



Future of Path Ratings in the Western Interconnection

July 23, 2026

ENGAGE WITH WECC





<Public>

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- However, all interpretations and positions are subject to change.
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Opening Remarks and Meeting Objectives

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**Electric Reliability
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July 23, 2026

Welcome and Opening Remarks

- Brainstorm the future of Path Ratings in the Western Interconnection
- Follow-up to earlier Reliability Assessment Committee (RAC) meetings
- Drivers for change:
 - Outdated [*Project Coordination, Path Rating, and Progress Report Processes*](#) framework, created 30 years ago; evolving landscape
 - January 2023 [*Path Task Force Report*](#)
 - Circumstance between WECC and two entities
 - WECC's subsequent letter

Today's Focus

Objective: Identify Interconnection Needs for Future Process

- **Morning Sessions**
 - Establish foundational context
 - Review background history
- **Afternoon Sessions**
 - Identify critical needs

Agenda Review



Opening Remarks and Meeting Objectives

10–10:20 a.m. (20 min)

Understanding the Path Rating Process: Foundations and History

10:20–11 a.m. (40 min)

Evolution of Path Ratings: Changes and Impacts

11–11:30 a.m. (30 min)

Flow-Based Methodology: Concepts and Application

11:30 a.m.–noon (30 min)

Lunch—Hosted by WECC

Noon–1 p.m. (60 min)

Charting the Future: Needs and Opportunities Panel

1:00–3:00 p.m. (120 min)

Networking Break

3:00–3:15 p.m. (15 min)

Needs for the Future: Stakeholder Discussion

3:15–4:30 p.m. (75 min)

Ground Rules for Collaboration



Out of Scope Today

Defending Past Practices

- Focus on tomorrow, not yesterday

Terminology Disputes

- Skip reliability vs. commercial debate

Governance and Ownership

- Postpone who-does-what discussions

Finger Pointing

- Keep it constructive



How We Engage

Forward Mindset

- Bring solution-oriented mindset

Active Listening

- Hear all perspectives today

Professional Respect

- Maintain calm, constructive dialog

Collaborative Choice

- Choose to be a part of the solution!

We are not here to protect the past or debate ownership. We are here to pioneer a stronger future together.

Stakeholder Feedback Summary

- The Path Rating Process (PRP)
 - “Makes planning entities aware of transmission projects and gives them an opportunity to collaborate and provide input into transmission projects for new additions and changes to the existing transmission system.”
 - “Facilitates the study of impacts that transmission projects can have on existing systems and looks at simultaneous transfers to determine interactions between paths (for nomogram development).”
 - “Ensures coordinated mitigations such as Operating Plans and nomograms are in place to address any detrimental impacts on other entities.”
 - “Ensures that transmission projects do not affect established path ratings and transfer capabilities (protection for existing ratings). No protection of ratings can lead to no investment, which leads to no new transmission, which leads to reliability issues.”
 - “Provides a coordinated, transparent, and consistent planning and study approach. Such a process is important in the West where there are many Planning Coordinators (PC) and Transmission Planners (TP), several independent transmission developers, and no large RTOs responsible for wide-area transmission planning. Such an environment creates complexities and challenges with varied and often competing interests.”

Understanding the Path Rating Process: Foundations and History

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Chifong Thomas

Principal, Thomas Grid Advisor

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Senior Engineer, WECC

Path Foundations: Potentially Related “Path” Terms

Contract Path (NERC Glossary)

- An agreed upon electrical path for the continuous flow of electrical power between the parties of an Interchange Transaction.

Scheduling Path (NERC Glossary)

- The Transmission Service arrangements reserved by the Purchasing-Selling Entity for a Transaction.

Qualified Path (WECC term in NERC Glossary)

- A transmission element, or group of transmission elements that has qualified for inclusion into the Western Interconnection Unscheduled Flow Mitigation Plan (WIUFMP).

Rated System Path Methodology (NERC Glossary)

- Characterized by an initial Total Transfer Capability (TTC), determined via simulation. Capacity Benefit Margin, Transmission Reliability Margin, and Existing Transmission Commitments are subtracted from TTC, and postbacks and counterflows are added, as applicable, to derive Available Transfer Capability. Under the Rated System Path Methodology, TTC results are generally reported as specific transmission path capabilities.

ATC Path (FERC definition)

- Any combination of Point of Receipt and Point of Delivery for which Available Transfer Capability (ATC) is calculated; any Posted Path.

Path Foundations: Example

230 kV lines ABC and DEF are identical:

- All line segments are the same length
- All line segments have the same Normal and Emergency Facility Ratings
- All Normal and Emergency System Voltage Limits are the same at all buses
- Both lines have no stability limits identified for reasonably expected maximum flows
- There are no IROLs identified for either line

The difference:

1. Line ABC is designated as a “path” in the Path Rating Catalog that has an Accepted Rating of 500 MW in the ABC direction
2. Line DEF is not designated as a “path” in the Path Rating Catalog, and it does not have a path rating



Path Foundations

- What is a path?
- What makes a path a path?
- Why are some transmission lines/Facilities (either grouped or individual facilities) designated as paths while others are not?
- What makes a path unique?
- In the example:
 - Why is line ABC a path?
 - Why is line DEF not a path?
- Why do we have paths?

Path Ratings Foundations

- From WECC's Path Rating Catalog:
 - A path rating can be related to a single transmission line or a group of parallel transmission lines. The transfer path may be composed of transmission lines between Balancing Authorities, internal to a Balancing Authority, or a combination of both.
 - The path ratings are "Maximum Path Transfer Capabilities" [...]
 - **Accepted Rating** — A project rating that has been reviewed and accepted by WECC members. This rating is granted by WECC after reviewed planning studies and will be the rating of the project when it is put into service, if it is built to specifications. This is a comprehensive rating including both the simultaneous and non-simultaneous transfer capabilities. (Protected Rating)
 - **Existing Rating** — Transmission path ratings that were known and used in operation as of January 1, 1994. (Protected Rating)
 - **Other [Rating]** — A transmission path rating, either proposed or planned, that is not an accepted or existing rating. (Rating is not protected by the Path Rating Process)

Path Ratings Foundations

Path Ratings are “**Maximum Path Transfer Capabilities**” — per WECC’s *Path Rating Catalog*

- Why do paths need ratings?
- What does it mean for a path to have a rating (an Accepted Rating)? What does it accomplish?
- Why do some transmission lines or groupings of transmission lines need ratings while others do not?
 - In the example, why does ABC have a Path Rating, but DEF does not?
 - What does the Accepted Rating do for line ABC that makes it different from line DEF?
- What is WECC’s role (staff and technical committees) in the Path Rating Process?
- Path Ratings and TTC
 - NERC/NAESB definition: *The amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems by way of all transmission lines (or paths) between those areas under specified system conditions.*
 - A Path Rating is a TTC value established in the planning horizon under a studied set of optimal conditions that achieve the maximum flows.
 - Why do we use both terms?

