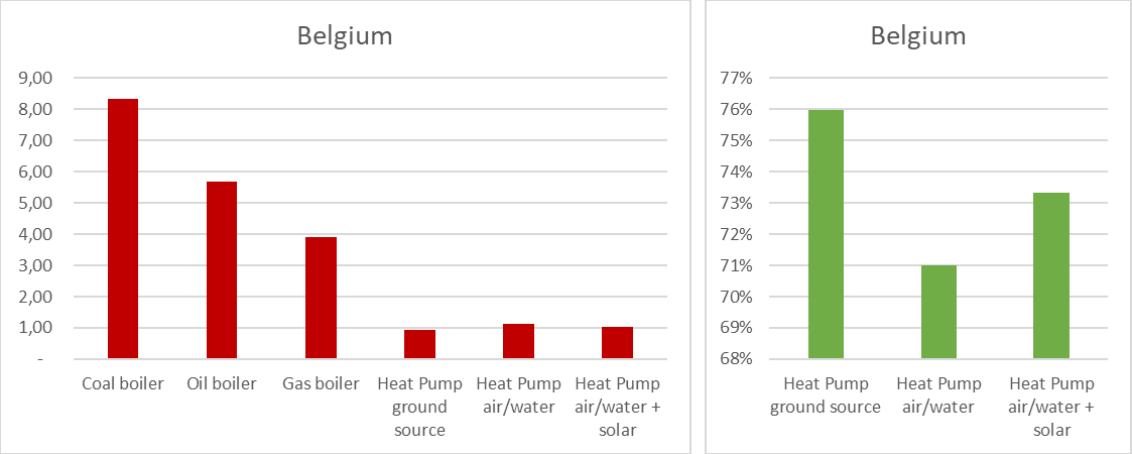


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

In 2021 the Flemish government has introduced a ban for oil in heating in all new buildings. In existing buildings, replacement is not allowed if the area is serviced by the gas grid. Gas heating is banned for apartments blocks unless used in combination with renewables. In Brussels capital region the oil ban will take place from 2025. In Wallonia in 2035.

Support Schemes for households' heating

Belgium: Energie Positive

Type. Central government grant scheme for fossil heating systems.
Description. Gas.be grants a premium for the replacement of a natural gas boiler installed in Belgium before 1 January 2000 with a new gas appliance (condensing boiler, gas heat pump, condensing hot air generator, hybrid gas heat pump, gas micro cogeneration).
Amount: 500 euros for a new natural gas boiler with a maximum nominal power of 70 kW (condensing boiler, gas heat pump, condensing hot air generator, hybrid gas heat pump, gas micro cogeneration), 5 euros extra per kW are granted with a ceiling of 2.500 euros per appliance (corresponding to 470 kW); 200 euros for a new natural gas hot water appliance for the immediate production of hot water or for its storage; 150 euros for a new appliance for individual space heating (stove, convector or built-in fire) with natural gas.

Source: https://prime.gas.be/nl/algemene-voorwaarden

Belgium: V.A.T. reduction

Type. Central government tax reduction scheme for fossils and RES heating systems.
Description. The reduced V.A.T. at 6% can be obtained in the case of renovation of a house for insulation, installation of solar boilers, photovoltaic solar panels, replacement of the central heating boilers.
Amount. VAT reduced at 6%. Standard VAT rate is 21%.

Source: https://financien.belgium.be/nl/particulieren/woning/verbouwen

Brussels: Primes énergie

Type. Local grant scheme for fossils and RES heating systems.
Description. *Primes énergie* promotes the installation of efficient boiler up to 40 kW, hot air generator or gas air heater; thermal regulation; heat pump for heating; water heater heat pump; collective chimney lining; solar water heater.
Amount: for condensation gas boilers 700/800/1200 EUR; for heat pumps for heating € 4.250/4500/4.750 (the amount of the premium is capped at 50% of the eligible costs of the invoice); for heat pump for hot water 1.400/1500/1.600 €; for solar thermal up to 4 m² from 2.500/3000/3.500 € (bonus of 200 € / m² of surface beyond 4 m²). The amount is depending on income group /A/B/C. Higher grants for low-income groups. In 2021 there is a bonus of 300/350/500 EUR when replacing old oil boilers and 600/700/1000 EUR when replacing old oil or coal stoves.

Source: https://environnement.brussels/thematiques/batiment-et-energie/primes-et-incitants/les-primes-energie-2021

https://leefmilieu.brussels/themas/gebouwen-en-energie/premies-en-stimuli/energiepremies-2021

Flanders: Property tax discount for major energetic renovations (Korting onroerende voorheffing voor ingrijpende energetische renovaties)

Type. Local tax reduction scheme for fossils and RES heating systems.
Description. A tax rebate can be obtained in case of energy renovation of buildings, with the total replacement of the heating and the insulation (of at least 75% of the building surfaces). Only valid if energy level max E60 (100 kWh/m2/year) is reached.
Amount: 100% discount on property tax for 5 years.

Source: https://www.energiesparen.be/korting-onroerende-voorheffing-voor-ingrijpende-energetische-renovaties?language=en

Wallonia: Renopack

Type. Local soft loan scheme for fossils and RES heating systems.
Description. Renopack is a 0% interest rate loan to carry out renovations. Houseowners with an annual income up to 97,700 EUR are eligible. It also covers energy efficiency measures, such as Installation of a condensing boiler, biomass boiler, biomass stove, heat pump, solar thermal.

Amount: 1,000 – 60,000 EUR.

Source: https://www.wallonie.be/fr/demarches/beneficier-du-renopack

Wallonia: Primes Habitation

Type. Local grant scheme for RES heating systems.
Description. Primes Habitacion is a subsidy for home energy improvement, which also covers various types of interventions on the heating system (see below).
Amount: the basic amount of the premium depends on the income and the composition of the household (5 income groups), with a maximum of 70% of invoices: heat pump for domestic hot water 500-3.000 €; heat pump for heating or combined 1.000-6.000 €; biomass boilers 1.000-6.000 €; solar water heaters 750-4.500 €; local biomass stoves 250-1.500 €; combined biomass boilers or stoves with solar water heaters in one operation 150% of the respective base premiums.

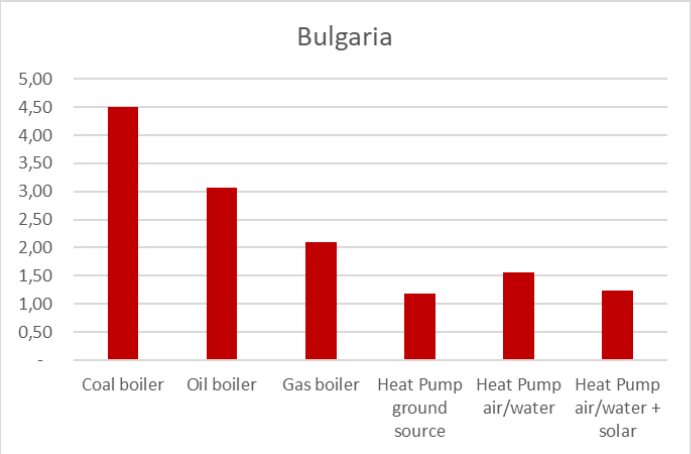
Source: https://energie.wallonie.be/fr/primes-habitation-a-partir-du-1er-juin-2019.html?IDC=9792

BULGARIA

Summary – main support schemes for heating of households

Fossil	Loan	Gas boiler	The Desiree Gas program used to subsidise the installation of gas boilers, but has expired. There is a possibility for soft loans. A household takes nearly 8 years to pay back the full cost of the investment.
Heat pumps	Loan	Air/water heat pump	The Bulgarian government offers loans to households wanting to buy a heat pump, but no grants are available at national level. Households are expected to pay back the full cost of the investment, which may take more than 15 years.
Solar thermal	Loan	Solar thermal system	The Bulgarian government offers loans to households wanting to buy a solar thermal system, but no grants are available at national level. Households are expected to pay back the full cost of the investment, which may take more than 8 years.

CO2e emissions from heating of an individual house



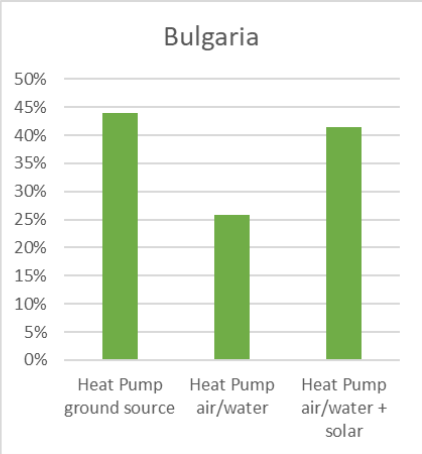


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

Support Schemes for households' heating

Energy Efficiency and Renewable Sources Fund (*фонд Енергийна ефективност и възобновяеми източници*)

Type. Central government soft loan scheme for fossils and RES heating systems.
Description. The Energy Efficiency and Renewable Sources Fund finances loans for rehabilitation and energy improvement of buildings in all sectors. Improvements to the heat source and distribution

systems are included: new high-efficiency boilers and burners; automatic boiler control systems; separate domestic hot water heaters for summer usage; substantial efficiency-driven modernization of existing boilers; boiler heat recovery devices; small cogeneration systems; high efficiency fossil fuel or electric-powered heat pumps; projects with utilization of renewable energy sources (RES) etc.

Source: https://www.bgeef.com/en/energy-efficiency-measures/

Property tax reduction

Type. Central government tax reduction scheme for RES heating systems.
Description. The improvement of renewable energy in buildings is promoted through a tax rebate for building owners. This incentive scheme provides that a building that has been granted a class A or B energy performance certificate can be exempted from property tax for a longer period of time (between 3 and 10 years) if renewable energy technologies are used in the building.

Source: http://www.res-legal.eu/search-by-country/bulgaria/single/s/res-hc/t/promotion/aid/tax-regulation-mechanism-3/lastp/111/

Project "Bulgarian Municipalities Working Together to Improve Air Quality" (LIFE-IP Clean Air)

Type. Local level grant scheme for fossils and RES heating systems.
Description. LIFE-IP Clean Air supports the implementation of the Air Quality Programs of the Sofia Municipality, Burgas Municipality, Ruse Municipality, Stara Zagora Municipality, Veliko Tarnovo Municipality and Montana Municipality. The main objective of the project is the improvement of air quality in the participating municipalities. The core instrument to achieve the objective is design and implementation of a scheme for transition to alternative forms of household heating. The scheme supports transition from heating with wood and coal to heating with pellets or gas. The new heating system is covered 100% by the grant, but the house owner has to cover costs of necessary internal installations in order to be compatible with the chosen equipment. Project budget 16.7 mill EUR, 2018-2024.

Source: http://lifeipcleanair.eu/en/index.html

DESIREE Gas (Demand Side Residential Energy Efficiency Through Gas Distribution Companies In Bulgaria) - CLOSED

Type. Central government grant scheme for fossil heating systems (Closed due to budget exhaustion in February 2020. Programme ended June 2020.)
Description. The Ministry of Energy of Bulgaria (ME), in the framework of the National Programme for Accelerated Gasification ("National Programme for Gasification"), uses grant support provided by the KIDSF (Kozloduy International Decommissioning Support Fund, managed by the European Bank for Reconstruction and Development), for the provision of incentives to households to connect to gas distribution networks. The assistance for the residential sector is delivered through a Demand Side Residential Energy Efficiency (DESIREE) Financing Facility, operating via the Gas Distribution Companies in Bulgaria.
Amount. 30% of the costs up to € 1.200.

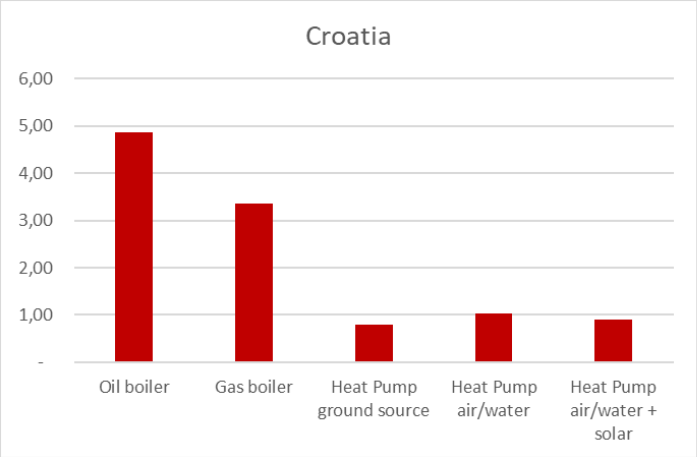
Source: https://desireegas.bg/en/

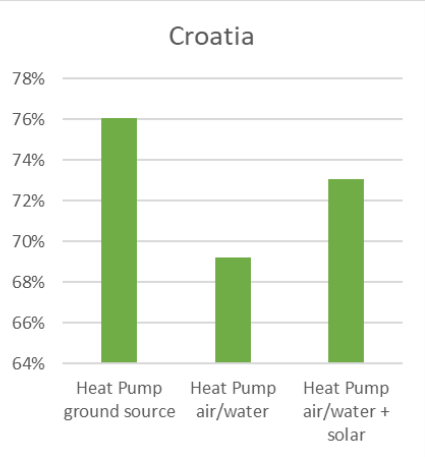
https://biomasa-energy.com/blog/%D0%BF%D1%80%D0%BE%D0%B3%D1%80%D0%B0%D0%BC%D0%B0-desire%D0%B5-gas/

CROATIA

Summary – main support schemes for heating of households

Fossil			Croatia does not subsidize fossil heating systems.
Heat pumps	Grants	Air/water heat pump	There ar no active schemes at the moment. Earlier the Croatian Government has supprted renewable heat technologies. The schemes covered up to 80% of costs for a heat pump, depending on the region. The last tender closed in January 2021. It still has not been renewed.
Solar thermal	Grants	Solar thermal system	There ar no active schemes at the moment. Earlier the Croatian Government has supprted renewable heat technologies. The schemes covered up to 80% of costs for solar thermal heating, depending on the region. The last tender closed in January 2021. It still has not been renewed.





CO2e emissions from heating of an individual house

Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Program for Energy Renovation of Family Houses – TEMPORARILY CLOSED

Type. Central government grant scheme for RES heating systems.

Description. The Program for Energy Renovation of Family Houses, implemented by the Fund for Environmental Protection and Energy Efficiency was **temporarily closed** on September 1, 2020, after the total amount of requested grants was exceeded in relation to the total available amount of planned financial resources.
Amount. The program co-financed up to 60% the increasing of the thermal protection of the houses including the installations of RES (solar heat converter systems, wood chip / pellet systems, air-water, water-water or ground heat pumps) and even water and photovoltaic systems for electricity generation for own consumption.

Source:
https://www.fzoeu.hr/hr/energetska_ucinkovitost/enu_u_zgradarstvu/energetska_obnova_obiteljskih_kuca/

***Public Call for co-financing the use of renewable energy sources for the production of heat or heat and cooling energy in households, for own consumption (Javni poziv za sufinanciranje korištenja obnovljivih izvora energije za proizvodnju toplinske ili toplinske i rashladne energije u kućanstvima, za vlastitu potrošnju)* - CLOSED**

Type. Central government grant scheme for RES heating systems. The programme ended by December 31, 2020.
Description. On September 7, 2020, the Fund for Environmental Protection and Energy Efficiency announced a public tender for the co-financing of the use of renewable energy sources for the production of heat or thermal and cooling energy of households, for self-consumption. The available funds amount to HRK 30.000.000. The call assigns funds to individuals for the installation of one or more new systems for the use of renewable energy sources for the production of thermal or thermal and cooling energy: biomass plants; heat pumps; thermal solar panels. The interventions concern houses of energy class A, B and C in continental Croatia and A and B in coastal Croatia.
Amount. The Fund will allocate funds for donations to users up to HRK 75.000 per application, for justified costs of procurement and installation of one or more systems (including VAT): up to 80%, but not more than HRK 75.000 in the area of special state interest and in the first group of islands; up to 60%, but not more than HRK 56.250 in a hilly and mountainous area and on another group of islands; up to 40%, but not more than HRK 37.500 in other areas of the Republic of Croatia.

Source: https://www.menea.hr/natjecaji/javni-poziv-za-sufinanciranje-koristenja-obnovljivih-izvora-energije-za-proizvodnju-toplinske-ili-toplinske-i-rashladne-energije-u-kucanstvima-za-vlastitu-potrosnju/

***Program for co-financing the purchase of condensing boilers for houses and apartments affected by the earthquake (Program sufinanciranja kupnje kondenzacijskih bojlera za kuće i stanove pogođene potresom)* – CLOSED**

Type. Local grant scheme for fossil heating systems.
Description. The program finances the installation of condensing boilers following the earthquake that hit the Zagreb area on 22 March 2020, partially or totally destroying numerous buildings in Zagreb and Krapina-Zagorje.
Amount. A single family can receive a grant of up to 80%, with a ceiling of HRK 8.000.

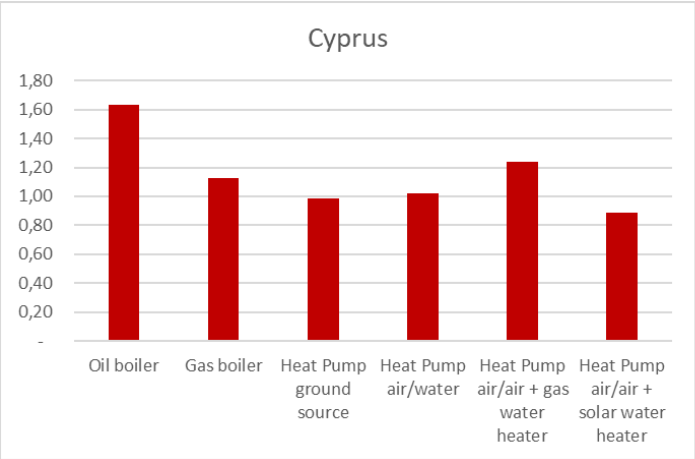
Source: https://www.fzoeu.hr/hr/sufinanciranje-kondenzacijskih-bojlera/7691

CYPRUS

Summary – main support schemes for heating of households

Fossil	Grants	Gas and oil boiler	The government launched a subsidy scheme to promote the installation of efficient gas boilers as well as renewable energy. The scheme targets existing buildings or large real estate units used as residences. The government covers between 60 and 80% of the cost, financing up to € 32,000 for a building. Households can expect an average subsidy of about €1,500. A one-earner-couple with two children could take less than a year to recover the installation costs.
Heat pumps	Grants	Air/water heat pump	The government's Save-Upgrade Houses scheme covers up to 60% of the costs of a heat pump, and 80% in the case of low-income housholds. Households can expect an average subsidy of about €5,500 for air-water heat pumps. A one-earner-couple with two children could take more than 4 years to recover the installation costs. For air-air heat pumps (air-conditioning units) there is a subsidy of €500 and a one-earner-couple with two children could take less than 2 years to recover the installation costs.
Solar thermal	Grants	Solar thermal system	The government's Save-Upgrade Houses scheme covers up to 60% of the costs of solar thermal system, and 80% in the case of low-income housholds. Households can expect an average subsidy of about €1,200. A one-earner-couple with two children could take less than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house



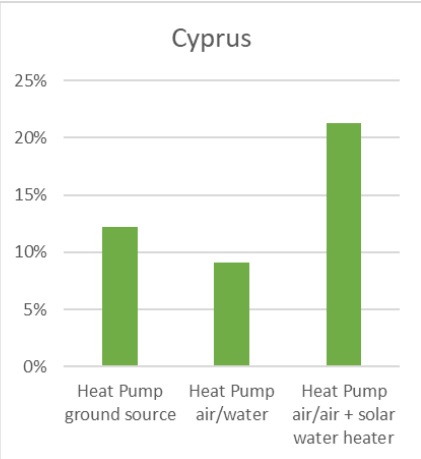


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

RES and Energy Conservation Fund, Sponsorship plan for the installation/replacement of solar systems for the production of hot water for residential use (ΣΧΕΔΙΟ ΧΟΡΗΓΙΩΝ ΓΙΑ ΕΓΚΑΤΑΣΤΑΣΗ / ΑΝΤΙΚΑΤΑΣΤΑΣΗ ΗΛΙΑΚΩΝ ΣΥΣΤΗΜΑΤΩΝ ΠΑΡΑΓΩΓΗΣ ΖΕΣΤΟΥ ΝΕΡΟΥ ΧΡΗΣΗΣ ΣΕ ΚΑΤΟΙΚΙΕΣ

Type. Central government grant scheme for RES heating systems.
Description. The program finances solar thermal with a subsidy.
Amount: € 350 for complete water heating systems (boiler + panels) whose solar panels have the keymark solar certification; € 175 for only solar panels with keymark solar certification. For mountainous areas the subsidy amount is double.

