National Association of State Energy Officials

NASEO-NARUC DER Integration and Compensation Initiative Webinar: Grid Modernization Strategies to Accelerate Deployment of DERs

April 13, 2023

Photo Courtesy of RL Martin

NASEO-NARUC DER Integration and Compensation Initiative

Convene and support state members to understand impact of their decision making related to the connection, operation, and compensation of DERs---within the distribution grid, bulk power system, and wholesale energy markets.

NARUC and NASEO will provide information, tools, access to experts, and peer sharing opportunities that assist members with FERC Order 2222 implementation in RTO/ISO regions and State oversight of transmission-distribution-customer (TDC) coordination outside of RTO/ISO regions.

Objectives:

- Inform key state decision makers
- Raise and evaluate risks and opportunities of different decision options
- Bring different perspectives to the table

Advisory Group:
An advisory group of 10 NARUC and NASEO members representing diverse regional perspectives will guide the project.

Agenda

- *Moderator:* Alexandra Fisher, Policy Advisor, Public Service Commission of the District of Columbia

Speakers:

- Lisa Schwartz, Senior Policy Researcher and Strategic Advisor, Lawrence Berkeley National Laboratory
- Paul Heitmann, Manager, Clean Energy Division, New Jersey Board of Public Utilities

Distribution and Grid Modernization Planning to Accelerate Deployment of Distributed Energy Resources

Lisa Schwartz

Presentation for NASEO-NARUC DER Integration and Compensation Initiative

April 13, 2023

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Types of distribution system plans

Electric utility distribution-related plans that include distributed energy resources (DERs), categorized from narrow to wider scopes:

- **Transmission and distribution (T&D) improvement plan** - Request expedited cost recovery for certain electricity system improvements (e.g., IN infrastructure Improvement Charge for T&D and storage investments)
- **DER plan** - Evaluates benefits and costs of DERs, assesses ways to increase their cost-effective deployment, and facilitates improved integration of DERs in distribution systems (e.g., NV)
- **Grid modernization plan** - Presents a reasoned strategy that links a proposed technology deployment roadmap to stated objectives; may include requests for regulatory approval of grid modernization investments and programs (e.g., NM)
- **Integrated distribution system plan** (IDSP, or integrated grid plan)* - Provides a systematic approach to satisfy customer service expectations and state's grid planning and design objectives, including integration and utilization of DERs and grid modernization (many states); may coordinate planning across T&D systems or bulk power and distribution systems more broadly (e.g., HI)

Transmission, electrification, energy security, and DSM plans may inform distribution and grid modernization plans.

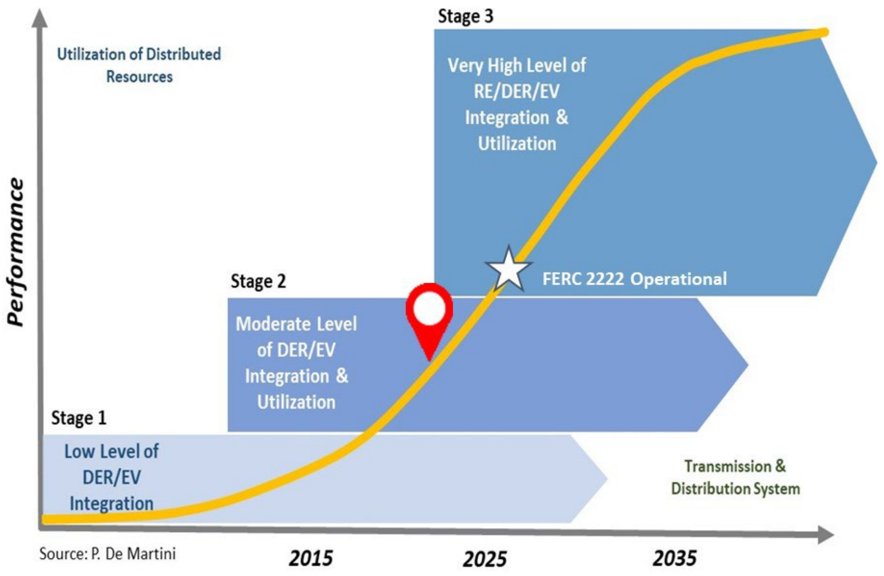
*See key IDSP process elements and proposed technology roadmap in *Extra Slides.*

Distribution system evolution based on DER adoption

Stage 1: *Low DER adoption (<5% of peak*)*. DER levels can be accommodated within existing distribution systems without material changes to infrastructure, planning and operations. Grid modernization addresses reliability, resilience, safety, and operational efficiency and enabling DER integration and utilization at low levels.

Stage 2: *Moderate adoption of DERs (5-20% of peak) including for wholesale & distribution services.* DERs — individually and in aggregations — are increasingly used as load-modifying resources for both distribution non-wires alternatives (NWAs) and wholesale capacity and ancillary services. Integrated distribution system planning and grid modernization are needed to enable real-time observability and operational use of DERs.

Stage 3: *Large-scale adoption of DERs (>20% of peak), including for wholesale & distribution services, plus community microgrids.* Utilization of DER aggregations (virtual power plants) is optimized to support grid service requirements for distribution and transmission systems. Multi-use/community microgrids help support local energy supply and resilience. Ultimately, distribution system-level energy transactions are enabled. This stage of DER utilization requires coordination across jurisdictions (e.g., FERC Order 2222) and infrastructure to support both grid and market operations.



*Installed DER capacity as a percent of distribution system peak

Source: Paul De Martini, Newport Consulting

Proactive planning is more effective.

Tell utility customers where the grid needs help and what services the grid needs. Provide appropriate incentives.

- *DER forecasting* helps planners avoid overbuilding and feeds into analysis of which feeders may be stressed by DERs.
- *Hosting capacity* is the amount of DERs that can be interconnected without adversely impacting power quality or reliability under existing control and protection systems and without infrastructure upgrades.

Together, these processes identify feeders that are likely to see DER growth and can be considered for proactive upgrades.

- *Non-wires alternatives* are DERs that provide specific services at specific locations to defer some traditional infrastructure investments, leveraging customer and third-party capital.
- *Locational net benefits analysis* systematically analyzes DER costs and benefits to assess the net benefits DERs can provide for a given area of the distribution system.

These analyses can inform retail rates and tariffs — e.g., location-based incentives for geotargeted DERs.*

*See *Extra Slides* for more on locational net benefits analysis and an example tariff.

Source: Adapted from Debbie Lew, Emerging distribution planning analyses, 2020

State trends for accelerating DER deployment through distribution and grid modernization planning

- More states are establishing planning requirements for DERs, distribution systems and grid modernization, by legislation or regulation.
  - Including planning to accelerate grid modernization and DER deployment
- Common state objectives for distribution & grid modernization planning involve DERs:
  - Support DER integration and utilization for grid services
  - Increase customer choice and engagement in energy services
  - Reduce greenhouse gas emissions and support a clean energy transition
  - Improve grid resilience
  - Accelerate deployment of new technologies and services to optimize grid performance and minimize electricity system costs
- State requirements that can accelerate DER deployment include:
  - DER-related analyses (*next two slides*)
  - Planning across bulk power and distribution systems (e.g., see Hawaiian Electric's draft 2023 Integrated Grid Plan)
  - Alignment of integrated resource planning (IRP) and distribution system planning, including DER forecasts (e.g., MN 12/8/22 order in Docket No. 21-694)
  - Integration of electrification planning with DER planning or distribution planning (e.g., NV and MN)
  - Expedited cost recovery* for grid modernization investments to support higher DER deployment levels (e.g., NM, IL, MN, IN)

*Utility consumer advocates and other stakeholders may not favor this approach.

DER-related distribution planning elements (1)

- DER forecast
  - Types, sizes, amounts and locations
- Hosting capacity analysis*
  - Utility maps show where interconnection costs will be low or high; supporting data provides details
  - Used for DER development, interconnection screens and distribution planning
- Grid needs assessment and NWA analysis to identify:
  - Existing and anticipated capacity deficiencies and constraints
  - Traditional utility mitigation projects
  - A subset of these planned projects that may be suitable for NWA to defer or avoid infrastructure upgrades for load relief, voltage, reducing power interruptions, and improving resilience

*See example state requirements and use cases in *Extra Slides*.

