THE NEXT DECADE OF DER

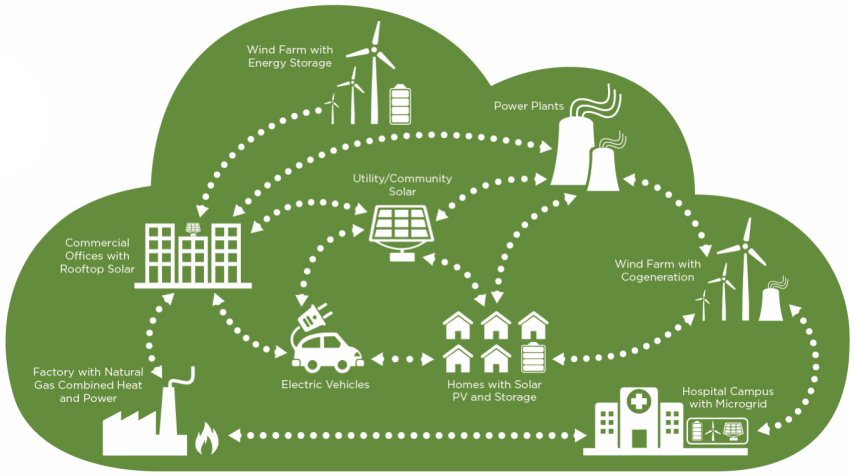
A LOOK AT THE MADRI MARKET FROM 2019-2028

JESSIE MEHRHOFF
RESEARCH ANALYST, NAVIGANT RESEARCH
DECEMBER 3RD, 2019

NAVIGANT

DISTRIBUTED ENERGY RESOURCES IN THE ENERGY CLOUD

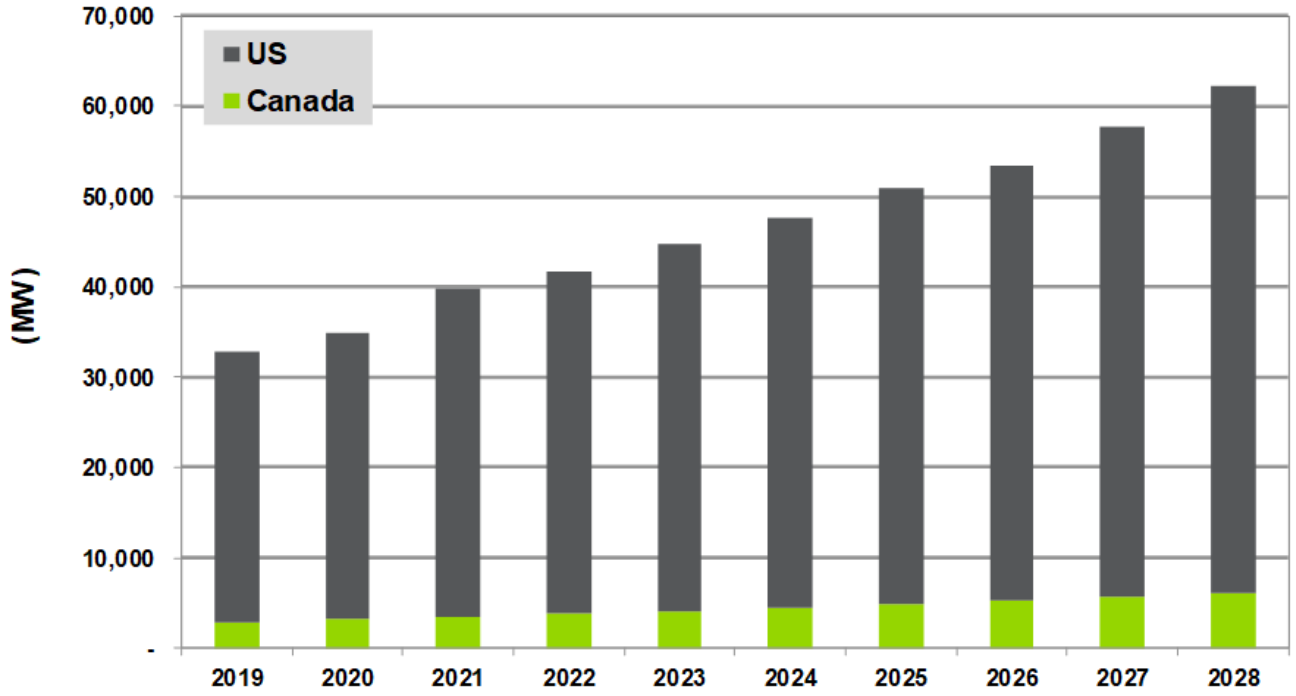
The proliferation of distributed energy resources (DER) is one of the most disruptive trends to the traditional energy industry for the foreseeable future



