

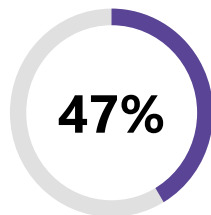
A photograph of a modern building complex featuring a prominent glass-enclosed skybridge connecting two parts of the structure. The building has a dark, textured facade and a cylindrical tower in the background. A large teal circle is overlaid on the right side of the image, containing the title text.

Energy Efficiency in
Danish Buildings
Danish Energy Agency
Anne Svendsen

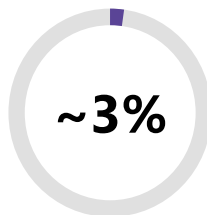
Denmark with focus on the power system

TODAY

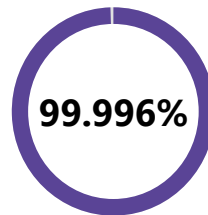
WIND POWER IN
POWER
CONSUMPTION*



WIND POWER
CURTAILMENT



SECURITY OF
SUPPLY



TARGETS

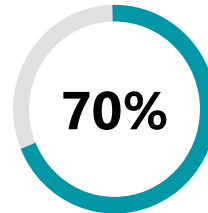
GREEN POWER
IN 2030



CLIMATE
NEUTRALITY IN
2050



GHG
REDUCTION IN
2030



Total
energy
consumption

Part of the Danish Energy Agency (DEA)

