THE NON-WIRES SOLUTIONS IMPLEMENTATION PLAYBOOK

A PRACTICAL GUIDE FOR REGULATORS, UTILITIES, AND DEVELOPERS

BY MARK DYSON, JASON PRINCE, LAUREN SHWISBERG, AND JEFF WALLER

ABOUT US

ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

AUTHORS & ACKNOWLEDGMENTS

AUTHORS

Mark Dyson, Jason Prince, Lauren Shwisberg, Jeff Waller

** Authors listed alphabetically. All authors from Rocky Mountain Institute unless otherwise noted.*

CONTACTS

Jason Prince, **jprince@rmi.org**
Jeff Waller, **jwaller@rmi.org**

SUGGESTED CITATION

Prince, Jason, Jeff Waller, Lauren Shwisberg, and Mark Dyson. *The Non-Wires Solutions Implementation Playbook: A Practical Guide for Regulators, Utilities, and Developers.* Rocky Mountain Institute, 2018. **http://www.rmi.org/insight/non-wires-solutions-playbook/**

Images courtesy of iStock unless otherwise noted.

ACKNOWLEDGMENTS

The authors would like to extend special thanks to the following organizations for their contributions to this work:

UNITED STATES CLIMATE ALLIANCE

US Climate Alliance

WSGR
Wilson Sonsini Goodrich & Rosati
PROFESSIONAL CORPORATION

Wilson Sonsini Goodrich & Rosati

The authors also thank the individuals from the following organizations, among others, who contributed their time, perspectives, and expertise to this work:

Avangrid
California Efficiency and Demand Management Council
California Energy Storage Alliance
California Public Utilities Commission
ConEdison
Consumers Energy
DC Department of Energy and Environment
Duke Energy
Enbala
Eversource Energy
Fluence
Great River Energy
Green Mountain Power
Grid Lab
Grid Policy
GridSolar
Hawaii Public Utilities Commission
Hawaiian Electric Company
Key Capture Energy
Liberty Utilities
Long Island Power Authority
National Grid
Navigant
Nest
New Energy Advisors
New York Department of Public Service
Office of the Governor, New York State
New York Power Authority
Newport Consulting Group
Pacific Gas & Electric
Regulatory Assistance Project
Rhode Island Office of Energy Resources
Southern California Edison
Stoel Rives LLP
Strategen
Sunrun
Tendril
Vote Solar
Wood Mackenzie

TABLE OF CONTENTS

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The dynamics of today's electric grid do not ensure that energy is efficiently distributed or that capital is efficiently allocated. Increasingly, portfolios of distributed energy resources (DERs)—also known as non-wires solutions (NWS)—can address these current inefficiencies by solving grid needs more cost-effectively than business-as-usual approaches to traditional infrastructure investment.

NWS are applications of DERs in specific locations that defer or eliminate an investment in traditional and costlier "wires-and-poles" infrastructure. In addition to deferring or avoiding more expensive traditional investments and providing reliable electric service, NWS can deliver ratepayers cost savings and support the integration of smart, customer-centered technologies that promote a cleaner, more flexible, and more resilient grid. However, despite these clear benefits, three key barriers have hampered widespread non-wires solution deployment: regulatory environments are not appropriately designed to encourage NWS, utility standard operating procedures do not systematically consider NWS, and procurement practices need to be refined to more effectively source NWS.

To help overcome these barriers and capture the compelling benefits NWS can provide, Rocky Mountain Institute created this *Non-Wires Solutions Implementation Playbook* to delineate innovative approaches to spur non-wires solution adoption and recommend planning and operational strategies to improve non-wires solution processes.

Utility investment in distribution infrastructure is big business

Since 2006, regulated utilities across the US have invested $55 billion each year, on average, in distribution, transmission, and generation infrastructure.[1] Historically, distribution infrastructure has represented the greatest share of utilities' expenditures as utilities seek to maintain and modernize extensive last-mile networks to serve hundreds of millions of electricity end-users.

Utilities have an incentive to make these investments because they are entitled to earn a regulator-approved rate of return on the capital expenditures that are included in their rate base (e.g., power plants, distribution lines, transformers). Even as electricity sales and peak demand have stayed flat in recent years, utility investments added to the rate base have increased. The rising ratio of utility distribution assets per customer raises concerns that rates may increase as the cost of distribution investments are passed through to customers for years to come.[2] To mitigate this risk, it is critical that grid investment decisions are prudent and result in the most cost-effective solutions.

Distributed energy resources can be used as non-wires solutions to save ratepayers money

Utilities and regulators can adapt existing planning processes in order to consider all possible solutions when making investments to address grid needs. Specifically, by taking advantage of the proliferation of distributed energy resources (DERs) and energy management software solutions, planning processes can ensure grid services are provided by the most cost-effective options, and provide safe, reliable electric service for customers.

For the purposes of this report, we define DERs to include the range of demand- and supply-side software and hardware resources that generate electricity or control loads and can be deployed throughout low-voltage electric distribution systems to meet energy and reliability needs. Common demand-side DERs include energy efficiency measures that reduce loads, and demand response mechanisms to regulate loads by generating electricity or otherwise reducing demand. Typical supply-side DERs are distributed generation technologies like rooftop or community-scale solar PV and combined heat and power systems. Energy storage resources like batteries are DERs that can act as both demand- and supply-side resources by serving as either load or generation as needed. Any of these DERs can be installed on the customer or utility side of the meter, and can be owned by the user, a third party, or the utility. When DERs are used to solve grid needs that would have otherwise required traditional utility infrastructure, they can be considered non-wires solutions (NWS). NWS are applications of DERs in specific locations that defer or eliminate an investment in traditional and costlier "wires-and-poles" infrastructure. NWS have also been called non-wires alternatives (NWA), which implies that they will be evaluated as alternatives to wires-and-poles infrastructure. In contrast, the terminology of "non-wires solutions" institutionalizes NWS as part of the utility's standard solution toolkit, indicating that they should be considered as part of a basic set of options.

Non-wires solutions provide a host of benefits and should be a key component of innovative distribution planning processes

States and utilities can incorporate NWS into distribution-level grid modernization and integrated planning efforts that are increasingly taking place across the nation. In addition to cost savings, the effective integration of NWS into planning processes can help capture the range of benefits that DERs and NWS provide, including:

- Ratepayer cost savings
- Flexibility for planning processes
- Progress toward clean energy goals
- Opportunities to test new utility business models
- Local economic development
- Job creation

To scale NWS several important market barriers must be addressed

Despite these myriad benefits, markets for NWS remain nascent. Although utilities across the nation spend tens of billions of dollars each year on distribution infrastructure, only a few have pursued NWS at scale. This sluggish uptake is due to a number of barriers, including:

- Regulatory frameworks that do not always encourage NWS
- Limited utility processes and expertise around NWS
- Limited procurement experience, which inhibits competitive non-wires solution proposals

Compounding these barriers, there is a need for coordination between four key sets of stakeholders to support NWS market development. Legislators, regulators, utilities, and developers have the opportunity to take on distinct—and overlapping—roles and responsibilities to establish, cultivate, and guide the NWS market. Legislatures can choose to play a key role in the earlier stages of NWS market development, but collaboration from the other three stakeholder groups is critical throughout the entire NWS life cycle.

This Implementation Playbook can help overcome barriers and scale the NWS market

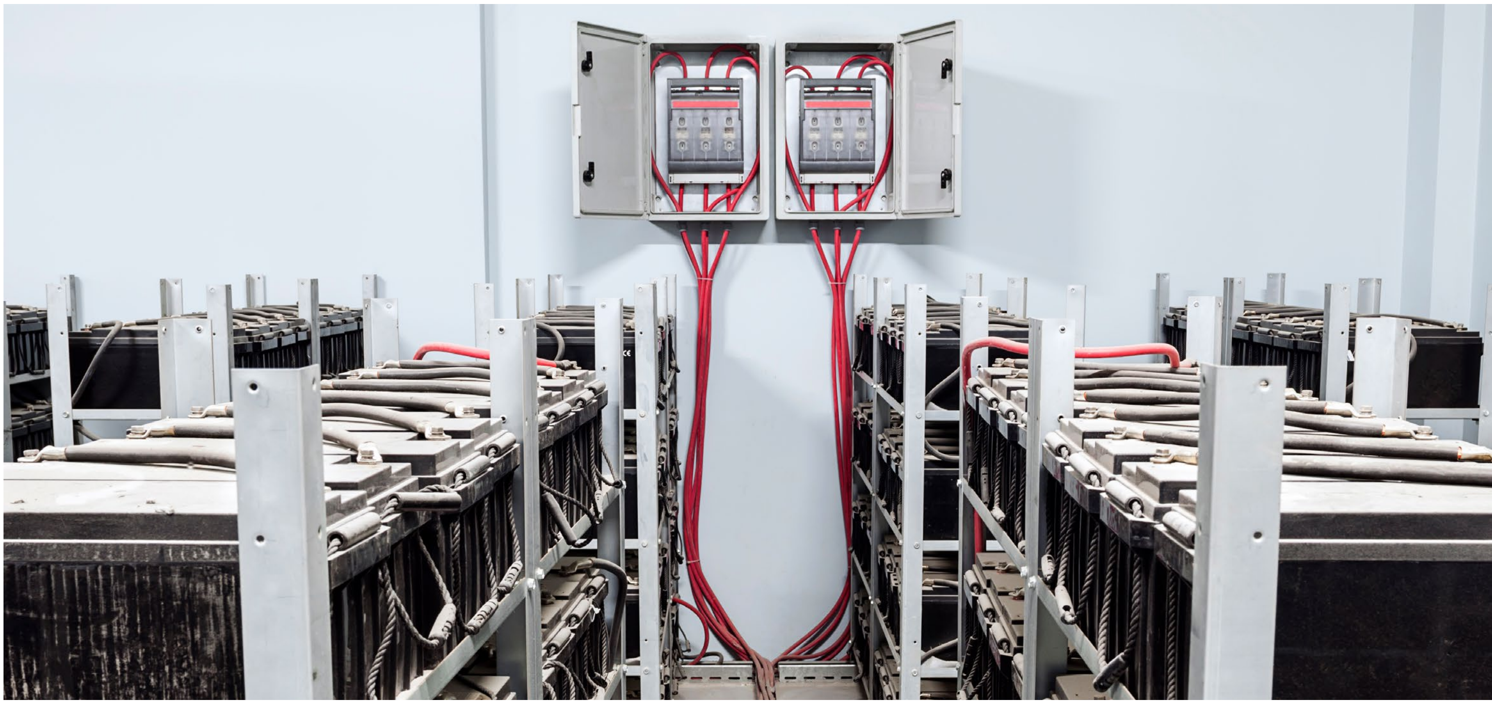
This Playbook seeks to address the barriers to NWS and catalyze deployment across the nation. It draws upon interviews conducted with more than 65 experts across 15 states, including over 20 utilities, as well as developers, regulators, and trade associations. The intent is to provide a common set of recommendations that any jurisdiction can build upon to directly implement and scale NWS.

The Playbook is composed of two sections: (1) a best practice framework and (2) implementation guidelines. The first section details best practices that underpin the three key elements that are critical for creating and sustaining successful NWS programs: establishing a supportive regulatory environment, integrating NWS into standard utility operating procedures, and creating a holistic process for NWS procurement. While the Playbook cites many examples drawn from NWS experiences in New York and California, the recommended best practices are applicable nationwide. Because every jurisdiction will need to adapt these recommendations to suit local circumstances, we provide guidance on how these recommendations can be applied in different contexts, including under different types of utilities: vertically integrated; wires-only; and consumer-owned and other nonprofit entities, such as cooperative and municipal utilities.

Section 2 provides practical implementation guidelines for the four key components underpinning non-wires solution implementation: screening criteria, competitive solicitation processes, evaluation frameworks, and contracting considerations.

The market for NWS is nascent but represents a promising opportunity for reducing customer costs and enabling a lower-carbon electricity grid. With the increase in spending on distribution infrastructure, there is a pressing need to turn to approaches like NWS to minimize the impact on customer bills. At the same time, NWS can unlock additional value from DERs while both reducing net system costs and promoting the cost-effective deployment of resources that are important for reducing CO_2 emissions.

Pursuing NWS today can help to further develop best practices, highlight the most valuable opportunities for non-traditional solutions, and prove the case for a more uniform, comprehensive market for NWS in the future. This report lays out best practices and provides practical guidance for developing key elements needed for implementation. It also highlights areas for future exploration as the market evolves. To further scale NWS by proving out the broader case for its application, there is a pressing need for more coordinated efforts to build on the lessons learned and find least-cost, best-fit solutions and processes that work across the wide variety of utilities and states that stand to gain.



THE SCALE OF THE NWS OPPORTUNITY IN A CHANGING GRID

Non-wires solutions can improve the system benefits of DER deployments to help realize savings of both dollars and emissions across the US

Directly capturing the distribution-level benefits (e.g., distribution capacity deferral value[3]) of DERs at the project level via a non-wires solution can improve system value of energy efficiency and demand flexibility measures by 30%, and battery storage by over 100%. In many cases, DERs are even cost-effective when only evaluated based on avoided generation costs. Using an average value of peak reduction for transmission and distribution,[4] we find that the additional, distribution-level avoided costs associated with the DER scenario are approximately $17 billion through 2030.

Additionally, increasing DER deployment can provide carbon emissions reductions via both direct and indirect mechanisms.[5] DERs can help realize direct carbon reductions by avoiding carbon-intensive electricity generation on the bulk power system, and can also enable indirect carbon savings by providing flexibility. As a conservative forecast, our analysis suggests that enabling distribution system revenue via NWS, scaled nationally, could avoid approximately 300 MT CO_2 over an assumed 20-year lifetime of DER assets.

INTRODUCTION

INTRODUCTION

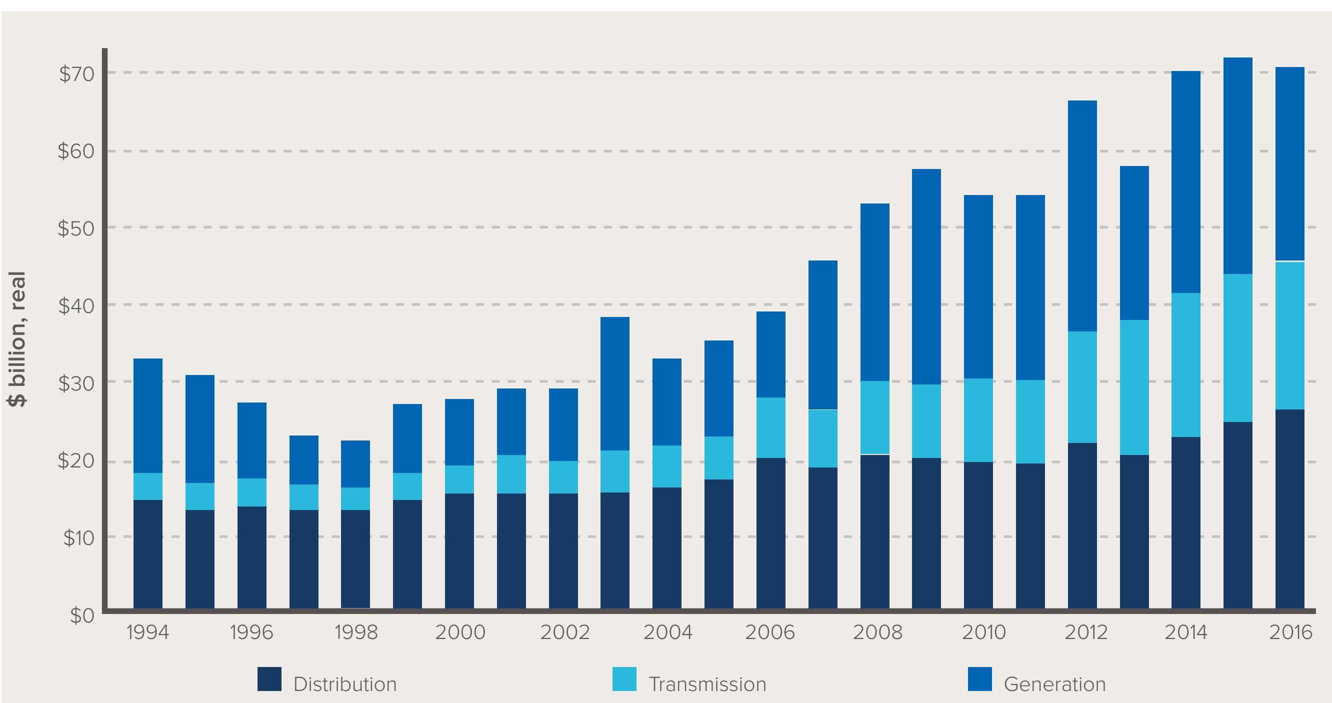
The dynamics of today's electric grid do not ensure that energy is efficiently distributed or that capital is efficiently allocated. Increasingly, portfolios of distributed energy resources (DERs)—known as non-wires solutions (NWS)—can address these inefficiencies by solving grid needs more cost-effectively than business-as-usual approaches to traditional infrastructure investment. NWS are applications of DERs in specific locations that defer or eliminate an investment in traditional and costlier "wires-and-poles" infrastructure solutions. In addition to ensuring deferring or avoiding these more expensive traditional investments and providing reliable electric service, NWS can deliver ratepayers cost savings and support the integration of smart, customer-centered technologies that promote a cleaner, more flexible, and more resilient grid. Despite these clear benefits, three key barriers have hampered widespread non-wires solution deployment: regulatory environments are not appropriately designed to encourage NWS, utility standard operating procedures do not systematically consider NWS, and procurement practices need to be refined to more effectively source NWS. To help overcome these barriers and capture the compelling benefits NWS can provide, Rocky Mountain Institute created this *Non-Wires Solution Implementation Playbook* to delineate innovative approaches to spur non-wires solution adoption and to recommend planning and operational strategies to improve non-wires solution processes.

Utility investment in distribution infrastructure is big business

Since 2006, regulated utilities across the US have invested on average $55 billion each year in distribution, transmission, and generation infrastructure.[6] Historically, distribution infrastructure has represented the greatest share of spending as utilities seek to maintain and modernize extensive last-mile networks to serve

FIGURE 1

US REGULATED UTILITY INVESTMENT

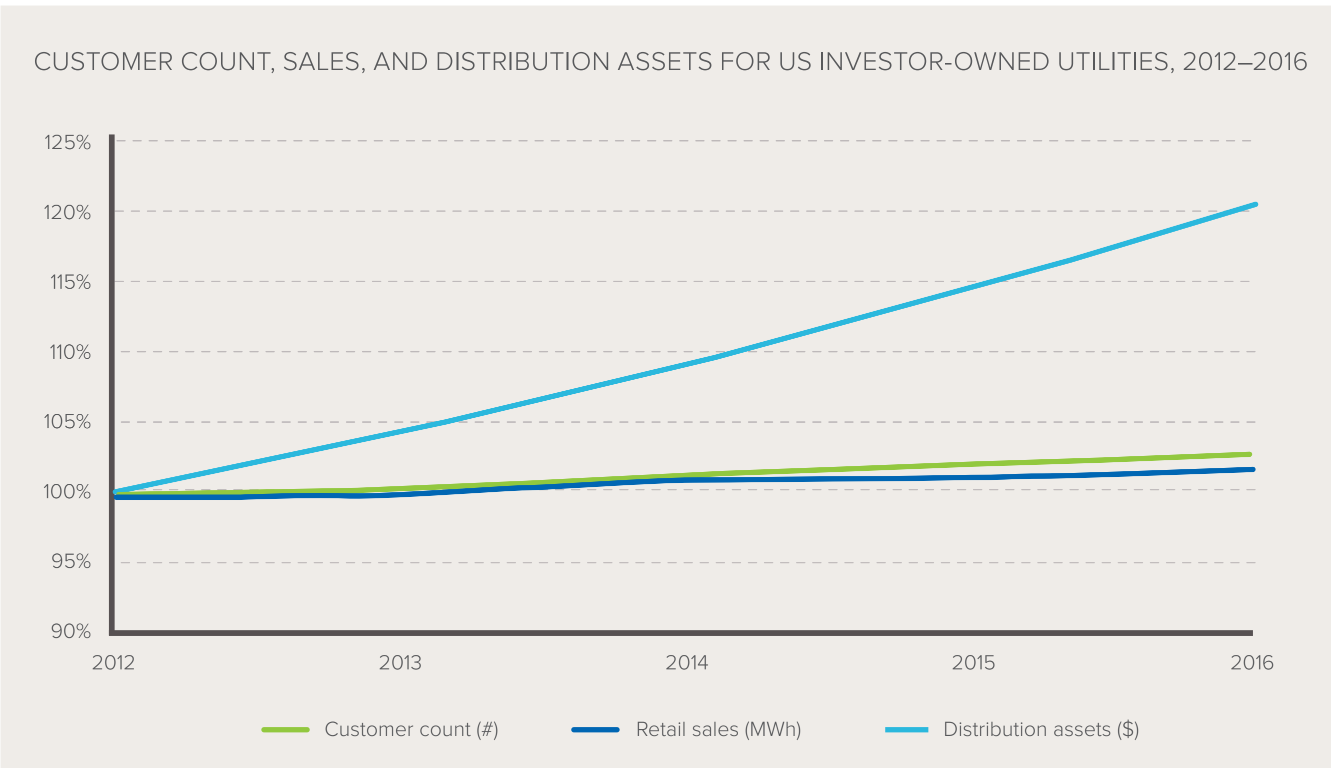


Source: RMI analysis of Bloomberg data

hundreds of millions of electricity end-users. Utilities have an incentive to make these investments because they are entitled to earn a regulator-approved rate of return on capital expenses (e.g., power plants, distribution lines, transformers) that are included in their rate base. In recent years, even as electricity sales and peak demand have stayed flat, utility investments included in the rate base have increased. The rising ratio of utility distribution assets per customer raises concern that rates may increase as the cost of distribution investments are passed through to customers for years to come.[7] To mitigate this risk, it is critical that grid investment decisions are prudent and result in the most cost-effective solutions.

FIGURE 2

INVESTOR-OWNED UTILITY DISTRIBUTION ASSETS PER CUSTOMER ARE INCREASING DESPITE STAGNATING ELECTRICITY CONSUMPTION (DATA NORMALIZED SO 2012=100)



Source: RMI analysis of S&P global data

Distributed energy resources can be used in non-wires solutions to save ratepayers money

Utilities and regulators can adapt planning processes to changing market dynamics and consider all possible solutions when making investments to address grid needs. Specifically, by taking advantage of the proliferation of distributed energy resources (DERs) and energy management software solutions, planning can ensure grid services are provided by the most cost-effective options, while ensuring safe, reliable electric service for customers.

For the purposes of this report, we define DERs to include the range of demand- and supply-side software and hardware resources that generate electricity or control loads and can be deployed throughout low-voltage electric distribution systems to meet energy and reliability needs. Common demand-side DERs include energy efficiency measures that reduce loads, and demand response mechanisms to regulate loads by generating electricity or otherwise reducing demand. Typical supply-side DERs are distributed generation technologies like rooftop or community-scale solar PV and combined heat and power systems. Energy storage resources like batteries are DERs that can act as both demand- and supply-side resources by serving as either load or generation as needed. Any of these DERs can be installed on the customer or utility side of the meter, and can be owned by the user, a third party, or the utility.

EXAMPLES OF DERs

- Responsive Building Equipment Controls (e.g., lighting sensors/controls, thermostats, water heater controls)
- Behavioral Demand Response (i.e., human responses to signals sent through various media)
- Energy Storage (e.g., battery, thermal, and others)
- Building Equipment Upgrades (e.g., lighting, HVAC equipment, or appliance replacements)
- Distributed Generation (various renewable and non-renewable resources)

When DERs are used to solve grid needs that would have otherwise required traditional utility infrastructure, they can be considered non-wires solutions (NWS). NWS are applications of DERs in specific locations that defer or eliminate an investment in traditional and costlier "wires-and-poles" infrastructure solutions. NWS have also been called non-wires alternatives (NWAs), which implies that they will be evaluated as alternatives to wires-and-poles infrastructure. In contrast, the terminology of "non-wires solutions" institutionalizes them as part of the utility's standard solution toolkit, implying that they should be considered as part of the default set of options.

Non-wires solutions provide a host of benefits and should be a key component of innovative distribution planning processes

In its 2018 state of the market reports for demand response and energy storage, the Smart Electric Power Alliance found that over half of the ~150 utilities surveyed were interested in NWS.[8] Catering to such growing interest, this playbook for non-wires solution implementation focuses on the application of NWS at the distribution-level, which is the largest utility capital investment category. Many of the recommendations presented here can be adapted for transmission-level projects, but distribution-level opportunities can be directly addressed by state actors such as public utilities commissions, and can avoid more complicated inter-state transmission investment issues associated with federal regulation.

