STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION

Docket No. DE 19-197

Electric and Natural Gas Utilities
Development of a Statewide, Multi-use Online Energy Data Platform

TESTIMONY OF
NIKHIL BALAKUMAR

August 17, 2020

On behalf of Greentel Group

STATE OF NEW HAMPSHIRE
BEFORE THE PUBLIC UTILITIES COMMISSION

DIRECT TESTIMONY OF NIKHIL BALAKUMAR

DEVELOPMENT OF A STATEWIDE, MULTI-USE ONLINE ENERGY DATA PLATFORM

August 17, 2020

Docket No. DE 19-197

Table of Contents

Introduction & Witness Qualifications

Q. State your name, the organization you work for, your position, and your business address

A. My name is Nikhil Balakumar, I am the Founder & Principal of Greentel Group, a grid modernization solutions firm located at 718 7th St NW, Washington, DC 20001.

Q. Describe your background and qualifications.

A. I have been working in the energy industry for more than 6 years with a focus on open energy data access and grid modernization. Between 2014-2016, I led the research & development group at Incentive Technology Group (ITG), a small technology firm where we built residential energy management applications to empower customers to make smart energy decisions. These applications leveraged real-time data from custom built sensors and analytics to provide customers a granular view of their home by appliance while making recommendations on how to save energy through both behavior change and new energy products. When attempting to commercialize the product, I realized customers were unable to access their real-time AMI data despite this infrastructure being ratepayer funded which significantly limited our ability to scale. This led to the founding of Greentel in 2016 and a significant part of our mission is advocating for statewide, centralized data platforms to accelerate grid modernization. Since our founding, my has work been primarily focused in two jurisdictions:

- **District of Columbia:** In 2018, we were significantly involved in introducing two pieces of legislation via the DC Council: the Clean Energy Omnibus Act (CEDC) and the Distributed Energy Resources Authority Act (DERA). The objective of CEDC was to codify aggressive climate & energy goals into law and was passed in December 2018. The objective of DERA was to create an independent distribution market operator responsible for creating a market to facilitate the integration DERs and electrification technologies required to meet the District's climate goals while maximizing private investment and social equity. DERA would be responsible for collaborative distribution planning and market operations with a centralized, statewide data platform as a foundational component. We expect the DC Council to reintroduce DERA as part of a broader climate economic recovery stimulus bill in Fall 2020.
- **New York:** In 2019, we led the 'DER Industry Data Initiative': a nine-month facilitated process in which we brought together DER industry members and consultants to examine and report on the role of data in animating the markets for DER products and services envisioned in New York's Reform the Energy Vision (REV). The group periodically received input from Staff and NYSERDA in an effort to maintain alignment with the current and future State policies and

programs. This initiative is referenced in the New York Department of Public Service (DPS) whitepaper issued in May 2020 to propose an 'Integrated Energy Data Resource' which would serve as a similar statewide, centralized energy data platform to support grid modernization efforts. All the recommendations of our initiative were incorporated into staff recommendations and we anticipate an order in Fall 2020.

Q. Have you previously testified before the New Hampshire Public Utilities Commission (NHPUC) or other regulatory bodies?

A. I have not testified before regulatory bodies within the State of New Hampshire.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of Greentel Group.

Q. Explain Greentel's interest in the creation of a statewide, multi-use online energy data platform

A. The Greentel Group is a clean energy company and our mission is to accelerate grid modernization by fostering an open ecosystem that taps into the creativity of the market for innovative solutions. Greentel works with distributed energy resources (DERs) developers, utilities and policymakers to develop a win-win regulatory framework and create new markets that encourage everyone to work together in the transition to a decarbonized, resilient and reliable grid.

To realize this vision requires the establishment of one common market foundation for energy entrepreneurs, utilities and regulators to be able to work together – we believe data is this foundation. At heart, Greentel is a technology company working to build a platform that fosters market activity 1) opening access to different types of energy data (customer, system and market) while 2) making sense of that data so policymakers can accelerate regulatory reform, energy entrepreneurs can deploy innovative solutions and utilities can unlock new business models all while maintaining grid reliability.

Greentel has worked extensively in multiple jurisdictions to consider statewide, multi-use energy data platforms as described above. Over the past three years, Greentel has conducted a considerable amount of analysis on the subject before the Commission considering various aspects of the platform

including; data availability, infrastructure needs, costs, security & privacy, governance structure and lessons learned from other jurisdictions. We believe our experience in the jurisdictions above and our combined expertise in policy, technology and cybersecurity may provide a valuable perspective to the New Hampshire Commission and inform the progress of this docket.

Q. Describe your involvement in DE 19-197 up until this point.

A. Greentel filed as an intervenor at the beginning of the docket in February 2020. Since then I have participated in every technical session and many informal discussions with all parties in the docket.

Summary of Policy Context

Q. What is the purpose of your testimony?

A. The COVID-19 pandemic and the ensuing economic crisis has State leaders looking for policy opportunities to stimulate the economy. The electricity sector has been the backbone of New Hampshire's economy and its transition into the 21st Century creates a tremendous opportunity to spur a new era of economic development while reducing emissions, saving ratepayers money and providing affordable, reliable and resilient power.

Technological advances and broader industry trends have created significant opportunities to "improve the reliability, resiliency, and operational efficiency" of the electric distribution system. Market-based solutions such as distributed energy resources (DERs) can provide numerous benefits to both individual customers, the broader rate base and the electric distribution system as a whole. DERs can save individual customers money, reduce emissions all while offering a broad set of cost-effective grid services including energy, capacity and ancillary services including real and reactive power flexibility for grid optimization, stabilization, hosting capacity, and reliability. The emergence of these flexible technologies is timely as large scale electrification takes place across the economy including the transportation, building and industrial sectors.

It is now possible to procure cost effective, market-based solutions to meet our grid needs, drive ratepayer savings all while bringing private investment dollars into the economy. This combination of benefits and the current economic crisis make it imperative the State facilitate the integration of and capture the full value of these technologies - and we can do so the New Hampshire, free market way. To

do this, we must re-envision the century-old regulatory structure to create an electricity market focused on efficiency and performance, where private sector and utility shareholder interests align.

No single entity can effectively tackle such an undertaking alone, we must fundamentally rethink how we plan, invest in and operate our grid. State leaders must channel all our energies into a statewide project, one that brings together utilities and industry - where American innovation and ingenuity are unleashed at full speed to modernize our grid and do so in a way that maximizes economic opportunity and ratepayer savings. **Transforming the U.S energy distribution system into an essential platform for innovative, cost-effective solutions is the lynchpin for these efforts. Simply put, we must build the Distribution System Platform (DSP) creating new markets to procure the most innovative, cost-effective, multi-value stream technologies to meet our grid needs**.

The Public Utilities Commission (PUC) plays a central role in leading this transition tasked with investigating and unlocking these opportunities through a variety of dockets including grid modernization, alternative net-metering tariffs, electric vehicles, demand response and more. Grid modernization is a complex and long-term project which is why the PUC should be equipped with the appropriate tools to guide this transition in a way that is holistic, fast and cost-effective - the data platform considered in DE 19-197 provides exactly that.

