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White Paper

WECC Path Concept

By

The Path Concept Task Force of the Planning Coordination Committee

Western Electricity Coordinating Council

September 20, 2013
Introduction

This paper and the accompanying slide presentation were developed as part of the assignment after the September 8, 2011 Event (Outage Activity ORG3) to address NERC comments to “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 [Real-Time Contingency Analysis] for real-time operating reliability.”

The NERC Glossary of Terms defines an Available Transfer Capability (ATC) Path as, “Any combination of Point of Receipt and Point of Delivery for which ATC is calculated; and any Posted Path.” Posted Path means “any control area-to-control area interconnection; any path for which service is denied, curtailed, or interrupted for more than 24 hours in the past 12 months; and any path for which a customer requests to have ATC or Total Transfer Capability (TTC) posted. For this last category, the posting must continue for 180 days and thereafter until 180 days have elapsed from the most recent request for service over the requested path. For purposes of this definition, an hour includes any part of an hour during which service was denied, curtailed, or interrupted.” Even though this definition has not been approved, it can serve as a starting point for the discussion of the concept of Paths in the Western Interconnection.

In WECC, a Path, as defined in the context of the Path Rating Process, is a facility(ies) between systems or internal to a system, for which schedules and/or actual flows can be monitored for reliability purposes. Facilities in a path may originate and terminate at the same point (substation or generating station) or at different points. Two or more individual paths can be combined into a single path for rating purposes, although they may be separate scheduling paths. Paths are often called cutplanes. When capitalized in this white paper, “Path” has the meaning as defined in WECC Project Coordination and Path Rating Processes.

The definition of Path was developed in WECC to address reliability requirements in addition to those governing the operation of a path in the NERC Standards. The concept of Path covers not
only the development of transfer capability over a set of transmission facilities (Paths) to support operations, but also addresses the interactions among multiple Paths (over wide geographical areas) due to simultaneous transfer limits for long-term planning purposes, and provides the linkage between planning and operation functions. Because of the need to address impacts of simultaneous transfer limits and interactions over wide geographical areas, the focus of Path is on major transmission projects connecting “subregions” in WECC.

Therefore, the discussion of Paths in WECC will necessarily include discussion of a process from the inception of a transmission project (or upgrade) through its coordination with and peer review by impacted parties, the establishment of a Path Rating in the planning horizon, and finally, to the handoff to operations. The linkage between planning and operations specifies that the methodology to determine the transfer capability of a Path in the operation horizon considers at least the same set of contingencies used in establishing the Path Rating.

This paper is organized to include the following sections:

- Conclusions and Recommendations
- History of WECC Path and Path Rating Process
- Purpose for Path Rating and Rating Process
- Compare and Contrast Transfer Capability Methods In Use
- Potential Impacts on WECC Planning Process if Paths within WECC were Eliminated

The Task Force members are included in Appendix 1.

Conclusions and Recommendations

The establishment of Path Ratings and nomograms codify the interactions between Paths, and provide for an elevated level of analyses and enhanced situational awareness that exceed the NERC requirements. While the planning studies provide the requirements for the design of Remedial Action Schemes, Path Ratings and nomograms do not obviate real-time analysis; rather they enhance it by identifying ahead of real-time operations the minimum sets of facilities to monitor; their maximum reliability limits; and to provide information as input to the development of operating procedures for use in the operations planning analysis tools.

For real-time analyses to be effective, they need to be based on established limits. While many of the operating limits are based on thermal ratings of facilities, many others are based on transient stability of the system. Limits from nomograms established during the Path Rating Process, updated with operating data in seasonal and day-ahead studies will augment the real-time analyses and provide for a wider area picture for the transmission operators. Studies associated with the Path Rating Process also provide the supporting information needed to establish operating procedures ahead of time and enhance situational awareness.

Understanding that the real-time system conditions will be different from those assumed in the studies, limits established in planning studies must be updated when newer information is available. In this manner, planning studies give a preview of possible consequences of potential contingencies under operating conditions, and when communicated between operators;
enhances wide-spread situational awareness. In reviewing the September 8, 2011 Southwest Event, it was not the use of the Paths or nomograms, but rather the less than effective communication in the day-ahead studies that contributed to the severity of the problem.