Understanding the Path Rating Process: Foundations and History

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Peter Mackin

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Path Ratings: A Short History

- Before Paths and Path Rating Process, when adding new transmission lines, ratings were applied often based on local practices, e.g.,
 - Often not considered potential Regional impacts
 - Based on non-simultaneous transfer studies and limited (not full-loop) models
 - Used different methodologies (assumptions and criteria)
 - Often based on thermal limits only
- After the project became operational, reliability was found to be adversely impacted, and the project rating had to be reduced to preserve reliability
- As more transmission projects were added, reliability issues became more complex

Need for Transparent Process

Process developed by Planners for use by Planners in planning studies

- Establish requirements for notification and peer review
- Establish consistent path definition, study assumptions, methodology, criteria
- Establish Facilities needed to support the transfer at the Path Rating associated with the new transmission project to maintain WECC reliability
- Identify potential limitations before a new transmission line is operational
- Protection of Rating – provide information for Project Owners to determine mitigation responsibilities *outside* WECC

The Path Rating Process has evolved over the years – focus on reliability

- Power industry change
- New technologies
- Lessons learned

Path Ratings are recorded in Path Rating Catalog – updated annually

Path Ratings: Catalog Purpose



What it IS:

- A reference document for planning
- A primary source of currently available information on maximum, non-simultaneous path ratings
- A resource for discussion of simultaneous interactions between major transmission paths



What it is NOT:

- Ascertain whether WECC Procedures were followed
- Support regulatory proceedings against a Member because of erroneous information
- Imply WECC approval of the “Existing” or “Other” Ratings; a path can receive an “Accepted Rating” via the Three-Phase Rating Process
- Provide OASIS information, ATC, or the most current operating limits
- Serve as a complete list of all path information
- Enforce, support, or implement any WECC Policy

Path Ratings: Timeline

- **Prior to 1991:** *Annual Progress Reporting Procedure*
- **8/1991:** *Notification Procedures for Changes in Facility Ratings and/or Operating Procedures*
- **11/1992 :** *Policies and Procedures for Rating Transmission Facilities*
- **11/1993:** *Interim Procedures for Regional Planning Project Review and Rating Transmission Facilities*
 - *(Original Path Rating Catalog Published in early 1994)*
- **1993 — 2012:** Several revisions
- **12/2012:** Project Coordination and Path Rating Processes
 - Addressed 27 Key Issues, including, “Fictitious Devices” in Rating Studies, Requirements for Entering Phase 2, Providing Models, Similarly Situated Projects in Phase 2, Consequences of Inactivity, etc., and Clarify Responsibility for Complying with NERC Standards
- **12/2014:** Incorporate Waiver Process and Minimum Requirements in Comprehensive Progress Report
- **10/2015:** Update to specify that Paths are Transfer Capabilities to align with the Path Operator Task Force White Paper
- **12/2021:** Update to remove common corridor reference
- **7/2022:** Added process for Rerating Paths due to Changes in Reliability Criteria Requirements

More Recent Activities

- **9/2020:** JGC Path Task Force (PTF) created
 - “to determine the relevance and role of (Path Ratings) in the operations and planning horizon...”; this includes exploration of the (relatively new) use of "Flowgate Methodology" by some utilities.
- **1/2023:** PTF recommends that the WECC Path Rating Process be reviewed and updated, replaced, or supplemented with a new process to ensure that entities who no longer use paths (or historical “path” concepts) or intend to move away from using paths in the planning horizon have a WECC process that gives them similar benefits — assigned to Studies Subcommittee (StS)
- **5/2026:** effort discontinued to incorporate Flowgate Method into the Path Rating Process.

Overview of the 3 Processes

1. Project Coordination

- Notification, solicit participation or review

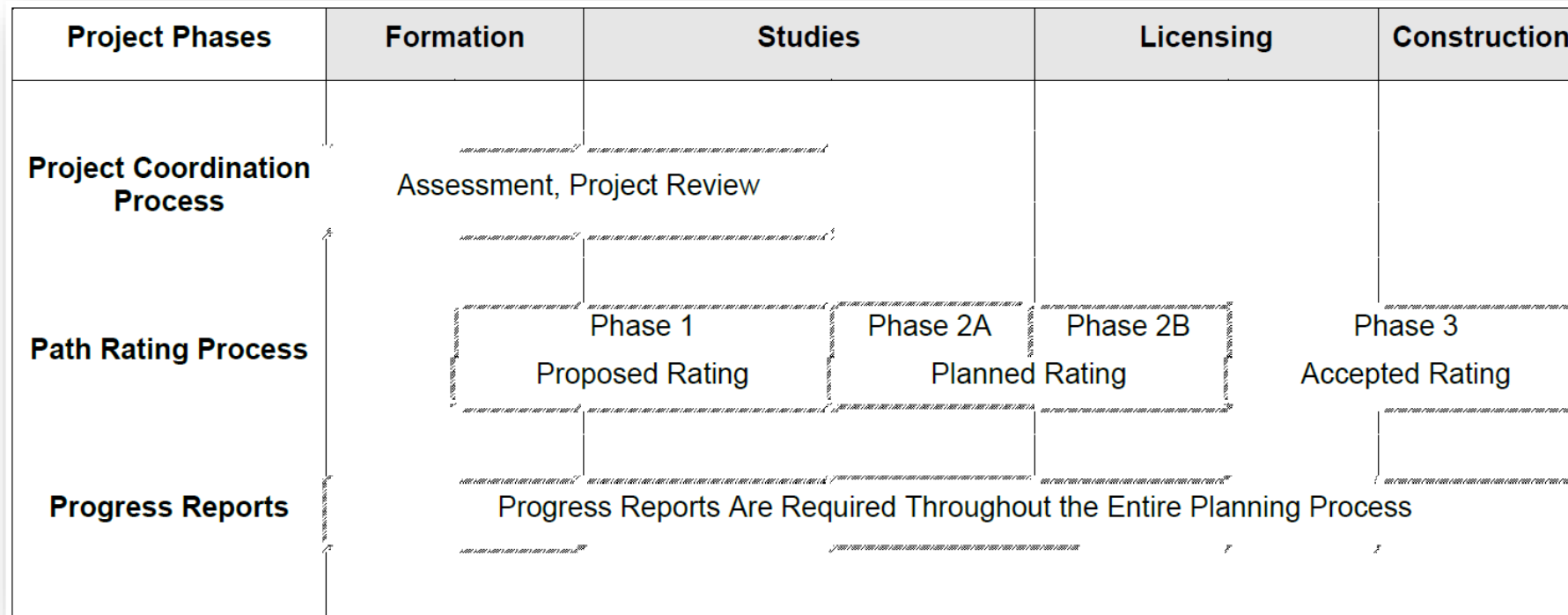
2. Path Rating Process (a.k.a. 3 Phase Rating Process)

- Standardizes:
 - Assumptions, methodology, criteria, process for planning studies
 - Guidelines on relationship between existing projects and future projects in various planning stages

3. Progress Reports

- Report on Significant Additions, opportunity for review and comments by others.