Digital transformations have been critical to major technological advancements in nearly every major sector for productivity, operational efficiencies, customer value and job creation - the energy sector must be next if we are to achieve the State's energy and grid modernization goals. The creation of a statewide, multi-use energy data platform ('data platform') represents an opportunity to realize this digital transformation and serve as a common market foundation to enable the collaboration and transparency required to tackle grid modernization.

Government, utilities, industry and the public must be able to holistically view the grid and clearly understand the current state, the envisioned future state and opportunities to deploy innovative energy solutions. Data granularity and access are the basic ingredients for building a broader ecosystem to support future grid planning and design, as well as creating well-structured competition to spur innovation and cost-efficiency in solutions development. A data platform is the first and foundational

step in realizing the vision of the DSP, empowering the PUC to ensure every decision made is data driven, cost effective with net benefits for all ratepayers.

The objective of this testimony is to provide the Commission a holistic, iterative and actionable path forward on how to leverage the data platform to advance the grid modernization objectives stated in recent Order No. 26,358. Other States are just considering developing such data tools after years of regulatory proceedings and billions in investments. We believe the corresponding timing of DE 19-197 and the recent order creates a tremendous opportunity to take lessons learned from other jurisdictions and do grid modernization right from the beginning.

Crowdsourcing Grid Modernization

Q. Why is it in the best interests of the Commission to crowdsource the best ideas to inform grid modernization decisions? What is the best way to do this?

A. Grid modernization is a complex, long-term project that will require an immense amount of stakeholder collaboration to determine new and creative ways to plan, invest in and operate the distribution system with one overarching goal - to build the distribution system platform creating new markets to procure the most innovative, cost-effective, multi-value stream technologies to meet our grid needs.

This is demonstrated by the breadth of New Hampshire energy-related statute which calls for leveraging a variety of DERs to meet energy needs:

- "The least-cost planning, restructuring, limited electrical energy producer, and electric renewable portfolio statutes support an emphasis on facilitating integration of DERs.
- The least-cost planning statute declares it the energy policy of the state to maximize the use of energy efficiency and demand side resources, requires LCIRPs to include an assessment of supply options including distributed energy resources."
- "That statute also directs the Commission to prioritize energy efficiency and other demand side resources when proposed options have equivalent cost, reliability, environmental, economic, and health-related impacts."

New planning methodologies including hosting capacity and locational value analysis will need to be developed and advanced over time. Market structures and processes must be designed to procure new energy services that are easily accessible and foster the most innovative solutions. Grid operations will need to evolve to manage high DER penetration scenarios efficiently and reliably. How success is measured and compensated will need to change to align with the new energy landscape. The significant task of creating new markets will require input from utilities, industry experts and market players such as DERs providers and communities and the most effective way to do this is to crowdsource the best ideas from all stakeholders to inform any regulatory decisions. The Commission has ultimate oversight for the electric distribution system responsible for ensuring customers receive safe, adequate and reliable service at just and reasonable rates. Thus, it is within its authority to bring in the appropriate stakeholders to best inform changes to distribution planning and operations to meet statutory obligations as has been done by jurisdictions across the country.

The Commission recognized this in their recent order with the establishment of the 'Grid Modernization Stakeholder Group' to "guide the distribution planning process more broadly" and to be provided access to "baseline system data" to develop hosting capacity analysis, locational value analysis, an interconnection portal, system performance metrics and participate in project prioritization etc. Timely, consistent and digital access to granular energy data is fundamental to performing the complex analysis required to make any meaningful progress in the areas described above and the DE 19-197 data platform serves as the foundational tool to achieve these objectives.

Q. Why is the DE 19-197 data platform the appropriate vehicle to crowdsource the best ideas?

A. Stakeholders will be constantly collaborating, sharing new ideas and making recommendations regarding the various grid modernization directives. Stakeholders require access to the same data from the same sources to inform these recommendations and staff also require this to validate whether recommendations truly serve the public interest. As such, staff and stakeholders need a 'single source of truth' for data to effectively serve in their respective roles in the regulatory process and DE 19-197 is the perfect vehicle to enable that. In particular, DE 19-197 can provide the following benefits:

- **Statewide Accessibility:** The regulatory process considers changes to distribution planning and operations for all three electric utilities at once. The centralized, statewide nature of the data

platform allows for holistic analysis and uniform recommendations for the entire state of New Hampshire.

- **Complex, Efficient Analysis:** All parties need to be able to digest and analyze data in a scalable, efficient manner that produces accurate results in a reasonable timeframe. The digital nature of the data platform allows electronic access to data which creates opportunities to leverage existing solutions to run complex analysis in a cost effective and timely manner. Data in inconsistent and non-digital formats such as PDFs creates significant barriers to enabling such analysis.
- **Multiple Data Type Analysis:** Analyzing different data types together such as customer, system and market data is required to enable robust analysis as detailed in sections below. A single data platform where multiple data types can be accessed and analyzed together enables significantly more use cases to unlocking both customer and grid value.

A centralized, statewide data platform to support grid modernization is a foundational investment in ensuring every future regulatory decision made is grounded in data, is cost effective and delivers the maximum value to ratepayers. We encourage the Commission to view DE 19-197 in the context of a 'single source of truth' and the long-term value such a tool can deliver for the State of New Hampshire.

Platform Users, Roles & Data Types

Q. Who are the stakeholders in New Hampshire's energy economy and what are their objectives?

A. It's important to consider the data platform in the context of New Hampshire's energy economy, specifically who the different stakeholders are in the electricity sector, their corresponding roles in grid modernization and how they can leverage data. Below, we provide high-level overviews on these topics - please note that a more detailed overview is available in the 'User Stories' section in Appendix A.

- **For regulators,** granular visibility into the distribution system creates transparency into the current vs future state of the grid, empowering regulators to forge a clear path to advance the various issues before the commission to meet the stated grid modernization objectives. Data serves as a "single source of truth" reaffirming their ability to make independent decisions that

purely serve the public interest and verify the validity of stakeholder recommendations. Regulators are tasked with reforming distribution planning and operations in ways never done before, considering a wide variety of new variables including resiliency, environment, new technologies etc. Thus, they need significantly more information to ensure the most cost-effective decisions are made.

- **For customers,** easier access to their own usage data and the grid conditions at their location empowers them to make the best choices about managing their energy. Primarily, this will allow easier engagement with third parties to understand which energy solutions deliver the most value. Currently, most customer solutions are scoped based on limited data which leads oversizing of DER systems and lost savings. Customers empowered with their data can not only save money but be active participants in energy markets to the benefit all ratepayers.
- **For third parties,** a common market data foundation will empower them to 1) be more effective contributors in the regulatory process to design energy markets 2) acquire customers and 2) eventually participate in these new markets. This could include proposing new, innovative hosting capacity methodologies or bidding DERs solutions to meet grid needs. This will also enable easier matching of consumer needs and consumption patterns with products and services that will lower customer electricity bills while also improving grid performance. In particular, communities can uniquely serve as a powerful vehicle for the strategic deployment of DERs given the aggregation of customers.
- **For distribution utilities,** a data platform could provide visibility into upcoming and already deployed DERs enabling more granular planning and operations. This includes sending price signals to deployed DERs that can provide a variety of energy services. As the transformational shifts described earlier begin to happen, utilities will face greater challenges in grid operations and stability – greater facility in data and communication with third parties will give utilities greater confidence in scaling grid modernization and charting their own path forward in choosing among strategic options.

