WECC

# 2022 Reliability Risk Priorities

June 15, 2022

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## Introduction

WECC evaluates and addresses a broad range of reliability and security risks. One of the ways WECC addresses reliability risks generally, and the Reliability Risk Priorities (RRP) specifically, is through engagement with its stakeholders. WECC has a diverse community of stakeholders that includes industry, policymakers, regulatory bodies, state and provincial government officials, special interest groups, and experts from various firms and national labs. WECC uses input from these strategic partners to shape its work on reliability and security risks to the Bulk Power System (BPS). The RRP process highlights risks that WECC and its stakeholders have identified as warranting particular time and resources for the benefit of the Western Interconnection. WECC strives to identify risks that have a unique impact on and importance to the reliability and security of the Western Interconnection, and to which WECC can make a material contribution. The identification of RRPs does not preclude work on other risks. The prioritization process is meant to aid WECC staff and technical committees in focusing their work. WECC shares information, results, and work products with policymakers, regulators, industry, and interested persons and organizations to inform conversations and decisions that promote reliability and security.

As conditions and influences on the system evolve, risks to reliability and security change. To account for this, WECC refreshes the Reliability Risk Priorities every other year.

## 2022 Proposed Reliability Risk Priorities

In selecting risks for the 2022 RRPs, WECC utilized two measures for evaluation: 1) the traditional risk approach using probability and impact; and 2) WECC's key criteria approach, looking at the uniqueness of the risk to the West and the potential for WECC to contribute materially to mitigating the risk. See the Appendix for more information on these measures.

Based on the measures and criteria, and considering input from the WECC Board of Directors and stakeholders, the 2022 proposed RRP list has been narrowed to the following four risks:

1. Cybersecurity
2. Extreme Natural Events
3. Resource Adequacy
4. Impact of Changing Resources and Customer Loads on the BPS

### 1. Cybersecurity

Cyberthreats can result in loss of control or damage to communications, data, monitoring, protection, and control systems, and operational tools. Attacks can cause the loss of situational awareness or even the loss of load. These attacks may also hinder resilience and recovery measures, further jeopardizing reliable grid operations.

Variables like entity size and sophistication, system configuration, and the number of threat vectors make this risk complex. Ransomware is a significant threat with the highest likelihood of all cybersecurity risks. The attack surface is vast and can compromise an entire company. Ransomware also creates a risk of sensitive data exposure. In addition, the clandestine nature of the threats to cybersecurity, and often the need to protect sensitive information about cybersecurity events, make this risk difficult to evaluate and track.

Cyberattacks are increasing in volume and sophistication. Fortunately, the majority of attempts are unsuccessful. Attacks are of various sizes and target various types of entities using a range of methods. Technological advancements have helped nefarious actors to advance their methods. The greatest impact to the BPS would most likely come from a coordinated, wide-area cyberattack on multiple elements (e.g., supply chain compromise such as SolarWinds). Malicious actors must be prevented from gaining access to systems that are critical to the operation of the grid.

The pervasiveness, increasing risk and potential harm that can result from a cyberattack compel us to prioritize cybersecurity as a risk priority for WECC. Although cybersecurity threats are not unique to the West, the gravity of the risk requires collective attention and mitigation. Moreover, some characteristics of the Western Interconnection require special consideration regarding potential cybersecurity threat vectors and impacts. For example, the West has a large number of Remedial Action Schemes (RAS) that use various devices, many of which are digital. The purpose of RAS is to take corrective action, which may include tripping load, to protect the larger system under specific conditions. Disruption or improper implementation of a RAS at a critical time could lead to unnecessary load loss or other interruption or damage to system elements.

### *WECC's Potential Contribution*

WECC can: 1) support continent-wide efforts; and 2) initiate work specific to the West. WECC supports continent-wide efforts at NERC and the Electricity Information Sharing and Analysis Center (E-ISAC), including GridSecCon and GridEx. WECC participates in events and provides information to these groups to help them address issues from a broad perspective. WECC also monitors and enforces mandatory standards for cybersecurity, and these standards are part of a broader critical infrastructure protection (CIP) standards regime. WECC participates on ERO committees such as the Security Integration and Technology Enablement Subcommittee (SITES) and the Security Working Group (SWG).

