# Unwiring the Country

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NONWIRES ALTERNATIVES (NWAs) AND DISTRIBUTED energy resources (DERs) are the main elements of a shift in transmission and distribution planning toward a more multi-stakeholder-engaged paradigm. The concepts around NWA planning, evaluation, and implementation are fast evolving in the United States. Different states, stakeholders, and utilities are experimenting with implementation variations in search of improved outcomes. Goals include reducing utility capitalized rate bases or at least cutting the growth rate of capital, incentivizing additional renewable penetration, and seeking overall lower costs and better energy supply performance. They can be achieved with planning procedures that holistically incorporate grid enhancements and DERs. State initiatives vary in two significant ways. One is the different attributes of DERs that can be brought to bear on NWA options and how cost–benefit analyses are performed. The second involves the roles and responsibilities of utilities, regulators, third-party entities engaged in evaluating utility plans and NWA proposals, and DER developers and stakeholders.

The first part of this article provides a summary of NWA activities and approaches in certain states. Several states are also compared and contrasted concerning roles and responsibilities they assume for different parties in NWA implementation. The second part focuses on a few aspects of NWA integration into distribution utility planning and operations. In particular, the role of third-party independent entities is discussed in more detail, as NWAs have opened discussions

*Digital Object Identifier 10.1109/MPE.2021.3134124*
*Date of current version: 21 February 2022*


1540-7977/22©2022IEEE

# The United States' Alternatives Today

around expanding the role of outside parties beyond what has been traditionally considered within utility planning frameworks.

## Summary of States' NWA Activities

Several states have ongoing activities to mandate and incentivize DERs as NWAs to defer and avoid grid investments as part of utility capital planning processes. These activities align with the regulatory objectives of fair rates, reliable service, societal and environmental benefits, and public safety. While some U.S. utilities are choosing to explore NWA opportunities on their own, a significant number of projects result from state-level regulatory processes and activities. In many states, NWA initiatives are targeted at deploying energy storage for grid services among other applications that incorporate power storage as part of routine utility planning. The activities summarized here are shown in Figure 1 and classified as investigation, initiative, and legislation. *Investigation* refers to states with proceedings to gather information and seek stakeholders' inputs. *Initiative* represents states with orders requiring utilities to make proposals and gather stakeholders' comments. *Legislation* denotes states with specific mandates from legislatures and utility commissions. The benefit streams that are "counted" in different state NWA frameworks vary to some extent. Table 1 summarizes this situation.

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### *California*

California is one of the pioneers in establishing formal NWA programs. In 2013, it was the first state to set an aggressive energy storage procurement or deployment target of 1,325 MW (with a maximum of 50% utility ownership) by 2024. In 2016, a bill (AB 2868) was signed into law, allowing 500 MW of energy storage to be rate based by the three investor-owned utilities (IOUs) in the state. The law also permits utility ownership of behind-the-meter storage as long as that does not unreasonably limit or impair the ability of nonutility enterprises to market and deploy energy storage systems.

Also in 2013, the California Public Utilities Commission (CPUC) instituted section 769 of the California Public Utilities Code, requiring electrical corporations to file distribution resources plan proposals. The objective was to identify optimal locations for the deployment of DERs. The code further instructs the CPUC to review plan proposals submitted for approval and modification to maximize ratepayer benefits from utilities' investments in distributed resources. Another important activity was conducted by a locational net benefits analysis working group examining the locational value of DERs, considering various value streams, such as transmission and distribution capacity deferral, wholesale energy market participation, and environmental benefits.

To further promote the deployment of distributed resources, the CPUC approved a pilot regulatory incentive mechanism that awards a 3–4% pretax incentive to utilities deploying cost-effective DERs that defer and displace traditional distribution investments. In addition, the body directed IOUs to procure at least 150 MW of preferred resources (e.g., energy efficiency, solar photovoltaic, and power storage resources). In 2018, it instructed IOUs to submit distribution deferral opportunity reports identifying prospects for DERs to cost effectively postpone and avoid traditional IOU investments to mitigate forecast distribution system deficiencies. These opportunities should be identified by using a set of screening criteria to ensure

that DER solutions are technically feasible and that sufficient time exists to issue requests for proposals.

