Reliability Planning Speaker Session

August 2, 2021

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Agenda

- Welcome
- Presentations and Q&A
  - New York State Reliability Council – Mayer Sasson, Steve Whitley, Roger Clayton
  - New York Independent System Operator – Zach Smith
  - Utility Consultation Group – Margaret Janzen (National Grid) and Ryan Hawthorne (Central Hudson)
  - New York State Department of Public Service – Tammy Mitchell
  - Vote Solar – Stephan Roundtree
  - New York Department of State Utility Intervention Unit – Erin Hogan
- Wrap-up

Reliability Challenges in Meeting CLCPA Requirements

New York State Reliability Council

Mayer Sasson, Chair of the Executive Committee
Stephen Whitley, Unaffiliated Member
Roger Clayton, Unaffiliated Member

Climate Action Council
Reliability Planning Speaker Session

August 2, 2021 1 pm

New York State Reliability Council
Introduction: Mayer Sasson

- Maintaining reliability is critical now and in the transition to meeting CLCPA requirements
- NYSRC is a FERC-approved entity responsible for the promulgation of reliability standards for New York, which are mandatory requirements for the NYISO
- The NYSRC establishes the annual Installed Reserve Margin ("IRM")
  - The IRM sets the minimum installed capacity margin above the estimated peak load to meet the NPCC requirement that the probability of shedding load is not greater than one day in ten years
  - The NYSRC conducts a complex probabilistic analysis of generation and transmission resources, and demand response, to determine the IRM
- Our key message to the CAC today is:

With the intermittency of renewables and the electrification of the economy, substantial clean energy and dispatchable resources, some with yet to be developed technology, over and above the capacity of all existing fossil resources that will be replaced, will be required to maintain reliability in the transition to meeting CLCPA requirements

Operating the System Reliably
Stephen Whitley

- Operators today fully utilize all available dispatchable and non-energy limited resources in New York

- Control Centers and their responsibilities:
    1. Operating with substantial energy limited resources is extremely difficult
    2. Demand and generation are balanced every six seconds
    3. If out of balance, the system could become unstable and collapse
    4. Operators are continually giving instructions to generation resources to increase or decrease generation or to reroute transmission flows as necessary to maintain reliability
    5. The availability and dispatchability of different types of reserves is critically important
    6. Need to maintain thermal, voltage, stability, and frequency requirements
    7. Fuel redundancy is critical during peak load and resource shortages
    8. Blackstart resources are needed to re-energize the system after a blackout without assistance from the grid

- Planning the system over the next ten years is required to identify the need for new transmission and generation resources to meet reliability standards

- Rigorous interconnection process to ensure new generation and transmission resources interconnect reliably – from concept, to infrastructure siting, permitting, engineering, procurement, construction and placing into service, can take 3 to 10 years depending on the type of resources

Operating the Future System Reliably

- As the percentage of renewable resources increases, the way we plan and operate the system must evolve, which was designed for the current mix in generation resources
- Limited fuel diversity and over-dependence on energy limited resources is a risk to reliability
- Recent events (cold snaps, rolling blackouts in California, load shedding for days in Texas) provide a caution to what we might face in the future

Operators will need additional dispatchable and sustainable energy resources to manage the substantially different system in order to maintain reliability

Installed Reserve Margin (IRM)

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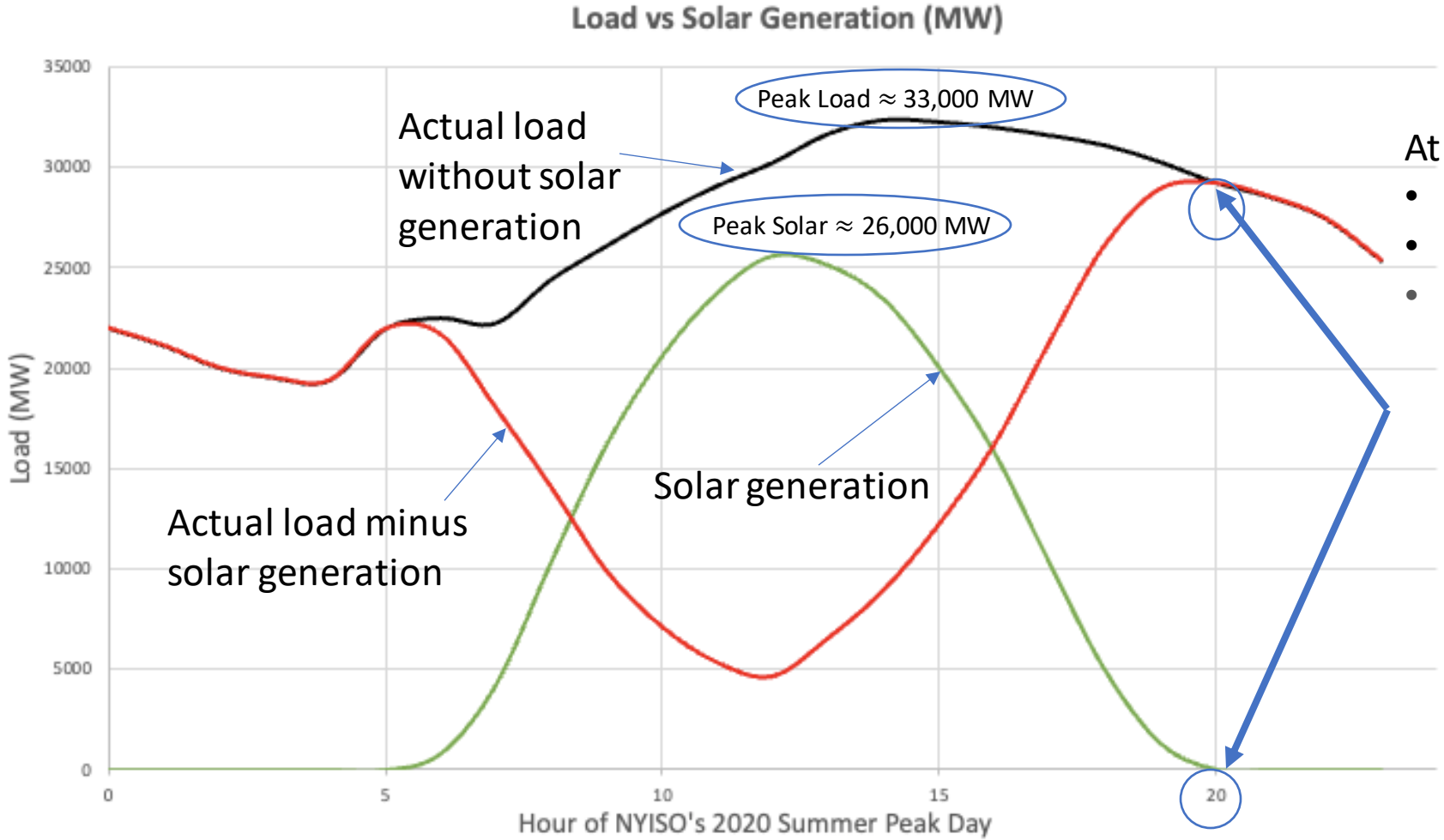
  - The IRM sets the minimum installed capacity margin above the estimated peak load to meet the NPCC requirement that the probability of shedding load is not greater than one day in ten years
  - The NYSRC conducts a complex probabilistic analysis of generation and transmission resources, and demand response, to determine the IRM

Future Challenges Presented by Significant Increases in Renewable Clean Energy Resources

Roger Clayton

Solar Impact on Resource Adequacy



At ~ 8:00 pm

- Net Load ≈ 29,000 MW
- Solar Generation ≈ 0 MW
- **Therefore, at a minimum:**
  - **Need ≈ 29,000 MW of current resources to reliably serve load**
  - **Can only retire ≈ 4,000 MW (33,000 – 29,000)**
  - **Total resources ≈ 55,000 MW (26,000 + 29,000)**
  - **Total reserve requirement ≈ 22,000 MW (55,000 – 33,000)**
  - **Current reserve requirement ≈ 6,600 MW**

For this case, the addition of 26,000 MW of new solar generation raises the reserve requirement to ≈ 22,000 MW & allows the retirement of only 4,000 MW of current resources

NYS DPS/NYSERDA "Initial Report on the New York Power Grid Study
Appendix E, Zero Emissions Electric Grid in New York by 2040 Study" 1/19/2021

Table 4-1 New York Annual Installed Capacity Supply Mix (in Megawatts)

	2025	2030	2035	2040
Thermal	24,447	23,458	24,113	17,269
Nuclear	3,381	3,381	3,381	3,381
Hydro	4,663	4,663	4,663	4,663
Onshore Wind	3,932	6,230	6,736	12,804
Offshore Wind	1,826	6,000	9,000	9,837
Grid Solar	3,099	3,808	6,426	16,759
Energy Storage	1,542	3,000	5,154	15,515
Other Renew	416	416	416	416
NYC Tx	1,250	1,250	1,250	1,250
BTM Solar (AC)	4,839	5,323	5,856	6,443
Totals (MW)	**49,395**	**57,529**	**66,995**	**88,337**

2040 Resources & Load – Initial Scenario

- Total resources = 88,337 MW
- Peak load = 38,000 MW
- Therefore:
  - **Total reserves ≈ 50,000 MW to reliably serve load**
  - **Current reserve requirement is ≈ 6,600 MW**

The study shows a 2040 reserve requirement of ≈ 50,000 MW in order to meet the CLCPA 2040 goals and the NYSRC Resource Adequacy Reliability Criterion

Observations

- Analyses presented herein plus other studies have indicated a need for significant new clean energy resources in New York in order to meet CLCPA requirements and NYSRC reliability criteria
- New resources plus full development of those sites presently identified in New York as suitable for solar or wind development will be required and will increase the New York reserve margin to unprecedented levels from the current ≈ 20% to over 100% by 2040
- The required new clean energy technologies:
  - Must be emissions free
  - Must be dispatchable
  - Must be fast ramping
  - Must have long-duration storage capability

The need for sufficient levels of new clean energy resources will steadily increase as the Grid is transformed … some of these resources rely on technologies that do not currently exist for utility-scale application

Concluding Remarks

- We have mentioned some of the challenges we expect to face in planning and operating a grid largely supplied by renewable resources
- We included appendices with a glossary of mentioned entities and terms and notes on NYSRC governance and the speakers
- The NYSRC website contains the IRM reports and the Reliability Rules document

The NYSRC stands ready to work with the Climate Action Council to enable the State to transition in a safe and reliable manner to meet its CLCPA requirements

- We look forward to answering any questions you may have on the issues we have discussed

Appendix

- Glossary
- The Speakers
- NYSRC Governance

Glossary of Entities

TERM	Definition
NYSRC	New York State Reliability Council
CLCPA	Climate Leadership and Community Protection Act
NYISO	New York Independent System Operator
FERC	Federal Energy Regulatory Council
NERC	North American Electric Reliability Corporation
NPCC	Northeast Power Coordinating Council, Inc.
IRM	Installed Reserve Margin
NYCA	New York Control Area
NYSRC EC	Executive Committee (NYSRC Board)

Glossary of Electricity Terms

TERM	Definition
Blackstart	Starting a generation resource without assistance from the electric system
Reliability	Performance of the bulk power system within applicable standards while supplying all load without adverse effects: generally assessed in two ways: adequacy and security
Adequacy	Ability of the power system to meet demand considering probability expectations of load and of generation and transmission outages
Security	Ability of the electric system to withstand disturbances such as electrical short circuits or unanticipated loss of system elements in a deterministic manner
Reserves	Amount of generating capacity available in excess of demand
IRM	Installed Reserve Margin, minimum generation resource capacity to meet the requirement that the probability of load disconnection does not exceed one day in ten years
NYCA	New York Control Area, the grid under the control of the NYISO

NYSRC Governance

- The NYSRC is governed by its Executive Committee ("EC") which is comprised of a representative of each of the New York electric utilities, Large Consumers, Wholesale Sellers, Municipal Systems and Cooperatives, and four Unaffiliated Members with no affiliation with any entity with interests in the New York Power System, for a total of 13 members
- An affirmative vote of 9 members is required to approve any measure
- The EC meetings are open to the public and regularly attended by representatives of the PSC, NYISO and NPCC.
- The PSC has consistently adopted the reliability standards of the NYSRC as the standards for New York State

The Speakers

Mayer Sasson
Dr. Sasson has been with Con Edison for more than 30 years working on system and regulatory reliability matters and is the current chair of the of the NYSRC EC. He is also on the board of NPCC. Earlier, he worked for American Electric Power and was on the team that developed the first control center with real-time applications. He is the recipient of various IEEE awards.

Stephen Whitley
Stephen Whitley is currently an Unaffiliated Member of the NYSRC EC. He previously served as the President/CEO of NYISO (2008-2016); COO of ISO New England (2000-2008); various positions at TVA including Director Electric System Operations and VP Transmission (1970-2000). He has served on numerous reliability committees at SERC, NPCC, and SPP.

Roger Clayton
Roger Clayton, is currently an Unaffiliated Member of the NYSRC EC and chair of the Reliability Rules Subcommittee. He has worked for some of the leading consultants in the United States as a technical specialist, as a developer of software tools and methods, and as a manager of professional engineers engaged in power system planning and economic analyses.

Questions?

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New York ISO
Independent System Operator

Planning for a Grid in Transition

Zach Smith

Vice President, System & Resource Planning

Reliability Planning Speaker Session

August 2, 2021

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

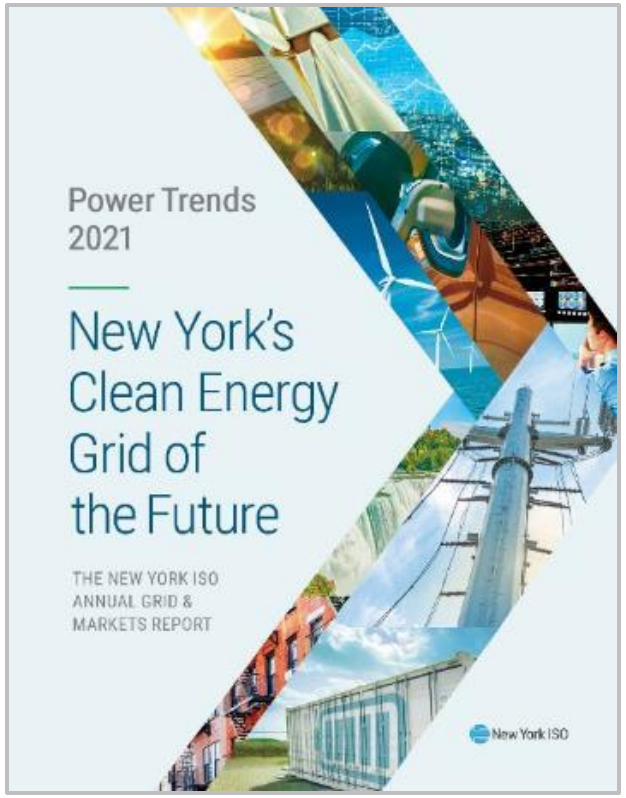
New York ISO

Power Trends 2021: New York's Clean Energy Grid of the Future

Current and emerging trends transforming the grid and electricity markets.