For the West, WECC uses its technical committee structure (specifically the Cybersecurity Work Group) to give entities a place to share information and concerns about cybersecurity. This will help bring pertinent, evolving information into the organization that can be used to help registered entities and industry. WECC can work to enhance and maintain a strong, security knowledge base in the technical committee structure, specifically the Reliability Risk Committee (RRC). WECC will continue to

facilitate efforts to share NERC information, best practices, and lessons learned with parties that need to prepare for cyberattacks. Possibilities for enhanced or new work include:

- Work with industry partners to create and share baseline CIP practices to help small and medium-sized entities manage their cybersecurity risks. Many small and medium-sized entities do not have significant resources and can benefit from this type of shared information.
- Create additional and more frequent opportunities for entities to share best practices and lessons learned. For example, WECC could work with its industry partners to gather and share best practices for the protection of low-impact systems and business systems.
- Work with NERC and E-ISAC to ensure that entities know how to access the threat information E-ISAC provides.
- Create more opportunities for education to help registered entities understand the CIP standards and how cybersecurity integrates with other frameworks in their companies, e.g., business systems.

## 2. Extreme Natural Events

Extreme natural events are becoming more common in the Western Interconnection due to wide-ranging changes in climate and weather patterns. Record-breaking temperatures, extended cold weather, prolonged drought, and increasing intensity of wildfires have forced entities to rethink how they plan and operate the system. The West also has several seismic zones, which represent a potential low-frequency, high-impact threat. There are many factors that make these events challenging for the West:

- Historical data about loads, weather, and generation are no longer reliable in predicting future conditions. The predictability of these factors has been the cornerstone of how entities plan and operate their systems. It has become increasingly difficult to address future challenges without accurate forecasts.
- Some natural events erode the region's ability to take advantage of the diversity that it has historically relied upon for efficient and effective operations. Diversity of generation resources and peak load have allowed the West to balance operational challenges by importing and exporting energy across a broad footprint. However, extreme weather events like wide-spread heat waves and heat domes that prevent the ability to take advantage of regional diversity create challenges in meeting load demands.
- Natural events, particularly those related to weather and climate, are dynamic and have become increasingly unpredictable in their severity, magnitude, and duration. This makes planning for these types of events difficult. Drought has also affected entities' ability to meet resource needs. Modeling system drivers like weather and climate change is complex and may require new or expanded modeling capability.

- An increasing portion of the resource mix in the Western Interconnection can be negatively affected by extreme natural events. This includes wind and solar resources, whose output is dependent on weather. It also includes resources like natural gas, which can be affected by fuel supply issues caused by severe weather or seismic events. Ensuring that operators have the information they need (through accurate models, tools, and real-time data) to understand and operate the system is a challenge as the complexity and input variables increase.

### *WECC's Potential Contribution*

WECC has monitored, participated in, and led work in this area and will continue to do so. The following are examples of the inquiries WECC can pursue and ideas for other actions WECC may take:

- What are the impacts of natural events on system operations?
  - Study system response to extreme event scenarios;
  - Quantify the load impacts of natural events and include the information in reliability assessments;
  - Partner with groups like the National Oceanic and Atmospheric Administration (NOAA) to merge climate and weather information with system information.
- How prepared and resilient is the West for these types of events?
  - Evaluate and help entities share plans and best practices for responding to natural events with other operators, regulators, and industry partners;
  - Monitor and enforce existing and new standards that address extreme weather, vegetation management, etc.;
  - Elevate the dialogue about aging infrastructure in high-risk areas to promote the awareness of and facilitate conversations about alternative approaches to replacement of high-risk assets;
  - Open a dialogue with strategic partners through the RRC about the value of adopting a WECC-wide wildfire mitigation data system;
  - Do we have the right datasets to simulate extreme natural events and what are the considerations for simulating extreme events in reliability assessments?
- What types of system characteristics and conditions expose the interconnection to the greatest risk from natural events?
  - Conduct probabilistic analyses to identify potential for high-risk conditions;
  - Share information about the implications of natural event risks specific to reliability with utilities, regulators, and policymakers.
- What solutions and mitigating activities are underway and on the horizon?
  - Gather experts and decision-makers to discuss consistent and practical solutions;
  - Share information with industry (best practices, readiness webinars, etc.).

## 3. Resource Adequacy

Resource adequacy has grown more complex and intertwined with other important considerations such as transmission adequacy. Extreme events, clean energy policies, wide variance in state regulatory and policy actions, customer choice patterns (e.g., the move toward vehicle electrification), and other drivers are increasing variability and causing the generation and load patterns in the West to shift. Regional resource and transmission planning must be prepared to account for these changes. The objectives of varying clean energy policies require integration of information and reimagined interconnection-wide approaches to how the system is planned and operated.

