



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

Program Overview | 5/16/23

Ammar Qusaibaty . i2X Co-lead . Solar Energy Technologies Office

An initiative spearheaded by the Solar Energy Technologies Office and the Wind Energy Technologies Office

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 the 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:

Examples of difficult interconnection challenges*

Utility
Stakeholder
view

High volume of
“speculative”
applications

Queue gaming by
developers

Limited capacity
and resources at
utilities to match
demand

Re-study work
because of high
withdrawal rates

Developer
Stakeholder
view

Limited Grid-
Capacity
Transparency

Lengthy Queue
Processing
Timelines

High Impact Study
Costs

Uncertainty in Cost
of System
Upgrades

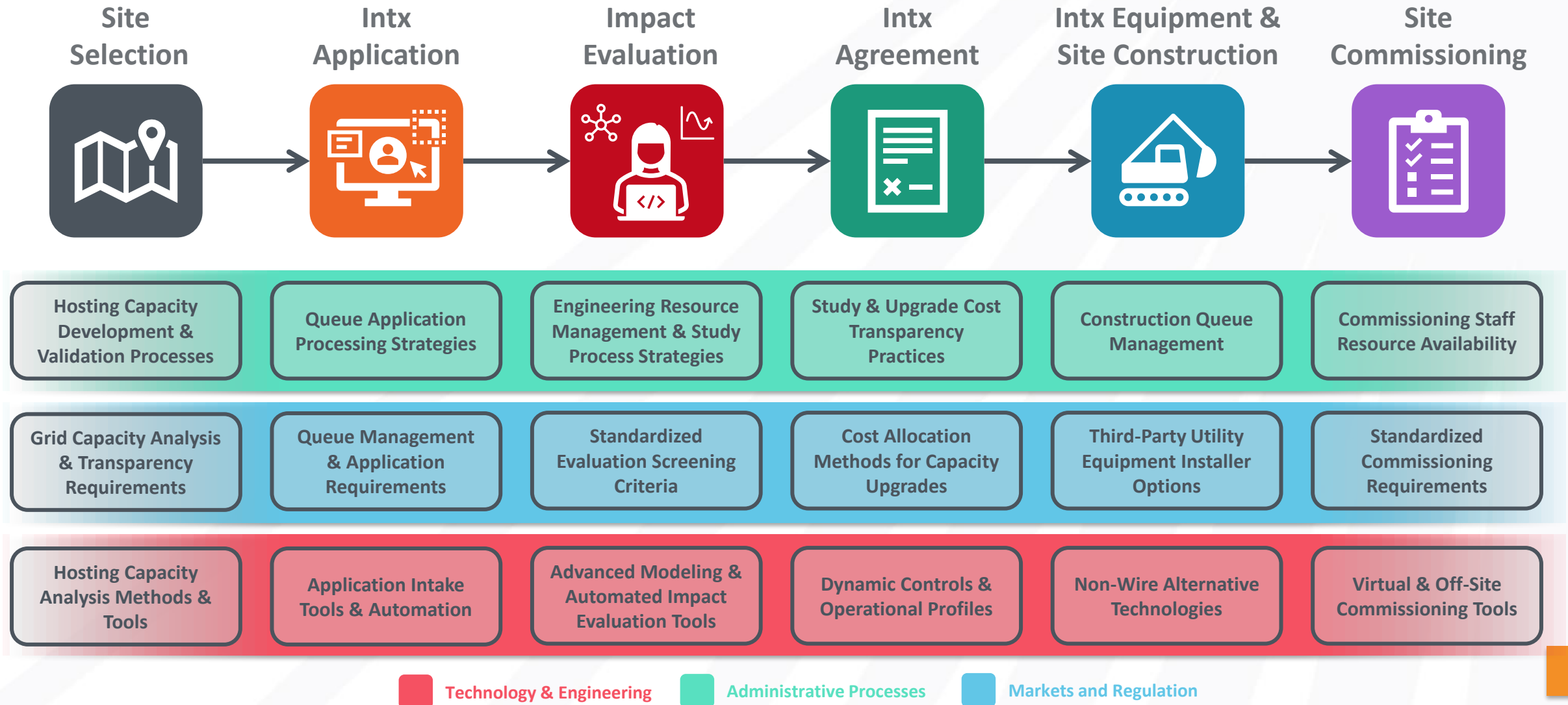
*Based on comments from stakeholders during interconnection hosted workshops