Key Themes:

- NYISO has always fulfilled our mission of maintaining grid reliability, overseeing efficient wholesale markets, and conducting expert grid system planning.
- The grid in New York is undergoing significant and rapid change:
  - advances in renewable technology are altering the generation mix;
  - extreme weather events are more frequent, impacting life and property; and
  - public policies are calling for bold action to achieve renewable investment and decarbonization mandates.
- The NYISO is committed to a strong partnership with lawmakers, policymakers, market participants and industry stakeholders to address the goals of the CLCPA.



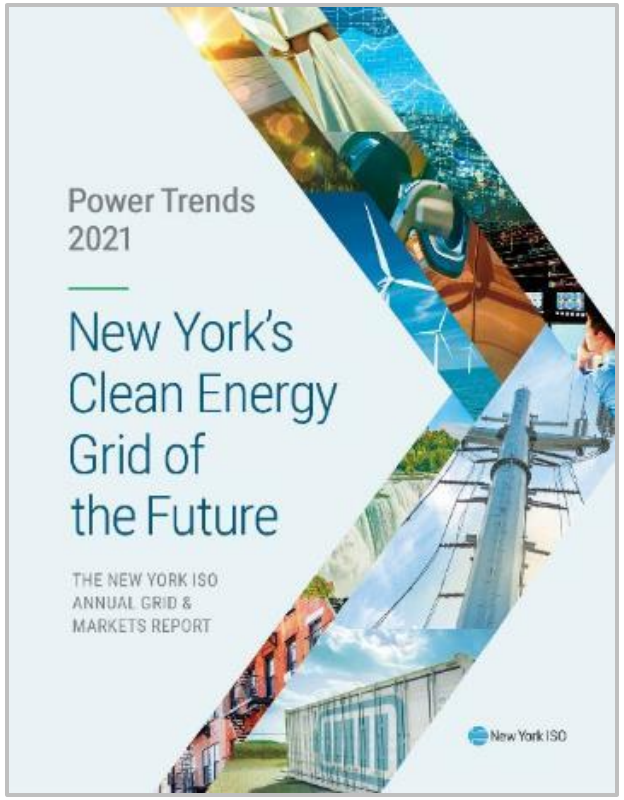
New York ISO

Power Trends 2021: New York's Clean Energy Grid of the Future

Current and emerging trends transforming the grid and electricity markets.

Key Themes: The Essential Role of NYISO's Markets

- The electric system is becoming more dynamic, decentralized, and reliant on weather-dependent intermittent generation.
- The NYISO's innovative wholesale electricity markets are empowering the changes envisioned by the CLCPA by aligning market signals with reliability, including:
  - new tools to integrate distributed energy resources (DERs) that blend the roles of supply and consumption;
  - energy storage participation rules for integrating new storage technologies, including co-located resources; and
  - engaging stakeholders in a Comprehensive Mitigation Review to evaluate and propose reforms to the mitigation rules for market entry of clean energy resources into its capacity market.



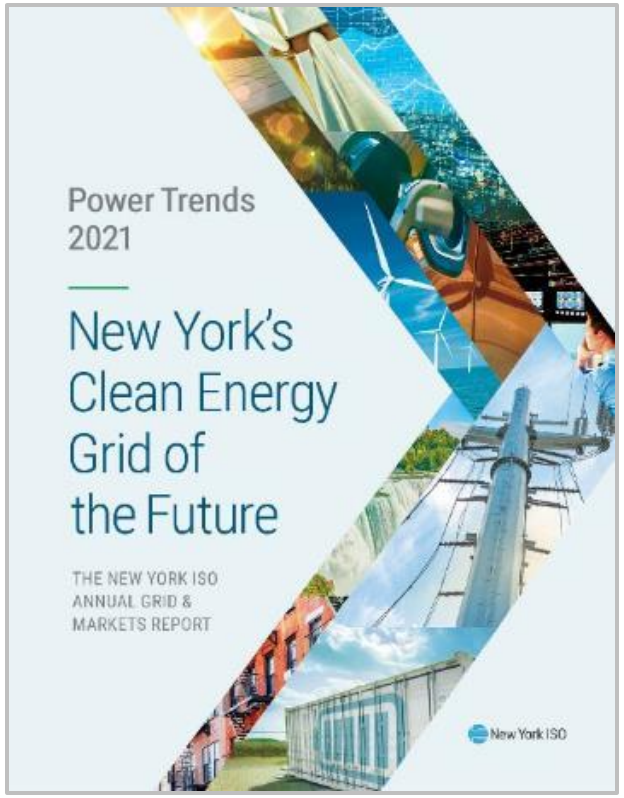
New York ISO

Power Trends 2021: New York's Clean Energy Grid of the Future

Current and emerging trends transforming the grid and electricity markets.

Key Themes: Enhanced Planning for the Future Grid

- The future grid will require new transmission to connect remote renewable resources to areas of the state where most energy is consumed.
  - Construction of new transmission is underway, but more needs to be done.
- NYISO's planning provides expert, independent information to:
  - inform market enhancements needed to integrate clean energy resources;
  - inform public policy development;
  - proactively identify reliability needs on the grid; and
  - inform of investment opportunities in support of the Clean Energy Grid of the Future.



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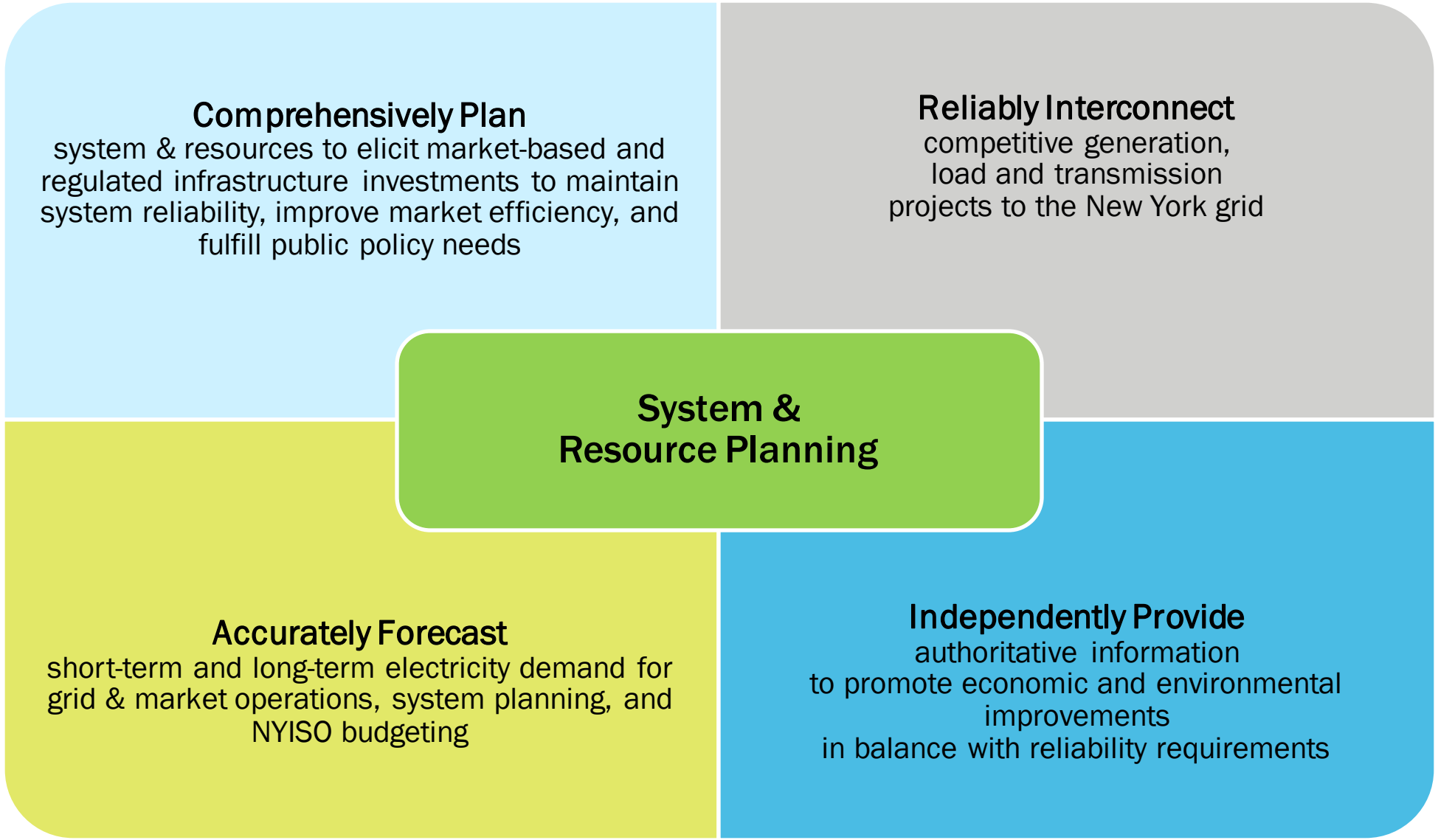

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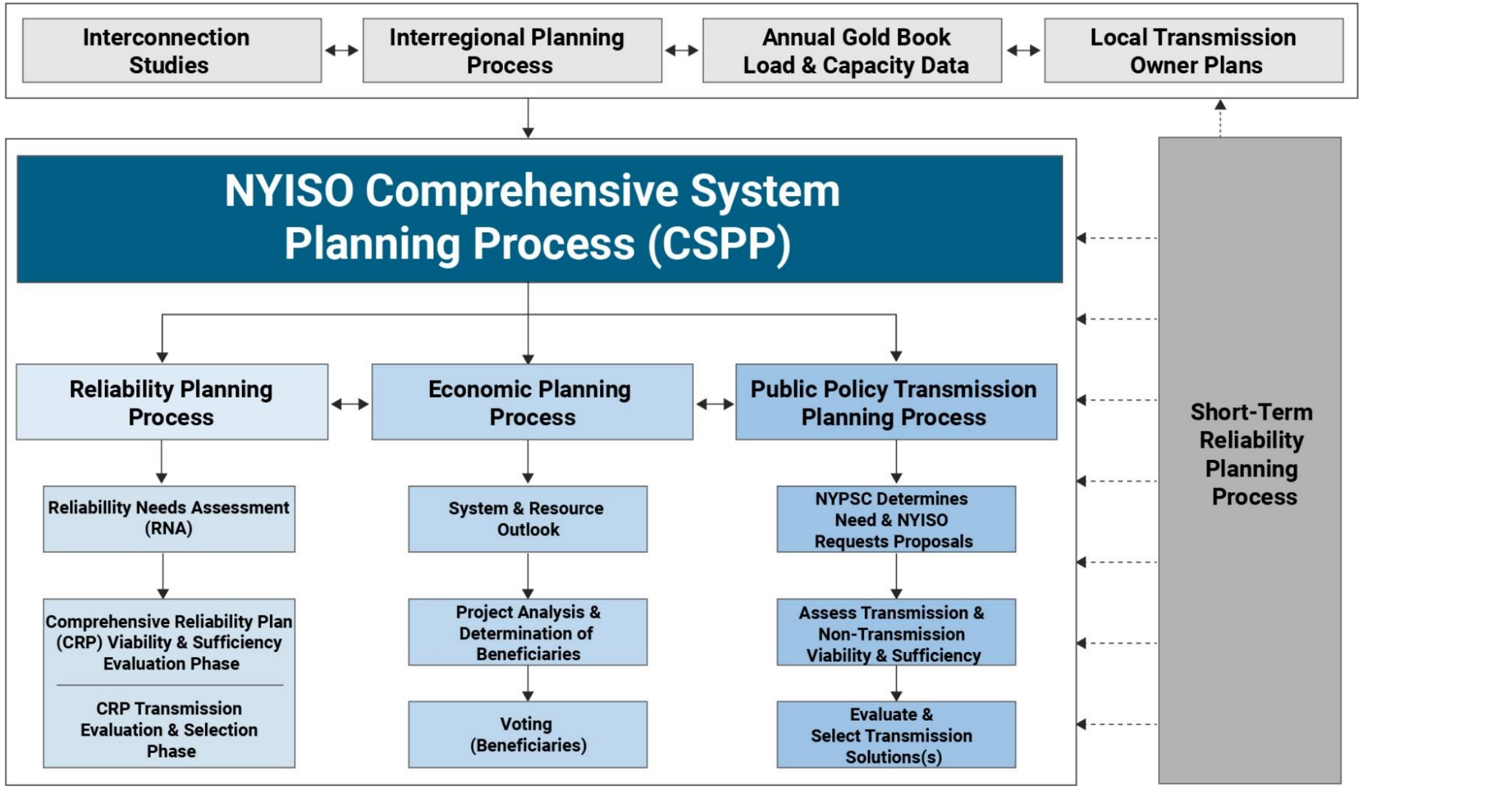
Comprehensive System Planning Process



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Reliability Planning Process

- **Reliability evaluations consist of resource adequacy and transmission security analysis of the New York Bulk Power Transmission Facilities over the 10-year planning horizon.**
- **The Short Term Reliability Process includes quarterly Short Term Assessments of Reliability (STARs) that evaluate the first five years of the planning horizon, with a focus on needs arising in the first three years.**
  - If reliability needs are identified in a STAR, Reliability Must Run (RMR) contracts are available as a last resort if the permanent solution cannot be in-service by the need date.
- **The biennial Reliability Needs Assessment (RNA) covers years 4-10 of the planning horizon.**
  - After considering any final updates that may affect the RNA findings, the NYISO issues a competitive solicitation for solutions to any reliability needs in years 4-10
- **The biennial Comprehensive Reliability Plan (CRP) documents the plans for a reliable grid over the 10-year planning horizon**
  - Includes evaluation and selection of transmission solutions to needs in years 4-10

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Reliability Planning Objectives

- Identify Reliability Needs of the Bulk Power Transmission Facilities pursuant to applicable reliability criteria (NERC, NPCC, NYSRC);
- Identify, through the development of appropriate scenarios, factors and issues that might adversely impact the reliability of the bulk system;
- Provide an open and transparent process whereby solutions to identified needs are proposed, evaluated on a comparable basis, selected (as applicable), and implemented in a timely manner to ensure the reliability of the system;
- Provide an opportunity first for the implementation of market-based solutions while providing for the reliability of the bulk system;
- Coordinate the NYISO's reliability assessments with local utilities and neighboring control areas.

