Regional Transmission Adequacy Guidelines

RRG Briefing
Portland, Oregon

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Process Clarification

- Objective: Balance reliability, economic, environmental and other public purpose objectives to optimize transmission and resources to meet the needs of the region.
- Expected result: One or more documents to supplement existing WECC, NERC, and utility reliability criteria
- Proposed Timeline:
  - First set of guidelines (highest priority issues): Sept. 30, 2005
  - Regional review and approval: Dec. 31, 2005

Objective

- How does the region address transmission adequacy challenges that current reliability criteria don't address?
  - How do the existing NERC/WECC standards for the bulk system apply to local load areas
- What guidelines are needed to address challenges that we have planning economic upgrades?
  - Current NERC/WECC address physical adequacy and not economic adequacy

Prioritization of Issues

First Step: Benchmarking → Helps establish the baseline for understanding current application of N-1 and N-2 criteria

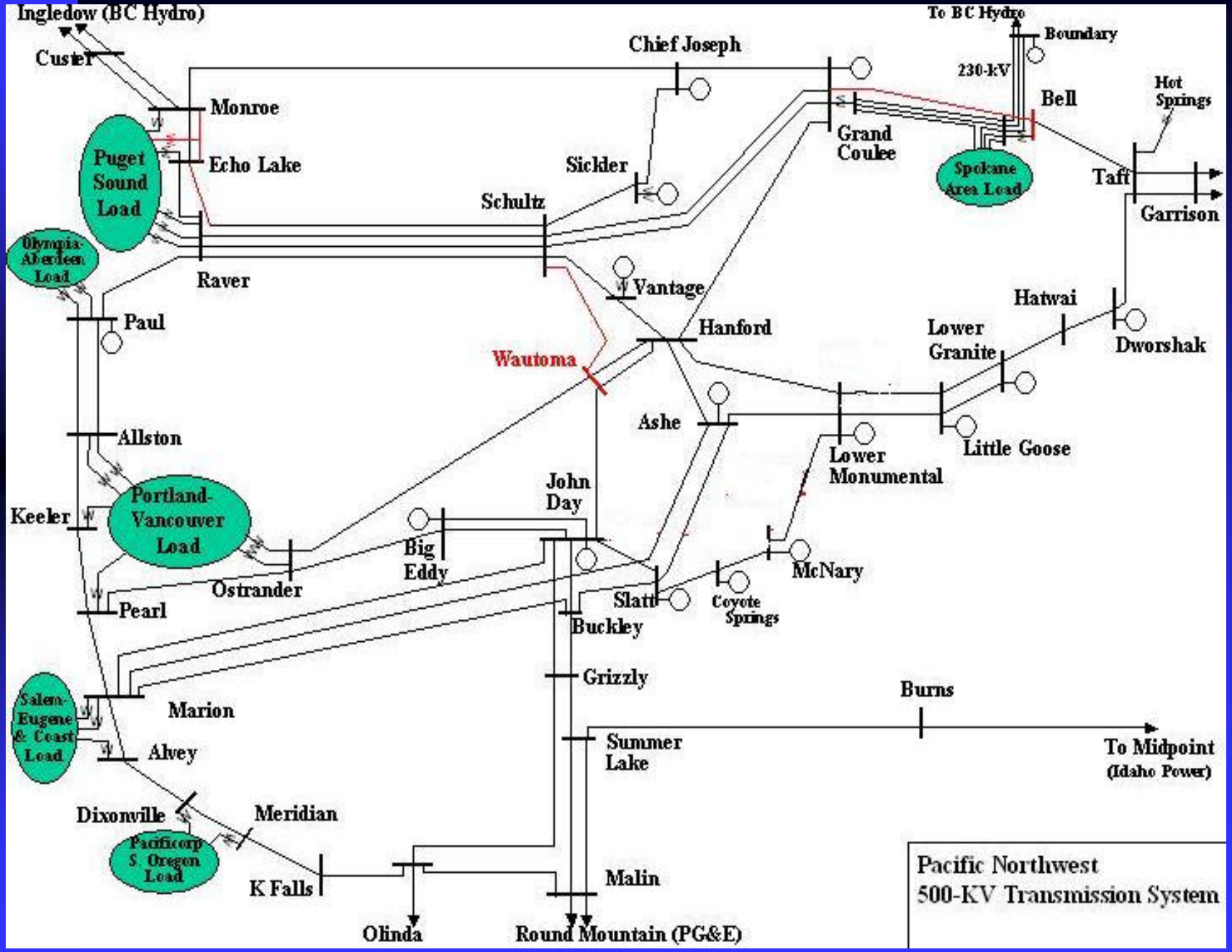
- Load service issue (e.g., Olympic Peninsula – Energy Efficiency/DSM)
  - N-2 requirements (should it be based on MW or geographic scope)
- Robustness of the system: N-1-1?
- Metrics to measure performance
- Linkage between Resource and Transmission Adequacy

