



**WECC**

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**Transmission Planning in the West—  
—Challenges and Opportunities**

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### Executive Summary

Planning and building regional and inter-regional transmission have been a challenge for quite some time. The need for additional transmission has been exacerbated by the changing resource mix driven by various public policy objectives towards cleaner resource mix. At the WECC Board's direction to further explore this issue, WECC staff interviewed several stakeholders on this topic and this white paper summarizes the key highlights from those interviews. The stakeholders shared their candid opinions on transmission planning challenges and this paper describes key aspects of those issues. Even though WECC in its role as regional entity does not plan or build transmission, stakeholders were also asked to share their thoughts on what role WECC could play in this regard to help deal with some of these challenges. This white paper also covers some ways WECC could help responsible entities in dealing with the challenges faced when planning and building new transmission at regional and inter-regional level.

The stakeholders shared various challenges and at a broad level the challenges can be categorized into two categories:

- Business Challenges
- Technical Challenges

As can be seen in this white paper, not only do most challenges reside in the category of "Business Challenges" but also those are the most complex challenges to deal with. Building transmission involves a lot of uncertainty around the rapidly changing business environment due to the long-term (>10-year) time frame required to build new regional or inter-regional transmission. This requires different mindsets around transmission planning where entities will need to get comfortable with the level of uncertainty involved, to decide whether to build new transmission or not. Not only that, but the investors must also wait 15-20 years before their investments will bear fruit. All of this is topped by lack of firm commitments from load serving entities and resource developers to utilize transmission service 15-20 years in advance of when the transmission will be available. This results in challenges with a lot of uncertainty around cost recovery. Not only that, but cost allocation i.e., who pays the upfront cost of transmission, is typically based on who receives the benefits from new transmission which remains a tough challenge to deal with when there could be multiple entities benefiting in varying degrees under varying system conditions.

One of the most time-consuming aspects of building new transmission is siting and permitting. Some stakeholders said the siting and permitting process alone could take 10+ years depending on the size of the project and the degree of engagement with several federal and state entities. Along with all these challenges, there is also a concern about the lack of personnel to perform various transmission planning activities and the skillsets required to deal with the plethora of challenges.

In the category of Technical Challenges, wide-area coordination is among the top. Without a west-wide Regional Transmission organization (RTO)—with the exception of CAISO and AESO—transmission

## Transmission Planning in the West—Challenges and Opportunities

planning activities are performed by individual Transmission Planners; in many cases the same entities are also registered as Planning Coordinators. This results in less-than-optimal transmission planning and inter-regional projects are not identified because transmission problems are handled at the local level.

Stakeholders who were interviewed identified several potential areas in which WECC can help with transmission planning. For example, when performing assessments in the long-term —greater than 10 years (>10-year)—time frame, interconnection-wide planning data may not be available. WECC already provides a lot of planning-related data to the stakeholders in the up-to-10-year time horizon, but there is a need for >10-year planning data. WECC could naturally serve as a hub for the development of this planning data. A need for 20-year-and-beyond (20+ years) planning data has also been highlighted by FERC's recent Notice of Proposed Rulemaking (NOPR)—RM21-17-000—in which FERC intends to require regional planning entities to perform longer-term (20+ years) planning assessments. Such long-term planning also requires development of various planning scenarios. WECC could also support the coordination and development of these interconnection-wide scenarios.

Along with creating the above datasets, WECC could also perform a “needs assessment” in the 20+ years planning time horizon, where the scenarios and datasets are assessed on an interconnection-wide basis for future transmission expansion. Local and regional planning entities could also use the information to propose transmission projects for further development. This might also guide the resource developers to focus their attention towards areas where a transmission solutions are more likely to be in the consideration for development.

Since stakeholders have indicated that siting and permitting have been the most time-consuming aspect of transmission project development, WECC could also look into facilitating conversations with various state and federal agencies who are involved in approval processes to determine whether WECC could guide and inform the transmission project developers who intend to build transmission at a regional or inter-regional level.

WECC will continue to work with all the stakeholders, including the Reliability Assessment Committee (RAC), to determine how WECC can contribute to the development of regional and inter-regional transmission in the West.

WECC wants to thank all stakeholders who took time to have a meaningful dialogue with WECC staff on this topic.

