Impact of reform to clean energy tax credits on investment, jobs and consumer bills

Public report | January 6, 2025

This independent report analyses the potential impact of reform to clean energy tax credits on investment, jobs, and consumer bills

AURORA

- The Inflation Reduction Act of 2022 (IRA) extended and expanded the Clean Energy Tax Incentives available to businesses, in particular the Investment Tax Credit (ITC) and the Production Tax Credit (PTC) for deploying renewables and storage technologies.
- This report quantifies the impacts of removing the ITC and PTC available for utility-scale onshore and offshore wind, solar PV and battery storage on investment, generation capacity, job creation, and wholesale and retail power prices between 2025 and 2040 across competitive power markets in the United States: ERCOT, CAISO, PJM, MISO, NYISO, ISO-NE and SPP.
- The analysis in this report is based on Aurora's modeling of two distinct scenarios: the base case, where tax credits are continued, and the Tax Credit Removal scenario where the ITC and PTC are removed for wind, solar and battery deployment. See more details in the Appendix.

Study limitations

- All analysis in this report address dynamics within the seven competitive wholesale electricity markets—representing around two-thirds of total US power consumption – and excludes regulated regions such as the WECC[1] and the SERC[2] in western and southeastern states.
- Results are likely to be a conservative estimate of the impact on investment, jobs, and clean tech deployment. The study focuses only on wind, solar and storage ITC/PTCs. Other clean energy policies (e.g. support for electric vehicles, hydrogen, CCS), behind-the-meter projects, and the potential impact on other sectors like manufacturing were not considered as part of the project scope.

About Aurora Energy Research

- Aurora Energy Research is a leading global provider of independent power-market forecasts and analytics for critical investment and financing decisions.
- This report is fully independent, technology-agnostic, and does not advocate for any specific policy or regulation.

1) Western Electricity Coordinating Council. 2) Southeastern Electric Reliability Council.

Executive Summary

AURORA

1 **Across US competitive electricity markets[1], the removal of tax credits for wind, solar, and battery deployments could result in at least $336bn less investment and 237GW less clean energy deployed over the next 15 years – all amid rapidly growing electricity demand.**

- Rapid electricity demand growth data centers and electrification across the US is driving a need for new generation capacity. Clean energy deployment averaged 25GW per year for the last five years.
- On an absolute basis, New York and Texas are the states that see the largest decline in clean energy investment—losing $4.4bn/year and $3.3bn/year on average through 2040, respectively.
- In relative terms, the removal of tax credits impacts investment in the Great Plains and Midwest most acutely, where total foregone clean energy investment exceeds 3% of 2023 state GDP.

2 **Decreased capacity would result in 97,000 net fewer American jobs created in construction, maintenance, and operations of power generation facilities.**

- Utility-scale renewables employed over 150,000 people across the United States in 2023. The clean energy job sector grew 4.2% from 2022 to 2023.
- Elimination of tax credits costs at least 103,000 full-time jobs across clean energy generation technologies. This is only partially offset by an increase in 6,000 fossil fuel jobs, resulting in a net loss of 97,000 energy jobs.
- These estimates are likely conservative since they do not capture indirect impacts (e.g. resulting from higher power prices) or the impact on regulated regions covering a third of the country's electricity demand.

3 **Removal of tax credits increases residential electricity bills by 10% on average, and up to 22% in certain states by 2040.**

- On average, annual power bills increase $142/year for consumers by 2040.
- Bills are expected to rise most sharply in states where average residential power prices are already high, like New York ($39/month increase) and Minnesota ($22/month increase), but also in states where residential energy demand is highest, such as Texas ($29/month increase) and Louisiana ($21/month increase).

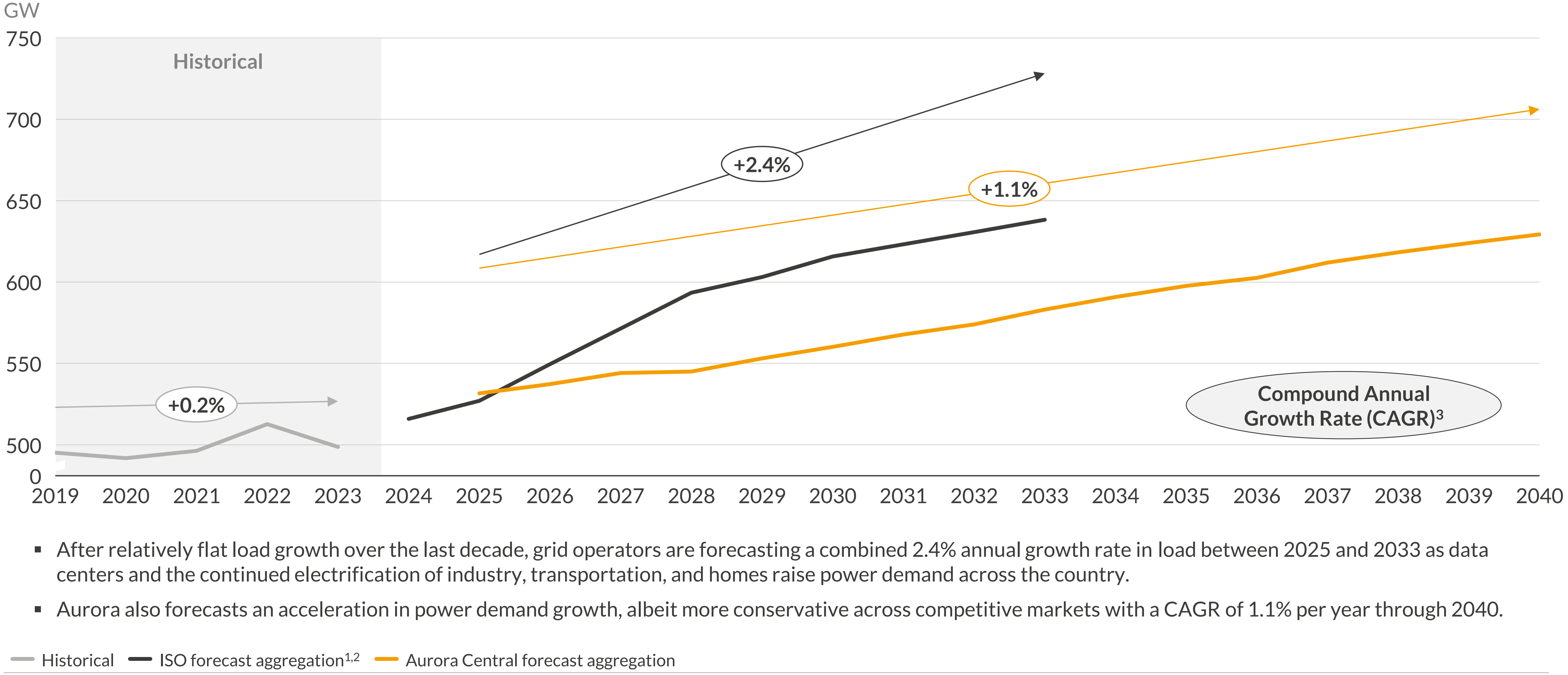
1) CAISO, ERCOT, ISO-NE, MISO, PJM, NYISO, SPP.

Sources: Aurora Energy Research, ERCOT

Accelerating power demand growth from electrification and data centers is driving the need for new generation capacity across the United States

AURORA

Historical and forecasted peak load, aggregated across the seven competitive Independent System Operators (ISO)[1,2]



- After relatively flat load growth over the last decade, grid operators are forecasting a combined 2.4% annual growth rate in load between 2025 and 2033 as data centers and the continued electrification of industry, transportation, and homes raise power demand across the country.
- Aurora also forecasts an acceleration in power demand growth, albeit more conservative across competitive markets with a CAGR of 1.1% per year through 2040.

1) CAISO, ERCOT, ISO-NE, MISO, PJM, NYISO, SPP. For more details on ISOs, see appendix. 2) SPP short-term load forecast is available through 2029; values are extrapolated linearly through 2033 here to match data availability from other ISOs. 3) Annualized average rate of growth.

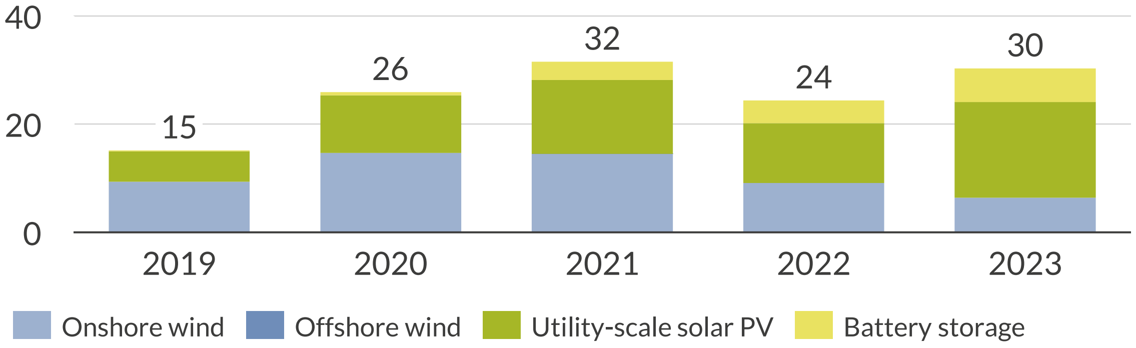
Sources: Aurora Energy Research, historic data and ISO forecasts come from respective ISOs

In the last five years, 127GW of clean energy has been deployed across the US, bringing with it new jobs and contributing to stable electricity prices

AURORA

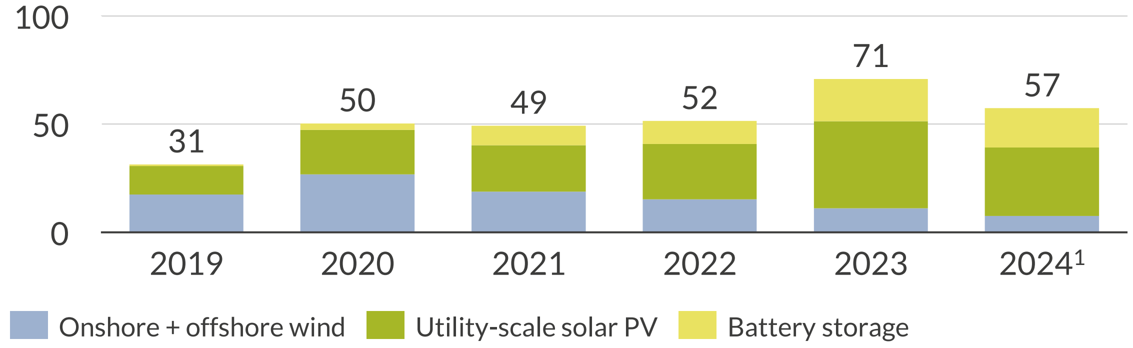
1 127GW of utility-scale wind, solar, and battery storage have been deployed since 2019 across the US, aided by federal tax credits

