EnergyHub®

Managing grid-edge DERs for grid reliability

Introduction

The grid is evolving.

Recent performance advances and cost reductions in distributed energy resources (DERs) have led to a proliferation of DERs at the grid-edge. From connected thermostats to electric vehicle chargers, DERs are no longer solely confined to large-scale utility pilot projects - they are increasingly appealing to consumers who want to gain increased independence in how they manage their energy needs. If not managed properly, these grid-edge DERs could start to present significant issues for utilities. If a utility plans properly to manage these assets, they can present tremendous opportunity.

In order to proactively take advantage of this trend, utilities need a distributed energy resource management system (DERMS) that can connect to myriad of DER device classes located at a wide variety of sites across the grid. Such a DERMS must be intelligent, flexible, scalable, and built to manage the unique aspects of grid-edge devices. When properly utilized, the DERMS allows a utility to manage DERs of all sizes across their service territory, whether owned by the utility or the customer, in order to deliver grid services and avoid building and maintaining expensive physical assets.

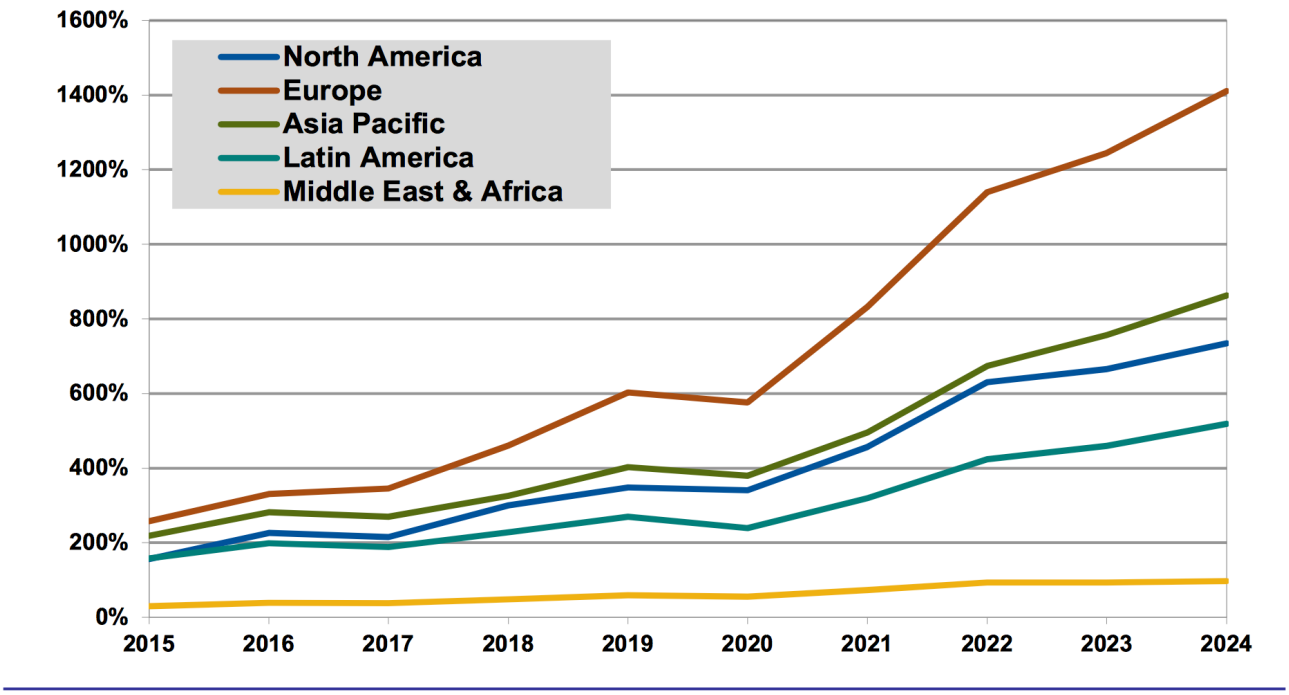
Legacy DERMS are unlikely to have the ability to respond to the proliferation and complexity of customer-sited DERs. Those DERMS, which were derived from early ADMS or low-tech DRMS software, lack the agility and flexibility needed to respond to greater penetration of DERs as the grid evolves.

