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Renewable Power Generation Costs in 2025

Presenters:
Deborah Ayres & Lourdes Zamora, Technology Economics team

TUESDAY, 06 OCTOBER 2026 • 14:00 – 14:30 CEST

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SPEAKERS



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Renewable Power Generation Costs in 2025

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Report + underlying data

Available through the QR code

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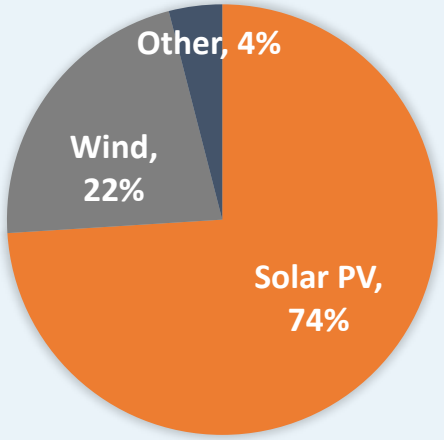
Renewables: Driving competitiveness and energy security

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690+ GW

Added globally in 2025

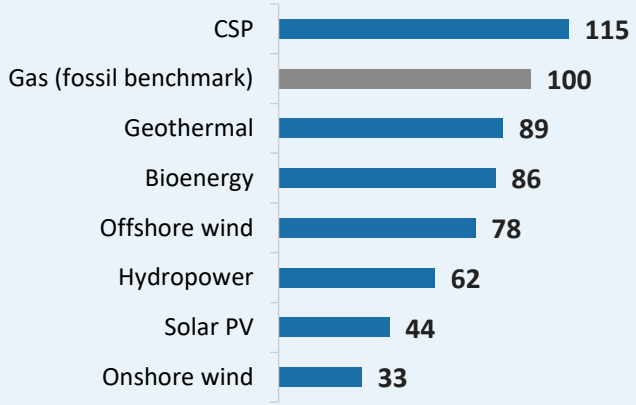
Solar PV and wind accounted for most new capacity.



>90%

of new utility-scale projects

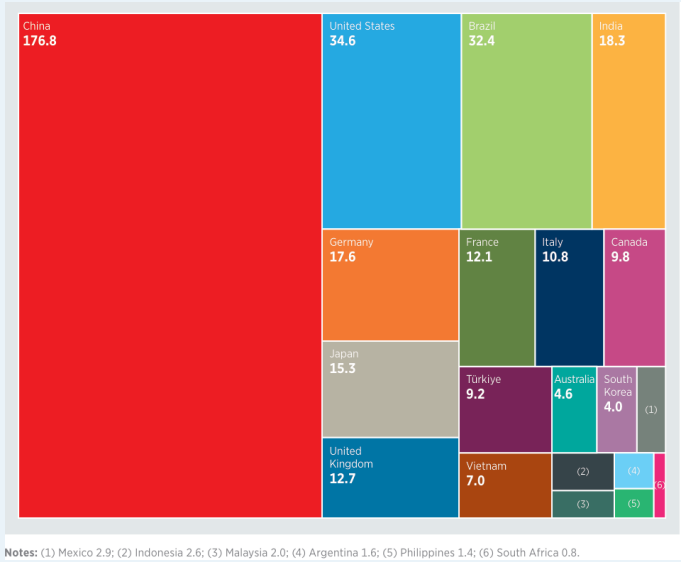
were below the cost of the cheapest new fossil-fuel alternative.



USD 480bn

Avoided in fossil fuel expenditures

Representing economic benefits.



Notes: (1) Mexico 2.9; (2) Indonesia 2.6; (3) Malaysia 2.0; (4) Argentina 1.6; (5) Philippines 1.4; (6) South Africa 0.8.

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Renewables: Declining costs and growing cost advantage

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Between **2010-2025, the LCOE has fallen by**:

- **Solar PV** **–89%**
- **Onshore wind** **–71%**
- **Offshore wind** **–63%**
- **Bioenergy** **–3%**
- **CSP** **–72%**

In contract, **the LCOE has increased by**:

- **Hydropower** **+41%**
- **Geothermal** **+53%**

- Renewable power has become more cost competitive.
- Renewables retained their cost advantage over fossil fuels.



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Solar Photovoltaic

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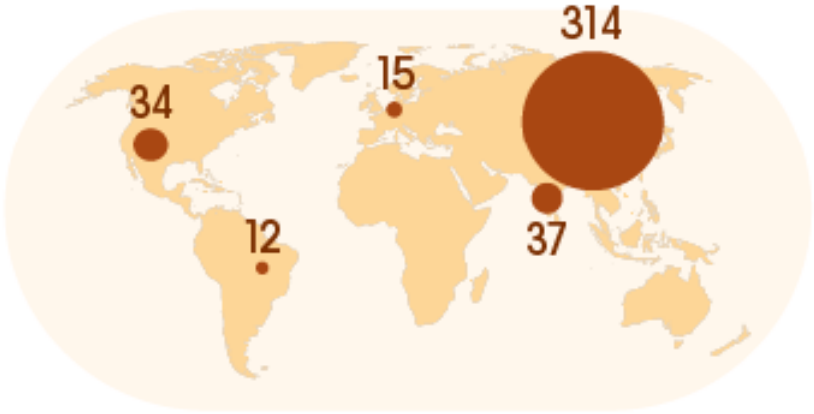
Historical cost trends: Utility scale solar PV 2010-2025

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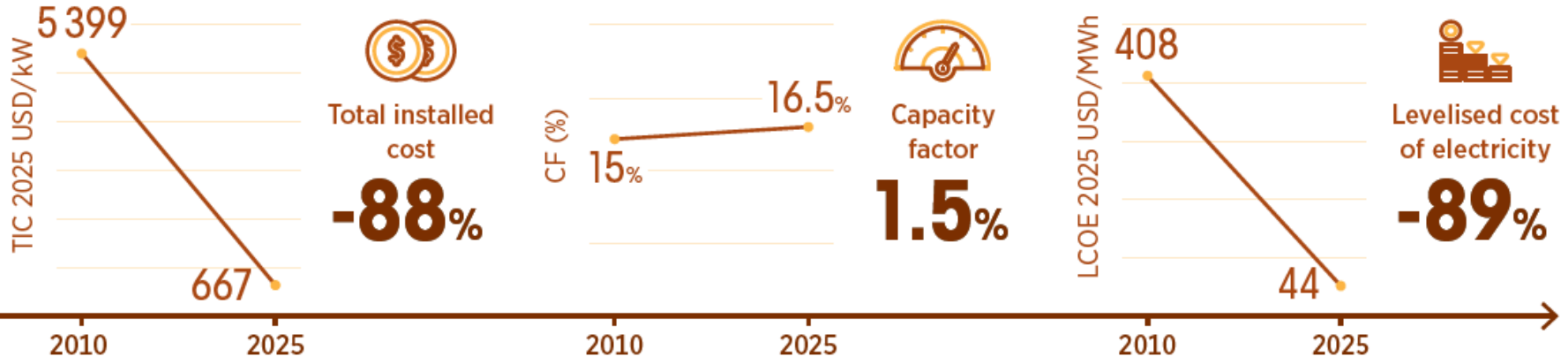
- In 2025, 511 GW were commissioned with around **58% of additions being utility-scale**.
- China leads deployment representing 62% of global additions
- Between 2010-2025:
  - Total Installed Cost −88% → USD 667/kW
  - LCOE −89% → USD 44/MWh

