



PBL Capital Investment Plan

Bonneville Power Administration

September 2001



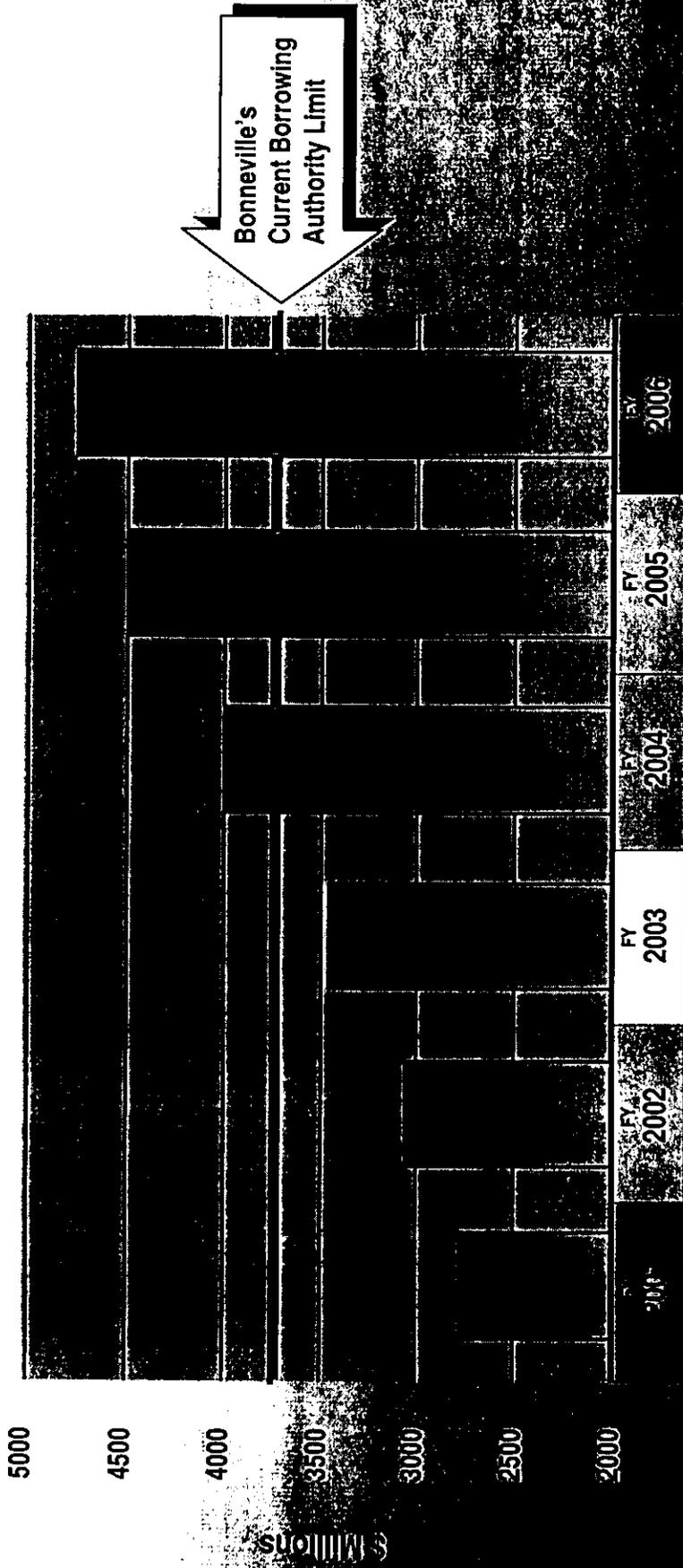
PBL Capital Investment Plan

Overview

- BPA's load reduction exercise provided a short-term solution to the supply/demand imbalance.
- Now it is time to move on to long-term solutions that address the fundamental issue of generation and transmission supply.
- A reliable power supply requires capital investment in both generation and transmission.
- These are multi-year projects with long lead times. Action is needed now.
- As a result, BPA has a projected need to increase its borrowing authority by \$2 billion (\$1.3 billion for transmission, \$0.5 billion for generation projects), and \$0.5 billion for conservation - (the balance of the needed capital comes from \$0.3 billion of retired debt).



Bonneville's Projected Use of Borrowing Authority



The graph shows BPA's projected total borrowing through FY 2006. The line on the graph shows that without an increase in BPA's borrowing authority, the agency will be unable to fund its infrastructure projects sometime during the 2004 fiscal year. That has an impact now because the capital projects require long-term planning. The agency needs to have its borrowing authority increased to provide a reliable source of capital to support long-term commitments to improvements in generation and transmission.

PBL Capital Investment Plan

- The PBL Capital Plan consists of four major components: investments in the hydro system, investments to acquire cost-effective conservation, investments in new computer hardware and systems, and fish and wildlife.
- Investments amounts in the 2002 Power Rate Case are sufficient to address investments in computer systems and fish and wildlife.
- Increased borrowing authority is needed to fund incremental components of conservation and generation investment plans.
- The FORPS represents about 90% of BPA's power supply and includes 31 hydro projects with over 200 generating units. These projects have an average age of 45 years. A life extension program has begun.
- BPA has a statutory mandate to acquire all cost-effective conservation when developing new power resources to meet future loads.



PBL Capital Investment Plan

- With limited prior investment generation availability for the FCRPS was as low as 82% compared to an industry benchmark of 90%
- Through direct funding, generation availability has been restored - 89% last year
- In 1998 Congress directed BPA to report on its program for managing generating assets; the Asset Management Strategy for the FCRPS was issued in mid-1999

The Strategy concluded there was a need to invest nearly a \$1 billion over the next 12-15 years

Without investments, recent history indicates that generation availability may decline as much as 1-7.5% per year

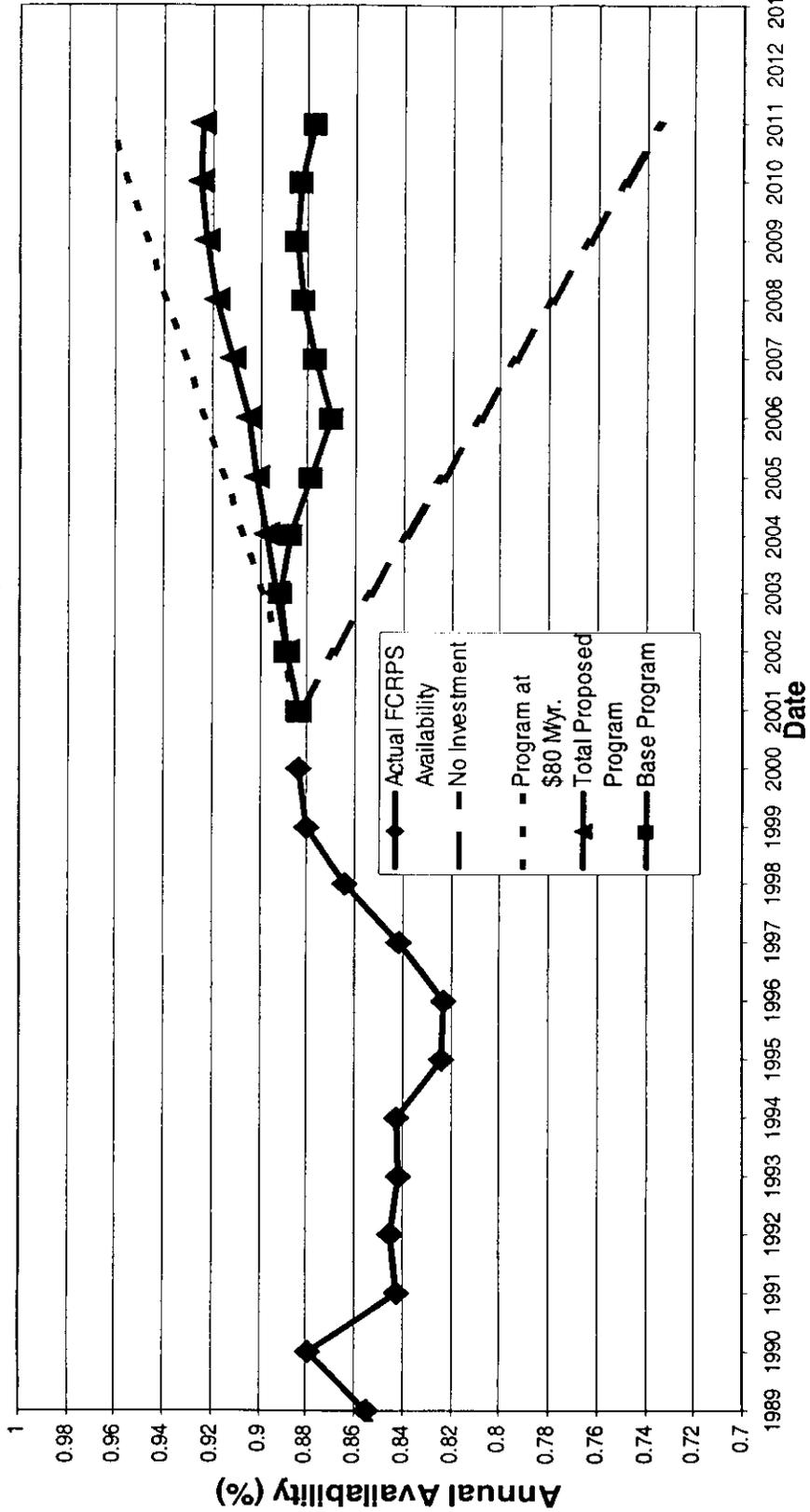
The goal is to achieve 95% availability

Over 10 years and for reliability investments alone, 360 MW of additional energy is possible at the full program levels

An additional 380 MW is possible through generation efficiency improvements, optimization of hydro operations, and new generation capacity at existing projects. Total investment budget is \$1.272 billion. Of this \$776 million was anticipated in the 2002 Power Rate Case. The \$496 million remaining represents additional investments which would provide a 1.8% internal rate of return (PBL's investment criterion)

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FCRPS - MW Weighted Availability and Projection of Availability with Different Levels of Reliability Investment





PBL Capital Investment Plan

The table below shows the original budget for the Asset Management Strategy and the additions proposed that support the request for increased borrowing authority for the 2002-06 Rate Period.