This white paper describes how the growth of grid-edge DERs requires a DERMS that was designed and developed with the grid-edge in mind. The paper discusses market drivers, critical DERMS functionality required to manage grid-edge assets, and enabling customers to participate in utility programs, and gives specific examples on how utilities can use a DERMS to effectively manage their system from the grid-edge to the substation.

The future grid will be highly distributed

Utility customers are installing thousands of grid-valuable devices every day, from connected thermostats to EV chargers to smart inverters. Analysts estimate there will be more than 40 million connected thermostats installed in homes by 2020[1] and that the number of residential solar installations will double from 2017 to 2020[2]. The rising popularity and diminishing cost of electric vehicles, connected water heaters, and behind-the-meter (BTM) energy storage are also clear indicators that we are already well on our way toward a more distributed grid. All together, experts estimate that more than 320 GW of conventional generation will be displaced by 2023[3].

DER Capacity Installments as a Percentage of New Centralized Generation, Regional Averages: 2015-2024



(Sources: Navigant Research, U.S. Energy Information Administration)

Utilities need to connect to DERs on the grid or face the prospect of costly alternatives. Increasing levels of distributed generation impose risks that today's distribution networks were not designed to handle, most notably bidirectional power flow. This can lead to multiple issues, such as voltage swell and malfunction of safety equipment. Control over grid-edge devices using a DERMS can mitigate these issues and help protect legacy grid assets.

Despite being a cause of such issues, DERs can be powerful tools to mitigate them. Control over grid-edge devices using a DERMS helps protect legacy equipment and makes the grid a more responsive and resilient system. Examples include reactive power regulation of voltage and power factor from smart inverters, fast-acting load shed from EVSE, and thermal and electrical storage of grid-interactive water heaters and stationary batteries.

BTM DERs have different capabilities, constraints, communication paths, and ownership models compared to the assets to which utilities typically connect. Despite the different operating characteristics and complexity, these DERs create a massive opportunity for utilities to provide targeted grid, market, and customer services.

There are already active utility programs showing the potential of the distributed grid. Utilities use smart thermostats for demand response across the country, with many utilities employing the Bring Your Own Thermostat® (BYOT) model which enables customer choice and allows utilities to deliver grid services using customer-owned assets. As the model for these programs evolves from BYOT to Bring Your Own Device (BYOD), utilities implementing these strategies early will be prepared to scale programs quickly as grid-edge DERs proliferate.

Taken together, the rapid and continuous growth of customer and third-party owned DERs, the challenges these assets pose, and the responsive capabilities they present amount to a significant opportunity for utilities looking to better manage the grid.

Opportunities for utilities

As the grid evolves, utilities will be under increased pressure to deliver grid services without spending more on capital assets, such as wires and substation equipment. The traditional model of building and siting assets is expensive, with these assets often having a low utilization factor and being used to address rare incidents such as coincident peaks. This approach is a significantly less efficient investment than a DERMS, which adds intelligence to existing assets and is located exactly where incidents arise. Utilities can defer or avoid these costs by leveraging DERs and a DERMS built for the grid-edge.

A DERMS empowers utilities to unlock the potential of DERs to deliver grid services. The distinct capabilities, constraints, and usage profiles of each asset make it useful for services across time horizons and from the system-level down to individual circuits. For example, siting DERs at an under-capacity feeder may render an asset useful for system-level services, but not grid-local ones; while its long duty cycles but high system coincidence factor make it useful for monthly utility demand charge reduction but not fast-reacting demand response.

Alongside the multitude of grid services these DERs unlock, utilities can build a better relationship with their customers by leveraging the relationship that device manufacturers maintain with those same customers. For instance, when a customer opens their connected thermostat app and receives an offer for a rebate on their electric bill by signing up for a demand response program, that interaction creates a positive experience for the customer that is directly associated with the utility's brand.

