

DECARBONISING HEATING IN BUILDINGS



KEY TAKE-AWAYS

Norway is close to a **complete decarbonisation of heating in the buildings sector**, achieved through:

- **subsidies for residential heat pumps**
- **high taxes on fossil fuels** for heating
- the construction of **district heating** facilities
- **gradual bans on fossil fuel boilers**

Over the years, the use of heat pumps has increased after the government began to offer **tax subsidies for heat pumps** beginning in 2003. This, along with a **tax increase on heating oil** together with a **carbon**

tax for heating, has helped stimulate growth in the heat pump market¹.

After the **waste landfill ban** was introduced in 2009, more investments were put into **developing district heating facilities** using **waste heat from incineration plants**². Additional waste heat sources are now used together with large-scale heat pumps to provide for district **heating and cooling**.

Electricity production in Norway relies on **renewable energy**, mainly from **hydropower**, complemented by **wind** and a small amount of thermal power.

1 Patronen et al., 2017

2 Patronen et al., 2017



OVERVIEW

The **carbon intensity of heating in Norway** is one of the **lowest in Europe**. It was achieved by **incentivising clean solutions and making costly fossil-based technologies**.

The first goal of the national government and municipalities was to **reduce pollution from oil-based heating**, especially in dense urban areas. The aim of **decarbonising heating completely for climate protection** builds on these earlier measures.

The city of Oslo today is planning the last step in the heating and cooling decarbonisation journey: improved recycling to **remove plastics** and further

reduce residual waste incineration emissions and a **carbon capture and storage** pilot project for **residual carbon emissions from high-temperature waste incineration**.

Co-benefits:

- Heat pump installations support **3,000 jobs** in Norway³
- Improved **air quality**
- Improved **environment protection** with landfills ban, sorting waste and high-temperature residual waste incineration

3 European Heat Pump Association, 2020



AIMS & TARGETS

Norway's government aimed to replace the remaining share of fossil-based heating with clean solutions by 2020.

- In the early 2000s, the government began facilitating the shift away from fossil-fuel heating **through**

subsidies for electric heating and investments in district heating.

- The **phase-out of fossil-fuel boilers** has been supported by a **gradual increase in taxes on**

heating oil as well as by including heating under the carbon tax.

→ The government **phased out the use of fossil fuels for heating**, which acted as 'trigger points' for decarbonisation.

- **2010: New boilers** for baseload heating were **banned** starting in 2011.⁴
- **2016: Fossil-fuel boilers were banned in new buildings**, starting in 2017.

4 Brekke et al., 2018

- **2017: A complete ban on fossil-fuel boilers** to heat all buildings, both new and old, starting in 2020.

It also established a **target** of cutting Norway's **emissions** by 340,000 tonnes per year, relative to overall national emissions of 53.9 million tonnes in 2015.⁵

5 Reuters Staff, 2017



POLICY INSTRUMENTS

Incentives:

→ In 2003, **purchase subsidies (grants, loans, tax credits)** were introduced to incentivise the **uptake of heat pumps by households**, the most common being air-to-air heat pumps.⁶ Heat pumps became so popular that the government decided to end the scheme in 2021.⁷

Taxation:

- The **carbon tax** introduced in 1991 includes heating.⁸ In 2019, the carbon tax for heating was 50.8 EUR per tonne.⁹
- Norway has a **higher tax rate on heating oils**, 45 percent **versus** 36 percent for **electricity**.¹⁰
- In 2017, the government **lowered the tax on electricity used in energy production and in district heating and cooling production** from 16.32 øre per kWh to 0.48 øre per kWh.¹¹

Bans:

→ In **2010**, Norway banned **new boilers** from using petroleum for baseload heating starting in 2011.¹²

6 Heimdal, 2011
7 Tognetti, 2020
8 Brekke et al., 2018
9 Rode, 2019
10 Kerr & Winskel, 2021
11 Patronen et al., 2017
12 Brekke et al., 2018