To promote transparency, IOUs are also required to provide assessment reports and publish their locational net benefits analysis data, similar to integration capacity analysis maps. IOUs have hosted and participated in workshop processes to develop tools related to capacity and locational benefit analyses. There also has been standardization in the state for developing DER growth scenarios and load forecasts.

### Colorado

The Energy Storage Procurement Act of 2018 required the Colorado Public Utilities Commission to establish mechanisms for the procurement of energy storage systems as part of utility planning processes. The bill also increased the renewable energy standard to 30% by 2020 for IOUs (i.e., Xcel Energy and Black Hills Corporation). Legislation requiring 3% of all electricity sales to come from renewable distributed generation by 2020, the Energy Storage Procurement Act, was signed in 2018, directing the Public Utilities Commission to establish mechanisms for the procurement of energy storage systems as part of utilities' planning. Xcel Energy and Black Hills also created a working group to analyze the benefits and challenges of energy storage and other NWA technologies.

### Connecticut

In June 2019, the Connecticut General Assembly energized the rapidly growing energy storage market by enacting legislation authorizing electric distribution utilities to own and rate base wholesale storage generation assets for the first time since industry restructuring was authorized, in 1998. The law allows utilities to build, own, and operate unlimited quantities of energy storage systems and automatically recover prudently incurred costs from ratepayers. A senate bill (SB 952) signed into law in June 2021 also establishes a target of 1,000 MW of energy storage by the end of 2030.

In October 2019, the state's Public Utilities Regulatory Authority (PURA) issued an interim decision (docket number 17-12-03) outlining PURA's framework for investigating methods to achieve an equitable modern electric grid. Several topics were identified for investigation in three phases from 2019 through 2021. In June 2020, NWAs were investigated as part of phase 3, whose objective was to establish a transparent and competitive process for comparing potential NWAs against traditional distribution system upgrades and other utility expenses. In March 2021, Eversource, an IOU, submitted its NWA screening process consisting of three phases: 1) technology screening and approval, 2) one NWA screening process per identified need (the company has an in-house tool for this screening phase), and 3) vendor qualification and NWA-based solution deployment.

### District of Columbia

In December 2019, the Public Service Commission of the District of Columbia passed an order to consider NWAs to defer distribution substation projects. According to the directive, the following factors are considered:

- ✔ the ability of NWAs to manage peaks caused by extreme weather conditions and provide capacity during rest of the year for transformers' N-1 contingency scenarios
- ✔ the controllability and robustness of communications for customer-owned storage resources
- ✔ safety considerations and standards (e.g., the fire code) for deploying stationary energy storage systems, particularly in densely populated urban locations.