N-2 Issue (load service)

- Local Area Network
- Loads and Transfers
- N-2 benchmarking discussed for following areas:
  - BPA – Load areas (Olympic Peninsula, and So. Oregon Coast)
  - PAC – So. Oregon
  - Snohomish System

Proposed Methodology

- Consequence
  - Peak load
  - Fraction of load that can be served under N-2
- Exposure
  - Likelihood of outage(s)
  - Load-duration curve
- Benefit/Cost analysis
  - Cost to fix
  - Societal cost of outages

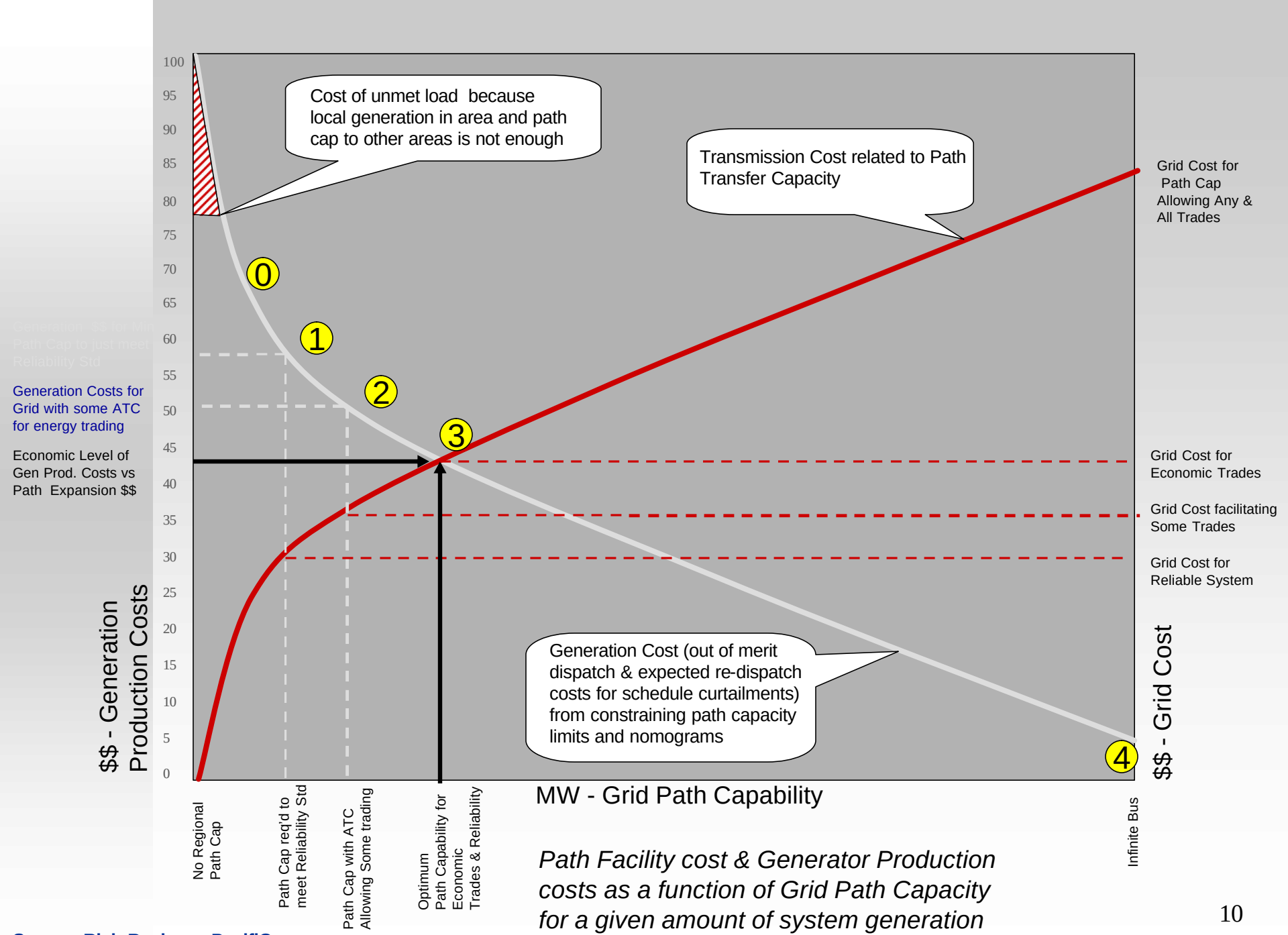

Ingledow (BC Hydro)
Custer
Chief Joseph
To BC Hydro
Boundary
230-kV
Bell
Hot Springs
Monroe
Puget Sound Load
Echo Lake
Sickler
Grand Coulee
Spokane Area Load
Taft
Garrison
Schultz
Olympia-Aberdeen Load
Raver
Vantage
Hatwai
Paul
Hanford
Lower Granite
Dworshak
Wautoma
Allston
Ashe
Little Goose
Lower Monumental
Portland-Vancouver Load
Keeler
John Day
Big Eddy
Ostrander
McNary
Pearl
Slatt
Coyote Springs
Buckley
Grizzly
Salem-Eugene & Coast Load
Marion
Burns
Alvey
Summer Lake
To Midpoint (Idaho Power)
Dixonville
Meridian
Pacificorp S. Oregon Load
K Falls
Malin
Olinda
Round Mountain (PG&E)
Pacific Northwest
500-KV Transmission System

N-1-1

- One element taken out of service intentionally and a contingency unintentionally trips another element
- Power system generally not planned to operate for all N-1-1 conditions (Number of combinations are tool large to plan and cost of the infrastructure needed will be too high)
- Operations cannot address all N-1-1 conditions with the available “tool box” (Safety Net?)

Examples

- Puget Sound - PSANI
- Eugene Area
- Redmond Area
- Suggested Solutions
  - Undervoltage load shedding
  - Coordinated Planned Outage (timeframe)



