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Improving Bulk Grid Interconnection, Expansion, and Utilization

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CEC Panel
May 4th, 2023

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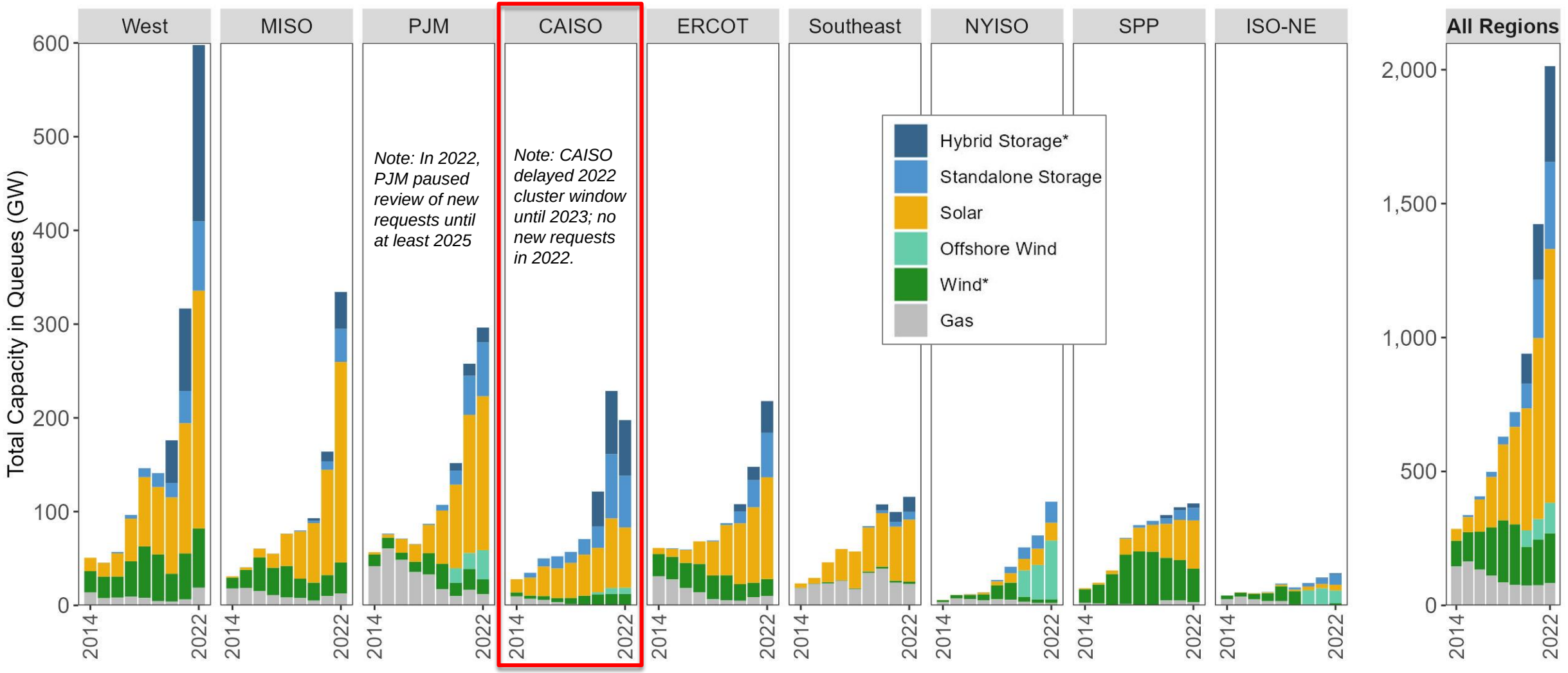
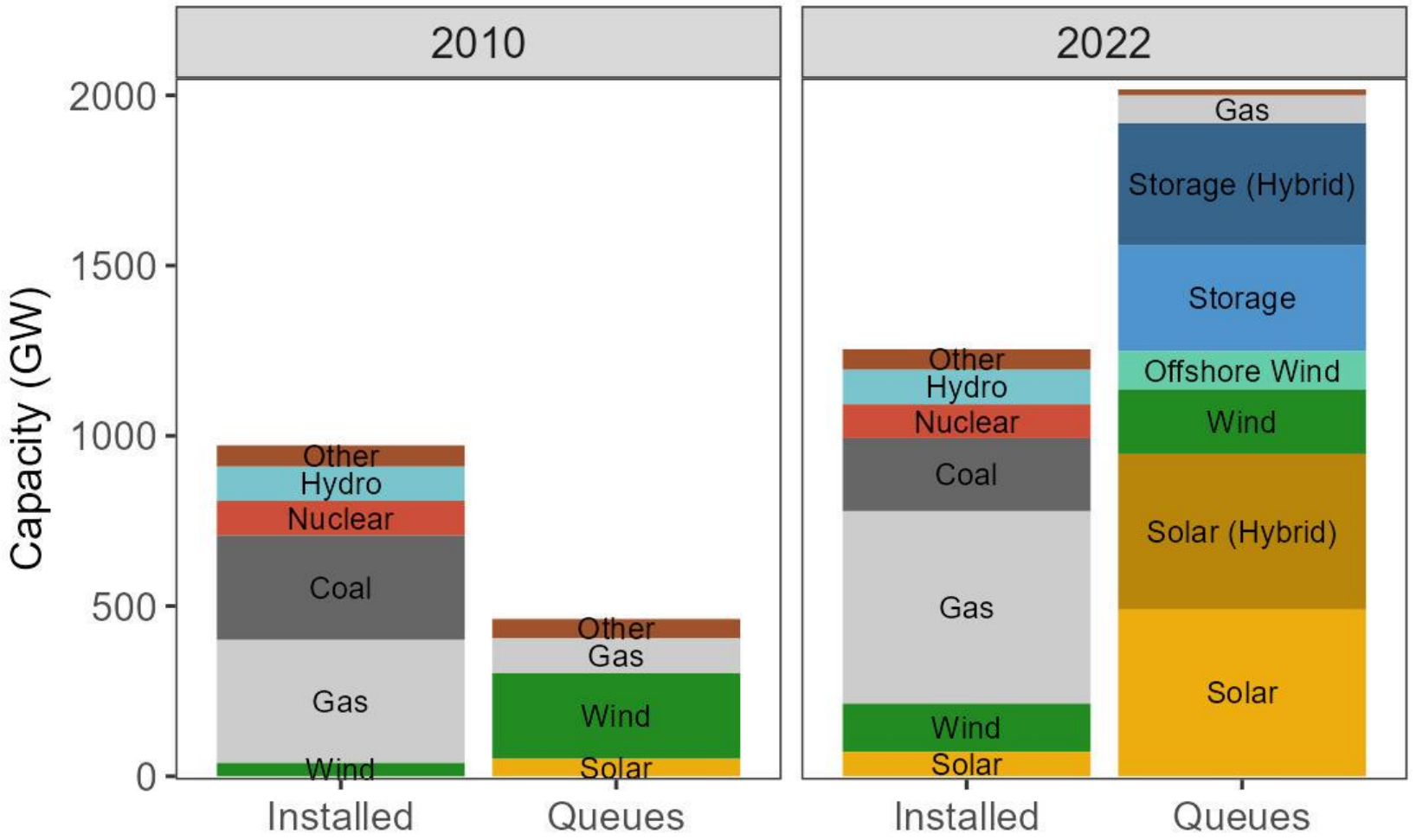
There has been a substantial increase in annual interconnection requests since 2013 (not just in CA); Over 2 TW of capacity active at end of 2022



