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Department of Energy's **Draft National Transmission Needs Study**

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Notice

- None of the information presented herein is legally binding.
- The content included in this presentation is intended for informational purposes only relating to the Draft 2023 National Transmission Needs Study.
- Any content within this presentation that appears discrepant from the Needs Study language is superseded by the Needs Study language.

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Overview of National Transmission ~~Congestion~~ Needs Study

as amended by Bipartisan Infrastructure Law

Federal Power Act §216(a) directs DOE to conduct assessments of:

historic and expected transmission capacity constraints and congestion

every three years

with consultation* from States, Indian tribes, and regional grid entities

- Department's triennial **state of the grid report**
- Reviews historic industry data, recent power system studies, published capacity expansion results
- Final published Summer 2023 **following public comment period**

*__consultation__ = **ability to contribute to Study draft** as referred to in Federal Power Act; NOT government-to-government *Consultation* with Tribes as defined by DOE Order 144.1

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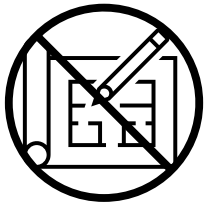
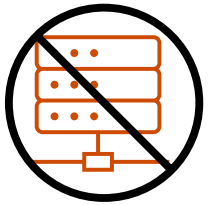
Understanding the Needs Study

	What It Is	What It Isn't
Objective	 Assessment of Needs	 Not prescribing solutions
Methods	 Considers published data and reports (80 references)	 No new modeling, cost-benefit analysis, or system planning
Output	 Needs organized by geographic regions	 Regions not synonymous with corridors

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National Transmission Needs Study

https://www.energy.gov/gdo/national-transmission-needs-study

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1. There is a pressing need for new transmission infrastructure.
2. Interregional transmission results in the largest benefits.
3. Needs will shift over time.

IV. Historical Data: Current Need

IV.a. Historical Transmission Investments

IV.b. Market Price Differentials

IV.b.1. Regional Price Differentials

IV.b.2. Interregional Price Differentials

IV.b.3. Transmission Value during Extreme Events

IV.c. Qualified Paths

IV.d. Interconnection Queues

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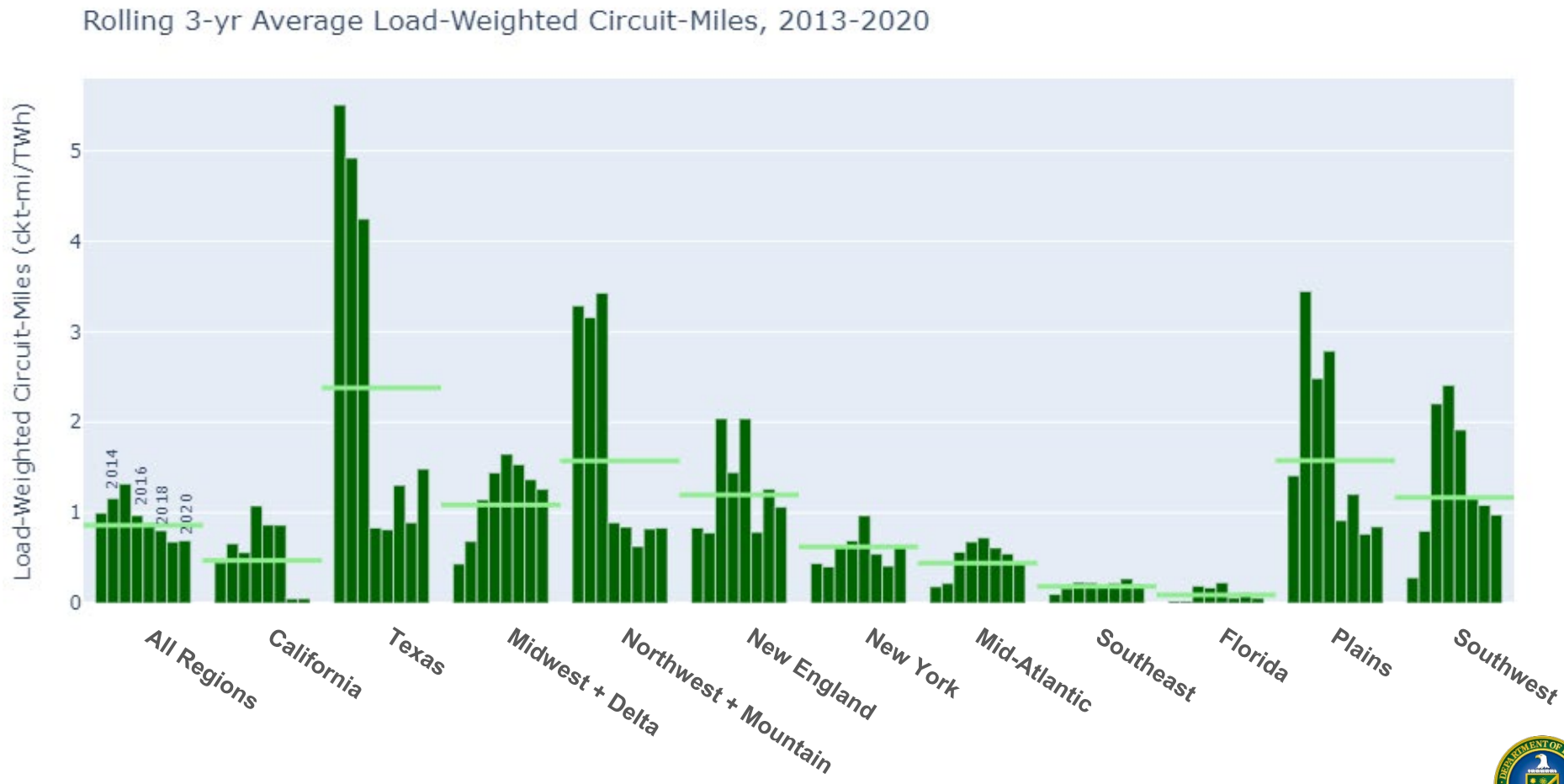
Transmission investments decreased during the second half of the 2010's.