A government agency under the Ministry of Climate, Energy and Utilities



Danish Energy
Agency

GLOBAL
COOPERATION

RENEWABLES

ENERGY
SUPPLY &
REGULATION
OF WATER AND
WASTE

CLIMATE &
ENERGY
ECONOMICS

Energy Islands

ENERGY
EFFICIENCY

We cooperate with 19 partner countries



Core competencies of Global Cooperation



ENERGY SYSTEMS
AND SCENARIOS



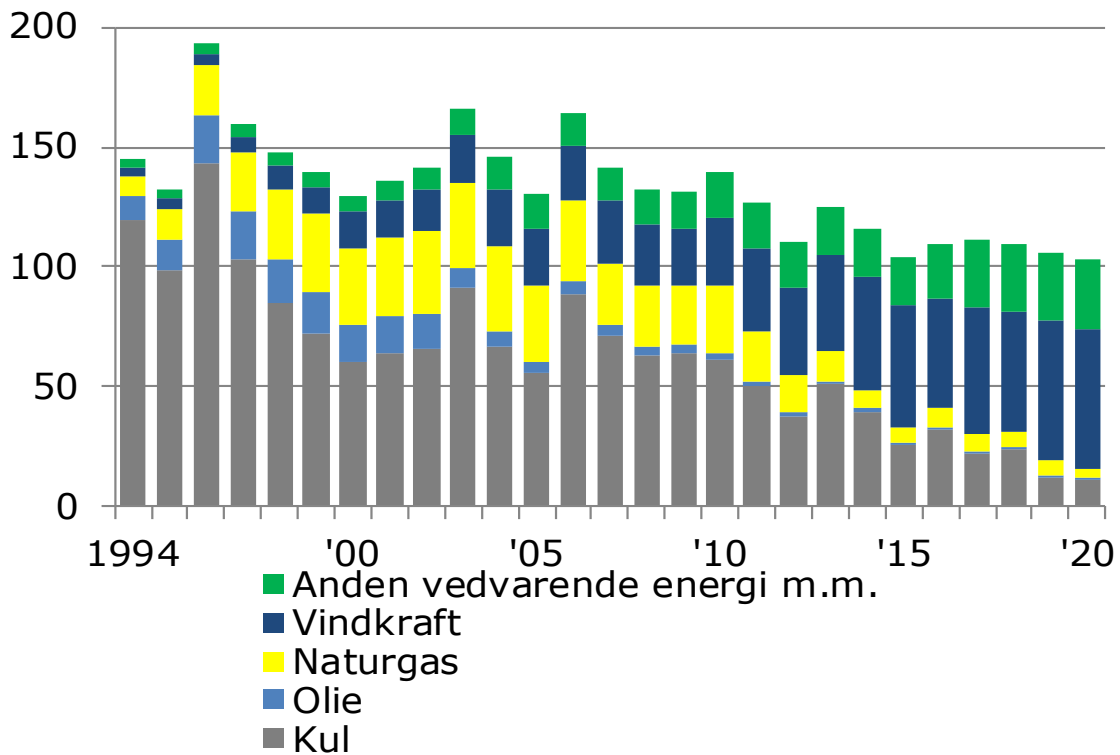
RENEWABLE
ENERGY





FLEXIBILITY AND
POWER STATIONS



ENERGY EFFICIENCY
AND DISTRICT HEATING

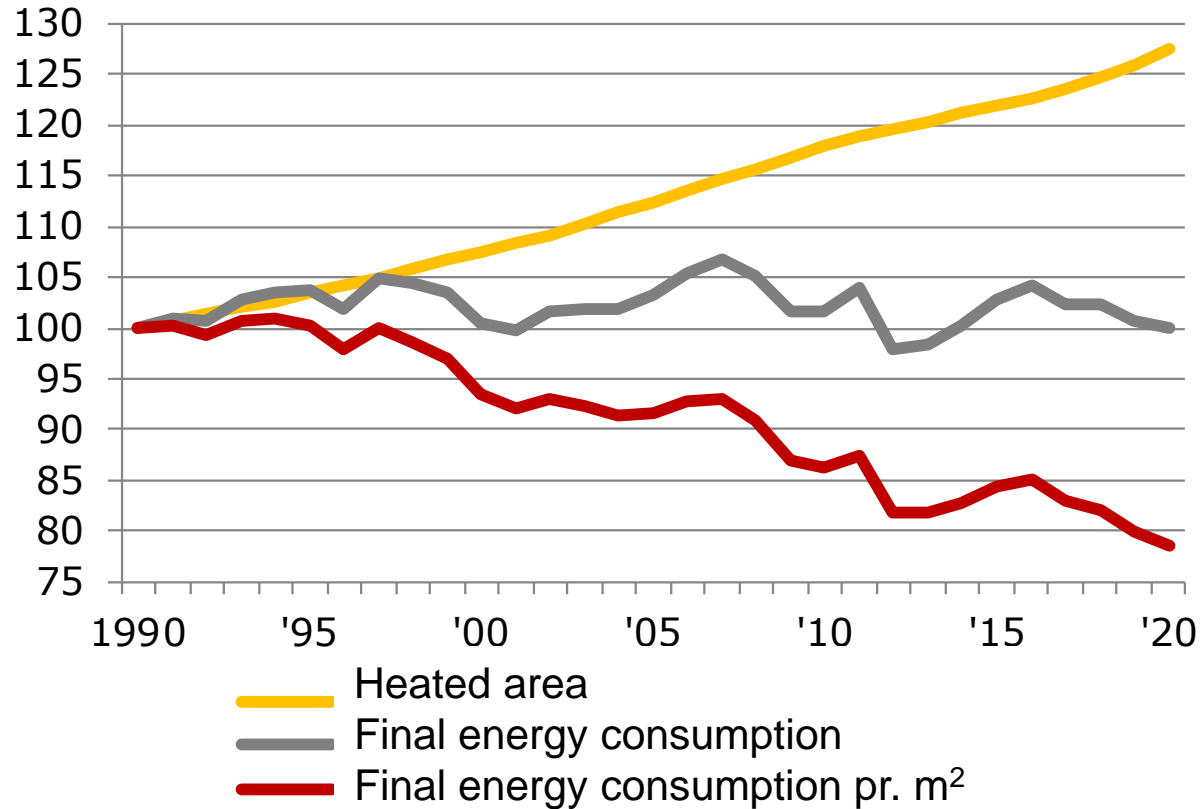




Energy Efficiency in Buildings The Danish situation

