International Energy Agency

The evolving role of thermal and clean firm technologies in low-emissions power systems

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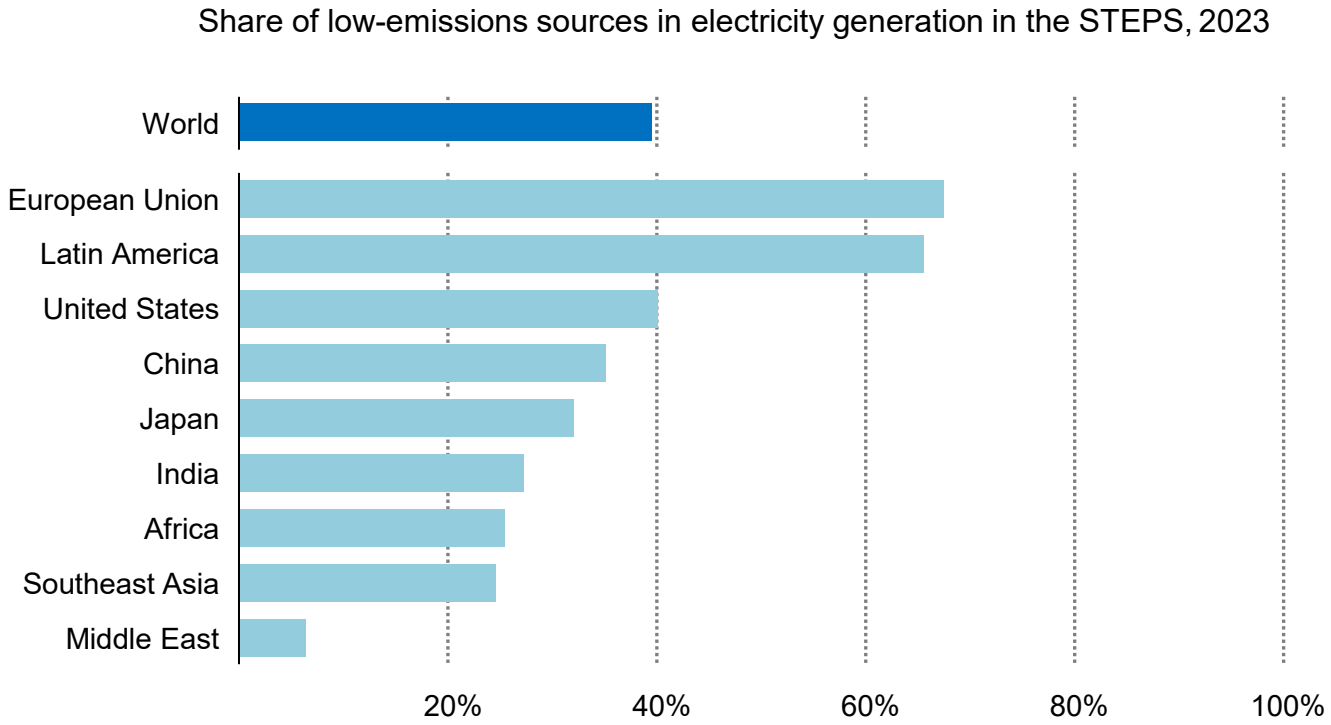
The nature of electricity systems is changing



Renewables, nuclear and other low-emission sources of electricity boost their share in all major economies, the rapid increase of variable forms of generation calls for new approaches to system integration

