WECC

15 New Registered Risks Evaluation

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Agenda

- 15 New Risk Evaluations
- Next Steps

Note: Five additional new risks are still under review or have been combined with existing.

Written Process

Risk Evaluation Process

General responsibilities for WECC staff:

- Lead the Risk Evaluation, with support and collaboration from RRC members.
- Obtain and incorporate RRC feedback as needed throughout the step.
- Facilitate a successful Risk Identification.
- Ensure that documentation is complete, accurate, and archived in an orderly way.

General responsibilities for RRC members and points of contact:

- Help WECC staff determine whether any activity is already underway that is addressing this risk.
- Help WECC staff determine the tolerability of the risk and rank the risk.
- Review the documents from the Risk Evaluation, discuss the evaluation with subject matter experts within your organization (and others as needed), and provide feedback.

The Risk Evaluation Process has three primary components:

1. Identify activities underway to mitigate the risk.
2. Determine the tolerability of the risk.
3. Rank the risk

8 New ENE

- ENE-005: Geomagnetic Disturbance
- ENE-006: Haboobs (Extreme Dust Storm)
- ENE-007: Atmospheric Rivers
- ENE-008: Rising Oceans and Coastal Erosion
- ENE-009: Extreme Winds
- ENE-010: Earthquakes
- ENE-011: Tsunamis
- ENE-012: Volcanic Eruptions

7 New Misc.

- INF-004: Facility Rating—Ambient Temperature Impacts on Transmission Capacity
- CYB-015: Technology Availability Risk
- IBR-006: Increasing number of long-term frequency deviations
- IBR-007: Forced Oscillations from Battery Energy Storage Systems
- OTH-001: Planning Case Accuracy
- OTH-002: Congested Radio Spectrum
- RES-004: Electrification: Electric Car & Heating

Overview—Analysis

- Purpose: Help determine the risk severity
- Each risk is assessed on a constant set of factors
  - Factors are defined in the RRC Risk Management Process (RRCRMP)
  - Each factor provides a score
- Weighting
  - Score—The combination of the impact and likelihood
  - Value—Risk resides in the Reliability Risk Matrix (RRCRMP Page 9)

Overview—Evaluation

- Purpose: Build on the analysis and support decisions
- Each risk is assessed on a constant set of factors
  - Probability, Materiality, Controllability, Span, and Velocity
- Initial Ranking

Reminder: This is only an initial draft to help promote conversation

Evaluation—Probability

- Probability of occurrence represents the probability of the risk occurring, using past occurrences and projections for future occurrences. Both a single event with significant impact and multiple events of the same risk that aggregate to significant impact are contemplated.
- Choose from:
  - **Almost Certain**—Occurs multiple times per year
  - **Likely**—At least annually
  - **Possible**—Occasionally
  - **Unlikely**—Infrequent
  - **Very Unlikely**—Extremely infrequent

RRC Evaluation—Severity

Severity of impact represents the severity level to which the risk, if it did occur, would affect the reliability and security of the bulk power system. Evaluation uses four weighted factors to determine the overall severity of impact score: materiality (40%), controllability (40%), velocity (10%), and span (10%).

Evaluation—Materiality

- Impact of given event on finances, load, or industry reputation
- Choose from:
  - **High**—Billions of dollars
  - **High Moderate**—Hundreds of millions
  - **Moderate**—Millions to tens of millions
  - **Low**—Hundreds of thousands
  - **Negligible**—Less than hundreds of thousands

Evaluation—Controllability

- The amount of influence we have over mitigating the event or risk
- Choose from:
  - **Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk
  - **Low**—Long remediation, general awareness but no procedures or mitigation in place
  - **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening
  - **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening
  - **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement

Evaluation—Span

- The length of time the event or risk could potentially last once it happens
- Choose from:
  - **> 2 Months**
  - **1-2 Months**
  - **1-2 Weeks**
  - **Days**
  - **Hours**

Evaluation—Velocity

- How quickly the event could materialize
- Choose from:
  - **Overnight**
  - **< Month**
  - **< Year**
  - **< 5 Years**
  - **> 5 Years**

ENE-005: Geomagnetic Disturbance

Condition:

- **Primary**: Coronal Mass Ejections (CME): Large expulsions of plasma and magnetic field from the sun. Can create geomagnetic storms, transferring energy from solar wind into earth's magnetosphere. Infrastructure above 50th parallel north is at highest risk.
- **Secondary**: Utilities are increasing satellite communications in remote areas to obtain substation and electrical equipment data via remote telemetering units (RTU).