Energy consumption for heating of buildings

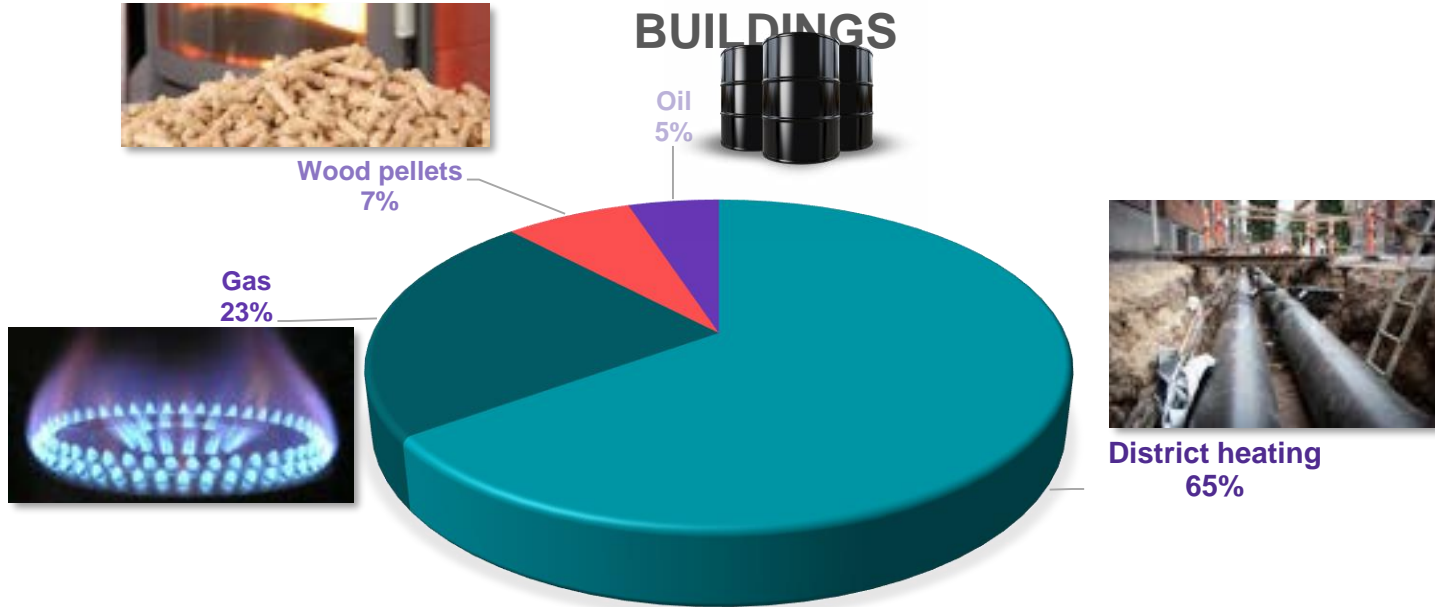
How is it going



Heating of Danish buildings

Heating types

DISTRIBUTIONS OF HEATING IN DANISH BUILDINGS



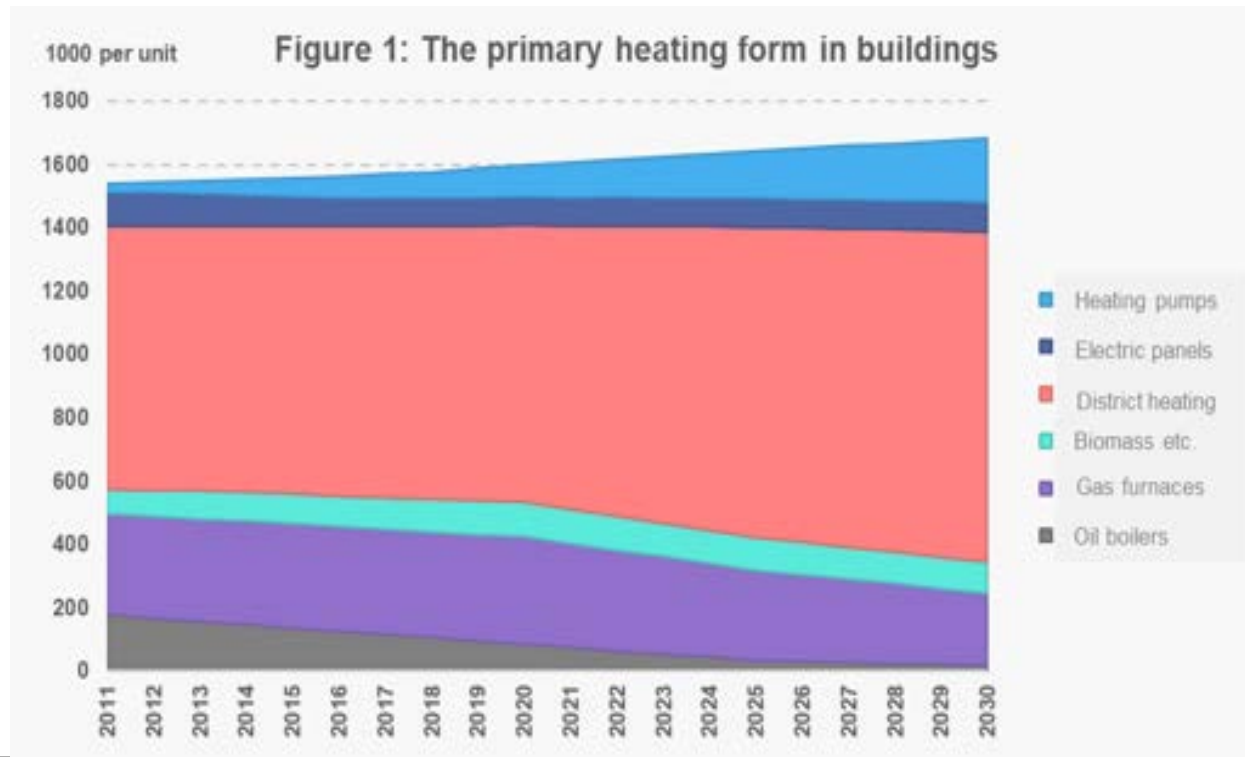
Is district heating clean?