Annual US-wide clean energy deployment by technology
GW



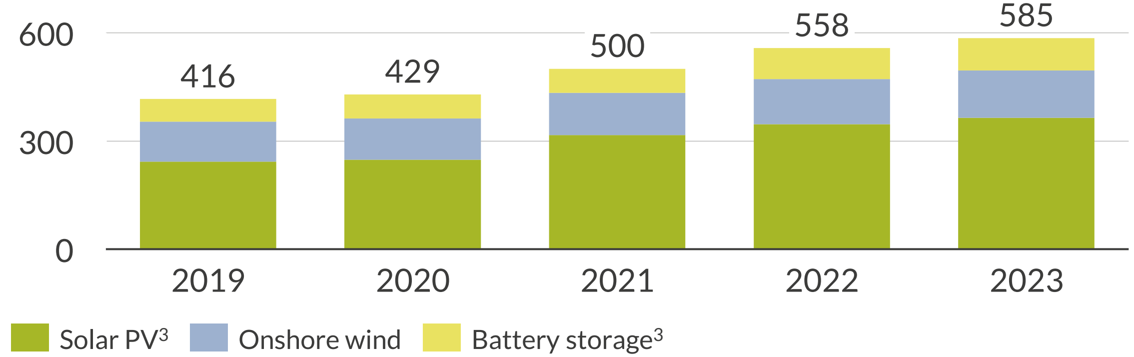
2 Over $300bn in public and private investments have been made in wind, solar, and storage deployments since 2019

Actual clean energy investment by technology[4]
$ billion (2023 real)



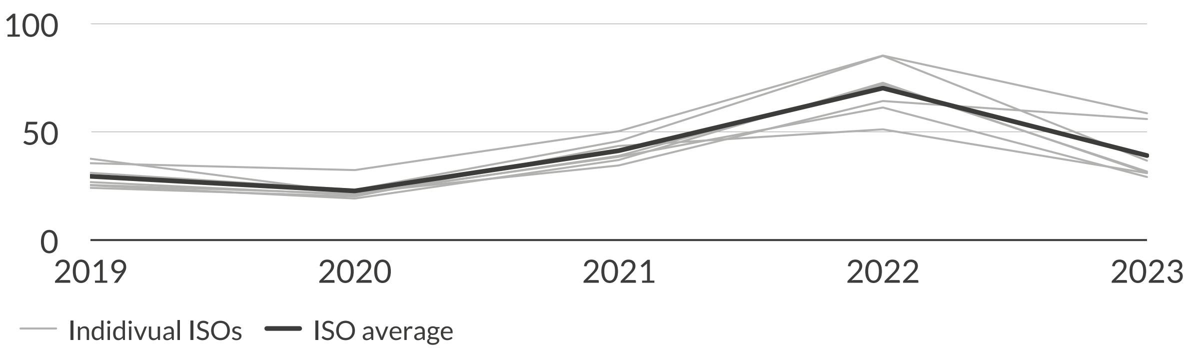
3 Clean energy jobs have grown in line with investment, growing to 54% of total electric power jobs in 2024

Full-time jobs by technology[4]
Thousands of jobs



4 Electricity prices have remained relatively flat over the past five years, due in part to rapid renewables penetration and limited load growth

Day-ahead wholesale electricity prices by ISO[2]
$/MWh (nominal)



1) 2024 data through end of Q3. 2) To increase readability, this graph excludes February 2021 prices in ERCOT, when Winter Storm Uri skyrocketed average day-ahead wholesale prices to $1,483/MWh. Including February, average 2021 day-ahead wholesale price in ERCOT was $155/MWh. 3) Includes both utility-scale and residential / behind-the-meter capacity. 4) These numbers do not include the investment or jobs in manufacturing for these technologies.

Sources: Aurora Energy Research, Rhodium, EIA, individual ISOs, US Department of Energy

In this study, Aurora modelled the seven competitive power markets in the US to explore the impact of tax credit removal on generators and consumers

Aurora base case assumptions and Tax Credit Removal scenario methodology

Key assumption	Aurora Base Case	Tax Credit Removal scenario
Capacity build	▪ Aurora's production cost and capacity expansion modelling yields detailed forecasts for plant-level economic build and retirements out to 2060 across competitive wholesale markets, with all assets meeting a target rate-of-return.	▪ Tax credit removal impacts project economics. For a view on state capacity in states covered by multiple ISOs, we take a non-urban node distribution as proxy.
Investment	▪ Calculated based on project CAPEX for new build assets.	▪ Impact of capacity build across competitive markets is translated into investment impact in all states building solar PV, onshore and offshore wind, or BESS.
Jobs	▪ Data from industry publications[1] and academic research are used to estimate job creation per MW of installed capacity by technology.	▪ Capacity changes relative to the base case are translated into increases and decreases in jobs by technology.
Electricity prices	▪ Hourly wholesale prices are modelled out to 2060 across competitive electricity markets (Independent System Operators – ISOs) internally consistent with capacity build.	▪ Historical data from EIA are used to correlate wholesale and residential electricity prices from 2014-2023. This correlation is applied to Aurora's forecasted wholesale prices to project retail rate impacts by state. For a view on wholesale electricity prices in states covered by multiple ISOs, we take a load distribution as proxy.
Load growth	▪ Aurora takes a comprehensive view on load growth across the modelled ISOs, considering population growth, electrification (of transportation, heating, oil and gas operations, etc.), and data center expansion.	▪ No changes to load assumptions in the Tax Credit Removal scenario.
Tax credits	▪ Aurora assumes all clean energy projects achieve base PTC and ITC rates; Energy Community adder depends on project location. Credit stepdown in the mid 2030s reflects policy uncertainty. *See appendix slide for more details.*	▪ PTCs and ITCs for wind, solar, and batteries are discontinued in 2025; safe harbor assumptions means projects under construction today can still receive tax credits, but no projects beyond this time frame receive tax credits. *See appendix slide for more details.*

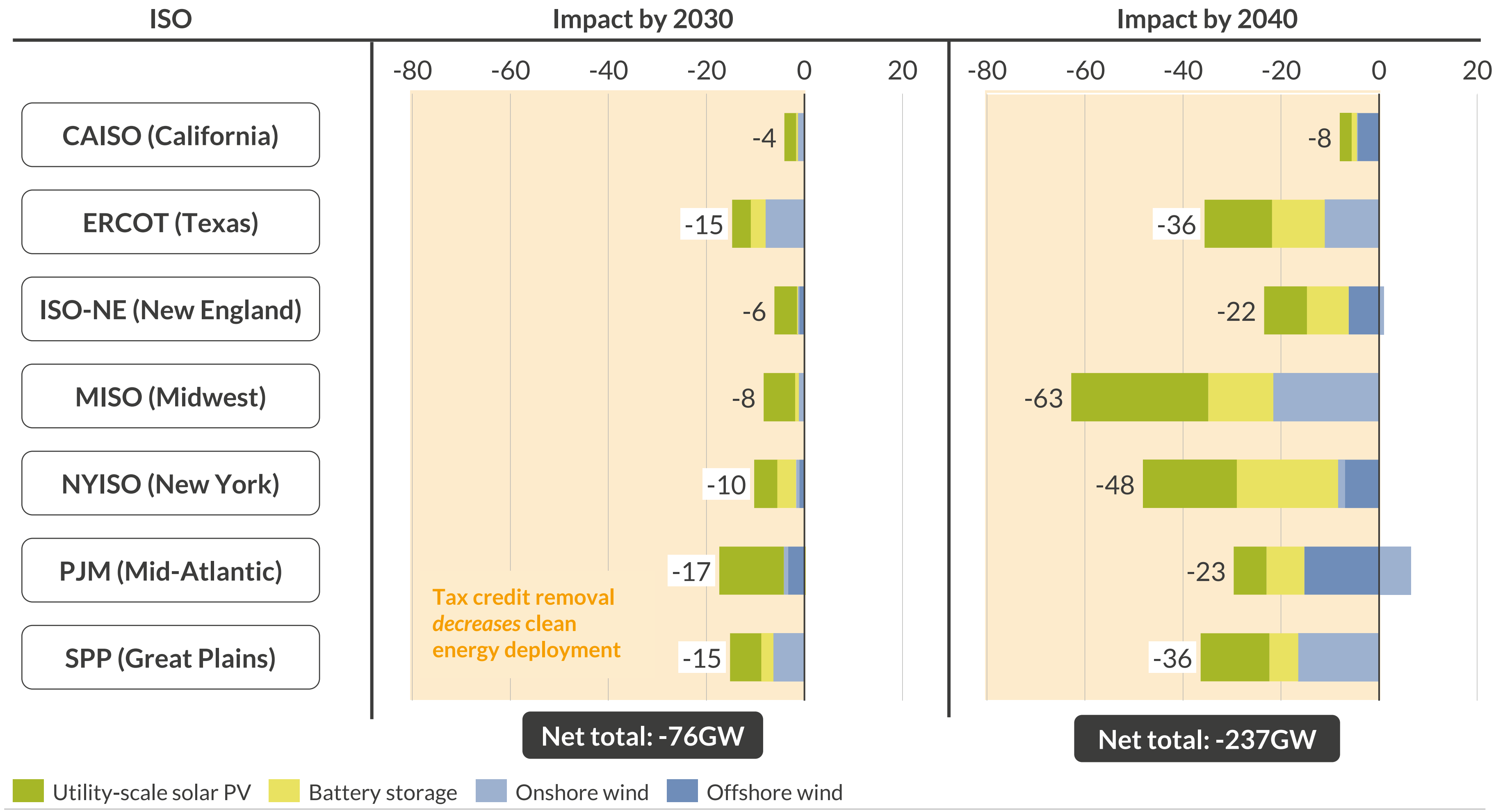
1) Including the DoE's US Energy Employment and Jobs Report.