The Task Force recommends that:

- WECC continues to use the rigorous and collaborative WECC Path Rating Process to support system planning. The resulting Path Ratings and nomograms, augmented by the seasonal analysis process, can be used to establish a ceiling for path scheduling limits that would be reviewed on a near real-time basis to ensure reliability.

- Recognizing that NERC Standards are a baseline, WECC processes continue to improve on the collaboration between transmission planners, transmission operators, and the many affected entities in determining the Path Rating/limit.

**History of WECC Path and Path Rating process**

a. The WECC (formerly WSCC) Path concept predates the concept of Flowgates. Concepts of Paths and processes for rating Paths were developed based on lessons learned since the establishment of the Western Interconnection in 1967.

b. Before the establishment of Paths and the Path Rating Process, when adding transmission lines to the system, WECC members typically performed less detailed studies. Examples of those studies typically included analyzing contract paths, performed rating studies based on non-simultaneous transfers and/or not representing the entire Western Interconnection topology.

c. Rating (or transfer capability) for a transmission project (or several projects in the aggregate across the same “cutplane”) was often based on thermal ratings only. Reliability problems associated with issues other than thermal ratings were often not identified before a project was placed into operation.

d. Even where transmission planning studies were done, they would cover non-simultaneous ratings only.

e. If there were interaction of power flows between projects, the simultaneous ratings were always less than the non-simultaneous ratings. After the project became operational, reliability was found to be adversely impacted and the project rating had to be reduced to preserve reliability.

f. As more transmission lines were added in the Western Interconnection, reliability issues became more complex. When members studied the additional transmission lines using various methodologies (including assumptions and criteria), and started scheduling power on the new lines, more reliability issues surfaced.

g. Several disputes followed, which led to a need for:

- Notification, consistent methodology and study processes, which include peer review; and
• Information and limitations provided to the operators before the project was placed in operation.

h. To preserve reliability, WECC developed rules to standardize Path definition, assumptions, criteria, and methodology for rating studies. For example, WECC established the probability for N-1 to be less than one in three years\(^4\) (based on historical data – Reliability Subcommittee document on probability of outage); and required consideration of single and credible multiple contingencies.

i. The Path Rating Process has evolved over the years as the power industry changed and new technologies developed and, based on lessons learned and focuses on reliability, has served WECC well.

- Prior to 1991 – Annual Progress Reporting Procedure
- August 1991 – Notification Procedures for Changes in Facility Ratings and/or Operating Procedures
- November 1993 – Interim Procedures for Regional Planning Project Review and Rating Transmission Facilities\(^5\)
- Several revisions between 1993 and 2012
- December 2012 – Project Coordination and Path Rating Processes

Purpose for Path Rating and Rating Process

The Task Force reviewed the concept of Paths, its application in WECC and arrived at the following purposes that the Path concept and Path Rating Process serve:

1. Information/communication - Provide:
   a. A reference document for planning purposes,
   b. A primary source of currently available information on maximum, non-simultaneous Path ratings to WECC Members (Path Rating Catalog\(^6\)),
   c. A specific identification of the facilities that make up the transmission Path, including the locations of applicable metering points,


\(^5\) The first Path Rating Catalog Published in early 1994.

\(^6\) The WECC Path Rating Catalog can be accessed through the WECC secured web page: http://www.wecc.biz/library/Pages/Path%20Rating%20Catalog.aspx
d. A discussion of the non-simultaneous flow limit and the conditions used to achieve this limit, which would be the Path Rating,

e. Any necessary Remedial Action Schemes used to achieve the Path Rating,

f. An identification of interactions or relationships with other paths including applicable nomograms (Information should be provided on where a “current” nomogram can be located),

g. Ownership and allocation of capacities on the Path,
h. Date of submittal or update and contact person(s).

