

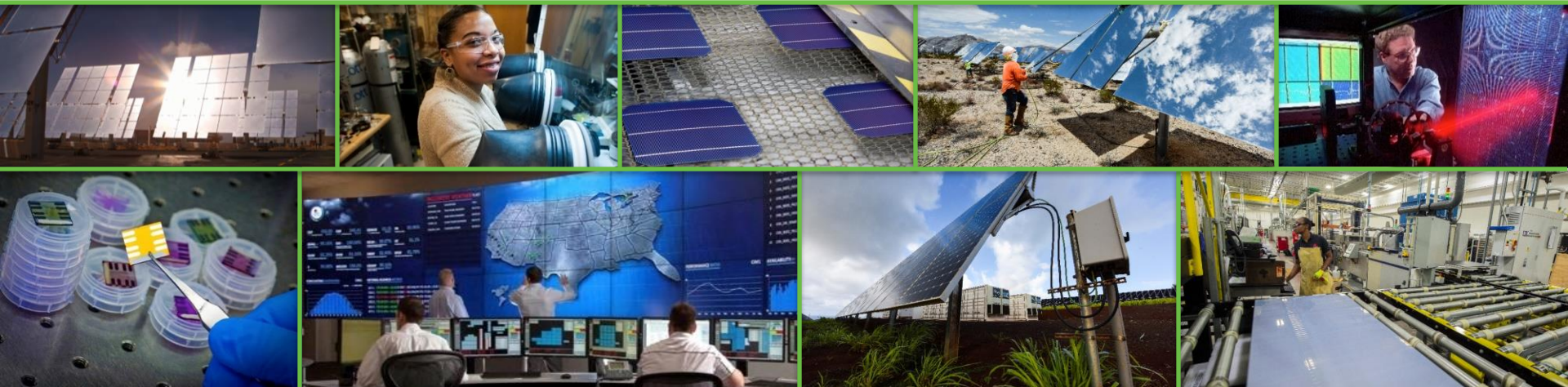


Simpler. Faster. Fairer Interconnection

Innovating to Build a Better Grid for All

Dr. Becca Jones-Albertus, Director

Solar Energy Technologies Office



Solar Energy Technologies Office (SETO) Overview

MISSION

We accelerate the **advancement** and **deployment of solar technology** in support of an **equitable** transition to a **decarbonized economy no later than 2050**, starting with a decarbonized power sector by 2035.

WHAT WE DO

Drive innovation in technology and soft cost reduction to make solar **affordable** and **accessible** for all Americans

Enable solar to support the **reliability, resilience, and security** of the grid

Support **job growth, manufacturing, and the circular economy** in a wide range of applications



Solar Futures Study Summary

1 **Deploy, deploy, deploy.** We must install an average of 30 GW of solar capacity per year between now and 2025 and 60 GW per year from 2025-2030. (In 2020 the U.S. installed 15 GW.)

- 1,000 GW of solar meets 40% of electric demand in 2035, 1,600 GW meets 45% in 2050.
- We must reshape workforce development, supply chains, siting and permitting, and regulation.
- Must facilitate a major growth in wind and storage.

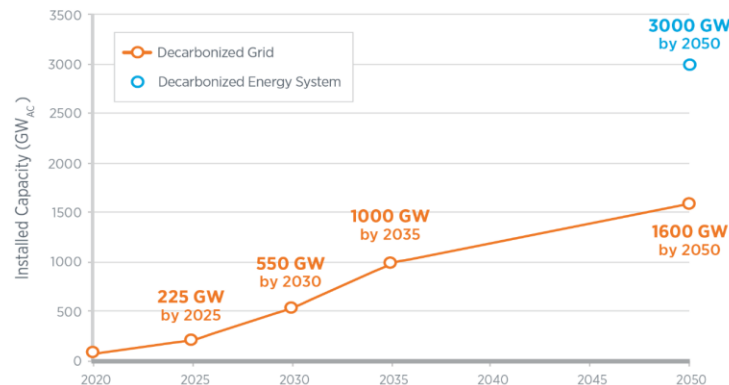
2 **With continued technological advances, electricity prices do not increase through 2035.** This includes solar, wind, energy storage, and other technologies.