Sources: Aurora Energy Research, EIA, US Department of Energy

A rollback of federal tax credits could reduce clean energy deployment 76GW by 2030 and 237GW by 2040

AURORA

Cumulative capacity delta to base case resulting from tax credit removal by ISO (Independent System Operator)
GW



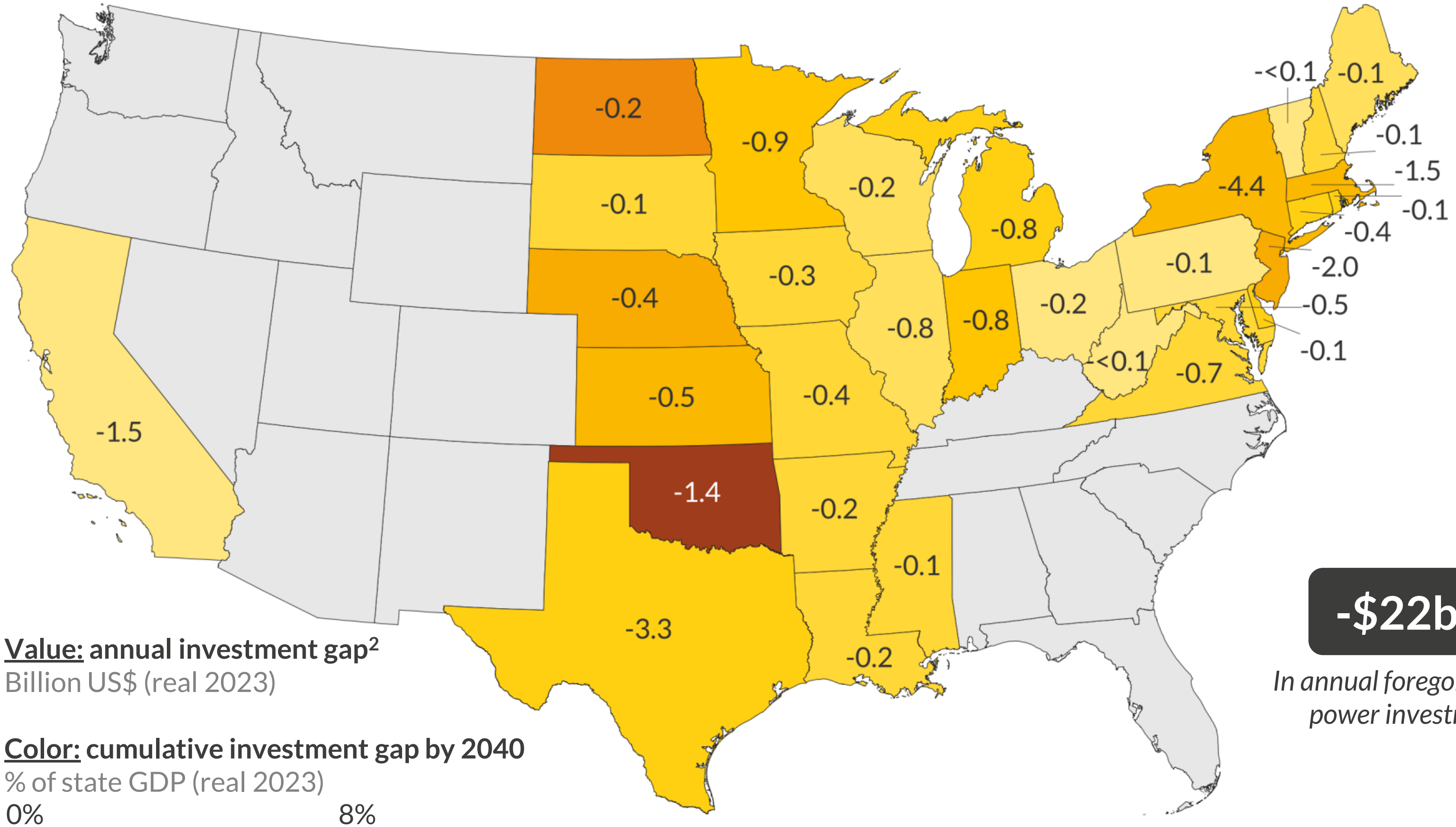
- Across competitive electricity markets in the United States, 76GW less clean energy projects are deployed by 2030 in a world without tax credits supporting the deployment of solar PV, wind, and battery storage technologies, and 237GW by 2040. Compared to the 256GW of capacity operational in 2023, this is a substantial reduction in future growth.
- Utility-scale solar PV is most impacted by the discontinuation of tax credits, seeing 41GW less buildout by 2030 and 93GW less by 2040.
- Offshore wind capacity is reduced 33GW by 2040; this affects coastal regions, where state support for offshore wind deployment is insufficient to make up for loss of federal support.

Sources: Aurora Energy Research

Removal of tax credits could lead to a loss of $22bn/year in clean power investment

AURORA

Investment gap for clean power deployment[1], Tax Credit Removal scenario relative to base case



-$22bn

In annual foregone clean power investment

Value: annual investment gap[2]
Billion US$ (real 2023)

Color: cumulative investment gap by 2040
% of state GDP (real 2023)
0% 8%

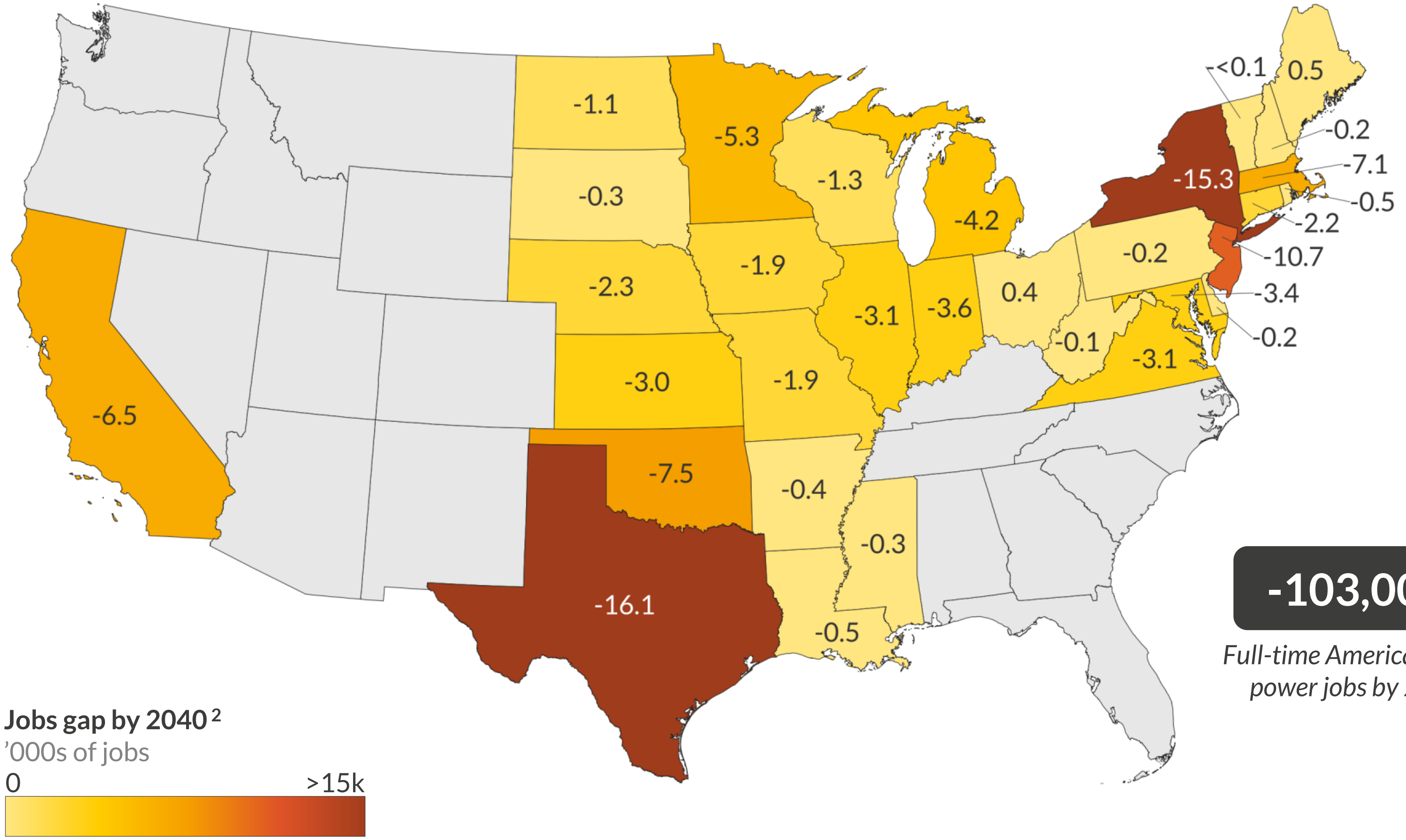
- ISO-wide investment in battery storage, solar, and wind projects totalled $57 billion in Q1-Q3 of 2024.
- Texas saw $24.8 billion, or 1% of state GDP, invested in the last 4 quarters alone. Tax credit removal would cut investment by twice that amount by 2040.
- New York and Texas alone would lose out on $116bn in investment, or 34% of the total.
- Cumulative investment lost in the Great Plains states is between 3 and 5% of 2023 GDP, and as much as 8% in Oklahoma.
- These numbers do not include the impact on investment in manufacturing of wind, solar and battery technologies.

1) Analysis available for deregulated wholesale markets covering 31 states and the District of Columbia. Includes impact to deployment of utility-scale wind, solar, and battery storage systems; excludes impact to manufacturing sector. 2) Delta with Aurora baseline forecast for 2025-2040.
Sources: Aurora Energy Research, Rhodium Group-MIT/CEEPR Clean Investment Monitor

Elimination of tax credits for wind, solar, and battery deployment puts at risk 31,000 jobs by 2030 and at least 103,000 jobs by 2040

AURORA

Jobs gap for clean power deployment by 2040[1,2]



-103,000

Full-time American clean power jobs by 2040

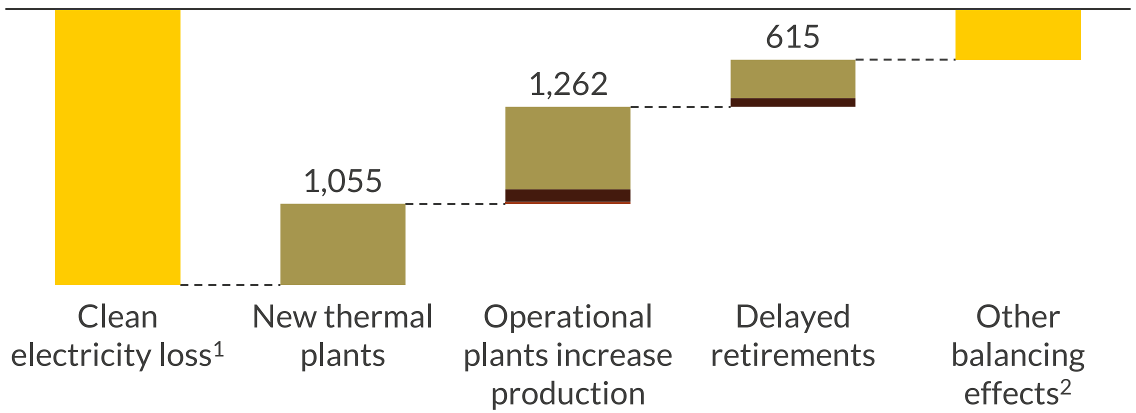
- Utility-scale wind, solar, and battery technologies employed over 150,000 people across construction, maintenance and operation, and professional services in 2023.
- Jobs in clean energy grew 4.2% from 2022 to 2023, more than double the speed of the overall economy at 2.0%.
- Cutting tax credits would be equivalent to 3+ years of lost jobs growth in American clean energy deployment and maintenance.
- These numbers do not include the impact on jobs in manufacturing of wind, solar and battery technologies.