Practically speaking, states and utilities can incorporate NWS into distribution-level grid modernization and integrated planning efforts that are increasingly taking place across the nation. A working group drawn from three national labs highlighted 16 state-driven efforts that are underway in response to the combination of increased penetration of DERs and aging grid infrastructure.[9] The North Carolina Clean Energy Technology Center also recently catalogued over 300 actions related to grid modernization pursued across 42 states and the District of Columbia solely during Q2 2018.[10] Using a range of approaches, these efforts provide a set of precedents that can be built upon to capture the many benefits that DERs and NWS provide, including:

- **Ratepayer cost savings:** Since NWS are typically pursued only if they are determined to be more cost-effective than alternative infrastructure options, they should therefore lead to lower costs for ratepayers.
- **Flexibility for planning processes:** Instead of investing in new infrastructure projects based on long-term, uncertain forecasts, planners can deploy modular, flexible non-wires solution portfolios when and where they are needed. This mitigates the risk that large investments will become stranded if load growth doesn't materialize as forecasted and provides a time-value-of-money benefit since more significant expenditures can be delayed until needs are realized.
- **Progress toward clean energy goals:** NWS projects deliver value by deferring or eliminating the need for traditional infrastructure. By stimulating demand and increasing the adoption of low-carbon resources like energy efficiency and demand response, NWS reduce the need for marginal, more carbon-intensive generation (see The Scale of the Non-Wires Solution Opportunity in a Changing Grid on page 16).
- **Opportunities to test new utility business models:** Utilities can use NWS to experiment with new ways of engaging with their customers and innovative technology companies. As utilities adapt to a changing set of consumer preferences, NWS can provide an opening to partner with customers and create DER programs that improve customer satisfaction and reduce the probability of ratepayer defection.
- **Local economic development:** Rather than deploying traditional utility-owned infrastructure, NWS can provide opportunities for local investment in communities where customer-sited solutions can address grid needs.
- **Job creation:** Whereas traditional infrastructure equipment markets are mature, non-wires solution projects support the animation of DER markets

in which rapid innovation is unlocking significant potential for new job growth.

To scale NWS several important market barriers must be addressed

Despite these significant benefits, markets for NWS remain nascent. Although utilities across the nation spend tens of billions of dollars each year on distribution infrastructure, only a few have pursued NWS at scale. This slow uptake is due to a number of barriers, including:

Regulatory frameworks that do not always encourage NWS

- Traditional cost-of-service utility regulation incentivizes capital investment in grid infrastructure, thus discouraging cost-saving NWS.
- Distribution planning processes have historically been opaque, making it difficult for regulators and market participants to identify and develop alternative solutions to address utility grid needs.

Limited utility processes and expertise around NWS

- At most utilities, institutional capabilities are not yet sufficient to effectively and systematically plan for, procure, and manage NWS.
- Utilities do not currently have enough readily available data to verify performance of demonstrated DER capabilities in non-wires solution applications.

Limited procurement experience, which inhibits competitive non-wires solution proposals

- Without clear standards, it is challenging for utilities and developers to efficiently work together through non-wires solution procurement processes.
- Additional clarity is needed on the nature of grid needs and the criteria utilities use to evaluate bids in order for developers to produce more competitive offers.
- Cost and deployment timelines may still limit non-wires solution competitiveness in certain contexts.

This Implementation Playbook can help regulators and utilities overcome barriers to NWS and scale the market

This Playbook seeks to address barriers to NWS and catalyze non-wires solution deployment across the nation. It draws upon interviews conducted with more than 65 experts across 15 states, including over 20 utilities, as well as developers, regulators, and trade associations.

Our intent is to provide a common set of recommendations that any jurisdiction can build upon to directly implement and scale NWS. The Playbook is composed of two sections:

Section 1: Best Practices

An in-depth discussion of best practices for the three enabling factors that are critical for non-wires solution implementation:

1. Establish a supportive **regulatory** environment
2. Integrate NWS into standard **utility** operating procedures
3. Employ a holistic process for non-wires solution **procurement**

Section 2: Implementation Guidelines

Practical implementation guidelines for the four key components underpinning non-wires solution implementation:

1. **Screening criteria** to identify potential non-wires solution projects
2. **Competitive solicitation** processes that lead to meaningful responses
3. **Evaluation frameworks** to determine if non-wires solution projects are viable and competitive
4. **Contract terms** attuned to non-wires solution project characteristics

As with all effective practices, non-wires solution processes are likely to evolve as lessons are learned from non-wires solution procurement and implementation. Despite the US market only representing ~2 GW of non-wires solution capacity at different stages of development as of April 2017, there is significant opportunity for rapid acceleration of non-wires solution deployment as utilities and regulators adopt and standardize best practices.[11]

THE SCALE OF THE NON-WIRES SOLUTION OPPORTUNITY IN A CHANGING GRID

Non-wires solutions can both increase the value of DERs deployed on the grid and increase the achievable market size for DERs by expanding revenue streams available to these resources. By expanding the cost-effective market size for DERs, NWS can lead to significant direct and indirect carbon emissions savings. At a national scale, we conservatively estimate that NWS could increase the achievable market size for DERs by approximately 6%, and lead to CO_2 reductions of nearly 300 million tons over the next 20 years.

Non-wires solutions can improve the system benefits of DER deployments and help realize over $17 billion in additional net present value from DERs through 2030 across the US

Directly capturing the distribution-level benefits (e.g., distribution capacity deferral value[12]) of DERs at the project level via a non-wires solution can dramatically increase the system value of DERs. In light of the disparity in avoidable costs across distribution systems noted by other analysts,[13] and the corresponding difficulty in assigning a single value to distribution benefits, we instead highlight a few examples where NWS or similar programs that capture value from avoided costs on the distribution system can significantly improve the benefits available from DER deployment.

- **Energy efficiency:** In a regulatory filing from National Grid in Massachusetts,[14] the utility lays out the total resource cost-benefit ratio for a wide range of energy efficiency programs. Including the utility's estimated distribution-level benefits in the cost-effectiveness calculation improves the average cost-benefit ratio by a savings-weighted average of 31%, compared to excluding distribution-level benefits from the cost-effectiveness calculations.
- **Demand flexibility:** RMI's 2018 study on demand flexibility technologies assessed the cost-effectiveness of eight different control strategies for reducing peak demand and lowering energy costs at the bulk system level.[15] We estimated the size of a least-cost portfolio of these strategies where the investment in the demand flexibility technologies was at cost parity with new gas-fired power plants to balance renewables, without accounting for distribution benefits. When we included distribution system benefits in the calculation, we found that the size of the demand flexibility portfolio was 32% greater than the scenario in which distribution benefits were excluded.
- **Batteries:** RMI's 2015 study examining the economics of battery storage across four different use cases examined the value of a fleet of batteries providing peak reduction services in the Brooklyn–Queens Demand Management non-wires solution project in New York.[16] In that case, including the distribution system benefits associated with battery deployment (i.e., the avoided costs of the substation upgrade in question) increased project revenue and system

value by over 100%, more than doubling the total value that would otherwise be delivered by the batteries providing wholesale market- and customer-facing services.

Even if DERs are cost-effectively deployed without directly addressing distribution-level avoided costs, the total system benefit provided by DERs can increase significantly when we consider those distribution benefits. For example, a recent RMI study examined the potential for a portfolio of DERs and utility-scale renewables to cost-effectively replace retiring fossil generation and avoid new investment in gas-fired generation.[17] The report examined a business-as-usual scenario in which new gas capacity replaces retiring capacity, as well as a clean energy scenario in which DERs and renewables replace most retiring capacity. Without valuing any distribution-level benefits of DERs, the scenarios are approximately equal in total present value costs; however, when valuing the avoided distribution-level costs at an average value of peak reduction,[18] the additional avoided costs associated with that level of DER deployment is approximately $17 billion through 2030. In other words, by capturing the distribution-level peak reduction and other benefits associated with an already cost-effective deployment level of DERs, non-wires solution projects that target DER deployment in areas of grid need can provide an additional $17 billion in value to the grid through 2030 by avoiding investment and upkeep of traditional distribution assets.

Non-wires solutions can unlock higher levels of DER deployment, offering significant carbon emissions reductions

Increasing DER deployment can provide carbon emissions reductions via both direct and indirect mechanisms.[19] DERs can help realize direct carbon reductions by avoiding carbon-intensive electricity generation on the bulk power system, either through line loss reduction, energy savings from efficiency measures, load shifting, or distributed generation from low-carbon sources. RMI's 2018 study examining the market size for clean energy portfolios found that a 1% increase in assumed DER adoption from the base case would directly reduce emissions through 2030 by 37 MT CO_2[20]—approximately equivalent to the total lifetime emissions from a new-build 1,000 MW combined-cycle gas turbine.

DERs can also enable indirect carbon savings by providing flexibility, thus reducing curtailment from and incentivizing investment in low-cost, zero-carbon, but variable energy resources like wind and solar. RMI's study on the potential impacts of demand flexibility found that shifting load can increase wind and solar energy project revenue by nearly 40%, incentivizing further investment in these resources in the long run.[21] Scaling the results of that Texas-focused study to represent national electricity consumption patterns, we found that for every 1% increase in demand flexibility deployment compared to the base case, 20-year CO_2 emissions fell by 11 MT CO_2, equivalent to 30% of the direct impacts.

While it is clear that the potential to reduce CO_2 through DER deployment is large, it is difficult to forecast the total magnitude by which NWS can increase deployment of DERs. As a conservative forecast, we evaluated the extent to which valuing the distribution-scale benefits of DERs would increase the cost-effective magnitude of deployment for both energy efficiency (using National Grid's 2016 filing noted above) and demand flexibility (using the supply curves presented in RMI's 2018 study). We find that increased cost-effective DER deployment and demand flexibility, enabled by valuing distribution benefits via NWS, would lead to approximately 6% greater CO_2 savings compared to the case in which distribution benefits are not valued in cost-benefit analysis. Combining that finding with the sensitivity analysis described above suggests that enabling distribution system revenue via NWS, scaled nationally, could avoid approximately 300 MT CO_2 over an assumed 20-year lifetime of DER assets.

This estimate is likely conservative, as flattening cost declines in efficiency, demand response, storage, and distributed generation will extend the supply curves for these technologies, leading to greater impact from the incremental value streams provided by NWS and correspondingly higher deployment levels. Opening up further opportunities for NWS, and thus DER deployment, by making them a common planning option can compound the impact, allowing for additional avoided costs and further scaling of carbon savings from DERs.

BEST PRACTICE FRAMEWORK

We have identified three key elements that are critical for creating and sustaining successful NWS programs: establishing a supportive regulatory environment, integrating NWS into standard utility operating procedures, and creating a holistic process for non-wires solution procurement. Each element is underpinned by a series of best practice recommendations listed below, which, in the aggregate, create the necessary conditions to support the full life cycle of non-wires solution deployment.

1. **Establish a supportive regulatory environment.** The regulatory environment, including rulings, precedents, and ongoing processes, is instrumental for enabling a scalable market for NWS in a particular jurisdiction. The regulatory framework at its best can elicit flexible responses from utilities and solution providers to ensure reliability and meet cost-reduction goals, without being overly prescriptive.

   Experience from non-wires solution projects across the US suggests that a supportive regulatory environment for NWS can:

   a. **Leverage the legislature** to drive systematic consideration of NWS
   b. **Provide an appropriate incentive structure** to encourage utilities to pursue non-wires solution projects
   c. **Clarify screening and evaluation criteria** to efficiently identify and assess non-wires solution opportunities
   d. **Enable data transparency** and access for solution providers
   e. **Encourage DER forecasting** to identify potential low-cost NWS that could take advantage of organically adopted DERs
   f. **Support collaborative stakeholder processes** to allow for input into non-wires solution processes from all interested and affected stakeholders

2. **Integrate NWS into standard utility operating procedures.** Processes and organizational structures within utilities can either facilitate or act as barriers to non-wires solution-oriented planning and procurement. Advanced utility processes can allow for the fair comparison of NWS against traditional solutions and encourage the effective engagement of external market

participants to best meet regulatory and utility-level objectives.

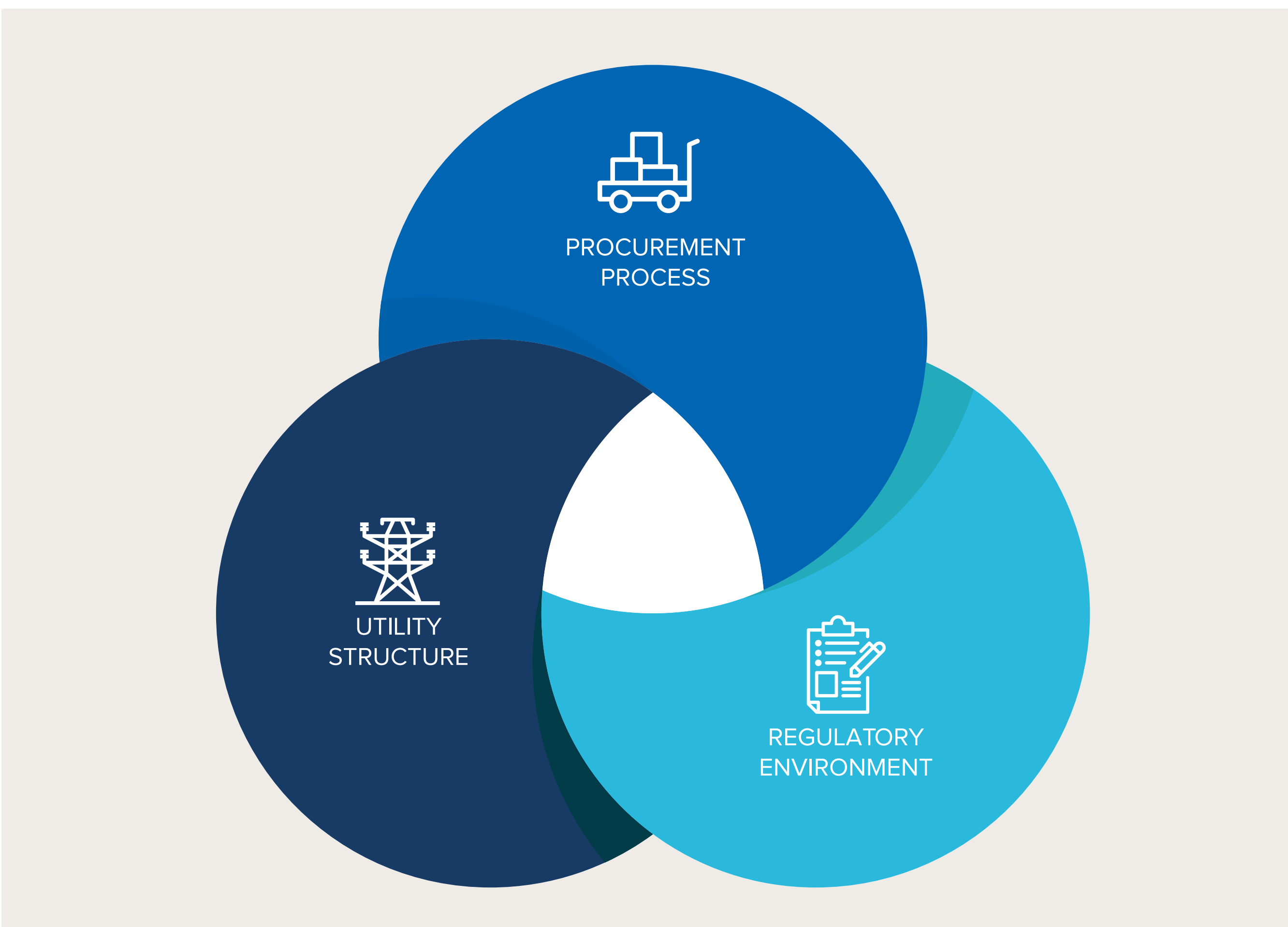
Utility experience in non-wires solution projects suggests that a well-designed set of organizational processes within a utility can:

a. **Consolidate accountability for non-wires and traditional solutions** within a single interdisciplinary utility team to facilitate fair assessment between different approaches
b. **Allow for both utility- and provider-led integration** of diverse technologies to meet grid needs
c. **Scale successful non-wires solution pilots to full deployment** in order to maximize learning and provide the greatest economic benefit

3. **Employ a holistic process for non-wires solution procurement.** Well-designed procurement practices can help ensure that opportunities to offer solutions are made available to the market in an efficient and fair manner that enables effective proposal development.

FIGURE 3

BEST PRACTICE FRAMEWORK



Utility and solution provider experience suggests that procurements should consider the range of options for sourcing NWS, including pricing and expansion of customer programs in addition to dedicated procurement via competitive solicitation. Since competitive solicitations have long been a predominant sourcing mechanism used for non-wires solution projects, this Playbook focuses on two key sets of recommendations to improve solicitation practices:

1. **Process enhancements** for the methods and interactions by which non-wires solution solicitations are developed:
    a. **Engage developers and other stakeholders** throughout the procurement process
    b. **Consider the role of third parties** in procurement

2. **Best-fit technical approaches** for developing the content of a request for proposal (RFP) to maximize the probability for technically feasible and cost-competitive results:
    a. **Provide data-rich needs descriptions** for the solutions being requested
    b. **Elaborate performance attributes for solutions** rather than technology requirements
    c. **Provide clear proposal evaluation criteria** as part of the solicitation
    d. **Keep options open for further DER market evolution,** including wholesale market participation and/or distribution-level service pricing
    e. **Lay out clear requirements in project contracts** to fairly allocate risk and ensure operational reliability

To address all of the recommended best practices for non-wires solution implementation, involvement is needed from four key stakeholders: legislators, regulators, utilities, and developers. As illustrated in Figure 5 on pages 22–23, these four entities have distinct—and overlapping—roles and responsibilities to establish, cultivate, and guide the non-wires solution market. Whereas the legislature's role is primarily in the earlier stages of this market's development, the other three stakeholder groups are expected to collaborate throughout the entire non-wires solution life cycle.

This Playbook's recommended best practices can be implemented in any utility context

The first section of this Playbook provides a detailed discussion of recommendations that each stakeholder group can adopt to implement the three core elements of the best practices framework for non-wires solution programs: a supportive regulatory environment, NWS integrated into utility operations, and holistic solicitation processes. Since every jurisdiction will need to adapt these recommendations to most appropriately suit their local circumstances, following the discussion of each of the three best practice elements is a table that describes key considerations for implementing the framework recommendations across three archetypical market structures:

- Vertically integrated investor-owned utilities (VIUs): VIUs own transmission, distribution, generation, and billing, and traditionally earn a regulated rate of return on prudently invested capital.
- Investor-owned utilities in restructured states (wires-only utilities): Wires-only utilities own distribution assets (not generation) and also earn a regulated rate of return based on their cost of service.
- Consumer-owned and nonprofit utilities: Consumer-owned and other nonprofit utilities are typically not regulated by state agencies but are overseen by member boards or city councils. Cooperative and municipally owned utilities (co-ops and munis) are among the most common of this type and are run by and for members of a community, or by a municipality. Federal power marketing agencies

like Bonneville Power Administration and Joint Power Authorities composed of a collection of municipalities also fall in this category as they are nonprofit and not regulated by state public utilities commissions. For the purposes of this report, we focus on the specific characteristics of co-ops and munis while recognizing the applicability of NWS to a broader set of nonprofit utility types.

FIGURE 4

THREE ARCHETYPAL UTILITY MARKET STRUCTURES

VERTICALLY INTEGRATED UTILITY	WIRES-ONLY UTILITY	CONSUMER-OWNED AND NONPROFIT UTILITIES
Vertically integrated utilities (VIUs) have a monopoly over electricity generation, transmission, distribution, and billing. In some vertically integrated states, customers may be able to choose their retail provider. Regulatory agencies oversee all VIU investments and costs. The VIU's capital and non-capital investment decisions are driven by what regulators allow them to include in their rate base and the permitted rate of return on those investments.	In states with restructured electricity markets, generation, transmission, and distribution are unbundled, and customers may be free to purchase from any suppliers on the grid. Utilities purchase electricity from generation companies via market mechanisms (such as power exchanges), which are typically conducted by independent system operators. Wires-only utilities do own distribution infrastructure, from which they earn regulated returns. Like VIUs, these investment decisions are overseen by regulators.	Unlike VIUs and wires-only utilities, consumer-owned and nonprofit utilities do not seek to earn a return for shareholders. Still they must have sufficient capital to support operations, maintain infrastructure, and invest in new initiatives. Co-ops operate on a not-for-profit basis and are owned by their members. Generation and transmission (G&T) co-ops provide electricity to distribution co-ops through their own generation or by purchasing power on behalf of distribution members. Many distribution co-ops face restrictions that limit how much generation they can own. Decisions are overseen by boards composed of members. Municipal utilities also operate on a not-for-profit basis and are owned and operated as city-operated agencies. Revenues are collected by the municipality, and can be subject to city council budgets and trade-offs with other city costs. Decisions are overseen by the city government.

FIGURE 5

NWS ROLES AND RESPONSIBILITIES

Group is engaged

	ROLES & RESPONSIBILITIES	LEGISLATURE	REGULATORS	UTILITY	DEVELOPERS
PHASE 1 Creating a hospitable environment for non-wires solutions	**Define a vision.** Who determines the vision for pursuit of non-wires solutions in a given jurisdiction?	**Articulates** a vision by introducing bill that supports new procurement practices	**Initiate** a proceeding to support vision development and implementation of non-wires solutions	**Expresses** goals for implementation and how the non-wires solutions support their business	**Ongoing** role in stakeholder engagement processes
	Develop incentives. Who is responsible for creating and defining the incentives?	**Provides** impetus for non-wires solutions incentives through legislation	**Develop** the appropriate incentive structure for non-wires solutions	**Engages** in developing the incentive framework for non-wires solutions or proposes incentives to regulators	
	Consider projects systematically. Who ensures that non-wires solutions are consistently considered as part of the utility planning process?	**Mandates** that utilities consider non-wires solutions that meet prescribed criteria	**Define** the process for how non-wires solutions projects are considered	**Establishes** internal processes for consideration of non-wires solutions	
PHASE 2 Identifying non-wires solutions opportunities	**Identify screening criteria.** Who designs the screening criteria for non-wires solutions?		**Define** the process for determining the criteria for identification of non-wires solutions	**Refines** screening criteria for particular circumstances	
	Share data. Who decides what utility data is made available?		**Define** requirements and process for sharing data to support development of non-wires solutions	**Ensures** data is collected and shared to enable non-wires solutions while maintaining customer and data security	

Table is continued on the next page

FIGURE 5 (CONTINUED)

Group is engaged

	ROLES & RESPONSIBILITIES	LEGISLATURE	REGULATORS	UTILITY	DEVELOPERS
PHASE 3 Developing and executing the procurement	**Scope the procurement.** Who determines needs and opportunities for non-wires solutions?		**Facilitate** project development, including approvals, cost recovery decisions, and process oversight (ongoing)	**Determines** needs and opportunities with data-based problem descriptions	**Propose** new and refine existing needs based on utility and other data
	Identify applicable technologies. Who determines what technologies are appropriate solutions to meet identified needs?			**Defines** solutions to be technology-agnostic and performance-based	**Propose** technologies and portfolios of solutions that can most effectively address needs
	Integrate technology portfolio. Who determines the appropriate technological solutions to meet the need identified?			**Integrates** portfolio of solutions to meet need	**Integrate** portfolio of solutions to meet need through contract with utility
	Determine asset ownership. Who owns the project? Are there any regulatory restrictions or requirements?			**Owns** some or all of the components in a non-wires solutions portfolio	**Own** some or all of the components in a non-wires solutions portfolio
PHASE 4 Implementing non-wires solutions	**Oversee operations and dispatch.** Who directs the operations of the project?			**Directs** project operations to meet needs and controls owned assets	**Control** assets under contract per utility terms, instructions, and signals
	Manage performance. Who assumes project performance risk?			**Assumes** risk for ultimate grid reliability and performance risk outlined in third-party contracts	**Accept** contracted performance risk associated with assets owned and contracted to utility
	Administer measurement and verification. Who is responsible for ongoing measurement and verification?			**Requires** and conducts specific measurement and verification practices to collect operational data	**Perform** ongoing measurement and verification to demonstrate performance per contract terms

01 SECTION 1: BEST PRACTICES

BEST PRACTICES

1. ESTABLISHING A SUPPORTIVE REGULATORY ENVIRONMENT

With few exceptions, almost all non-wires solution projects and programs developed to date have been driven by regulatory action. Regulators can play several key roles in reducing barriers and accelerating non-wires solution deployment. To start, regulators can establish a vision for NWS within their jurisdiction and send clear signals to developers and utilities that NWS can be desirable, cost-effective alternatives to traditional infrastructure. In line with that vision, regulators can develop mandates or incentives that encourage utilities to systematically consider non-wires solution deployment. Regulators can also direct utilities to integrate consideration of NWS into existing planning processes or create a new independent entity to source non-wires solution opportunities. Once non-wires solution projects are identified, regulators can further encourage market growth by supporting transparent evaluation and approval processes for NWS.

a) Leverage the legislature to drive systematic consideration of NWS

In states where regulators may have limited statutory authority, state legislatures can take on a larger role in reducing market barriers for NWS. In fact, legislative bodies are often instrumental in articulating a state's vision for NWS. Legislatures can direct regulators or utilities to pursue NWS for reasons aligned with regulatory mandates (typically for just and reasonable rates, universal service, reliability, and safety), or in the interest of clean energy and other state environmental policy goals. Examples of legislatures that have initiated state action on NWS include:

- In 2006, the Rhode Island legislature passed the Energy Conservation, Efficiency, and Affordability Act, which mandated least-cost procurement and required non-wires solution consideration for system reliability investments in the distribution network.[22]
- In 2010, Maine passed its Smart Grid Policy Act that required DERs to be assessed to meet the goals of creating a more modern grid and reducing greenhouse gases.[23]
- Illinois's Future Energy Jobs Act from 2016 encourages deployment of cost-effective DERs to diversify the state's energy resource mix and protect its environment.[24]

b) Provide an appropriate incentive structure to encourage utilities to pursue non-wires solution projects

Markets with traditional cost-of-service regulation are not designed to motivate utilities to pursue NWS. Because they receive a rate of return on capital investments, utilities are incentivized to maximize spending on infrastructure, including distribution system upgrades, and not pursue lower-cost solutions. This tension between the regulated incentive structure for utilities and ratepayer costs has resulted in highly contested proceedings for utility investment proposals. Increasingly, utilities are being asked to justify large distribution spending plans, as stakeholders attempt to ensure investments are necessary for grid reliability or relate to structural grid modernization rather than one-off projects or those perceived to bolster utility returns.[25] To better align utility and ratepayer interests, it is critical for regulators to motivate utilities to pursue NWS by providing them with mandates and/or incentives.

