

Joint Planning Process In Western US & Canada

PEER EXECUTIVE EXCHANGE

Bonneville Power Administration

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Joint Planning Process In Western US & Canada

- Puget Sound Energy, Inc.
- Investor Owned Utility
- Western Washington State
- Hydroelectric, Coal, Combustion Turbines, Combined Cycle
- Transmission at 500, 230, 115 kV
- Winter peak load ~ 5,600 MW

Presenter - Joseph (Joe) W. Seabrook

WECC and NERC Background

- National Electric Reliability Council

www.nerc.com

- Western Electricity Coordinating Council

www.wecc.biz

- History

[WECC History.doc 1-2 (2)]

Electronic files indicated with file name enclosed in square brackets. File name is followed by sheets in notebook, and total sheets in document. For example, 1-2 (2) indicates sheets 1 through 2 are in the seminar notebook, and the document has two sheets total.

Joint Planning Process In Western US & Canada

- Data System for Base Cases
- Requirements for Data in Cases
- Planning Standards (Reliability Criteria)
- Planning Requests, Needs
- Development and Selection of Plans
- Announcing Plans

Data System for Base Cases

- Annual Ten-Year Case Schedule

[pcc_handbook_section_6_pages9-33.pdf 1-3, 12, 21-23 (25)]

- Case Assumptions

- » Four Seasons, and Sub-Regional Load Levels

- » Transfer Levels on Major Paths

- » Operating Transfer Capability Cases (6)

- » Planning Cases (5)

- Late Data Procedure

- » Notification Procedure

- Schedule Example

- Case Data Sheet Example

2002

TEN-YEAR POWER FLOW AND STABILITY DATA COMPILATION SCHEDULE

CASE	DATE DATA REQUEST MAILED	DATE DATA DUE TO SUB COORD DATE L&R INFO DUE TO SUB COORD	DATE DATA DUE TO AREA COORD	DATE DATA DUE TO STAFF	STAFF SEND CASE FOR REVIEW	DATE COMMENTS DUE TO AREA COORD	DATE AREA COORDINATOR COMMENTS DUE TO STAFF	STAFF FINALIZE DATE
2002 HS3-OP	07/06/01	07/20/01	07/27/01	08/31/01	09/14/01	09/21/01	09/28/01	10/10/01
2002 LS2-OP	07/06/01	08/03/01	08/10/01	09/14/01	09/28/01	10/05/01	10/12/01	10/24/01
2006 HS2-S	08/31/01	09/14/01	09/21/01	10/26/01	11/09/01	11/16/01	11/23/01	12/05/01
2011 HS1	10/05/01	10/19/01	10/26/01	11/30/01	12/14/01	12/21/01	12/28/01	01/09/02
02-03 HW1-OP	12/07/01	12/21/01	12/28/01	02/01/02	02/15/02	02/22/02	03/01/02	03/13/02
02-03 LW1-OP	12/07/01	01/04/02	01/11/02	02/15/02	03/01/02	03/08/02	03/15/02	03/27/02
2003 HSP1-OP	02/01/02	02/15/02	02/22/02	03/29/02	04/12/02	04/19/02	04/26/02	05/08/02
2003 LSP1-OP	02/01/02	03/01/02	03/08/02	04/12/02	04/26/02	05/03/02	05/10/02	05/22/02
04-05 HW1	03/29/02	04/12/02	04/19/02	05/24/02	06/07/02	06/14/02	06/21/02	07/03/02
2007 HS1	05/03/02	05/17/02	05/24/02	06/28/02	07/12/02	07/19/02	07/26/02	08/07/02
2008 LSP1-S	06/07/02	06/21/02	06/28/02	08/02/02	08/16/02	08/23/02	08/30/02	09/11/02
2003 HS4-OP	07/12/02	07/26/02	08/02/02	09/06/02	09/20/02	09/27/02	10/04/02	10/16/02
2003 LS1-OP	07/12/02	08/09/02	08/16/02	09/20/02	10/04/02	10/11/02	10/18/02	10/30/02
2004 HS1-S	09/06/02	09/20/02	09/27/02	11/01/02	11/15/02	11/22/02	11/29/02	12/11/02
11-12 HW1	10/11/02	10/25/02	11/01/02	12/06/02	12/20/02	12/27/02	01/03/03	01/15/03