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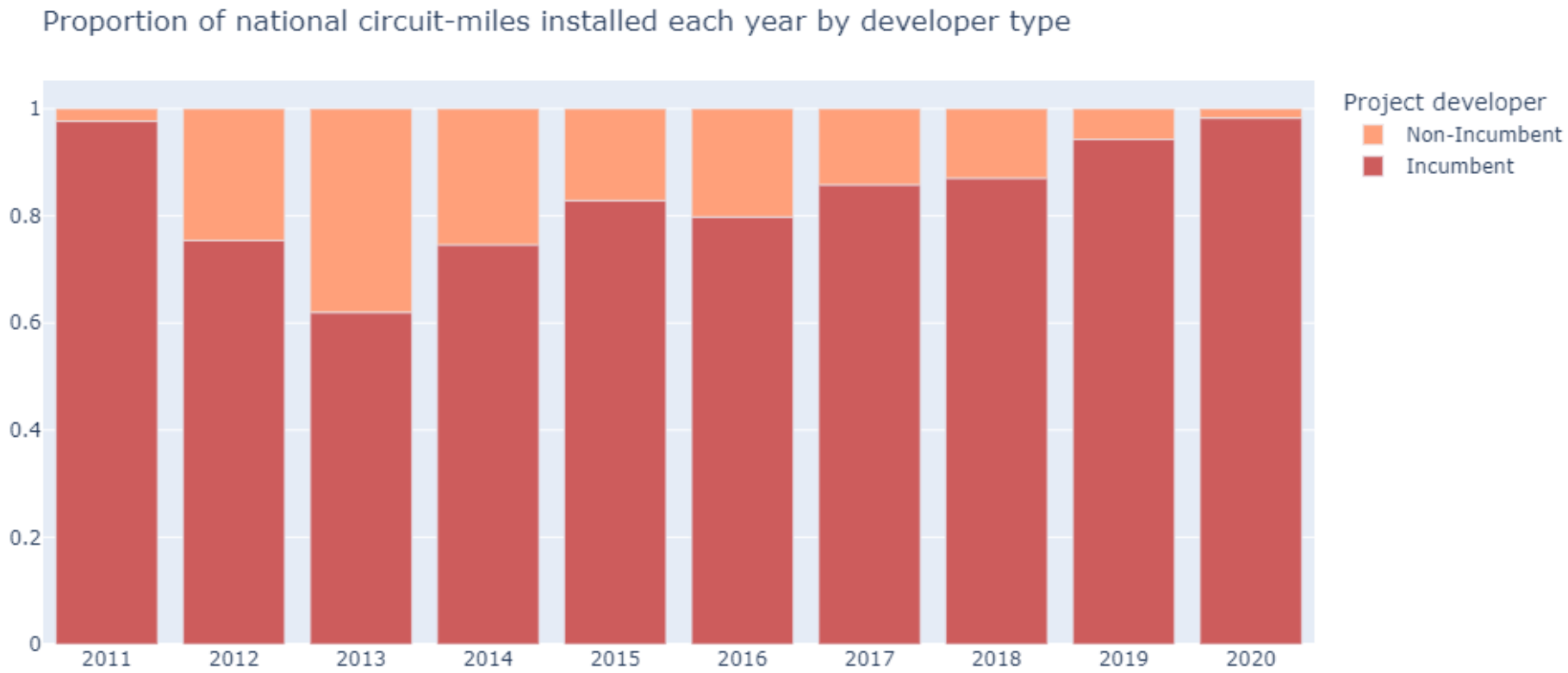
Non-incumbent developers' share of energized projects has decreased from 40% in 2013 to less than 5% in 2020.



Data from MAPSearch Transmission Database (2020). All transmission lines rated at or above 100kV.