District heating is produced on the basis of:

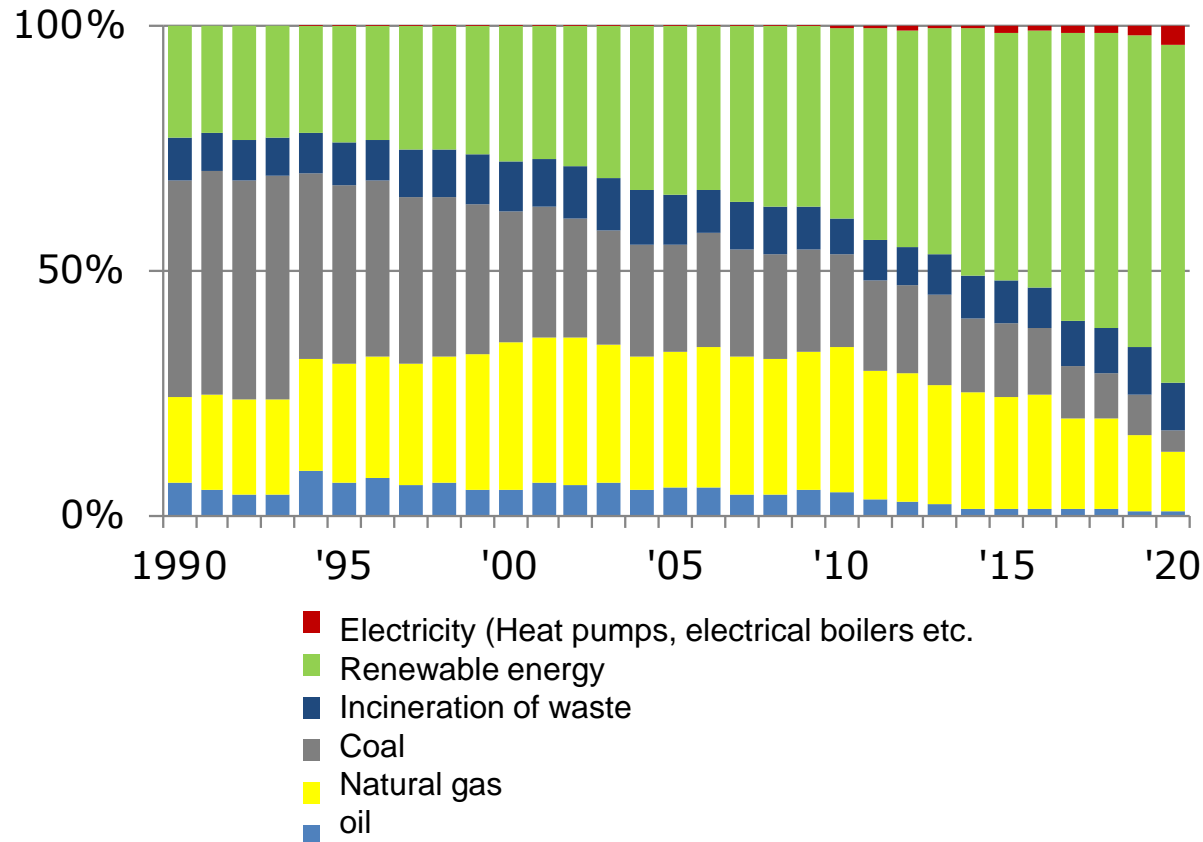
- Incineration of waste,
- wood chips,
- straw,
- wind,
- solar heating,
- geothermal energy,
- natural gas,
- oil, coal,
- surplus heat from industry and more.