2. Establish Path Rating to:
   a. Identify transfer limitations for regional planning analyses to maintain system reliability,
   b. Integrate new projects into new or existing Paths so the system can be planned to operate to preserve interconnected system reliability and efficiency,
   c. Identify simultaneous interaction for operation before future project is placed in service, identify the potential need for scheduling limitations, and a basis for curtailment of schedules between paths and rights-holders,
   d. Provide for a more consistent link between planning and operations,
   e. Provide an upper bound for transfer capability based on reliability considerations after project is placed in service,
   f. Assure a reasonable and diligent effort to identify simultaneous limitations and assure their resolution prior to operation.

3. Coordination – Establish a strictly reliability-based open process to provide:
   a. A forum for discussion of simultaneous interactions between major transmission Paths,
   b. A clear statement of Project Plan of Service, defined milestones, and assumptions behind the Path Rating,
   c. Certainty for the project sponsor(s) and the rest of WECC on the capacity that can be used for future transactions,
   d. The opportunity for owners of existing or future facilities that may be affected by the new project to assess potential impacts and the required mitigation,
   e. Technical starting point for allocation of capacity between affected parties,
   f. Protection of Rating and address interactions (support for negotiation outside of WECC process),
   g. Information in an open forum; establish Path Ratings and provide peer review process for approval by interested parties.
Compare and Contrast Transfer Capability Methods In Use

To assess the continued need for Paths and Path Ratings, the investigation was expanded to include a review (including a limited survey) of the methodologies generally used in WECC and in other Interconnections (See Appendix 2). To that end, the current NERC Standards MOD-028, -029 and -030, augmented with short surveys could provide the information for this review.

The different MOD methods (Area Interchange, Rated Path, and Flowgate) are different ways of determining the TTC. In WECC, Paths define and inventory the limits across the system. The purpose of NERC Standards MOD-028, -029 and -30 is to increase consistency and reliability in the development and documentation of Transfer Capability calculations for short-term use performed by Transmission Entities to support technical analysis and system operations.

NERC Standard MOD-001 requires each Transmission Operator to select one of the methodologies listed in MOD-028, -029 and -030 for calculating Available Transfer Capability (ATC) or Available Flowgate Capability (AFC) for each ATC Path per time period identified for those facilities within its Transmission operating area. While the Flowgate methodology (MOD-030) is common in the Eastern Interconnection with the Area Interchange methodology (MOD-028) being used in the Southeast, the Rated System Path Methodology (MOD-029) is the most common methodology applied in the WECC. (See Appendix 2 for more detailed information.) However, recent review shows that MOD-030 (the Flowgate Methodology) is governing a number of interfaces across the network in the Pacific Northwest; MOD-028 (the Area Interchange Methodology) is used for some TTC calculation in the Rocky Mountain area, and MOD-029 is used in some areas in Saskatchewan. While the methodologies described in all three Standards (MOD-028, -029 and -030) can also be used for planning purposes, WECC Project Coordination and Path Rating Processes specify the conditions under which the transfer capability of a Path be rated in the planning process to provide the link between planning and operations.

Potential Impacts on WECC Planning Process if Paths within WECC were eliminated

Given that the Path and Path Rating Process serve many purposes in addition to supporting operations, eliminating Paths in WECC will require alternative ways to support the functions currently addressed in the WECC processes involving Paths.

These include ways to:

7 MOD-028: Area Interchange Methodology; MOD-029: Rated System Path Methodology; MOD-030: Flowgate Methodology
- Recognize and account for interactions between systems regardless of ownership or operational control;
- Assess impacts of new projects on WECC system overall reliability early in the project planning process;
- Alert the Reliability Coordinator(s) and the Transmission Operator(s) of potential system issues due to interactions between power flowing on different parts of the WECC system before a new project comes on-line;
- Provide the scheduling limitations for each Path;
- Provide the contact information and ownership of each Path;
- Provide notification to others of planned projects for regional planning and coordination; and
- Define service under existing contracts.

Many existing contracts are written based on the concepts of Paths; eliminating Paths may require renegotiation of transmission service contracts or revisions to operating procedures to accommodate existing contracts.