Path Facility cost & Generator Production costs as a function of Grid Path Capacity for a given amount of system generation

Source: Rich Bayless - PacifiCorp

Transmission Adequacy Issues

- Reliability Versus Economic Adequacy: Policy issues
  - Keep the lights with reasonable assuredness
  - Provide comparable access to supply markets,
  - Provide economic access to economic markets for lowest cost
- Generation costs versus grid transfer path costs
- Generation costs include?
  - Cost of unmet load
  - Out of merit generation production costs as limited by path ratings and scheduling limits
  - Expected curtailment re-dispatch following transmission outages
  - Generation cost/price volatility: illiquidity created by transmission constraints
- What is the "prudent utility practice" and acceptable amount of generation costs at point 1
  - How is acceptable amount established
  - To whom and how are costs allocated now – tariff provisions
    - Generation and transmission
  - What is meant by firm?
- If grid is expanded to point 2 to bring reliability back from pt 0
  - "Lumpyness" of transmission capacity additions and environmental, ROW concerns
  - How much to add (why stop at point 2?)
  - Allocation of costs and capacity added: present tariff treatment
  - Who pays for extra
- For pt 3, how is path capacity allocated to make sure of best use
  - Who pays for added capacity
  - Who receives generation cost reductions
- Pt 4: Decoupling transmission and generation, totally comparable service
  - Society can't afford to add enough transmission to decouple generation from transmission costs totally,
  - or provide exactly comparable service.
  - How to provide fair allocation of costs and benefits