The interconnection relies on the ability to move power on large and expansive transmission lines across great distances to take advantage of regional diversity. However, capturing regional diversity is becoming less predictable. As capacity margins shrink across the interconnection, the room for error narrows in determining which resources to rely on and how to move energy to load.

In addition, there are a variety of modeling techniques, datasets, time frames, and metrics used to analyze, measure, and track resource adequacy and transmission availability in the West. And, as models become more complex, traditional models may not accurately reflect changes to the system. For example, old modeling of renewable resources may not accurately reflect how these resources affect the current system. The accuracy of these models and datasets is vital to understanding the resource adequacy and transmission landscape.

Traditionally, resource and transmission planning have occurred as two distinct disciplines because of the jurisdictional considerations for approval of each. Also, transmission capacity and resource adequacy require different subject matter expertise. To plan a system that is both resource and transmission adequate, and that can withstand extreme weather events, resource adequacy and transmission adequacy must be considered on an interconnection-wide basis to ensure a comprehensive regional approach to system planning.

### *WECC's Potential Contribution*

WECC currently studies and evaluates resource adequacy and transmission plans in the Western Interconnection. It uses input from industry, policymakers, and regulators to shape its work. WECC then shares information from its analysis with planning entities, regulators, and the broader group of stakeholders. WECC will continue to improve its stakeholder engagement to gather input, shape analytical work, and share useful and timely information, particularly with its regulatory and policy partners.

Given its work on both resource adequacy and transmission adequacy, WECC is well positioned to lead discussions and work to conduct comprehensive (resource and transmission) reliability analyses of the system. By optimizing and combining its existing transmission and resource models to conduct comprehensive system planning, WECC can lead efforts in system modeling.

WECC's resource adequacy work focuses largely on resource plans, but there is a noticeable absence of information on how or whether integrated resource plans are carried out. To complement its current studies, WECC will evaluate how past resource plans have been implemented and the potential implications to resource adequacy and reliability.

There are various methods, tools, and data used by different entities to conduct resource adequacy analyses and planning in the West. The differences between these analyses can create confusion, especially for regulators and industry decisionmakers. WECC can evaluate and assess the range of resource adequacy analyses and work with resource planning entities to reconcile gaps and identify areas of improvement in resource planning.

In addition to studies and analyses, industry, regulators, and policymakers look to WECC to facilitate interconnection-wide conversations about resource adequacy and transmission planning. WECC's unique interconnection-wide perspective, access to data and resources, and resource agnostic approach make WECC the ideal organization to continue this work. WECC will work with stakeholders to develop products that provide useful information, host conversations that inform and aid decision-makers, and gather input and information to understand the challenges utilities face.

## 4. Impact of Changing Resources and Customer Loads on the BPS

New and emerging technologies such as inverter-based resources (IBR) and electric vehicles make grid planning and operations more complex. Emerging technologies must be integrated into the system in a way that does not degrade reliability. To do this, the behavior and operation of new technology must be understood in the context of bulk power system operations. To date, the West has experienced several system disturbances related to the performance of solar IBRs[1] that demonstrate the need to address this risk.

As the resource mix and load composition continue to rapidly change, the West needs to accelerate its ability to study and model the impact on the grid. In some cases, the West simply does not have adequate models and data to evaluate the impacts associated with the changing technology (e.g., models for IBRs need to be improved throughout the Western Interconnection). Accurate models and data need to keep pace with the changing resource mix and loads to ensure reliability.

The resource mix changes as the industry adapts to meet the challenges created by drivers like public policy, extreme weather, shifts in load patterns, and electrification. As the Western Interconnection changes with increased speed and complexity, system planners and operators will have to understand and account for different technology and the potential risks it may pose to reliability. As has been the

[1] See the NERC 2021 California Solar PV Disturbances Report.

case with IBRs, particularly solar generation facilities, adapting the technology and system operations to ensure reliability can take years.

While the challenges of emerging technology are not unique to the West, the large amount of IBRs being integrated in the Western Interconnection makes this risk unique to the West. Despite a great amount of work in this area, models and data still need substantial improvement—they are not keeping up with the pace of IBR integration. Events related to IBRs continue to occur, and, as the number of IBRs continues to increase, so will the challenges to maintaining reliability.

