Resilient Smart Grid Customers

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Workshop Report

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Day 1 – April 3rd

Key Note speaker - Ms. Larisa Dobriansky, Esq. Senior Vice President of General MicroGrids

Ms. Dobriansky gave DOE's Dan Ton's presentation on his behalf. In addition to giving Dan Ton's presentation, Ms. Dobriansky also discussed the requirement that was made to state and local communities to develop an Energy Assurance Plan as part of the ARRA money states accepted.

Ms. Dobriansky described the DOE Program on Microgrids and Grid Resiliency. She provided DOE's Microgrid definition and its key attributes. She pointed out that DOE considers microgrids as integral parts of a Smart Grid and plan a key role in DOE's Grid Modernization efforts, particularly at the vulnerable distribution level. She showed the US test bed of DOE R&D in microgrids and described existing and planned R&D in larger demonstration projects. She designated R&D performance targets for microgrids by 2020 and presented the system design solicitation currently "on the street" aimed at testing of a microgrid system design with controller. DOE is planning a microgrid Grand Challenge Competition and other microgrid activities. She ended the presentation describing the planned DOE FY15 and beyond resilient electric distribution R&D and described the workshop to be held at BNL in June 2014 on engaging stakeholder in grid resiliency DOE goals, metrics and priorities and a Smart Grid Peer review.

What is resiliency and the anticipation of disruptive events - Charlie Scirbona - Orange and Rockland Utilities; Robert Broadwater- Electrical Distribution Design, Inc.

What is Resiliency?

What was determined is that there are multiple definitions, including absorptive capacity and the ability to bounce back. But what was discussed in more detail was the need for the anticipation of disruptive events. Design and plan a system than can be protected from disruptive events, or have processes to reduce the amount of people that would be affected with the occurrence. This has to be done with a system that recognizes and anticipates events. After the event occurs, then the system has to have the ability to reorganize to a restorative capacity.

Overall, metrics must be developed to evaluate the system, and effectiveness of the system's operations. Metrics can help provide a baseline and an agreed to capability for setting and meeting expectations.

What effects resiliency today? The "alphabet soup of systems" that organizes data today, does not create information. What happens to the data once it is entered into the system is an issue; the data does not get turned into information. Data analytics or data integration once the data is

placed in the system needs to be improved and integrated to provide an entire picture to what is happening.

A single holistic system needs to be developed that includes the ability to conduct analytics within one system. This system needs to include the design and construction models too. The Integrated System Approach (ISM) used at ORU helps gather, organize, and analyze the data and create the information needed. ORU is exploring with BNL making more use of radar storm data.

GIS is an area that needs to become more robust. Errors in the GIS system stem from the data in GIS. The GIS system must been maintained frequently, as it can change on a daily basis. The data needs to be updated when changes are made. Fixing GIS is a manual process, and takes time and people to fix.

Analysis of the resiliency process has to be an incremental one

- Absorptive
    - Base system
    - Protection System
    - Automated Switching
- Adaptive
    - Automated Switching
    - Manual operations
        - Storm conditions
        - Blue sky days
    - Future Adaptive
        - Demand responses
        - Portable generation
        - Micro grids

Storm hardening needs to be done and it should be done through mechanical, design and operational improvements.

- Mechanical Improvements
    - Larger class poles
    - Larger guy strands with larger anchor rods
    - High strength construction
- Design Improvements
    - Eliminate double circuits on pole lines
- Operational improvements
    - Enhanced tree trimming

The goal of the program is to reduce outages, identify where the critical loads are, what critical missions need to be maintained, and priority of restoration.

The following are important:

- Government engagement
- Critical Customers are a function time and mission

Policy and Communications, By Robert Kwartin, Vice President ICF International

Robert Kwartin's presentation focused on the communication and policy for utilities when not only dealing with critical customers, but also regulators.

Bob used the concept that "Reputational Capital" is important. Utilities need to ensure that their reputation is not tarnished.

There is increased pressure from the government and regulators because public perception of utilities is low.

The face of the utilities is the not only the line people who are out repairing lines, but the executives need to be get into the community too.

All the utilities plans should be aligned with each other.

