

NORTHWEST POWER POOL

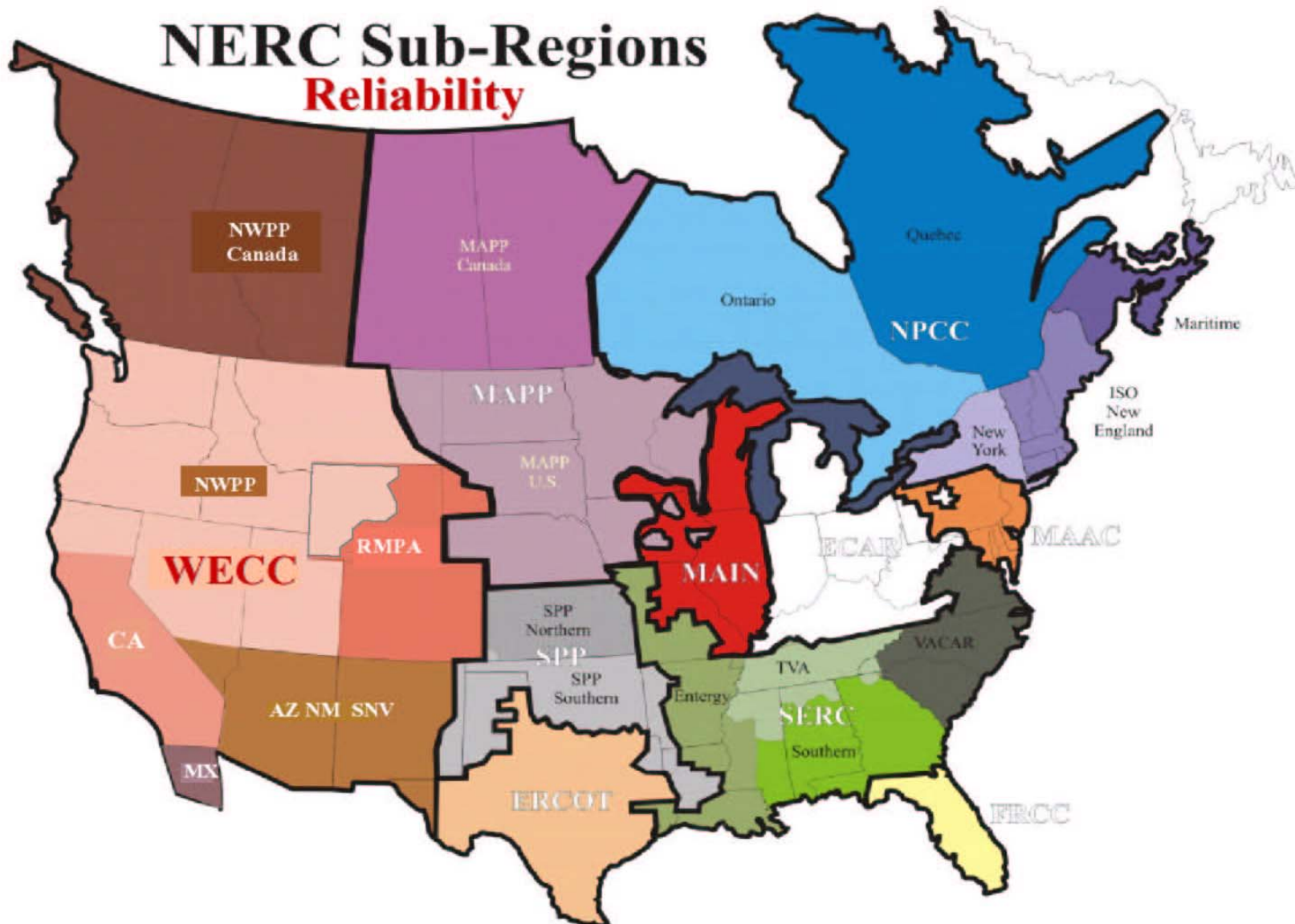
Reliability through Cooperation

2006



NERC Sub-Regions

Reliability



NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL (NERC)

NERC is a not-for-profit company formed as a result of the Northeast blackout in 1965 to promote the reliability of the bulk electric systems that serve North America. It works with all segments of the electric industry as well as customers to “keep the lights on” by developing and encouraging compliance with rules for the reliable operation of these systems. NERC comprises ten Regional Reliability Councils that account for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico.