The end result could well be some concept similar to Path Rating and Path Rating Review process. The reliability risk does not justify moving to a different process.
Appendix 1: Path Concept Task Force

- Chuck Matthews (BPA)
- Chifong Thomas (BSE) - Chair
- Jeff Billinton (CAISO)
- Jim Tucker (Deseret G&T)
- Bangalore Vijayraghavan (PG&E)
- Gordon Dobson-Mack (Powerex)
- Brian Keel (SRP)
- David Franklin (SCE)
- Joseph Wilson (Tacoma Power)
- Peter Mackin (USE)
- Bob Easton (WAPA-RMR)
- Branden Sudduth (WECC)
Appendix 2: Detailed comparison of MOD-028, MOD-029, and MOD-030 with requirement references

The purpose of NERC Standards MOD-028, -029 and -030 is to increase consistency and reliability in the development and documentation of Transfer Capability calculations for short-term use performed by Transmission Service Providers to support analysis and system operations. NERC Standard MOD-0019 requires each Transmission Operator to select one of the methodologies listed in MOD-028, -029 and -030 for calculating Available Transfer Capability (ATC) or Available Flowgate Capability (AFC) for each ATC Path per time period identified for those facilities within its Transmission Operating area. While the flowgate methodology (MOD-030) is common in the Eastern Interconnection with the area interchange methodology (MOD-028) being used in the Southeast, the Rated System Path Methodology (MOD-029) is the most common methodology applied in WECC. However, recent review of paths and flowgates in North America shows that MOD-030 is governing a number of interfaces across the network in the Pacific Northwest, and MOD-028 is used for some paths in the Rocky Mountain area, and MOD-029 is used in some area in Saskatchewan. An example of application of MOD-029 and MOD-030 is shown in Appendix 3.

Paths in the West were already established as the Transmission Service Providers in the WECC began developing their ATC Paths and the subsequent Open Access Same-time Information System (OASIS) postings in the mid-1990s. The Paths had Point of Receipt (POR)/Point of Delivery (POD) combinations developed for OASIS postings of where entities knew that transmission service business was likely to occur. This is the genesis of the MOD-029 standard – or Rated System Path – that was included in the MOD Standards development specifically for the WECC. This is different from how ATC Paths were developed in the Eastern Interconnection where they were based primarily on BA-BA interfaces when MOD-030 (Flowgate method) and MOD-028 (Area Interchange method) were developed.

The WECC Path concept was developed to facilitate determination of the maximum limit for reliable power transfer over a subset of all transmission facilities (i.e., a Path) connecting the source and sink areas under different ownership and/or operational control. This is accomplished by first determining the non-simultaneous transfer limit (i.e., Path Rating) for the Path and nomograms are developed for those Paths where the power transfer on one Path can impact the power transfer on another Path11 to govern the maximum allowable simultaneous

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10 MOD-028: Area Interchange Methodology; MOD-029: Rated System Path Methodology; MOD-030: Flowgate Methodology
11 The impacted paths can be non-contiguous.
transfers between the Paths. WECC has an established notification and peer review process\(^\text{12}\) whereby the Path Ratings are developed and published in the Path Rating Catalog, and provide a link between planning and operations.

A detailed comparison of the methodologies is highlighted below and in Table 1. Context information about which method was used in different regions was gathered through conversations with WECC staff and staff from one Eastern Reliability Coordinator.

**Highlights of Interesting Differences as they relate to TTC and ATC calculations:**

- MOD-029 generally has a more detailed description of Transmission Modeling Assumptions as compared with MOD-028 and MOD-030;

- MOD-028 and MOD-030 call for the Reliability Coordinator Area and Adjacent areas to be modeled, whereas MOD-029 allows for a more narrowly defined study area involving the Transmission Operator’s Area and contiguous Transmission Operator Areas. However, in WECC, the entire WECC System would be modeled regardless of methodology used.

- MOD-030 sets TTC as a function of studied limits (thermal, voltage or stability), whereas MOD-029 has seven ways of establishing the TTC depending on specific conditions and MOD-028 has four ways of establishing TTC;
  - MOD-029 allows for the Path TTC to be determined by a nomogram when simultaneous interactions exist between Paths. Conversely MOD-028 and MOD-030 do not mention simultaneous interactions or nomograms.