Source: Rand et al. Visit https://emp.lbl.gov/queues.

Active capacity in grid interconnection queues (~2,000 GW) exceeds the installed capacity of the entire U.S. power plant fleet (~1,250 GW)

Entire U.S. Installed Capacity vs. Active Interconnection Queues

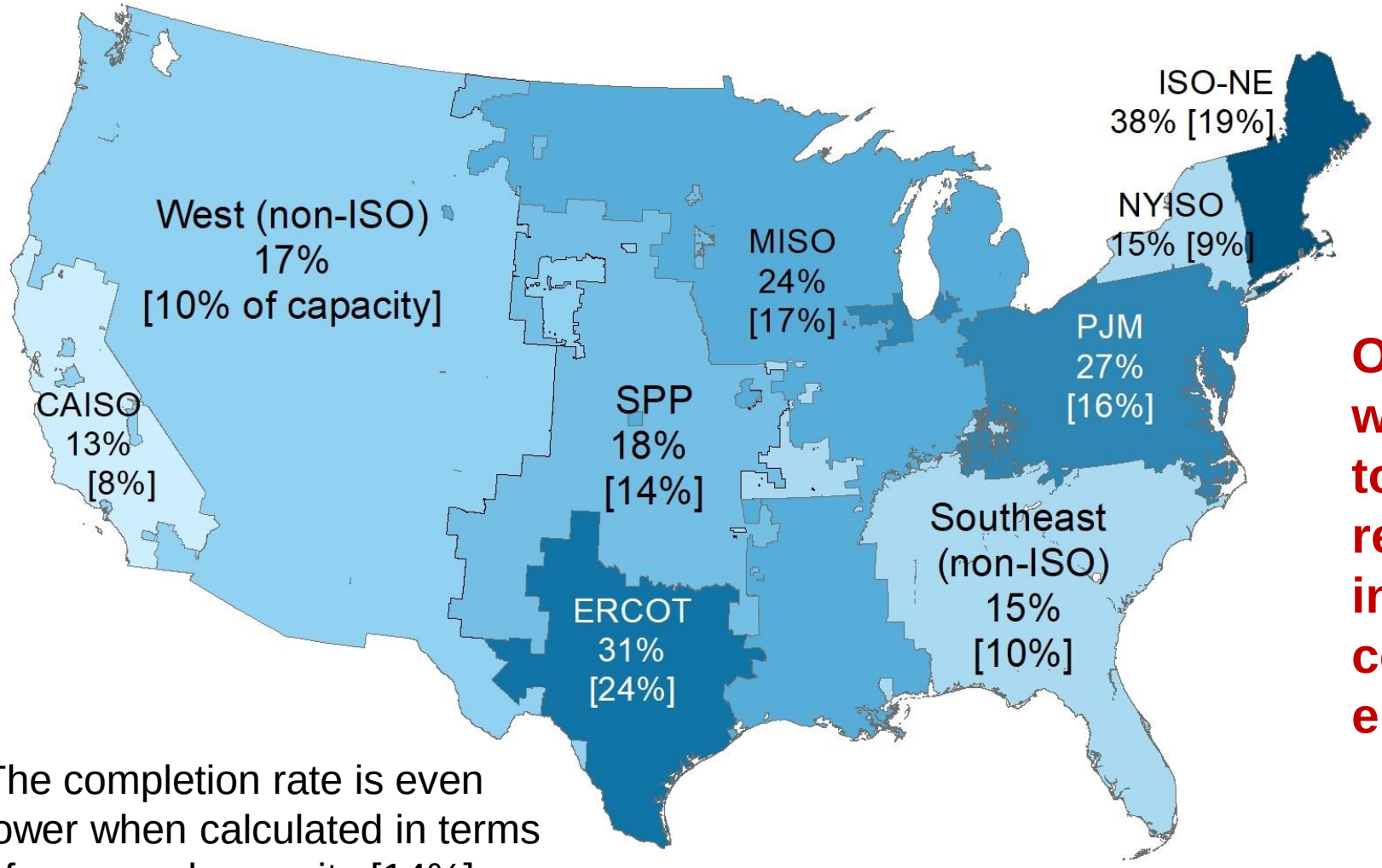


More than 95% of active capacity in interconnection queues is zero-carbon

Source: Berkeley Lab, "Queued Up". 2023

Notes: (a) Hybrid storage in queues is estimated for some projects. (b) Total installed capacity from EIA-860, December 2022.

Only 21% of projects that applied for interconnection prior to 2018 have been built – 72% have been withdrawn (7% are still actively trying!)

