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German Renewables Week

Virtual 2021

Industrial decarbonisation: The role of green power procurement and hydrogen

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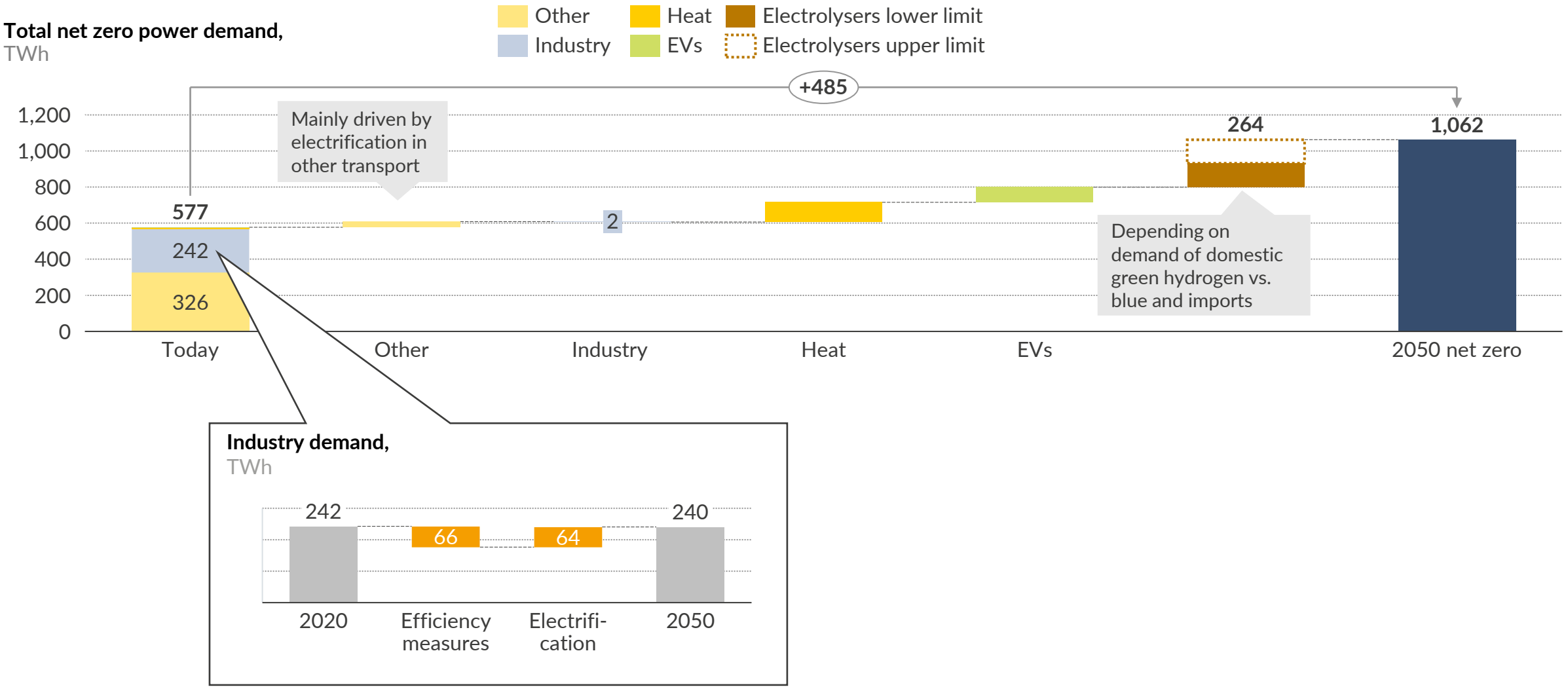
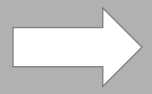
Osborne Clarke | uniper | FORESIGHT Climate & Energy | TAGESSPIEGEL ENERGIE & KLIMA BACKGROUND