Q. What types of data are needed to support grid modernization?

A. It's important to view the different types of energy data in the context of the grid with one foundational principle: when put together, these data types create a clear picture of customer needs, grid needs, the corresponding economics and ultimately how to harmonize such needs to the benefit of all ratepayers. These data types are in essence different layers of different parts of the grid that closely

interact with each other and should not be viewed in silos at the risk of not considering impacts to all sides.

Below we consider 5 categories of data and the appropriate context for leveraging such data:

- **Individual Customer Data:** The goal of this data is to recreate the customers energy profile, the various options for energy solutions and the associated savings (and revenue from new markets). This will allow third parties to provide the most custom solutions to meet customer needs and empower customers to make the best decisions. Data associated with individual customers including their interval energy usage, billing information etc.
- **Community Data:** The goal of this data is to create an aggregate view of a community's energy use to inform any strategic decisions that align with local environmental and energy goals. This includes individual customer information described above and aggregate information at the community level in areas such as load, customers by rate class etc.
- **System Data:** The goal of this data is to recreate the grid from a technical perspective to understand current grid needs, electrification related loads and opportunities to integrate DERs in a way that maximizes customer and grid value. This includes the system model detailing grid assets, their rating capacity and the relationships between such assets. It also includes the assets corresponding grid conditions including network demand, hosting capacity, power quality and reliability. These assets would start with the substation all the way downstream to the individual circuits, nodes and meters. It's important to note that 'grid-edge' system data, specifically individual circuits, nodes and meters, is critical to the scalable integration of DERs.
- **Market Data:** The goal of this data is to add an economic layer on top of both customer and system data to understand the value of DERs solutions, individual customer bill impacts, ratepayer impacts and the broader operational efficiency of the grid. This would include individual customer tariffs which can be incorporated into estimating customer savings for DERs solutions as well as distribution investment plans which are required to design DER energy services tariffs.
- **Third Party:** The goal of this data is to provide a more accurate picture DERs interconnected to the grid and their corresponding operational characteristics to inform planning, market operations and grid operations. This includes the specific type of DER, corresponding location and load characteristics for assets such as distributed solar, storage, electric vehicles, electric vehicle chargers etc.

For reference, the New York Department of Public Service (DPS) issued a whitepaper in May 2020 to propose an 'Integrated Energy Data Resource' which would serve as a similar statewide, centralized energy data platform to support grid modernization efforts. NY DPS staff identified similar categories of data and proposed a minimum viable dataset (MVDS) comprising the most basic set of information needed to accelerate grid modernization as shown below.

Grid Condition & Performance Data	Business Case & Market Data	Customer Data
System Elements	Distribution Network Value - Tariff	Customer Class
Hosting Capacity Analysis	Distribution Network Value - Non-Wires Solution	Tariff
Network Demand	Bulk Power Market Value	Bill
Voltage & Power Quality	Distribution Investment Plan	Interval Usage
Reliability Statistics	Other	Location

New York Department of Public Service Whitepaper, Recommendation to Implement an Integrated Energy Data Resource, Minimum Viable Dataset.

Appendix B includes detailed data requirements determined for the MVDS. The complete NY DPS staff recommendations regarding data and the phases of implementation incorporates the MVDS and the other categories above.

Q. Does combining different data types unlock additional value and important use cases?

A. Yes. It's critical to understand not just what types of data are needed but how these data types can be best used in combination to unlock the most valuable use cases for the State of New Hampshire. This starts with understanding that these data types don't exist in silos, are directly related to each other and when used in combination significantly improves the ability to plan for and deploy DERs solutions quickly, successfully and in a way that maximizes both customer and grid value. Below, we explain the relationships between data types and the value of bringing them together.

- **Customer - Market (Customer Value):** Bringing customer and market data together creates the ability to identify the best DERs solution given existing tariffs to maximize customer savings. Combining both types of data enables a quick analysis of to offer customers variations of DER solutions in different tariff scenarios. However, this only considers DERs from the customer perspective without consideration for system and ratepayer impacts. Being proactive about leveraging customer and system data together will allow DERs deployment in a way that delivers value to the individual customer and the broader rate base.
- **System - Market (Grid Value):** Bringing system and market data together creates the ability to identify grid needs and the associated value of DERs across the grid at a temporal and locational level. Opportunities can be identified for DERs to provide capacity, hosting capacity, power quality, reliability services and the locational value can be determined by comparing the costs vs. traditional investments.
- **Customer - System - Market (Customer + Grid Value):** Bringing together both customer value and grid value is critical for third parties to scope and deploy DERs that deliver value to the individual customer, broader rate base and the grid. Third parties can target customers in locations with higher grid value and can respond to price signals, NWA procurements etc. in a timely manner with robust solutions. Thus, any meaningful consideration and strategic deployment of DERs will require combining these data types.
- **System - DER Data:** Bringing together system and DER data provides a more granular and accurate picture of the grid to enable better planning and operations including streamlining the interconnection process for upcoming projects and procuring energy services from already deployed DERs.

Per NY DPS, "relational information that identifies and characterizes the relationships between different individual information elements is a foundational resource that enables useful analyses based on those relationships". Customers and DERs must be mapped to a location on the grid, each location must be mapped to certain grid conditions and grid conditions must be mapped to a distribution investment plan. Only then can a holistic and robust analysis take place to advance various grid modernization issues.

Grid Modernization & the Role of Data

Q. What are the key stages of activities that encompass grid modernization?

A. Before diving into how data plays a foundational role in grid modernization, we must first understand the key stages of activities that encompass grid modernization. The Commission Staff report on grid modernization recommendations filed January 31, 2019 identifies three key stages of activities that collectively for the Distribution System Platform: 1) Planning, 2) Grid Services/Market Operations and 3) Grid Operations. We agree with this categorization and recommend two additional stages: 'DER Market Jumpstart' and 'System Performance Metrics & Performance Based Ratemaking'. We recognize the additional stages could be incorporated into the other stages but recommend a holistic analysis of the topics given their significance to achieving the stated grid modernization objectives.

1. **DER Market Jumpstart:** Even in the current regulatory paradigm, facilitating the integration of DERs can provide numerous benefits including individual customer savings, the ability to participate in demand response markets and providing grid services in the future. Barriers must be reduced for customers to be able to access customer facing DERs solutions from third parties.
2. **Planning:** The planning process must evolve to be able 1) to identify the capacity on the grid for various DERs 2) the value of DERs on a temporal and locational basis and 3) consider DERs multiple value streams as alternatives to traditional capital investments to meet grid needs.
3. **Grid Services/Market Operations:** A market structure must be created in which third parties can easily participate in grid services markets where DERs can provide value including energy, capacity and ancillary services including real and reactive power flexibility for grid optimization, stabilization, hosting capacity, and reliability
4. **Grid Operations:** An operational framework must be developed for utilities to integrate and manage DERs in a scalable, cost-effective, reliable manner to reflect any new market structure.
5. **System Performance Metrics & Performance Based Ratemaking:** A new set of metrics must be developed to measure success based on new factors such as efficiency, performance and resiliency. As such, utilities require new business models to align incentives to the new metrics.