TOP MARKETS

Capacity additions (GW) in 2025



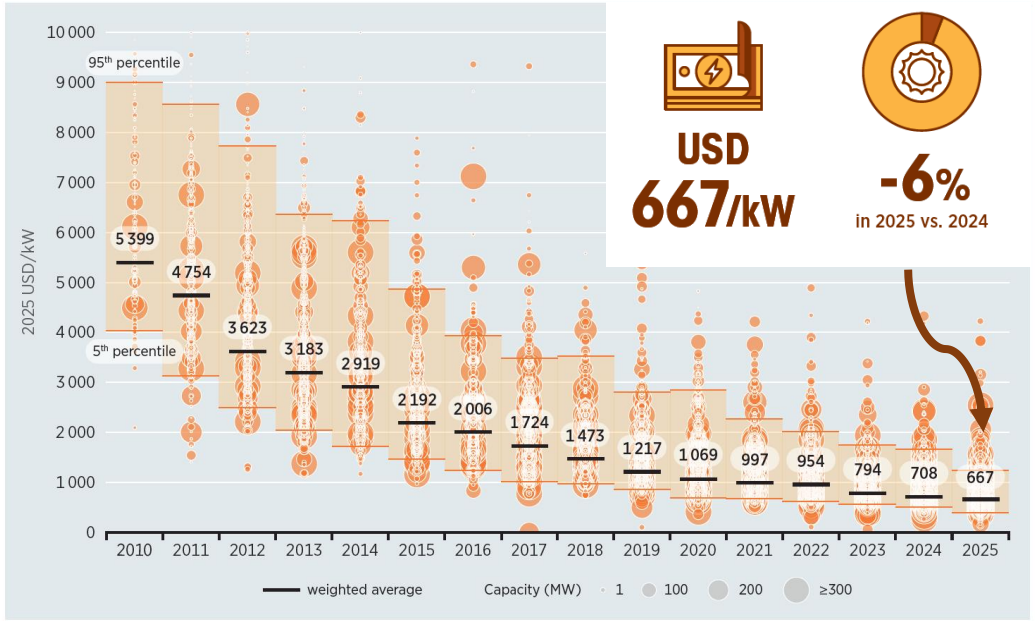
KEY PARAMETERS**



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Total Installed Cost

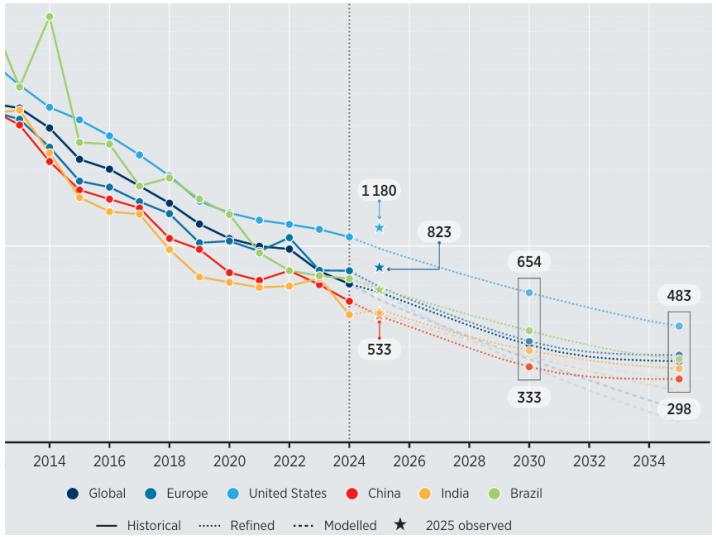
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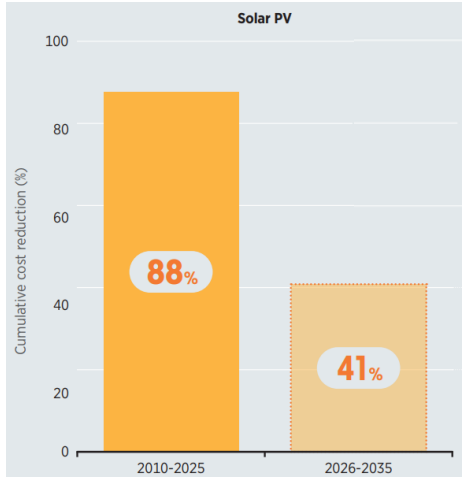


USD 667/kW

-6% in 2025 vs. 2024

Costs declines continues but at a slower pace





	2015			2025		
	5th percentile	Weighted average	95th percentile	5th percentile	Weighted average	95th percentile
	(2025 USD/kW)					
Africa	1 630	**3 520**	5 215	593	**837**	1 139
Central America and the Caribbean	2 091	**2 675**	4 052	649	**931**	1 016
Eurasia	2 541	**3 521**	4 619	764	**998**	1 256
Europe	1 372	**1 801**	3 638	518	**823**	1 501
Oceania	2 212	**2 728**	2 855	612	**921**	1 785
Other Asia	1 863	**2 716**	5 049	488	**882**	2 020
Other North America	2 035	**2 706**	6 153	702	**887**	1 777
Other South America	2 289	**3 280**	5 573	488	**867**	1 538
Brazil	2 139	**2 558**	2 697	503	**672**	1 138
China	1 560	**1 662**	2 834	374	**533**	785
India	1 116	**1 585**	2 576	397	**545**	656
United States	1 979	**3 137**	4 953	679	**1 180**	1 767

Cost trends and drivers across major markets.

- TIC : low module prices, developer competition, market scale & maturity
- TIC : higher BoS costs, import tariffs, supply chain constraints

O&M

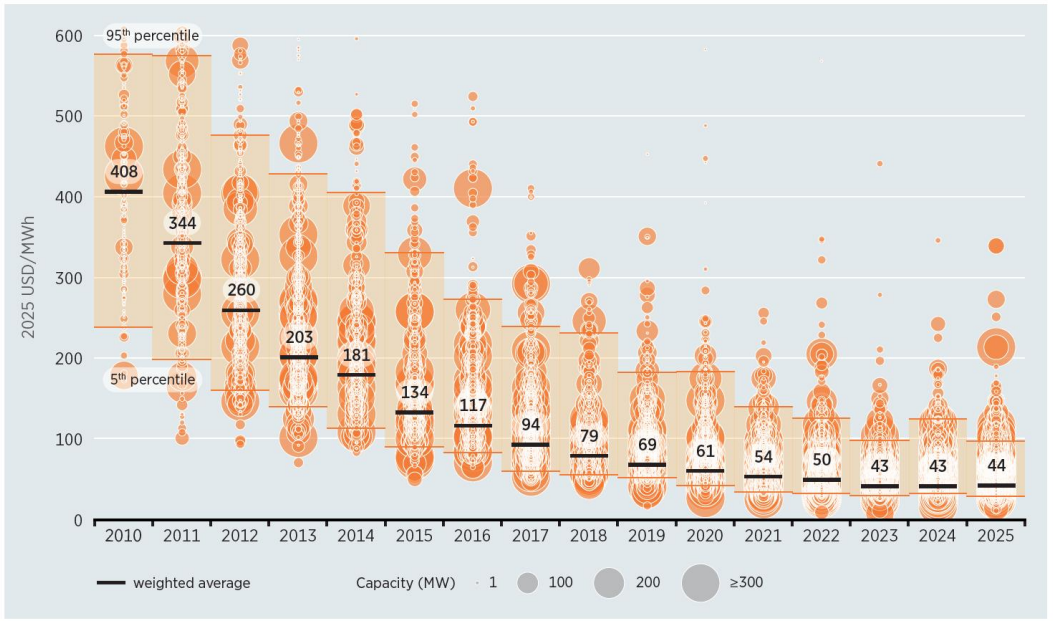
- Average O&M costs rose 5% YoY driven by higher commercial and security expenses.
- Technical operations, insurance, and preventive maintenance comprising around 80% of total expenses.