Consequence:

- **Primary**: Geomagnetic-induced currents (GIC) may cause:
  - Transformer hot-spot heating or damage,
  - Loss of reactive power sources,
  - Increased reactive power demand,
  - Protection system malfunction, and
  - Possible voltage collapse and blackouts.

  Extremely strong GMD events, though rare, can induce strong quasi-DC currents in the grid that affect system voltages, relay and protection system performance, and the operation and health of some large power transformers.
- **Secondary**: Geomagnetic storms can disrupt/delay communication of critical data. GMD events in the West are not a significant concern, but evidence indicates they are expanding further into the interconnection.

Cause:

- The ejection of charged material from the sun and the interaction of this material with space around the earth (atmosphere and magnetosphere).

ENE-005: Geomagnetic Disturbance

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	In Place	Increasing	Historical and highly publicized	Likely	Exists today	Natural	**17.0**	High

DECISION: Geomagnetic Disturbance

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Likely	Moderate	Uncontrollable	Days	< Month

ENE-006: Haboobs (Extreme Dust Storm)

Condition:

- Haboobs and debris flows are expected to increase annually, with more frequency due to changing climate. Example: on December 13, 2020, the WI experienced an event on a major section of the Pacific AC Intertie due to the loss of three critical 500 kV lines, effectively opening the path (i.e., open loop configuration).

Consequence:

- **Primary**: Large dust storms can:
  - Take down trees and power lines,
  - Bury equipment,
  - Fill reservoirs and rivers with dirt,
  - Damage buildings, and
  - Cause extreme health issues in livestock and people.
- **Secondary**: Dust after the storms can prevent or reduce output of utility-scale and rooftop solar panels. Reduction can last several days after the storms as owners work to clean panels. Delays can be extended during drought conditions with local governmental programs limiting water use. Dust storm contamination of the line insulators and subsequent high humidity can cause lines to flash and fault.

Cause:

- Thunderstorm outflow winds. Strong thunderstorm winds can start a dust storm that can drastically reduce visibility.

ENE-006: Haboobs (Extreme Dust Storm)

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Increasing	Historical and generally published	Possible	Exists today	Natural	**16.0**	High

DECISION: Haboobs (Extreme Dust Storm)

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Possible	Low	Uncontrollable	Hours	Overnight

ENE-007: Atmospheric Rivers

Condition:

- Atmospheric rivers are the most significant transport mechanisms of freshwater. Transport occurs under wind, temperature, and pressure conditions. In December 2022 and January 2023, California had nine back-to-back atmospheric rivers, creating the longest stretch in 70 years.

Consequence:

- The 2022-2023 atmospheric rivers led to impressive rain and snowfall totals and record-breaking floods. This created catastrophic mud and debris flows in recent wildfire areas. Mud and debris flows can clog rivers and dams, disrupt travel, and damage life and property, which also reduces recovery efforts.

Cause:

- Narrow, elongated corridors of concentrated moisture transport associated with extratropical cyclones.

ENE-007: Atmospheric Rivers

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Increasing	Historical and generally published	Possible	Exists today	Natural	**16.0**	High

DECISION: Atmospheric Rivers

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Possible	Low	Uncontrollable	Days	< Month

ENE-008: Rising Oceans and Coastal Erosion

Condition:

- Sea level rise.

Consequence:

- Beaches recede and nearby structures (including coastal power plants and transmission lines) become more vulnerable to storm damage.

Cause:

- Two different mechanisms with respect to global temperature increases:
  - As the oceans warm, seawater expands, causing a rise in water level.
  - Melting land ice adds water to the oceans.

