

2020-2021 Scenarios Sensitivities

Assessment Introduction and Purpose:

Scenario planning, as practiced at WECC, is a continuous learning process used to imagine plausible futures, to gain a better understanding of the drivers of change, and to provide a set of “hooks” to WECC stakeholders to make informed decisions today to better assure the future reliability of the Western Interconnection bulk power system (BPS).

The purpose of this study assessment is to build upon what was learned from the 2018-2019 WECC scenario studies, namely:

- Strategies to address pronounced changes in diurnal load demand shapes due to electrification, rooftop solar, and growth in other distributed energy resources.
- Further learning from the findings of the previous scenario studies with other variations of plausible future demand-side load profiles, from an “S-shape” load growth perspective as suggested by the NREL Electrification Futures Study.
- Further learning from the findings of the previous scenario studies with other variations of plausible future resource portfolios.
- Further learning from the findings of the previous scenario studies with other variations of how consumer choice and end-use may evolve.
- Further learning from the findings of the previous scenario studies with regard to energy-water-climate change (EWCC) and other wild card futures.

The ultimate goal of this continuous learning process is to further the understanding of how future reliability of the Western Interconnection may be compromised by critical risk uncertainties and what strategies and decisions may be needed today in order to address those critical risk uncertainties.

Team Lead and WECC staff support:

The Scenario Working Group (SWG), led by chairwoman Amy Mignella, and supported by WECC staff liaison Michael Bailey.

Key Reliability Questions:

1. Are the drivers of change from previous scenario studies still relevant? Namely:
 - a. (2018-2019) – consumer choice, policy decisions, market forces,

- b. (2016-2017) – technology advancement, economic growth/decline.
2. What new drivers of change should be considered? What are their level of impact and uncertainty relative to the previous drivers of change considered?
3. How might the reliability of the BPS be impacted by different levels of electrification?
4. What strategies may be viable to flatten diurnal load demand shapes such as demand-side management, load shifting, time-of-use, rate structures, etc?
5. How might the resource mix evolve, what might be the relevant drivers of change, what reliability risks might evolve (e.g., variability)?
6. How might the resource commitment and dispatch roles change?
7. How might new resource technologies advance (e.g., storage) and what might their cost/benefit potentials be?
8. What new market mechanisms might be needed to address future reliability risks (e.g., commitment, dispatch, ancillary constraints)?
9. How might distributed energy resources and micro-grids evolve and what might their impact to reliability?
10. What other wild card and black swan events, such as energy-water-climate change, pandemic, and social unrest may be impactful to future reliability, in what ways, and can they be modeled and studies (time permitting).

Reliability Risk Priorities:

Continued learning from the scenario studies, as outlined by the key reliability questions, are relevant to all of the WECC Reliability Risk Priorities.

The Reliability Risk Priorities are:

- Resource adequacy and performance.
- Changing resource mix,
- Distribution system and customer load impacts, and
- Extreme natural events.

Assessment Requirements:

- **Tools:**
 - A production cost simulation tool to simulate annual energy production, commitment, dispatch, binding constraints, unserved load, and unmet reserves.
 - A capital expansion tool to produce resource portfolios to present to the PCM tool.
 - A power flow tool to determine plausible future infrastructure build outs and to further assess the results of the PCM.
 - A geospatial tool to assess resource and transmission potential needs.
- **Partnerships:**



- NREL – leveraging their electrification futures study.
- NREL – leveraging their loads and resource scenario ensembles.
- NREL – leveraging their EWCC expertise.
- Sandia – leveraging their EWCC expertise.
- PNNL – leveraging their EWCC expertise.
- **Models:**
 - WECC ADS (launch point for 20 year horizon)
 - NREL demand-side scenarios (to extend the ADS load model out another 10 years)
 - NREL standard scenarios (to extent the ADS resource model out another 10 years)
 - NREL, Sandia, PNNL hydro modeling and EWCC constraints.
 - New electrical storage models.
 - Enhanced hydro models.
 - New DER models.
- **Data:**
 - ADS PCM and power flow data.
 - Resource and transmission capital expansion data.
 - Load and resource portfolio data from NREL scenarios.
 - Updated hourly profiles for electrical storage.
 - Updated hourly profiles for hydro.
 - PCM proxies for DER.

Study outline:

- Metrics (Q4/2020 – Q1/2021)
 - SWG and Scenarios Task Force
 - Identify NREL demand-side scenarios to use.
 - Identify NREL standard resource scenarios to use.
 - Determine input proxies and metric adjustments needed.
 - Provide EWCC guidance to Labs.
- PCM (Q1/2021)
 - Start with 2030 ADS PCM
 - Augment with NREL demand and resource scenarios.
 - Apply additional model adjustments as needed.
- Power Flow (Q1-Q2/2021)
 - Determine where to locate potential new resources.
 - Further evaluate critical simulation hours identified by PCM.
- Dynamics (N/A)
 - Not yet determined as being applicable or beneficial in the long-term.
- Analysis and Report (Q2-Q3/2021)

- Analyze the study
- Create study report

Timeframe of Study:

Planned Horizon (10-year) to Long-term Horizon (20-year)

Reporting Metrics:

(Describe what reporting metrics you are going to use for this assessment to address the purpose of the study (e.g., UFLS, UVLS, Resource Adequacy, fault current, unserved energy, cascading outages, Transmission congestion).)

Near-term Horizon (0-5 years) (establish a baseline)

- Path Utilization
- Generation Portfolio Mix (by tech type & by fuel)
- Load Energy/Demand
- CO₂ Emissions
- Water Consumption

Planned Horizon (5-10 years) (establish reference trajectory)

- Path Utilization
- Generation Portfolio Mix (by tech type & by fuel)
- Load Energy/Demand
- Unserved Energy
- Dump Energy
- Unmet Reserve
- CO₂ Emissions
- Water Consumption/Constraint

Long-term Horizon (10-20+ years) (scenario focus)

- Path Utilization
- Path Expansion Need
- Generation Portfolio Mix (by tech type & by fuel)
- Load Energy/Demand



Draft 2020-2021 Scenario Sensitivities Scope

- Unserved Energy
- Dump Energy
- Unmet Reserve
- CO₂ Emissions
- Water Consumption/Constraint
- LCOE (or some variant thereof)