Q. How does data support each stage of grid modernization?

A. Below we walk through each stage of activities, the corresponding objectives and how various combinations of data can advance key issues before the Commission. A few items to provide additional context:

- **Theme 1:** This overview is written in the spirit of the broader theme embodied in the Commission's Order No. 26,358, - to enable "a more inclusive and collaborating planning

process". This also attempts to show what's possible when a collaborative vehicle such as the 'Grid Modernization Stakeholder Group (GMSG)' is established to crowdsource the best ideas from a diverse set of stakeholders to inform regulatory decisions.

- **Theme 2:** An additional theme we emphasize is the elevation of the conversation and solutions when stakeholders have access to a single source of truth (data) via a digital platform. Powerful, quick and affordable analysis + lessons learned from other jurisdictions will accelerate how we plan, invest in and operate our grid to meet the needs of the 21st Century.
- **Theme 3:** A majority of the analysis described below can be acquired through affordable, out of the box software solutions that would leverage the data platform.
- Any quotes are direct references Order No. 26,358.
- Any topics under 'Role of Data' with a * are key directives from Order No. 26,358 and how they'd directly stand to benefit from data access.
- Any topics under 'Role of Data' without a * will likely be "any proposed topics of further inquiry" after GMSG has moved forward on the initial topics.

1. DER Market Jumpstart

Objectives
• "Facilitate integration of DERs" to provide individual customer value (No grid services within current regulatory framework) • Identify already deployed DERs to procure energy services upon creation of such markets
Role of Data
Customer Acquisition (Customer + Market Data) • **Customer Data:** Upon customer consent, third parties can leverage interval usage and billing data to accurately and quickly scope a DER solution that provides the maximum customer savings • **Market Data:** Third parties can work with customers to select the best tariffs and project bill savings. DERs can also provide services in existing markets such as demand response.
Interconnection (System Data + DER Data)*****

- **System Data:** DERs providers can understand the customers location on the distribution system and the hosting capacity for the circuit to anticipate and avoid any grid constraints. This reduces costs and streamlines the interconnection process.
- **DER Data:** Upon interconnection, third parties provide visibility into assets which can be incorporated into planning. Price signals can also be sent to these customers in the future if their DERs can provide grid services.

2. Planning

Objectives

- Develop a "granular and transparent approach that accommodates an evolving electric system" specifically to "facilitate integration of DERs" and "plan for strategic electrification"
- Develop a "upfront collaborative planning process" to "help ensure that planned investments are the optimal use of finite ratepayer dollars"
- Develop advanced planning methodologies including hosting capacity analysis, locational value analysis, probabilistic load forecasting etc.
- Develop a project prioritization process to ensure "meaningful consideration of alternatives to traditional capital investments when those alternatives ay be capable of satisfying a grid need at least cost"

Role of Data

Hosting Capacity Analysis (System Data)*****

- New Hampshire can mature hosting capacity analysis (HCA) very quickly and affordably given the progress in other jurisdictions. Many initial and current methodologies assume worst case scenarios based on just the peak load day, severely underestimating DER capacity. Stakeholders that have significant experience in other markets can provide the latest methodologies and run simulations with existing system data to provide HCA for solar, storage and electric vehicles immediately at little to no cost. The sooner capacity can be identified for all types of DERs, the sooner they can provide grid value. In addition, service territories with AMI could immediately provide real-time hosting capacity by circuit and node.

Locational Value Analysis (System Data + Market Data)*****

New Hampshire can mature locational value analysis (LVA) very quickly and affordably given the progress in other jurisdictions. Stakeholders that have significant experience in other markets can provide these methodologies and run simulations with system and market data that provide locational value for a variety of DERs immediately at little to no cost. The sooner opportunities can be identified for all types of DERs, the sooner they can provide grid value. In addition, service territories with AMI could immediately provide LVA by circuit and node.

- **System Data:** Understand grid needs at a temporal and locational level that can be addressed by DER grid services. LVA can evolve over time account for a variety of energy services including energy, capacity and ancillary services including real and reactive power flexibility for grid optimization, stabilization, hosting capacity, and reliability.
- **DER Data:** Leverage distribution investment plans to understand cost of traditional capital investments to calculate locational value for each grid need.

Load Forecasting Methodology (System + DER Data)*****

New Hampshire can mature load forecasting very quickly and affordably given the progress in other jurisdictions. Stakeholders that have significant experience in other markets can provide these methodologies and run simulations with system and DER data to provide probabilistic forecasting for electrification and a variety of DERs immediately at little to no cost.

- **Probabilistic & Electrification Load Forecasting*:** As DER penetration and electrification increases and the need for probabilistic load forecasting becomes necessary, stakeholders that have significant experience in other markets can provide these methodologies and run simulations with system and DER data that provide forecasting for a variety of DERs immediately and "high load growth scenario to account for accelerated deployment of electric vehicles, heat pumps, and other load building end-uses".

System Planning Data Transparency (System Data)*****

With a data platform being considered in DE 19-197, stakeholders would have access to the majority of system data and could determine which subset of data can be made public without threatening grid security. A new access point could be quickly built on the data platform to make this subset of data available.

Project Prioritization (System + Market Data)*****

Stakeholders that are also third party market participants can contribute their perspectives on whether DERs solutions are technically and economically viable to meet different grid needs within the determined time horizon.

- **System Data:** Third parties can analyze the characteristics of 1 or more circuits to understand the constraints and whether 1) DERs can offer services to meet those needs 2) if there are enough viable customers on those circuits and 3) whether the DERs can be deployed in time to alleviate those grid constraints.
- **Market Data:** Third parties can compare the cost of a DER solution vs. a traditional capital investment and determine whether it meets the criteria of the least-cost integrated resource planning framework.
- **DER Data:** All stakeholders can understand where existing DERs are deployed and whether they can provide grid services.

3. Market Operations

Objectives

- Develop a streamlined process and vehicle to communicate grid needs opportunities to the market via NWS RFPs, price signals etc.
- Determine what level of data is sufficient to include in the appropriate vehicle for the market to respond to grid need opportunities with viable solutions
- Determine standards for constitutes a viable solution
- Develop a streamlined process and vehicle for the market to respond to grid needs opportunities
- Develop a streamlined process and vehicle to settle market transactions for grid services

Role of Data

Non-Wires Solutions (Customer + System + Market Data)*****

NWS RFPs often state the high-level grid needs but don't provide sufficient data to develop viable DERs solution proposals. Stakeholders can provide input into what data is needed to bid a viable solution as described below.

- **Customer Data:** Third parties can understand the grid location's corresponding region so they know where to acquire new customers and/or leverage existing customers.
- **System:** Third parties can analyze the characteristics of 1 or more circuits to understand the constraints and whether 1) DERs can offer services to meet those needs 2) if there are enough viable customers on those circuits and 3) whether the DERs can be deployed in time to alleviate those grid constraints.
- **Market Data:** Third parties can compare the cost of a DER solution vs. a traditional capital investment and determine whether it meets the criteria of the least-cost integrated resource planning framework before bidding.

4. Grid Operations

Objectives

- Develop "streamlined interconnection processes" to "help advance the planning objective of facilitating DER integration"
- Develop a grid operations framework to 1) manage the system impacts associated with a low, medium and high DER-penetration scenarios and 2) align with the market operations framework and leverage DERs for grid services

Role of Data

Interconnection (System Data + DER Data)*****

- **System Data:** Third parties can understand the customers location on the distribution system and the hosting capacity for the circuit to anticipate and avoid any grid constraints. This reduces costs and streamlines the interconnection process.
- **DER Data:** Upon interconnection, third parties provide visibility into assets which can be incorporated into planning. Price signals can also be sent to these customers if their DERs can provide grid services.