Processes



Notes:

- “Proposed Rating” — used at the initiation and throughout Phase 1 of the Path Rating Process.
- “Planned Rating” — final rating at the conclusion of Phase 1 of the Path Rating Process and used throughout Phase 2 of the Path Rating Process.
- “Accepted Rating” — final rating granted at the conclusion of Phase 2 of the Path Rating Process and is also the rating that is used when the Project is placed in-service.

Path Rating Process

Phase 1	Phase 2A	Phase 2B	Phase 2B	Path Rating Process
Started by Project announcement through WECC Data Collection Process or by letter to RAC and StS members. This establishes the “Proposed Rating”	Started by acceptance of a Project Comprehensive Progress Report by StS. This establishes the “Planned Rating”	Started by acceptance of the study plan and Foundational Base Case(s) by the Project Review Group. This establishes the “Similarly Situated” project(s) that must be studied by the Project.	Completed when the WECC Phase 2 Rating Report is accepted by RAC. This establishes the “Accepted Rating”	Completed when the Project enters commercial operation.

Objectives:

- Integrate projects while preserving reliability and efficiency and Accepted or Existing Ratings
- Communicate plans, performance and limitations
- Discover simultaneous limitations and resolve concerns
- Provide forum for Participation in review of project studies
- Conclude studies in a timely manner
- Provide information for parties to develop curtailment and/or cost sharing agreements outside of WECC

Paths Subject to the Path Rating Process (Section 2.3)

1. The limiting condition for the TTC of the path or the SOL for facilities that affect the path is on another system and the affected member system requests the path be rated.
2. The study criteria required for establishing Accepted or Existing Rating has been changed and a path owner(s) or Project Sponsor(s) in at least Phase 2b of the Path Rating Process have requested a new path rating.
3. The path must be operated within the constraints of a nomogram to meet Standards, the elements of the nomogram are in different systems, and one of those systems or a neighboring member system requests the path be rated.
4. The path owners or operators have requested a seasonal or operational TTC for a new path, or for an existing path that is in excess of an existing path's rating.
5. A facility that an Existing or Accepted Rating depends on is modified or retired, regardless of ownership.

The Rating of a Path

At the *pre-outage power transfer* level equal to the Path Rating, for the *most limiting contingency* the system can meet the *post-outage performance* requirements in the NERC Standards and WECC Criteria.

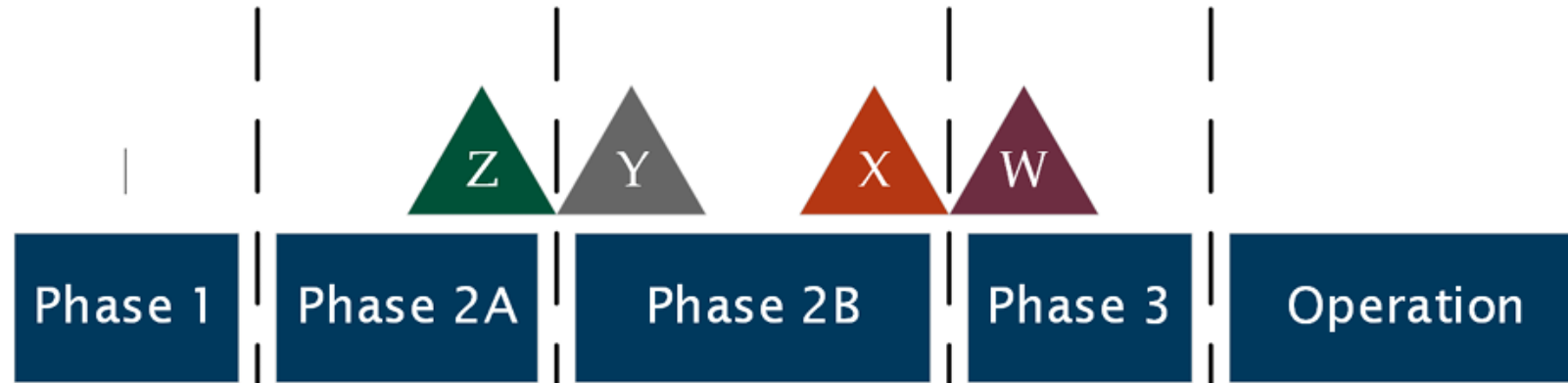
Principles:

- Reliability Limited Ratings — limited to levels that meet the NERC Reliability Standards and WECC Criteria
- Flow-Limited Ratings — limited by achievable power flow over the Path, not by reliability considerations, e.g., the amount of available resources.

Protection of Path Rating = new project will not cause a reduction in an Accepted Rating of another Path

=> Requires Mitigation of impacts by new project to maintain system reliability

Similarly Situated Projects – Relationship between Projects in Phase 2A, 2B, and Phase 3



1. Project X and Project Y are similarly situated.
2. Project Y enters Phase 2B after Project X and has the burden of performing the simultaneous study that includes Project X.
3. Project X does not have the burden of (but is not precluded from) performing the simultaneous study that includes Project Y.
4. Project X and Project Y must consider the impacts on each other and share in the responsibility of mitigating the impacts (Planned Ratings are not protected).
5. Projects X, Y, and Z have the burden of mitigating the impacts on Project W in Phase 3 (Accepted Ratings are protected).
6. Project Z is in Phase 2A, and must take Projects W, X, and Y into account in its studies.

Regardless of location(s) of the Processes – Planners need to:

- Provide notification to others of planned project for regional planning and coordination
- Provide reference information and data on which to base study assumptions and on study methodologies
- Recognize and account for interactions between systems under different PCs
- Assess impacts of new projects on WECC system overall reliability early in the project planning process
- Provide information and limitations for each path in a central location
- Alert the RC(s) and the TOP(s) of potential system problems due to interactions between power flowing on different parts of the WECC system before a new project comes online

Evolution of Path Ratings: Changes and Impacts

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What Was it Like in the Mid/Late 1990s?