DER-related distribution planning elements (2)

- Programs to geotarget energy efficiency, demand flexibility, distributed PV and storage, and managed electric vehicle (EV) charging to meet location- and time-dependent distribution system needs
- Grid modernization strategy and technology roadmap*
  - Including investments needed to integrate, monitor and use DERs for grid services
- Proposals for pilots
  - Resilience projects (e.g., solar+storage, microgrids)
  - Time-varying pricing

Figure 8. Measures creating the total demand reduction for the pilot

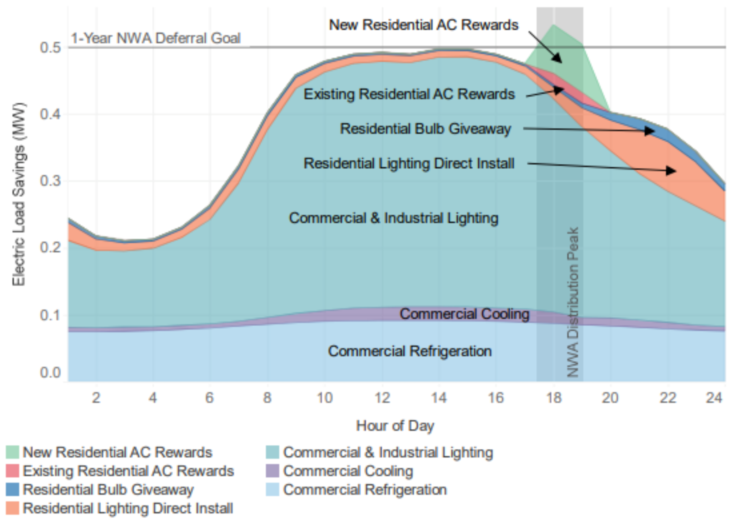
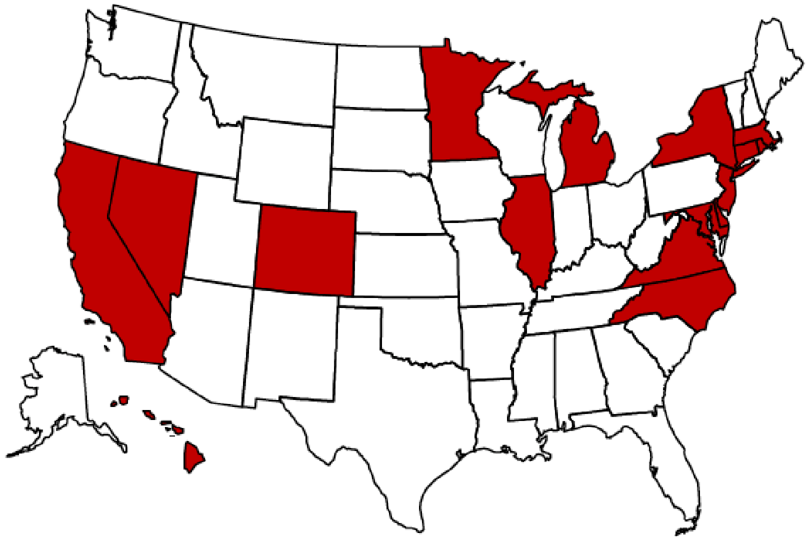


Figure source: CEE 2021

Hosting capacity analysis filed in 16 states + DC*



*Source: Interstate Renewable Energy Council, presentation for New Mexico Public Regulatory Commission. May not be fully comprehensive.

Example hosting capacity maps

Southern California Edison
Orange & Rockland – NY, NJ
Xcel Energy – MN
Dominion Energy – VA, NC
Pepco Holdings – DC, MD, DE, NJ
Unitil – MA
National Grid – RI
National Grid – MA
Eversource – CT
NY: Central Hudson, Consolidated Edison, National Grid, Rochester Gas and Electric, New York State Electric and Gas

Source: https://www.irecusa.org/our-work/hosting-capacity-analysis/

California "Integration Capacity Analysis"

- Models how much new distributed generation — as well as **load** (including EV charging) — can be accommodated on the distribution system at specific locations, using actual grid conditions
  - Understanding capacity for new load is especially important in the context of state electrification initiatives, as well as energy storage projects (load+generation).
- PUC's ruling on Jan. 27, 2021, directed utilities to refine Integration Capacity Analysis maps and include them in data portals: PG&E, SCE (see user guide), SDG&E*

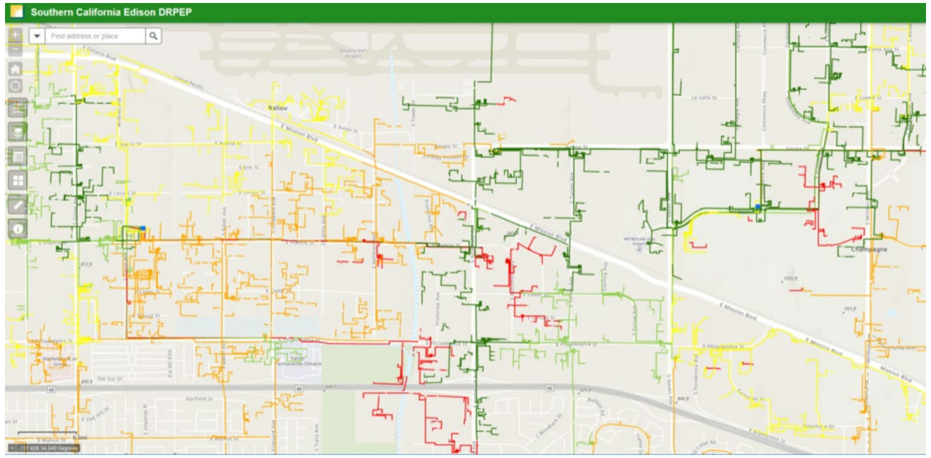
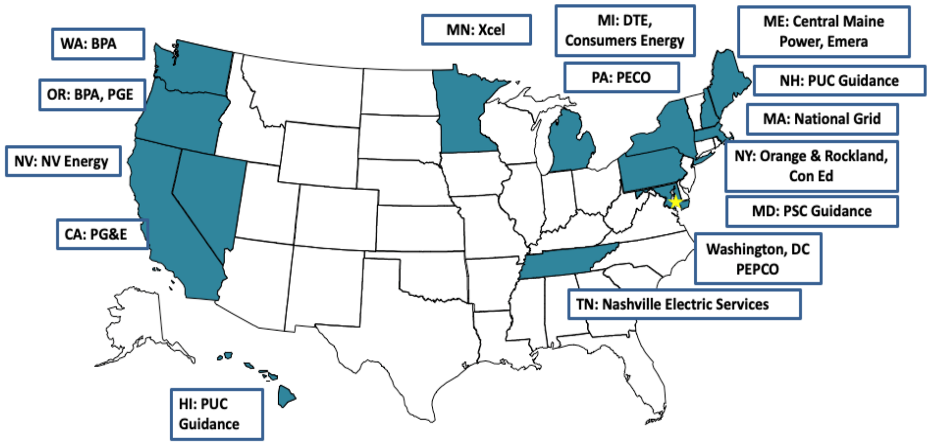


Figure source: Southern California Edison

*In addition to maps, the data portals include the utility's Distribution Investment Deferral Framework map (Grid Needs Assessment + Distribution Deferral Opportunity Report).

Non-wires alternatives

- Objectives: Provide load relief, address voltage issues, reduce power interruptions, enhance resilience, or meet local generation needs
- Potential to reduce utility costs
  - Defer or avoid infrastructure upgrades
  - Implement solutions *incrementally,* offering a flexible approach to uncertainty in load growth and potentially avoiding large upfront costs for load that may not show up.
- Typically, the utility issues a competitive solicitation for NWA for specific distribution system needs and compares these bids to the utility's planned traditional grid investment to determine the lowest reasonable cost solution.
- Jurisdictions that require NWA consideration include CA, CO, DE, DC, HI, ME, MI, MN, NV, NH, NY and RI. Other states have related proceedings, pilots or studies underway.

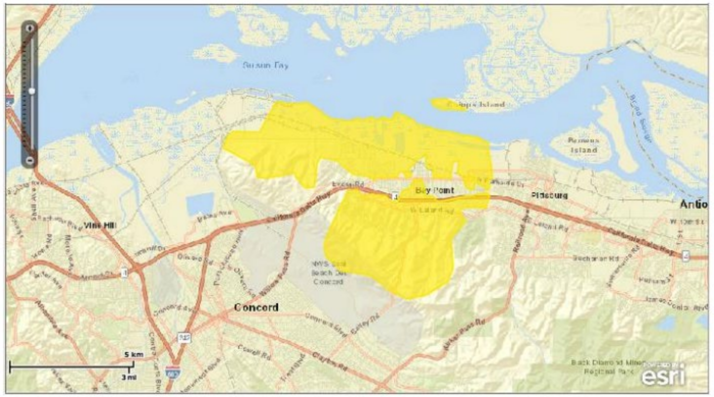


Case studies featured in *Locational Value of Distributed Energy Resources*

NWA procurement strategies: California example

- 3 procurement mechanisms identify opportunities to cost-effectively defer or avoid traditional utility investments to use DERs to mitigate forecasted deficiencies:
  1. Distribution Investment Deferral Framework - Annual Grid Needs Assessments and Distribution Deferral Opportunity Reports
     - Examples: SCE, PG&E, SDG&E
     - Following a Distribution Planning Advisory Group stakeholder process, the utilities submit Advice Letters to the CPUC seeking approval to issue request for offers (RFO) for competitive annual solicitations for specific deferral projects.
  2. Standard Offer Contract Pilot* - Utilities select offers for front-of-the-meter* DERs through a simple auction with *standardized contract terms*.
  3. Partnership Pilot – Utilities *prescreen aggregators* to procure behind-the-meter (BTM)* DERs to accelerate deferral implementation; *first-come, first-served*

Willow Pass Substation Bank 3 Map

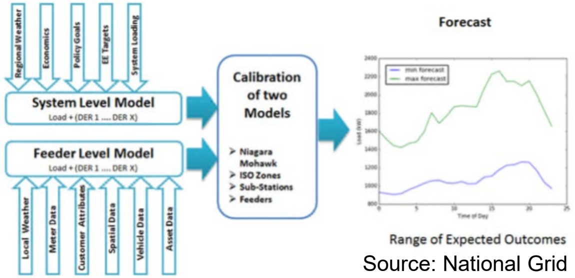


Source: PG&E presentation on 2021 RFO

*See *Extra Slides* for more information on these programs. Front-of-the-meter refers to assets directly connected to the distribution network. BTM refers to DERs connected to the customer's side of the utility's service meter.