Source: Rich Bayless - PacifiCorp

Contact Information

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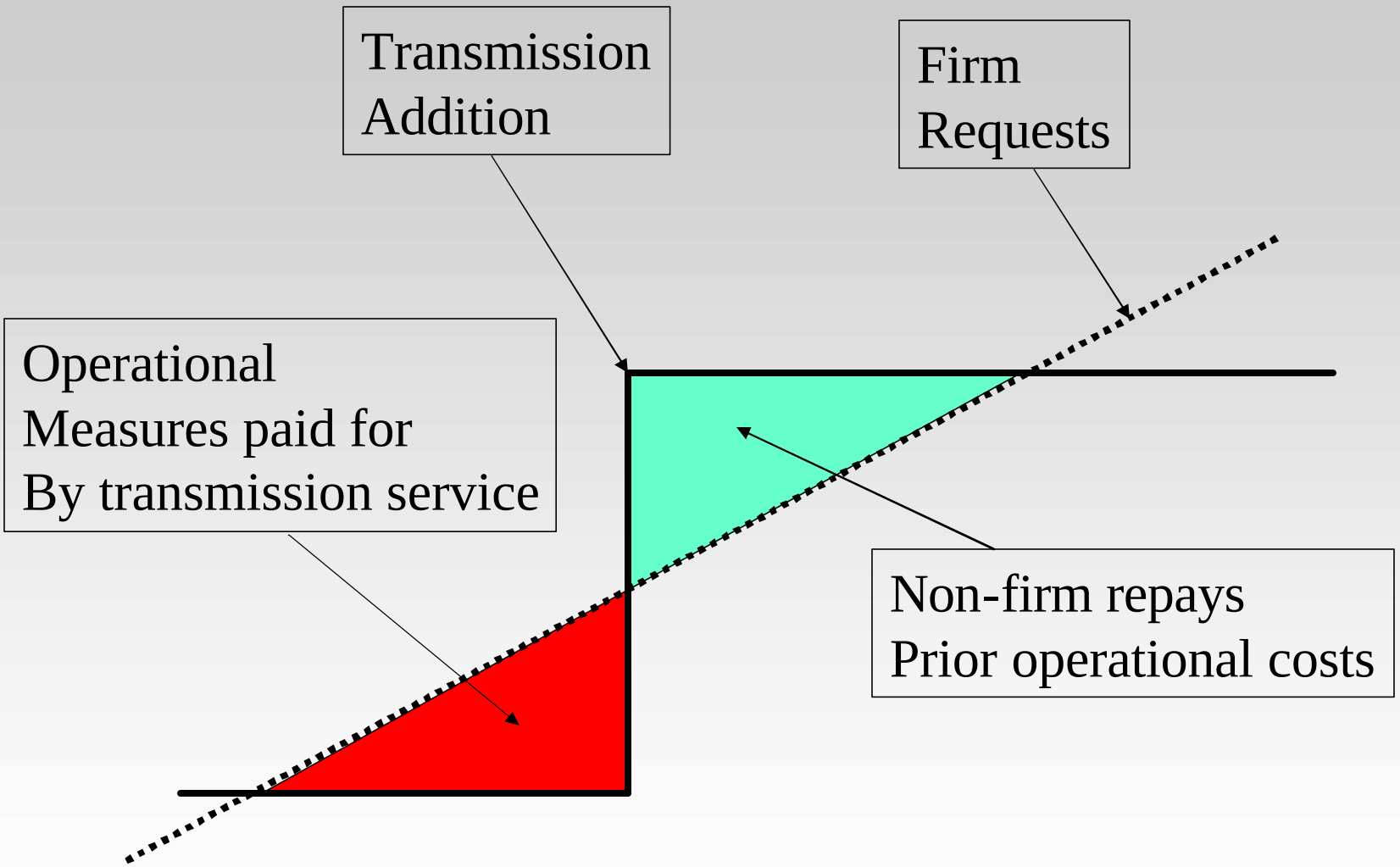
Backup Slides



Source: Bill Mittelstadt (BPA)

Potential Elements of a Transmission Adequacy Guidelines

Reliability Standards

- NERC, WECC and BPA standards
- Explicit performance criteria such as LOLP
- Probabilistic criteria
- Robustness tests
- Extreme event tests

Economic Indicators

- Societal benefit/cost analysis of reliability – Value of load loss
- Acceptable levels of congestion
- Definition of least cost solutions
- Price volatility and tolerance
- Assurance level for maintaining ATC across flowgates

Potential Elements of a Transmission Adequacy Guidelines

Expansion & Pricing Policy

- Drivers
  - Generation
  - Load
  - Transfers into, out of and through the region
  - Flexibility
- Financial
  - pricing expansion
  - Advance financing requirements or other risk management tools