1) Analysis available for deregulated wholesale markets covering 31 states and the District of Columbia. Includes impacts on construction and operation of utility-scale wind, solar, and battery storage systems; excludes impacts on manufacturing sector. 2) Delta with Aurora baseline forecast for 2040, assuming constant relationship between new capacity and job creation.
Sources: Aurora Energy Research, US Department of Energy, IWEC, GWEC, Aldieri et al. (2020)

Job losses are partially offset by a 6,000 increase in the fossil fuel sector, though not enough to make up for the 103,000 clean energy jobs lost

AURORA

Electricity production comparing Tax Credit Removal scenario to base case (2025-2040), TWh

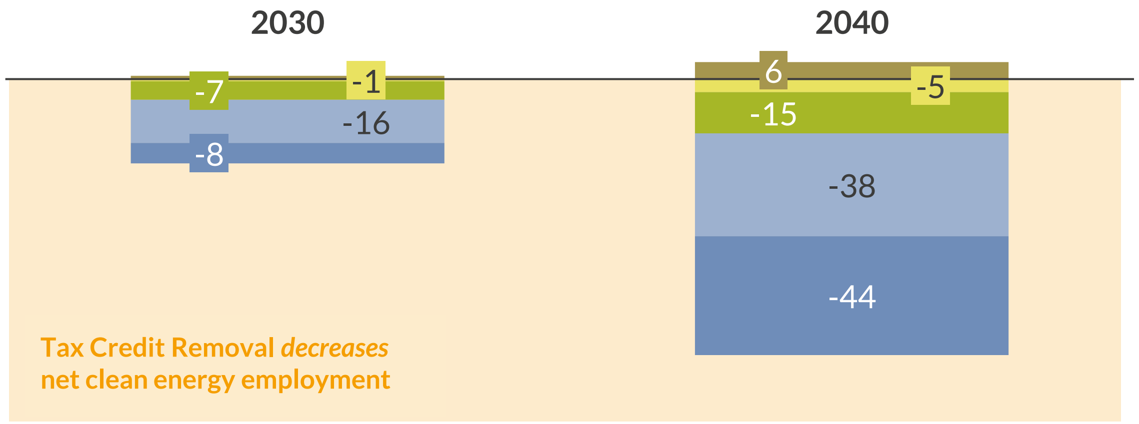


Fossil fuel job impact	4,000 new jobs	No impact	2,000 jobs retained

- The loss in clean electricity generation from the discontinuation of tax credits means that demand must be met in other ways, primarily through fossil-fuel fired generation such as natural gas and coal.
- Most demand is made up through more production from existing plants (35%), meaning these plants are running for longer hours and/or at higher output levels. Some projects that retired in the base case scenario see longer lifetimes in Tax Credit Removal scenario because of more favorable economics due to clean energy decline (making up 17% of lost generation), and the rest is made up for by new build thermal plants (29%).

Gas | Coal | Nuclear

Job impact by technology in Tax Credit Removal scenario relative to base case
Thousands of jobs



Net energy job impact	-30,000 lost jobs	-97,000 lost jobs

- The increase in fossil-fueled fired generation lends to more jobs, though not enough to make up for the loss of clean energy jobs.
- Higher load factors from operational plants results in minimal new jobs, construction of new thermal plants altogether create four thousand new jobs.

Battery | Onshore wind | Gas-fired generation
Solar | Offshore wind | Coal-fired generation

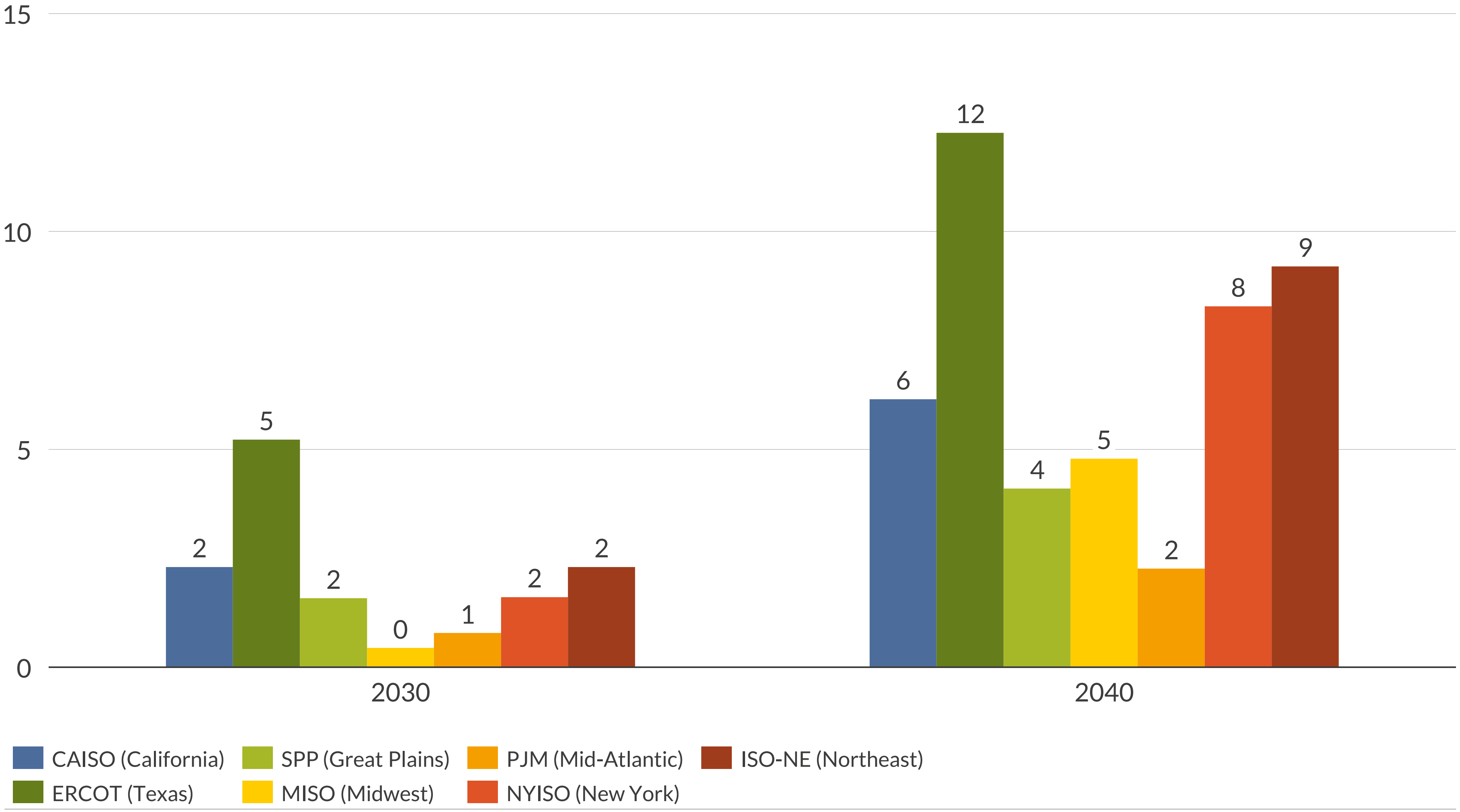
1) The reduction in onshore wind, offshore wind, and solar PV generation in the Tax Credit Removal scenario relative to base case. 2) Other balancing effects include increased generation from dispatchable non-gas, coal, or nuclear plants (e.g. hydro), reduced battery storage losses from less battery storage on the system, reduced demand from price-responsive demand technologies (such as Bitcoin mines in ERCOT).

Sources: Aurora Energy Research, EIA

Removal of tax credits leads to higher wholesale power prices across markets

AURORA

Around the Clock (ATC) price deltas by US ISO, Tax Credit Removal scenario relative to base case
$/MWh (2023 real)



- The elimination of tax credits for renewables and storage deployment results in wholesale power prices rising across every competitive market throughout the next two decades.
- ERCOT (ISO covering the majority of Texas) is disproportionately impacted by tax credit removal. Given high load growth in the state and a lack of state policies supporting clean energy deployment the state loses a lot of cheap electricity generation, raising wholesale electricity prices by $5/MWh by 2030 and $12/MWh by 2040.
- Wholesale power prices rise much faster through the 2030s due to lower investment in renewable energy in a world without clean energy tax credits.

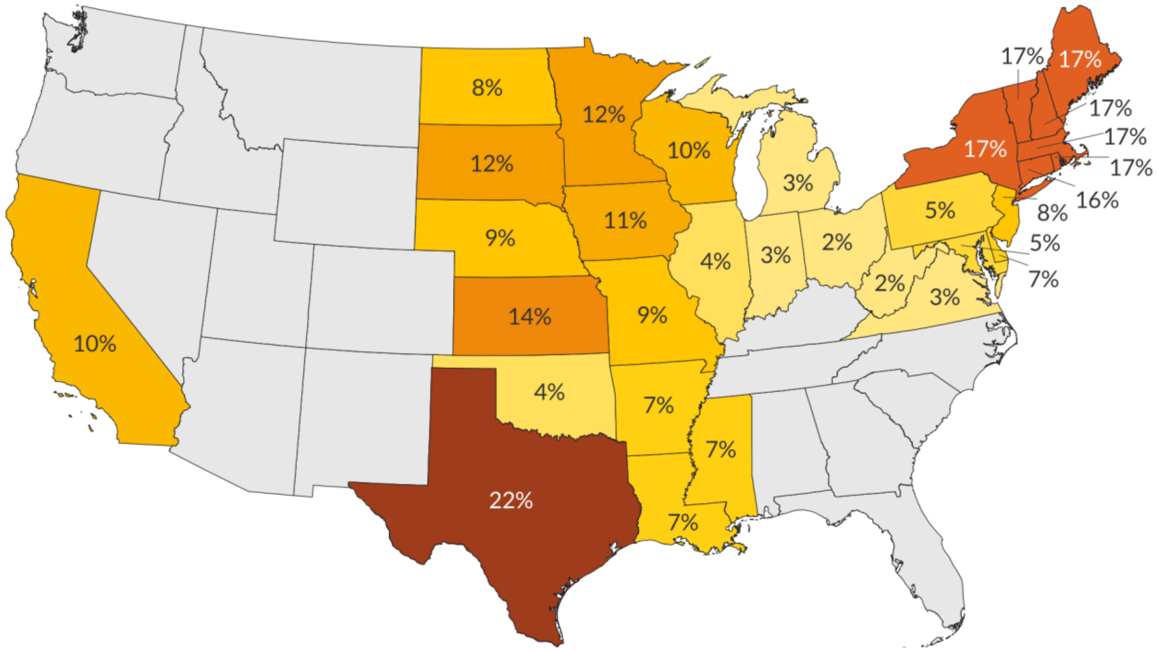
Sources: Aurora Energy Research

By 2040, removal of tax credits could raise retail rates by ~10% and yearly energy bills by ~$142 on average

