

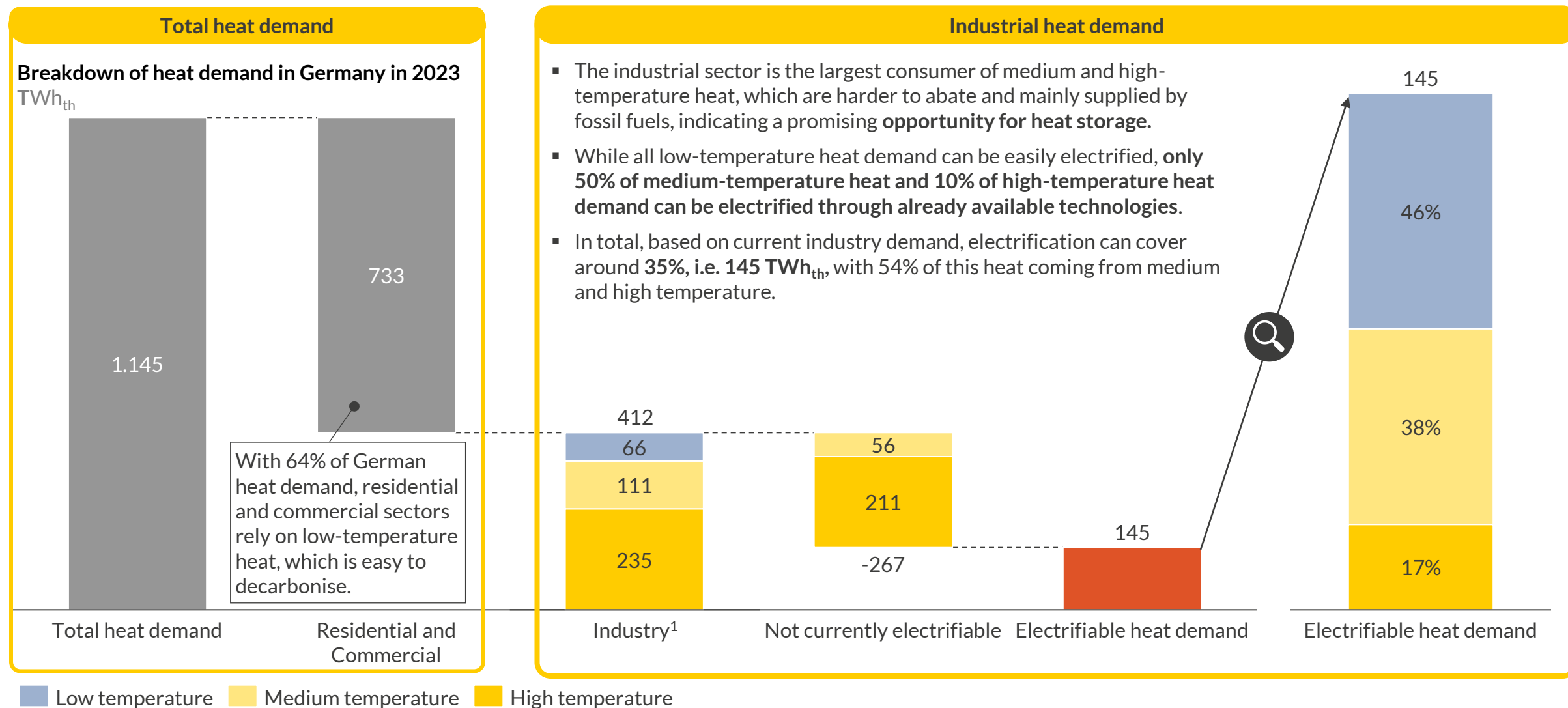
Hold the Heat: Exploring Germany's Thermal Storage Potential