Other Objectives

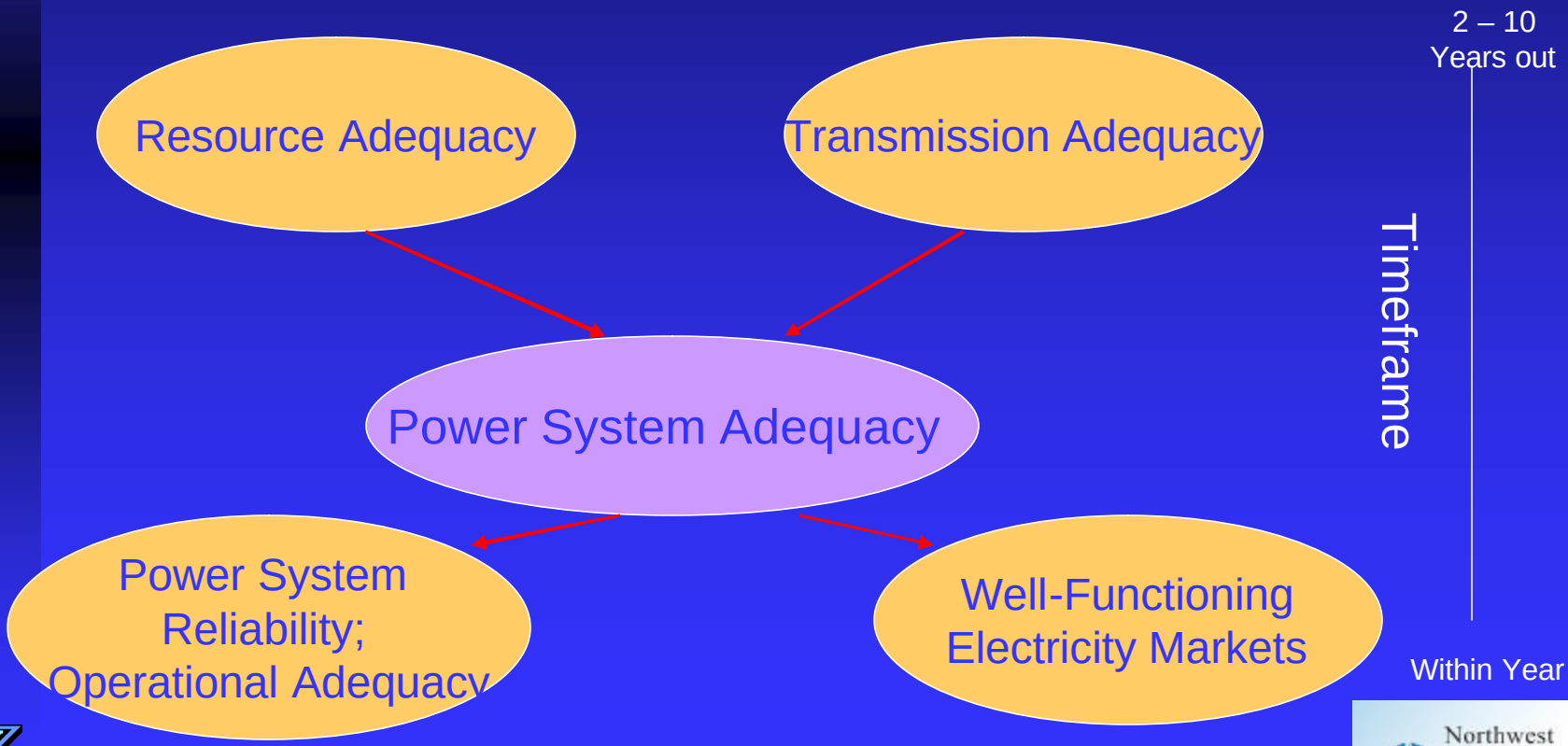
- Development of renewable
- Resource diversity
- Economic development
- Seasonal products

Possible Solutions

- Amounts and obligations for RAS (or special protection scheme)
- Re-dispatch (mechanisms)
- Curtailment strategies
- Non-Wires Solutions
- Changes to maintenance practices to provide for more flexibility
- Better load forecast mechanisms
- Investigate and incorporate new technologies
- Locational Marginal Pricing (LMP) – Requires formation of an Independent Transmission Operator
- Computer tools to assess state of the transmission system in real-time

