EMBER

Europe’s path to prosperity

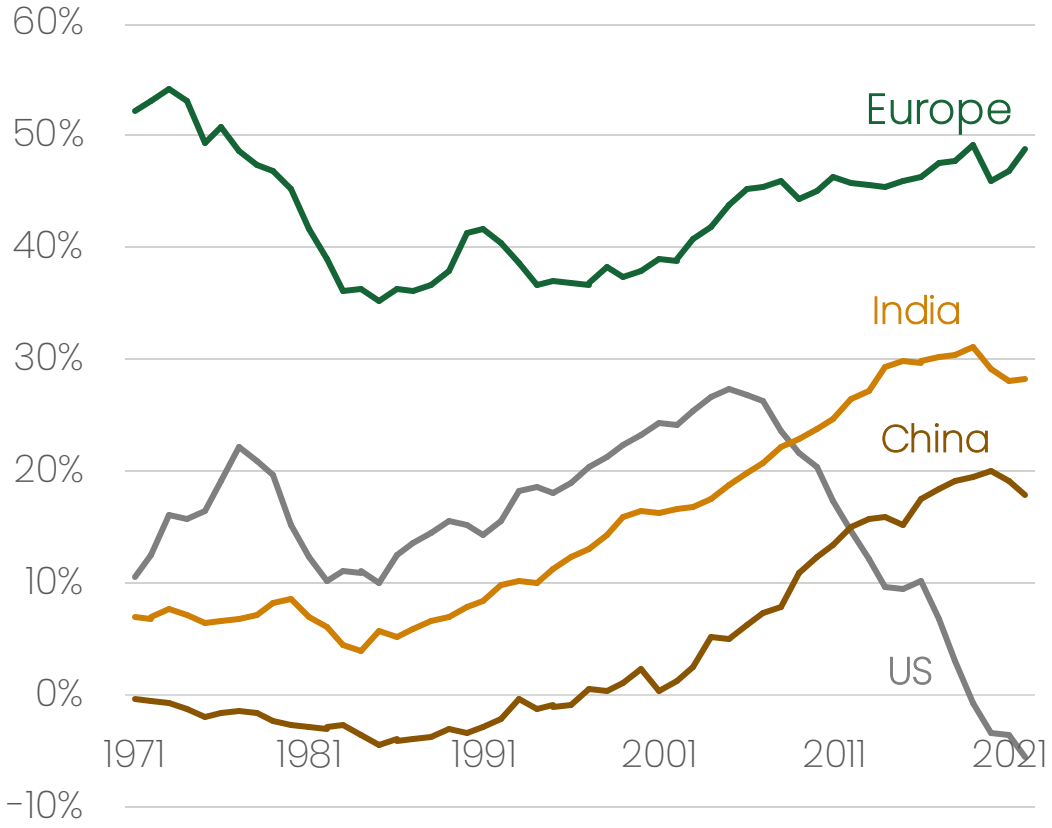
Presentation to Watt’s Next EU

Kingsmill Bond, CFA

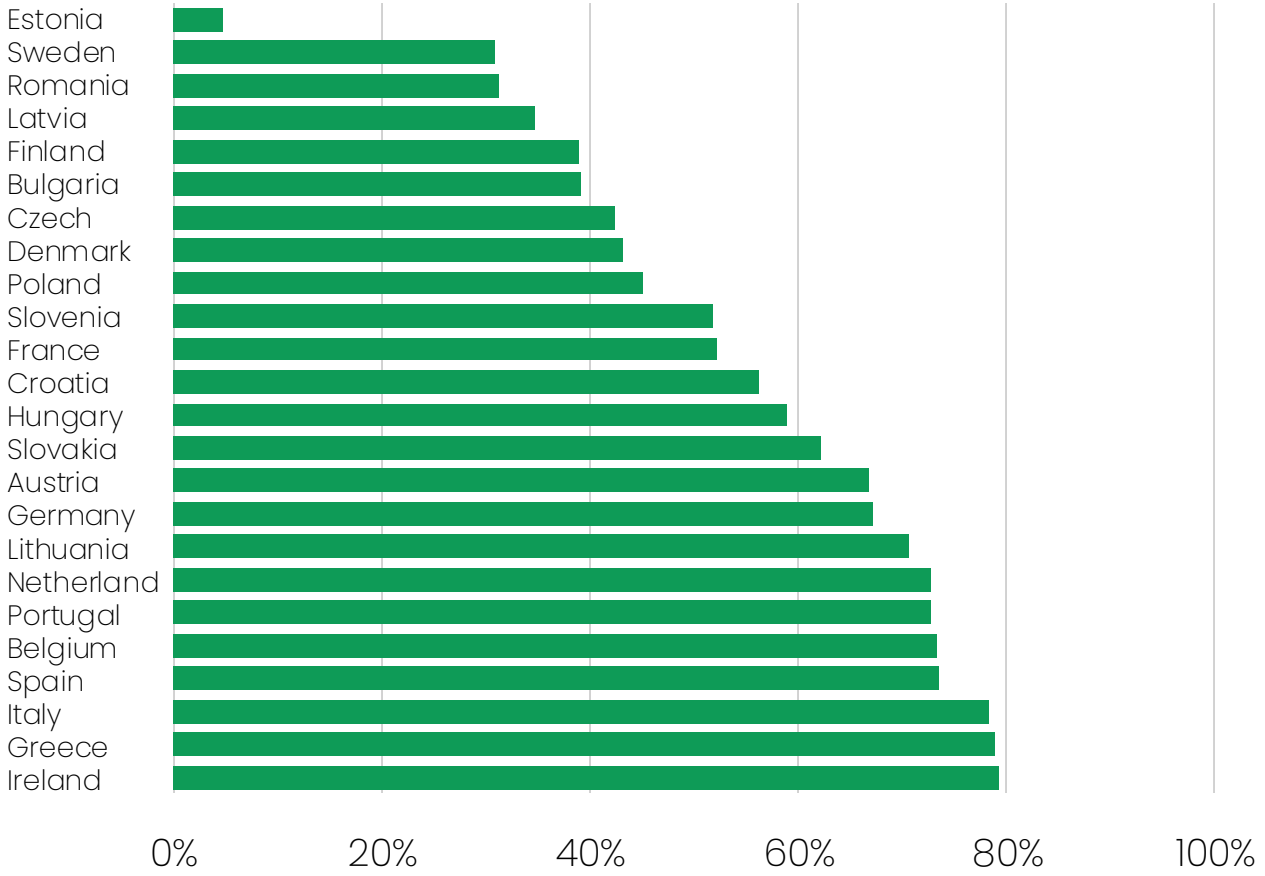
December, 2025

Europe has high dependency on fossil fuel imports

Net fossil fuel imports as share of primary energy demand



Net fossil fuel imports as share of demand 2022



Source: IEA WEB, Ember calculations for Greater Europe (I)

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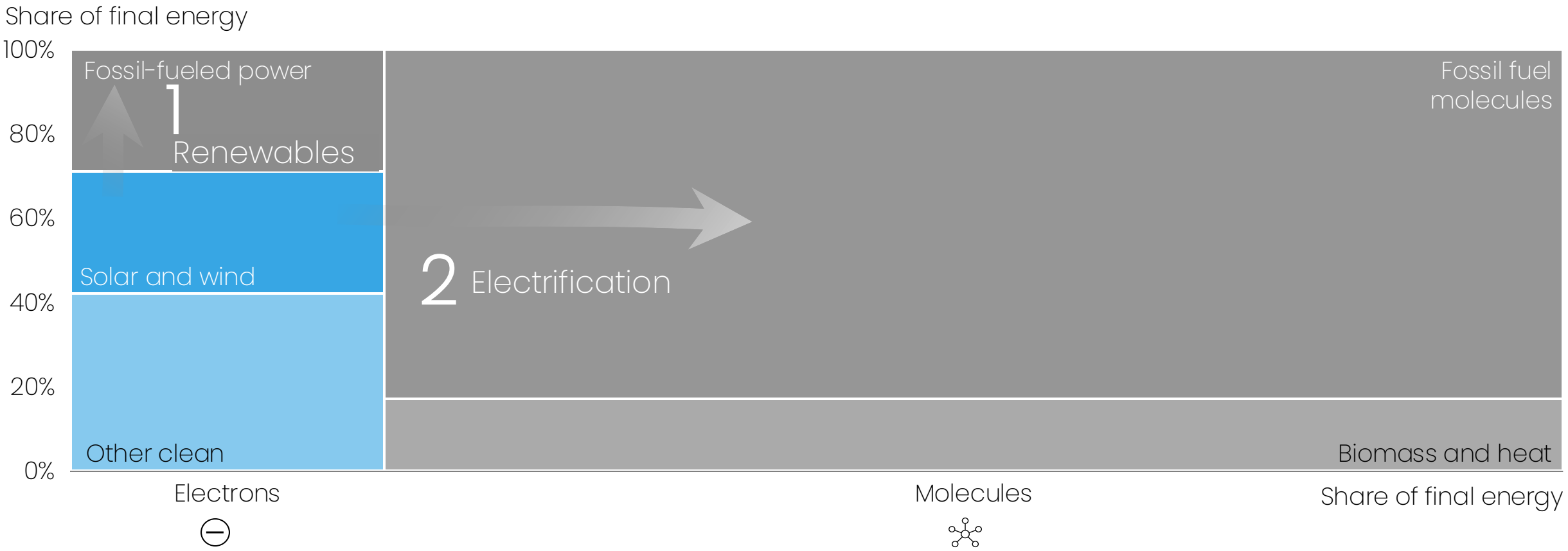
There are two main ways to reduce fossil demand