BUDGET (\$ million)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total \$ FY 2002-06	Total \$ FY 2007-11	Grand Total \$ FY 2002-11
Asset Management Strategy funds for reliability and generation efficiency <small>(includes rate \$289)</small>	39.9	36.8	60.7	62.1	62.2	362.6	492.8	775.4
Generation Expansion (new development at existing projects)	14.1	27.0	15.9	20.0	28.0	105.0	186.0	291.0
Past Years Carry Forward (prior years funds budgeted but not expended; 25% in gen. effic. & 75% in reliability)	0.0	0.0	16.0	30.4	33.6	80.0	0.0	80.0
Hydro Optimization Increment (funds for additional energy that has quick, significant economic return)	1.0	2.0	4.0	4.0	4.0	15.0	10.0	25.0
Reliability Investment Increment (additional funds to maintain a consistent investment in reliability)	0.0	1.2	19.4	13.9	13.4	48.0	52.2	100.2
Subtotal Incremental	15.1	30.2	55.2	68.3	79.0	248.0	248.2	496.2
TOTAL	105.0	117.0	117.0	130.4	141.2	610.6	661.0	1,271.6



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The projected investment in the FCRPS will produce energy equivalent to the output of two new CCTs at a fraction of the fixed cost and with free fuel. This energy gain was used to evaluate the rate of return that is a critical part of the justification for the investment program.

INCREMENTAL ENERGY ACQUIRED (aMW)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total FY 2002-06	Total FY 2007-11	Grand Total FY 2002-11
Small Capital	*	*	*	*	*	*	*	*
Generation Efficiency	10.0	10.0	15.4	22.6	22.2	80.2	76.9	157.1
Hydro Optimization	6.0	9.1	18.1	21.2	21.2	75.6	84.7	160.3
Reliability Investments	28.1	28.1	33.8	33.4	32.8	156.2	207.9	364.1
Generation Expansion	0.5	6.1	3.8	4.3	11.1	25.8	33.0	58.8
TOTAL	441.6	56.8	71.1	81.5	87.3	357.8	402.5	740.3

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- The planned investment in the FCRPS is considerably less than that of other comparable hydro systems on an installed capacity basis. See table below.

	FCRPS Investment per Installed Capacity (\$/kW) FY2001-2006	
Compared to past levels of investment by other hydro utilities		
Representative Hydro Utilities Benchmark		
BC Hydro		> \$ 7.00 /kW
Ontario Power Generation		\$ 6.16 /kW
Vattenfall (Sweden)		\$ 16.67 /kW
Duke Power		\$ 4.66 /kW
TVA		\$ 16.52 /kW
Seattle City Light		\$ 14.20 /kW
		\$ 7.42 /kW



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Rates of Return on FCRPS Investments

- Internal rates of return for the entire 10-yr program for each category of investments, assuming 20 years of benefits and expected market prices from the second table below, are:

Category	Total Program
Generation Efficiency	35%
Hydro Optimization	168%
Reliability	32%
Overall	39%
Generation Expansion	TBD *

* The overall rate of return for the entire program is 39%.

Internal rates of return for base and incremental investments under a range of future market prices are:

Category	Base Program	Incremental Program	Total Program
Expected Market Prices (\$48/mwh)	40%	20%	39%
High Prices (\$72/mwh)	67%	57%	65%
Low Prices (\$24/mwh)	19%	16%	18%

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- A diverse portfolio of resources provides a more reliable approach to meeting Bonneville's load obligations
- Investments in energy efficiency help reduce financial risk associated with market purchases when market prices are volatile
- The NWPPC's Power Plan specifies that Bonneville's share of the regional target for cost-effective conservation will be about 220 aMW by 2006, and nearly 500 aMW by 2011.

The Conservation Augmentation Strategy, dependent on new borrowing authority, is expected to produce about 100 aMW during the next 5 years, and approximately 125 aMW in the following 5 years, or about 25% of the Council's target.

ConAug offers several ways for customers to participate in regional energy conservation; the overall capital budget for ConAug is based on an average cost per megawatt acquired, but budgets for component programs are not set beyond FY 2002.

Capitalizing the conservation purchases spreads the cost of the conservation over a number of years, thereby reducing the rate impact of acquiring the conservation over the 2002-06 Rate Period.

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Conservation Investments

- ConAug program components include (1) Request for Interest in Reducing Load Through Conservation (IRLC), (2) Residential Compact Fluorescent Lighting, (3) "Vending Miser", (4) Federal "Quick Start", and (5) several other initiatives that still are being designed.
- Since Bonneville is negotiating program features and customer-specific deals, individual contracts and types of measures are not known far in advance. Bonneville is setting cost targets that will change as prices on the market changes.
- Through its "Energy Web" Initiative, Bonneville also is exploring how best to integrate demand side management, distributed generation, including direct application renewables (DAR), and other "cutting edge" technologies into its resource portfolio.



PBL Capital Investment Plan

- The following table summarizes BPA's new Conservation Investments:

SUMMARY (\$ millions)	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total FY 2002-06	Total FY 2007-11
	Con Aug	\$ 24.0	\$ 40.2	\$ 58.0	\$ 73.8	\$ 94.0	\$ 290.0
* IRLC	\$ 13.5	\$ 16.2	N/A	N/A	N/A	\$ 29.7	N/A
* Regional CFL	\$ 3.5	N/A	N/A	N/A	N/A	\$ 3.5	N/A
* Vending Miser	\$ 4.7	N/A	N/A	N/A	N/A	\$ 4.7	N/A
* Fed Quick Start	\$ 2.1	N/A	N/A	N/A	N/A	\$ 2.1	N/A
Energy Web	\$ 2.0	\$ 2.0	\$ 2.0	\$ 2.0	\$ 2.0	\$ 10.0	\$ -
TOTALS	\$ 26.0	\$ 42.2	\$ 60.0	\$ 75.8	\$ 96.0	\$ 300.0	\$ 200.0
CUMULATIVE TOTALS	\$ 26.0	\$ 68.2	\$ 128	\$ 204	\$ 300		

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Rates of Return on Conservation Investments

- Internal rates of return for the 5-year conservation capital program from a regional cost-effectiveness viewpoint (assuming 20 years of benefits, and not reflecting "lost revenues" to BPA) are shown in the following table. (If the lost revenues to BPA are included, the ROR is negative; see the second table for the resulting rate impact.)

Conservation 5-Year Program	ROR
Total Expected Market Prices	14.5%
Total High Market Prices	25.3%
Total Low Market Prices	3.1%

Accumulated Net Revenues from Conservation Investment, Accounting for Lost Revenue Effect

Conservation Infrastructure Investments	Accumulated Net Revenues (\$000)		Rate Impact (\$/MWh)	
	FY2002-2006	FY2002-2011	FY2002-2006	FY2002-2011
Expected Market Prices	\$ (67,450)	\$ (196,634)	0.22	0.38
High Market Prices	\$ 22,358	\$ (46,623)	0.07	0.08
Low Market Prices	\$ 13,892	\$ (415,646)	0.38	0.58

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Summary

- The PBL is embarking on a 10-year Capital Investment Plan that identifies a need for \$1 billion of new capital for FY 2002 through FY 2011. This is incremental to a base level of \$775 million in planned capital expenditures over the next 10 years.
- Actual investment levels will be determined through BPA's capital budgeting process and review by customers, constituents, the administration and Congress
- These 10-year projections of BPA's investments in hydro-electric facilities and conservation, along with needed investments in transmission facilities, identify a \$2 billion increase in BPA's limit on borrowing authority.
- This amount should be adequate to fund 10 years of Bonneville's capital needs to meet its responsibilities as an on-going transmission owner and manager of the FC/RPS

Washington EFSEC

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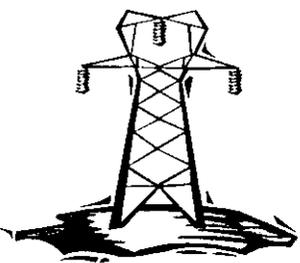
Transmission Briefing

By
Vickie VanZandt
VP, Transmission Operations & Planning
May 14, 2001

1

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Transmission Assessment



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BPA Transmission System

- BPA operates 80% of the high-voltage grid in its service area (OR, WA, ID and western MT).
 - More than 15,000 miles of line
 - Two fully redundant control centers
 - Over \$5 billion federal investment
 - About \$540 million in annual revenues
- About 50% of the grid looking at the U.S. portion of the NW Power Pool (add eastern MT, WY and UT).
- BPA voluntarily complies with FERC open access rules.