Linkage of Resource and Transmission Adequacy

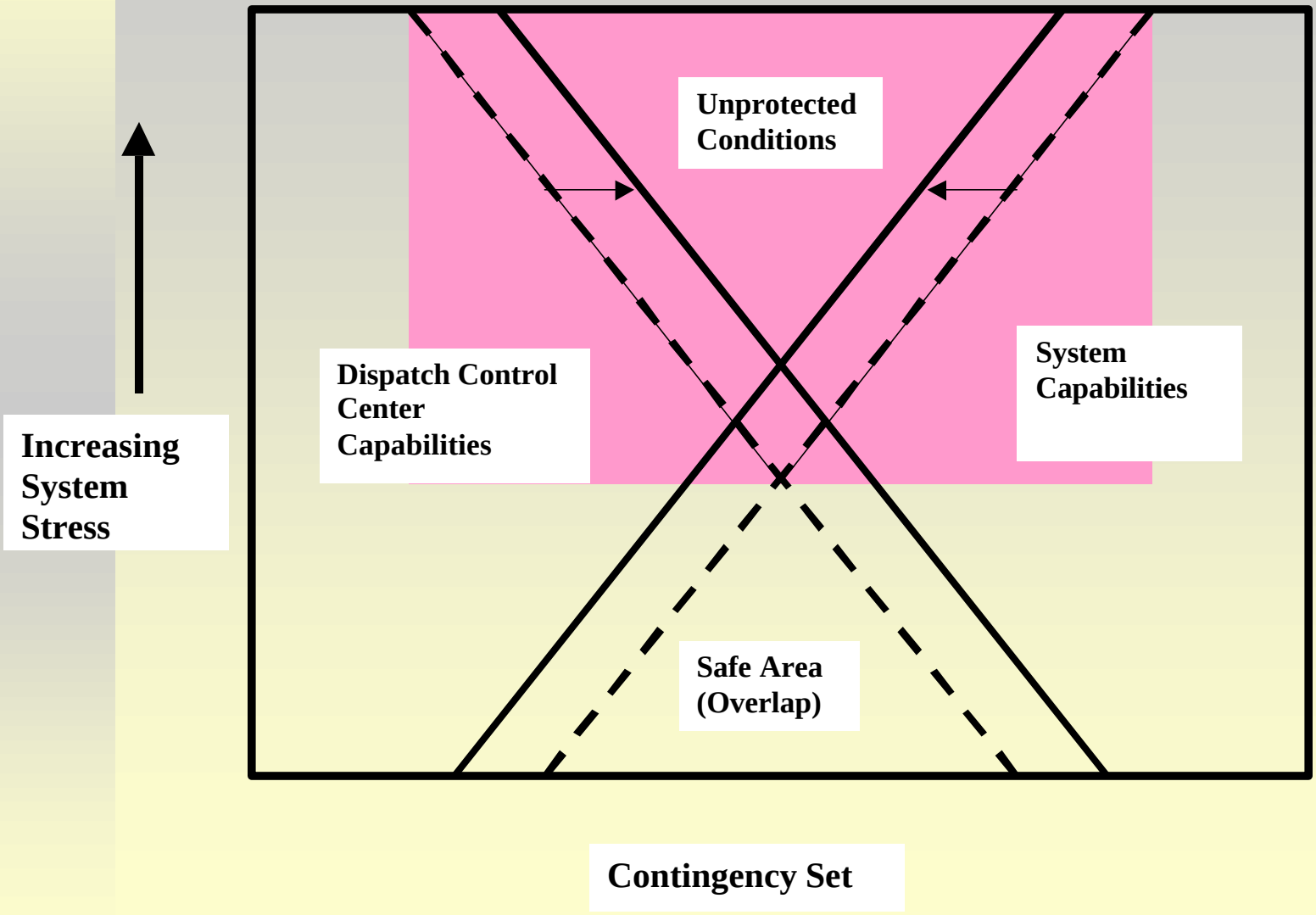
Adequacy = Physical (lights stay on) **and** Economic (acceptable risk that prices reasonable & not volatile) **or** just Physical?