72 percent of the district heating is produced using renewable energy such as sun, wind, biomass, biogas and geothermal energy.

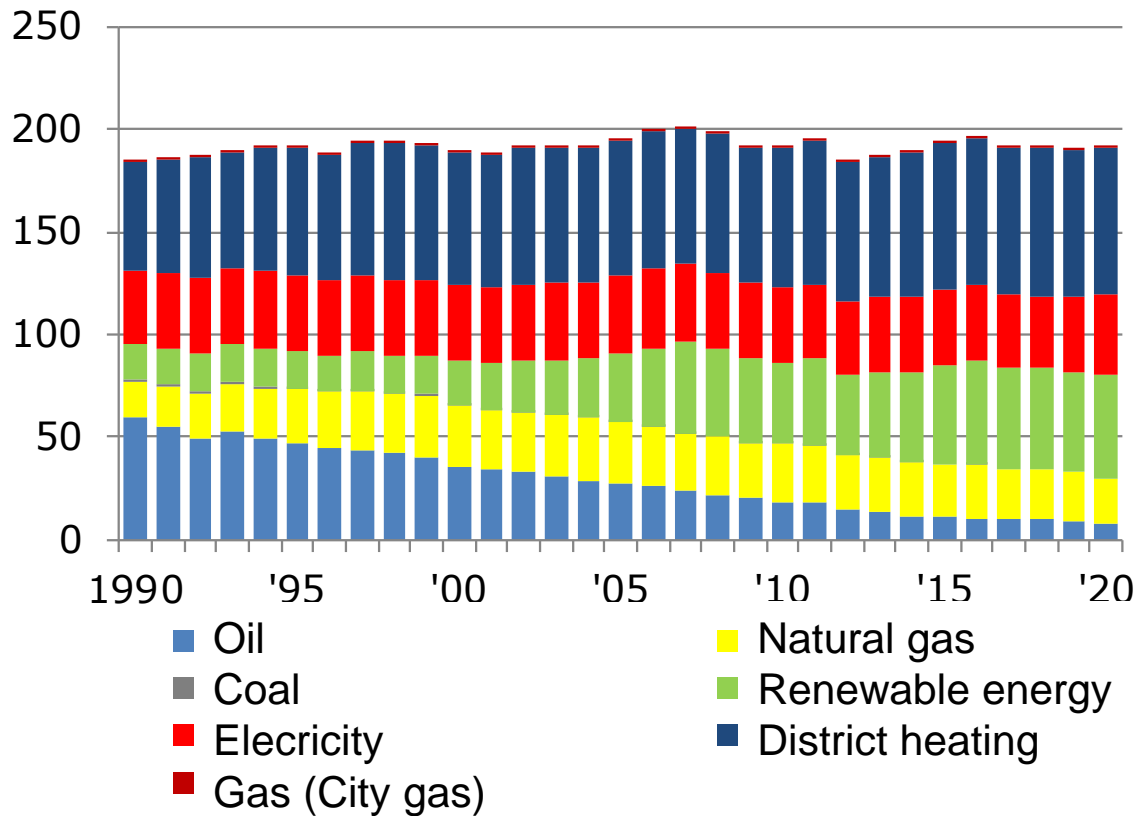
Mix of energy for heating in buildings



Energymix for the production of district heating

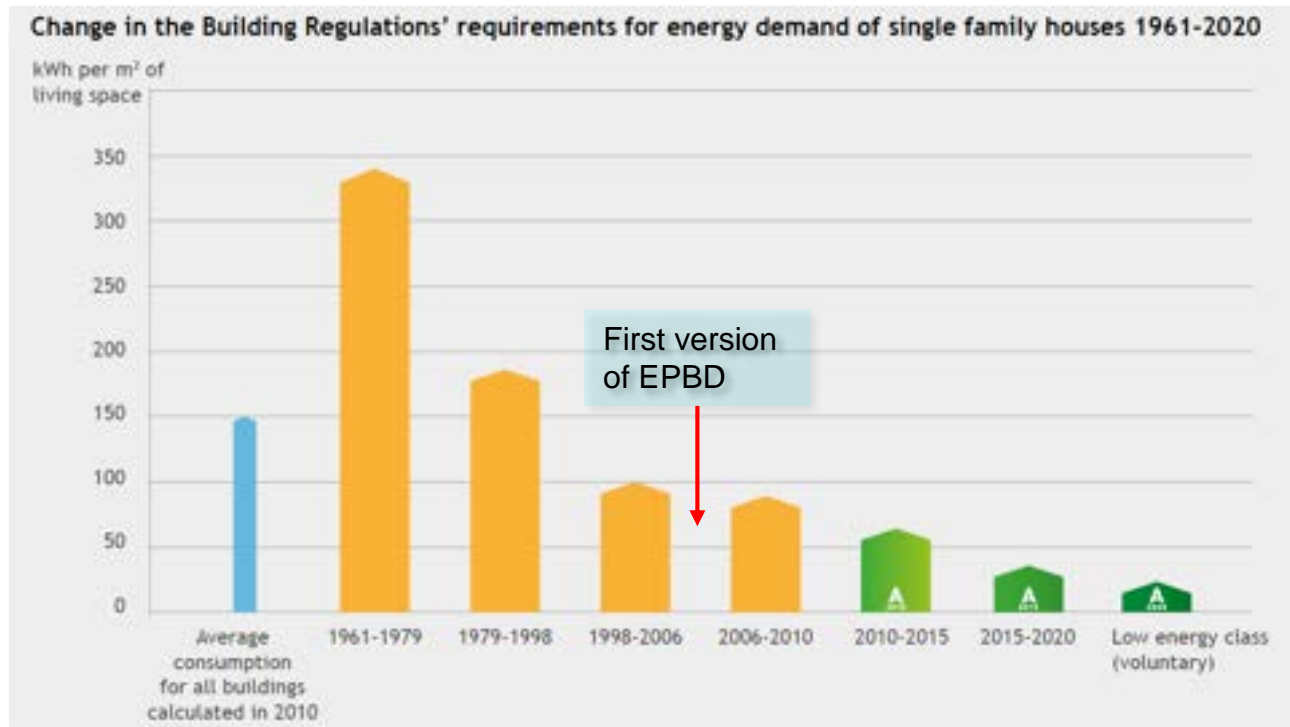


Energy consumption in households, PJ



The Danish Building Code

Primary energy classes



The Danish Building Code

Primary energy classes

Building code version	Energy frame kWh/m ² /year		Voluntary energy classes kWh/m ² /year			
	Domestic	Non-domestic	Domestic	Non-domestic	Domestic	Non-domestic
BR08			<i>Low energy class 1</i>		<i>Low energy class 2</i>	
	70+2200/A	95+2200/A	35+1100/A	50+1100/A	50+1600/A	70+1600/a
BR10			<i>Low energy class 2015</i>		<i>Building class 2020</i>	
	52.5+1650/A	71.3+165/A	30+1000/A	41+1000/A	20	25
BR15	30+1000/A	41+1000/A			20	25
BR18	30+1000/A	41+1000/A			<i>Voluntary energy class</i>	
					27	33
BR18	30+1000/A	41+1000/A	<i>Renovation class 1</i>		<i>Renovation class 2</i>	
			52.5+1650/A	71.3+1650/A	70+2200/A	95+2200/A