Source: https://www.resecfund.org.cy/iliaka_2021

Save-Upgrade Houses (ΕΞΟΙΚΟΝΟΜΩ –ΑΝΑΒΑΘΜΙΖΩΣΤΙΣ ΚΑΤΟΙΚΙΕΣ)

Type. Central government grant scheme for fossil and RES heating systems.
Description. The scheme aims at large-scale energy requalification of existing buildings or real estate units used as residences, which belong to natural persons living permanently in areas under the control of the Republic of Cyprus. The scheme encourages: insulation of roofs, floors, walls; installation of efficient windows, efficient gas boilers; heat pumps, solar thermal (also solar cooling); biomass boilers; efficient lamps; micro-cogenerators; etc. The overall budget of the scheme amounts to € 16.5 million. Closing date for the call is December 12, 2021; or when the budget is used.
Amount: The amount of the subsidies is equal to 60% of the expenses (80% in the case of low-income families). Maximum amounts: solar heating $1,200; air-water, water-water and ground source heat pump €5,500; high performance gas boiler €2,000; autonomous air-conditioning €500 for up to 4KW in cooling and €900 for the ones having higher than 4KW in cooling. For cooling the label must be A+++ and for heating A+. The total amount of units needed is determined by an energy efficiency planning test.

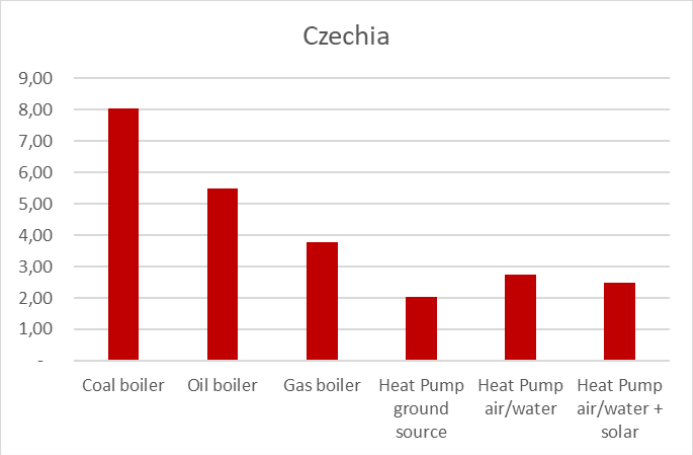
The maximum amount cannot exceed € 22,000 for each building (€ 32,000 if you make house category A energy efficient, insulate house, get 25% of energy from RES and put limits on energy needs for heating).

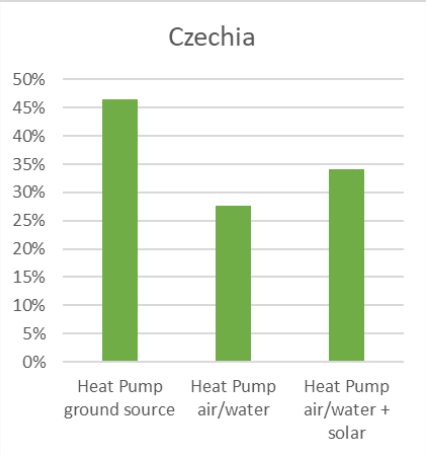
Source:
http://www.meci.gov.cy/MECI/sit/sit.nsf/dab57a092c36651fc225816f001d2b7f/2f3aeac1aa17f759c225868c004509c6?OpenDocument
http://www.meci.gov.cy/MECI/sit/sit.nsf/All/D0ADF375DF8F83E9C22586E8002803CB?OpenDocument
https://ecosmart.com.cy

CZECH REPUBLIC

Summary – main support schemes for heating of households

Fossil	Grants	gas boiler	The government's so-called Green Savings Programme provides subsidies to households willing to make the switch from coal, coke and coal briquettes to gas boilers. The grant for gas boilers covers 50% and can reach up to CZK 25,000. Households can expect anaverage subsidy of about €1,000. A one-earner-couple with two children could take about 2 years to recover the installation costs.
Heat pumps	Grants	Air/water heat pump	The government's Nová zelená úsporám scheme covers up to 50% of the costs of a heat pump. Households can expect an average subsidy of about €2,400. A one-earner-couple with two children could take more than 8 years to recover the installation costs.
Solar thermal	Grants	Solar thermal system	The government's Nová zelená úsporám scheme covers up to 50% of the costs of a solar thermal system. Households can expect an average subsidy of about €1,400. A one-earner-couple with two children could take more than 4 years to recover the installation costs.





CO2e emissions from heating of an individual house

Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

The New Green Savings Programme (Nová zelená úsporám)

Type. Central government grant scheme for fossil and RES heating systems.
Description. The New Green Savings Programme of the Ministry of the Environment supports the reduction of the energy intensity of residential buildings (complex or partial thermal insulation), construction of houses with very low energy intensity, environmentally friendly and efficient use of energy sources and renewable sources of energy (RES). Eligible applicants are owners or builders of family houses and apartment buildings, both individuals and legal entities. The programme incentives solar thermal and photovoltaic systems, controlled ventilation system with heat recovery from the exhaust air (recovery), use of heat from wastewater, replacement of electric heating with a heat pump system, replacement of local stoves (e.g. stoves used as the main source of heat for heating). Also condensing boilers are incentivized. The subsidies are increased in case of building insulation.
Amount. 50% of the eligible costs. The maximum amount is: solar thermal systems for hot water CZK 35.000, for hot water and heating 50.000; biomass boiler with manual fuel supply 40.000 (50.000 in case of insulation), with automatic fuel supply 80.000 (100.000); biomass stoves with hot water exchanger with manual fuel supply and closed fireplace inserts with hot water exchanger and fireplace stove or biomass insert with hot water exchanger with automatic fuel supply 40.000 (50.000); water-to-water and ground-source heat pump 80.000 (100.000); air-to-water heat pump 60.000 (75.000); gas condensing boiler 25.000 (35.000); connection to the heat supply system 30.000 (40.000); installation of controlled ventilation systems with heat recovery 75.000 (100.000); etc. An additional bonus is provided in the case of combining the replacement of the boiler with thermal insulation (CZK 20.000) or with solar thermal (CZK 10.000)

Sources: https://www.sfzp.cz/en/administered-programmes/new-green-savings-programme/
https://www.novazelenausporam.cz/nabidka-dotaci/rodinne-domy-zdroje-energie/

DENMARK

Summary – main support schemes for heating of households

Fossil	tax deduction	Gas boiler	Despite its green policies, the Danish government supports repair and replacement of gas boilers through tax reductions of 26% of the labour costs for the installation. When replacing a gas boiler the household can expect a tax reduction of about €300. A one-earner-couple with two children could take about 1 year to recover the installation costs.
Heat pumps	grants	Air/water heat pump	The government has plans to replace up to 70,000 oil boilers and 170,000 gas boilers with district heating systems and heat pumps. Households can expect an average subsidy of about €1,900. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Solar thermal	tax reduction	Solar thermal system	The Danish government supports installation of solar thermal systems through tax reductions of 26%. Households can expect a tax reduction of about €500. A one-earner-couple with two children could take about 2 years to recover the installation costs.

CO2e emissions from heating of an individual house

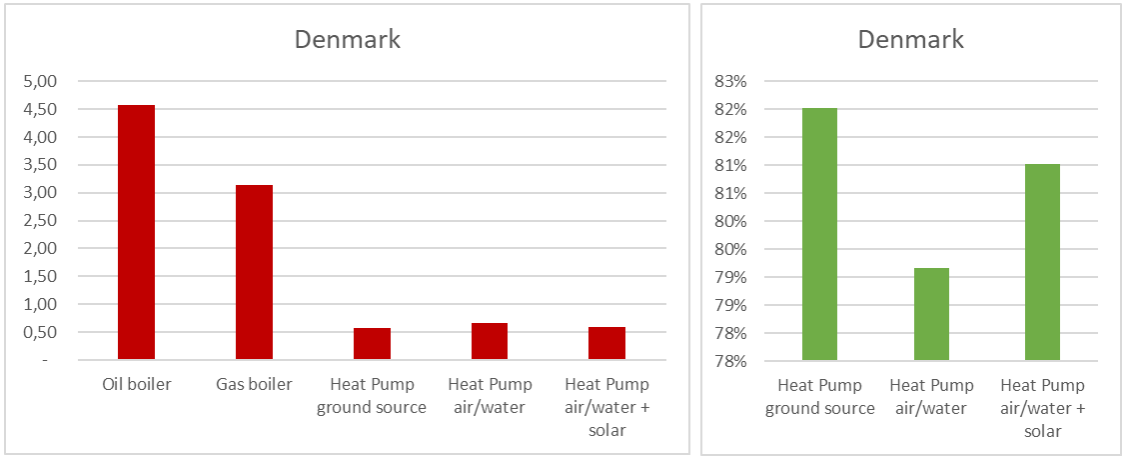


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The Danish government has banned oil boilers in new buildings in 2013.

Support Schemes for households' heating

The Building Pool - Grants for energy savings and energy efficiency improvements in buildings for year-round housing (Bygningspuljen)

Type. Central government grant scheme for RES heating systems.
Description. The Danish Energy Agency administers this scheme, that provides subsidies for energy savings and energy efficiency improvements for year-round homeowners, including private homeowners, owner associations, cooperative housing associations, public housing associations (on some conditions), dormitories, landlords, etc. The subsidies concern various types of interventions including thermal insulation, windows and conversion of the primary heat source (from oil boiler, gas boiler, biomass boiler or direct electric heat) to heat pump (only air/water or ground source class A^{++} or A^{+++} heat pump, and only if the home is not located in a district heating area). All subsidies are calculated on basis of fixed subsidy rates, set by the Danish Energy Agency, using estimated average market prices. The subsidy does not exceed 20% of the market price for the energy improvement measure itself and is only available as long as the budget last. In addition, a weighting is made to give larger subsidy to better energy solution. The grant also depends on the size of the house. The scheme is running for 2020 to 2026 with several calls every year. The scheme has changed so only buildings with energy label E, F and G can receive support, except for change to heat pump and the maximum support has been lowered, so more house owners can be supported. The scheme is heavily oversubscribed, so in spring 2021 only around ¼ of applicants were granted support. The next call will be in September 2021.
Amount. For heat pumps the grant is 15% of the market price for an A^{++} heat pump and 20% of the market price for an A^{+++} heat pump. installed in a 140 m^2 building. Ground/water heat pump DKK 14.000 for an A^{++} heat pump and DKK 23.000 for an A^{+++} heat pump installed in a 140 m^2 building. For example: for an A+++ air/water HP installed in a 140 m^2 house the subsidy is DKK 19.000 (approx. € 2.500); and for an A^{++} air/water heat pump DKK 14.000 (approx. € 1.900).

Sources: https://ens.dk/service/tilskuds-stoetteordninger/bygningspuljen

Home-job-scheme (Bolig-job-ordningen)

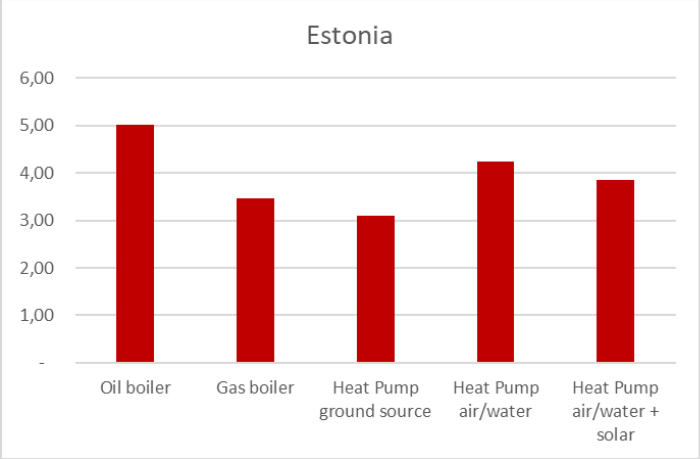
Type. Central government tax reduction scheme for fossils and RES heating systems.
Description. A tax deduction can be obtained for certain work on the home (craftsperson deduction), as well as for some services (service deduction), e.g. cleaning. The tax deduction includes work on energy efficiency measures, e.g. thermal insulation, windows, PV-systems, installation of heat pumps and solar thermal systems. Repair or replacement of gas boilers is also supported. Oil and biomass boilers are not supported. Only salary costs are supported (not equipment). The tax deduction scheme cannot be combined with The Building Pool grants.
Amount. Maximum DKK 25.000 can be deducted per person annually for work on the house (in 2021. The maximum was increased due to corona). The saving is 26% of the deducted value.
Source. https://skat.dk/skat.aspx?oid=2234759

ESTONIA

Summary – main support schemes for heating of households

Fossil		Gas boiler	Estonia does not support fossil heating. The Väikeelamute rekonstrueerimistoetus that earlier supported gas boilers has been suspended. A household takes less than 4 years to recover the full cost of the investment.
Heat pumps		Air/water heat pump	Estonia's Väikeelamute rekonstrueerimistoetus has been suspended and there is no support for heat pumps. A one-earner-couple with two children could take more than 12 years to to recover the full cost of the installation.
Solar thermal		Solar thermal system	Estonia's Väikeelamute rekonstrueerimistoetus has been suspended and there is no support for heat pumps. A one-earner-couple with two children could take about 6 years to to recover the full cost of the installation.

CO2e emissions from heating of an individual house



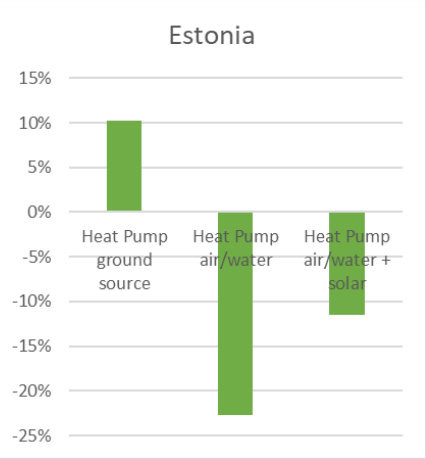


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Estonia's power generation has a high share of coal thus the CO2-emission is high. As a result, using air-water heat pumps has a higher CO2-emission than efficient gas boilers.

Support Schemes for households' heating

Reconstruction grant for small residences (Väikeelamute rekonstrueerimistoetus) - SUSPENDED

Type. Central government grant scheme for fossil and RES heating systems. Is closed for applications.
Description. The program promotes various energy efficiency interventions, including: replacement or refurbishment of the heating system and related works; construction, replacement or reconstruction of a ventilation system and related works; the acquisition and installation of renewable energy production equipment together with the necessary equipment for energy conversion and storage of energy production and related works (for *renewable energy production installation* the Regulation means an installation that generates heat or electricity by means of the sun); purchase and installation of equipment for the use of waste heat from waste water and related works. Among the incentivised heating systems there are also gas boilers.
Amount: between 30% and 50% and up to 20.000-50.000 euros depending on the Estonian regions and the type of the house. The lower values apply to small residences.

Source: https://www.riigiteataja.ee/akt/103062020014
https://kredex.ee/en/services/housing/private-home-renovation-support

Renovation grant 2020 (Rekonstrueerimistoetus 2020) - CLOSED

Type. Central government grant scheme for RES heating systems.
Description. Programme aimed to promote comprehensive reconstructions of apartment buildings. The grant is round-based and applications are approved within the volume of the funds allocated to the region.

Source: https://kredex.ee/en/services/elamistingimuste-parandamiseks/renovation-grant-2020

FINLAND

Summary – main support schemes for heating of households

Fossil	tax reduction	Oil boiler, gas boiler	The Finish government supports upgrading, improvement and repair of heating systems through tax reductions of 40%. When replacing an oil boiler the household can expect a tax reduction of about €300. A one-earner-couple with two children could less than 2 year to recover the installation costs.
Heat pumps	grants	Air/water heat pump	The heat pump market in Finland is among the fastest growing in Europe. The government invested more than €600 million in subsidies, which resulted in 100,000 new units installed in 2020. Heat pumps currently deliver about 15% of the country's heat supply. A household can receive a €4,000 subsidy for installing a heat pump. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Solar thermal	tax reduction	Solar thermal system	The Finish government supports installation of solar thermal systems through tax reductions of 40%. When installing a solar system can expect a tax reduction of about €700. A one-earner-couple with two children could take less than 3 years to recover the installation costs.

CO2e emissions from heating of an individual house

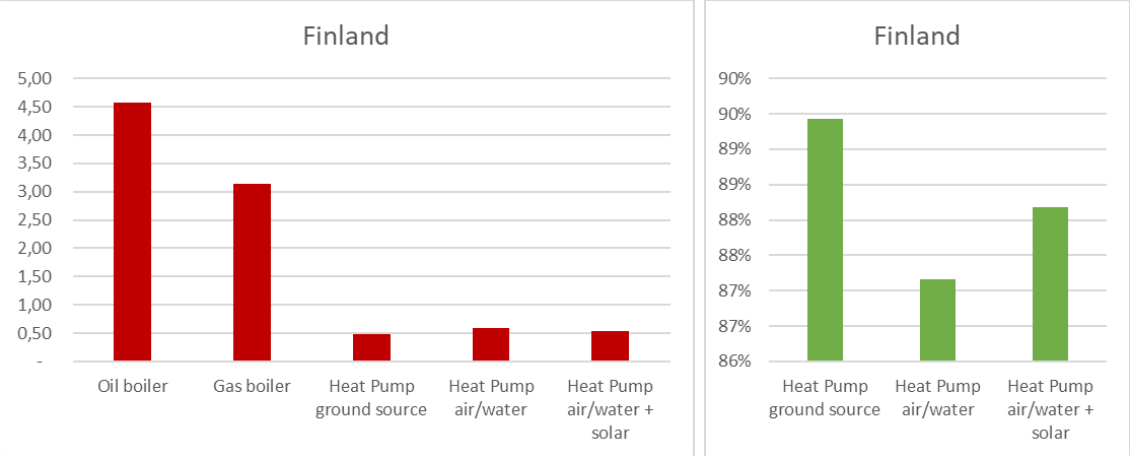


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to oil*

The comparison is made with oil because Finland has very little gas heating. The Finnish government has set 2035 as the phase out date for oil in heating.