Source: NW Resource Adequacy Metrics & Standards. TAS meeting, Jan. 10, 05, PDX.

Northwest Power and Conservation Council

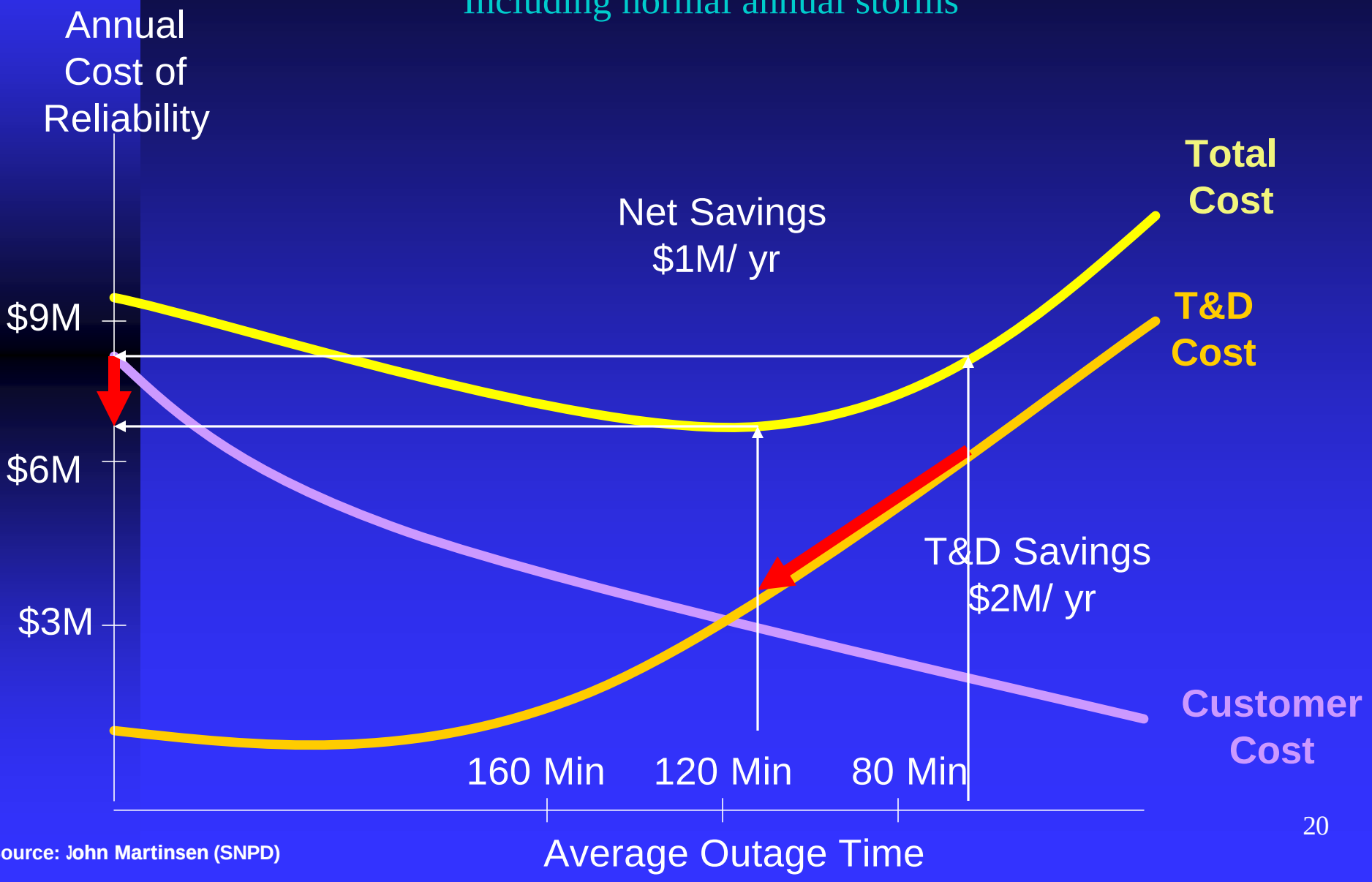
Reducing Risks



Source: Bill Mittelstadt & Brian Tuck (BPA)

System Reliability Engineering

Including normal annual storms



Source: John Martinsen (SNPD)