

Development of electricity capacity on thermal power plants

A projection towards 2040

October 2022

The focus of the analysis is a projection of the Danish thermal electricity capacity towards 2040

The analysis is the Danish District Heating Association's assessment of a projection of thermal electricity capacity

With this analysis, the Danish District Heating Association presents a qualified assessment of the projection of the Danish thermal electricity capacity towards 2040 under the currently applicable framework conditions, known political initiatives and development plans for the rest of the energy system, as well as a number of assumptions regarding technology development, fuel price developments, CO₂ quotas etc. The projection focuses on the coming 10-year period, but an assessment is presented for up to a 20-year horizon.

There is a need for debate and a decision on the thermal, flexible electricity production units

A large number of studies and development plans in the industry are based on the Danish Energy Agency's Analysis Assumptions for Energinet. Several electricity producers have indicated to the Danish District Heating Association that the projection of electricity capacity in the assumptions is too optimistic under the current framework for the electricity market.

The focus and limitations of the analysis

- Projection of the Danish thermal electricity capacity towards 2040.
- Under known regulatory framework conditions, known political initiatives and development plans for the rest of the energy system.
- The analysis is not an assessment of the future level of security of electricity supply.

Main conclusions



Thermal electricity capacity risks phase-out sooner than expected

There is a very limited tendency to invest in new thermal plants, while several plants are being phased out in line with the lifetime of the plants and the expiration of their heating contracts. Waste incineration and a smaller proportion of biomass plants continue operation, but primarily for heat production with CO2 capture, which contributes to the reduction of electricity capacity.



A large part of the remaining thermal plants have few operating hours

A large proportion of the remaining thermal electricity capacity will – especially after 2030 – have very few operating hours and, under the current market framework, is at great risk of closing.



An electricity system with low diversity comes with a risk

A Danish electricity system primarily based on solar and wind – and European electricity systems that follow the same development – in combination with society's dependence on electricity further enhances the importance of a stable electricity supply and a high level of security of electricity supply. A reduction of the thermal electricity capacity can worsen the capacity adequacy and the security of electricity supply.

Recommendations of the Danish District Heating Association

Political decision on the need for flexible electricity production capacity in the Danish system

Flexible electricity production is essential for a high security of electricity supply and the Danish District Heating Association therefore calls for a political stance on the need for and the extent of flexible electricity production capacity in Denmark.

Launch initiatives that support the electricity market being able to maintain flexible electricity production units

Flexible electricity production contributes to the security of electricity supply when the sun and the wind are not available. Security of electricity supply is the backbone of the desired electrification of society and therefore has great socio-economic value. Even so, there are flexible thermal power plants that close or are considering closing down because there is no positive project economy in owning and operating them. In a future electricity market model, the value of these units being available and able to deliver the necessary electricity production must be monetised properly.

National objectives for the work with a new European electricity market model

The EU Commission is on its way with a proposal for a new electricity market model, which could have a major impact on the Danish energy system of the future. The Danish District Heating Association therefore proposes that Denmark prepares and presents objectives for how a new electricity market model can support the energy system of the future. In addition to supporting green transition, high security of electricity supply, diversity in the production mix and independence of Russian gas, transparent objectives should be established through the involvement of relevant industries and stakeholders for how a new European electricity market model can create value for Denmark.

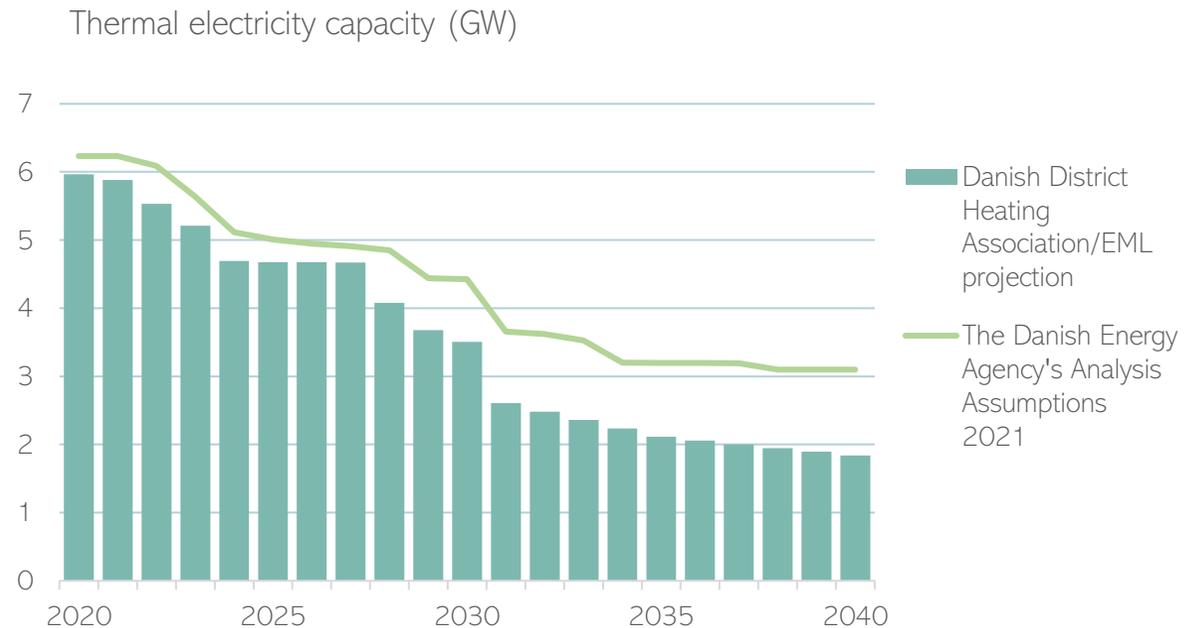
The thermal electricity capacity is reduced faster than expected