Source: Adapted from Natalie Mims Frick, Berkeley Lab

Example planning challenges (1)



Source: National Grid

- Forecasting DERs and impacts for specific distribution system components/areas
  - Making DER forecasts spatially granular (e.g., by substation, feeder)
  - Incorporating DER program shapes
  - Incorporating EV forecasts
  - Disaggregating load forecasts to identify trends in individual end uses and assess DER impacts on load profiles
  - ➢ *Among the solutions: using end-use load profiles; using customer adoption models to account for the impact of DER cost and performance, incentives, retail rates, peer effects, and customer demographics; benchmarking against 3rd party forecasts; probabilistic forecasting; and using scenarios (e.g., electrification, high PV+storage)*
- Hosting capacity analysis
  - Costs (hardware, software, personnel)
    - For validating data inputs, improvements for modeling feeders, simulating power flows, and providing results
  - Accuracy
    - Data availability, validation, granularity (sub-feeder), model settings, update frequency (annually insufficient)
  - Typically only PV is included, not other DERs — energy efficiency and demand flexibility can *increase* hosting capacity
  - Electrification usually not considered — except CA, MN requires consideration of EV charging
  - Data redaction due to utility concerns about cyber/physical security — whether a bad actor can use information about line location, loads, or lines supplying critical facilities for targeted attacks
  - ➢ *But, locational data are available from other sources (e.g., Google Maps), and data alone is insufficient to carry out an attack and may not increase the risk of a successful attack.**

*Interstate Renewable Energy Council, Key Decisions for Hosting Capacity Analysis, 2021

Example planning challenges (2)

- Consideration of proactive upgrades to increase hosting capacity
  - Cost allocation
- Non-wires alternatives
  - Insufficient quantity of viable bids to meet the utility's full need for any deferral opportunities
  - Long lead times for procurement
    - New CA Standard Offer Contract and Partnership Pilot are designed to accelerate procurement timelines to enable NWA deployment.
  - Often NWA don't pass cost-benefit test. Few DERs selected to date, but…
    - Examples of successful NWA projects in NY, CA, MI and MN*
    - Xcel Energy proposed changes to its NWA process for MN with stakeholder input.

*Schwartz and Frick 2022, Frick et al. 2021, DTE 2021, PG&E 2022 and CEE 2021

Source: Con Edison BQDM Quarterly report, May 2022

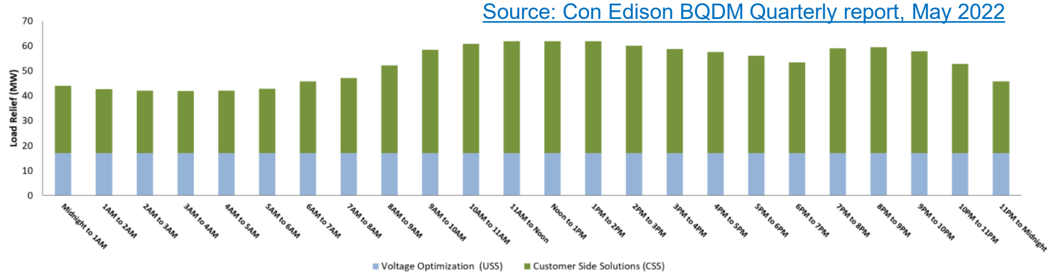


Figure 1: Hourly Load Profile of Operational BQDM Customer-Side Solutions and Non-Traditional Utility-Side Solutions. *Note: A 1.5 MW 4-hour utility-side battery energy storage system is not depicted in the load profile as its dispatch varies.*

Aspect/Component	Current Method	Proposed Method
Timeframe	Full NWA lifetime	**10-year deferral period***
Ownership Model	Utility ownership	**Load reduction contract or** utility ownership
Load Reduction Requirement	Exact MWh of load at risk on peak day	**Peak output for the duration of the risk**
Stacked Values	No stacked values	**Stacked values included**
Pro-Rating Values	No pro-rating, full values included	**Values pro-rated** for just the load reduction period (ARR split)
Solar Performance	PVWatts TMY simulation for one location in Minnesota	PVWatts TMY simulation for **five locations** in Minnesota

* Subject to change.

Source: Jody Londo, Integrated Distribution Planning at Northern States Power Company — Minnesota. May 13, 2022.

Catalog of State Distribution Planning Requirements

- *Later this spring* – Interactive map, detailed state-by-state table, document library
- *Later this year* — Report updating our 2017 and 2018 publications on state engagement in distribution system planning as well as presentations on regulatory approaches
  - Materials will be posted on Berkeley Lab's integrated distribution system planning website
- **General information and procedural requirements**
  - Planning goals and objectives, type of plan (e.g., grid mod plan, distribution system plan, integrated grid plan, DER plan, T&D improvement plan), frequency of filing, planning horizon, term of action plan, stakeholder engagement & equity, type of commission action on filed utility plans
  - Links to legislation & regulations, commission proceedings & orders, utility plans
- **Substantive requirements**
  - Baseline information required on current distribution system
  - Load and DER forecasting
  - Reliability and resilience analysis and metrics
  - Grid needs assessment & solution identification, including NWA analysis
  - Hosting capacity analysis
  - Grid modernization strategy and roadmap
  - Coordination with other types of planning

Also: **Berkeley Lab/NASEO brief on ways state energy offices are engaging in distribution planning**

Resources for more information

Berkeley Lab's integrated distribution system planning website

Berkeley Lab's research on time- and locational-sensitive value of DERs

Center for Energy and Environment (CEE), Non-Wires Alternatives as a Path to Local Clean Energy: Results of a Minnesota Pilot, 2021

DTE Electric Company, 2021 Distribution Grid Plan: Final Report, Michigan Public Service Commission Case No. U-20147, 2021

N. Frick, S. Price, L. Schwartz, N. Hanus and B. Shapiro, Locational Value of Distributed Energy Resources, Berkeley Lab, 2021

ICF, Integrated Distribution Planning: Utility Practices in Hosting Capacity Analysis and Locational Value Assessment, 2018

NARUC, Berkeley Lab, and Pacific Northwest National Lab, Peer-Sharing Webinars for Public Utility Commissions on Integrated Distribution System Planning, 2023

L. Schwartz and N. M. Frick, Berkeley Lab, "State regulatory approaches for distribution planning," Presentation for New England Conference of Public Utility Commissioners," June 16, 2022

B. Sigrin and A. Mills, "Forecasting load on distribution systems with distributed energy resources," Distribution Systems and Planning Training for Southeast Region, March 11, 2020

Pacific Gas & Electric, 2022 Grid Needs Assessment, California Public Utilities Commission proceeding R.21-06-017, Rulemaking to Modernize the Electric Grid for a High Distributed Energy Resources Future, August 15, 2022

U.S. Department of Energy, *Modern Distribution Grid*, Vol. IV, 2021

Xcel Energy, *2022-2031 Integrated Distribution Plan*, 2021

Contact

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For more information

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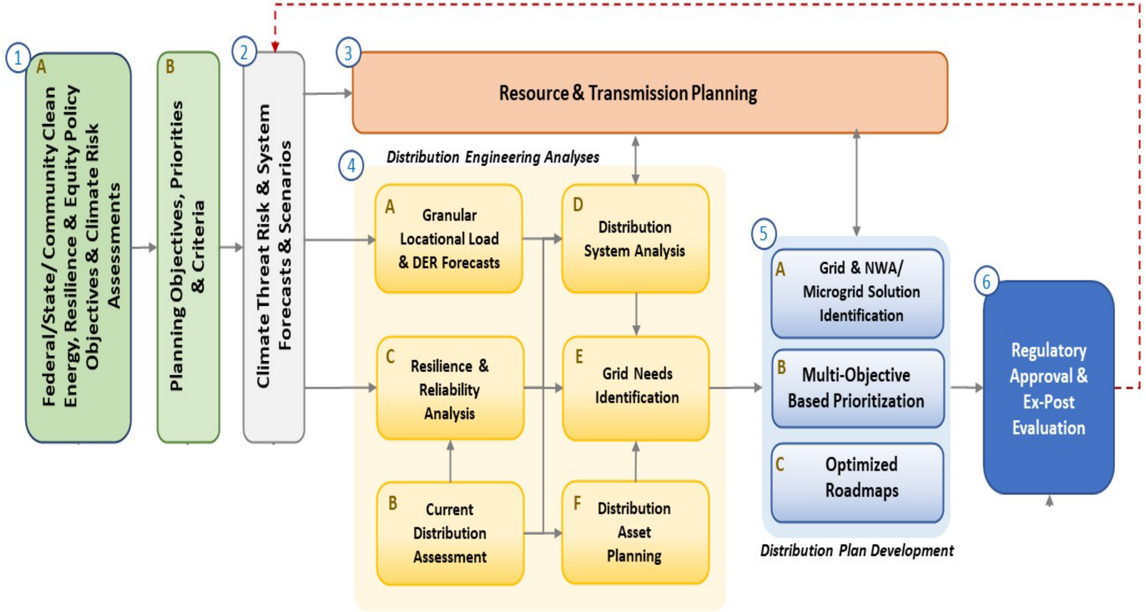
Extra Slides

Key process elements for IDSP

1. Planning Objectives, Priorities and Criteria
2. Forecasting
   - System Forecasts & Scenarios
   - Risks from Climate Threats
3. Resource & Transmission Planning*
4. Distribution Engineering Analyses
5. Solution Identification, Evaluation and Prioritization
6. Regulatory Review & Ex Post Evaluation