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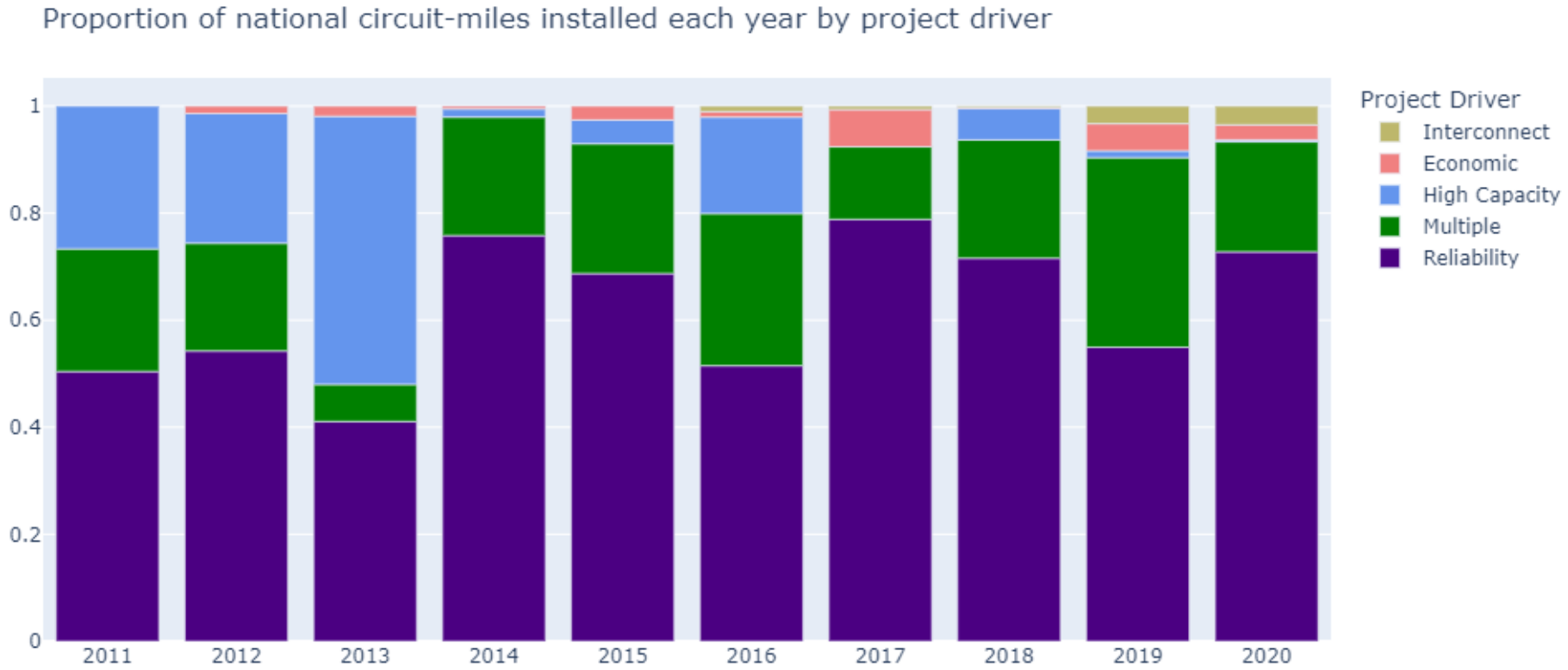
Share of projects addressing reliability concerns have increased. Share of high-capacity projects moving generation have decreased.



Data from MAPSearch Transmission Database (2020). All transmission lines rated at or above 100kV.

Interconnect projects to designed to connect power plants to grid.
Economic projects are designed to alleviate congestion causing high electricity prices.
High-capacity projects are designed to bring large amounts of generation far distances, usually at voltages >=345kV.
Reliability projects are meant to address a reliability concern on the grid.
Multiple drivers are for projects designed for at least two of the above drivers.

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V. Review of Existing Studies: Current and Future Needs

- V.a. Reliability
- V.b. Resource Adequacy
- V.c. Clean Energy
  - V.c.1. Offshore Wind
  - V.c.2. Clean energy on tribal lands
- V.d. Congestion
  - V.d.1. New England
  - V.d.2. New York
  - V.d.3. Mid-Atlantic
  - V.d.4. Midwest and Delta
  - V.d.5. Plains
  - V.d.6. California and the West
- V.e. Curtailment
- V.f. Resilience
- V.g. Electrification
- V.h. Non-Wires Alternatives
  - V.h.1. Energy Storage
  - V.h.2. Distributed Energy Resources
  - V.h.3. Grid-Enhancing Technologies
  - V.h.4. Microgrids
- V.i. Barriers to Transmission Development

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50 Transmission studies reviewed (2018-2022)

Dept. of Energy

1. **NREL** Renewable Energy Potential on Tribal Lands (2018)
2. **NREL** Microgrids for Resiliency (2020)
3. **NREL** Interconnection Seams Study (2020)
4. **DOE** Solar Futures Study (2021)
5. **NREL** North American Renewable Energy Integration Study (2021)
6. **NREL** 2021 Standard Scenarios (2021)
7. **NREL** Extreme Weather and High Variable Renewable Energy (2021)
8. **NREL** Microgrids for Resiliency (2021)
9. **DOE** Renewable Energy Resource Assessment for the U.S. (2022)
10. **DOE** Grid-Enhancing Technologies: Ratepayer Impact (2022)
11. **LBNL** Empirical Estimates of Transmission Value (2022)
12. **NREL** Storage Futures Study: Grid Operational Impacts (2022)

Consultant

13. **Wood Mackenzie** Regulatory Evolution for Decentralized Grid (2019)
14. **Americans for a Clean Energy Grid** Consumer, Employment, and Environmental Benefits of Electricity Transmission Expansion (2020)
15. **Brattle / Anbaric** Offshore Wind Transmission in New England (2020)
16. **Brattle / Anbaric** Offshore Wind Transmission for New York (2020)
17. **Evolved Energy Research** Massachusetts Energy Pathways (2020)
18. **Vibrant Clean Energy** Why local solar for all costs less (2020)
19. **American Council on Renewable Energy** Transmission Makes the Power System Resilient to Extreme Weather (2021)
20. **Brattle** Transmission Planning and Benefit-Cost Analyses (2021)
21. **Breakthrough Energy** A 2030 United States Macro Grid (2021)
22. **Evolved Energy Research** Oregon Clean Energy Pathways (2021)
23. **Vibrant Clean Energy** Plan for Economy-Wide Decarbonization (2021)