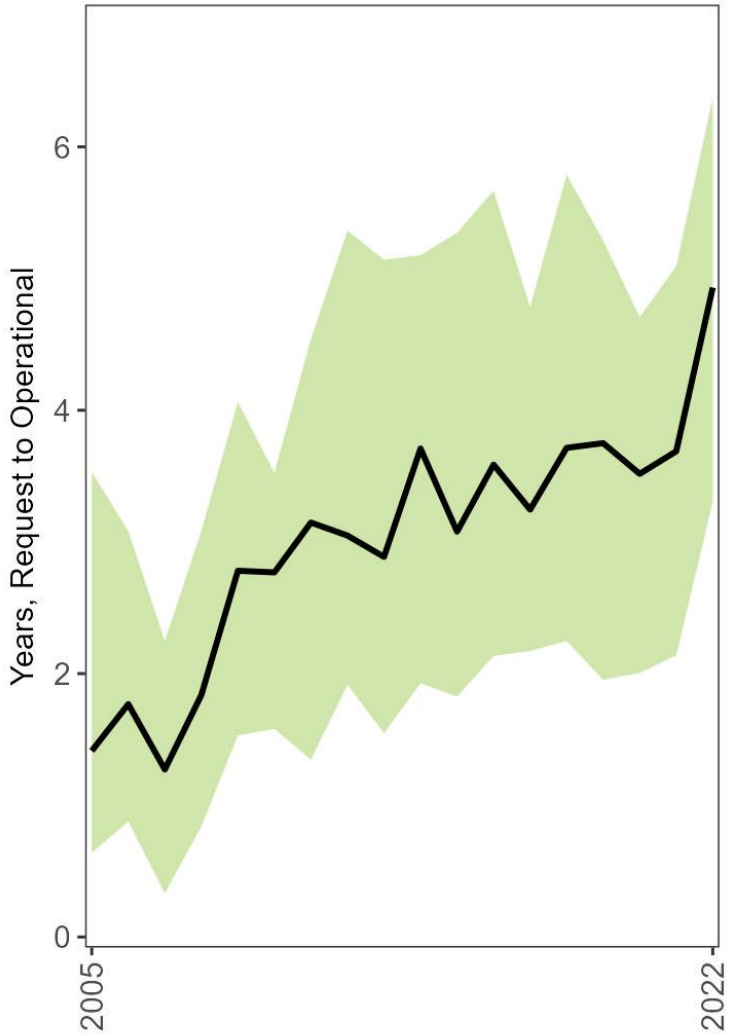


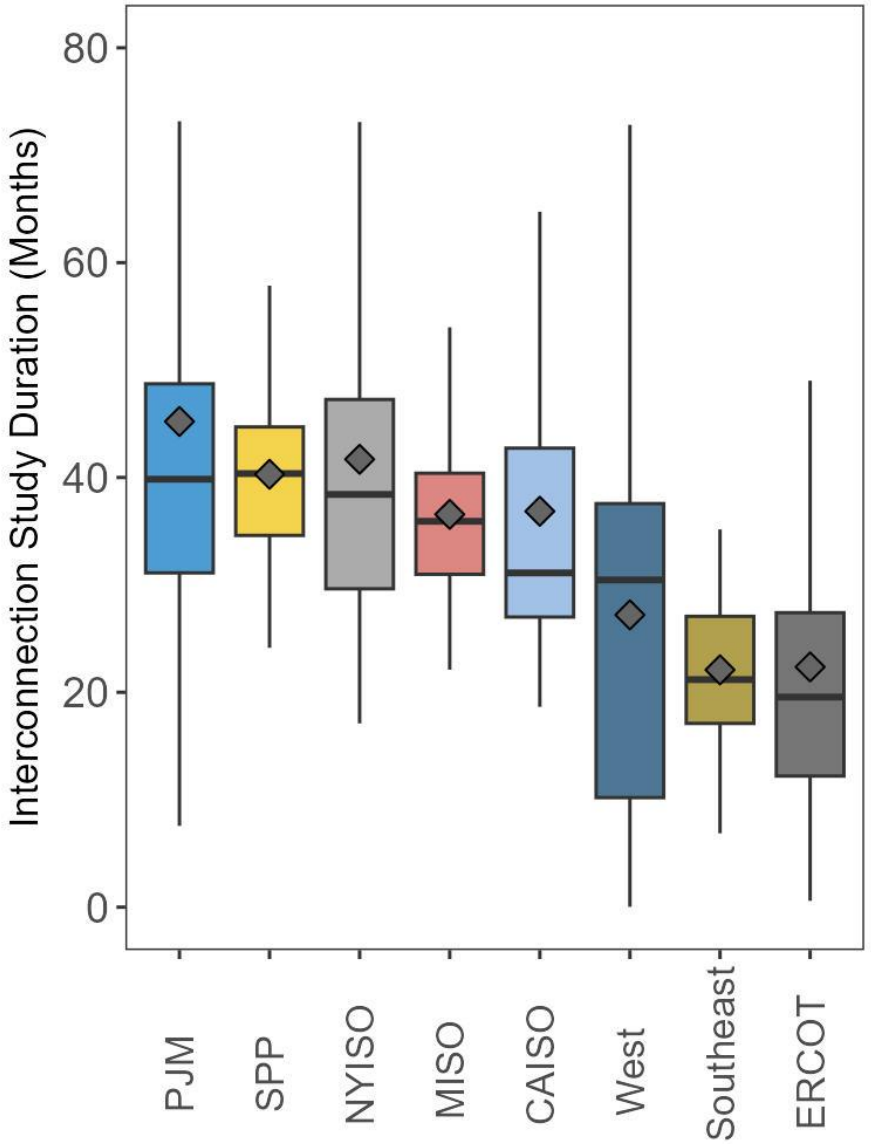
The completion rate is even lower when calculated in terms of proposed capacity [14%]

One consequence of high withdrawal rates is the need to restudy the projects that remain in the queue, increasing uncertainty in cost outcomes and further elongating the process

Source: Berkeley Lab, "Queued Up". 2023

Evidence of a Problem #1: Projects are taking longer to complete interconnection studies and connect to the grid – from 2 years in 2005 to 5 years in 2022