DER Management (System + DER Data)

- **System Data:** Utilities can monitor grid conditions and determine whether actions need to be taken involving DERs.

- **DER Data:** Price signals can also sent to these customers if their DERs can provide grid services or require curtailment.

5. System Performance Metrics & Performance Based Ratemaking

Objectives

- Develop performance criteria and metrics that have 1) "traceability to functionalities associated with the grid modernization objectives" and "are investment-specific as appropriate"
- Develop a performance based ratemaking framework that aligns with "flat or declining" load, "encourage utilities to embrace competitive resources" and aligns with performance metrics

Role of Data

System Performance Metrics (System + Market Data)*****

- **System Data:** Determine and regularly measure the technical metrics that determine overall grid performance
- **Market Data:** Determine and regularly measure the economic metrics that determine operational efficiency

Q. How do we harmonize the relationship between DE 19-197 and grid modernization to develop a holistic, coherent strategy?

A. It is our hope the arguments above make it abundantly clear how grid modernization, Order No. 26,358 and the DE 19-197 data platform intersect. Now the question is - how do we bring this all together into a holistic, coherent strategy that drives cost-effective decisions from day 1?

We request the Commission to consider all these components in the context of the Distribution System Platform (DSP) - specifically a centralized, statewide market platform with the DE 19-197 data platform as the first and foundational layer. The Commission references National Grid's Rhode Island System Data Portal which "provides a single interface where a user can access a hosting capacity map, non-wire alternative candidate solicitations, a heat map detailing the thermal loading of electric distribution circuits, area planning studies, and load forecasts". We agree with this high-level characterization of a

single interface for grid modernization activities and would recommend viewing the DSP as three key layers for such an interface:

1. **Data Layer:** As described earlier, this first layer serves as the fundamental driver to develop other grid modernization related functionalities such as hosting capacity maps and interconnection portals. In addition, data is needed not only to develop but support the long-term use of functionalities such as NWS bids from third parties. Each of these functionalities is in essence rooted in data.
2. **Grid Layer:** The second later serves as a digital and GIS representation of the grid displaying grid conditions and opportunities for DERs solutions by circuit. Directives from the recent order including hosting capacity maps, locational value analysis and system performance metrics which could be made available via this layer.
3. **Market Activity Layer:** While the second layer is purely informational, this layer allows third parties to engage in different market actions. Directives from the recent order including an interconnection portal and responding to NWS solicitations which could be made available via this layer.

Viewing all these components in the context of a single platform with the described layers above, provides the Commission a clear, tangible way to monitor the progress of various grid modernization related topics before the commission. In addition, building off the statewide, centralized principles of DE 19-197 creates a uniform, common market across the state of New Hampshire reducing barriers to entry and fostering a vibrant statewide market for DERs solutions. Finally, it's important to note that the data layer would be the only component that needs to be built from scratch, other functionalities can be procured from affordable, robust 'out of the box' software solutions.

Conclusion

Below we respectfully provide our recommendations for the first order in the DE 19-197 docket and hope the insights above provide the sufficient context and insights to make the best decisions to meet our grid modernization objectives.

Q. Should the platform use a statewide logical data model and one that is extensible to future types of data?

A. Yes, we support a statewide logical data model that establishes a common format for each type of data and the corresponding relationships between these data types. Customers must be mapped to DERs to a location on the grid, each location to certain grid conditions and grid conditions to distribution investment plans. Only then can a holistic and robust analysis take place to advance various grid modernization issues. Different data types can be iteratively added to the platform and the logical data model should be designed to accommodate these needs.

Q. What software development methodology should be used to build the platform?

A. Traditional software development practices leveraged the "Waterfall" methodology which would specify all the platform requirements upfront, not be amenable to any scope changes and would build out all the functionality before incorporating any feedback. We do not recommend this methodology as it creates significant risk in cost overruns and not being able to verify the viability of the functionality built until till the end of the process.

We recommend the use of the "Agile" methodology which is an iterative development approach that builds out functionality incrementally and regularly incorporates feedback from platform users to inform design decisions. This approach allows a baseline product to be quickly developed, evaluated and iterated upon mitigating the risk of missing requirements and cost overruns.

Q. What functionality would be recommended for Phase 1?

A. At a high-level we recommend Phase 1 include two data types: 1) Individual Customer and 2) Community data. Making individual customer data immediately available aligns with enabling Stage 1 of grid modernization 'DER Market Jumpstart' as described in previous sections. This will allow customers to easily engage with third parties, understand the purely customer value of a DER solution and accelerate their deployment across the State of New Hampshire. Deployed DERs can be leveraged in the future for grid services when such markets are created.

We also believe it is imperative Community-level data be immediately available given the recent passage of RSA 53-E. Community data is in essence aggregated individual customer data and thus it is advisable to deploy both customer data related functionalities together. Please see the 'User Stories' in Appendix A for details on Phase 1 recommendations.

Q. What functionality would be recommended for Phase 2?

A. At a high-level we recommend Phase 2 include two data types: 1) System and 2) Third Party data. We acknowledge Docket # IR 15-296 is likely the appropriate venue to determine such requirements and would recommend any data made available (including baseline system data) be done so via the DE 19-197 data platform. Please see the 'User Stories' in Appendix A for details on Phase 2 recommendations.

Q. What is the appropriate governance model to ensure the successful implementation of the platform?

A. Given the need for a diverse set of stakeholders and perspectives to advance various grid modernization related issues, we recommend any governance structure appropriately represent the different parties. We recommend the creation of a "Data Platform Council" that would be responsible for three key functions:

1. Approving standards for the Data Platform Hub, including shared logical data model, API standards, and standards for authentication and authorization;
2. Ensuring that new Data Sources meet established standards in order to be included in the Data Platform Hub;
3. Evaluating the ongoing performance of Data Platform to ensure it is meeting its goals (e.g., enabling priority user stories listed in Appendix A.).

The Data Platform Council would oversee implementation and ensure successful ongoing operation of the Data Platform, in accordance with the direction set by PUC and subject to final oversight by PUC.

Q. Is there an opportunity to leverage performance-based ratemaking to ensure the successful implementation of the platform?

A. The Commission stated they remain willing "to consider performance incentive mechanisms that are narrowly tailored to a specific investment prior to that more comprehensive proceeding, as long as the incremental costs of such a mechanism are adequately justified." We believe the DE 19-197 data platform is an opportunity to consider such mechanisms given the foundational role this platform plays to progress in grid modernization. Performance metrics will need to be developed that correspond to the the data platform functioning as intended prior to any PBR design.

One specific mechanism we recommend considering is the ability to rate base cloud-based software as a service (SaaS) technologies which will ensure the data platform is built leveraging the latest technologies. A resolution passed by a national association for state utility regulators (NARUC) in 2016 that

encourages commissions to allow power companies to rate base investments in cloud-based software as a service (SaaS) technologies and earn a regulated rate of return — just as they do with other software platforms. Utilities may prefer the SaaS option because, like Microsoft's Office, it can offer cost and operational advantages over hosting information in onsite servers, argues the resolution from the National Association of Regulatory Utility Commissioners (NARUC). Cost constraints preventing a move to cloud computing should be removed.