Mandates or Incentives?

Although not mutually exclusive, there are two main channels regulators can pursue to support NWS: mandates and incentives.

Non-wires solution mandates have catalyzed the market

Mandates that require utilities to consider NWS for needs that meet certain criteria have been broadly applied. A number of states—including California, Maine, New Hampshire, New York, Rhode Island, and Vermont—require utilities to consider distribution-level non-wires solution projects that meet defined screening criteria. Most recently, the Michigan Public

Service Commission proposed a new Distribution Planning Framework, which also includes a requirement to develop non-wires solution screening criteria and identify potential non-wires solution projects.[26] In addition to mandates that trigger an evaluation of potential non-wires solutions, California and New York have required utilities to develop non-wires solution pilot projects (see **Non-Wires Solutions Pilot Projects** on page 29).

Mandates like these have been an effective tool to catalyze non-wires solution markets, but care should be taken to ensure market flexibility and manage compliance. To avoid inhibiting non-wires solution market growth, mandates should be structured to encourage flexible compliance options. For example, instead of requiring NWS projects to include specific technologies, a mandate could instead require technology-agnostic solicitations. This flexibility can support the mandate's desired regulatory outcomes while fostering innovation from market participants.

Regulators must also have effective strategies to monitor compliance with mandates. For example, to verify that utilities apply required screening criteria accurately, regulators need to perform due diligence on utility analyses. This might require a substantial time commitment and a need for regulators to acquire additional resources, learn new skills, and build internal capacity. Moreover, if a state does not have a transparent distribution planning process, the necessary data may not even be available for regulators to evaluate compliance. For these reasons, mandates need to be carefully designed and sufficiently supported by regulatory expertise to instill confidence in market participants, maintain reasonable timelines for project approvals, and sustain market growth.

> **"One might ask: why provide the IOUs with any incentive at all? Why not just direct the utilities to choose DERs whenever they are less costly than traditional distribution investments? The problem is that, given the complexity of the distribution system, this Commission is ill-equipped, at least at present, to determine with the necessary specificity exactly when and where such DER deployment opportunities may exist… Practically speaking, command-and-control regulation faces major challenges in this context. Instead, if our objectives are to be achieved, we should create the appropriate utility incentives, such that the IOUs will affirmatively seek opportunities to deploy DERs in the pursuit of their own shareholders' interests."**
>
> **— Former California PUC Commissioner Mike Florio on mandates versus incentives[27]**

Incentives that align utility compensation with cost-effective deployment of NWS promote long-term market growth

As detailed by Wood Mackenzie Power & Renewables in its 2017 state of the non-wires solution market report, a range of incentive structures for NWS has been tested.[28] The first category of incentives allows utilities to earn a rate of return on NWS projects, similar to the rate of return earned on the traditional utility rate base. With incentives based on rate of return, utilities will still try to maximize spending on distribution system upgrades, but upgrades may now include non-wires solution portfolios. This type of incentive enables NWS to compete with traditional projects of similar cost but does not necessarily motivate utilities to pursue more cost-effective solutions. Regulators in California and New York have tested this incentive and experimented with variations on a rate of return for total expenditures on NWS: in New York, some NWS have earned even higher rates of return than traditional investments if they achieve specified performance goals, and in California, utilities have earned a fixed rate of return on payments to non-wires solution developers.

The New York State Department of Public Service has also piloted a new type of incentive that attempts to overcome the utility's bias to maximize capital expenditures. The share-of-savings incentive, used in the Central Hudson Peak Perks project,[29] allows utilities to earn a percentage of the savings achieved by a non-wires solution project. The Peak Perks project uses demand response pricing and rebates to encourage customer load reduction and adoption of Wi-Fi-enabled thermostats and pool pumps. Central Hudson is authorized to earn back 30% of the savings from the Peak Perks project, while 70% of the savings must be passed onto ratepayers. The risk inherent in share-of-savings incentives is that utilities will only pursue NWS that provide substantial savings, and will not consider projects where DERs could provide a lower-carbon solution at, or near, cost parity. Moreover, determining the utility's portion of the savings can be a contentious and lengthy process. For this reason, more standardized and agreed-upon rates would help the share-of-savings incentive structure scale. Overall, expanding the implementation of share-of-savings incentives represents one of the most promising options to motivate utilities to identify NWS that deliver the greatest ratepayer benefits.

Trends in performance-based regulation and platform utility models may provide utilities with new revenue streams and provide regulators the opportunity to test new approaches

Broader trends in performance-based regulation could provide additional motivation for utilities to pursue NWS. Several states are considering incentives that equalize earning opportunities for utility procurement of service-based solutions (e.g., solutions typically procured through ongoing service contracts such as load management through software, or energy efficiency programs) with earning opportunities for procurement of infrastructure. Methods being tested include allowing utilities to earn a fixed rate of return on qualified service expenses or to prepay service contracts that are added to the rate base as lump-sum expenses.[30]

As described in RMI's ***Reimagining the Utility*** report, some states are considering policy changes that enable utilities to serve as integrators and hosts for market activity, earning revenue for providing these platform services. In New York, the concept of distributed system platforms operated by the utility provides a roadmap for how the platform concept could be leveraged to enable NWS. The transition toward compensation for services and platform revenues could fundamentally change the utility business model and animate the non-wires solution market as utilities increasingly engage third-party providers to meet needs at all levels of the grid. This platform-oriented approach will also require regulators to provide nimble oversight for a fast-paced, transactional market. Non-wires solution projects can be an opportunity to begin building these streamlined processes and testing new approaches for regulation.

Utilities and other stakeholders can influence non-wires solution deployment in the absence of regulation

Non-wires solution programs have not always been initiated by a regulator or legislature—they have also been initiated by utilities themselves and influenced by stakeholder intervention. Arizona Public Service (APS) decided to deploy storage to defer replacing 20 miles of transmission and distribution lines to the rural town of Punkin Center. In deploying 2 MW and 8 MWh of battery storage at Punkin Center, APS stated that the project was very cost-effective, especially when it factored in additional revenue from providing frequency regulation, participating in capacity reserve markets, and arbitraging wholesale power markets. The project also helped APS to meet storage installation goals that had been set through a memorandum of understanding (MOU) with Arizona's Residential Utility Consumer Office (RUCO). The MOU was initiated through a settlement for an APS filing that proposed adding gas generation to its Ocotillo Power Plant, and also stated that APS would consider all alternative resources for future projects. This MOU was only one of many factors in APS's decision to install storage at Punkin Center but demonstrates a potential pathway for stakeholders to influence utilities to consider NWS.

Flexible or prescriptive?

Regulators have taken a variety of tactical approaches to reduce market barriers to widespread non-wires solution adoption. In New York, regulators created a flexible framework through its Distributed System Implementation Plan guidance, which left room for utilities to experiment their way forward.[31] Through stakeholder processes, the Department of Public Service approved initial adders to compensate NWS, but allowed each utility to design and propose its own adders or other incentives. The Department of Public Service similarly developed a benefit-cost analysis (BCA) whitepaper to guide evaluation of investments (including NWS) but allowed utilities to finalize their own BCA handbooks and streamlined the regulatory approval process for projects that pass BCA tests. Utilities have reacted to this regulatory flexibility by testing different strategies to identify the scalable approaches that work best for their specific context. Another benefit of New York's flexible approach is that stakeholders are able to collectively learn from a range of implementation approaches instead of all being committed to a single path. However, providing such latitude does carry the risk that non-wires solution development will be haphazard and disjointed in the absence of a clear and uniform path to scalable implementation.

In contrast to New York's experience, regulators in California took a more structured approach to non-wires solution implementation. Through its Distributed Resource Plan proceeding, utilities were required to pursue a specific set of non-wires solution demonstration projects to test the application of NWS for different grid needs.[32] Utilities were also required to develop a formal distribution investment deferral process to systematically identify and propose NWS as part of their annual planning. A separate set of requirements from California's Integrated Distributed Energy Resources proceeding mandated that utilities solicit competitive bids according to a detailed solicitation framework that was associated with a defined incentive structure and value.[33] California pursued this prescriptive approach to establish comprehensive and consistent statewide non-wires solution processes in which results from pilots would inform standard distribution planning practices to identify and procure capex deferral opportunities. The mandates ensured specific non-wires solution hypotheses could be tested, but also required extensive regulatory involvement. Drawbacks of this approach are both temporal (slowing down market development given the requirement to conduct a series of pilots before moving to operationalize the results) and substantive (utilities could not devise projects that focused on issues outside of CPUC's list).

As an indication of the comparative success New York and California have had deploying NWS, it is interesting to note that although both states began developing non-wires solution strategies in 2014, as of April 2017 New York had ~1 GW of projects in its pipeline, while California only had ~100 MW.[34] Evidently, the more flexible New York approach spurred faster non-wires solution adoption. As an indication that California may be ramping up its deployment of NWS, utilities there recently released their first Distribution Deferral Opportunity Reports reflecting hundreds of MW of identified potential non-wires solution opportunities.[35] These reports will be updated annually and represent a major shift in California transitioning out of its

NON-WIRES SOLUTIONS PILOT PROJECTS

Flexible versus prescriptive approaches to non-wires solution demonstration projects in California and New York provide two instructive examples on how demonstration project design can impact adoption of NWS. In both states, regulators provided utilities with guidelines to pilot NWS, but their approaches and outcomes were quite different.

In 2014, the California Public Utilities Commission (CPUC) required the state's three investor-owned utilities to develop distribution resources plans that included the design of five demonstration projects, each of which tested a particular technical issue associated with the value and location of DERs on the grid.[36] Two of these demonstration categories were particularly relevant for gaining experience with NWS as they required project proposals for deferral opportunities based on locational benefits, and the provision of multiple grid services. In 2016, the CPUC required another set of demonstration projects through the Competitive Solicitation Framework and Regulatory Incentive Pilot, which prescribed four grid services that NWS could provide, established a procurement process and fixed incentive, and required utilities to develop between one and four NWS projects to test the pilot structure.[37]

By contrast, the New York State Department of Public Service provided less prescriptive guidance to inform the development of non-wires solution pilots. Utilities were first required in 2015 to propose at least one non-wires solution pilot in their initial distributed system implementation plans.[38] Additional regulatory direction was provided in 2016 when utilities were required to identify non-wires solution opportunities in their capital investment plans.[39] The Department of Public Service also created a list of principles that utilities were expected to incorporate into the DER demonstration projects they created. The principles were designed to encourage utilities to develop partnerships with third-party service providers, seek solutions from market participants, test different price and rate design frameworks, and propose rules to support competitive markets. These principles were more open-ended than the pilot guidelines in California as they were designed to encourage utilities to use demonstration projects as a way to test different market mechanisms for NWS.

The contrasting pilot design approaches in California and New York speak to the distinct goals of each jurisdiction. California's highly prescriptive approach was geared toward devising an effective way to integrate the large amounts of DERs that already exist on their grid. As a result, regulators in the state focused more on developing standardized technical and operational requirements to efficiently interconnect and manage projects of certain types. By contrast, New York's flexible-by-design strategy was aligned with the context of its Reforming the Energy Vision process, which is intended to redesign the utility business model and encourage entrepreneurial approaches through permission to experiment.[40]

For utilities in states without specific regulatory guidance on DER demonstration projects, there is an opportunity to learn not only from the results of non-wires solution pilots in other jurisdictions, but also from the design of such pilot programs. Utilities intending to integrate NWS into their core operations should seek to create pilots that test clearly defined operational, technical, or rate design questions required to support non-wires solution programs as part of the utility business model. In doing so, they should engage with market participants to effectively explore different approaches to designing pilots that test those questions.

pilot experimentation phase to more standardized procurement at scale. Still, the capacity of deployed NWS remains relatively low in both states given the potential.

c) Clarify screening and evaluation criteria to more efficiently identify and assess NWS opportunities

Screening criteria

A growing number of utilities and regulators are trying to redesign planning processes to better consider the ability of DERs to address grid needs. This presents an opportunity to operationalize non-wires solution screening by integrating it into the planning process. Simply put, if planned distribution upgrades meet a set of defined screening criteria such as project type, timing, and cost, an analysis is triggered to determine which option—traditional or non-wires solution—is more cost-effective. Thus far, regulators have been primarily responsible for developing screening criteria and directing their integration into utility planning. Regulators have also led or hired neutral third parties to facilitate stakeholder processes for developing screening criteria. Regulatory leadership in these processes provides stakeholders with confidence that screening criteria are being developed in a way that is transparent and neutral, and that incorporates both their needs as well as those of utilities.

Regulators should design screening criteria that utilities can customize. Utilities within a state have different grid needs, loads, generation portfolios, and customer mixes—all of which may influence the efficacy of screening thresholds within their service territory. Regulators can lead on structuring screening categories and methodologies but should allow utilities flexibility to propose changes that align screening criteria with their grids and internal processes.

Regulators should also consider the adaptability of screening criteria to changing market conditions. Screening criteria make sense in today's emergent non-wires solution market because they help point utilities toward the most suitable opportunities. As utilities become more comfortable identifying non-wires solution projects, regulators should direct that screening criteria be regularly updated and reevaluated to ensure they do not constrain potential solutions.

For more information on the development of screening criteria, see the **Screening Criteria section** on page 53.

Evaluation criteria

Regulators can also lead the refinement of benefit-cost analysis (BCA) frameworks to accurately value NWS. BCA frameworks for efficiency and demand-side management have long been the purview of regulators, and have been codified in documents such as the California Standard Practice Framework[41] and the New York Benefit Cost Analysis Framework.[42] BCA frameworks should be reviewed and updated to capture the full cost and value of NWS. Details on how BCA frameworks can be altered to reflect the value of NWS are provided in the **Proposal Evaluation section** on page 64. Regulators should also consider flexibility within BCA frameworks to allow utilities to adapt them for values and costs unique to their service territory.

d) Enable data transparency and access for solution providers

For successful development of NWS, solution providers need access to significant amounts of data, including utility system data and customer usage data. Access to data not only enables developers to propose more targeted solutions to utility needs, but also supports the regulators' oversight role by granting regulators better information to review utility planning and investment decisions.

Traditionally, the distribution system planning and investment process has occurred mostly within the utility, with little public disclosure. Regulators can play an important role in ensuring that planning processes capture system data needed to support non-wires solution development, and making data readily available to the market. They can also help define and enforce customer and cybersecurity protocols to ensure some information is redacted for security purposes without rendering the data ineffective for developers. States developing integrated distribution planning (IDP) or integrated grid planning (IGP) processes can consider including non-wires solution evaluation as a key component of those efforts and think about what types of data can be captured and made available to support development of NWS.

Specifically, non-wires solution providers benefit from public maps of grid needs and the locational value of addressing those needs. Utilities in several states, including **Rhode Island**, **New York**, and **California**, have locational value maps published or under development. In addition, public information on hosting capacity—how much additional distributed generation can be deployed on given circuits before approaching reliability issues—can be valuable to non-wires solution developers. Utilities in **Minnesota**, **Colorado**, **Hawaii**, **the District of Columbia**, **New York**, **California**, and several other states have published hosting capacity maps.

Regulators can also play a role in developing rules governing customer usage data. In 2014, the California PUC issued a rulemaking "Decision Adopting Rules To Provide Access To Energy Usage And Usage-related Data While Protecting Privacy Of Personal Data."[43] In this decision, the CPUC directed utilities to provide public, zip-code aggregated usage data to universities and nonprofits for research, and to local governments. Moreover, the decision outlines a process for other stakeholders hoping to access the data. More recently, when California investor-owned utilities restricted public access to their PV Renewable Auction Mechanism maps, the CPUC intervened and required them to restore access to the maps to ensure market transparency into hosting capacity and locational value data.[44] From the perspective of a developer of customer-interfacing NWS, clear processes for requesting data access can save time and better inform solution development. For a broader overview of national efforts on data, the American Council for an Energy-Efficient Economy provides a summary of customer data access provisions in each state.[45]

e) Encourage DER forecasting to help identify low-cost NWS that leverage expected DERs

Regulators can encourage utility planning processes to include more robust forecasting of DERs to support non-wires solution procurement. Utilities have well-established protocols for forecasting load, including sensitivity analysis. Similar forecasting can be conducted for DER growth, and can be shared with both regulators and solution providers.

DER growth forecasting could help utilities to "right-size" the scope of grid needs over time and identify more cost-effective non-wires solution opportunities. For example, if there is projected load growth that may lead to capacity issues, utilities should also understand if DER growth on the same feeder might offset some of the potential need. Moreover, utilities could use projected DER growth as part of a non-wires solution. Existing and projected resources could be leveraged through customer programs to cost-effectively reduce or eliminate the need for certain distribution system upgrades. Regulators can require utilities to demonstrate that they have considered existing and projected DERs as part of a non-wires solution or traditional project. If solution providers are given access to DER projections, they can develop proposals that leverage or synergize with those assets. Additionally, projects can be designed to be more flexible and cost-effective if developers have a clearer picture of the future demand for their products.

Regulators can define the types of sensitivity analyses that should be conducted for both load and DER growth projections. In particular, there is a need for more probabilistic planning in DER forecasting to match the degree of complexity embedded in demand forecasting. Given the inter-relationship between expected load and DER projections, a utility's ability to optimize its investments depends on a statistical analysis of the most likely future scenarios. More detailed probabilistic analyses will generate a range of expectations for how customer load is likely to change and interact with DERs in the future. This will help planners more readily consider the value flexible resources provide in addressing uncertainty and adapting to changing conditions over time.

f) Support collaborative stakeholder processes to allow for input into NWS processes from all interested and affected stakeholders

Stakeholder input is critical for the development of durable non-wires solution rules, incentives, and processes. Ideally, regulators should lead and host the stakeholder engagement process for NWS; at a minimum, regulators should be involved in all aspects of stakeholder engagement. Stakeholder engagement in developing non-wires solution processes is necessary because NWS are relatively new and more complicated than traditional approaches to capital expenditure investments, so no one individual or organization holds all the answers.

Leadership in non-wires solution stakeholder engagement by regulators—as opposed to utilities—can lend more credibility and neutrality to the process. For example, if stakeholder processes are not officially docketed for public view, there may be concerns that meaningfully different perspectives are not being adequately considered and incorporated into outcomes. Regulatory leadership of non-wires solution processes can also lead to more consistency in a state, which is valuable for scaling the market. If regulators run the stakeholder engagement process, they can set clear expectations for utilities and developers around what is required for non-wires solution project approval. In particular, consistency of processes across utilities makes it easier for solutions providers to bid their services.

Running an effective stakeholder engagement process for NWS may require capacity building of regulatory staff. Regulators can also consider engaging neutral facilitators to run the process, as a way to ensure that stakeholder feedback is collected in a collaborative, streamlined way. Given the staff capacity and stakeholder time commitment required, as well as the need to better integrate planning and non-wires solution consideration, regulators in states pursuing stakeholder engagements for grid modernization or integrated planning may consider how they can integrate NWS into those processes rather than running separate, parallel processes.

Regulators may also consider using independent researchers or technical working groups to conduct neutral analyses to support a stakeholder process. Working groups organized around specific non-wires solution topic areas have been valuable in making progress on contentious subjects in integrated planning and NWS. Working groups should be designed with tangible outcomes in mind, and with the right level of specificity to ensure that questions can be addressed during the allotted time.

As an alternative to a regulator-led process, there are models in which independent entities have run successful stakeholder engagement processes around integrated planning, DER procurement, and NWS. For example, the Northwest Power and Conservation Council manages a collaborative process to identify regional energy and conservation needs in the Pacific Northwest.[46] The Council is an independent body, and develops a resource plan every five years that utilities can reference in their own planning. In order for similar independent bodies to successfully drive change, they require firm support from regulators, utilities, and state governments.

Another approach to stakeholder engagement is currently being pursued in Hawaii where the utility Hawaiian Electric Company (HECO) is leading an innovative stakeholder engagement process as part of

FIGURE 6

MARKET-SPECIFIC CONSIDERATIONS FOR THE REGULATORY ENVIRONMENT BEST PRACTICE RECOMMENDATIONS

RECOMMENDATIONS FOR REGULATORS AND OVERSIGHT BOARDS	VERTICALLY INTEGRATED UTILITY	WIRES-ONLY UTILITY	CONSUMER-OWNED AND NONPROFIT UTILITIES
PROVIDE AN APPROPRIATE INCENTIVE STRUCTURE TO ENCOURAGE UTILITIES TO PURSUE NWS	• Performance-based ratemaking tools could be applied to reduce the incentive to build capital-intensive infrastructure. • Consider allowing a rate of return on generation resources that are used for NWS to encourage utility pursuit of NWS. • Consider a rate of return on non-capital costs (e.g., service solutions).	• Performance-based ratemaking tools could be applied to reduce the incentive to build capital-intensive infrastructure. • Definitions of which expenditures can earn a rate of return can be adjusted to consider operating expenditures for customer programs or storage and distributed generation.	• Because they are operated by and for the people of a community, the nonprofit business model seeks to provide the lowest-cost service to its customers. So long as management incentives are aligned with members' interests, co-ops and munis would be inclined to consider NWS if they are more cost-effective. • City councils or co-op boards could mandate utility consideration of NWS. • Co-ops could consider renegotiating contracts to allow for additional ownership of generation.
CLARIFY SCREENING AND EVALUATION CRITERIA TO ENABLE EFFICIENT NWS OPPORTUNITY IDENTIFICATION AND ASSESSMENT	• Regulators should be involved in convening stakeholders to develop screening and evaluation criteria that utilities can further refine. • Screening and evaluation criteria should be adapted to each utility based on the types of investments they can pursue. For example, VIUs should have evaluations that consider the impact of non-wires solution opportunities on generation, whereas wires-only companies only need to evaluate transmission and distribution impacts.		• In the absence of state regulatory oversight, screening criteria need to be developed internally. • There is potential to codevelop screening criteria among utilities (e.g., affiliated co-ops or a consortium of municipal utilities).

Table is continued on the next page

its integrated grid planning effort.[47] HECO's proposal outlines a structured engagement model with subject-specific working groups, a technical advisory panel, stakeholder council, and broad customer and public engagement. This type of robust framework for stakeholder involvement and decision-making transparency can help mitigate neutrality concerns and relieve some of the burden on regulators.

FIGURE 6 (CONTINUED)

<table>
<tr><th>RECOMMENDATIONS FOR REGULATORS AND OVERSIGHT BOARDS</th><th>VERTICALLY INTEGRATED UTILITY</th><th>WIRES-ONLY UTILITY</th><th>CONSUMER-OWNED AND NONPROFIT UTILITIES</th></tr>
<tr><td>ENCOURAGE DER FORECASTING TO ENABLE IDENTIFICATION OF POTENTIAL LOW-COST NWS</td><td>• Data to enable DER forecasting may be easier for VIUs to obtain given their oversight and control at all levels of grid infrastructure.</td><td>• DER forecasting may require more third-party coordination to collect data and predict trends given lack of ownership over generation assets, and market management by independent system operators.</td><td>• Forecasting may be more challenging for smaller utilities with fewer resources and less advanced equipment, although projections would only need to consider data for a smaller number of customers compared to a large regulated utility.

• For co-ops, there is also a need to coordinate with G&T co-ops to ensure power supply arrangements are not violated.</td></tr>
<tr><td>LEAD COLLABORATIVE STAKEHOLDER PROCESSES TO ALLOW FOR INPUT INTO NWS PROCESSES FROM ALL INTERESTED AND AFFECTED STAKEHOLDERS</td><td colspan="2">• Whether regulators lead the stakeholder process themselves, hire neutral facilitators, or invite utilities to take the lead, they should remain involved to ensure the inclusion of a wide range of stakeholders, including ratepayer advocates, developers, environmental organizations, trade associations, technical experts, and electric customers.

• For wires-only utilities, also consider including the full range of wholesale market participant stakeholders.</td><td>• Nonprofit utilities can use NWS as opportunities to engage and educate consumers, co-op members, and municipal customers to ensure their support and participation.</td></tr>
</table>

2. INTEGRATING NWS INTO STANDARD UTILITY OPERATING PROCEDURES

Utility procurement practices, organizational structures, and expertise are currently designed to efficiently procure traditional infrastructure solutions. Adjustments need to be made if utilities are to fully capture the benefits of non-wires solution opportunities. While specific NWS pilots and individual project case studies have garnered attention, more focus on how utilities can standardize, operationalize, and streamline planning and procurement for NWS is necessary. This will allow for the fair comparison of NWS against traditional approaches and for effective engagement of non-utility market participants to best meet regulatory and utility-level objectives.

a) Consolidate accountability for NWS within a single interdisciplinary utility team in order to facilitate fair assessment between different approaches

If NWS are to become key tools in the utility planning toolkit, utilities need to create NWS teams that are fully integrated into the utility's business-as-usual operations and that are directly involved in the planning process, rather than have niche departments focused on one-off projects.

