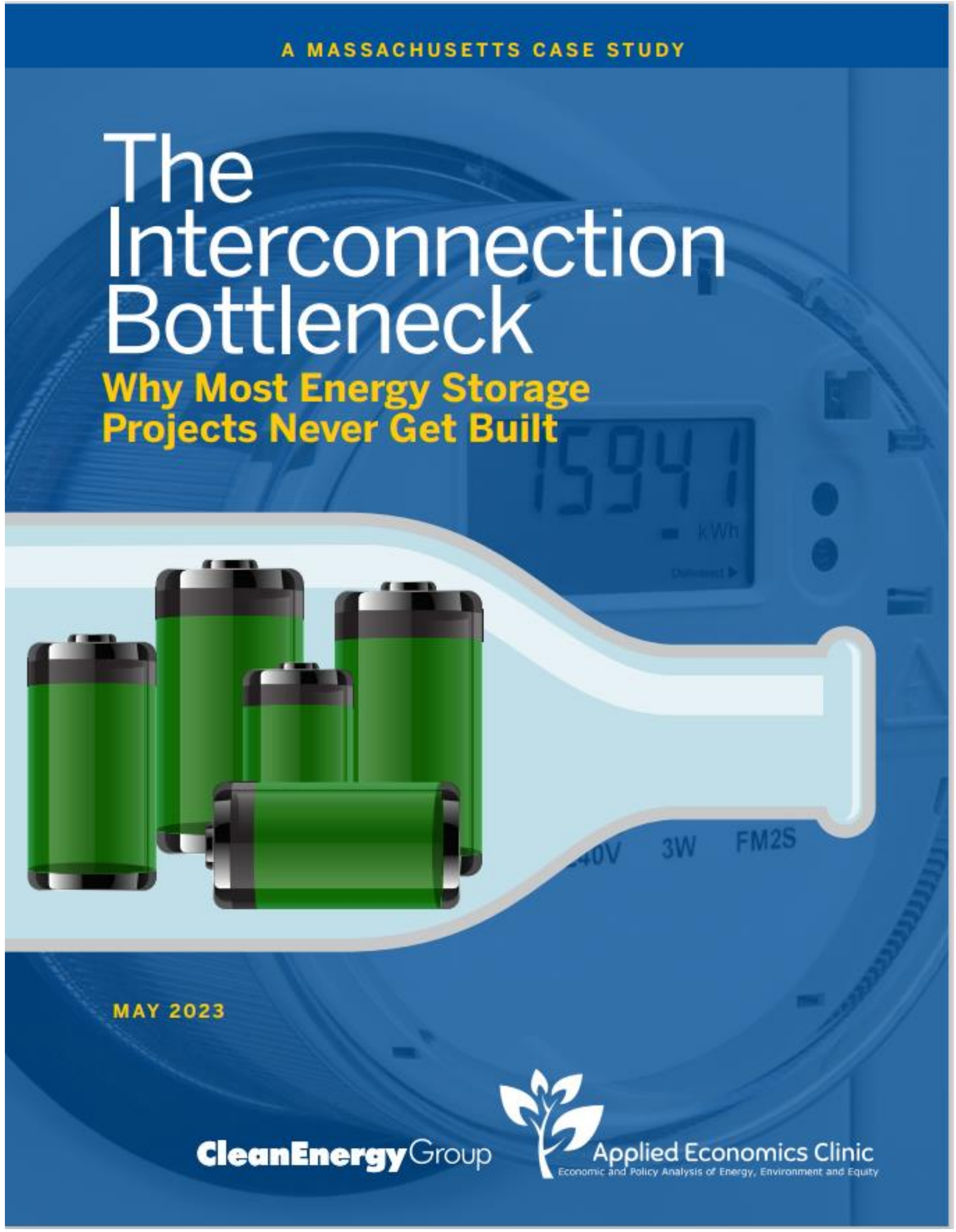
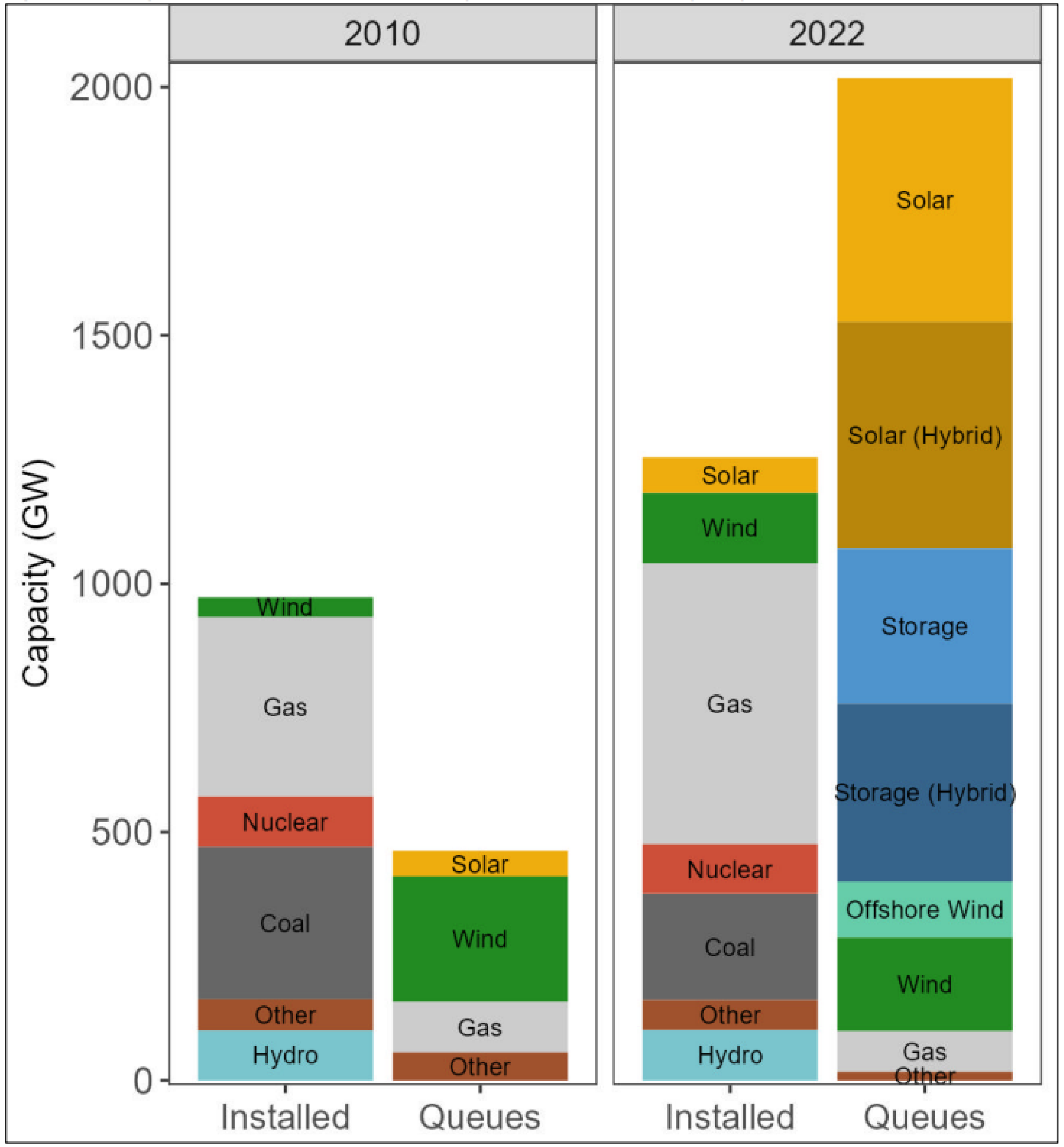
New Report on Interconnection Barriers to Energy Storage and Solar+Storage