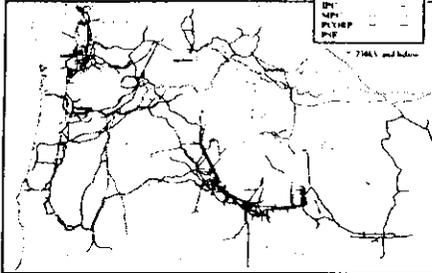
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Fragmentation of the NW Grid

- Five investor-owned utilities also own NW transmission facilities.
- In addition, some consumer-owned utilities own transmission and IO operate control areas.
- Fragmented ownership and "parallel paths" have made it difficult to fix some transmission bottlenecks, and certainly leads to less than optimal solutions.

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Combined Transmission Grid

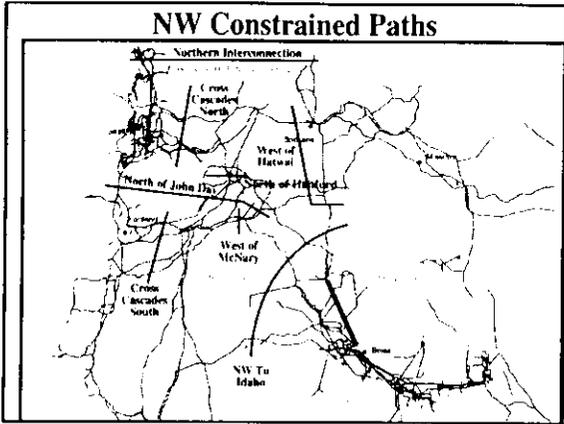


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Current Situation

- The system is under stress because it is operating at or near capacity
- System constraints are affecting our ability to use & care for the system
 - Availability pressures exists to run the system harder
 - Outages for Maintenance & Construction are more difficult to obtain and are compressed in time, due to high utilization by the markets.
- Likelihood of system failure is increasing
 - The system facilities are aging (500kv grid is over 30 years old)

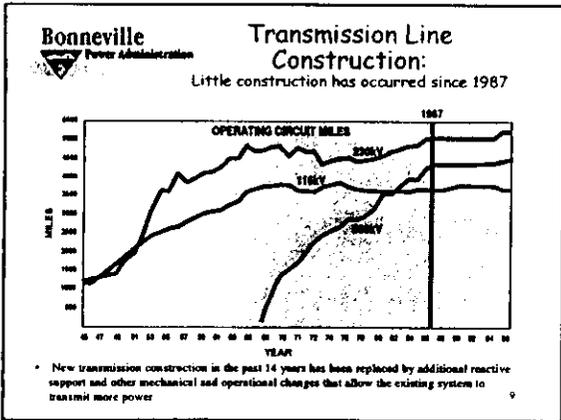
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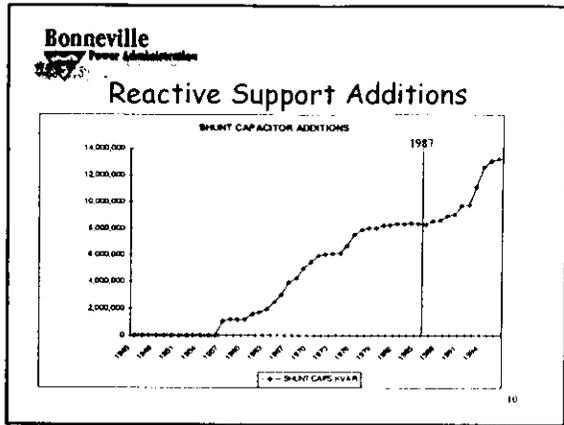


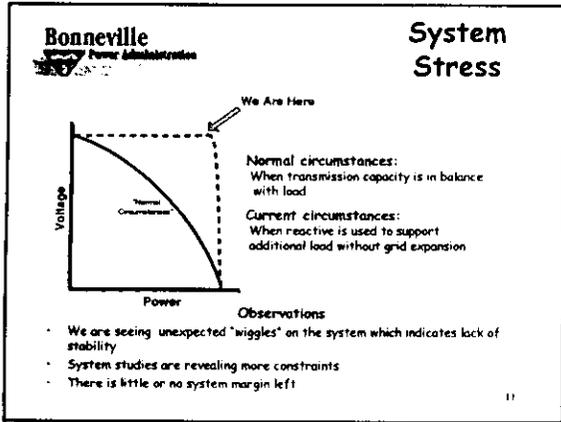
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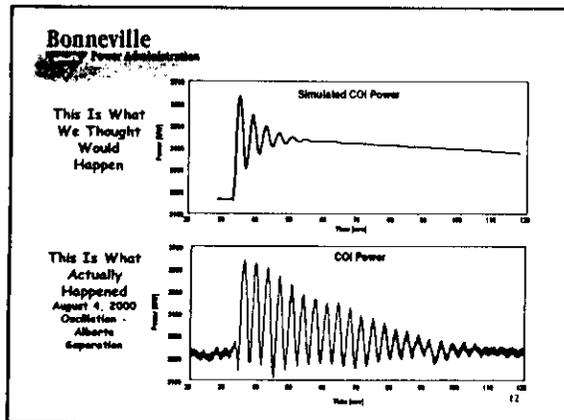
Current Situation

- Approximately 27,000 MW of generation is potentially being sited in the Northwest
 - The Transmission System will become more stressed with the addition of generation if nothing is done to reinforce the existing network
- RTO will begin operation in FY04, at the earliest (sets time baseline)









How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
 - Gaming may occur which could be detrimental to system
- The western interconnection's energy crisis isn't just a generation issue -- it's the transmission system to move it around too
- We've used controls and communications to safely use the margin that was built in, but we've taken this about as far as we can
- California Market conditions are stressing the interties and existing congested paths

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**Regional Transmission Is Not
Keeping Up With Needs**

(From NW Power Pool 10 - YR Forecast)

	<u>1998</u>	<u>2008</u>	<u>% Increase</u>
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

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Solutions

- Recognize that transmission investments are needed now
- Encourage Generation be built near load or uncongested paths as possible
- Seek all conservation & renewable resources available to reduce & manage loads
- Understand the problem has been building over the last decade and there are no quick fixes.
 - It takes two to five years to plan, site & build a major transmission line.
- Seek cooperation and support of other transmission owners (IOUs & Publics) in the Pacific Northwest to meet this challenge

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We Need A Bunch of Wire

- Infrastructure Proposal
 - Puget Sound I-5 Corridor
 - Seattle Area Load Service
 - Canadian Entitlement
 - North of John Day Relief
 - Allows Use of Southern Intertie
 - Bi-Op Commitment
 - Adds Flexibility for Low Water Years
 - West of McNary
 - Somebody Will Site Near Hermiston
 - West of Hatwai and Idaho to the NW
 - California Won't Help Us Any Time Soon, Making Montana and Idaho Imports More Critical To Meeting Regional Winter Peak
 - De-Couple From Sub-Grid
 - Minimizes Effects of Main Grid Outages on Underlying Sub-Grid and distribution Systems

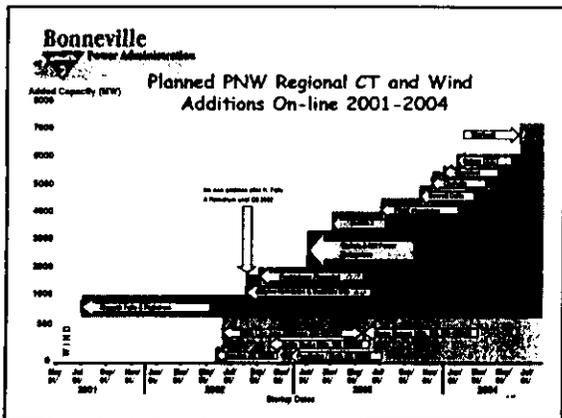
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We Need A Bunch of Wire

- Infrastructure Proposal (continued)
 - Proposal Assumes Some Generators Integrate -- But Not All
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15
- Puts A Little Margin Back Into the Grid
 - Needed For A Competitive Market To Work
 - So We Can Meet Regional Load During Outages
 - So We Can Meet Load and Move Power When Load Goes Away
 - So We Can Actually Do Some Maintenance Without Harming the Market
 - So the RTO Doesn't Start with the Regional Grid heavily congested.