3 **The grid will be reliable and resilient.** Storage, transmission, and flexibility in load and generation are key.

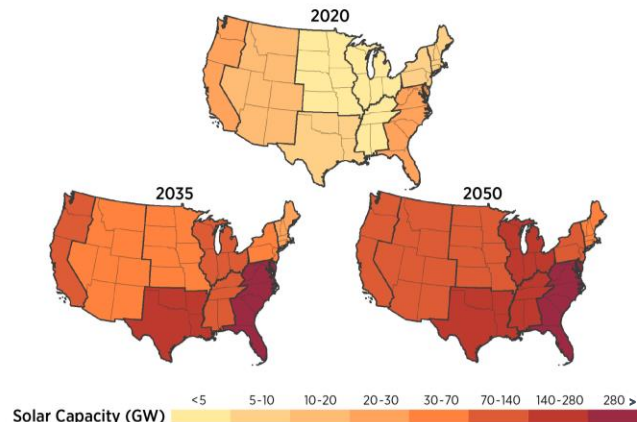
4 **Expanding clean electricity supply yields deeper decarbonization.** Electrifying buildings, transportation, and industry reduces carbon emissions.

5 **Policy changes are necessary.** Limits on carbon emissions and/or clean energy incentives.

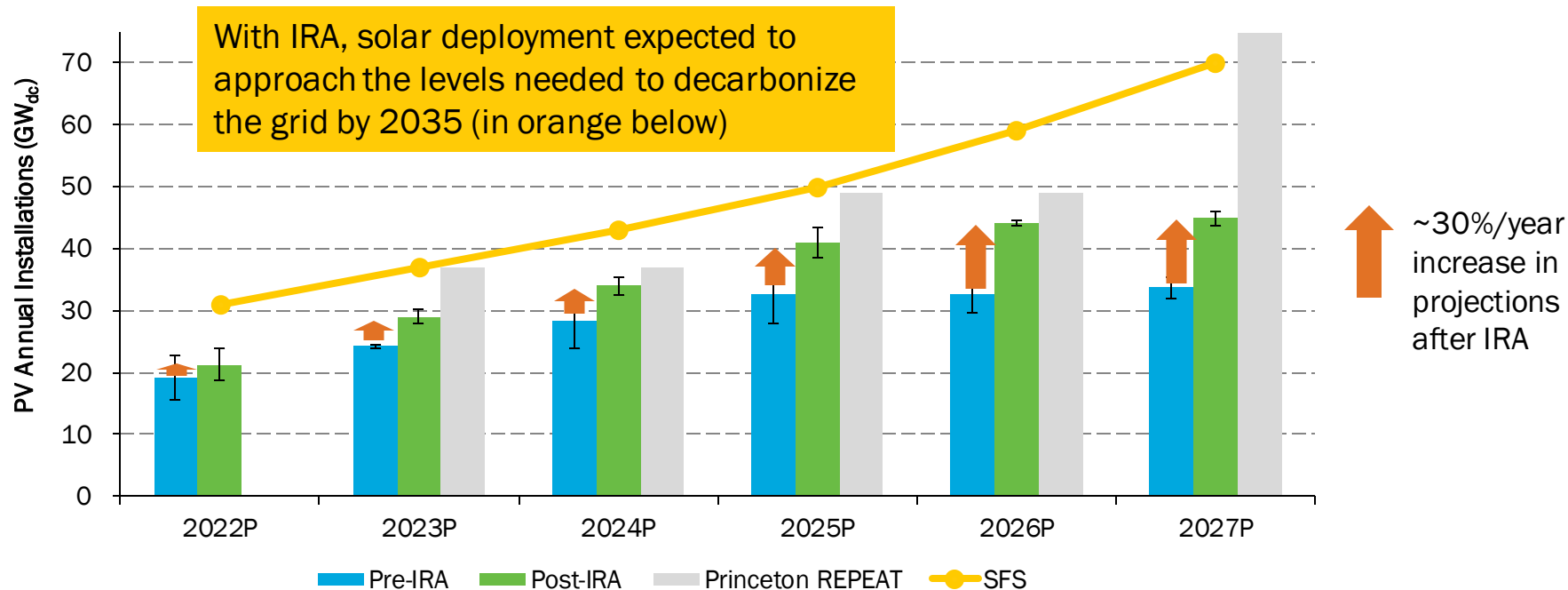
Solar Deployment 2020-2050



Solar Capacity by Census Division in 2020, 2035, and 2050



Estimated Impact of IRA on U.S. PV Deployment



Notes: P = projection. Colored bars represent average projections, and error bars represent high and low projections, line represents the Decarb+E scenario from the Solar Futures Study (SFS).