DER Growth Behind & In Front of the Meter:

- 2019 North America DER Capacity: 32.8 GW
- 2028 North American DER Capacity: 62.1 GW
- CAGR: 7.4% over the coming decade

Annual Installed Total DER Power Capacity by Country, North America: 2019-2028



Source: Navigant Research. 1Q 2019. *Global DER Deployment Database*

NAVIGANT

KEY DER MARKET LANDSCAPE TRENDS

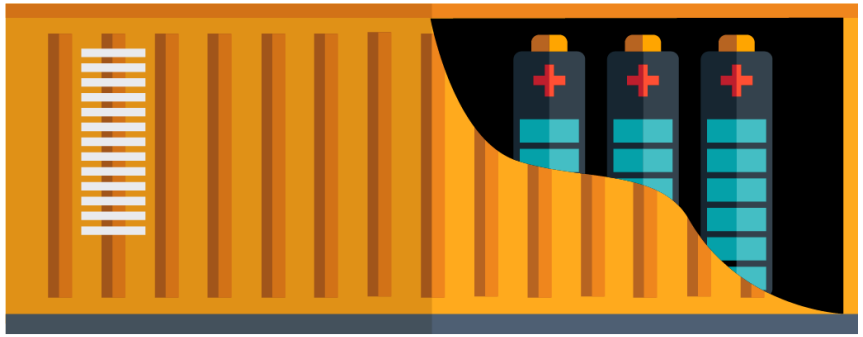
Across North America, drivers growing the DER market will outweigh the challenges faced by utilities, solutions providers, and end-customers.

DER Market Drivers

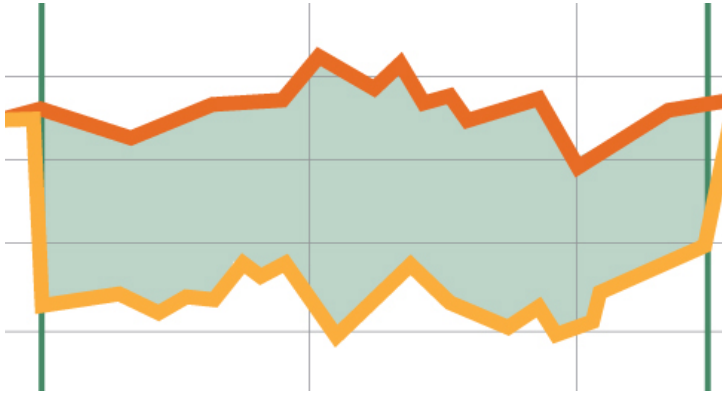
- Falling technology costs
- Energy savings, climate, and sustainability targets
- Improved customer engagement
- Programmatic developments (BYOD, IDER)

DER Market Barriers

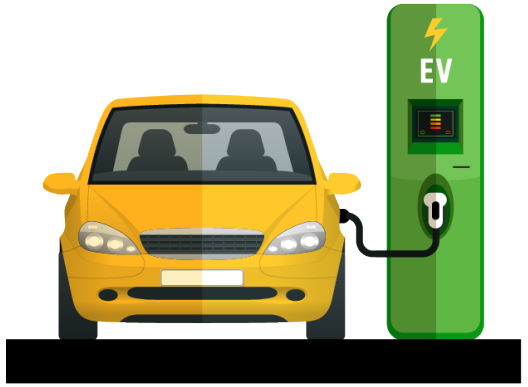
- Proof-of-concept & pilot-sized programs
- Slower pace of regulatory change
- Cybersecurity & data privacy threats