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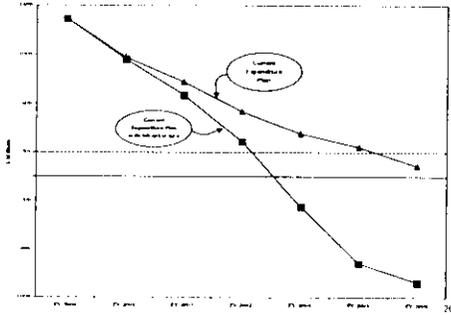
How Does This Get Paid For?

- This infrastructure plan reflects an additional \$775 over our current expenditure plan for 2002-2006 of \$1.3B
- The integration of between 5000 - 5500 MW of generation -- and corresponding use of the transmission system recovers the cost of the new wires
- More generation than that should lower rates

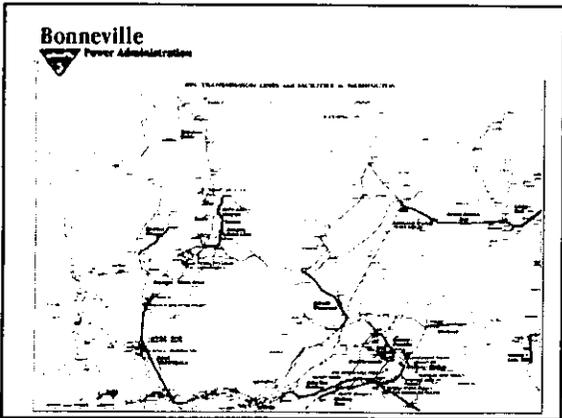
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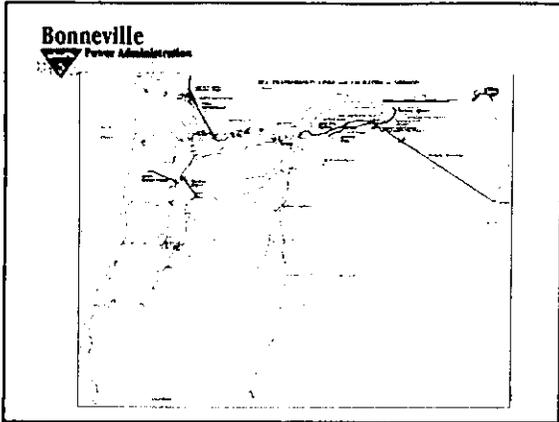


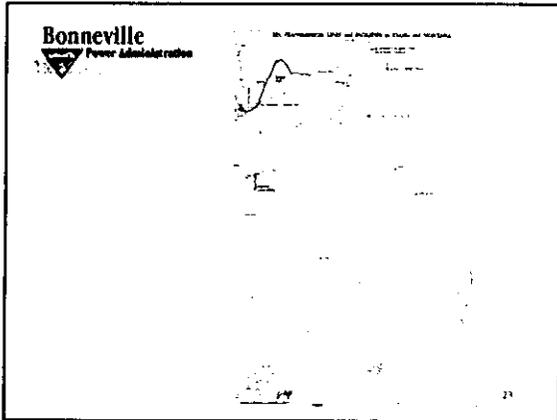
Bonneville's Remaining Borrowing Authority



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Power Administration

Our Concerns

- Resource Requirements will be large
 - Capital - BPA will need access to additional borrowing authority
 - Staff
 - System & Processes
- Keeping the system going as we address these issues will be difficult
- The system may fail before we can act

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Generation Integration

- Queue is 27,000 MW Deep!
- Other Transmission Owners Reporting Similar Traffic

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Generation Integration How To Cope?

- Apply More Resources to the Question
- Some Other Work Will Take Back Seat for the Short Term

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Generation Integration How To Cope?

- Under Consideration
 - Close the Big Queue for Now?
 - Work Through Existing Backlog
 - Possible 'Open Season' for Integration Requests a Few Times per Year?

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Generation Integration How To Cope?

- Under Consideration
 - Different Queue Criteria
 - Require Tariff Mod? Move Up in Rank if:
 - Have Gas Supply?
 - Don't Require Transmission Construction Beyond Local Integration Facilities?
 - Relieve Seasonal Transmission Congestion?

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Generation Integration How To Cope?

- Check Out Synergies With Gas Siting
 - Common Use of Right of Way
 - Good and Bad
 - Discussed Infrastructure Plans with Washington EFSEC Director
 - Are there potential siting efficiencies -- Joint Queue with Gas?

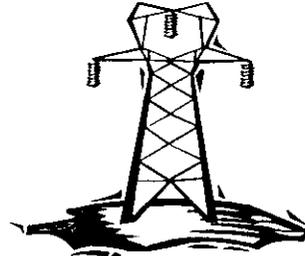
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Montana Transmission Briefing

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June 1, 2001

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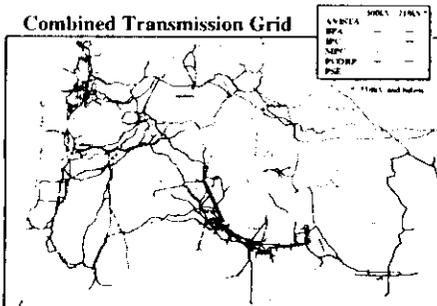
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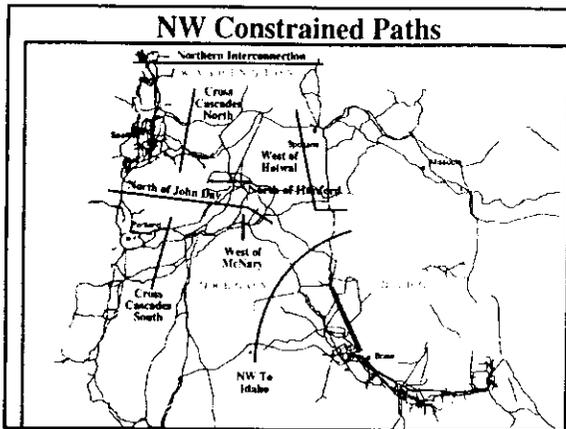


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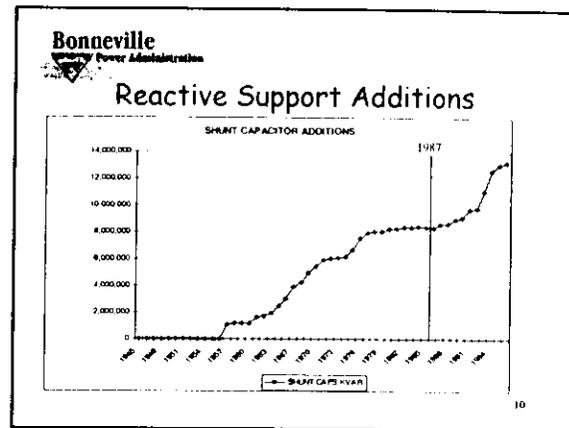
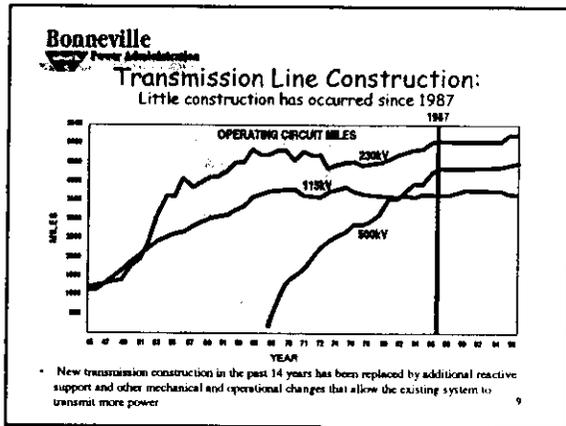
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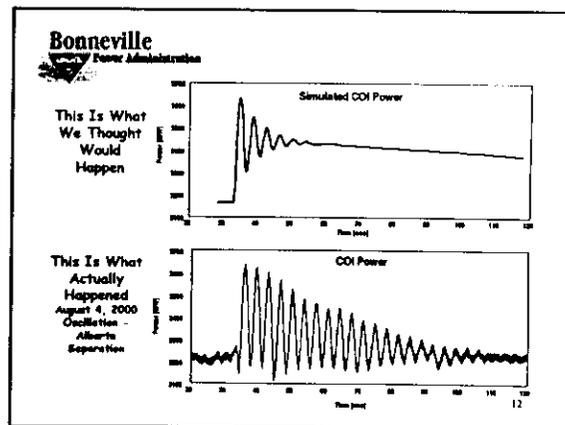
Bonneville Power Administration System Stress

Normal Circumstances: When transmission capacity is in balance with load

Current circumstances: When reactive is used to support additional load without grid expansion

Observations

- We are seeing unexpected "ripples" on the system which indicates lack of stability
- System studies are revealing more constraints
- There is little or no system margin left