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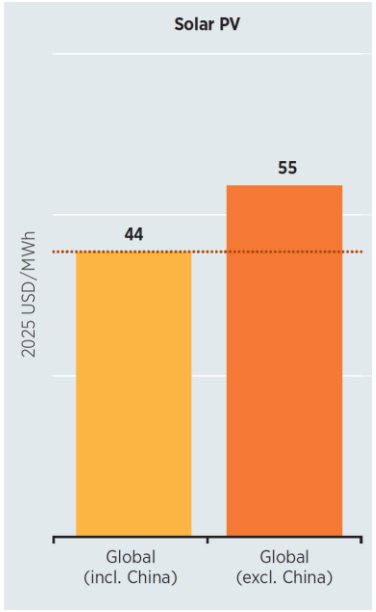
Levelized Cost of Electricity

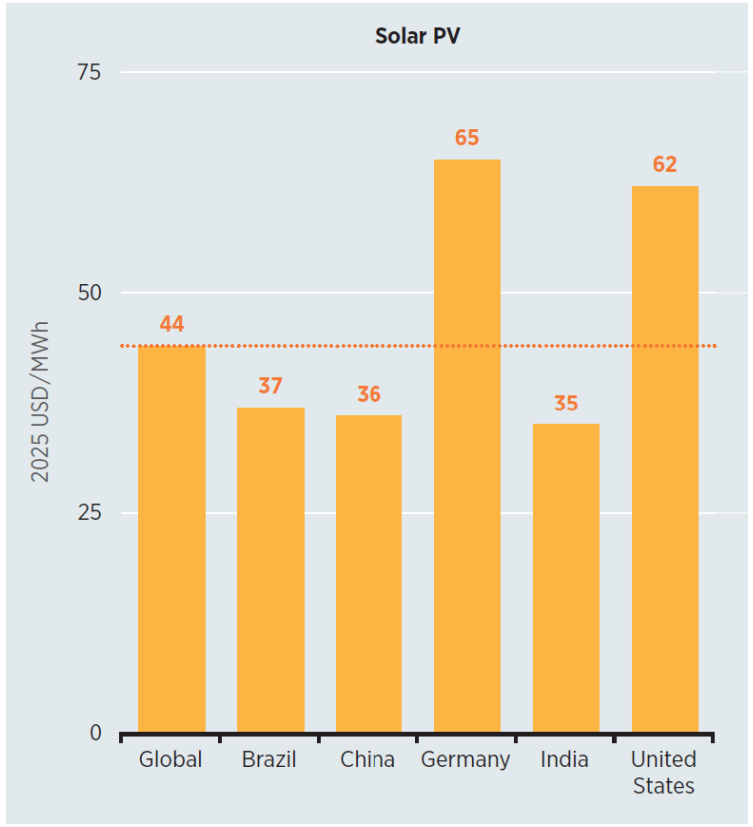
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Historical trend 2010-2025



2025





- At global level, LCOE remained flat at USD 44/MWh, with a slight increase of 1%.
- Excluding China, the global LCOE was USD 55/MWh, 23% higher.

- India: **35 USD/MWh**
- Between 2024 and 2025, the LCOE decreased in most of the major markets, although the underlying drivers varied across markets.

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Technology trends: Solar and floating photovoltaics

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- **Module efficiency:** efficiencies close to 25%
- **Next-generation technology:** Silicon-perovskite tandem cells being tested by developers
- **AI-driven digitalisation:** from project design and construction to plant operation and maintenance
- **Co-location:** solar+storage



Floating photovoltaics

- High resource potential in specific markets with deployment concentrated in Asia
- Land-use advantage enabling solar expansion where land is constrained with additional synergies when integrated with hydropower reservoirs
- Economics is improving reaching a LCOE of USD 53/MWh in 2025.
- Key barriers: Limited FPV-specific policies, lack of standardised technical guidelines, safety and durability concerns, and availability of suitable water bodies.

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Onshore wind

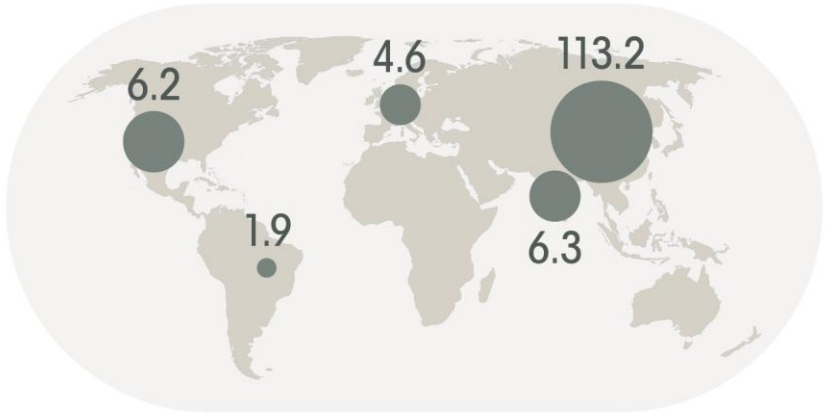
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Key parameters: Onshore Wind 2010-2025

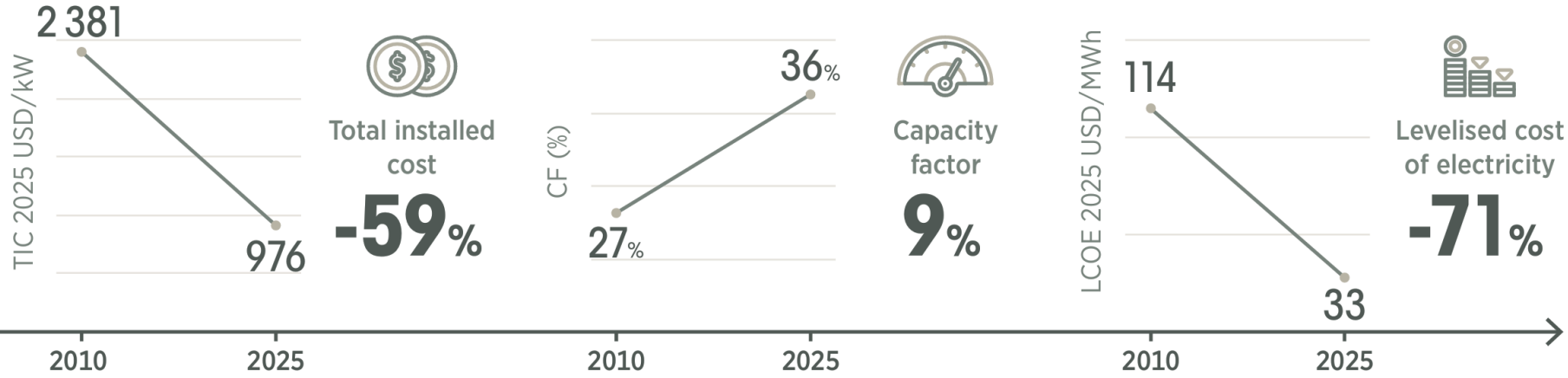
- In 2025, 150 GW were commissioned.
- China supplied ~3/4 of 2025 additions; US and India followed.
- Between 2010-2025:
  - Total Installed Cost −59% → USD 976/kW
  - Capacity factor +9 pp → 36%
  - LCOE −71% → USD 33/MWh