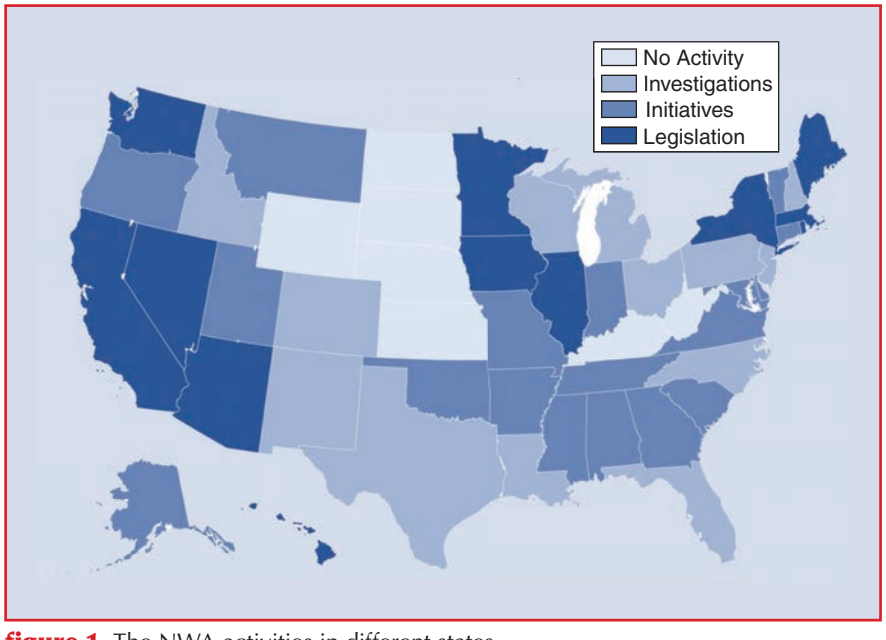


**figure 1.** The NWA activities in different states.

### Hawaii

Hawaiian Electric is pursuing integrated grid planning that would expand opportunities for resources, grid services, and NWAs for the transmission and distribution system. The Hawaii Public Utility Commission approved the plan in March 2019, and a soft launch was set to demonstrate the sourcing and evaluation of NWAs the same year. Hawaiian Electric was seeking solutions, including aggregated DERs, that could defer the expansion of East Kapolei's (located in Oahu) distribution capacity, which was forecast to be impacted by considerable load growth. The sourcing was technology agnostic and included behind- and front-of-the-meter solutions.

Other highlights of this planning process include the following:

- ✔ establishing customer-centric planning
- ✔ creating greater market opportunities for DERs and demand response providers and grid-scale developers
- ✔ enabling the development of an optimal portfolio of solutions to address resource, transmission, and distribution needs
- ✔ maintaining transparency through multilevel stakeholder engagement and an independent technical advisory panel
- ✔ implementing a streamlined 18-month planning process culminating in a five-year integrated plan with discrete proposals submitted to the Public Utility Commission for review
- ✔ facilitating most of the key aspects of the integrated grid planning development process, such as forecast assumptions and market barriers, through subject matter expert-based working groups.

### *Illinois*

In 2017, the Illinois Commerce Commission launched NextGrid, an initiative to create a shared base of information about electric utility industry issues and opportunities for grid modernization. It is based on collaboration between key stakeholders and includes several working groups of subject

**table 1. The benefit value streams in selected states.**

| Value Category | Value Stream | State | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CA | MA | NY | NV | HI | IL | NH | CO | MD | MN | ME | NJ |
| Generation | Avoided energy | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided fuel hedge | | | ■ | | | | | ■ | ■ | ■ | | ■ |
| | Avoided capacity and reserves | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided ancillary services | ■ | | ■ | ■ | ■ | ■ | | ■ | | | ■ | |
| | Avoided renewable procurement | ■ | ■ | | ■ | | | ■ | | ■ | | | ■ |
| | Market price reduction | | ■ | ■ | | | ■ | ■ | | ■ | | ■ | ■ |
| Transmission | Avoided deferred transmission investment | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided transmission losses | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided transmission operation and maintenance | | | ■ | | | | | | | | | |
| Distribution | Avoided deferred distribution investment | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided distribution losses | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Avoided distribution operation and maintenance | | | ■ | | | | | | | | | |
| | Avoided reliability costs | ■ | | ■ | | | ■ | | | | | | |
| | Avoided resiliency costs | ■ | | ■ | | | ■ | | | | | | |
| Environmental/society | Monetized environmental/health benefits | ■ | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | | | |
| | Social environmental benefits | | | ■ | | ■ | | | | ■ | ■ | ■ | ■ |
| | Security enhancement/risk | | ■ | ■ | | | ■ | | | | | | ■ |
| | Societal (economy/jobs) | | ■ | ■ | | | ■ | | | ■ | | | ■ |

CA: California; MA: Massachusetts; NY: New York; NV: Nevada; HI: Hawaii; IL: Illinois; NH: New Hampshire; CO: Colorado; MD: Maryland; MN: Minnesota; ME: Maine; NJ: New Jersey.
Source: "Locational Value of Distributed Energy Resources."

matter experts from utilities, businesses, and environmental organizations. The groups identified solutions to address challenges facing the state as it moved into the next stage of electric grid modernization, including new technologies and policies to improve the network. The NextGrid process identified the value of DERs to the grid as a key topic. This built on the Future Energy Jobs Act, calling for the implementation of locational and temporal DER evaluation after a 5% threshold of photovoltaic penetration was passed. The 2021 Clean Energy Job Acts (SB 2408) revised this, extending the photovoltaic incentives, creating a new photovoltaic-plus-storage incentive, and requiring utilities to prepare filings addressing additional avoided-grid-cost benefits and evaluations.