2002-2003 HEAVY WINTER – 02-03 HW1-OP

CASE DESCRIPTION

- I. CASE DUE DATES: To Area Coordinator: December 28, 2001
To Staff: February 1, 2002
- II. PURPOSE: **TO REPRESENT ANTICIPATED OPERATING CONDITIONS WITH HEAVY FLOWS FROM NORTHWEST TO CALIFORNIA.**
- III. ITEMS TO BE PREPARED:
- | | | |
|----------------|---------------------|-----------------|
| Operating Case | From Case | 01-02 HW3 |
| File (1) | Stability Data | Master Dynamics |
| Operating Case | Significant Changes | 01-02 HW3 |
| | | 2001 Sig. Add. |
- IV. LOADS: 80-90% of winter peak in the Northwest, 90-100% of winter peak elsewhere.
- V. TIME: Late afternoon 1600 to 1800 hours.
- VI. GENERATION**
- | | <u>HYDRO</u> | <u>THERMAL</u> |
|------------------------------------|--------------|----------------|
| Canada | High | -- |
| Northwest | High | High |
| Idaho/Montana | Median | High |
| Colorado/Wyoming | Low | High |
| Northern California Hydro | 70% | -- |
| California | Low | Median |
| Arizona/New Mexico/southern Nevada | Low | Median |
- VII. INTERCHANGE**
- | <u>RATING</u> | <u>CONDITION</u> | <u>TARGET*</u> | <u>%</u> |
|---|------------------|----------------|----------|
| Canada to Northwest | Low | 500 | 16% |
| Northwest to California/Nevada (COI/RATS) | Heavy | 3800 | 78% |
| (PDCI) | Heavy | 2500 | 81% |
| Path 15 S-N | -- | -- | -- |
| Wyoming/Idaho to Northwest | -- | -- | -- |
| Montana to Northwest | Moderate | 1500 | 68% |
| Utah/Colorado to Southwest | Low | 600 | 38% |
| Southwest to Calif. (EOR/WOR) | Moderate | 4000/5000 | 53% |
| Intermountain to Adelanto DC | Heavy | 1800 | 94% |
| Midway to Vincent | Heavy | 2800 | 93% |

* Actual flows within $\pm 10\%$ of target are acceptable, but not to exceed the actual rating of the path.

