Distribution Needs Cases /Additional Use Cases

Ontario Energy Board – Framework for Energy Innovation Working Group

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Agenda

Developed Distributions Needs Cases

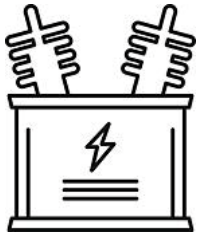
Additional Use Cases

Distribution Need:
*Adequate **capacity** to serve customer loads*

USE CASE
Describes potential, specific situation within the distribution network
Ex: The load forecast shows that a substation will reach the system's maximum capability in 3 to 5 years due to new loads being connected

Traditional Utility Solution

Non-Wires Alternative (NWA)



Distribution Upgrades
Add new substation, a new transformer, and/or new or upgraded distribution lines

Avoided upgrades

Distributed Energy Resources
Deploy local FTM solar and storage as DERs to address load peaks that are causing capacity constraints

Relationships between Distribution Need, Use Case, NWA, DER

Capacity: Including addressing network needs, constraints, load peak management, and load forecasting.

Reliability: Delivery of power during normal operating conditions and throughout planned network service events and activities

Power Quality: Providing steady supply voltage at the customer entrance as per the CSA standard limits.

Resilience: Availability of power during unplanned outages and catastrophic events.

Distribution Needs

Geo-targeted EE/DR	- Commercial & industrial EE/DR - Aggregated/portfolio approach
Energy Storage	- Managed charging/discharging - Combined with solar PV
Solar PV	- Behind the meter (on-site) - Local resource (front of the meter)
Electric Vehicles	- Managed charging - Vehicle to grid (V2G)

DERs for Distribution Needs

DER: Industrial DR

Distribution Need: Capacity

Use Case:

A feeder line has new customer requests for added commercial/industrial capacity that will not be available without significant reconfiguration and time.

NWA Description:

Demand response systems that reduce load from existing customers can enable increased capacity for new customers, as long as they provide for consistent power quality and reliable supply for the anticipated duration and timing to alleviate constraints.

DER Solution:

Industrial demand response (DR) controls that are installed at key customer sites and configured to be both remotely monitored and dispatchable could be used to avoid costly feeder upgrades.

DR solutions for large users are mature, scalable, and cost-effective.

Examples:

Bonneville Power - Northwest Open Automated Demand Response Technology Demonstration Project

NRG Demand Response Programs

Use Case Example – Industrial Demand Response

DER: Electric Vehicles

Distribution Need: Reliability

Use Case:

Scenario where distribution lines without backup supply either at the distribution level or transmission supply level. Potential for long duration or frequent outages during maintenance. Reliability unsatisfactory for two or more customers.

NWA Description:

In urban areas, there are parts of the system that are served radially and aren't economic or feasible to reinforce and provide more reliable supply. In these instances, the utility generally won't build new facilities to improve reliability. DERs are available to provide energy to customers islanded power during an outage.

DER Solution:

When needed, EVs are close to the load and could be dispatchable for customer reliability needs. EV capabilities for reliability needs depend on number of EVs, location, available storage, and technical considerations for using on-board batteries as a critical load power supply.

EVs are a stable technology with high scalability, are potentially dispatchable with the appropriate technical solution, and can be deployed at relatively low cost via incentive programs.

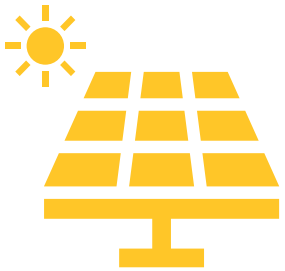
Examples:

Smart Electric Power Alliance – A Comprehensive Guide to Electric Vehicle Managed Charging (2019)

T&D World - **U.S. Utilities Expanding Managed Charging Programs for EVs, Finds Study (2020)**

Utility Dive - As utility collaboration with charging companies rises, emerging differences could impede EV growth (2020)

Use Case Example – Electric Vehicles



DER: Local Solar PV and Storage Projects

Distribution Need: Resilience

Use Case:

A utility has experienced that a particular section of a 44 KV distribution feeder is subject to multiple outages from catastrophic tree failures and contacts. The trees in question are not in the utility ROW or on private land making it difficult to apply any further vegetation control measures. The outages are significant often resulting in half of the service area being out for 2 hours or more.