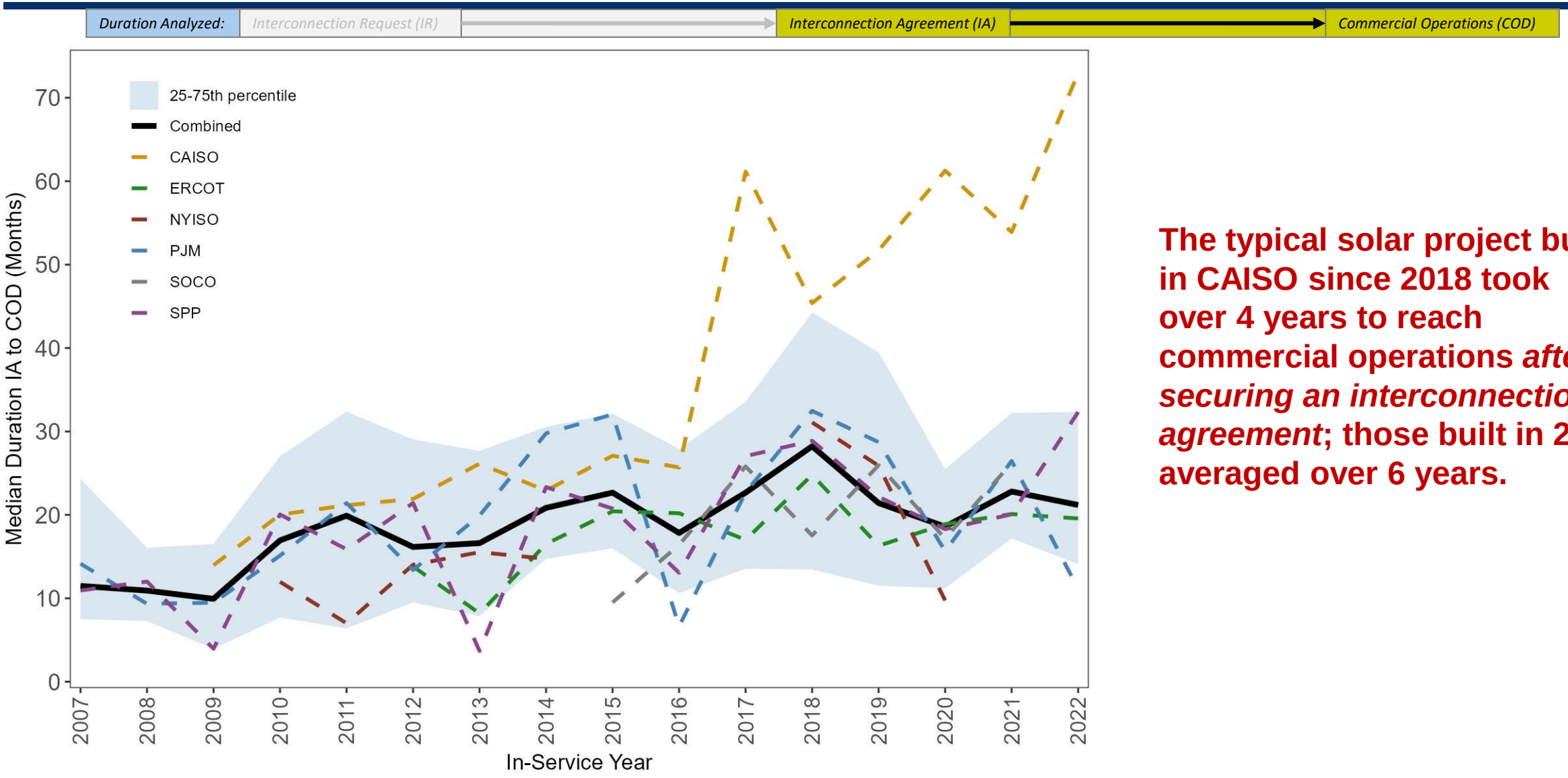




- Interconnection request to COD timelines reached 5 years in 2022
- Interconnection study process >3 years in most grid operating regions
- But some regions are processing studies much more rapidly, e.g., ERCOT

Source: Berkeley Lab, "Queued Up". 2023

Typical duration from IA to commercial operations date (COD) has increased modestly since 2007, except in CAISO where recently built solar projects took 4-6 years *after* securing an IA