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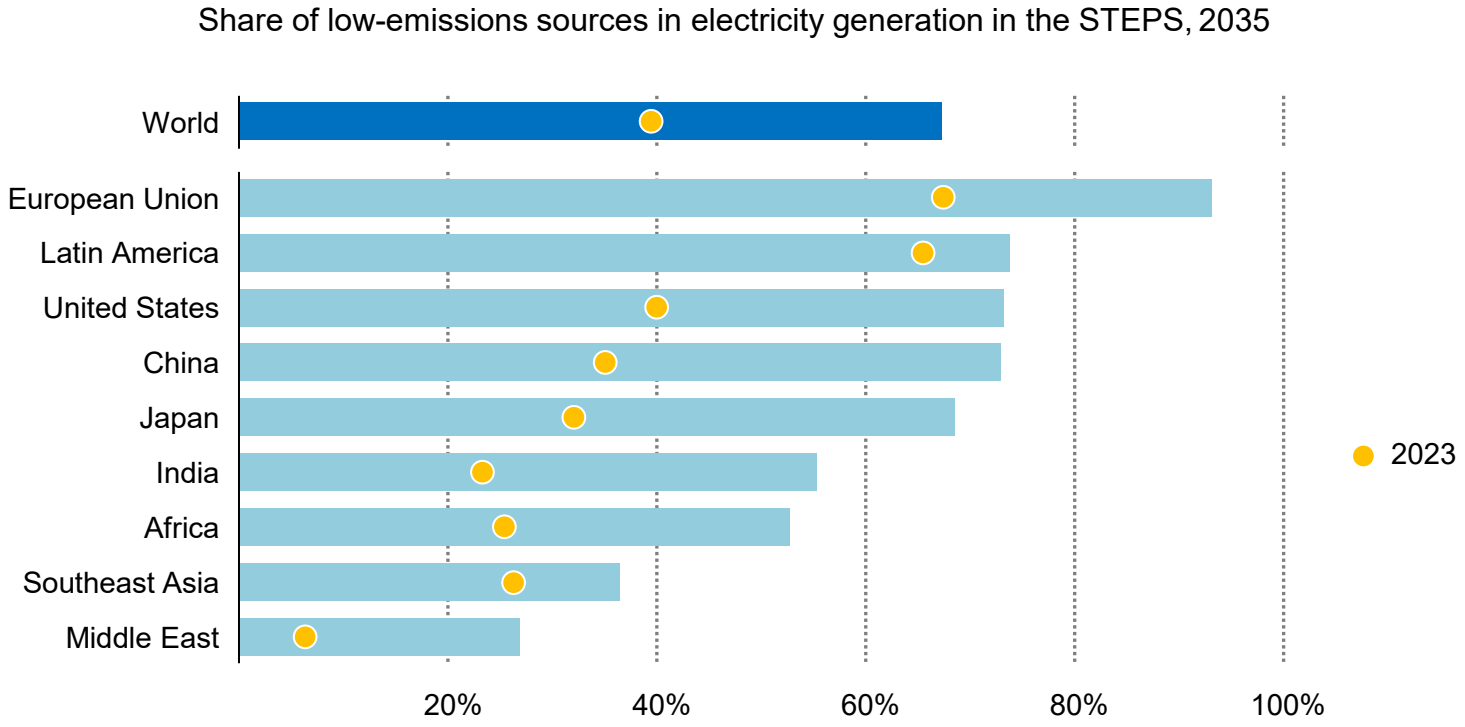

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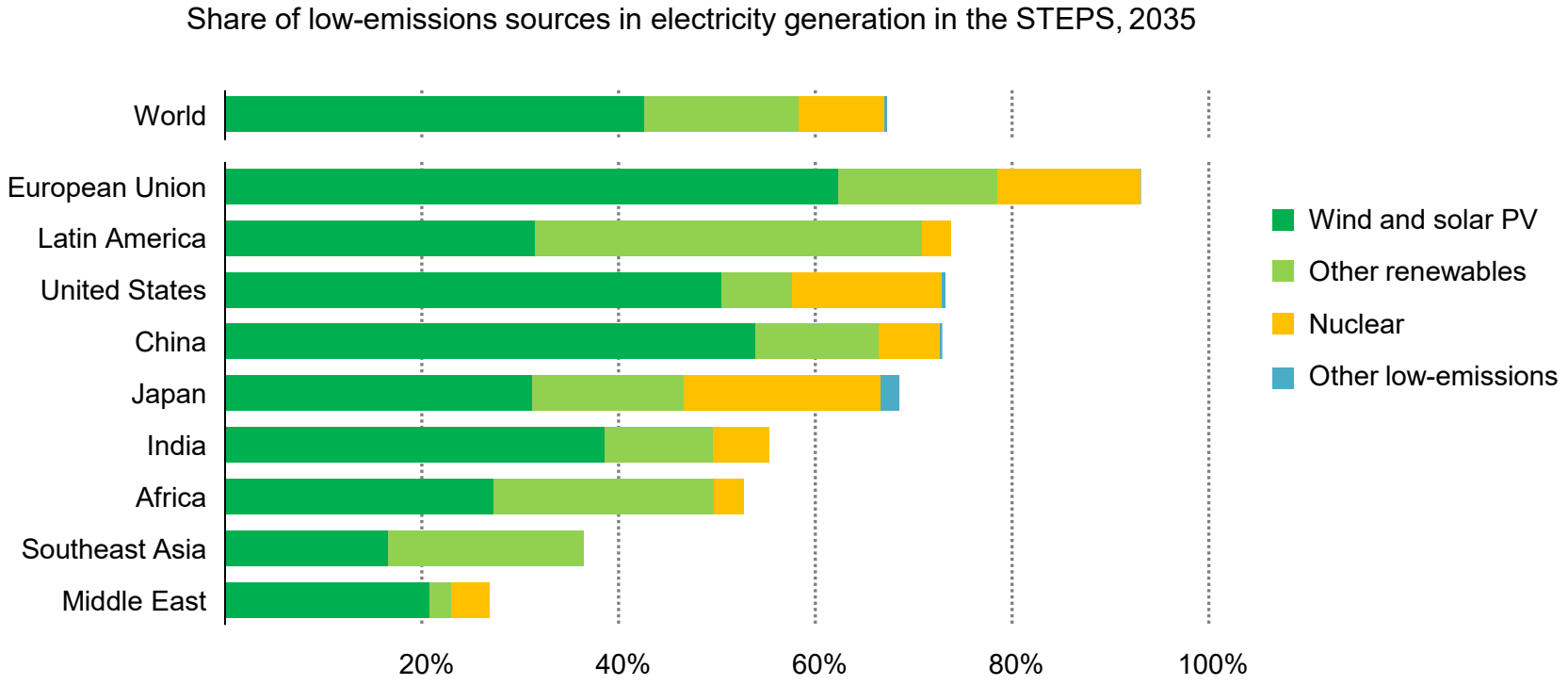