- NERC was a voluntary industry organization; voluntary reliability policies
- WECC was a stakeholder-driven regional coordinating council; WECC board composed of utility executives
- Decisions about system planning, system operations, and related business matters made by industry at WSCC/WECC
- No advanced real-time tools like state estimation, real-time contingency analysis, etc.
- 1996 blackout; need for change
- Path Ratings Process and other related initiatives for operations and planning
 - Operating Transfer Capability (OTC): a time-specific variation of a Path Rating
 - Reliability Management System (RMS) agreement
 - List of Major WECC Paths monitored
 - Path Operator

Electric Reliability Organization (ERO) and Reliability Standards

- Energy Policy Act of 2005
- Formation of ERO
- NERC and the Regional Entities
- WECC designated a Regional Entity with delegated responsibilities
- Section 215 of the Federal Power Act; statutory functions
- NERC Reliability Standards became the source for determining reliability obligations for planners and operators.
- Fundamental shift in the identity of NERC and the Regions
- WECC transitioned from trade association to social welfare organization in 2013

OTC and WECC Major Paths Codified in Reliability Standards

- RMS concepts, OTC, and Path Operator responsibilities for Major WECC Paths reflected in initial version of NERC Reliability Standard TOP-STD-007-0
- Required operation within established OTCs for Major WECC Paths
- The standard was eventually replaced by TOP-007-WECC-1, which replaced “OTC” in TOP-STD-007-0 with the term “System Operating Limit” (SOL) found in the Glossary of Terms Used in NERC Reliability Standards.
- Path-centric approach to operations reliability codified into the Reliability Standards

Transition Away from Path-centric Operations

- NERC's *Suggestions Related to the 2011 Southwestern Blackout Event*
- In his September 13, 2012, letter to WECC, Gerry Cauley, CEO of NERC at that time, speaking about the WECC initiative "Role of Path Operators (ORG3)," stated:
 - *"NERC is pleased to see that WECC is holding additional discussions to clarify the role of Path Operators, including the potential to implement contractual relationships and make use of RTCA and other tools to improve the accuracy of system operating limits. As these discussions continue, NERC suggests that you also review the concept of Path Ratings and whether, as the Western Interconnection has become more highly interconnected, the Path Rating and Path Operator concept, along with the use of nomograms, still has merit for real-time operations. Other Interconnections do determine Flowgate limits for purposes of interchange scheduling but rely more fully on RTCA for real-time operating reliability."*

Path Operator Task Force (POTF)

The POTF report was approved by the WECC Operating Committee on October 8, 2014, and contained the following recommendations:

- SOLs and TTCs are separate and distinct, but they work together to ensure that reliability is achieved in real-time operations.
- The Path Operator concept is eliminated, but the roles and responsibilities of the Path Operator are distributed among the TOPs and the RC.
- A SAR will be established to retire TOP-007-WECC-1.
- Paths that are not associated with transient or voltage stability limits will not have uniquely monitored SOLs; however, they will continue to have TTCs.
- Consistent with the RC SOL Methodology, SOLs are the Facility Ratings, voltage limits, and stability limits that are observed pre- and post-Contingency.
- TTC is the measure of maximum power transfer across a WECC Path that respects these SOLs, pre- and post-Contingency. TTCs will still need to be determined through transfer analysis and prior studies.
- Nomograms can be used to determine TTCs and can provide guidance to operators as part of operating plans, but the nomogram itself may not be an SOL.
- The WECC Path Rating Catalog will continue, and the WECC Path Rating Process remains unchanged; however, the resulting Path Rating will serve as a maximum TTC value – not as an SOL.

Major Operational Changes on April 1, 2017

- TOP-007-WECC-1a was retired
- Peak Reliability's revised SOL Methodology became effective
- New/revised TOP and IRO Reliability Standards became effective
 - RC creates an Outage Coordination Process and TOPs and BAs do what it says (IRO-017-1 R1 and R2)
 - TOP and RC perform an Operational Planning Analysis (OPA) to identify SOL exceedances (TOP-002-4 R1, IRO-008-2 R1)
 - TOP and RC develop and communicate Operating Plans for SOL exceedances identified in OPA (TOP-002-4 R2, IRO-008-2 R2)
 - TOP and RC perform a Real-time Assessment (RTA) at least once every 30 minutes to identify SOL exceedances (TOP-001-3 R13, IRO-008-2 R4)
 - TOP implements Operating Plans for SOL or IROL exceedances identified in RTA (TOP-001-3 R14)
 - RC notifies TOPs and BAs of SOL or IROL exceedances (IRO-008-2 R5)
 - TOP notifies RC of actions taken to address SOL exceedances (TOP-001-3 R15)
 - Definition of Operational Planning Analysis and Real-time Assessment was revised to include an evaluation of pre- and post-Contingency states

Significant Changes to FAC Standards Effective April 1, 2024

- Revised definition of SOL:
 - “All Facility Ratings, System Voltage Limits, and stability limits, applicable to specified System configurations, used in Bulk Electric System (BES) operations for monitoring and assessing pre- and post-Contingency operating states.”
- Retirement of FAC-010-3: System Operating Limits Methodology for the Planning Horizon
- Revised FAC-011-4: System Operating Limits Methodology for the Operations Horizon
 - System Voltage Limit and stability limit establishment requirements
 - Required contingency events
 - SOL exceedance clarified
- Revised FAC-014-3: Establish and Communicate System Operating Limits

Path Task Force (PTF)

- From the PTF Charter:
 - The purpose of the PTF is to determine the relevance and role of Total Transfer Capability (TTC), WECC Path Ratings, and the “Project Coordination, Path Rating, and Progress Report Processes” in the operations and planning horizon [...]
- The PTF concluded that:
 - *“while WECC Paths, Path Ratings, and WECC Path TTCs may have a significant role in business practices associated with ATC postings on the Open Access Same-Time Information System (OASIS), the Path Task Force (PTF) determined that the reliability role of WECC Paths, TTCs, and Path Ratings in the operations horizon is primarily to assist in situational awareness. TTC and Path Ratings can serve as a heads-up to operators for potential SOL exceedance.”*
- Industry changes resulted in a significant decrease in role and relevance for WECC Paths, Path Ratings/TTCs in operations reliability

Retirement of TTC Reliability Standards; Transfer to NAESB

- Retirement of FAC-013-2: Assessment of Transfer Capability for the Near-term Transmission Planning Horizon
- In its [petition](#) to retire FAC-013-2, NERC stated:
 - “NERC has determined that the Transfer Capability assessment is not an indicator of BES reliability [...] The additional Transfer Capability assessment required by FAC-013-2 serves only a market function; it does not provide for System reliability.”
- Retirement of NERC “MOD-A” Reliability Standards for TTC and ATC; transfer to NAESB (2024); reflected in NAESB standard WEQ-023
- In its [petition](#) to retire the “MOD-A” standards, NERC stated:
 - “The existing MOD A Reliability Standards provide little, if any, benefit to the reliable operation of the [Bulk Power System] BPS. ATC and AFC, as well as e-Tags, are commercially-focused elements, facilitating interchange and balancing of interchange. System Operators are ambivalent to these commercial arrangements. System Operators monitor Real-time flows to maintain reliability of the BPS according to System Operating Limits and Interconnection Reliability Operating Limits. If a scheduled interchange would violate either of these limits, the System Operators must disregard the scheduled interchange and operate the System within its actual reliability limits.”