Renewables replace fossil electricity; electrification replaces fossil molecules

EU final energy demand in 2024



Sources: IEA WEO 2025; Ember analysis. Other clean electrons are mainly nuclear and hydro.

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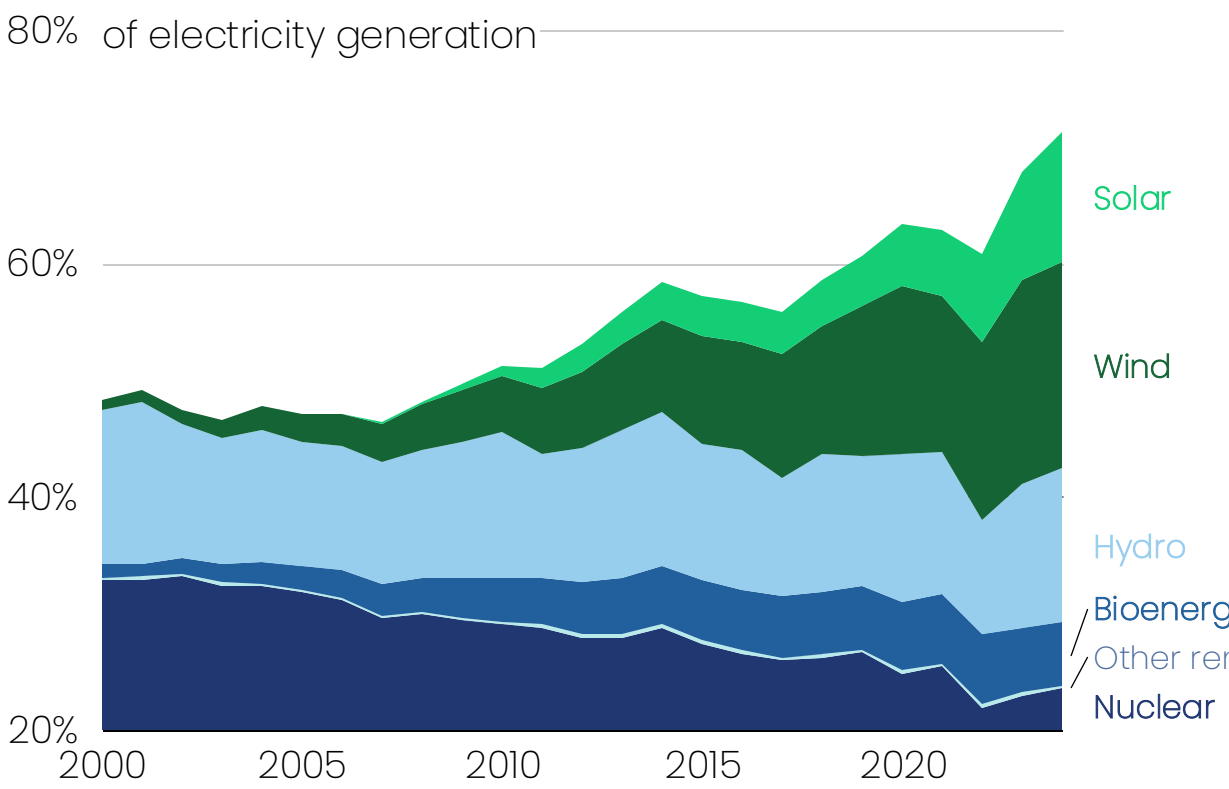
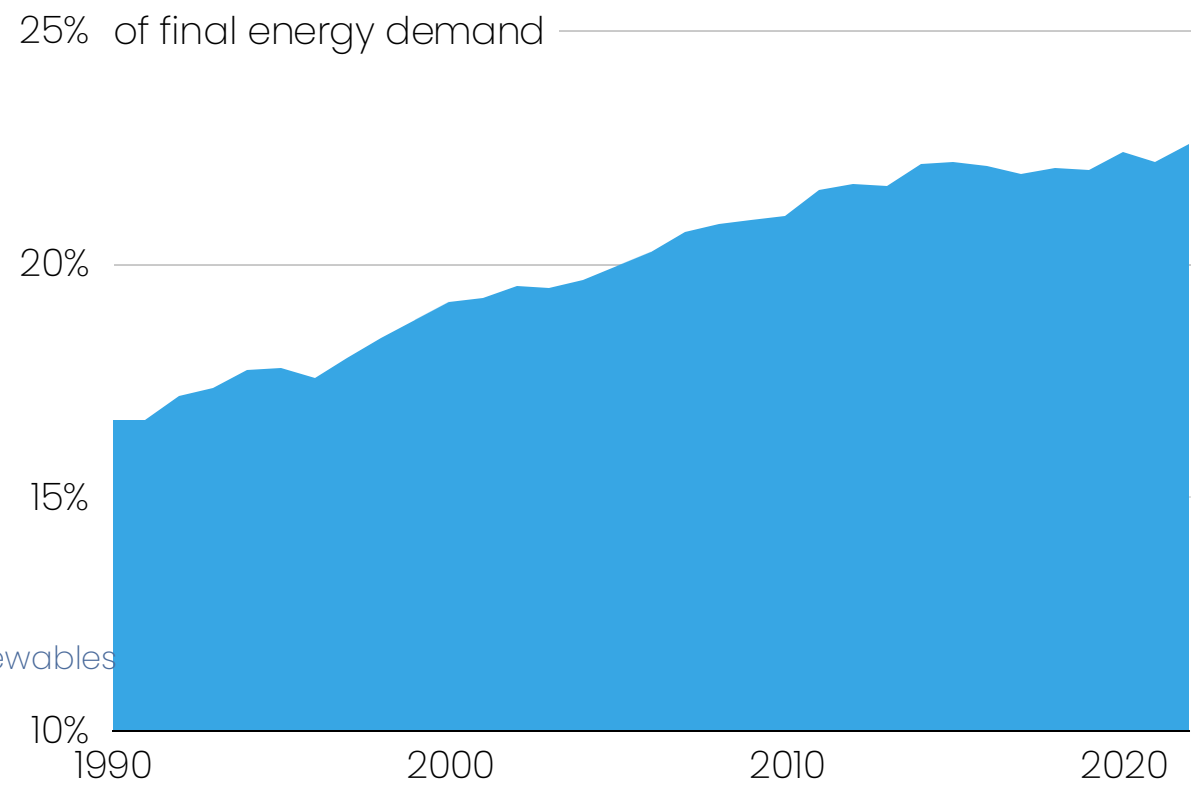
Renewables have grown but electrification has not