Support Schemes for households' heating

Avustus pientalon öljylämmityksestä luopumiseksi (Grant for giving up oil heating in a detached house)

Type. Central government grant scheme for RES heating systems.
Description. The grant is for owners of detached single or double residential houses used all year. The grant supports cost of removing oil heating system and replacement with a new non-fossil heating system or district heating. The grant scheme runs until resources are used.
Amount. The subsidy is €4,000 for conversion to district heating, air-water heat pumps and ground source heat pumps. For other non-fossil heating systems it is €2,500.
Source: https://www.ely-keskus.fi/oljylammityksen-vaihtajalle

Tax credit for household expenses

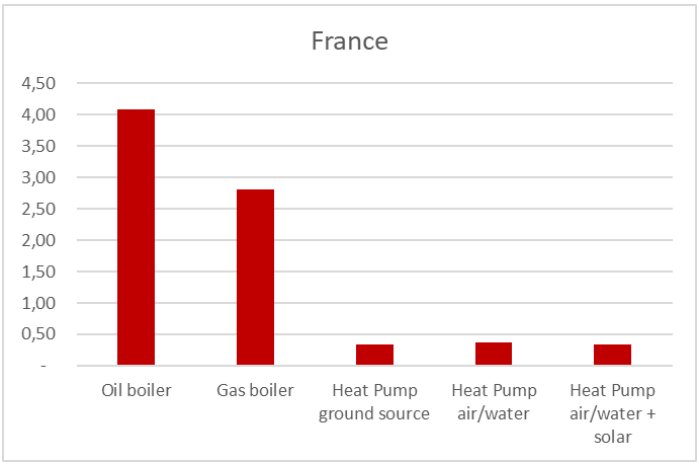
Type. Central government tax reduction scheme for fossils and RES heating systems.
Description. Tax credit for household work and renovation, e.g. upgrading, improvement and repair of heating systems; as well as installation of heat pumps and solar thermal. The deduction only covers cost for work (salaries) and not equipment.
Amount. The deduction is 40% of the costs minus 100 EUR, with an annual maximum of 2,250 EUR per person. No reduction if a subsidy is granted for part of the costs.
Source. https://www.vero.fi/en/individuals/tax-cards-and-tax-returns/income-and-deductions/Tax-credit-for-household-expenses/

FRANCE

Summary – main support schemes for heating of households

Fossil	Grants, VAT reduction	Gas and oil boilers	The French government subsidises gas boilers through various grants and VAT reduction, such as the Prime Coup de Pouce, which runs until June 2021. Households can expect an average subsidy of €1,500 incl. VAT reduction. A one-earner-couple with two children could take less than 1 year to recover the installation costs.
Heat pumps	Grants, VAT reduction	Air/water heat pump	France has several energy efficiency schemes in place. Among other incentives, the Prime de Transition Energétique "Ma Prime Rénov" funds the installation of air to water heat pumps. Households can expect an average subsidy of about €5,200 incl. VAT reduction. A one-earner-couple with two children could take about 3 years to recover the installation costs.
Solar thermal	Grants, VAT reduction	Solar thermal system	France has several energy efficiency schemes in place. Among other incentives, the Prime de Transition Energétique "Ma Prime Rénov" funds the installation of solar thermal technologies. A one-earner-couple with two children can expect an average subsidy of about €5,000 and the total installation cost will be covered.

CO2e emissions from heating of an individual house



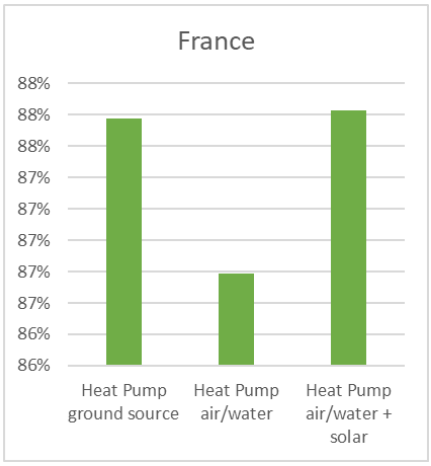


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

The French government has introduced a de facto ban on gas boilers by 2022 and a progressive phase-out between 2022 and 2025 in collective housing.

Support Schemes for households' heating

Information on programmes for the public https://www.faire.gouv.fr/aides-de-financement

Éco-prêt à taux - 33 -egu (éco-PTZ)

Type. Central government soft loan scheme for fossil and RES heating systems.
Description. The zero-interest eco-loan (eco-PTZ) allows to finance the energy renovation of the houses. Promoted interventions: thermal insulation; installation, adjustment or replacement of heating systems or production of domestic hot water; installation of heating systems using a renewable energy source; installation of equipment for production of domestic hot water using a renewable energy source. Also condensing gas boilers are included. The programme runs til the end of 2021.
Amount: The maximum amount is between € 7,000 and € 30,000 depending on the works

Source: https://www.service-public.fr/particuliers/vosdroits/F19905

Aide de l'Anah: travaux d'amélioration de l'habitat

Type. Central government grant scheme for fossil and RES heating systems.
Description. Various types of efficiency measures for old buildings. The programme is supporting low-income households.
Amount. Subsidies up to 50% (maximum amount of subsidized work excluding taxes 20,000) in the case of energy improvement.
Source: https://www.service-public.fr/particuliers/vosdroits/F1328
https://www.faire.gouv.fr/aides-de-financement/programme-anah

Prime "Coup de pouce économies énergie": chauffage

Type. Central government grant scheme for fossil and RES heating systems.
Description. This energy bonus allows to pay the costs of replacing the heating system. This award can be claimed until December 31, 2025. From June 30, 2021, there will be no subsidies for gas. Can be combined with Eco-PTZ and Ma Prime Rénov.
Amount: Installation of an efficient biomass boiler € 4,000 for low-income families and 2,500 for non-low-income families; Installation of an air/water or water/water or hybrid heat pump € 4,000 or 2,500; Installation of a combined solar system € 4,000 or 2,500; connection to a heating network supplied by renewable energies (ENR & R) 700 € or 450; installation of a very high energy performance gas boiler € 1,200 or 600 (until June 30, 2021); installation of a high-performance wood-burning appliance 800 € or 500.

Source: https://www.service-public.fr/particuliers/vosdroits/F34421
https://www.ecologie.gouv.fr/sites/default/files/Evolutions%20li%C3%A9es%20aux%20Coups%20de%20Pouce%20-%20mai%202021.pdf

Prime "Coup de pouce thermostat avec régulation performante"

Type. Central government grant scheme for fossil and RES heating systems.
Description. The Prime promotes the installation of thermostats. The award can be claimed until 31.12.21.

Amount: 150 €.

Source: https://www.service-public.fr/particuliers/vosdroits/F35338

Prime de transition énergétique "Ma Prime Rénov"

Type. Central government grant scheme for fossil and RES heating systems.
Description. The energy transition bonus called *Ma Prime Rénov* can be granted to any owner to finance the works and/or the energy renovation costs of his main residence. The programme promotes various interventions related to heating: condensation boilers (except the one using fuel oil); biomass boilers; solar thermal; geothermal or solar thermal heat pumps; air/water heat pumps; water heater heat pumps; connection equipment, or connection fees and costs, to a heating or cooling network; removing an oil tank. From January, 2021 is was extended to all houseowners and from July 1, 2021 it also supports flat owners.
Amount. The overall amount of the premium is capped at € 20.000 per home, over a period of 5 years. The amount depends on the family income. Boiler with very high energy performance, with the exception of the one using fuel oil as an energy source € 800-1.200; automatically fed boiler running on wood or other biomass €8.000-10.000; manual feed boiler operating on wood or other biomass € 6.500-8.000; independent heating or domestic hot water supply equipment running on wood or other biomass €1.200-3.000; solar thermal €6.500-8.000; domestic hot water supply equipment powered by solar thermal energy € 3.000-4.000; heating or domestic hot water supply equipment operating with hybrid thermal and electric solar collectors with liquid circulation €2.000-2.500; geothermal or solar thermal heat pump € 8.000-10.000; air/water heat pump €3.000-4.000; water heater heat pump € 800-1.200; connection equipment, or connection fees and costs, to a heating or cooling network € 800-1.200; removal of an oil tank € 800-1.200. Households are divided into four income groups. For the highest income (over €60.336 for a 4-person family), there is only a reward for deep renovation projects (min. 55% energy savings). Lower subsidy than above mentioned for incomes between €39,192 and €60,336). Can be combined with Energy saving certificates provided by companies.

Source: https://www.service-public.fr/particuliers/vosdroits/F35083

VAT reduction

Type. Central government tax reduction scheme for fossil and RES heating systems.
Description: In France, the purchase of commodities is subject to a reduced VAT rate if they are related to investments in the improvement, the transformation, the fittings, the conservation or certain equipment of buildings constructed more than two years prior (Code Général des Impôts, art. 278-0 bis, 1). Thus, the purchase of such commodities by private individuals is indirectly promoted. The reduced VAT includes boilers, heat pumps, fireplace inserts, wood-burning stoves, solar water heaters.
Also, gas boilers are included.
Amount the reduced VAT rate is 5.5% (Art. 278-0 bis, *Code Général des Impôts*). Standard VAT rate is 20%.

Source: https://agirpourlatransition.ademe.fr/particuliers/finances/aides-a-renovation/tva-a-55

Tax credit for energy transition Crédit d'impôt pour la transition énergétique (CITE) - CLOSED

The scheme was closed by December 31, 2020; and replaced by the Ma Prime Renov programme.

Type. Central government tax reduction scheme for RES heating systems.

Description: The Energy Transition Tax Credit (*Crédit d'impôt pour la transition énergétique* CITE) applies to expenditure on the insulation of homes or equipment that reduces their energy consumption. In regard to heating, the programme promotes Equipment for heating or the production of domestic hot water powered by wood, solar energy or other biomass; heat pumps other than air / air.

Amount: The tax credit depends on the work done and cannot exceed 75% of the value paid by the owner. The tax credit is however limited to: € 2.400 for one person and 4.800 for a couple subject to joint taxation. The ceiling is increased by 120 € per dependent person (60 € per child in alternate residence).

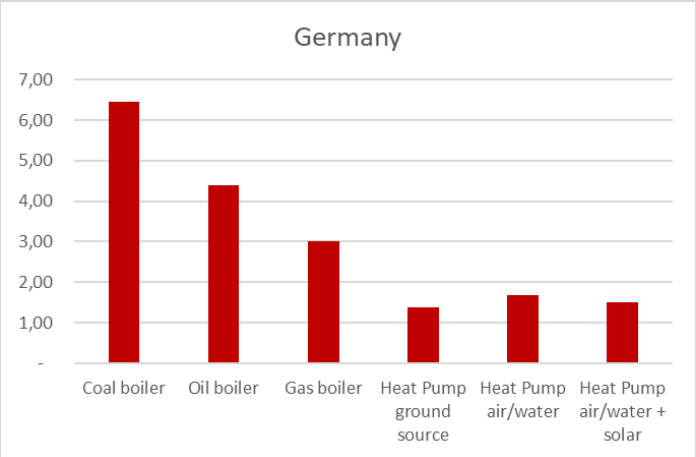
Source: https://www.service-public.fr/particuliers/vosdroits/F35083
https://www.faire.gouv.fr/aides-de-financement/credit-impot-transition-energetique

GERMANY

Summary – main support schemes for heating of households

Fossil	Grants	Gas boilers, hybrid technologies	Germany's Market Incentive Programme provides grants to install hybrid heating systems running on both gas and renewable energy. The government covers up to 40% of the installation costs of a gas boiler if it's installed in combination with renewable heat technologies.
Heat pumps	grants	Air/water heat pump	German subsidy schemes cover up to 35% of the installation costs of a heat pump. Households can benefit from an additional 10% if the heat pump replaces an oil boiler. In Hamburg an additional local grant of 1,500 is possible. Households can expect an average subsidy of about €5,000. A one-earner-couple with two children could take less than 3 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	Germany promotes renewable energy-based heating or cooling for all buildings. it covers up to 30% of the installation costs of a solar thermal system. Households can expect an average subsidy of about €1,500. A one-earner-couple with two children could take less than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house



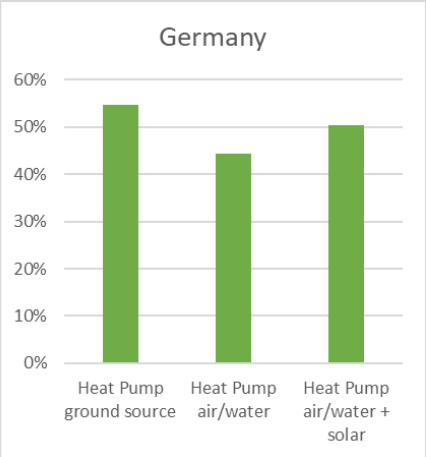


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The German government has set 2026 as the phase out date for oil in heating in new and existing buildings when alternatives are available.

Support Schemes for households' heating

Refurbishment KfW Efficiency House

Type. Central government grant or soft loan scheme for refurbishment.
Description: KfW promotes the refurbishment of houses if after refurbishment they do not exceed a specific energy requirement for a comparable new house. KfW has defined six levels of support for a "KfW Efficiency House". In order to meet the high energy standard of a *KfW Efficiency House*, extensive investments such as the renewal of heating systems, thermal insulation and replacement of windows, are usually required. If the costs and effort of a complete refurbishment would be too high it is also possible to implement single measures only (for example for thermal insulation of walls, roof and floor space; renewal of windows and exterior doors; installation/renewal of a ventilation system; optimisation of heat distribution for existing heating systems).
Amount: The kind of the promotion is either a grant or a loan. In case of a grant, the amount is between 20% (not more than 10.000 €) and 40.0 % (not more than 48.000).

Source: https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestandsimmobilie/

Bundesförderung für effiziente Gebäude (Federal support for energy efficient buildings)

Type. Central government grant scheme for fossil and RES heating systems.
Description: As part of the support for energy efficient buildings (BAFA) promotes efficient technologies that provide buildings with renewable energy-based heating or cooling. The grants are awarded as partial funding based on the eligible investment costs. It supports gas condensing boilers ("Renewable Ready"). This applies only to hybrid installations where gas is coupled with a renewable technology), hybrid gas heating, Solar thermal systems, Biomass systems, Heat pump systems. It also supports connection to district heating, when over 55% of production is RE-based (over 25% when replacing oil boilers).
Amount: Solar thermal system 30%, biomass system or heat pump system 35% (45% in case of oil boiler replacement), renewable energies hybrid heating (EE hybrids) 35% (45% in case of oil boiler replacement), gas hybrid heating with renewable heat generation 30% (40% in case of oil boiler replacement), gas hybrid heating with subsequent integration of renewable heat generation (Renewable Ready). There is a cap of €60.000 EUR per living unit for the whole programme, incl. insulation, ventilation, etc.

https://www.bafa.de/DE/Energie/Effiziente_Gebaeude/Sanierung_Wohngebaeude/Anlagen_zur_Waermeerzeugung/anlagen_zur_waermeerzeugung_node.html

Heating with renewable energies - CLOSED

The programme closed as an independent programme on December 31, 2020. From 2021 support for RES heating systems is part of *Bundesförderung für effiziente Gebäude*. See above.
Source:
https://www.bafa.de/DE/Energie/Heizen_mit_Erneuerbaren_Energien/Foerderprogramm_im_Ueberblick/foerderprogramm_im_ueberblick_node.html

Hamburg: Renewable Heating (Ernäuerbare Wärme)

Type. Local government grant scheme for fossil and RES heating systems.

Description. The local government subsidizes large solar heating systems with above 20m2 collectors, i.e. multifamily systems, air-water and ground source heat pumps. There is no support for gas heating, but support for gas driven heat pumps similar to ground source heat pumps. The programme can be combined with the federal program and the program from KfW.

Amount. Large solar heating: The support is for water heating systems 100 €/m2 (only 75 €/m2 for new houses) and for combined systems also for heating 200 €/m2 (only 150 €/m2 for new houses). Air source heat pumps: 1,500 €, larger systems 40 €/kW nominal heat output. Ground source heat pumps: 4,200 €, for larger systems 100 €/kW nominal heat ouput, but maximum 15% of heat collector costs (20% for use of waste water as heat source).

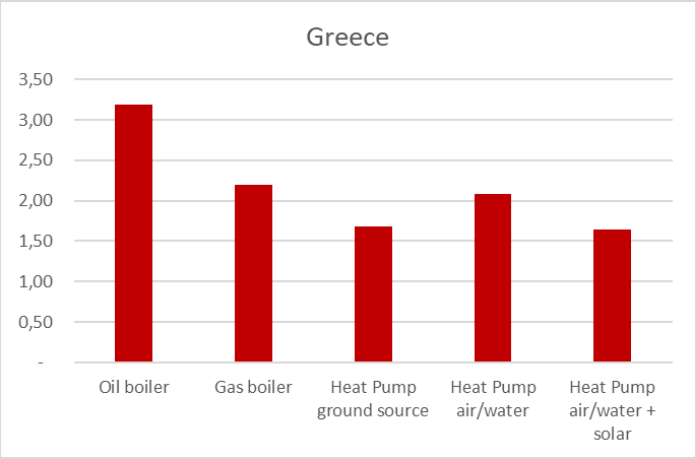
Source. https://www.ifbhh.de/foerderprogramm/erneuerbare-waerme

GREECE

Summary – main support schemes for heating of households

Fossil	grants	Gas and oil boilers	Greece's Energy Saving at Home scheme funds gas, LPG and even oil boilers. The scheme covers up to 70% of the costs depending on household income and type of technology. Households can expect an average subsidy of about €1,500 for a gas boiler and €2,100 for an oil boiler. A one-earner-couple with two children could take less than 2 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	The national energy saving programme funds the installation heat pumps, covering up to 70% of the costs. The program will run until December 2021. Tax reductions in the order of 10% of the costs may also apply. Households can expect an average subsidy of about €6,000. A one-earner-couple with two children could take more than 4 years to recover the installation costs.
Solar thermal	grants, tax reduction	Solar thermal system	The national energy saving programme funds the installation of solar thermal systems, covering up to 70% of the costs. The program will run until December 2021. Tax reductions in the order of 10% of the costs may also apply. Households can expect an average subsidy of about €3,000. A one-earner-couple with two children could take more than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house



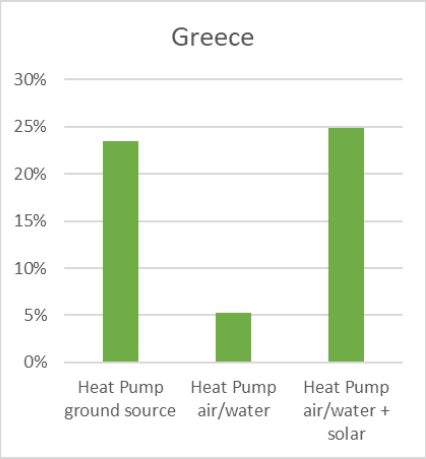


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Energy Saving at Home II (*Εξοικονόμηση κατ' οίκον II*)

Type. Central government grant scheme for fossil and RES heating systems.
Description: The national Programme *Energy Saving at Home II* (*Εξοικονόμηση κατ' οίκον II*). The program aims to improve the energy performance of residential buildings through the provision of interest-free loans and subsidies (60%, 65% or 70%, depending on the family income, the number of children, etc.). The program remains open until the funds run out, the deadline for programme "round B" is 31 12 2021. The programme grants the upgrading of the heating/cooling systems, including both the replacement with heating systems powered by fossil fuel (oil/natural gas/liquefied petroleum gas) and by renewable sources (biomass and heat pumps).
Amount: The subside covers up to 70% of the costs, depending on the family income, the number of children, etc. The maximum amount is 25.000 € per apartment. The maximum amounts, by category of intervention, are: oil condensing boilers (up to 34 kW) € 6.400, methane and LPG € 3.500; for geothermal heat pumps up to 12 kW € 6.100; for cogenerators up to 20 kW € 6.900; for biomass € 2.000; for air / air heat pumps € 2.000; for solar thermal € 10.000. There are higher amounts for larger heating systems.