To best support creative and practical NWS, utilities can design their internal organizational structures to promote effective communication between planning, procurement, and DER experts. The process of planning for, procuring, and implementing NWS is complex, requiring cross-functional and interdisciplinary communication among utility departments that may not be accustomed to collaborating. The relative nascence of NWS means that no one department or function within the utility holds the institutional knowledge of how to operationalize a successful NWS program. Utilities motivated to build that internal competency, and ultimately integrate non-wires solution projects into their business model, will need to develop a more comprehensive approach.

While some utilities have relied on internal champions throughout their organization to drive their non-wires solution efforts, that decentralized approach is difficult to sustain. Another reason why non-wires solution projects fail to be properly operationalized into the utility's core business model is that NWS teams are often housed in "utility of the future" or "innovative solutions" groups, which typically generate pilots but not business-as-usual programs.

Instead, utilities should establish a cross-functional team composed of employees with backgrounds in areas including: electric supply, distribution planning, permitting and interconnection, energy efficiency and customer programs, system standards, policy, internal strategy, contracting, and procurement. Not only are these cross-cutting teams more likely to consider NWS in a holistic manner, but they may be more bold and innovative working in concert than if responsibility for NWS were spread throughout the utility organizational structure. Some examples of utilities that have developed cross-functional teams include:

- Pacific Gas & Electric's Grid Integration and Innovation group
- ConEd's Distributed Resource Integration team
- National Grid's Customer Innovation and Development department
- New York Power Authority's Clean Energy Business team
- Southern California Edison's Integrated Innovation and Modernization team
- Arizona Public Service's Customer Technology and Product Development team

A more centralized NWS team also represents an opportunity to streamline processes and create efficiencies to deploy NWS faster. When planning and procuring for various non-wires solution projects is spread across multiple departments (e.g., energy efficiency in customer programs, battery storage in DER solutions), each will have different processes for its various activities. These siloed approaches inhibit the utility's ability to develop and execute comprehensive NWS to meet its grid planning needs. Integration of NWS groups into the utility's business-as-usual processes is an important element for creating a successful NWS program, but absorption of NWS teams into traditional wires groups carries a risk that consideration of NWS projects becomes perfunctory. Utilities should strike the right balance between integrating NWS groups into the core business of the utility while keeping the team's reporting lines distinct enough to ensure against any internal bias toward wires solutions. In practice, some utilities have an NWS team as a separate group within distribution planning, while others have opted for a distinct NWS group with a reporting line outside of distribution planning.

b) Allow for both utility- and provider-led integration of diverse technologies to meet grid needs

Developing a non-wires solution project to resolve a particular grid issue often requires assembling a portfolio of technologies that collectively address the need. Both utilities and third parties can play the role of integrating the various non-wires solution components to fashion a comprehensive portfolio solution.

Many utilities favor playing this integration role because they are most knowledgeable about the grid and have ultimate responsibility for its proper management. These utilities want to ensure that they are forming NWS that not only address a specific grid issue, but that also align with the utility's role in ensuring overall grid reliability and safety. The utility-as-integrator approach can lower barriers to entry for developers participating in NWS since they can bid on discrete pieces of the overall solution rather than be expected to put forth a comprehensive portfolio of solutions when they may not have the capacity or technical know-how to do so. By offering components of the non-wires solution portfolio to bidders, utilities can help animate a wider non-wires solution vendor market.

At the same time, a developer-centric integration role has advantages as well. This turnkey approach may be favorable for smaller or resource-constrained utilities that would prefer third parties to manage the non-wires solution portfolio. Moreover, encouraging developers and DER aggregators to partner together to submit joint bids to utility RFPs may produce solutions that the utility had not envisaged, and that may better address the need and/or be more cost-effective than the utility's approach. Utilities may also not be familiar with new technologies and how they can be integrated to create effective NWS. Technology developers and aggregators themselves may be better positioned to determine how their approaches will work in concert and can present the utility the best optimized and integrated solution.

c) Lay the groundwork to scale successful NWS pilots to full deployment in order to maximize learning and provide the greatest economic benefit

Non-wires solution pilots are an important way for utilities to gain comfort with NWS as effective alternatives to traditional grid infrastructure. Utilities should therefore use non-wires solution pilots to test technologies, operational performance of non-wires solution portfolios, and incentive and contracting terms with developers. The lessons learned from scoping, soliciting, and operating non-wires solution demonstration projects are important elements that can meaningfully shape more permanent NWS programs.

Still, there is a risk that utilities spend too much time launching multiple non-wires solution pilot projects without incorporating pilot learnings into more permanent grid-planning procedures. Running too many pilots may discourage developer participation in the absence of a clear market for their services. Instead, defined protocols of transitioning pilots to programs are critical if utilities are to consider NWS in a more systematic way as part of their business-as-usual operations.

Pilots should therefore be structured in the context of a larger plan aimed at solidifying NWS as part of the standard utility operating procedure. To most effectively do so, utilities should establish a forward-looking process of pilot design that builds on previous pilot results and has technical or market-design elements to test so that the cumulative results can roll up into building an NWS program at scale.[48]

Moreover, there is an opportunity for early movers in the NWS sector to share results of their pilots and demonstration projects to help spark market growth. Socializing these results more broadly can help utilities in other jurisdictions incorporate learnings without running duplicative pilots, and focus their own pilot design on more discrete issues relevant to their particular operations. Wider adoption of non-wires solution technologies and a deeper understanding of their benefits will fundamentally help address a key barrier and attract more participants to grow the market. Ultimately, utilities have to make a demonstrated commitment that the goal of non-wires solution pilot projects is for NWS to be an integral part of the planning processes. Without that explicit commitment, responsible staff won't have the incentives to explore and refine non-wires solution projects in a meaningful way.

FIGURE 7
MARKET-SPECIFIC CONSIDERATIONS FOR BEST PRACTICE RECOMMENDATIONS FOR UTILITY PROCESSES

RECOMMENDATIONS FOR UTILITIES	VERTICALLY INTEGRATED UTILITY	WIRES-ONLY UTILITY	CONSUMER-OWNED AND NONPROFIT UTILITIES
CONSOLIDATE ACCOUNTABILITY FOR NON-WIRES AND TRADITIONAL SOLUTIONS WITHIN A SINGLE INTERDISCIPLINARY TEAM WITHIN THE UTILITY	• VIUs can leverage existing expertise within the utility by drawing professionals from representative teams.	• Wires-only utilities can leverage existing expertise within the utility by drawing professionals from representative teams. • Since wires-only utilities don't own generation, the team may also consider bringing in representatives from market operators or external parties responsible for generation.	• Given resource constraints, interdisciplinary teams at nonprofit utilities are more likely to have lean structures with a smaller number of individuals responsible for integrated job functions and serving as internal champions for NWS.
ALLOW FOR BOTH UTILITY- AND PROVIDER-LED INTEGRATION OF DIVERSE TECHNOLOGIES TO MEET GRID NEEDS	• VIUs are more likely to prefer to integrate NWS projects because of their comprehensive control and expertise. • VIUs desire for asset ownership (as opposed to third-party ownership) may also drive their preference for integration.	• Wires-only companies are more likely to engage with third-party integrators, especially with regards to non-wires solution projects that are generation focused.	• Given their more limited resources, nonprofit utilities are likely to find more value in third parties playing the integration role and providing turnkey solutions.
LAY THE GROUNDWORK TO SCALE SUCCESSFUL NON-WIRES SOLUTION PILOTS TO FULL DEPLOYMENT	• Utilities should ensure pilots are designed by an integrated NWS team and that pilot results will meaningfully inform a holistic strategy for non-wires solution deployment.		• Nonprofit utilities should consider prioritizing learning from pilots done elsewhere, given their limited ability to run multiple pilots. • Co-ops and munis can share learnings via trade associations like the National Rural Electric Cooperative Association, or city government networks.

3. EMPLOYING HOLISTIC PROCESSES FOR NWS PROCUREMENT

Even with the right combination of incentives and mandates, robust distribution planning, and a utility team dedicated to NWS, the practical procurement of NWS is still a complex challenge. Well-designed solicitations and/or other procurement practices are critical to ensure that market participants have the opportunity to offer their solutions.

Current utility procurement practices need to be reexamined to determine whether they effectively support non-wires solution sourcing. In this emerging market, developers require more access to grid and customer data than is required for traditional solutions. Similarly, utilities will need additional information from solution providers to verify the technical feasibility of their proposed solutions projects and to perform benefit-cost analyses.

a) Utilities should consider the range of options for sourcing NWS

There is a range of possible procurement strategies for utilities to consider, but the following three are the most common: customer programs, pricing mechanisms, and competitive solicitations.[49] In practice, there can be overlap between these options and, in some cases, all three approaches can be used simultaneously.

The three NWS sourcing options are not mutually exclusive

Utilities can use all three non-wires solution sourcing options simultaneously to achieve project outcomes. In its Brooklyn Queens Demand Management (BQDM) program, ConEdison used all three approaches to make progress toward its 52 MW load reduction target, including running a competitive auction, augmenting existing customer programs and tariff-based programs, and releasing competitive RFPs.

In addition to using multiple approaches in one project, the distinctions between the three types of procurement (customer programs, pricing mechanisms, competitive solicitations) are often not distinct. GridSolar managed the procurement of a non-wires solution for Central Maine Power to defer a transmission project in Boothbay, Maine. In its technology-agnostic, competitive solicitation, GridSolar awarded contracts to providers of energy efficiency, demand response, and distributed energy resources. Whereas energy efficiency and demand response might typically be considered customer programs, they were procured in this non-wires solution through a competitive solicitation.

Similarly, there are many examples of hybrid pricing and customer programs. For example, Green Mountain Power (GMP) in Vermont provides customers with a lower rate structure for separately metered water heaters (**Rate 3**) if they agree to let the utility shut off their water heater at critical times. The shutoff component of this rate structure would independently be considered a demand response customer program, but GMP has inextricably bundled it with pricing.

Developing frameworks to determine which options are best suited for common use-cases can help utilities make decisions more quickly, and at scale. To help inform these frameworks, descriptions of the three primary sourcing options are provided below.

1. **Customer programs** encompass demand-side management offerings in which the utility compensates customers for participating in measures including energy efficiency, device-enabled demand response programs (e.g., smart air conditioning or smart thermostat programs), pricing-based demand response programs (e.g., peak-time rebates), and behind-the-meter generation and storage.
2. **Pricing mechanisms** involve changes to customer tariffs, including time-of-use rates, demand charges, critical peak pricing (CPP), variable peak pricing (VPP), real-time pricing (RTP), net-metering (NEM), feed-in-tariffs (FITs), and New York's Value of DER (VDER).
3. **Competitive solicitations** are standalone procurements in which a utility asks the market to competitively offer solutions, typically through a request for proposals (RFP) or an auction process.

There are several factors that inform which category or combination of categories a utility pursues to source NWS:

- **Scope of procurement:** Competitive procurements are best suited to larger projects, due to high, fixed transaction costs. A utility may choose to bundle together several smaller needs into one procurement effort that spans a larger geographic area. This approach might open up additional solutions, such as software solutions, which may be more feasible in certain instances, for example when applied to several feeders rather than one.
- **Timeline:** The choice of procurement option is impacted by the amount of time available before the grid need. For example, to meet a grid need with a short lead time, a utility should prioritize time-to-operation and consider leveraging existing customer programs or issuing an expedited RFP. Expansion of existing pricing to a new geographic area within the service territory, such as peak time rebates or critical peak pricing, may also be possible to implement quickly, but new pricing or rate changes may require lengthy regulatory approval processes. The nature of the solution proposed will also influence the speed of procurement. Behind-the-meter solutions—whether competitively solicited or implemented through customer programs—may require longer timelines due to uncertainty around how long it will take for the required number of customers to opt in. Front-of-the-meter solutions sourced through competitive solicitations face risks in land acquisition, permitting, and interconnection that could delay their deployment, however there are examples in which expedited procurement and approvals have led to solutions coming online expeditiously.[50]
- **Project complexity:** Pricing mechanisms and customer programs are most suitable for standardized projects, where targeted technologies can be packaged into a customer offering. In order to maximize customer understanding and adoption, customer programs and pricing mechanisms must be relatively straightforward and effortless, although the necessary simplicity can constrain the universe of solutions that are possible.
- **Certainty of need:** Customer programs and modular DER solutions are attractive for addressing needs that are less certain because they can scale and adjust over time. For example, a residential storage program can be designed to roll out over several years, with targets for the number of customers enrolled increased or decreased in response to progress on meeting

the need. This flexibility of deployment can help to avoid stranded assets. Likewise, both technologies deployed through customer programs and DERs can provide a variety of services and may be reprogrammed to meet new or different needs as they emerge. For example, storage that originally provided load reduction on a strained circuit may be able to meet voltage support needs if the need arises.

- **Risk tolerance:** For the utility, the most obvious risk of non-wires solution implementation is that the projects ultimately do not satisfactorily address a grid need. Customer programs and pricing signals rely on consumer behavior and participation to be successful, creating a potential execution risk for utilities. Strategies to mitigate the risks associated with customer participation are common, including adding technologies that automatically respond to grid needs, such as smart thermostats and smart air conditioners. Utilities can also use data from existing customer programs and tariffs to provide a more accurate assessment of customer responsiveness. Competitive solicitations can be structured to balance risk between utilities and developers according to a utility's risk tolerance. A portfolio of customer programs, pricing, and solicitations can help to mitigate the risk associated with any single type of procurement. Additional recommendations for considering risk in solicitations are provided in the **NWS Contracting Considerations section** on page 70.

1. Customer Programs

Creating new or expanding existing customer programs can be an effective way to meet an identified grid need. Customer programs can be targeted to geographic areas and to customer types (e.g., high-usage customers), which makes them well-suited for non-wires solution applications. Customer programs can also be structured to provide different payments according to the severity of need across the service territory. ConEdison segments its customers participating in the **Distribution Load Relief Program** into two tiers according to location, with Tier 2 participants compensated $8/kW/month more than Tier 1 participants.

Many customer programs provide direct benefits for participants. For example, peak-time rebate programs provide financial incentives to customers who reduce their loads during peak times, but otherwise do not affect prevailing rates. Other programs offer customers new benefits in exchange for grid services. For example, Green Mountain Power offers its residential customers in Vermont eight to 12 hours of backup from energy storage for $15/month in exchange for control of their battery to reduce load during peak events.[51]

Despite delivering clear customer value, it can be difficult and expensive to secure high levels of customer adoption in targeted geographic areas, and expanding the geographic reach of customer programs may not always be technically feasible. To increase the likelihood of success, customer programs require clearly delineated partnerships between utilities and technology providers. Marketing and comarketing should clearly define the relationship between the utility and developers to ensure that customers trust and adopt potential solutions. For new customer programs, the utility can include an offer of customer engagement support in its solicitations to market participants. For example, Pacific Gas & Electric (PG&E) has offered customer engagement and lead generation support to bidders in their solicitations for non-wires solution pilots.[52]

2. Pricing Mechanisms

Pricing mechanisms can also be a powerful tool in the non-wires solution toolbox. Utilities can use different types of time-of-use rates, demand charges, and peak pricing to encourage load shifting or load reduction and support deferral of infrastructure investments. Pricing mechanisms such as net metering, feed-in-tariffs, and New York's VDER, can be used to compensate DER generation and offset load. Design of pricing should reflect grid needs, be technology agnostic, and align with policy goals. Rate changes require regulatory approval, and any localized pricing must consider ratepayer impacts across the utility's service territory.

The necessity to prove to regulators that new rates won't adversely shift costs across the service territory can make it difficult to target rates to specific feeders or substations. Nevertheless, San Diego Gas & Electric piloted an opt-in time-of-use rate that included premiums for use during the top 200 peak hours on each circuit.[53] Circuit peaks were called for each customer based on his or her location, and resulted in rate increases of $0.19/kWh above baseline during peak hours.[54] This pilot was intended as a proof of concept and had a small number of participants but provides an early example of what rates designed to meet distribution system needs might look like.

Implementing tariffs may also require significant lead time to obtain regulatory approval and mitigate ratepayer impacts. As an extreme example, the time-of-use rate concept was first introduced in California following the state's 2001 energy crisis, and the formal rate reform process was not initiated until 2013. Default time-of-use pricing for residential customers will finally be implemented in 2019.[55] Voluntary rates can be easier to implement and, though it can be challenging to recruit customers, some utilities have had noted success: Over 50% of Arizona Public Service's residential customers are enrolled in its voluntary time-of-use-rate, which helps to reduce summer peak loads.[56]

To develop innovative location-based tariffs, utilities can build on successes in implementing differential compensation for distributed generation. Many states have seen a shift away from net metering, which compensates distributed generators at retail rates. Some of these states are shifting toward models like New York's VDER, which compensates distributed generators based on where and when they generate electricity. The **VDER** concept is anchored in a "value stack" with components that include avoided cost of carbon emissions, cost savings to customers and utilities, and other savings from avoiding expensive capital investments. Mechanisms like VDER can provide incentive for customers to install DERs where they provide the most value to the grid and help to mitigate the need for potential infrastructure upgrades.

3. Competitive Solicitations

Solicitations refer to approaches where an open, competitive process asks bidders to provide solutions for a specific need. Typically, competitive solicitations are formulated as an RFP or an auction. In both approaches, solutions are evaluated against one another on technical feasibility and cost. In an RFP process, solutions may also be compared according to qualitative factors, such as community or environmental benefits. In a non-wires solution solicitation, the issuer may select a single bid or a portfolio of bids.

Auctions have been used to procure DERs in California and specifically to procure a non-wires solution in New York. A successful auction requires a fairly mature market, with a pool of prequalified bidders that have a good understanding of the solicitation requirements and expectations. Auctions may provide additional transparency to the market because the clearing price is often made public, whereas the cost of winning bids for RFPs is released less frequently. While an auction is efficient, it is also a blunt mechanism: auctions value different types of resources on the basis of price alone and may not allow for comparing the unique attributes of those resources. Additionally, auctions may require significant development time to design the structure and to qualify vendors.

For its Brooklyn Queens Demand Management (BQDM) program, ConEdison procured 22 MW of peak load reduction (out of its 52 MW project target) through a reverse auction. The auction started with a price ceiling, and solutions providers decreased their bids in real time until the desired MW of load reduction was met; all bidders were then compensated at the clearing price. The risk of an auction with a clearing price is that the utility may overpay for resources; the clearing price of $988/kW-year was set by energy storage, one of the more expensive resources, and was far above the previous prices ConEdison had paid for other demand response resources.[57]

RFPs have been used to procure many non-wires solution projects, and most closely mirror traditional utility procurement processes. In an RFP, the non-wires solution procurer will publicly issue a package of information including data about the need, descriptions of the solutions, instructions for response, timelines, and criteria for evaluation. Based on this information, solutions providers develop bids according to instructions. The issuer of the solicitation evaluates the bids it receives and selects a bidder or portfolio of bidders.

Best Practices for Competitive Solicitations

The remainder of this section will focus on procurement of NWS through **competitive solicitations using RFPs**, in large part because it has been the most prevalent sourcing strategy used for non-wires solution projects thus far. Customer programs and pricing mechanisms are relatively nimble and flexible, allowing utilities to develop new implementation strategies fairly easily. In contrast, the traditional utility RFP process has many rules, processes, and standards that create institutional barriers to innovation and adaptation. To adapt this traditional process to ensure RFPs for NWS are most effective, we focus on two categories of best practice competitive solicitation recommendations:

1. **Process enhancements:** considerations for improving the methods by which non-wires solution solicitations are developed
2. **Best-fit technical approaches:** considerations for designing the content of an RFP to maximize the probability for technically feasible and cost-competitive results

1. Solicitation Process Enhancements

Soliciting non-wires solution projects requires increased coordination between a complex set of stakeholders. RFP development and evaluation processes can be improved to engage and leverage the expertise of complex sets of stakeholders, build the market's capacity to participate, and transparently share lessons learned.

a) Engage developers and other stakeholders throughout the process

Stakeholder engagement is critical at every step of the non-wires solution solicitation process to ensure creative solutions; competitive and technically feasible bids; and that stakeholders understand how a project provides value within the targeted geographic area. Whereas a traditional procurement process typically involves some level of information asymmetry in favor of the utility to ensure a bidding process remains competitive, non-wires solution procurement requires that utilities and developers spend significant time learning from one another. Maximum transparency and frequent communication are necessary at this early stage of market development to ensure that precedents determined now set the market up for future success and scale. Specific stakeholder engagement actions should be considered before, during, and after running a competitive solicitation process.

Items to Address Prior to an RFP Release

Engagement with developers prior to RFP development can be extremely valuable for all parties. Developers can articulate the types of data and information that would best position them to develop meaningful solutions, and they can provide valuable input on the initial feasibility of utility-proposed solutions. Early in the development of a more standard RFP process, developers should be given the opportunity to play an educational role, providing information to utilities on the latest DER technologies and their various applications.

Engagement with other stakeholders prior to RFP development can also help utilities design more durable solutions that deliver maximum customer and grid benefit. For example, earlier this year, PG&E released a request for offer (RFO) for its Oakland Clean Energy Initiative (OCEI), which seeks to procure local resources in combination with some substation upgrades to compensate for the retirement of a fossil fuel generator and meet local transmission reliability needs.[58] PG&E worked with the community extensively in the development of the proposal, including local labor, environmental groups, and the Maritime Port of Oakland, both to identify feasible projects and to ensure the community would benefit. Since NWS are often dependent on customer participation, it is extremely helpful to understand their needs and concerns to structure an effective solution. Community stakeholders and/or customers in the community may also hold key resources that can be used for a non-wires solution, such as land or rooftops. ConEdison has worked continuously with the New York City Housing Authority to identify opportunities for load reduction in its facilities, which represent a large portion of load in the BQDM project area.[59]

Before issuing an RFP, a utility should understand the size, technology, and time limits that are likely to eliminate potential developers, and structure the solicitation to lower barriers to entry. For example, New York lengthened RFP developer feedback response time from six weeks to 10 weeks, which was intended to allow developers with fewer resources more time to compete effectively. To the greatest extent possible, utilities should also seek to leverage their own assets to reduce barriers to entry for non-wires solution developers, such as utility-controlled land and streamlined interconnection processes. In its OCEI RFO section for utility-owned storage, PG&E states that offers will be considered for projects sited on PG&E-owned land, and that PG&E will lead on interconnection and some aspects of permitting for these projects.[60] To ease the interconnection process, utilities should provide guidelines or relevant examples of the types of support they may be able to provide, and which upgrades and equipment are likely to be the responsibility of bidders.

Utilities may also choose to explore alternative solicitation vehicles in addition to RFPs or RFOs. For instance, a request for information (RFI) can occur prior to an RFP as a formal way to collect information from potential bidders. RFIs can be effective in helping the solicitation issuer identify specific questions or data that would be valuable to use in the solicitation. ConEdison, for example, released an RFI in advance of its BQDM program to better understand how to effectively craft its solicitation.[61]

Key Considerations During the Solicitation Process

Solicitation opportunities should be posted in a central, public repository to maximize bidder accessibility and exposure. Once an RFP for a non-wires solution is released, ongoing contact with bidders is essential. Best practices from experience to date include ongoing utility collaboration with developers on non-wires solution RFPs through monthly pre-bid conference calls and webinars designed to encourage developer questions. These conversations provide an opportunity for bidders to clarify aspects of the RFP and better understand the utility's goals, which improves the likelihood that utilities will receive bids that align with their vision. After bid submission, the utility should continue this two-way communication and allow bidders time to address any information deficiencies or questions regarding their bids.

Following the initial RFP release, it can be helpful for utilities to screen bidders based on their intent to bid. Qualified vendors move forward in the solicitation process based on their technical readiness, creditworthiness, access to capital or history financing similar projects, and a willingness to accept the utility's commercial terms. Prequalification creates a more streamlined process that allows utilities to evaluate bids more quickly. The Joint Utilities in New York have laid out sample criteria for vendor prequalification in their Supplemental Distributed System Implementation Plan, including vendor deployment experience, credit requirements, and a first-pass evaluation of the fit of the solution to the need.[62]

During the solicitation process, some utilities create the opportunity for developers to connect with each other and develop integrated solutions. For newer technologies and less mature applications of NWS, developers and technology providers may have more ideas of how to assemble a portfolio than the utility. In its recent non-wires solution RFPs, National Grid included an offer to connect bidders that wish to address one component of the solution with other bidders looking to partner.[63] For developers with fewer resources or experience, this type of offer can provide an opportunity to compete for a piece of the project. For utilities, connecting solutions providers can result in creative packages of products that would not have otherwise been generated.

Important actions to take following bidder selection

Once bids are evaluated and vendors selected, the utility should clearly communicate with all bidders the reasons why their bids were or were not selected. At this critical stage of non-wires solution market development, it is important to provide transparent feedback for all bidders to improve the overall quality of future responses. Scaling NWS will require a large pool of vendors that understand how to deliver products aligned with utility needs.