Around 40% of net zero power demand today comes from industry



Source: Aurora Energy Research

Green power procurement and hydrogen are key pillars of decarbonisation efforts

	Effects on power demand	Accessibility / Ease of implementation	Time frame for effective implementation	Impact on decarbonisation
Energy efficiency		★★★★☆	Mid term	High
Green power procurement		★★★☆☆	Mid to long term	High
Hydrogen		★★☆☆☆	Long term	Case specific applicability
Electrification		★★☆☆☆	Long term	Case specific applicability
Carbon offsetting		★★★★☆	Short term	Small - None

Sources: Aurora Energy Research

PPAs have low market maturity in Germany

Possible options	Guarantees of Origin (GoOs)	Power purchasing agreements (PPAs)	Own assets
Market maturity	★★½☆☆	★★☆☆☆	★★★★☆
Capital requirements	★☆☆☆☆	★★½☆☆	★★★★☆
Price hedge	unfavourable	neutral	favourable
Capability building	★☆☆☆☆	★★½☆☆	★★★★☆
Additionality			

Sources: Aurora Energy Research

Most existing PPAs in Germany are from solar PV

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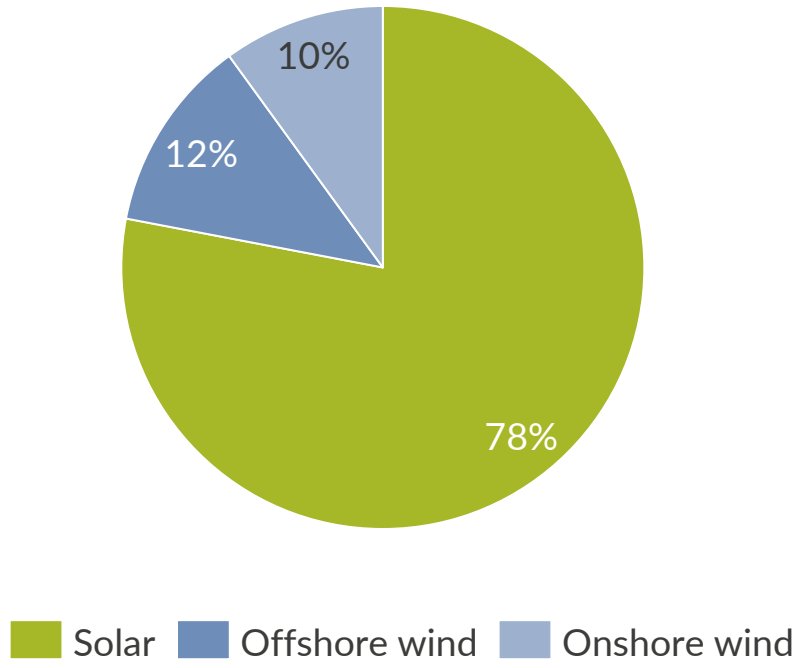
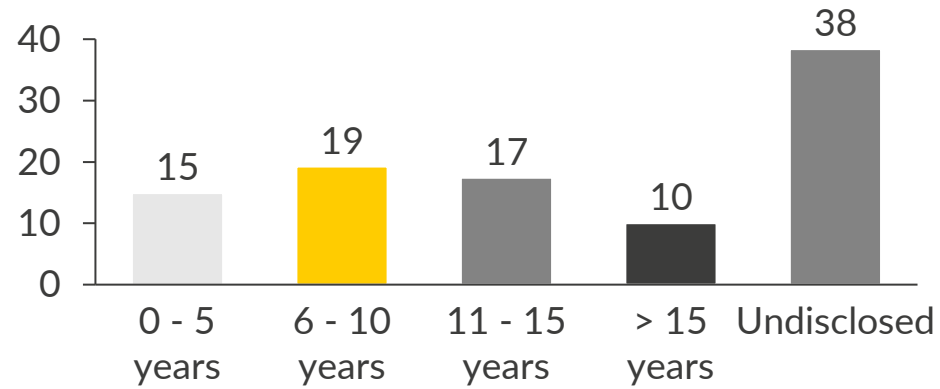
Technology Share PPAs in Germany
% of installed capacity