### Maine

In 2019, the Maine legislature passed an act to manage electricity costs by using NWAs. Based on this law, every IOU must produce an annual subtransmission and distribution plan and identify forecast needs and corresponding traditional grid upgrades. This plan must analyze system requirements for the next five years and provide a schedule and associated costs. Moreover, system capacity and forecast loads by substations and circuits must be described.

Further, utilities need to perform NWA opportunity screening for the identified needs. NWAs will be considered if the estimated cost of a traditional grid project is more than US$500,000. For distribution projects above that threshold, an NWA solution will be analyzed if there is a reasonable likelihood that it would be more cost effective than a proposed wire project. Projects with one of the following criteria are excluded from NWA screening:

- ✔ They are needed for redundant supply to a radial load.
- ✔ They are necessary to address maintenance, asset condition, and safety needs.
- ✔ They are required to solve stability and short circuit problems.
- ✔ They must be in service within one year.

### Massachusetts

In February 2019, the state's Department of Public Utilities issued two orders for storage rules that opened revenue streams to utilities, third-party developers, and customers. The orders clarified net metering rules for solar-plus-storage facilities and capacity rights ownership to dispatch storage resources. In early 2021, a bill (S.2144) was introduced in the Massachusetts Senate, requiring every electric utility to prepare a grid modernization plan every three years. The plan is required to do the following:

- ✔ evaluate the locational benefits and costs of current local energy resources and identify optimal areas for local energy resources during the next 10 years, based on reductions and increases in regional generation capacity and demand, avoided and increased investments in transmission and distribution infrastructure, safety benefits, and reliability benefits, including other savings local energy resources provide to the grid and avoiding costs to ratepayers
- ✔ provide information about the interconnection of distributed generation via hosting capacity maps that are accessible to the public and updated regularly
- ✔ update interconnection procedures for distributed generation
- ✔ propose and identify locational-based incentives and other mechanisms for the deployment of cost-effective local energy resources that satisfy planning objectives
- ✔ propose cost-effective methods of coordinating programs, incentives, and tariffs to maximize the locational benefits and minimize the incremental costs of local energy resources
- ✔ identify additional utility spending to integrate cost-effective local energy resources into distribution planning
- ✔ recognize additional barriers to the deployment of local energy resources.

### Minnesota

In August 2018, the Minnesota Public Utility Commission approved integrated distribution planning requirements for Xcel Energy. This framework orders Xcel to develop processes that analyze the value of DERs to the distribution grid. The Public Utility Commission requires Xcel Energy to file an integrated distribution planning report annually and smaller utilities to file every two years, specifying distribution investments five years into the future. Utilities are to itemize nontraditional distribution projects, including NWA analysis.

Xcel Energy filed its second integrated distribution planning report in November 2019, indicating that in future analyses, the utility would consider locational net benefits. In this plan, Xcel Energy also reviewed the viability of using a portfolio of demand response, storage, and solar as NWAs for nine distribution system projects. In June 2019, the Minneapolis-based Center for Energy and Environment launched an NWA pilot in partnership with Xcel Energy to test whether targeted energy efficiency and demand response promotion could defer distribution grid investments.

### Nevada

Nevada lawmakers have approved several clean energy and energy storage bills. In 2017, a bill (Senate Bill 204) directed state regulators to consider requiring utilities to purchase energy storage in the following years. A separate piece of legislation (Senate Bill 145) would establish an incentive program for energy storage within the state's solar program. Nevada Senate Bill 146, passed in June 2017, required Nevada Energy to submit a distributed resources plan to the Public Utility Commission of Nevada by 1 April 2019 as an addendum to its integrated resource plan. The plan's requirements included the following:

- ✔ evaluation of the locational benefits and costs of DERs
- ✔ proposed standard tariffs for the deployment of cost-effective DERs
- ✔ a proposal for cost-effective methods of coordinating existing programs to maximize the locational benefits of DERs
- ✔ identification of additional spending to integrate distributed resources into distribution planning
- ✔ classification of barriers to DER deployments.

