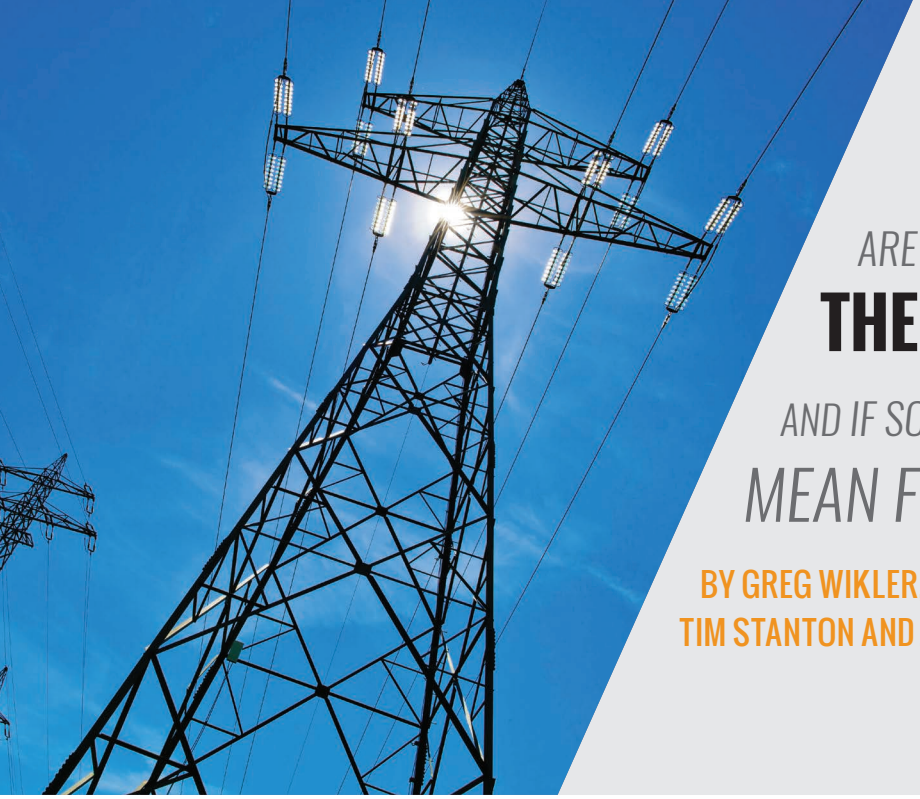


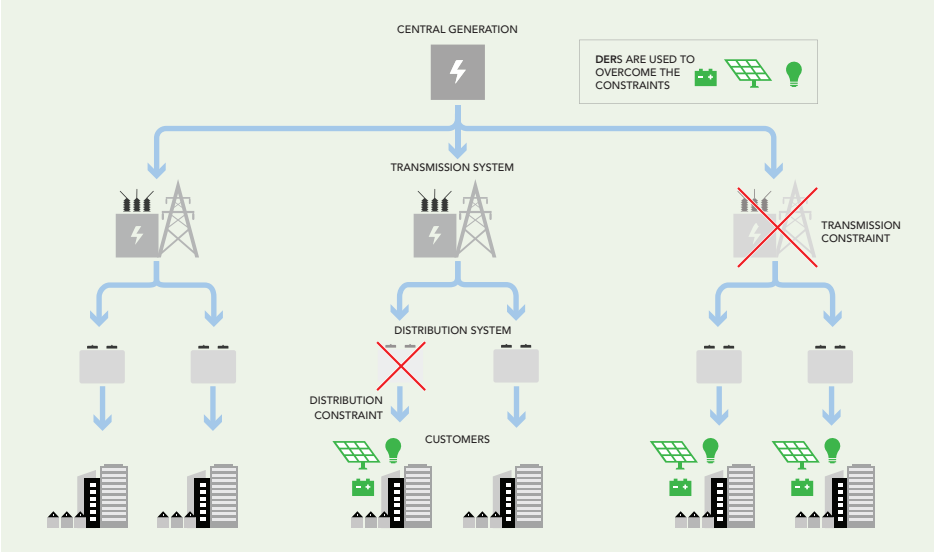
ARE NON-WIRES SOLUTIONS THE NEXT BIG THING AND IF SO WHAT DOES THAT MEAN FOR OUR BUSINESSES?