Academic

25. **MIT** Two-Way Trade in Green Electrons: Decarbonization in NE (2020)
26. **UC Berkeley** The 2035 Report (2020)
27. **MIT** The Value of Inter-Regional Coordination and Transmission (2021)
28. **Princeton** Net Zero America Final Report (2021)
29. **Texas A&M** Stability Considerations for Synchronous Interconnect (2022)

Industry

30. **ISO-NE** 2019 Economic Study: Offshore Wind Integration (2019)
31. **FERC** Barriers And Opportunities For High Voltage Transmission (2020)
32. **WECC** 2038 Scenarios Reliability Assessment (2020)
33. **EIPC** State of the Grid (2021)
34. **FERC** February 2021 Cold Weather Outages (2021)
35. **ISO-NE** First Cape Code Resource Integration Study (2021)
36. **ISO-NE** 2021 Economic Study: Future Grid Reliability Study (2021)
37. **MISO** Renewable Integration Impact Analysis (2021)
38. **NERC** Long-Term Reliability Assessment (2021)
39. **BPA** Strategic Asset Management Plan (2022)
40. **CAISO** 20-year Transmission Outlook (2022)
41. **MISO** Long Range Transmission Planning to Address Reliability (2022)
42. **NERC** State of Reliability Report (2022)
43. **SPP & MISO** Joint Transmission Interconnection Queue Study (2022)
44. **WECC** 2040 Clean Energy Sensitivities Study (2022)
45. **-50. Independent Market Monitor** 2020 reports for each RTO (2021)

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VI. Capacity Expansion Modeling: Anticipated Future Need

VI.a. Included Studies and Scenarios

VI.b. Within Region Transmission Deployment

VI.c. Interregional Transfer Capacity

VI.d. International Transfers

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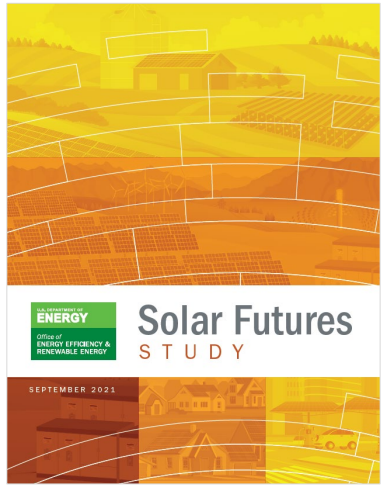
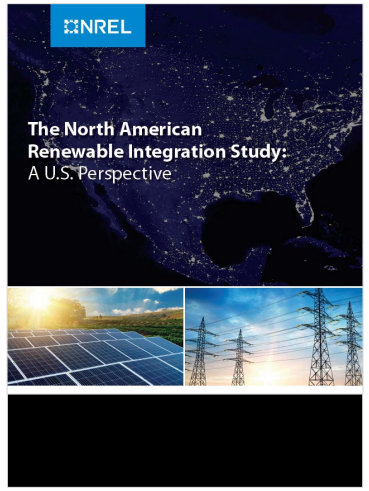
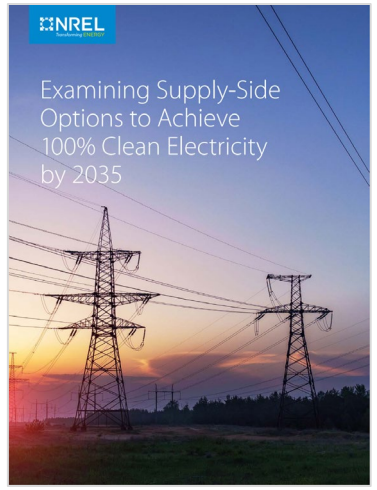
Data from 6 capacity expansion studies are analyzed to identify future regional and interregional transmission needs.

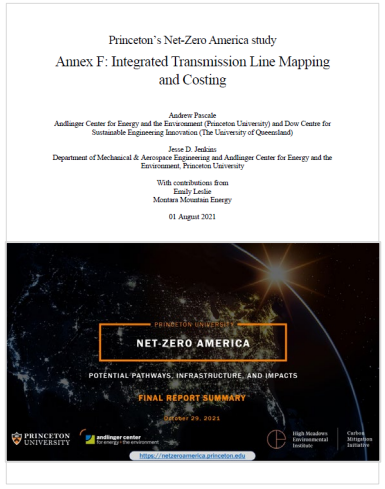
National Lab Reports

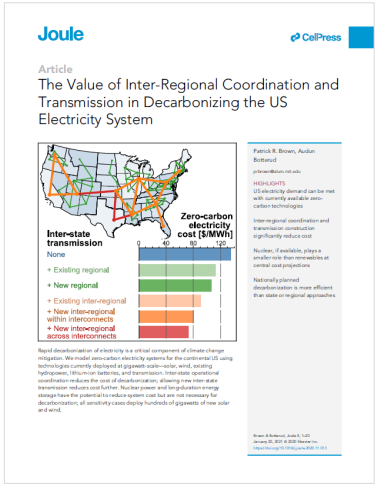






Academic Reports





Capacity expansion models optimize for least cost power sector solutions nation-wide given a range of input assumptions.

Model results help identify quantities of cost-effective transmission solutions and are used here as a proxy for future need to meet generation and demand growth.