Requirements for Data in Cases

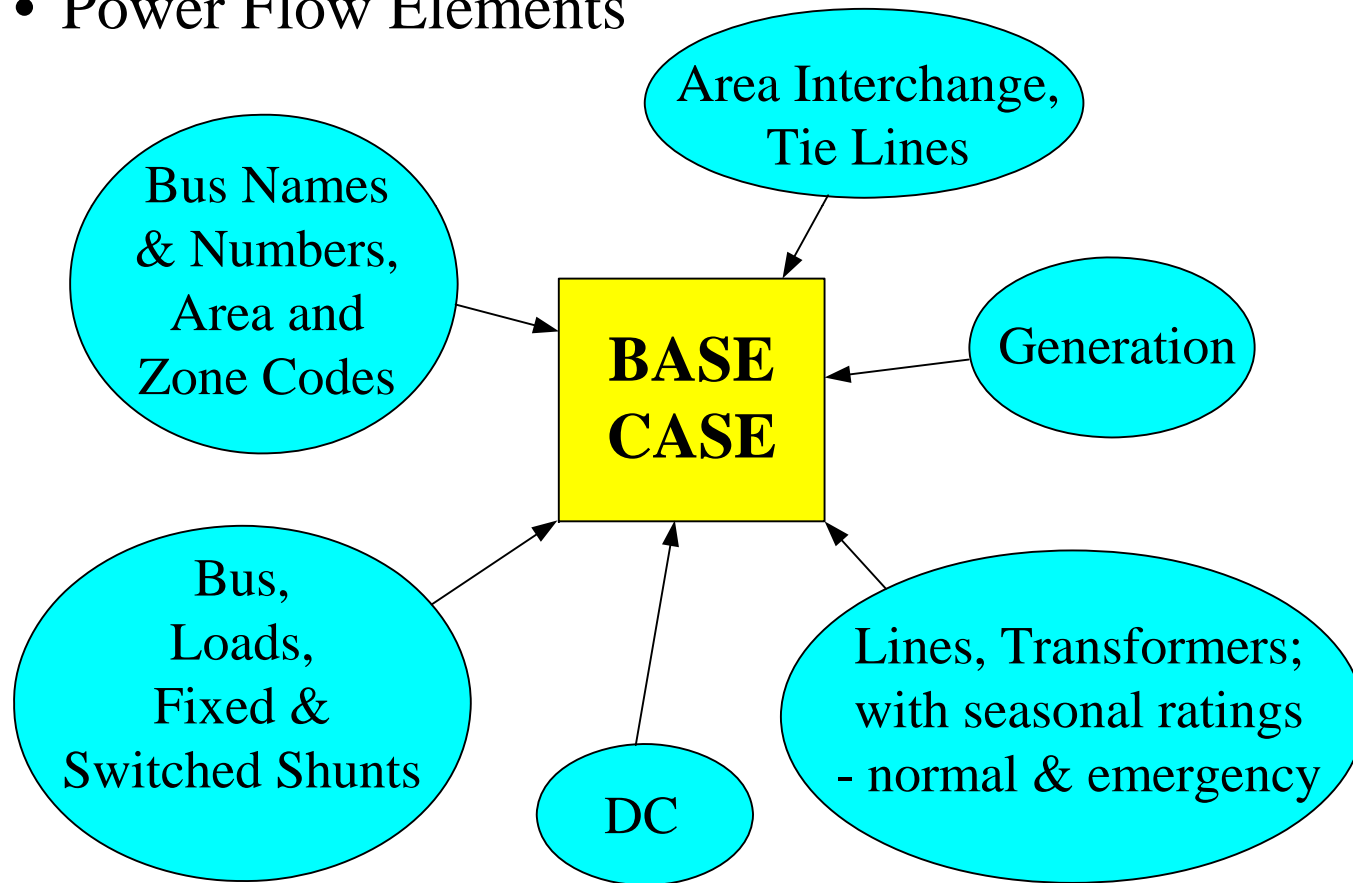
- Data Preparation Procedural Manual

[dppm2.2.pdf 0 (20)]