AURORA

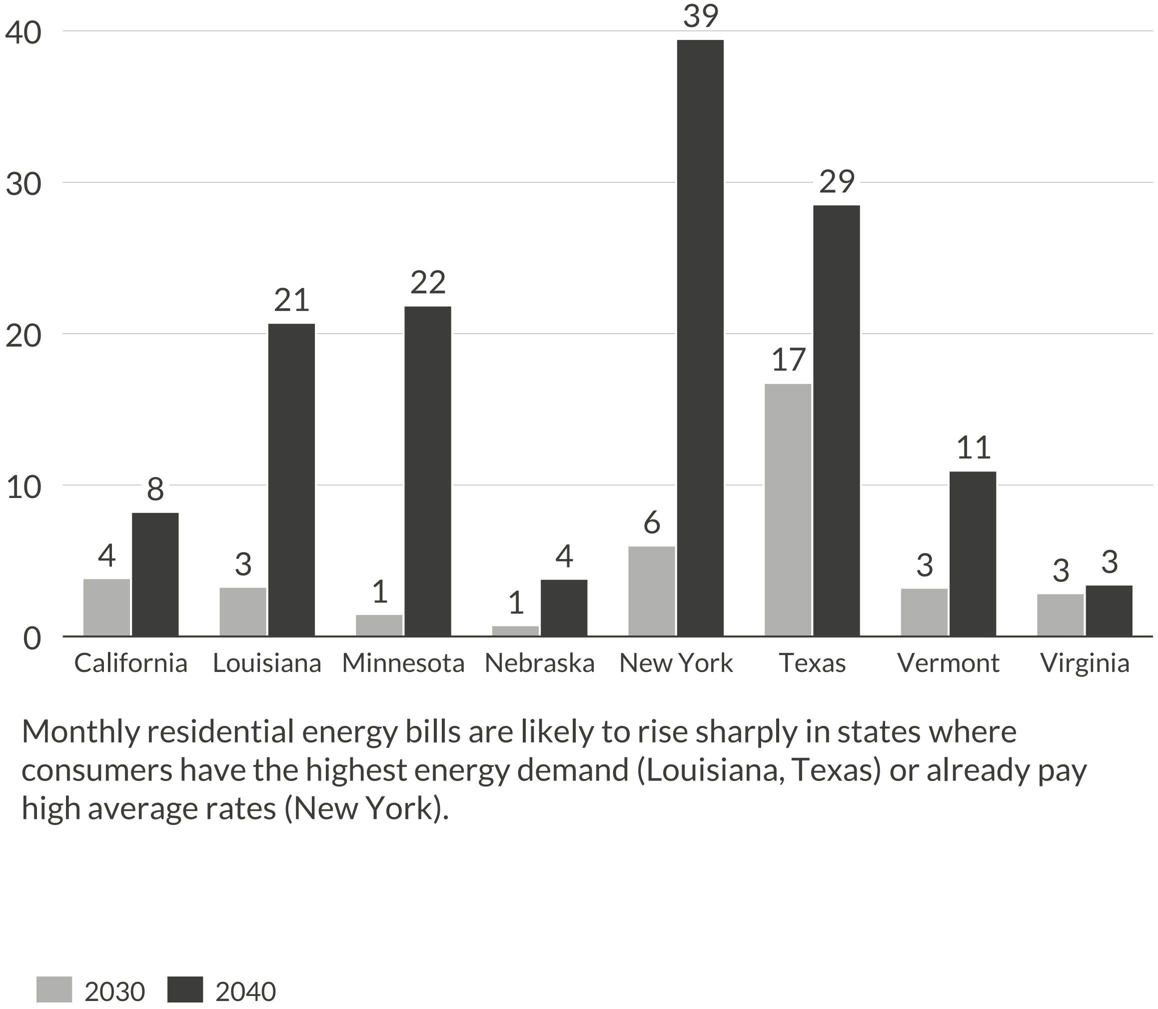
Retail rate increases by state, 2040[1,2]

% delta from base case



Monthly residential energy bill increases by selected state[2,3]

$ over base case (2023 real)



- Without tax credits to incentivize renewable energy development, average retail electricity rates are expected to be 3% higher in 2030, rising to 10% higher on average by 2040.[1,2]
- Removing 169GW of low marginal cost wind and solar generation from the system by 2040 leads to higher power prices rise as more expensive generation must be used to meet demand.

- Monthly residential energy bills are likely to rise sharply in states where consumers have the highest energy demand (Louisiana, Texas) or already pay high average rates (New York).

1) Compared to estimated retail prices in 2040 from a baseline scenario with investment and production tax credits. In this scenario, renewable energy generation is typically replaced with gas and peaking generation, which has a higher short run marginal cost. 2) Analysis available for deregulated wholesale markets covering 31 states and the District of Columbia. No data available for states in gray. 3) Forecasted retail rate multiplied by state-specific 2023 average monthly residential demand

Sources: Aurora Energy Research, EIA

Agenda

I. Additional context

II. Additional results

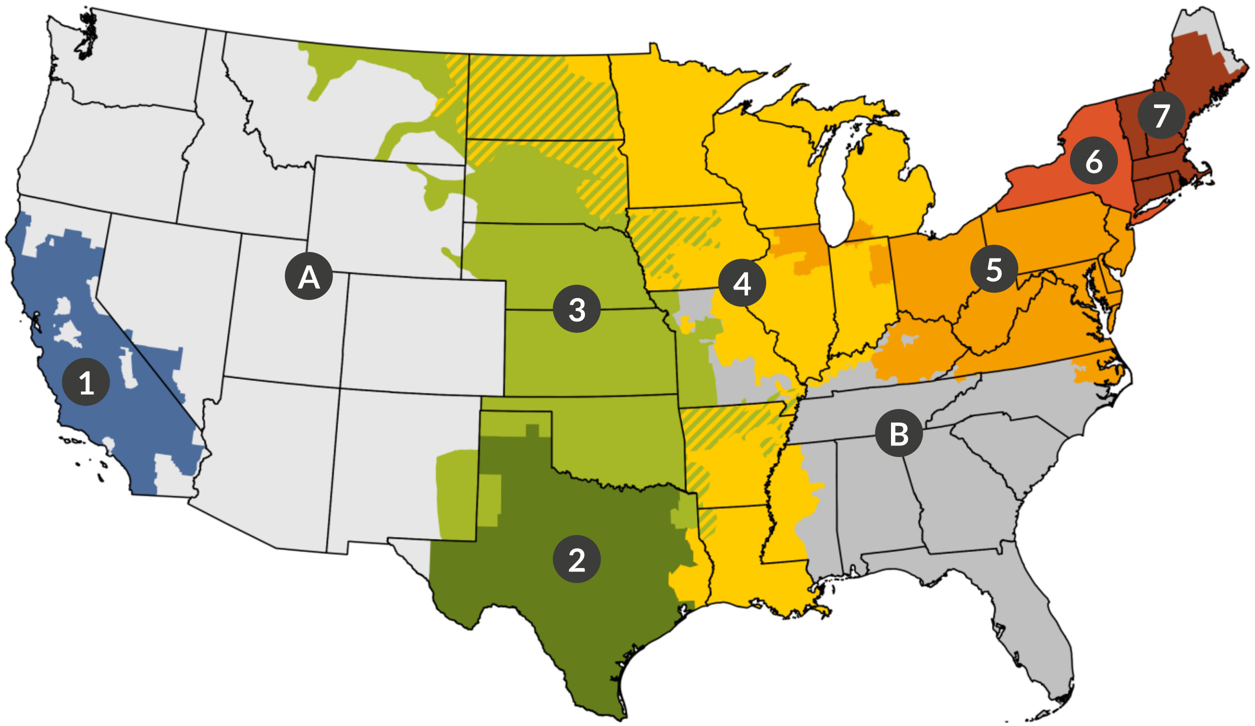
III. About Aurora

Aurora models all seven competitive electricity markets in the United States

AURORA

Two thirds of overall electricity demand in the lower 48 states is served by Independent System Operators (ISOs). ISOs use competitive market mechanisms that allow independent power producers and non-utility generators to trade power. The WECC and SERC regions remain vertically integrated by utility or balancing authority (BA).

Map of US wholesale electricity markets[1]



ISO	Installed capacity,[2] GW	Annual load,[3] TWh	Projected peak load growth[4]	Renewables penetration[3]
CAISO 1	82	220	9.7%	42%
ERCOT 2	140	447	9.2%	41%
SPP 3	100	284	9.9%	40%
MISO 4	200	656	6.0%	20%
PJM 5	219	770	3.7%	10%
NYISO 6	44	147	17.0%	24%
ISO-NE 7	38	110	11.4%	18%

Non-ISO	
WECC A	*Out of scope for this study*
SERC B	

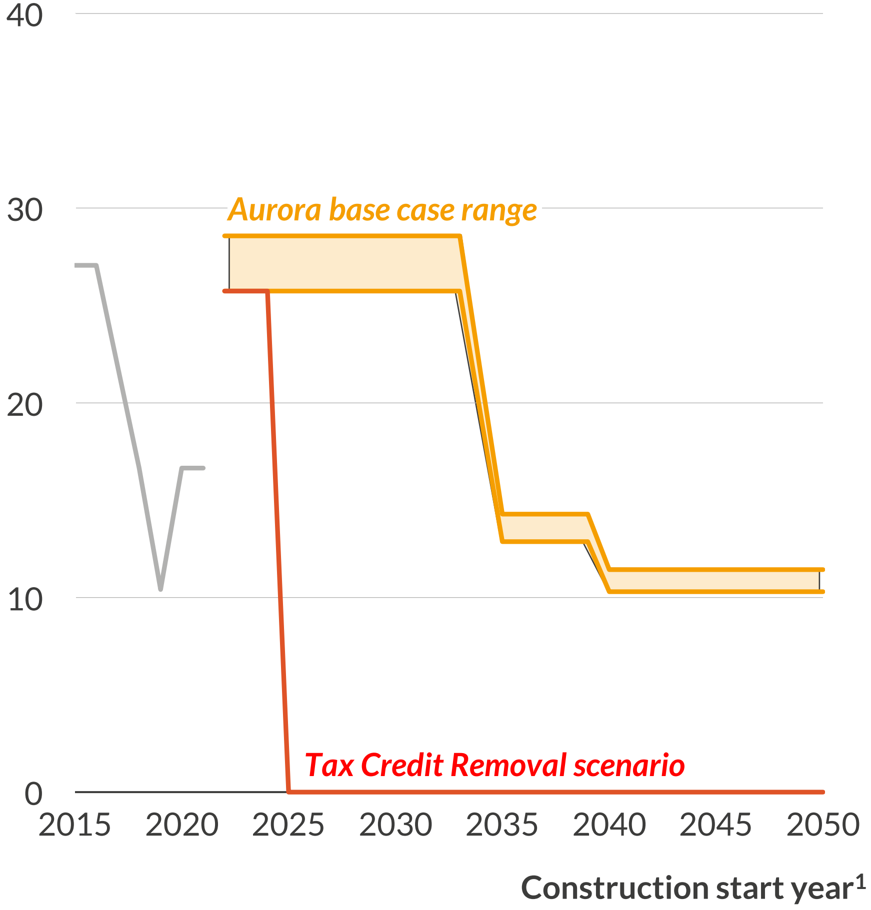
1) Gray areas are regulated, meaning they are vertically integrated utilities responsible for the production, transportation, and sale of electricity to consumers. 2) Data from December 2023 EIA 860m and ERCOT CDR. Includes capacities of plants not bidding fully into wholesale or capacity market. 3) 2023 data. 4) Compares 2024 through 2030. SPP data from individual ISO market report.