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DEC Peaker Rule: A Model of Prudent Planning

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DEC Peaker Rule

- New York State Department of Environmental Conservation (DEC) adopted a regulation to limit nitrogen oxides (NOx) emissions from simple-cycle combustion turbines ("Peaking Units") (referred to as the "Peaker Rule")
- The Peaker Rule required all impacted plant owners to file compliance plans by March 2, 2020. NYISO considered generators' compliance plans in the development of the 2020 Reliability Needs Assessment Base Case
- The compliance plans result in approximately 800 MW of capacity being unavailable during the summer starting in 2023, and approximately 1,400 MW total capacity unavailable in 2025. The vast majority of this capacity is located in New York City.
- The multi-year phased approach, established through collaboration between the NYISO and state agencies, provides for prudent and orderly planning for a reliable grid.

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Current System Reliability Issues

- **Tightening margins through 2030 are primarily driven by expected reductions in available New York City generation capacity to comply with NOx emission regulations.**
  - NYISO initially identified reliability needs associated with generator deactivations due to DEC Peaker Rule compliance.
  - Reliability Needs were eliminated through updated system plans in coordination with local utilities and DPS.
- **Reliability risks are driven by forecasted demand in combination with insufficient transmission or generation to serve the forecasted load.**
- **The 2021-2030 Comprehensive Reliability Plan will address the plan to maintain reliability as well as the potential risk factors as the resource mix continues to change.**

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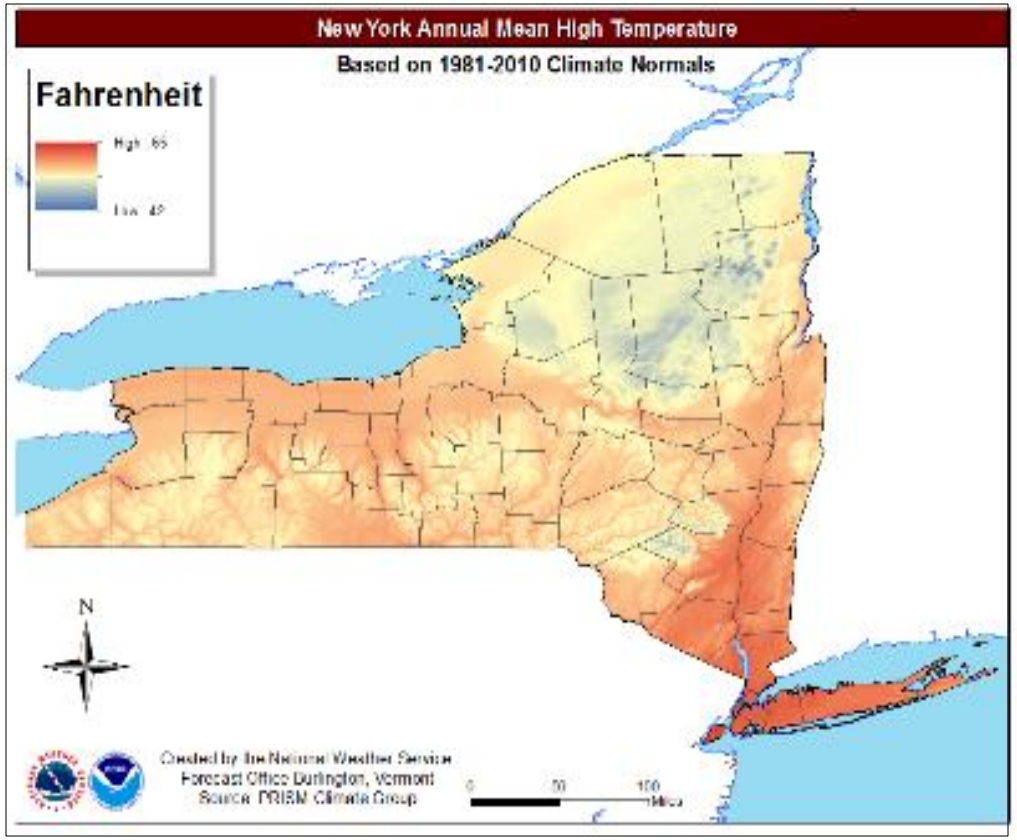
CLCPA Scenarios in Reliability Planning

Climate Change Study – Phase 1

- Evaluate temperature trends and state climate impact studies
- Develop long-term energy, peak, and hourly load shapes that reflect the potential impact of climate change
- Construct additional forecast scenarios that reflect state policy goals and include climate change impacts
- Develop long range models to incorporate into future studies



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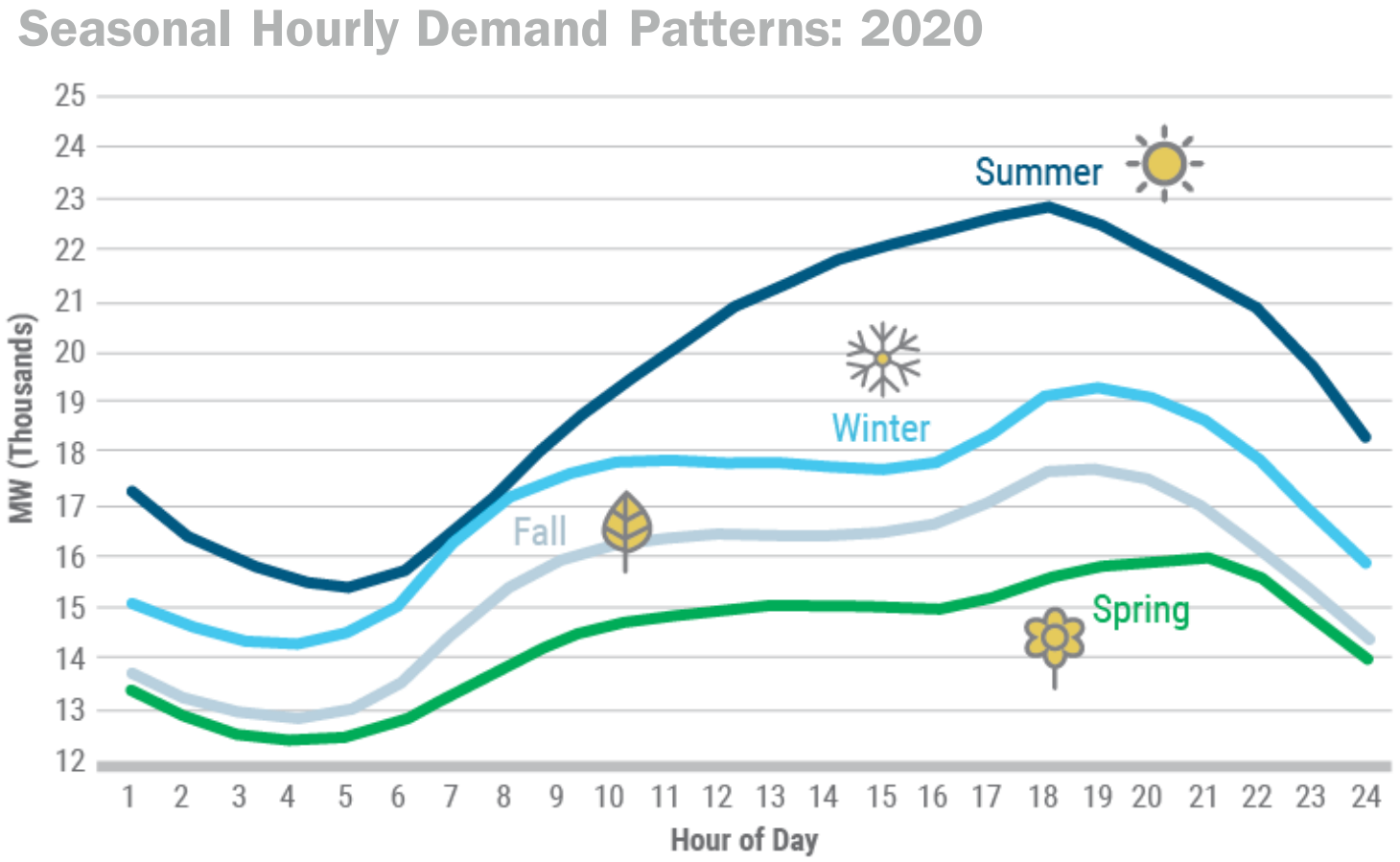
Seasonal Electricity Demand Patterns

Daily Usage Pattern for Each Season

- Demand for electricity fluctuates throughout the day and varies by season
- Hourly demand is influenced by the time of day and weather
- Seasonal variations in demand reflect weather



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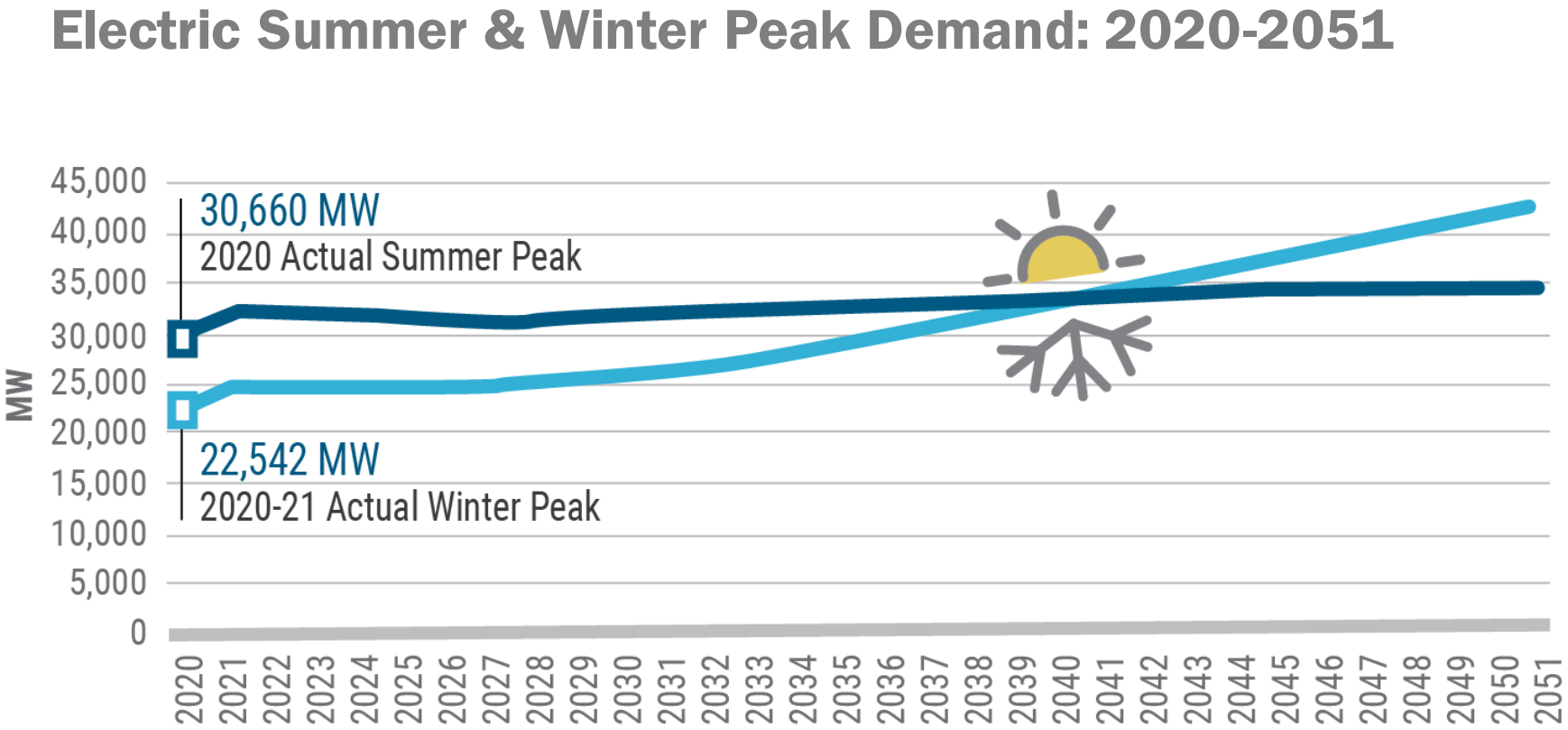
Demand Trends: Peak Demand Forecast

- The NYISO winter and summer peak load forecasts suggest that electrification will drive a shift in NY from a summer-peaking system to a winter-peaking system.
- The timing and degree of this shift will be influenced by EV and heat pump technology adoption.