Electrification has been stagnant in Europe for over a decade

1. Renewables



2. Electrification



Source: Ember, IEA WEB

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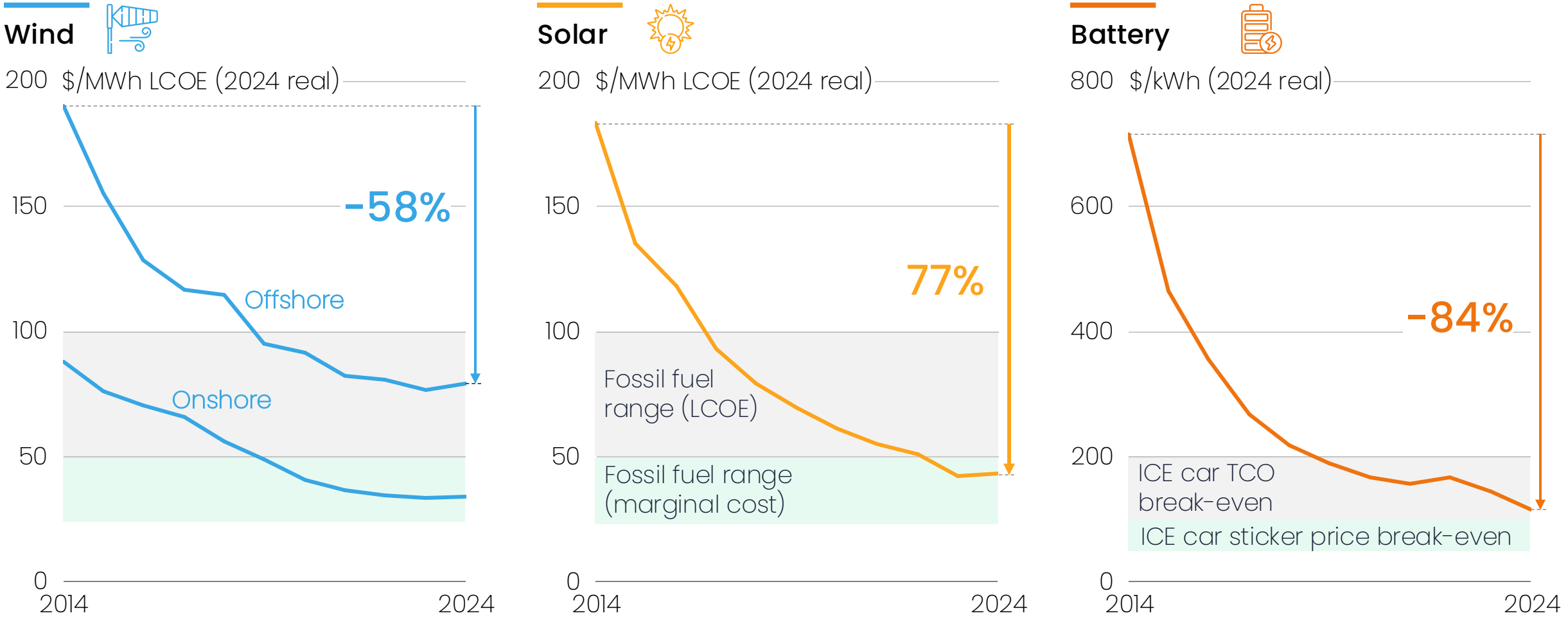
Electrotech is cheap enough to challenge the incumbents

After decades of cost innovation electrotech is now cheaper than fossils



Sources: IRENA, BNEF (Batteries), Ember

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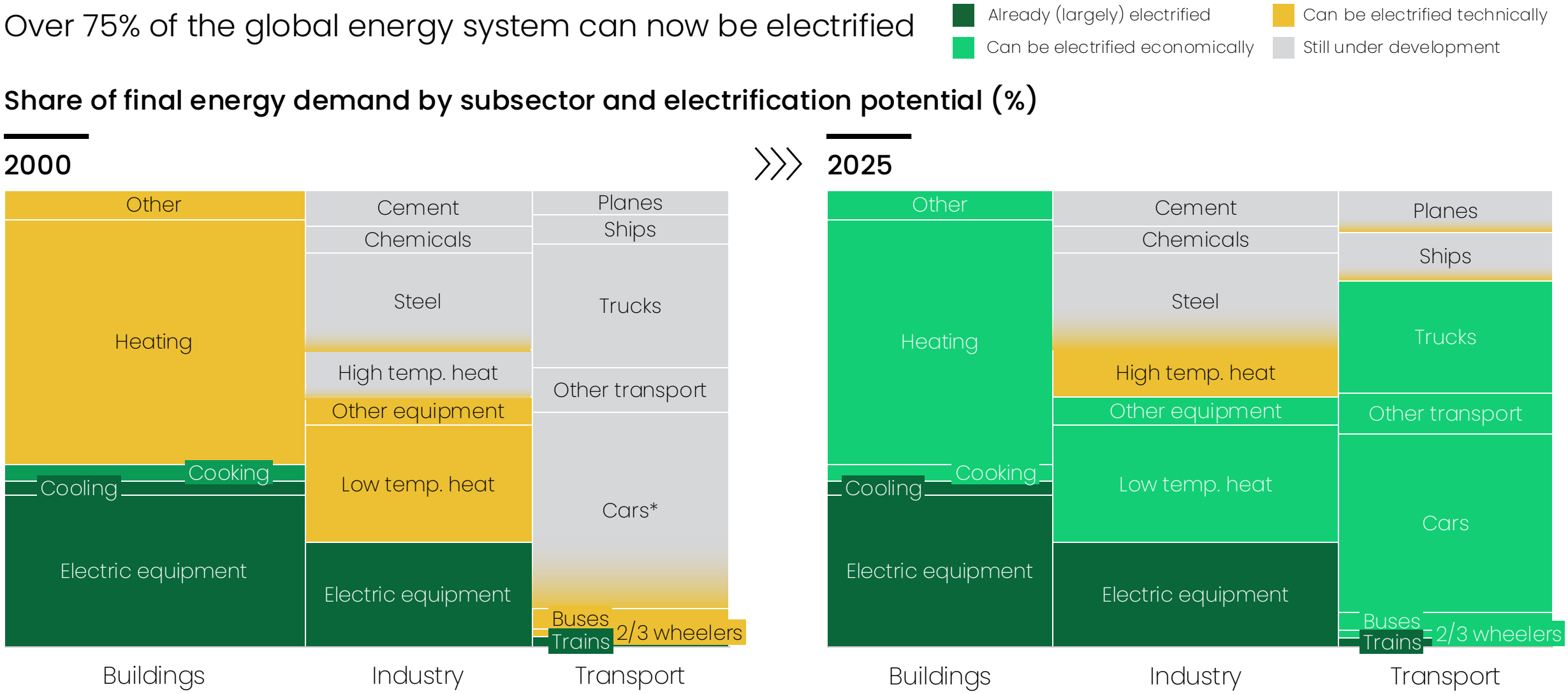
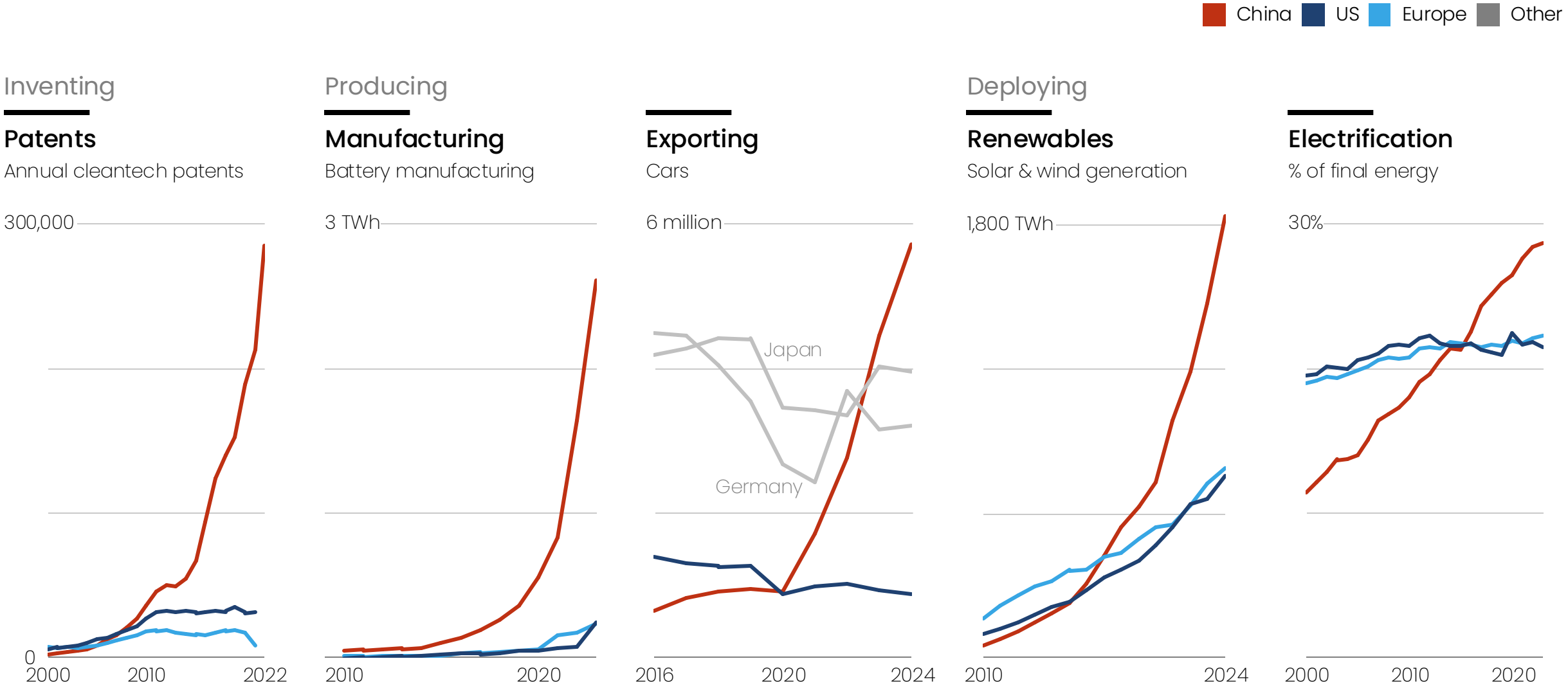
The electrification ceiling is high and rising