System Stress

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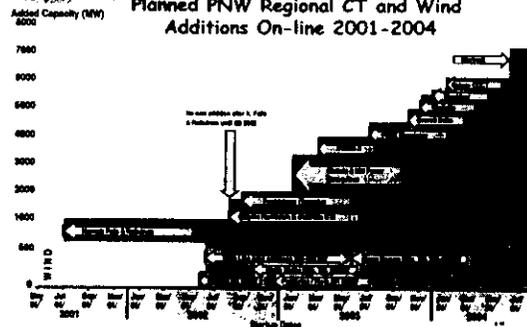
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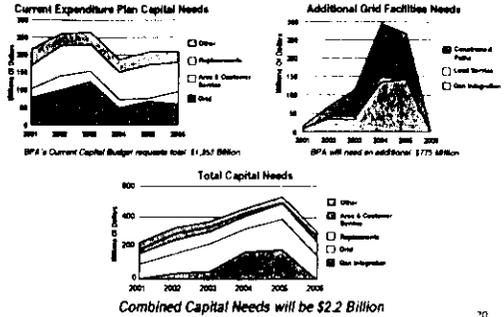
Planned PNW Regional CT and Wind Additions On-line 2001-2004



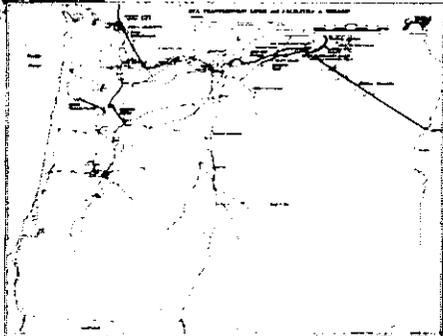
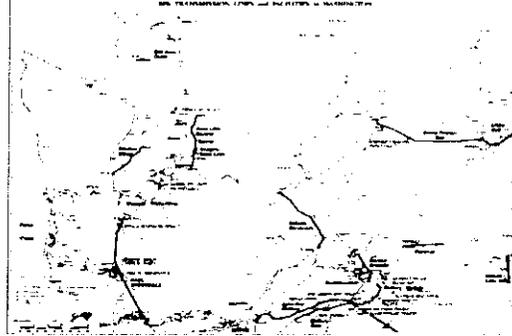
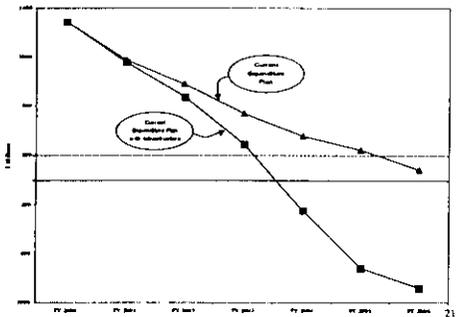
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Expenditure Plans



Bonneville's Remaining Borrowing Authority



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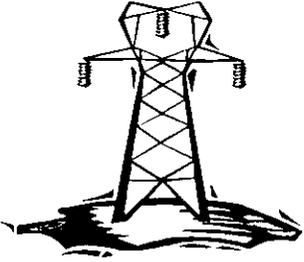
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Power Administration

Transmission Briefing
for BLM Management Team
By
Vickie VanZandt
VP, Transmission Operations & Planning
June 13, 2001

Bonneville
Power Administration

Transmission Assessment



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BPA Transmission System

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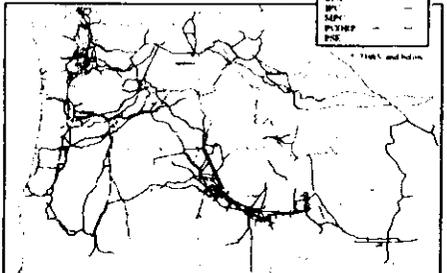
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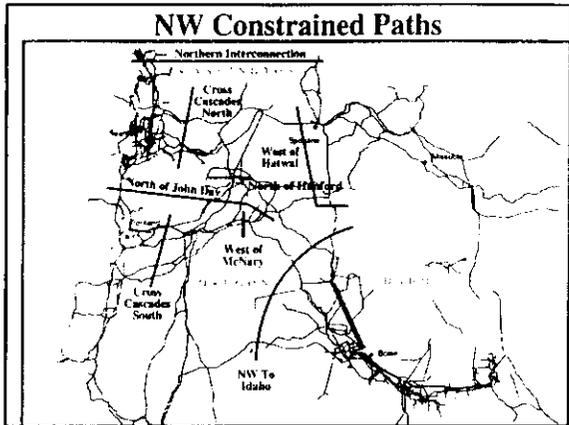
	WY	MT	WY
BPA	—	—	—
BY	—	—	—
SNP	—	—	—
PS&NP	—	—	—
POE	—	—	—



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Current Situation

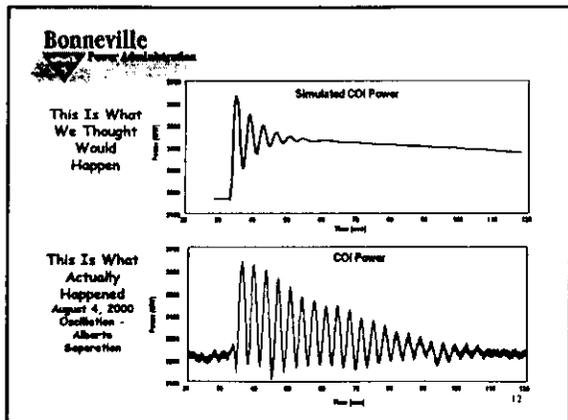
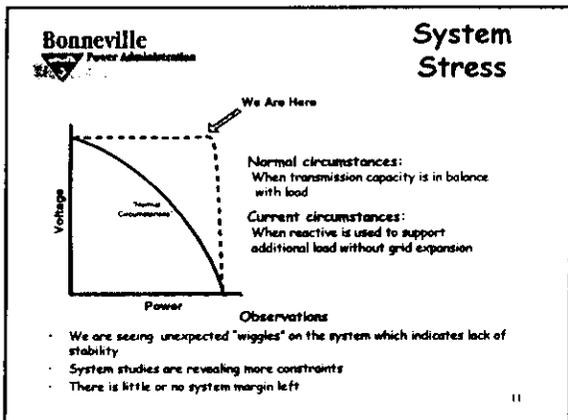
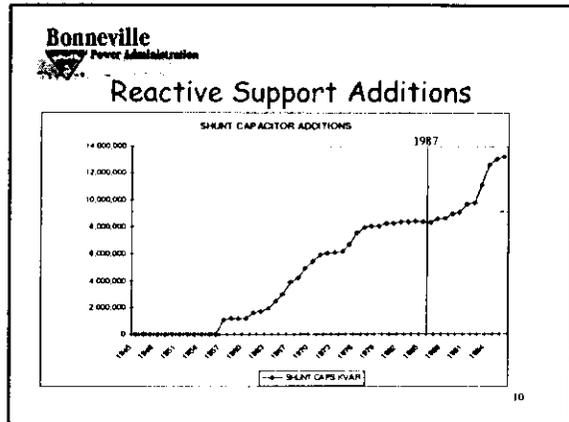
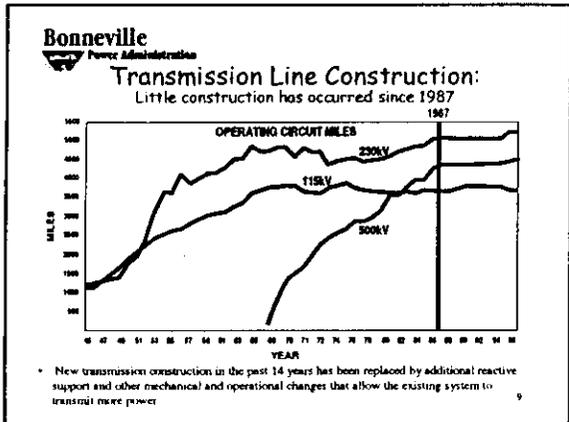
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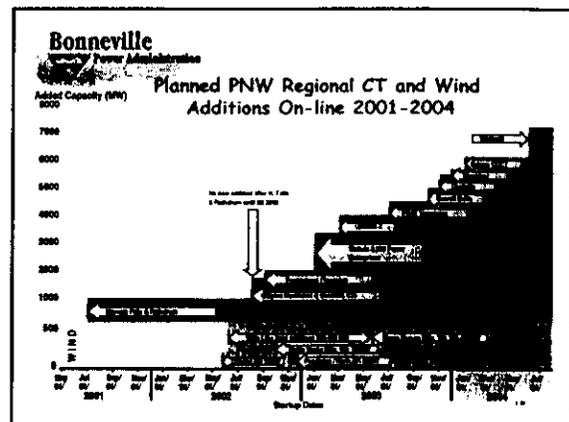
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19

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Expenditure Plans

BPA's Current Capital Budget requests total \$1.353 Billion.
BPA will need an additional \$775 Million.