Published May 2023
Webinar May 23

Figure 4. Changes in national interconnection queues and installed capacity



Reproduced from: LBNL. 2023. "Grid connection requests grow by 40% in 2022 as clean energy surges, despite backlogs and uncertainty." Available at: https://emp.lbl.gov/news/grid-connection-requests-grow-40-2022-clean.

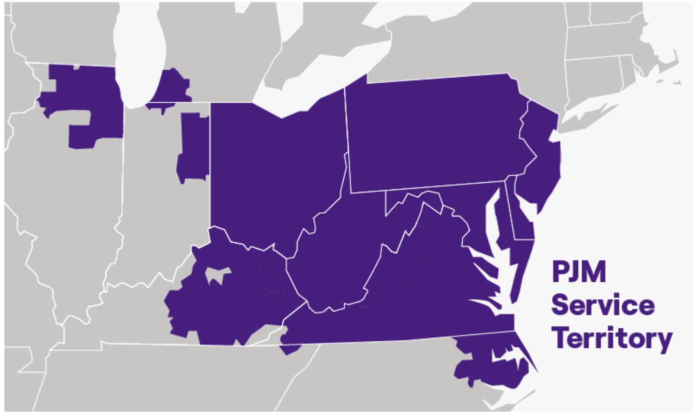
National Interconnection Queues

- Capacity has quadrupled in 12 years
- The makeup of queued projects has changed dramatically, with the growth of solar and energy storage
- Just 14% of queued capacity 2000-2017 reached commercial operation

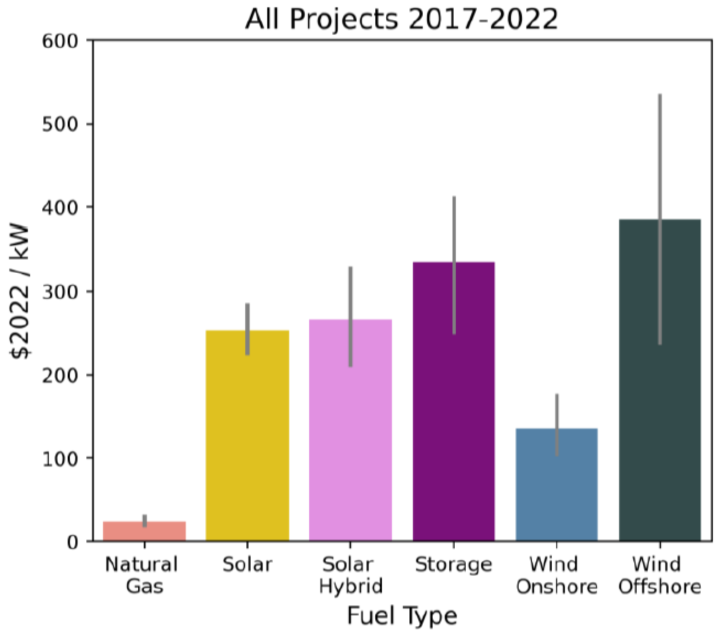
Regional Interconnection Queues

Case Study: PJM

- PJM interconnection queue doubled in capacity since 2019
- Interconnection costs have increased
  - 2000-2009: $18-$30 $/kW median
  - 2010-2019: $8-$85 $/kW median
- Network upgrade costs drive increases
- Interconnection costs of storage, solar, and wind exceed those of natural gas