- Level of Detail (used for rating systems)
- Full Participation by All Members

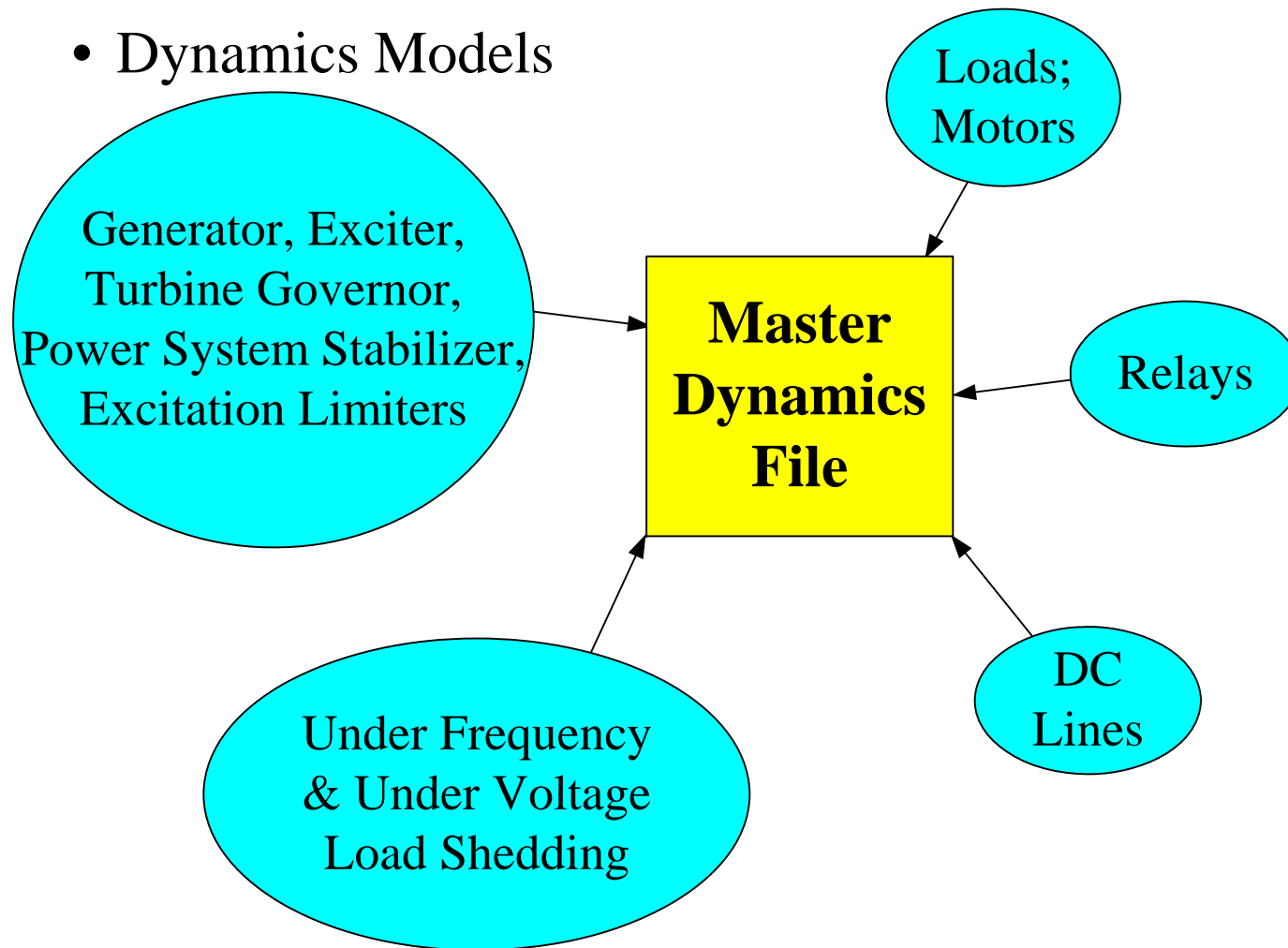
Requirements for Data in Cases

- Power Flow Elements



Requirements for Data in Cases

- Dynamics Models



Planning Standards (Reliability Criteria)

- NERC/WECC Planning Standards

- [WSCC_Reliability_Criteria_0402.pdf 1, 4-30 (147)]

- Merger of Criteria

- Standards, Measures, Guides

- System Adequacy and Security

- » Categories A through D

- [Voltage_Stability_Criteria_Undervoltage_Load_Shedding_Strategy_and_Reactive_Power_Reserve_Monitoring_Methodology.pdf 1-10]

- [WECC_Voltage_Stability_Methodology_7-11-01.pdf 1-7 (7)]

- System Modeling Data Requirements

- System Protection and Control

- System Restoration

Planning Standards (Reliability Criteria)

- NERC/WECC Compliance Enforcement Program
 - Annual Assessments and Corrective Plans
 - Compliance Templates
 - Annual Regional Report to NERC
 - Annual Audit

Planning Standards

- Probability Based Reliability Criteria

[Phase_1_PBRC_Implementation_Procedure.pdf 1-16 (16)]

Table A: Phase I PBRC Performance Table

Performance Level	Disturbance Outage Class	Outage Frequency (outages/year)	Mean-Time-Between-Failure (year)	ΔV_1 (%)	Δt (cycle)	ΔV_2 (%)	fmin (Hz)	Damp. (%)
A	Single Element	0.33 =	= 3	25	20	5	59.6	>0
B	Bus Section	0.033- 0.33	3 - 30	30	20	5	59.4	>0
C	Two Element	0.033 - 0.33	3 - 30	30	40	10	59.0	>0
D	More than Two Elements (I)*	0.0033 - 0.033	30 - 300	NO CASCADING PERMITTED				
E	More than Two Elements (II)*	< 0.0033	300 <	EVALUATE FOR RISKS & CONSEQUENCES				

Notes * These two classifications, I & II, describe the new contingency definitions for level D and E Performance Levels approved at the February 12-13, 1998 PCC meeting. The classifications are related to splitting the existing WSCC Level D (as well as the Categories D of the new NERC Planning Standards) into two classes.

ΔV_1 , Δt , ΔV_2 , fmin and Damping are defined in the June 25, 1998 Phase I PBRC Development and Implementation report.