BATTERY STORAGE



LOAD BALANCING



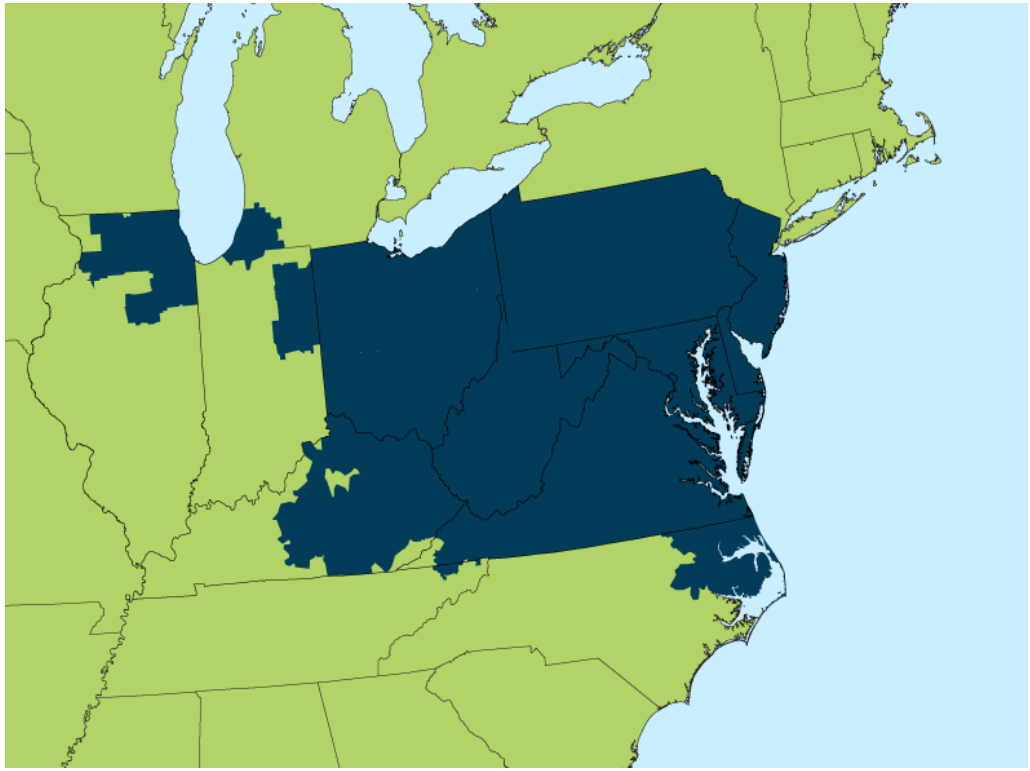
EV CHARGERS

Graphics Source: CPower Energy Management

THE FUTURE OF DER IN PJM

PJM is in the rule design process to allow DER participation in the market, but is already one of the more active wholesale markets for DER participation.

- PJM's 2019 Wholesale DER (W-DER) proposal includes:
  - Provisions for DER that inject, interact with retail customers, and are smaller than 100 kW in size
  - Borrows from status quo sale of generation capacity, and some DR regulations, to suit a new class of DER
- PJM's capacity performance requirements will become more stringent and fully implemented 2020-2021.
  - Increases risk for C&I customers & independent aggregators
  - May also increase demand for winter resources to match summer AC load capacity



Source: PJM Interconnection, PJM DER Education Subcommittee

NAVIGANT

SELECT DER DEVELOPMENTS ACROSS MADRI STATES: DISTRICT OF COLUMBIA

Sustainability targets and grid modernization efforts will drive DER growth in DC over the coming decade.

District of Columbia

- Achieve carbon neutrality by 2050
  - 2020 plan to achieve carbon neutrality by 2050
  - 50% reduction in GHG emissions below 2006 levels by 2032
  - 100% renewable electricity by 2032
  - Public transportation and private fleet vehicles to become emissions free by 2045
- Power Path DC Initiative
  - Founded on the Modernizing the Energy Delivery System for Increased Sustainability (MEDSIS) vision
  - Stakeholder process with 6 distinct working groups

Image Sources: DC Public Service Commission, DC Department of Energy and Environment

SELECT DER DEVELOPMENTS ACROSS MADRI STATES: ILLINOIS

In Illinois, local projects like the Bronzeville Microgrid will incorporate DER while state subsidies for nuclear will continue to support existing centralized generation stocks.

Illinois

- Bronzeville Microgrid
  - Located in Southern Chicago
  - To build upon ComEd's smart grid platform
  - Phase I:
    - 2.5 MW of load
    - Battery storage, solar PV, CHP, fuel cells
    - Feeder reconfiguration
    - Serve 490 customers
  - Phase II:
    - Additional 4.5 MW of load and 7 MW of DER
    - When complete, will serve 1,000+ customers across segments
- IL among other states continuing to support nuclear generation.

