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An Agile Approach to DERMS Implementation – Delivering Value Fast

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SUMMARY

The challenges and opportunities facing National Grid today resemble those of several other large electric utilities throughout the United States. The company serves 2.8 million electric customers in New York and Massachusetts. NY and MA are both leaders in the adoption of renewable energy sources like solar and wind. Additionally, both have laid out aggressive clean energy targets of net-zero carbon emissions by 2050, highlighting the importance of electric vehicles (EV) and electric heat pumps (EHP) in achieving these goals.

Delivering this clean energy vision involves electric utilities transitioning from a simple one-way to a bi-directional flow of power and information. Utilities must manage an increasingly dynamic and complex electric distribution system. There is a tremendous opportunity to tap into the benefits of Distributed Energy Resources (DER) management alongside the rapid deployment growth of DER if DERs can be utilized to holistically optimize the electric power system. Many utilities realize the opportunities to optimize this new system for demand and control through a Distributed Energy Resource Management System (DERMS).

National Grid identified 19 core areas or capabilities essential to deliver all the services it hopes to offer in the future in its DERMS solution. The Company believes that multiple software and hardware components are needed to implement the DERMS solution and must be closely integrated with a common data architecture; however, components may be developed and deployed at different times based on customer and business value. To avoid a complicated scope and requirements phases that drastically slow the deployments, National Grid chose to treat its DERMS as a platform of products, each with a unique delivery timeline. In addition, the company started several demonstration pilots to test complicated DERMS features such as controlling devices of specific customer groups, focusing on solving essential and urgent needs first and quickly. Using Agile product development principles, the company's DERMS platform continues to evolve with each product having multiple iterations along the journey.

Treating DERMS as a platform of products allows for diverse DER management capabilities to be developed over time to accelerate value realization to customers in line with how DER growth evolves across its service territory and will allow the Company to adapt to evolving needs through refinement of its DERMS plans. By continuously monitoring and assessing changes in market conditions, regulatory policies, and DER growth trends the platform approach will enable the Company to integrate DER more efficiently, start offering new products and services to customers more quickly, deliver on improved DER customer satisfaction, realize broad system benefits for all customers, and increase reliability and power quality.

National Grid would like to share its lessons from taking on such a strategy, explain why it will become essential in the future for utilities to adopt similar methods, and discuss some of the regulatory challenges it faced during the process.

KEYWORDS

DERMS, Agile, Grid Modernization, DERMS Platform, Delivering Value Fast

INTRODUCTION

Given the diverse types and sizes of DER and the numerous use cases needed to further advance the integration of DER with the Company's electric distribution system, the Company believes that multiple software and hardware components are needed to implement the DERMS Platform and must be closely integrated with a common data architecture; however, components may be developed and deployed at different times based on customer and business need. National Grid anticipates this proposed investment will be delivered through multiple, parallel workstreams, each focused on specific DERMS products but part of an integrated product portfolio that ensures ongoing and planned implementation work within the portfolio and other enterprise systems coordinated based on timing and functional dependencies across workstreams.

The Company's DERMS Platform address 7 common use cases in the DER life cycle, which include interconnection of DERs, DER registration, DER program enrolment, long-term DER planning, operational DER planning, DER operations, and DER settlement.

- **DER interconnection** may include managing interconnection application process, data, and agreements
- **DER registration** which may include customer interaction and recording of individual DER settings, capabilities, control modes, etc. as needed, and any coordination with the ISO-NE as necessary
- **Program enrolment** may include managing utility DER program rules, terms, and conditions, coordination, and aggregations
- **Long-term DER planning** may include the Identification and inclusion of potential DER solutions to long-term planning constraints and derivation of the locational value of mitigating these constraints in conjunction with the Company's integrated planning process
- **Operational DER planning** may include forecasting DER capability based on short-term load forecasts, DER ISO schedules, identifying distribution constraints due to DER operation and performing security-constrained economic dispatch possibly in conjunction with ADMS, identifying locational value to mitigate system constraints, and operational coordination with the ISO-NE as necessary
- **DER operation** may include monitoring real-time system conditions and constraints in conjunction with ADMS, facilitating near-term or real-time dispatch or re-dispatch of DER such as for ISO-NE and/or utility schedules or reliability needs to maintain grid security
- **DER settlement** may include measurement, verification, and the associated calculations to determine DER performance against any contracted or enrolled utility program obligations or utility tariffs, and storing of historical dispatch requests and DER performance to utility dispatch requests