NERC RELIABILITY CRITERIA

- **The foundation of electric system reliability in North America is built upon the “control area” concept.**
 - Control areas are obligated to follow established reliability criteria
 - Control areas are required to match their prevailing load with their generation acquisitions - continuously
 - *If generation is insufficient to satisfy the prevailing load, then the load must be reduced (curtailed)*

NERC RELIABILITY COORDINATORS

- **There are 21 Reliability Coordination offices in North America**
 - The role of the Reliability Coordinator is to maintain a big picture overview of the piece of interconnected network for which they have responsibility
 - The Reliability Coordinator has ultimate authority over the control areas within their Reliability area

NWPP HISTORIC DATES

- 1942 - Operating Committee
- 1964 - Pacific Northwest Coordination Agreement signed
- 1990 - Transmission Planning Committee

VISION

The Northwest Power Pool serves as a forum for reliability and operational adequacy issues in the Northwest for both transmission and generation

DEMOGRAPHICS

- 7 U.S. States
- 2 Canadian Provinces
- Federal, Public, Private, Provincial Ownership
- International Boarder (Treaties associated with water)
- Non-Jurisdictional as well as Jurisdictional
- Preference Act– Public Law 88-552
- 160 Consumer-owned electric utilities
- 17 Control Areas (34 in the Western Interconnection (WI)).
- 62,149 Transmission circuit miles (53.7% WI)
- ~78,000 Megawatts Total Resources (44% WI)
- ~ 45% Winter Peak load of the WI
- ~ 45% Energy load of the WI
- Automated Reserve Sharing Procedures
- Hydro Coordination
- Hydro Thermal Integration
 - *Hydro located on the West (BC, ID, OR, WA)*
 - *Thermal located on the East (AB, MT, NV, UT, WY)*