- MOD-030 Requirement 2 identifies the circumstances when flowgates need to be included or created in the AFC analysis process. WECC has defined conditions under which a Path must go through the WECC Rating Process.

- MOD-028 and MOD-030 describe the minimum requirements for the Available Transfer Capability Implementation Document (ATCID) in more detail, whereas MOD-029 refers to the ATCID in sections but merely to ensure that exceptions are noted. However, MOD-001 is the Standard that describes the minimum information to be included in ATCID.

- MOD-028 and MOD-030 require Transmission Operators to establish TTC for ATC Paths and to include in Flowgates when the Outage Transfer Distribution Factor (OTDF) is greater than or equal to 5 percent. MOD-029 has no such threshold.

• MOD-028 and MOD-030 are prescriptive in their Source and Sink modeling; MOD-029 does not explicitly refer to sources and sinks.

• MOD-028 explicitly defines the frequency of recalculating the Total Transfer Capability, whereas MOD-029 and MOD-030 are silent on the issue.
Table 1: Detailed comparison of MOD-028, MOD-029, and MOD-030 with requirement references

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<td>Increase consistency and reliability in the development and documentation of transfer capability calculations for short-term use in support of analysis and system operations</td>
<td>Same</td>
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<td>Applicable to entities who use:</td>
<td>Area Interchange Methodology to calculate ATCs</td>
<td>Rated System Path Methodology to calculate ATCs</td>
<td>Flowgate Methodology to calculate AFCs</td>
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<td>Transmission Modeling Assumptions</td>
<td>Details from R2, R3 - Assumptions</td>
<td>Details from R1 - Data and assumptions consistent with time period being studied (R1.1)</td>
<td>Details from R3, R5, R6 - Assumptions in effect during the applicable period of the AFC calculation (R5.2)</td>
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<td>- Modeling data and topology of its Reliability Coordinator’s area of responsibility (R2.1)</td>
<td>- Model includes (R1.1.1) o TOP area</td>
<td>- Modeling data and system topology for the Facilities within its Reliability Coordinator’s Area (R3.4)</td>
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<tr>
<td>- Modeling data and topology for immediately adjacent and beyond Reliability Coordinator areas (R2.2)</td>
<td>- Models all elements in service (R1.1.2)</td>
<td>- Modeling data for immediately adjacent and beyond Reliability Coordination Areas (R3.5)</td>
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<tr>
<td>- Expected generation and transmission outages, additions and retirements, included as specified in ATCID (R3.1.1.)</td>
<td>- Models all generation greater than 20 MVA (R1.1.3)</td>
<td>- Include expected generation and transmission outages, additions and retirements within the scope of the model and the applicable period of AFC calculation (R5.2)</td>
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<td>- Models PSTs in non-regulating mode (R1.1.4.)</td>
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<td>- Load forecast (R3.1.2.);</td>
<td>- Uses load forecast (R1.1.5.)</td>
<td>- Load forecast (R6.1.1.)</td>
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<tr>
<td>- Unit commitment and dispatch order, (R3.1.5.)</td>
<td>- Uses transmission additions and retirements (R1.1.6.)</td>
<td>- Unit commitment &amp; dispatch order (R6.1.2.)</td>
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<tr>
<td>- Facility ratings specified by GOs and TOs (R2.3)</td>