DERMS VISION

The Company has recently conducted a series of workshops to develop a broader and more unified future vision of DER management that builds on its current knowledge of integrating and managing DER while minimizing delivery risk and prioritizing more immediate customer needs.

The outcome of this effort concluded with a roadmap comprised of 19 products through the integration with other utility enterprise systems to position National Grid to be successful in managing DER against a variety of outcomes for DER evolution, and regulations, technology advances, and customer preferences. The diagram below depicts at a high level the Company's overall DER management process and associated supporting products.

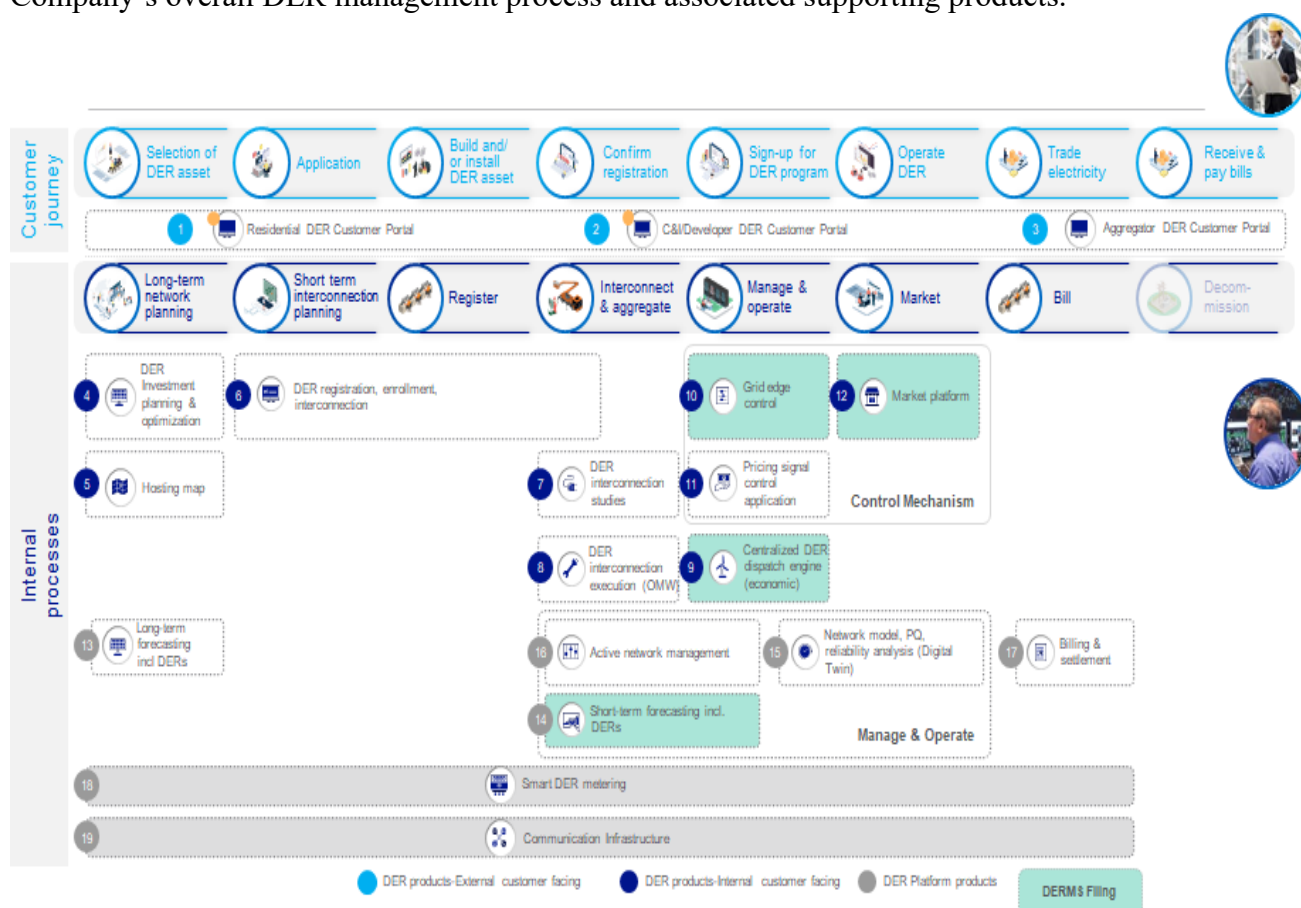


Figure 1. DERMS Platform Products