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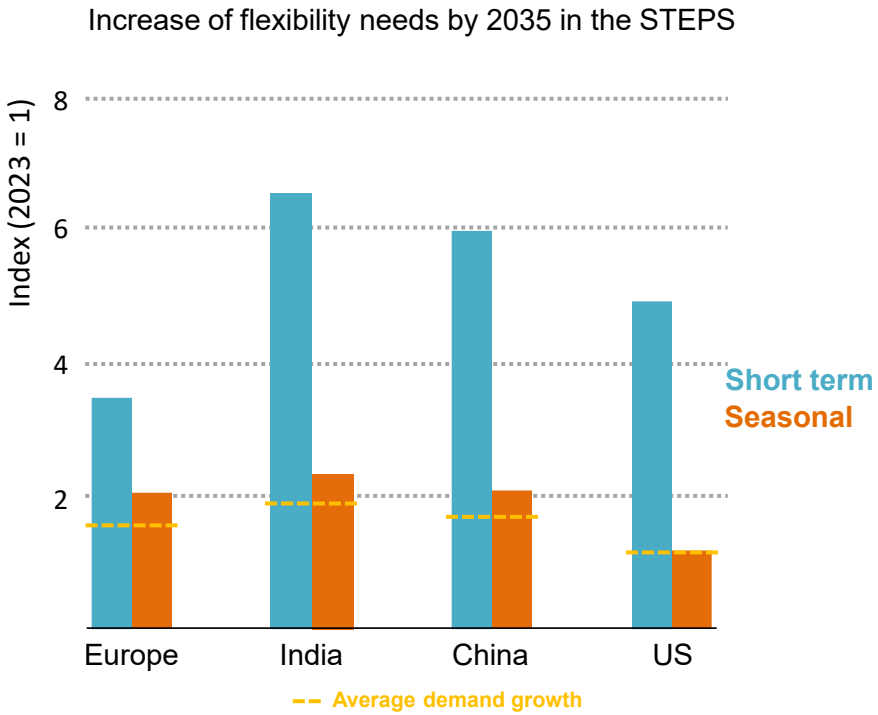
The need for flexibility in electricity systems is growing