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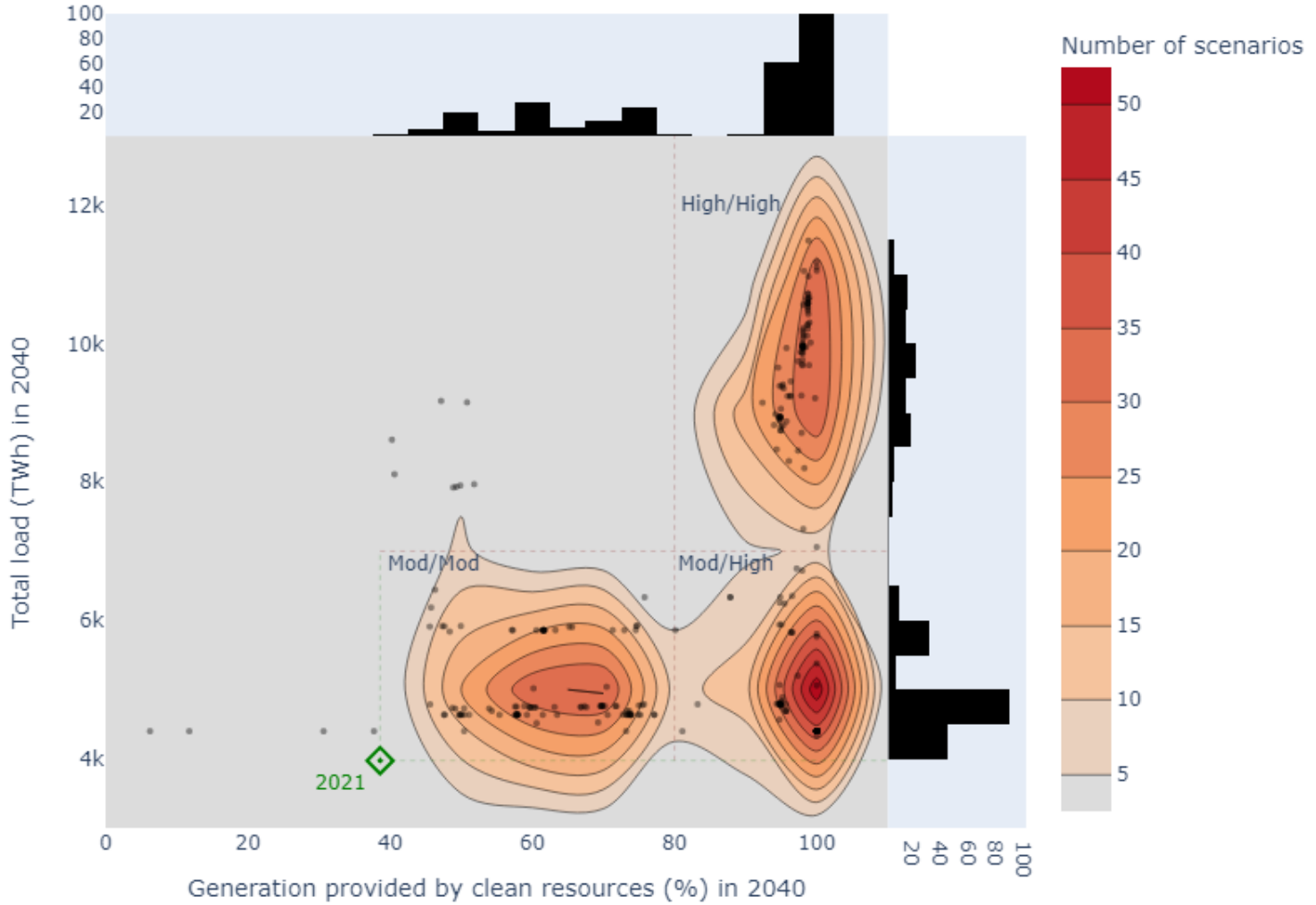
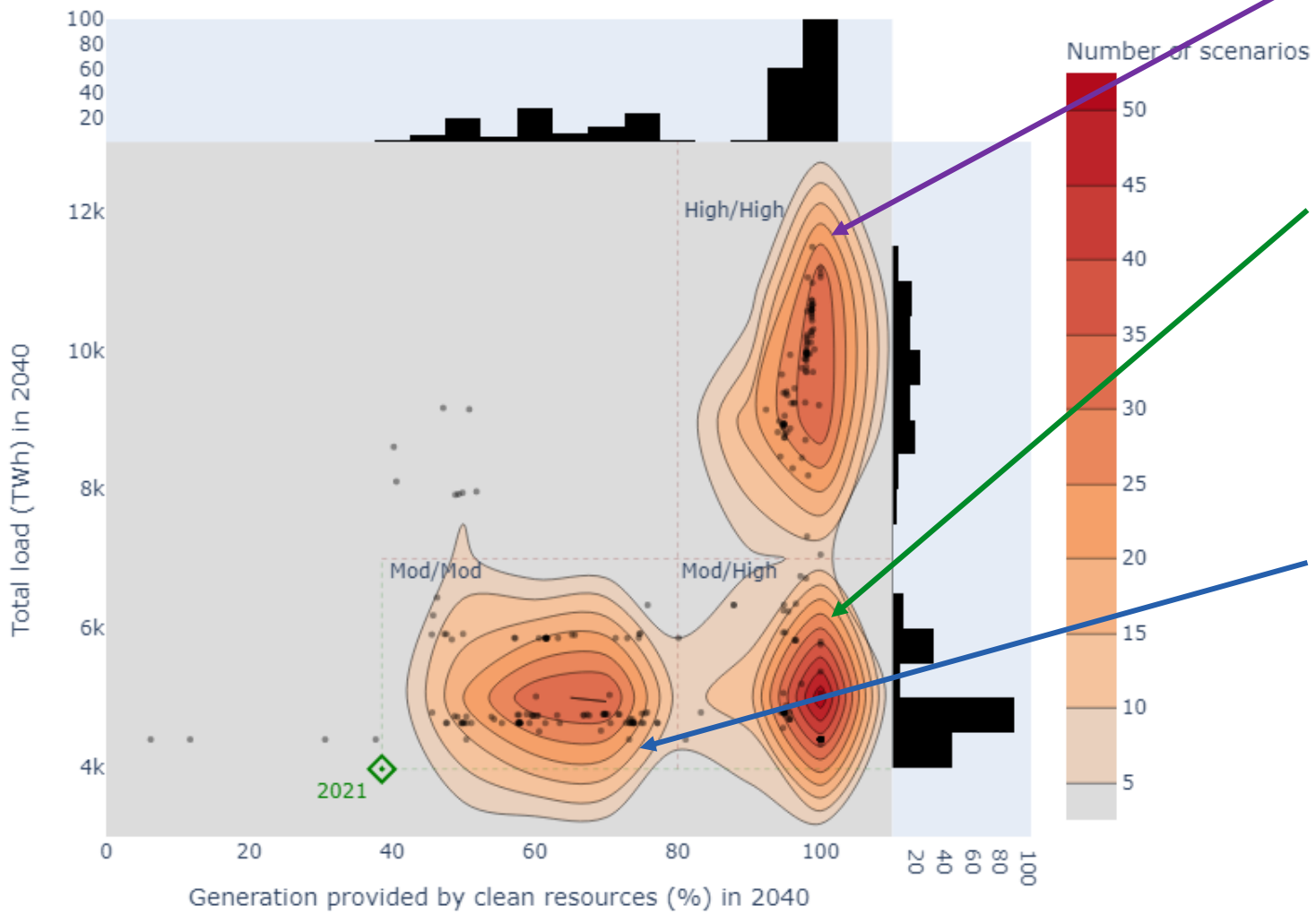
300 scenarios among 6 studies describe a wide range of power sector futures in different years.