Tenor
%, in years



Price clauses in Germany

Price clause	Occurrence today
Fixed price	High
Indexed	Low
Collared	Low - Medium

Sources: Aurora Energy Research

Strong industrial demand and corporates seeking green image suggest a strong demand for PPAs in Germany

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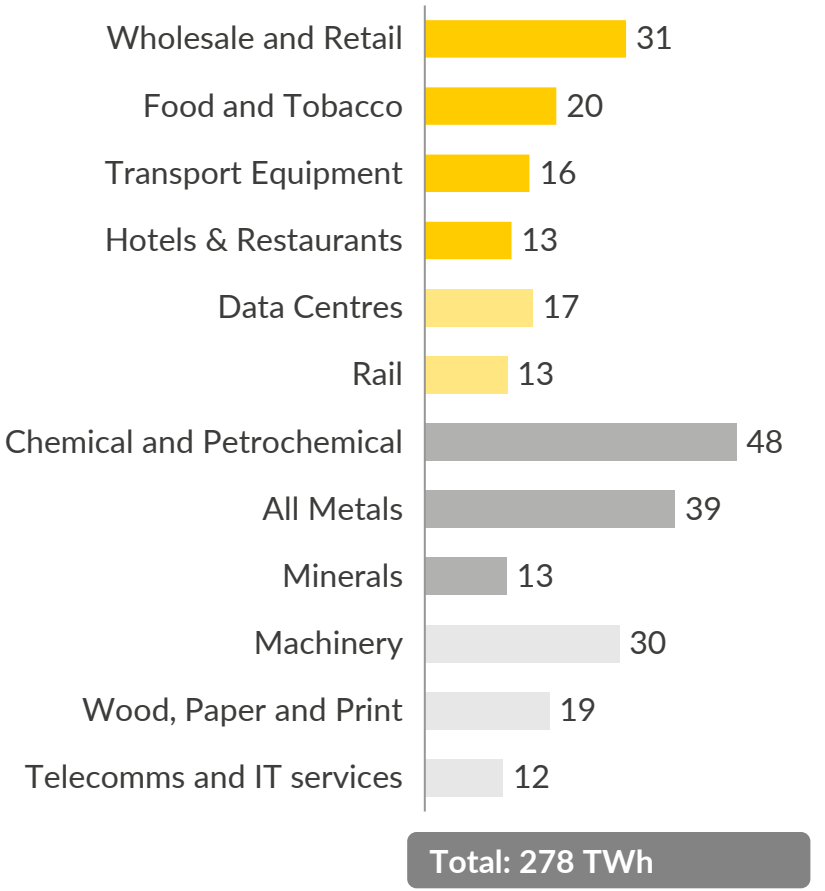
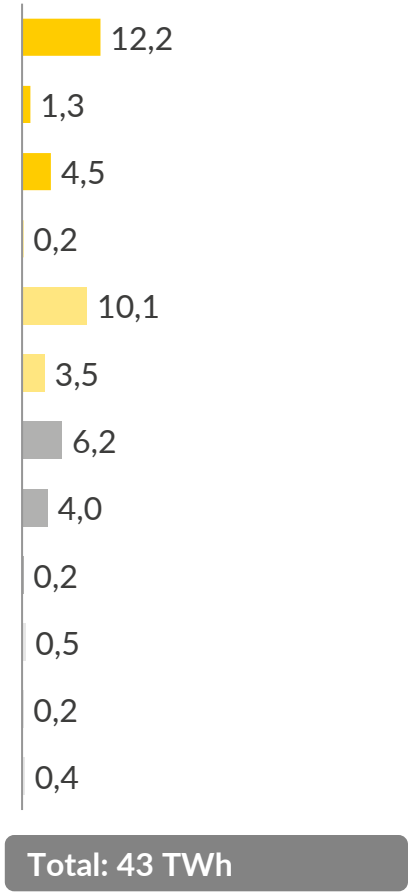
Net electricity demand (2030 estimate)[1]
TWh