Source: https://exoikonomisi.ypen.gr/to-programma
https://exoikonomisi.ypen.gr/documents/10182/146747/%CE%9F%CE%94%CE%97%CE%93%CE%9F%CE%A3+%CE%95%CE%9E%CE%9F%CE%99%CE%9A_II_2018_7%CE%B7+%CE%A4%CE%A1%CE%9F%CE%A0+final.pdf/03e26765-2b06-4033-a1a9-454c6da3d429

Tax regulation mechanism

Type. Central government tax reduction scheme for RES heating systems.
Description. According to the Tax regulation mechanism (Law No. 2238/1994) it is possible to benefit from 10% of the project costs, that may be deduced from taxable income (up to a maximum of € 3.000) for interventions to install renewable heating technologies. This mechanism is mainly used for solar thermal.
Amount. 10% of the costs up to a maximum of € 3.000

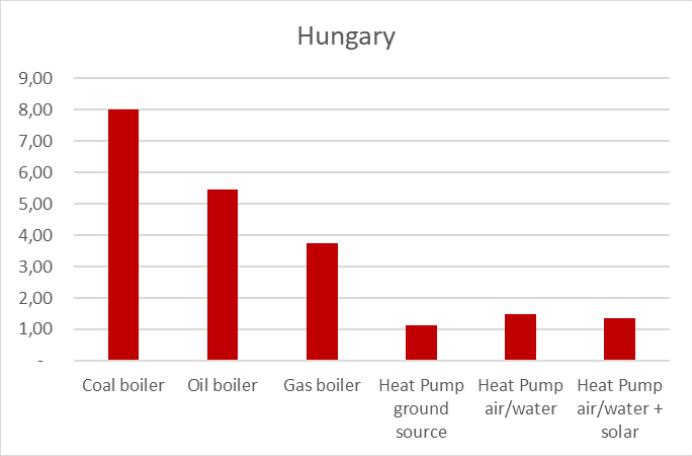
http://www.res-legal.eu/en/search-by-country/greece/single/s/res-hc/t/promotion/aid/tax-regulation-mechanism-i-law-no-22381994/lastp/139/

HUNGARY

Summary – main support schemes for heating of households

Fossil	grants	Coal, gas and oil boilers	As of January 2021, a new subsidy scheme Home Renovatation Aid covers up to 50% of costs for families with children. The scheme includes all heating system also fossil fueled boilers. For a gas boilder households can expect an average subsidy of about €1,200. A one-earner-couple with two children could take less than 3 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	In 2019, the uptake of heat pumps in Hungary was 7.4 units every 10,000 people, making it one of the EU countries with the lowest number of units per capita. As of January 2021, a new subsidy scheme covers up to 50% of the home renovation costs, including the installation of heat pumps. Households can expect an average subsidy of about €5,000. A one-earner-couple with two children could still take more than 8 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	As of January 2021, a new subsidy scheme covers up to 50% of the home renovation costs, including the installation of solar thermal systems. Households can expect an average subsidy of about €2,500. A one-earner-couple with two children could still take more than 4 years to recover the installation costs.

CO2e emissions from heating of an individual house



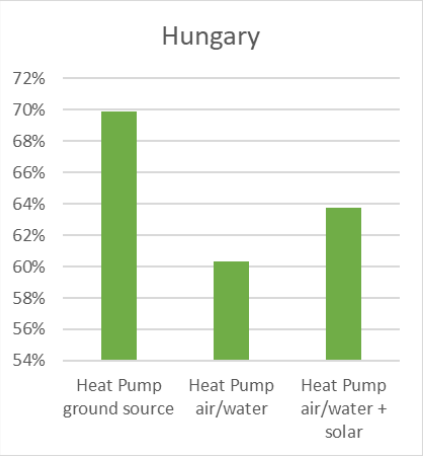


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Home Renovation Aid (OTTHONFELÚJÍTÁSI TÁMOGATÁS)

Type. Central government grant scheme for RES heating systems.

Description. The program provides renovation aid for families with at least one child (or a planned one), Government Decree No 518/2020 (XI. 25.). The program is effective from January 1, 2021, to December 31, 2022. It supports a wide range of renovations, not only energy efficient homes. Installation, modernization or replacement of heating systems are supported, this includes fossil fuels. Installation of solar hot water systems are also supported.

Amount. 50% of the invoiced renovation costs, up to a maximum of HUF 3 000 000.

Source. http://www.allamkincstar.gov.hu/hu/lakossagi-ugyfelek/otthonfelujitasi_tamogatas_altalanos_tajekoztato
http://www.allamkincstar.gov.hu/files/Lakoss%C3%A1gi%20%C3%BCgyfelek/Otthonfel%C3%BAj%C3%ADt%C3%A1si%20t%C3%A1mogat%C3%A1s/518_2020_korm_rendelet_20210421.pdf

Housing Green Capital Requirement Discount (Zöld Tőkekövetelmény-kedvezmény Program)

Type. Central government soft loan scheme for RES heating systems.

Description. The program promotes with subsidized financing various interventions in the field of efficiency, including change of heating systems (includes gas boilers), installation of solar panel or solar collector; installation of geothermal, air-water, air-to-air heat pump; installation of wind turbine; installation of heat and electricity storage units; thermal insulation of building envelopes. The program runs till 2024.

Amount: the amount of the discount is 5% for the energy quality classification "BB", 7% for the energy quality classification "AA" or higher, 5% for modernization interventions. Minimum level of green interest subsidy is 0.3%.

Source: https://www.mnb.hu/sajtoszoba/sajtokozlemenyek/2020-evi-sajtokozlemenyek/konnyites-hatarido-hosszabbitas-a-lakascelu-zold-tokekovetelmeny-kedvezmeny-programnal

https://www.mnb.hu/letoltes/tajekoztato-zold-kedvezmeny-2020-julius.pdf

IRELAND

Summary – main support schemes for heating of households

Fossil			Ireland does not subsidise fossil fuel heating systems
Heat pumps	grants	Air/water heat pump	The uptake of heat pumps is growing steadily in Ireland, with over 32,000 installations in 2017. Households can expect an average subsidy of about €3,500. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	Households can expect an average subsidy of about €1,200. A one-earner-couple with two children could take less than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house

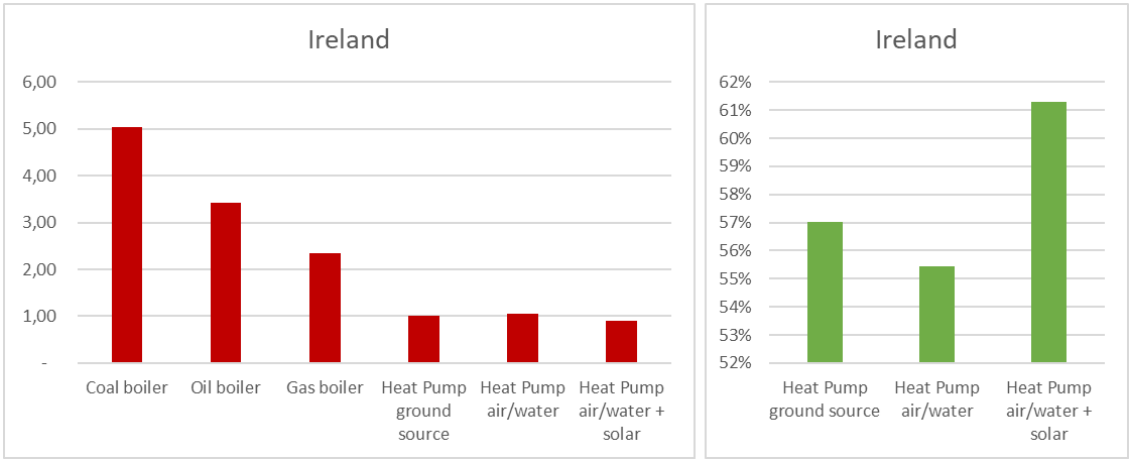


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

The Irish government will ban oil boilers in new building from 2022 and gas boilers in 2025.

Support Schemes for households' heating

Home energy grants: Heat pumps grant and Solar Water Heating grant

Type. Central government grant scheme for RES heating systems.
Description: Sustainable Energy Authority of Ireland (SEAI) provides a wide range of grants to upgrade homes, in order to make them warmer and more energy efficient.
Amount: for Air to Water, Ground Source to Water, Exhaust Air to Water and Water to Water Heat Pumps € 3.500; for Air to Air Heat Pumps € 600. For the Solar Water Heating the amount 1.200 €. If three different upgrades are completed the grant value will be increased by €300. If four the value will be increased by an additional €100.

Source: https://www.seai.ie/grants/home-energy-grants/
https://www.seai.ie/grants/home-energy-grants/heat-pump-systems/
https://www.seai.ie/grants/home-energy-grants/solar-water-heating-grant/

National Home Retrofit Scheme

Type. Central government grant scheme for RES heating systems.
Description: **Description**: This scheme is aimed at engaging groups of private households, registered Housing Associations and Local Authorities and Energy Utilities or other organisations who wish to participate in delivering a "One Stop Shop" type service for energy efficiency works. The programme promotes also heat pump technology, solar PV and solar water heating. This grant is not open to individual homeowners.
Amount: 35% for privates. Maximum grant amount available is €2 million. Applicants must consider grant for at least €100,000.

Source: https://www.seai.ie/grants/national-home-retrofit/

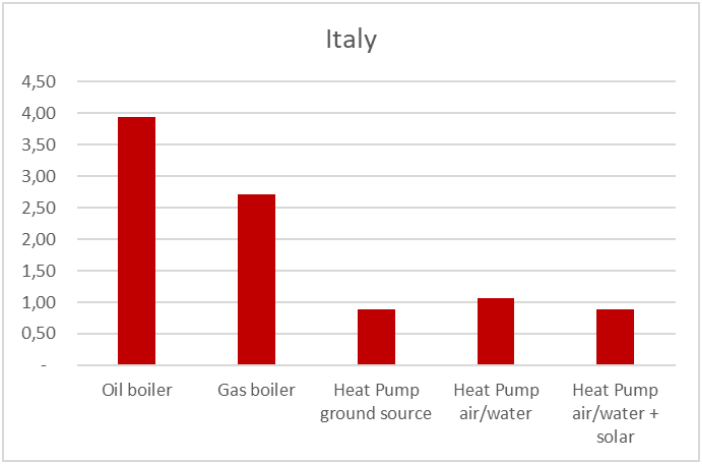
ITALY

Summary – main support schemes for heating of households

Fossil	Grants, tax rebates	Gas and oil boilers	Italy has amongst the highest subsidises in Europe, with a tax rebate of up to 110% of the costs of a gas boiler under certain circumstances. The normal tax rebate is 50% for gas and a oil boilers. Other national schemes are also available. Using the SuperBonus Scheme all costs can be covered upfront.
Heat pumps	tax rebate	Air/water heat pump	Italy is the only country where, under certain circumstances, the government can subsidise more than the entire cost of a heat pump thanks to a generous tax rebate (110%). In other cases the tax rebate is 65%. The tax rebate can also become a discount at the point of sale, but several conditions apply. The government set up several schemes, the most popular of which is the Superbonus incentive. Using this all costs can be covered upfront.
Solar thermal	tax rebate	Solar thermal system	Italy is the only country where, under certain circumstances, the government can subsidise more than the entire cost of a solar thermal system thanks to a generous tax rebate (110%). This tax rebate can also become a discount at the point of sale, but several conditions apply. The government set up several schemes, the most popular of which is the Superbonus incentive. Using this all costs can be covered upfront.

CO2e emissions from heating of an individual house

Fig A (left) CO2e-emissions in ton/year/family for different heating solutions



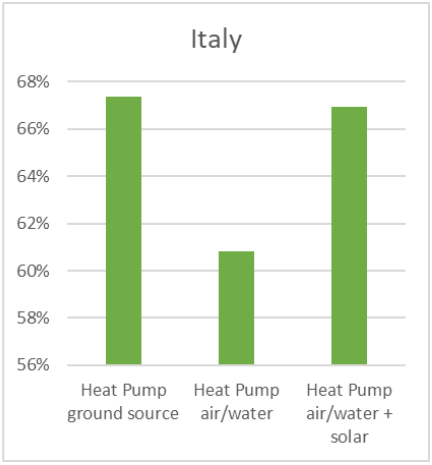


Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The Italian government has set 2050 as the phase out date for all fossil technologies in heating.

Support Schemes for households' heating

"Superbonus"

Type. Central government tax reduction scheme for fossil and RES heating systems.
Description. The so-called law Decreto Rilancio (Relaunch Decree), in the context of urgent measures regarding health, support for work and the economy, as well as social policies related to the epidemiological emergency from Covid-19, increased the deduction rate for expenses incurred to 110% from 1 July 2020 to 31 June 2022, for the "driving" interventions: 1) insulation of over 25% of the external walls surface; 2) replacement of the heating system with a more efficient one, i.e. with heat pumps, condensing boilers, hybrid appliances (integrated heat pump with condensing boiler), micro-cogeneration, solar thermal, biomass boilers (but only in specific cases); 3) seismic risk reduction. If combined with these interventions, also other specific interventions in the field of energy efficiency are subsidised: installation of photovoltaic systems, infrastructure for charging electric vehicles in buildings, efficient windows, shadowing systems, building automation, etc. The energy class must be improved by minimum two (e.g. D to B) – so Ecobonus is the interesting scheme, when it is only the heating plant that is changed. The tax rebate can also become a discount at the point of sale, but several conditions apply.
Amount: tax deduction of 110% of the expenses incurred. Maximum amount: heat pumps € 15.000, 20.000 or 30.000, depending on the kind of the house; condensing heat generators 30.000 €; micro-cogeneration 30.000 €; solar thermal 60.000 €; biomass boilers 30.000 €.

Source: https://www.informazionefiscale.it/ecobonus-2021-detrazione-fiscale-110-65-50-spese-ammesse-limiti-requisiti
https://www.agenziaentrate.gov.it/portale/documents/20143/233439/Guida_Superbonus110__.pdf/49b34dd3-429e-6891-4af4-c0f0b9f2be69
https://www.agenziaentrate.gov.it/portale/superbonus-110%25

"Ecobonus"

Type. Central government tax reduction scheme for fossil and RES heating systems.
Description. Tax deduction program with a value ranging from 50% to 75% (or to 85% in case of interventions combined with anti-seismic intervention) of the incurred costs for various efficiency measures, including condensing boilers, heat pumps, micro-cogeneration, biomass, solar thermal. The tax rebate can also become a discount at the point of sale, but several conditions apply.
Amount: heat pumps 65% of the expenses, with a maximum ceiling of 30.000 €; condensing heat generators 50% (for individual houses) or 65%, maximum 30.000 €; solar thermal 65%, 100.000 €; biomass boilers 50%, 30.000 €.

Source: https://www.informazionefiscale.it/ecobonus-2021-detrazione-fiscale-110-65-50-spese-ammesse-limiti-requisiti
https://www.agenziaentrate.gov.it/portale/documents/20143/233439/Agevolazioni+fiscali+per+risparmio+energetico+it_Guida_Agevolazioni_Risparmio_Energetico.pdf/364ab72b-b873-c28e-1e75-0ebbf0cdd7a5

Renovation Bonus "Bonus Ristrutturazioni"

Type. Central government tax reduction scheme for fossil and RES heating systems.
Description. Tax deductions for simple houses renovations, which however includes energy saving interventions, including photovoltaics and RES or fossil heating systems.

Amount: tax deduction of 50% of the expenses incurred. Maximum amount: 96.000 €.

Source: https://www.informazionefiscale.it/bonus-ristrutturazioni-2021-novita-come-funziona-lavori-ammessi-beneficiari
https://www.agenziaentrate.gov.it/portale/documents/20143/233439/Guida_Ristrutturazioni_edilizie08092019.pdf/3a3c355b-249d-358a-ae69-a22cff87838b

VAT reduction (IVA agevolata)

Type. Central government tax reduction (VAT) scheme for fossil and RES heating systems.
Description. Discounted VAT at 10% instead of 22% on RES. The reduced VAT is also for condensing boilers (but only for part of the costs).
Amount: the reduced VAT rate is 10%. Standard VAT rate is 22%.

Conto Termico

Type. Central government grant scheme for fossil and RES heating systems.
Description. Conto Termico is a subsidy dedicated to interventions for increasing the energy efficiency and the production of thermal energy from renewable sources. The beneficiaries are mainly public administrations, but also companies and individuals. The scheme is funded with 900 million euros per year, of which 200 are destined to public administrations. Thanks to the programme it is possible to refurbish buildings to improve their energy performance, thus reducing consumption costs and quickly recovering part of the costs incurred. The programme promotes heat pumps (also hybrid and water heater heat pumps), biomass boilers, biomass stoves and Solar Thermal.
Amount: the grant depends on many factors and can reach 40% of the costs incurred.

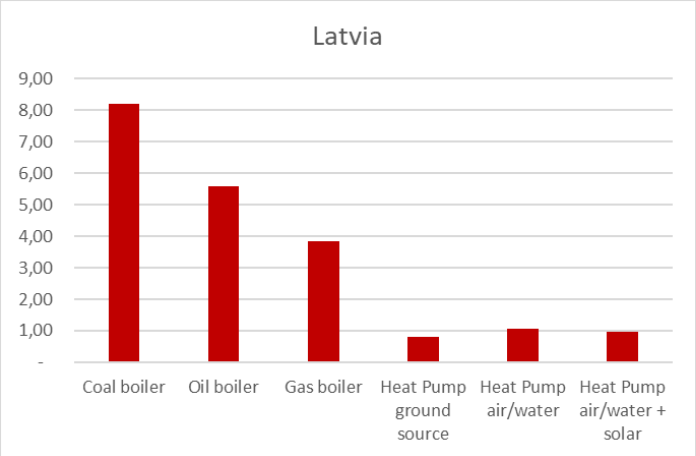
Source: https://www.gse.it/servizi-per-te/efficienza-energetica/conto-termico

LATVIA

Summary – main support schemes for heating of households

Fossil	Loans	Gas boiles	The government's soft loan scheme for energy renovation subsidize gas and oil boilers. The program will provide guarantees for the loan up to 30% of the amount paid by a household, max €20.000. 500 loans will be approved per year.
Heat pumps	Loans, grants	Air/water heat pump	The government's soft loan scheme for energy renovation subsidize heat pumps. The program will provide guarantees for the loan up to 30% of the amount paid by a household, max €20.000. 500 loans will be approved per year. Under certain circumstances it is also possible to receive af grant of maximum €5,000. This will be available for 240 households per year.
Solar thermal	Loans	Solar thermal system	The government's soft loan scheme for energy renovation subsidize solar thermal systems. The program will provide guarantees for the loan up to 30% of the amount paid by a household, max €20.000. 500 loans will be approved per year.

CO2e emissions from heating of an individual house



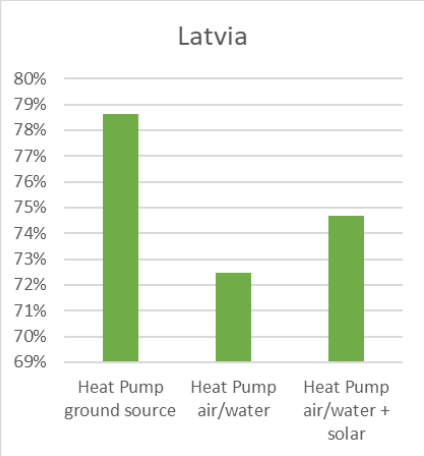


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Support for energy renovation of houses

Type. Central government soft loans and grants scheme for fossil and RES heating systems.