Over 75% of the global energy system can now be electrified



Sources: IIASA; IEA; BNEF; Ember analysis • Note: excluding feedstock *Technologies available for subset of total end-use with a clear path to expansion

China and Asia are seizing the opportunity



Sources: Ember, IEA WEB, IRENA, BNEF, NYT.

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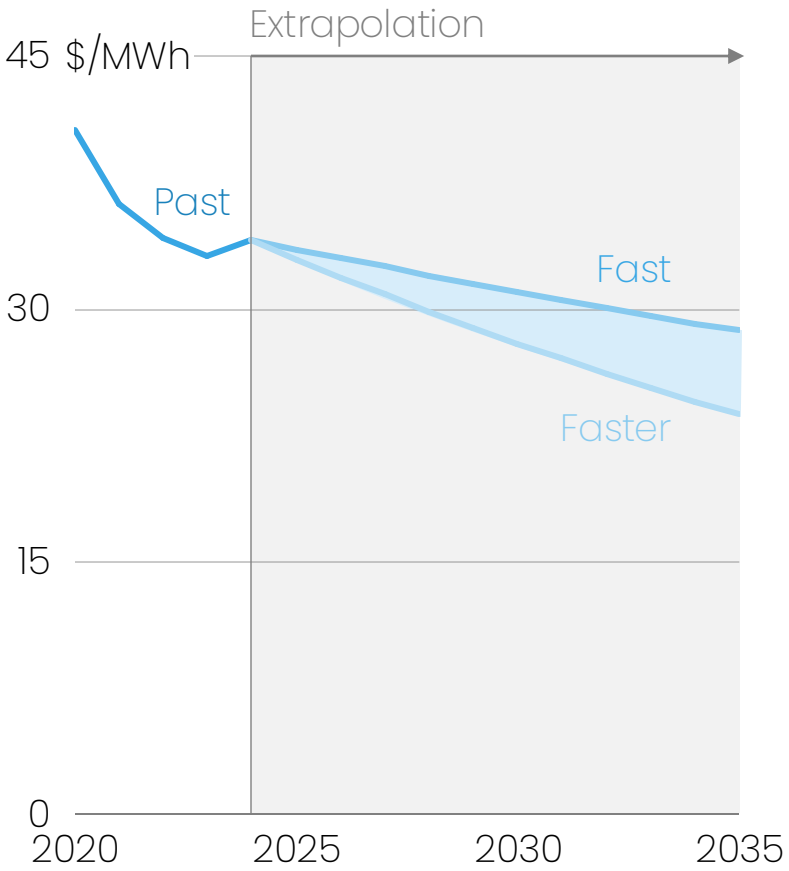
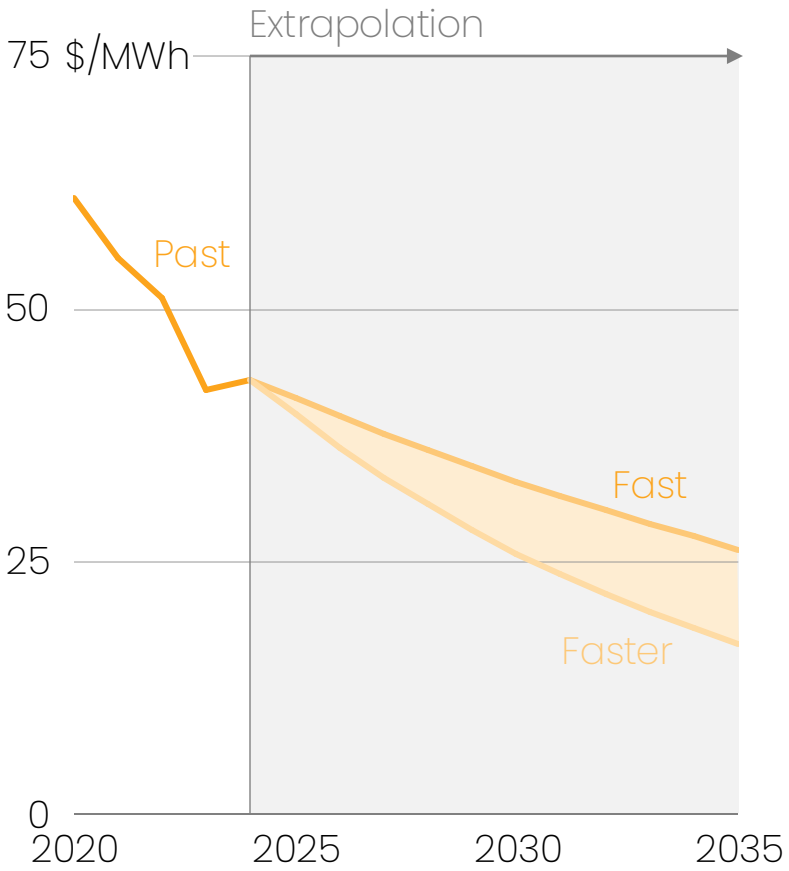
Electrotech will get cheaper driven by learning curves

From competitive to irresistible

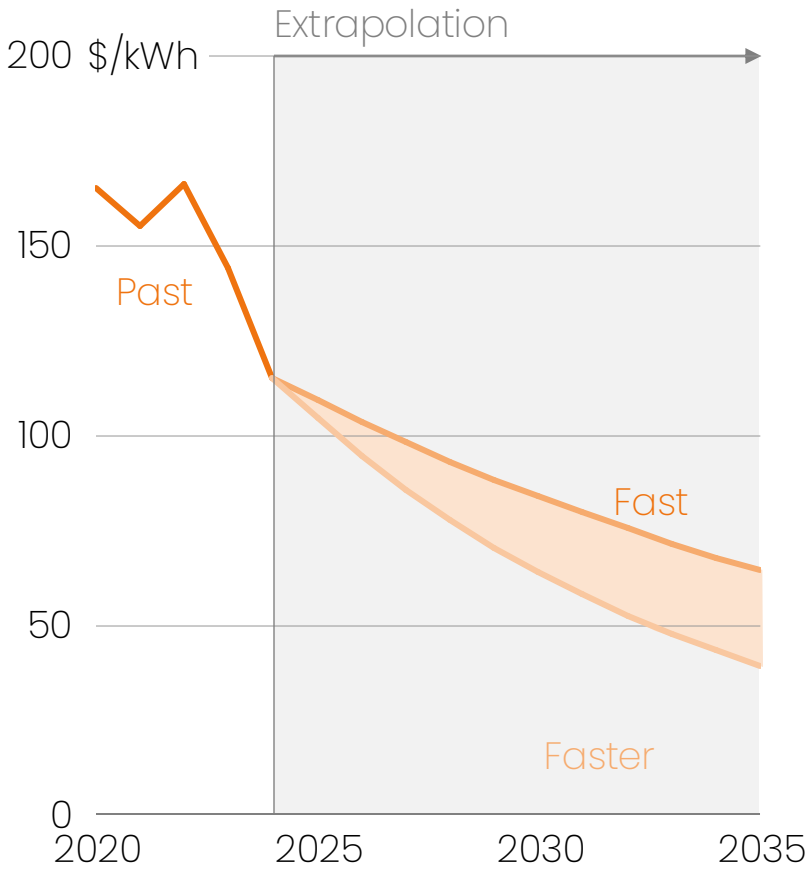
Onshore wind costs



Solar costs



Battery costs



Sources: IRENA, BNEF, Ember Futures extrapolation based on learning rates; a method set out in detail by Oxford INET among others. Costs are derived by extrapolating historic growth rates and learning rates for each of the key technologies for the next decade. Solar assumes growth (g) of 15%-18% and learning rates (LR) of 20-30%. Wind 8-13%(g) growth 12-17% (LR). Batteries 19-22% g & 19-29% LR.