Potential Market Size
2030, TWh



Corporate PPA demand segmentation
%, TWh

End consumer proximity	Energy intensity: High	Energy intensity: Low
High	Green Image Seekers (42%)	Green Giants (32%)
Low	Intermediates (24%)	Price Hedgers (2%)

Green Image Seekers | Green Giants | Price Hedgers | Intermediates

1) Excluding minor service and industry that could not be categorised in these segments

Source: Aurora Energy Research

Hydrogen is a promising emissions reduction pathway for the hard-to-abate industry sectors

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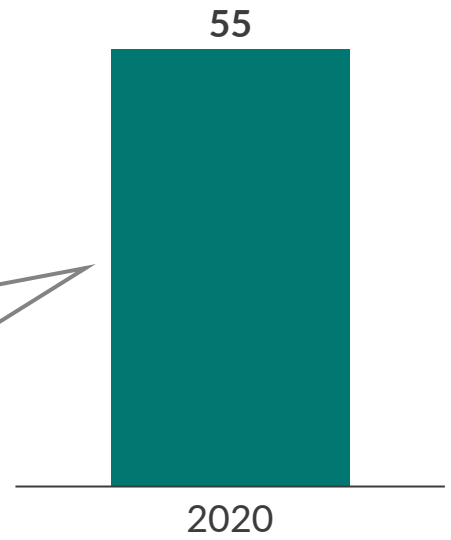
Potential of H_2 as a feedstock

Sectors	H_2-based processes
High-heat industry	
Steel	Direct Reduced Iron (DRI) for primary steel production
Chemicals	
High-Value Chemicals	▪ Methanol-to-olefin (MTO) / -aromatics (MTA) process with use of methanol from H_2 ▪ Chemical recycling (pyrolysis, gasification)
Ammonia	Hydrogen based steam reforming
Methanol	
Petrochemicals	Hydrocracking, hydrotreating, desulphurisation

Industrial hydrogen demand today,

TWh



Sources: Aurora Energy Research

By 2050, up to 80 TWh of hydrogen will be required annually for industrial processes