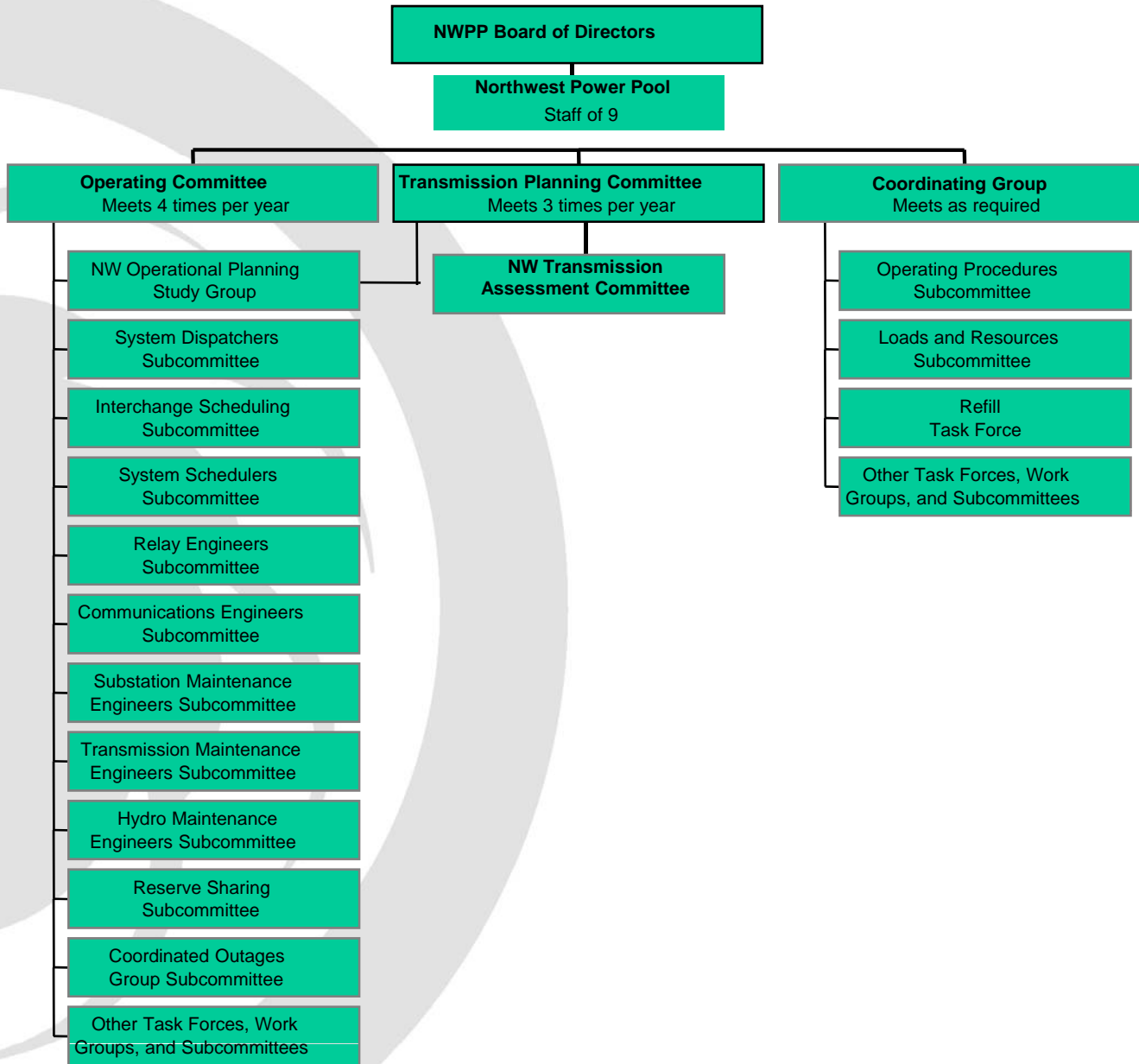


THREE MAIN COMMITTEES

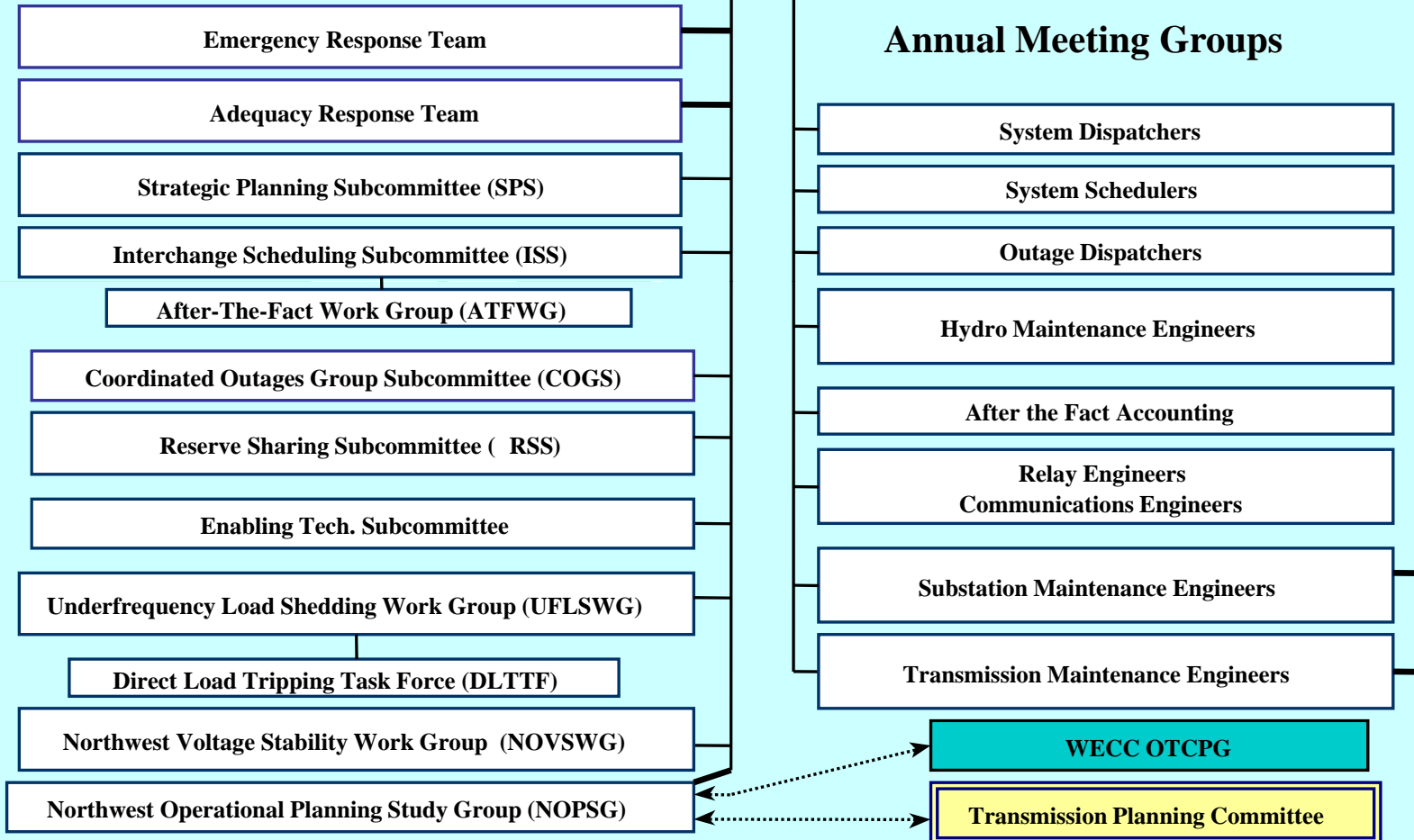
- **Operating Committee**
 - *Foster coordination and communication.*
- **Coordinating Group**
 - *Administer the Pacific Northwest Coordination Agreement, optimizing Columbia Basin hydro generation.*
- **Transmission Planning Committee**
 - *Provide a forum for reliable transmission planning.*

PARTICIPANTS

- Utilities and generators within the Northwest Interconnected areas.
- Eight States and two Canadian Provinces.
- 17 Control areas.