Description. The Council of Ministers approved a family support program by December 2020. It provides for the provision of portfolio guarantees for commercial bank loans for the implementation of energy efficiency improvement measures for private homes. The program will also promote: the purchase and installation of a new boiler. Due to the scarce resources available, the program is expected to provide an average of only 500 loans per year for the implementation of energy efficiency measures in the private housing sector. There is also a grant scheme available for families with minimum 3 kids or residing outside Riga/Jurmala regions; if there is minimum 20% reduction in energy consumption, and minimum energy class C is reached after the renovation. The grant will be available for only 240 houses per year.

Amount. The guarantee rate will be up to 30% of the loan amount, not exceeding € 20.000. The grant will be € 5,000.

Source: https://www.em.gov.lv/lv/pirmo-reizi-privatmaju-ipasniekiem-bus-pieejams-atbalsts-maju-atjaunosanai-un-energoefektivitates-uzlabosanai

New programmes will be available in 2022.

LITHUANIA

Summary – main support schemes for heating of households

Fossil			Lithuania does not subsidise fossil fuel heating systems
Heat pumps	tax rebate	Air/water heat pump	A tax reabate scheme is available for multi-family houses, but not for individual households. Until 30 April 2021 the replacement of biomass boilers with heat pumps were subsidized. 50% of the costs were covered.
Solar thermal	tax rebate	Solar thermal system	A tax reabate scheme is available for multi-family houses, but not for individual households.

CO2e emissions from heating of an individual house

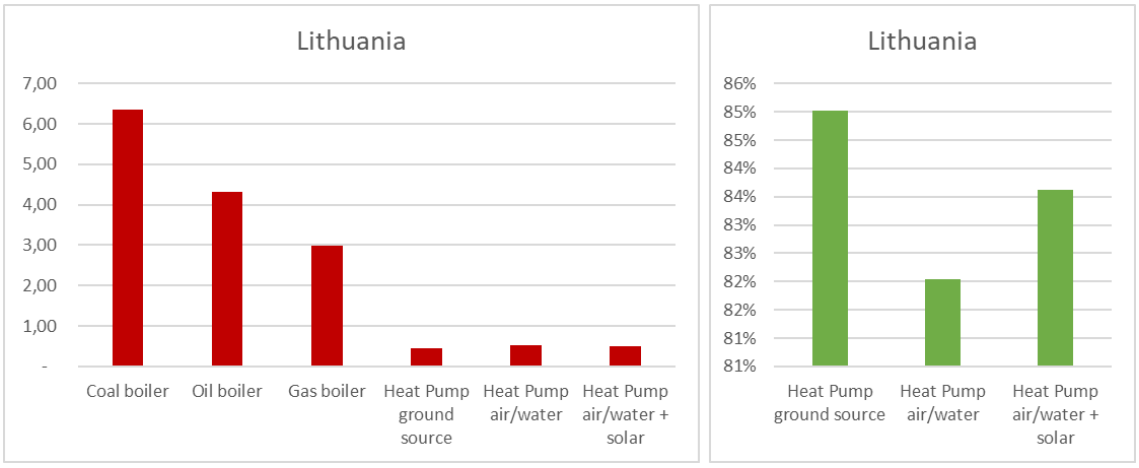


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Boiler replacement in households "Katilų keitimas namų ūkiuose" – CLOSED for applications

Type. Central government grant scheme for RES heating systems.
Description.The *Katilų keitimas namų ūkiuose* incentive is dedicated to the households to replace old inefficient biomass boilers with efficient biomass (biofuel) boilers or with heat pumps (geothermal, aerothermal or hydrothermal). The subsidy covers 50% of the expenses incurred. The program budget is around 15 million euros. The call was open for applications between March 31 and April 30, 2021. The Call, which is part of Measure 04.3.2-LVPA-V-111 Priority 4 "Promotion of energy efficiency and production of energy from renewable sources" of the Operational Programme for EU Structural Funds Investments for 2014-2020, is managed by the Environmental Project Management Agency under the Ministry of Environment of the Republic of Lithuania (Aplinkos projektų valdymo agentūra). There are no new calls planned.
Amount: 50% of costs eligible for support.

Source: https://www.apva.lt/katilu-keitimas-namu-ukiuose/
https://www.apva.lt/en/ongoing-projects/

Programme of modernisation of multifamily houses Daugiabučių namų atnaujinimo (modernizavimo) programa

Type. Central government tax grant scheme for refurbishing.
Description. Flat owners, who participate in the programme and modernise their buildings, are eligible for 30% rebate of total renovation costs, concrete percentages depending on a set of implemented improvements. Recently new legislation in this area have broadened scope of renovation – from the so called engineering or small renovation, which includes heat substation, hot water piping, sewage system, thermostatic valves on radiators, heat cost allocators on radiators to a full package of measures including thermal insulation of the building envelope, windows replacement and others. The programme is leaded by the Housing energy efficiency agency (BETA Būsto energijos taupymo agentūra)
Amount: 30% rebate of total renovation costs.

Sourcehttp://www.betalt.lt/veiklos-sritys/programos/daugiabuciu-namu-atnaujinimo-modernizavimo-programa/102/?c-45/t-105

Climate Change Programme

Type. Central government grant scheme for RES heating systems
Description. Support for use of renewables in private and public sector. Subsidizes solar heating, heat pumps, replacement of fossil fuel boilers with biofuel, etc. Applications are accepted from June 21 till December 31, 2021, or until funding is used. Total amount of fund is only €1 mill. For the private sector. The programme is only for private legal entities and not for households.
Amount. Maximum subsidy 30%.

Source:.https://www.apva.lt/en/national-investments/climate-change-program/

LUXEMBURG

Summary – main support schemes for heating of households

Fossil			Luxembourg does not subsidise fossil fuel heating systems
Heat pumps	loan	Air/water heat pump	The government's subsidy scheme covered up to 25% of installation costs of a heat pump before it ended in December 2020. Households could expect an average subsidy of about €2,500. A one-earner-couple with two children could take less than 4 years to recover the installation costs. Households can currently benefit from a loan scheme.
Solar thermal	loan	Solar thermal system	The government's subsidy scheme covered up to 50% of installation costs of a solar thermal systems before this scheme ended in December 2020. Households could expect an average subsidy of about €5,000. A one-earner-couple with two children could take less than 2 years to recover the installation costs. Households can currently benefit from a loan scheme.

CO2e emissions from heating of an individual house

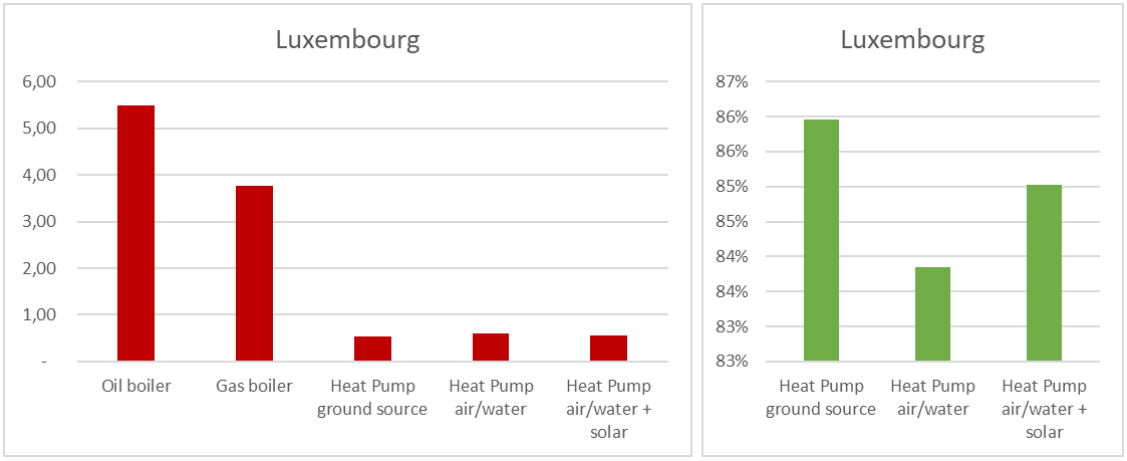


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

In Luxembourg from 2023 a ban on both oil and gas boilers in new buildings will be in place from 2023.

Support Schemes for households' heating

PRIMe House 2017 - CLOSED

Type. Central government grant scheme for RES heating systems.

Description. The Ministry of the Environment (Ministère de l'Environnement) grants subsidies for investment projects undertaken to improve the long-term sustainability of a residential building; implement technical installations making use of renewable energy sources (solar thermal systems; solar photovoltaic systems; heat pumps; wood-fuelled boilers; implementation of a heat network and/or connection to a heat network). This support for technical installations closed December 31, 2020 (except for photovoltaics). The PRIMe House 2017 scheme also applies to the construction of new sustainable dwellings, and for which the building permit is applied for between 1 January 2017 and 31 December 2020.

Amount: solar thermal system for production of domestic hot water 50% of actual costs (maximum € 2.500); solar thermal systems with auxiliary heating 50 % of actual costs (max € 4.000); Geothermal heat pump (geothermal probes, geothermal collector or latent heat accumulator systems with solar thermal collector) 50% of actual costs (max € 8.000 for an individual house and 6.000 per housing unit for a multi-unit building); Air-water heat pump 25% of actual costs (max € 2.500); compact device including controlled mechanical ventilation and recycled air/water heat pump (only for near-zero energy single-family houses) 25% of actual costs (max € 2.500); Wood pellet or wood chip boiler 40% of actual costs (max € 5.000 for an individual house and 4.000 per housing unit for a multi-unit building); wood pellet stove (connected to the heating network) 30% of actual costs (max € 2.500); log boiler or combination log/pellet boiler 25% of actual costs (max € 2.500 for a detached or a semi-detached house). Installation of a buffer tank with a capacity of 30 l/kW (wood pellet or wood chip boiler): bonus in the amount of 15% of the allocated financial aid. Replacement of an existing fossil fuel boiler or electrical heating system by a wood-fuelled boiler: bonus in the amount of 30% of the allocated financial aid.

Source:https://guichet.public.lu/en/citoyens/logement/construction/performances-energie/aide-financiere-logement-durable-2017.html
https://guichet.public.lu/en/citoyens/logement/renovation-transformation/performances-energie/aide-installations-techniques-regime-2017.html

Zero-interest "KlimaPrêt" climate loan and Low-interest "KlimaPrêt" climate loan

Type. Central government soft loans scheme for refurbishing.

Description. *KlimaPrêt* climate loans aim to promote sustainable renovation of dwellings that are over 10 years old by prefinancing the renovation work. These climate loans contribute not only to responsible energy consumption and environmental protection, but also to lowering energy costs, and increasing the comfort and value of the dwelling.

Amount for the Zero-interest: The beneficiary of the zero-interest climate loan must pay back only the capital of the loan, in the amount of no more than EUR 50,000, over 15 years maximum. The Ministry of Housing also offers a one-time capital grant, equal to 10% of the main loan (capped at EUR 5,000), so as to reduce the overall amount that is to be paid back.

Amount for the Low-interest: Low-interest climate loans are limited to a main amount of EUR 100,000 per building over a duration of 15 years. The Government awards an interest subsidy of up to 1.5% and equal to no more than 10% of the main amount (i.e. maximum EUR 10,000). The interest rate of the subsidy can by no means be higher than the actual interest rate of the loan.

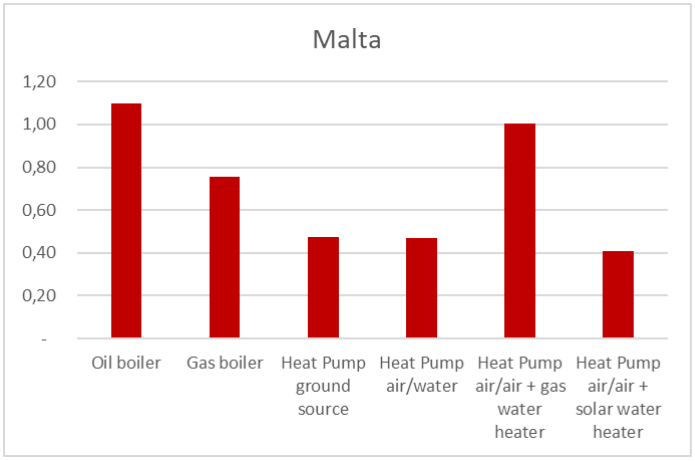
Sources:https://guichet.public.lu/en/citoyens/logement/renovation-transformation/prets-climatiques/pret-climatique-taux-zero.html https://guichet.public.lu/en/citoyens/logement/renovation-transformation/prets-climatiques/pret-climatique-taux-reduit.html

MALTA

Summary – main support schemes for heating of households

Fossil			Malta does not subsidise fossil fuel heating systems
Heat pumps	grants	Heat pump water heater	The Heat Pump Water Heater scheme provides grants covering part of the installation costs for a heat pump. The subsidy amounts to €1,000 per household. A one-earner-couple with two children could take more than 6 years to recover the installation costs. The scheme will expire in December 2021.
Solar thermal	grants	Solar thermal system	The Solar Thermal Water Heater scheme provides grants covering part of the installation costs for solar thermal system. The subsidy amounts to €700 per household for a basic system and up to €1,400 for a premium system. A one-earner-couple with two children could take less than 2 years to recover the installation costs. The scheme will expire in December 2021.

CO2e emissions from heating of an individual house



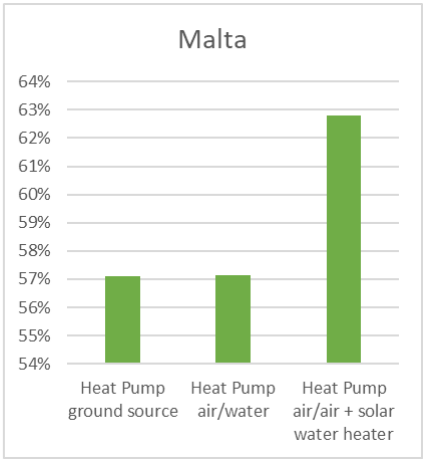


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to oil*

The comparison is made with oil because Malta has very little gas heating.

Support Schemes for households' heating

Solar Water Heater Scheme

Type. Central government grant scheme for RES heating systems.
Description. The Solar Water Heaters scheme is administered by the Regulator for Energy and Water Services to encourage the use of energy efficient equipment in the domestic sector. This scheme is funded through national funds and applies to private individuals (natural persons) for use in their residential properties, and for organisations that are not carrying out an economic activity. This scheme was launched by means of Government Notice GN539 of 2021 as amended by GN776 of 2021 and is valid until December 31, 2021.
Amount: This scheme provides a grant of 50% of the eligible costs up to €700 for a basic solar heating system and up to €1,400 for a premium type, exceeding 100-litre capacity (max. 75% of costs). Another supplementary fund of up to €500 is allocated for general maintenance of the solar heater over its lifetime. Eligible expenditure includes the purchase of a Solar Water Heater or Collector including VAT and its maintenance over the years.

Source:https://rews.org.mt/#/en/sdgr/465-2021-solar-water-heater-scheme
https://www.energywateragency.gov.mt/news/new-solar-water-heaters-and-heat-pumps-schemes-launched/

Heat Pump Scheme

Type. Central government grant scheme for RES heating systems.
Description. The Heat Pump Water Heater scheme is administered by the Regulator for Energy and Water Services to encourage the use of energy efficient equipment in the domestic sector. This scheme is funded through national funds and applies to private individuals (natural persons) for use on their residential properties, and for organisations that are not carrying out an economic activity. This scheme launched by means of Government Notice 538 of 2021 is valid until December 31, 2021, or until funds are exhausted.

Amount: This scheme provides a grant of 50% of the eligible costs up to €1,000. Eligible expenditure includes the purchase of a heat pump water heater including VAT.

Source: https://www.rews.org.mt/#/en/sdgr/466-2021-heat-pump-water-heater-scheme

NETHERLANDS

Summary – main support schemes for heating of households

Fossil			The Netherlands does not subsidise fossil fuel heating systems
Heat pumps	grants	Air/water heat pump	With 45,000 units sold in 2019 and a strong commitment by the government in the decarbonsation of heating systems, the Netherlands are one of the fastest growing markets for heat pumps. A subsidy scheme provides around €2,200 for the installation of a heat pump, depending on the type of technology. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	With over 70.000 square meters of panels installed in 2019 and a strong commitment by the government in the decarbonsation of heating systems, the Netherlands are the second fastest growing markets for solar thermal installations. A subsidy scheme provides around to €1,000 for the installation of a solar thermal system. A one-earner-couple with two children could take less than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house

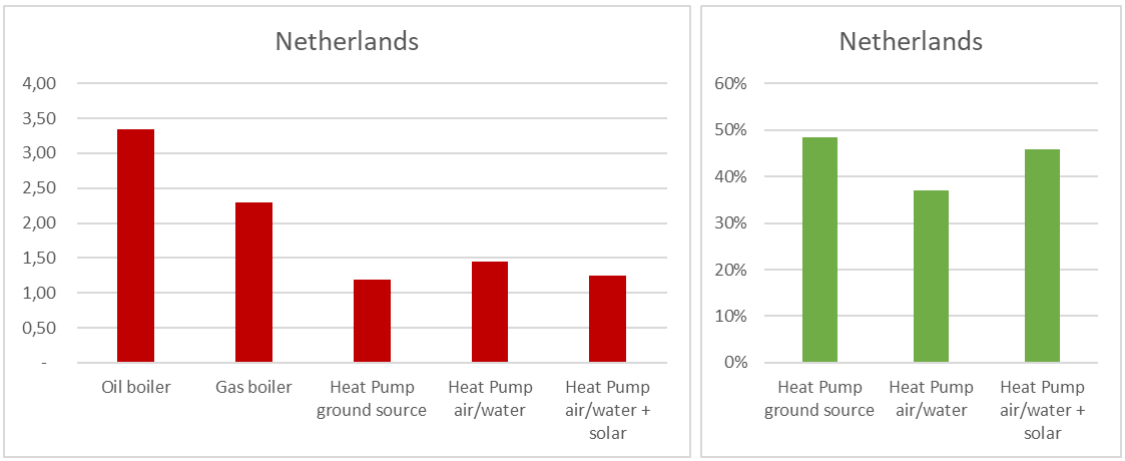


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The Dutch government has removed in 2018 the obligation for gas distributors to connect new buildings. This has led to a *de facto* ban on gas boilers in new buildings.

Support Schemes for households' heating

Sustainable energy investment subsidy scheme (Subsidie duurzame energie voor particulieren ISDE)

Type. Central government grant scheme for RES heating systems.

Description.The Sustainable energy investment subsidy (ISDE) is dedicated to heat pumps, solar boilers, connection to district heating and thermal insulation. This will reimburse part of the costs after purchasing the device. Heat pumps up to 70 kW are promoted. The heater has to be equipped with an air-to-water heat pump, a groundwater heat pump or a water-to-water heat pump. Solar water heaters, with a total opening area of up to 200 m^2, are also promoted. The solar boiler is intended for the production of domestic hot water or for heating a room in combination with the production of domestic hot water.

Amount: For the heat pumps the subsidy is €500 for heat pumps smaller than 1 KW. For an air-water heat pump larger than 1kW the subsidy is € 1,100 +100 €/kW; for water-water and ground source heat pumps the subsidy is € 2.500 for heat pumps between 1 and 10 kW (+100 €/kW for larger heat pumps). There is a premium of €150 for A+ heat pumps, and €300 for A++ or higher. For the solar thermal up to 10 m^2, the subsidy amount is 0.68 € per kWh of annual production. For a 4 m^2 solar system the grant is about 1,000 €.