Stakeholder engagement throughout

*Integration with IRP and transmission planning where applicable

Source: Paul De Martini, Newport Consulting

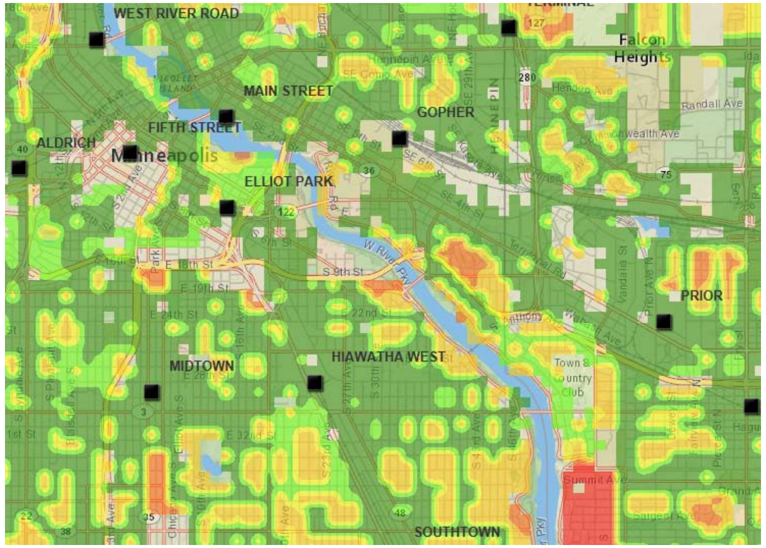
Hosting capacity analysis use cases

	Use Case	Objective	Capability	Challenges
Hosting Capacity Analysis Use Cases	**Development Guide**	Support market-driven DER deployment	Identify areas with potentially lower interconnection costs	Security concerns; analysis/model refresh; data accuracy and availability
	Technical Screens	Improve the interconnection screening process	Augment or replace rules of thumb; determine need for detailed study	Data granularity; benchmarking and validation to detailed studies
	Distribution Planning Tool	Enable greater DER integration	Identify potential future constraints and proactive upgrades	Higher input data requirements; granular load and DER forecasts

Source: ICF International

Example hosting capacity analysis requirements over time: Minnesota (1)

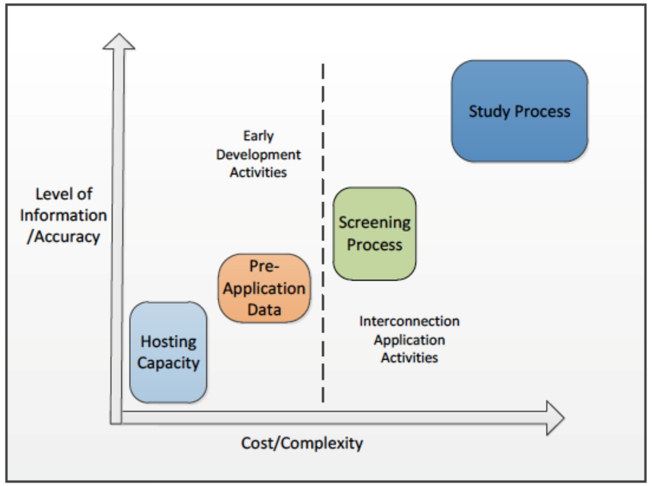
- The PUC requires analysis of each feeder for solar ≤1 MW and potential distribution upgrades necessary to support expected distributed generation levels, based on utility's IRP filings and Community Solar Gardens program.
- Utility filed 1st hosting capacity analysis in 2016 (Docket 15-962)
  - Commission's Aug. 1, 2017 decision requires filing analysis Nov. 1 each year
  - Provided guidance for future analysis, including reliable estimates and maps of available hosting capacity at feeder level
    - Details to inform distribution planning and upgrades for efficient integration of distributed generation
    - Detailed information on data, modeling assumptions and methodologies



Source: Xcel Energy

Example hosting capacity analysis requirements over time: Minnesota (2)

- Aug. 15, 2019, order (Docket 18-684) required further improvements
  - Work with stakeholders to improve value of analysis, with more detailed data in maps
  - Provide spreadsheet with hosting capacity data by substation and feeder, with peak load, daytime minimum load, installed generation capacity, and queued generation capacity
  - For feeders with no hosting capacity, identify "The full range of mitigation options … including a range of potential costs … and financial benefits…." Some solutions are low or no cost.
  - Identify costs and benefits of replacing or augmenting initial interconnection review screens and supplemental review and automating interconnection studies
- July 23, 2020, order (Docket 19-666)
  - Adopts long-term goal to use hosting capacity analysis in interconnection fast-track screens
  - Requires estimating costs for more frequent updates and other use cases (e.g., initial interconnection review screens and supplemental review), considering *load* hosting analysis
- June 1, 2022, order (Docket M-21-694)
  - Modified future requirements to proactively plan investments in hosting capacity and other necessary system capacity to allow distributed generation and EV additions consistent with the utility's forecast for DERs — in coordination with IRP

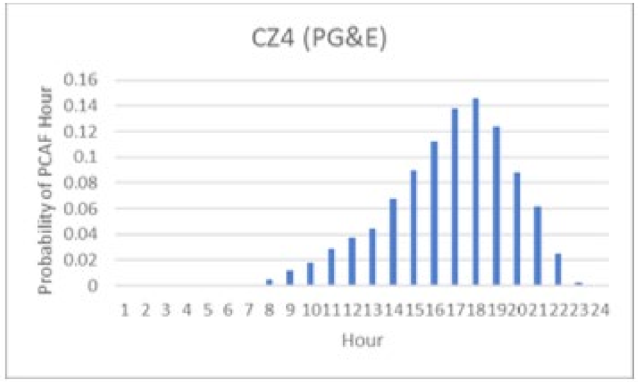


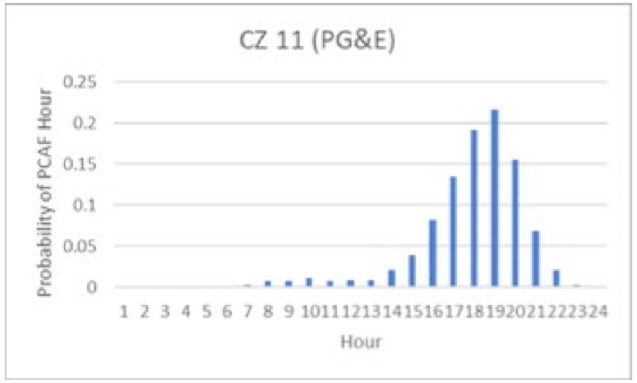
Source: Xcel Energy 2021

Locational value of DERs

- In addition to analyzing DERs as alternatives to *specific projects*, utilities can conduct *systematic* studies of DER locational value to:
  - Better understand where to target them
  - Calibrate incentive levels
  - Reduce load growth for specific areas of the distribution system
  - Reduce the need for traditional distribution system upgrades
- Locational net benefits analysis analyzes costs and benefits of DERs to determine the net benefits they can provide for a given area of the distribution system.
- These studies can become a routine and transparent part of the distribution planning process. The information also can be used for DER programs and rate designs.

Example PG&E peak capacity allocation factors distribution by hour for climate zone 4 and climate zone 11. Source: [Avoided Cost Calculator](#) (2021)





DER tariffs

- ▶ DER payments based on DER value
  - For example, New York's Value Stack tariff compensates DER based on location, in addition to energy, capacity, environmental and demand reduction values
  - Each utility identifies locational-specific relief value zones
  - Response to event calls in these zones results in additional DER compensation