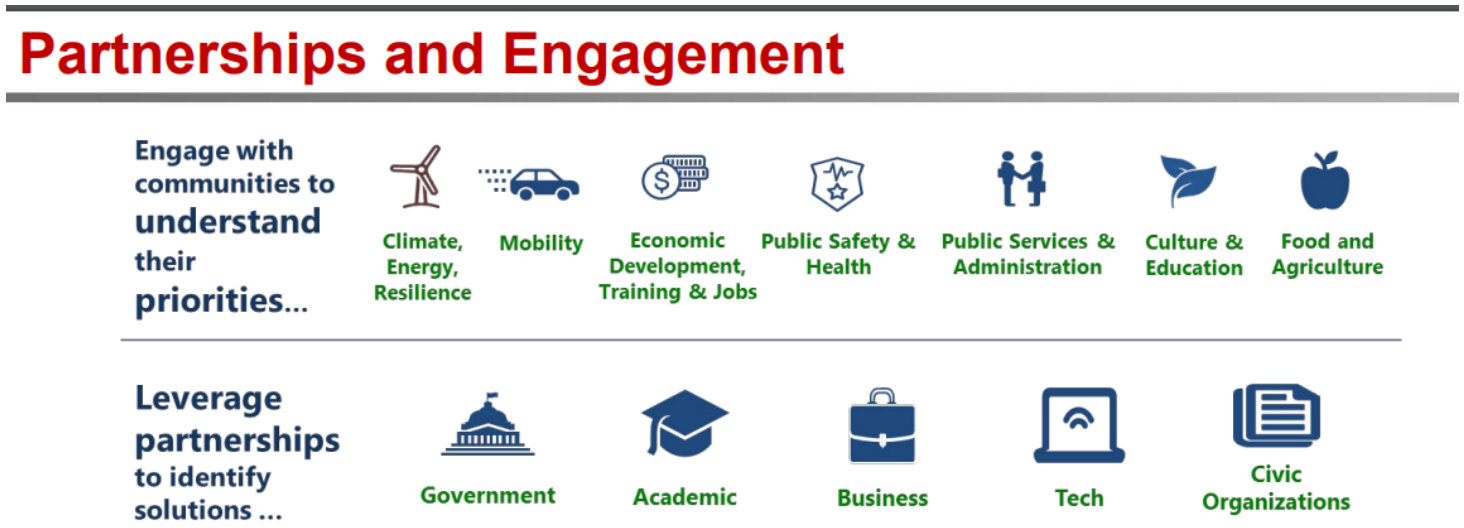


Image Sources: Commonwealth Edison (MEEA Conference)

NAVIGANT

SELECT DER DEVELOPMENTS ACROSS MADRI STATES: MARYLAND

Maryland is showing a continued commitment to energy efficiency, while integrating DER like solar PV through community solar programs.

Maryland

- Community Solar Pilot Program
  - 3 year program: 2017-2020
  - Residential and commercial incentives
- EmPOWER Maryland Efficiency program
  - Launched 2008 with a 25% energy reduction by 2020
- Newer state-level initiatives show continued support for DER:
  - DG+ Mapping Tool
  - Alternative Fuel Infrastructure Program
  - Energy Storage Tax Credit

Image Sources: Maryland Energy Administration(top), Chesapeake Climate Action Network (bottom)

SELECT DER DEVELOPMENTS ACROSS MADRI STATES: NEW JERSEY

Like other MADRI states, sustainability targets are driving DER in New Jersey. The state also has an increased focus on both reliability and resiliency years following Superstorm Sandy.

New Jersey

- 2019 Energy Master Plan
  - Transportation & building sector emissions reduction
  - DER deployment with a focus on underserved populations
  - Focus on demand-side management program
  - Grid and utility infrastructure modernization
  - Advancement of DER and new technologies
- 100% Clean Energy by 2050
  - 35% renewable energy by 2025
  - 50% renewable energy by 2030
  - Offshore wind to be bolstered by distributed generation
    - 4.1% of electricity must come from solar by 2028