BY GREG WIKLER, ROBIN MASLOWSKI, TIM STANTON AND JAY PAIDIPATI

As distributed energy resource (DER) deployments grow around the country, utilities and policymakers are beginning to recognize the importance of being strategic and mindful of the timing and extent of DER deployments. Non-wires solutions (NWS) represent a process that helps to facilitate the deployment of DERs. Navigant Research defines NWS as: "An electricity grid investment or project that uses non-traditional transmission & distribution (T&D) solutions, such as distributed generation, energy storage, energy efficiency, demand response, and grid software and controls, to defer or replace the need for specific equipment upgrades, such as T&D lines or transformers, by reducing load at a substation or circuit level."[1] This article outlines how NWS is working in today's changing electric grids and identifies a number of NWS case studies that will help affirm why we think NWS might be the next big thing for energy service providers.

Traditionally, when a transmission or distribution system operator had a need to upgrade or replace infrastructure due to aging equipment or load growth, they would procure new equipment on which it could earn a regulated rate of return. No thought was given to alternatives in addressing the issue; it was simply seen as replacing equipment.

Figure 1. Locational Value of Demand Reduction to Relieve T&D Constraints



However, more creative solutions are being explored to address infrastructure needs at a lower cost with higher customer and environmental benefits as grid management and DER technologies continue to rapidly advance. Utilities now look to increase customer engagement and provide more value-added services, as policy concerns related to cost and the environment have grown.

As an example of this, Figure 1 illustrates how the value of demand reduction from certain customers may be higher if there is an upstream constraint on the T&D system that can be relieved by reducing the net load downstream with DERs. The distribution substation in the middle of the diagram is projected to be overloaded in the near future (marked by the red "X"). Downstream of this constraint, there is a load pocket (marked by customers with green DER icons) where the value of reducing demand[2] is higher than other areas on the system where there is no T&D constraint. Similarly, on the right side of the diagram, a transmission constraint is depicted with an expanded load pocket due to a higher number of customers downstream of the constraint.

In load pockets that have a high value of demand reduction, utilities may consider offering targeted and focused customer incentives and conduct targeted marketing campaigns to drive faster adoption of demand-reducing technologies and utility-funded DER programs. Utilities can justify these higher incentives because of the location-specific benefits that these measures provide.

When is DER Appropriate to Defer T&D Upgrades?

As more and more utilities consider NWS as an alternative to traditional T&D investments, there are an increasing number of case studies in which DER is shown to be more cost effective and timely than a traditional T&D investment—and vice versa. The suitability of a NWS solution to meet an identified system need is a function of assessing the costs and time to implement the traditional solution in comparison with the NWS. It is a vital analysis to balance the consideration of DER to meet system needs against the mandate to provide safe, reliable and affordable service to customers. This assessment begins by determining the suitability of the T&D need for deferral, then evaluating the localized customer characteristics and equipment saturations to support DER adoption.

Traditional Solution Characteristics

To determine whether a specific T&D investment can effectively be deferred by DER and would be suitable for an NWS, example criteria for consideration could include:

Project Type Suitability: Determines if project needs are appropriate for DER.

- Project is needed for load relief and/or reliability.

Timeline Suitability: Used to assess whether there is sufficient time to conduct an NWS solicitation and implement before required in-service date.

- Large projects (e.g., projects on a major circuit or substation and above) must be 36-60 months.
- Small projects (e.g., projects that are feeder level and below) must be 18-24 months.

Cost Suitability: Considers the likelihood of an NWS to be cost effective.

- Large projects have no cost floor.
- Small projects must be greater than or equal to a certain minimum threshold.

If the proposed project area meets these suitability criteria, the utility should then determine the annual capacity deficiency that would need to be met through DERs, as well as the avoided costs from the deferred or avoided T&D investments to determine the benefits assigned to the NWS.

Alternative Solution Characteristics

On the other side of the equation, the utility must assess the potential availability for DER within the localized area of need to determine whether these resources can fully offset the traditional solution during all hours of need. This demands a more detailed understanding of localized customer characteristics and equipment saturations than is typically captured within DER programs.

The most important aspect of assessing the viability of alternative solutions is collecting granular (e.g., feeder-level) data that focuses on:

- Customer demographics (e.g., sector/segment, income, etc.).
- Current saturation of DERs (e.g., percentage of efficient lighting, portion of customers with plug-in electric vehicles, etc.).[3]
- Technical potential for DER uptake (e.g., rooftop square footage available for solar PV).
- Hourly load shapes for available resources and how those align with the local area T&D need.

In conjunction with robust cost curves for each DER, this granular data lays the foundation for the current market state and can even provide indications of future uptake by translating customer demographic data into indicators on the propensity for adopting various DER technologies.

With this foundation, similar methods to those used in potential and forecasting studies (e.g., diffusion modeling, discrete choice analysis, etc.) can project forward the relative adoption of DER technologies at a granular, localized level.