Sources: BNEF, 2Q 2022 Global PV Market Outlook, 5/27/22; BNEF, 3Q 2022 Global PV Market Outlook, 8/26/22; Wood Mackenzie and SEIA, Q2 2022 US Solar Market Insight, 6/22; Wood Mackenzie and SEIA, Q3 2022 US Solar Market Insight, 9/22. Princeton REPEAT, Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act of 2022, 8/22. U.S. Department of Energy, Solar Futures Study, 9/21.

Executive Order on Climate and Equity

- **Establishes the Administration's climate goals:**
A carbon-free electricity sector by 2035 and a decarbonized economy by 2050.
- **Establishes the Justice40 Initiative:** Sets a goal that 40 percent of the overall benefits of certain Federal Investments (including clean energy and energy efficiency) are to flow to disadvantaged communities.
- **Prioritizes climate in foreign policy and national security.**
- **Requires a government-wide approach to climate**
- **Requires Federal agencies to use authorities, public lands/waters, and financial programs to catalyze clean energy deployment**



Administration Priorities COVID Plan

BRIEFING ROOM

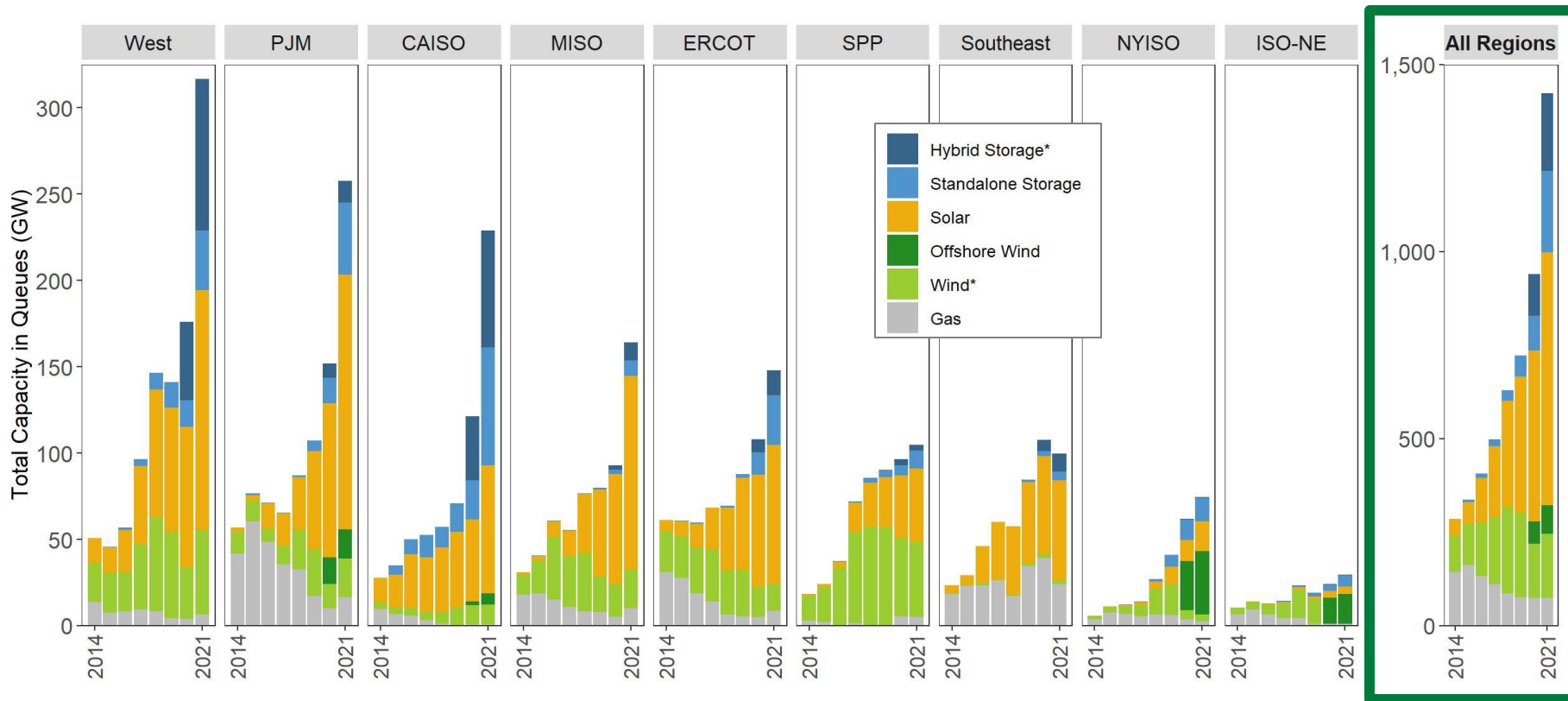
Executive Order on Tackling the Climate Crisis at Home and Abroad