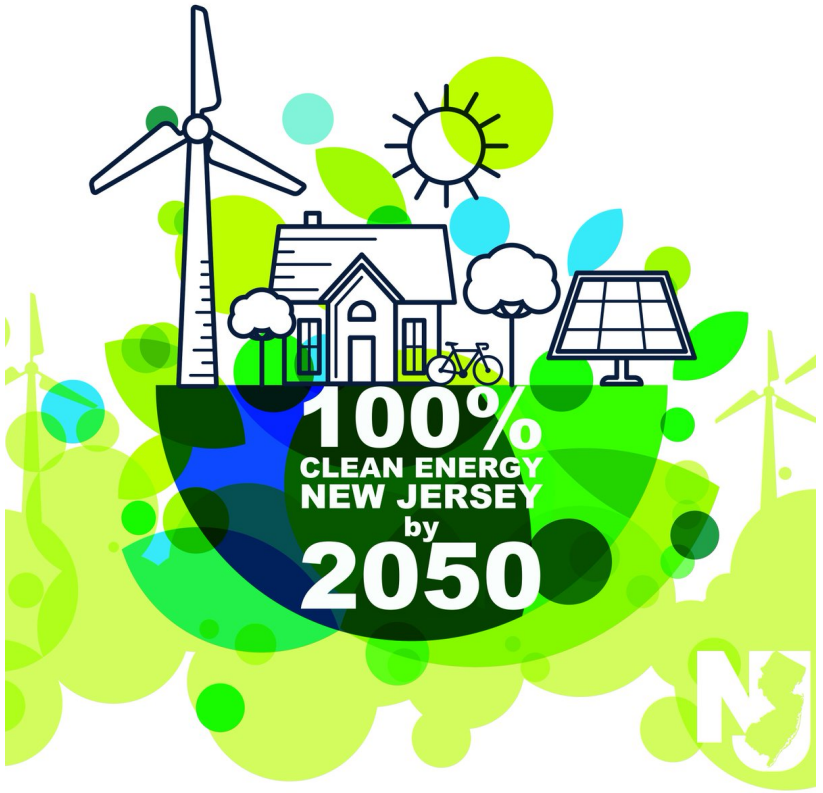


Image Sources: New Jersey Clean Energy

NAVIGANT

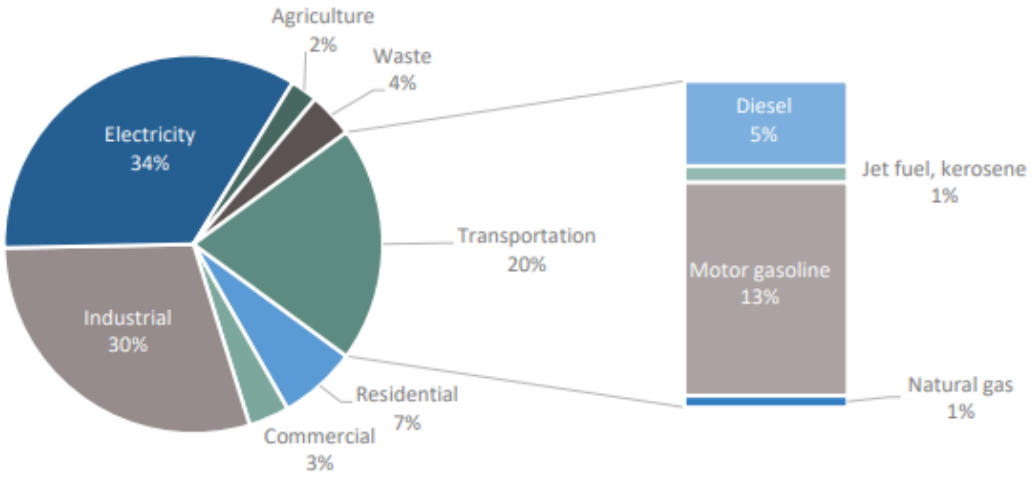
SELECT DER DEVELOPMENTS ACROSS MADRI STATES: PENNSYLVANIA

Despite historic fossil fuel production & export, Pennsylvania's 2019 notice to join the RGGI and continued focus on energy reduction may drive DER proliferation across the state.

Pennsylvania

- Regional Greenhouse Gas Initiative
  - GHG target reductions of 26% by 2025 and 80% by 2050, compared to 2005 levels
  - Allowance prices at $5.20 per ton (Sept. 2019)
- Act 129 Phase 3 (2016-2021)
  - Efficiency critical to reducing emissions, act also includes fuel switching working groups and smart meter procurement
- Pennsylvania Electric Vehicle Roadmap
  - Transportation emissions are 20% of GHG emissions in Pennsylvania
  - Replace 25% of state fleet vehicles with EVs by 2025

Figure 2: 2013 Pennsylvania Gross Greenhouse Gas Emissions by Sector



(Source: DEP 2016 GHG inventory)

Image Source: Pennsylvania Department of Environmental Protection

NAVIGANT

QUESTIONS & COMMENTS

JESSIE MEHRHOFF
Research Analyst
202.481.8461
jessie.mehrhoff@navigant.com

NAVIGANT