PJM Interconnection Costs by Fuel Type

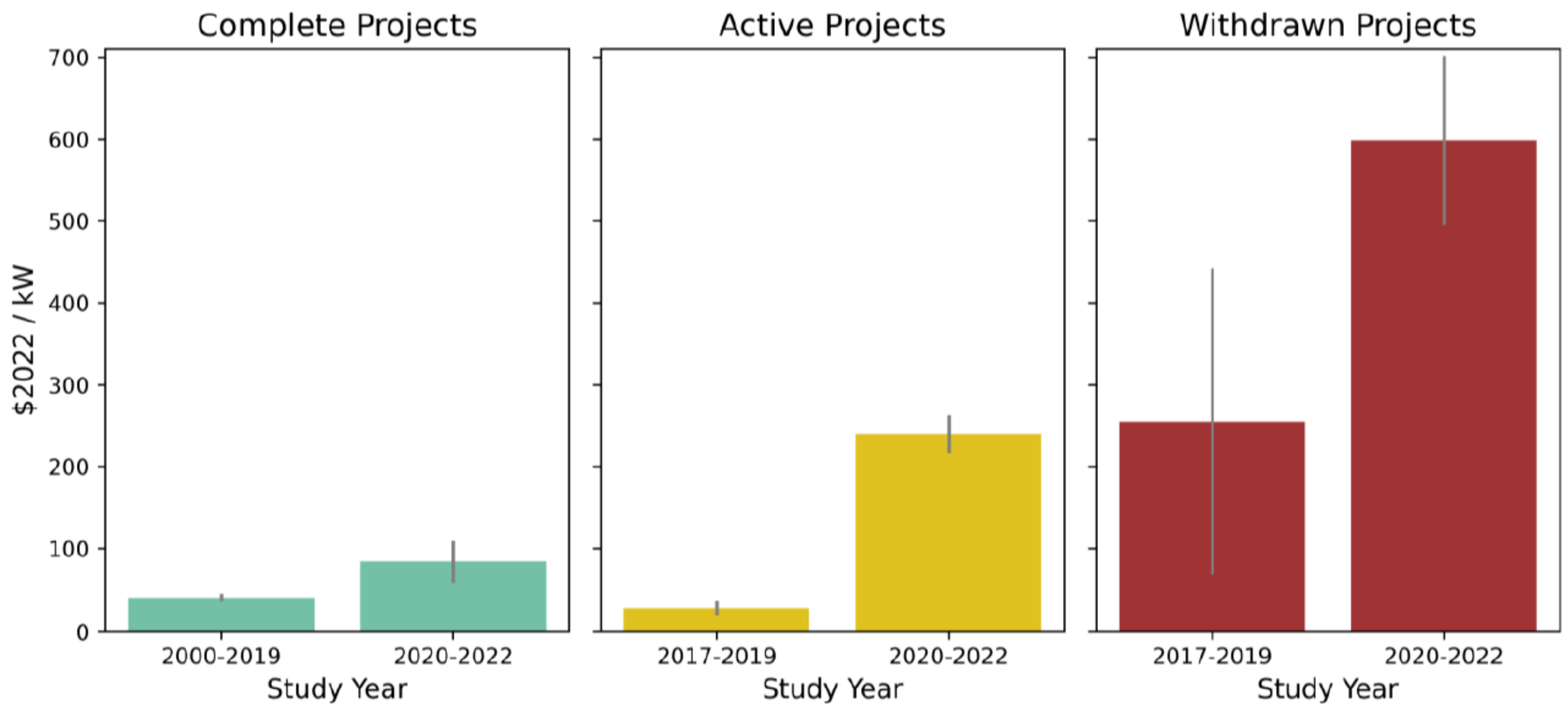


PJM Interconnection Costs – Large Scale Projects ($/kW)

- Offshore Wind $385
- Energy Storage: $335
- Solar $253
- Onshore Wind $135
- Natural Gas: $24