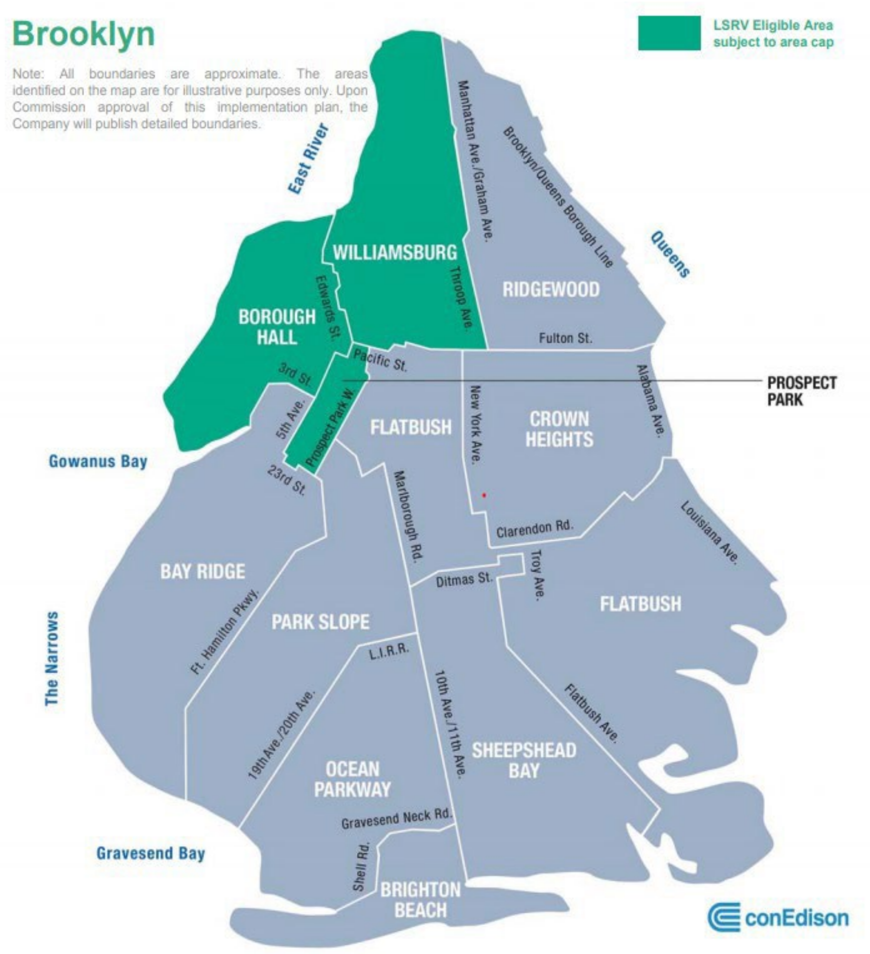
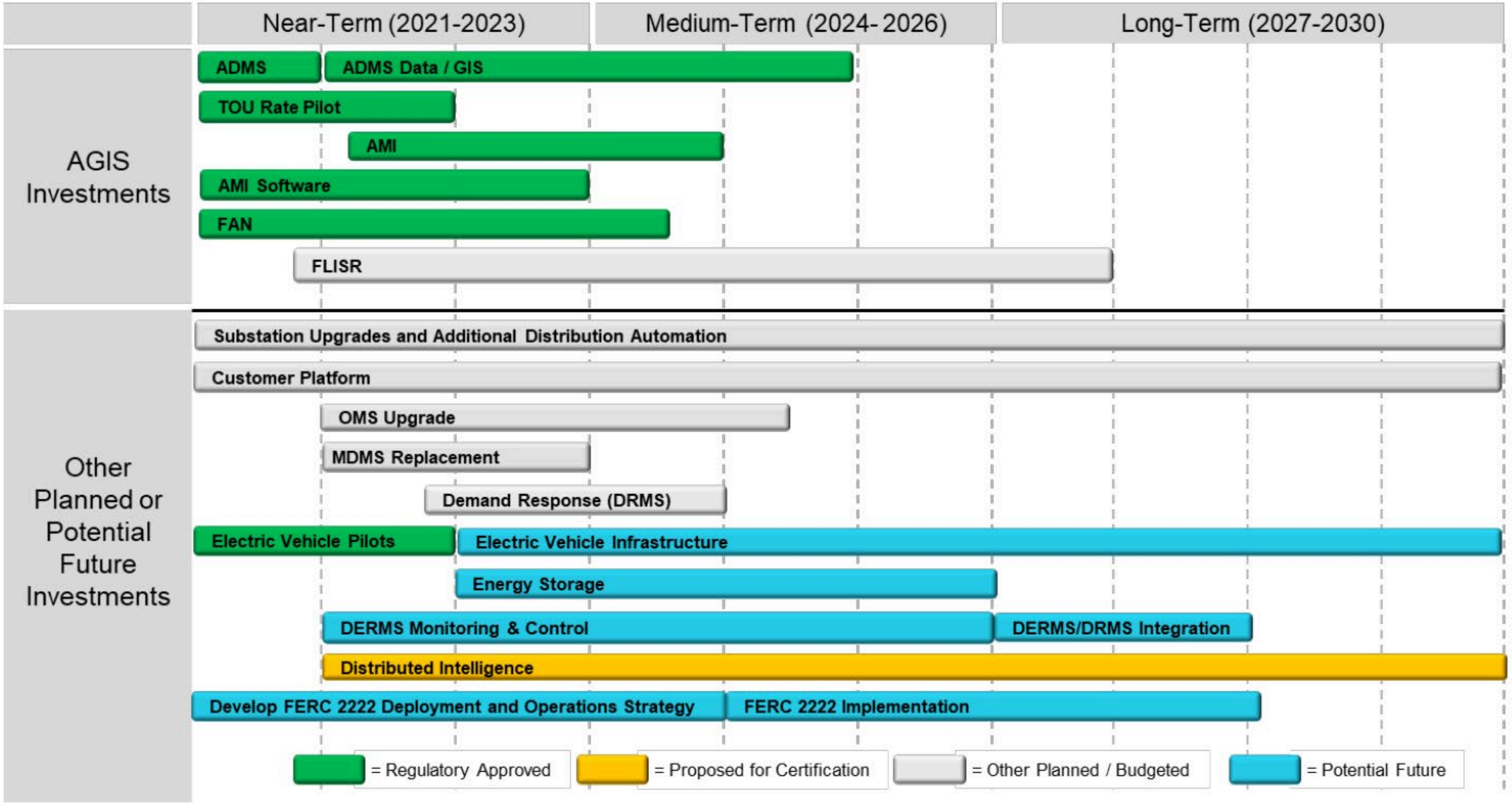


Figure source: Con Edison LSRV Zone map

Source: Adapted from Juliet Homer, Pacific Northwest National Laboratory

Illustrative Grid Modernization Investment Plan



Source: Xcel Energy 2021

AGIS – Xcel Energy's Advanced Grid Intelligence and Security initiative, ADMS – Advanced Distribution Management System, GIS – Geographic Information System, AMI – Advanced Metering Infrastructure, FAN – Field Area Network (visibility and control), FLISR - Fault Location, Isolation, and Service Restoration, OMS – Outage Management System, MDMS – Meter Data Management System, DERMS – DER Management System

Partnership Pilot

- Customers participate in the pilot through a pre-screened aggregator.
- Pre-screened aggregators meet experience and financial viability criteria, and have demonstrated the capability to reliably dispatch DERs.
- The pilot is first-come, first-serve. It remains open until the subscription period closes or when the utility contracts 120% of identified need.
- When the utility receives offers that meet 90% of the capacity needed to defer the distribution project, the utility contracts with the aggregators.
- The pilot budget is capped at 85% of the estimated cost per kW of traditional investment.
- Annually, each utility must identify three projects to test the pilot.

[Southern California Edison Partnership Pilot Project]

Partnership Pilot Project Name: New Circuit at El Casco Substation

Project Cities May Include	Need Area	Tranche	Tranche Status	Tranche Procurement Goal (Capacity - MW)	Tranche Procurement Goal (Energy - MWh)	Subscription Period Launch Date	Subscription Period End Date	Operating Date	Deferral Value (Cost Cap-PV $)	Tariff Budget (Nominal $)	Deployment Budget	Reservation Budget	Performance Budget
Beaumont, Calimesa	Jonagold Circuit	1	Open	0.1	0.1	1/18/2022	12/1/2022	6/1/2024	$65,627	$12,130	$2,426	$3,639	$6,065
		2	Closed	0.3	0.6	~1/15/2023	12/1/2023	6/1/2025	$61,271	$80,056	$16,011	$24,017	$40,028
		3	Closed	0.4	0.7	~1/15/2024	12/1/2024	6/1/2026	$57,205	$102,738	$20,548	$30,822	$51,369
		4	Closed	0.4	0.6	~1/15/2025	12/1/2025	6/1/2027	$53,408	$96,868	$19,374	$29,060	$48,434
		5	Closed	0.3	0.5	~1/15/2026	12/1/2026	6/1/2028	$49,864	$88,795	$17,759	$26,639	$44,398
		6	Closed	0.3	0.3	~1/15/2027	12/1/2027	6/1/2029	$46,554	$58,605	$11,721	$17,581	$29,302
		7	Closed	0.3	0.4	~1/15/2028	12/1/2028	6/1/2030	$43,465	$85,954	$17,191	$25,786	$42,977
									Total Tariff Budget	$525,146			

Source: Natalie Mims Frick, Berkeley Lab

Standard Offer Contract

- Participants use a standard contract to offer front-of-the meter DERs to avoid or defer identified utility distribution investments.
  - Contract is based on Technology Neutral Pro Forma contract — for example, SDG&E’s contract is here.
  - DERs can be dispatchable or non-dispatchable.
- Participants can submit partial or full offers, and the utility can combine offers together to create a solution. Offers include a $/kW-month price.
- The offer price cap is the value of a one-year deferral of the planned distribution project, which the utilities publish. Once 90% of the capacity is filled the utilities start the contract process.
- Utilities are required to select one project annually to test the pilot.

Southern California Edison Standard Offer Contract Pilot Project

Project Description	Tier	Location(s) of Need	Distribution Service Required	Operating Date	Max 10-year Capacity Need (MW)	Max 10-year Duration (hr)	Standard Offer Contract Pilot Project Ranking
New Circuit at Eisenhower	Tier 1	Crossley 33kV	Capacity	6/1/2024	2.9	6	1
New Circuit at El Casco Substation	Tier 1	Jonagold 12kV	Capacity	6/1/2024	0.4	2	2
New Circuit at Elizabeth Lake	Tier 1	Guitar 16kV Oboe 16kV Trumpet 16kV	Capacity (UCT) FLAG	6/1/2024	9.0	11	3

Source: Natalie Mims Frick, Berkeley Lab

NJ Grid Modernization

Reducing Friction for DER Interconnection to, and Compensated Operation within, the electric distribution system for advancement of NJ's Energy Master Plan strategies