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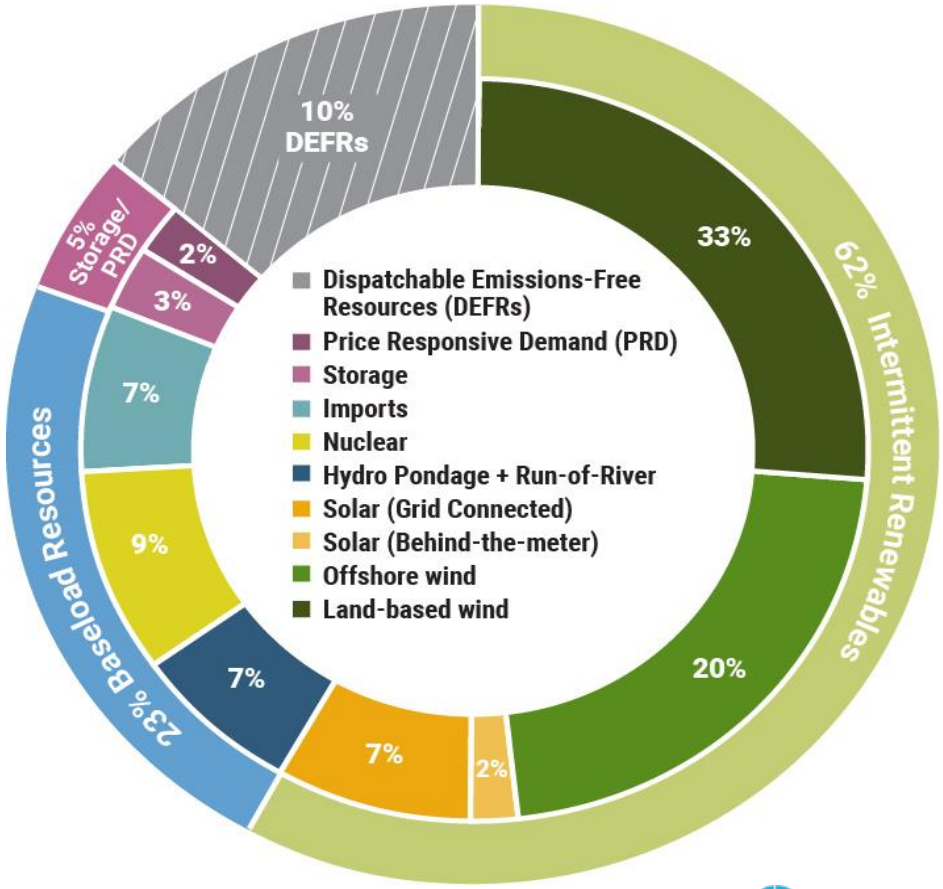
Climate Change Study – Phase 2

- Modeled various generation scenarios that could meet policy objectives in 2040
- Study examined whether the bulk power system would be able to serve load and meet reserve requirements under a variety of conditions
- Assessed the resiliency of the grid for climate events such as periods of extreme temperatures, wind lulls, and severe storms

Projected CLCPA Winter Energy Production by Resource Type



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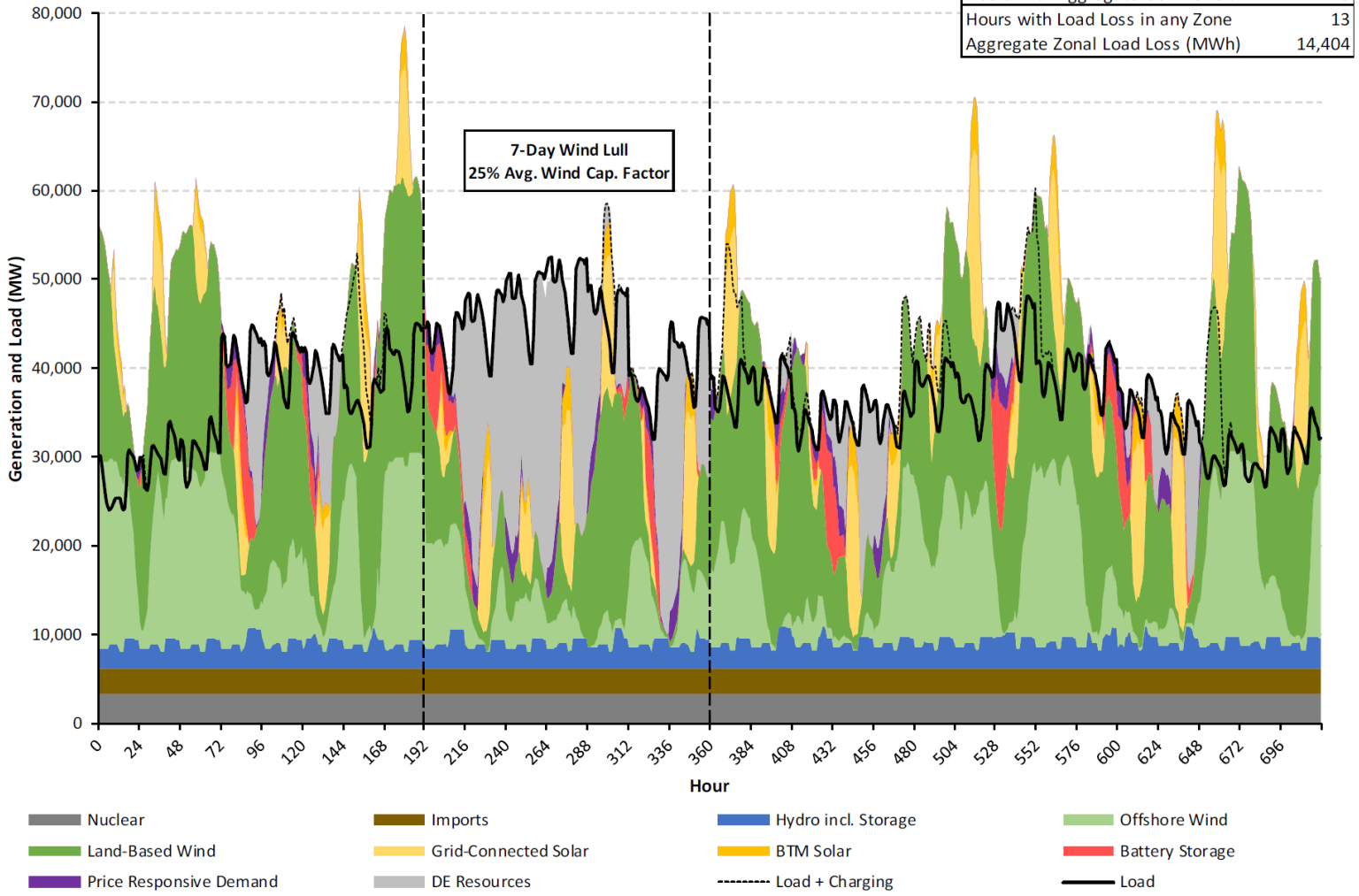
Dispatchable Emission-Free Resources

- Large quantity of installed dispatchable energy resources needed in a small number of hours
- Dispatchable resources must be able to come on line quickly, and be flexible enough to meet rapid, steep ramping needs

Aggregate Load in Period (MWh)	27,322,037
Aggregate Gen in Period (MWh)	32,527,026
Gen Surplus/Deficit (MWh)	5,204,989
Hours with Aggregate Gen Deficit	13
Hours with Load Loss in any Zone	13
Aggregate Zonal Load Loss (MWh)	14,404



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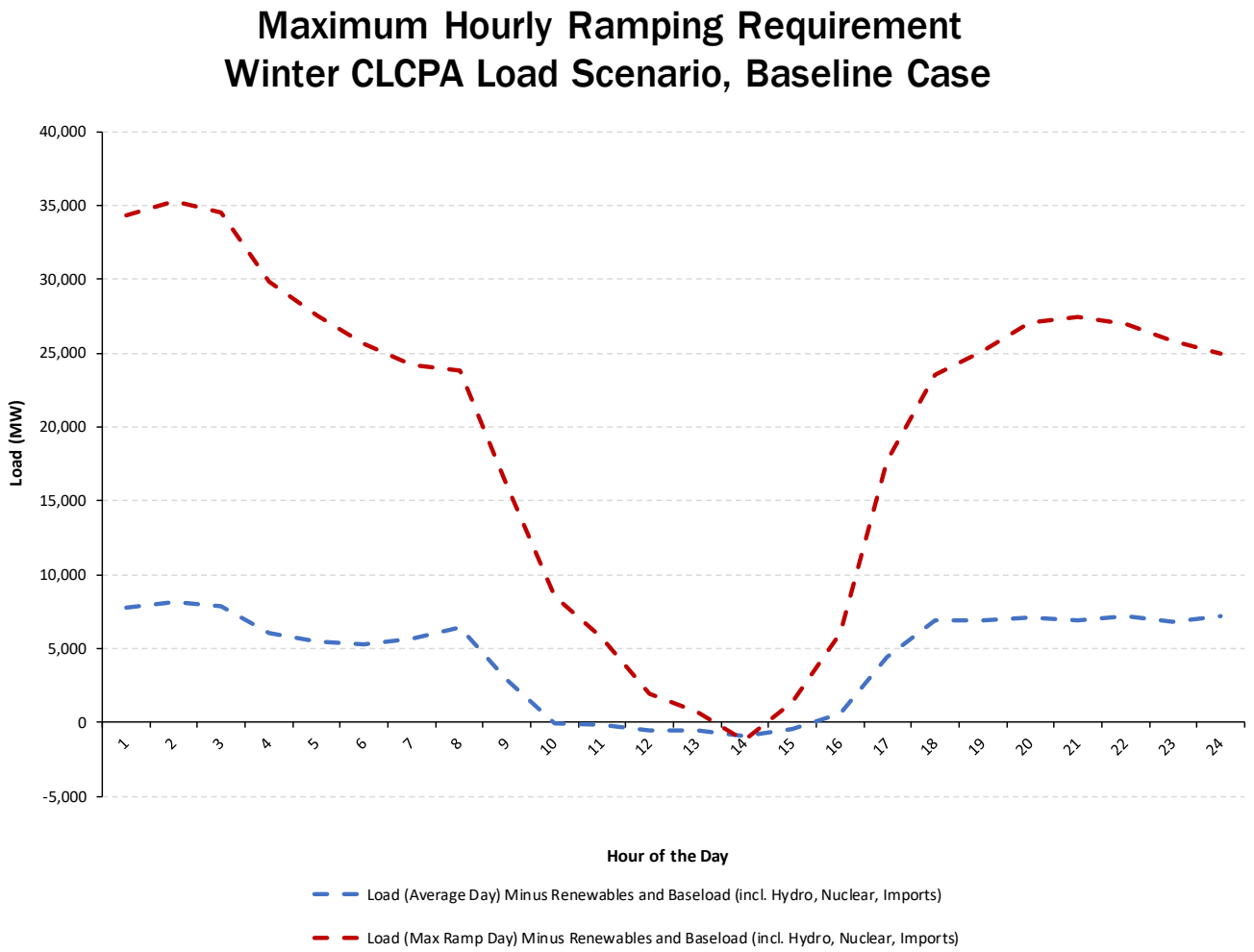
Ramping Capability Attribute

- Resources are needed that can come on line quickly, and be flexible enough to meet rapid, steep ramping needs
- On an average day, storage could meet evening peaks, but resources are needed if storage is depleted and renewable output is low
- In a winter scenario, dispatchable resource output across the state must increase from 362 MW to 27,434 MW in six hours of the most stressed day



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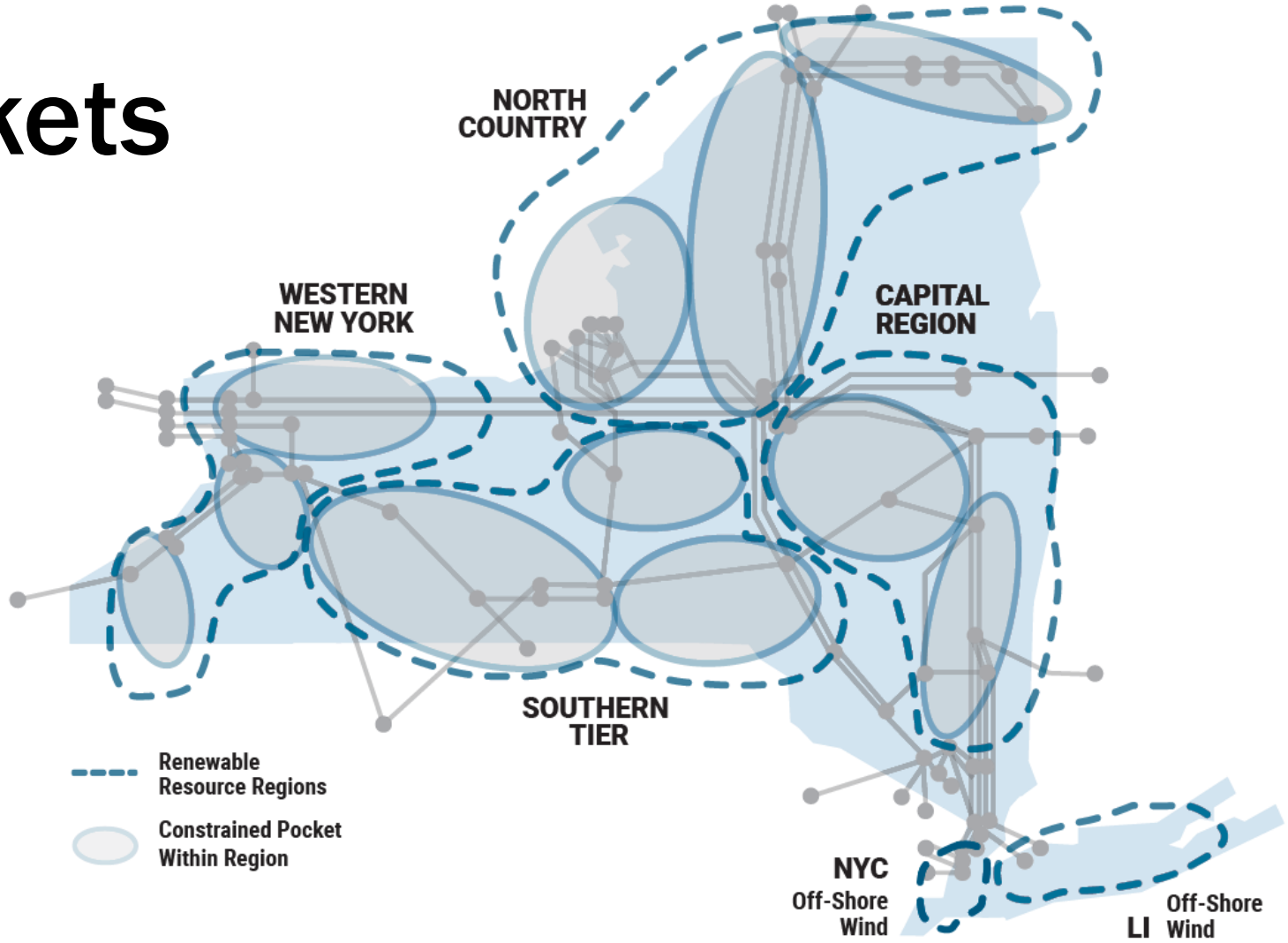
Renewable Generation Pockets

- NYISO conducted a “70X30” analysis in its economic planning study to identify transmission constraints that may prevent the delivery of renewable energy to achieve the 2030 state policy target.
- In each of the major pockets observed, renewable generation would be curtailed due to the lack of sufficient bulk and local transmission capability to deliver the power.
- The results support the conclusion that additional transmission expansion, at both bulk and local levels, will be necessary to efficiently deliver renewable power to New York consumers.



