WECC

2019 Integrated Study Program

Reliability Assessment Committee

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Table of Contents

Introduction

In January 2018, the Reliability Assessment Committee (RAC), through its Studies Subcommittee (StS), began developing an integrated study program for 2018-2019. The goals of the Study Program were to identify all of the reliability assessments that the RAC determined to be significant to pursue and to prioritize the assessments to identify those that could reasonably be expected to be completed by December 2019.

During 2018, the StS focused on developing a process for identifying priority reliability assessments to include in the study program. Also, the RAC and its subcommittees were developing a three-year work plan to identify specific work products to be completed each year through 2021.

The 2019 Integrated Study Program identifies the specific reliability assessments and other studies scheduled to be completed by the RAC and its subcommittees in 2019.

Phase 1 Reliability Assessments

The StS approved the following Phase 1 Reliability Assessments that are scheduled to be completed in 2019:

Assessment #1: Changes to System Inertia with High Renewable Implementation

Key Reliability Questions:

1. What potential reliability risks could arise from changes to the resource mix in the Western Interconnection over the next 10 - 20 years from the retirement of 90 to 100% of the coal fleet and an increase in renewable technologies?
2. What are the impacts of changes to system inertia (impacts on initial frequency response to a disturbance, attenuation and stabilization of the initial frequency decline) and impacts on primary frequency response to a disturbance?
3. How might additions of energy storage impact reliability?

Potential Essential Reliability Service (ERS) Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability

Assessment #2: Significant Electrification

Key Reliability Questions:

1. Do high market penetration levels (e.g., sales of 10%, 25%, 50%) of passenger and commercial electric vehicles create potential reliability risks or potential reliability enhancements for the Western Interconnection in the 10 to 20-year horizon?

2. What reliability risks could result from a significant increase in demand caused by a significant effort to electrify non-electrical energy uses?
3. How will the increasing penetration of electronically-interfaced end-use loads (e.g., air conditioning, motor loads converted to variable frequency drives (VFDs) or electronically commutated motors (ECMs), electric vehicle charging) affect reliability of the Western Interconnection in the future?

Potential ERS Impacts:

- Resource inadequacy
- Limitations to voltage stability
- Increased risk of cascading outages
- Reduction to frequency response after a disturbance

Assessment #3: System Resilience Under Extreme Natural Disaster

Key Reliability Question:

1. What are the reliability impacts of a major disruption in years 2020, 2028 and 2038, e.g., the short-term impacts of natural events (e.g., large fires which could simultaneously force the Pacific AC and Pacific DC interties out of service or earthquakes which could disable large sections of the electric grid?

Potential ERS Impacts:

- Resource inadequacy
- Transmission inadequacy
- Interruption of natural gas supply

Assessment #4: El Paso Natural Pipeline Disruption

Key Reliability Questions:

1. Would an interruption in gas supply from the El Paso Pipeline, as described in WECC's Gas-Electric Interface Study, create stability risks in Southern California or Arizona?

Potential ERS Impacts:

- Interruption of natural gas supply
- Resource inadequacy
- Increased Loss of Load Probability (LOLP)

Assessment #5: Water Availability Issues

Note: this assessment has been combined with the Energy-Water-Climate Change Scenario assessment (Scenario 5 below) as a single assessment.

Assessment #6: Reliability Impacts of Most Likely Year 10 Future

Key Reliability Questions:

1. In the Year 10 "Base Case" (2028), are there any reliability risks associated with path flows, resource adequacy, system stability or other parameters?

Potential ERS Impacts:

- Transmission inadequacy
- System instability
- Resource inadequacy,
- Reduction to frequency response after a disturbance

Scenario-Based Reliability Assessments

In 2018, the Scenario Development Subcommittee (SDS) created four future scenarios for the Western Interconnection. Also, the SDS has recommended additional assessment of the potential reliability impacts of the Energy-Water-Climate Change Scenario, created in 2015. The StS approved the following Scenario-Based Reliability Assessments that are scheduled to be completed in 2019:

Scenario 1: Open Market, Restricted Choices

Key Reliability Questions:

1. Could the development of disparate electric service markets create reliability risks based on limited addition of utility-scale resources?