- In **2016**, Norway banned the use of **fossil-fuel heating in new buildings and in major renovations** starting in 2017.¹³
- In **2017**, Norway banned the **use of oil to heat buildings** beginning in 2020, including new and old buildings, private homes, businesses and public facilities. The law exempts buildings not connected to the electricity grid. Agricultural buildings are exempt until 2025.¹⁴

Building codes:

→ Norway implemented the Energy Performance of Buildings Directive 2002/91/EC in 2010.¹⁵

Communication:

- Consumers are encouraged to take advantage of the incentives for heat pumps via **information campaign**.
- The government operates a **national information centre** on energy efficiency in buildings, answering close to 60,000 questions a year on everything from new regulations to home efficiency subsidies.
- The centre also offers **workshops** with expert advice on building renovations.

13 Norwegian Ministry of Climate and Environment, 2020
14 Kerr & Winskel, 2021
15 Brekke et al., 2018



ACHIEVEMENTS & LESSONS LEARNED

Overall achievements (2017 data)

→ 85 percent of buildings in Norway are heated with electricity,¹⁶ 11 percent with district heating, 1 percent with fossil gas, 1 percent with solid fuels, and 2 percent with "other sources".¹⁷

Zoom on heat pumps:

- Norway has the **highest number of heat pumps per capita** in Europe.¹⁸
- In 2020, there were a total of 1.4 million heat pumps in operation.¹⁹ Currently, **25 percent** of Norwegian **buildings** have heat pumps.²⁰
- 14,500 **grants** were issued in 2018 to remove existing heating systems and to subsidise new heating systems. 90 percent of grantees chose some form of a heat pump.²¹
- With **subsidies**, a one-income household with two children could **recover** installation **costs** of a heat pump in four years.²²
- **Lessons learned with heat pumps:** EU regulations on energy labelling for heat pumps must be flexible with different climates.²³

Zoom on district heating:

- The number of district heating facilities is small compared with other Nordic countries.²⁴
- District heating doubled in the past 10 years²⁵ after landfills were banned in 2009 and more waste incineration plants were built.²⁶

- District heating not only uses energy from waste incineration plants but also from other industries and bioenergy sources.
- Commercial and public services sector are the largest consumers of district heating at 62 percent, followed by residential consumers at 21 percent and industry consumers at 18 percent.²⁷
- District heating companies are mostly **publicly owned** in Norway.²⁸ More district heating facilities were developed between 2009 and 2010, which was the result of massive investments in production and network facilities through **funding from ENOVA**. ENOVA is Norway's research and development arm for climate technology and a part of the Ministry of Climate and Environment.

Lessons Learned with district heating:

- The potential for new production of district heating in densely populated large cities is limited once they are already built, which explains the small decline in new production between 2013 and 2015. But there is still potential for district heating in smaller cities as they become more densely populated.²⁹
- Higher taxes on electricity can indirectly lead to an increase of district heating.³⁰

Lessons learned with building codes:

- Norway required the use of **smart meters** for all end-users of electricity beginning in 2019, which has ensured more energy efficiency in buildings, impacting heat demand.³¹

16 Kerr & Winskel, 2021

17 Patronen et al., 2017

18 European Heat Pump Association, 2020

19 European Heat Pump Association, 2020

20 Tognetti, 2020

21 Kerr & Winskel, 2021

22 Tognetti, 2020

23 Rode, 2019

24 Patronen et al., 2017

25 Kerr & Winskel, 2021

26 Patronen et al., 2017

27 Brekke et al., 2018

28 Patronen et al., 2017

29 Patronen et al., 2017

30 Patronen et al., 2017

31 Patronen et al., 2017



GHG EMISSIONS REDUCTIONS & COSTS

Emissions from **heating** in households and buildings accounted for only **2 percent of total national emissions** as of 2020,³² compared with an average of 36 percent for the EU.³³

Heat subsidies totaled 275 million NOK in 2018, up from 165 million NOK in 2017.³⁴

32 Norwegian Ministry of Climate and Environment, 2020

33 European Commission, 2019

34 Kerr & Winskel, 2021

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Learn more:

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237/02-DO-2021/EN

November 2021, Version: 1.0

Agora Energy

www.agora-energy.org

info@agora-energy.org