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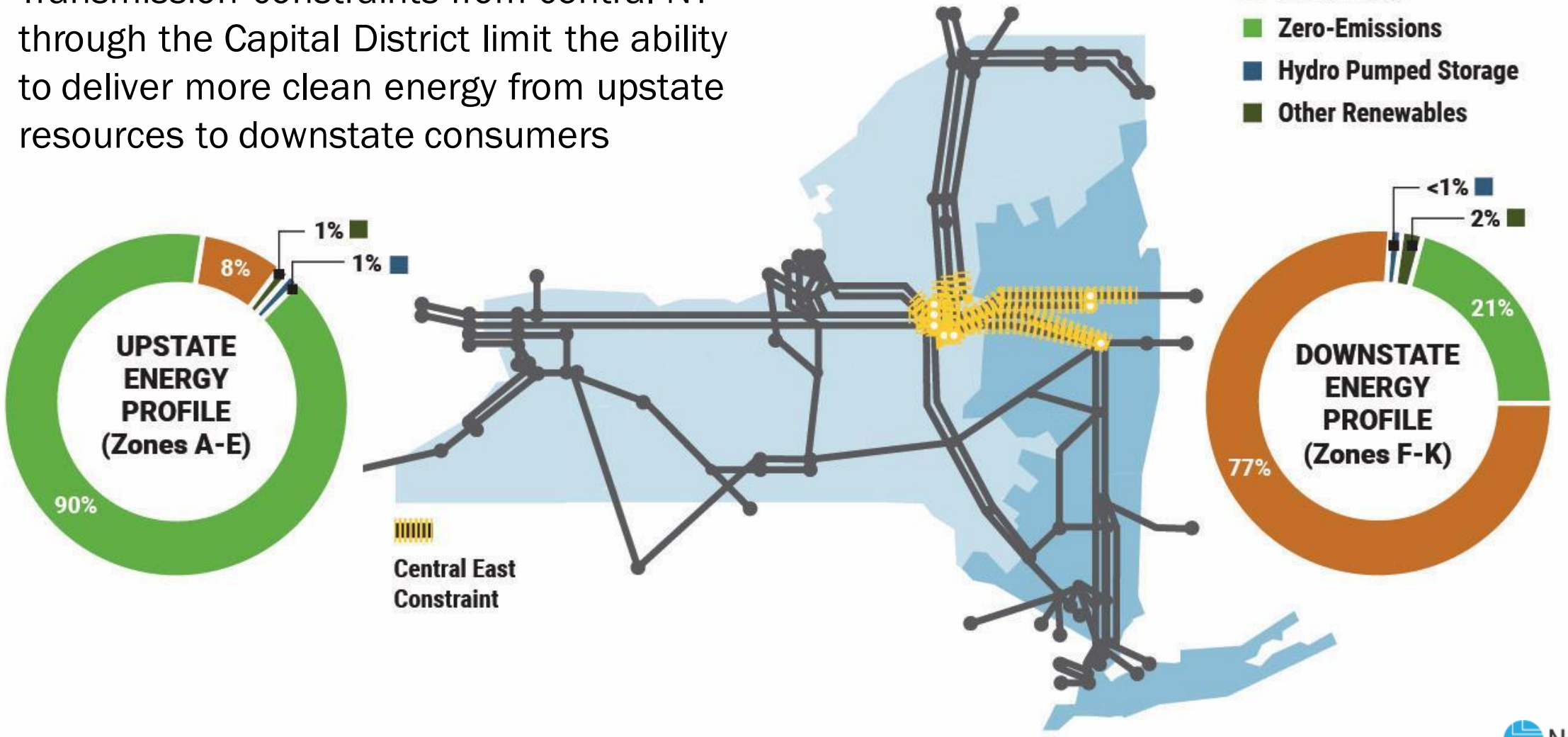
Tale of Two Grids

Transmission constraints from central NY through the Capital District limit the ability to deliver more clean energy from upstate resources to downstate consumers



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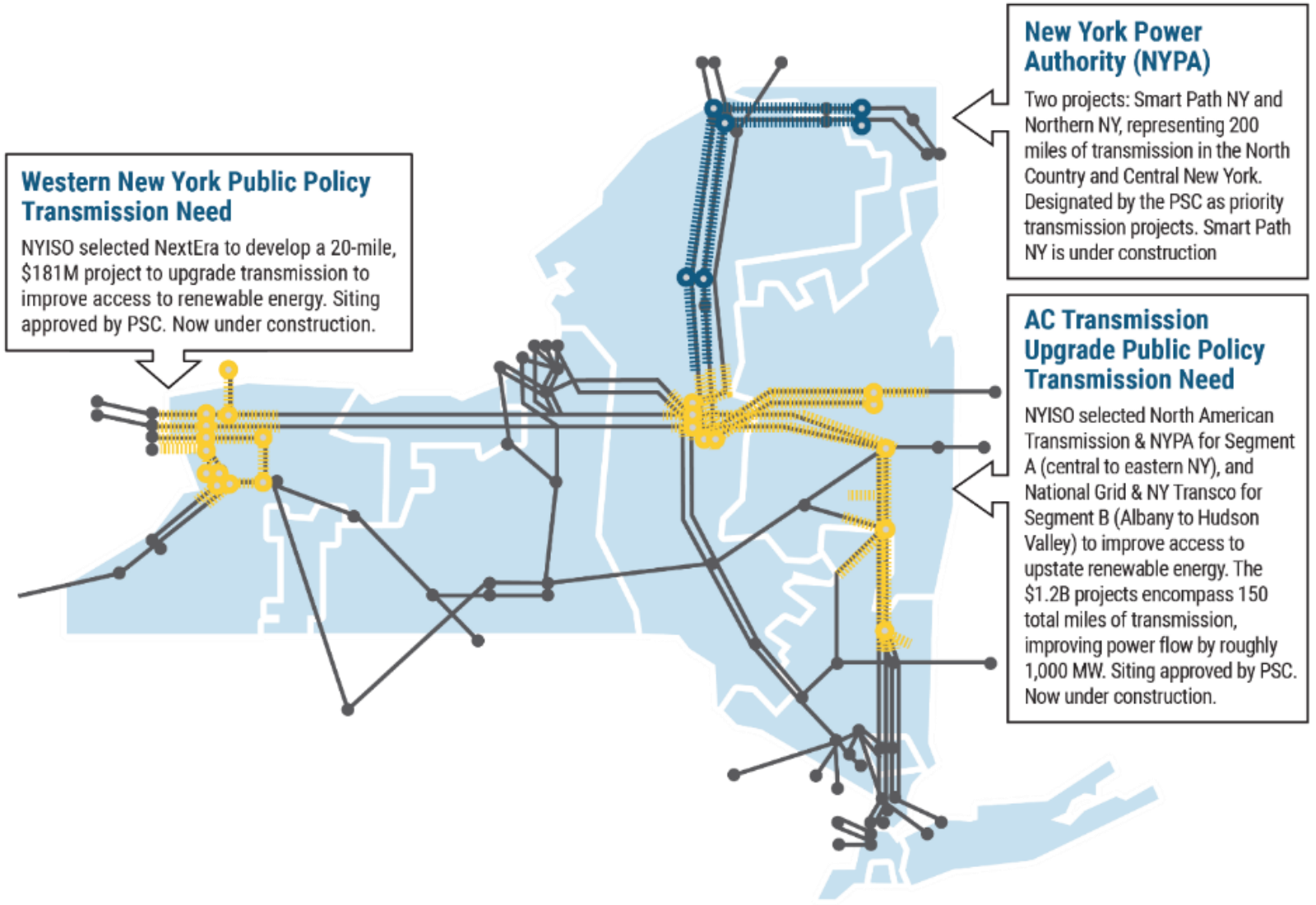
Ongoing Transmission Planning and Construction



Transmission investment needs driven by public policy requirements:

- Needs are identified by the NYS Public Service Commission
- Solutions are solicited and evaluated by the NYISO
- NYPA designated for priority transmission projects by PSC in some instances
- New need identified to facilitate delivery of offshore wind to NYS

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Grid in Transition

Conclusions

New York ISO

Key Takeaways

- The variability of meteorological conditions that govern the output from wind and solar resources presents a fundamental challenge to relying on those resources to meet electricity demand
- Battery storage resources help to fill in voids created by reduced output from renewable resources, but periods of reduced renewable generation rapidly deplete battery storage resource capabilities
- The current system is heavily dependent on existing fossil-fueled resources to maintain reliability. Eliminating these resources will require investment in new and replacement infrastructure, and/or the emergence of a zero-carbon fuel source for thermal generating resources.
- The dispatchable and emissions-free resources needed to balance the system must be significant in capacity, able to ramp quickly, and be flexible enough to meet rapid, steep ramping needs.
- Transmission investment, at both bulk and local levels, will be necessary to efficiently deliver renewable power to New York consumers.
- NYISO provides transparency to system planning through public posting of reports and additional educational materials on NYISO's website

New York ISO

Questions?

New York ISO

Maintaining Reliability during the NY Clean Energy Transition

Utility Consultation Group

Reliability Planning
Speaker Session

August 2, 2021

Who We Are

A consortium of New York's gas and electric utilities, focused on providing expertise and perspective to the Climate Action Council and its advisory panels

AVANGRID

People. Power. Possibilities. Central Hudson A FORTIS COMPANY

conEdison, inc.

Orange & Rockland

MEUA

National Fuel®

nationalgrid

UCG Principles

1. Utilities are fully supportive of the Climate Leadership & Community Protection Act's (CLCPA) goals and the decarbonization of the electric and gas energy systems.
2. Customers will continue to value reliability, resiliency, and safety of the energy system during and after decarbonization. Reliability becomes even more critical as our state economy is increasingly electrified over time.
3. Technology development and diversity of clean resources are essential for long term success.
4. Pursue cost-effective solutions to support an affordable clean energy transition for all New Yorkers; including smart deployment of transmission & distribution system upgrades.
5. Regional strategies can help ensure environmental and economic justice.

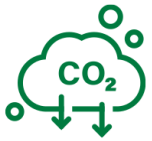
Zero-Emission Electric Sector Targets

RENEWABLES:
70% by 2030
(100% non-emitting by 2040)

OFFSHORE WIND:
9,000 MW by 2035
(Current level: 0 MW)

DISTRIBUTED SOLAR ENERGY:
6,000 MW by 2025
(Current level: 1,987 MW)

ENERGY EFFICIENCY:
185 trillion BTU Reduction by 2025



GHG REDUCTIONS:
40% by 2030
85% by 2050

Reliability & the clean energy transition

Reliability is critical and cannot be compromised

Energy systems are complex and require extensive long-term planning

Transition to a clean energy future is feasible, but must be orderly, responsible and cost effective

Our customers need reliable energy service – every minute, every day

Reliability underpins the foundation of the clean energy transition as electrification increases

A robust and dynamic transmission and distribution grid is critical to managing the complexity of intermittent renewable resources

Reliability is critical and cannot be compromised

Energy systems are complex and require extensive long-term planning

Transition to a clean energy future is feasible, but must be orderly, responsible and cost effective

We need to:
Anticipate
Innovate
Optimize

Collaboration with stakeholders is critical to meeting customer needs

Reliability is critical and cannot be compromised

Energy systems are complex and require extensive long-term planning

Transition to a clean energy future is feasible, but must be orderly, responsible and cost effective

Reaching CLCPA targets requires keeping "all options open"

We can learn from the clean energy transitions of other states and countries

<u>Utilities are well positioned to lead energy transition</u>

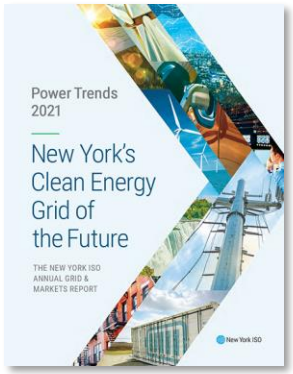
- ✓ Deep understanding and leveraging of the existing energy systems
- ✓ Already investing in emerging technology, energy resources
- ✓ Proven track record of emissions reduction and delivery of clean energy

Reliability is critical and cannot be compromised

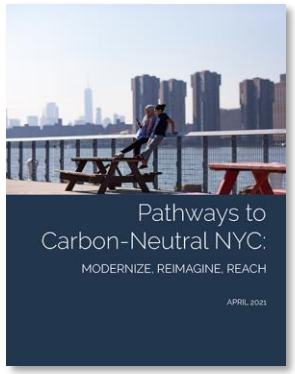
Energy systems are complex and require extensive long-term planning

Transition to a clean energy future is feasible, but must be orderly, responsible and cost effective

Resource List



May 2021



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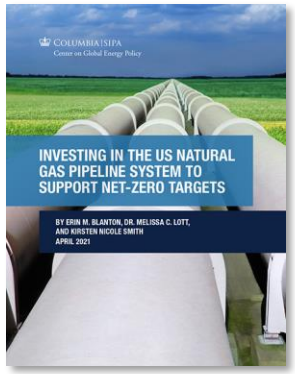
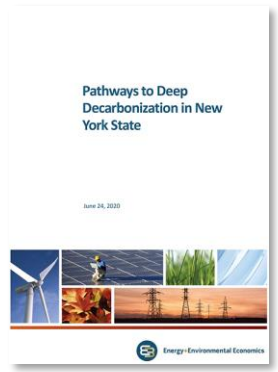


April 2021

February 2021

January 2021

December 2020



June 2020

UCG Advisory Panel Comment Filings

- Power Generation Advisory Panel
- Transportation Advisory Panel
- Energy Efficiency & Housing Advisory Panel
- Energy Intensive Trade Exposed Industries Advisory Panel
- Agriculture & Forestry Advisory Panel
- Adaptation & Resilience Working Group