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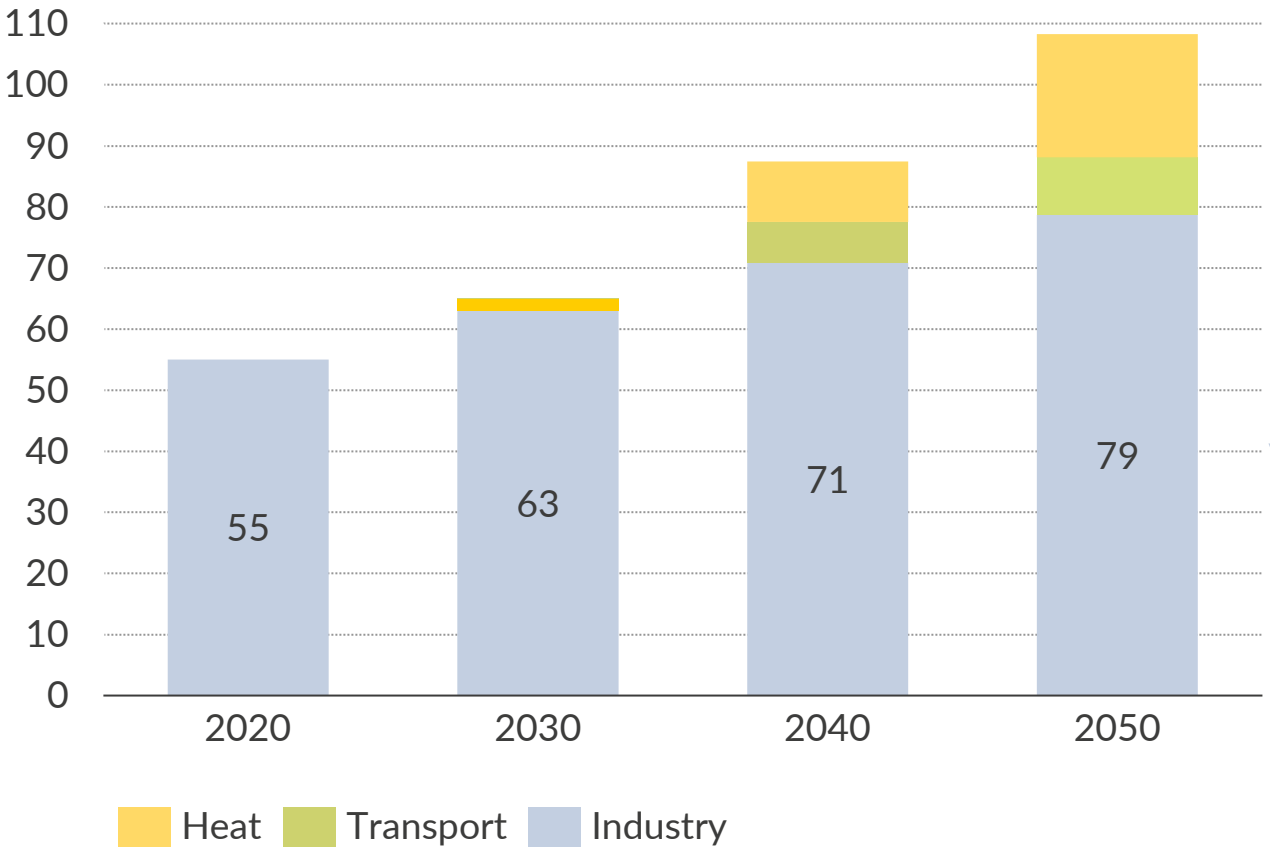
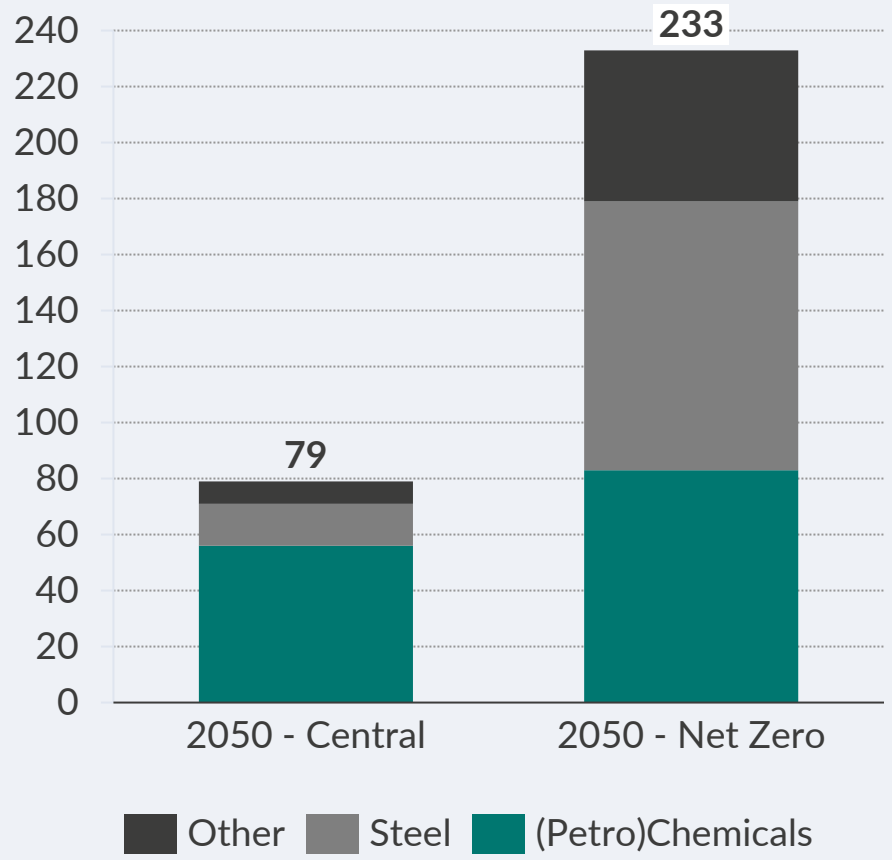
Total annual hydrogen demand by sector,
TWh



