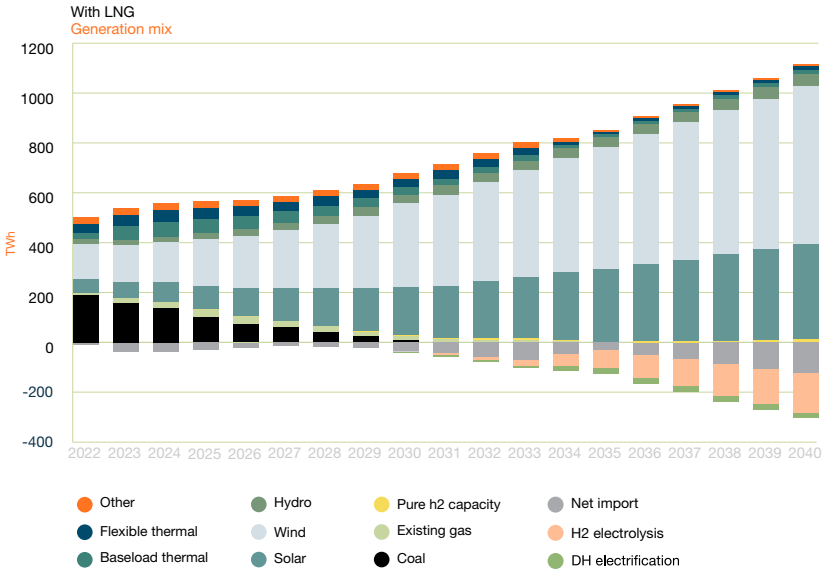
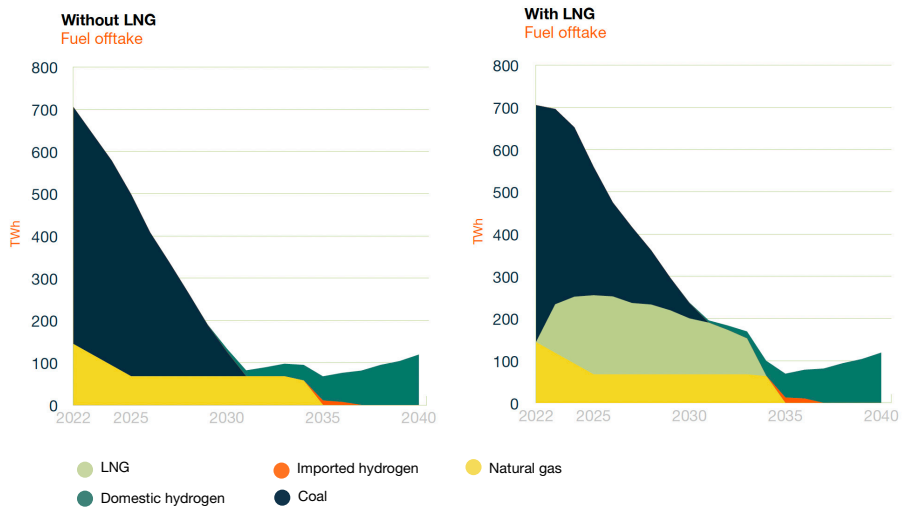
1. Germany should switch to LNG and rapidly increase renewables to phase out Russian gas.



10%

By 2035, Germany will require 780 TWh of renewable energy to operate a net zero electricity system, up from 195 TWh today. This will require at least 45 TWh new renewable energy each year, a 10% year-on-year increase.

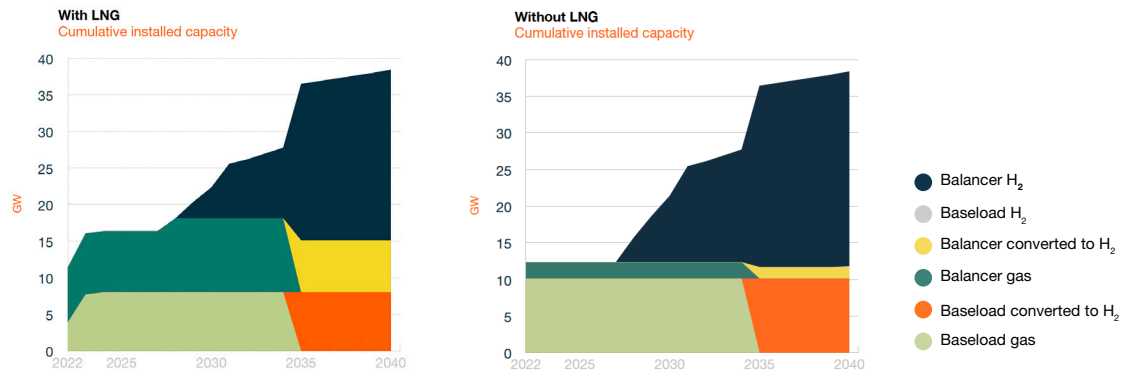
2. Introducing LNG allows coal to be phased out faster and the high share of renewable energy enables domestic production of hydrogen.