Source: Lawrence Berkeley National Laboratory

PJM Interconnection Costs by Request Status



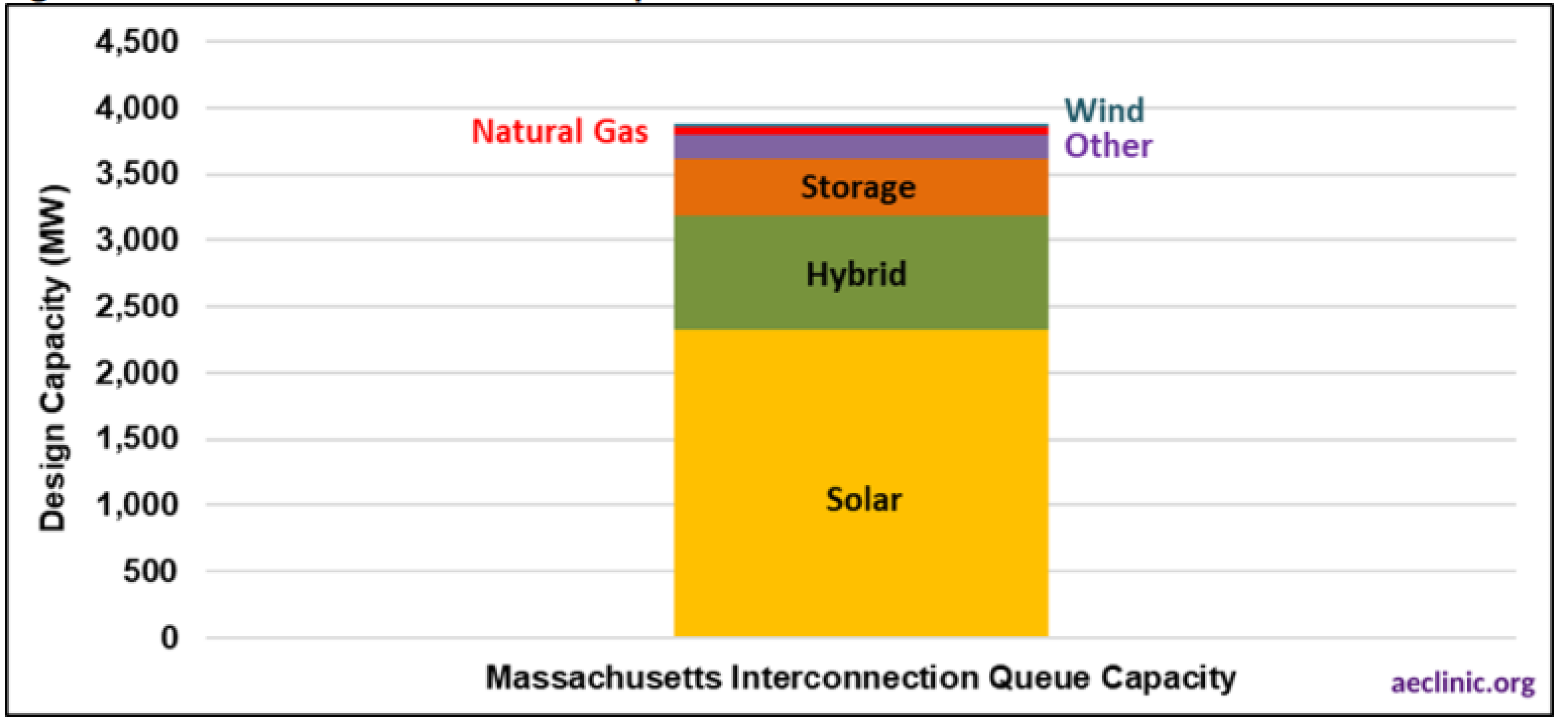
Primary driver of cost increases: network upgrade costs during interconnection processes.

Source: Figure 3 in Seel et al. 2023. Interconnection Cost Analysis in the PJM Territory. Berkeley Lab. Available at: https://eta-publications.lbl.gov/sites/default/files/berkeley_lab_2023.1.12-_pjm_interconnection_costs.pdf.

State-Level Interconnection Queues

Case Study: Massachusetts

Figure 3. Massachusetts interconnection queue



Solar, storage and hybrid solar+storage make up 93% of the Massachusetts interconnection queue

Case Study: Massachusetts

The Good News: Solar and storage targets and incentive programs have worked! – more capacity entering queues

The Bad News: Authorized storage and solar+storage capacity remains near zero for most years

Result: The majority of proposed projects do not get built

Lost Investment: Proposed capacity additions waiting in the Massachusetts interconnection queue represent approximately **$8 billion** in planned investments, or 1.2 percent of the Commonwealth's total economic activity for 2022.

Figure 1. Proposed and authorized solar and storage capacity additions of solar and storage per year in Massachusetts