The commission opened an investigation and rulemaking docket in July 2017 and approved temporary regulations in 2018 that established the filing, content, approval, and updating process for distributed resources plans. In 2018, it approved an order requiring Nevada Energy to incorporate DERs, such as solar and energy storage, into its three-year system plan. The requirements for the distribution resource planning outlined the following key components:

- ✔ a forecast of the net distribution system load and DER penetration (both energy and nameplate capacity) at the system, substation, and feeder levels
- ✔ a hosting capacity analysis to determine the number of DERs that can be accommodated on each feeder section without adverse impacts
- ✔ a locational net gains analysis supporting a location-specific cost–benefit analysis of DER projects to serve as the basis for comparison between NWAs and traditional solutions
- ✔ a grid needs assessment that combines the three preceding components for an analysis of NWAs to identify constraints on the electric grid as well as infrastructure upgrades and DER projects that may provide solutions to those restrictions.

### New Hampshire

In 2016, the state legislature passed a bill requiring the New Hampshire Public Utilities Commission to initiate a proceeding to develop new alternative net metering tariffs. Recognizing that more information would be needed to inform the process, the commission ordered a value-of-DERs study and NWA pilot. In 2018, a systemwide value-of-DERs study scope was proposed, but the commission decided to modify its NWA pilot into a study of the locational value of distributed generation. The goal was to determine the avoided costs of deferred capacity investments at the distribution level. This became the focus of New Hampshire's work under the Multistate Initiative to Develop Solar in Locations That Provide Benefits to the Grid project.

In 2018, Public Utilities Commission staff began gathering stakeholders to develop a locational-value-of-distributed-generation study scope and held a public, in-person technical workshop focused on it. In 2019, the staff filed a proposed study scope, which was followed by a public hearing and written comment period before final commission approval with some modifications. The selected approach will closely follow current utility planning methods and practices to best represent investment decision making in the New Hampshire context. Consultants will work closely with the state's three regulated utilities through three high-level steps: 1) identifying locations for detailed analysis, 2) determining avoided and deferred investment costs, and 3) assigning values, using load profiles to map against generation profiles. This study scope has formed the basis of a request for proposals to solicit a vendor to conduct the analysis.

### New York

One of the objectives of New York's "Reforming the Energy Vision" is to incentivize utilities to leverage the deployment of DERs to address problems traditionally handled by new investments in centralized generation, transmission, and distribution infrastructure. In early 2016, the New York Public Service Commission issued formalized guidance to utilities, requiring that they file NWA candidate opportunities in their distributed system implementation plans. It further directed every utility to file a benefit–cost analysis handbook including methods and formulas for calculating utility-specific DER values and avoided costs (project- and location-specific when applicable) in the context of NWA projects.

The utilities were also required to propose NWA suitability criteria as part of their planning procedures and identify all projects in their five-year capital plan to meet the conditions and indicate when NWA solicitations would be issued. The proposed suitability criteria developed by the joint utilities consider eligible project types, such as load relief, reliability, power quality, conservation voltage reduction, and resiliency. Any project that requires the relocation of an existing facility or investment in communication and software capabilities is excluded. A timeline and minimum grid project cost threshold (e.g., US$1 million for large projects) are other stipulations. From 2020 data, New York utilities had 45 current and upcoming NWA procurements listed on their "Joint Utility" website and summarized in their distribution system implementation plans. Among the projects, the success rate in terms of implemented NWAs was 18%.

The Public Service Commission further required regulated utilities to propose tariff-based compensation to DERs based on the stack of values that can be delivered, including wholesale energy, capacity, environmental value, demand reduction, and locational system relief based on marginal-cost-of-service studies. New York also has an energy storage road map. It identifies short-term recommendations for how power storage can deliver value to consumers and cost effectively address the grid's needs and demands. This supports the governor's energy storage target of 1,500 MW by 2025.