### Introduction

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At WECC's June 2022 board meeting, a technical session was held on "Transmission Planning and Optimization in the West." The discussion at the technical session was about how, with the changing resource mix, expansion in the current transmission system is going to be a critical factor. However, today's transmission planning processes are fragmented, which poses a challenge to entities who are building regional and inter-regional transmission projects. After the technical session and further discussions at the June 2022 board meeting, the WECC Board of Directors assigned an action item to WECC staff to "Perform a gap analysis to identify challenges with existing transmission planning processes and report back on potential activities on how to add value to transmission planning in the West."

To better understand the challenges with existing transmission planning processes, WECC staff scheduled interviews with various stakeholders about what they are facing when trying to build new transmission. Staff identified several stakeholders and conducted 27 interviews, which included stakeholders from:

- State and provincial utility commissions' staff and state bodies;
- Transmission Planners and Planning Coordinators (utilities);
- Regional Planning Groups;
- Resource Planners;
- Independent consultants involved with transmission planning;
- NERC staff;
- FERC staff;
- Independent power producers; and
- Merchant transmission developers.

WECC selected stakeholders from each category, and asked each three questions:

1. What are the challenges you are facing in building new transmission in a timely manner?
2. How can these challenges be addressed at an industry level?
3. What could WECC's role be in addressing these challenges?

This white paper summarizes the challenges the stakeholders named in the interviews and describes the roles WECC could play to help address those challenges. The exact responses and identities of interviewees are confidential.

### Business Challenges

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#### Complexity of Regional and Inter-regional Transmission Planning

As stakeholders described transmission planning challenges during the interviews, it was clear that transmission planning and building regional and inter-regional transmission is complex and time consuming. This section summarizes what entities shared about the challenges they face when building regional and inter-regional transmission projects.

#### Uncertainty with inter-regional and regional projects

A typical regional or inter-regional transmission project takes more than a decade to plan and build, which brings a lot of uncertainty and risk from a business perspective. When a project takes 15 to 20 years from inception to operation to provide reliability and economic benefits, the entities involved with planning are faced with uncertainty about what the business environment (and business case) will look like that far into the future. How loads and resources will shift in the 15-to-20-year time frame is uncertain. Entities face questions like, “Will there be enough load and resources to use transmission to make it economical?” and “What will the business environment be like?” Regional and inter-regional projects span many entities and states. Because the system is interconnected, the projects are affected by decisions the other regions make about resources and loads. It is often hard to justify building transmission, because it is difficult to predict the resource plans of external regions that may have significant impact on transmission.

In a nutshell, building transmission at the regional and inter-regional level requires a long-term commitment from project developers as they face a lot of uncertainty with estimating the true need and benefits of building transmission.

#### Timing Mismatch Between Generation and Transmission

At times, there is a chicken-and-egg situation between transmission development and resource development. As mentioned above, a typical regional or inter-regional transmission project could take a decade or two to complete. With the changing resource mix, a typical solar or wind plant could come online in three to five years from inception to production. A resource developer would like to have some assurance on the available transmission capacity to be able to sell the energy. A transmission developer, though, would like to see commitment from resources and loads to use the transmission before building new transmission. So, resource developers find it difficult to build resources without transmission, and transmission developers find it difficult to build transmission without enough resources and loads to justify cost and without some level of assurance they will recover that cost.

### Mindset for Planning

The challenge with this mismatch in timing between generation and transmission requires a different approach and mindset for planning regional and inter-regional transmission. Many entities still have the old planning mindset: vertically integrated utilities planned with confidence in load forecasts and future resource size and location. But planning has changed—future loads and resources are less certain. Entities with very low risk tolerance (where significant transmission capacity is pre-sold and cost recovery figured) need to think differently to build new regional and inter-regional transmission.

The investors will need to be patient to recover their costs. Planning mindsets should change from reactionary planning to holistic planning. This will require visionary leadership—able to cut through the fog of uncertainty and remain patient enough to see long-term benefits of transmission as opposed to easy short-term fixes that solve the problems of today.

### Misaligned Priorities

Some stakeholders have expressed that new transmission may hurt existing resources owned by utilities; therefore, they may not see it in their best interest to build that new transmission project. Some stakeholders have suggested that RTOs may be a solution to this, because they are independent and plan the system independently. Others have argued that it depends on how the RTOs are setup. If an RTO's governance is setup so that only consensus transmission gets built, then an RTO may not provide the full benefits as desired. Some interviewed stakeholders suggested that utilities see benefits in doing their own planning because it gives them control over decision making.

