

# **Solar Energy Cost**

Energy transition, Renewable energy, Renewables

# How did solar energy become the 'cheapest energy source in history'?



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Read Time

5 Min

# Lazard's Levelized Cost of Energy+ (LCOE+)



Levelized cost =

Total cost over lifetime

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Total energy over lifetime

With adjustments for net present value

Levelized Cost, cents/kWh

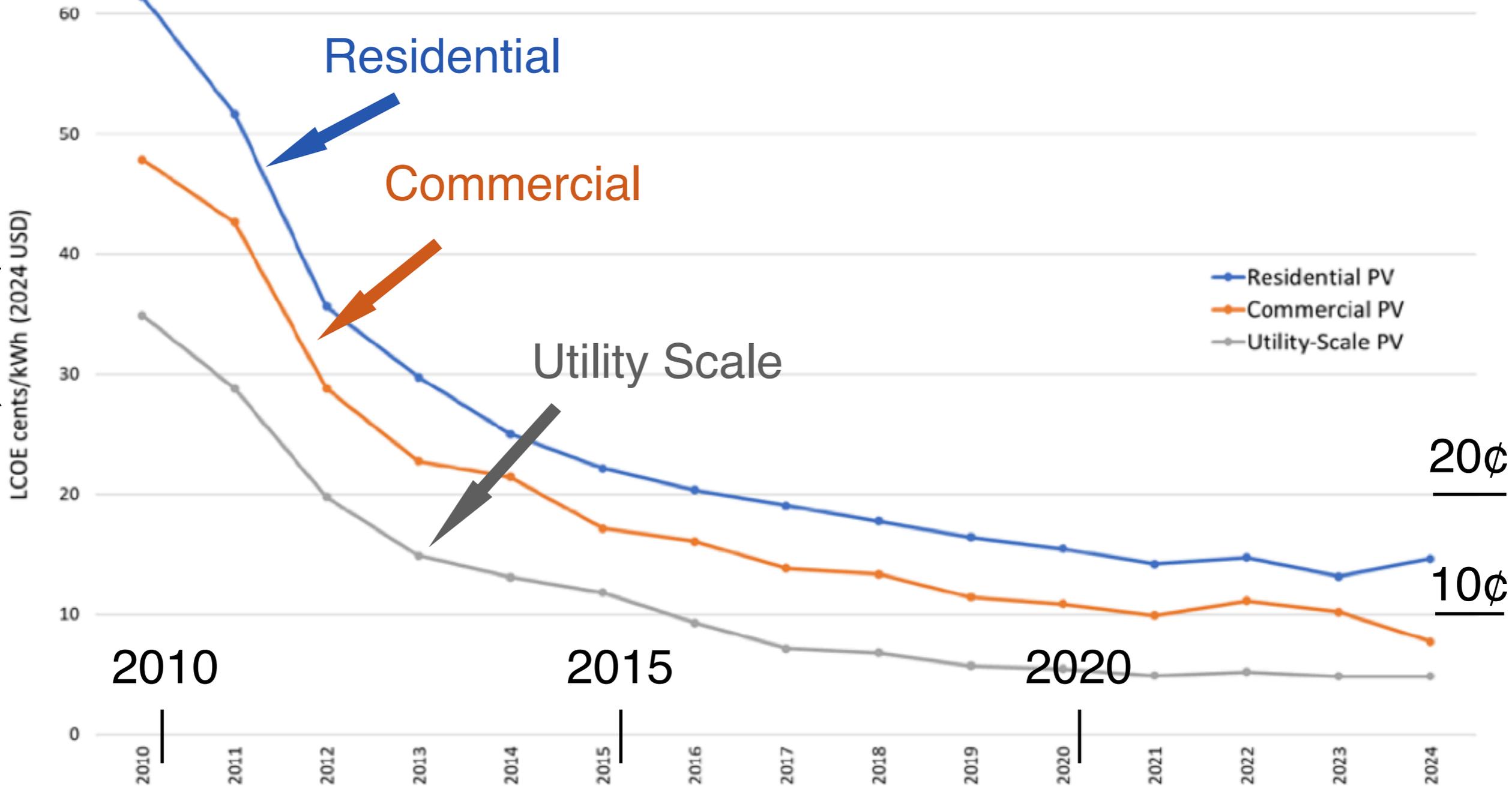


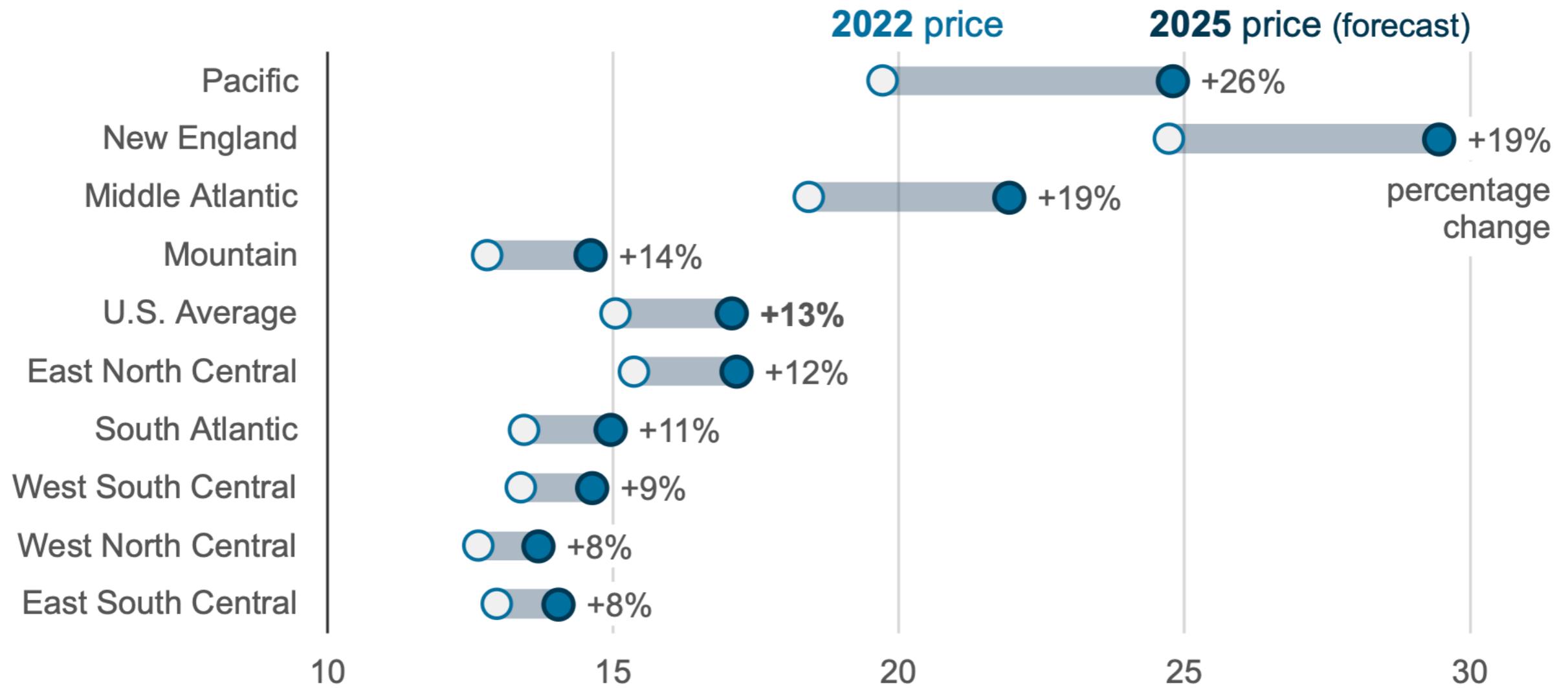
Figure ES-3. PV LCOE by sector, 2010–2024, in cents/kWh (2024 USD)

## Documenting 15 Years of Reductions in U.S. Solar Photovoltaic System Costs

Vignesh Ramasamy, Jarett Zuboy, David Feldman,  
Meenakshi Narayanaswami, Michael Woodhouse, and  
Robert Margolis

*National Renewable Energy Laboratory*

## Regional retail residential electricity prices (2022 and 2025) cents per kilowatthour



**Data source:** U.S. Energy Information Administration, *Short-Term Energy Outlook*, May 2025

**Data values:** U.S. Regional Electricity Prices to Ultimate Customers

From U.S. Energy Information Administration

## The Spearmint Energy Solution

Providing a double impact - a **profitable enterprise** while adding useful services to the grid.

The efficiency that optimization experts bring to support both supply and logistics helps the overall system run more smoothly, allowing more streamlined delivery and fewer disruptions in service. The same applies to storage.



Battery energy storage improves the reliability, resiliency, and safety of the grid.



Batteries are a clean alternative to peaking generation units, reducing CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, and particulate emissions.



Battery energy storage reduces wasted generation, especially from solar and wind resources.