20%

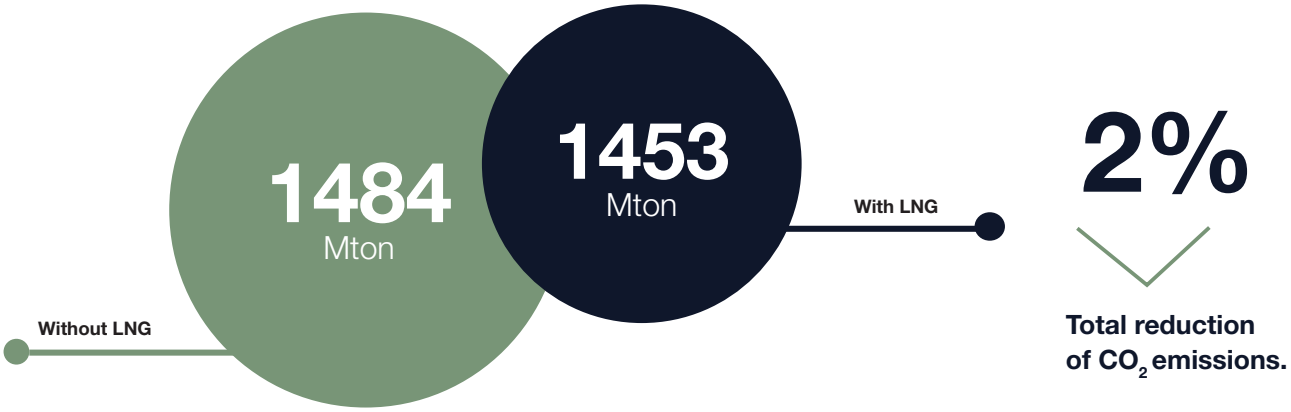
Coal use can be cut by 20% by introducing LNG now. Hydrogen also starts to appear in 2028, with high renewable capacity supporting a shift to sustainable fuels.

3. The German power system requires flexibility to support renewables. Without LNG, only 2 GW of flexibility is possible, compared to over 10 GW with LNG, potentially harming renewable build-out.



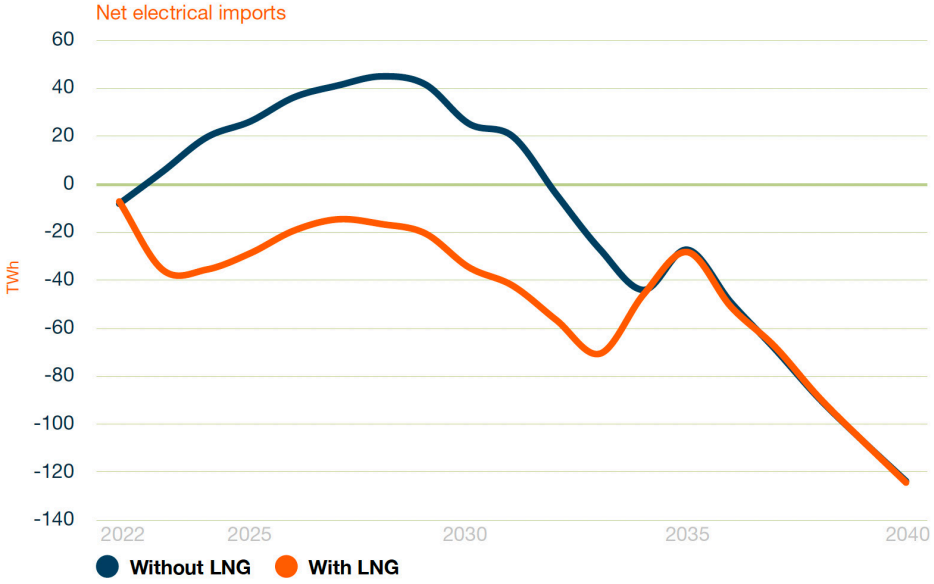
4. LNG path leads to lower emissions and avoids the risk of stranded assets.

Total CO_2 emissions 2022-2045



The total of the non-LNG scenario is 600 bn EUR and 619 bn EUR for the LNG scenario between now and 2045. The comparative carbon savings over that period are significant, with Germany saving 30 Mton CO_2, a total emissions reduction of 2%.

5. Without LNG, Germany will have to import energy for the next 10 years, increasing its reliance on neighbouring countries.



With LNG in the mix, Germany would be able to export a net of 457 TWh of electricity between now and 2035, compared to the alternative scenario without LNG, in which Germany imports a net 150 TWh in the same period.

With imported LNG, Germany has higher security of supply compared to relying on electricity imports. Firm flexible capacity can hedge against extremely high electricity prices, especially during cold winter months when electricity demand is high all across Europe.

METHODOLOGY

The modelling is based on techno-economic optimisation of Germany's power system. The modelling compares two different scenarios where Russian gas is phased out: one where LNG is added to the capacity mix, and one where coal is prolonged to meet capacity.

The detailed PLEXOS optimisation modelling uses a chronological approach, i.e., the variability and seasonality of renewable generation and load need to be balanced hour-by-hour in the model. Thus, the modelling accurately dimensions the required flexibility and storage capacity in the studied power system.

To cost optimally meet the future demand and political targets, the modelling adds required technologies to the system. The available options include different renewable sources, such as wind, solar PV and geothermal, thermal technologies from gas engines and turbine power plants - to nuclear power, storage technologies, such as battery and pump storage, and technologies to produce sustainable fuels.

ABOUT WÄRTSILÄ

Wärtsilä Energy leads the transition towards a 100% renewable energy future. We help our customers to decarbonise by developing market-leading technologies. These cover future-fuel enabled balancing power plants, hybrid solutions, and energy storage and optimisation technology, including the GEMS energy management platform. Wärtsilä Energy's lifecycle services are designed to increase efficiency, promote reliability and guarantee operational performance. Our portfolio comprises 76GW of power plant capacity and more than 110 energy storage systems delivered to 180 countries around the world.

Wärtsilä has developed this report to use our energy modelling expertise to present a clear pathway for Europe to maximise its use of renewable energy and cut costs for consumers. We believe data-based policy decisions are essential for creating a future energy system that is secure, sustainable, and low cost.

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