Combined Capital Needs will be \$2.2 Billion

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Bonneville's Remaining Borrowing Authority

21

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G-9

1. Puget Sound Area
2. North of Hanford/
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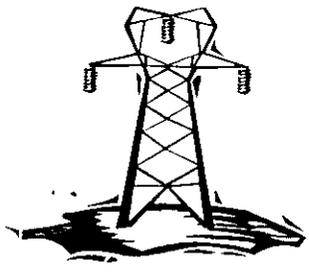
Bonneville
 Western Power Administration

Transmission Infrastructure
 Briefing
 for Oregon PUC

By
 Vickie VanZandt
 VP, Transmission Operations & Planning
 June 2001

Bonneville
 Western Power Administration

Transmission Assessment



Bonneville
 Western Power Administration

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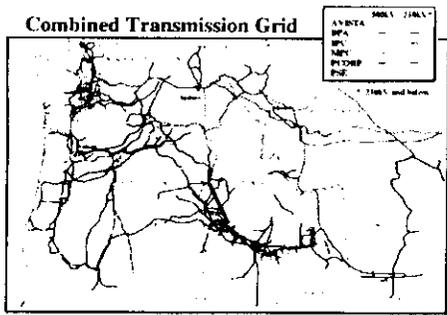
Bonneville
 Western Power Administration

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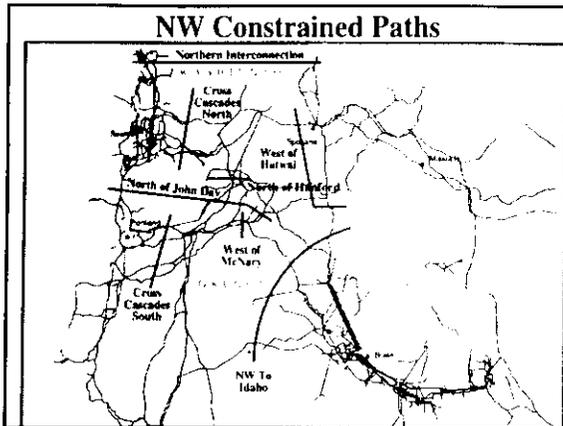
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Bonneville
 Western Power Administration

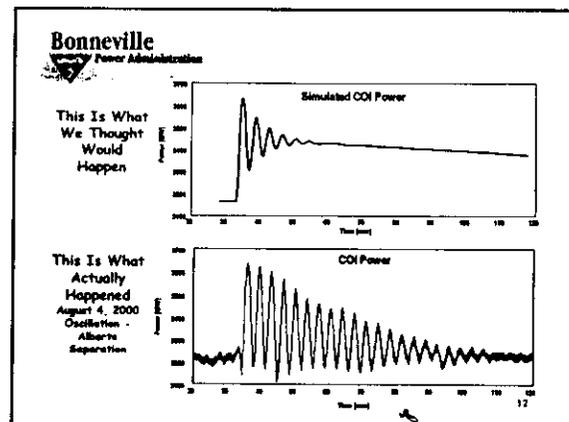
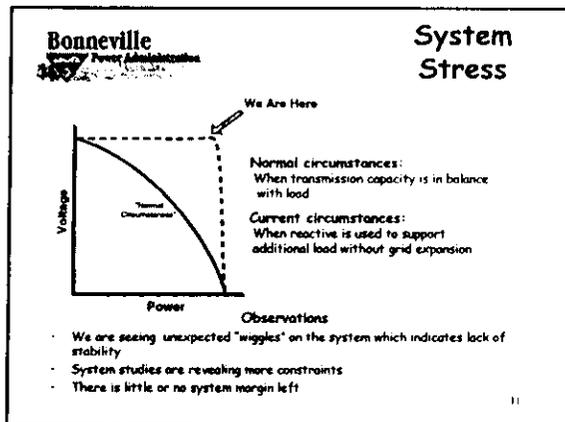
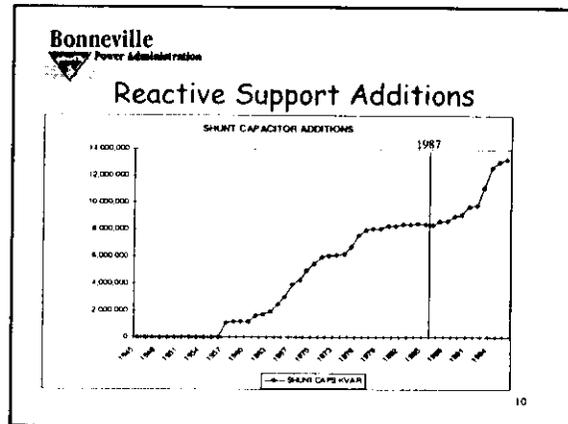
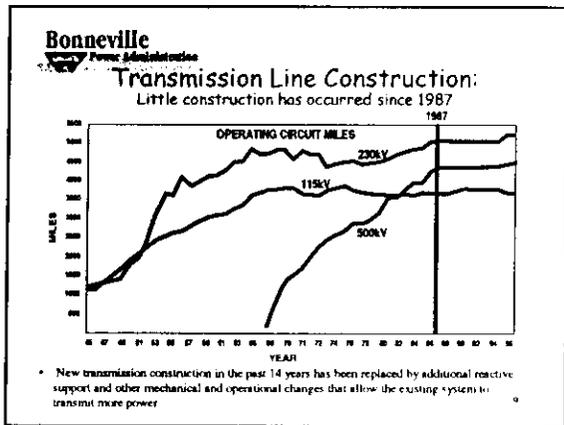
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Power Administration

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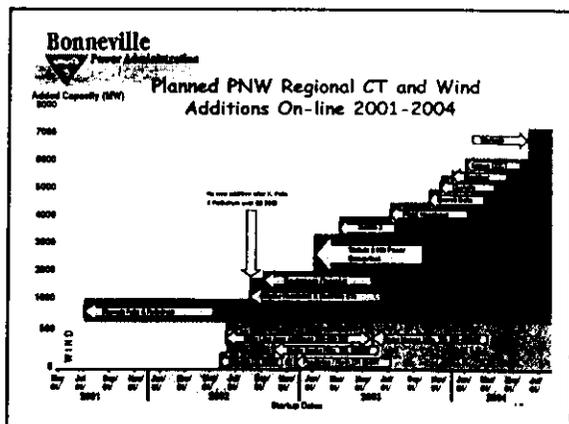
16

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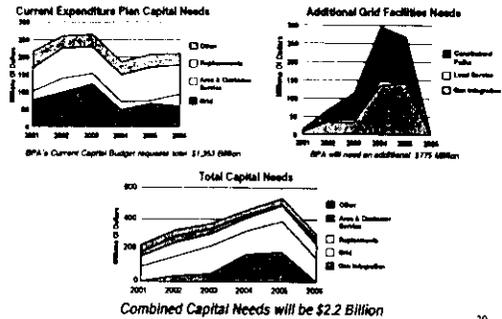
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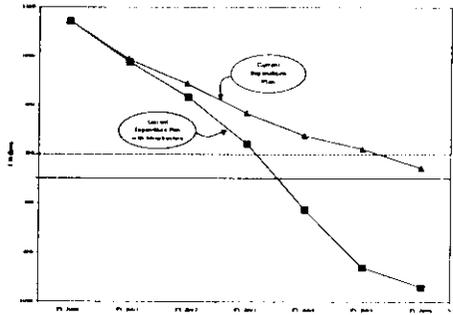
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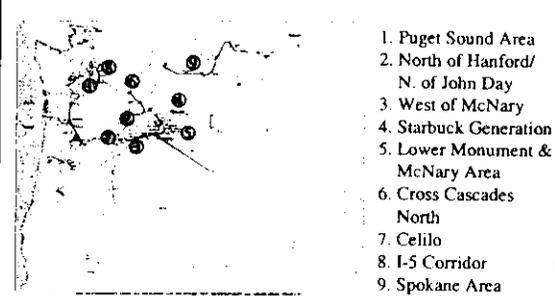
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Bonneville's Remaining Borrowing Authority



G-9



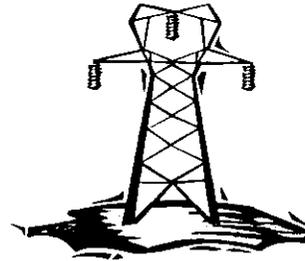
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Transmission Infrastructure
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July 12 2001