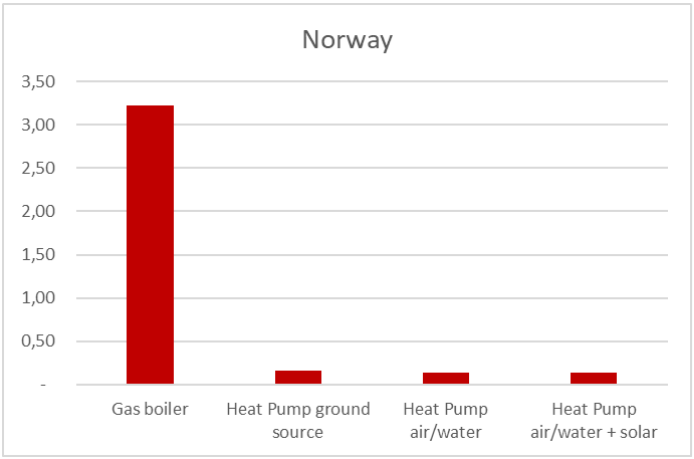
Source: https://www.rvo.nl/subsidie-en-financieringswijzer/isde/woningeigenaren
https://zoek.officielebekendmakingen.nl/stcrt-2020-65131.html

NORWAY

Summary – main support schemes for heating of households

Fossil			The Norwegian government does not subsidize fossil fuel heating. In 2012 a climate agreement in the Parliament announced phaseout of oil for heating purposes by 2020. This was adopted as law in 2017. From 2020 it is illegal to use fossil oil for heating in buildings. Some of-grid buildings and hospitals can continue until 2025. For new building the building code of 2010 required that 60 % of the heating need (40 % for buildings below 500m2) should be supplied with other sources than fossil fuel and direct electricity. From 2017 it was not permitted to install heating equipment for fossil fuel (oil and gas) in buildings. In district heating fossil fuel is only used as reserve capacity.
Heat pumps	grants	Air/water heat pump	The subsidy scheme for installation of renewable heating systems in residential building was substantially reduced from 2020. Norway is the country with the highest amount of HP per capita. Air-to-Air Heat pumps are currently installed in roughly 25% of Norwegians buildings without subsidy. Heat pumps for water borne systems are so mainstream that the government decided to end or reduce the subsidies in 2021. The subsidy scheme subsidize air-water heat pumps with NOK 5,000 (until July 1, 21) and water-liquid heat pumps with NOK 10,000. A one-earner-couple with two children could take more than 4 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	A subsidy scheme provides grants to install solar thermal systems in the order of NOK 5,000. The government also provides an extra NOK 200 for each m^2 of panels installed. A one-earner-couple with two children could take about 2 years to recover the costs to install an average system.

CO2e emissions from heating of an individual house



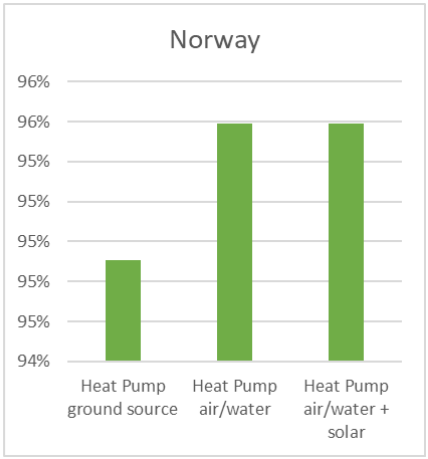


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

In 2020 the Norwegian government became the first in the world to ban the use of oil in heating in both new and existing boilers. Consumers had to replace their oil technologies by that year.

Support Schemes for households' heating

Enova Grant (Enovatilskuddet)

Type. Central government grant scheme for RES heating systems.

Description. Enova, the Norwegian government enterprise responsible for promotion of environmentally friendly production and consumption of energy, grants energy efficient and climate friendly technologies to owners of residential buildings. The program provides incentives for many technologies: thermal insulation, mechanical ventilation, photovoltaics as well as renewable energy plants for heat production. The subsidy scheme for installation of renewable heating systems in residential building was substantially reduced from 2020. Since January 2021 air-air heat pumps are no longer subsidized. Heat pumps for water borne systems are also mainstream and the incentive for air-to-water heat pumps will be cancelled July 1, 2021.

Amount: Solar thermal NOK 5.000 more NOK 200 every m^2, up to NOK 10.000; air-water heat pumps NOK 5.000 (expires July 1, 2021); liquid-water heat pumps, biomass stoves (but only with water jacket) and biomass boilers NOK 10.000. Also grants for change to water-borne heating system up to 10,000 NOK and accumulation tank up to 5,000 NOK.

Source: https://www.enova.no/privat/alle-energitiltak/

POLAND

Summary – main support schemes for heating of households

Fossil	Grants	gas boilers, oil boilers, coal boilers	Poland has several subsidy schemes in place. Home owners with an annual income of less than PLN 100,000 can receive grants to replace heating systems based on solid fuels with gas and oil boilers (and coal boilers before July 1, 2021). The grant can cover up to 30% of the costs or up to 60% for low-income households. A one-earner-couple with two children could take less than 4 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	A subsidy scheme known as Program Czyste Powietrze funds up to 30% of the costs of a heat pump in detached houses. The scheme applies to households with an annual income of less than PLN 100,000. The heat pump market in Poland is still small, with roughly 27.000 units sold in 2017. A one-earner-couple with two children could take more than 8 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	A subsidy scheme known as Program Czyste Powietrze funds up to 30% of the costs of a solar thermal system. The scheme applies to households with an annual income of less than PLN 100,000. A one-earner-couple with two children could take more than 4 years to recover the installation costs.

CO2e emissions from heating of an individual house

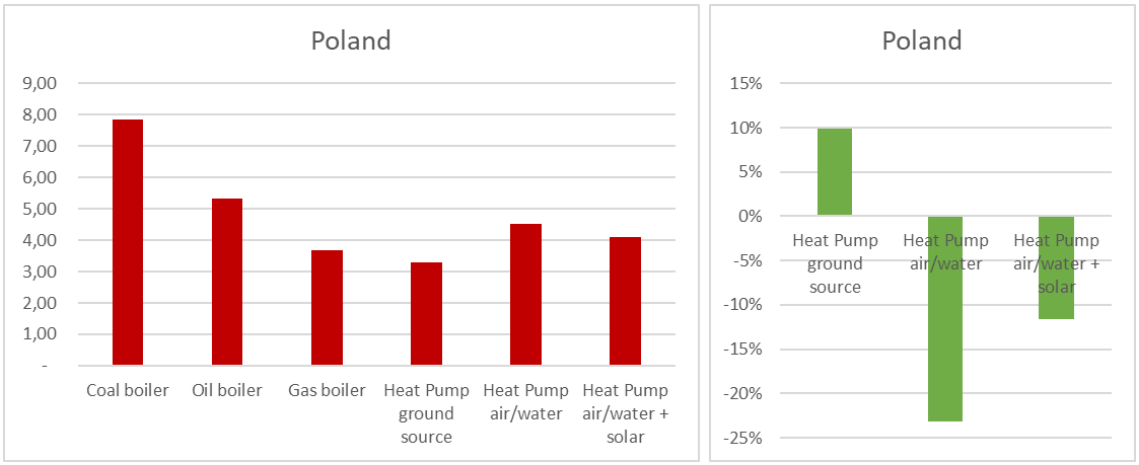


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Poland's power generation has a high share of coal thus the CO2-emission is high. As a result, using air-water heat pumps has a higher CO2-emission than efficient gas boilers.

Support Schemes for households' heating

Clean Air Priority Program Subsidies (Program Czyste Powietrze - dofinansowania)

Type. Central government grant scheme for fossil and RES heating systems.

Description. The purpose of the program is to improve air quality and reduce greenhouse gas emissions by replacing heat sources and improving the energy efficiency of single-family residential buildings. It is the main scheme for this type of buildings. Beneficiaries are natural persons who are owners or co-owners of single-family residential buildings, with an annual income not exceeding PLN 100.000. The programme co-finance the replacement of old and ineffective solid fuel heat sources with efficient ones and other interventions. The programme runs till 2027.

Amount. The amount depends on the technologies: air/water heat pump: 30% of the cost, max PLN 9.000, or 60% and max 18.000 for low-income families; air/water heat pump (higher efficiency class): 45% of the cost, max PLN 13.500, or 60% and max 18.000 for low-income families; air/air heat pump: 30% of the cost, max PLN 3.000, or 60% and max 6.000 for low-income families; ground source heat pump: 45% of the cost, max PLN 20.250, or 60% and max 27.000 for low-income families; gas and oil condensation boiler: 30% of the cost, max PLN 4.500, or 60% and max 9.000 for low-income families; coal boilers (only until 30th June 2021): 30% of the cost, max PLN 3.000, or 60% and max 6.000 for low-income families; wood gasification and wood pellet boiler: 30% of the cost, max PLN 6.000, or 60% and max 12.000 for low-income families; wood pellet boiler (best standard): 45% of the cost, max PLN 9.000; electric heating: 30% of the cost, max PLN 3.000, or 60% and max 6.000 for low-income families; solar thermal: 30% of the cost, max PLN 4.500, or 60% and max 9.000 for low-income families. Max 30.000 PLN (37,000 low-income families) in total for projects.

Source: https://czystepowietrze.gov.pl/czyste-powietrze/

Clean Air Priority Program Stop Smog

Type. Central government grant scheme for fossil and RES heating systems.

Description. The program finances the replacement or liquidation of heat sources and thermal modernization in single-family residential buildings of energy poor people in heavily polluted areas. The program is intended for energy poor people who own or co-own single-family residential buildings. Scope of the Program is: the replacement or elimination of high-emission heat sources with low-emission ones; the thermomodernization of single-family residential buildings; the connection to the heating or gas network. The support is through municipalities, municipalites apply to the programme.

Amount: up to 80% of funding for investment costs from the state budget.

Source: https://czystepowietrze.gov.pl/stop-smog-2/

Clean Air Priority Program Thermomodernization relief (Program Czyste Powietrze - Ulga termomodernizacyjna)

Type. Central government tax reduction scheme for fossil and RES heating systems.

Description. The goal of the program is to improve energy efficiency and to reduce dust and other pollutant emissions to the atmosphere from existing single-family residential buildings or to avoid air pollution emissions from newly built single-family residential buildings. High subsidies are dedicated

to furnace replacement and thermomodernization of single-family homes. Financial support covers: preparation of design documentation (modernization of the internal installation and replacement of the heat source, reconstruction of the roof for insulation), purchasing of equipment, installations (substation with temperature programmers, heat pumps, condensing gas boilers, solar collectors, photovoltaic cells), purchasing of building materials as a part of building thermomodernization.

Amount: The amount of the deduction cannot exceed PLN 53,000. Higher amounts for combination of thermomodernization and RES installation

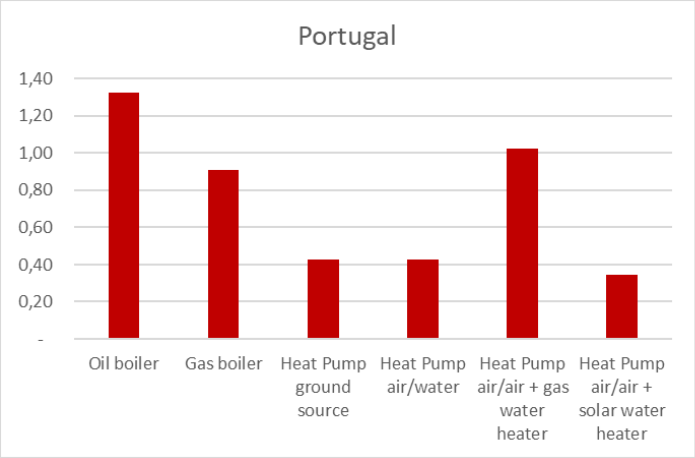
Source: https://czystepowietrze.gov.pl/ulga-termomodernizacyjna-2/

PORTUGAL

Summary – main support schemes for heating of households

Fossil	Loans	Gas boilers	The government's Efficient Home scheme from 2020 provides low-interest loans for gas boilers and renewable heating systems to be repaid within 20 years. The loans range from €2,500 and €100,000 depending on whether building renovation is needed.
Heat pumps	grants	Air/water heat pump	The government's Edifícios Mais Sustentáveis funds 85% up to €2,500 for the installation of a heat pump. A one-earner-couple with two children could take more than 8 years to recover the installation costs of an air/water heat pump but less than a year for an air/air heat pump.
Solar thermal	grants	Solar thermal system	The government's Edifícios Mais Sustentáveis funds 85% up to €2,300 for the installation of a solar thermal system. A one-earner-couple with two children could take less than a year to recover the installation costs.

CO2e emissions from heating of an individual house



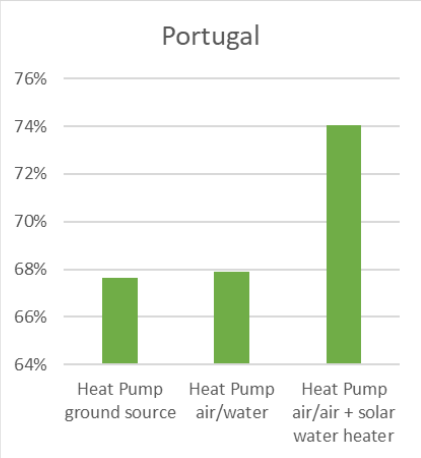


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to oil*

The comparison is made with oil because Portugal has very little gas heating.

Support Schemes for households' heating

Program Efficient Home 2020 "Casa Eficiente"

Type. Central government soft loans scheme for fossil and RES heating systems.
Description. Casa Eficiente 2020 program provides loans at favourable conditions for interventions aimed to improve the environmental performance of private residential buildings, with particular attention to energy and water efficiency, in addition to the management of urban waste. Interventions can affect the building envelope and its systems. Thanks to the program, subsidized loans are granted, of between a minimum of 2,500 and 100,000 euros. Maximum duration of the loan 20 years. In addition to various energy efficiency interventions, the program promotes the installation of heat pumps, biomass boilers and solar thermal.

Source: https://casaeficiente2020.pt/sobre-o-programa/
https://casaeficiente2020.pt/media/1148/regulamento-casa-eficiente-2018-03-01.pdf

Fundo Ambiental 2021 - Programa de Apoio a Edifícios Mais Sustentáveis (More Sustainable Buildings)

Type. Central government grant scheme for RES heating systems.
Description. The scheme called "More Sustainable Buildings" *(Edifícios Mais Sustentáveis)* is part of the Program *Economic and Social Stabilization Program* (PEES), approved by the Resolution of the Council of Ministers no. 41/2020, that establishes, among others, a set of measures to boost economic employment, by launching of small works, of quick execution and spread throughout the territory, that can absorb some of the impact of the economic crisis caused by the pandemic caused by the disease COVID-19. The scheme subsidizes various interventions: building insulation, more efficient windows, heat pumps, solar thermal, biomass, photovoltaic, water saving, biomaterials, etc. Phase II of the programme has been announced in June 2021.
Amount. Heat pumps and solar thermal 85% of the expenses, up to a maximum of € 2.500; biomass boilers 85% up to € 1.500. The equipment must be minimum energy class A+. Maximum subsidy for a single-family building is € 7,500 in total.

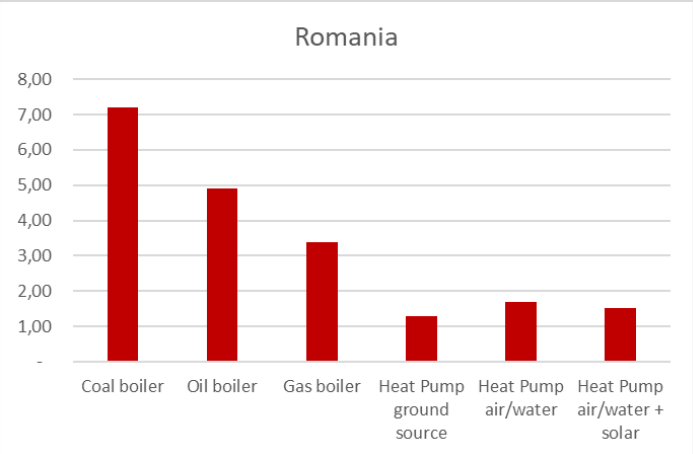
Source: https://www.fundoambiental.pt/apoios-prr/paes-2021.aspx

ROMANIA

Summary – main support schemes for heating of households

Fossil	Grants	Gas boilers, CHP	Romania's Casa Eficientă Energetic scheme subsidises gas boilers, and micro cogeneration (CHP) technologies based on gas. Grants can reach up to RON 70,000 for each project, and can cover 40% to 60% of the investment. Households can expect a subsidy of about €1,200 for a gas boiler. A one-earner-couple with two children could take less than 3 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	A subsidy scheme known as Casa eficientă covers up to 60% of the installation costs of a heat pump (except for air/air heat pumps). Households can expect a subsidy of about €5,000 for a heat pump. A one-earner-couple with two children could take more than 10 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	A subsidy scheme known as Casa eficientă grants €2,500 for the installation of a solar thermal system. A one-earner-couple with two children could take more than 4 years to recover the installation costs.

CO2e emissions from heating of an individual house



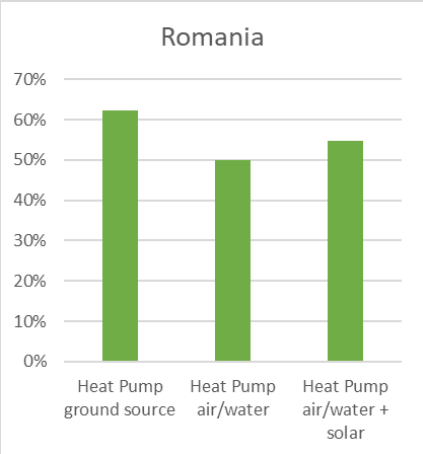


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

Support Schemes for households' heating

Program Efficient Home "Casa Eficientă Energetic"

Type. Central government grant scheme for fossil and RES heating systems.
Description. The program *Casa eficientă energetic* is aimed to increase the energy efficiency in the single-family dwellings. The program subsidies condensation boilers, heat pumps (except air/air heat pumps) solar thermal panels, micro cogenerators (natural gas, biogas, gasification of household waste and non-household waste, as wood waste, wood pellets, agricultural pellets), and other interventions (mechanical ventilation with heat recovery, insulation, LED, etc.).
Amount. The amount of financing is granted differently, depending on the energy efficiency indicators reached. the maximum amount is RON 70.000, including VAT for each project, without exceeding 60% of the total value of the eligible investment expenses (40, 50 or 60%).