A utility's release of non-proprietary data or lessons learned following a procurement process can also provide useful market information. Earlier this year, Xcel Energy ran a competitive all-source solicitation process for generation and released to the public anonymized data regarding the cost and number of bidders for each type of technology.[64] This information, specifically the strikingly low cost of renewable resources, generated significant interest and shifted many stakeholder perceptions regarding the cost of these resources. Similar data regarding cost and efficacy of NWS can support the evolving understanding of their value and broaden the marketplace for non-wires solution services.

FIGURE 8

HOW TO ENGAGE STAKEHOLDERS

PRIOR TO RFP RELEASE

- Understand DER offerings and capabilities
- Understand community needs and resources
- Evaluate initial technical feasibility of the proposed project
- Identify technology provider data needs
- Ensure developers understand how bids will be evaluated

DURING SOLICITATION PROCESS

Prescreen the list of bidders to those that qualify
- Answer bidder questions to improve the quality of bid
- Continue to engage bidders through webinars and conference calls
- Connect bidders to one another to foster integrated solutions

AFTER BIDDER SELECTION

- Provide specific feedback to bidders on why they were/were not selected
- Share lessons learned with peer utilities and the public
- Release non-proprietary information that can help move the market forward

b) Consider the role of third parties in procurement

In most non-wires solution procurement examples, the utility has led the competitive solicitation processes including development, release, and selection. If the utility is structured to transparently support the identification, evaluation, and procurement of non-wires solution opportunities at scale, then keeping these functions in-house should reduce transaction costs. However, there are a few reasons to consider moving this function outside the utility altogether:

- Utilities may not have the capacity or risk tolerance to manage a robust non-wires solution procurement process.
- There may be desire from stakeholders for an additional layer of transparency or neutrality in the non-wires solution procurement process.
- Key stakeholders in non-wires solution development may lie outside of the utility.

Several examples exist of third-party involvement in non-wires solution solicitations. In Boothbay, Maine, GridSolar LLC, a private third party, was responsible for the full solicitation and development of a non-wires solution pilot project to defer the need to build a transmission line.[65] GridSolar was given the autonomy to develop the project by the Maine PUC as a result of a settlement contesting a new transmission line proposed by the utility, Central Maine Power. The first non-wires solution in the state, and an early proof of concept for NWS in the US, the Boothbay project entirely removed the risk of project development from the utility. GridSolar was expected to deliver a specified capacity when called upon to do so by Central Maine Power. After three years of reliable operation, the pilot terminated because it became clear that the projected load that had been the justification for the transmission line proposal had not materialized. DER assets that were part of the Boothbay portfolio remained in place or were moved and repurposed. While the consideration of NWS in Maine has since become a legislative mandate, GridSolar's pilot was the validation the state needed to propose this mandate, and to show the utility and ratepayers the value of NWS.

Washington, D.C., is in the process of exploring an entirely new model for NWS identification and solicitation development. In its proposed DER authority model, a neutral, third-party entity would assume all these roles as a complement to the regulator.[66] In many respects, the DER authority resembles a wholesale market model, in which an independent systems operator is responsible for identifying needs and issuing solicitations or creating pricing mechanisms to procure wholesale resources. Some of the advantages of this model are improved transparency (i.e., ensuring that NWS receive fair consideration alongside traditional solutions), and the avoidance of opportunities to use screening criteria to artificially exclude projects (e.g., by a utility splitting traditional grid infrastructure projects into multiple smaller ones that are under thresholds for size or cost that would otherwise trigger non-wires solution evaluation).

Finally, there are states in which a third-party entity may need to play a key role in non-wires solution implementation if it is primarily responsible for designing and procuring customer programs. For example, Energy Trust of Oregon and Efficiency Vermont run competitive solicitations for energy efficiency and customer programs in their respective states.[67] Similarly, the federal agency Bonneville Power Administration considers and implements NWS across the eight western states where it transmits and sells electricity.[68] These organizations will need to play a key role, including maybe issuing the solicitation, in any non-wires solution opportunity that would leverage customer programs.

2. Best-fit technical approaches for solicitation

In addition to solicitation process enhancements, material changes to RFPs will enable non-wires solution providers to participate more effectively. RFPs should provide ample data to bidders accurately describing the identified need and desired performance attributes of the solution, while remaining agnostic to all potential technology proposals. Solicitations should strive for specificity but refrain from being technically deterministic. The following considerations describe key components of solicitations, and how they may need to be altered for NWS.

c) Provide data-rich needs descriptions for the solutions being requested

The foundation of a non-wires solution RFP is the utility's clear articulation of the problem it's trying to solve. To date, most non-wires solution projects have been implemented for load relief needs, though NWS have also been considered for hosting capacity, reliability, and voltage support.[69] Needs descriptions should focus on describing the problem, not the potential solution. Utilities should strive to construct needs descriptions that are not prescriptive and do not presume a particular technical outcome.

It is critical for needs descriptions to include sufficient data to enable developers to design effective solutions. In general, developers are interested in as much data as the utility is willing to provide to develop detailed solutions. More specifically, technology providers seek an understanding of the magnitude, duration, and frequency of the need; granular (hourly or sub-hourly) load profiles; and the grid topology of the affected area. These types of data can be included in solicitation documentation, and, ideally, made publicly available online. For example, all New York utilities' non-wires solution opportunities are listed on **dedicated pages on their websites** and some of their specific solicitations link to public GIS maps including hosting capacity, Locational System Relief Value and Value of DER, and existing distribution assets.

In addition to data that characterizes the grid need, bidders offering demand side management, efficiency, and customer-sited distributed generation are interested in customer demographic data. Breakdowns of commercial and residential customers, building stock information, and aggregated load profiles can be extremely valuable to solutions providers. Utilities should seek to release customer demographic data that enables customer-sited solutions to compete effectively, without compromising customer privacy or data security. For a more complete list of data to be included in an RFP, please reference the **Competitive Solicitation Processes section** on page 58.

Needs descriptions should also leverage probabilistic analysis undertaken in planning processes. Detailing the probabilities for ways in which the need may change over time allows developers to design more flexible, modular solutions. A more probabilistic approach could signal to developers that the utility values flexibility in its evaluation of solutions. Revealing the cost of the traditional infrastructure solution that a non-wires solution would be compared against can be a helpful data point. The decision whether or not to provide the cost-to-beat for NWS has been contentious, with utilities citing concern that bidders could price their solutions just shy of the cost cap, rather than bidding at true cost. While this could lead to suboptimal pricing, it would still lead to NWS that are less expensive than traditional solutions. Furthermore, if the non-wires solution market was sufficiently competitive, concerns of providing a cost to beat would be less relevant because bidders would be sufficiently motivated to bid a cost to compete against each other. From a developer's perspective, this information can be critical to determining whether their proposed solutions are cost-effective. This allows them to more efficiently allocate their resources to participating in solicitations that they know will be successful. In New York, cost-to-beat data is provided on a utility-by-utility and case-specific basis, whereas in California it is supposed to be included as part of the Distribution Investment Deferral Framework.[70]

d) Elaborate performance attributes for solutions rather than technology requirements

Next, an RFP should articulate how the solution is expected to meet the described need. Solutions should be framed in terms of attributes and performance, rather than specific technologies. Technology providers themselves should be able to determine whether their product is a good fit to meet the need, and utilities benefit little by limiting the solution set. The Joint Utilities in New York often include a statement of this technology agnosticism in their RFPs: "This RFP is open to all DER approaches that display the potential to provide load relief in the areas identified."[71]

Solutions descriptions should elaborate the reliability criteria for DERs as part of a non-wires solution. As described in California's Competitive Solicitation Framework Working Groups Final Report, "DERs will need to be able to deliver specified services reliably at very precise locations, at specific times, and in predictable amounts."[72] As a result, reliability and availability performance requirements must be very clearly articulated in non-wires solution RFPs.

Developers must understand if and how utilities intend to dispatch resources to meet a particular need. DER solutions can either be active resources that require signals for dispatch, or passive resources that constantly reduce load or operate independent of utility instruction. Technology providers of active resources need to know how much advance notice will be given prior to dispatch, how signals will be sent, and what the quality of their response should be over a specified time period. These protocols should be designed to meet the grid need without unnecessarily limiting the types of technologies that can respond. The level of control required by the utility, for both dispatch and data visibility, should be made clear to developers. RFP instructions should also indicate how dispatch will account for other services the asset may provide in addition to distribution deferral, such as customer resilience or resource adequacy. For a more complete list of data to be included in an RFP, please reference the **Competitive Solicitation Processes section** on page 58.

Developers should also understand who will be assembling the portfolio of solutions, and whether bids are aimed at meeting the full grid need specified or if they are to be a discrete component of the ultimate solution. In most cases, the utility will organize bids into a complete solution. If DER providers are expected to work with aggregators to design more complete solutions, that should be explicitly stated within the RFP.

e) Provide clear evaluation criteria as part of the solicitation

Utilities should consider updating evaluation frameworks to reflect the range of values that NWS provide, and communicate evaluation criteria transparently to bidders.

Evaluation of non-wires solution bids should first assess the technical feasibility and cost-effectiveness of the proposed solutions. Beyond cost-comparison of technically acceptable solutions, utilities should adapt more comprehensive benefit-cost analysis (BCA) frameworks to reflect the range of benefits that NWS provide. NWS provide local system benefits and avoided costs, which may not be accounted for in existing BCA calculations. Additionally, BCA methodologies can be updated to reflect some of the benefits that are more difficult to quantify, such as emissions reductions, air quality improvements, economic development, and other non-energy benefits to customers and society. Ideally, these values should be incorporated into a single framework that allows for side-by-side comparison of non-wires solution portfolios that include different strategies and technologies.

A utility's RFP should clearly state how bids will be evaluated so that developers can craft solutions that reflect the utility's priorities. Clear methodologies for how solution costs and benefits will be quantified are critical for transparency and bid optimization. Utilities source the most cost-effective solutions when they can draw from a mature and competitive market. Providing transparent evaluation criteria can help build developer trust in the solicitation process and encourage continued participation in the utility's non-wires solution solicitations.

In California, for example, non-wires solution solicitations clearly state bids will be evaluated on a least-cost, best-fit basis. The state already uses the principles of "least cost, best fit" through procurement of renewable portfolio standard resources, local capacity requirements, and other all-source solicitations for resource adequacy. Cost metrics (also included in the solicitation) are first used to assemble an optimized portfolio, which is then reviewed for additional services and potential conflicts, and finally reviewed for qualitative factors such as project viability.[73]

The Joint Utilities in New York use a different approach, and language in their RFPs indicates that the objective of the bid evaluation process is to identify solutions that "provide the greatest overall value to customers."[74] A list of factors by which bids will be evaluated is provided in the RFP itself, including quantitative considerations such as cost, and qualitative items such as timeline and project viability, environmental benefits, and community impact. These factors are explicitly not listed in order of importance, nor given any weighting. The RFPs indicate that the utility's BCA framework will be used to evaluate the bids, but that framework—which is already complex for developers to navigate—is only one of several evaluation approaches that utilities indicate they will use. Therefore, developers have expressed that the BCA framework does not, in itself, provide respondents with sufficient clarity on how non-wires solution bids may be evaluated. From a developer's perspective, this makes it very challenging to prioritize their efforts in preparing their bids or to understand why their proposal was not selected. Within the utility, a framework that requires more qualitative and customized analysis may be difficult to scale if many bids are received.

Further recommendations on structuring these evaluation frameworks can be found in the **Proposal Evaluation section** on page 64.

f) Keep options open for further DER market evolution, including wholesale market participation and/or distribution-level service pricing

As existing grid infrastructure ages and DER adoption accelerates on the distribution system, utilities increasingly face unprecedented challenges—and opportunities—for system management. Forecasting future demand and generation needs is becoming increasingly complex, and utilities should weigh the risk of stranded investment capital in traditional assets if/when grid needs no longer match developments. Not only can DERs defer infrastructure investments, they can also provide a number of other distribution-level services that are uniquely qualified to address emerging grid needs and customer demands. In particular, the flexibility and modularity of DERs should be considered in non-wires solution procurement. Non-wires solution solicitations, for example, could include upper and lower bounds on load forecast estimates, and encourage bidders to show how their solution might be able to scale up or down within the range of projections. Additionally, non-wires solution providers should be encouraged to provide a menu of services their product can offer beyond meeting the current need.

The concept of a distribution services market, though nascent, could expand the marketplace for NWS. Instead of procuring packages of resources to meet specific needs, a mature market would allow a distribution system operator to cultivate a portfolio of DERs that can be called upon to provide a variety of distribution-level services. A distribution services market could also provide utilities with a wider range of available resources if a distribution need arises. Currently, one non-wires solution portfolio is typically required to meet a defined need with a high degree of certainty. However, in a market structure, there is often a redundancy of resources that can provide critical services. In wholesale ancillary services markets for example, many different generators are capable of providing voltage support or frequency regulation as there is no single asset responsible for maintaining grid reliability. While this concept is more likely to be implemented in deregulated states that have wholesale energy markets or states with high DER penetrations, it could be applied to any type of utility with appropriate regulatory or board approval.

Many value streams that DERs offer at the distribution level—such as phase balancing, voltage management, hosting capacity, shaping EV and building electrification loads, and local resilience—are not currently well-quantified. For example, using NWS for hosting capacity is an increasingly relevant application that was included in California's Distribution Resource Plan Demo D pilots.[75] In its CPUC proposal after the solicitation evaluation concluded, PG&E requested permission to forego selecting any bidders. In its summary of lessons learned, PG&E relayed that bidders had difficulty determining the value of hosting capacity, which was reflected in bids that came in at higher costs than PG&E expected. For behind-the-meter solutions, the terms of hosting capacity services were often in conflict with customer time-of-use rates: solar generation often occurred during higher-priced hours, so shifting loads to better utilize solar imposed new costs to customers.[76]

As markets mature for capturing the value of DERs, RFPs will increasingly have to specify the rules for participation across programs. California has an active working group in its Integrated Distributed Energy Resources proceeding that is focused on the concept of "incrementality," or how to determine if a DER that is already being compensated through an existing program is also able to provide services and be compensated under a new solicitation. For example, PG&E asks solicitation participants to specify if the assets they are bidding into an RFP already participate in other utility programs. PG&E uses a table to explain the concept of providing a solution that is incremental to other tariffs and solicitations. For instance, an existing energy efficiency program would have to specify how adding a new component of a program or increasing incentives would materially enhance uptake to be considered incremental.[77] This framework should be reevaluated on a recurring basis to surface any unintended consequences such as excluding DERs used for NWS from other compatible value streams.

Rules and contracts developed for new solicitations should ensure that resources are not being double-counted in a way that could affect project reliability, while leaving room to evaluate the best use of resources in a future with different grid needs. Frameworks for incrementality or participation in multiple programs should also be designed to ensure they do not unnecessarily restrict NWS from access to critical subsidies. Rather than a formal incrementality framework, ConEdison has provided a statement on cross-program participation in its Non-Wires Alternatives Program Agreement,[78] which states that assets are eligible to receive compensation from other programs provided they meet the non-wires solution performance criteria and are not compensated at a value greater than their costs.

g) Lay out clear requirements in project contracts to fairly allocate risk and ensure operational reliability

The risk profiles for NWS differ from traditional grid infrastructure in some key aspects including dispatch control, performance standards, and payment structures. Utility procurement contract templates should be adapted to account for these differences. At the same time, these contracts need to strike a balance between giving utilities sufficient confidence that NWS will reliably deliver critical grid services, while ensuring that the risk placed on developers does not result in cost-prohibitive bids or otherwise stymie the market. Balancing these risks in non-wires solution contracts has been challenging for utilities and developers, and there are currently few examples of standard non-wires solution contract structures. To support more standard structures, contracting considerations for terms describing dispatchability, payment, performance, and construction can be found in the **NWS Contracting Considerations** section on page 70.

FIGURE 9

MARKET-SPECIFIC CONSIDERATIONS TO ENSURE HOLISTIC NWS PROCUREMENT PROCESSES

RECOMMENDATIONS FOR PROCUREMENT TEAMS	VERTICALLY INTEGRATED UTILITY	WIRES-ONLY UTILITY	CONSUMER-OWNED AND NONPROFIT UTILITIES
USE DIVERSE APPROACHES FOR ENABLING NWS, INCLUDING PRICING MECHANISMS, EXPANSION OF CUSTOMER PROGRAMS, AND COMPETITIVE SOLICITATION	• Utilities in each market should consider all three procurement options and evaluate their relative merits to best address a given system need. • Attention should be paid to the relative transaction ease of pricing and customer programs compared to solicitations, which might make the former more desirable to resource-constrained nonprofit utilities.		
DEVELOP A COMPREHENSIVE COMPETITIVE SOLICITATION PROCESS THAT PROVIDES AMPLE DATA AND IS TECHNOLOGY AGNOSTIC TO ENSURE MEANINGFUL BIDS	• VIUs may be able to structure non-wires solution procurements to align with their core business model if regulators approve addition of new assets to their rate base. Therefore, VIUs have a strong incentive to design user-friendly and data-rich RFPs to stimulate strong responses. • VIUs also are likely to have the requisite institutional capacity to comprehensively draft and evaluate the range of technologies proposed in non-wires solution offers.	• Depending on the level of regulatory support for NWS, wires-only utilities can leverage NWS procurements to expand ownership of different asset types (like storage) or increase the rate base by including new expenditure classes. • Wires-only utilities may lack familiarity with contracting structures for ownership of some technologies (like distributed generation) so procurement teams may need to rely on external precedents or consultants. • If wires-only utilities do not own NWS, they may need to pay greater attention to the participation of assets in wholesale markets to avoid conflict in overlapping provision of services.	• Co-ops and munis may have difficulty attracting bids from developers given the small size of their non-wires solution needs. Consider aggregation of needs across multiple co-ops and munis. • Many co-ops face the issue of self-generation caps due to contracts with G&Ts, potentially limiting the suitability of some technologies for NWS.

02

SECTION 2: IMPLEMENTATION GUIDELINES

IMPLEMENTATION GUIDELINES

Having detailed best practice frameworks for developing robust NWS programs, we turn from outlining enabling conditions to practical guidelines that regulators and utilities can adopt to procure non-wires solution projects. This section includes detailed considerations for the four central elements underpinning successful implementation of NWS:

1. **Screening criteria** to identify potential non-wires solution projects
2. **Competitive solicitation** processes that lead to meaningful responses
3. **Evaluation frameworks** to determine if NWS are viable and competitive
4. **Contract terms** attuned to non-wires solution project characteristics

1. SCREENING CRITERIA

Screening criteria for NWS can help prioritize utility procurement efforts on projects that offer the highest value and likelihood for developer bid success. Screening criteria can thus help grow the still-nascent market for NWS, minimizing false starts and pursuit of marginal opportunities. In the long run, as utilities gain more non-wires solution experience, screening criteria should evolve to be more inclusive of a wider universe of potentially viable NWS.

With NWS still fairly nascent, planners can most efficiently identify viable non-traditional solution opportunities by adapting existing planning practices to screen for non-wires solution suitability. Typical planning involves regularly determining system needs based on review of load forecasts, asset conditions, system reliability, load serving capability, and other relevant operational data. Once needs and timing are identified, planners estimate costs for a range of possible solutions and select the most cost-effective option to include in capital budgets. This traditional process can better support NWS if planners simply used screening criteria to determine if NWS should be included as part of the potential solution options considered. Instead of actively pursuing NWS for every grid need, screening allows utilities and developers to focus on the most viable non-wires solution projects, ensuring more productive market engagement.

Any criteria used for screening should evolve over time to avoid artificially limiting the market as more non-wires solution applications are proven. Criteria should also be applied as heuristics guiding decisions to further evaluate NWS rather than as rigid boundaries used across all situations. Rhode Island embeds flexibility in its screening by clarifying that utilities can use their discretion to pursue NWS even if a need does not pass one or more of its criteria.[79] New York regulators have also noted that screening criteria may unreasonably limit non-wires solution opportunities and that utilities should consider public policy goals and other justifications for pursuing NWS despite screening results.[80]

Development of screening criteria can build upon existing frameworks

A range of approaches has been taken to develop and integrate screening criteria into planning processes. States or utilities beginning to engage with NWS can develop their own screening criteria that build on established precedents. Descriptions, examples, and critical considerations for five illustrative screening criteria categories adopted by different jurisdictions are provided below.

FIGURE 10

COMPARISON OF CATEGORIES INCLUDED IN VARIOUS DISTRIBUTION SCREENING CRITERIA

SCREENING CRITERIA CATEGORY	CATEGORY DESCRIPTION	CALIFORNIA	NEW HAMPSHIRE (LIBERTY UTILITIES)	NEW YORK	RHODE ISLAND	VERMONT
1. TIMING	Evaluate different non-wires solution options based on different need dates	✓	✓	✓	✓	✓
2. ECONOMIC VALUE	Prioritize NWS for high-value projects		✓	✓	✓	✓
3. PROJECT TYPE	Narrow scope of non-wires solution analysis to certain system needs	✓		✓		✓
4. ASSET CONDITION	Exclude specific system needs from non-wires solution analysis		✓		✓	
5. PROJECT SIZE	Limit non-wires solution analysis to smaller-scale projects		✓		✓	

1. Timing

NWS should only be considered where they can be deployed in time to address a need

Recognizing that it takes time to procure NWS, a timing screen can be used to exclude consideration of NWS for grid needs that are expected within a certain time frame. Initially, NWS might only be pursued when there is both enough time to address a need by deploying a non-traditional solution and enough contingency to deploy a traditional solution in the event the non-wires solution project is delayed. As utilities become more familiar with implementing NWS and developing operational contingency plans, they should consider shorter time screening thresholds for specific projects. Utilities may also want to use a timing threshold to exclude needs identified particularly far in the future due to the increased forecast uncertainties.

Developing specific criteria

To determine the appropriate amount of time to serve as the threshold for non-wires solution consideration, a utility can look to its historical experience procuring solutions for specific types of needs and then add extra time for a contingency margin. It can delineate components of solution implementation (project identification, solution sourcing, evaluation, approval, deployment), and focus on how long each step is expected to take for non-wires and traditional solutions. As an illustrative example, if, over the last five years, it took 12 months on the average for a utility to deploy traditional projects to address a 5 MW load relief need, that utility might want to exclude NWS for similar identified needs that are less than 24 months in the future. The 24-month threshold is thus designed to assure the utility that it could pursue an NWS project with enough contingency to deploy a traditional solution if necessary.

Rhode Island and Liberty Utilities in New Hampshire use timing thresholds in this way, requiring NWS consideration only for needs at least 30 or 24 months in the future, respectively. Timing criteria can also be made more flexible by differentiating thresholds by non-wires solution project type, size, or sourcing mechanism. For example, New York uses a criterion that differentiates timing thresholds based on project size, and California differentiates based on project types. California investor-owned utilities' recent Distribution Deferral Opportunity Reports note that they are prioritizing NWS for needs at least 36 months out. The state's Distribution Investment Deferral Framework however notes that even short-term needs within 18 months could potentially be addressed by NWS, granted non-RFO sourcing mechanisms and expedited regulatory approvals. This flexibility is important since some non-wires solution technologies like storage can, in certain circumstances, be the best and fastest to deploy, as Southern California utilities demonstrated with its expedited procurement of 70 MW of storage in six months in response to the 2015 Aliso Canyon gas leak.[81]

Considerations

Timing criteria should be designed keeping in mind that different DER technologies come online in different timeframes. It is possible that storage can be deployed very quickly but implementing other NWS, like new geo-targeted demand-side management programs, may take longer to engage and recruit customers. Contingency time is also a critical consideration that utilities need to incorporate into timing thresholds. Non-wires solution project milestones should be delineated in contract structures so that utilities can track deployment and ensure reliable service via either the non-wires solution or a contingency strategy if the non-wires solution is delayed.

2. Economic Value

A screening process should prioritize the highest-value opportunities for NWS, often corresponding to situations where the traditional solution is very expensive

This screening category uses cost thresholds to exclude NWS from consideration for minor, inexpensive projects in which high transaction costs could disproportionately disadvantage them. Since NWS are only pursued if they are cost-effective, this screen helps target the highest-value opportunities where NWS can avoid sufficient traditional expenditures to be cost-competitive, even including the potential additional costs associated with procuring them.

Developing specific criteria

Utilities should reference their historical capital planning experiences to identify average costs for traditional projects that have been approved to meet particular system needs. For example, a utility could inventory all the distribution investments it made over the past five to 10 years to identify typical cost parameters for certain categories of projects. Ideally, planners would then use these parameters to develop unique cost thresholds for different project categories. For example, Rhode Island's screening framework states that cost floors should vary across different project types and timeframes. New York utilities similarly have differentiated thresholds for "small" and "large" project types. Utilities in Vermont differentiate cost thresholds between distribution and transmission projects, and furthermore they include consideration of the relative cost differential between a traditional solution and the non-wires solution rather than just an absolute threshold for the cost of the former.

Considerations

Utilities can and do make exceptions to this economic screen for pilot or other demonstration projects intended to identify issues and build comfort with unfamiliar technologies. The thresholds established by utilities should therefore be flexible so they don't exclude NWS that may be compelling despite addressing needs where traditional solutions may be inexpensive. Given the range of potential non-wires solution benefits, it may be reasonable for utilities to recommend—and regulators to approve—NWS for environmental or planning flexibility purposes even if they are below screening cost thresholds.

