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THE FUTURE OF POWER - MARKET OUTLOOK 2050



NORDICS + NORTHERN EUROPE
SPRING 2024

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The Nordics: Balancing Growth and Electrification

A renewables surge has created an electricity surplus, which along with local opposition is slowing new investments. To drive long-term renewable growth, demand must rise. Electrification, data centers, and green hydrogen production will be key. Balancing renewable growth with increasing demand and addressing local concerns will determine the development of the Nordic power market. The recognition that offshore wind power is completely dependent on subsidies creates increased uncertainty about investment volumes and power prices in the long term.

Current Consumption

Approximately 390 TWh of annual electricity consumption, with 60% used by households and services. Temperature changes heavily influence this sector due to heating needs. Industrial consumption remains relatively stable across the year.

The Rise of Smart Consumption

Consumers are becoming more flexible, responding to price signals to adjust their energy use. This is already visible in practices like smart heat pump control and EV charging. The widespread rollout of smart meters in Norway and Sweden has further supported this trend, allowing most consumers to choose spot-price based electricity contracts.

The Dual Path to Decarbonization

Direct Electrification: Wherever possible, sectors will transition directly to using electricity as their primary energy source.

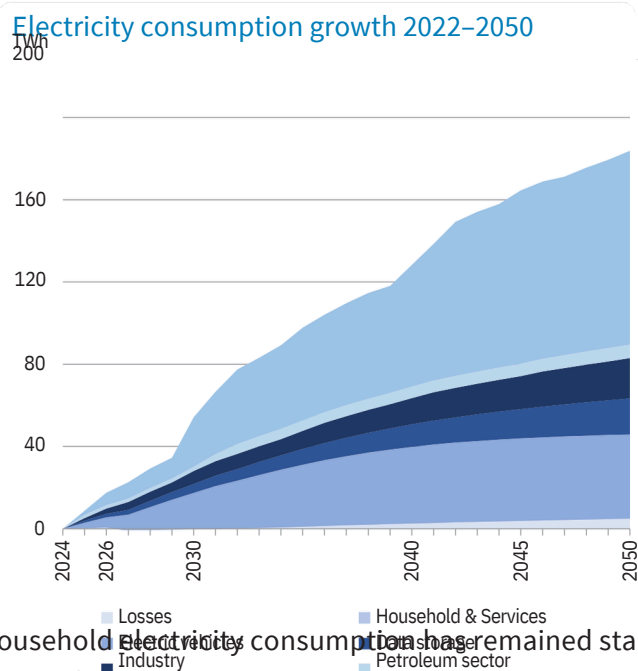
Indirect Electrification: In sectors where direct electrification is challenging (like shipping or some industrial processes), green hydrogen will play a vital role.

Household & Service Sector Trends

Population Growth: The Nordic population has grown by 7.3% over the past decade, with notable increases in Sweden (11.2% more households) and Norway (14.4% increase in households).

Efficiency Gains: Despite more people and devices, household electricity consumption has remained stable thanks to efficiency improvements driven by regulations and incentives.

Denmark's Transition: Many Danish households are switching away from gas and oil heating, primarily towards heat pumps or district heating. This shift is expected to save approximately 0.7 TWh by 2035.



German Power

While the 15 GW of solar capacity added in 2023 is a significant step forward, Germany must accelerate investments across all renewable energy sources to reach its 2030 goals. Progress with wind power and other technologies lags behind. Given the current pace, it seems highly unlikely that Germany will achieve its ambitious emissions reductions and renewable energy targets by 2030.

The path to a climate-neutral society by 2050 hinges on a transformative power sector. The journey begins with an ambitious target: a 65% reduction in emissions by 2030 compared to 1990 levels. This needs to be followed by an even steeper decline, reaching 88% by 2040. The following decade will see a crucial focus on the widespread adoption of climate-neutral technologies. Finally, by 2050 and beyond, any remaining emissions will be balanced through technologies like carbon capture and storage (CCS) and initiatives like tree planting that offset carbon emissions.

Power consumption

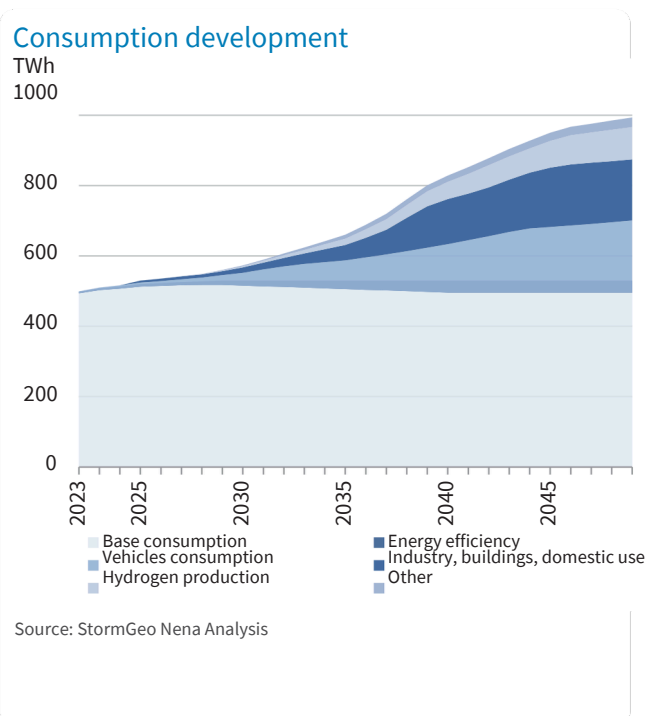
German electricity consumption witnessed a significant decline in 2023, dropping by 6% to nearly 500 TWh. This represents the lowest level observed in several decades. Several key factors contributed to this development: the slow recovery from the pandemic, the economic impact of the war, mild winter, and a growing focus on energy efficiency. Looking ahead, it's unlikely that base consumption will return to its previous highs. However, with the increasing electrification of society – a crucial step towards achieving carbon neutrality goals – overall power demand is expected to gradually rise. As previously projected, we anticipate German power consumption to nearly double by 2050. This highlights the significant role electrical power will play in the future energy mix, with its share steadily increasing.

Base consumption

The Energy Efficiency Act sets an ambitious target of reducing annual energy consumption by roughly 500 terawatt hours (TWh), approximately a quarter of 2021 levels, by 2030. To achieve this, the act imposes several efficiency obligations. The federal government will be responsible for a substantial reduction of at least 45 TWh per year from 2024, while states must cut consumption by at least 3 TWh. Additionally, companies with high energy usage will be required to adopt energy management systems. Data centers, for instance, must make use of waste heat to improve their energy efficiency.

Automobile decarbonization

Germany saw a moderate increase in electric vehicle (EV) registrations in 2023, reaching 1.41 million with a year-on-year growth of 400,000. Even though we expect annual additions to speed up dramatically, we consider the government's ambitious goal of 15 million EVs on the road by 2030 too unrealistic. It would require an average annual sales increase of about 2 million vehicles. The government is consid-



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StormGeo The Future of Power - Market Outlook 2050.
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