Transmission Assessment



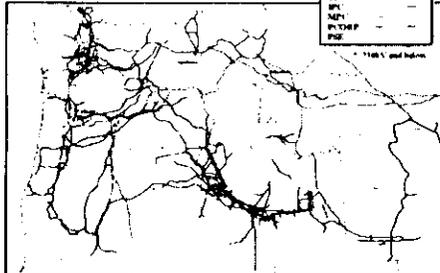
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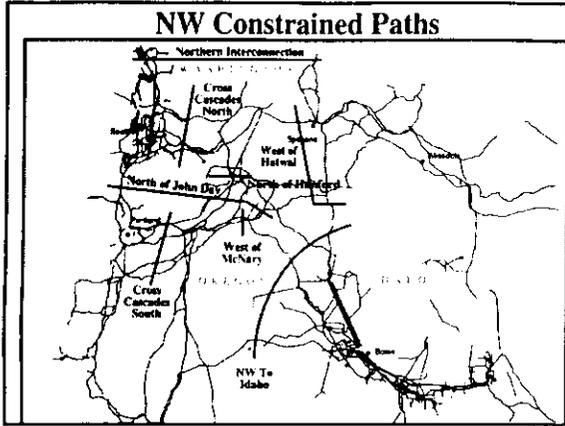
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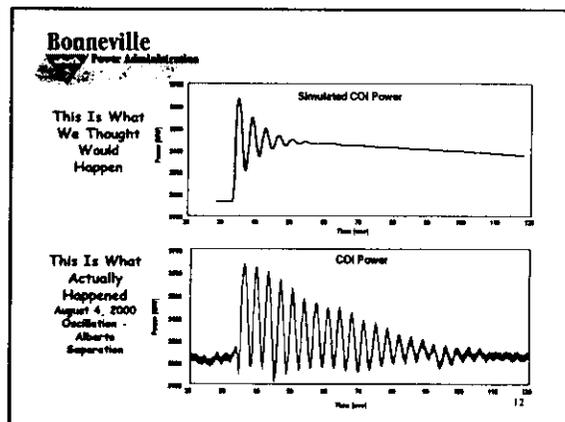
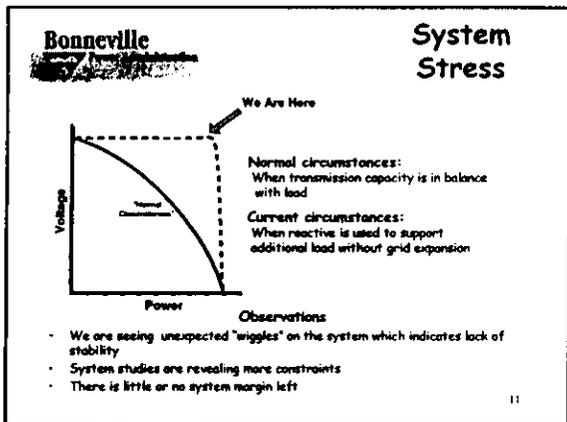
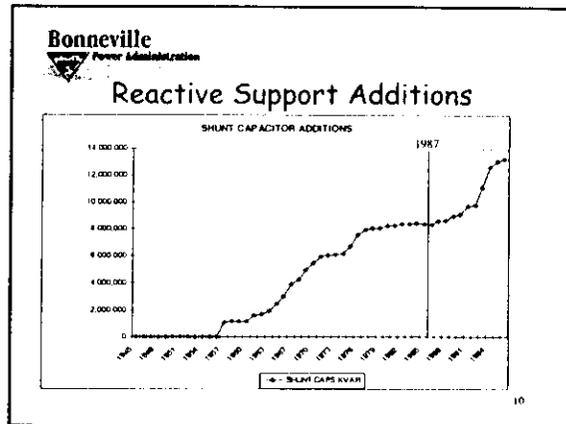
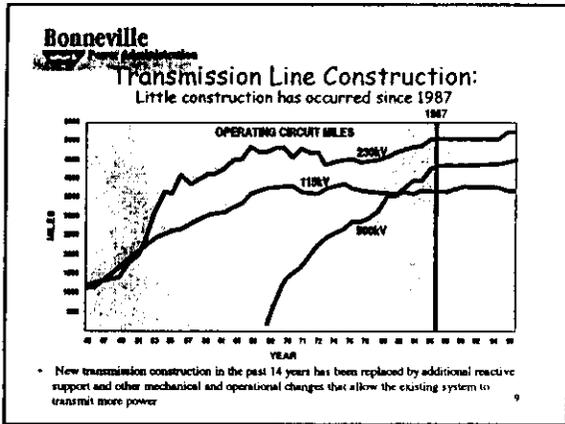
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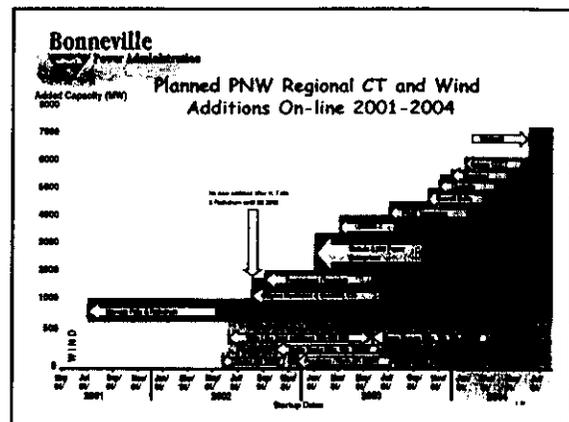
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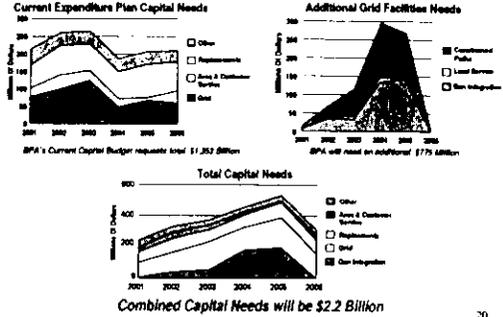
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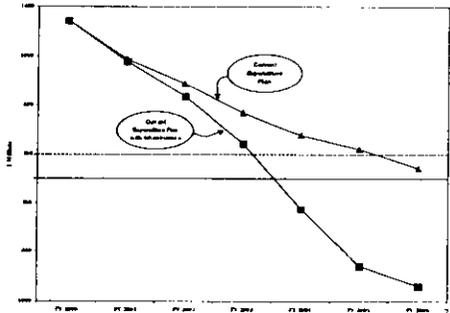
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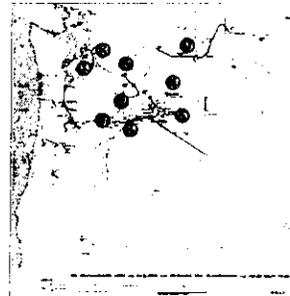
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G-9



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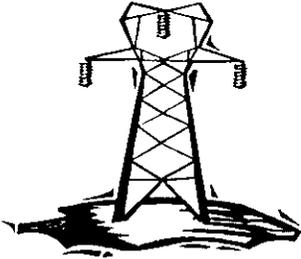
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 August 8, 2001

1

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 Western Power Administration

Transmission Assessment



2

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 Western Power Administration

Summary

- **Current Situation**
 - Loads growing steadily at 1.8% per year
 - Little new transmission since 1987
 - Transmission use growing steadily at 2% per year
- **Objectives**
 - Keep the lights on — reinforce the system to comply with national reliability standards
 - Interconnect needed new generation
 - Remove constraints that limit economic trade & our ability to maintain the system

3

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Infrastructure Proposal

- Requested Borrowing Authority Will Allow Completion of Transmission Infrastructure Additions to Accomplish 3 Main Objectives:
 - 1 Assures Service for Existing Firm Transmission Contracts & Reduces Bottlenecks.
 - Load growth in region has been occurring steadily at 1.8 percent per year over the past decade.
 - Little new transmission has been constructed since 1987.
 - Congestion points (called cutplanes) are increasing to the point BPA is having to curtail firm power deliveries.
 - Examples:
 - Colstrip generation into Washington and Oregon since late May
 - Curtailment scheme into Puget Sound Area within this next year.
 - Inability to get exports to intertie because of congestion within BPA's network.

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Infrastructure Proposal

- 2 Reinforcements of Transmission to Assure Minimal Conformance with Reliability Standards for Major Load Centers (Seattle, Portland, Spokane)
 - Increased Reliability Standards imposed by NERC and WSCC as a result of 1996 outages have reduced the available transmission capacity on certain paths in our interconnected systems (BPA-SQL, BPA-Avista, BPA-PGE/PacificCorp) (analogous to introducing a restriction in a pipeline).
 - Adding transmission lines to these interconnected systems increases reliability (decreases probability of blackouts) and allows maintenance without interruption to service.
- 3 Interconnect New Generators into BPA Grid
 - 28,000 MWs of new generation requests (50+ generators)
 - Only 1/4 to 1/3 of these will probably materialize
 - Generators pay for interconnections, however "downstream" transmission will become more congested

5

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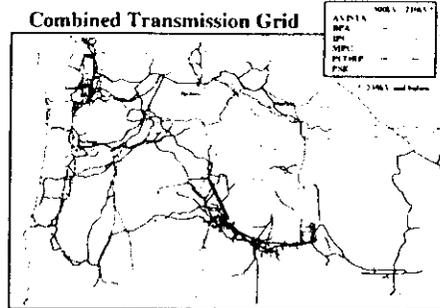
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The Need for Transmission

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 - Reinforces Load Centers
 - Integrates Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated (30 to 50 New Plants)
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15 (Constraint in Central California)
 - Puts A Little Reliability Margin Back Into the Grid
 - To Reduce Exposure to Cascading Electrical Outages with Big Impacts
 - Needed For A Competitive Wholesale Market To Work
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The Need for Transmission

- Market Effects
 - Unregulated Generators Can Exercise Local Market Power if Transmission Is Constrained
 - Transmission Represents Only 3-10% of the Total Cost of Wholesale Power Transactions and Represents Cheap Insurance Against the Potential Abuse of Market Power
 - Such Transfers of Wealth Become Significant Losses to Society - Potentially Eliminating the Benefits of Deregulation for Consumers and the Economy
 - Transmission Can Play a Vital Role in Ensuring These Benefits of Competition

10

Why Is This Necessary Now?

