Breakout session – 06/11/2014 – Resiliency Workshop

Definitions of Operational response

- Bring the system back up

Operational assessment

- Get information back to the control center
- Sensors

- Some utilities are fully automated, others are not. Not automated depend on human interaction to collect information
- Sensors can only give so much information. A human might be needed for full assessment
- Assessment is part of the response phase. You need to know and understand the scope of the damage to begin the response
- Assessment might include sensor health to understand extend of damage.
- Operational response go hand in hand with recovery operations.
- There is a dedicated group doing assessment, one overseeing and crews on the ground doing work.
- Chronologically: event occurs, crews bring extra information in addition to sensor information, then recovery begins. It can be looked at as a series of steps.
- Different utilities have different ways of responding. It might vary depending on size of utility.

Brainstorming critical R&D needs:

- Technologies for rapid damage assessment to facilitate rapid recovery
- Proactive assessment of damage (automated calls to customers, smart meters) **(5)**
- *R&D Projects:*
    - Damage assessment
    - UAVs to support real-time googlemaps
    - Meteorological tools at micro level (e.g., real-time google maps/streetview)
    - Low cost ubiquitous monitoring devices
    - New devices to support degradation identification
    - Harden communications

- Situational awareness **(5)**
- State estimation under disrupted conditions
- Open architecture to allow visualization of event information from multiple information systems in utilities (Crews on the field, SCADA, DMS, etc).
- Platform for situational and state awareness to coordinate first responders including fire crews, etc. Technologies for coordination.
- *R&D Projects:*

    - Develop architecture
        - to interface with E911 platform use by first responders
        - integrated with ubiquitous monitoring devices
        - demonstrated via testbed
    - State estimation with new data and new devices
    - Cyberphysical degradation and its understanding when it occurs to respond to it
    - 3-phase state estimation

- Decision support to determine restoration priorities **(4) - 13**
- Automated analysis for optimal decision support
- Restoration process simulation to determine optimal recovery best-practices and play-back of previous event for crew training
- Advancing (cost-effective) automation of distribution system operations.
- DG islanding capabilities and utility visibility into islands, integration into DMS
- Coordination of resynchronization of islands
- Integration of microgrid and DER
- Having restoration process models to couple back into planning activities to predict how long the recovery efforts will take. Example: crew routing. Can the process then later be improved?
- *R&D Projects:*
    - Develop technologies to find alternative restoration strategies
    - Cost effective resilient control systems (automation for resiliency)
    - Understanding islanding in advance vs. islanding in response to an event
    - Coupling of electric restoration models to other infrastructure models (transportation, communications, etc.)
    - Integration of microgrids to DMS
    - Advancing standardization of microgrid resources such as inverters, DGs
    - Technologies for controllability and observability of microgrids by utilities
-

- Data analytics, better understanding of data needs
- Improve resiliency of communications systems and integration/visibility into/from electric operations systems
- Interdependency between communication infrastructure and ability to gather information about system state **(4) - 5**

- Understand tradeoffs of hardening, self-healing, recovery crews and automation **(3)**

- Technology for safe clearing of debris that pose electrical risks (e.g., entangled wires on trees on the road) b/c there are not enough electrical crews to clear roads. **(1)**

-

- Cheap SCADA control switch **(2)**

- How much automation is needed? How much is cost-effective?