June 11th – Resilient Electric Distribution Grid R&D Workshop Notes

Breakout session: Identification of R&D areas for Design, preparedness, and planning for a resilient electric distribution grid

Moderator: Russell Bent, Los Alamos National Laboratory

- Segmentation and recombination were considered as the first main area.

  o One of participants stated it could be in the form of a microgrid

- Data sharing and operation is also important especially in real-time

  o GIS was suggested under/along with data sharing

  o One of the participants asked what would be the business model for it , Who would pay for it?

- Interdependency architecture with fuel supply

- Impact assessment by population and economics

- What best topology should be used/considered

  o Loop, mesh

  o New operational schemes, microgrids

- Are operators prepared for this? What needs to be done to train them?

  o Additional continuous workforce training needed?

- Power flow model and planning needs to be done considering the followiing:

  o Real-time/disparate data – SPARSE

  o Cloud computing/server … as in a computational model

  o Communication

  o Fast response

  o GIS

  o Contingency Data

- o Stability control

- Resource management is important – to know current inventory and crews

- Event modeling (one of the participants countered: that we should not over rely on models, many a times crews with significant experience know much more than any model can tell. A 40 year experience cannot be beaten by any model)

  - o Extent of Damage and which categories of loads needs to be prioritized smartly

- Hardware areas:

  - o Protection

  - o Switching

  - o Controls, power electronics

- Load prioritization

  - o possibly dynamic prioritization (if a hospital already has a back-up generator then it is better to allocate to other non backed-up critical/important loads)

  - o End user participation

- Event predictive assessment

  - o Real-time data

- Business operations under stress conditions

- Building systems for community engagement

- Stability control

- Set up a National Computing resource?

Consolidated and shortlisted R&D topics for Voting:

- Segmentation and recombination/reconfiguration (microgrid) & Topology – loop to mesh – new operational scheme **(18-20 votes - highest)**

- Data sharing and operation rules & Power flow model/planning (real-time data, GIS, cloud computing, etc) **(16 votes – 2nd hightest)**

- Interdependency architecture with fuel supply **(2-3 votes)**

- Impact assessment **(10 votes)**

- Resource management – inventory/crews & Operator preparedness **(8 votes)**

- Event modeling and Event predictive assessment **(14-15 votes – 3rd position)**

- Protection, power electronics and Switching Control – hardware **(15 votes … later was relegated to 4th position on reconsideration)**

Identification of Project areas for Top 3 R&D areas:

1. **Design of Segmented/Agile Distributed system**

   - Microgrid to feeder integration **(11 votes)**

   - Emergency controls, segmentation, communications **(14 votes)**

       o Tools for adaptive settings

   - Why are we doing it … What is the policy?

   - Define microgrid/classes/types/markets **(5 votes)**

   - Load participation/prioritization **(9 votes)**

   - Economical protection scheme: Affordable hardware **(10 votes)**

   - How to have an economical changing typology? **(7 votes)**

       o N-1 does not capture … fundamental problem: Design operation awareness

2. **Big Data & Analytics (Power flow modeling)**

   - Real-time database – speed **(15 votes)**

   - Open database **(13 votes)**

   - Power flow solving **(10 votes)**

       o Real-time stochastic/stackable power flow

       o Data reduction

   - Data reduction **(8 votes)**

   - Multi-scale modeling: DIST+TRANS **(16 votes)**

   - Data validation & dealing with uncertainty **(14 votes)**

3. **Stochastic/ Uncertainty - Event modeling and Event predictive assessment**

- Robust control to uncertain data **(18 votes)**

- Predictive models **(13 votes)**

    o Threats

    o Loads

    o Assets

    o Real-time data

- DER/Renewable/ uncertain generation   **(10 votes)**