"Utilities best serve customers, society, the environment, and the grid by making software procurement decisions regardless of the delivery method or payment model," declares NARUC's "Resolution Encouraging State Utility Commissions to Consider Improving the Regulatory Treatment of Cloud Computing Arrangements." "NARUC encourages state regulators to consider whether cloud computing and on-premise solutions should receive similar regulatory accounting treatment," it concludes. "Both would be eligible to earn a rate of return and would be paid for out of a utility's capital budget."

Q. Can advanced metering infrastructure enable important use cases for the platform?

A. Yes. AMI, if available, serves as a foundational grid modernization technology significantly increasing the sophistication of data analysis and grid modernization as a whole. 'Grid-edge' visibility at the circuit and node level is critical to identify opportunities for DERs and most utilities don't have this granularity of data. Many jurisdictions only view AMI as a customer facing technology when in fact, with the right software capabilities, can provide this visibility not only into customer load but behind the meter DERs and granular 'grid-edge' conditions. Current AMI deployments are significantly underutilized failing to capture the technology's full value for both customers and the grid as described below.

Grid Modernization Stages	**AMI Benefits**
DER Market Jumpstart	● Third parties can leverage 15 minute - 1 hour interval demand data which is critical to scoping more accurate DERs solutions. Monthly data often results in overestimates requiring the customer to unnecessarily pay for larger solutions.

Planning	• Develop real-time hosting capacity for distributed solar, storage and electric vehicles by feeder and node • Identification of individual circuits and nodes expecting load growth for transportation, building and industrial electrification • Integration of DER data for more accurate planning
Grid Services/Market Operations	• Send price signals to customers with DERs solutions • Leverage DER monitoring data for settlement on market transactions
Grid Operations	• Streamline interconnection process with real-time monitoring of node and circuit • Monitor and provide visibility into third party behind the meter assets (either via integrations with DER system or utility secondary meter) • Provide real-time grid conditions to utility to support system operations
System Performance Metrics & Performance Based Ratemaking	• Provides more granular data to inform development of more precise performance metrics.

We strongly recommend the Commission consider the utilization and integration of AMI into distribution planning and operations to support grid modernization. New Hampshire will have the future proof capabilities required to accelerate the integration of DERs in a cost-effective, reliable way. In addition, these capabilities create a significantly more DER friendly environment attracting private investment into the local economy. Two key areas to consider:

- **Leverage existing AMI:** We recommend leveraging existing infrastructure which can provide some of the benefits described above while considering a broader statewide rollout. Unitil has deployed AMI within their service territory and would serve as an excellent demonstration of the grid value described above.
- **Deploy new AMI:** AMI, equipped with the latest software capabilities, can enable the full range of benefits described above serving as a future proof investment in grid modernization. We recommend the consideration of a broader statewide rollout of AMI provided they include the latest software capabilities.

Q. In what sequence should the different layers of the distribution system platform be built? Should the data layer be built first?

A. We recommend the data layer be built as a priority and leverage the minimum viable dataset (MVDS) approach of New York to provide a baseline level of customer, system and market data while evolving capabilities in the future. This core set of data will be required to develop functionality of other layers including hosting capacity analysis, locational value analysis, system performance metrics etc. However, we recognize the immediate value of an interconnection portal to address current DERs applications and would recommend this be built as a priority as well provided all functionality is built together as part of a single market platform interface.

Appendix A.

Background & Introduction

User stories illustrate the desired outcomes of major user groups (defined below) utilizing the statewide Energy Data Platform. As part of the agile software development process, we suggest the following major user groups, their use case premises and user stories for the consideration of the Commission. This list of user stories is not intended to be comprehensive or final, but is offered as a starting point for further discussion.

This format was deemed useful by the DE 19-197 intervenors during the technical sessions and informal discussions of the past several months as a means of documenting outcomes in a specific, succinct, and non-technical manner so that all parties could participate in productive discussions about the goals and priorities for the Platform.

We propose that a finalized set of user stories be included in the final ruling by the Commission so that the intended outcomes for the Platform are documented in an accessible and testable fashion. This will allow the Commission and intervenors to ascertain whether or not the completed Data Platform is effectively meeting all of the desired outcomes.

This appendix of User Stories was compiled through a collaborative process that included discussions and engagement with many of the intervenors in DE 19-197. This document is an attempt to capture as many as possible of the desired outcomes that were articulated through various channels during this collaborative process that preceded the filing of testimony. We are open to the possibility that, through the remainder of this adjudicative proceeding, these user stories may be refined and improved upon further by way of input from and collaboration with other parties to this proceeding.

Definitions

- **Major user groups** are the individuals, groups or entities that will use the Energy Data Platform. We organize users into six major user groups: customers (C); third parties (TP); Community Power Aggregations (CPA); government (PUC); utilities (U); and Electric Grid Modernization (GM).

- **User story premises** are the broad goals of a major user group.
- **User stories** are specific achievable outcomes enabled by the Data Platform, which were identified by various internevors in DE 19-197. Each user story is prioritized in this narrative as "high priority" (meaning it should be part of the Platform from the outset or as soon afterwards as possible), "low priority" (it can be delayed to a later iteration of the Platform if necessary), or "future" (it will not be needed until other aspects of New Hampshire's energy landscape mature further)

Customers User Stories (C-)

Customer User Story Premise: A customer needs to be able to access energy solutions that provide energy usage savings, revenue opportunities, and environmental benefits.

High Priority Customer User Stories:

- **C-1** A customer needs to be able to share his/her historic energy information (usage, cost/billing info, etc.) held by a utility with a Third Party (any non-utility entity such as distributed energy resource (DER) provider, CPA, non-profit, competitive supplier, etc.) in order to determine

whether a certain service or product is a good fit for the customer. For example, this could include sending energy information to (i) a rooftop solar provider for getting a price quote; (ii) a competitive supplier to receive a price estimate; (iii) to a storage provider to determine the appropriate size of behind-the-meter battery storage; and many other examples.

- **C-2** A customer needs to be able to share his/her ongoing energy information (usage, cost/billing info, etc.) held by a utility with a Third Party (any non-utility entity such as DER, CPA, non-profit, competitive supplier, etc.) in order to use a service, such as a DER. Some examples include, but are not limited to, monitoring of post-retrofit energy efficiency; gathering residential or commercial and industrial (C&I) usage data for demand response settlement and ongoing management; verifying performance of behind-the-meter battery storage over time. This use case might be combined with User Story C-1 – for example, a customer might execute requests for both historic and ongoing information at the same time.
- **C-3** An individual customer needs to be able to download their historical data so they can analyze it for opportunities or get customized recommendations about the potential energy and economic impacts of changing energy suppliers or rate plans, installing PV/batteries/other DERs, or making other changes to their energy use. This might not involve an explicit relationship with a third party if the customer is using a software tool directly.
- **C-4** A customer needs to know that their personally-identifiable information will not be released to any party without their consent so that they can use the platform without concern for their privacy. That consent may be granted to a CPA by virtue of not opting out from a municipal aggregation initiation, or as part of an opt-in service initiation with another third-party provider.

Future Customer User Stories:

- **C-5** A customer needs to be able to share historic and ongoing energy information for multiple fuels in addition to electricity. This includes the ability to share gas information per the same requirements as electric information.