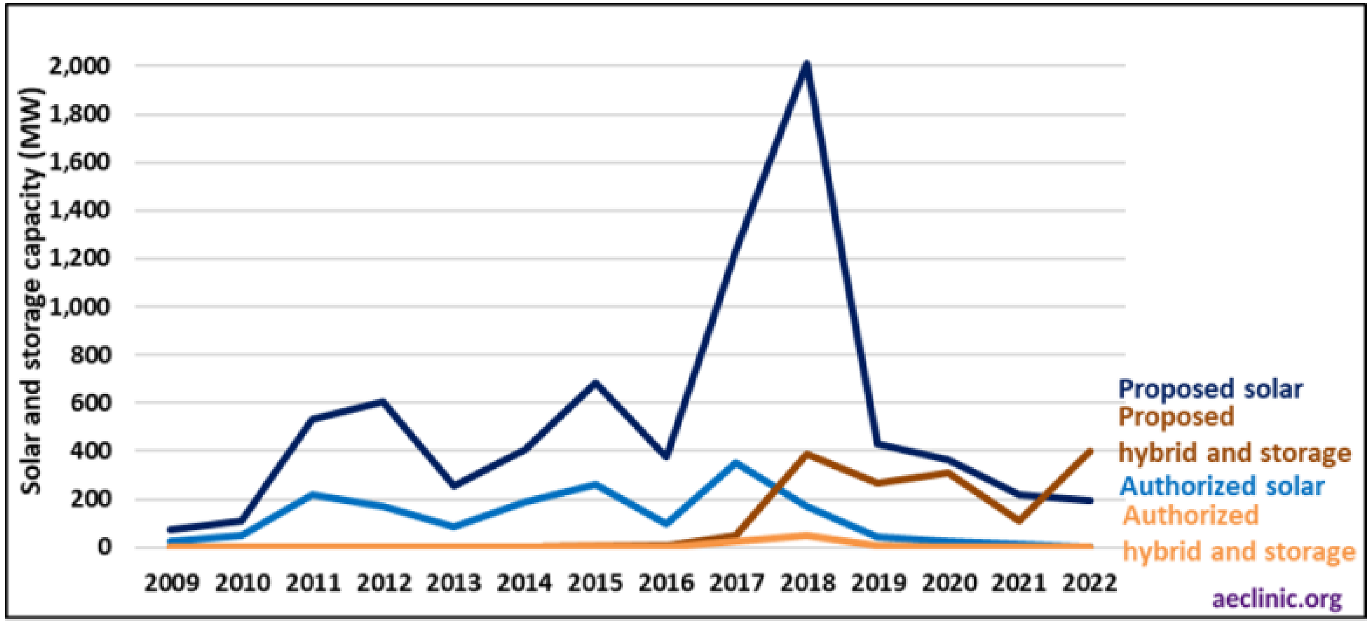
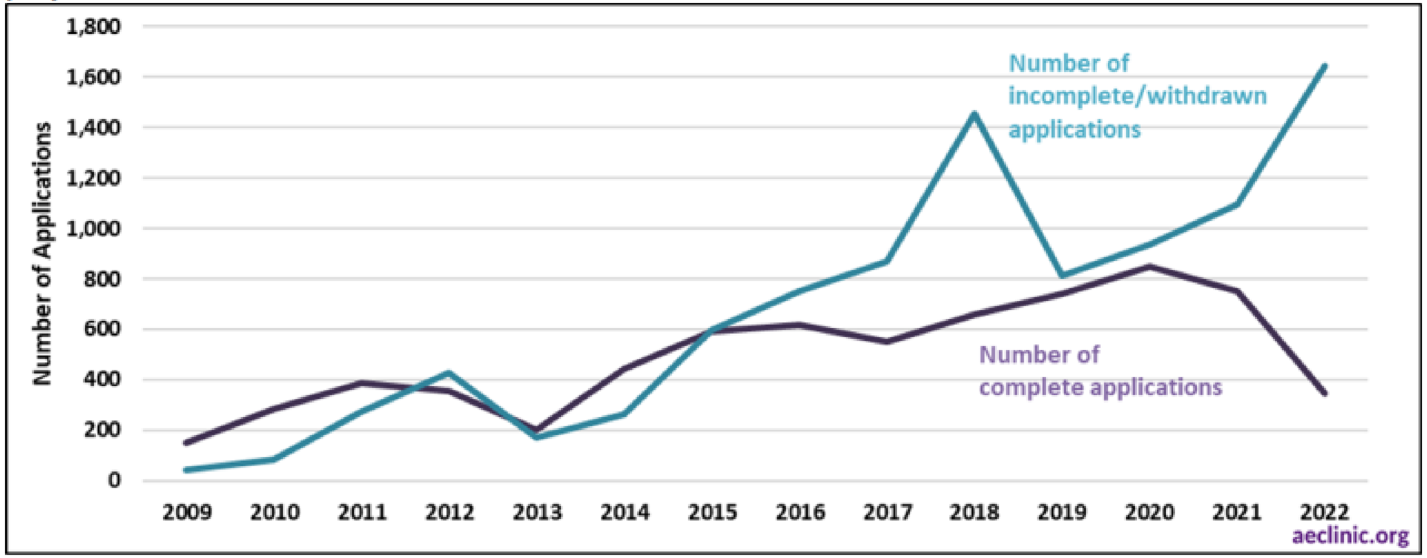