Northwest Power Pool
OPERATING COMMITTEE (OC)



POOL OPERATIONS – Physical

- Adequacy Assessments - to assess the NWPP ability to meet and sustain load demands at all times including extreme load conditions as a result of weather or loss of generation

RELIABILITY – Defined

- Two Foundational Elements
 - **Adequacy** - The ability to supply the aggregate electrical demand and energy of consumers
 - **Security** - The ability to withstand sudden disturbances

PHYSICAL FACTORS (that Drive Northwest Reliability)

- Generation/Resources
- Load
- Transmission
- Temperature

LOAD/RESOURCE PLANNING

Existing Resources

- Resources $\approx 80,000$ MW
 - *Hydro* (35%) $MW(59\%)$ aMW
 - *Thermal & Other* (65%) $MW(41\%)$ aMW
- Reserves are Built-in (NWPP Reserve Sharing)
- Coordinated System Water
 - *1936-37 Water* $\approx 11,000$ aMW
 - *Average Water* $\approx 14,000$ aMW

LOAD/RESOURCE ANNUAL PLANNING – Existing Resources

- Resources - Capacity ≈ 80,000 MW
 - *Hydro (59%)*
 - *Thermal & Other (41%)*
- Peak Winter Load ≈ 58,000 MW
- Energy - Delivered ≈ 325,000
GWh
 - *Hydro (35%)*
 - *Thermal & Other (65%)*



COLUMBIA RIVER TREATY

- 1948 Vanport flood
- 1950's Treaty negotiated
- 1965-73 Canada builds three dams: Duncan, Arrow and Mica
- US allowed to build Libby
- Canada gets flood control payment
- Canada gets 1/2 of the “coordinated” US benefit from the Mica, Arrow, and Duncan
- 30 years of benefit calculated and sold to US utilities