SETO - Reimaging Interconnection for Solar Energy, June 2021

WETO – Distributed Wind Workshop, August 2020 and Wind Systems Integration Workshop, June 2021

i2x – Kick-off Webinar, i2X Office Hours, Community Solar Developers, RE+ Event

Solutions and innovations (Today)



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 procedures*

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



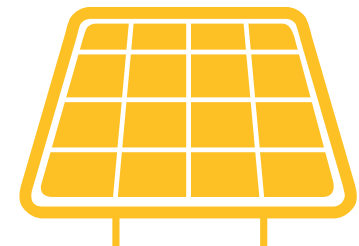
Equity

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 penetrations levels increase and technologies advance



5x

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

i2X Key Elements

Mission: To enable a **simpler, faster, and fairer** interconnection of clean energy resources all while enhancing the **reliability, resiliency, and security** of our electric grid.



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



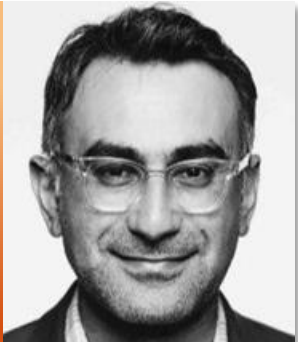
Technical Assistance

Leverage DOE laboratory expertise to support stakeholder roadmap implementation



i2X Leadership Team

SETO



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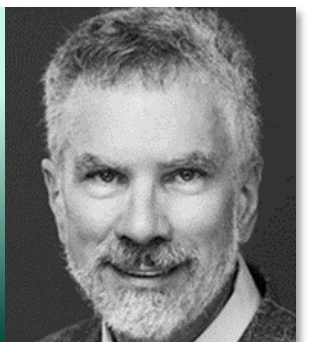
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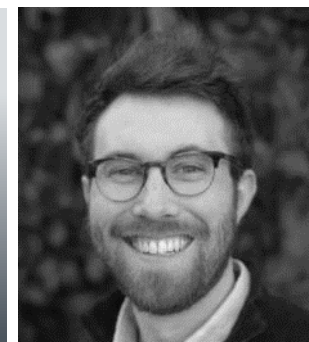
Tom McDermott

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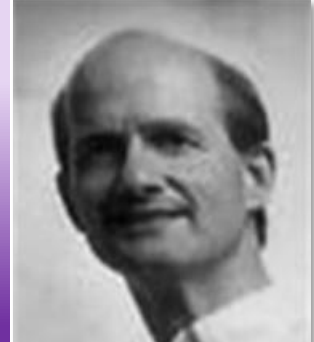
Karyn Boenker

LBNL



Will Gorman

NREL



Michael Ingram

Highlights on i2X since June 2022

Stakeholder Engagement

- 740+ people at 530+ partner organizations joined i2X
- Five meetings for two Solution e-Xchanges completed and more planned
- 60+ Office-Hour Calls with stakeholders

Data & Analytics

- BPS interconnection cost reports for MISO, PJM, NYISO, SPP published
- 2023 Queued Up report updates published on IX timelines for BPS
- Interconnection cost reports for ISO-NE to publish soon