Although cost thresholds have varied widely across sets of screening criteria, regulators can support more uniform threshold development by providing utilities with threshold determination methodologies or other guidance. Regulators can also review threshold determination documentation to verify that the utility's analysis is rooted in actual business practices. When reviewing capital investment plans, regulators can further ensure that the full costs to address a system need are not artificially segmented to fall below cost thresholds and avoid non-wires solution consideration.

3. Project Type

Certain investment categories can be deprioritized from non-wires solution consideration

Utilities spend billions of dollars each year maintaining the distribution systems that provide the last mile of electric service to end-use customers. Some of these investments, for needs like capacity constraints, are more suitable to defer or avoid by implementing NWS than others like reactionary repair of damaged equipment where there is limited time for planning. By categorizing different types of needs and assessing the ability for NWS to solve them, a project type screen can help utilities prioritize non-wires solution consideration for those categories where NWS would be most capable of addressing needs.

Developing specific criteria

Utilities typically categorize investments to meet distribution grid needs in their capital budgeting processes. For example, in their Supplemental Distributed System Implementation Plan, New York utilities summarize capital investment projects into 11 different categories including load relief, asset condition, and non-transmission or distribution infrastructure.[82] To determine the applicability of NWS to each project category, the utilities define the types of services needed to address each. Certain categories like "public requirements," in which existing facilities must be relocated to accommodate rights-of-way, were deemed not relevant for NWS since the investment is for a service unrelated to capacity or performance. Similarly, the "non-transmission or distribution infrastructure investment" project category was not considered applicable for NWS because the investment is for things like telecommunications or other such services that support grid operations rather than grid operating infrastructure. Based on their analysis, New York utilities considered load relief and reliability the most conducive to NWS but remain open to opportunities in which NWS can provide value across most other categories.

California has similarly categorized investment types for system needs, and notes specific ones to prioritize for non-wires solution consideration in its Distribution Investment Deferral Framework.[83] The Framework details the screening process investor-owned utilities must follow to develop annual Distribution Deferral Opportunity Reports that identify potential non-wires solution projects. As part of a technical screening, investments in certain project types are excluded from non-wires solution consideration, such as investments for non-capacity related reliability like automation, fault detection, and sectionalizing equipment. Besides a few categories not applicable for NWS, California rules generally consider distribution capacity, voltage/VAR support, reliability, and resilience services as best suited for NWS.

Considerations

The range of services that NWS can provide has not yet been fully explored. To date, most projects have addressed distribution or generation capacity constraints. Nonetheless, as collective experience with NWS grows and more pilots demonstrate their ability to effectively provide a wider range of grid services, NWS may be considered in a growing number of projects. New York and California both explicitly note that additional opportunities for NWS may exist and warrant further investigation. New York cites specific policy and structural changes needed to enable wider applicability of NWS for investment categories like power quality and conservation voltage reduction.[84] California similarly highlights resilience as an area in which NWS can play a larger role if interconnection, protection, communication, and visibility considerations are addressed.

4. Asset Condition

Specific investments can be excluded from non-wires solution consideration, ideally as part of a broader screening category

The same rationale for using a project type screening category is also relevant for using an asset condition screening category. Essentially, a utility might want to exclude certain investment types from analysis of NWS for safety or reliability reasons. Instead of reviewing and determining non-wires solution suitability for all potential investment categories, it might choose to screen for a specific category like asset condition so that any investment to address an asset condition need is excluded from non-wires solution consideration. Since the function of this category is aligned with the broader project type screening category though, it can be consolidated as a subset of the latter. For example, New York explicitly considers asset condition as part of its project type screening category.

Developing specific criteria

Rhode Island and Liberty Utilities have included an asset condition category in their screening criteria. Unlike New York, California, and Vermont, they don’t have a separate project type screening category, so asset condition is the only investment type that is explicitly excluded for non-wires solution consideration. Asset condition investments are defined as planned repairs, replacements, or enhancements of existing infrastructure to ensure safe and reliable service. Ostensibly, this asset condition category was emphasized because there was an expectation that such investments would not be conducive to NWS, but that other investment types would. This approach might help encourage other non-wires solution projects, but is also likely too narrow and overly prescriptive since, as New York utilities discuss in their Supplemental Distributed System Implementation Plan, investments to repair or replace equipment may have components that could be suitable for NWS.[85]

Considerations

This category can effectively be combined with determinations of non-wires solution suitability for a wider breadth of project types. In practice, applying this category has proved problematic in Rhode Island, where it has been used less as a guideline and more as a definitive rule. For instance, the majority of projects proposed in National Grid's System Reliability Procurement Reports have been excluded from non-wires solution analysis based on the fact that most investments are somehow related to asset condition since Rhode Island's distribution system was largely developed in the 1920s.[86]

5. Project Size

Initial procurements can screen for non-wires solution opportunities that are below a certain size threshold to limit potential downsides of non-performance

Project size thresholds can be used as a precaution to provide utilities with the assurance that any non-wires solution project failure would be manageable. By limiting non-wires solution consideration to needs where less than a prescribed amount of peak load would be addressed, the utility would know that even a worst-case non-wires solution non-performance event could not trigger extensive outages. Although this screening category has been used in several jurisdictions, it's likely to decline in importance as large non-wires solution projects are piloted and their performance validated. Although it might serve a purpose for early stages of non-wires solution procurement, it is likely a screening category that will be unnecessary and potentially counterproductive in a more mature non-wires solution market environment.

Developing specific criteria

Utilities can try to limit initial NWS to relatively small needs to mitigate the risk of potential failures. Smaller non-wires solution projects also might make it easier for utilities to develop operational contingencies as risk management plans for non-wires solution non-performance. At the distribution level, both Rhode Island and Liberty Utilities of New Hampshire use project size as a screening criterion, only considering NWS for needs that relate to less than 20% of a given area's load. Vermont similarly uses 25% as its criterion for transmission projects, but it does not include a project size screen for the distribution level. It is unclear precisely how these thresholds were developed, and regulators should require analytical rigor before applying such criteria in the future.

Considerations

This criterion should provide utilities with the necessary assurance to get more comfortable with NWS. It should not preclude larger non-wires solution projects if they can prove sound risk mitigation strategies, and it should not indicate to the market that NWS will perpetually only address small needs. Ultimately this guideline should be a stepping-stone to larger procurements, once more performance data has been captured from implemented NWS.

2. COMPETITIVE SOLICITATION PROCESSES

Once a decision has been made to pursue NWS through a competitive solicitation, the utility should design the RFP to maximize the number of technically acceptable, cost-effective bids. For decades, utility procurement departments have run solicitation processes for traditional assets, but NWS solicitations require new and different considerations. To scale this market, it is important that solicitations are drafted with appropriate specificity, flexibility, and transparency.

Considerations for Crafting a High-Impact RFP

Prior to drafting an RFP, there are several high-level questions that the issuer should consider in order to determine the appropriate solicitation scope and quantity of information to be included.

FIGURE 11
CONSIDERATIONS FOR CRAFTING A HIGH-IMPACT RFP

Have existing DERs and programs been identified within the geographic area that could be used in an NWS?	Assess existing programs and DER penetration. Understand how existing DERs or customer programs could be leveraged in a solicitation or instead of issuing a solicitation.
Has bundling multiple identified needs into one RFP been considered, to enable a broader set of solutions and leverage economies of scale?	NWS projects may be bundled such that they enable potential solutions that need greater economies of scale to participate, such as software solutions. Bundling may reduce transaction costs, though could increase complexity and risk associated with execution. If the solution requires customer acquisition, bundling can also lead to efficiency gains in marketing.
Have developers been engaged to better understand the unique capabilities of their technologies, the feasibility of meeting the given need with an NWS cost-effectively, and data needs for developing an effective solution?	Consider an RFI, or additional stakeholder engagement before issuing an RFP to better gauge market interest and gather data necessary to issue a solicitation. Understanding the state of the market can help ensure that a solicitation will receive competitive bids.
Have stakeholders been engaged to understand potential community assets that can be leveraged through an NWS, and the community's concerns and needs?	Consider additional stakeholder engagement. This process can help to identify customers and assets that can be utilized to lower project costs and understand how a project can deliver value to customers. Community support and collaboration can result in stronger, more durable projects, and improve the probability of regulatory approval.
Are the costs of the traditional solution known, and is there an established threshold below which ideal solutions will bid?	Understand the costs of the traditional solution, and determine how that number will be used in evaluating bids.
Are there already prequalified vendors bidding into the solicitation?	Consider a vendor prequalification process to expedite review of bids and improve confidence that a set of bids will be received from qualified vendors.
Can the bid evaluation methodology be explained clearly to respondents?	Consider testing evaluation methodologies with bidders prior to RFP release to ensure clarity. Developers should be able to calculate how the utility will value their solution. Educational webinars or in-person workshops could be utilized to familiarize evaluation criteria with bidders.
Have communications protocols between the NWS and grid operators been developed and socialized with developers?	It is critical for developers to understand how grid operators intend to dispatch and call upon resources, and determine if their proposed solution is compatible with planned operation. RFPs should also lay out cybersecurity requirements. It can expedite interconnection and project commissioning to clearly delineate communication and cybersecurity requirements in the RFP.

RFP Components

The following are more specific considerations for crafting key sections of an RFP, including data requirements and insights on how a non-wires solution RFP might differ from an RFP for a traditional solicitation.

Needs-based problem description

A needs-based problem description with ample—and specific—data is necessary to provide respondents with a sufficient level of information to develop bids that are responsive to the issue the utility is seeking to address.

Technology providers likely require the following minimum level of information in a utility's non-wires solution needs description:

- **Type of need:** Different system needs (e.g., load relief, voltage support) require distinct technologies and/or approaches. Providing clarity around the need in an RFP encourages responses that include least-cost, best-fit technologies.
- **Need characterization:** Including the expected magnitude, frequency, and duration of the need, and predicted changes in the need with season and time can allow developers to perform technology-specific analysis to assess technical feasibility prior to submitting a formal bid, reducing unnecessary work during evaluation.
- **Projected online date:** The forecasted online date dictates the project timeline for developers. The online date should be realistically determined, so that it does not preclude developers with certain types of technology from bidding. If applicable, the solicitation should also include commitments on behalf of the issuer to support its desired timelines, such as streamlined interconnection and permitting.
- **Grid topology of the affected area:** Developers should be able to understand the system in which their technology will be deployed, including existing equipment condition and age, to develop solutions that interface seamlessly with existing grid assets and maintain reliability. National Grid and the Joint Utilities in New York provide **public maps** containing pertinent grid topology and feeder-level load information.
- **Geographic and customer demographic data:** Geographic data, such as GIS maps, can help developers to determine where their proposed solutions will be sited. Including the demographics of the geographic area of interest, such as breakdowns by customer class and aggregated load profiles, enables developers to propose realistic customer-sited solutions. Any customer demographic data released should also comply with customer data privacy restrictions. In its non-wires solution solicitation for load relief at Columbus Circle, ConEdison provides a **breakdown** of count, average and peak demand, and consumption for customers of various types.
- **8,760-hour load profiles:** Equipping developers with granular, hourly, or sub-hourly load data of the affected circuits enable them to calculate more accurately the reliability and availability of proposed solutions. Several RFPs include typical peak day hourly **load profiles**, though few have included full 8,760-hour load profiles as an attachment.
- **Hosting capacity data:** Many proposed non-wires solution projects include the addition of DERs (including solar and storage) that, at certain times, deliver power back to the grid. It is therefore important to know the ability of the target substation or circuit to "host" more DERs without compromising reliability, power quality, or safety, or requiring significant additional upgrades.[87] Hosting capacity map examples are provided from utilities in **Minnesota**, **Colorado**, **Hawaii**, **the District of Columbia**, **New York**, and **California**.
- **Overview of existing tariffs and programs:** Existing tariffs and programs and their current levels of participation in the target geographic area help developers identify areas of potential synergy. National Grid's **Old Forge RFP** includes data on existing program participation and information on distributed generation applications in the area of interest.

- **Plan for compensation:** The RFP should outline how the utility proposes to compensate the non-wires solution project (i.e., fixed or variable payments) and for how long (length of contract), or indicate if the utility is open to other payment option proposals. Specificity around compensation terms is a key driver of the developer's response, as well as determining the type of financing it will be able to secure.

Although it does not include all of the information recommended on this list, an illustrative example of system data to be included in NWA solicitations by the Joint Utilities in New York is presented below.[88]

FIGURE 12

NEW YORK JOINT UTILITIES SUPPLEMENTAL DSIP EXAMPLES OF SYSTEM DATA ELEMENTS TO BE INCLUDED IN RFP

TYPE OF SYSTEM DATA	ILLUSTRATIVE EXAMPLE
Size of the need	1 MW
Seasonality	June–August
Temporal profile of need	Between the hours of 1 and 4 p.m., for no more than three consecutive days
Duration of deferral	Five years
Geographical characterization of need area	A map showing the approximate boundaries of the need area, perhaps labeled with zip code information
Customer characterization of need area	Approximately 2,000 customers, split 80 percent residential and 20 percent commercial and industrial

Performance-based solution description

A performance-based solution description details the desired attributes and functions of a non-wires solution, while remaining agnostic with respect to the type of technology that should be employed. Specificity in this description is vital to ensure that proposed solutions will perform in a way that effectively meet the target need. Performance-based solutions descriptions should include the following considerations for NWS:

- **Dispatch details:** Though not all developers will need this data, providers of active solutions (e.g., those that need to be dispatched) should be provided with a general understanding of how often resources will be called upon and how and when signals will be sent, as well as expectations around response time. Utilities may not want to divulge specific protocols for security purposes, but enough detail should be provided to ensure that proposed solutions will be interoperable with existing control systems. Additionally, developers should be pointed toward cybersecurity protocols or requirements that may be applicable to NWS.
- **Technology readiness criteria:** While ensuring that reliability criteria are met, non-wires solution descriptions should not unnecessarily restrict solutions that utilize new technology, and utilities may have to adjust expectations from traditional solicitations around qualitative requirements for technology “readiness.” For example, utilities may require that technology used for NWS have been demonstrated in an in-situ pilot, rather than deployed on a large number of existing projects. Projects with longer lead times or lower reliability thresholds should consider a broader range of technologies. Pilot projects and research and development programs should be used to test the reliability of new technologies, provide developers feedback to improve the technology readiness of their solutions, and create a pipeline of technologies ready for deployment in NWS.
- **Reliability, maintainability, availability:** Reliability is defined as the probability of normal performance under standard operating conditions over a period of time. Reliability is often calculated as mean time between failures, or the total operational time divided by the number of failures within that time frame. Maintainability refers to the amount of time between failure and normal operation. Availability is a combination of those two metrics, representing the ratio of total uptime to total downtime, and is typically represented as a percentage. To the extent that a certain degree of availability is necessary to meet the specified need, it should be detailed in the solution description. Alternatively, bidders should be asked to provide their guaranteed or minimum levels of availability for their proposed technical solutions.
- **Standard operating conditions:** An RFP should describe the ambient conditions under which the solution will be expected to operate, such as temperature ranges or applicable noise restrictions. Specifying these criteria from the outset can help avoid costly delays during development. Likewise, technology providers should be asked to give the normal operating conditions for their products.

National Grid contains a summary table at the front of its **solicitation** for NWS at Van Dyke, Buffalo 53, and Golah-Avon, which includes both succinct problem statements and solutions requirements including dispatch criteria and availability.

Instructions to respondents

If bidders are provided with ample data in an RFP needs and solutions description, they should be asked to provide responses with a comparable level of detail that describe how their proposed solution will adequately address the utility’s desired outcome. Developers should strive to include sufficient information for utilities to have confidence in the solution’s technical feasibility, without being so overwhelmingly technical that they inhibit easy comparison across bids. Non-wires solution solicitations should consider asking for all bidders to provide the following information:

- **Background and qualifications:** If there is no prequalification process, non-wires solution providers should describe their relevant experience, including delivery of similar projects. Unlike traditional infrastructure providers with decades of experience, many non-wires solution players will have more limited experience, which should not preclude their participation; utilities may need to adjust their traditional qualification requirements to address this issue.
- **Solution description:** If probabilistic load forecasts are provided to developers, a utility should ask developers to describe how their solution will respond under varying conditions. Likewise, if hourly load forecasts are provided, solutions can be expected to demonstrate hourly load reductions using their technology. Developers should also be asked to specify any additional values or services that the project could provide, and any additional needs they think may also be met by their proposal.
- **Cost description:** Consider providing a uniform way for developers to provide a breakdown of their project's cost, whether through a template, key metrics, or a defined process. Ensuring that solution costs are provided in standard, comparable format could potentially save the utility many hours of recalculation during bid evaluation.
- **Measurement and verification plan:** Because NWS are still emergent, it is even more important to collect data, and for developers to share their data with the utility. Accurate measurement and verification data will help improve scoping for future projects, and sharing non-proprietary results can help the whole market move forward.
- **Additional data needs for project implementation:** Requesting that developers clarify the data required for their project implementation allows utilities to start identifying and organizing information to expedite project development. Additionally, if the same data needs are identified by several developers, utilities might consider including it in future solicitations. Data in terms of the performance output is also important for utilities to more effectively manage the grid.
- **Description of non-energy benefits and impacts:** Developers should be encouraged to include descriptions of how their proposals provide non-energy benefits and community and environmental impacts in their responses. NWS have the potential to drive progress toward carbon reduction, economic development, and other policy goals. These benefits should be included in utility evaluation frameworks (see the Proposal Evaluation section), and the methodologies used to quantify the benefits made transparent so that developers can tailor solutions to optimize them.

Several utilities have provided spreadsheet tools for respondents to highlight key comparable information about their bids.

Solicitation timeline

In an RFP, utilities should lay out realistic timelines for the solicitation process, project development, and implementation:

- **The solicitation process** timeline should include sufficient time for developers—including those with limited resources—to prepare and submit responses. Additionally, the RFP should highlight opportunities for prospective bidders to ask questions. Utilities should lay out a reasonable timeline for evaluation of bids and make clear when they intend to select bidders.
- **Project development and implementation** timelines should reflect the timing of the need to be met and allow enough lead time for different technologies to compete.

Evaluation criteria

There is a need for utilities to include a clear description of how bids will be evaluated within the RFP. This description should include both criteria for technical feasibility and benefit-cost analysis. Developers should be able to understand the relative importance of the different assessments that will be used to evaluate bids.

Recommendations for structuring criteria for evaluation are provided in the **Proposal Evaluation section** below.

RFP examples

The following links to RFPs for some of the projects discussed in this playbook are provided for reference:

- **Joint Utilities of New York: Centralized portal** with links to all non-wires solution opportunities for each of the New York utilities
- **GridSolar:** Boothbay, Maine **RFP** (2013)
- **Southern California Edison:** Local Capacity Requirements **RFO** (2013)
- **Pacific Gas & Electric:** Distribution Resources Plan **RFO** for Demo C and Demo B (2017)
- **Bonneville Power Authority:** Non-Wires Measures for South of Allston **RFO** (2016)

3. PROPOSAL EVALUATION

NWS represent a new type of procurement to solve critical grid needs. As such, they require a well-considered evaluation methodology because they span traditional lines of supply, demand, and infrastructure options. Evaluation must consider both the technical ability of a non-wires solution to meet the grid need and its cost-effectiveness in doing so. While numerous studies have sought to quantify the technical services that DERs can provide the grid and have weighed the relative merits of different cost-effectiveness tests, the NWS context requires unique considerations. To effectively compare varying non-wires solution approaches and appropriately value the range of benefits that they provide, holistic and NWS-specific methodologies for technical and benefit-cost analyses can be adopted. Transparency into these methodologies should also be provided to the market to facilitate non-wires solution bid development.

Utilities should only deploy a non-wires solution once they have verified that it is technically capable of solving the relevant grid need

In California, technical screening is an upfront process that happens before going to market to seek solutions. DERs are considered to provide four grid services (distribution capacity, voltage support, reliability, and resiliency) and needs are only considered for NWS if they relate to those services. In other jurisdictions without initial technical screens, the feasibility assessment occurs once proposals are received. Evaluation may be different depending on who integrates the solution. If the utility is serving as the solution integrator, it might have to develop and evaluate aggregated portfolios of proposals. Alternatively, if a third party is the solution integrator, the utility might evaluate complete solutions that have been integrated into portfolio proposals. In either case, since NWS are required to replace traditional infrastructure that supports system operations, it is paramount that the non-wires solution be technically equivalent to ensure reliability. For example, for a non-wires solution to defer the planned upgrade of a transformer that was expected to exceed its peak loading limits, the project proposal would have to demonstrate that it could be deployed in time and could effectively reduce loading to remain within the equipment's designated limits.

To ensure that non-wires solution proposals are evaluated fairly and effectively, technical evaluation of bids should be based on detailed modeling of both passive load impacts (e.g., from energy efficiency or distributed PV) and dynamic or active controllable responses from dispatchable technologies (e.g., demand flexibility and energy storage technologies). Leading non-wires solution examples suggest that these evaluation tools can include:

- **Hourly modeling:** Tools should aggregate year-long hourly profiles (e.g., load reductions, dispatch outputs) from candidate proposals to determine if the expected response across a portfolio of technologies is adequate to meet the system need (e.g., peak hour loading, contingency scenario). Sub-hourly modeling, if available, will provide an even more accurate representation of non-wires solution benefits.
- **Response time:** For active technologies (like

batteries and demand flexibility), response time and/or automatic scheduling capabilities will be a determining factor to ensure that these resources can be secured far enough in advance to address system needs as well as any emergency services that the utility values.

- **System integration:** Technology-level review of the candidate solutions and their respective hardware/software specifications assures utilities that they can effectively integrate control and/or measurement and verification (M&V) needs with their existing systems.
- **Location-specific data:** Specificity in the scope of a proposed solution, including its relationship to hosting capacity and targeted customers or technologies, would help a utility determine if the proposal would solve the need and can help it compare different proposals against each other.

Evaluation of technical feasibility should also take into account several categories of risks that may arise as part of portfolio deployment, operations, and payment settlement. Utilities can quantify these risks for each solution component, develop corresponding operational contingency plans, and integrate the costs of those plans into the portfolio evaluation. Risk evaluation can be done at both the project-specific and portfolio-wide level (see the **NWS Contracting Considerations section** on page 70 for strategies to effectively allocate risk via contracting). Liberty Utilities explicitly considers risks by ranking each non-wires solution against a set of prescribed risks in their evaluation process.[89] Rhode Island also references consideration of a suite of risks in the prudency component of their evaluation.[90] Building on these best practices, evaluation approaches and modeling tools should take into account specific risks corresponding to different DER technologies and the portfolio as a whole, illustrated in the following table:

FIGURE 13

TECHNICAL RISKS AND MITIGATION STRATEGIES BY TECHNOLOGY

	TECHNOLOGY APPLICABILITY				
TECHNICAL FEASIBILITY RISK	ENERGY EFFICIENCY (EE)	DEMAND RESPONSE (DR)	DISTRIBUTED GENERATION (DG)	BATTERY ENERGY STORAGE (BES)	MITIGATION STRATEGIES
Operational-level performance uncertainty (e.g., outages, software malfunctions, connectivity issues, resource variability)	✓	✓	✓	✓	Operational performance risk is common to all DERs that function as a non-wires solution. They are best addressed by using probabilistic modeling to determine the expected range of availability during constraining events. Common-mode failures across DERs (e.g., connectivity issues that would limit active control across the portfolio) should also be identified, their impacts evaluated, and addressed if needed (e.g., through backup communications channels or portfolio diversification).
Planning-level performance uncertainty	✓	✓	✓	✓	Planning-level risks associated with DER deployment apply to all technologies, and manifest as uncertainty around whether the technology portfolio can be deployed fast enough to meet the project-level need. These risks can be mitigated by deploying technologies in stages and measuring progress during deployment to identify issues and enable course-correction.

Table is continued on the next page

FIGURE 13 (CONTINUED)

	TECHNOLOGY APPLICABILITY				
TECHNICAL FEASIBILITY RISK	ENERGY EFFICIENCY (EE)	DEMAND RESPONSE (DR)	DISTRIBUTED GENERATION (DG)	BATTERY ENERGY STORAGE (BES)	MITIGATION STRATEGIES
Causal risks related to improvements over baseline	✓	✓			Causal risks apply to demand-side management technologies and are driven by uncertainty around whether the technologies are directly responsible for load reductions. Use of advanced, statistics-based M&V strategies can more accurately measure the contributions of EE and DR, better assess whether the portfolio is meeting its targets, and identify potential intervention approaches if it is not.
Non-participation		✓	✓	✓	Non-participation risks pertain to actively controlled DER technologies (e.g., DR, smart inverters on distributed PV and batteries) that don't respond during critical events. This risk can be partially mitigated by performance guarantees backed by financial penalties and security deposits from counterparties that incentivize participation. Risks can also be more certainly mitigated by including contractually mandated direct control elements in technology deployments or managed by modeling typical non-participation rates as part of the statistical modeling of the expected response (see above).