JANUARY 27, 2021 • PRESIDENTIAL ACTIONS

The United States and the world face a profound climate crisis. We have a narrow moment to pursue action at home and abroad in order to avoid the most catastrophic impacts of that crisis and to seize the opportunity that tackling climate change presents. Domestic action must go hand in hand with United States international leadership, aimed at significantly enhancing global action. Together, we must listen to science and meet the moment.

By the authority vested in me as President by the Constitution and the laws of the United States of America, it is hereby ordered as follows:

Active Interconnection Requests Have Surged

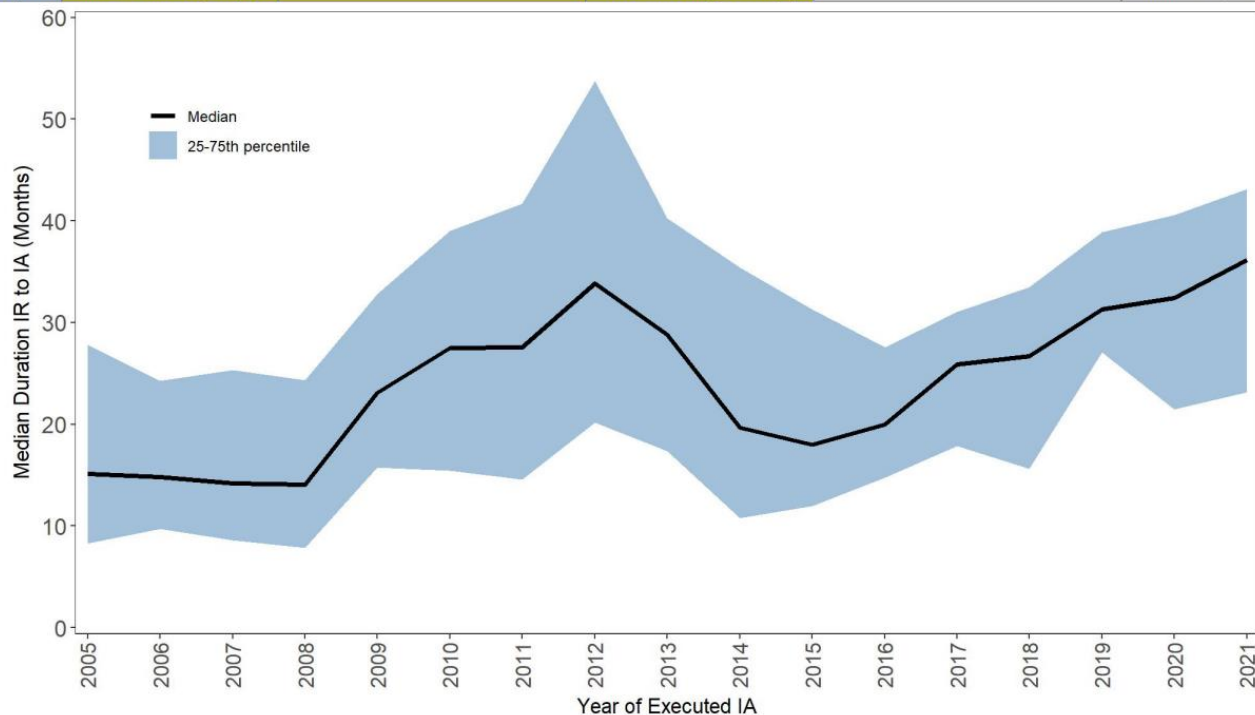


Source: Rand et. al., "Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2021", April 2022:

<https://doi.org/10.2172/1864543>

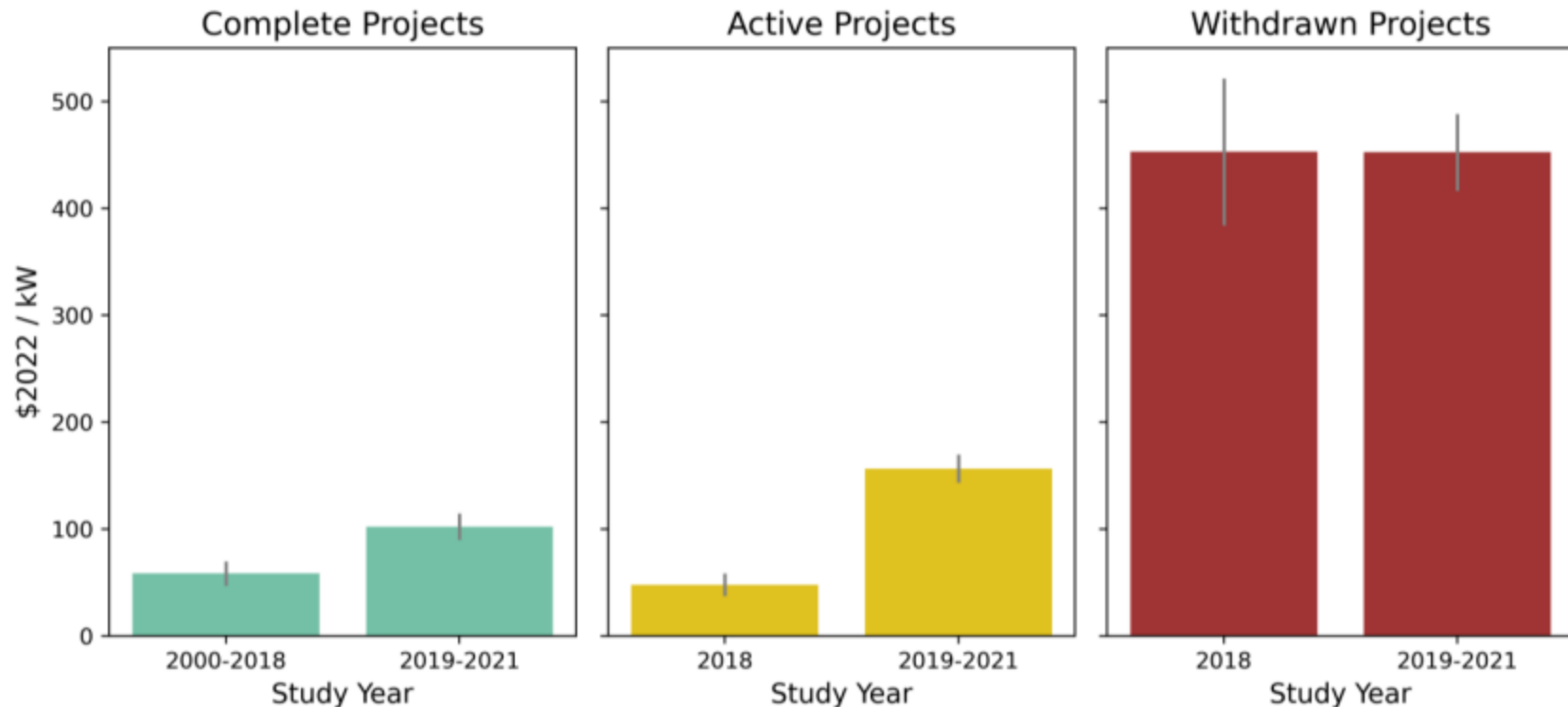
Interconnection Queue Times are Increasing to Over 3 years

Duration Analyzed: Interconnection Request (IR) → Interconnection Agreement (IA) → Commercial Operations (COD)



Notes: (1) Sample includes 2,717 projects from 5 ISO/RTOs and 4 Western utilities with executed interconnection agreements since 2005. (2) Not all data used in this analysis are publicly available.