Sources: Aurora Energy Research, FERC, NERC, individual ISOs

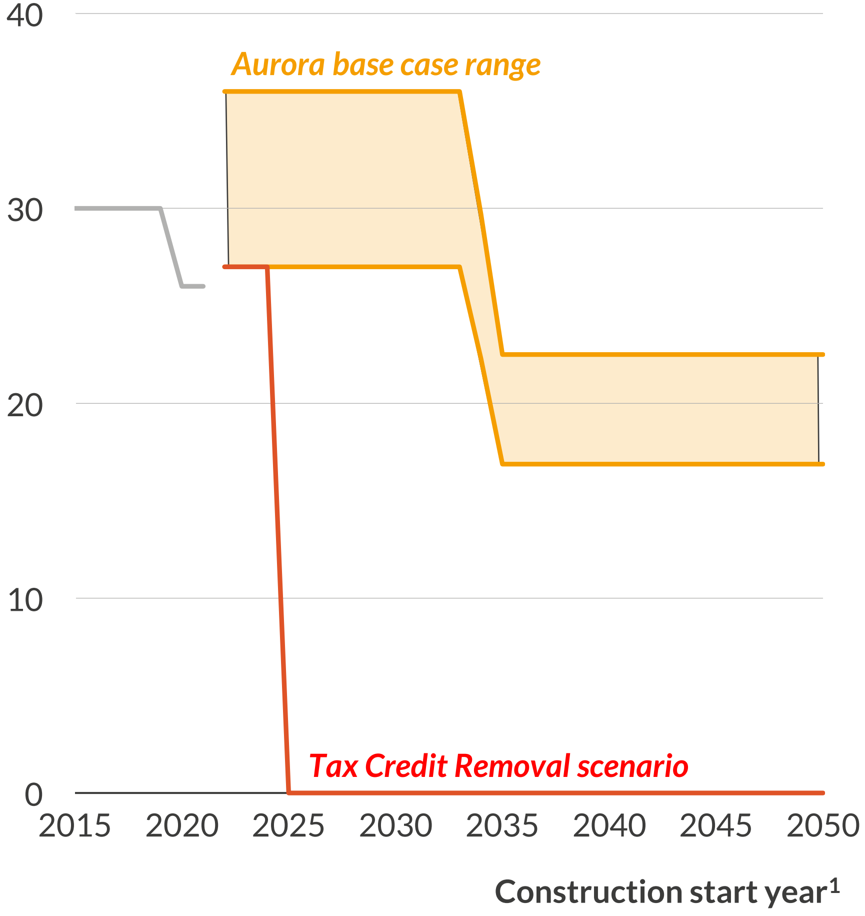
Aurora assumes a minimum $25.7/MWh PTC and 27% ITC; the Tax Credit Removal scenario eliminates these values in 2025

AURORA

PTC value (post transaction cost)
$/MWh (real 2023)



ITC value (post transaction cost)
% capital expenditure



Historic values — Aurora base case tax credit value, upper and lower bound — Tax Credit Removal scenario

1) Legacy project rules enable a 4 year construction time for projects. 2) Excludes transaction costs.

Sources: Aurora Energy Research, EPA

- The Aurora base case assumes all economically-built projects meet labor requirements; some projects realize the Energy Community adder depending on location. No projects in the base case achieve the Domestic Content adder.
- ITC adders are relatively more attractive than PTC adders: ITC adders are 10p.p. additions to the base rate + wage requirement values, whereas PTC adders are a 10% addition of the base rate + wage requirement values.
- Values step down in the base case in the 2030s to reflect some level of policy uncertainty.
- All PTC and ITC value is subject to a 10% haircut per Aurora's assumptions, reflecting some value lost to tax credit transactions.

Agenda

AURORA

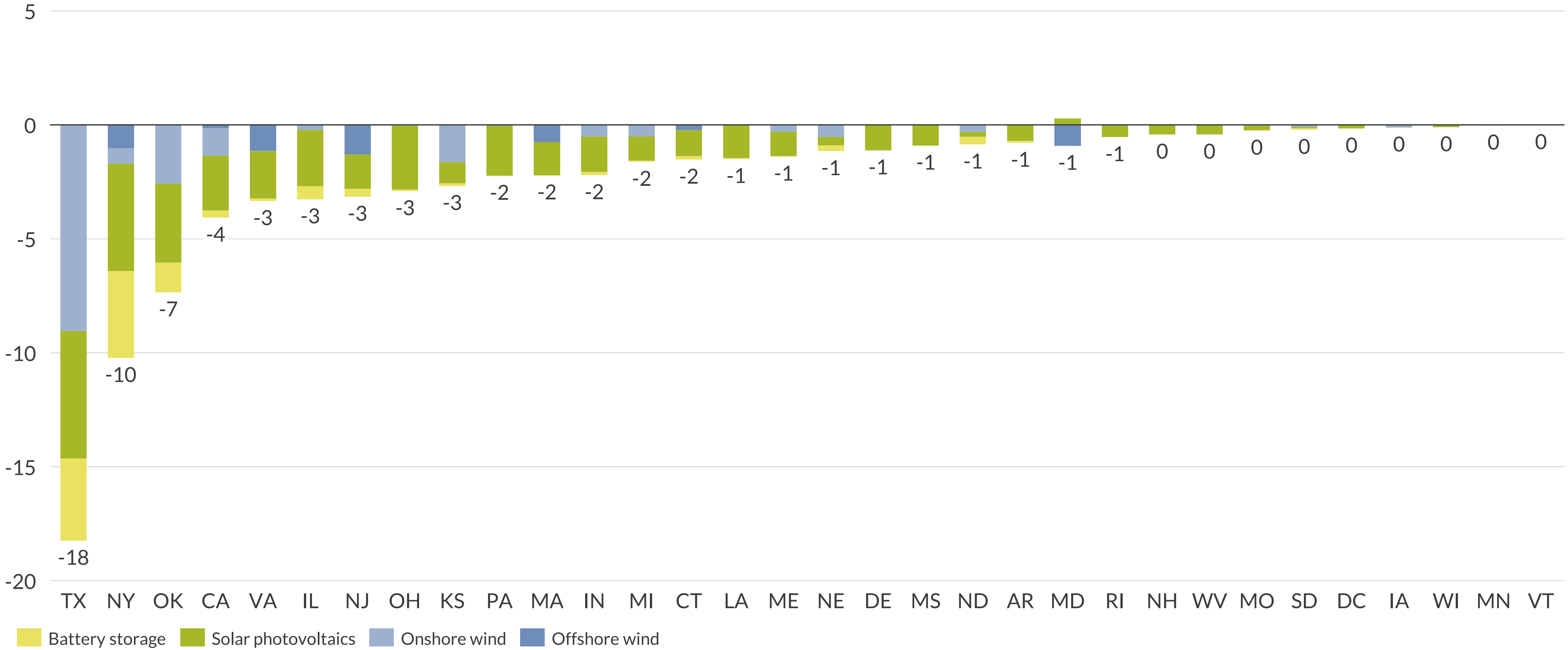
I. Additional context

II. Additional results

III. About Aurora

Capacity delta by state, 2030

Installed capacity deltas compared to base case by state[1]
GW (2030)



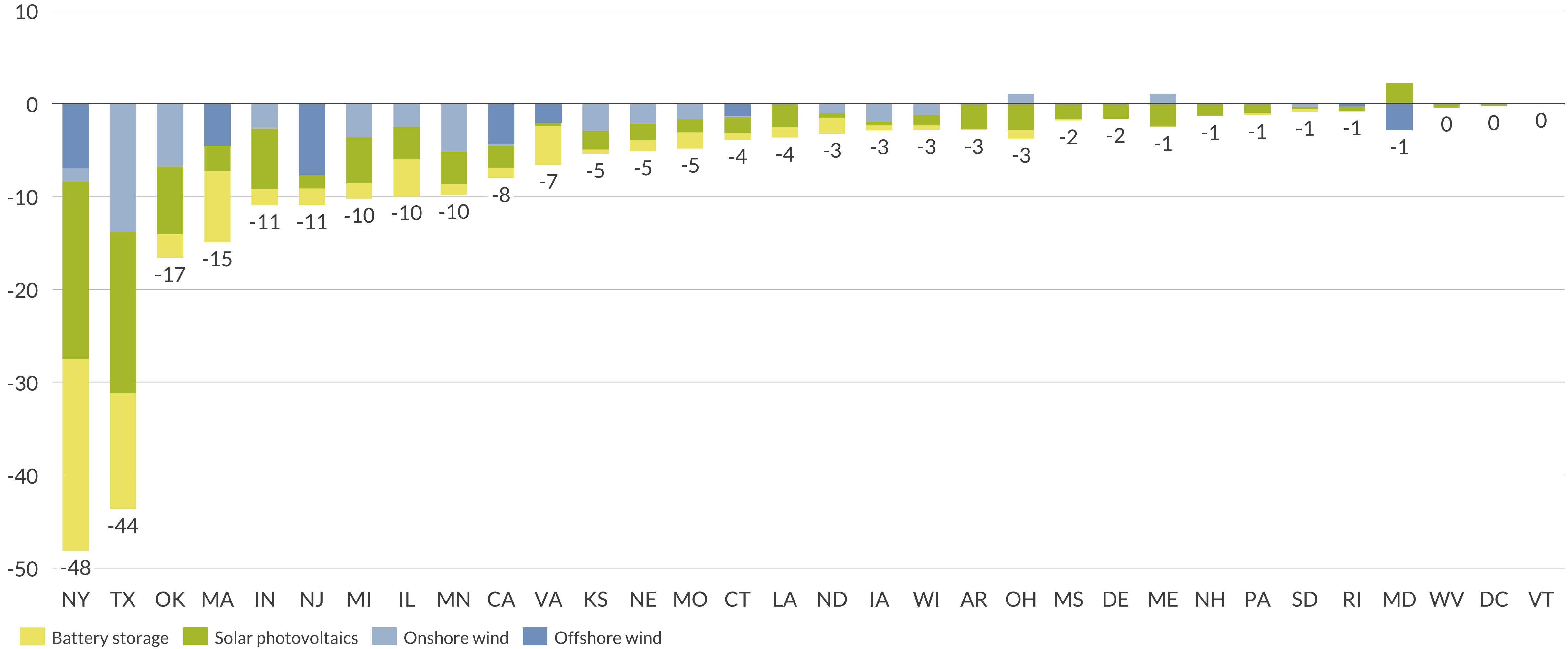
1) Analysis available for deregulated wholesale markets covering 31 states and the District of Columbia.