Natural grouping of all scenarios based on power sector characteristics



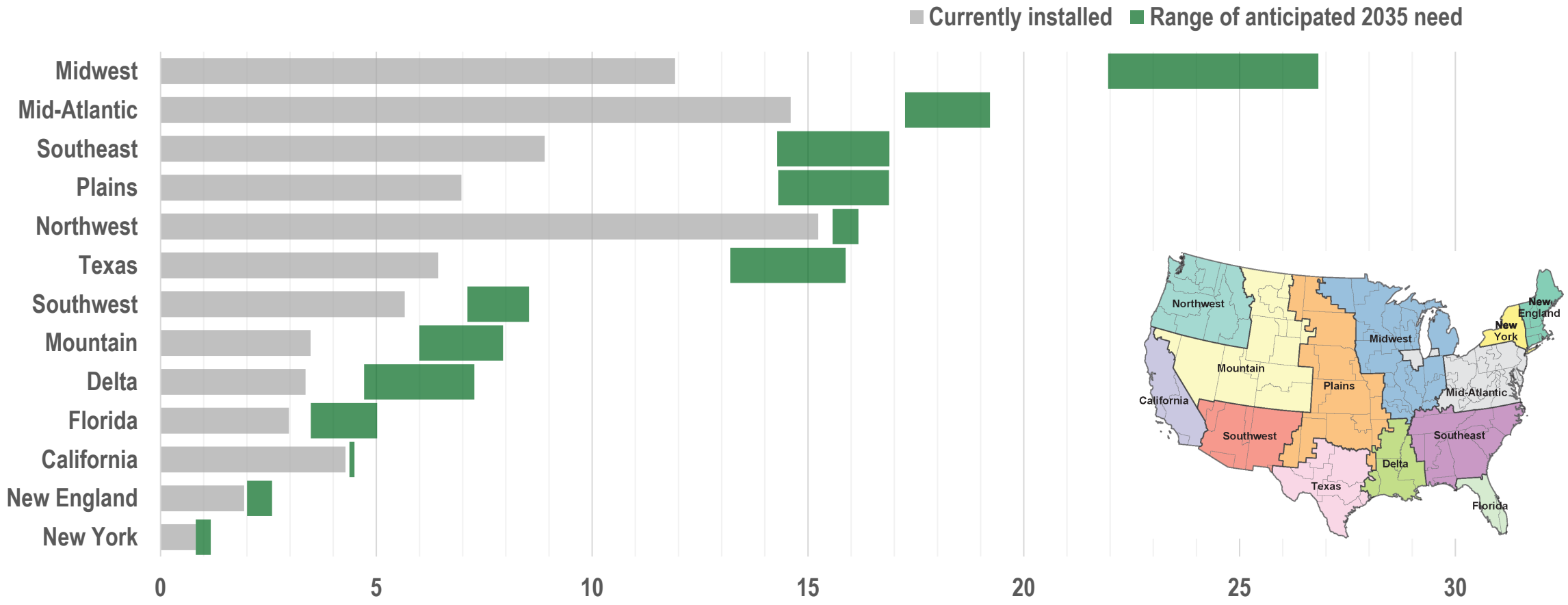
High clean energy,
High load growth
New policies