get inspired! 2025, 10th September 2025

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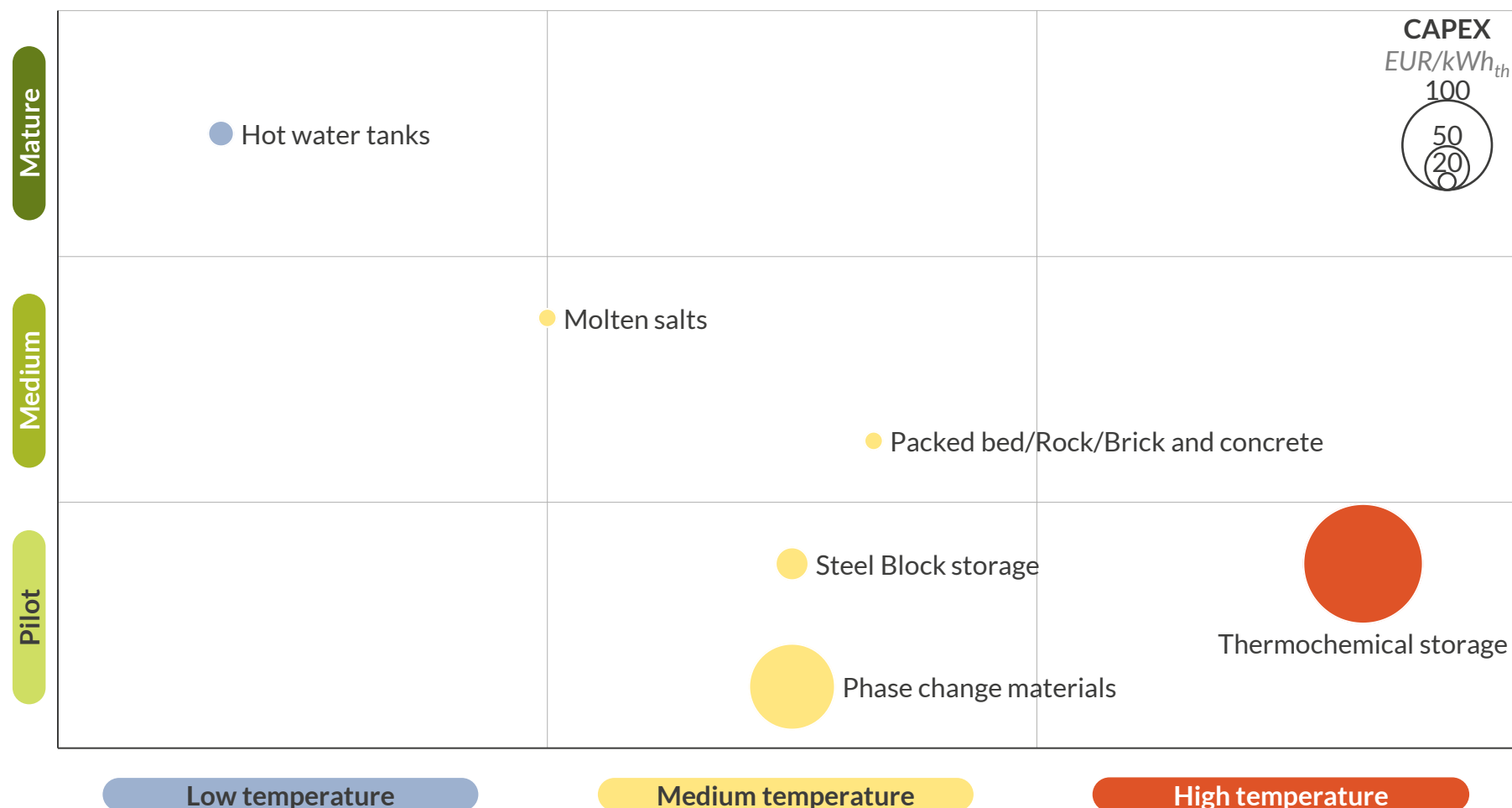
Industrial heat consumption, representing a third of German demand, is dominated by fossil fuels, presenting an opportunity for heat



1) Temperature breakdown estimated based on Fraunhofer study Langfristszenarien 3, 2019.