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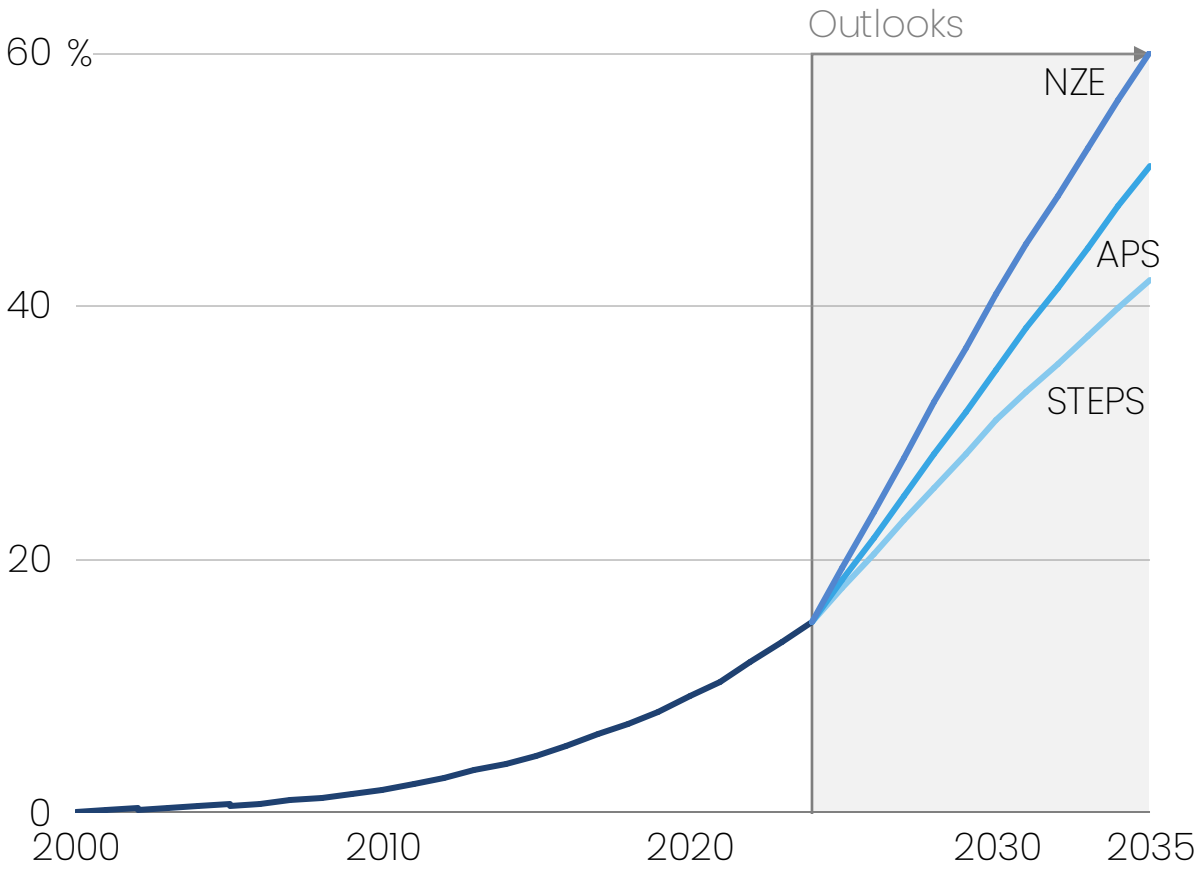
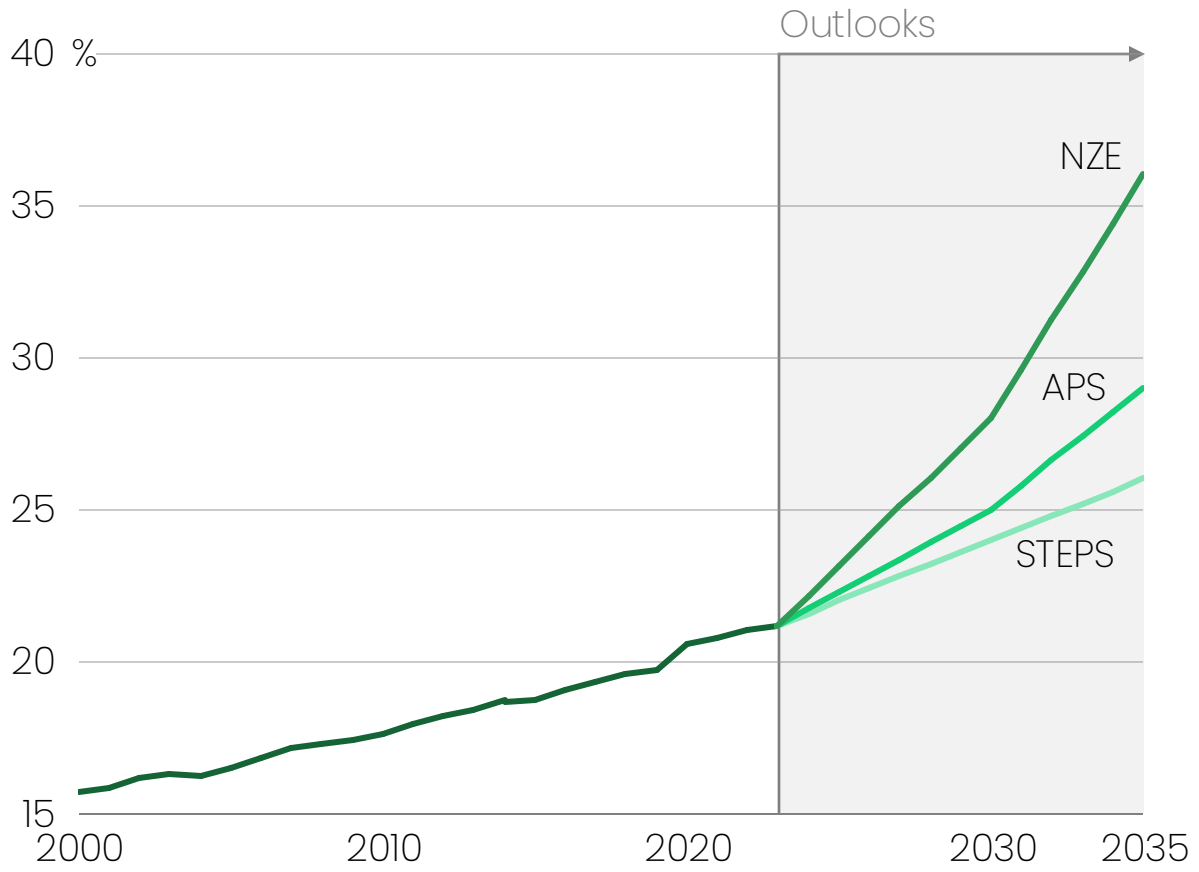
Renewables and electrification will keep growing

The momentum will continue

Solar & wind share of global generation



Electricity share of final energy



Sources: Ember, IEA WEO 2024 scenarios. Note NZE stands for (Net Zero), Announced Policies (APS), Stated Policies (STEPS)