Evolution of Transmission Planning Principles, Goals, and Requirements

- FERC Order 888 (1996) — posed mandatory open-access transmission tariffs on transmitting electricity in interstate commerce to promote competition in the wholesale power market
- FERC Order 890 (2007) — requires that the transmission planning process on both local and regional levels be coordinated, open and transparent
- FERC Order 1000 (2011) — requires local transmission planners to participate in regional planning processes
- FERC Order 1920 (2024) — requires use of multiple long-term scenarios to identify needed infrastructure, incorporate Grid-Enhancing Technologies (GETs), quantify regional benefits, and negotiate state-supported cost allocations

Order 890 Transmission Planning Principles

- Coordination
- Openness
- Transparency
- Information Exchange
- Comparability
- Dispute Resolution
- Regional Participation
- Economic Planning Studies
- Cost Allocation

Western Entities Transitioning to Flow-based Methodology

- Some entities have transitioned from the Path Rating Methodology to the flow-based methodology — APS, SRP, TEP (soon), SPP BA/TSP area in the West*, others internally to their system
- Doesn't involve paths; doesn't use the Path Rating Process
- Two very different approaches in the West
- RTOs elsewhere in North America are all flow-based
 - From the PTF Report: "It is reasonable to consider that these future developments in the West [RTOs] may not use a path-based approach but might rely on a flow-based approach."
- Path Ratings Process applies to some — but not all — in the Western Interconnection

Summary of Changes Over the Last 30 Years

- Formation of Electric Reliability Organization (ERO); WECC designated a Regional Entity with delegated responsibilities; NERC Reliability Standards
- Southwestern Blackout of 2011 – NERC letter to WECC
- WECC changed from trade association to social welfare organization in 2013
- POTF recommendations to decouple SOLs from TTCs in 2014
- Retirement of TOP-007-WECC-1a, which required operation within WECC Path SOLs in 2017
- Major changes to TOP and IRO Reliability Standards and RC SOL Methodology in 2017
- POTF Report in 2023 describing the role and relevance for paths, path ratings, and TTC
- Revised definition of SOL, retirement of FAC-010, revised FAC-011 and FAC-014 in 2024
- MOD Reliability Standards that govern TTC/ATC moved to NAESB WEQ-023 in 2024
- FERC Orders 888, 890, 1000, and 1920
- Some entities transitioning from Path Rating methodology to flow-based methodology

Flow-Based Methodology: Concepts and Application

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Flowgate Methodology

Presented to WECC

7/23/26



What is a Flowgate?

- Physically, a flowgate is a **transmission element** such as a transmission line or a transformer.
- For Flowgate Methodology, it is a **monitored facility which is critical** to the determination of available transmission capacity (ATC).
- All transmission facilities which has **potential to reach their facility limit** for either normal system conditions (N-0) or contingency conditions (N-1) are designated as the flowgates and are monitored.
- Formally a flowgate is a monitored facility for either a N-0 conditions or a specific (N-1) contingency (Mon-con pair).

Flowgate Methodology Features

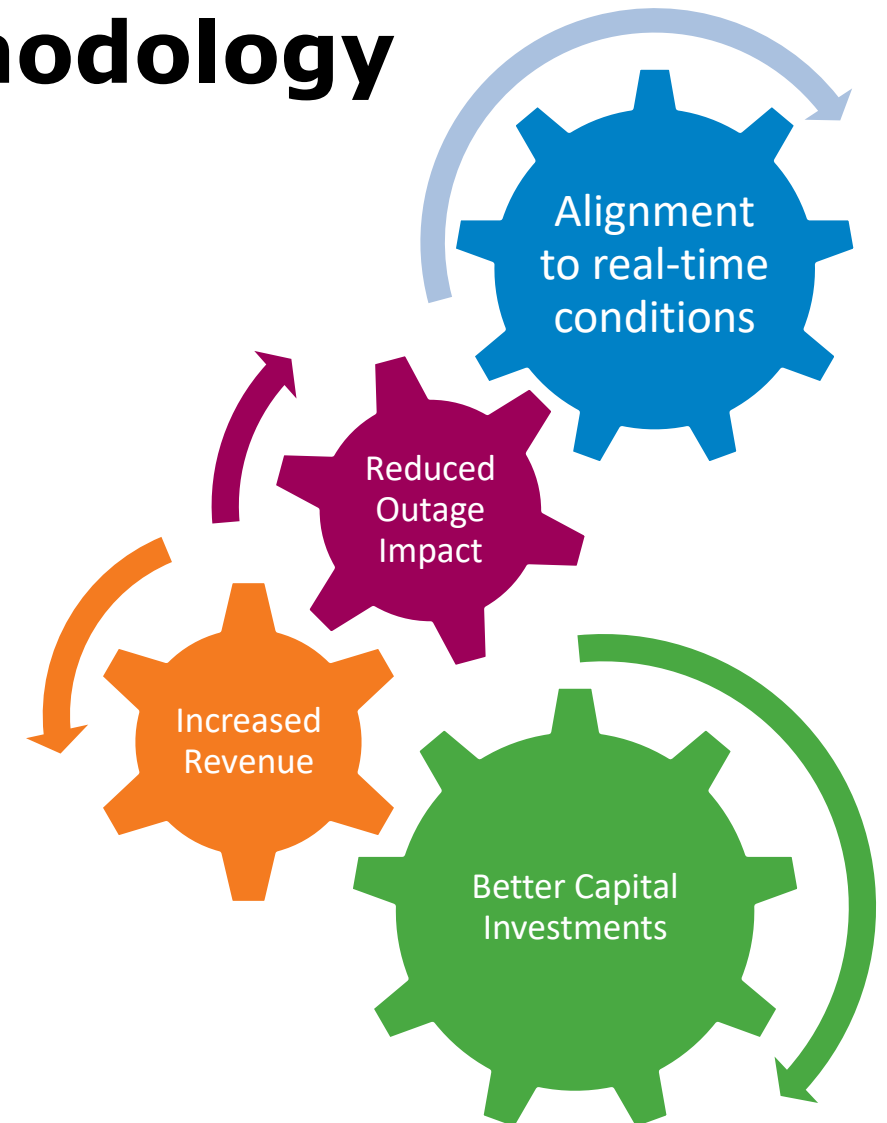
- BA=Balancing Authority
- TSP=Transmission Service Provider
- **Scheduling is from entity to entity(BA to BA or TSP to TSP) and is not path specific.**
- **Flowgate Methodology is designed to closely align with real world. Load, generation dispatch, transmission service, and topology are modeled based upon the best available data for the period being studied.**