Planning Standards

- Probability Based Reliability Criteria
 - Reclassify Facility Assignment to Categories
 - » Exceptions List (30 Contingencies)
 - » BPA Example – Two Adjacent Circuits
 - » Single Pole Tripping, High Insulation Strength, Lightning Protection
 - » Category C to Category D

Planning Requests, Needs

- OASIS Request
 - Load Service Obligations
 - Transmission Service
 - Generator Integration
 - » Generator Interconnection Standards
 - » PSE Generator Interconnection Standard
[PSE Intercon.pdf 1, 3-4 (44)]
 - » BPA Generator Interconnection Standard
[BPA GenInt99.doc 1-2 (58)]

Development and Selection of Plans

- Regional Planning Guidelines

[Procedures_For_Regional_Planning_Project_Review_402.pdf 1-26 (77)]

Part 1

- Foster Regional Planning Perspective
- Promote Efficient Use & Development of Facilities
- Assure Relevant Planning Issues are Considered
- Open Subscription in RTO

[Stage2Filing_Plan&Exp_AttachmentItoFilingLetter.pdf 0 (17)]

http://www.rtowest.com/Doc/Stage2Filing_Plan&Exp_AttachmentItoFilingLetter.PDF

Development and Selection of Plans

- Check List of Considerations
 - Each Project Shall:
- Principles Followed at Sub-Region
 - Before Reaching Region

Announcing Plans

- In the Common Base Cases when announced
- Procedures for Project Progress Reports and Annual Reporting
 - Progress Report Policies and Procedures
[Progress_Report_Procedures_2002.pdf 1-5 (5)]

Conclusion

- WECC using a Structure that:
 - Organizes Required Data from many Entities
 - Empowers Experts in Many Areas
 - Encourages Accountability & Maintaining Standards

Transmission Path Rating Principles

Rated Transfer Capability

- Three Phase Rating Process (pages 13 and following)

[Procedures_For_Regional_Planning_Project_Review_402.pdf 1-26 (77)]

Part 2

- Rated System Path Method
- Project Description, Proposed Path Rating
- All Members Notified
- Phase 1 – 60 Day Minimum Review

Activity

- » Regional Planning Policy Committee Assessment
- » Full Inclusion in Base Cases
- » Comprehensive Progress Report & Letter requesting to All Members

Rated Transfer Capability

- Phase 2– 30 Day Minimum Review

- Activity

- » Phase 2 Review Group Formed if Requested (Peer Review)
 - » Demonstrate Conformance with Planning Standards
 - » Identify Non-Simultaneous Transfer Capability
 - » Identify Simultaneous Transfer Capability (with Competing Paths)
 - » Address Mitigation of Simultaneous Problems
 - » Resolve Comments and Requests