NARUC-NASEO DISCUSSION

April 13, 2023

The Grid Modernization Process … framing

TACTICAL <<< >>> STRATEGIC

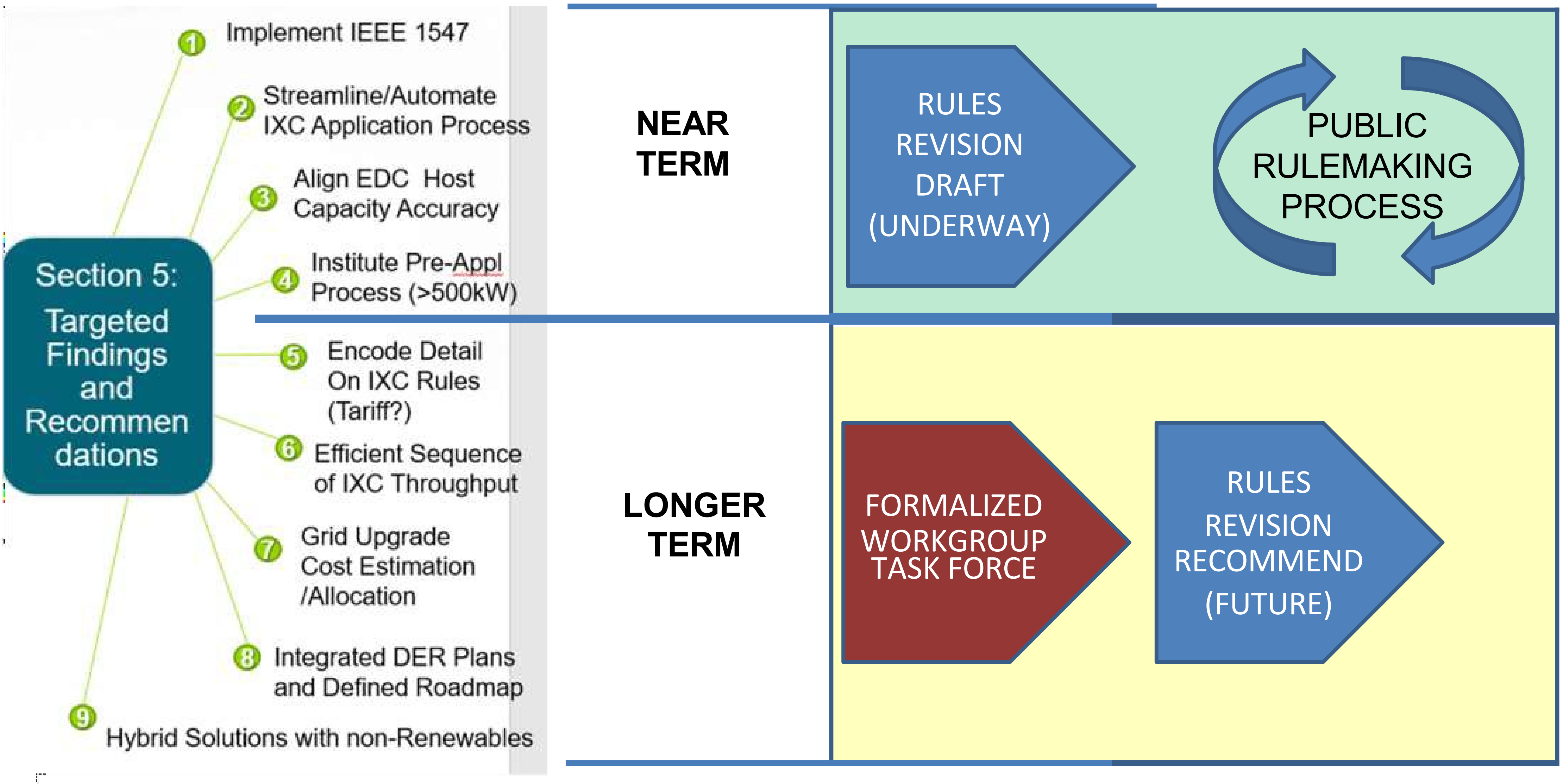
BPU New Jersey's cleanenergy program njcleanenergy.com

- **Key Drivers**
- **Methods**
- **Timelines**
- **Critical Issues**

RULES

N.J.A.C.
14:8-5

The Grid Modernization Process ... implementing



GRID MOD DRIVERS

Impetus for the New Jersey Grid Modernization Program

Climate goals and energy efficiency:

- The New Jersey Legislature has identified energy efficiency and conservation as key components of the State's goal of 100% clean energy by ~~2050~~. 2035
- Governor Murphy signed the **Clean Energy Act in 2018,** directing the Board to adopt programs that ensure universal access to energy efficiency and serve the needs of low-income communities.
- In 2020, the **Energy Master Plan** established that the State's priorities in developing its statewide EE structure are affordability, equity, environmental justice, economic development, decarbonization, and public health.

Addressing equity in energy efficiency:

- Meeting the state's climate goals will require scaling up residential energy efficiency services, particularly for limited income residents, Black and Brown residents, and residents of underserved, under resourced, and historically excluded communities.
- These residents often occupy older, deteriorated housing, with conditions that negatively impact health and financial and housing stability for families. These are often the same conditions that result in deferral from programs providing critical energy-efficiency services.
- Investment to reduce deferrals from energy efficiency programs and coordination with other housing programs is necessary to create equitable energy efficiency service delivery.

Challenge: What's Driving the Need for GridMod

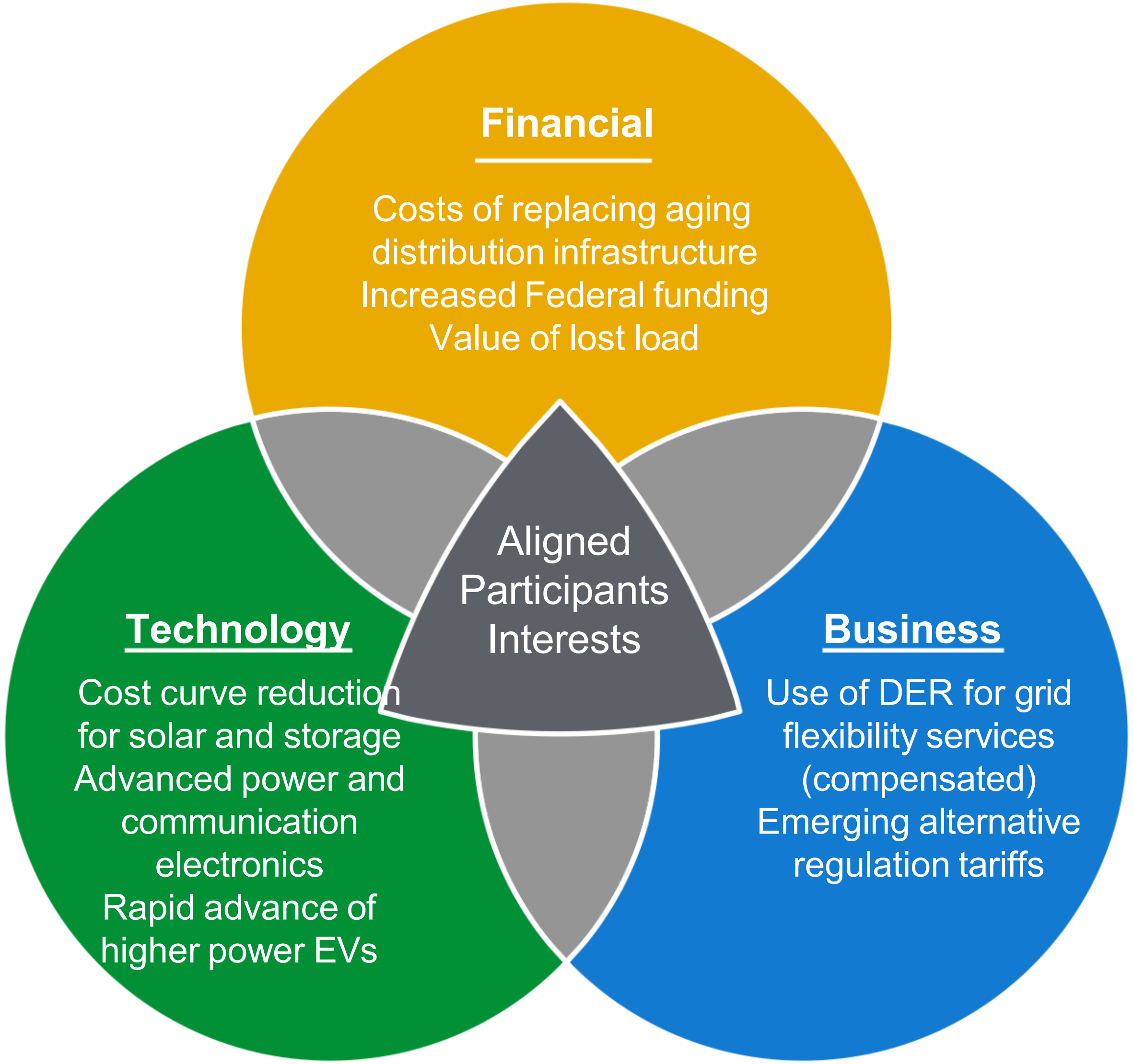
Need for dramatic ramp in "attachment" of Clean Energy to achieve GHG emission reduction.

Consumers demanding economic and resilient power to mitigate growing climate driven disruption.

Ensuring fairer energy and environmental equity outcomes – empowering communities.