Heat storage technologies are diverse, with each covering a specific range of temperature; High temperature requires higher CAPEX

Selected heat storage technologies & use cases

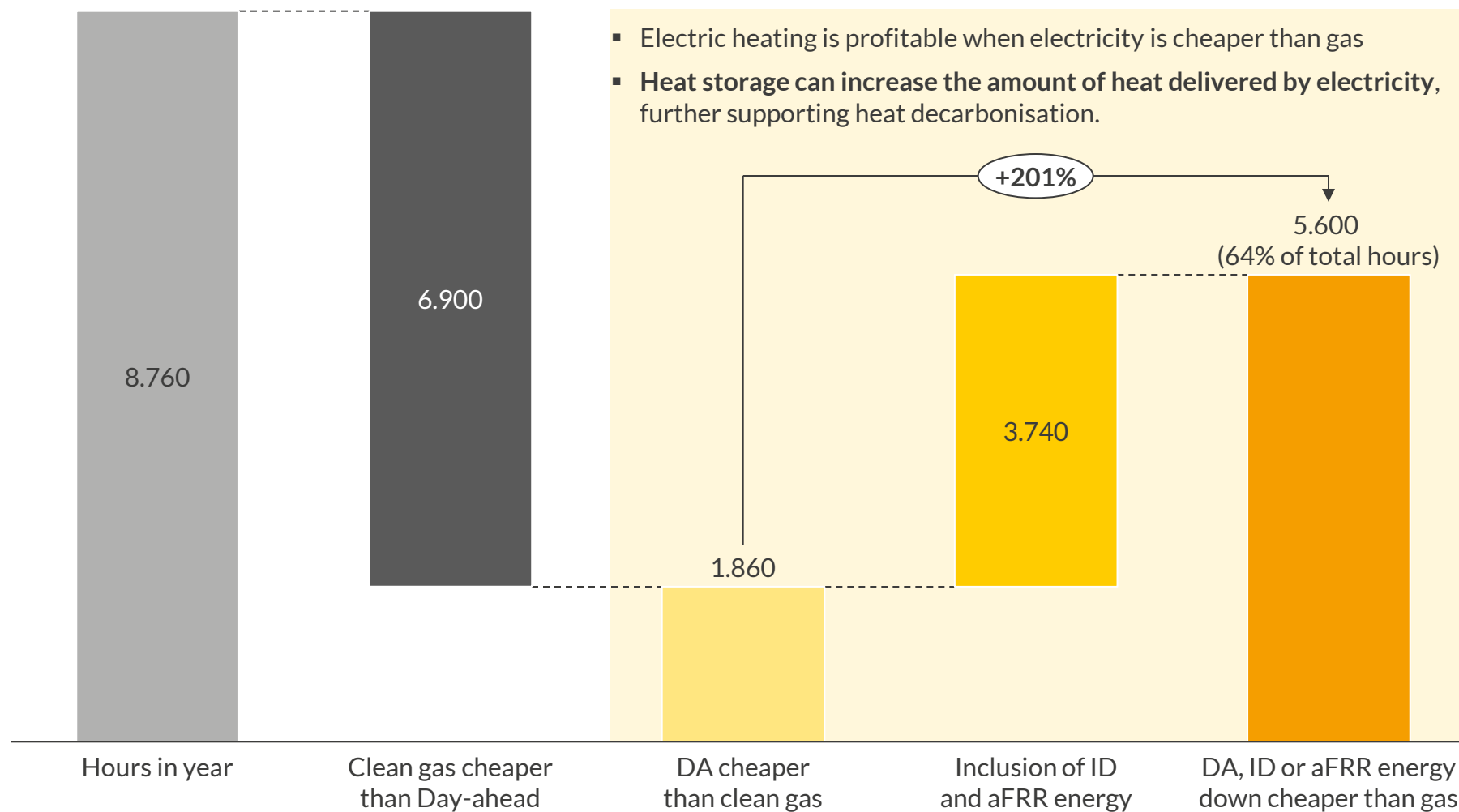


- Established heat storage technologies such as hot water tanks are already widely utilized in the residential sector to produce low-temperature heat.
- Other storage technologies such as molten salts, rock bed storage or thermochemical storage provide low-carbon solution for medium- and high-temperature process heat, crucially needed for decarbonizing the industry sector.
- Though such technologies have not yet become fully commercial, their flexibility could contribute to a robust energy system.