Rated Transfer Capability

- Phase 3

- Activity

- » Construction and Monitoring

- » Operating Transfer Capability Studies

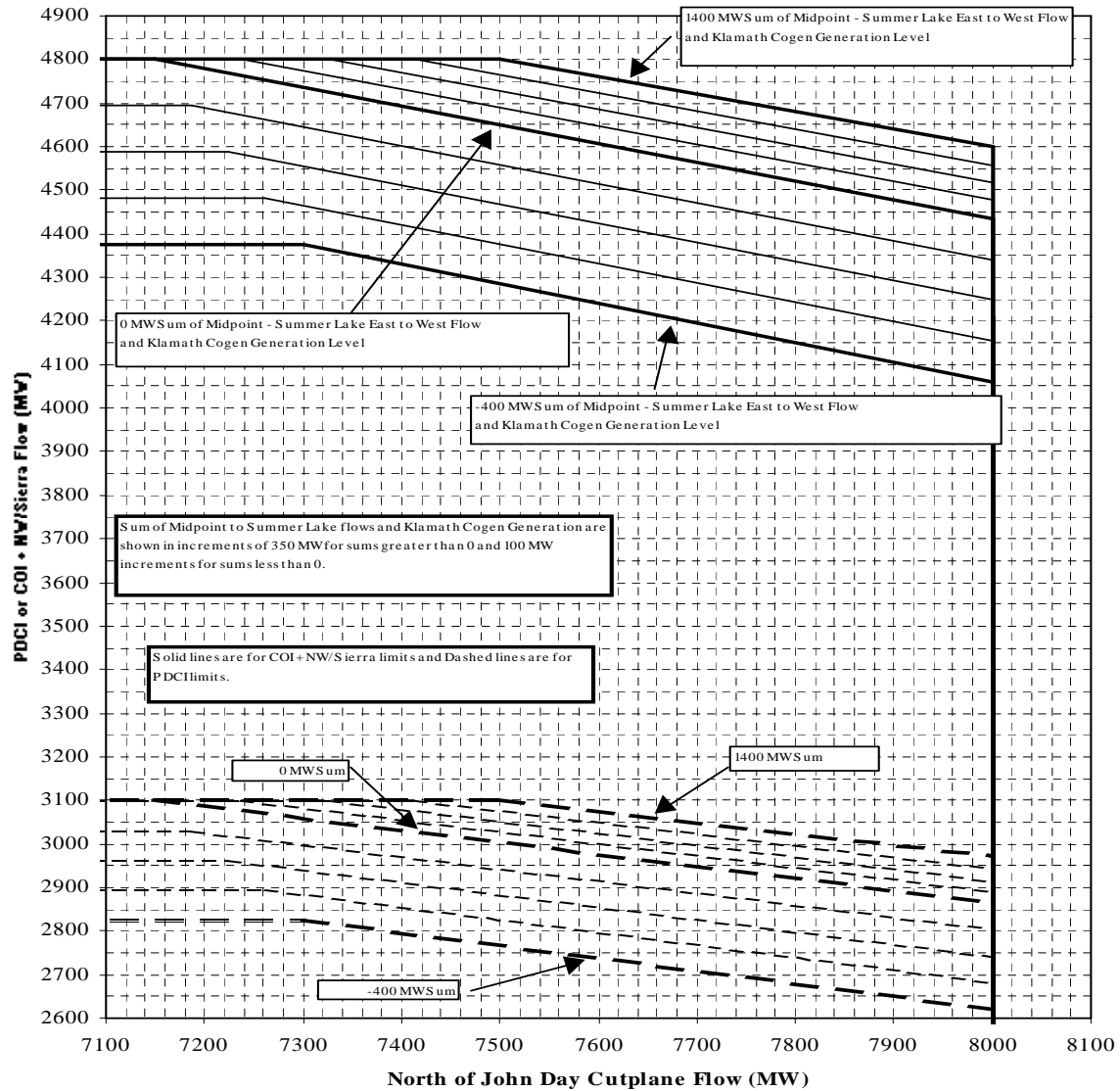
Rated Transfer Capability

- Path Rating Catalog
 - Rated Transfer Capabilities
 - Ratings:
 - » Accepted (Three Phase Rating Process)
 - » Existing (Known & Used in Operation before 1994)
 - » or Other

Total Transmission Capability Determination (TTC)

- Operating Transmission Capability Determination
- OTC Policy Group (TTC = OTC in WECC)
 - [OTC_HANDBOOK_05-30-02.pdf 1-16, 45, 46, 57-62 (71)]
 - Operating Transmission Capability by Season
 - Studies Done by Four Sub-Regional Groups
 - » Determine Paths to Study
 - » Heavy and Light Load Conditions
 - » Nomograms For Path Interactions
 - PACI verses North of John Day
& Mid-Point-Summer Lake
 - Review of Operating Procedures by Season

**North of John Day vs. COI + NW/Sierra or PDCI Flow
(Spring 2002 Prorata Operating Nomogram Chart)**



Available Transmission Capability Determination (ATC)

- $ATC = TTC - \text{Existing Transmission Commitments (including CBM)} - TRM$
 - Existing Transmission Commitments includes native load
 - $TRM = \text{Transmission Reliability Margin}$, can be 0
 - $CBM = \text{Capacity Benefit Margin}$ may include generation reserves
- Posted on OASIS sites

Available Transmission Capability Determination (ATC)

- OTC & Existing Transmission Commitments
- OTC Posted Hourly
 - Conditions, Generation, Loads, Weather
- OTC Adjusted by Outage Schedules
- OTC Adjusted Hourly by Forced Outages

Curtailement Procedures During Emergencies

- OTC's Pre-Determined for Outages
 - For Elements Affecting Path Ratings
- Remedial Action Schemes Employed
 - Generator Tripping
 - Lines and Load Tripping
 - RAS Approval Group

Curtailment Procedures During Emergencies

- Safety Net Policy
 - [WECC-POLICY12.pdf 1-4 (4)]
 - Under-Frequency Load Shedding
 - [WSCC_Coordinated_Off-Nominal_Frequency_Load_Shedding_and_Restoration_Plan.pdf 1-7 (27)]
 - Under-Voltage Load Shedding
 - [Undervoltage_Load_Shedding_Guidelines.pdf 1-22 (76)]
 - Manual Load Shedding

Conclusion

- Rigorous Process to Establish Path Ratings, Seasonal Ratings, Hourly Ratings, Outage Ratings helping Us Avoid Operating Where We Have Not Studied
- Since 1996 Disturbances
 - Evaluated failures: Gen. trips, excitation, UFLS
 - Effective models: Governor/power controls, loads