Electricity sector transitions raise short-term flexibility needs

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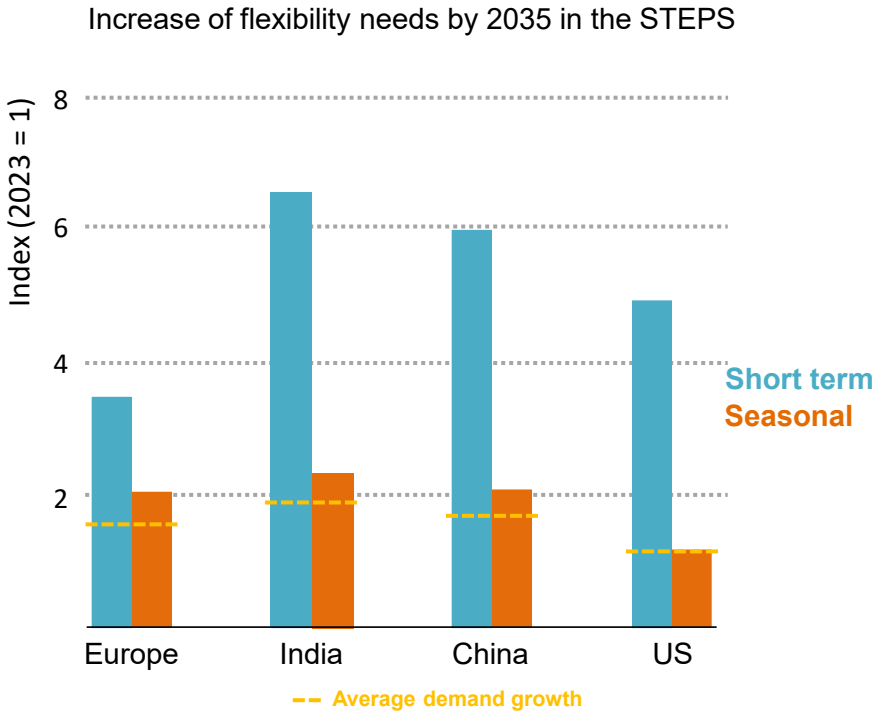
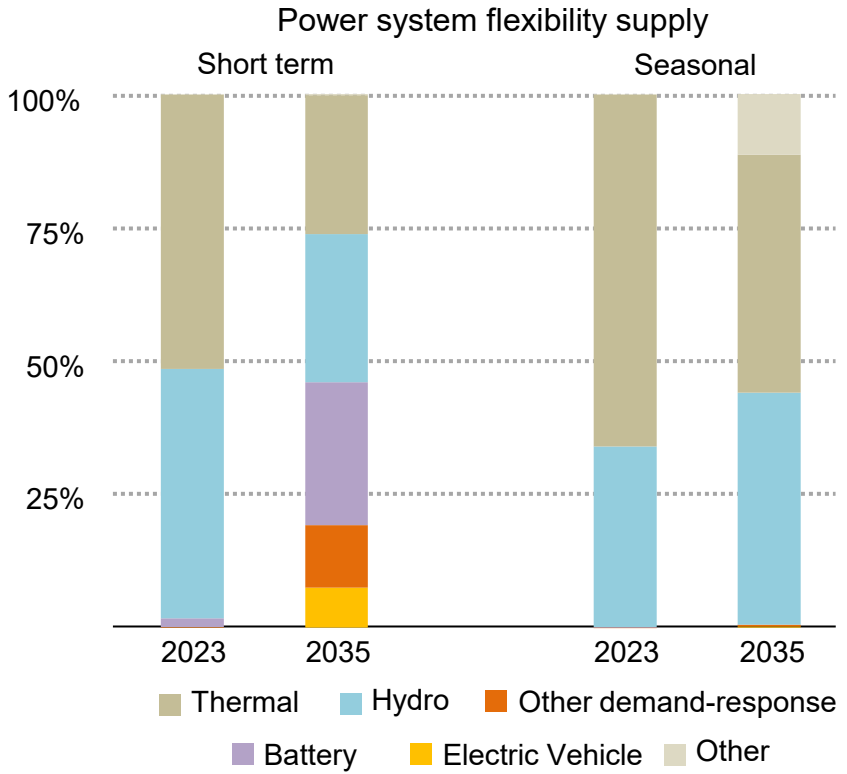
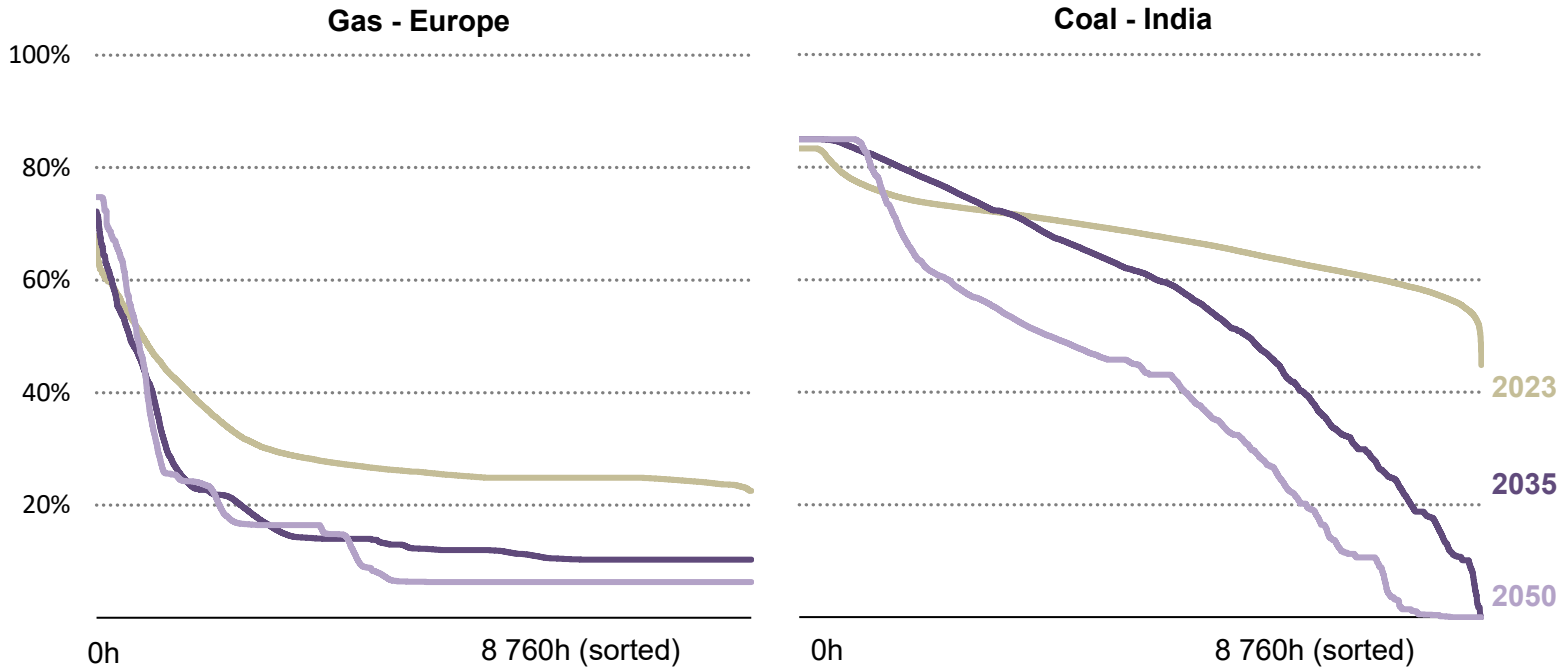