High clean energy,
Moderate load growth
Market driven (no policies)
Existing* policies
New* policies
→ **Current policies (w/ IRA) here**

Moderate clean energy,
Moderate load growth
Market driven (no policies)
Existing* policies

*at time of research, all pre-Inflation Reduction Act (IRA)

Regional Transmission Expansion Results: 2035 Mod/High



Results of scenarios which enable a 2040 power system:

- 80% - 100% clean energy deployment
- 25% - 75% load growth
- 95 - 100% decarbonization from 2005 levels

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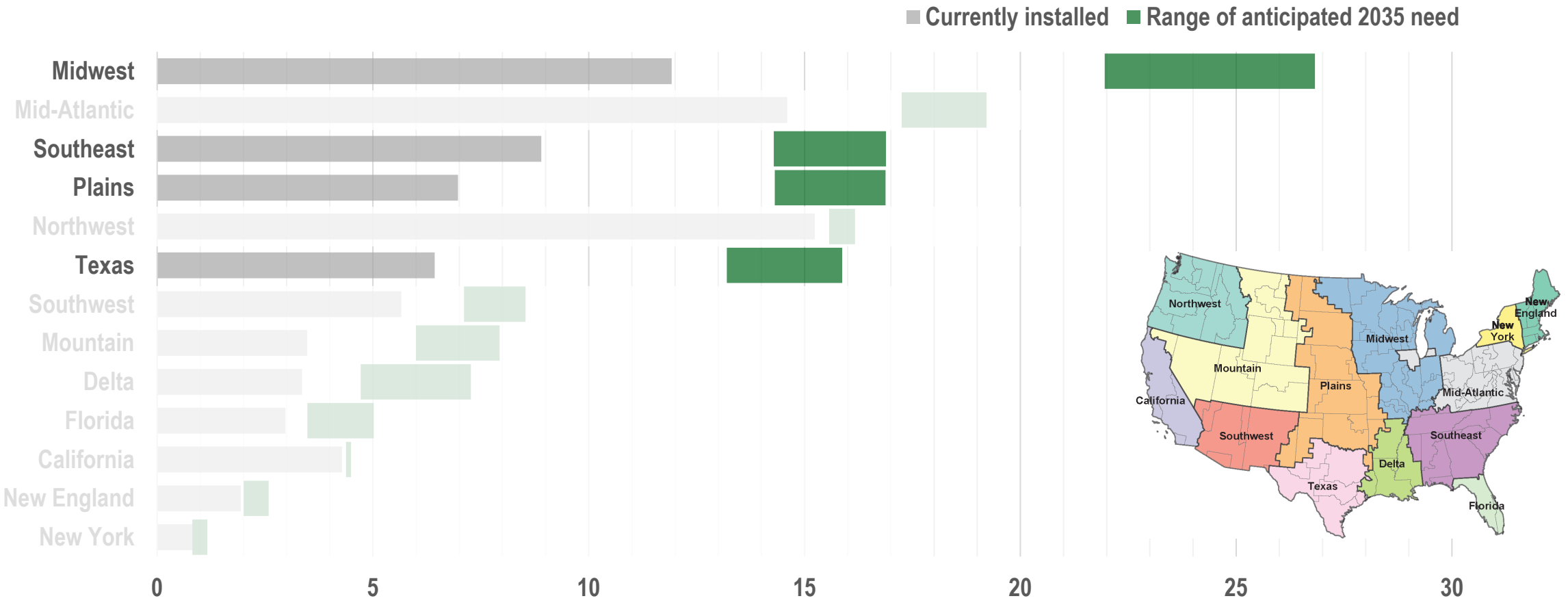
Regional Transmission Expansion Results: 2035 Mod/High