# Battery energy storage in Texas

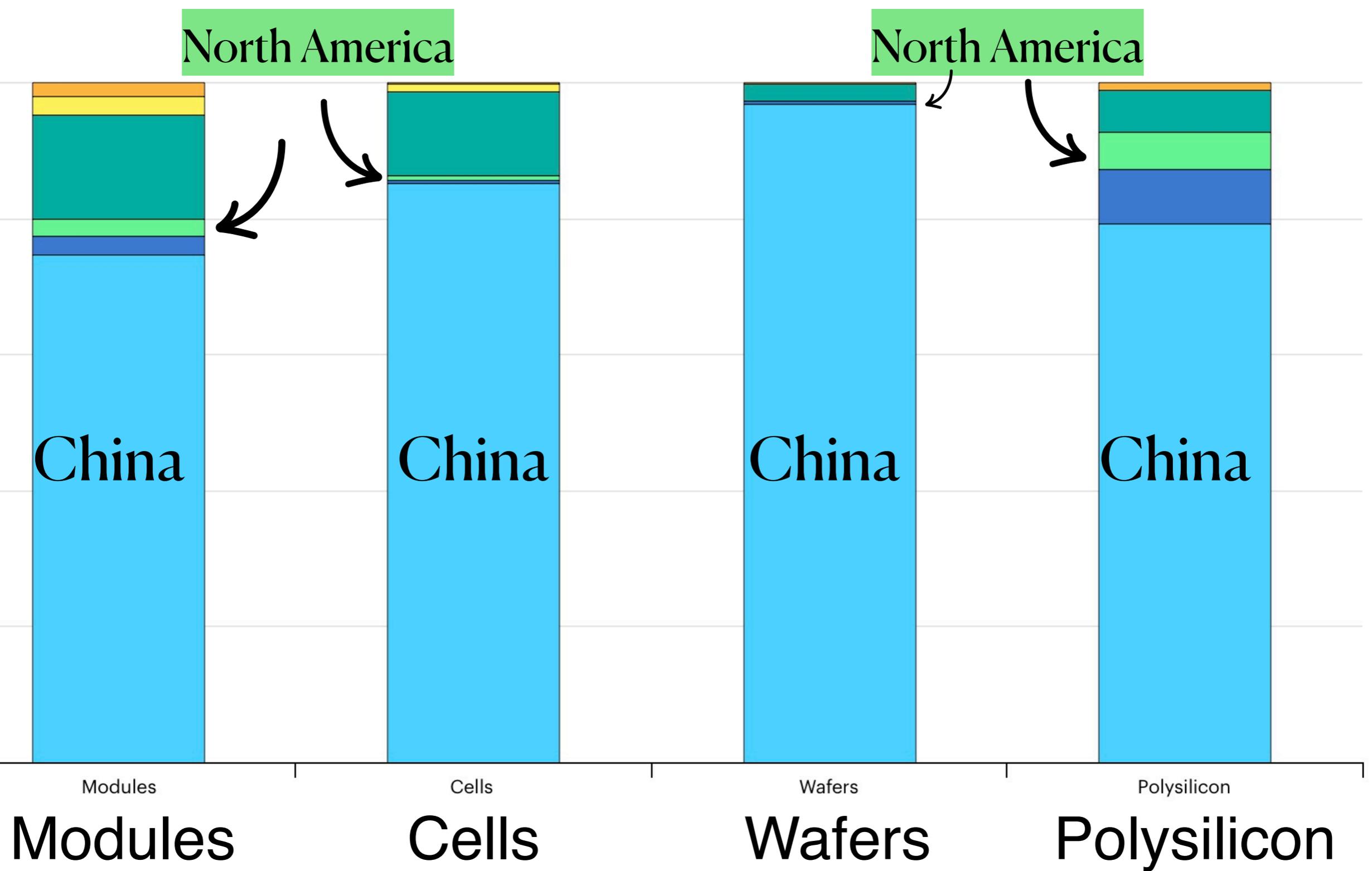
## Utility-scale batteries emerge as key to stabilizing energy grid