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

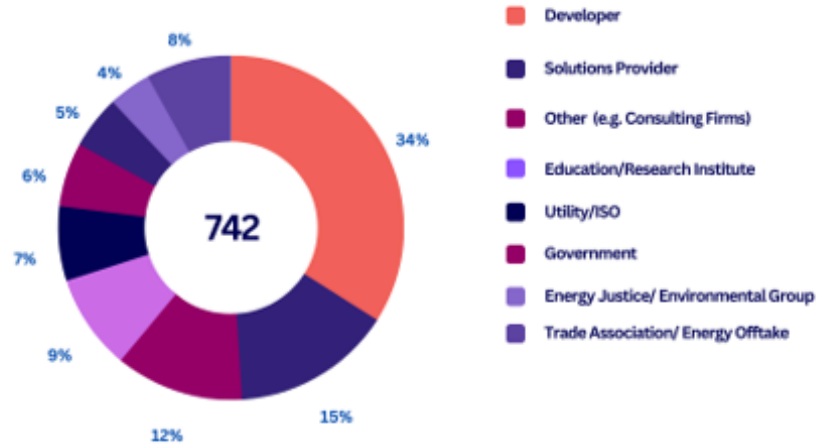
Response to i2X has been incredible

740+ professionals in 530+ organizations

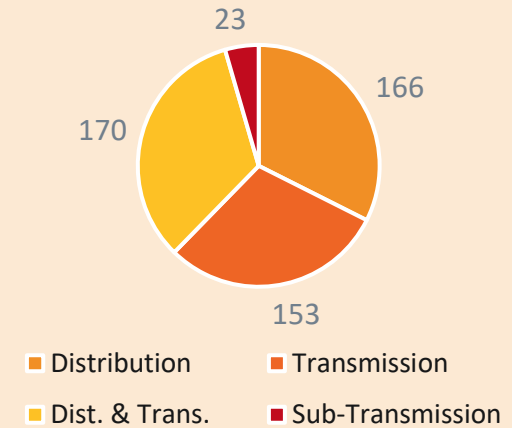


By Sector

Utility / ISO



By Jurisdictional Area of Interest



Intro to i2X Solution e-Xchanges



- **FY23 Goal:** Inform and formulate a 5-Year Strategic Roadmap for interconnection & study guides with real world action
 - Topical challenges and issues
 - Practical solutions to implement and scale
 - Knowledge gaps and new solutions to pilot
 - Success goals and measures of success
- **FY23 Schedule:** Solution e-Xchanges to be held for 2hrs on Wednesdays and/or Thursdays during April - August.
 - Queue Management and Cost Allocation for both BPS and DER most extensive number of meetings due to popular demand
 - Four other topics (e.g. EEJ, Data Transparency, Workforce)
 - Options for specialized topic meetings
- **Beyond FY23 :** Solution e-Xchanges to continue building a national forum for all stakeholders as a community of practice, excellence and innovation (Ideation. Solution-driven Collaboration. Peer-Learning.)



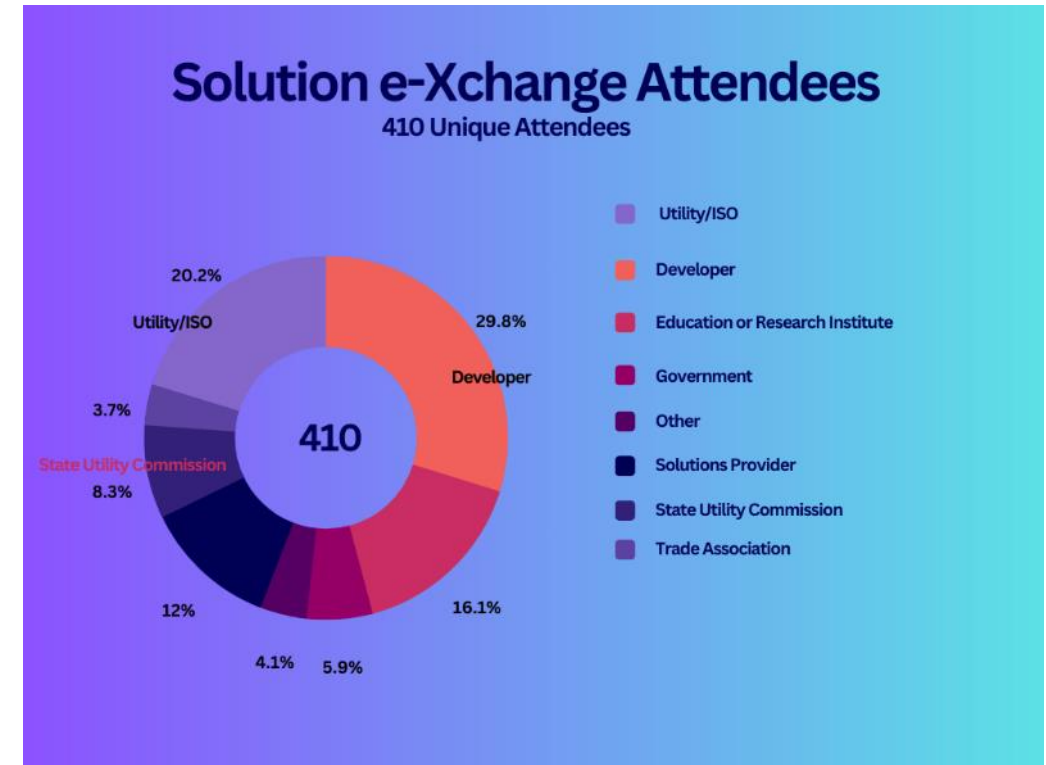
i2X Solution e-Xchange Topic Areas



- **Queue Management and Cost Allocation**
 - Innovative interconnection solutions exist?
 - Technology, regulation, administration, and organizational change focus
- **Grid Engineering Practices and Standards**
 - Engineering and technology focus
 - *How* can proposed solutions be executed?
- **Equity and Energy Justice**
 - Multidisciplinary
 - *Who* is impacted by and benefits from proposed solutions?
- **Data Transparency**
 - Multidisciplinary
 - *What* transparency concerns must be addressed?
- **Interconnection Workforce and Training**
 - Multidisciplinary