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NEW YORK STATE OF OPPORTUNITY. Department of Public Service

Electric System Planning for Reliability

August 2021

DPS Oversight of Utility Reliability Planning

Traditional Transmission & Distribution Investment Planning

- Utilities have an obligation to reliably serve forecasted customer loads
  - Adequate transmission and distribution capability to serve customers
- Reliability planning by the utilities is overseen by the PSC and DPS Staff through various proceedings and activities
  - Rate cases
  - Quarterly meetings
  - Capital investment plans
  - Summer and Winter preparation
  - Safety/reliability investigations
  - Electric Safety Standards Compliance
  - Reliability Performance Mechanisms
- These activities are part of the agency's standard regulatory oversight and "day-to-day" enforcement of electric safety and reliability

DPS Oversight of Utility Reliability Planning

- Electric system reliability is constantly evaluated on a real-time and forward-looking basis based on a multitude of factors and impacts
  - Customer demands
  - Planned and unplanned outages
  - Weather
  - Regulatory requirements
  - Interconnection requests
  - State policy
- Staff works with utilities on these matters; the PSC has regulatory authority and responsibility to ensure reliability is maintained

DPS Interaction with other Reliability Entities

- DPS Staff participates actively in each of the NYISO's planning processes
  - Reliability Planning
  - Economic Planning
  - Public Policy Transmission Planning
    - The PSC has identified 3 Public Policy Transmission Needs for competitive project solicitation through the NYISO's process:
      - Western New York PPTN
      - AC Transmission PPTN
      - Long Island OSW Export PPTN
    - WNY and AC projects under construction; LI PPTN approved by PSC in March
- DPS staff also participates in the NYSRC committees and on the NPCC Board

Reliability Planning Example

Indian Point Retirement Planning

- In 2013, anticipating the possibility of the retirement of Indian Point and potential for reliability impacts, the PSC initiated a proceeding to establish a contingency plan
- Indian Point Contingency Plan was developed
  - Identified and evaluated reliability issues due to retirement of the facility
  - Recommended Solutions: Transmission Owner Transmission Solutions (TOTS)
    - 450 MW of added transfer capability
    - Staten Island unbottling
    - Series compensation installed at Marcy
- In January 2017, Entergy and NYS announced an agreement to close the IP plant.
  - Unit 2 retired April 30, 2020
  - Unit 3 retired April 30, 2021

Reliability Planning Example

DEC Peaker Rule

- In 2019 NYSDEC adopted new regulations limiting NOx emissions from simple-cycle combustion turbines with compliance obligations starting in 2023
- NYISO's Reliability Planning Process identified system reliability needs in Zone J:
  - Reliability needs identified beginning in 2025
  - Resource adequacy and transmission security violations
- In response to the identified reliability needs, Con Edison submitted updates to its Local Transmission Plan:
  - Three new 345 kV feeders
- Con Edison petitioned the PSC for approval of the proposed transmission projects
  - PSC approved in April 2021
  - Identified immediate reliability deficiencies are effectively eliminated

CLCPA and Accelerated Renewable Growth Act

PSC Response:

- In response to the requirements of CLCPA and the Accelerated Renewables Growth Act, the Commission issued an Order on Transmission Planning on May 14, 2020 (Case 20-E-0197)
- The PSC directed the Utilities to undertake a study and to propose a planning and investment framework for local transmission and distribution investments driven by CLCPA
  - The Utilities filed the study and their proposals for CLCPA investment criteria on November 2, 2020
- Concurrently, the PSC along with NYSERDA undertook two other studies:
  - **Offshore Wind Integration Study** - identified possible grid interconnection points and offshore transmission configurations and assessed onshore bulk transmission needs to reliably integrate 9,000 MW of offshore-wind generation
  - **Zero-Emissions Electric Grid in New York by 2040** study - identified bulk transmission upgrades potentially necessary to support the State's path to a 100% decarbonization of the electricity sector by 2040
- The three studies together comprise the Power Grid Study, which was filed on January 19, 2021

DPS/PSC Transmission Planning for CLCPA

Maintaining system reliability is the cornerstone of all transmission planning efforts aimed towards achieving the CLCPA goals:

- Working with the NY utilities on developing a framework and methodology for calculating headroom on the existing transmission system to assist renewable project developers in identifying beneficial and cost-effective interconnection locations
- Identifying cost effective local transmission projects seeking to address potential curtailment and facilitate additional renewable energy to be delivered throughout the system
- Identification of generation pockets and regions of the state with significant developer interest and addressing the electric infrastructure in these areas to reliably interconnect renewable resources.
- Identifying public policy transmission needs for competitive project solicitation and procurement through the NYISO's Public Policy process
- Identifying Priority Transmission Projects which require immediate action to address near-term system constraints and renewable energy integration and delivery limitations.
- Evaluating and implementing advanced technologies to enhance the capability of the existing and future transmission and distribution system.

Distribution Planning Initiatives

Distributed Energy Resources (DER)

- Utilities have been increasing capital expenditures to upgrade distribution substations and feeder to increase hosting capacity for DER

Grid Modernization

- Increased efforts and spending on ADMS, DERMS, AMI, and other advanced technologies for the distribution system

Electric Vehicles (EV's)

- Increased penetration of EV's and associated charging stations requires utilities to enhance their forecasting methodology and develop EV load profiles

Energy Storage Systems (ESS)

- ESS can store renewable generation helps smooth out demand profiles and meet States clean energy goals economically and efficiently

Transmission Planning for CLCPA: Reliability Considerations

The electric system is complex; various capabilities and attributes are needed to maintain reliability:

- **Resource Adequacy** – An adequate amount of generation resources to meet consumer demands is needed to maintain reliability. Need to consider technical definitions of what an adequate resource level should be, and at a reasonable cost.
- **Fuel Diversity** – Most renewable resources have intermittent output based on fuel availability (sun/wind). A diverse resource fleet combining both intermittent and dispatchable resources is needed to maintain reliability.
- **Fast ramping** – ability of a generator to start or stop on command and the time required to increase or decrease output. Future load shapes could lead to a need for fast ramping resources to follow real-time demands.
- **Black Start** – ability of a generator to start operation without outside electrical supply. A need will continue to exist for Black Start resources to bring the system back online in the event of a blackout.
    - Wind and solar resources are not capable of providing reliable Black Start capability
    - Hydro and large Battery Energy Storage have the potential to provide black start
- **Power Flow Dynamics** – With large amounts of renewables being added to the system, particularly significant amounts of offshore wind into NYC and Long Island, the way that power flows across New York's electric grid will change, impacting the way the grid is reliably operated and planned in the future.

Questions?

Reliability Planning Speaker Session:

Need to Prioritize Renewables & Equity Demands

VOTE SOLAR

Why Are We Here?

VOTE SOLAR

Climate disruption and toxic pollution are threatening our health and safety

…

… Not a question of whether we can or should shift the grid to be 100% renewable and maintain reliability; it's the law.

Key Takeaways

VOTE SOLAR

1. Reliability is paramount, particularly for vulnerable communities in climate crisis;

2. Integrating renewables into the grid while maintaining reliability is possible, and in fact cost-effective;

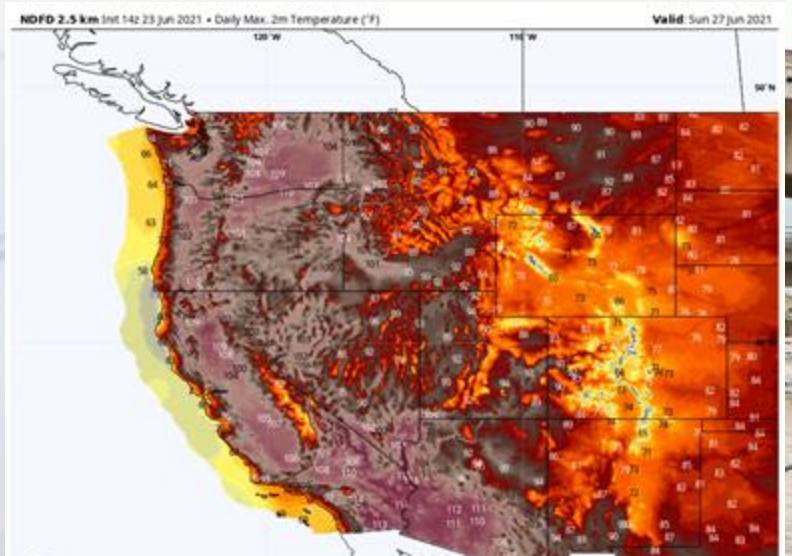
3. Aggressive adoption of a renewables-based grid is arguably the only lawful path to decarb and equity mandates

1. Reliability is Paramount

VOTE SOLAR

Lack of electricity service during extreme weather events impacts disadvantaged community members first and worst.

Interruption of electricity, combined with lack of wealth & resources, can lead to deepening poverty, housing insecurity, illness, and death.



2. Repowering or Perpetuating Fossil Generation is Not Necessary for Reliability

VOTE SOLAR

- Centralized fossil-based grids are proving to be unreliable in our changing climate and cannot withstand increasingly frequent extreme weather events (Texas/Uri; NYC outages/near brownouts)

- Modernizing the grid by adding demand flexibility, efficiency, and distributed energy resources including rooftop solar and storage but also EVs and microgrids is the solution we need to meet reliability needs of tomorrow

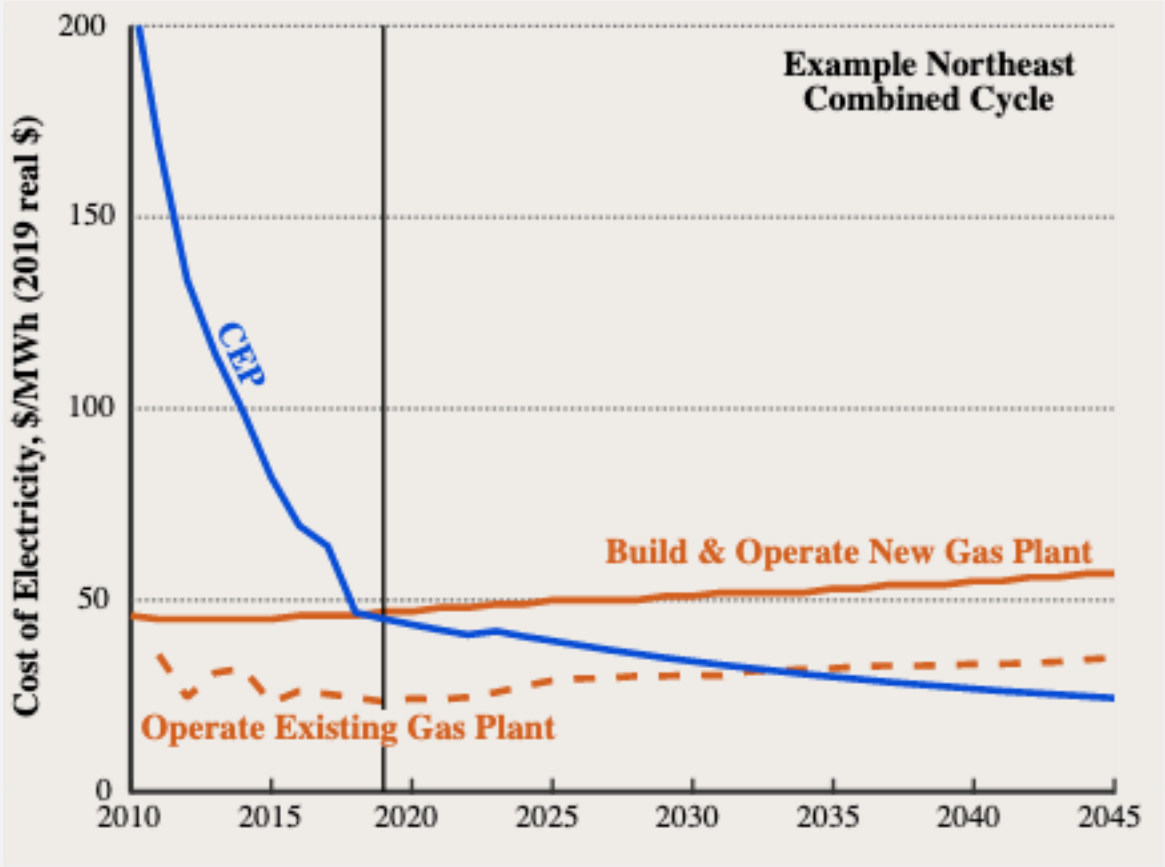
- Renewables pair cost-effectively with local grid modernizing infrastructure like storage and microgrid tech – don't have to pay the huge external cost of fossil

RMI Clean Energy Portfolio Study

VOTE SOLAR

2019 study found that investing in efficiency, demand response, renewables and storage is:

1. **LESS COSTLY than building new combined cycle fossil**
2. **Will be <u>less costly than operating existing gas plants</u> as soon as 2025**



Local Solar for All - Vibrant Clean Energy Future Grid Study

VOTE SOLAR

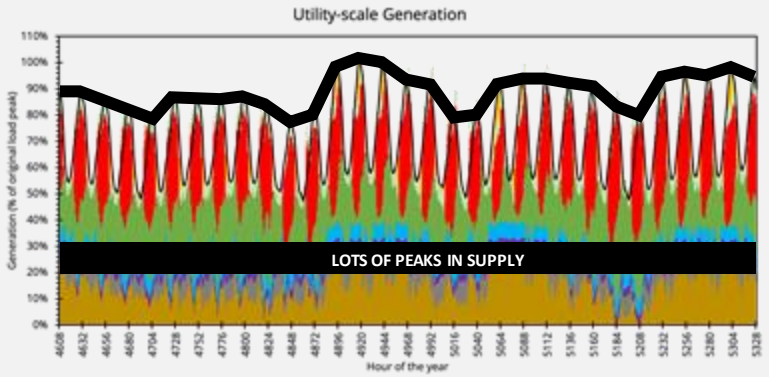
December 2020 future grid modelling study found that:

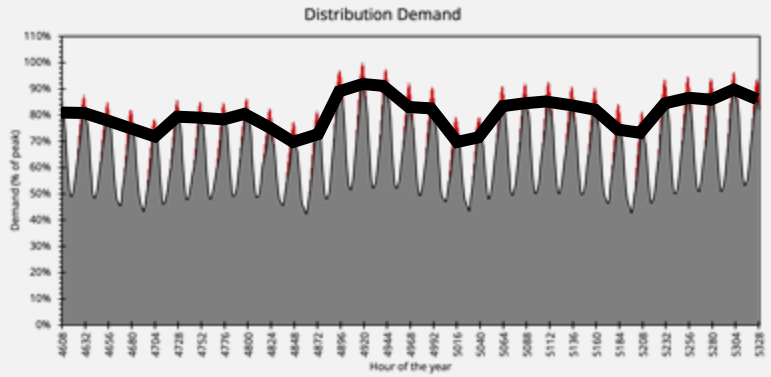
- **High integration of solar and storage connected with distributed grid provides key services for stable bulk power system;**
- **facilitate integration of large scale renewables;**
- **This was the lowest-cost 100% clean scenario**

DERs Ease Stress On The Bulk Power System

UTILITY-SCALE GENERATION ⟷ DISTRIBUTION DEMAND

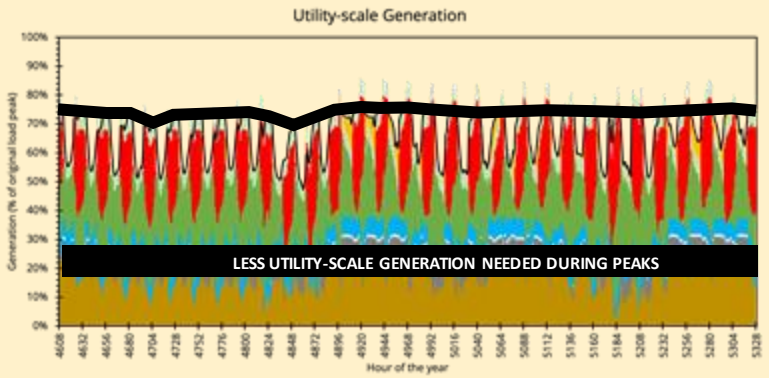
BASE CASE
(summer month in sample state)

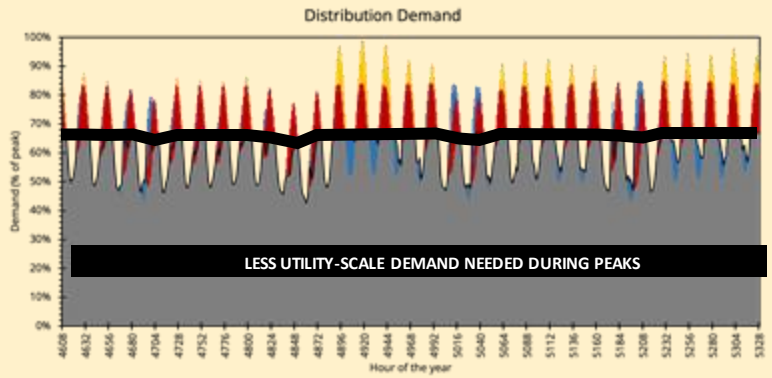




- Demand is sharp and spikey and supply ramps up and down to meet peaks
- More firming capacity and peaker plants are required to meet demand at times of the day when customers are using the most electricity
- Distributed solar + storage have minimal impacts on "shaping load" and meeting system needs

DER
(summer month in sample state)





- Demand is smooth because local solar + storage can be deployed at peak times and reshapes load from the perspective of the utility grid (above 69kV)
- Permanently eases stress on system during critical peak hours & reduces how much bulk-scale power is needed to serve the distribution grid
- Less bulk power = less money on expensive peaker plants and firming capacity thus overbuilding the system

E.G.: Con Ed TRACE projects

VOTE SOLAR

In response proposed retirement of downstate peakers subject to the 2019 so-called "Peaker Rule," Con Edison submitted, and the PSC approved plans for three Transmission Reliability and Clean Energy (TRACE) projects

According to Con Ed, these grid upgrades will alleviate transmission security concerns arising from the drop in net operating capacity from decommissioning peakers

3. Local generation & storage promotes Equity

VOTE SOLAR

- **Fossil pollution causes vast public health challenges which largely aren't included in reliability vs transition discussion**

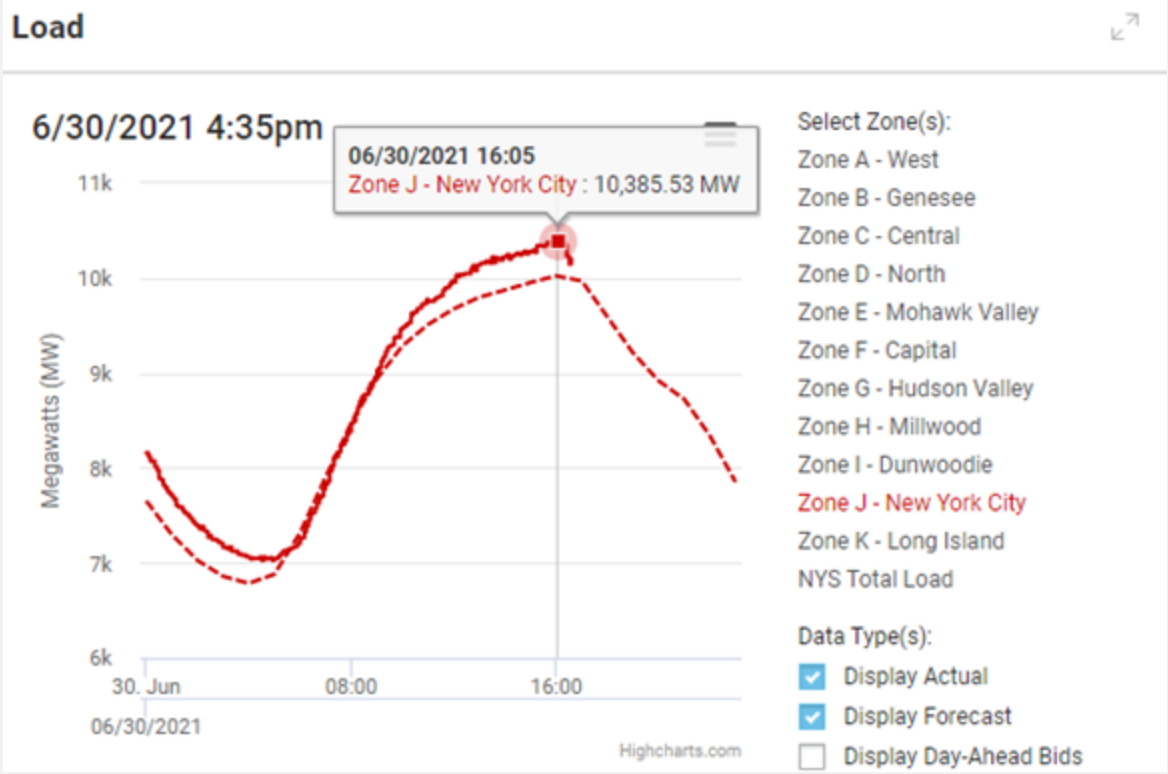
- **Building renewables, batteries, and microgrids in high-load DACs results in improved public health and better preparedness / functionality during grid stresses and shocks**

- **Prioritizing state investment DAC local grid infrastructure is a pathway to meet CLCPA investment equity mandate**

EE; Demand Response

- Energy use reduction has significant env. health and economic benefits to DAC members; also contributes to grid health in periods of peak load.

- Demand response offers further opportunity to stabilize and reduce load



Lawfulness of New Fossil is Unclear

VOTE SOLAR

CLCPA requires state agency decisions consider compliance with CLCPA climate targets; must not disproportionately harm DACs;

- **Scoping plan should adhere to these requirements vis a vis need for fossil, given harm and viability of alternatives**

Discussion

VOTE SOLAR

Backup slides

Historic and projected costs of clean energy portfolio vs. new and existing CCGT

Example: typical Northeast US plant

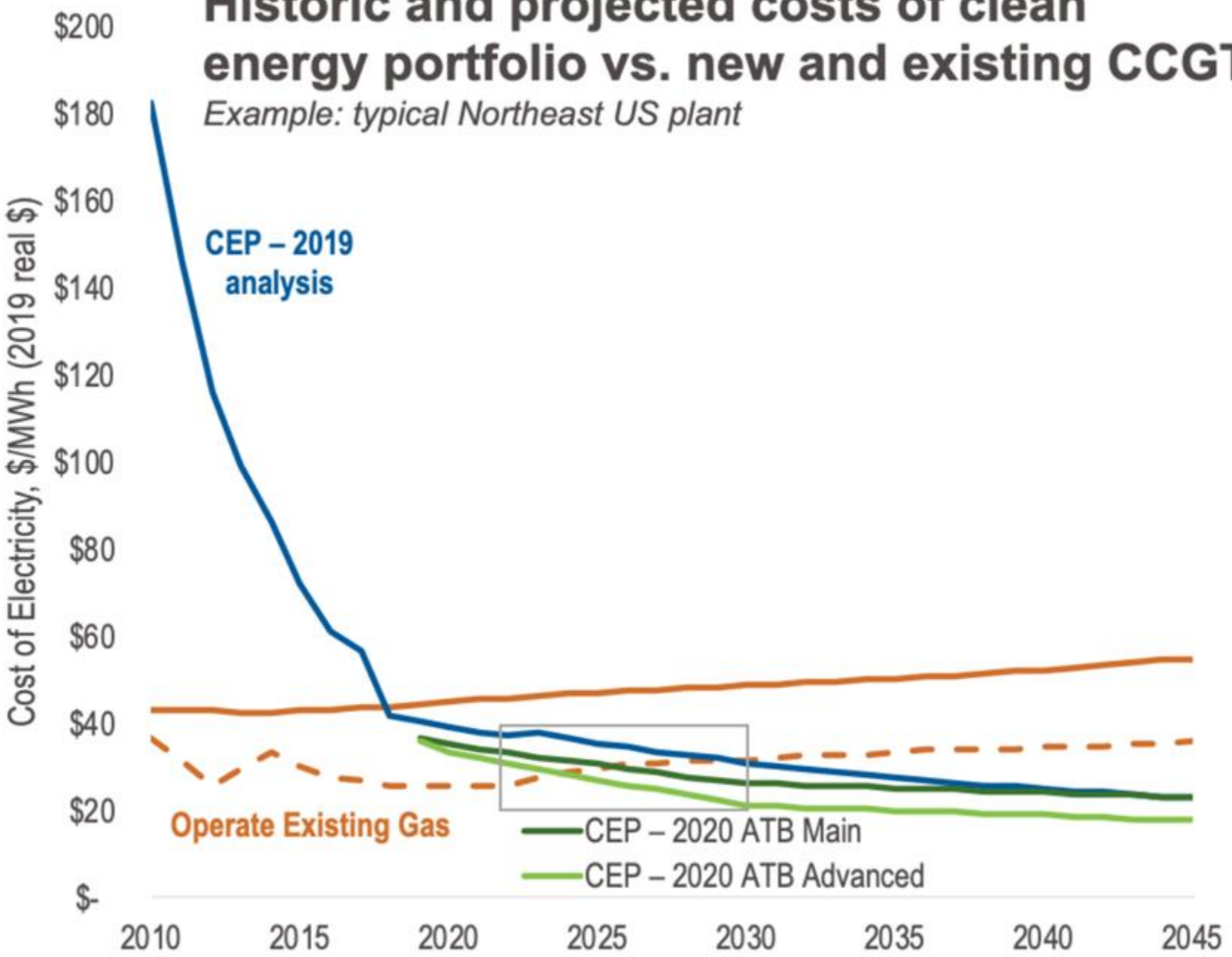


Exhibit 3: Comparison of CEP analysis using 2019 and 2020 data for clean energy resource costs

VOTE SOLAR

NEW YORK STATE OF OPPORTUNITY.

Division of Consumer Protection

Reliability Planning Speaking Session

Utility Intervention Unit

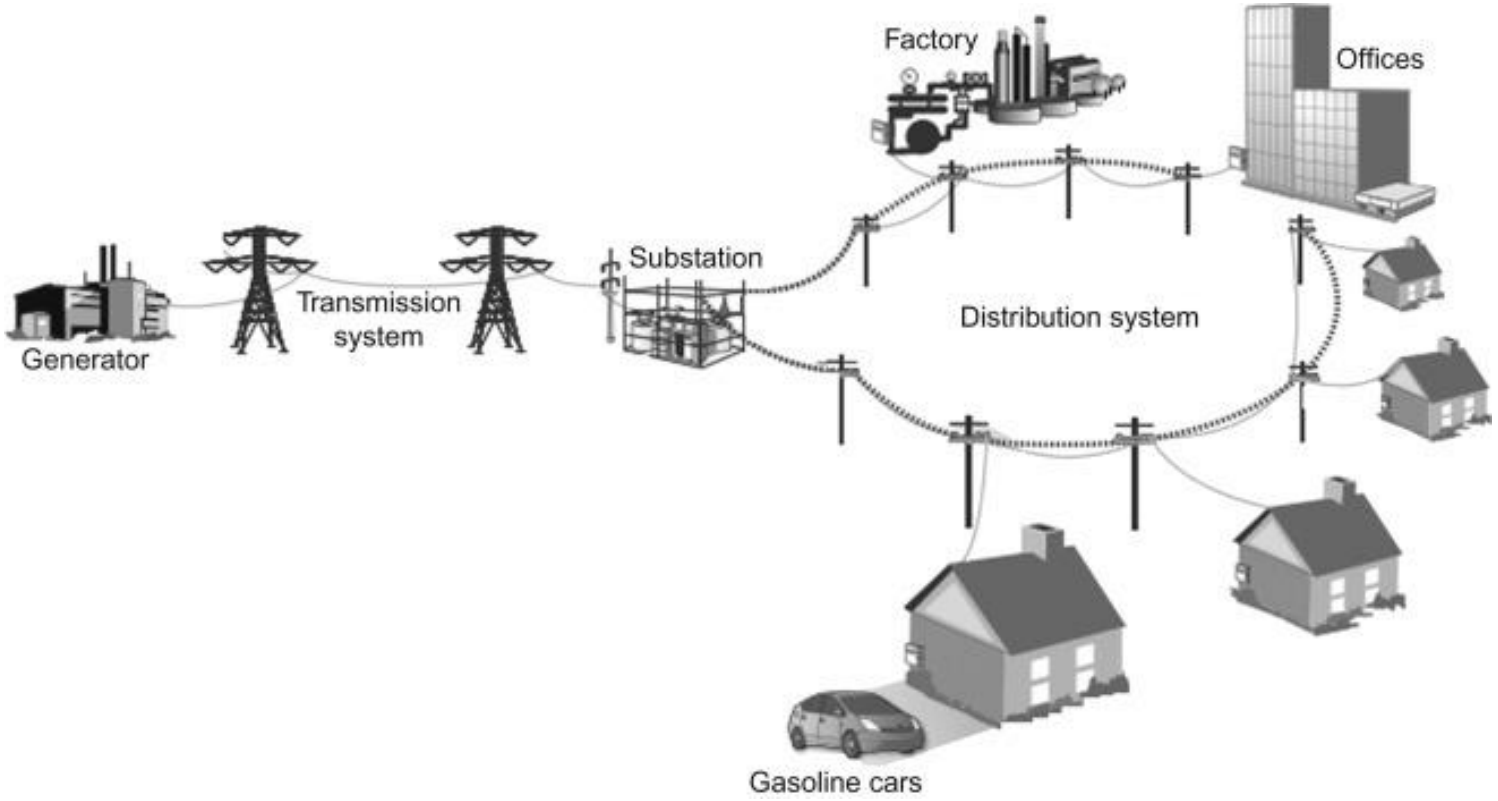
A Division of New York Department of State

August 2, 2021

"In a nutshell our challenge is to steer clear of the technical and institutional pathway that together yield poor service, expensive power, or a failure to decarbonize quickly."