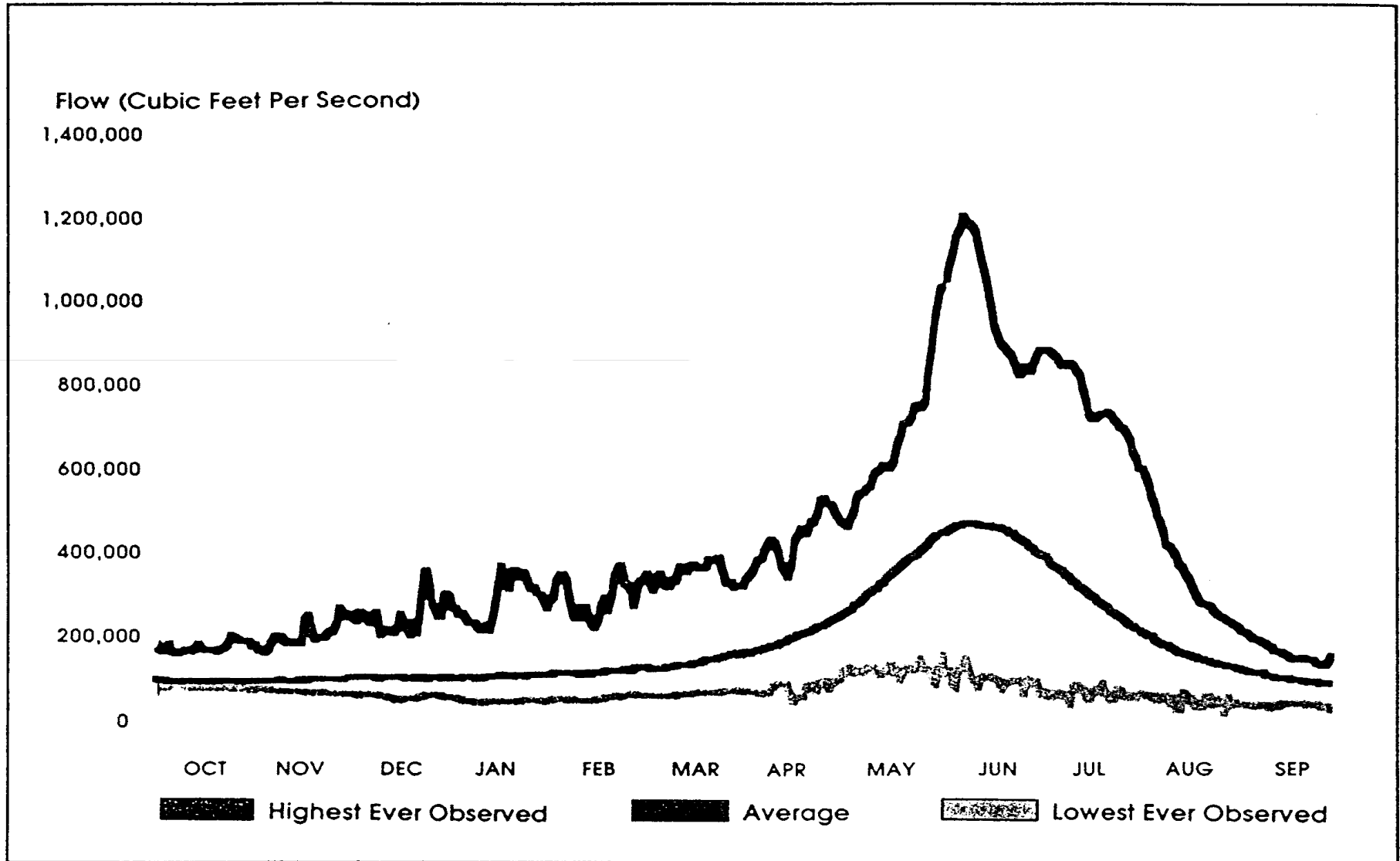
COLUMBIA RIVER TREATY

- Revelstoke filled
- Non-Treaty Storage Agreement

PNCA COORDINATION

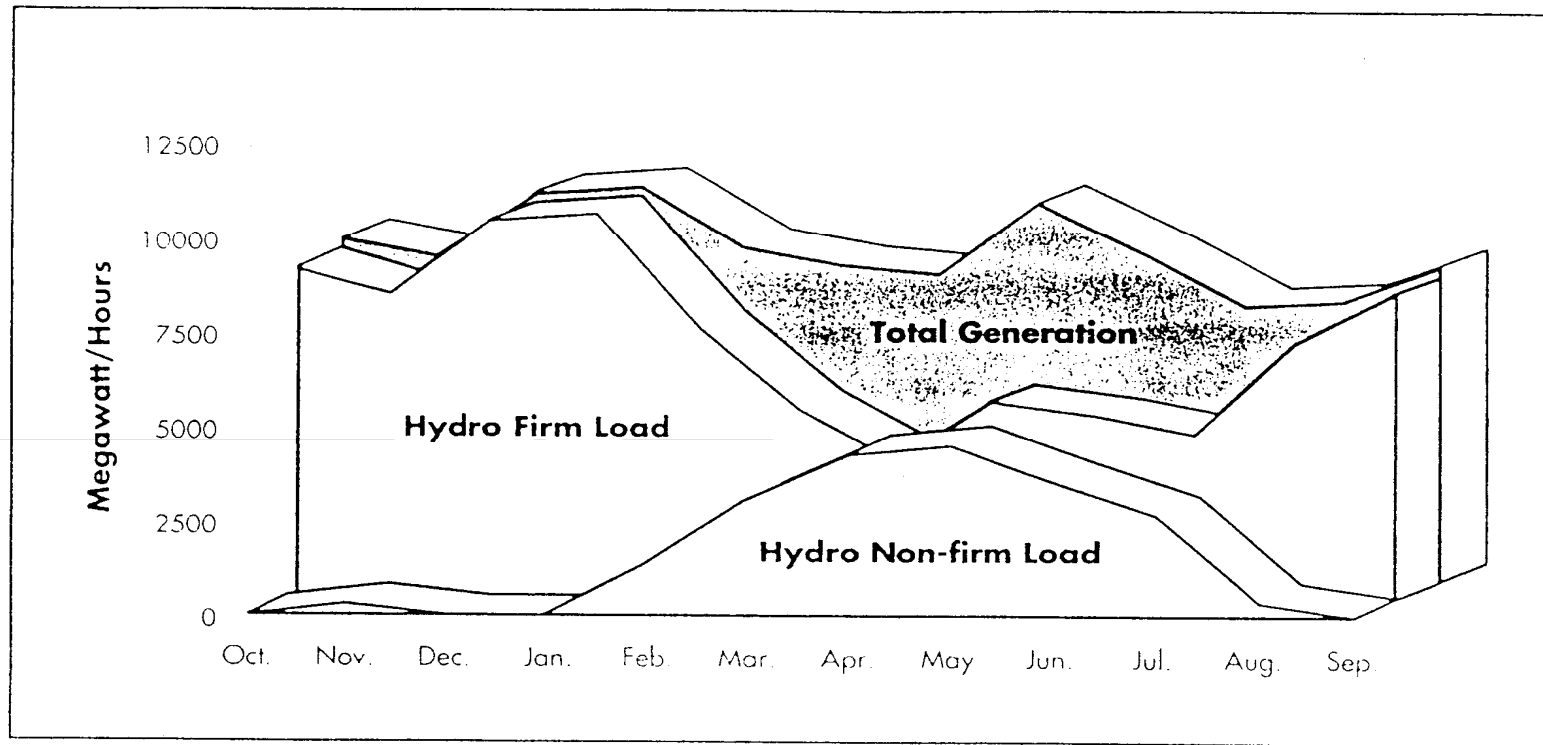
- Critical Period Planning: That period in the historical water record that meets the least amount of firm load
- Previously the Critical Period was 4 years, but now 7 months
- Output of planning process are operating curves for reservoirs and FELCCs the systems