Sources: Aurora Energy Research

Capacity delta by state, 2040

AURORA

Installed capacity deltas compared to base case by state[1]
GW (2040)



1) Analysis available for deregulated wholesale markets covering 31 states and the District of Columbia.

Sources: Aurora Energy Research

Results by state, 2030

AURORA

State	Battery storage delta (MW)	Solar photovoltaics delta (MW)	Onshore wind delta (MW)	Offshore wind delta (MW)	Total capacity delta (MW)	Investment delta ($bn, 2023 real)	Clean energy jobs delta	Monthly retail price delta (%)	Monthly retail price delta ($, 2023 real)
Arkansas	-82.5	-696.6	-5.0	0.0	-784.1	-0.89	-127	0.1%	$0.18
California	-305.8	-2406.2	-1205.4	-150.0	-4067.4	-6.69	-1710	3.5%	$3.85
Connecticut	-141.2	-1143.0	-8.3	-229.4	-1521.8	-2.16	-518	4.0%	$6.28
Delaware	0.0	-1121.4	20.9	0.0	-1100.5	-1.18	-168	2.7%	$3.55
District of Columbia	0.0	-159.8	0.0	0.0	-159.8	-0.17	-27	1.5%	$1.25
Illinois	-577.1	-2467.2	-225.0	0.0	-3269.3	-3.65	-654	1.2%	$1.62
Indiana	-139.7	-1548.0	-516.0	0.0	-2203.7	-2.74	-733	0.9%	$1.35
Iowa	0.0	-6.0	-110.0	0.0	-116.0	-0.19	-100	1.2%	$1.38
Kansas	-115.6	-924.7	-1644.0	0.0	-2684.2	-3.91	-1642	7.4%	$5.12
Louisiana	-30.0	-1457.6	-5.0	0.0	-1492.6	-1.66	-250	1.5%	$3.29
Maine	-23.4	-1063.0	-304.6	0.0	-1390.9	-1.79	-453	3.8%	$4.53
Maryland	0.0	283.9	-2.1	-913.0	-631.2	-2.98	-1187	1.5%	$1.58
Massachusetts	1.4	-1457.0	0.0	-760.8	-2216.4	-4.02	-1270	3.9%	$5.24
Michigan	-52.4	-1057.7	-506.1	0.0	-1616.3	-2.07	-636	1.0%	$1.38
Minnesota	-15.0	-6.0	-10.0	0.0	-31.0	-0.04	-11	1.0%	$1.48
Mississippi	0.0	-906.0	-5.0	0.0	-911.0	-1.04	-156	1.4%	$1.97

Sources: Aurora Energy Research

Results by state, 2030

AURORA

State	Battery storage delta (MW)	Solar photovoltaics delta (MW)	Onshore wind delta (MW)	Offshore wind delta (MW)	Total capacity delta (MW)	Investment delta ($bn, 2023 real)	Clean energy jobs delta	Monthly retail price delta (%)	Monthly retail price delta ($, 2023 real)
Missouri	-29.6	-186.0	-43.5	0.0	-259.1	-0.32	-72	2.1%	$2.40
Nebraska	-245.5	-378.8	-529.1	0.0	-1153.4	-1.57	-556	1.1%	$0.74
New Hampshire	-8.9	-421.0	0.0	0.0	-429.9	-0.47	-71	3.8%	$5.05
New Jersey	-354.0	-1496.5	-1.6	-1306.0	-3158.0	-6.64	-2039	2.7%	$3.31
New York	-3818.7	-4706.2	-668.5	-1035.6	-10228.9	-14.48	-3049	3.1%	$6.01
North Dakota	-338.0	-207.4	-312.5	0.0	-857.9	-0.98	-339	2.5%	$2.01
Ohio	-64.8	-2805.7	-38.0	0.0	-2908.5	-3.30	-507	0.7%	$0.67
Oklahoma	-1312.6	-3457.4	-2581.2	0.0	-7351.2	-9.38	-2991	-2.1%	-$1.71
Pennsylvania	-2.0	-2180.3	-53.0	0.0	-2235.3	-2.53	-412	1.8%	$2.49
Rhode Island	-7.9	-483.0	0.0	-44.8	-535.7	-0.69	-142	3.8%	$3.81
South Dakota	-62.5	-58.0	-94.7	0.0	-215.3	-0.26	-99	3.3%	$2.16
Texas	-3608.8	-5590.9	-9051.9	0.0	-18251.6	-23.42	-9329	11.2%	$16.75
Vermont	-7.5	-3.0	0.0	0.0	-10.5	-0.01	-1	3.8%	$3.22
Virginia	-107.4	-2069.7	-15.0	-1147.0	-3339.2	-6.58	-1915	2.0%	$2.87
West Virginia	0.0	-409.0	-16.0	0.0	-425.0	-0.49	-83	1.5%	$2.72
Wisconsin	0.0	-93.4	-13.9	0.0	-107.3	-0.14	-28	0.8%	$0.88

Sources: Aurora Energy Research

Results by state, 2040

AURORA

State	Battery storage delta (MW)	Solar photovoltaics delta (MW)	Onshore wind delta (MW)	Offshore wind delta (MW)	Total capacity delta (MW)	Investment delta ($bn, 2023 real)	Clean energy jobs delta	Monthly retail price delta (%)	Monthly retail price delta ($, 2023 real)
Arkansas	-82.5	-2717.3	22.3	0.0	-2777.5	-2.78	-439	7.0%	$15.85
California	-1094.5	-2366.2	-204.2	-4350.0	-8014.9	-22.08	-6527	9.7%	$8.22
Connecticut	-757.6	-1748.0	-7.4	-1376.2	-3889.2	-6.71	-2209	16.5%	$18.47
Delaware	0.0	-1618.0	26.0	0.0	-1592.1	-1.81	-247	7.4%	$8.68
District of Columbia	0.0	-256.9	0.0	0.0	-256.9	-0.27	-43	3.8%	$2.77
Illinois	-4004.0	-3475.6	-2483.1	0.0	-9962.7	-11.40	-3092	4.0%	$6.25
Indiana	-1714.7	-6543.0	-2671.6	0.0	-10929.2	-12.47	-3615	3.3%	$5.32
Iowa	-500.0	-400.0	-1954.0	0.0	-2854.0	-4.02	-1860	10.7%	$13.11
Kansas	-463.9	-2037.3	-2904.6	0.0	-5405.8	-7.40	-2986	14.1%	$8.95
Louisiana	-1078.8	-2554.8	-2.0	0.0	-3635.6	-3.68	-503	6.7%	$20.72
Maine	-23.4	-2460.0	1016.7	0.0	-1466.6	-0.84	503	16.7%	$15.25
Maryland	0.0	2247.8	16.7	-2821.0	-556.5	-7.61	-3418	4.9%	$4.05
Massachusetts	-7697.6	-2664.6	1.7	-4564.7	-14925.2	-22.73	-7137	16.6%	$16.48
Michigan	-1663.8	-4977.6	-3597.4	0.0	-10238.8	-12.34	-4184	3.0%	$4.93
Minnesota	-1143.3	-3500.0	-5162.9	0.0	-9806.2	-12.82	-5310	12.4%	$21.85
Mississippi	-162.1	-1627.2	-2.0	0.0	-1791.3	-1.91	-285	6.9%	$8.61

Sources: Aurora Energy Research

Results by state, 2040

AURORA

State	Battery storage delta (MW)	Solar photovoltaics delta (MW)	Onshore wind delta (MW)	Offshore wind delta (MW)	Total capacity delta (MW)	Investment delta ($bn, 2023 real)	Clean energy jobs delta	Monthly retail price delta (%)	Monthly retail price delta ($, 2023 real)
Missouri	-1747.0	-1420.2	-1659.2	0.0	-4826.4	-5.65	-1851	8.9%	$10.44
Nebraska	-1217.0	-1746.0	-2152.5	0.0	-5115.6	-6.38	-2313	8.7%	$3.81
New Hampshire	-9.0	-1306.8	0.0	0.0	-1315.7	-1.36	-219	16.7%	$16.30
New Jersey	-1753.6	-1471.6	12.7	-7680.3	-10892.8	-29.41	-10724	8.0%	$9.11
New York	-20672.0	-19106.5	-1395.6	-6979.9	-48154.0	-66.04	-15296	17.1%	$39.46
North Dakota	-1662.7	-541.5	-1027.9	0.0	-3232.0	-3.62	-1130	8.4%	$5.89
Ohio	-957.2	-2792.5	1054.5	0.0	-2695.2	-2.26	417	1.9%	$1.56
Oklahoma	-2512.3	-7303.5	-6762.4	0.0	-16578.2	-21.01	-7479	3.9%	$2.29
Pennsylvania	-197.6	-1014.9	0.9	0.0	-1211.6	-1.63	-182	5.3%	$6.45
Rhode Island	-7.9	-544.0	0.0	-269.1	-821.0	-1.45	-455	16.7%	$13.44
South Dakota	-331.6	-205.8	-324.9	0.0	-862.4	-1.01	-350	12.4%	$7.02
Texas	-12474.7	-17406.2	-13758.2	0.0	-43639.1	-50.12	-16150	22.1%	$28.54
Vermont	-7.5	0.0	0.0	0.0	-7.5	-0.01	-1	16.7%	$10.96
Virginia	-4158.1	-317.8	43.3	-2080.0	-6512.6	-11.25	-3109	2.8%	$3.44
West Virginia	0.0	-406.0	14.1	0.0	-391.9	-0.44	-55	2.4%	$4.18
Wisconsin	-451.2	-1166.2	-1185.6	0.0	-2803.0	-3.48	-1293	10.3%	$9.46