Comparison of Traditional and Alternative Solutions

Once the available capacity and associated costs are understood for the potential portfolio of NWS options, the NWS options should be compared to the traditional solution. Some questions to consider through this process include:

- **Is the timing of the demand reduction provided by the NWS coincident with the peak loading of the T&D constraint?**
- **Does the NWS portfolio screen as cost effective?** Utilities and regulators typically apply a Total Resource Cost or Societal Cost Test for cost effectiveness screening of NWS.
- **Is the NWS portfolio less costly than the traditional solution?** In some instances, the NWS portfolio may screen as cost effective, but still be more costly than the traditional solution.
- **What are the overall effects on the company's bottom line (e.g., in terms of shareholder value) from an NWS versus a traditional solution?** Under certain regulatory conditions, investment in capital T&D upgrades may look more attractive than investment in DER from the perspective of regulated rates of return.
- **Does the NWS portfolio provide sufficient reliability, as compared to the traditional solution?**

In a simplified analysis, the "nameplate capacity" of each DER measure must be converted into "firm capacity" before calculating the T&D benefit associated with the demand reduction. For example, a solar PV system rated at 10 kW of nameplate capacity may only provide 1 kW of firm capacity to the T&D constraint due to variations in weather and cloud cover, coincidence with the timing of the constraint, the length of the constraint, and other reasons. For more rigorous analyses, one should compare the shape of the constraint to the "firm" impact shape of each measure on an hourly or sub-hourly basis to determine if the "need" is met at all times.

Case Studies

One recent example of a successful NWS project is Consolidated Edison Company of New York's (Con Edison) Brooklyn Queens Demand Management (BQDM) Program.[4] Con Edison has very high T&D infrastructure costs and developed a DER program to help defer upgrades in several parts of its territory through a variety of DER solutions, including demand response, distributed solar and battery storage. Con Edison pursued this initiative on its own, but other utilities are beginning to receive regulatory directives to pursue NWS. A recent example includes the California Public Utilities Commission (CPUC) denial of a request by Pacific Gas and Electric (PG&E) to build natural gas plants for local reliability. Instead, the CPUC directed PG&E to procure DER, including distributed solar, storage, and DR, to meet local needs.

On the other hand, it is not always feasible or cost effective to offset T&D investments with DER. There have been recent examples in California and New York where NWS assessment processes have been carried out and through the analysis and regulatory approval processes, NWS portfolios were either deemed unnecessary or were less economical than the original T&D investments.

What Does This Mean for our Businesses?

At this early stage in development, there is no standard business model and procurement process for utilities to implement NWS. Currently, there are four models being considered and tried by utilities. The first is request for proposal (RFP), a typical utility procurement model. Auction mechanisms similar to those used to procure resources in wholesale markets are being explored by utilities. Another option being explored is procurement with current demand-side implementation contractors to keep things simple, quick and transparent for the customers. The last possibility is internal utility resource deployment if the utility has the required capabilities.

Evaluating NWS will require a different approach than traditional DSM projects. Metering will extend beyond customer buildings and include distribution and potentially transmission level data to confirm demand reductions are occurring as intended. In addition, data collection cannot be done at any time. It will have to coincide with the same peak events that NWS are trying to reduce. Finally, evaluation will require experience with a broad set of technologies, not just EE and DR.

There is no one right answer for all situations; each case will depend on the utility's internal structure and capabilities along with the regulatory construct in which it operates. But we see ample evidence throughout North America that NWS interest and experience is expanding. We expect NWS to play an important role in the future of distributed energy resources.

References

[1] Navigant Research, "Non-wires Alternatives: Non-traditional transmission and distribution solutions". Q2 2017.

[2] This demand reduction must be coincident in time with the peak loading of the constraint in order to provide these T&D benefits.

[3] The saturation of energy efficiency measures can not only help inform the potential for further energy efficiency uptake, but can also inform the savings baseline for measures within an NWS (i.e., as an "existing conditions baseline"). In many jurisdictions, a utility is only able to claim savings under a traditional energy efficiency program for a baseline unit that is consistent with energy code. However, within an NWS, it is more appropriate to look at the savings for replacement of the actual existing unit—which in some cases may have an efficiency that is below code.

[4] https://www.Con Edison.com/en/business-partners/business-opportunities/brooklyn-queens-demand-management-demand-response-program

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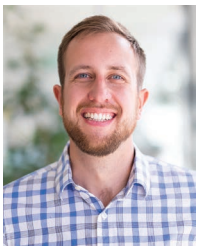

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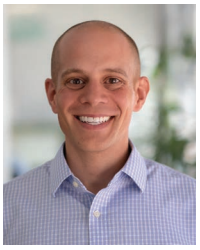

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