TOP MARKETS

Capacity additions (GW) in 2025



KEY PARAMETERS**



Cost trends: Onshore Wind 2010-2025

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TOTAL INSTALLED COSTS

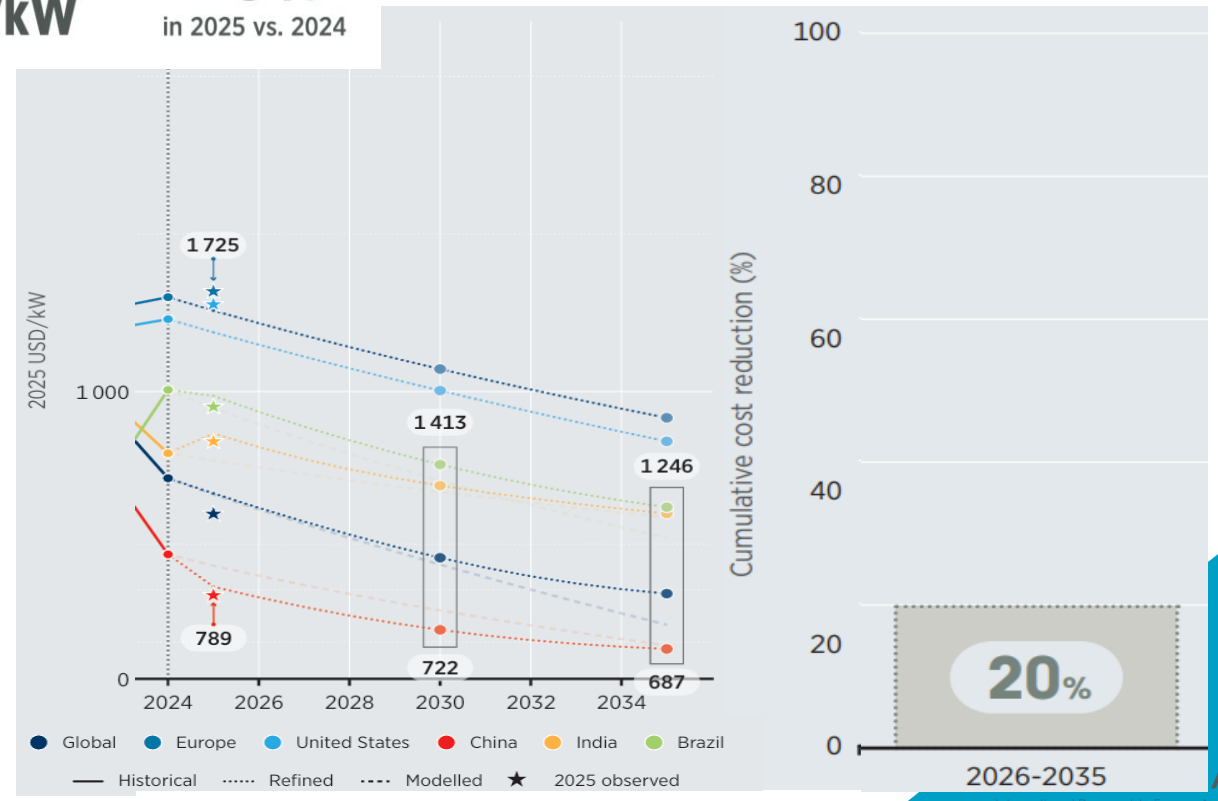
Global total installed costs for onshore wind in China fell to a record low of USD 789/kW in 2025; in Brazil, costs fell by 4%; in the United States, India and Germany costs rose by 3-7% compared to 2024.

	2025		
	5th percentile	Weighted average	95th percentile
	(2025 USD/kW)		
Africa	1 391	**1 550**	1 897
Eurasia	845	**1 397**	1 982
Europe	1 244	**1725**	2 380
Oceania	1 787	**1 787**	1 787
Other Asia	844	**1 713**	2 881
Other North America	1 623	**1 810**	2 250
Other South America	1 095	**1 314**	2 252
Brazil	1 016	**1 282**	1 516
China	553	**789**	1 163
India	782	**1 172**	1 301
Unitad States	1 014	**1 668**	2 672

USD 976/kW

-8% in 2025 vs. 2024

- Future cost declines depend on market reforms, efficient permitting, stable policy frameworks, revenue visibility and continued grid expansion.