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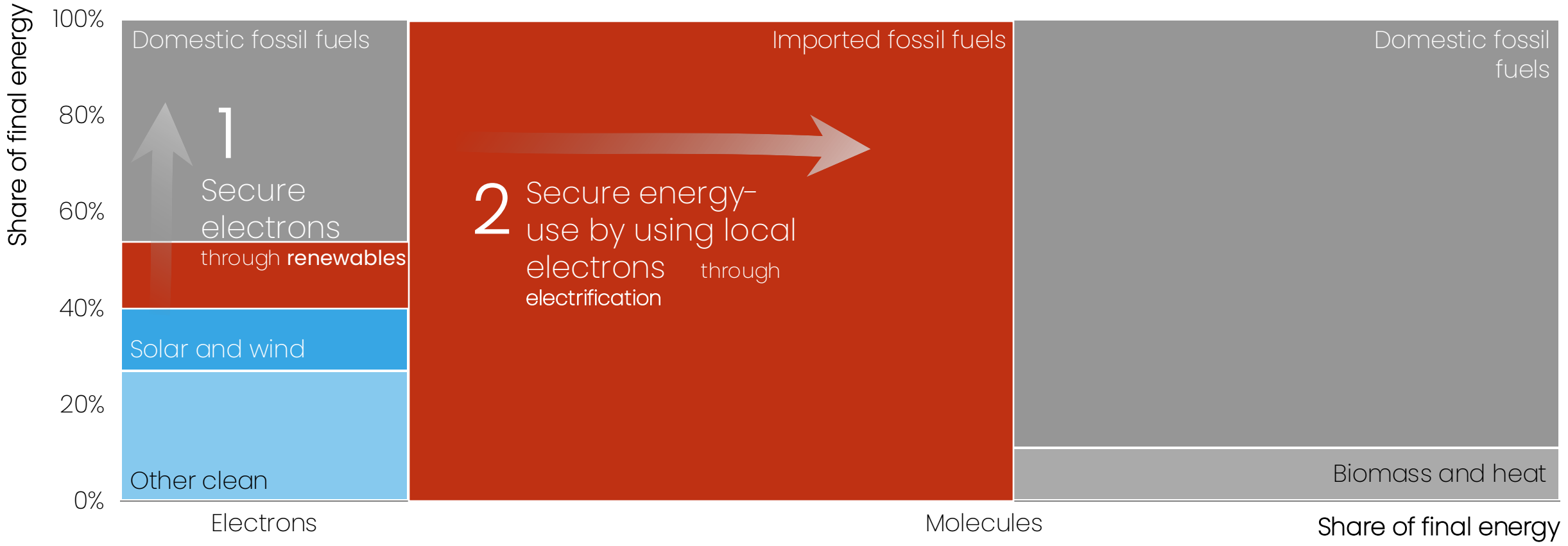
Electrotech brings energy security

More domestic renewables and electrification can drastically curb energy dependence

Global energy demand in 2023



Sources: IEA WEO 2024, IEA WEB, Ember • Notes: In gross terms and in final EJ. Other clean electrons are mainly hydro and nuclear.

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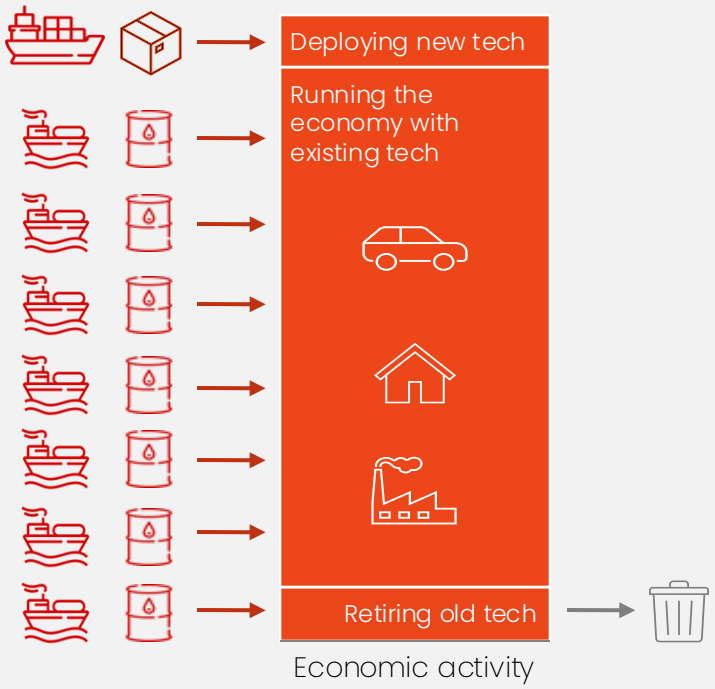
Electrotech imports are not the same as fossil imports

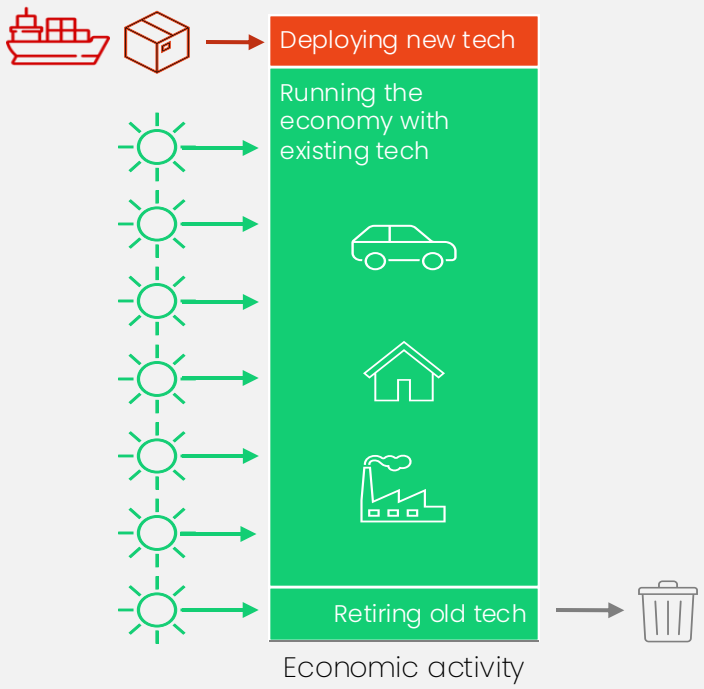
When fossil flows stop, the economy stops. When electrotech flows stop, only growth is at risk

From fossil import dependency... → ...to electrotech import dependency... → ...to full circular energy independence.

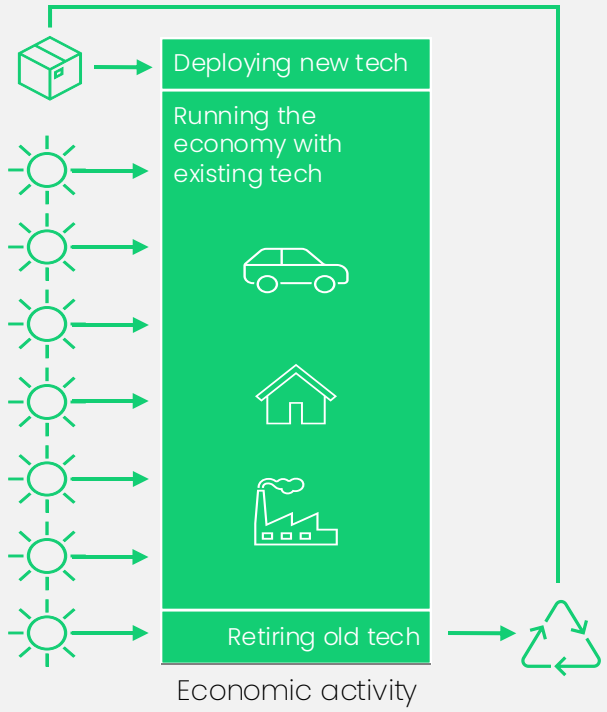
In an economy running on fossil imports, **when imports stop, all activity stops**



In an economy running on imported electrotech, **when imports stop, only growth is inhibited.**



In an economy running on local circular electrotech, **trade shocks have little impact**