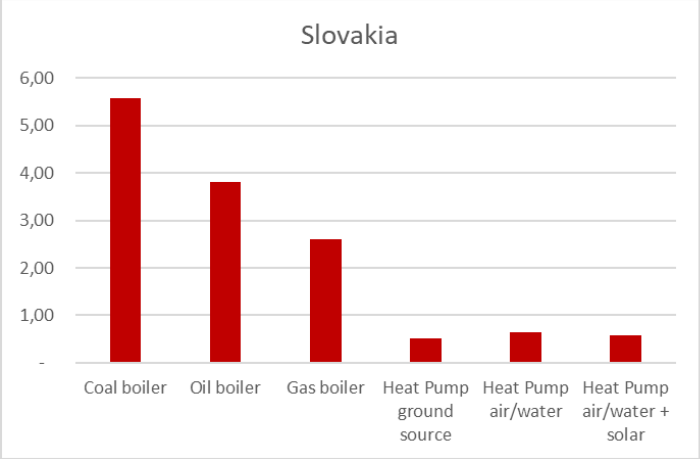
Source: https://www.afm.ro/casa_eficienta_energetic.php
https://www.afm.ro/casa_eficienta_energetic_ghid_finantare.php

SLOVAKIA

Summary – main support schemes for heating of households

Fossil	Grant	Gas boilers	Slovakia supports the replacement of old combustion systems with gas boilers, giving out grants of up to €3000 for the cost and installation of the appliance as well as connection to the gas grid.
Heat pumps	grants	Air/water heat pump	A subsidy scheme known as Zelená domácnostiam II incentivizes the uptake of heat pumps, covering about €272/kWp. Households can expect an average subsidy of about €2,700. A one-earner-couple with two children could take more than 8 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	A subsidy scheme known as Zelená domácnostiam II incentivizes the uptake of solar thermal systems, covering about €400/kW. Households can expect a subsidy of about €1,500 for the average installation. A one-earner-couple with two children could take more than 4 years to recover the installation costs.

CO2e emissions from heating of an individual house



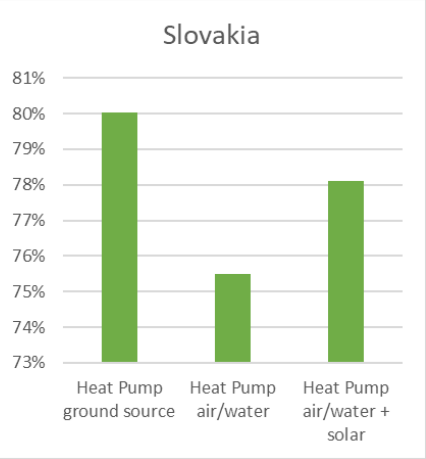


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

The Slovak government plans to ban the sale and installation of oil boilers in 2023.

Support Schemes for households' heating

55th call for the replacement of obsolete domestic combustion systems with low emissions (excluding RES)

Type. Central government grant scheme for fossil heating systems.
Description. The 55th *call for the replacement of obsolete domestic combustion systems with low emissions* (*Výzva zameraná na náhradu zastaraných spaľovacích zariadení v domácnostiach za nízkoemisné (s výnimkou OZE) OPKZP-PO1-SC141-55* supports the installation of condensing gas boilers replacing heating with solid fossil fuel. Currently closed for applications. The programme is expected to become active later in the year.
Amount: up to 3000 euro for a gas boiler, installation, and connection to the gas grid.

Source: https://www.op-kzp.sk/obsah-vyzvy/55-vyzva-zamerana-na-opkzp-po1-sc141-55/
https://www.op-kzp.sk/dotacie-na-vymenu-kotlov/

Program Green for households II (Zelená domácnostiam II)

Type. Central government grant scheme for RES heating systems.
Description. Under the Zelená domácnostiam II program of the Slovak Innovation and Energy Agency (Slovenská inovačná a energetická agentúra SIEA), the following technologies are promoted: heat pumps, biomass boilers, solar thermal as well as wind turbines and photovoltaic. The programme is not active currently as the funds are used, but it will become active again later this year (2021). The programme runs until 2023.
Amount. The base rate for solar collectors for a family house is € 400/kW of installed capacity of the solar collectors, the maximum amount of support is 1.400 € per installation; outside district heating areas the amount is € 440/kW and maximum € 1.540 per installation. The basic rate for a heat pump for a family house is € 272/kW of installed heat pump power, the maximum amount of support is € 2.720 per installation. The basic rate for biomass boilers for a family house is 80 €/kW of installed boiler power, the maximum amount of support is € 1.200 per installation. Maximum 50% of the costs.

Source: https://zelenadomacnostiam.sk/sk/domacnosti/podporovane-zariadenia/tepelne-cerpadla/
https://zelenadomacnostiam.sk/sk/domacnosti/podporovane-zariadenia/kotly-na-biomasu/
https://zelenadomacnostiam.sk/sk/domacnosti/podporovane-zariadenia/slnecne-kolektory/

SLOVENIA

Summary – main support schemes for heating of households

Fossil	Grant, loans	Gas boilers, CHP	The Eko Fund scheme provides grants and loans available for gas boilers. It covers 30% of the cost or up to €2000. The subsidiy can also cover 100% of the cost for low-income households. Households can expect a subsidy of about €1,200. A one-earner-couple with two children could take less than 2 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	A subsidy scheme known as Eko Sklad covers up to 50% of the installation costs of a heat pump. Households can expect a subsidy of about €3,200. A one-earner-couple with two children could take more than 6 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	A subsidy scheme known as Eko Sklad covers 30% of the installation costs of a solar thermal system. Households can expect a subsidy of about €1,200. A one-earner-couple with two children could take more than 4 years to recover the installation costs.

CO2e emissions from heating of an individual house

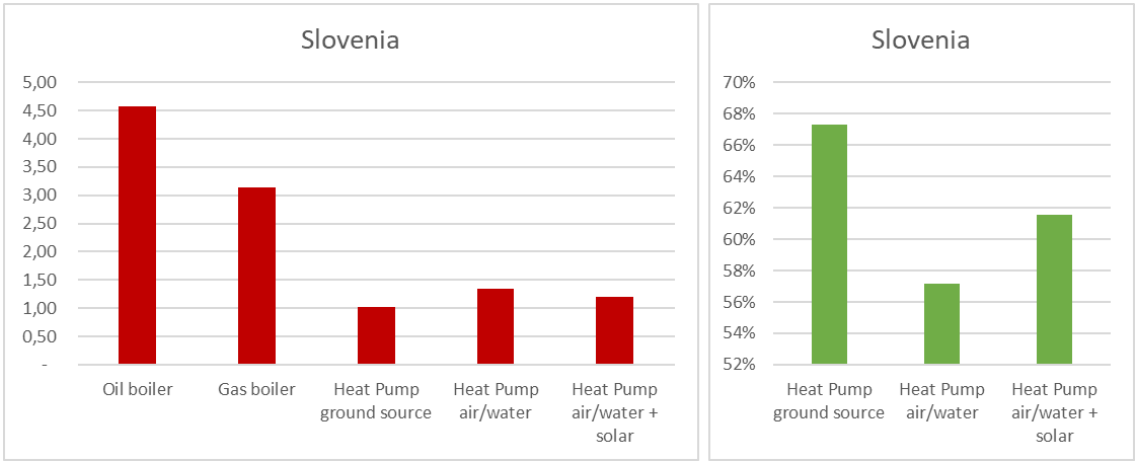


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

Support Schemes for households' heating

Eco Fund Subsidies and loans (Eko Sklad)

Type. Central government grant and soft loans scheme for fossil and RES heating systems.
Description. The Eko Fund makes subsides and loans available for various technologies: heat pumps, solar thermal, biomass boilers, condensing gas boilers and micro cogeneration (only loans). It also funds connection to district heating systems and ventilation with heat recovery.
Amount for subsidies. Solar thermal: up to 30% of the investment value (100% for low-income families), maximum € 300 per m^2. Condensing gas boilers: up to 50% of the investment value, 25% for multiapartment houses), maximum € 2.000. Biomass boilers from 20 to 60% (100% for low-income families) of the investment value, maximum from € 2.000 to € 5.000. Heat pumps: from 20 to 50% of the investment value (100% for low-income families), maximum from € 2.500 to € 5.000. When replacing an old heating device, the subsidy is 40% (50% in municipalities with air quality plan). The maximum for an air-air heat pump is € 2,500 (€ 3,200 in municipalities with air quality plan) and for water-water and ground source heat pump € 4,000 (€ 5,000 in municipalities with air quality plan).
Amount for loans. 3-month Euribor plus 1,3%, minimum loan amount € 1.500.

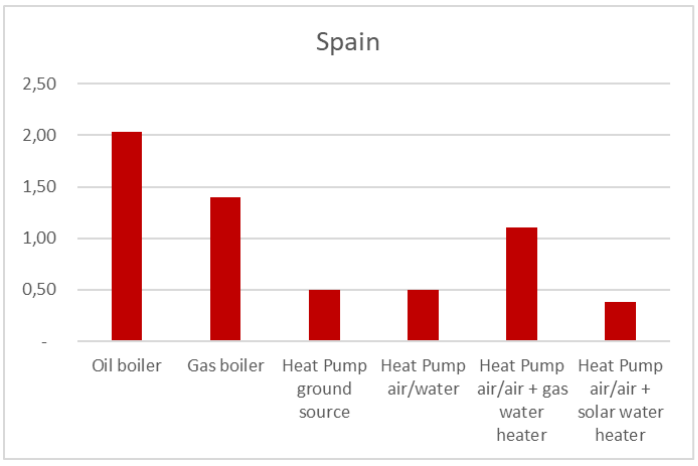
Source:https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/solarni-ogrevalni-sistem
https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/plinski-kondenzacijski-kotli-3
https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/mikro-soproizvodnja-toplote-in-elektrine-energije
https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/kurilne-naprave-na-lesno-biomaso
https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud/toplotne-crpalke

SPAIN

Summary – main support schemes for heating of households

Fossil	Grants	Gas boilers	Regional governments (Comunidades Autónomas) are in charge of providing grants for the installation of gas boilers as part of a wider national plan. The scheme provides grants ranging from €100 to €400 to households in several regions. A one-earner-couple with two children could take less than 2 years to recover the installation costs.
Heat pumps	grants	Air/water heat pump	Spain's Rehabilitación Energética de Edificios scheme covers up to 35% of the cost of a heat pump. Bonuses apply for low-income families (+10%) and for building renovation (+15%). Municipal incentives are also popular in some areas. The scheme runs until July 2021. Households can expect an average subsidy of about €3,500. A one-earner-couple with two children could take more than 4 years to recover the installation costs.
Solar thermal	grants	Solar thermal system	Spain's Rehabilitación Energética de Edificios scheme covers up to 35% of the cost of a solar thermal system, depending on the region. Bonuses apply for low-income families (+10%) and for building renovation (+15%). Municipal incentives are also popular in some areas. The scheme runs until July 2021. Households can expect an average subsidy of about €1,800. A one-earner-couple with two children could take more than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house



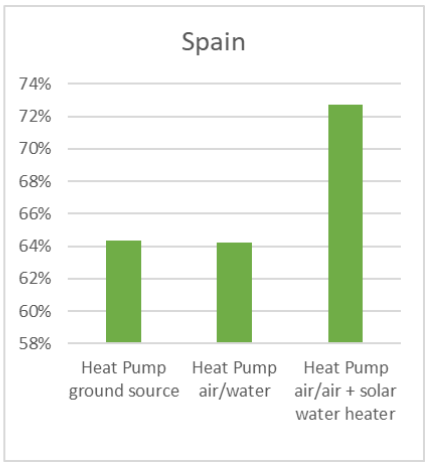


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

Support Schemes for households' heating

Programa PREE. Rehabilitación Energética de Edificios

Type. Central government grant scheme for RES heating systems.
Description. The regulatory bases of this Program will be governed by Royal Decree 737/2020, of August 4, 2020, which regulates the aid program for energy renovation actions in existing buildings and regulates the direct granting of aid from this program to the autonomous communities and cities of Ceuta and Melilla. The programme promotes also the improvement of the energy efficiency of thermal installations, such as: substitution of conventional energy for solar thermal energy, geothermal energy or biomass, improvement of the energy efficiency of the generation subsystems not included previously (e.g. the heat pump), improvement of the energy efficiency of distribution, regulation, control and emission subsystems of thermal installations. The programme closes for applications July 31, 2021. The budget was expanded March 3, 2021.
Amount: 35% of the eligible cost. In case of renovation of individual homes or premises within buildings, this percentage will be 25% and 15%, respectively. The value can be increased by, up to 15% if it meets the social criteria, up to 15% if the action reaches energy class A and up to 20% if the action criterion is met integrated.

Source: https://www.idae.es/ayudas-y-financiacion/para-la-rehabilitacion-de-edificios/programa-pree-rehabilitacion-energetica-de

Support for RES heating systems

A new supports scheme has just been announced.

"Royal Decree 477/2021, of 29 June, which approves the direct granting to the autonomous communities and the cities of Ceuta and Melilla of aid for the implementation of various incentive programmes linked to self-consumption and storage, with renewable energy sources, as well as the implementation of renewable thermal systems in the residential sector, within the framework of the Recovery, Transformation and Resilience Plan".

Source. http://cido.diba.cat/legislacio/11951352/real-decreto-4772021-de-29-de-junio-por-el-que-se-aprueba-la-concesion-directa-a-las-comunidades-autonomas-y-a-las-ciudades-de-ceuta-y-melilla-de-ayudas-para-la-ejecucion-de-diversos-programas-de-incentivos-ligados-al-autoconsumo-y-al-almacenamiento-con-fuentes-de-energia-renovable-asi-como-a-la-implantacion-de-sistemas-termicos-renovables-en-el-sector-residencial-en-el-marco-del-plan-de-recuperacion-transformacion-y-resiliencia-ministerio-para-la-transicion-ecologica-y-el-reto-demografico

Local Support for RES heating systems

Different local grants exist in the Spanish regions.

A compendium on different subsidy schemes in the regions, not only for heating systems but for building rehab et. al., can be found here: https://instalacionesyeficienciaenergetica.com/ayudas-y-subvenciones-eficiencia-comunidades-autonomas/

Support schemes in the Comunidad Autónoma of Aragón:
https://www.aragon.es/-/subvenciones-y-ayudas

Support for geothermal heat pumps in Galicia
Comunidad Autónoma de Galicia gives grants to geothermal heat pumps. Maximum subsidy is 30%.
http://tramites.administracion.gob.es/comunidad/tramites/recurso/ayudas-para-el-ahorro-y-eficiencia-energetica/7410df3a-bb3d-4c74-8fce-f796b4fa1403

Boiler renovation plan (Plan Renove de calderas)

Type. Central government (locally applied) grant scheme for fossil heating systems.
Description. The boiler renovation plan promote is implemented in most Autonomous Communities (regions) of Spain. It is responsible for replacing consumer boilers with more efficient ones, offering economic incentives. The Autonomous Communities oversee the boiler renovation plan to users with the aim of reducing the energy bill of homes and promoting the use of safer natural gas appliances according to the RITE. These grants are designed for all those users who wish to replace their individual boiler with another condensing boiler that uses natural gas or LPG. It is important to note that the original boiler to be replaced must be electric or make use of a fuel considered non-renewable. All local schemes are closed for applications. Most of them by the end of 2020. No new announcements yet.
Amount: The subsidy is very variable, but is usually between 100 and 400 euros, depending on the Autonomous Community.

Sources:

Castilla la Mancha
https://docm.castillalamancha.es/portaldocm/descargarArchivo.do?ruta=2020/06/24/pdf/2020_3950.pdf&tipo=rutaDocm
Castilla y Leon:
https://www.tramitacastillayleon.jcyl.es/web/jcyl/AdministracionElectronica/es/Plantilla100Detalle/1251181050732/Ayuda012/1284984151617/Propuesta

Valladoid:https://www.valladolid.es/es/actualidad/noticias/convocan-ayudas-municipales-rehabilitacion-edificios-objeto
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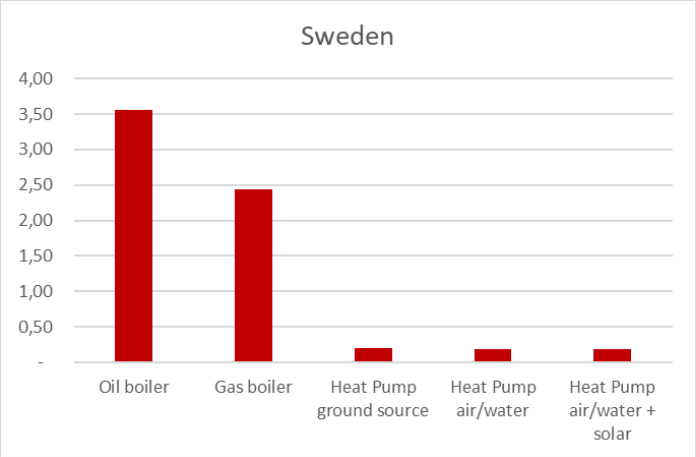
Fuerteventura
http://www.cabildofuer.es/documentos/Industria/Subvenciones/plan_estrategico_2018-2020.pdf
Aragon: https://calderas.renovearagon.com/

SWEDEN

Summary – main support schemes for heating of households

Fossil	tax rebate	Gas and oil boilers	The Rot-avgrad tax deduction has been in place since 2009. It provides tax reductions (30%) for the installation of both gas and oil boilers in homes, but this is seldom used. Sweden is also the country with the highest share of renewable energy used to heat homes. Biomass heating is used in individual houses, but the share is falling, and heating by heat pumps and direct electric heating dominate. Much of the district heating is from biofuel.
Heat pumps	tax rebate	Air/water heat pump	The government grants tax reductions for the installation of heat pumps, which can cover up to 30% of the labour costs but does not include the cost of technology. A one-earner-couple with two children could take more than 4 years to recover the installation costs.
Solar thermal	tax rebate	Solar thermal system	The government grants tax reductions for the installation of solar thermal systems, which can cover up to 30% of the labour costs but does not include the cost of technology. A one-earner-couple with two children could take more than 2 years to recover the installation costs.

CO2e emissions from heating of an individual house



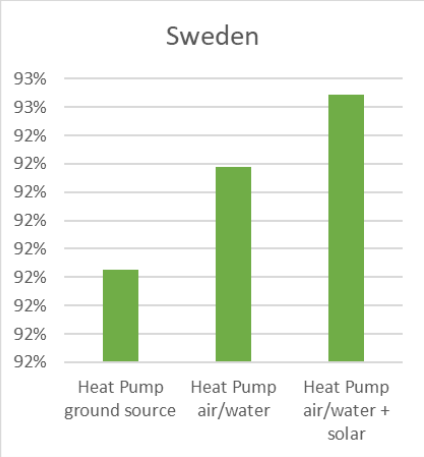


Fig A (left) *CO2e-emissions in ton/year/family for different heating solutions*
Fig B (right) *% lower CO2e-emission when choosing a Renewable energy solution compared to gas*

Support Schemes for households' heating

Tax deduction (Rot-avgrad)

Type. Central government tax reduction scheme for fossil and RES heating systems.
Description. The decision to introduce the ROT (Rot-avgrad) deduction was made in the Riksdag on May 13, 2009. Individuals who own homes, holiday homes or condominiums are entitled to deduct 30% of the labour costs of the installation (not of the technology) for works on the house (in condominiums: for internal maintenance). The deduction may also concern interventions on the heating system, such as the installation of heat pumps, biomass boilers, gas/oil/diesel boilers, solar panels.
Amount: the maximum deduction is SEK 50.000 per year and is 30% of the cost of the work (not the technology).