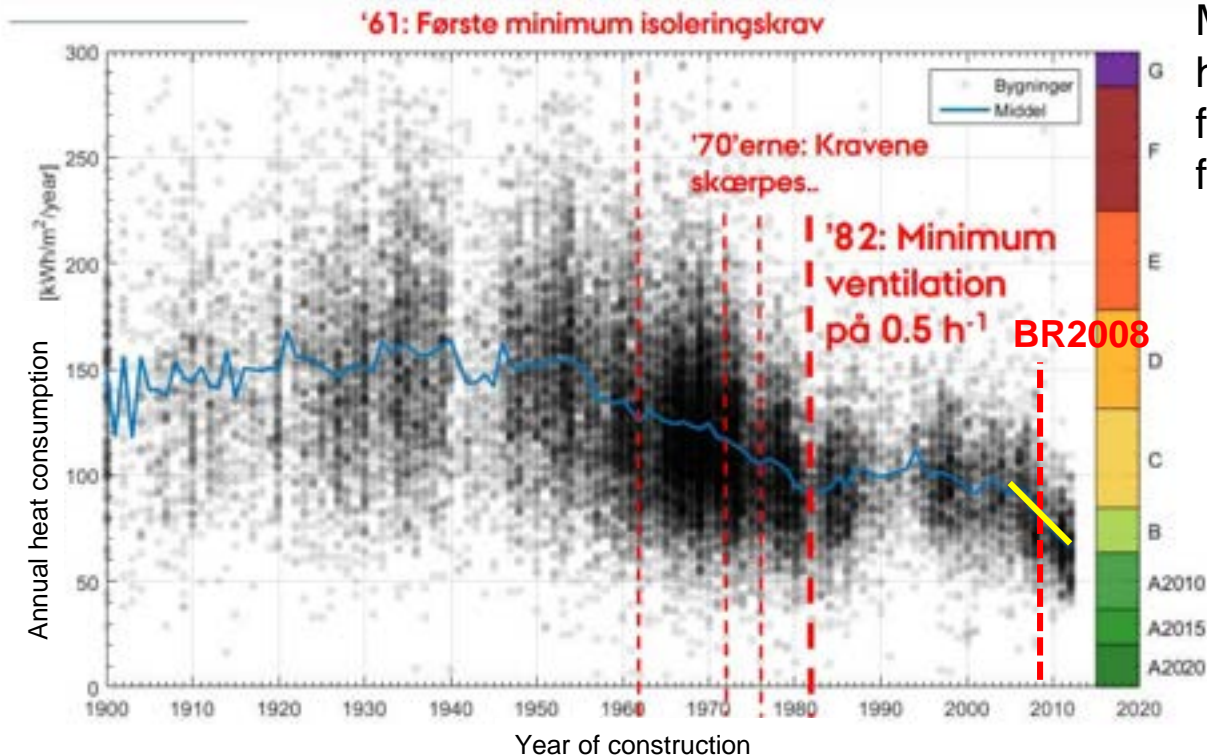
A is the heated floor area

Primary energy factors

Energy type	Energy frame	Voluntary energy class
District heating	0.8	0.6
Electricity	2.5	1.8
Other energy forms: gas, oil, biomass	1.0	1.0

How is it really going? Energy consumption of real houses

According to construction year



Measured district heating consumption from 28.000 single-family houses

Energy renovation

Energy renovation incentives

- High taxes on energy
- **Energy saving commitment** for the energy utilities until end 2020
- **Subsidy schemes** for component replacement and for scrapping of oil boilers
- **Tax reimbursement scheme** for part of the salary for skilled craftsmen doing energy renovation in homes
- **Funding Scheme for energy renovation** in municipalities and regions
- **Energy Performance Certificates** for existing buildings
- **Platform with information** to home owners, craftsmen and consultants
- **Training and education** of craftsmen and consultants on energy efficient building renovation

The Danish Building Code

Sustainability will be included by 2023

Year	Kg CO ₂ -eq/m ² /year	
2020	Two year trial of the sustainability class	
2023 – BR23	Requirement in the building code LCA calculations required	
	New building above 1000 m ² 12	New building below 1000 m ² -
2025	10.5	8
2027	9	7
2029	7.5	6

Approx. **30 kWh/m²** for residential buildings and **41 kWh/m²** for non-residential buildings

Requirements in the building code from 2023

- **Life cycle assessment (LCA)** –, production of materials, transport to the building site, Construction
 - **Resource (energy) use** at the construction site
 - **Total economic analysis (LCC)** – costs for construction, operation and maintenance
 - Development of an **operation and maintenance plan** for maintaining the indoor climate
 - Documentation of **problematic substances** in the building and the building materials
 - Detailed verification and documentation of the **daylight level**
 - Documentation of **degassing from building materials** to the indoor climate
-
- Documentation of noise from ventilation systems in housing

Energy Renovation

The Danish Building Code

- **Mandatory** to follow the building code by **major renovations if profitable**
- **The profitability is determined by:**

Annual energy savings x lifetime of the component / investment > 1.33

- If a component of the building envelope is completely replaced, **minimum requirements for the U-value.**
- **Voluntary renovation classes** in the current building code
- If a **component/appliance** is renovated (not entirely re-placed) profitable energy improvements shall be made. When replacing energy systems – heat, cooling and ventilation – the minimum requirements for new buildings apply.
- Replacement of an old oil boiler with a new oil boiler is **only possible outside areas with district heating or natural gas.**

Energy renovation

Public buildings

- Targets according to the EU directive: 2020-2030: 3 % of public buildings shall annually be energy renovated to energy label B. For buildings used by other state institutions (e.g. high schools, universities and museums), the requirement is a reduction of the energy demand by 10% in 2030 compared to 2020.
- Municipalities: the Danish Energy Agency makes voluntarily agreements with the municipalities for reducing the energy consumption in public buildings.
- Most municipalities have signed an agreement to annually reduce their energy demand by 2-4 %
- The Government provides subsidized funding and cheap loans for energy saving measures in the buildings of the regions and municipalities

Energy Performance Certificats (EPCs)

Are they valuable

- Danish EPCs are registered in a central database and displayed on a public website.
- About 50% of all buildings have an EPC.
- A survey from 2016 shows that a better EPC leads to a higher sales price for a building.
- The information imbedded in the EPCs are used by the banks, and by the energy agency to assess the current energy state of the Danish building stock and from this be able to developed appropriate initiatives for further reduction of the energy demand in Danish buildings.