### *WECC's Potential Contribution*

WECC has been working, and can continue to work, with industry to explore the range of solutions to address this issue. Through its technical committees, WECC will continue to study, gather, and share information on the performance of resource technology (both utility- and customer-owned) and load technology and best practices for integration. WECC and industry can collaborate to create guidelines and share best practices. In addition, WECC will accelerate its work with entities to improve model accuracy and data quality. WECC can help industry work with technology vendors to identify best practices, industry needs, and solutions in programming changing resource technology for better integration into the BPS. In some cases—for example, with IBRs—the discussion has become a national conversation. WECC will continue to support and participate in regional and national dialogue to better inform practices within the Western Interconnection.

## RRPs in Work Planning

The 2022 WECC Reliability Risk Priorities will be a key input for WECC staff and the technical committees in creating their three-year work plans. Through the work planning process, all technical committees will create and approve three-year work plans by the end of 2022. (Of note, the work of the technical committees covers a range of risks, and committee work is not limited to the 2022 RRPs.) In addition, the RRC is responsible for ongoing identification of risks. As part of this work, the RRC will identify and help align committee work to address a range of risks. Ultimately, the JGC will review the work plans to align the technical committee work with WECC's strategic objectives, which include addressing the RRPs.

## Risk Priority Development Process

On February 15, 2022, WECC hosted the Risk Priorities Workshop. The workshop was an opportunity for stakeholders to discuss the many risks facing the Western Interconnection, framed similarly to NERC's 2021 Electric Reliability Organization (ERO) Reliability Risk Priorities Report (RISC Report). The 185 attendees, representing 76 organizations, discussed the impact and likelihood of the risks and ranked their top risks. WECC used the discussions and ranking at the workshop to develop a preliminary list of 11 RRPs:

1. **Aging Infrastructure**—The BPS infrastructure in the Western Interconnection is aging, some of it exceeding its expected lifetime. Upgrading and replacing this infrastructure is daunting. In addition, the varying vintages of infrastructure make integration with newer systems challenging.
2. **Control and Protection Systems Complexity**—Control and protection systems are complex and are constantly being upgraded and replaced. Varying vintages and capabilities make integration a challenge. The technical nature of these systems requires a high level of expertise and knowledge.
3. **Cybersecurity**—The increasing digitization of the Western Interconnection exposes the system to a growing number of sophisticated cyberattacks that can hinder or disrupt reliable operations.
4. **Extreme Natural Events**—Extreme natural events such as wildfires, drought, widespread heatwaves, and seismic events have unique occurrence patterns and impacts on the West. The increasing severity and magnitude, as well as the difficulty in predicting these risks, makes them even more challenging for planners and operators of the system.
5. **Human Performance and Skilled Workforce**—The complexity and intricacies of the BPS require knowledgeable, highly trained, and experienced personnel to plan and operate. The power industry is challenged by the workforce transition seen across many industries. The number of people with expertise in planning and operating the system is declining.
6. **Increasing Electrification**—Electrification of buildings, transportation, and other sectors has the potential to change demand characteristics, perhaps substantially. This presents a challenge in how we model, plan, and operate the system.
7. **Loss of Situational Awareness**—Situational awareness is critical to the coordinated operation of the system, and its loss can and has had catastrophic effects on reliability. With multiple risks and threats to the delivery of information and protection of digitized systems, this remains a risk.
8. **Modeling and Data Accuracy**—Accurate data and modeling are essential to effectively planning and operating the system. The complexity of models and range of data necessary to accurately examine the system is increasing, creating a challenge for parties that plan and operate the system.
9. **Regulatory Uncertainty**—The effects of state and federal regulatory and policy action are not well understood, which makes it difficult to understand the impacts of, plan for, and react to these kinds of actions. In addition, it is not clear what information about reliability is used in making regulatory and policy decisions. This creates a challenging and confusing landscape that industry, state regulators and policymakers, and others must navigate.

10. **Resource Adequacy**—Many factors are causing changes and increased variability in the generation and demand characteristics in the West. This, coupled with the future being more difficult to predict than ever, presents urgent and difficult challenges for resource planning.
11. **Variations in Technology Design and Performance**—Ensuring that technology with different design and performance characteristics can work together seamlessly is becoming more difficult given the growing variety of technology vintage and capability. This risk applies to technology of many types, including control and protection systems and transmission technology.