Existing cost-effectiveness tests should be tailored to appropriately compare NWS proposals against each other

There is a range of well-established cost-effectiveness tests designed to evaluate the impact of DERs on distribution grids. Five tests in particular have been commonly leveraged to conduct benefit-cost analysis (BCA) for utility initiatives: societal cost test, total resource cost test, utility cost test, ratepayer impact measure, and participant cost test. Although these tests overlap in a number of ways, each has its distinct perspective and approach, along with its relative strengths and weaknesses.[91] Application of any of these tests to evaluate a non-wires solution requires adaptations to ensure the range of local benefits that NWS can provide are considered. For example, whereas the traditional calculation methodologies focus on system-level energy and capacity-value inputs, non-wires solution evaluation should account for distribution-level components of avoidable costs and potential benefits.

Other important considerations for a non-wires solution evaluation framework include:

- **Evaluate all non-traditional distribution system enhancement categories with a single framework** so that non-wires solution proposals based on different strategies (supply, demand, or infrastructure) and technologies can be effectively compared.
  - A stated goal of Rhode Island's BCA framework was for it to be able to evaluate costs and benefits across any and all programs or policies to enable direct comparisons of the relative merits of various investment options.[92]
- **Cost-effectiveness tools should be able to optimize portfolios of solutions** instead of assessing individual measures. This approach borrows from integrated resource planning practices that optimize different sets of possible supply solution combinations. Optimization of portfolios with a multitude of variables is complex and automation through software tools will facilitate the transition from current manual approaches to more streamlined optimization practices.
  - New York's BCA framework was explicitly designed to assess portfolios, rather than individual measures or investments, to allow the consideration of potential synergies and economies between resources or measures as they are aggregated to satisfy a given need.[93]
- **Use state-, utility-, and project-specific data** so that model inputs are as granular as possible, with system-wide energy, transmission, and distribution avoided costs broken down to assign locational values wherever possible to more accurately reflect the local nature of non-wires solution costs and benefits.
  - California's Locational Net Benefits Analysis tools represent an effort to identify and quantify location-specific avoided costs and benefits associated with deferral or avoidance of distribution system expenditures.[94] Central Hudson Gas & Electric in New York also worked with Nexant to conduct a detailed study to determine location-specific avoided transmission and distribution costs.[95]
- **Develop calculations for hard-to-quantify benefits** so that additional sources of non-wires solution value, such as environmental, social, and economic development benefits are accounted for in a transparent way that developers can use to optimize their bids.
  - The New York BCA requires that externalities (defined as effects of one economic agent on another that are not accounted for in normal market behavior) are quantified when possible, and at least considered qualitatively when not. For example, ConEdison's BCA includes prescriptive calculation methodologies for external benefits including net avoided CO_2, SO_2, and NO_x, and notes that avoided land, water, and net non-energy benefits related to utility or grid operations would be assessed qualitatively by the traditional cost-effectiveness tests like the societal cost test that are embedded as part of the overall BCA evaluation process.[96]

- **Consider incrementality to mitigate incentive double-counting** and to ensure that NWS projects are deployed as a result of the non-wires solution sourcing mechanism and not in connection with other programs. Concerns could otherwise arise regarding the solution benefits being included in both the non-wires solution evaluation and the cost-effectiveness justification for other programs like energy efficiency or net energy metering.
  - In their Supplemental Distributed System Implementation Plan, New York utilities note that certain non-wires solution opportunities may overlap with existing tariff programs. To address this, they suggest that rules need to be clarified delineating attribution between NWS and other related programs and that compensation needs to be coordinated across programs to account for the potential for a single resource to participate in multiple programs.[97] California also addressed this issue through a working group focused on issues of incrementality as part of its Competitive Solicitation Framework proceedings.[98]
- **Include option value in evaluation** by using probabilistic approaches to reflect uncertainty in underlying planning variables and capture the planning flexibility benefits that NWS can provide. In lieu of established precedents, this aspect of best practice for evaluation requires additional attention to develop appropriate calculation methodologies.
  - Utility planners identify and prioritize future system needs based on projections of inherently local and interdependent factors like load, price, and weather. Instead of using average projections, planning can employ statistical analysis of the probabilities associated with a range of projections to help fully capture the avoided cost benefits that non-wires solution projects can provide.[99]
- **Consider conducting independent technical analysis to diligence non-wires solution opportunities** including the quantification of their costs and benefits.
  - California includes in its evaluation framework the role of an independent professional engineer to conduct technical reviews of the assumptions and results of the annual planning process and the application of deferral screening criteria.[100]

Examples of evaluation processes that include these best practices can be drawn from jurisdictions with the most non-wires solution experience

New York has established a robust benefit-cost analysis methodology that, despite being complex, manages to encompass the key best practices for non-wires solution evaluation.[101] The state's Public Service Commission developed a BCA framework that the utilities used as the basis for producing their respective BCA handbooks. These BCA handbooks are widely used to evaluate all investments in distributed system platform capabilities, procurement of DERs via competitive selection and tariffs, and energy efficiency programs. The handbooks include extensive documentation on the benefits and costs that are evaluated, defines calculation methodologies for each category, and includes relevant local data where possible. Portfolio optimization is central to this BCA framework, and externalities (like environmental and economic benefits) are required to be considered. Option value is also addressed through mandatory sensitivity analysis on key assumptions.

Rhode Island has developed its own benefit-cost framework through extensive stakeholder engagement.[102] The state adapted the total resource cost test to more fully reflect its energy, environmental, and social policy objectives. The resulting evaluation framework contains a broad set of factors, including consideration of environmental and social externalities, and details options for benefit and cost quantification methodologies alongside the relevant data needed for each calculation. The framework encourages the inclusion of location-specific data and option value considerations in recognition of the fact that costs and benefit values will vary by time, location, electrical product, technology, and customer. It also states that as the regulator and market participants gain experience with each cost and benefit category and driver, standard practices will evolve and become more sophisticated.

Utility evaluation process transparency can add value to the market

If utilities were able to share the models and processes they use to evaluate non-wires solution proposals, developers could more accurately anticipate the competitiveness of their bids and optimize them to maximize value to the utility. Developers argue that without clear evaluation criteria, their ability to tailor solutions that address utility needs and provide relevant benefits is inhibited. On the other hand, utilities are concerned about releasing information they consider their intellectual property, such as the complex evaluation models they have dedicated considerable resources to developing. Utilities also develop operational contingencies to accommodate identified risks, and it may be difficult to publicly release these strategies. Further, if the utility is going to be the integrator, a developer might not even be able to use the utility's evaluation model to determine the competitiveness of their bid, since the utility would be aggregating it with others to evaluate on a portfolio basis.

Despite the tension evident in providing full transparency into evaluation details, it is reasonable to conclude that some degree of insight into utility evaluation procedures and methodologies would help improve bids and support effective market engagement.

4. NWS CONTRACTING CONSIDERATIONS

RMI is grateful to Peter Mostow, Scott Zimmermann, Grace Hsu, and Tim Cronin of the Energy Practice of Wilson Sonsini Goodrich & Rosati for helping us prepare this section.

Utilities have a long history of contracting for third-party services, and are able to draw on those precedents when negotiating terms with third-party owners of non-wires solution projects. To a large extent pro forma non-wires solution contracts can mirror existing utility documents, however there are four key areas—dispatchability, payment, performance, and construction—that require the most attention to effectively adapt standard contract clauses to the non-wires solution context. These adjustments relate to the fact that risk profiles for certain non-wires solution technologies differ from traditional grid infrastructure. Since the non-wires solution market is not yet mature, there is no broad agreement on how these risks should be allocated and the lack of consensus slows down the negotiation process between utilities and developers. For the non-wires solution market to scale more rapidly, market participants should coalesce around mutually agreeable contracting structures that recognize stakeholders' needs and the characteristics of DER technologies used in non-wires solution applications.

Contracts between non-wires solution integrators ("Integrators")—typically but not always a utility—and NWS developers ("Developers") can take many forms and have many names. In general, however, each such contract contemplates the Developer agreeing to deploy a technology or method (the "Resource") to achieve a net reduction in the electricity demand in a designated area of the grid. This net reduction may be achieved by generating or discharging electricity within the target area, either by causing a customer account ("Account") in that area to shift consumption from one period in the day to another, or by causing an Account to eliminate certain consumption altogether.

Another distinction among NWS contracts is the level of control the Integrator has in reducing electricity demand. One type of non-wires solution contract allows an Integrator to cause the reduction in demand to occur at a time of the Integrator's choosing. This type of "dispatchable" non-wires solution contract could, for example: a) allow an Integrator to call on a Developer to discharge a battery, b) cause Accounts to turn off, or reduce consumption of building equipment, appliances, or lighting, or c) initiate generation from a dispatchable generator (e.g., fuel cell). Another type of non-wires solution contract contemplates a reduction in demand that is fixed and non-responsive in nature. This could involve: a) a Developer's permanent shifting of certain recurring consumption by an Account from one period in the day to another on a long-term basis, b) the Developer's installation of more efficient lighting or HVAC equipment at an Account's building, or c) the Developer's installation of non-dispatchable distributed generation (e.g., solar not paired with storage) at an Account's facility.

Developers are working with a broad array of technologies to meet the functional requirements of differing NWS, and many specific types of NWS contracts can be fulfilled by more than one technology. Therefore, in conducting a solicitation for NWS resources, an Integrator will want to keep its request for proposals and its non-wires solution pro forma contract as technology-neutral and standardized as possible, keeping in mind the array of technologies available to Developers. Accordingly, this section does not provide an exhaustive list of technology-specific provisions that would appear in each possible non-wires solution contract type; rather, we have focused on the most critical terms in any non-wires solution contract, with an eye toward highlighting those that differ from more traditional standard contracts between a utility and Developer (e.g., power purchase agreement for solar, or energy savings performance contracts for energy efficiency). These key contract provisions are described in detail below, with specific consideration given to their application in the context of some of the more commonly deployed non-wires solution technologies. Important to note is that often an Integrator will seek or receive bids for multiple technologies in a non-wires solution solicitation, and sometimes multiple technologies are contemplated under one non-wires solution contract. For example, energy efficiency contracts might involve the installation of new lighting and HVAC equipment (with stronger performance efficiency as compared to existing equipment) as well as an overlay of smart controls and sensors to maximize operational efficiency and allow for dispatchability.

Non-Wires Solution Contract Types

Developing more standardization around non-wires solution contract terms is an important way to accelerate the NWS market. Contract norms create a common set of expectations for market participants, which simplifies negotiations and the procurement process more generally. Illustrative of the current lack of standardization is the number of different contract types in the NWS market, including:

- Resource Purchase Agreement
- Purchase and Sale Agreement
- Power Purchase Agreement
- Capacity Attribute Purchase Agreement
- Energy Storage Agreement
- Demand Response Agreement
- Demand Response Energy Storage Agreement
- Energy Efficiency Agreement
- Permanent Load Shift Agreement

While this contract nomenclature often describes the purpose of each given contract, the manifold contract names obscure the fact that that the names themselves do not dictate any specific terms or parameters for the relevant Resource. Much more important than the contract name is the way in which risk is allocated among the parties.

Key Terms in NWS Contracts

The most central provisions in a non-wires solution contract will look similar to many other utility contracts (e.g., milestone schedule, payment formulas, performance guarantees). Still, they of course must account for the unique nature of the Resource being procured—both in terms of its function and the technology being utilized. The table on the following page discusses the provisions that require the most modifications from typical utility contracts to accommodate the non-wires solution context.[i] Additionally, it identifies certain market solutions to the risk-balancing exercise between Integrators and Developers that can be adopted across technologies, as well as some technology-specific considerations.

FIGURE 14

KEY TERMS IN NWS CONTRACTS

ISSUE	DISPATCHABILITY	
TERMS INCREASING RISK ON INTEGRATOR	• No control over dispatch of Resource or limited control (e.g., fewer days on which dispatch is allowed, fewer allowed dispatches per day or per month, shorter allowed dispatch duration).	• Limited visibility into, and requirements for, participating Accounts. • Unrestricted Developer rights to utilize the Resource on its own behalf (or on behalf of third parties).
TERMS INCREASING RISK ON DEVELOPER	• High level of Integrator control over dispatch timing, frequency, and duration. • Greater Integrator visibility into, and requirements for, participating Accounts.	• No Developer rights to utilize the Resource discretionarily on its own behalf (or on behalf of third parties).
MARKET SOLUTIONS FOR BALANCING RISK	• The Integrator's level of control over dispatch depends on the technology and on the Integrator's needs. The Integrator will need to pay for greater levels of control over dispatch because such priority is valuable (in that it may require the Developer to forgo other revenue streams) and because it may require additional technologies (i.e., storage, sensors). • Integrator's level of visibility into, and requirements for, participating Accounts can be limited to ensuring that the Resource is addressing the Integrator's need (e.g., location of accounts, size of estimated Resource based on Accounts).	• Developers often will seek to reserve the right to discretionarily utilize the Resources on its own behalf or on behalf of others in order to obtain additional revenue streams (i.e., from behind-the-meter-customers and/or from markets that may not be in existence at the time the non-wires solution contract is entered into such as future energy, capacity, or ancillary services markets). Integrators may grant these Developer utilization rights (because doing so enhances project financeability) but must ensure that such rights do not undermine the Integrator's primary objective in entering into the non-wires solution contract and also do not compromise the operational integrity of the Resource (e.g., by increasing wear on equipment).

Table is continued on the next page

[i] Many other provisions—for example those concerning agreement effectiveness, contract regulatory approval as a condition precedent, Developer governmental approvals, disputes, indemnification, limitations of liability, standard representations and warranties, etc.—do not need to be adapted nearly to the same extent and, in many cases, can simply be copied from standard utility contract forms.

FIGURE 14 (CONTINUED)

ISSUE	DISPATCHABILITY	
TECHNOLOGY-SPECIFIC CONSIDERATIONS	**Storage** • A non-wires solution contract involving energy storage often takes the form of (1) a permanent load shift agreement, by which the Developer agrees to shift an Account's consumption from one period in the day to another period in the day over a period of years, or (2) a demand response resource purchase agreement or energy storage agreement pursuant to which the Integrator is typically granted the right to call for dispatches of the resource within agreed upon parameters.	• Integrators can contract with a Developer for priority use over the storage unit (as compared to utilization on the Developer's own behalf or on behalf of a behind-the-meter customer). **Distributed Generation** • In the case of dispatchable distributed generation, the Integrator might require that the Developer dispatch specifically (or exercise all reasonable efforts to dispatch) during grid events declared by the Integrator.
ISSUE	**PAYMENT**	
TERMS INCREASING RISK ON INTEGRATOR	• Fixed monthly payments based on (1) an assumed or forecasted level of reductions that the Resource is expected to achieve or (2) the capacity value of the Resource.	
TERMS INCREASING RISK ON DEVELOPER	• Variable monthly payments based on the actual reductions the Resource achieves.	
MARKET SOLUTIONS FOR BALANCING RISK	• It is typical to have variable monthly payments based on the Accounts' actual usage as compared to an assumed baseline amount that is calculated pursuant to an agreed upon formula. Payment formula may include incentives for strong reduction performance.	• Alternatively, if fixed monthly payments are used, Integrators can mitigate some of the risks involved with fixed payments by requiring Developers to provide performance guarantees, which are in turn backstopped by credit support (e.g., corporate guarantee, letter of credit, or reserve account), as discussed in greater detail below.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	PAYMENT
TECHNOLOGY-SPECIFIC CONSIDERATIONS	**Energy Efficiency** • Energy efficiency projects can involve a wide variety of technologies, each of which invites specific considerations that need to be addressed. Lenders that finance energy efficiency projects typically prefer the certainty of fixed monthly payments over a performance-based payment structure and seek to avoid the risk associated with establishing and measuring performance against baseline energy consumption. Performance-based payments are also disfavored by Developers because they are not in full control over the ambient or load characteristics of a building given the role of the building's staff in operating and maintaining the building. • In the case of heavy and/or expensive building equipment upgrades (e.g., replacement of HVAC equipment, lighting, or appliances, as opposed to the mere installation of sensors and switches), an Integrator might pay the Developer for a significant portion of the expected savings upon the installation of the equipment, followed by payment for the remainder of the expected savings on a periodic basis thereafter after taking into account actual performance. **Storage** • For energy storage non-wires solution contracts, it is common to have a fixed payment component for installed capacity and a performance-based variable component based on actual dispatch. The separate payments for capacity and actual dispatch can be negotiated to provide sufficient comfort to financiers (i.e., to ensure adequate baseline revenues for project financing). **Distributed Generation** • NWS contracts for distributed generation will generally look more like a typical power purchase agreement than other NWS contracts, often with the Developer simply receiving a per kWh energy payment.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	PERFORMANCE	
TERMS INCREASING RISK ON INTEGRATOR	• No performance guarantee from the Developer to the Integrator. • No contract termination right in the event of significant Resource underperformance. • Maintenance responsibilities belong to the Account customer as opposed to the Developer. • Limited rights to performance reports.	• No right to inspect the resource and/or audit the Developer's performance calculations and measurements. • In situations where the Resource involves multiple Accounts, the Integrator is given limited visibility into those Accounts and no rights regarding whether Accounts can be circulated in and out of the Resource.
TERMS INCREASING RISK ON DEVELOPER	• The Developer guarantees to the Integrator the performance of the Resource at negotiated levels, agrees to pay liquidated damages for performance shortfalls, and backs up the obligation with the Developer's balance sheet or credit support. • Abrupt termination right in the event of Resource underperformance. • Maintenance handled by the Developer. • Equipment warranty and spare parts inventory requirements.	• Comprehensive performance report requirements. • Broad Integrator inspection and audit rights. • In situations where the Resource involves multiple Accounts, the Developer must provide detailed information on each Account to the Integrator and is restricted in its ability to circulate Accounts in and out of the Resource.
MARKET SOLUTIONS FOR BALANCING RISK	• Performance guarantees are typical, with negotiated baselines, exceptions, and penalties. Liquidated damages should correspond to Integrator's actual costs incurred when the Resource underperforms (e.g., replacement capacity or energy). If the Developer entity that is party to the non-wires solution contract is not creditworthy, then its performance guarantee should be backed by an adequate form of credit support (e.g., parent guaranty, letter of credit, cash in escrow).	• Developers may negotiate flexibility in performance guarantees to render them less absolute. For example, performance metrics can be calculated on a rolling basis to avoid hair-trigger liquidated damages based on short-term performance. When a Resource is implemented across multiple Account sites, Developers can benefit from a "portfolio effect" to smooth out performance issues: over-performance at one Account site can counter an underperforming Account site elsewhere.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	PERFORMANCE
MARKET SOLUTIONS FOR BALANCING RISK (CONTINUED)	• The Integrator has a right to terminate the non-wires solution contract only in the event of consistent Resource underperformance (e.g., less than 80%–90% of estimated performance over the course of two years). • Maintenance obligations vary depending on technology. • Reporting requirements and inspection rights vary but typically grant the Integrator with an adequate method for confirming performance of the Resource and the Developer's invoices. • In situations where the Resource involves multiple Accounts, often the Developer is allowed to freely circulate Accounts in and out of the Resource (subject to specified eligibility requirements). Typically, the Developer is obligated to at least provide the Integrator with a monthly list of participating Accounts.
TECHNOLOGY-SPECIFIC CONSIDERATIONS	**Energy Efficiency** • Energy efficiency NWS contracts might include a performance guarantee by the Developer in favor of the Integrator that promises the Resource will achieve minimum levels of energy savings. Similar to renewable energy power purchase agreements, these performance guarantees are set at some percentage of projected energy savings to be achieved by the Resource at the Accounts, forecasted based on technical assumptions regarding the Resource and the Accounts' historical energy usage. If these minimum levels of energy savings are not met, the Developer is typically obligated to pay liquidated damages as compensation for the underperformance. • The challenge with performance guarantees lies in the establishment of a baseline. The calculation of an energy efficiency project's performance will need to address, through carve-outs, specific circumstances over which the Developer has little or no control, including changes in building load profile, operations, occupancy, or the Account customer's default of its obligations. Developers often reserve the right to adjust the baseline if any of these exceptions occur. • Routine maintenance on energy efficiency equipment is typically performed by the Account customer rather than by the Developer.* Equipment is located within a building and may be difficult for the Developer to access during normal hours without providing ample advance notice. It therefore can be serviced more efficiently by the Account customer. For these reasons, Developers tend to heavily negotiate the guaranteed turnaround time for any equipment repairs. • A spare parts inventory is not frequently required as equipment can be very expensive, susceptible to obsolescence, or readily available when needed (e.g., sensors, lighting, ballasts).

*The Developer can, however, perform remote diagnosis and troubleshooting of specialized control equipment.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	PERFORMANCE	
TECHNOLOGY-SPECIFIC CONSIDERATIONS (CONTINUED)	**Energy Storage** • In the case of energy storage NWS contracts, performance guarantees can be structured both for variable payments (i.e., for energy dispatch) and fixed payments (i.e., for capacity). Contracts typically include a minimum level of threshold capacity that must be achieved; if the Developer fails to reach this level, the Integrator pays nothing at all for the relevant contract period. • NWS contracts for battery storage usually contemplate battery degradation by requiring a specified amount of capacity in year one of the non-wires solution contract and then accepting a degree of expected degradation thereafter. In addition to a performance guarantee, however, a battery degradation warranty provided by the manufacturer to the	Developer is often passed through to the Integrator. This warranty resembles a solar photovoltaic project degradation warranty in that it guarantees that degradation won't exceed a specified percentage per year. The Developer may also serve as the Integrator's agent for any warranty claims. • The Developer typically retains most maintenance obligations given the specialized nature of storage technology; although this can vary among different technology types, behind-the-meter Resources, and in-front-of-the-meter Resources. • Integrator NWS agreements are an important lynchpin for enabling third-party financing of battery storage projects, so Integrators frequently have leverage for negotiation.
ISSUE	**CONSTRUCTION**	
TERMS INCREASING RISK ON INTEGRATOR	• No milestone requirements for Developer's installation of relevant equipment.	• No independent engineer certification of construction completion and/or commercial operation.
TERMS INCREASING RISK ON DEVELOPER	• Strict milestone requirements for installation of equipment. Strict Integrator termination rights in lieu of "pay-for-delay" liquidated damages (which would inhibit the Integrator's right to contract termination). • Strict requirements for construction notice-to-proceed (NTP), with associated pre-NTP termination rights for the Integrator.	• Overly burdensome independent engineer certification requirements.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	CONSTRUCTION	
MARKET SOLUTIONS FOR BALANCING RISK	• Construction and/or commercial operation requirements, as applicable, with liquidated damages in the event of a delay. The Developer should be allowed to "pay-for-delay" for a significant period of time as opposed to facing immediate termination in the event that construction or commercial operation is delayed. Liquidated damages should replicate the Integrator's costs in the event that the Resource is delayed (e.g., expected cost to replace capacity or energy). • If a non-wires solution contract requires regulatory approval, then, in the case of NWS technologies involving significant construction timelines, construction and commercial operation milestones should be pushed back in the event that the regulatory approval is unexpectedly delayed. Where a Resource requires significant equipment installations prior to operation, the Developer likely will not be	able to finance those installations until the regulatory approval is obtained. A delay in the Integrator obtaining that regulatory approval should therefore also allow for a corresponding delay in construction. Integrators and Developers should consider allowing for similar extension rights where a Resource requires significant Account recruitment operations prior to commercial operation because Developers can be hesitant to undergo that recruitment prior to obtaining regulatory approval of the non-wires solution contract (so as to avoid upsetting customers with long wait times before installations or operations actually commence). • Independent engineer certification requirements dependent on technology and non-wires solution function.
TECHNOLOGY-SPECIFIC CONSIDERATIONS	**Energy Storage** • Independent engineer certification requirements are typical for energy storage NWS contracts. For in-front-of-the-meter Resources, in-person inspection by an independent engineer is likely to be required. For behind-the-meter Resources, Developers prefer independent engineer sign-off on a representative design and specifications or to perform remote inspections based on observable data. Developers try to avoid the cost associated with a visit to each individual site particularly in the residential context or for smaller systems.	**Energy Efficiency** • In the case of energy efficiency NWS contracts involving smaller/lighter equipment (e.g., lighting, sensors), such equipment may be required to meet certain classifications (e.g., UL listings), but it is typically impractical from a cost perspective for it to be inspected and certified by an independent engineer. As with energy storage, representative designs may be approved by an independent engineer.

Table is continued on the next page

FIGURE 14 (CONTINUED)

ISSUE	CHANGE IN LAW
CHANGE IN LAW	• NWS contracts often involve new technologies and new revenue streams within electric utility markets. Given the likelihood of regulators establishing additional rules for these technologies and revenue streams during the term of a non-wires solution contract, NWS contracts should take into account changes in law. Because the precise issues that regulators will address in the future and the approaches that they will take on those issues are difficult to predict, NWS contracts sometimes include general language indicating that the parties will cooperate and act in good faith to restore the initial relative economic benefits of the parties under the non-wires solution contract in the event of a change in law. • The possibility of future marketable attributes of the Resource is something that a non-wires solution contract should expressly contemplate (e.g., specific attributes tradeable in a subsequently developed market). This can be done by allocating to one party the right to market and sell future attributes, with the revenues and costs associated therewith either being allocated to the same party or shared between the parties.

CONCLUSION

CONCLUSION

The market for NWS is nascent but represents a promising opportunity for reducing customer costs and enabling a lower-carbon electricity grid. With the rate of spending on distribution infrastructure increasing, there is a pressing need to turn to approaches like NWS to minimize the impact on customer bills. At the same time, NWS can unlock additional value from DERs while also reducing net system costs, promoting the cost-effective deployment of resources that are important for both directly and indirectly reducing CO_2 emissions.