Additional subjects, like capacity maps, cross these topics and will be addressed from these different perspectives. Follow the schedule of events on the i2X website.

First 5 meetings starting April 2023



5-Year Strategic Roadmap

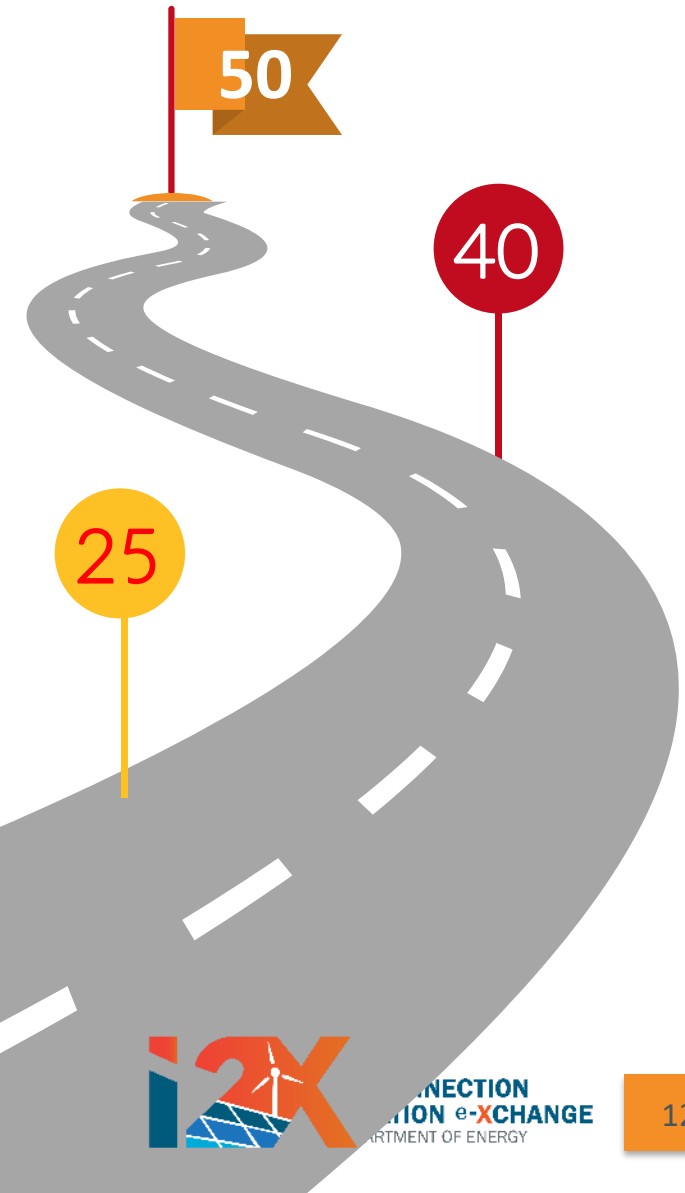
By stakeholders for stakeholders

Discussion Goal: 50% cost and 50% schedule reduction in 5 years and transitioning to no more than 1-year from application to build going forwards

- Expert-Informed goal setting
- Success milestones & gaps to address
- Transparent key performance indicators
- Covers both DER & BPS and their interplay
- Customizations for size and region
- Covers challenging topics
- Stakeholder Actions. Multi-stakeholder actions
- Transition planning for new processes
- Buy-in, Adoption, and Updates