<td>- Uses Gen additions and retirements (R1.1.7.)</td>
<td>- Contains Gen Facility ratings provided by GO (R3.1)</td>
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<td>Contingencies to be examined</td>
<td>Use all Contingencies meeting the criteria described in the ATCID (R4.1.)</td>
<td>All planning criteria contingencies (R2.1.)</td>
<td>First Contingencies (R2.1.1.)</td>
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<td>- The ATCID should include a description of the manner in which Contingencies are identified for use in the TTC process (R1.4.)</td>
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| Determining TTC (max flow or reliability limit) | Determine the incremental TTC for each ATC Path by increasing generation and/or decreasing load within the source BA and decreasing generation and/or increasing load within the sink BA until either (R6.1):  
  - A SOL is reached on the Transmission Service Provider’s system, or  
  - A SOL is reached on any other adjacent system in the Transmission model that is not on the study path and the distribution factor is 5% or greater  
  If can’t simulate, incremental TC by the results of the case where the maximum adjustments were applied (R6.2)  
  Contractual Rights (R6.4)  
  Sum of Facility Ratings of all ties comprising the ATC Path (R6.3) | Set based on satisfying all criteria including (R2.1):  
  - All elements at or below 100% of their continuous rating  
  - Demonstrate transient, dynamic and voltage stability post-contingency with no transmission element above its emergency rating  
  - No uncontrolled separation  
  If not possible to simulate a reliability-limited flow in a direction counter to prevailing flows, set the TTC for the non-prevailing direction equal to the TTC in the prevailing direction (R2.2)  
  By contract rights (R2.3)  
  By nomogram (R2.4)  
  Through determination of how to resolve an adverse impact on an existing path (R2.5)  
  By contractual agreement (R2.6)  
  By historical precedence (R2.7) | Establish the TFC of each of the defined Flowgates as equal to (R2.4):  
  - For thermal limits, the SOL of the Flowgate  
  - For voltage and stability limits, the flow that will respect the SOL of the Flowgate |
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<td><strong>Documenting the Calculation of TTC/TFC</strong></td>
<td>Written documentation (M2. &amp; M8.)</td>
<td>Create a study report (R2.8)</td>
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<tr>
<td><strong>Determining when a Path or Flowgate is required</strong></td>
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<td><strong>Information to be included in the “Available Transfer Capability Implementation Document” (ATCID)</strong></td>
<td>Details from R1</td>
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<td><strong>Threshold for Establishing TTC in ATC Path or inclusion in Flowgate</strong></td>
<td>R6.1: DF ≥ 5%</td>
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<td><strong>Modeling of the Source &amp; Sink</strong></td>
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<td><strong>Calculating the ETC or the Impact of ETC for firm commitments</strong></td>
<td>R8</td>
<td>R5</td>
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<td><strong>Calculating the ETC or the Impact of ETC for non-firm commitments</strong></td>
<td>R9</td>
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<td><strong>Components of the firm AFC/ATC formula</strong></td>
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<td>R7</td>
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<td>Violation Severity Levels</td>
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**Unusual terms:**