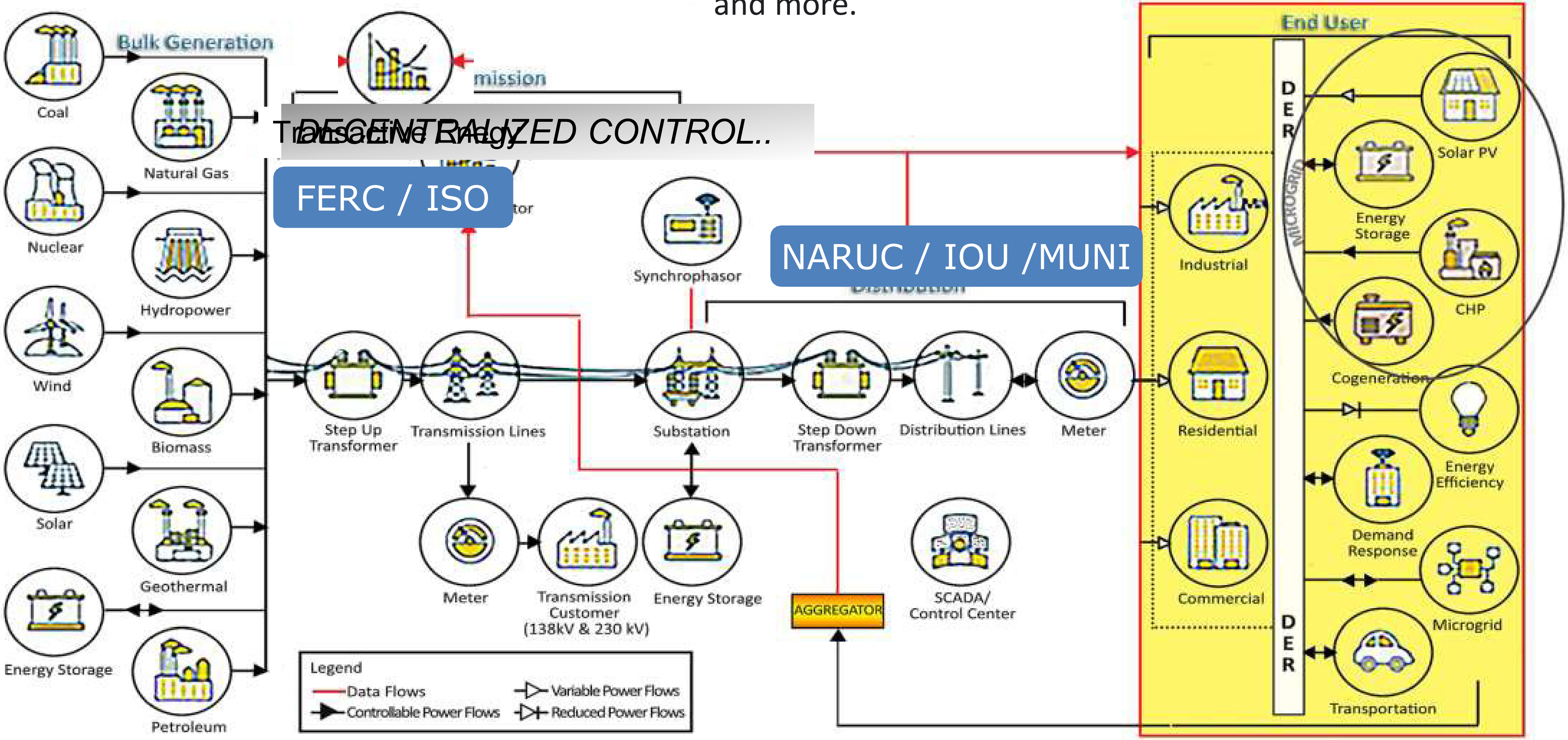
Technology advancing to make DER more affordable, flexible and controllable.

Electric Transportation that can both take and give electric power (V2G)



Technology Changes Driving Grid Mod

It includes a variety of changes, such as **accommodating new technology, new forms of electricity generation and distribution, installing smart meters, updating grid infrastructure, integrating renewable energy sources,** and more.



Strategic Policy Action – NJ Energy Master Plan

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector

Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources

Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand

Strategy 4: Reduce Energy Consumption and Emissions from the Building

Strategy 5: Decarbonize and Modernize New Jersey's Energy System

Strategy 6: Support Community Energy Planning and Action with an Emphasis on Encouraging and Supporting Participation by Low- and Moderate-Income and Environmental Justice Communities

Strategy 7: Expand the Clean Energy Innovation Economy

Grid Modernization underpins two primary strategies outlined in the NJ Energy Master Plan

Executive Action

In 2018, Governor Murphy signed **Executive Order No. 28** directing state agencies to develop an updated **Energy Master Plan (EMP)** that provides a path to 100 percent clean energy by 2050

In Feb 2023 Governor Murphy Signed **Executive Order 315 …** Adoption through Executive Order No. 315 of an **accelerated target of 100% clean energy by 2035**

… and outlined six pillars that will serve as the foundation for a cleaner, greener, and more resilient New Jersey.

Legislative Action (Passed)

P.L.2018, c.17 - AN ACT concerning clean energy, amending and supplementing P.L.1999, c.23, amending P.L.2010, c.57, and supplementing P.L.2005, c.354 (C.34:1A-85 et seq.).

Known as the "**Clean Energy Act**", this bill required the Board to conduct an energy storage analysis, make changes to the solar renewable energy certificate program, adopt energy efficiency and peak demand reduction programs, adopt a "Community Solar Energy Pilot Program," and provide tax credits for certain offshore wind energy projects.
The bill took several critical steps to improve and expand New Jersey's renewable energy programs.

GRID MOD METHODS

Energy Transition Change Process

Incremental

CURRENT CONDITIONS

- Distribution grid hosting constraints
- Large cost barriers for individual projects
- Extensive application processing delays
- Applications made just to hold queue
- Inequitable economic and environmental
- Free Rider applicants just to hold queue

Philosophy

Pre-Condition

- Customer Aware
- Smart inverters
- Reasonable Financing
- Compensate DERs
- Quality data M&V
- Motivated EDCs

2023-4

Intervention

Immediate Action

- Reduce application processing time
- Update and unify hosting capacity
- Proactive planning
- Require smart inverters
- Open screen limits

2025-6

Impact

Long-term outcomes

- Create a gridflex services market
- Spread the grid upgrade burden
- Maximize grid hosting capacity
- Drive increased energy storage
- EDC filed DER / Microgrid tariffs

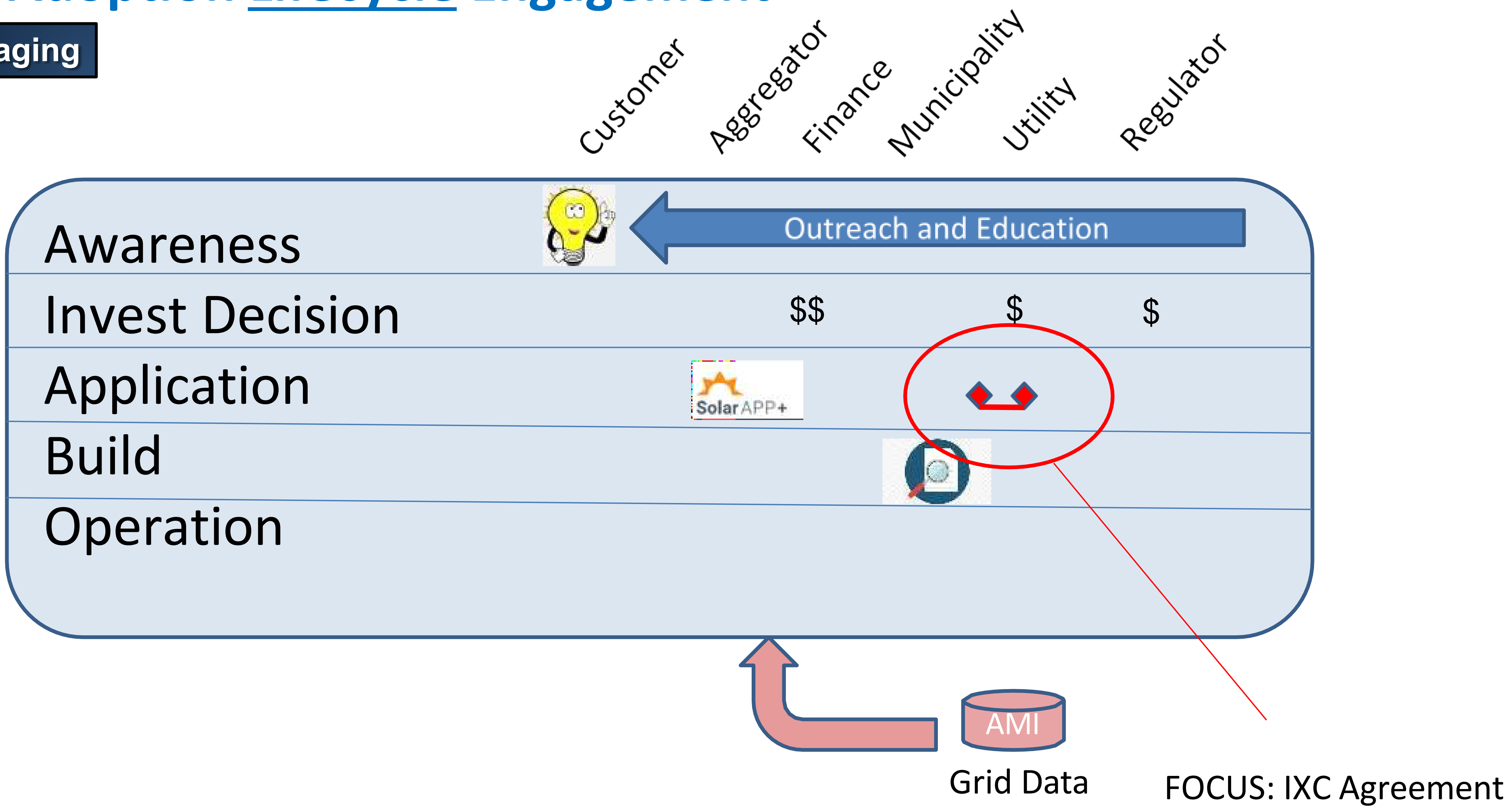
2027+

VISION

- Highly cost effective grid upgrades
- Economic engine driven by DER
- Participatory grid with DER Aggregation
- Strong community based clean energy
- Strong market mechanism driving DER investments
- Max. risk-mitigated private funding
- Flexible dist grid ops.