### Rhode Island

According to the Comprehensive Energy Conservation, Efficiency, and Affordability Act passed in 2006, the state's

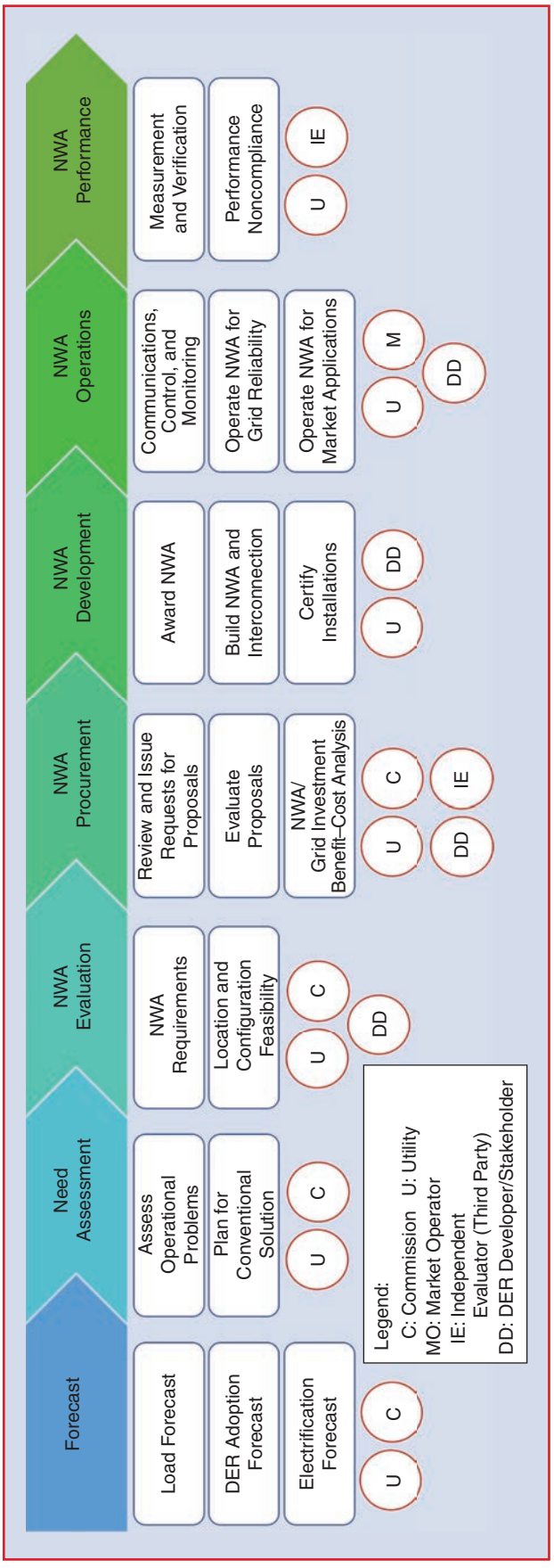


**figure 2.** The role of different actors in NWA implementation.

utilities are required to consider NWAs to defer transmission and distribution investments in their annual system reliability procurement plan. In addition, according to updated Rhode Island Public Utility Commission "Least Cost Procurement Standards," the utilities must evaluate NWAs based on the following criteria:

- ✔ The need is based on asset conditions.
- ✔ The cost for the grid solution is more than US$1 million.
- ✔ If load reduction is necessary, it must be less than 20% of the relevant peak in an area.
- ✔ The start date for a traditional grid project is at least 30 months in the future.

The procurement standards also encourage the utilities to consider hybrid solutions if NWAs can defer only part of traditional grid investments. Thus, cost-effective combined NWAs and grid bundles would be studied.