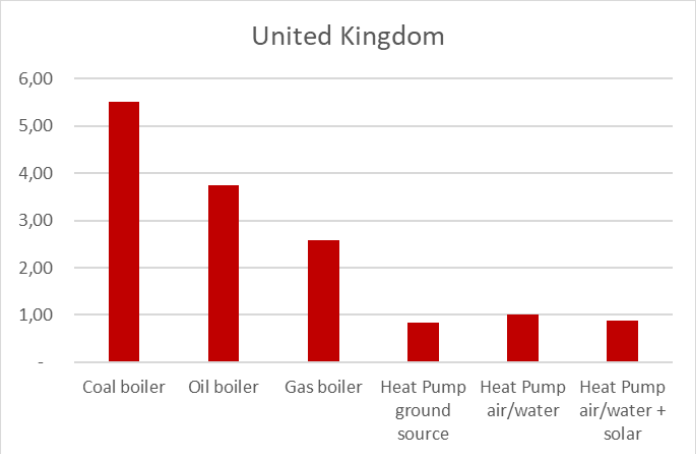
Source:
https://www.skatteverket.se/foretagochorganisationer/skatter/rotochrut/gerarbetetratttillrotavdrag.4.5c1163881590be297b5173bf.html

UNITED KINGDOM

Summary – main support schemes for heating of households

Fossil	Grants	Gas boilers	Despite being one of the very few European governments to announce a plan for the phase-out of gas boilers by 2033, grants for the installation of new gas boilers are available under the Free Boiler Scheme run by Energy Obligated Companies (i.e. large utilities) and sponsored by the British government. The amount can cover 100% of the costs.
Heat pumps	grants	Air/water heat pump	The Green Homes Grant was presented as one of the first and richest subsidy schemes for heat pumps in Europe, with the government promising to make heat pumps the primary heating technology for new homes. However, the scheme closed on March 31, 2021 due to bad management The Scheme was labelled "disstrous" by the Parliamentary Environmental Audit Comittee. Under previous plans, low-income households could receive subsidies covering 100% of the installation costs. The Domestic Heat Incentive offers support through feed in tariffs for seven years. Over seven years the subsidy is higher than the investment
Solar thermal	grants	Solar thermal system	The Green Homes Grant heavily supported the installation of solar thermal systems. However, the scheme closed on March 31, 2021 due to bad management The Scheme was labelled "disstrous" by the Parliamentary Environmental Audit Comittee. Under previous plans, low-income households could receive subsidies covering 100% of the installation costs. The Domestic Heat Incentive offers support through feed in tariffs for seven years. Over seven years the subsidy is nearly covering the investment.

CO2e emissions from heating of an individual house



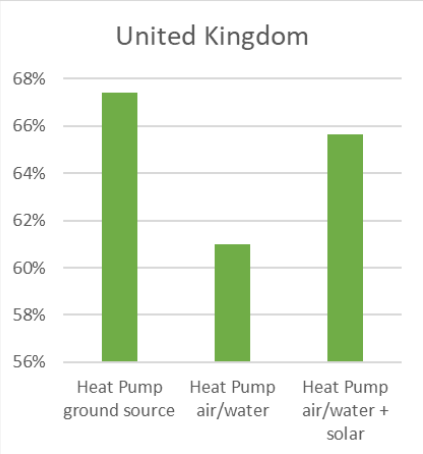


Fig A (left) CO2e-emissions in ton/year/family for different heating solutions
Fig B (right) % lower CO2e-emission when choosing a Renewable energy solution compared to gas

Support Schemes for households' heating

Domestic Renewable Heat Incentive

Type. Central government grant scheme (feed in tariff) for RES heating systems.
Description. The RHI promotes biomass boilers, solar water heating, certain heat pumps. The scheme is available in England, Scotland and Wales. Payments are made for 7 years and are based on the amount of renewable heat made by the heating system, calculated according to the *Domestic RHI scheme*. New build properties will not normally be eligible. The only exception is if the applicant is building his/her own home. The Scheme runs till March 31, 2022.
Amount. According to the document Domestic RHI tariffs table (2021/22), the tariff, in £/kWh are: biomass 0,0701 £/kWh; Air Source Heat Pump 0,1092 £/kWh; Ground Source Heat Pump: 0,2129 £/kWh; Solar Thermal 0,2149 £/kWh. There are limits on the amount of space heating a house can receive payments for. The heat demand limits are set at 20,000kWh for ASHPs, 25,000kWh for biomass boilers and stoves and 30,000kWh for GSHPs. There is no limit for solar water heating systems.

Source: https://energysavingtrust.org.uk/grants-and-loans/renewable-heat-incentive/
https://www.gov.uk/government/publications/changes-to-the-renewable-heat-incentive-rhi-schemes/changes-to-rhi-support-and-covid-19-response
https://www.ofgem.gov.uk/publications-and-updates/domestic-rhi-tariff-table

Green Home Grant - CLOSED

Type. Central government grant scheme for RES heating systems.
Description. The Green Homes Grant heavily supported heat pumps and solar thermal. However, the scheme closed on March 31, 2021 due to bad management The Scheme was labelled "disastrous" by the Parliamentary Environmental Audit Comittee. The Green Home Grant promotes energy improvements in the houses. Homeowners and residential landlords can apply for a grant voucher towards the cost of installing energy efficient improvements to their homes. Insulation and installation of low-carbon heating systems are included. About the low carbon heating measures, the scheme covers: air source heat pump, ground source heat pump, solar thermal (liquid filled flat plate or evacuated tube collector), biomass boiler, hybrid heat pump.
Amount. Vouchers will cover two-thirds of the cost of eligible improvements, up to a maximum government contribution of £5.000. Households on low income can receive vouchers covering 100% of the cost of the improvements, up to a maximum of £10.000.

Source: https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme

Free Boilers Scheme

Type. Central government grant scheme for fossil heating systems.
Description. Energy Company Obligation (ECO) is a government scheme whereby the larger energy companies have an obligation to invest in energy efficiency measures to reduce energy use and resident's energy bills therefore reducing fuel poverty. Funding is available to those on certain benefits towards replacing an old inefficient boiler with a brand-new condensing one.
Amount. Boiler grant funding can vary according to the property and survey will usually be required. The amount can reach the 100% of the costs.

Source: https://www.boilergrants.info/

Home Energy Scotland Loan

Type. Local government soft loan and grant scheme for fossil and RES heating systems.
Description. Interest free loans and cashbacks of up to £17,500 are available in Scotland for energy efficiency and renewable heating. Cashback for renewable heating systems is not normally available. The cashback values are subject to availability while funds last or until the end of the financial year – whichever is sooner. Funds will be allocated on a first-come, first-served basis.
Amount. Heating system (gas, LPG or oil boilers): up to £5,000 (no cashback available). Solar water heating systems: £5,000 (£1,250 loan plus up to £3,750 cashback). Heat pumps (air-water, water-water, ground source or hybrid air source to water): £10,000 (£2,500 loan plus up to £7,500 cashback). Biomass boilers or stoves (non-automated, non-pellet stoves or room heaters are not eligible): £10,000 (£2,500 loan plus up to £7,500 cashback). Connections to a renewably powered district heating scheme: £5,000 (£1,250 loan plus up to £3,750 cashback).
Source. https://www.homeenergyscotland.org/find-funding-grants-and-loans/interest-free-loans/overview/

ANNEX: METHODOLOGY AND SOURCES

This annex explains the methodology and sources used in this report, except the sources for information on national subsidies that are given in the country pages.

Greenhouse Gas Emissions from Heating of an Individual House

Heat consumption

The heat consumption is calculated for a house of 110 m^2. For each country it consists of:

- 110 m^2 times the national average specific space heat consumption for 2018 from the Odyssee-Mure database, see: https://www.odyssee-mure.eu/publications/efficiency-by-sector/households/heating-consumption-per-m2.html, except for Belgium, where data is from the BSO database for 2014 (https://ec.europa.eu/energy/eu-buildings-database_en) and for Norway, where data is from SINTEF, Norway.
- The average EU-27 energy consumption for hot water of 3400 MJ/person/year times 4 persons. Energy for hot water is according to Eurostat data from 2018, source: https://ec.europa.eu/eurostat/statistics-explained/images/1/17/Energy_consumption_households_data2019_final.xlsx, divided by 447.7 million EU citizens . We use the EU average for energy for hot water for all countries.
- Reduction to 80% to compensate for the energy efficiency of the present heating system.

Efficiencies

To calculate emissions, first we calculate energy demand for each type of fuel. This is calculated from above heat demand and technology specific efficiencies. For most technologies are used efficiencies from base cases from Ecodesign Review and preparatory studies, but for some technologies we have used market data instead, as there is a fast development of the technology. This is in particular the case for air source heat pumps and ground source heat pumps.

- Coal boiler: 75% from Ecodesign Preparatory Study Lot 15, task 5 report, higher heating value (GCV).
- Oil boiler: 86% from Ecodesign Review Study on hydronic heaters 2019, GCV, source: https://www.ecoboiler-review.eu/Boilers20”17-2019/documents-boilers-2017-2019.htm.
- Gas boiler: 88% from Ecodesign Review Study on hydronic heaters 2019, GCV.

- Air source heat pump for hydronic heating: SCOP 3,6 for average climate, taken as lowest efficiency within the best 25% of the Danish market (the no 19 in a list of 77 air source heat pumps at https://sparenergi.dk/forbruger/vaerktoejer/varmepumpelisten). The BAT on Danish market has SCOP = 3.9. For cold climate we use 3.3, based on an average of 9% lower efficiency at cold climate for air source heat pumps (derived from market data).
- Ground source heat pump for hydronic heating: SCOP 4.6, estimated in the following way: With present Ecodesign methodology the ground source heat pump with the lowest efficiency within the best 25% of the Danish market (the no 12 in a list of 48) has SCOP = 4. With the proposed change from brine temperatures from -3˚C/0˚C to 2˚C/5˚C, the SCOP will increase around 15%, giving SCOP = 4.6. This change is proposed with the current review of ecodesign regulations, see WG 1-2-3 Space Heaters Interim Report, 17/12 2020, available from https://www.ecoboiler-review.eu/documents.htm
- Air-air heat pump: SCOP = 5.35 for average climate, from Ecodesign Review Study of Air conditioners and comfort fans, 2019, source https://hal-mines-paristech.archives-ouvertes.fr/hal-01796759.

For ratio between higher heating value (GCV) and lower heating value (NCV) is used 1.125 for gas, 1.047 for oil, and 1.04 for coal.

For solar thermal for hot water is used the following coverage of hot water energy demand: it covers 78% in warm climate, 58% in average climate, and 53% in cold climate, calculated with the simplified method for solar water heating proposed by Solar Thermal Europe for Ecodesign regulation with a 4 m^2 solar collector and specifying an L-size water heater. The method is described here: https://www.ecoboiler-review.eu/downloads/20200623_WG4_SolarHeatEurope_proposal_simplified-method.pdf.

The demand covered by solar is subtracted before calculating electricity demand for heat pumps.

The efficiencies of air source heat pumps are for each country taken as the efficiency in the most dominant climate zone for space heating in the country according to Ecodesign and energy labelling regulations. This map shows these climate zones:

Map of climate zones (warm, average, cold) from energy labelling regulation for air source heat pumps, EU 811/2013

The efficiencies of solar water heaters are for each country taken as the efficiency in the most dominant solar climate zone in the country according to Ecodesign and energy labelling regulations.

This map shows these climate zones:

Map of climate zones (warm, average, cold) from energy labelling regulation for solar water heaters, EU 812/2013

Emissions

The emissions are calculated for heating with coal, oil, gas, as well as with electricity for air source heat pumps and ground source heat pumps. In addition to these types of heating is included the option of solar water heating in combination with air source heat pumps. For countries with primarily warm climates (Malta, Cyprus, Portugal, Spain) the option of an air-air heat pump combined with a solar water heater is included. This option is also popular in parts of other countries, including Italy, Greece and France, but we only include it in the four countries, where both warm climate zones cover the majority of the country.

Emission factors for fuels are standard CO_2 emission factors from IPCC 2006:

- Gas (methane) 202 g/kWh
- Heating oil: 267 g/kWh
- Coal (bituminous) 340 g/kWh

The emission factors are relative to the lower heating values (NCV) and are the direct emissions with combustion, not including upstream emissions.

Emissions from electricity are for each country the emission from electricity production increased with 7% to include losses in the electricity networks. National electricity emissions are from 2019 from European Environmental Agency, source https://www.eea.europa.eu/data-and-maps/daviz/co2-emission-intensity-8/download.table.

Emissions from power production are reducing with reduction of fossil fuel use in power production, in particular phase-out of coal use. The emissions of the sectors covered by EU-ETS, where the power sector is the dominant, has already fallen 33% from 2005 to 2019 and they will continue to fall, guided by reductions in EU-ETS credits and with introductions of more wind and solar power. For the previous 2030 target of 40% reduction, the emissions covered by EU-ETS were set to reduce 43% 2005-2030. If the present 55% target is also implemented with a 3% higher reduction in the EU-ETS 2005-2030 target, the reduction will be 58%; but it can also be higher, as reductions in the energy sector is faster and often cheaper than reductions in many other sectors. With a 58% reduction 2005-2030, the reduction 2019 – 2030 will be 37%. As this is likely to be achieved in the power sector with reductions of emissions per kWh of electricity rather than with less electricity use, the specific emissions per kWh produced, can be estimated to be reduced around 37% in 2030 compared to the figures given by EEA for 2019.

Refrigerants

For heat pumps emissions from loss of refrigerants to the emissions from electricity production are added.

The loss of refrigerants is estimated to a European average of 63% during the 17-year typical lifetime. This is calculated using the Ecodesign Review Study on hydronic heaters 2019, report 5 page 23. In this report it is assumed that 25% of the heat pumps lose all refrigerants during use (malfunctioning) and that of the remaining 75%, 50% of the refrigerant is recovered at end of life while the other 50% is lost. This gives emissions of 25% + 50% of 75% equal to 25%+ 38% =63% of the refrigerant.

The Ecodesign Review Report find that the refrigerant contents of heat pumps are 4.8 kg for an air source heat pump and 3.09 kg for a ground source heat pump. This is well above that market data for air source heat pumps; but seems reasonable for ground source heat pumps. Thus, for ground source heat pump, we use this refrigerant content and assume R134A as refrigerant. For air source heat pumps, we use market data instead.

We have identified refrigerant content of three air source heat pumps on the market in 2021:

1. Vølund F120-8 with 5.5 kW nominal heating capacity contains 2.4 kg R410 refrigerant with GWP 2088, total GWP of refrigerant 5.0 t CO_2e. See data https://volundvt.dk/produkter/luft-til-vand-varmepumpe/sortimentsoversigt/produkt/f2120-luft-vand-varmepumpe. Of this is lost 63% with global warming effect of 3.15 t CO_2e, annual LCA emissions during 17 years of service life: 0.19 tons CO_2e.
2. Metroair I12 with 9 kW nominal heating capacity contains 2.6 kg R410 refrigerant with GWP 2088, total GWP of refrigerant 5.4 tons CO_2e. Of this is lost 63% with global warming effect of 3.4 tons CO_2e, per year during 17 years of service life: 0.20 tons CO_2e.
3. Toshiba 801H(R)W-E with 7.49 kW nominal heating capacity contains 1.25 kg R32 refrigerant with GWP 677, total GWP of refrigerant 0.85 tons CO_2e. Of this is lost 63% with global warming effect of 0.53 tons CO_2e kg, per year during 17 years of service life: 0.03 tons CO_2e.

We use in this report the average of these examples: emissions: 0.14 tons $CO2_e$/year.

With the change to refrigerants with lower GWP of refrigerants, in particular if legislation will support use of natural refrigerants, the market can be expected to move to R290 and other refrigerants with lower GWP. In the future the example 3 can be expected to be more representative.

For air-air heat pumps, we have identified refrigerant content for two models on the market in 2021:

1. Toshiba Greenline Edge with 3.2-4.2 kW nominal heating power contains 0.76 kg R32 with GWP 776, total GWP of refrigerant 514 kg CO_2e. Of this is lost 63% with global warming effect of 324 kg CO2e, per year during 12 years of service life: 27 kg CO_2e (Information from Gidex.dk)
2. Toshiba Greenline D9 with 4.5 kW nominal heating power contains 0.9 kg R32 with GWP 776, total GWP of refrigerant 710 kg CO_2e. Of this is lost 63% with global warming effect of 513 kg CO_2e, per year during 12 years of service life: 37 kg CO_2e (Information from Gidex.dk)

We use average of two examples: emissions per unit: 32 kg CO_2e/year.

Affordability of Heating Installations – Upfront Costs

As an indication for affordability, we chose the time it will take to repay upfront costs for heating installations, calculated as investment costs minus generally available subsidies for the standard identified household. Instalments to repay the upfront cost are set to the 5% of the average income of

this standardised family in each country according to Eurostat. Subsidies that only are available in special economic zones, such as islands, are not included. Subsidies that are only available with some intervals are included, as far as the subsidy program is still active and will have openings in the future.

The national average income for each country is average net earnings from Eurostat: https://ec.europa.eu/eurostat/databrowser/view/earn_nt_net/default/table?lang=en

As a rule, only the most favourable incentives available to the standard household considered were taken into consideration for the maps based on this report on coolproduct.eu.

Equipment and Installation Costs

The costs are in general adapted from Ecodesign Review Study 2019: https://www.ecoboiler-review.eu/Boilers2017-2019/study-boilers-2017-2019.htm Report 2, 3 and for gas boilers table 10 in report 5 on https://www.ecoboiler-review.eu/Boilers2017-2019/documents-boilers-2017-2019.htm

For oil boilers: Danish equipment costs, from internet offers 2021, as costs in the review study are unrealistic high.

For air source heat pumps is used 10,000 €, which is a more realistic including installation than the 8,177 € used in the review study.

For ground source heat pumps is used the price for air source heat pumps + 3,000 € to cover the extra work with underground brine tubes, total 13,000 €. Though it is still an average rough estimation, this is more realistic than the 22,177 € given in the review study.

For coal boilers: Ecodesign Preparatory Study Lot, task 5 report, table 5-35, equipment + installation costs for 25 kW retort boiler with 20 year service life, see https://www.eup-network.de/fileadmin/user_upload/Produktgruppen/Lots/Working_Documents/BIO_EuP_Lot_15_Task5_Final.pdf

For air-air heat pumps: Ecodesign Review Study of Air conditioners and comfort fans, 2019, source https://hal-mines-paristech.archives-ouvertes.fr/hal-01796759

For solar water heaters, https://www.ecoboiler-review.eu/Waterheaters2017-2019/documents-waterheaters-2017-2019.htm

The following table lists the investment costs according to the Ecodesign review studies in the center column and in the right column it lists the investment costs that we use to calculate subsidies as well as affordability.

Technology	**Cost, Review Study,** Task 2 table 24	**Final price used** incl. work, VAT
Gas boiler replacing old boiler at same location	€ 1,215 + € 1,392 = € 2,607	€ 2,500 (equip. € 1,250, work € 1,250)
Oil boiler replacing old boiler at same location	€ 6,000 + € 6,849 = € 12,849	€ 3,500 * (equip. € 2,500, work € 1,000)

Coal boiler replacing old boiler at same location	€ 4,000 + € 1,500 = € 5,500 in 2007**	€ 6,500 (equip. € 4,800, work € 1,700)
Air source heat pump, replacing boiler	€ 4,000 + € 4,177 = € 8,177	€ 10,000 (equip. € 7,000, work € 3,000)
Ground source heat pump, replacing boiler	€ 7,000 + € 15,177 = € 22,177	€ 13,000 (equip. € 7,000, work € 6,000)
Air-air heat pump one unit per house, also aircon***	€ 1,500	€ 1,500 (equip. € 800, work € 700)
Solar thermal with antifreeze	€ 1,924 + € 978 = € 3,921	€ 5,000 (equip. € 3,000, work € 2,000)
Solar thermosyphon no antifreeze	€ 2,010 + € 663 = € 2,673	€ 2,700 (equip. € 2,000, work € 700)

* Danish equipment cost

** Final price includes 17% price increase 2007 – 2018 in Euro zone.

*** Air-air heat pumps are used as the technology of choice together with solar water heating for countries with primarily warm climate: Portugal, Malta, Cyprus, Spain. A house of 110 m^2 will normally require two air-air heat pumps for heating in warm climate, but as a house owner in the warm climates will often buy an air conditioner for cooling, we only include the investment of one unit. The air-air heat pumps are reversible and can be used as air conditioners.