Model Construction and Updates

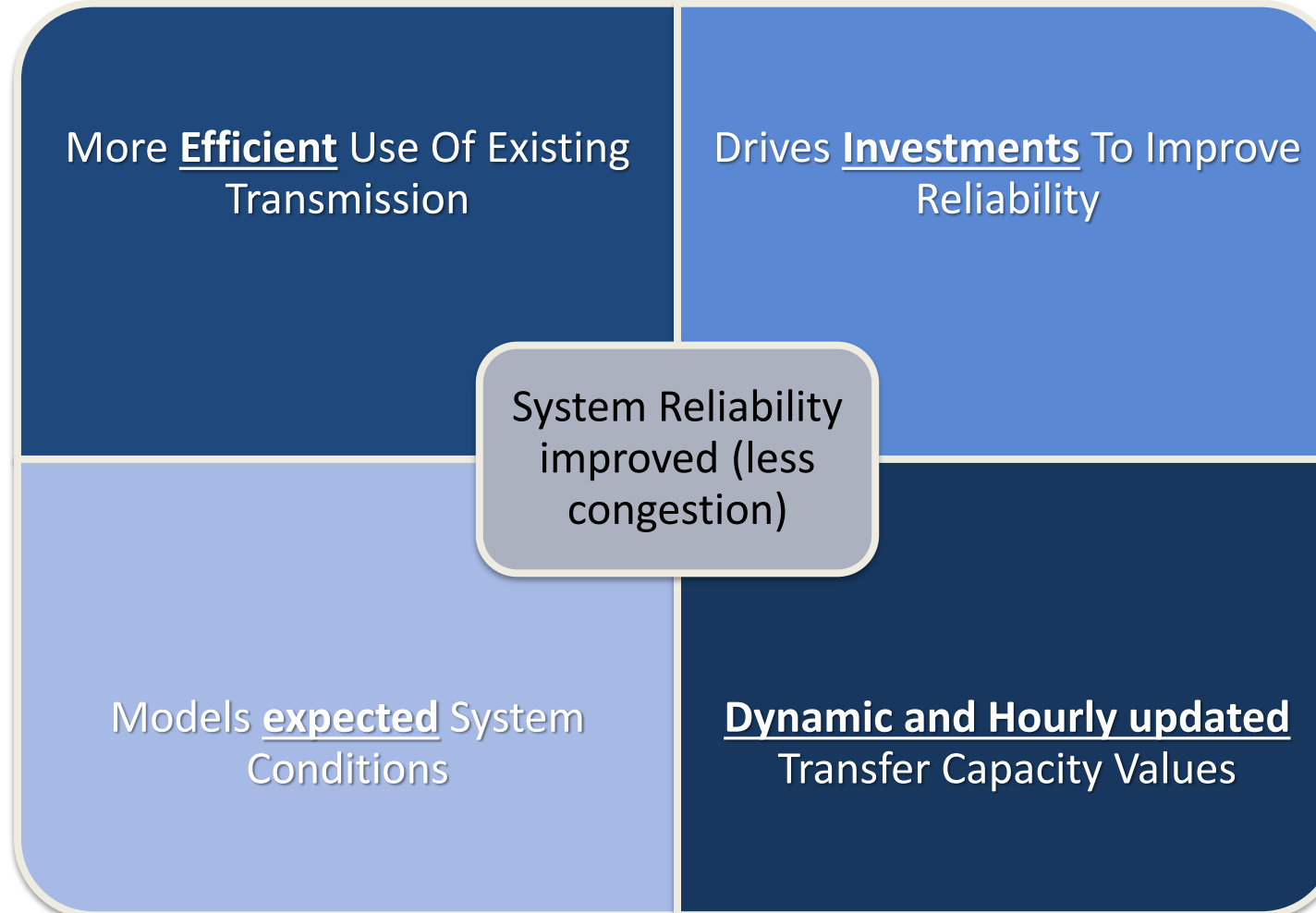
- Models and Available Transfer Capability(ATC) calculations are updated hourly
- Models are constructed for various future time frames, hourly, daily, monthly using the best available data
- **All planned outages are also modeled**

Benefits of the Flowgate Methodology

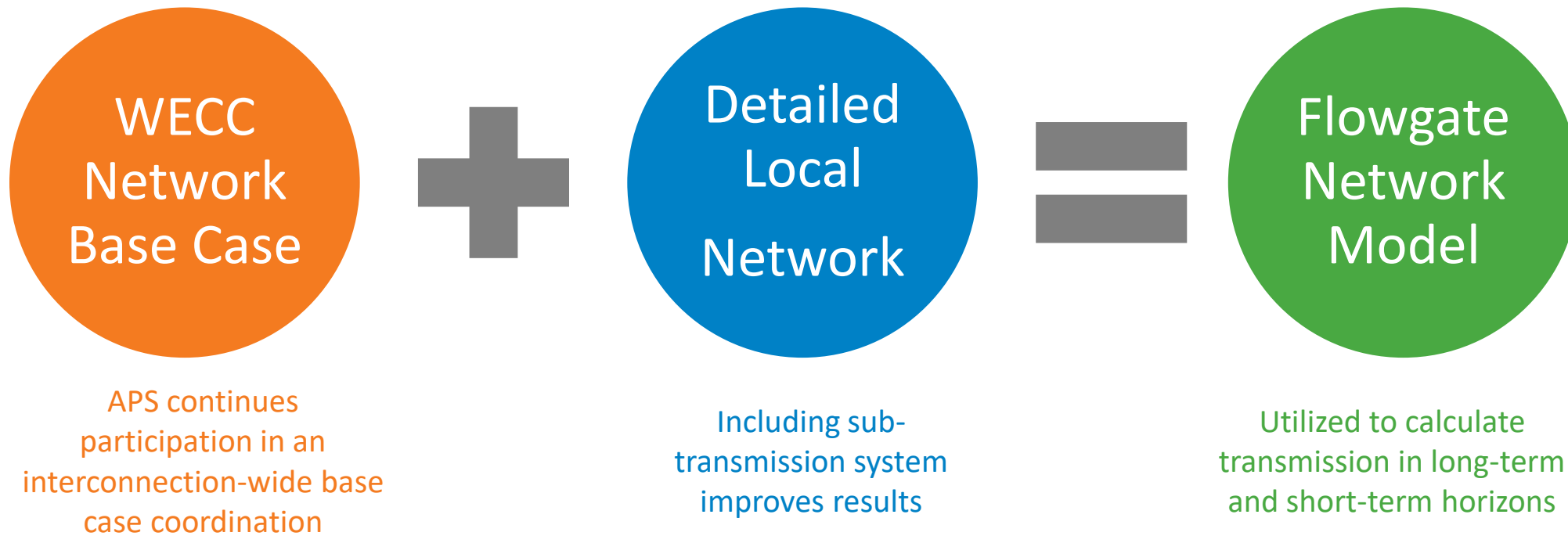
- **Operational Reliability**
 - Scheduling better aligns with real-time power flow conditions
 - Reduces Transmission Congestion
- **Market Efficiency**
 - Reduces scheduling barriers
- **Customer Value**
 - Reduce transmission capital investment
 - Additional transmission revenue opportunity