NWA Description:

The utility is seeking DER options to provide resilience (10 MW) of short-term energy within the service area during storm season (May-Oct) and can be dispatchable when high winds are forecasted with delivery for up to 2 hours.

DER Solution:

Provide guidance on the specific energy needs and potential interconnection points so that third party developers can install solar PV plus storage at key feeder locations to be able to deliver energy when needed while also generating solar energy for local/community supply when not needed for resilience.

Examples:

Renewable Energy World - Liberty Utilities plans solar + storage microgrid for wildfire mitigation in NWA plan (2020)

Solar Power World - Arkansas boots up 10-MW solar, 24-MWh storage facility in Fayetteville (2019)

Duke Energy - North Carolina regulators approve Duke Energy's innovative microgrid project in Madison County (2019)

Use Case Example – Local Solar PV and Storage Projects

DER: Market-Based DR Aggregation

Distribution Need: Capacity

Use Case:

Capacity constraints are forecasted in the short-term for a specific group of distribution lines due to increasing loads and upgrades would be expensive and lengthy to address this issue.

NWA Description:

Changing consumer behaviors and/or load patterns in these areas could alleviate the expected capacity constraints, enabling continued overall load growth without costly line and equipment upgrades.

DER Solution:

Implement a market-based approach to aggregated demand response from the residential and small commercial sectors. This solution would leverage a combination of third-party platforms and appropriate incentives to shift and/or modify loads in sufficient volumes to address the capacity issues.

Examples:

Joint Utilities of New York – Distributed System Planform Enablement Newsletter (Nov 2021)

Peak Load Management Alliance - Non-Wires Alternatives: Case Studies from Leading U.S. Projects (2018)

Energy Efficiency in Rhode Island's System Reliability Planning (2014)

Use Case Example – Market-Based DR Aggregation

DER: DER Portfolio Approach

Distribution Need: Capacity

Use Case:

A service territory is experiencing rapid growth in customers and load due to ongoing housing and commercial development. In the next 2-3 years, this expansion of service will begin to create issues with capacity to serve the overall load and demand peaks.

NWA Description:

In order to defer adding significant new capacity in the affected service territory, alternative approaches to reduce and modify the load profile from existing customers as well as new customers. Due to the varied distribution needs, a variety of solutions are likely to be needed that can work together collaboratively to reduce the need for traditional service upgrades.

DER Solution:

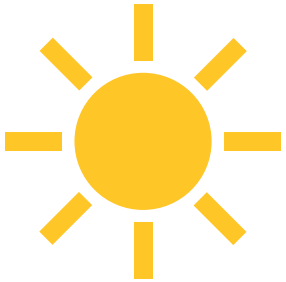
A portfolio of DER technologies could be deployed to reduce both potential capacity constraints from both existing customer loads and for new residential and business customers. The aggregated solution could potentially include energy efficiency, demand response, BTM solar, combined heat and power, managed EV charging, and other technologies as appropriate.

Examples:

Utility Dive - BQDM program demonstrates benefits of non-traditional utility investments (2019)

Grid Solar - Booth Bay Pilot Project (Maine, 2013)

Use Case Example – DER Portfolio Approach



DER: Residential & Commercial PV

Distribution Need: Power Quality

Use Case:

In an areas where there has been significant adoption of solar PV for residential and commercial customers, the production of those systems change the typical load profile served by specific substations.

NWA Description:

To address both routine power quality issues and those caused by fluctuating load characteristics, there is a need for addressing power quality by utilizing solutions that are already potentially present at the distribution level. This approach could avoid substation upgrades and delay transformer replacements.

DER Solution:

Smart inverters that are installed with residential and commercial solar PV systems are capable of helping to address power quality issues as they arise on the local network. Providing interconnection, technical, and operational guidance for customers as they plan for and install their solar PV systems could unlock the potential for DER-based solutions to these localized power quality issues.

Examples:

Interstate Renewable Energy Council (IREC) - California Marks Important Milestone for Balancing Grid Needs, Consumer Protection in Key Smart Inverter Function (2021)

Use Case Example – Residential & Commercial Solar PV

Additional NWA examples in attached document:

- BTM Solar
- Utility-Owned Solar and Storage
- Electric Vehicles
- Residential Demand Response (DR)
- Consumer and Industrial (C&I) DR and Energy Efficiency (EE)
- Aggregated mix of DERs/Micro-Grids
- Batteries

Additional information