Utilities need to develop a year-round customer engagement plan, not only communicate during storms.

Important questions were presented:

What are people really willing to pay for electricity?

Then what is the cost of electricity lost?

How can communication and engagement be measured?

CL&P Emergency Preparedness & Response Coordination with our Communities – Douglas McCracken, Director - Emergency Preparedness Northeast Utilities

This presentation was about how the "lessons learned" from CL&P's experience in the 2011 Halloween snow fall affected the emergency preparedness in the company and how Northeast Utilities created an emergency management program to support the effective restoration of power to its areas.

During this storm there were issues with the communities and state of CT on what the utility role and responsibility would be with downed trees and blocked roads. The state and communities felt the utilities should clear the roads, and the utility felt that their responsibility would be to ensure the power is off from the wire in the debris.

After the storm, an after action item was to work with the state of Connecticut to develop protocols and procedures on roles and responsibility of the utility and the local community. When there is a storm, the CL&P will be responsible for ensuring that the there is no power in the lines in the debris, so its deemed safe, then the local community will remove the debris. With regards to critical customers, an agreement was reached between the state and CL&P to a definition of what are critical customers. CL&P definition is:

Critical Facility—A building or structure where loss of utility services may interrupt functions considered essential for the delivery of vital services and the life safety of the community. They usually include emergency response facilities (fire, police, rescue, emergency operations centers), hospitals, licensed convalescent homes, facilities designated as emergency shelters, (public) water supply, and waste water treatment as provided by DPH and DEEP, communications facilities (E911 and Public Safety Answering Points), and any other assets pre-identified, or identified at the time of the emergency as needed, jointly by the municipality or DEMHS, and the utilities to be of critical importance for the protection of the health and safety of the population.

If a community deems any other facility critical that is not in this definition, then the community liaison has a form for the governmental leader to sign, acknowledging that their decision to divert resources for a facility that is now to be declared critical may delay the power restoration for customers.

CL&P has also worked with the community on various priorities for road clearing and definitions for blocked roads. CL&P has placed community liaisons in each community of the 149 towns in Conn. This ensures that the utility and community have two way communications during an emergency.

Exploring Dependencies and Interdependencies – An Interactive Discussion – Bill Raisch, Director, Global Risk Network International Center for Enterprise Preparedness (InterCEP)

This was an interactive discussion regarding what is resilience, what are the key drivers, how does a utility operationalize resiliency and then how is all this interaction measured.

A discussion was held on what is risk, what was discussed was the definition of Risk in ISO 31,000, the impact of uncertainty on objectives.

Then a discussion occurred on dependencies and interdependencies within the utility companies.

One issue that was discussed was how the lack of understanding of how the infrastructure works and how best to interface can result in poor public policy.

With power outages there can be unintended consequences for “unknown until they occur type” dependencies that have not been considered nor have plans been made in advance. When these occur, the parties must muddle through the recovery.

Common Impacts

- Loss of people
- Loss of offices

A discussion ensued on the importance of gaming, sitting and brainstorming events, it is important to discuss the potential of events and how these events would affect the power grid. Discussion also pursued what is the probability of risks along with the magnitude of the risks. Some events we fail to consider because we do not imagine such types of events. Without imagining such events, we fail to plan for plausible events thinking that such events are not really possible. Often it is considered too far outside the realm of possibility.

The definition of critical user was discussed, and how many times this is a political decision and driven by local, state and national politics with or without discussion with utilities.

As time without power increases, the order of effects kicks in, the first order, which could be life safety and life sustaining issues; the second order, certain governmental and critical economic facilities; and then the third order, additional economic or political entities.

Day Two – April 4th

BNL Northeast Emergency Management Academy – Carol Kessler and Richard Ohlsen

Presented on BNL initiative of developing the BNL Northeast Emergency Management Academy and possibility of expanding this into the Energy Sector, this was received well from all. There is interest from utilities to use the Academy to train utilities and their leadership in incident management

Determination and Prioritization of Critical Loads – Alan Berscheid, National Infrastructure Simulation, and Analysis Center (NISAC)

An overview of the NISAC was done and how the NISAC is used to predict outages and critical loads for power outages. This system is used by DHS to predict damage in potential emergencies in DHS Critical Infrastructure Sectors. The system conducts a systems analysis on various critical infrastructure processes and predicts the damage and losses when "pieces of the system" fail.