Cost trends: Onshore Wind 2010-2025

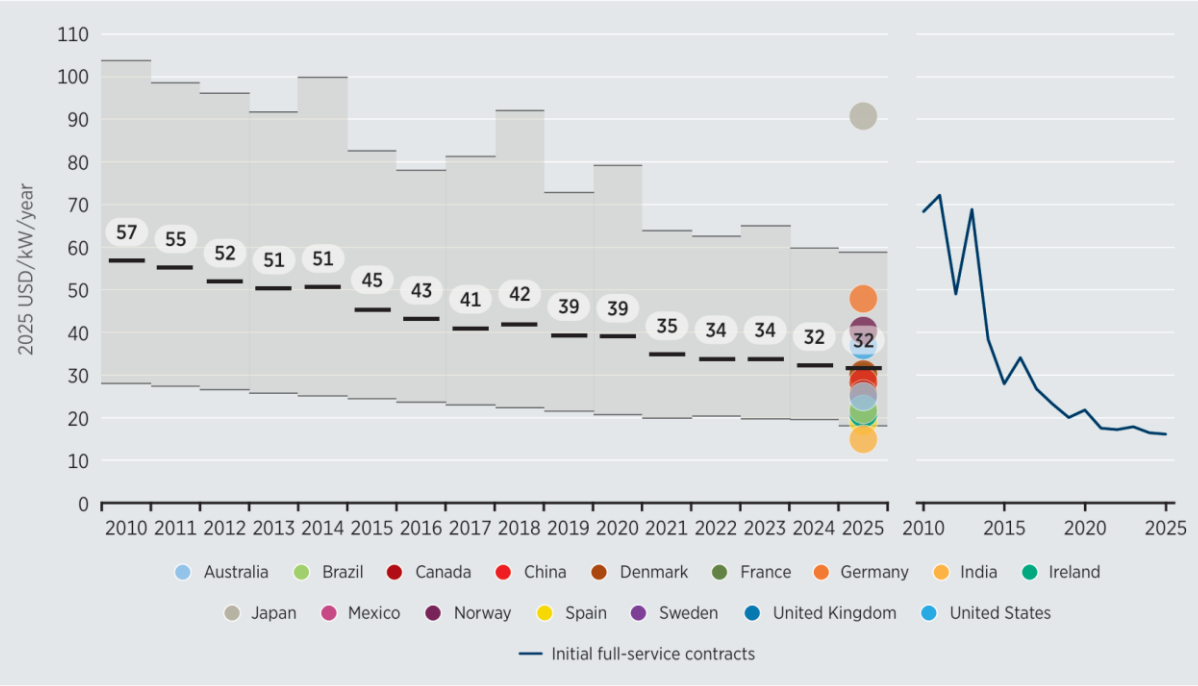
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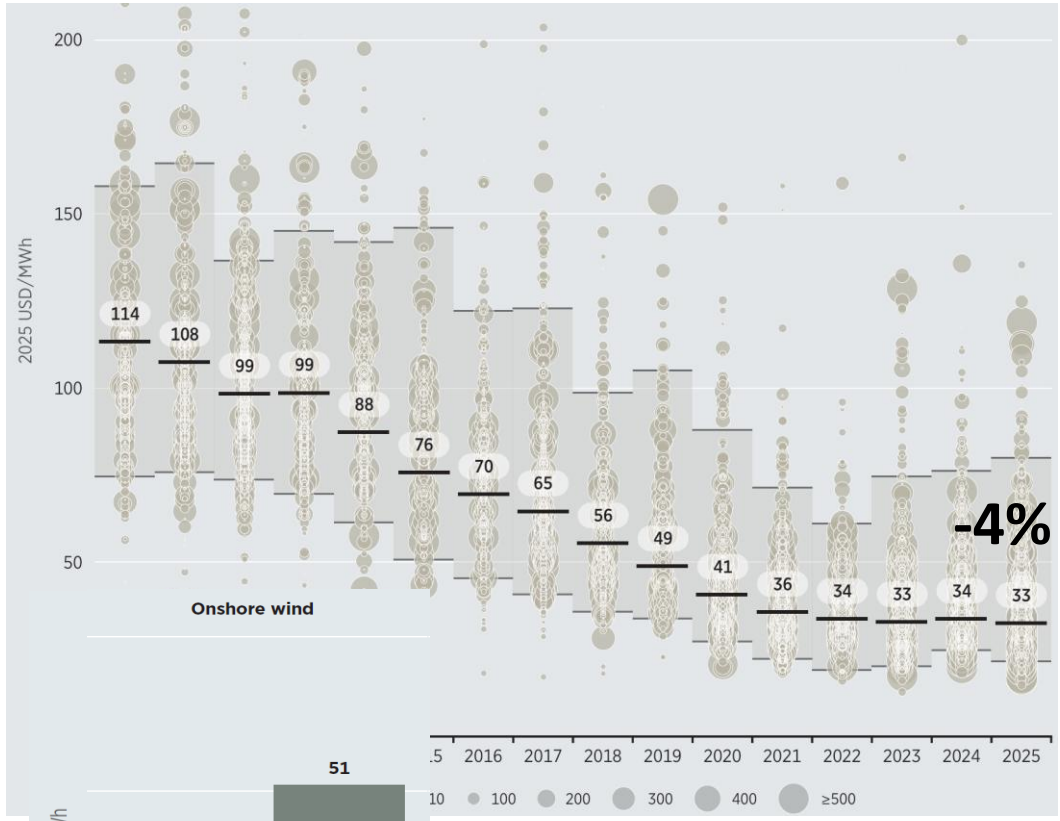
O&M

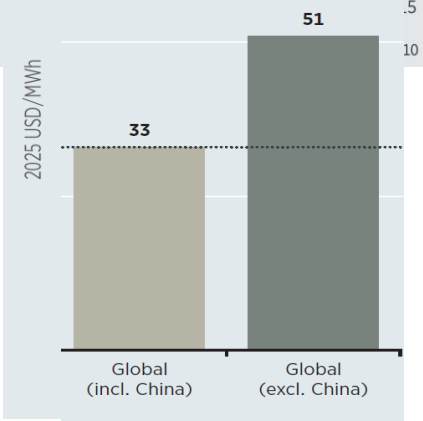
- Full-service contract prices **–76%** since 2010.
- 2025 range: USD 15 (India) to 91 (Japan) per kW/yr.
- Expected to stay stable as reliability improves.

LCOE

- **USD 33/MWh** in 2025 (–4% y-o-y).
- Where capital is expensive, financing can matter as much as equipment cost.







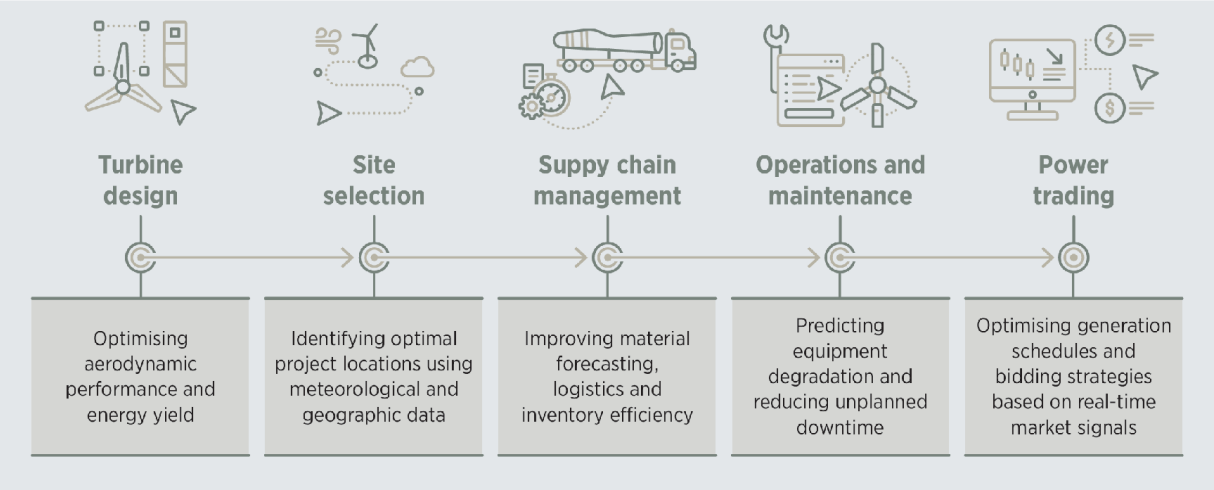
- Financing remains a key cost driver.

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Technology trends: Onshore Wind 2010-2025

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- **From upsizing to reliability:** project optimization and resilient supply chains. Wind turbine prices -> manufacturers are rebuilding margins.
- **AI-driven digitalisation:** from turbine design to market-responsive power trading
- **Co-location:** wind + storage or wind + solar + storage.