Example of initiatives – Replacement of oil and gas boilers

Danish population: 5.8 mio

Today: 65 % of Danish buildings are heated by district heating

Rest: Oil boilers: 80,000 units

Gas boilers: 380,000 units

Wood pellet boilers: 120,000 units

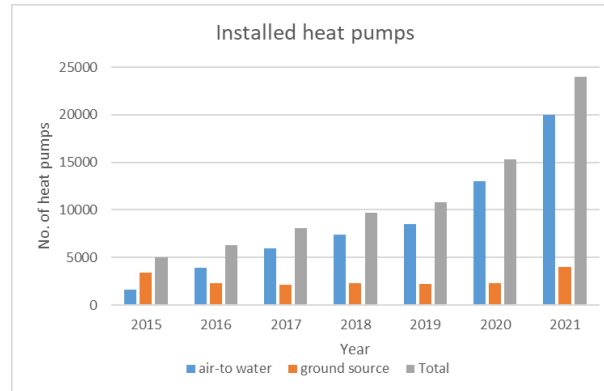
Large part of these installations are going to be converted to district heating. However, about 200-300,000 installations are to be converted to heat pumps before 2030.

-> Need for 20-30,000 new heat pumps annually!

Heat pumps in Denmark

Installation rate

Installation rate:



Installers' associations claim that they can install 50,000 heat pumps in 2022

Why the low installation rate:

- Heat pumps are more expensive than gas or oil boilers
- Lack of knowledge among the house owners and the installers
- When a boiler breaks down, the local installer may not have experience with heat pumps and prefer to sell a traditional boiler
- Uncertainty on the efficiency and the maintenance of heat pumps

Evaluation of heat As a service

Results of the Danish effort

<https://ens.dk/en/our-responsibilities/global-cooperation/tools-and-publications>

Click on "Energy Efficiency"

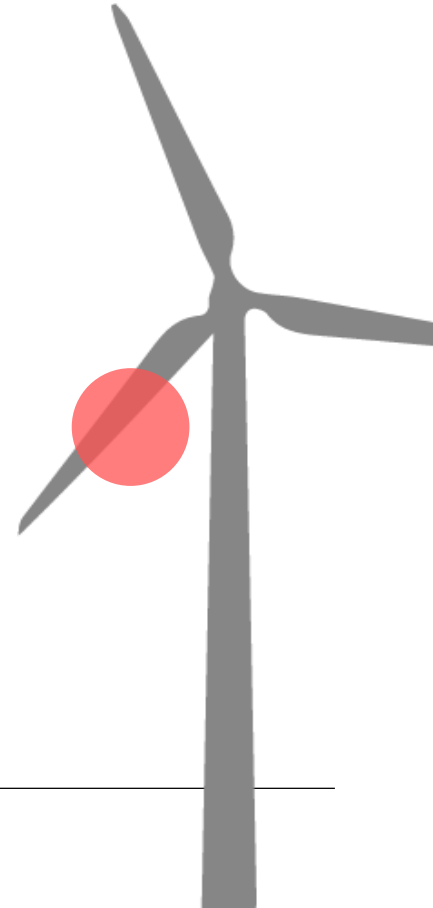


Certified heat pump installers

RE installers

A certified RE installer has been educated, has passed an exam and is skilled in all aspects of installing a RE system. For heat pumps, this means knowledge and skills in:

- relevant legislation
- environment, safety and noise issues
- function of heat pumps and related components
- providing advice to the customer
- determination of the energy demand for space heating and domestic hot water in order to correctly size a heat pump
- How to correctly connect to the heating system of the house including dimensioning of pipes and pipe insulation
- evaluating if changes to the heat-emitting system are necessary
- adjusting the controllers of the heat pump and the heat emitting system
- installing safety equipment





Thank you



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My LinkedIn →