Hydrogen demand for industry by process,
TWh



Source: Aurora Energy Research

H_2 demand in 2050 will mostly be met by Steam Methane Reforming + CCS and electrolysis

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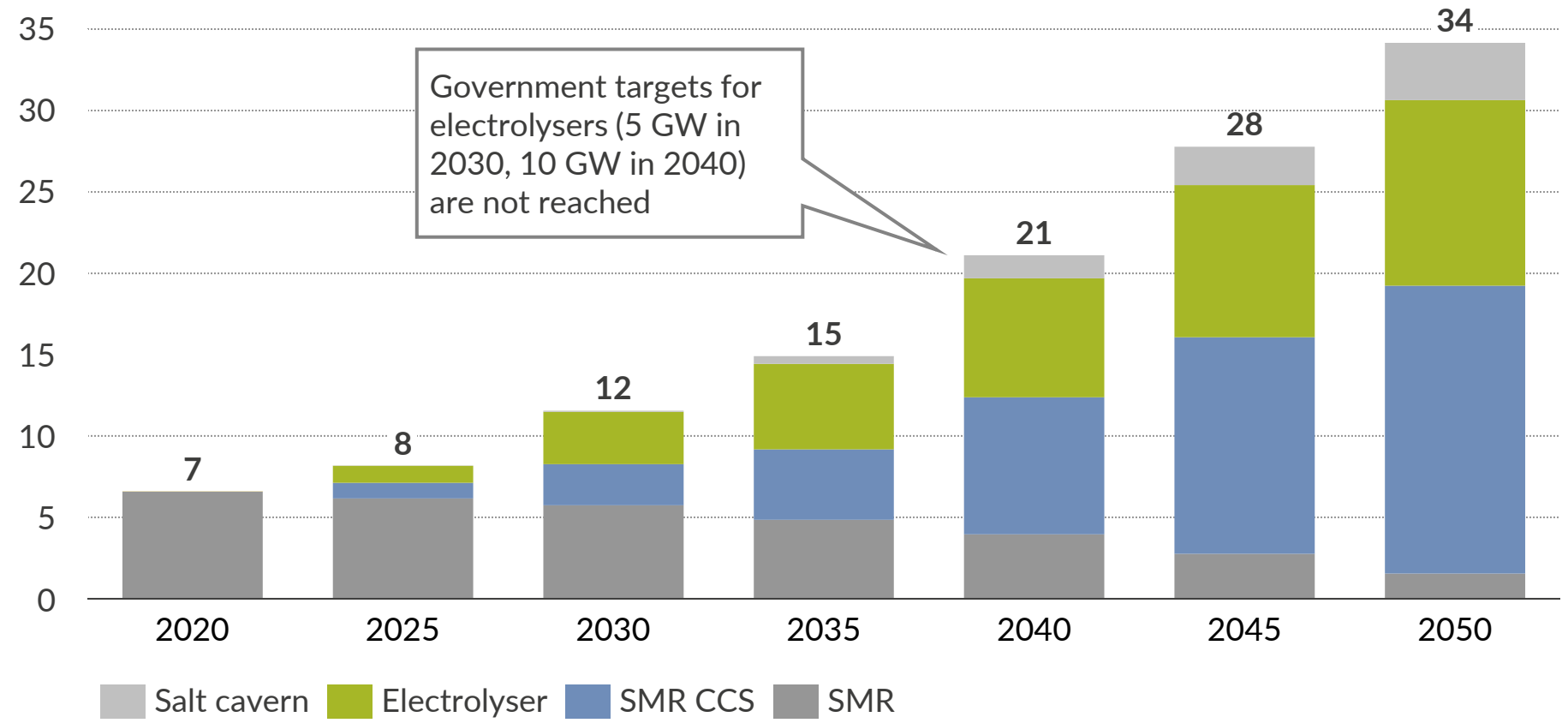
Hydrogen supply capacity,
GW



Source: Aurora Energy Research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