Columbia River Streamflows



Flow on the Columbia River is generally measured at The Dalles, Oregon. Historic records show an annual pattern, with peak flows in late spring.

Graph of Typical Year



Loads and power production also vary significantly during the year. Hydro projects are fueled by water flows, which are higher during the spring and summer as snowpack melts. Loads are highest in the winter in the Northwest, as people turn up their thermostats to keep warm. Surplus energy can be either sold in the Northwest or sent to California, which has higher loads in the summer, and California utilities can send energy back to the Northwest in the winter, when we need it.

COORDINATED RESERVOIR OPERATIONS

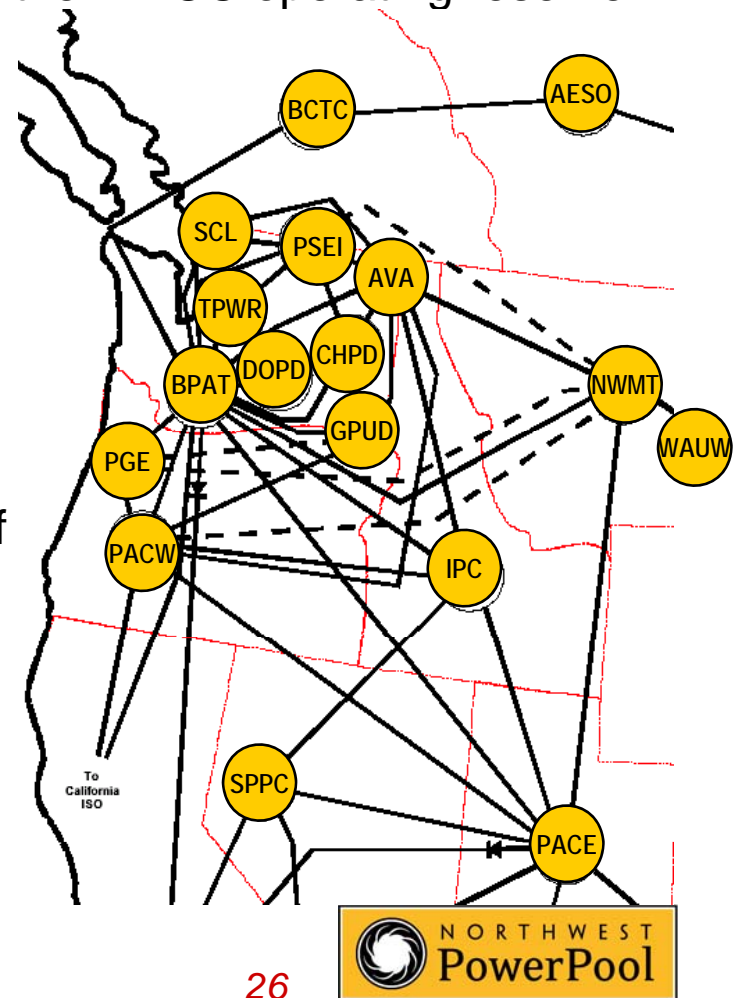
- Actual Energy Regulation
 - FELCCs and curves from the planning process
 - Actual and estimated streamflows
- Proportional draft
- Energy in lieu of water
- Provisional energy

POOL OPERATIONS – Physical

- Contingency Reserve Sharing to provide 60-minute recovery assistance following
 - Loss of a generating resource.
 - Failure of generating unit to increase due to:
 - *Failure to start.*
 - *Plant internal equipment problems.*