MISO: Interconnection Costs Are Growing Over Time

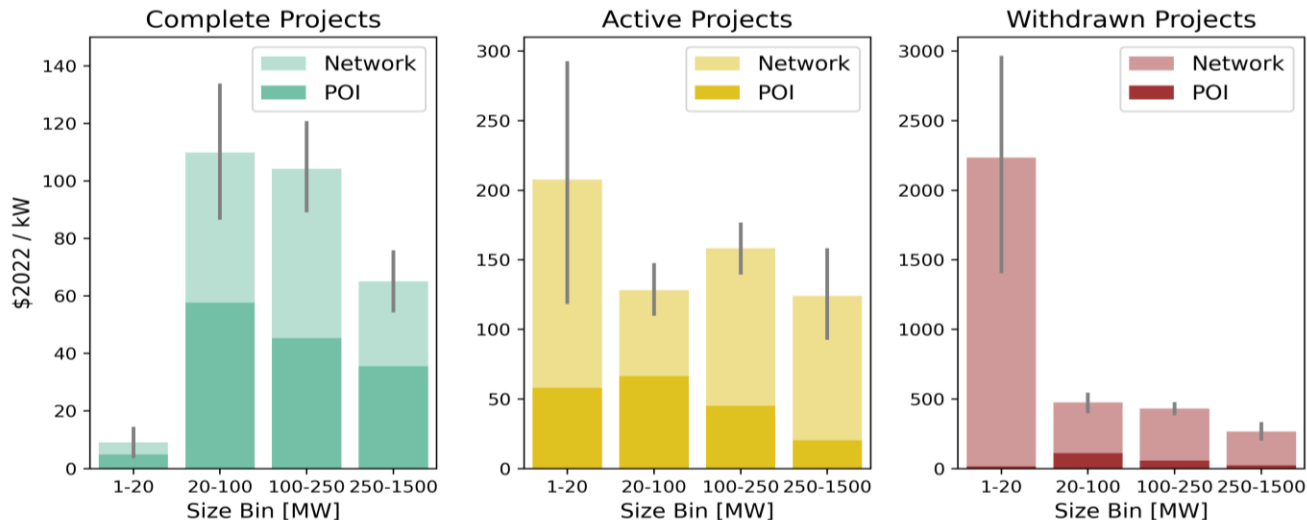


Source: Lawrence Berkeley National Lab, Generator Interconnection Cost Analysis in the Midcontinent Independent System Operator (MISO) territory: <https://escholarship.org/uc/item/0x13z248>

MISO: Smaller Generators Have Higher Interconnection Costs per kW

Projects with larger nameplate capacity have greater interconnection costs in absolute terms, but these costs do not scale linearly on a per kW basis, falling from \$705/kW (small) to \$283/kW (medium), \$259/kW (large), and \$167/kW (very large project size).

MISO: Total Interconnection Costs by Size Bin and Request Status



Source: Lawrence Berkeley National Lab, Generator Interconnection Cost Analysis in the Midcontinent Independent System Operator (MISO) territory: <https://escholarship.org/uc/item/0x13z248>

Why Interconnection and Why Now?

*From 40 MW/day of new PV to 80-160MW/day, Wind 5x, Offshore wind 30 GW
By 2035 (13 -15 years): needs 2x/4x faster Interconnection Processes*

Zero-Carbon Future

Irreversible path to zero-carbon electricity system by 2035 is contingent on paradigm-shifts in interconnection practices to deploy clean energy technologies at exponential scales



5x

Increase in the expected number of solar & wind deployments every year to meet 2035 targets

* Adapting Solar Futures Study findings of average +30GW/year (2020-2025) and +60GW/year (2025-2035) for solar

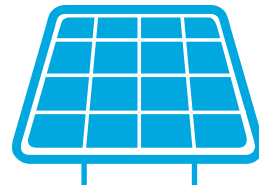
Equity

Inclusive and just transition. Broad group of stakeholders required to fully understand the regulatory, technical, and process challenges in interconnection