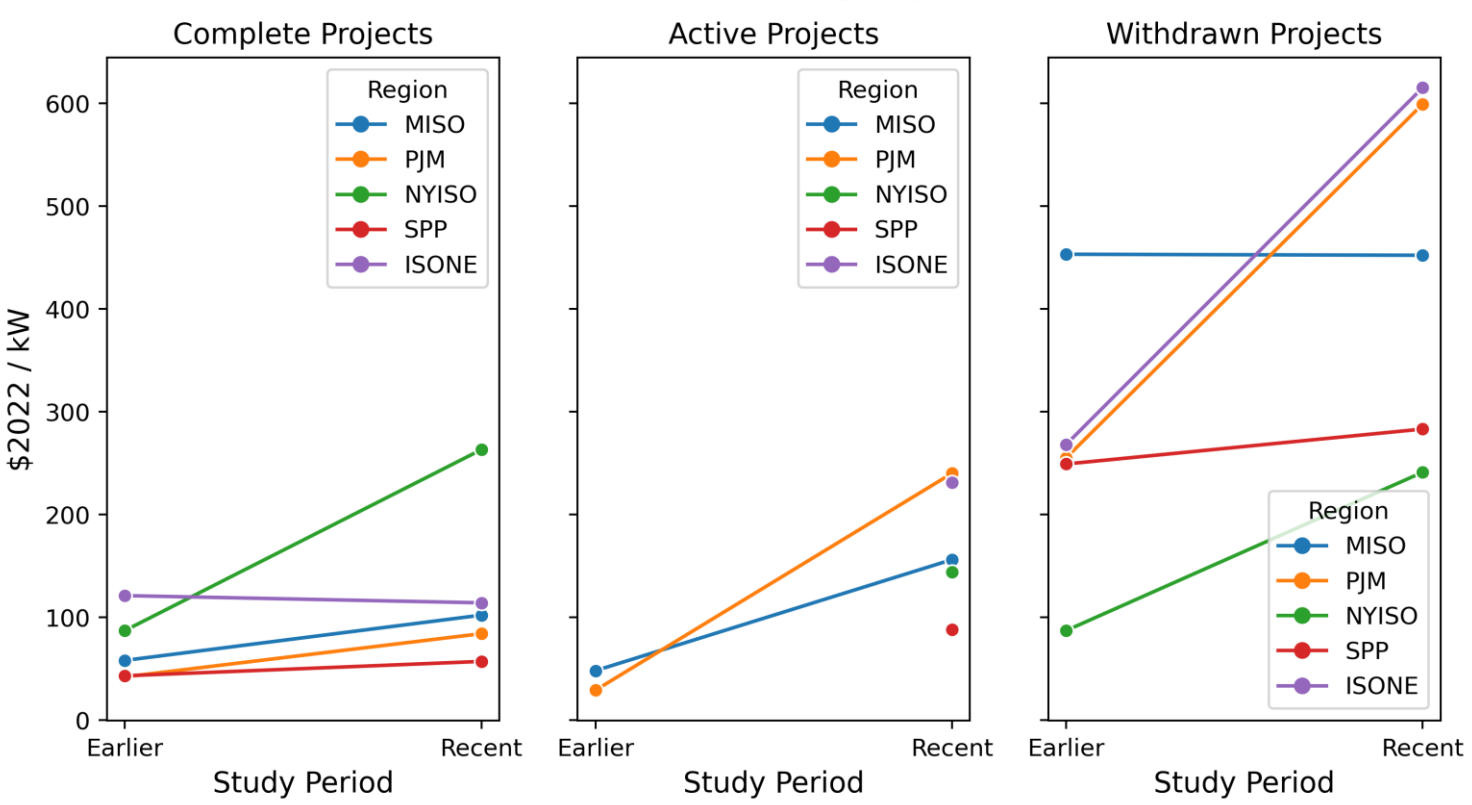


The typical solar project built in CAISO since 2018 took over 4 years to reach commercial operations *after securing an interconnection agreement*; those built in 2022 averaged over 6 years.

Notes: (1) Data were only available for 737 projects across 5 ISO/RTOs and one utility (Southern Company), out of 3,846 total "operational" projects in the full dataset. (2) Not all data used in this analysis are publicly available.

Evidence of a Problem #2: Grid connection costs are increasing due largely to network upgrades, and are higher for wind, solar, and storage – driving project withdrawals

Average Interconnection Costs



- Interconnection costs have grown across regions
- These trends are largely driven by **network upgrade** costs
- **Wind, solar & storage** interconnection costs are often **higher** than natural gas
- **High & unpredictable interconnection costs likely lead to higher queue entry and more withdrawals**

Source: Berkeley Lab, Interconnection Cost Analyses, 2023

DOE's Interconnection Innovation e-Xchange (i2X)

Mission: To enable a **simpler**, **faster**, and **fairer** interconnection of clean energy resources while enhancing the **reliability**, **resiliency**, and **security** of our **distribution** and **bulk-power electric grids**

Stakeholder Engagement

- Nation-wide engagement platform and collaborative exchanges
- Generate innovative solutions from discussion with utilities, grid operators, state/local governments, clean energy industry, non-profits

Data & Analytics

- Collect and analyze interconnection data to inform solutions development
- Increase transparency of interconnection process

Strategic Roadmap

- Create roadmap to inform interconnection process improvements
- Identify both near- and long-term opportunities and solutions

Technical Assistance

- Leverage DOE laboratory expertise to directly support stakeholders
- Focus on requests targeting key problems identified in roadmap

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