ENE-008: Rising Oceans and Coastal Erosion

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Minor	None	Increasing	Historical and highly publicized	Likely	Long Term (5+ yrs.)	Natural	**13.0**	Medium

DECISION: Rising Oceans and Coastal Erosion

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Unlikely	Moderate	Uncontrollable	> 2 Months	< 5 Years

ENE-009: Extreme Winds

Condition:

- Extreme wind types:
  - Straight Line,
  - Wind Shear,
  - Gale Force,
  - Terrain Induced,
  - Gusts,
  - Downdraft,
  - Macro, and
  - Microburst.
- Typical weather events with extreme winds:
  - Thunderstorms,
  - Derecho,
  - Tornado,
  - Hurricanes,
  - Haboobs,
  - Blizzards, and
  - Gales.

Consequence:

- Damage utility equipment or disrupt regional or local electric utility operations.

Cause:

- Change in weather predictability.

ENE-009: Extreme Winds

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Increasing	Historical and highly publicized	Possible	Exists today	Natural	**16.0**	High

DECISION: Extreme Winds

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
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RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Likely	Moderate	Uncontrollable	Hours	Overnight

ENE-010: Earthquakes

Condition:

- In the Western Interconnection, specific areas are more prone to earthquake events than others. These areas are primarily along the West Coast and in the Pacific Northwest. The Cascadia subduction zone is significant for the Pacific Northwest and can have extreme implications. Increased seismic activity results from the massive loss of groundwater experienced since the western drought began.

Consequence:

- Critical infrastructure in an earthquake-damaged area will be out of service for an extended period. A major earthquake (7.0 – 7.9) or greater will damage well-designed infrastructure. Oceanic earthquakes can generate tsunamis, causing extensive damage along the coastal regions where generation is located.

Cause:

- An earthquake is the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves.

ENE-010: Earthquakes

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Severe	In Place	Neutral	Historical and highly publicized	Possible	Exists today	Natural	19.0	High

DECISION: Earthquakes

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Unlikely	High Moderate	Uncontrollable	> 2 months	Overnight

ENE-011: Tsunamis

Condition:

- Earthquakes, volcanic eruptions, and other explosions above or below water all have the potential to generate a tsunami.

Consequence:

- 600-mile Cascadia subduction zone from Vancouver Island, Canada, to Northern California, along with the threat of a major earthquake creating colossal waves, it is possible to have significant coastal damage; disruption to critical infrastructure, communities, homes, and structures; and loss of lives.

Cause:

- A tsunami is a series of waves caused by a large displacement of water, generally in an ocean or a large lake.

ENE-011: Tsunamis

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Unknown	Historical and generally published	Possible	Exists today	Natural	**16.0**	High

DECISION: Tsunamis

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Very Unlikely	Moderate	Uncontrollable	1-2 Months	Overnight

ENE-012: Volcanic Eruptions

Condition:

- Volcanoes are often found where tectonic plates diverge or converge, and most are underwater. Known volcanos in the Northwest are Mount Rainier, Mount Hood, Mount Adams, Mount St. Helens, and Glacier Peak, located in the Cascade Range. The western part of North and South America makes up the extreme eastern edge of the area known as the "Ring of Fire," "Circum-Pacific Belt," or the "Circum-Pacific Ring," which is known for tectonic plate movement, volcanos, and subduction areas.

Consequence:

- Significant volcanic eruptions near critical infrastructure will render it inoperable, and terrain changes may make replacement take months to years.

Cause:

- A volcanic eruption is a rupture in the crust of a planetary-mass object, such as Earth, that allows hot lava, volcanic ash, and gases to escape from a magma chamber below the surface.

