WECC

2019 Study Program Recommendations for future work

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System Inertia w/High Renewables

- Update all Short Circuit Model busses with GIS data to represent the system more fully on the map plot;
- Complete additional short circuit analyses in CAPE/Aspen where one case has all coal removed and the other includes coal to include zero and negative sequence;
- Complete autumn power flow and dynamic analyses; The results included in this report are for the selected summer case;
- Evaluate dynamic stability where frequency response and voltage regulation capability is enabled for all added IBR or all IBR (Since this study did not enable frequency response and voltage regulation capability for the added IBR).;
- Evaluate the differences in Path flow loading and run contingencies on related loaded paths;
- Analyze in greater depth the impact that the addition of energy storage (Batteries/CAES) has on reliability;
- Evaluate possible mitigations for path overloads; and
- Optimize the system for the best mix of energy storage and renewables.

Significant Electrification

- This study was the first coordinated effort to assess the reliability impact of electrification in the Western Interconnection. Such studies should continue as more information becomes available. There are several regional and national efforts under way that will provide more information on the impacts of the electrification of the grid.
- The peak load value for 2028 occurred in the summer. However, the task force recommends studying a winter peak power flow case. During the winter, heat pumps for water and space heating will convert more typically non-electric utilities to electric load, affecting the colder and more northern areas in the WI. The total load for the interconnection will be less in the winter compared to the summer, but it will change the path flows due to higher loads in the northern part of the system.
- Modeling DER-EV as dispatchable load with an associated cost would more accurately represent the flexibility of the electrification load. Having a flexible portion of DER-EV helps serve the most unserved energy, but more studies should be conducted to assess the value of the DER-EV. Studying various levels of dispatchable load availability, at varying dispatch costs, would produce some interesting results, and this would even offset the need for adding more generation to meet the increased electrification load.
- The task force also recommends studying generation changes in the Year 10 future. By strategically adding generation to meet the increased load, the generation portfolios could better adapt to the needs in the load scenario. Inverter-based resources can be dispatched differently than conventional generation and could serve a large part of the ramping load due to electrification and decrease unserved energy.
- This study used the most extreme load scenario to evaluate the potential outcomes. The task force recommends studying other scenarios to analyze more realistic implications for increased electrification. Modeling the electrification load forecast using the utilities' Integrated Resource Plans would create a more realistic scenario that might produce different results, including the threshold at which the system starts to experience unserved energy and transmission utilization constraints.
- While PCM studies show reduction in the total energy transfers on certain paths, further assessment of path flows, variability, and ramp rates must be conducted to ensure the transmission system can reliably accommodate them.

Extreme Natural Disaster

- This study is the first of its kind to evaluate the WI during an extreme natural disaster. It would be valuable to study more outages caused by extreme natural disasters to test stability and adequacy of under other contingencies affecting different parts of the Western Interconnection. Doing so would add to the knowledge of the BES's resiliency and could identify potential reliability risks.
- One of the challenges of this study was collecting appropriate and up-to-date data to model the assumptions for the scenario. Participants in future studies should seek partnership with other entities working on similar studies to help create more scenarios and assumptions. Also, future assessments should explore potential partnerships with national laboratories, taking advantage of the labs' technical expertise and modeling capabilities. The 2028 ADS planning cases used for this assessment were based on two-year-old data and assumptions. The task force also recommends aligning this study more appropriately with the ADS planning case building cycle to use the most current data and assumptions.

Scenarios

- Sensitivities around demand-side management to smooth diurnal load shapes by shifting load from periods of evening peak demand to lower load demand periods when energy production from solar is high and when energy spillage is prevalent should be studied further. Methods to promote demand-side management should be investigated further as well, whether through policy, markets, industry, or consumer choice mechanisms.
- Sensitivities around fuel prices relative to different resource portfolio scenarios, economic assumptions, and other factors that affect production cost should be studied further. There are many factors that will influence the production costs of resources, how resources are committed and dispatch, and the price spreads between resource technology types. When price spreads between resource technology types are narrow, the commitment and dispatch of resources are much more sensitive underlying assumptions that factor into production cost. When price spreads are wide, the commitment and dispatch between resource types are less sensitive. In this context, it is important to further study the inter-relationships between underlying factors (such as fuel cost, emission costs, efficiencies, and resource portfolio mix) that determine how resources are committed and dispatched to better understand how simulation results may change.
- Sensitivities around resource flexibility, which has the potential of committing more resources that can provide additional dispatch flexibility at evening peak demand periods, should also be studied further as well as methods to assure adequate resource flexibility at evening peak demand, whether from policy, markets, industry, or consumer choice.
- Sensitivities around electrical storage and its effectiveness and viability to provide resource flexibility at evening peak demand, should also be studied further as well as methods to optimize electrical storage with solar, whether from policy, markets, industry, or consumer choice.
- Extend the ADS to include a twenty-year planning horizon including the necessary quality control and peer review mechanisms.
- Create demand-side load ensembles, either adapted from the work of the National Labs or created from scratch, based on underlying drivers developed through scenario planning WECC 2038 Scenarios Reliability Assessment 126 methods that would then be available to WECC and stakeholders to mix and match in study case creation as an augmentation to the ADS.

Scenarios Cont.

- Create resource portfolio ensembles, either adapted from the work of the National Labs or created from scratch, based on underlying drivers developed through scenario planning methods that would then be available to WECC and stakeholders to mix and match in study case creation as an augmentation to the ADS.
- Sensitivities around micro-grids and their potential to hinder or improve reliability assurance of the BPS should be studied further as well as methods to assure reliable integration of microgrids to the BPS, whether from policy, markets, industry, or consumer choice.
- With the accelerated growth in vehicle electrification, was to optimally integrate electric vehicles (EV) to the BPS, including infrastructure, need to be studied further, whether from policy, markets, industry, or consumer choice.
- Further study is required to better understand how DER may evolve and their potential to hinder or improve reliability assurance of the BPS as well as methods to assure reliable integration of DER, whether from policy, markets, industry, or consumer choice.
- Further study is required to better understand how customer choice may evolve and the BTM implications to reliability assurance of the BPS.
- Sensitivities around the simultaneous feasibility test (SFT) for the commitment and dispatch of resources to better understand how the SFT may need to be optimized to accommodate transformations in the BPS.

Most Likely 10 year future

- None

Natural Gas Disruption

- None

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Electric Reliability and Security for the West

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