Electricity sector transitions raise short-term flexibility needs, primarily met by batteries and demand response, and seasonal flexibility, calling largely on hydro and thermal power

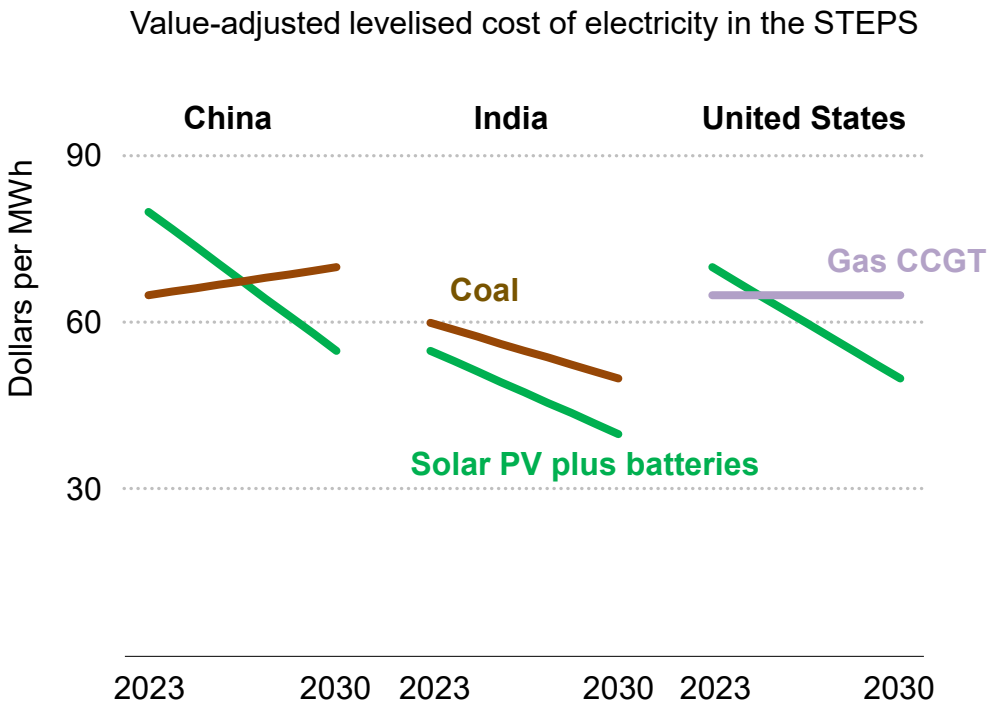
The role of thermal power plants is evolving

Duration curve of hourly capacity factors of natural gas plants in Europe and coal plants in India in the STEPS



Dispatchable thermal power plants operate over a wider range throughout the year by 2035 than they do today, especially during periods of peak demand, providing flexibility and secure capacity