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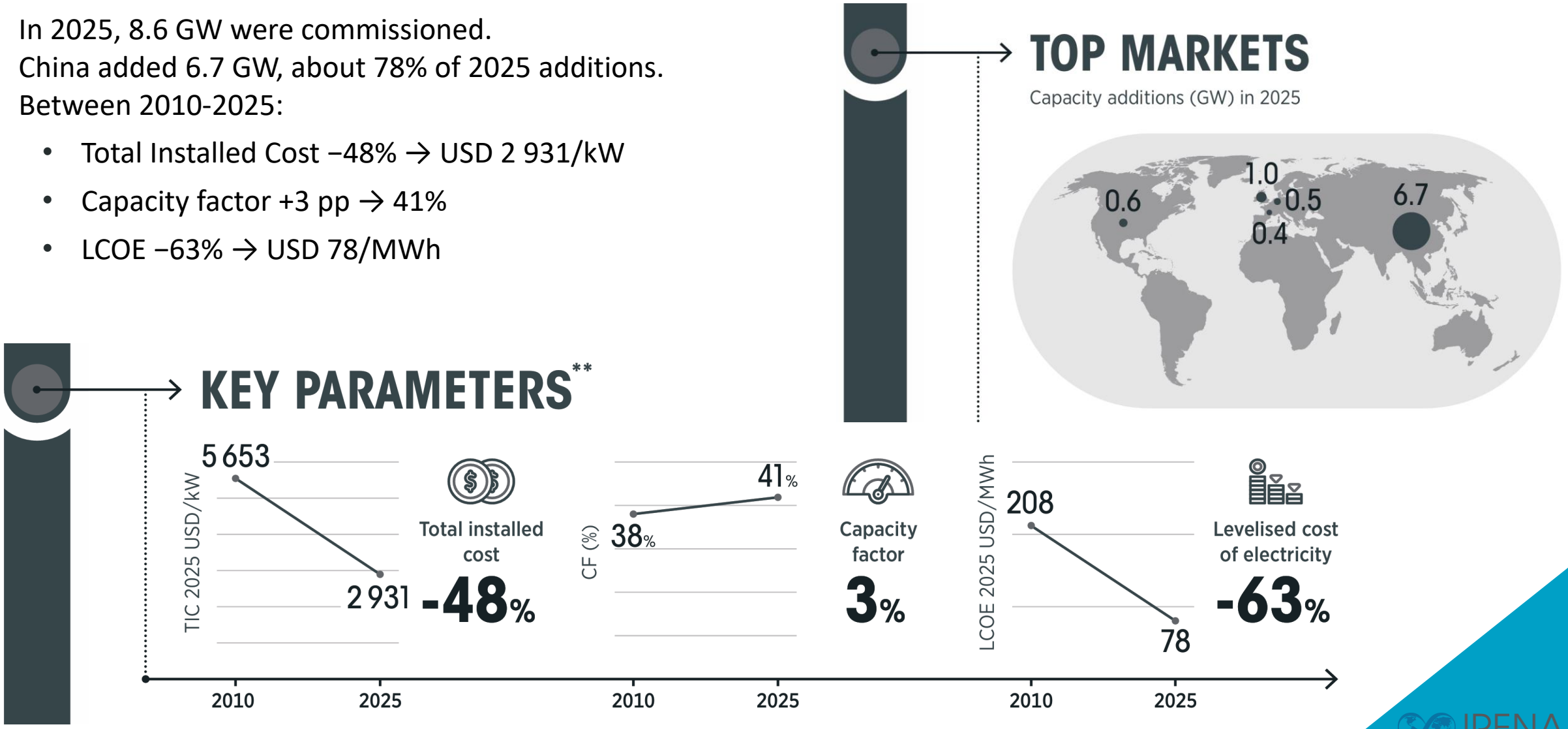
Offshore wind

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Key parameters: Offshore Wind 2010-2025

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- In 2025, 8.6 GW were commissioned.
- China added 6.7 GW, about 78% of 2025 additions.
- Between 2010-2025:
  - Total Installed Cost −48% → USD 2 931/kW
  - Capacity factor +3 pp → 41%
  - LCOE −63% → USD 78/MWh



Cost trends: Offshore Wind 2010-2025

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Total Installed Costs

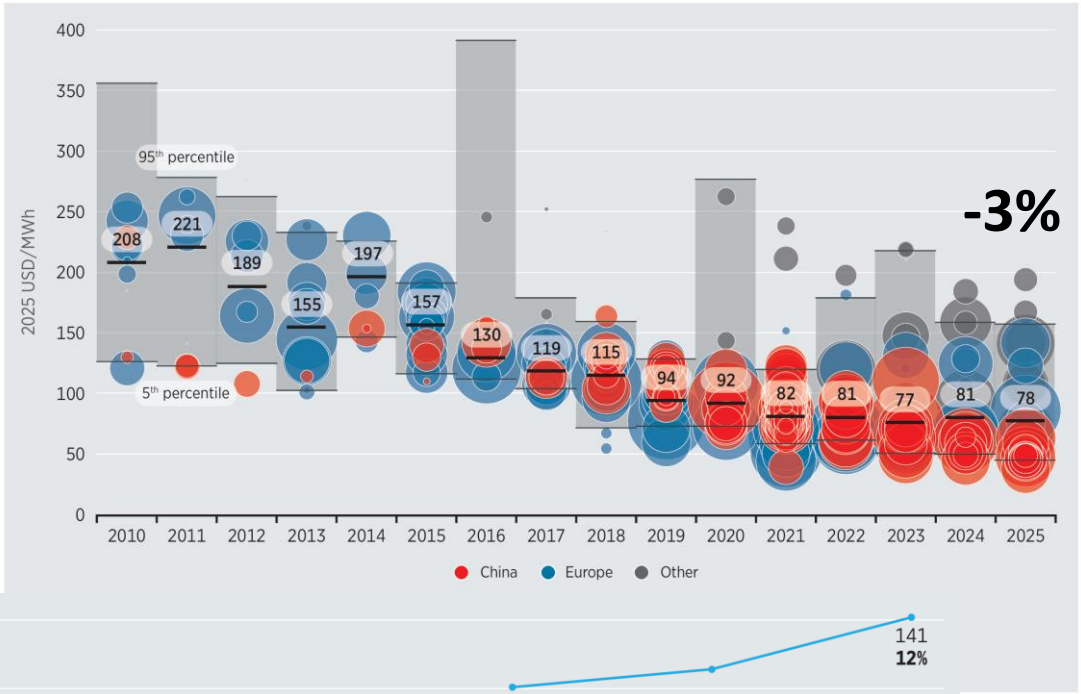
Asia had the lowest costs, led by China at USD 1 542/kW, followed by Europe and North America. Differences reflect market maturity, supply-chain development and project characteristics.