### *Virginia*

The Grid Transformation and Security Act (2018) allowed Dominion Energy Virginia to invest in up to 30 MW of battery storage pilot projects. In August 2019, the utility signed off on four projects with a combined capacity of 16 MW to expand opportunities for additional energy storage to support its boost in renewables and improve grid reliability. These pilots were to help Dominion analyze the use of energy storage for grid stability support instead of traditional system upgrades. There is also an administrative code in Virginia (56-585.5 D 4) that requires utilities to address NWA programs and file for approval of NWA initiatives related to energy storage every year.

## NWA Implementation in Utility Distribution Planning and Operations

Integrated distribution planning offers an opportunity for increased transparency and an improved ability to inform and obtain input from stakeholders. The main method of achieving greater transparency is stakeholder engagement, which has been a component of integrated distribution planning processes in Hawaii, California, and other states. Increased transparency can lead to greater investment support, innovative solutions to grid constraints, and additional benefits. Key to the success of NWA implementation is the clear definition of responsibilities for various actors (commissions, utilities, market operators, independent third-parties/evaluators, DER developers, and stakeholders) and effective coordination among them.

Figure 2 illustrates the main steps of an NWA implementation life cycle along with actors involved in each stage. The process starts with load, DER, and electrification forecasts. As shown, a utility is engaged in almost every stage and often plays the lead role except

for operating NWAs for market applications where an independent operator would assume the main responsibility. Even for market applications, the utility needs to be involved to make sure DER market participation does not compromise the reliability of the distribution grid. Similarly, for NWAs owned by a third party, the utility is not engaged in the construction phase.

The role of the commission is normally related to the review and approval of a utility's plans and decisions except load and electrification forecasts, which in California are the responsibility of the CPUC. Third-party independent entities are typically engaged to review and audit steps such as issuing requests for proposals, proposal evaluation, and benefit–cost analysis of NWAs versus grid investment. Feedback and inputs from DER developers and stakeholders concerning certain steps, such as NWA requirements, technology and configuration feasibility, and benefit–cost analysis, would be very helpful in the process. For NWAs owned by third parties and for nonreliability DER operations (e.g., behind-the-meter backup generation), developers should assume the lead role.

## NWA Integration Into Utility Planning Cycles

Many distribution system upgrades are done on an annual cycle. In the fall, capacity and reliability issues exposed in the summer will drive planning, and construction is planned for the spring to be operational well before the next summer peaks. Projects are planned based on the uncovered problems, and engineering designs are executed to budget these projects. Once reviewed and approved, the projects proceed to procurement and construction. The timing of this cycle poses some challenges to incorporating NWA evaluation, developing NWA requests for proposals, reviews by independent third-party entities, procurement, negotiation, and contracting, constructing, testing, and certifying NWAs. Further, this cycle does not facilitate grid investment as a fallback should the procurement fail. Therefore, it is necessary to develop a set of suitability criteria to guide utility planners as to which projects should be evaluated for NWA potential.

For example, the routine end-of-life replacement of assets (poles, transformers, and circuit breakers) is always going to be more economical and faster than any NWA approach and should be excluded. The alternative is to extend the planning cycle to accommodate the NWA procurement process. California is one of the states that has excluded these routine, short-term grid upgrades from consideration for NWAs for this reason. Without a properly defined set of criteria, the utility planning and budgeting process must be compressed without compromising the quality and accuracy of the results. The quality and accuracy of budgeting, in particular, are critical, as they are the basis of evaluating NWA solutions.

## NWA Operations

Utilities should develop detailed and comprehensive NWA operational requirements, especially for nonutility-owned and operated NWA, as these will provide critical reliability services to the distribution grid. Unlike in wholesale energy markets, the performance of a resource in the distribution grid is not fungible. That is, in wholesale markets, if a resource fails to meet its scheduling or dispatch, the market will have ensured sufficient reserves to replace it at the moment, and the nonperforming resource bears the cost of that plus any applicable penalties. When an NWA resource fails to perform, however, some grid constraint is presumably violated, with implications for asset life, potential customer service interruptions, and quality reduction. In the worst case, there could be more than just an underserved load if grid and customer equipment is damaged.