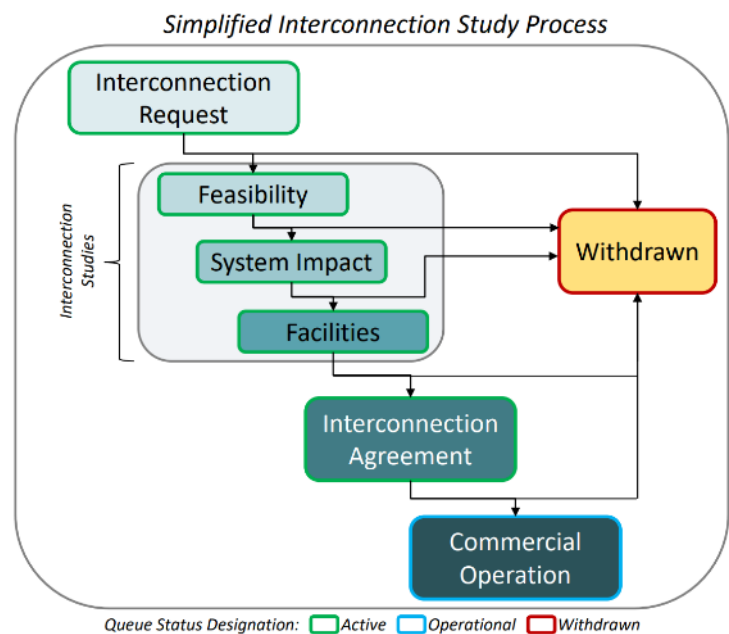


FERC NOPR RM22-14



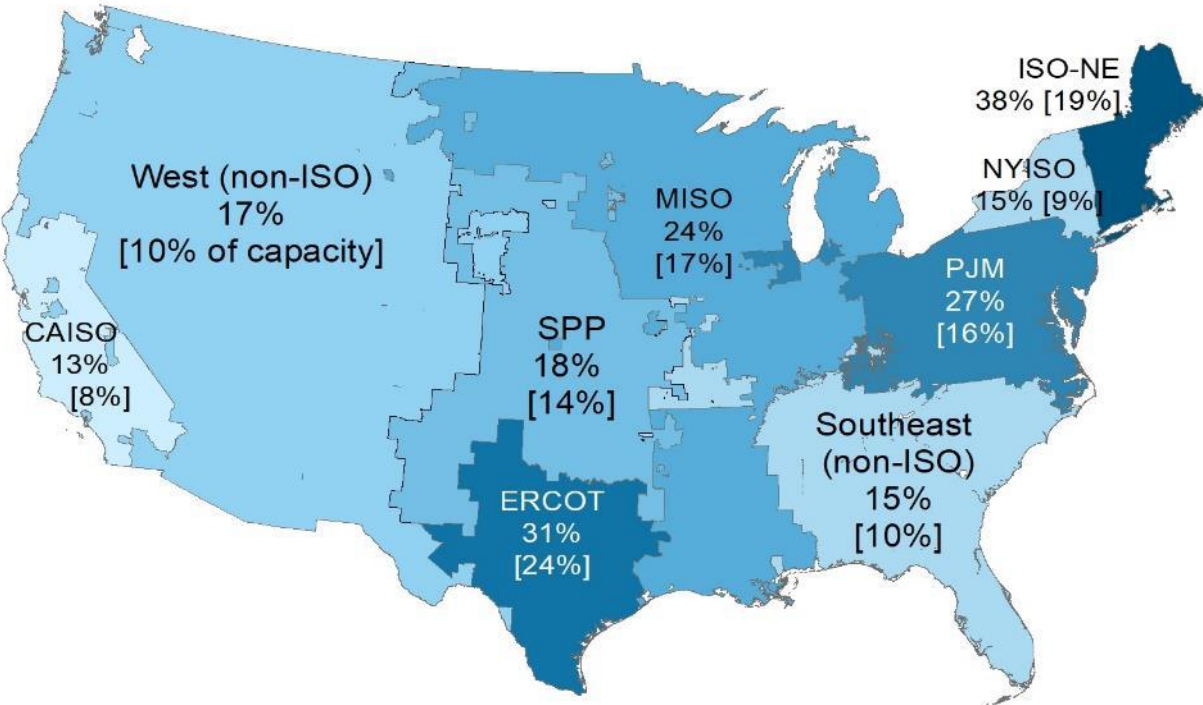
Only 21% of projects that applied for interconnection prior to 2018 have been built – 72% have been withdrawn (7% are still actively trying!)