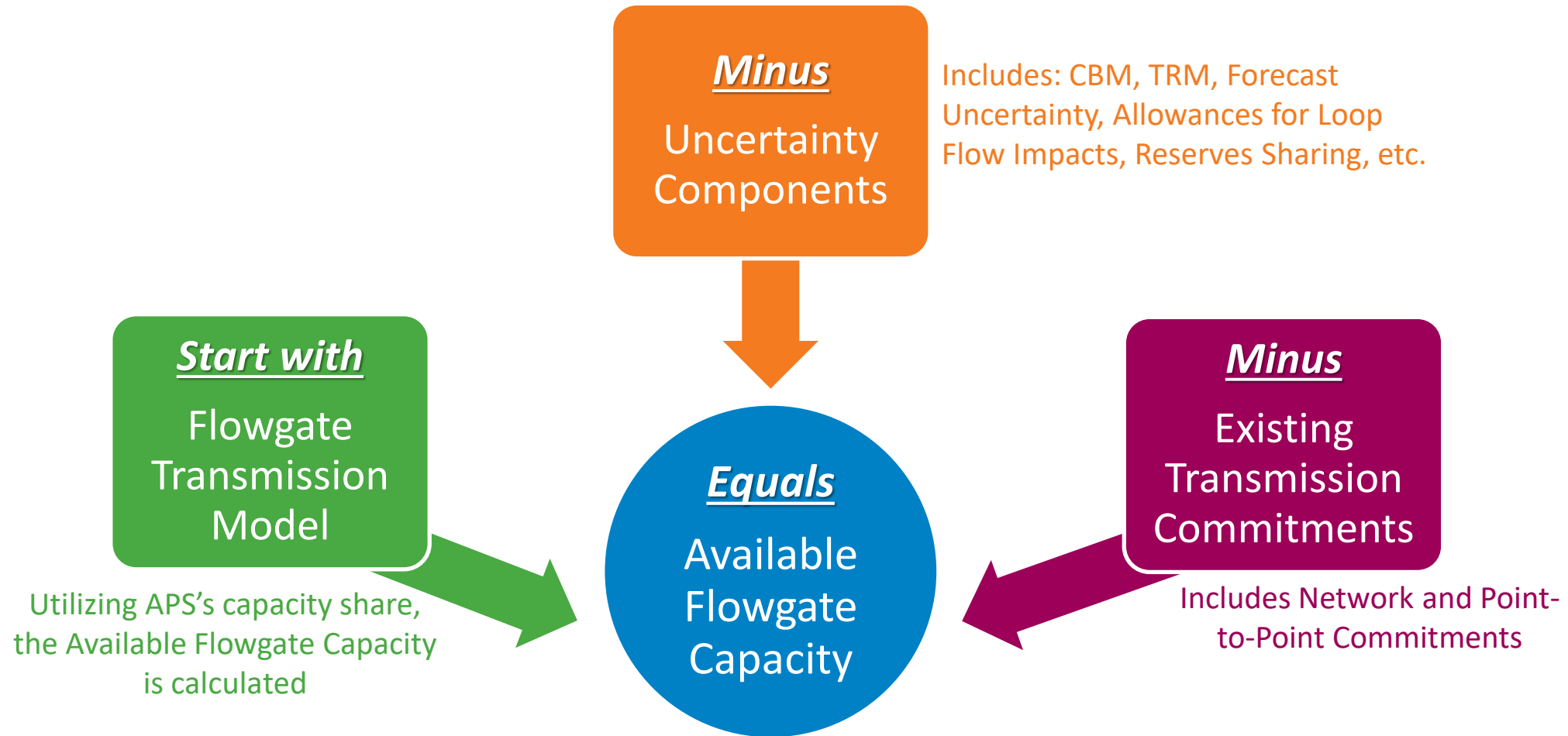
Benefits of the Flowgate Methodology



Modeling Approach



Transmission Capacity Calculations



Available Transmission Capacity(ATC)

- Start with Total Flowgate Capacity (TFC)
- Subtract power flowing on the flowgate
- Subtract reservation impacts of schedules not already included in the power flow
- Subtract desired margin
- This gives Available Flowgate Capacity (AFC)
- Calculate Transfer Distribution Factors (TDF)
- Available Transmission Capacity (ATC)= AFC/TDF
- Final ATC is minimum of all flowgates ATC

Transmission Capacity Management with Jointly Owned Facilities

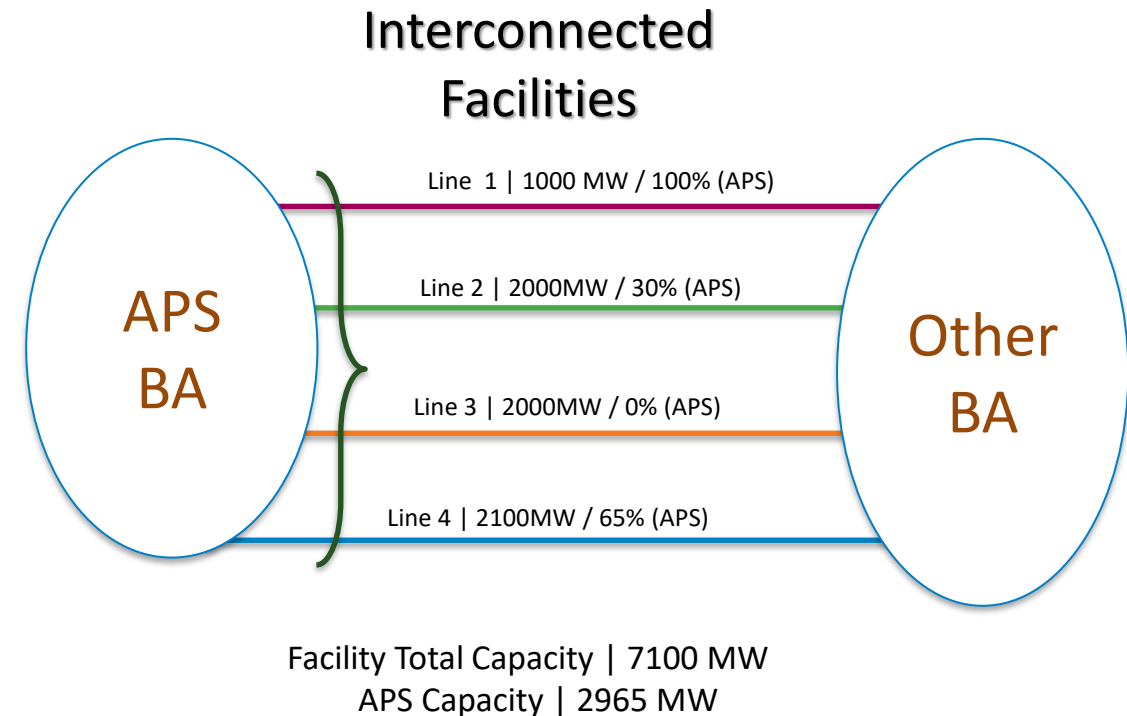
Scenario A

- Other BA limited to take only 1500MW from APS; therefore, APS would limit the transfer between APS and the Other BA to 1500MW