Different mechanisms can be established to mitigate NWA nonperformance issues. For example, a utility can acquire the equivalent of NWA capacity reserves that are available should primary NWAs fail to ensure the reliability of the system. Some nonperformance provisions need to be specified in the contracts with the NWA operator, reflecting the possible costs to consumers and the utility. The utility should also include reasonable NWA monitoring and operational control requirements via integration into its systems to ensure compliance.

## Role of Third Parties and NWA Stakeholders

Many stakeholders recommend that an independent third party play a significant role in different stages of NWA planning and deployment. Consequently, some public commissions intend to write into law specific roles for independent entities, from reviewing utility plans (e.g., Connecticut's strawman proposal) to assessing NWA offers. These stakeholders argue that involving third parties would improve the transparency of utility planning and decision-making processes, enable a leveler field for NWAs to compete with traditional solutions, and result in more NWA deployment.

Currently, the level of stakeholder engagement varies by state according to integrated distribution planning and NWA procedures. In California, independent evaluators should review utilities' grid assessments, traditional upgrade candidate solutions eligible for NWA evaluation, and NWA decisions within a preestablished program framework. However, evaluators neither conduct grid assessments nor design NWA solutions. The state uses a distribution investment deferral framework to assess the potential of NWAs and procure DERs as infrastructure investment alternatives. Utilities are responsible for grid planning and soliciting and evaluating bids, and evaluators are responsible for monitoring the process and verifying evaluations. Third parties can also advise utilities on the operation and control phase by providing technical, operational inputs for different technologies.

In New York, developers (aggregators) operate/control DERs based on need assessments conducted by utilities in accordance to design parameters. The role of stakeholders in NWA planning and decision steps is limited to providing input and feedback about the methodology and framework adopted by utilities. One of the highlights in Hawaiian Electric's proposed integrated grid planning in 2018 was a multilevel stakeholder engagement that included designing different utility-led working groups. The groups advised the utility by providing input and feedback on the methodology of different steps, from load and DER forecasting to NWA decisions and benefit–cost analysis. While stakeholders' engagement is necessary to promote a transparent and increased integration of NWA into the electric grid, given the highly technical and critical nature of utility planning and operations, there are some considerations to be made to effectively involve third parties without compromising the reliability of the distribution system.

## Conclusions

Until recently, this summary would have been limited to California and New York. Today, a significant portion of the United States has legislation, commission orders, and investigations underway. The NWA concept is gaining momentum. Details regarding definitions, frameworks, scopes, roles, and responsibilities are rapidly evolving. Regulators, stakeholders, and utilities are still very much in a learning mode concerning constructing and implementing a streamlined NWA-related framework and process.

Utilities are responsible for grid investment plans to ensure the reliable, safe, and equitable delivery of power to consumers in a cost-effective manner. DERs can and should be an integral part of grid planning in a systematic way, as they can realize avoided-cost benefits, among others. Besides the theoretical questions about how to calculate and capture the benefits, there are numerous planning, policy, and implementation considerations to be accounted for to seamlessly integrate NWAs into utility planning and operations.

Frameworks for lowering grid costs through DERs continue to be evaluated. However, to have an accurate and fair evaluation, there should be a two-by-two matrix of costs and benefits on both axes. While a final decision will incorporate the direct costs of a DER solution (via a request-for-proposals process, for example), benefits beyond solving immediate planning problems are not considered. For instance, the benefit of a grid investment in terms of increasing hosting capacity is not taken into account in most frameworks. The value of the grid has been taken for granted for decades, but now it needs to be assessed against the value of DERs. This and other issues will have to be resolved through time as the NWA concept's implementation evolves and matures.

Articles in the popular media focused on decarbonization and electrification have recently begun mentioning that major grid investments will be needed to accommodate the electrification of transportation, buildings, industry, and even agriculture. Decarbonization leads to increased distributed renewable resources, e.g., DERs, so planning the grid investments needed in the short-to-medium term to enable full-bore electrification in the medium-to-longer term will necessarily include integrated planning and NWAs. Today's NWA planning efforts can be seen as the first steps in developing a process for grid investments supporting electrification.

## For Further Reading

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