For 2025, electricity is projected to be cheaper than clean gas during 64% of hours, when using DA, ID and aFRR energy down

Comparison of profitable hours for heat production between clean gas¹ and electricity in 2025

Number of hours



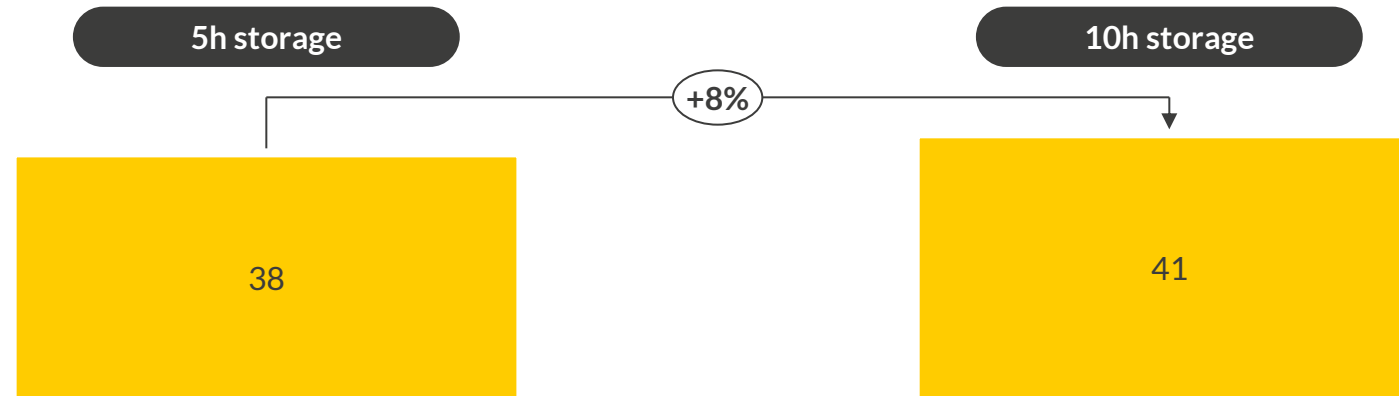
- Assuming the electrification potential of the industry sector of 145 TWh_{th} (2023) stays constant and considering the market conditions (electricity v. gas prices + ETS), we would expect around **73 TWh_{th}** of heat covered by electricity sources.
- This is only possible when optimizing the electricity feed-in from DA, ID and aFRR energy.
- When charging only from from the Day-ahead, electricity is cheaper only in 21% of hours.

1) The price of clean gas is defined as the sum of natural gas price and the ETS price for the carbon content of gas

Heat storage is profitable when optimising across various markets and utilising discounts offered under § 19 Abs. 2 StromNEV

Share of heat from electricity with different storage attachments – different configurations

%



Necessary reduction in fixed grid fees to reach an IRR of 10%

%



The § 19 Abs. 2 StromNEV grants up to 80% discount in the fixed grid fee portion for consumers who avoid peak hours. In this case, a reduction of only 44% in grid fees would result in an IRR of 10% for the 10-hours storage duration.

- The heat output provided by electricity is less than the number of hours during which electricity is cheaper than gas, due to grid fees and taxes applied to electricity.
- Here, we account for variable grid fees of 5.8 €/MWh in addition to 1.89 €/MWh in taxes and levies on electricity, assuming the highest available exemptions. Fixed grid fees amount to 88.9 €/kW per year.
- Regarding gas, no extra grid fees are considered, based on the assumption of full exemption.

1) Business cases assessed based on the following assumptions: COD: 2027, discharging capacity: 5MW_{th}, 0% degradation rate, 20 years of lifetime, 100% availability, charge : discharge proportion – 2:1.

Heat storage, together with a flexible electricity charging strategy, can help decarbonise the industrial sector without breaking the bank on energy costs

- 1 The industrial sector accounts for one-third of Germany's heat demand, predominantly met by fossil fuels. In 2023 alone, the amount of heat that can be electrified was approximately 145 TWh_{th}.
- 2 Implementing heat storage increases the volume of heat supplied via electricity, thereby improving the potential for decarbonisation within the industrial sector.
- 3 However, technologies capable of storing medium and high-temperature heat are still in early development stages and involve relatively high capital expenditure.
- 4 The business case of heat storage is most competitive to gas when fully leveraging its flexibility—i) sourcing electricity across all available markets (DA, ID, aFRR) and ii) optimising grid fees by avoiding peak load hours.

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