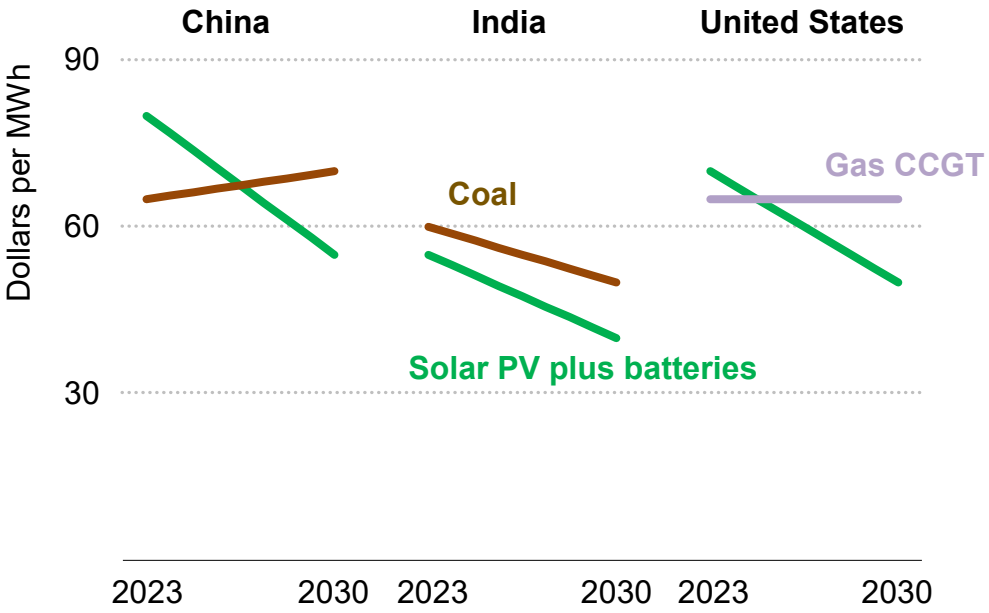
“Firming” solar PV with battery storage is increasingly competitive



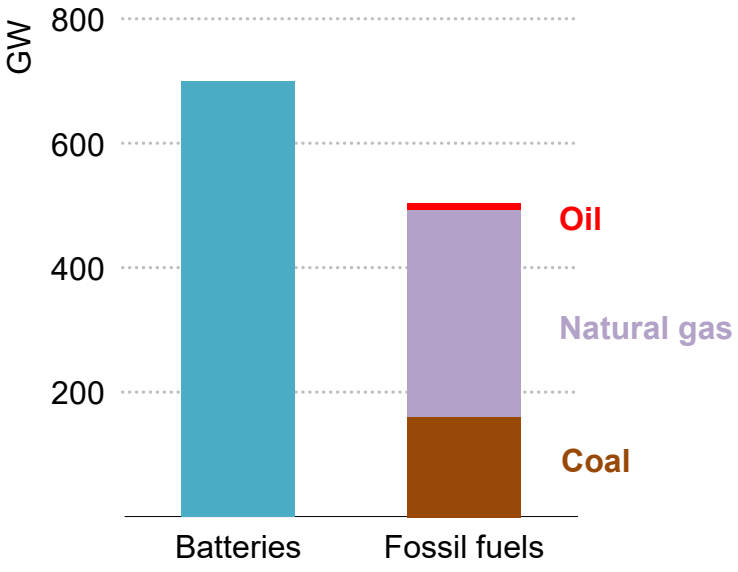
If properly valued, solar PV plus batteries can be one of the most competitive electricity sources in many markets.

“Firming” solar PV with battery storage is increasingly competitive

Value-adjusted levelised cost of electricity in the STEPS

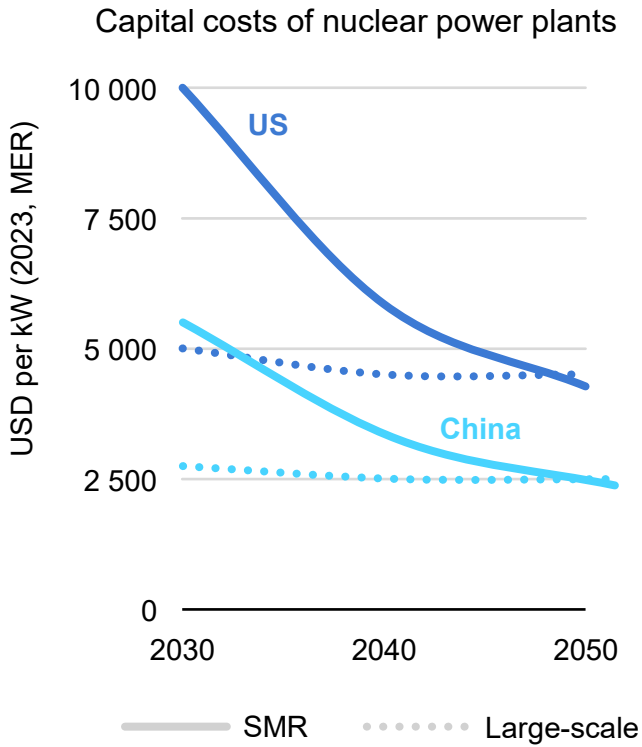


Capacity additions in the STEPS, 2024-30



If properly valued, solar PV plus batteries can be one of the most competitive electricity sources in many markets. Over 700 GW of battery storage capacity is added by 2030, more than all new fossil fuel capacity combined.