Some stakeholders have argued that, due to this lack of independence in transmission planning, a robust and optimized comparison of transmission solutions and transparency may not be fully achieved.

Regional and inter-regional transmission projects span several states, and some states may become pass-through states and may not see the full benefits. Some stakeholders believe that the studies and assessments that will most benefit regulators may not be happening. This makes it hard for the regulators to make informed decisions. For example, if resource and transmission planning is not coordinated and optimized, it is difficult for regulators to see whether the right choices are being made for the long run. Currently, transmission planning is done separately from resource planning at different groups at incumbent utilities. This results in a siloed planning approach in which transmission solutions are not comprehensively considering the long-term resource needs and, similarly, resource planning is not considering the long-term transmission solutions, resulting in less-than-ideal planning on both fronts.

### Cost Allocation and Cost Recovery

Stakeholders repeatedly mentioned cost allocation and cost recovery as a major challenge when building new transmission. Different states have different levels of tolerance to cost versus benefit; therefore, different states may see costs versus benefits differently for transmission projects that span multiple states. States also face challenges when justifying costs to their stakeholders due to the uncertainty related to loads and resource assumptions that are a couple of decades away.

From a business perspective, transmission developers face challenges with transmission capacity commitments so that they can build a line. The off-takers of transmission service may not want to commit to a capacity that may be unavailable for the next 10 to 15 years.

Cost allocation for transmission is typically done based on the proportion of benefits received by each entity. Determining who benefits from a particular transmission project, and to what extent, becomes challenging for regional and inter-regional projects spanning several utilities and states.

FERC Order 1000 was meant to provide a mechanism to address the challenges being faced at the time by public utility transmission providers and [for](#) more transmission projects to be considered in the transmission planning process and the increased likelihood that transmission facilities will move forward to construction.<sup>1</sup> However, FERC Order 1000 is seen by entities as a cost allocation process once a regional transmission need is identified, and, as FERC acknowledged in a recent NOPR (RM21-17-000), it again sees a need for reform in the regional and inter-regional transmission planning processes.

Stakeholders mentioned several other challenges related to cost recovery and allocation:

- For a resource to serve load at a regional level, pancaked rates across several transmission providers make it less economical to connect resources when several transmission owners are involved. Some entities have very low risk tolerance for major transmission projects, so they want a significant amount of capacity sold and cost recovery figured out before deciding whether to build new transmission.
- Generation interconnection projects have become more costly due to transmission upgrades,<sup>2</sup> and interconnection costs are taking up an increasing percentage of overall generation interconnection costs.
- If resources and loads (energy suppliers and energy consumers) are not willing to make long-term commitments, it becomes more challenging for transmission developers to make investments.

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<sup>1</sup> FERC Order 1000, Section C, Item 42

### Siting and Permitting

Several stakeholders identified siting and permitting as the most time-consuming aspect of the transmission development processes. Several projects have had siting and permitting processes take a decade or so to complete. The federal government and different states have different approval processes, so a transmission developer must go through several different processes. Even in one state several federal, state, and local government agencies may be involved in the approval process. Transmission in the West, at times, also must pass through a large area of federal land, which then involves various federal land and environmental approval processes. One stakeholder mentioned that siting and permitting costs alone were a significant portion of the total cost of a project.

At times, it is hard for a transmission project developer to know what approvals are required and which entities are responsible for granting those approvals.

### Lack of Personnel Resources

Several stakeholders identified challenges with workforce availability. Many among the workforce in the electric industry are retiring, and the demand is high for skilled people who can perform the kinds of complex analyses that are needed for these long-term transmission projects. There appears to be a strong need for training for the next generation of transmission planners so that entities are equipped with the expertise they need to deal with the challenges described in this paper. In addition to the shortage of technical experts, some entities are facing challenges with finding line crew and construction personnel to build projects that are getting close to construction.

With the resource mix changing to include more inverter-based resources (IBR)—whose behavior can more accurately be analyzed in electromagnetic transients (EMT) simulations—EMT data, models, and analysis expertise is also needed. This is a specialized type of analysis that was typically not needed for conventional resources. The lack of EMT studies expertise has also been challenging for stakeholders involved with transmission planning.