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**Differences:**

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<th>Narrow model focus: (Transmission Provider + other TPs)</th>
<th>Broader model focus: Reliability Coordinator Area + adjacent</th>
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<tr>
<td>Reflects outage conditions</td>
<td>Starts with ALIS</td>
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Appendix 3 – Example - Excerpts from BPA’s ATCID (Feb 13, 2013)

The Bonneville Power Administration originally developed its ATC Methodology in 2003. In 2012 BPA conducted a thorough review of transmission constraints across its network. As a result of this review they confirmed MOD-029 applies to eight paths (see Figure 2 below) and MOD-030 applies to fifteen flowgates (see Figure 3 below). In general, BPA applies MOD-030 to internal paths/flowgates internal to its network where it owns and operates other transmission paths in parallel between sources and sinks. Whereas BPA applies MOD-029 to paths that provide only a source or a sink to the BPA network, or where BPA does not own and operate major transmission paths in parallel to a BPA path between source and sink. This mainly applies to paths that are interties or external interconnections between the Pacific Northwest and other areas within WECC.

A comprehensive discussion of BPA’s process for calculating Transfer Capability across its network is included in the Available Transfer Capability Implementation Document (ATCID), found at http://transmission.bpa.gov/business/atc_methodology/ATCID.pdf]. A few excerpts are shown below:

42 **Methodologies Selected**

43 MOD-029-1

44 BPA has elected to use the Rated System Path Methodology described in NERC Standard MOD-029-1 as its methodology to determine ATC for its Interties, External Interconnections and some Paths internal to BPA’s Network. The description of how BPA implements this methodology is included in Section VII of this ATCID. (MOD-001 R1)

48 MOD-030-2

49 BPA has elected to use the Flowgate Methodology described in NERC Standard MOD-030-02 as its methodology to determine AFC for its Network Flowgates. The description of how BPA implements this methodology can be found in Section VIII of this ATCID. (MOD-001 R1)
Figure 2
BPA Paths Map

Figure 3
BPA Network Flowgate Map
Follow-up Questions that BPA answered:

1) What guidelines were applied to decide whether to manage particular constraints with MOD-029 vs. MOD-030?

When flows from source to sink traverse the BPA network, crossing multiple main grid flowgates internal to the Pacific Northwest and BPA owns and operates some of the parallel lines that share the flow between source and sink, then BPA can manage the AFC across the flowgates using Standard MOD-030. Standard MOD-029 is applied to paths that either provide only a source or a sink to the BPA network, or when BPA does not own and operate other main grid lines in parallel between the source and sink. This mainly applies to connections between the Pacific Northwest and other areas within WECC.

2) Why was West of Hatwai kept as a Path (MOD-029), whereas South of Allston converted to a Flowgate (MOD-030)?

West-of-Hatwai is in series with the Montana Intertie and is not in parallel with other main grid flowgates across the BPA network. Therefore, the ATC across the West-of-Hatwai path is managed under Standard MOD-029. For transfers from sources to sinks in the north-to-south direction across the BPA network, BPA owns and operates other main grid flowgates in parallel to the South-of-Allston path (e.g. North-of-Hanford). Therefore, the ATC across the South-of-Allston path is managed under Standard MOD-030.

3) What significant differences do you perceive between MOD-029 and MOD-030?

To manage ATC across a path using Standard MOD-029 (Rated System Path Methodology) it is assumed 100 percent of an obligation can be scheduled across the path up to its limit. To manage ATC across paths that use Standard MOD-030 (Flowgate Methodology) it is assumed that if there are multiple paths under the operational control of BPA in parallel between a source and sink, obligations between the source and sink are assessed using the resulting distribution of flows across the parallel paths. A transaction between source and sink could be restricted if its flows cause one of the parallel flowgates to reach its limit.
4) Could MOD-030 be applied to the major interties (e.g. Path 66 or Path 3) with other systems?

The major interties only provide a single source or sink to the BPA network, not a path between sources and sinks that is owned and operated by BPA. Therefore, BPA could not use Standard MOD-030 by itself to manage ATC across major interties that connect BPA to other areas within WECC. While technically possible to apply Standard MOD-030 to major interties, there could be significant policy changes associated with getting agreement from all the owners of major paths (e.g. Path 66 – PACI).

5) How will simultaneous interactions be managed with WECC Paths that are now managed with MOD-030 (e.g. reinforcement of Path 4 can impact N>S transfer capacity on Path 3)?

Regardless of the method of managing the ATC or AFC across particular paths or flowgates, all paths are planned and operated to respect their reliability limits per the WECC Path Rating Process and/or by a Transmission Entity’s SOL methodology. In this particular example, the ATC across Path 3 would be managed for obligations between Canada and the Pacific Northwest, whereas obligations across the Cross Cascades North flowgate would be managed for all obligations that utilize that flowgate. Since there are other main grid flowgates in parallel to the Cross Cascades North flowgate across the BPA network that are owned and operated by BPA, the ATC can be managed using Standard MOD-030.

Path 3 consists of two 500 kV lines that connect from the Lower Mainland of British Columbia to the Puget Sound area in Northwest Washington. In addition, Path 3 also includes one 230 kV line with a phase shifter that connects the 230 kV network in eastern British Columbia to Boundary substation in Northeastern Washington. Since the 500 kV lines and the 230 kV line connect into two different points on the BPA network, the flows across them have different impacts to the BPA network. Therefore, even though TTC and ATC from an obligations perspective don’t differentiate between these lines, the 500 kV portion of the path and the 230 kV portion of the path are managed separately during actual system operation to respect the impacted system limits.