WECC posted the preliminary list for public comment from March 1 to April 1, 2022. Based on public and stakeholder input, and an evaluation of specific criteria (identified in more detail in the Appendix), WECC narrowed the list to six proposed risks for consideration and comment by the Board:

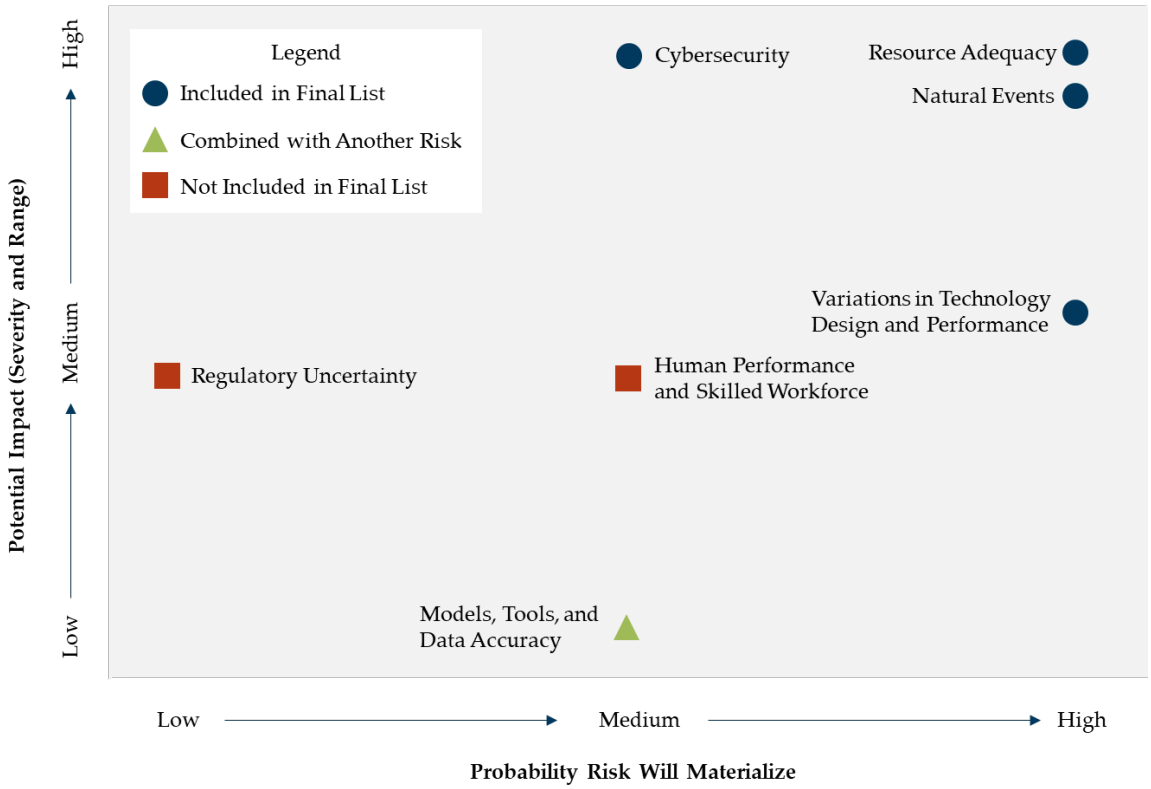
1. Extreme Natural Events
2. Human Performance and Skilled Workforce
3. Modeling, Tools and Data Accuracy
4. Regulatory Uncertainty
5. Resource Adequacy
6. Variations in Technology Design and Performance

The six proposed risks were discussed at the Board workshop on April 26, 2022, by the Board and by panelists from WECC's major stakeholder groups: Member Advisory Committee, Western Interconnection Regional Advisory Board, Joint Guidance Committee, Technical Committee Leadership, and the Western Interconnection Compliance Forum. WECC staff used input from the Board workshop and the discussions during the RRP refresh process and comment period to narrow the final list of risk priorities for Board approval on June 15, 2022.

# Appendix

## Traditional Measure

This measure provides a traditional probability *x* impact look at the seven risks discussed at the Board Workshop.




The range of probabilities accounts for some of the proposed risks having already occurred.