Small modular reactors could grow rapidly



Falling costs, government support and new business models could open a new era for nuclear energy

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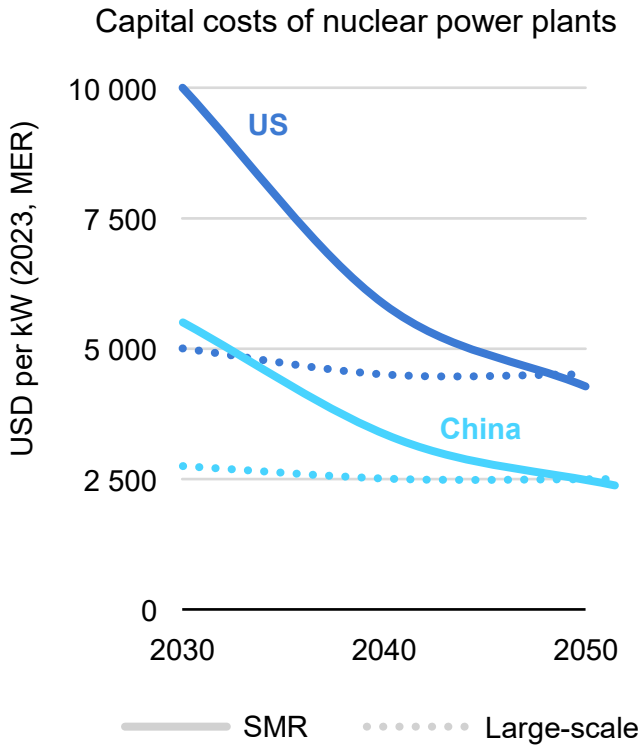
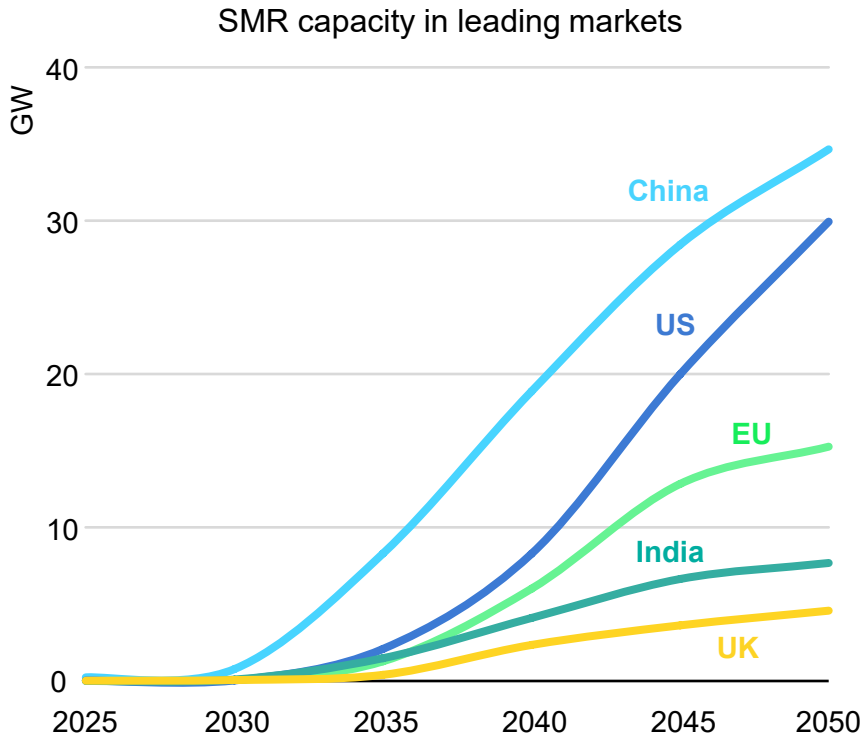
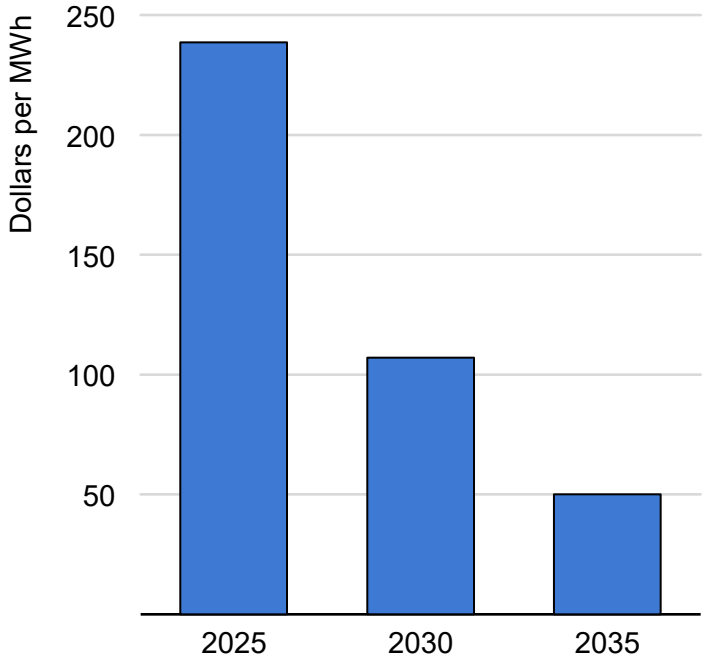