Results of scenarios which enable a 2040 power system:
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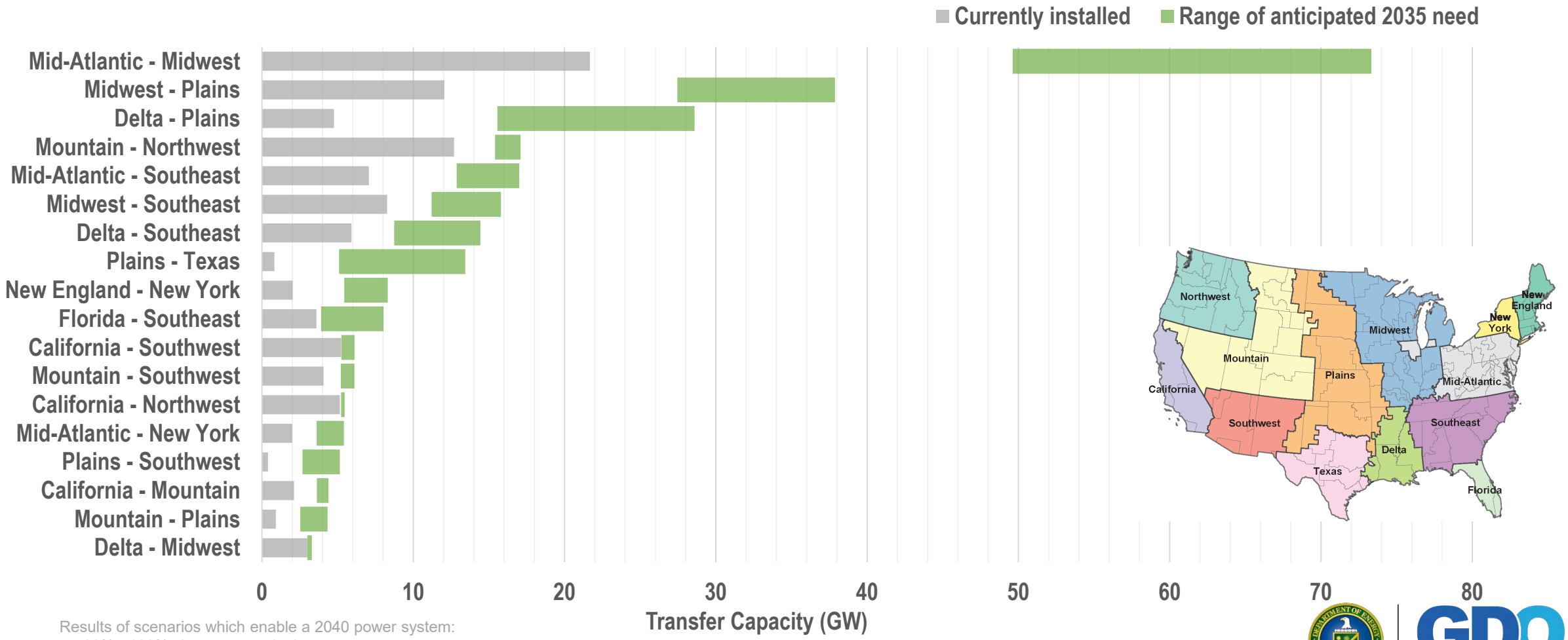
Interregional Transfer Capacity Expansion Results: 2035 Mod/High



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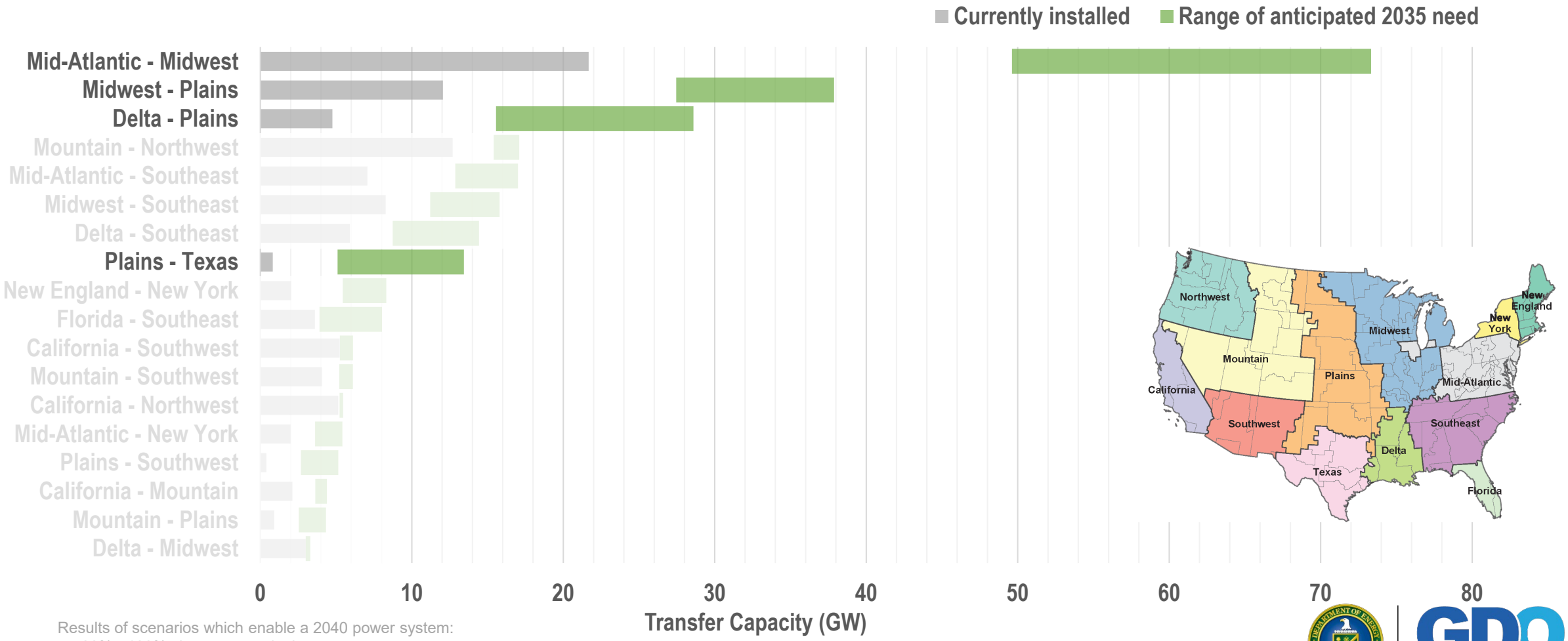
Interregional Transfer Capacity Expansion Results: 2035 Mod/High



Results of scenarios which enable a 2040 power system:

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Your input is requested!

To comment on the Needs Study, please email your comments as a **pdf attachment** to **NeedsStudy.Comments@hq.doe.gov**

Deadline April 20 (or 45 days after posted in Federal Register)

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