NORTHWEST POWER POOL

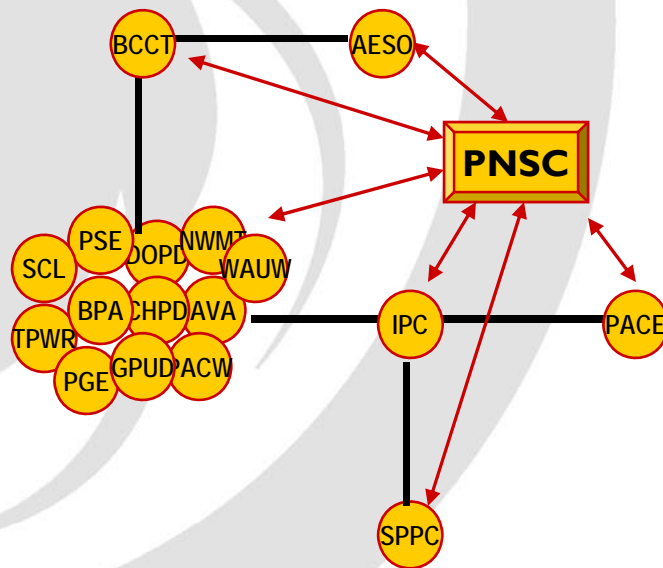
- The Northwest Power Pool (NWPP) serves as a “reserve sharing group” for the sixteen control areas in the Pacific Northwest
- The NWPP in aggregate must satisfy the WECC operating reserve requirements.
- Only contingency reserves are shared.
- Since the NWPP is so large, the 5% and 7% contributions are almost always larger than the MSSC. Therefore, each control area’s “obligation” to the NWPP is normally set to the 5% and 7% contributions of its generation.
- Each NWPP member is responsible for maintaining its own:
 - regulating reserve,
 - reserve for interruptible imports, and
 - reserve for on-demand obligations.



GETTING RESERVE FROM OTHER MEMBERS

The Control Area that experiences a loss of generation:

- must first use its contingency reserve “obligation” (e.g. 268 MW).
- is entitled to request the contingency reserve “obligations” of other members to cover the balance of the loss (e.g. 432 MW).
 - The request is transmitted electronically (ICCP) to the PNSC computer system.
 - The computer system “prorates” the request to other members with some regard for minimizing transmission impacts.



- The computer system sends electronic signals (ICCP) back to the requestor and out to the other pool members
- The computer signals go directly into each control area’s AGC, triggering generation changes. Effectively establishes dynamic schedules from pool members to the requestor.
- 60 minute limit.

SETTLEMENTS HERE AND NOW

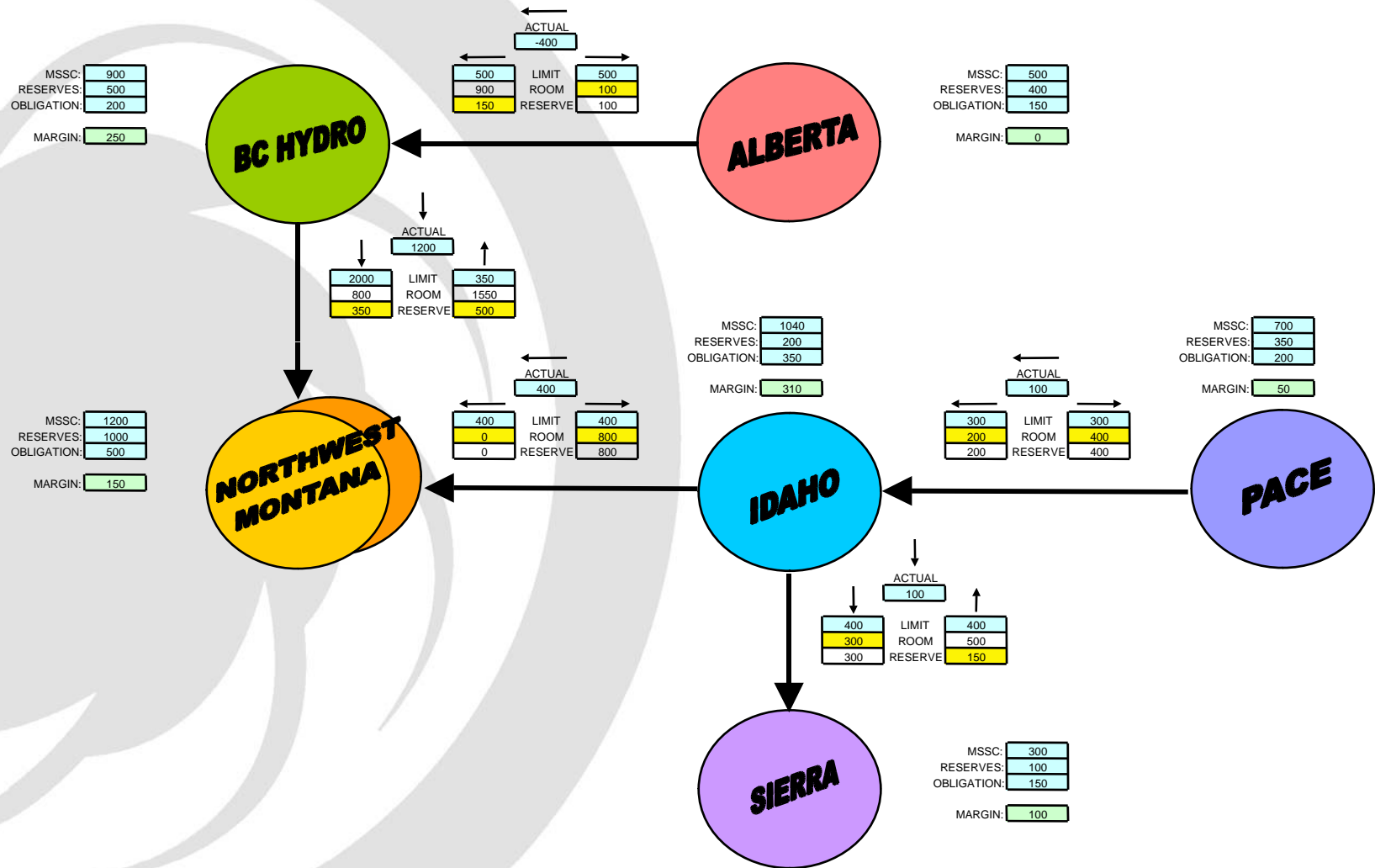
- The adopted NWPP Contingency Reserve Sharing Procedure settlement language allow for financial settlements and physical settlements.
 - Financial Settlements states that receivers should reimburse deliverers for the energy delivered at the Dow Jones Mid-Columbia index price.
 - Physical Settlements allow for the return of energy
- Procedure does not preclude members from mutually agreeing to an alternative means for settlement. Members are encouraged to be flexible when working with jurisdictional members who believe they are legally prohibited from financially settling reserve deliveries.