Third Party User Stories (TP-)

Third Party User Story Premises:

- A third party, such as a CPA or competitive energy supplier, can provide customers different choices for energy suppliers and rate structures to reduce energy bills.
- A third party, such as a DER or energy service provider, can provide customers custom energy solutions not requiring grid interconnection (energy efficiency, demand response) that reduce energy bills.

- A third party can provide customers custom with energy solutions requiring grid interconnection (solar, storage, electric vehicles, electric vehicle chargers etc.) that reduce energy bills while minimizing grid constraints and interconnection costs.
- A third party can provide customers with custom energy solutions requiring grid interconnection (solar, storage, electric vehicles, electric vehicle chargers etc.) that reduce energy bills, minimize grid constraints and interconnection costs, and create new revenue opportunities by both bidding and settling transactions for grid services such as capacity, demand reduction, hosting capacity, power quality, reliability etc.
- A third party can participate in the wholesale energy market as a load serving entity for the purpose of procuring or selling electrical energy or capacity on behalf of its participating retail electric customers, including itself.
- A third party can provide visibility into deployed solutions to the utility, communities, government agencies, and other entities for the purposes of maintaining reliability, tracking and meeting energy goals, etc.
- A third party provides customer service to answer customer questions about bills to support the energy solutions it provides.

High Priority Third Party User Stories:

- **TP-1** A third-party energy service provider needs to be able to access energy data so that it can offer services to customers across the state of New Hampshire in multiple distribution utility territories without incurring multiple costly data integration efforts with every individual utility provider.
- **TP-2** A third party needs to be able to convey customer authorization and request billing data from a utility through a fully-automated interface and receive at least three years 15-minute interval data (or the finest resolution available, if 15-minute is not supported by their meter) in a standard format such as Green Button within 30 minutes of making the request.
- **TP-3** A customer with multiple buildings across different utility territories needs to be able to access data from all of their buildings in a common format in order to view and analyze the data.
- **TP-4** A competitive energy supplier, Community Power Aggregation (CPA), or authorized third-party provider needs to be able to access a customer's updated electric and/or gas meter reading data as soon as that data has been collected from the meter and verified appropriately so that they are able to make fully-informed decisions on the best energy solutions to use, save, store, generate, or export energy in their homes and businesses.
- **TP-5** A customer or third-party needs to be able to access standardized representations of all available tariffs for a given meter service point so that they can accurately calculate hypothetical bill costs for a historical or proposed future monthly and hourly energy and demand profile.

- **TP-6** A third party needs to know how much its customers' energy use costs to deliver at different times of day and year so that it is able to offer its customers time-varying-rates (TVR, such as time of use (TOU) and real-time pricing (RTP)) and bill them accurately so that it can procure low-cost energy, generate their own energy and/or reduce their energy usage at the appropriate times of day and year and distribute those costs equitably among its members.
- **TP-7** A third-party customer service representative needs to be able to access customer bills and supporting data in a timely fashion (minutes, not days or hours) in order to answer customer questions over the phone or in an online interface.
- **TP-8** An individual customer, authorized aggregator, or a CPA serving a customer needs to be able to access both raw meter reading and billing determinants and how that customer's incurred cost is broken down by various fixed and variable components, including energy, fuel surcharge, Renewable Energy Credits (RECs), demand, capacity, etc. so that they can plan relative to expectations about how those cost components might change in the future.

Low Priority Third Party User Stories:

- **TP-9** A customer or third party needs to know whether they will be able to site a distributed energy resource (DER) behind their meter, whether there will be utility fees associated with the interconnection, and how much that DER's grid services will be worth at that location, in order to make a decision about whether that DER is a good investment.
- **TP-10** A third party needs to be able to respond to price signals and requests for proposals (RFPs) with robust DER solutions that can provide grid services to support the distribution planning process. A third party needs to understand the system conditions including system topology, the rating of assets, their relative relationship of assets to each other and the specific grid characteristics of those assets (capacity, hosting capacity, power quality, reliability etc.).
- **TP-11** A third party needs to access near-real-time, highly granular data in order to participate in wholesale power markets, including engaging in settlements. This requires access to granular interval usage data of a customer at the interval required for settlement.

Future Third Party User Stories:

- **TP-12** An independent system operator (ISO) such as ISO-NE can access information for any market settlements. This requires granular interval usage data for participating resources at the interval required for settlement.
- **TP-13** A third party needs to be able to provide utilities, communities, and government agencies up to date information so that they can demonstrate the value of their services. Utilities can leverage this information for distribution planning including procuring services from deployed solutions while

communities and governments can track solution deployments to meet energy objectives. This includes information on the operational characteristics and location of deployed solutions.

Community Power Aggregation User Stories (CPA-):

CPA User Story Premises:

- A community (municipality or county) wants to manage their energy on behalf of its residents for purposes including saving residents money, meeting local climate & energy goals, and developing innovative and competitive retail electricity markets.
- A community needs to be able to onboard and manage energy services for individual customers who do not opt out of or who consent to being included in an aggregation program.
- A community needs to provide customer service to individual community residents to support any energy services provided including providing accurate energy bills and access to customer service representatives.

High Priority CPA User Stories:

- **CPA-1** A community needs to be able to access anonymized, but not aggregated, energy use data from all accounts in their jurisdiction in order to analyze the options for procuring different energy supply or demand reduction and flexibility resources that will lower costs and/or environmental impacts of all the residential, municipal, and business energy use in their jurisdiction, regardless of which distribution utility is currently serving that customer. This process examines the most cost-effective options for each individual load-shape in the population and then aggregates those options to explore policies at the community level.
- **CPA-2** A community needs to be able to access hourly (or better) energy data that can be aggregated by rate class in order to measure the retail cost, CO_2 and other impacts of its energy use on an hourly, marginal basis. This analysis will allow the community to determine if it is meeting its goals for reducing the energy burden and climate impact goals set by the community.
- **CPA-3** A CPA needs to be able to access the full list of names, physical addresses, and contact information for all customers in its service territory from each distribution utility that is currently serving them so that it can communicate with them and notify them of the upcoming opt-out decision they need to make. Note that the contact information for customers (ratepayers) is not necessarily the same as the contact information that the municipality may have for the taxpayer listed for a building, as tenants often pay their own utility bills.
- **CPA-4** A CPA needs to be able to receive utility meter data promptly after the distribution utility reads the meter so that it can issue a bill to an individual customer and collect payment. The CPA also

needs to know past energy use, which tariff(s) the account is on, and past payment history of the customer.

Low Priority CPA User Stories:

- **CPA-5** A CPA needs to be able to conduct consolidated billing so that it can present the customer with a streamlined bill.
- **CPA-6** A CPA needs to be able to access load data with adequate granularity and latency to allow it to settle with all load-serving entities that supply its members, based on the hourly load and other grid services its members participated in.

Future CPA User Stories:

- **CPA-7** A CPA needs to be able to add and update customer records to the platform so that it can support customers with adding or changing service.
- **CPA-8** A community wants to analyze the options for taking actions to lower costs and/or environmental impacts of all the residential, municipal, and business energy use in their jurisdiction. This process examines aggregated gas usage in addition to electricity usage.