Falling costs, government support and new business models could open a new era for nuclear energy, with over a thousand SMRs totalling 120 GW by 2050.

Cost reductions could open a huge market for next-gen geothermal

Next-generation geothermal LCOE with high transfer of skills



Rapid cost reductions could unlock over 800 GW of next-generation geothermal by 2050

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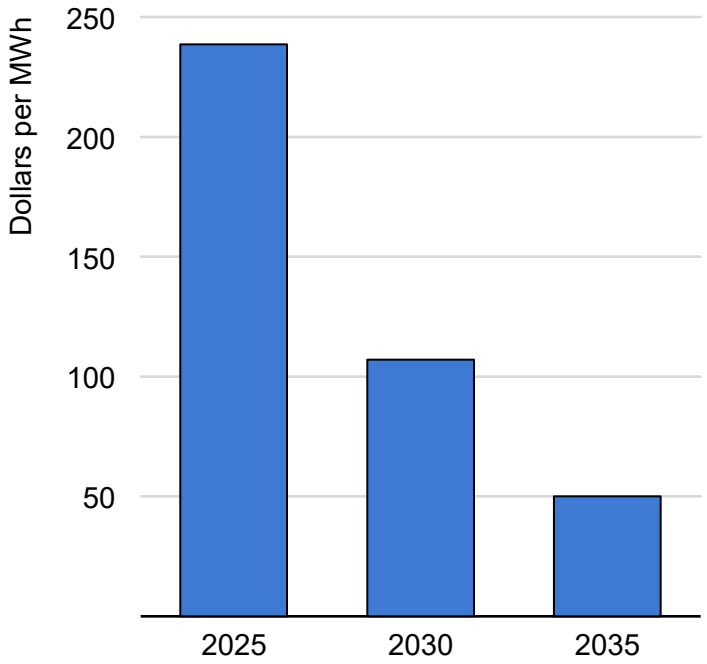
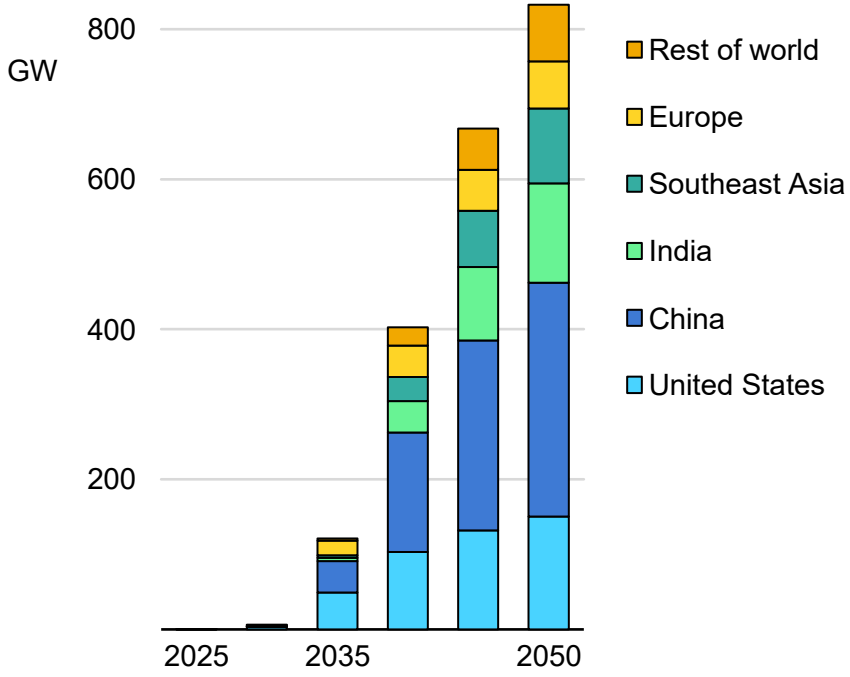


Market potential for next-generation geothermal



Rapid cost reductions could unlock over 800 GW of next-generation geothermal by 2050 with the largest markets in the United States, China, India, Southeast Asia and Europe