At immediate risks without imports

Not at immediate risk

Sources: Ember• Note: bar sizes are illustrative

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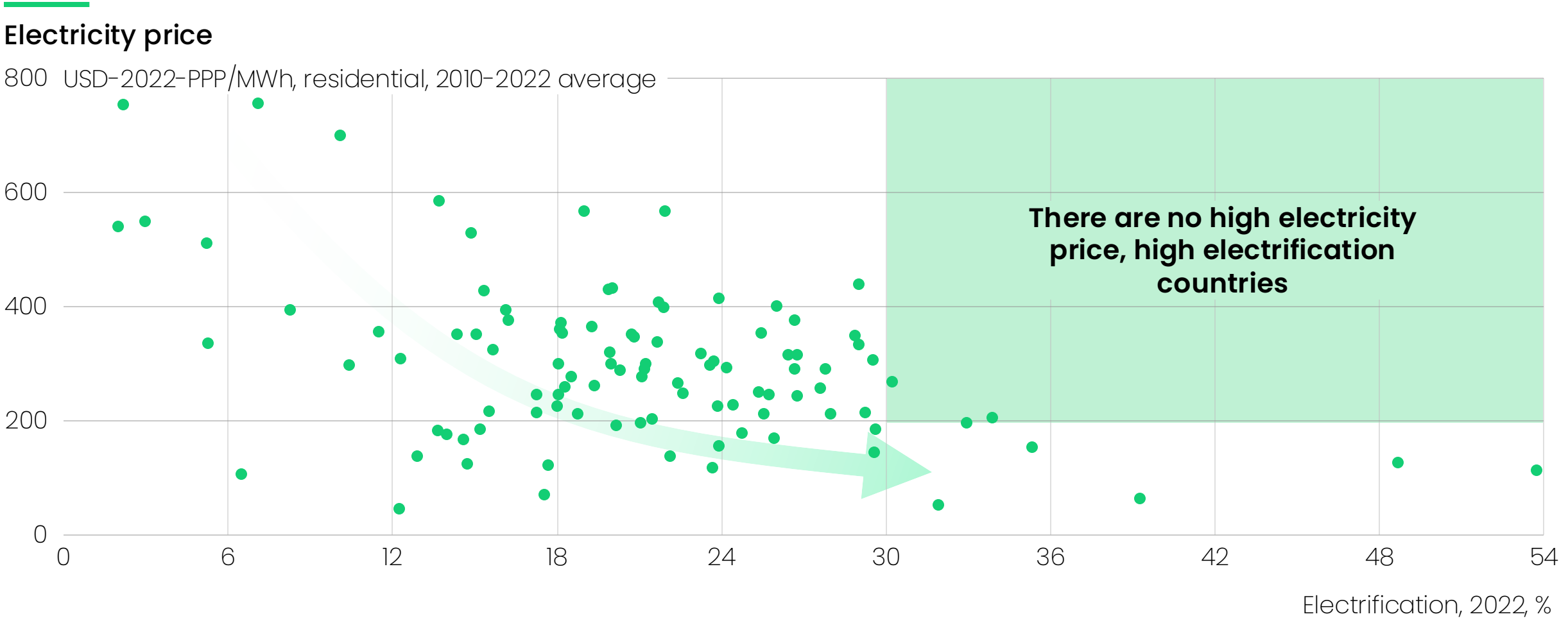
The key is to optimize electricity for price not carbon

Lower prices incentivise uptake



Sources: IEA; Ember analysis

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Pick technologies that have the wind in their back

Many popular solutions will struggle in the face of reality

	Physics Does it make the energy system more efficient?	**Economics** Is it small and modular, so it can be manufactured at scale and benefit from learning curves?	**Geopolitics** Does it enhance the independence and security of its user?
CCS	✗ **No**	✗ **No**	✗ **No**
Biofuels	✗ **No**	✗ **No**	✗ **No** **unless you are Brazil**
Green hydrogen	✗ **No**	✗ **Not really** **except for the electrolyser**	✓ **Yes** **unless imported**
Electrotech	✓ **Yes**	✓ **Yes**	✓ **Yes**

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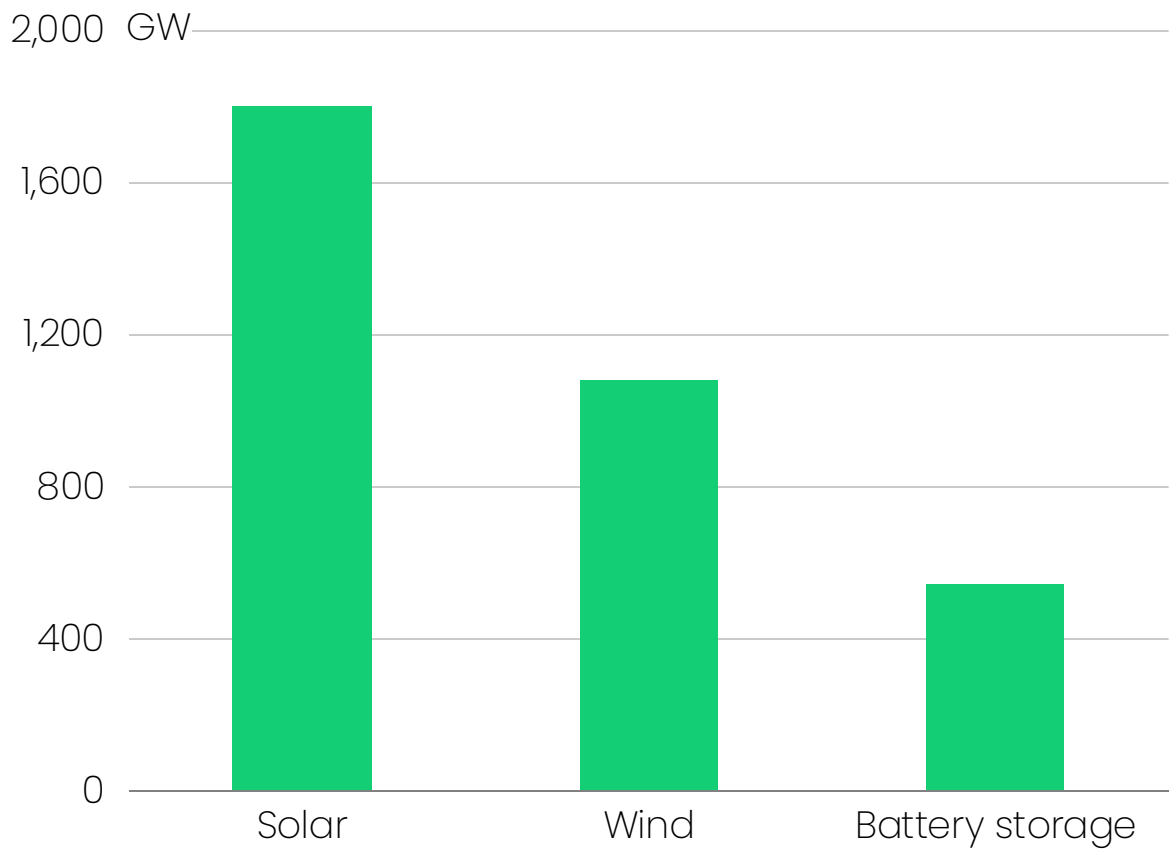
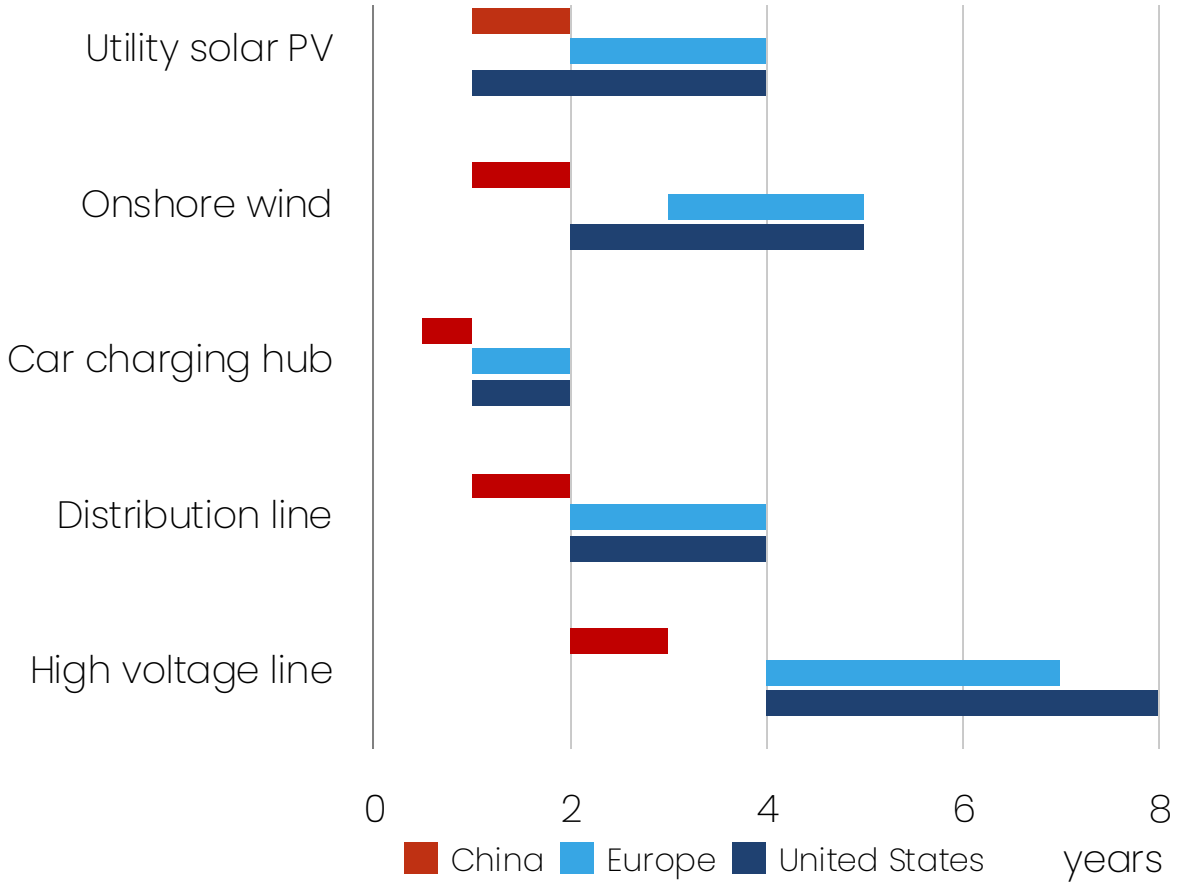
Back the builders not the blockers