NOVEMBER 2024 | BY NATHAN GONZALES

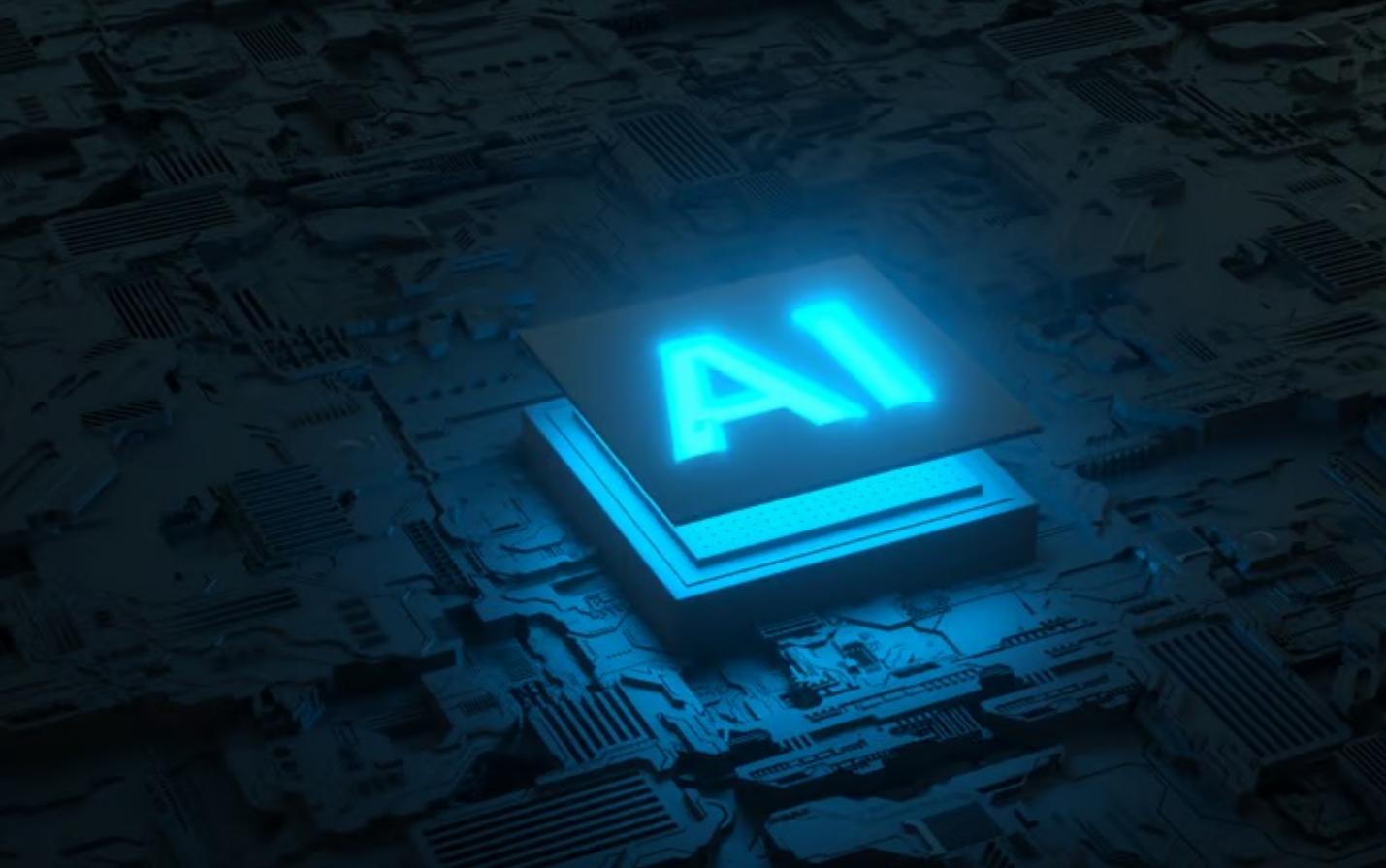


Revolution battery storage project in Crane County, Texas, is a large-scale battery energy storage facility developed, owned and operated by Spearmint Energy, designed to provide grid stability and support the integration of renewable energy sources in the region. It is one of the largest battery storage projects in the state, with a capacity of 150 megawatts and 300 megawatt-hours of storage. Photo courtesy of Spearmint Energy.

From [COMPTROLLER.TEXAS.GOV](https://COMPTROLLER.TEXAS.GOV)



IEA (2022), Solar PV manufacturing capacity by country and region, 2021, IEA, Paris <https://www.iea.org/data-and-statistics/charts/solar-pv-manufacturing-capacity-by-country-and-region-2021>, Licence: CC BY 4.0



Solar energy from photovoltaic cells is becoming more and more common, as the price is drops.

Financial advisors such as Lazard calculate a Levelized Cost of Energy to help investors decide what choices to make. This is the total cost over the lifetime of the electrical energy source, such as a solar panel, or natural gas plant, or whatever, divided by the total electricity produced. They adjust the price based on how much an investor would have to pay up front and how much is paid over time.

Data from the National Renewable Energy Laboratory show the leveled cost of solar energy has dropped dramatically over the last 15 years. As with most products, the bigger the scale, the better the price.

For comparison, the average retail price of electricity is about 15 cents per kilowatt hour, in the same range as solar energy. But the price of traditional energy is rising, while we can expect further improvements to lower the price for solar energy.

Obviously we need energy storage systems for solar energy, and there are many types in continued development. Companies such as Spearmint Energy are already making money by buying energy when it's cheap and selling it when it's more expensive.

Spearmint uses battery farms such as this one in Texas, near a major data center.

Now, who's getting the most benefit from solar panel technology? It appears to be China. At each phase of manufacturing, China is the dominant player.

Our future includes more and more use of electricity for Artificial Intelligence, Cryptocurrency, Electric Vehicles, and other technology. Maybe we should think about catching up with China.