Non-wires solutions are thus a key priority for near-term action and can help lay the groundwork for future opportunities to scale the market for DERs as a core component of cost-effective grid infrastructure. Pursuing NWS today can help further develop best practices, highlight the most valuable opportunities for non-traditional solutions, and prove out the case for a more uniform, comprehensive market for NWS in the future. Specific opportunities exist in a few key areas:

- **Enabling the transparent and equitable valuation of location-specific services.** Pursuing NWS today can shed light on how location-based value can most efficiently be made transparent and accessible to DERs through programs (e.g., New York's Value of Distributed Energy Resources proceeding, or other tariff-based approaches) to encourage structural procurement of DERs where they can provide the most value. Experience in the near-term can also help increase understanding and inform the development of practices to address equity issues with geo-targeted pricing or programs to ensure customer understanding and satisfaction, even if neighbors may be faced with different rates or program options.
- **Identifying and expanding the range of services NWS can cost-effectively offer.** Early experience with non-wires solution projects can effectively test the range of distribution needs that NWS can address, fostering innovation while avoiding duplicity of pilots. Results of early projects can inform updated processes for predicting the cost-effectiveness of non-wires solution opportunities, so that projects can be screened more accurately for commercial viability.
- **Testing the relationship of NWS with related utility and regulatory efforts.** Emerging non-wires solution portfolios across the US relate directly to broader grid modernization efforts, including Integrated Distribution Planning proceedings and the concept of Independent Distribution System Operators. Further pursuit of NWS within these broader efforts can highlight how planning processes can consider NWS without requiring formal screening criteria, and how DER participation in wholesale markets may impact NWS deployment and performance as DERs are increasingly used to provide grid services at multiple levels of the grid.

Regulators, utilities, and technology or service providers all have a role to play in streamlining processes to enable a lower-cost grid. Experience to date has demonstrated a business case for NWS across a wide range of utility territories, available to be pursued by utilities and vendors as long as the right regulatory framework is in place. This report has laid out best practices and provided practical guidance for developing the key elements needed for implementation. It has also highlighted areas for future exploration as the market evolves. To further scale NWS by proving out the broader case for its application, there is a pressing need for more coordinated efforts to build on the lessons learned and find least-cost, best-fit solutions and processes that work across the wide variety of utilities and states that stand to gain.

ENDNOTES

ENDNOTES

[1] "US Utility Investment Is Booming, but Sales Are Not Keeping Up," Bloomberg, 2018. **https://about.bnef.com/blog/u-s-utility-investment-booming-sales-not-keeping/**

[2] Paul Alvarez and Dennis Stephens, "Modernizing the Grid in the Public Interest: A Guide for Virginia Stakeholders," October 5, 2018, **https://static1.squarespace.com/static/598e2b896b8f5bf3ae8669ed/t/5bbe4f71e2c4835fa247183f/1539198852367/GridLab_VA+GridMod_Final.pdf**

[3] Sue Tierney, "Value of 'DER' to 'D': The Role of Distributed Energy Resources in Local Electric Distribution System Reliability," April 21, 2016, **http://www.analysisgroup.com/uploadedfiles/content/news_and_events/news/tierney_value_of_der_to_d_cpuc_thought_leaders_workshop_4-21-2016.pdf**

[4] Mark Dyson, James Mandel, et al., *The Economics of Demand Flexibility*, RMI, 2015, **https://rmi.org/insight/the-economics-of-demand-flexibility/**

[5] Mark Dyson, *4 Ways Demand Flexibility Can Enable a Low-Carbon Grid*, RMI, October 1, 2015, **https://rmi.org/blog_2015_10_01_4_ways_demand_flexibility_can_enable_a_low_carbon_grid/**

[6] "US Utility Investment Is Booming, but Sales Are Not Keeping Up," Bloomberg, August 15, 2018, **https://about.bnef.com/blog/u-s-utility-investment-booming-sales-not-keeping/**

[7] Paul Alvarez and Dennis Stephens, *Modernizing the Grid in the Public Interest: A Guide for Virginia Stakeholders*, October 5, 2018, **https://static1.squarespace.com/static/598e2b896b8f5bf3ae8669ed/t/5bbe4f71e2c4835fa247183f/1539198852367/GridLab_VA+GridMod_Final.pdf**

[8] Herman K. Trabish, "Not Your Grandma's DER Distributed Resources Modernize, Prove Value to Grid," September 27, 2018, **https://www.utilitydive.com/news/not-your-grandmas-der-distributed-resources-modernize-prove-value-tog/533020/**

[9] Juliet Homer et al., "State Engagement in Electric Distribution System Planning," December 2017, **https://emp.lbl.gov/sites/default/files/state_engagement_in_dsp_final_rev2.pdf**

[10] Autumn Proudlove, Brian Lips, and David Sarkisian, "50 States of Grid Modernization," August 2018, **https://nccleantech.ncsu.edu/wp-content/uploads/2018/10/Q2-18-GridMod-Exec-Final-1.pdf**

[11] "Non-Wires Alternatives Projects: Emerging Utility Revenue Sources for the Distributed Energy Market," June 23, 2017, **https://www.woodmac.com/reports/power-markets-non-wires-alternatives-projects-emerging-utility-revenue-sources-for-the-distributed-energy-market-58115883/**

[12] Sue Tierney, *Value of 'DER' to 'D': The Role of Distributed Energy Resources in Local Electric Distribution System Reliability*, April 21, 2016, **http://www.analysisgroup.com/uploadedfiles/content/news_and_events/news/tierney_value_of_der_to_d_cpuc_thought_leaders_workshop_4-21-2016.pdf**

[13] Ibid.

[14] Massachusetts DPU docket 16-129, August 1, 2016, **https://eeaonline.eea.state.ma.us/EEA/FileService/FileService.Api/file/FileRoom/9199254**

[15] Cara Goldenberg, Mark Dyson, and Harry Masters, *Demand Flexibility: The Key to Enabling a Low-Cost, Low-Carbon Grid*, RMI, February 2018, **https://info.rmi.org/demand_flexibility**

[16] Garrett Fitzgerald et al., *The Economics of Battery Energy Storage*, RMI, 2015, **https://rmi.org/insight/economics-battery-energy-storage/**

[17] Mark Dyson, Alex Engel, and Jamil Farbes, *The Economics of Clean Energy Portfolios*, RMI, 2018, **https://rmi.org/insight/the-economics-of-clean-energy-portfolios/**

[18] Mark Dyson, James Mandel, et al., *The Economics of Demand Flexibility*, RMI, 2015, **https://rmi.org/insight/the-economics-of-demand-flexibility/**

[19] Mark Dyson, *4 Ways Demand Flexibility Can Enable a Low-Carbon Grid*, RMI, October 1, 2015, **https://rmi.org/blog_2015_10_01_4_ways_demand_flexibility_can_enable_a_low_carbon_grid/**

[20] Mark Dyson, Alex Engel, Jamil Farbes, *The Economics of Clean Energy Portfolios*, RMI, 2018, **https://rmi.org/insight/the-economics-of-clean-energy-portfolios/**

[21] Cara Goldenberg, Mark Dyson, and Harry Masters, *Demand Flexibility: The Key to Enabling a Low-Cost, Low-Carbon Grid*, February 2018, **https://info.rmi.org/demand_flexibility**

[22] An Act Relating to Public Utilities and Carriers—Rhode Island Energy Efficiency Management, April 25, 2006, **http://www.ripuc.org/eventsactions/docket/3759-RIAct.pdf**

[23] Title 35-A: Public Utilities §3143, last modified November 3, 2017, **http://www.mainelegislature.org/legis/statutes/35-a/title35-Asec3143.html**

[24] Illinois General Assembly, SB2814, **http://www.ilga.gov/legislation/99/SB/PDF/09900SB2814lv.pdf**

[25] Document Record, Ohio Public Utilities Commission, July 2018, **https://dis.puc.state.oh.us/DocumentRecord.aspx?DocID=bb4c8191-b212-4a0d-97f0-c9d874fd180a**

[26] Sally A. Talberg, Norman J. Saari, Rachael A. Eubanks, *Michigan Distribution Planning Framework*, Michigan Public Service Commission, September 1, 2018, **https://mipsc.force.com/sfc/servlet.shepherd/version/download/068t0000002STnIAAW**

[27] "Assigned Commissioner's Ruling Introducing a Draft Regulatory Incentives Proposal for Discussion and Comment," R. 14-10-003, California Public Utilities Commission, April 4, 2016, **http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M159/K702/159702148.PDF**

[28] "Non-Wires Alternatives Projects: Emerging Utility Revenue Sources for the Distributed Energy Market," June 23, 2017, **https://www.woodmac.com/reports/power-markets-non-wires-alternatives-projects-emerging-utility-revenue-sources-for-the-distributed-energy-market-58115883/**

[29] "Peak Perks," Central Hudson, **https://www.cenhud.com/energyefficiency/peak-perks**

[30] *Utility Earnings in a Service-Oriented World*, Advanced Energy Economy Institute, January 30, 2018, **https://info.aee.net/hubfs/AEE Institute_Utility Earnings FINAL_Rpt_1.30.18.pdf**

[31] "Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision," Case 14-M-0101, State of New York Public Service Commission, April 20, 2016, **http://www.raabassociates.org/Articles/NY PSC %282016%29 DSIP Guidance Order.pdf**

[32] "Assigned Commissioner's Ruling on Guidance for Public Utilities Code Section 769—Distribution Resource Planning," R. 14-08-013, California Public Utilities Commission, February 6, 2015, **http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5108**

[33] Decision Addressing Competitive Solicitation Framework and Utility Regulatory Incentive Pilot," R. 14-10-003, California Public Utilities Commission, December 22, 2016, **http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K555/171555623.PDF**

[34] *Non-Wires Alternatives Projects: Emerging Utility Revenue Sources for the Distributed Energy Market*, June 23, 2017, **https://www.woodmac.com/reports/power-markets-non-wires-alternatives-projectsemerging-utility-revenue-sources-for-the-distributed-energy-market-58115883/**

[35] John St. John, "Distribution Deferral: California's Alternative to Non-Wires Alternatives," October 8, 2018, **https://www.greentechmedia.com/squared/read/the-distribution-deferral-opportunity-reportcalifornias-alternative-to-non**

[36] "Assigned Commissioner's Ruling on Guidance for Public Utilities Code Section 769—Distribution Resource Planning," R. 14-08-013, California Public Utilities Commission, February 6, 2015, **http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=5108**

[37] "Decision Addressing Competitive Solicitation Framework and Utility Regulatory Incentive Pilot," R. 14-10-003, California Public Utilities Commission, December 22, 2016, **http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K555/171555623.PDF**

[38] "Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision," Case 14-M-0101, State of New York Public Service Commission, February 26, 2015, **http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B0B599D87-445B-4197-9815-24C27623A6A0%7D**

[39] "Proceeding on Motion of the Commission in Regard to Reforming Energy Vision," Case 14-M-0101, State of New York Public Service Commission, April 20, 2016, **http://www.raabassociates.org/Articles/NYPSC%282016%29 DSIP Guidance Order.pdf**

[40] "California and New York DER Demonstration Projects," ScottMadden Inc., 2017, **https://www.scottmadden.com/wp-content/uploads/2017/05/ScottMadden_CA-and-NY-Demo-Project_SOV_2017_0523.pdf**

[41] *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects*, California Public Utilities Commission, October 2001, **http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf**

[42] "Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision," Case 14-M-0101, State of New York Public Service Commission, February 26, 2015, **http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bF8C835E1-EDB5-47FFBD78-73EB5B3B177A%7d**

[43] "Decision Adopting Rules to Provide Access to Energy Usage and Usage-Related Data While Protecting Privacy of Personal Data," R. 08-12-009, California Public Utilities Commission, May 5, 2014, **http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M090/K845/90845985.PDF**

[44] "Administrative Law Judge's Ruling Regarding Photo Voltaic Renewable Auction Mechanism Maps," R. 14-08-013, California Public Utilities Commission, October 9, 2018, **http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M231/K128/231128458.PDF**

[45] "State and Local Policy Database," American Council for an Energy-Efficient Economy, **https://database.aceee.org/state/data-access**

[46] *Seventh Northwest Conservation and Electric Power Plan*, Northwest Power and Conservation Council," February 25, 2016, https://www.nwcouncil.org/reports/seventh-power-plan

[47] "Planning Hawai'i's Grid for Future Generations," Hawaiian Electric Maui Electric Hawai'i Electric Light, March 1, 2018, https://www.hawaiianelectric.com/documents/about_us/our_commitment/20180713_dkt_2018_0156.pdf

[48] Courtney Fairbrother et al., *The Role of Pilots and Demonstrations in Reinventing the Utility Business Model*, RMI, 2017, https://www.rmi.org/insight/pathways-for-innovation/

[49] Curt Volkmann, "Integrated Distribution Planning," GridLab, https://static1.squarespace.com/static/598e2b896b8f5bf3ae8669ed/t/5b15ae6470a6ad59dcb92048/1528147563737/IDP+Whitepaper_GridLab.pdf

[50] Julia Pyper, "Tesla, Greensmith, AES Deploy Aliso Canyon Battery Storage in Record Time," January 31, 2017, https://www.greentechmedia.com/articles/read/aliso-canyon-emergency-batteries-officially-upand-running-from-tesla-green#gs.6OdcnsQ

[51] "How Does the GMP and Tesla Powerwall Program Work?" Green Mountain Power, https://greenmountainpower.com/help/products-services/gmp-tesla-powerwall-offer/

[52] "Distribution Resources Plan: Request for Offers," Pacific Gas and Electric Company, 2017, https://www.pge.com/pge_global/common/pdfs/for-our-business-partners/energy-supply/electricrfo/wholesale-electric-power-procurement/2017-distributed-resources-planning-and-request-foroffers/DRP_Protocol_2017_Final.pdf

[53] "Schedule TOU-DR-E3," San Diego Gas & Electric Company, 2016, https://www.sdge.com/sites/default/files/elec_elec-scheds_tou-dr-e3.pdf

[54] "San Diego Gas & Electric Company (U 902-E) Quarterly Report on Progress of Residential Rate Reform (PRRR)," R. 12-06-013, November 1, 2017, http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442455576

[55] "Residential Rate Reform/R. 12-06-013," California Public Utilities Commission, http://www.cpuc.ca.gov/General.aspx?id=12154

[56] *The National Landscape of Residential TOU Rates*, The Brattle Group, November 2017, http://files.brattle.com/files/12658_the_national_landscape_of_residential_tou_rates_a_preliminary_summary.pdf

[57] Katherine Tweed, "Con Edison Unveils Auction Numbers for Its Pioneering Demand Management Program in New York," August 5, 2016, https://www.greentechmedia.com/articles/read/the-numbers-arein-for-con-edisons-demand-management-program#gs.V2VvFQY

[58] "2018 Oakland Clean Energy Initiative RFO," PG&E, 2018, https://www.pge.com/en_US/for-our-businesspartners/energy-supply/electric-rfo/wholesale-electric-power-procurement/2018-oakland-clean-energyinitiative-rfo.page?WT.mc_id=Vanity_rfo-ocei&ctx=business

[59] Griffin Reilly, "Brooklyn Queens Demand Management Program Implementation and Outreach Plan," January 29, 2018, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B8FF8D6D6-7E2B-4D83-9B9C-8B3E54612B8C%7D

[60] "Oakland Clean Energy Initiative Request for Offers Solicitation Protocol," PG&E, 2018, https://www.pge.com/pge_global/common/pdfs/for-our-business-partners/energy-supply/electric-rfo/wholesale-electric-power-procurement/2018%20OCEI/OCEI_Protocol_FINAL.pdf

[61] "Request for Information: Innovative Solutions to Provide Demand Side Management to Provide Transmission and Distribution System Load Relief and Reduce Generation Capacity Requirements," Con Ed, March 31, 2015, **https://www.coned.com/-/media/files/coned/documents/save-energy-money/rebates-incentives-tax-credits/work-with-the-neighborhood-program/demand_management_project_solicitation-rfi-reopen_ver2.pdf**

[62] "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, **https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf**

[63] "Request for Proposal (RFP): Non-Wires Alternative Solutions Project Development Services," National Grid, December 4, 2017, **https://www.nationalgridus.com/media/new-energy-solutions/pdfs/rfp_nonwires alternativesolutionsvandykebuffalogolahavon_2017 1205.pdf**

[64] "2016 Electric Resource Plan: 2017 All Source Solicitation 30-Day Report," Public Service Company of Colorado, December 28, 2017, **https://www.documentcloud.org/documents/4340162-Xcel-Solicitation-Report.html**

[65] "Boothbay Sub-Region Smart Grid Reliability Pilot Project," GridSolar LLC, January 19, 2016, **https://neep.org/sites/default/files/resources/FINAL_Boothbay Pilot Report_20160119.pdf**

[66] Distributed Energy Resources Authority Act of 2018, B22-0779, Council of the District of Columbia, 2018, **https://legiscan.com/DC/text/B22-0779/2017**

[67] "RFPs and RFQs," Energy Trust of Oregon, **https://www.energytrust.org/about/explore-energy-trust/rfps-rfqs/**; and "Requests for Proposals," Efficiency Vermont, **https://www.efficiencyvermont.com/about/requests-for-proposals**

[68] "Non-Wires," Bonneville Power Administration, **https://www.bpa.gov/Projects/Initiatives/Pages/Non-Wires.aspx**

[69] *Non-Wires Alternatives: Case Studies from Leading U.S. Projects*, E4TheFuture, PLMA, Smart Electric Power Alliance, November 2018, **https://e4thefuture.org/wp-content/uploads/2018/11/2018-Non-Wires-Alternatives-Report_FINAL.pdf**

[70] Decision on Track 3 Policy Issues, Sub-Track 1 (Growth Scenarios) and Sub-Track 3 (Distribution Investment and Deferral Process), R. 14-08-013, California Public Utilities Commission, February 15, 2018, **http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K858/209858586.PDF**; and "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, **https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf**

[71] "Request for Proposal (RFP): Non-Wires Alternatives to Provide Demand Side Management for Transmission and Distribution System Load Relief," Con Edison, May 19, 2017, **https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/columbus-circle---nonwires-alternatives-project-solicitation.pdf?la=en**

[72] "Competitive Solicitation Framework Working Group Final Report Filed by Southern California Edison Company (U 338-E), Pacific Gas and Electric Company (U 39-M), San Diego Gas & Electric Company (U 902-E), and Southern California Gas Company (U 904-G)," R. 14-10-003. August 1, 2016, **https://drpwg.org/wp-content/uploads/2016/07/2016-08-01-CSFWG-Final-Report-Joint-Competitive-Solicitation-Framework-Working-Group.pdf**

[73] Ibid.

[74] "Request for Proposal (RFP): Non-Wires Alternatives to Provide Demand Side Management for Transmission and Distribution System Load Relief," Con Edison, May 19, 2017, https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/columbus-circle---nonwires-alternatives-project-solicitation.pdf?la=en; and "Request for Proposal (RFP): Monsey non-Wires Alternative Project to Provide Solutions for Distribution System Reliability and Load Relief," Orange and Rockland Utilities Inc., October 24, 2017, https://www.oru.com/-/media/files/oru/documents/businesspartners/non-wires-alternatives/nwa-rfp-monsey-august-2017.pdf?la=en.

[75] "Report Guides States to Optimize Modern Electric Grid," Interstate Renewable Energy Council, December 17, 2017, https://irecusa.org/2017/12/tools-to-build-the-modern-grid/

[76] "Distribution Resources Plan, Track 2, Demonstration Project D Request for Offer (RFO) Results," Pacific Gas and Electric Company, June 15, 2018, https://www.pge.com/tariffs/assets/pdf/adviceletter/ELEC_5314-E.pdf

[77] "2017 Distribution Resources Plan RFO," PG&E, 2017, https://www.pge.com/en_US/for-our-businesspartners/energy-supply/electric-rfo/wholesale-electric-power-procurement/2017-distribution-resourceplan-and-request-for-offers.page

[78] "Non-Wires Alternatives Program Agreement," Con Edison, https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/non-wires-alternativesprogram-agreement.pdf

[79] "State of Rhode Island and Providence Plantations Public Utilities Commission Least Cost Procurement Standards," Rhode Island Public Utilities Commission, July 28, 2017, http://rieermc.ri.gov/wp-content/uploads/2018/05/4684-lcp-standards_7-27-17.pdf

[80] "Order on Distributed System Implementation Plan Filings," State of New York Public Service Commission, March 9, 2017, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BF67F8860-0BD8-4D0F-80E7-A8F10563BBA2%7D

[81] Julia Pyper, "Tesla, Greensmith, AES Deploy Aliso Canyon Battery Storage in Record Time," January 31, 2017, https://www.greentechmedia.com/articles/read/aliso-canyon-emergency-batteries-officially-upand-running-from-tesla-green#gs.6OdcnsQ

[82] "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf

[83] "Administrative Law Judge's Ruling Requesting Answers to Stakeholder Questions Set Forth in the Energy Division Staff Proposal on a Distribution Investment Deferral Framework," R. 14-08-013, California Public Utilities Commission, June 30, 2017, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M191/K623/191623481.PDF

[84] "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf

[85] Ibid.

[86] "System Reliability Procurement 2019 Report—Final Draft," National Grid, 2018, http://rieermc.ri.gov/wpcontent/uploads/2018/09/2019-srp-report-final-draft.pdf

[87] "Report Guides States to Optimize Modern Electric Grid," Interstate Renewable Energy Council, December 17, 2017, https://irecusa.org/2017/12/tools-to-build-the-modern-grid/

[88] "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, **https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf**

[89] "State of New Hampshire Before the Public Utilities Commission," Liberty Utilities, January 15, 2016, **https://www.puc.nh.gov/Regulatory/Docketbk/2016/16-097/INITIAL FILING - PETITION/16-097_2016-01-15_GSEC_DBA_LIBERTY_LCIRP.PDF**

[90] "State of Rhode Island and Providence Plantations Public Utilities Commission Least Cost Procurement Standards," Rhode Island Public Utilities Commission, July 28, 2017, **http://rieermc.ri.gov/wp-content/uploads/2018/05/4684-lcp-standards_7-27-17.pdf**

[91] Mark Fulmer and Bruce Biewald, *Misconceptions, Mistakes and Misnomers in DSM Cost Effectiveness Analysis*, ACEEE, 1994, **https://www.nwcouncil.org/sites/default/files/CostEffectivenessTest_Review.pdf**

[92] "Report to the Rhode Island Public Utilities Commission," Docket 4600: Stakeholder Working Group Process, April 5, 2017, **http://www.raabassociates.org/Articles/RI 4600 Final WG Report 4-5-17.pdf**

[93] "Staff White Paper on Benefit-cost Analysis in the Reforming Energy vision Proceeding," Department of Public Service, July 1, 2015, **https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/c12c0a18f55877e785257e6f005d533e/$FILE/Staff_BCA_Whitepaper_Final.pdf**

[94] The California IDER and DRP Working Groups, **https://drpwg.org/**

[95] Josh Bode, Shannon Hees, and Jennifer Gai, *Location Specific Avoided Transmission and Distribution Avoided Costs Using Probabilistic Forecasting and Planning Methods*, Nexant, June 2016, **http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B6ED0A866-16AB-4ED5-9F6E-AA67AA42B878%7D**

[96] *Benefit Cost Analysis Handbook*, Con Edison, July 31, 2018, **https://www.coned.com/-/media/files/coned/documents/our-energy-future/our-energy-projects/coned-bcah.pdf?la=en**

[97] "Supplemental Distributed System Implementation Plan," Joint Utilities, November 1, 2016, **https://jointutilitiesofny.org/wp-content/uploads/2016/10/3A80BFC9-CBD4-4DFD-AE62-831271013816.pdf**

[98] "Recommendations from Subgroup 3b: Double Counting/Incrementality," IDER Competitive Solicitation Framework Working Group, July 11, 2016, **https://drpwg.org/wp-content/uploads/2016/07/CSFWG-Sub-Team-3b.-Double-Counting-Incrementality.pdf**

[99] *Geo-Targeted DSM Cost Effectiveness Methodology on a Local Scale*, Dunsky Energy Consulting, September 2015, **http://www.dunsky.com/wp-content/uploads/2016/09/NGrid-Geo-Targeted-DSM-Final-Redacted.pdf**

[100] Administrative Law Judge's Ruling Requesting Answers to Stakeholder Questions Set Forth in the Energy Division Staff Proposal on a Distribution Investment Deferral Framework," R. 14-08-013, June 30, 2017, **http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M191/K623/191623481.PDF**

[101]"Staff White Paper on Benefit-cost Analysis in the Reforming Energy vision Proceeding," Department of Public Service, July 1, 2015, **https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/c12c0a18f55877e785257e6f005d533e/$FILE/Staff_BCA_Whitepaper_Final.pdf**

[102] "Report to the Rhode Island Public Utilities Commission," Docket 4600: Stakeholder Working Group Process, April 5, 2017, **http://www.raabassociates.org/Articles/RI 4600 Final WG Report 4-5-17.pdf**

22830 Two Rivers Road
Basalt, CO | 81621 USA
www.rmi.org