Unlock the queues of electrotech that want to come online

Clean energy stuck in the connect queue



Typical deployment time



Sources: IEA. Note: solar & wind queue is global; battery storage is in select markets only.

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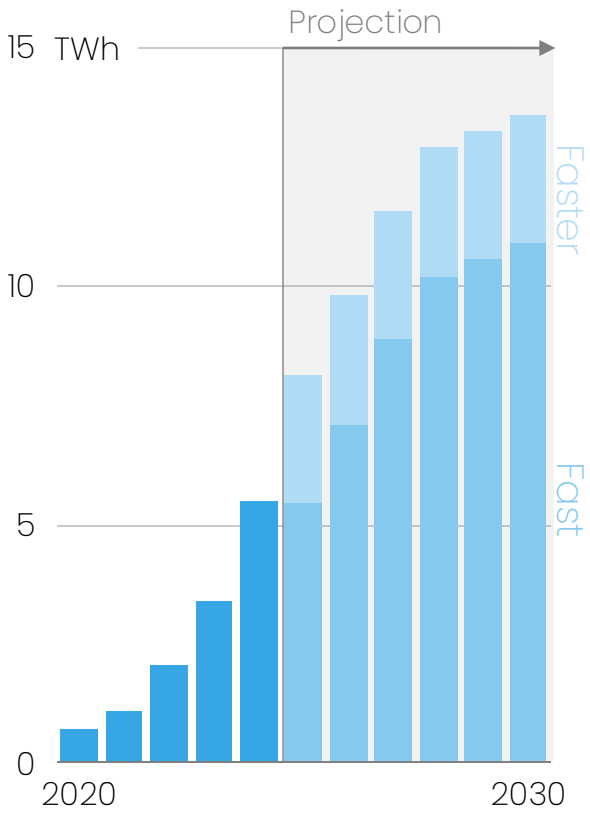
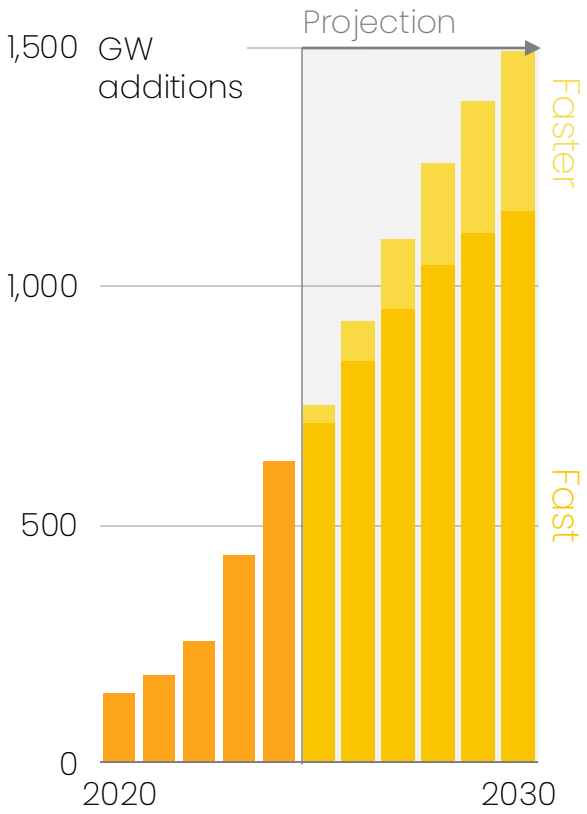
This is the decisive decade

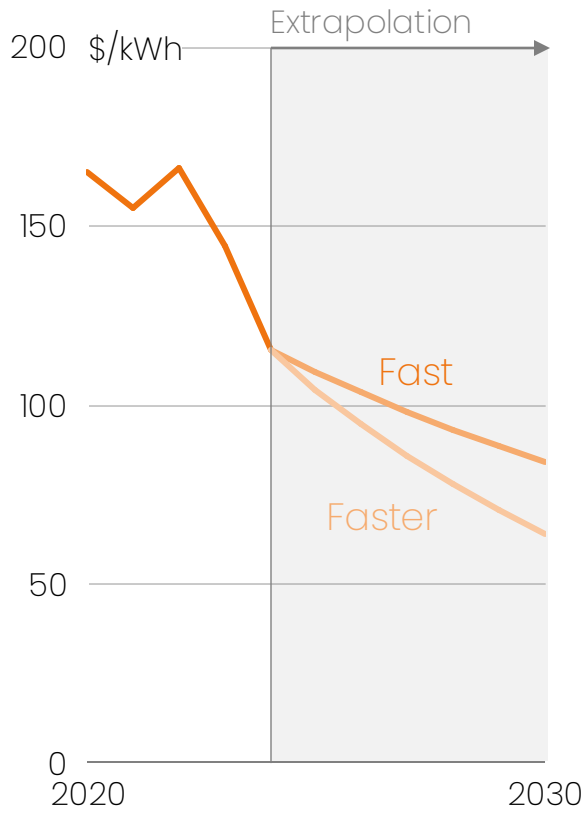
Manufacturing capacity is built: Batteries



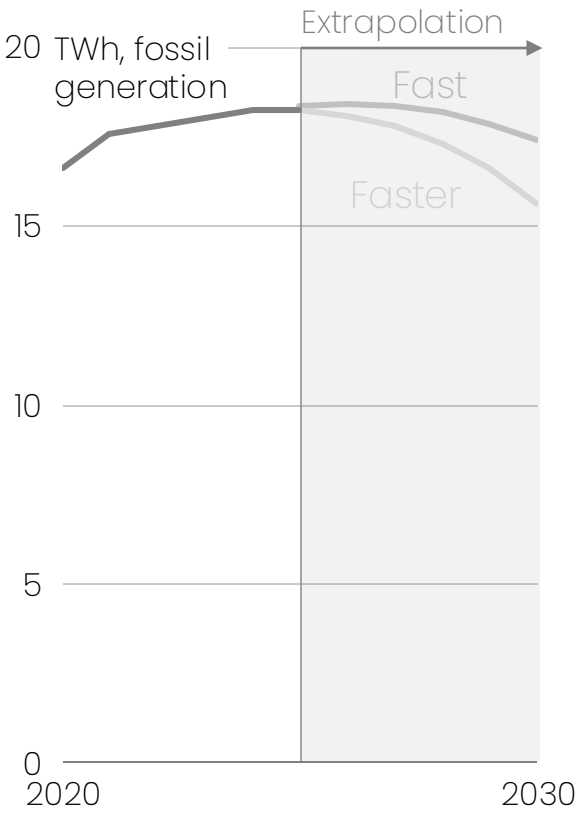
S-curves hit their steepest parts: Solar



Electrotech get too cheap to resist: Batteries



Fossil fuel demand enters terminal decline



Sources: BNEF, RMI, Ember Futures extrapolation for fossil fuel demand, assuming 3% growth in electricity demand and 15-20% growth in solar and wind supply

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