Potential ERS Impacts:

- Resource inadequacy
- Transmission inadequacy
- Inadequate voltage support

Scenario 2: Open Market, High Choice

Key Reliability Question:

1. As distributed resources become significant, what infrastructure changes and upgrades in the BPS and distribution systems might be needed for system integration, co-optimization, and coordinated operations?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability

Scenario 3: High Mandates, Restricted Choices

Key Reliability Questions:

1. As more utility-scale wind and solar resources are brought into the Western Interconnection, what kind and at what level will fossil, storage and other non-intermittent resources be needed to assure reliability in the forms of resource adequacy, operational integrity and system stability?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability
- Resource inadequacy

Scenario 4: High Mandates, High Choice

Key Reliability Questions:

1. As more utility-scale wind and solar and distributed energy resources are brought into the Western Interconnection, what kind and at what level will fossil, storage and other non-intermittent resources be needed to assure reliability in the forms of resource adequacy, operational integrity and system stability?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability
- Resource inadequacy

Scenario 5: Energy-Water-Climate Change Scenario

Key Reliability Questions:

1. What potential risks to the reliability of the Bulk Electric System in the Western Interconnection would result through changes to the climate?
2. What potential geographic shifts in electricity demand due to changing demographics driven by reactions to increased global warming and extreme weather events might occur in the region?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability
- Resource inadequacy
- Transmission inadequacy

Phase 2 Reliability Assessments

The StS approved the following Phase 2 Reliability Assessments. These assessments may completed in 2019 or later, depending upon resource availability:

Assessment #7: Utility Business Models

Key Reliability Questions:

1. Will alternate utility business models create reliability risks?

Potential ERS Impacts:

- Loss of operational flexibility, for example, less direct control of loads and generation by the grid manager
- Limitations to ramping ability
- Challenges to distribution-transmission interfaces

Assessment #8: Resource Adequacy Under Contingency

Key Reliability Question:

1. Will there be sufficient resource adequacy if generator outages in 2028 follow historic patterns observed in 2015-2017?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability
- Resource inadequacy
- Increased LOLP

Assessment #9: Gas Unit Unavailability

Key Reliability Question:

1. What reliability risks could be created by gas generators being unavailable because they are uneconomic to keep running?

Potential ERS Impacts:

- Reduction to frequency response after a disturbance
- Limitations to ramping ability
- Resource inadequacy
- Increased LOLP

Other Reliability Assessments and Studies

The following studies and assessments are included in the RAC 2019-2021 Work Plan as work products for which the StS is responsible:

Geomagnetic Disturbance (GMD) Studies

As defined in TPL-007-3 R4, WECC will perform an interconnection-wide assessment to determine GIC currents on "On-Peak" and "Off-Peak" cases modeling at least one year within the Near-Term Transmission Planning Horizon.

Key Reliability Question:

1. In the event of a geomagnetic disturbance (GMD) event, could geomagnetically-induced currents (GIC) cause transformer hot-spot heating or damage, loss of Reactive Power sources, increased Reactive Power demand, or Misoperation(s), the combination of some or all of which may result in voltage collapse and blackout?

Potential ERS Impacts:

- Transformer hot-spot heating or damage
- Loss of Reactive Power sources
- Increased Reactive Power demand
- Misoperation(s)
- Voltage collapse and/or blackout

Under-Frequency Load Shedding (UFLS) Assessment

WECC, through the UFLS Review Group, will review the performance of the WECC UFLS Plans and help WECC Members meet their compliance obligation to NERC Reliability Standard PRC-006-2.

Key Reliability Question:

1. Do WECC's UFLS plans adequately use planned and controlled load shedding to protect the Bulk Electric System (BES) against major losses of generation?

Potential ERS Impacts:

- Uncontrolled generation loss
- Interconnection-wide blackouts