ENE-012: Volcanic Eruptions

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Neutral	Historical and generally published	Possible	Exists today	Natural	**16.0**	High

DECISION: Volcanic Eruptions

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Very Unlikely	Moderate	Uncontrollable	1-2 Months	Overnight

INF-004: Facility Rating—Ambient Temperature Impacts on Transmission Capacity

Condition:

- Most utilities in the interconnection publish seasonal facility ratings that guide studies and the use of the transmission system via FAC-008. Fundamental areas of concern are:
  - Per FERC 881, ratings will need to be evaluated hourly on a rolling 240-hour window.
  - As forecasting errors are greater at extreme temperatures, both high and low, there is a potential for energy insufficiency when extreme weather occurs. Differences in the forecasting errors magnify the potential for differences between Real-time and planning models.
  - Each Transmission Owner is responsible for developing their methodology. This may create seams issues, including:
    - Multi-owned facilities.
    - Facilities with a change of ownership.
- Ambient conditions can be more restrictive than conditions studied in seasonal and planning timelines. A difference between seasonal studies and Ambient Adjusted Ratings (AAR) could cause facilities to operate outside the operating plan based on when AARs conflict with default ratings. This may result in transfer curtailment, generation restrictions, load losses, etc.…

Consequence:

- FERC 881 will result in such rigorous and necessary computations that new personnel or technology solutions may be needed. Changes are being made to how TPs address the many interconnection requests, and AARs will magnify the potential impact on an already stressed process.

Cause:

- Uncoordinated facility ratings can cause operational issues.

INF-004: Facility Rating—Ambient Temperature Impacts on Transmission Capacity

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	Some	Increasing	No historical or minimally publicized	Possible	Near Term (1-5 yrs.)	Man-Made	**16.0**	High

DECISION: Facility Rating—Ambient Temperature Impacts on Transmission Capacity

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Possible	Low	Controllable	1-2 Months	< Month

CYB-015: Technology Availability Risk

Condition:

- Out-of-date systems (electro-mechanical).

Consequence:

- Functionally unusable to current staff because of the difference between new and old technology. Systems or data are unavailable to the right people at the right time.

Cause:

- Not investing in consistent technology or an increasing gap between new and old technology.

CYB-015: Technology Availability Risk

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Major	Some	Increasing	Historical and highly publicized	Unlikely	Exists today	Man-Made	9.0	Medium

DECISION: Technology Availability Risk

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
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RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Unlikely	Low	Controllable	1-2 Weeks	< Month

IBR-006: Increasing Number of Long-term Frequency Deviations

Condition:

- Increase in long-duration frequency deviation events within the Western Interconnection.

Consequence:

- The Western Interconnection is experiencing an increase in the number of frequency deviation events where the interconnection frequency gradually declines and is not corrected for several minutes (mostly noticeable during periods of large solar generation changes). As these events lower the interconnection frequency for several minutes, there is an increased risk of activating underfrequency load shed relays if a large generator loss or credible double-contingency occurs at the same time.

Cause:

- Under-generation of BAs

IBR-006: Increasing Number of Long-term Frequency Deviations

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Minor	Some	Increasing	No historical or minimally publicized	Almost Certain	Exists today	Man-Made	20.0	High

DECISION: Increasing Number of Long-term Frequency Deviations

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Almost Certain	Low	Strong	1-2 Months	< Year

IBR-007: Forced Oscillations from Battery Energy Storage Systems

Condition:

- As more IBRs are added to the Western Interconnection, the industry is seeing them generate oscillations, some that resonate at or near the known natural modes of the system. If the system is stressed, a forced oscillation could cause instability of the grid.

Consequence:

- Forced oscillations can cause transmission facility overloads, generator instability and other problems that could lead to facility damage, islanding, and other reliability issues.

Cause:

- Incorrect inverter settings can cause real power oscillations that are made more problematic due to the type of facility and the programmability of its control systems.

IBR-007: Forced Oscillations from Battery Energy Storage Systems

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Major	None	Increasing	Historical and generally published	Almost Certain	Exists today	Man-Made	23.0	Extreme

DECISION: Forced Oscillations from Battery Energy Storage Systems

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Almost Certain	High Moderate	Uncontrollable	Hours	< Month

OTH-001: Planning Case Accuracy

Condition:

- As two types of organizations originate transmission projects (current Transmission Owners and Operators, and independent transmission developers), information about transmission projects originated by independent developers may not be submitted to WECC to be included in future studies.

Consequence:

- If the transmission planners are not informed about transmission projects in an appropriate time frame, they are not able to determine and coordinate any effects these projects have on their transmission planning assessments and any impacts outside of the interconnecting entity.

