WECC
Electric Reliability and Security for the West

2020-2021 Study Program Assessment Scope

Author

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Impact of Distributed Energy Resources (DER) and DER Management Systems (DERMS)

Assessment Introduction and Purpose:

The purpose of this study is to determine the impact of Distributed Energy Resources (DER) and DER Management Systems (DERMS) on the Western Interconnection. This study will model DER/DERMS in both the PCM and Power Flow to identify BPS reliability risks potentially related to a high DER/DERMS penetration in the WI.

- What specific reliability questions/risks will this study answer/identify:
    - Increase DER, Decrease Thermal
        - Scale DER
            - Dispatchable DER
            - Define DER for study: Types of DER: sources
                - Composition Load Model
                - Distribution residential scale, solar, biomass, etc
                - Utility scale
        - Retire thermal units to a certain year
    - Tripping of DER, all at same time
        - Ride through capability
        - Ex, solar providing support to system, inverter technology, AS
        - Smart inverter, storage
    - Scenario for study, story for study
        - Summer peak time outage? Dynamic response of DER (all off vs all on)
    - Sensitivity study
        - Demand Side Management, Managements system, Microgrid
    - Combine BES and Distribution system
        - Interaction between the two
            - Non managed charging, vs managed charging
                - Impact to system
                - DG, EV management, load management-energy/load shift

    - Patterns, availability of EVs,
    - Load shift with DER

- Study Process:
  - PCM - How DER is dispatched
    - Modified 2030 ADS PCM case
    - No Storage, no Demand Response

  - Powerflow - How DER dynamically responds
    - Heavy summer case Power flow case, very stressed case, tune case to cause motors to stall. Then see how DER responds
    - Powerflow stressed case ex. Heavy Summer - Stability Study/Dynamics
      - Dynamics
        - Smart Inverter capability
        - Non-smart inverters

Assumptions:

For this study, DER/DERMs include the following:

- Distributed Generation
  - Utility scale
  - Behind the meter
  - Commercial
  - Residential

The following will **not** be considered DER/DERMS for this study:

- Energy Storage
  - Energy storage will help alleviate reliability risks. This study will not include Energy Storage for a more aggressive bookend study. May consider additional sensitivity study
- Microgrids
  - Additional Sensitivity Study on the DER study
- Demand Response
  - Demand Response will help alleviate reliability risks. This study will not include Demand Response for a more aggressive bookend study. May consider additional sensitivity study

This study will model DER by the following criteria:

- Study varying levels of DER penetration
  - Determine DER penetration by state

- Model DER as Reduction in load and/or as Dispatchable DER
- Model DER by price or other reliability indicator (reflect a smart meter or management system)
- DER Locations - Scale existing DER to appropriate levels
- Determine communication of information response time for DER. How Fast to respond to an event

Decisions to be considered in this study in future scoping:

- How much DER?
  - State basis, what % of DER penetration per state
- How to model DER?
  - Commercial, Residential
  - Reduction in Load, Dispatchable DER
- Gas/Thermal Backup, thermal reduction
  - How much thermal resources to keep in the case?

Team Lead and WECC staff support:

TBD

Key Reliability Questions:

- What impacts could DER and microgrids have on resource flexibility and system stability of the BPS? (Need more info)
- Given a significant capacity of Distributed Energy Resource Management Systems (DERMS), perhaps 500 MW by 2030, how would DERMS increase or decrease BPS reliability risks?
- How might increases in DER and microgrids deployments introduce risk to BPS reliability? (Need more info)
- How might load profiles of the BPS change with increases in DER and microgrid deployments? (Need more info)
- What are the quantified reliability benefits and risk of moving towards a future with greater control over DER? (Need more info)

Reliability Risk Priorities:

This study will address the following Reliability Risk Priorities:

- Resource adequacy and performance,
- Changing resource mix,
- Distribution system and customer load impacts

Assessment Requirements:

(What Tools, Models, Data are required to accomplish this study?)

- **Tools** –
  - **PCM (GridView)**-Use to simulate an 8,760 hour PCM on the model
  - **Power Flow (PSLF)**-Use to simulate a Power Flow study on model
- **Models** –
  - **Production Cost Model**
  - **Power Flow**
  - **DER/DERMS models**
- **Data** –
  - **2030 ADS PCM**
  - **2030 ADS Power Flow**
  - **DER/DERMS data representation**

Study outline:

(Workplan - Outline each task of the study, the duration for each step, and who is responsible for each task?)

- Detailed scoping of study – DER/DERMS Team (11/11/2020-12/15/2021)
- Research and develop DER/DERMS models for PCM – DER/DERMS Team (12/15/2020-3/15/2021)
- Research and develop DER/DERMS models for PowerFlow – DER/DERMS Team (12/15/2020-3/15/2021)
- Starting with a WECC PowerFlow (ex. 2030 HS1) – Tune case for DER/DERMS study so motors will stall – DER/DERMS Team (3/15/2021-5/15/2021)
- Starting with the 2030 ADS PCM - Build case with DER/DERMS models implemented – DER/DERMS Team (3/15/2021-5/15/2021)
- Run case PCM – WECC Staff (5/15/2021-6/4/2021)
- Run case PowerFlow – WECC Staff (5/15/2021-6/4/2021)
- Power Flow Dynamics - WECC Standard Dynamic Contingencies– WECC Staff (6/4/2021-7/4/2021)
- Analysis and Report
  - Analyze the study - DER/DERMS Team (7/4/2021-7/14/2021)
  - Create study report - DER/DERMS Team (7/14/2021-7/30/2021)

Timeframe of Study:

Year 10

Reporting Metrics:

(Describe what reporting metrics you are going to use for this assessment to address the purpose of the study (e.g.,

- Resource mix
- Unserved energy
- UFLS, UVLS
- Fault/Contingency analysis -Ride through TBD