Scenario B

- Other BA can take 5000MW from APS, however, APS ownership is only 2965 MW, therefore APS would limit the transfer to 2965MW

Thus, lesser of the two BA limit is scheduled





Flow-based Planning



*Working together to responsibly and economically
keep the lights on today and in the future.*



SouthwestPowerPool



SPP.org



southwest-power-pool

Annual FG process – Outputs used in Operations and Short-term TSR eval

- Determines “permanent” flowgates; Operations determines “temporary” flowgates
- AC First Contingency Incremental Transfer Capability (FCITC) Analysis performed using PSSE MUST™
- Assessment performed on SPP base reliability ITP models for Study Year (SY) summer, fall, and winter peaks and SY+1 spring peak
- FCITC performed for all SPP OASIS transfer paths
- Limiting constraints with transmission distribution factor (TDF) > 3% reported
- N-1 contingency analysis performed on all SPP and first tier 100 kV and above Facilities
- Monitor SPP BES Facilities
- Raw results narrowed down to a list of potential flowgate candidates for addition or removal

Aggregate Transmission Service Study Process

- 2 open windows per year; transmission service requests studied as cluster
- Customers must provide accurate and specific source-to-sink information, even for external sources/sinks
- Uses Base Reliability (“BR”) models
 - System intact and N-1 analysis performed
- Monitor all elements
- Constraints mitigated through network upgrades
- Coordinated with affected systems

Planning Coordinator Assessments

- Utilize Base Reliability (“BR”) models
- Monitor all elements
- Consider base flows (intra-BA; Network Resources service Network Load) as well as net interchange (inter-BA; protects confirmed long-term firm transmission service)
- Constraints/overloads identified
 - Some constraints mitigated through system adjustments, up to and including load shed
- Mitigations that do not allow for load loss considered in SPP regional planning process (ITP; CPP)

Regional Planning Process

- Base Reliability (BR)
 - Uses non-coincident load peaks
 - Meant to protect firm service
 - Represents a “worst case” look
 - ACCC on BR/MPM models using SPP/local criteria
 - Contingencies: P1–P2.1 typically
 - Reliability needs narrowed by staff
- Market Powerflow Models
 - Uses coincident load peaks based on specific hours of the year
 - Meant to represent how the market behaves
 - Economic needs come from constraints causing inefficient dispatch

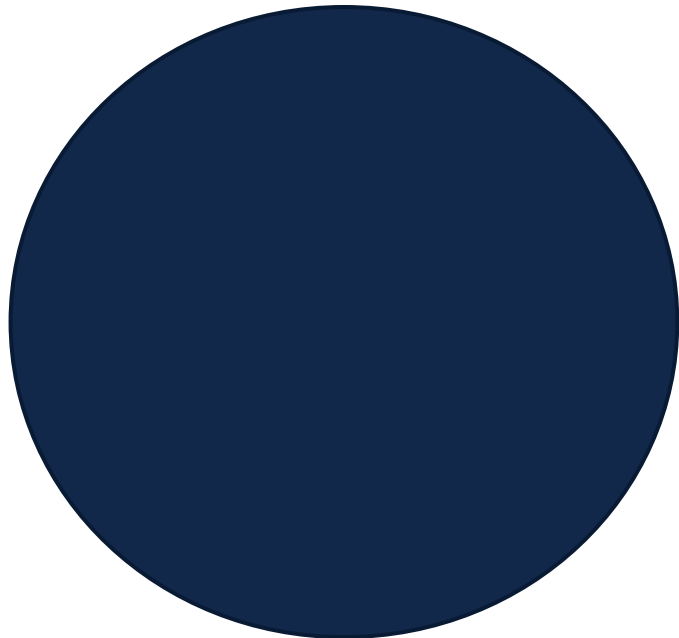
Interregional Coordination

- Exchange data and information
- Perform affected system analyses for transmission service and generator interconnection
- Long-term planning coordination
 - Ensure load and transactions (yours and your neighbors') can be served
- Coordinated system planning process
 - Analyze mutually beneficial projects

Differences between Contract Path & Flowgates

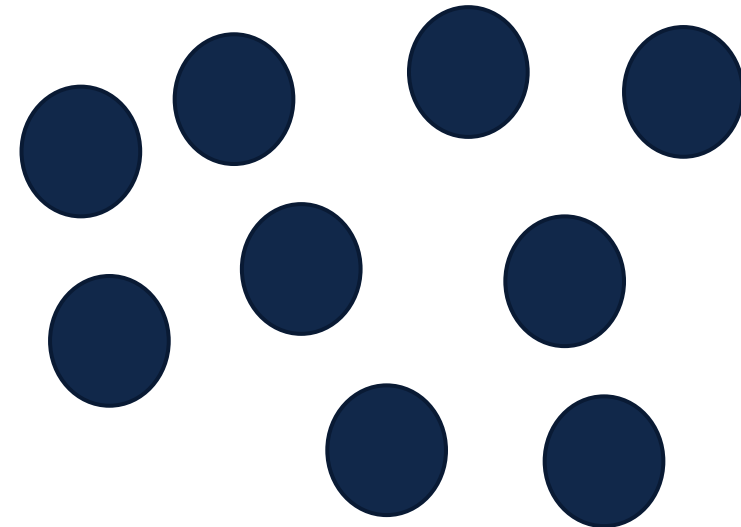
- Contract Path

- Generally, groups of facilities (cut plain/wide-area)
- Often significant transfer limits (>1000 MW)



- Flowgates

- Generally one mon-con pair of facilities (focused area)
- Often more limited capability (<500 MW)





Contact Slide

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Future of Path Ratings in the Western Interconnection

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ENGAGE WITH WECC



Charting the Future: Needs and Opportunities Panel

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Needs for the Future: Stakeholder Discussion

**Electric Reliability
and Security for the West**

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Key Takeaways and Action Steps

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