### Technical Challenges

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#### Changing Resource Mix

The resource mix in the Western Interconnection is changing rapidly. This is largely driven by aggressive state and federal policy goals towards cleaner energy resources. The locations for these new resources are often in parts of the system where transmission has been sparse, which drives the need for a significant amount of new transmission to be built to benefit from the availability of cleaner sources of energy at those locations.

### Less-than-optimal Transmission Planning

Many stakeholders said that FERC Order 1000 does not require planning to be optimized throughout a region. Therefore, planning has mostly been done at a local level, which is resulting in less-than-optimal transmission planning. There is a perception that, for some regions, regional planning is strictly to meet compliance with FERC Order 1000 requirements. Most of transmission planning is done in a “bottom-up” planning approach due to generation interconnection requests or to satisfy local planning needs. This results in a lack of a holistic, wide-area look to find regional and inter-regional solutions to allow large amounts of generation to come online. This has also been a focus of the FERC NOPR RM21-17-000 titled “Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection.”

### Regional Projects Require Regional Need

Due to these challenges, some utilities prefer to do transmission planning outside of a regional planning construct, so most transmission is being built outside of regional- and inter-regional-level planning. Planning entities, then, are solving transmission issues at the local level to address specific performance or capacity requirements. Since transmission issues are being handled at a local level, regional studies are not identifying a need for a regional or inter-regional projects.

### Coordination

A generator interconnection project may affect several transmission-owning entities. Each transmission-owning entity has its own process for assessing impacts to its systems. At times, the interconnecting entity may not be willing to coordinate with other affected entities on behalf of the resource owner. This results in challenging and time-consuming processes for resource owners to finalize the interconnection. This issue also highlights the challenges with the lack of centralized transmission planning.

Some stakeholders have attributed this to the lack of a West-wide RTO. Others do not see an RTO as the “silver bullet” that will solve all the problems. But a basic construct of an RTO is to assume transmission planning responsibilities of member entities. In that regard, an RTO does provide a one-stop-shop for interconnecting resources, where the RTO takes the responsibility of coordinating with different owners, as appropriate. This provides a centralized coordination and decision-making process that helps make timely decisions and simplifies processes for the entities involved.

One major challenge to optimized transmission planning that the stakeholders brought up is the lack of integrated resource and transmission planning. This lack of coordination between resource and transmission planning results in less-than-optimal transmission planning.

In the Western Interconnection, most transmission planning entities have also assumed the responsibility of Planning Coordinator. This has resulted in fragmentation of transmission planning activities and coordination is done individually by each transmission planning entity with other neighboring Transmission Planners.

### Generation Interconnection Queues

Several of the incumbent transmission owners have expressed concerns with the generation interconnection queues and a need for process improvement. The generation interconnection queues have become long, at times with the total generation capacity in the queue two to three times the maximum load served by the incumbent Transmission Owner. They believe most of these requests will likely not result in actual resource development.

On the other hand, resource developers have opined that it takes too long to interconnect generation. Interconnection queues are getting harder to manage for Transmission Owners. Some resource developers believe that the cluster process does not work either. A cluster process is one in which several interconnection requests are analyzed simultaneously, versus assessing each interconnection request individually.

### Data Coordination and Availability

Several stakeholders expressed concerns with getting the right data for various types of planning activities, such as:

- Short circuit models;
- Remedial action schemes;
- Loads and resource data in the 15-to-20-year time horizon;
- Inverter-based resource data; and
- Resource retirements.

WECC does collect and distribute some of this data; however, there is a need for a more coordinated effort to address the challenges of getting the required data appropriate for each type of transmission planning assessment.

### Equipment Availability

Some entities are seeing tighter supply chains for transmission and substation equipment. These issues existed before, but, after the onset of the COVID-19 pandemic, have exacerbated the situation, especially for procurement of transformers. Entities are seeing transformer lead times of two years or more. Some stakeholders had to order transformers two years in advance of interconnection agreements.

### Opportunities

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Several stakeholders shared their perspectives about opportunities for WECC and other stakeholders to consider. This section covers those opportunities.

#### Data Availability

WECC could support the collection, compilation, and distribution of data such as:

- Short circuit models;
- Remedial action schemes;
- Loads and resource data in the 15-to-20-year time horizon;
- Inverter-based resource data; and
- Resource retirements.