Complexity

The modern grid is transforming rapidly, and grid Interconnection processes are growing ever more complex as penetration levels increase and technologies advance



Interconnection Innovation e-Xchange (i2X)

Mission: To enable the **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 working groups



Data & Analytics

Collect and analyze interconnection data to inform solutions development



Strategic Roadmap

Create roadmap to inform interconnection process improvements



Technical Assistance

Leverage DOE laboratory expertise to support stakeholder roadmap implementation



www.energy.gov/i2x

Highlights of i2X Since June 2022

Stakeholder Engagement

- 600+ people at 400+ partner organizations joined i2X
- Cost Allocation, Grid Data Transparency and EEJ will be the **first three working groups**
- First interconnection study bootcamp @GridTECHConnect

Data & Analytics

- BPS interconnection cost reports for MISO and PJM published
- 2023 Queues updated with timelines for BPS
- Interconnection cost reports for NYISO, ISO-NE, SPP to be published

Strategic Roadmap

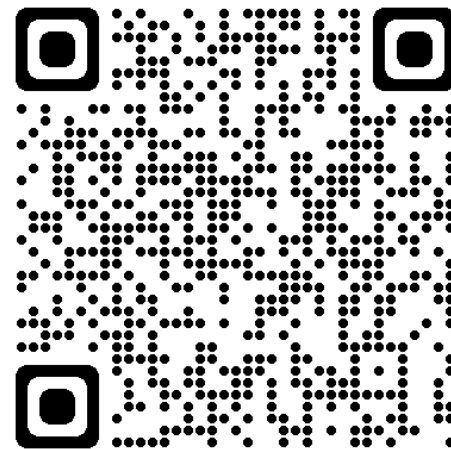
- Early outlines of the Roadmap presented in public events
- Overviews of the Roadmap's companion interconnection study guides
- A technical engineering group for a BPS interconnection study guide started

www.energy.gov/i2x



i2X Technical Assistance Opportunity

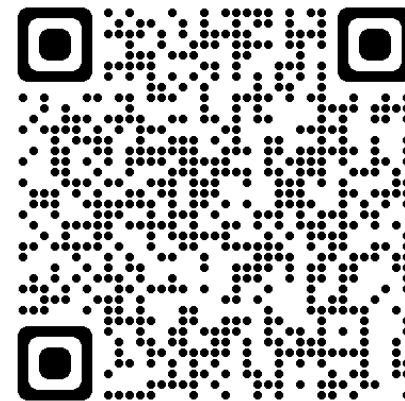
- **Purpose:** Support organizations facing interconnection challenges (DER or BPS)
- **Scope:** Solar, wind, storage or hybrid integration of these technologies
- **Funding:** Up to \$750,000 for up to 12 projects
- **Deadline:** Apply online by 03/22/2023



www.energy.gov/i2X

Technical Assistance Topical Interest Examples

- Alternative solutions to direct transfer trip grid upgrades
- Methods for prescreening and interconnection planning for community-based renewables
- Integrated grid planning and interconnection queue management
- Practices for affected systems interconnection studies on transmission grid networks
- Interconnection-related network upgrade estimation tools



www.energy.gov/i2X



Join . Stay Connected . Engage . Collaborate



**INTERCONNECTION
INNOVATION e-XCHANGE**
U.S. DEPARTMENT OF ENERGY

Website: energy.gov/i2X

Email: i2x@ee.doe.gov

Thank you !

SETO Newsletter – Stay in Touch!



SIGN UP NOW:
energy.gov/solar-newsletter

The SETO newsletter highlights the key activities, events, funding opportunities, and publications that the solar program has funded.

Learn About Upcoming Funding Opportunities

EERE Funding Opportunity Updates

Promotes the Office of Energy Efficiency and Renewable Energy's funding programs.



SIGN UP NOW:

[energy.gov/eere/funding/
eere-funding-opportunities](https://energy.gov/eere/funding/eere-funding-opportunities)

SETO Newsletter

Highlights the key activities, events, funding opportunities, and publications that the solar program has funded.



SIGN UP
NOW:

energy.gov/solar-newsletter



QUESTIONS