The simulation is incident driven.

A discussion started that the utilities could use this information, as of now this information is used by DHS and is not funneled down to the locals.

Zones of Vulnerability – Frank Rahn, Whitney Research Services

This presentation focused on the vulnerability that the electrical grid has from transmission to distribution. Risk has to be planned for multiple failures.

Looking at the system, areas that are susceptible for multiple faults need to be identified.

The grid today is more susceptible for failures and issues due to solar flares than in the past due to the growing amount of long transmission lines being installed.

One issue is that the larger EHV transformers take months to build, and there is a limited supply of these transformers available (230 KV and larger).

Discussion also occurred on designing substations with various conditions in mind, transformers that are next to each other with fire walls and suppression systems installed. Also security of these systems needs to occur against malevolent attack.

Power Shift: Challenges to Energy Assurance in the 21st Century – Matthew Sinn, Tennessee Valley Authority

This presentation was a study conducted for DHS by the Homeland Security Institute. The presentation went over the reliability and the electrical system that is in jeopardy through statistical numbers.

The perception that in the turn of the 20th century, electric was a luxury, in the middle to the end of the 20th century electric was a commodity ; and today electric is a human right or need.

A discussion occurred on what industry stakeholders are expecting for the 21st century. Customers have an increased expectation, especially with the increased immediate digital age. Has the increased

reliability in the electrical grid affected the customers where customers are no longer used to have sporadic outages as in the past?

One issue that was raised is the communication to customers and the ownership of responsibility. Customers need to take ownership of their own preparedness in advance of a storm. Even though utilities inform the community what to expect for recovery duration, the media will still blast the utilities for taking too long to restore the power to the community.

Wrap up

Identification of critical customers

Day one concluded with a discussion on the identification of critical customers, how they are identified, and who they are. The following are the main points that came out of that discussion:

1. Locations – high risk populations
2. Discussions with state and local governments
3. Time of year
    a. E.g. during Super Storm Sandy polling places became a critical facility due to national elections
    b. Political season, e.g. what offices are up for election
    c. Seasons of the year
        i. With leaves on the tree, wind damage increases
        ii. With extreme weather conditions vulnerable populations could need warming or cooling centers
4. Critical Customers are a function of time
    a. The longer the outage, the more facilities and organizations can become critical
        i. Economic impact
        ii. Political impact
5. Mission of organizations
    a. E.g., APD cuts the pay check for 2/3 of the nation's companies, that mission is critical economically for more than the local community
6. What manufacturing is in the local area
    a. Precision manufacturing, a power outage during a process could cause the batch to be damaged and then the process to start all over
7. Politics and the political area in the locality
8. Press/media
9. Critical customers are a function of planning
10. The need for the utility to be flexible to allow for changes in the critical customer as the event enfolds
11. Proactive education
12. Public perception
13. Proactive evaluation of critical customers
    a. Has a generator plug in been installed
    b. Has the facility identified with the local community the requirements that would be needed if a generator is needed to provide power (USACOE and FEMA Prime Power forms pre-filled out and inspected annually)
    c. Explain the process of power restoration

Future workshops

After the discussion on Critical Customers, a discussion was held on the topic of future workshops:

1. Communications
    a. Customer advocates
    b. Regulators
    c. Politicians
    d. Understanding the electrical infrastructure
    e. Stakeholders
2. Policy Decision Making
    a. Barriers for utilities to remove for sound policy making
    b. Policies that will allow utilities to allow for a greater investment to update the infrastructure
3. Energy Assurance Planning
    a. State and local Energy Assurance Plans
    b. Cost of effectiveness of alternatives
    c. Potentially Identical and commonalty
        i. Similar issues between utilities
        ii. Similar issues between state and local communities
4. Climate Change and the Grid
    a. Vulnerabilities
    b. Nexuses of specific threats
5. Emergency Management
6. New Control Devices
    a. New technologies
7. Technical Science versus Social Science
    a. Convince people to accept new ways
    b. Removing low risk small events to high risk large events