Figure 2. Massachusetts complete and incomplete/withdrawn applications of solar and storage projects



Takeaways: Some Problems

Cost causation

Cost of infrastructure upgrades are borne by the project whose application triggered the need to upgrade; storage projects often require hosting capacity upgrades due to bidirectional power flows

Results: High interconnection costs, especially for solar and storage projects

Project-by-project grid upgrades

Grid upgrades are made in reaction to individual project proposals, which are considered one at a time

Results: Lengthening queues, long wait times, grid upgrades are locational and reactive rather than systemic and proactive

Storage not incorporated into interconnection protocols

Storage not included in interconnection rules; utilities make unreasonable assumptions about storage operational parameters (for example, modeling that assumes charging during peak demand hours, and export of full nameplate capacity during off-peak hours); utilities unfamiliar with export-control technologies

Results: inflated perceived risks and resulting inflated costs for storage interconnection

Takeaways: Some Solutions

Socialized costs

The cost of infrastructure upgrades could be shared among the stakeholders who benefit

Proactive, integrated, system-wide and iterative grid planning

Predictive modeling and forecasts of hosting capacity needs can be used to preemptively upgrade the grid; this is an iterative process

Updated interconnection protocols that incorporate storage

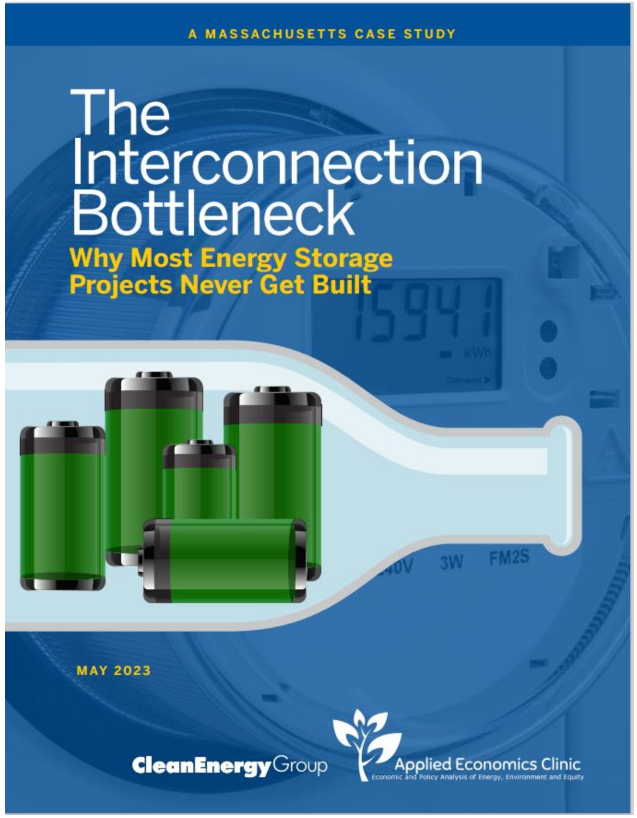
Assess storage needs based on realistic operating parameters; incorporate control technologies and/or operating agreements; expedite smaller projects

Thank You!

Todd Olinsky-Paul
Todd@cleanegroup.org
(845) 625-8807

CleanEnergyGroup
Innovation in Finance, Technology & Policy

CleanEnergy States Alliance



Webinar May 23