WECC currently collects some of this data, and there are some efforts underway to come up with strategies to collect data for additional needs like EMT data, short circuit data and models, etc. WECC is well suited to serve as a central hub for data collection and dissemination for the types of data required for long-term planning.

Stakeholders also mentioned the availability of short circuit models and RAS data in the context of meeting a need for performing specific types of analysis and not necessarily as an impediment to building new transmission.

WECC currently collects and provides loads and resource data in the 10-year time horizon. However, it might be feasible to work with relevant stakeholders to produce datasets that cover the longer-term horizon.

#### Support with Longer-term Transmission Planning

As the FERC NOPR has indicated, and because it takes more than a decade for a regional or inter-regional project to be operational, WECC could support regional planning groups and utilities on building baseline, interconnection-wide data-sets such as loads and resources data used for resource adequacy assessments, power flow and stability base -cases, production cost models, etc. Additionally, the FERC NOPR has pointed out the need for scenario development for at least a 20-year outlook, so that transmission planners are looking at a wide range of possible futures as they consider transmission development.

#### Interconnection-wide Needs Assessments

Some stakeholders suggested that an interconnection-wide transmission needs assessment would be beneficial. This analysis would target several future scenarios with different assumptions on loads and resources to identify locations in the West that could benefit from transmission expansion. The assessment would be provided to regional planning groups and other stakeholders who could then



perform further analysis to determine which transmission solutions would be most suitable to meet those needs. This might also help the resource developers to focus their attention on those areas where it is most likely to have a transmission solution developed. Such an assessment could also include modeling of extreme weather events and further highlight the need for transmission under severe conditions. This assessment would point to regions of the system where congestion might be expected to occur, which then would inform decision-makers to suggest specific solutions to alleviate potential congestion or reliability issues.

Another type of assessment suggested by one stakeholder was an assessment of historic transmission use and differences in energy prices between regions. This would show whether increased transmission use could help reduce energy prices between regions.

Some states have aggressive clean-energy policy goals that require resources to be brought in from other states. Additionally, those policy goals are shifting various sectors of the economy towards electrification, such as transportation and residential heating, which furthers the need for adequate transmission. This will require transmission to be built across several states. Some stakeholders have suggested creating required datasets and performing analysis for those specific needs.

Another stakeholder encouraged WECC to do more analyses specifically focused on helping policy makers understand the reliability implications of potential policies.

Stakeholders have also suggested that performing long-term assessments such as 20-years and beyond may require additional tools to be built to facilitate the appropriate type of analysis. WECC could help facilitate those conversations and help industry acquire solutions appropriate for these longer-term analyses.

### **Training**

Some stakeholders have suggested that WECC be involved in training new engineers perform various aspects of transmission planning. This could include training with models, various types of analyses, and other activities when performing assessments.

### **State and Federal Approval Process**

One stakeholder suggested that WECC might play a role in helping with federal- and state-level approvals for transmission. This would require consulting with states as to what this would look like and what kind of role WECC could play in helping with those approval processes. Another stakeholder suggested that WECC could produce a guideline that will help a new transmission developer become aware of the required steps to develop a new transmission project when it comes to federal and state approval processes.

### Dynamic Line Ratings

There has been increased focus on dynamic line ratings, and FERC NOPR RM21-17-000 has also suggested the use of dynamic line ratings (DLR) in long-term planning. Some stakeholders have suggested WECC conduct forums or share information on how to use DLRs in long-term planning and what might be the challenges associated with DLRs for long-term planning.

### Project Coordination

WECC currently has a Project Coordination, Path Rating, and Progress report process. Certain stakeholders have mentioned that WECC's project coordination process has been very helpful in coordinating project activities because it serves as a centralized hub where communication and coordination across projects and activities occur. At times, project developers have found it difficult to determine the affected transmission owners for each project; therefore, a centralized coordination process is helpful to them. WECC could initiate activities to enhance the current Project Coordination process to enhance coordination and improved communication around various transmission projects.

### Next Steps

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WECC staff intend to engage with a broader set of stakeholders to discuss the challenges identified in this paper, and, more importantly, the opportunities where WECC could provide value to transmission planning processes. The challenges are many and often complex; however, WECC believes that it can provide value to the overall transmission planning process without taking on any functional responsibilities related to transmission planning. Soon, WECC will engage with stakeholders, especially the RAC, on the topics described above and on some of the valuable activities WECC could undertake concerning data collection and modeling related to long-term transmission planning.