There are several reasons why the plants are closing down

Solar and wind take over large parts of the electricity production, which leads to a decrease in electricity production at thermal plants, which is why a large part of the plant capacity will be phased out over the next few years. The plants close when their technical lifetime ends or their heating contracts expire, as there is no economy in extending their lifetime or investing in either new fossil or biomass-fired CHP plants. Coal and natural gas in electricity production will already be phased out in the mid-2020s, as a result of the closure of the existing CHP plants and rising fuel- and CO₂-prices.

Some plants are switching to heat production to a greater extent

Waste incineration plants and partly biomass plants are transitioning to a greater extent to heat production and a reduced electricity capacity, which results from more variable electricity prices and the installation of CO₂ capture.



A large part of the remaining thermal plants have few operation hours

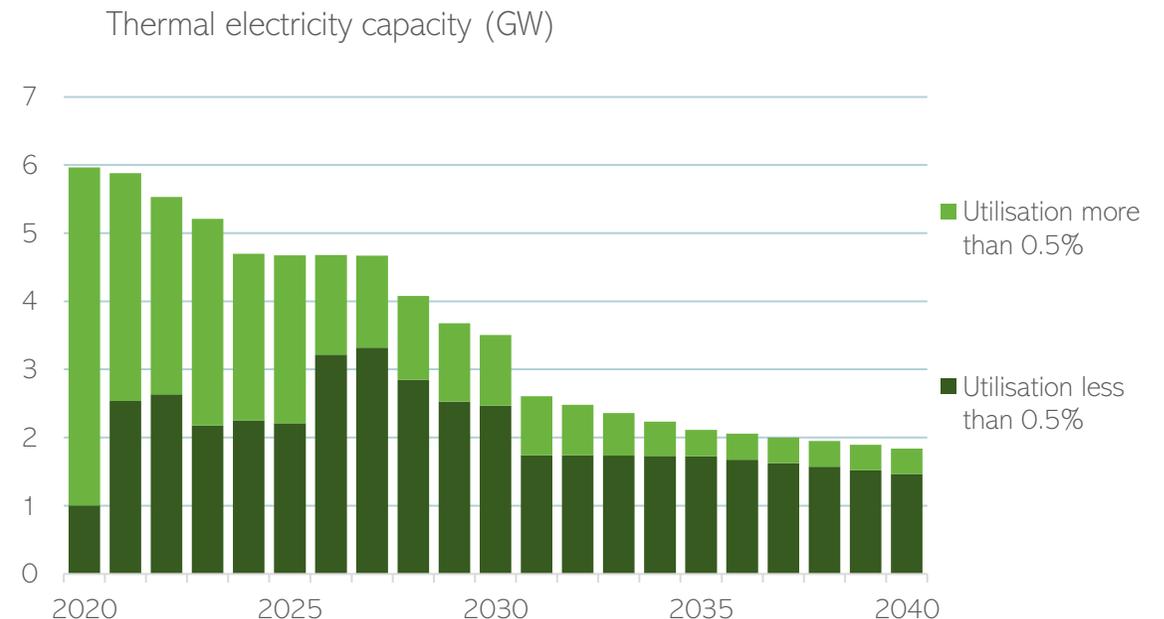
The number of full load hours on thermal plants is reduced over time

There is great uncertainty about the amount of ready-to-operate capacity at thermal plants in the future, as a result of more volatile electricity prices and their corresponding project economy. The figure shows an overview of the proportion of thermal plants that have a utilization rate of less than 0.5 % and thus less than 50 full load hours per year. With large development plans for electricity interconnectors abroad that exceed the Danish classic electricity consumption, it is assessed that there is an additional risk that plants with less than 50 full load hours per year will be replaced by down-regulating, flexible electricity consumption (boilers and heat pumps) and exchange of electricity on the interconnectors.

The model assesses when a plant will close based on a financial calculation. It only closes plants if the costs of leaving them operating exceed the potential income and the price of decommissioning the plant, and since the model works with discounted values, it often leaves plants standing, even if the activity at the plants is very limited. This will probably not be the case, which is why it must be assumed that a large part of these plants will be closed.

The plants are necessary to cover the energy demand

It is worth noting that even though the plants have a low utilization rate, they are necessary for the model to cover the energy needs in the most extreme hours. Actors will probably not take this into account if the project economics for operation and ownership of the plant over a certain period of time are negative. The reduction in the degree of utilization of the electricity capacity is largely due to the rising gas and CO2 prices, which drastically reduces the utilization of the less efficient electricity producing plants with natural gas a fuel.





DANISH DISTRICT HEATING ASSOCIATION