The future of DERMS

The traditional utility asset management strategy has been to focus on managing a small number of large endpoints. While this approach has provided value under the legacy utility model, the evolution of the grid and proliferation of customer-sited DERs will soon render that model obsolete. The DERMS of the past were designed for simple command and control over utility assets on utility networks – none of which hold up in the new model of third-party ownership, limited control and monitoring, and new communication networks and protocols.

The EnergyHub Mercury DERMS was designed to manage every class and size of DER – from the grid-edge to the substation. In managing a group of DERs to deliver multiple services to the utility, Mercury considers the scale, location, consumption profile, and performance characteristics of each asset under management. Rather than siloing control over similar assets, the platform distills the operational characteristics of different DERs into grid-centric groups, enabling heterogeneous DERs to be optimized jointly for superior results. Building on EnergyHub's experience managing a diverse DER ecosystem, Mercury 3.0 is uniquely equipped to perform such technology-agnostic management.

The evolution of today's DERMS must move beyond the manual, signal-centric approaches of the past. EnergyHub's Mercury DERMS is built for autonomous operation based on providing grid-services to meet utility objectives, minimizing reliance on operator intervention and manual control. Mercury is designed to optimize and dispatch fleets comprised of various DERs, across multiple grid services.

Beyond the management and delivery of grid services, a DERMS must also simplify how DERs, especially customer-owned and -sited DERs, are incorporated into utility programs. Utilities face a variety of unique issues when taking on the marketing of these programs and enrollment of customer-owned devices:

- How do you find customer-owned assets to enroll in programs?
- How do you get your offers in front of those customers?
- How do you verify the eligibility of every customer?
- How do you connect your DERMS to the wide variety of DERs owned by customers?

A modern DERMS needs to enable all of those processes. Mercury includes a suite of tools designed to address these issues, developed based on years of experience in enabling customer participation in utility programs and managing customer-owned assets for utilities. The platform provides customer-facing recruiting websites, enrollment processing using EnergyHub's Automated Enrollment Verification technology, and APIs integrated with EnergyHub's DER partners to bring program offers directly to the customer and rapidly allow the utility to manage enrolled devices.

EnergyHub designed and developed Mercury to be the most robust DERMS on the market. Created from years of experience managing successful demand response programs and input from the largest utilities in the country, the Mercury DERMS enables utilities to provide advanced grid services for utilities with an eye toward the distributed grid of the future.

The DERMS-ADMS relationship

Utilities deploying an ADMS will benefit from enlisting a DERMS as well through grid-support requests. While an ADMS focuses on real-time grid stability, a DERMS supplements that focus by providing grid services and situational awareness, spanning longer time horizons, at the grid edge. An ADMS can rely on a DERMS to provide near-term visibility and responsiveness while ensuring future objectives, such as resource adequacy and meeting a forecast solar and system peaks. EnergyHub's Mercury DERMS works in tandem with a utility's ADMS to ensure that the utility has a 360-degree view of its grid operations.

About EnergyHub

EnergyHub is the connected device and DER solution for utilities. EnergyHub's Mercury DERMS platform is the most widely used enterprise DERMS for managing grid-edge distributed energy resources into the grid. Utilities use EnergyHub's Mercury DERMS to manage customer-sited DERs and partner with customers to deliver more powerful demand response and grid service solutions using the industry's largest ecosystem of connected devices and distributed energy resources. EnergyHub is the leading provider of Bring Your Own Thermostat® services to utilities, having developed and popularized the concept in 2013. EnergyHub is an independent subsidiary of Alarm.com (NASDAQ: ALRM), the leading technology provider of connected home solutions. For more information, visit www.energyhub.com.

Endnotes

1 Parks Associates, "More than 100 million U.S. households do not have a smart home device." Parks Associates Research. May 3, 2017

2 Perea, Austin, et al., "U.S. Solar Market Insight." Greentech Media. June 2016

3 Eller, Alex; Lawrence, Mackinnon, "Distributed Energy Resources Global Forecast." Navigant Research. 2015