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: 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>

Source: Berkeley Lab, “Queued Up”. 2023

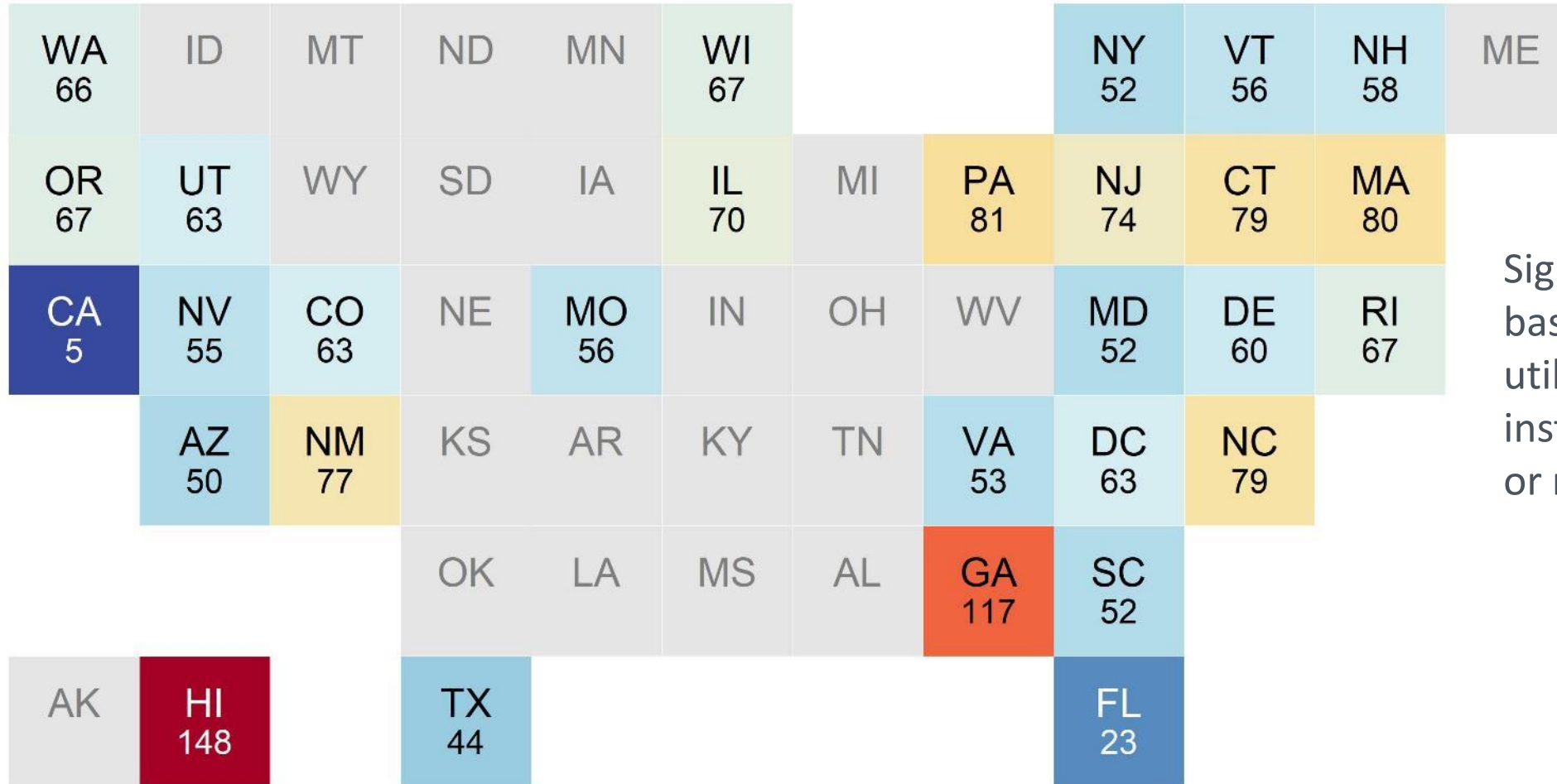


The completion rate is even lower when calculated in terms of proposed capacity [14%]

Overall Interconnection Time

(Business Days in an interconnection process from 1st Submit to PTO)*

PV-Only | 1-10kW
Installed 2017-2021



Significant differences based on whether utilities require pre-install approval to build or not

*Source: NREL's SolarTRACE Dataset

i2X Technical Assistance Opportunity

- **Purpose:** Support U.S.-based 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. More **funding available** as needed
- **Areas of 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
 - Cost allocation methodologies for grid upgrades that enable fast-track interconnection study



Join . Engage . Collaborate

Questions?

Website: energy.gov/i2X

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