DER Adoption Lifecycle Engagement

Engaging



Facilitated Stakeholder Engagement

Collaborative

Core Project Team

BPU — New Jersey Board of Public Utilities

Guidehouse

NJ EDC Engagement

Rockland Electric Company

New Jersey Natural Gas

PSEG

atlantic city electric — An Exelon Company

Non-EDC Engagement (Examples)

INDUSTRY ASSN

SEIA Solar Energy Industries Association

IREC

DEVELOPERS

sunnova

conEdison Solutions — a Con Edison Clean Energy Business

OEMs

Bloomenergy

TESLA

FuelCell Energy

RATEPAYERS

State of New Jersey Division of the Rate Counsel

NJ Grid Modernization Program (Actors)

Realistic

AIMING FOR BEST COLLABORATIVE RECONCILIATION

Role/Stakeholder Group	SEED	COLLECT/COMBINE	CONSOLIDATE	PUBLISH
Electric Power Distribution				
Wholesale Market				
DER Solution Design		ALIGN	CONSENSUS RESOLVED	
Equipment/System OEM				
NJ Ratepayer				
Regulatory				

COLLABORATIVELY AGREED

POLITICALLY RESOLVED

Grid Mod | Action Categories

Studies and Investigations
Legislative or regulatory-led efforts to study energy storage, grid modernization, utility business model reform, or alternative rate designs, e.g., through a regulatory docket or a cost-benefit analysis.

Grid Modernization Policies
New state policy proposals or changes to existing policies related to grid modernization, including energy storage targets, energy storag compensation rules, interconnection standards, and customer data access poli

Planning and Market Access
Changes to utility planning processes, including integrated resource planning, distributio system planning, and evaluation of non-wires alternatives, as well as changes to state and wholesale market regulations enabling market access.

Financial Incentives for Energy Storage and Advanced Grid Technologies
New statewide incentives or changes to existing incentives for energy storage, microgrids, and other modern grid technologies.

Utility Business Model and Rate Reform
Proposed or adopted changes to utility re on and rate design, including performancebase ing, decoupling, time-varying rates, and reside nd charges.

Deployment of Advanced Grid Technologies
Utility-initiated requests, as well as proposed legislation, to implement demand response programs or to deploy advanced metering infrastructure, smart grid technologies, microgrids, or energy storage.

Source: North Carolina Clean Energy Technology Center, *The 50 States of Grid Modernization: Q2 2022 Quarterly Report*, July 2022.

GRID MOD TIMELINES

EDC Meeting Jan 14th

Dec 9th EDC Orientation

Guidehouse

- EDC Joint Template Review

Jan 14th 20 minute presentations

PSEG

JCPL

ACE

RE

COMMON "EDC REPORT" PRESENTATIONS

+

pjm

- DER Aggregation

Order 2222

FERC Opens Wholesale Markets to Distributed Resources

FERC

TOPICS ADDRESSED

- Clean Energy strategies
- Review Past Interconnection Processing Performance
- Interconnection Process Staffing
- Present Circuit Hosting Capacity
- Nameplate Solar summaries
- Cost Impacts for Upgrades

Non-EDC Meeting Jan 28th

TOPICS ADDRESSED

- Project Risk and Barriers
- Emerging Tech and Business Models
- Industry Standards and Best Practices
- Workflow and Process Automation

FuelCell Energy

sunrun

conEdison Solutions
a Con Edison Clean Energy Business

TESLA

MSSIA
MID-ATLANTIC SOLAR & STORAGE INDUSTRIES ASSOCIATION

ANBSYSTEMS
energizing solutions

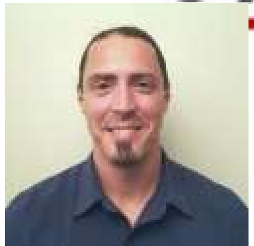
Bloomenergy

SEIA Solar Energy Industries Association

IREC

sunnova

Ad Energy



Guidehouse Report w/Recommendations

- Improve **Access** to Relevant Information for Applicants
- Manage Queue and Reduce Application Processing **Intervals**
- Reduce Barriers to DER **Adoption**

Section 1: Introduction

Section 2: Study Methodology

Section 3: Stakeholder Findings

Section 4: Common Practice

Section 5: Targeted Findings and Recommendations

1. Implement IEEE 1547
2. Streamline/Automate IXC Application Process
3. Align EDC Host Capacity Accuracy
4. Institute Pre-Appl Process (>500kW)
5. Encode Detail On IXC Rules (Tariff?)
6. Efficient Sequence of IXC Throughput
7. Grid Upgrade Cost Estimation /Allocation
8. Integrated DER Plans and Defined Roadmap
9. Hybrid Solutions with non-Renewables

ANB SYSTEMS energizing solutions, TESLA, Bloomenergy, PSEG, MSSIA, Rockland Electric Company

Jersey Central Power & Light A FirstEnergy Company, atlantic city electric An Exelon Company, sunnova, fuelcellenergy, sunrun, IREC, conEdison Solutions a Con Edison Clean Energy Business, Ad Energy

IREC

LBNL
NREL
CPUC
(and IOUs)
Duke
IEEE
EPRI
FERC/PJM

CA
NY
VA
DC
MD
NC/SC

STATE BENCHMARKING:
Tabular comparisons among equivalent DER Interconnection Process elements are made for; Processing timelines, Hosting Capacity maps, Metering requirements, and Fees.

Updating the DER Interconnection Rules

LONGER TERM <<< NEAR TERM

RULE UPDATE/EXPANSION

N.J.A.C.
14:8-5

2023-4

Rules
Evolution

2025

GRIDMOD FORUM TASK FORCE RECOMMENDATIONS

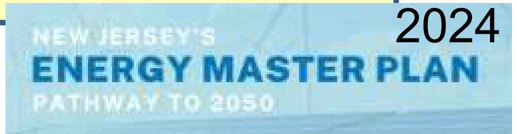
Recommendation #5 – NJ BPU should convene a technical working group to adopt and develop into N.J.A.C.14:8-5, current specific industry guidance such as from IREC, California Rule 21, IEEE 1547, and similar sources

Rec #6 – NJ EDCs should implement a uniform streamlined flexible queue process across EDCs that would prioritize a "first ready, first through" approach to support viable projects

Rec #7 – NJ BPU should define a mechanism to establish numerical cost and capacity thresholds above which grid modernization costs could be spread over a broader set of beneficiaries

Rec #8 – EDCs should submit integrated DER and integrated distribution plans that will allow NJ to meet the EMP goals.

Rec #9 – NJ BPU should consider allowing non-renewable fuel sources play in the net metering market at a reduced rate,



2024 Update

Updating the DER Interconnection Rules

IMMEDIATE RULE **UPDATES**

N.J.A.C.
14:8-5


State of New Jersey
Governor Philip D. Murphy
Lt. Governor Sheila Y. Oliver

Board of Public Utilities
www.nj.gov/bpu/

Joseph L. Fiordaliso
President

Mary-Anna Holden
Dianne Solomon
Bob Gordon
Dr. Zenon Christodoulou
Commissioners

NOTICE[1]

KEY CHANGE ELEMENTS		HIGHLIGHTS
.1	Definitions	Introduce several advanced grid planning and management terms
.2	General	Introduce Export Control capabilities, raise L1 threshold from 10kW to 25kW, clarify storage integration approach, introduce smart inverter upgrades, unify and automate a Common Interconnection Application Process (CIAP), establish dedicated EDC single POC office, establish formal dispute resolution process, expand allowable screening violation customer mitigation options, require annual PSUP and encouraging substation reverse power flow upgrades, introduce terms for DER Aggregation considerations,
.3	Certification	Defines applicable certification standards for smart inverters
.4, .5, .6	Level 1&2&3	Clearer specification of thresholds, intervals, workflow, and mitigations within each process tier. Level 3 provided with **much** clearer requirements than previous version of Rule. Use of PAVE request introduced and export control options delineated.
.7	Fees	Allows maximum $100 fee for Level 1 interconnection applications (formerly zero fee). Changed fee structure and raised per kW charge for Level 3. Allows for Board to adjust fees going forward based on future conditions. Introduces the concept of a “Board reviewed” “minor modifications” cost threshold that Level 2 upgrade costs can be charged to Customer-Generator.

IMMEDIATE RULE **EXPANSIONS**

N.J.A.C.
14:8-5

Updating the DER Interconnection Rules

KEY CHANGE ELEMENTS		HIGHLIGHTS
.8	Testing, Maint, and Inspection	No major changes
.9	EDC Reporting	Defines comprehensive performance tracking metrics for ensuring that the interconnection process is running smoothly and improving over time as grid modernization proceeds. Includes throughput, completion ratios, capacity achieved, hosting growth, etc..
.10	PAVE (PreApp)	Establishes the formal process for, and required EDC execution of, developer requests for critical distribution system technical information prior to launching a full interconnection application. (Note: limited to certain larger capacity systems)
.11	Hosting Capacity	Defines the requirement for consistent, accurate, and accessible circuit hosting capacity information and its presentation interface as interactive maps.
.12	PSUP (Proactive)	Establishes the framework (through tariff filing) for proactive EDC system upgrade planning that aims toward enabling optimal hosting capacity growth and DER-provided grid flexibility services.
.13	Dispute Resolution	Establishes formal dispute resolution process

Adjacent Proceedings Driving Change in NJ

PROGRAM	DOCKET NO.	KEY DRIVERS
A. AMI Data	QO21010085	• Enabling 3rd party access to energy data; • Driving an "app economy" for innovative solutions utilizing data;
B. Energy Storage	QO22080540.	• Incentivizing promising applications/locations for energy storage siting and grid integration; • Deriving suitable Resilience metrics;
C. Microgrids	QO16100967	• Efficiency and resilience; • Enabling higher DER attachment; • Grid Flexibility Services;
D. Hydrogen Fuel Cell	N/A	• Governor's Hydrogen Fuel Cell Task Force; • Hydrogen Hub joint proposal to DOE (NYSERDA led); • Potential for using Class 1 fuel cells as DER, electrolyzers;
E. EV Charging	QO20050357	• Potential for bidirectional V2G services; • Grid optimization for extreme power MD/HD charging;

GRID MOD CRITICAL ISSUES

TBD

Questions & Suggestions