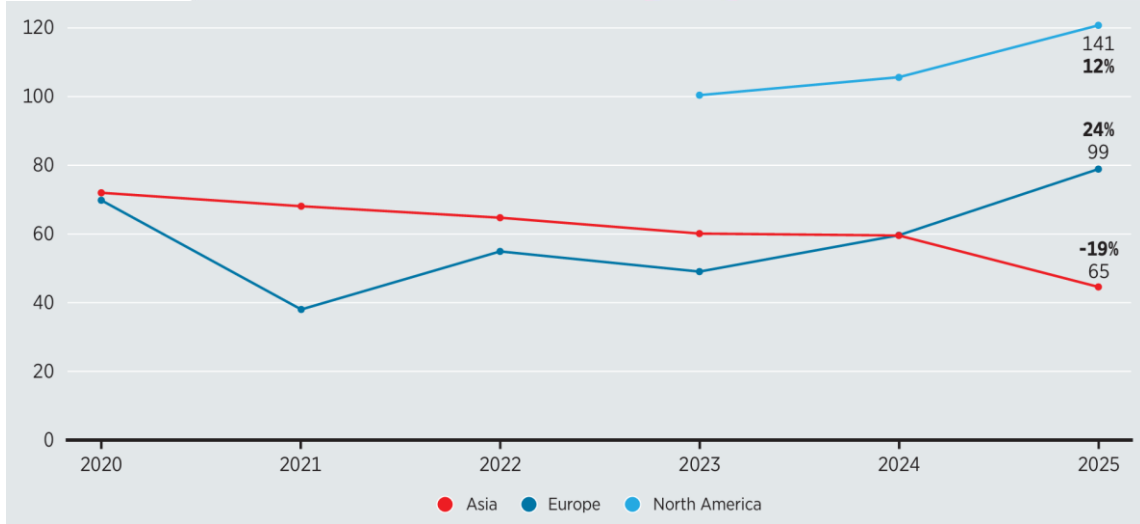


USD 2 931/kW

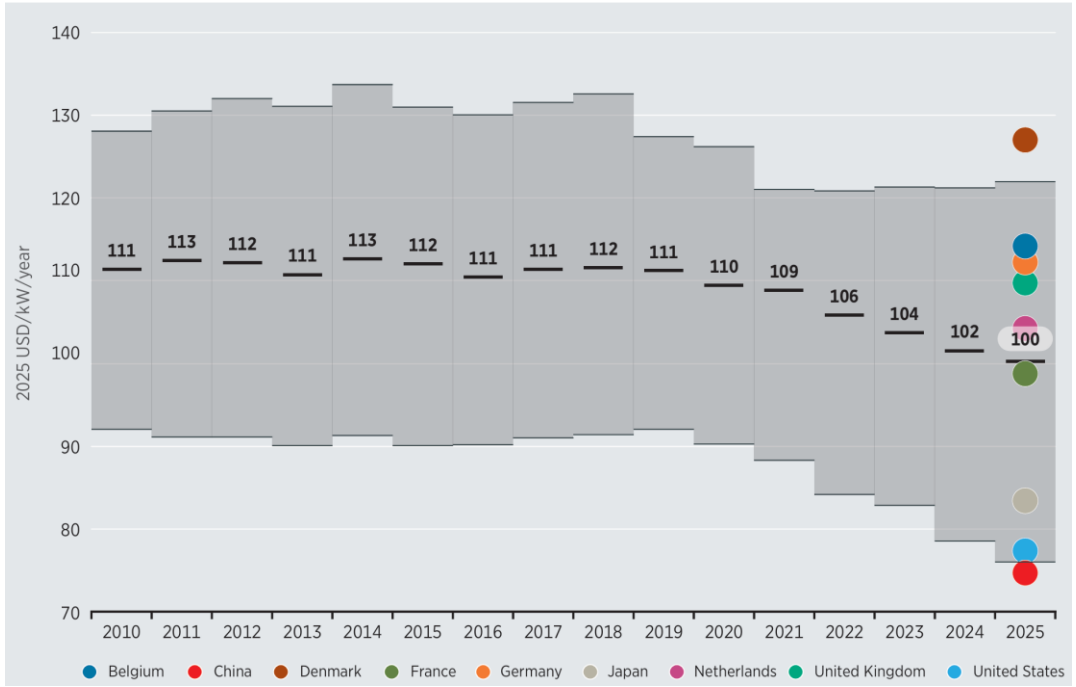
-0.3% in 2025 vs. 2024

LCOE





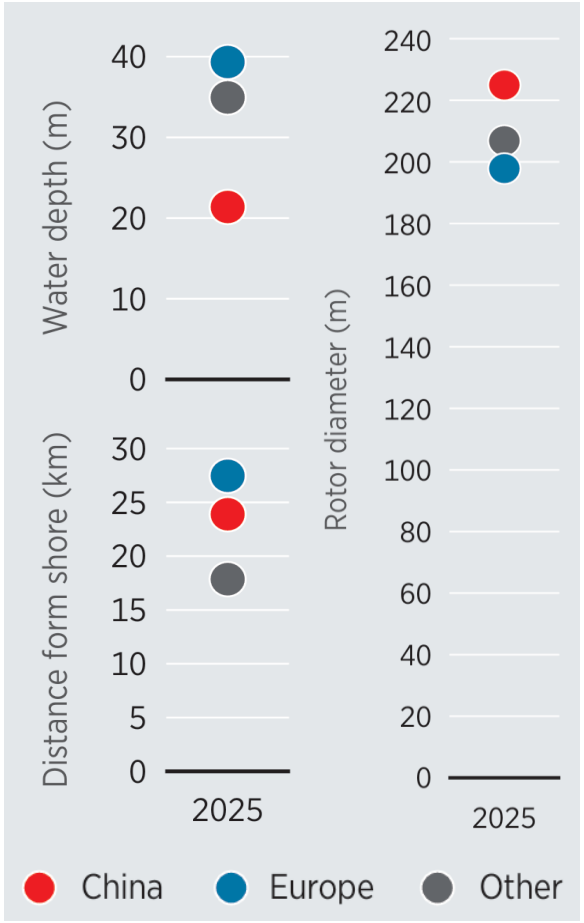
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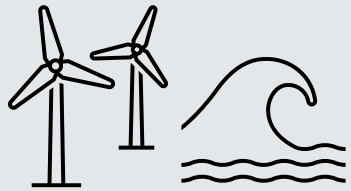
Technology trends: Offshore Wind 2010-2025

- Offshore wind: scaling up, deeper and farther from shore.
- Between 2010-2025:
  - Turbines 3.1 MW → 10.3 MW average; up to 16 MW in China.
- In 2025:
  - Water depth: China 21 m, Europe 39m, and RoW 35m.
  - Distance from shore: China 24 km, Europe 27 km, and RoW 18 km.
  - Rotor diameter: China 225 m, Europe 198 m and RoW 207 m.
- From upsizing to reliability.
- Outlook: Digital asset management, regional grid integration, innovative auction mechanisms, and floating wind technologies.



Floating offshore wind

- About 278 MW were operational globally in 2025, across >15 projects.
- Larger project pipelines, standardized project guidelines, clearer auction design and better permitting are needed.