RESERVE SHARING GROUP

The NWPP Reserve Sharing Group includes all the control areas in the Northwest region:

- Avista
- Alberta Electric System Op.
- BC Transmission Corp
- Bonneville Transmission
- Chelan PUD
- Douglas PUD
- Grant PUD
- Idaho Power
- Northwestern Energy
- PacifiCorp West
- PacifiCorp East
- Portland General Electric
- Puget Sound Energy
- Seattle City Light
- Sierra Pacific Power
- Tacoma Power
- WAPA Upper Great Plains

REAL-TIME APPROACH TO ADDRESSING TRANSFER PATH CONSTRAINTS ON CONTINGENCY RESERVE DELIVERIES



POOL OPERATIONS – Physical

- Under-frequency Load shedding - to arrest frequency decline in the event of a contingency such as severe generation/load imbalance.
- System Restoration - Restore a Base Transmission Grid within 45 minutes and to restore all NWPP loads within 4 hours

POOL OPERATIONS – Physical

- Outage Coordination - to coordinate the schedule of transmission outages enhancing system reliability and reducing the number of hours under constrained conditions
- Emergency Response Team - the ability to respond to a real time reliability issues such as extreme temperature conditions creating extreme load

INTERCHANGE ACCOUNTING

- Interchange Accounting is managed through a third party reporting agency - CASSO. This allows for an independent firm to accurately account for all interchange between all the Control Areas (16) within the NWPP.

INADVERTENT EXCHANGES

- Inadvertent Interchange provides a measure of non-scheduled Interchange and bilaterally scheduled inadvertent payback.

POOL OPERATIONS – Physical

- Adequacy Assessments - to assess the NWPP ability to meet and sustain load demands at all times including extreme load conditions as a result of weather or loss of generation

INDEPENDENT POWER PRODUCERS

- Independent Power Producers (IPPs) participate in the industry by contractual agreements (Interconnection) with the Control Area

TRAINING

- NWPP is a NERC and WECC qualified provide of continuing education hours
- Courses
 - Reserve Sharing
 - System Restoration
 - Underfrequency Load Shedding
 - Time Error Control

TRANSMISSION PLANNING

- Sub-Regional Studies to identify
 - Transmission option within a Sub-Region
 - Connections to Regional Transmission
 - Parities with similar interests and goals – local stakeholder involvement
 - Local costs and reliability benefits

TRANSMISSION PLANNING


- Northwest Transmission Assessment Committee (NTAC)
 - Forum to address forward looking planning and development of a robust and cost effective Northwest Power Pool area transmission system
 - Contribute to, coordinate, and improve databases and models
 - Coordinate among the parties (i.e., SSG-WI)

NWPP DERIVED BENEFITS

- Operational coordination
- Coordinated reliability programs such as operating reserves
- Coordinated hydro system operation and planning
- Coordination and cooperative communication during critical conditions
- Planning coordination

QUESTIONS?





Thanks