Cause:

- As the typical process works within the MOD-032 standard where information is submitted by the PCs and TPs, a project initiated by an independent developer often lacks a designated TP or PC to provide this information until the facility is close to commercial operation. The process is also unclear about submitting this information or designating a PC and TP in an appropriate time frame to allow for the planners to do their assessments.

OTH-001: Planning Case Accuracy

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Minor	None	Neutral	No historical or minimally publicized	Almost Certain	Exists today	Man-Made	20.0	High

<Public>

DECISION: Planning Case Accuracy

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Almost Certain	Moderate	Moderate	> 2 Months	< 5 Years

OTH-002: Congested Radio Spectrum

Condition:

- The radio frequency spectrum is one of the most critical and limited resources utilities use to operate and maintain a reliable power transmission system. Radio spectrum is used for services that ensure reliable control, protection, restoration, generation, and marketing of electric power for the BES. Most of these services are carried out by utility-owned-and-operated high-capacity microwave radio networks. Radio spectrum is required to operate electric power systems; fiber optic networks cannot replace many radio systems and, in many situations, can't provide the reliability electric utilities need.

Consequence:

- Potential interference levels have been proven substantial in the field. The impact of this is two-fold; the increased interference to existing utility networks decreases reliability for both protection and control and will directly affect regulatory compliance and operation of the BES. Additionally, the increased congestion prevents growth to meet demands for incorporating wind and solar generation, electric vehicle charging networks, and other increasing demands on the grid.

Cause:

- In recent years, the regulators of radio spectrum have proposed and allowed other services to enter these microwave radio bands used by utilities through band sharing, unlicensed radio applications, and repurposing portions of these bands for other services, which lead to increased congestion and interference.

OTH-002: Congested Radio Spectrum

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Increasing	Historical and highly publicized	Likely	Exists today	Man-Made	**17.0**	High

DECISION: Congested Radio Spectrum

RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Almost Certain	Negligible	Low	1-2 Weeks	< 5 Years

RES-004: Electrification—Electric Car & Heating

Condition:

- Load transformation is being driven to replace natural gas and fuel oil used for building heat and petroleum energy sources for transportation (mainly automotive and trucking) with electric, which will lead to a higher demand on energy and capacity as well as the delivery infrastructure.

Consequence:

- Traditional forecasts of energy demands will be inadequate if advanced planning of production and delivery of electricity does not consider the large increase in demand in all seasons and, more significantly, in the winter months when heating loads will greatly increase.

Cause:

RES-004: Electrification—Electric Car & Heating

CONSEQUENCE / IMPACT LEVEL	MANDATORY CONTROLS	EMERGING TREND	EVENT HISTORY	LIKELIHOOD LEVEL	EXPECTED RISK TIME FRAME	NATURE OF RISK	WEIGHTING SCORE	WEIGHTING VALUE
Moderate	None	Increasing	No historical or minimally publicized	Likely	Near Term (1-5 yrs.)	Man-Made	**17.0**	High