- Low: likely but not yet occurring at a level to constitute a risk to reliability
- Medium: imminent or occurring but with little or no direct effect on reliability to date
- High: occurring (or already occurred and may again) with direct effect on reliability

Potential impact refers to the extreme potential impact of any given risk and includes both severity and range of impact:

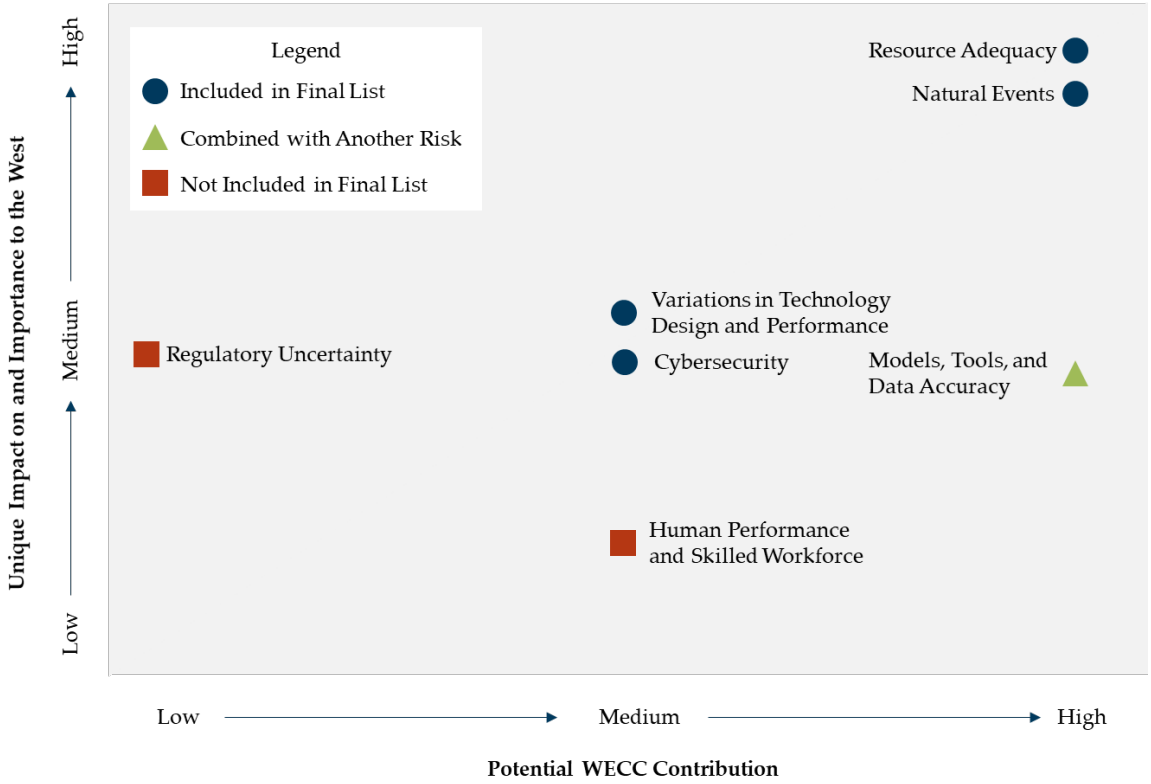
- Low: low and localized potential impact
- Medium: low but widespread potential impact or high but localized potential impact
- High: high and widespread potential impact

## WECC Key Criteria Measure

WECC's key criteria help measure how appropriate it is for WECC to include a particular risk in its RRPs by looking at:

1. The uniqueness of the risk's impact and importance to the Western Interconnection.
2. Whether WECC can make a material contribution to the reliability and security of the Western Interconnection by addressing the risk.

WECC considered stakeholder feedback, as well as its own mission, capabilities, and strategic priorities in assigning a score to each risk for both criteria.




The uniqueness of the impact and importance of the risk to the West is measured as:

- Low: risks that are not unique to the Western Interconnection in occurrence or impact.
- Medium: risks that may be experienced more broadly than the Western Interconnection (their occurrence is not unique), but, because of the characteristics of the Western Interconnection, their impact and importance to the West is unique.
- High: risks that have a unique occurrence in and potential impact on the West.

WECC's potential contribution to address or mitigate a risk is measured as:

- Low: WECC's contribution is generally to monitor the risk and provide useful, unbiased information. This may be because WECC does not have the authority or capability to take action or has made a strategic decision not to take a more active role.
- Medium: WECC's main contribution is to participate in and support other initiatives that are adequately addressing the risk. These may be national or continent-wide initiatives but may

also be activities specific to the West (e.g., Reliability Coordinator initiatives). While WECC's contribution to these issues is valuable, WECC does not take the lead.

- High: It is appropriate for WECC to take a lead role in mitigating this risk through actions such as initiating substantive work, facilitating discussions, and supporting decision-making by sharing information and assessing issues. WECC's contribution in this case takes full advantage of its unique perspective and unbiased focus on reliability and security. WECC's involvement adds value that is otherwise difficult or impossible to gain.