The Company also plans to implement a change management strategy to ensure these comprehensive DER management capabilities are incorporated into its business processes, data governance, and operational enterprise systems. Investments in DERMS will work for hand in hand with existing grid modernization investments such as line sensors, IT, and an Advanced Distribution Management System (ADMS) to support the Company's grid modernization needs to optimize system performance by attaining optimal levels of grid visibility, command and control, and self-healing.

The Company's future vision of its DERMS Platform implementation is illustrated in 2. Some of the capabilities currently are in different implementation stages, including some being demonstrated through pilot projects with plans to scale up, if successful.

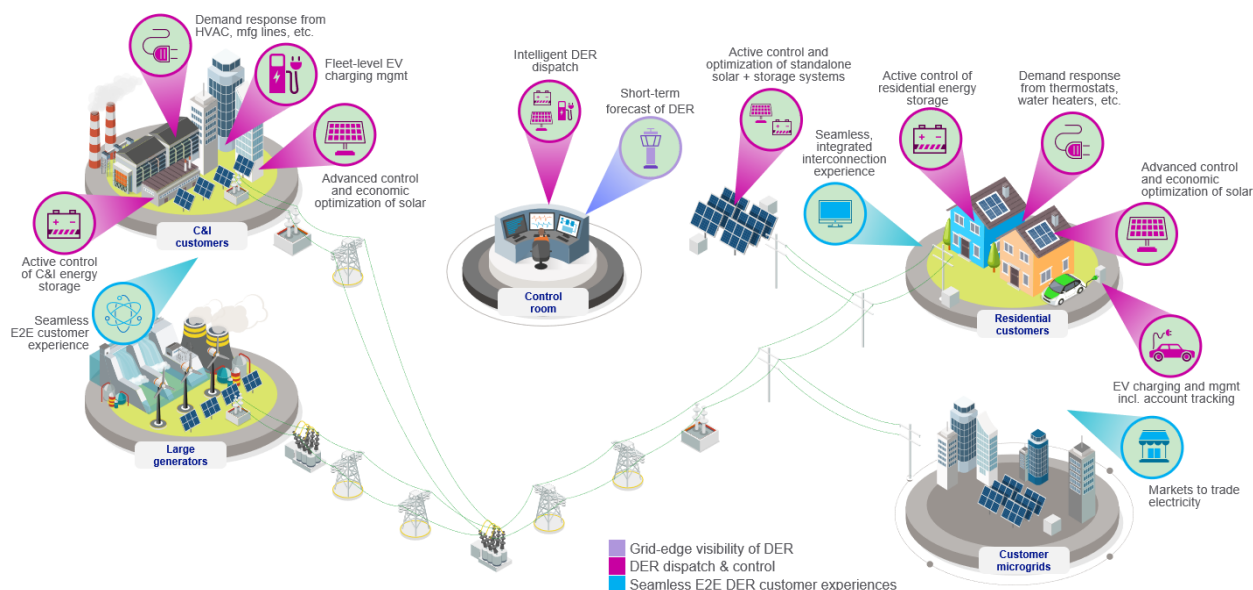


Figure 2. National Grid's Future DER Management through its DERMS Platform

FIRST WAVE OF PRODUCTS:

Over the next five years, the Company plans to launch prioritized DERMS products within CY22 to CY25 to deliver early DER management capabilities that will begin a phased implementation of the DERMS Platform using agile principles. As an outcome of the Company's DERMS roadmap assessment the Company has chosen to prioritize the following products that are not currently addressed by ongoing projects or previously proposed filings, and that most efficiently and timely deliver value to customers based on current regulatory commitments and challenges faced by customers:

DERMS Product	DERMS Product Description
Wave 1:	
Advanced Short-term forecasting including DERs	The solution that integrates data from different sources to predict short-term load and supply on the distribution system in real-time inclusive of DER impacts
Centralized DER dispatch engine	Economic dispatch solution for DER that co-optimizes DER dispatch based on financial factors and physical grid needs
Grid edge control	Manage requests from utility systems to dispatch DERs, aggregate as needed, and transmit through DER dispatch signals

The Company is proposing early investments in Wave 1 products of its DERMS Platform roadmap to accelerate capabilities to forecast DER impacts on the distribution system, to support control center operations, and the ability to dispatch and control DER based on real-time SCADA measurements and later through system needs identified by an ADMS load flow analysis. These investments will support numerous use cases that enable near-term customer value such as enabling non-wire alternative projects to defer specific system infrastructure upgrades, advancing the use of demand response and load flexibility for grid services,

optimizing the dispatch of energy storage facilities to address system constraints and increasing DER enablement through innovative interconnection solutions.

Wave 2:	
Market platform	Control application that sends price signals to customers to indirectly modulate DER output or usage and a platform that facilitates the trading of energy services between all stakeholders (prosumers, aggregators, utility, etc.) such as through a distribution-level market

Later investments in Wave 2 of the Company’s DERMS Platform roadmap drive capabilities to improve market opportunities for DER and improved integration with wholesale markets once other dependencies such as Advanced Metering Infrastructure (AMI) deployment and ADMS implementation have progressed. Wave 1 products focused on forecasting system needs and implementing DER dispatchability will also enable new markets and enhance the ability of the Company to engage with DER through grid services.

DEVELOPMENT FRAMEWORK:

The Company plans to develop each product using the following high-level framework:

1. Define a minimum viable product (MVP) based on customer and user research, technical and operational feasibility assessment, hypotheses and assumptions validated, and business case as an outcome of product validation from the DERMS Investigation effort or earlier work completed by the Company.
2. Develop a detailed MVP procurement, design, and implementation plan covering a limited operational area within the Company’s service territory based on the Company’s assessment to build or buy specific components of the product solution.
3. Implement and test the MVP to validate customer value and further validate hypotheses and assumptions.
4. Rapidly iterate the MVP design (e.g. Alpha, Beta versions) to achieve the desired outcomes
5. Transition to full-scale product deployment and evolve product features over time through customer feedback and evolving regulatory needs, market dynamics, and technological advancement in DER and DER management solutions.

CONCLUSION

Soon electric utilities will be connected to millions of customers' devices through households and businesses. It is for this reason that utilities must continue to implement critical, foundational investments across their distribution system to unlock advanced capabilities to monitor and control such devices to prepare for a new reality where power and data flow in two directions. Utilities need to find new ways to implement key technological solutions rapidly. Technological deployments must be simplified and expedited without any increase of risk to safety or impact on system reliability. Utilities must continue to look for ways to introduce agility into their working methods. DERMS is one of the key technologies such methods are likely to be successful.