Peter Fox-Penner, Institute for Sustainable Energy

Past



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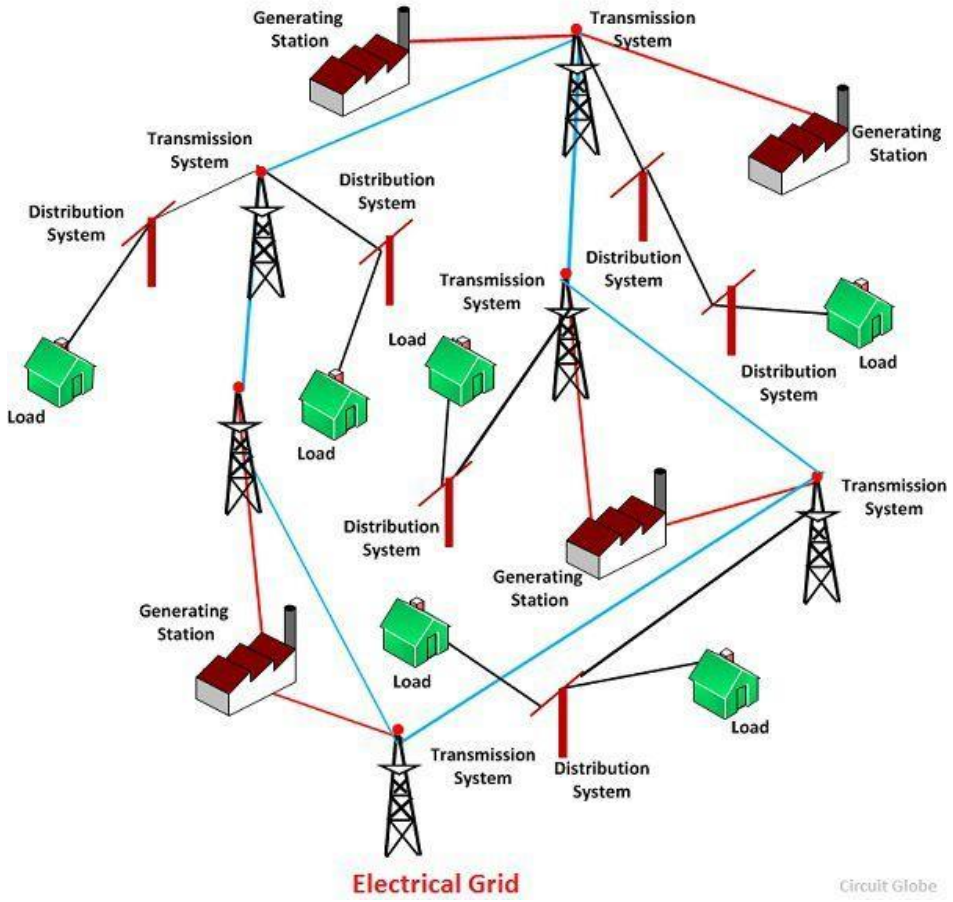
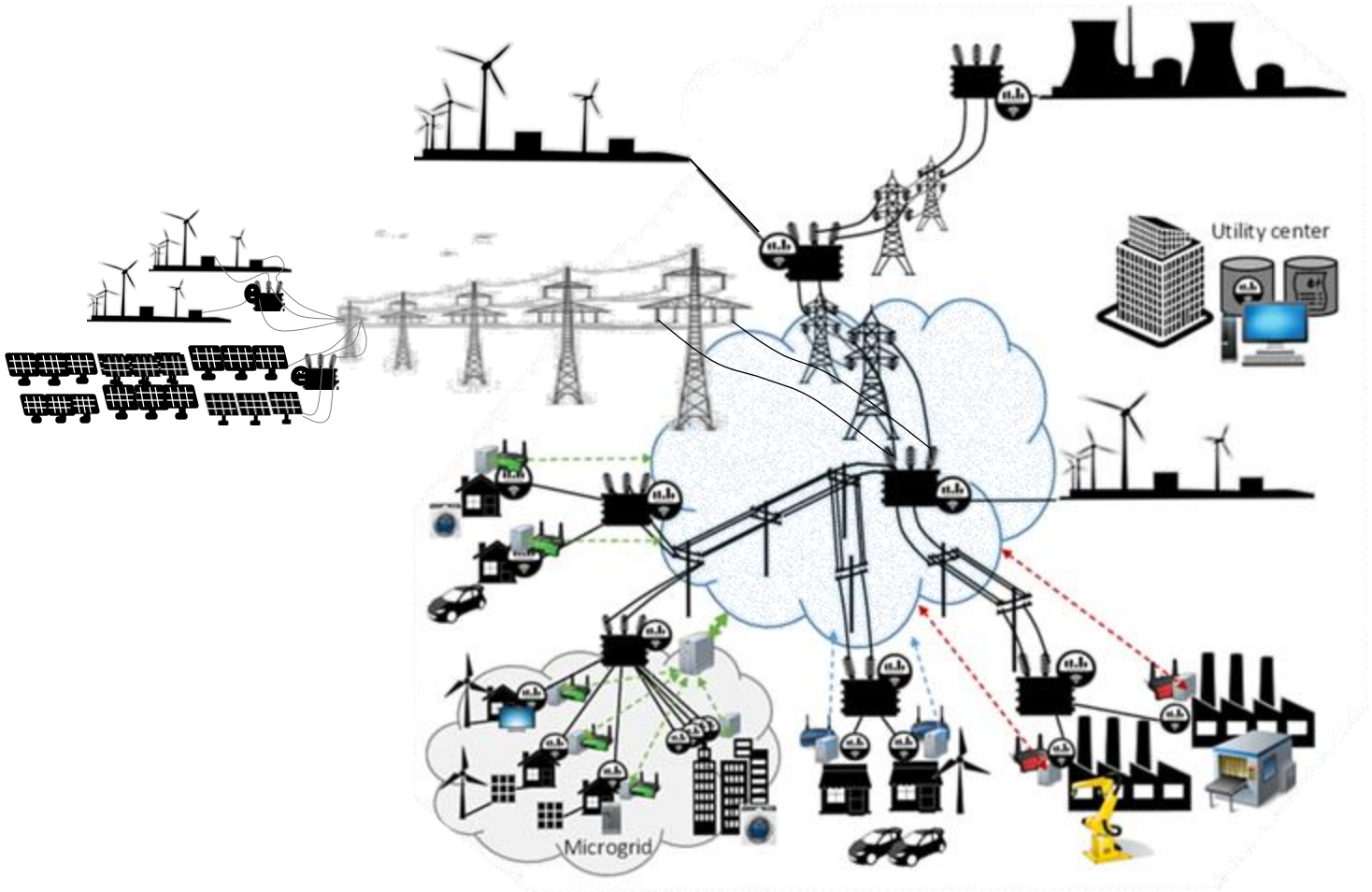
Current



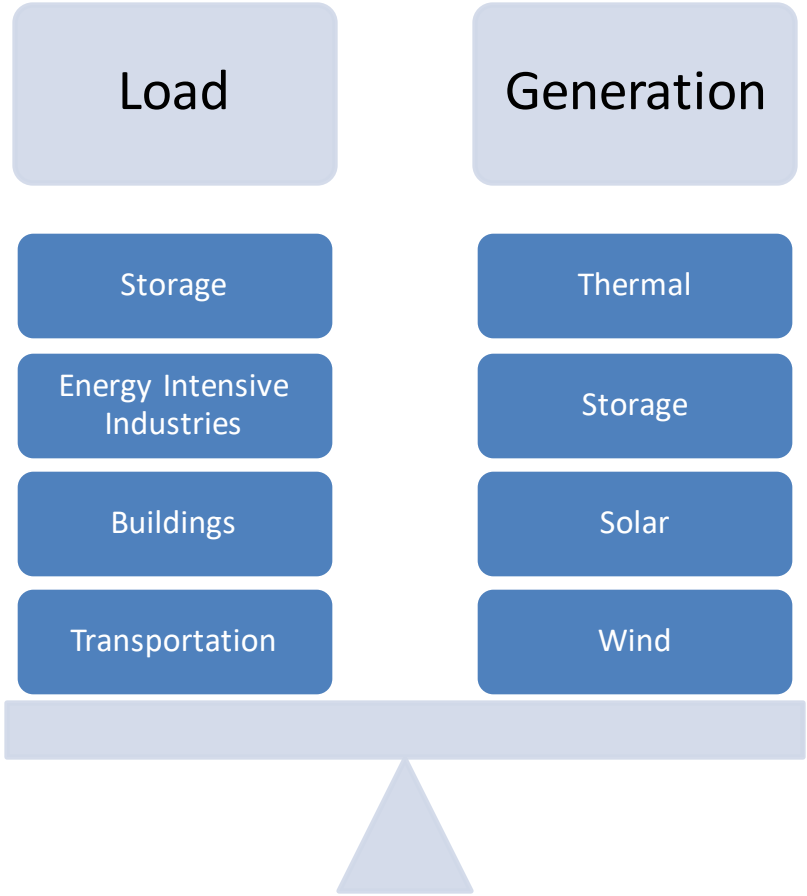
Source: https://circuitglobe.com/wp-content/uploads/2016/12/power-grid.jpg

Future

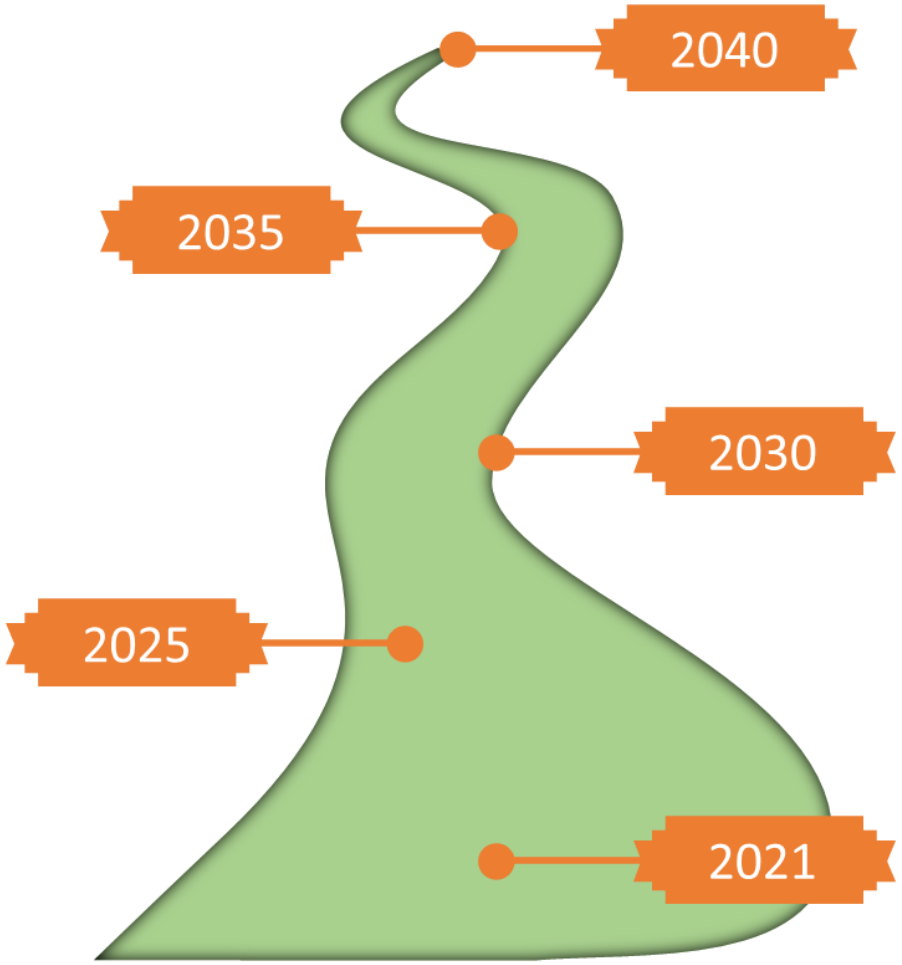


Source: https://www.researchgate.net/profile/Georgios-Z-Papadopoulos/publication/329868487/figure/fig3/AS:731206832361472@1551344702132/Illustration-of-the-next-generation-Smart-Grid-system.png
With modifications

One Constant
Load and Generation Must Balance



Considerations of Changes in Load



Have we reached our 2040 goal?

Are there any new technologies or improvements to existing technologies?

Have we reached our 2030 renewable goal?

Have programs reached their targets? Have they exceeded them or are they behind?

How are the decisions now going to impact prices in the future and adoption of electrification?

SWOT

- Strengths
- Weaknesses
- Opportunities
- Threats

"In planning for battle I have always found that plans were useless,

but planning is indispensable."

Dwight D. Eisenhower

Questions?

Wrap-up