DECISION: Electrification—Electric Car & Heating

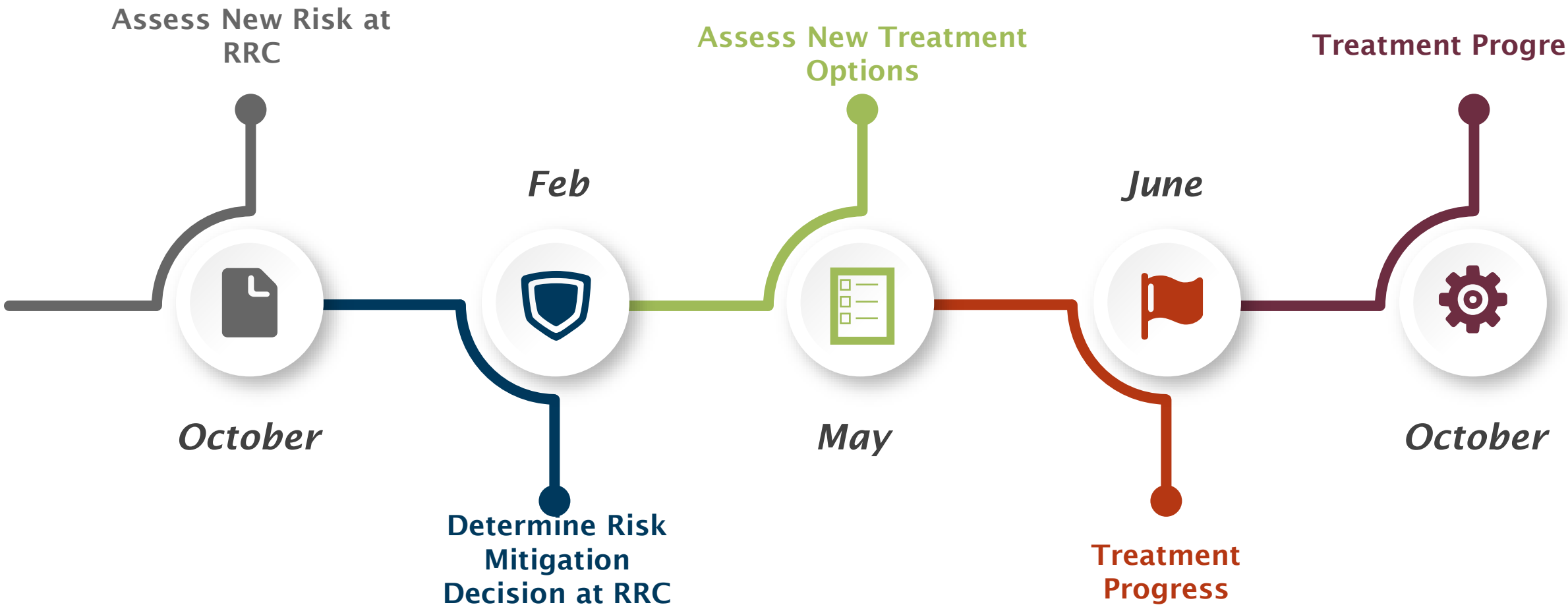
RISK PROBABILITY	MATERIALITY (40%)	CONTROLLABILITY (40%)	SPAN (10%)	VELOCITY (10%)
Almost Certain—Occurs multiple times per year **Likely**—At least annually **Possible**—Occasionally **Unlikely**—Infrequent **Very Unlikely**—Extremely infrequent	**High**—Billions of dollars **High Moderate**—Hundreds of millions **Moderate**—Millions to tens of millions **Low**—Hundreds of thousands **Negligible**—Less than hundreds of thousands	**Uncontrollable**—Unable to prevent, lack of knowledge regarding the risk **Low**—Long remediation, general awareness but no procedures or mitigation in place **Moderate**—Quick remediation, studies are done, white papers shared, potential mitigation happening, more guidelines/mitigation happening **Strong**—Very isolated, some procedures in place, best practices exist, industry starting to change, resilience happening **Controllable**—Preventable, industry expertise exists in managing risks, proven mitigation strategies exist, showing improvement	**> 2 Months** **1-2 Months** **1-2 Weeks** **Days** **Hours**	**Overnight** **< Month** **< Year** **< 5 Years** **> 5 Years**

RISK PROBABILITY	MATERIALITY	CONTROLLABILITY	SPAN	VELOCITY
Likely	High Moderate	Moderate	> 2 Months	< 5 Years

Next Steps

- February/March 2025 RRC Risk Mitigation decision for these 15
- Reduction efforts will lead to treatment planning in 2025

Next Steps


Assess New Risk at RRC
October
Feb
Determine Risk Mitigation Decision at RRC
Assess New Treatment Options
May
June
Treatment Progress
Treatment Progress
October

RRC Evaluation—Risk Mitigation Decision

- Purpose: Determine the RRC risk appetite.
- Choose from:
  - **Accept**—The current level of risk is acceptable or will be a watch item.
  - **Transfer**—Risk should be managed outside of the RRC's treatment options.
  - **Reduce**—Implement controls to reduce the likelihood, threat, or where the vulnerability intersects.

WECC

Electric Reliability and Security for the West

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