Government (PUC-):

PUC User Story Premises:

- The Public Utilities Commission (PUC) can review utility rate case proposals and ensure any approved proposals meet the least-cost planning framework and consider alternatives to traditional capital investments when those alternatives may be capable of satisfying a grid need at least cost.
- The PUC can conduct rate design to meet the evolving needs of the grid.

High Priority PUC User Stories:

- **PUC-1** The PUC can conduct independent demand studies to verify the analysis provided by utilities. This will require access to system topology, asset ratings and historical network demand.
- **PUC-2** The PUC can conduct an analysis to identify various rate design scenarios to encourage customers to change their energy use to relieve grid constraints. This will require customer interval usage data and existing tariff structures.
- **PUC-3** The PUC can conduct an analysis to identify various rate design scenarios to develop Performance Based Ratemaking to realign utility incentives with additional outcomes besides cost and reliability.

Utility User Stories (U-)

Utility User Story Premises:

- The regulated electric and gas utilities maintain the systems of record for meter and billing data systems.
- The utilities are also responsible for participating in distribution system planning, maintenance and expansion.
- The quantity and size of distributed energy resources (DERs) is rapidly growing to the point that it impacts distribution grid planning, but the distribution utilities do not own or control these resources in many cases.

High Priority Utility User Stories:

- **U-1** A utility needs to be able to satisfy data requests from multiple authorized parties, including customers, third-parties, CPAs, and others, using a standard format and transfer mechanism so that these requests do not place an undue burden on their IT resources.
- **U-2** A utility needs to receive updated customer name and contact information via a consistent format and transfer mechanism from CPAs and other competitive suppliers so that it can perform maintenance on poles, wires, meters, and other distribution system equipment that might require communication with all affected customers.

Low Priority Utility User Stories:

- **U-4** A utility needs to receive interval sub-metered energy performance data from DERs that are operating on its distribution network via a consistent format and transfer mechanism so that the utility can integrate the actual performance of those deployed DERs into its distribution planning.

Electric Grid Modernization User Stories (GM-)

Grid Mod User Story Premises:

- The Grid Modernization Stakeholder Working Group (GMSG) can review information on each utility's progress on hosting capacity analysis and presentation, locational value initiatives, and interconnection procedures.
- The GMSG and the Independent Professional Engineer (IPE) can participate in a collaborative planning process including the evaluation, selection, and prioritization of investments in a manner that accommodates changing customer expectations while also minimizing customer bill impacts.

- The GMSG and IPE can participate in a collaborative distribution planning process including considering alternatives to traditional capital investments when those alternatives may be capable of satisfying a grid need at least cost.
- The GMSG and IPE can participate in a collaborative distribution planning process including prioritizing and maximizing the use of energy efficiency and demand side resources investments when proposed options have equivalent cost, reliability, environmental, economic, and health-related impacts.
- The GMSG can examine and develop metrics for measuring system performance consistent with the Commission's statutory mandate and the distribution system planning objectives.

High Priority Grid Mod User Stories:

- **GM-1** The GMSG and IPE can access Utility Baseline System Data in a timely manner and in a format that can be easily digested and analyzed. This data is required to support their respective functions per the Commission grid modernization order.

Future Grid Mod User Stories:

- **GM-2** The GMSG can review hosting capacity analysis and locational value initiatives to ensure they provide the most accurate and up to date information while considering all the value streams that alternatives to capital investments can provide. The GMSG needs the inputs, assumptions and methodologies used for such analysis and also needs to understand the system conditions including system topology, the rating of assets, their relative relationship of assets to each other and the specific grid characteristics of those assets (capacity, hosting capacity, power quality, reliability etc.).
- **GM-3** The GMSG needs to understand the system conditions including system topology, the rating of assets, their relative relationship of assets to each other, the specific grid characteristics of those assets (capacity, hosting capacity, power quality, reliability etc.) and locational value so that they can consider alternatives to capital investments to meet grid needs and determine whether they are technically feasible.

Appendix B.

Please see the data requirements below for the minimum viable dataset (MVDS) proposed in New York which would support a majority of the user stories above.

Customer Data

Data Elements	Data Points	Interval	Historical	Update Frequency
Customer Class	• Residential, Commercial, Agriculture, Industrial	As Changes Occur	N/A	As Changes Occur
Tariffs	• Customer specific tariff • All available tariffs (customer specific)	As Changes Occur	N/A	As Changes Occur
Customer Bill	• Customer Name • Address • Monthly Billing Information	Monthly	2 years	Monthly
Customer Interval Usage	• Service point/Meter ID; • Account number or Electric or Gas Choice ID; • Time stamp for each meter reading; • An identifier of the quality of the data (estimated, billable, etc.); • Interval usage as registered by the meter; • Peak Load Contribution (Capacity and Transmission)	• 5 minute • 15 minute • 1 hour • (as available)	2 years	Monthly
Location	• Feeder ID • Node • Region • Pricing Zone	As Changes Occur	N/A	As Changes Occur

System Data

Data Elements	Data Specification	Time Series Interval	Historical	Forecast	Update Frequency
System Model	• Assets(s) Rating Capacity/Sizing • Asset(s) Age • GIS Map	N/A	N/A	As available	Daily/Weekly (Updated as new assets are mapped, deployed and/or replaced
Hosting Capacity (By Feeder)	• Methodology Employed • Underlying Data Inputs and Assumptions (System Model, Forecasted Demand, Forecasted Generation, Projects in Queue) • Reasons for Hosting Capacity Constraints	1 hour	2 years	As available	Weekly/Monthly
Network Demand (By Feeder)	• Interval Demand & Forecasts • Minimum and Peak Demand & Forecasts • DER Generation & Forecasts	1 hour	2 years	As available	Weekly/Monthly
Power Quality (By Feeder)	• Voltage • Frequency deviation • Wave Form	15 minute	2 years	As available	Monthly
Reliability Statistics (By Feeder)	• Outage time stamp and duration • # of customers out and interrupted • Sustained and Momentary outages by day	Daily	2 years	As available	Monthly
Customer Type by Location w/ Service Need	• Current Customer Class/Type • Forecasted Customer Class/Type			As available	

Market Data

Data Elements	Data Points	Update Frequency
Distribution Network Value - Tariff	• Digital tariff books for all utilities in the State – gas, steam, electric, including all riders (VDER, LSRV, DRV, etc.) – and rate sheet updates as issued • Digital BCA Handbook • Value Stack Calculator • Digital CSRP, DLRP Manuals, Gas DR Manuals	Updated as 1) Grid needs are identified, 2) Investment planning changes and 3) Network value calculations change
Distribution Network Value – Non-Wires Solution	• Wires Solution Cost • NWA/DER Value • Underlying technical parameters associated with NWS opportunity – service need, network constraints, etc. (type: voltage control, reactive power, hosting capacity, capacity, reliability, resiliency; attributes: MW, time, duration, location)	
Bulk Power Market Value	• NYISO Tariff • NYISO DR manual • NYISO Gold Book • Historical Pricing • Dual Participation restrictions, rules	
Distribution Investment Plan	• Planned investments (What, where, when, how much, why, and have they considered all alternatives to least cost) • Deferral opportunities • Deadline/Timeline for solution deployment	
Other	• NYC Local Law 84 Building Database • NYC Climate Mobilization Act (GHG Coefficients, fine/penalty provisions)	