RoW: Rest of the world

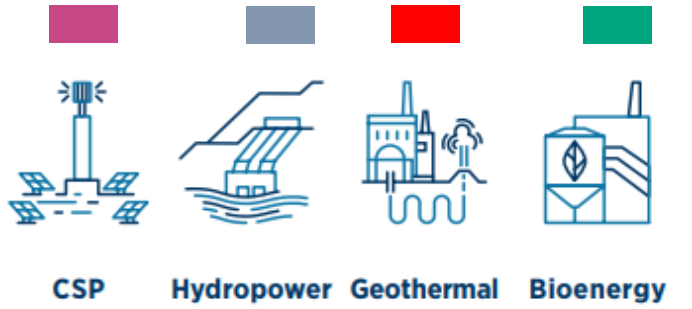
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Dispatchable renewables

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Costs and innovations across dispatchable technologies

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		CSP	Hydropower	Geothermal	Bioenergy
LEVELISED COST OF ELECTRICITY	2025 (USD/MWh)	115	62	89	86
	Change 2024-2025	9% ↑	9% ↑	53% ↑	-2% ↓
TOTAL INSTALLED COST	2025 (USD/kW)	2 418	2 079	5 997	3 606
	Change 2024-2025	-36% ↓	-10% ↓	46% ↑	9% ↑

- Costs for CSP reached low records; they exclusively represent costs in China - the only market with deployment in 2025.
- Higher-temperature receivers and improved thermal storage

- Higher LCOE, as lower total installed costs were offset by lower capacity factors resulting from operational design choices.
- Plant modernization, digital optimization, pumped-storage integration and operation flexibility.

- Cost trends largely influenced by the specific locations where projects are commissioned.
- Enhanced geothermal systems (EGS), advanced drilling technologies

- Higher total installed costs and capacity factors, driving a slight decline in the global weighted average LCOE.
- Sustainable feedstocks, advanced biofuels, carbon capture and storage, and waste-to-energy integration.

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Energy storage

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Global battery storage deployment

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The global energy storage market keeps growing



Capacity additions

reached 307 GWh in 2025
67% increase compared to 2024



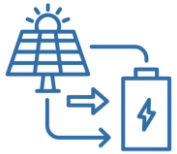
Market leaders

China (53%)
United States (17%)



Chemistry

Lithium-ion batteries lead utility-scale deployments



Co-location

25% of solar assets included co-located battery in 2025

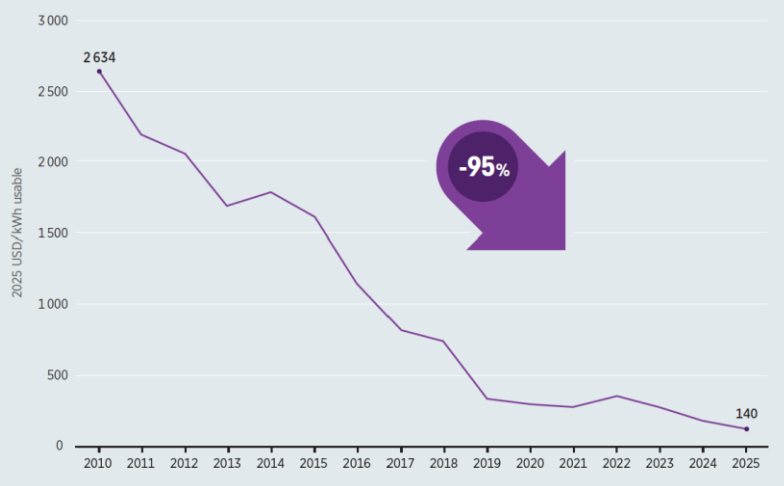
Growth drivers

- Declining storage costs accelerating hybrid projects
- Increased revenue streams (arbitrage, capacity markets)
- Reduced renewable curtailment
- Provision of grid services

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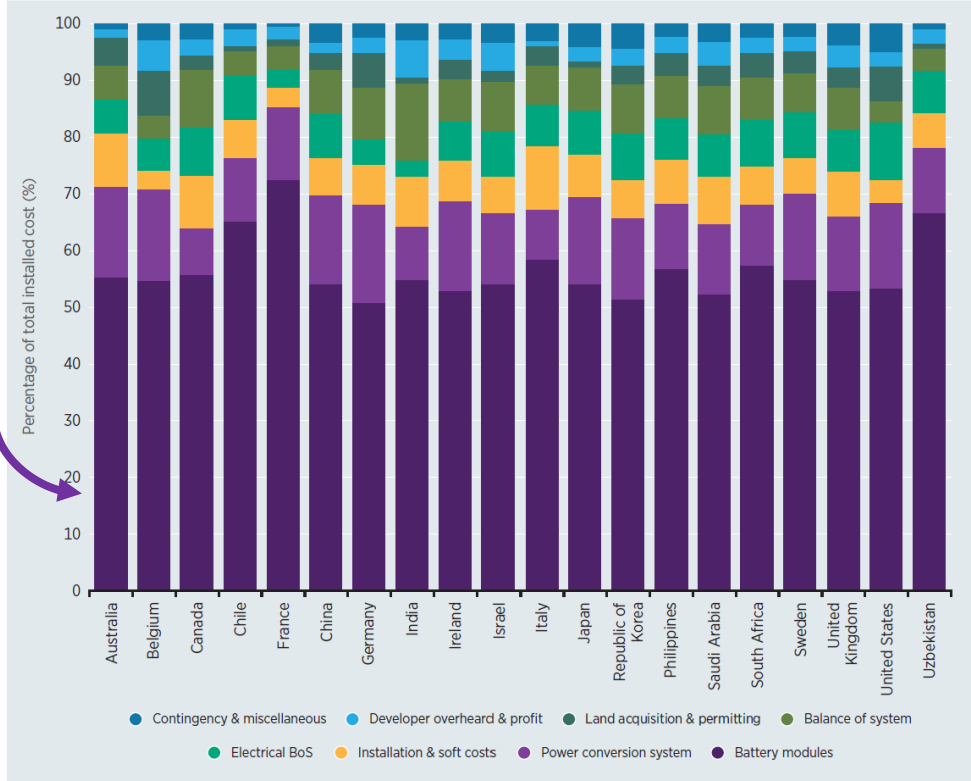
Utility-scale BESS deployment cost trends



Costs of installed energy storage fell by:

- -95% between 2010-2025
- 30% year-on-year

Battery modules dominate and represent 56% of TIC



Drivers for potential cost reduction:

- Lower soft costs: Faster permitting, lower overheads, and standardized project design
- Smarter integration: More efficient system design, faster construction, and smoother grid connection

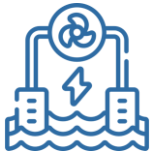
LDES reaches a strong growth momentum

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2 GW / 25 GWh added in 2025

China dominates, with the US following similar growth trends as seen in energy storage markets



Pumped hydro is the most competitive LDES technology and leads deployment

153 USD/kWh

the technology landscape includes
Vanadium redox flow batteries
Compressed Air Energy Storage (CAES) which is expected to overtake flow batteries in coming years

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Key takeaways

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1

Renewable power is increasingly cost-competitive

Technological improvements, economies of scale and deployment have driven substantial cost reductions.

2

The drivers of cost are becoming more diverse

Technology remains important, while financing, supply chains, storage, market design and other market conditions are increasingly relevant.

3

Co-location is becoming the standard

Co-location is no longer a niche approach. It is becoming an important model for new renewable projects.

4

Broader innovation can support cost reductions

Innovation in different areas will shape future cost trends and help sustain progress towards more reliable and affordable renewable energy across different markets.

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Q & A
5 min

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