Sources: Aurora Energy Research

Agenda

I. Additional context

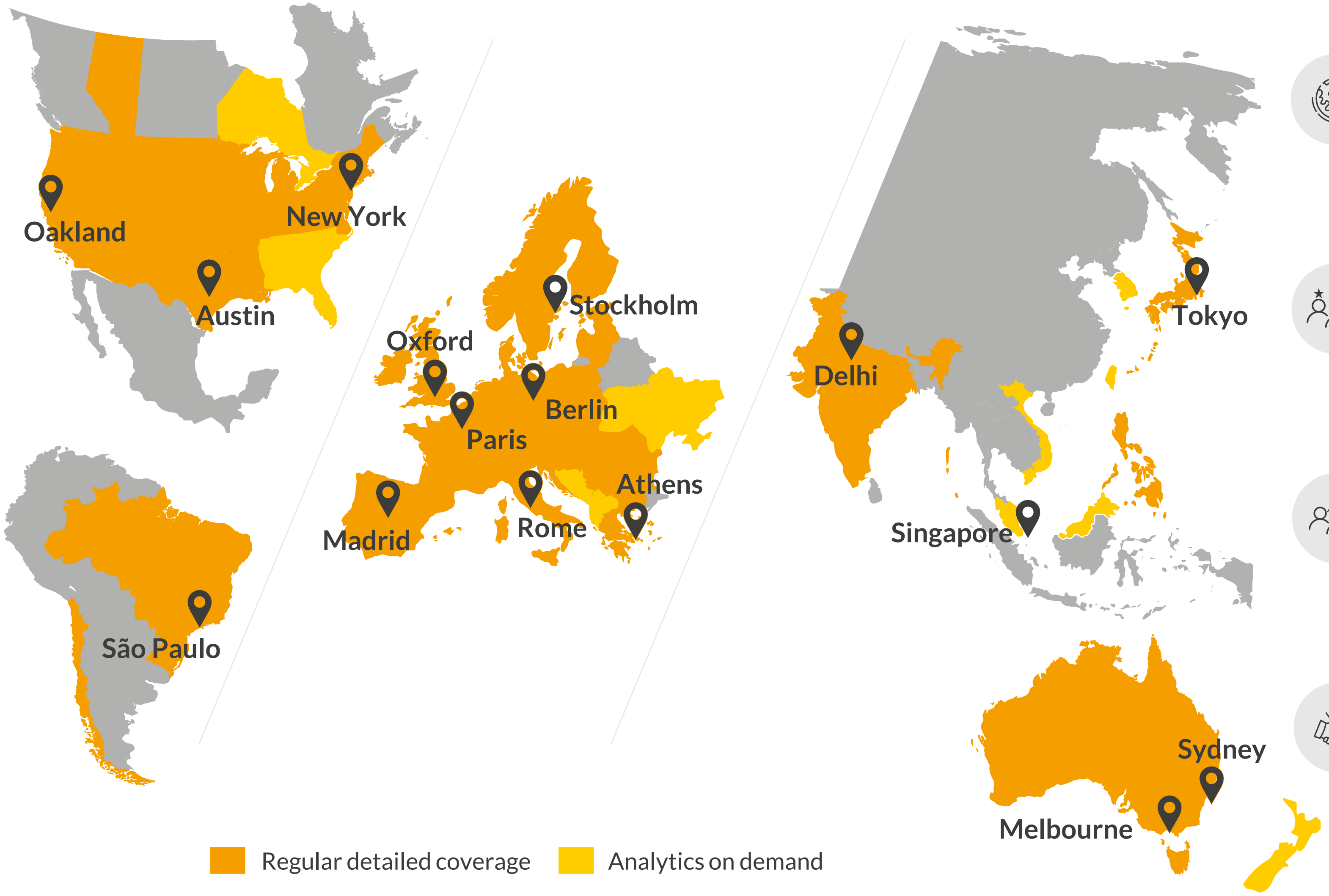
II. Additional results

III. About Aurora

Aurora provides independent forecasts and data-driven intelligence for the global energy transition

AURORA

- Power markets
- Renewables & PPAs
- Storage
- Grid & Congestion
- Electric vehicles
- Hydrogen (H_2)
- Carbon (CO_2)
- Natural gas



16 offices

900+ market experts

850+ subscribing companies

150+ transactions supported in 2024

Source: Aurora Energy Research

Our market-leading models underpin a comprehensive range of seamlessly integrated services to best suit your needs

AURORA

Customization of services

Advisory

Access tailored expert advice and analytics for your crucial projects. Dedicated support for strategy, investments, transactions and policy engagements

1400+ projects globally

Trusted consulting for project valuation, debt/tax equity financing, capital raises, project siting, policy analysis, and PPA support

Software Solutions

Make standard analysis bespoke with direct access to our models. Unique SaaS subscriptions to create your own scenarios and asset-specific investment cases

100+ company licenses

Market-level simulation tool: Origin

Asset-level valuation tools for batteries, wind, and solar

Aurora Maps visualizer for siting analysis and nodal forecasts

Subscription Analytics

Receive quarterly outlook reports, bankable price forecasts, **sample investment cases and timely strategic insights** for power and commodities

850+ subscribing companies

Power & Renewables fundamental reports including bankable price forecasts & strategic insights

Bankable battery storage analysis with detailed costs and revenue for investment cases

Bankable nodal basis forecasts, spatial analysis & nodal trends based on bottom-up power flow modelling

Models & Data

Market-leading models for power, gas, hydrogen, carbon, oil & coal markets

Proprietary and continuously updated cutting-edge models populated with highest quality curated datasets

Developed over 10 years, 70+ dedicated modellers

Source: Aurora Energy Research

Aurora services: subscriptions providing price forecasts and market analytics for developers, asset owners, investors, energy consumers, and regulators

AURORA

Subscription Analytics: Receive regularly updated forecasts, sample investment cases and timely deep-dives

Ad-hoc customized support:

1 Power & Renewables

Keep up to date on a specific power market; zonal price curves as well as in-depth quarterly reports and events to keep a pulse on market *(Quarterly updates)*

What the service is:
- Bankable monthly forecasts (2050) to support asset financing , scenario analysis; in-depth fundamental analysis to underpin your investment strategies
- Roundtable discussions, workshops and ongoing support from dedicated teams

Assorted use case examples:
- Understanding a market at depth and keeping up to date with market and policy developments, with on-call, ad hoc support
- Reliable, bankable wholesale price forecasts to support asset financing and valuations - six scenarios updated quarterly

2 Flexible Energy Add-on

Go deep on battery and peaker business case economics and fundamentals. Understand hourly granularity of a specific market to build investment cases *(Quarterly updates)*

What the service is:
- Detailed analysis and hourly granular forecasts for power, balancing, and ancillary services plus investment case data for battery & peakers
- Roundtable discussions, workshops and ongoing support from dedicated teams

Assorted use case examples:
- Developer seeking to understand detailed battery costs and revenue streams/stacking across various configurations
- Investor comparing differences in BESS gross margin, IRR, NPV across hubs and entry years with representative nodal basis

3 Nodal Add-on

Understand nodal economics and trends through bottom-up power flow modelling. Site specific valuation, congestion, curtailment and other uses cases *(Quarterly updates)*

What the service is:
- Bankable nodal forecasts, spatial congestion analysis, site-specific valuation and other features through bottom-up power flow modelling
- Roundtable discussions, workshops and ongoing support from dedicated teams

Assorted use case examples:
- Investor evaluating site specific risks and implications during phase 1 of a transaction
- Developer seeking to identify the drivers and trends in congestion patterns and nodal pricing outcomes throughout the system to support early development pipeline

4 Advisory

Best for: Custom projects or transactions that need dedicated expert support. Typically, transaction diligence and asset valuations

What the service is:
- Tailored expert advice and analytics support to deliver diligence on a specific project including advisory transactions, policy views, and strategy insights

Assorted use case examples:
- Developer seeking bespoke nodal forecast and asset valuation with sensitivity analysis
- Investment firm seeking due diligence support to derisk a specific transaction
- Regulator seeking to understand policy impact of market reforms

Unique, proprietary, in-house modelling capabilities underpin Aurora's superior analysis

AURORA

5 Integrated Models

- **Global Commodities (AER-GLO)**
- **Hydrogen (AER-HY)**
- **Gas (AER-GAS)**
- **Power markets (AER-ES)**
- **Nodal/network model (AER-EN)**

INPUTS

- Technology
- Policy
- Demand
- Commodity prices[1]
- Weather patterns

Dispatch model

- ½ hourly or hourly
- Iterative modelling
- Dynamic dispatch of plant
- Endogenous interconnector flows

Continuous iteration until an equilibrium is reached

Investment decisions module

- Capacity market modelling
- Capacity build / exit / mothballing
- IRR / NPV driven
- Detailed technology assessments

OUTPUTS

- Capacity mix
- Generation mix
- Power & Ancillary Service prices
- Capacity market prices
- Profit / Loss and NPV
- Electric vehicle charging

ADDITIONAL INPUTS

- Network snapshot - existing & future
- Nodal load map
- Nodal generation map

OUTPUTS

- Power flows & losses
- Nodal prices / loss factors

Up to 70 specifications modelled for each plant	**c. 85k** investment hours on modelling capabilities	**~15k** model runs per week	**80+** strength of modelling team globally	**Quarterly updates** through subscription research

1) Gas, coal, oil and carbon prices fundamentally modelled in-house with fully integrated commodities and gas market model

Source: Aurora Energy Research

Details and disclaimer

Publication
Impact of reform to clean energy tax credits on investment, jobs and consumer bills

Date
8 January 2025

Prepared by
Lizzie Bonahoom
(Lizzie.Bonahoom@auroraer.com)
Connor McMann
(Connor.McMann@auroraer.com)
Callaway Sprinkle
(Callaway.Sprinkle@auroraer.com)

Approved by
Olivier Beaufils
(Olivier.Beaufils@auroraer.com)
Oliver Kerr
(Oliver.Kerr@auroraer.com)

AURORA

General Disclaimer

This document is provided "as is" for your information only and no representation or warranty, express or implied is given by Aurora Energy Research LLC and any of its affiliates (together "Aurora"), their directors, employees, agents or affiliates (together, Aurora's "Associates") as to its accuracy, reliability or completeness. Aurora and its Associates assume no responsibility, and accept no liability for, any loss arising out of your use of this document. This document is not to be relied upon for any purpose or used in substation for your own independent investigations and sound judgment. The information contained in this document reflects our beliefs, assumptions, intentions and expectations as of the date of this document and is subject to change. Aurora assumes no obligation, and does not intend, to update this information.

Forward-looking statements

This document contains forward-looking statements and information, which reflect Aurora’s current view with respect to future events and financial performance. When used in this document, the words "believes", "expects", "plans", "may", "will", "would", "could", "should", "anticipates", "estimates", "project", "intend" or "outlook" or other variations of these words or other similar expressions are intended to identify forward-looking statements and information. Actual results may differ materially from the expectations expressed or implied in the forward-looking statements as a result of known and unknown risks and uncertainties. Known risks and uncertainties include but are not limited to: risks associated with political events in Europe and elsewhere, contractual risks, creditworthiness of customers, performance of suppliers and management of plant and personnel; risk associated with financial factors such as volatility in exchange rates, increases in interest rates, restrictions on access to capital, and swings in global financial markets; risks associated with domestic and foreign government regulation, including export controls and economic sanctions; and other risks, including litigation. The foregoing list of important factors is not exhaustive.

AURORA

ENERGY RESEARCH