- We Need to Restore Some Margin (Especially for Summer Grid Operations)
 - Curtailments needed to Maintain Margin
 - Vulnerable to Cascading Electrical Outages
 - Ability to Maintain the System Seriously Impaired
- We Don't Want to Delay Integration of Needed Resources
 - Major Transmission Facilities Take 3-5 Years
 - Generators Can Be Up in 18 Months
 - Even with Aggressive Schedule Planned (2002-2006), We Will Not Accommodate Some Generators' On-Line Dates

11

Current Situation

- The system is under stress because it is operating at or near capacity
- System constraints are affecting our ability to use & care for the system
 - Availability pressures exists to run the system harder
 - Outages for Maintenance & Construction are more difficult to obtain and are compressed in time, due to high utilization by the markets.
- Likelihood of system failure is increasing
 - The system facilities are aging (500kv grid is over 30 years old)

12

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Constraints

- The Transmission System Is Heavily Congested
 - Little transmission has been built since 1987
 - East to West paths are constrained in the fall and winter as eastern generation serves western load center peaks
 - North to South paths are used up in the spring and summer as loads go down in the NW and pick up in the SW
 - The margin that was built into the transmission has been used up as regional loads and through-transactions have grown (transmission system load up by 2% per year for over 8 years - see data next page)
 - Outages for Maintenance and New Construction Seriously Hampered

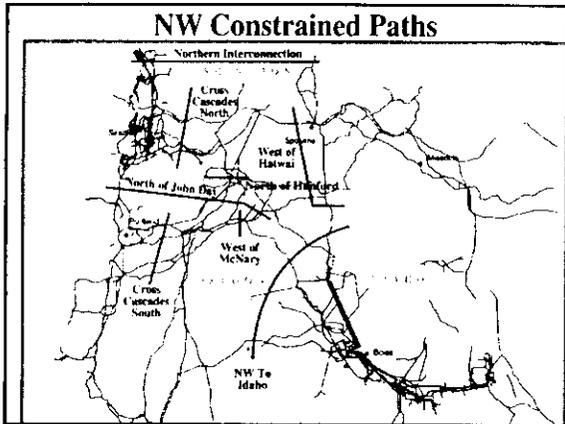
11

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Transmission Use Has Grown 2% Per Year For Over 8 Years (Load Growth and Thru-Put)

BPA TOTAL TRANSMISSION SYSTEM LOAD: JAN 1993 - JUN 2001
(8 1/2 Years)

14



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How Constrained Is The System?

- North of John Day
 - Transmission Service Requests In Hand Exceed Capacity by 1700MW by 2001
 - Deficit Grows to Over 5000 MW by 2004
- Cross-Cascades North
 - Only 200 MW Left on 10,000 MW Path
 - Requests Exceed Capacity by 400 MW in 2004
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- West of McNary
 - Sold Out
 - Over 5000 MW of Generation Waiting in the Queue - Some Under Construction Now
 - The First Line Will Allow About 2800 MW to Connect

16

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Energy Power Administration

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- West of Hatwai
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 - Approximately 700 MW of Actual Schedules Cut on May 22
 - Firm Contract Holders Have Been Restricted in Pre-Schedule Every Day Since Then
- Idaho to the Northwest
 - 25 MW Deficit Today
 - Requests Exceed Capacity by 97 MW by October
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17

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Energy Power Administration

Transmission Line Construction: Little construction has occurred since 1987

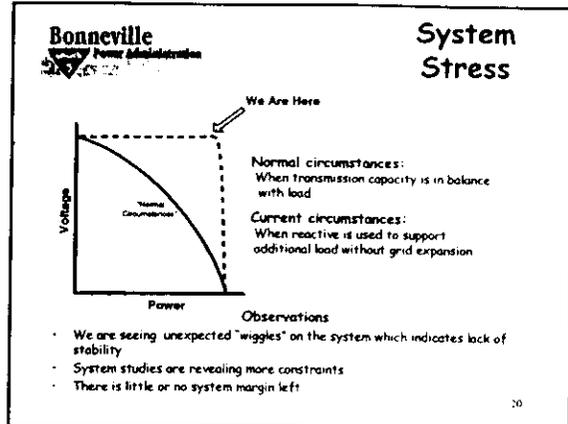
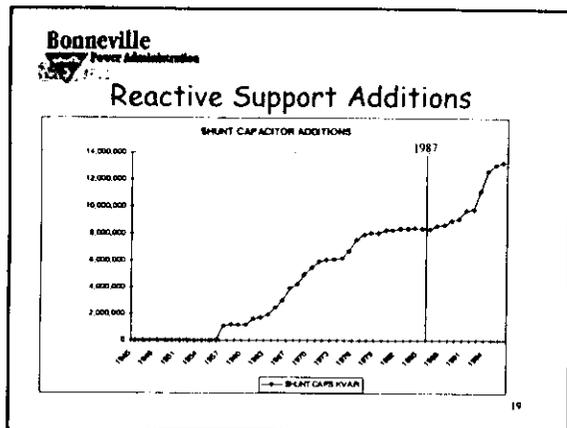
OPERATING CIRCUIT MILES

110KV
230KV
500KV

YEAR

- New transmission construction in the past 14 years has been replaced by additional reactive support and other mechanical and operational changes that allow the existing system to transmit more power

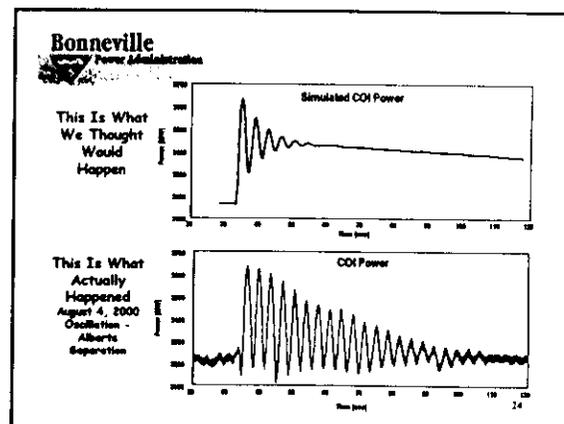
18



- Bonneville Power Administration**
- ## Reliability?
- Rolling-Blackout Reliability Problem?**
 - Constrained Transmission Means Curtailment of Transfers
 - Generation May not be Available where Needed
 - Result is a Rolling Blackout - Manageable Load Reduction Actions by System Operator
 - Some Warning, Limited in Scope and Duration
 - What Happens Too Often in California
 - Cascading Reliability Problem?**
 - Operation at Risk May be Unavoidable
 - Exposure to Voltage Collapse or Loss of Synchronism
 - Sudden - Generally Only System Restoration Manageable
 - Widespread Load and Generation Loss, Equipment Damage Possible
- 21

- Bonneville Power Administration**
- ## Increased Risk?
- Line Maintenance Compromised
 - Reduced Transmission Capacity Reserve Increases Risk of Operating Outside Safe Limits
 - Greater Vulnerability to Unexpected Events
 - Greater Difficulty in Managing Schedules to Maintain Reliability Margins
 - Loss of Operational Flexibility Leads to Operating at Risk
- 22

- Bonneville Power Administration**
- ## Reliability?
- System Damping is a Good Indicator of the Grid's Ability to Withstand and Recover from Problems Without Cascading Electrical Outages
 - Lightning Strikes, Equipment Outages or Failures
 - The Next Slide Demonstrates that the Western Transmission System is Not Very Well-Damped Anymore (particularly in the summer)
 - Upper Graph - Well Damped (Simulation of Event)
 - Lower Graph - Not Well Damped (Actual Response to Event)
 - Like a Car With Worn Out Shocks going Over a Bump
- 23



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Reliability?

- The Most Important Reason for the Infrastructure Proposal is to Reduce the Risk of Rolling Blackouts and Sudden, Cascading Electrical Outages with Big Societal Impacts
- These Events are Rare, But Historical US Data (through 1996) in the Next Slides Indicate Not THAT Rare. Events Affecting Over 1,000,000 Customers Occur About Once Per Year.
- These Events Will Become More Frequent Absent Intervention with Infrastructure

25

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Big Power System Disturbances Are Not As Rare As You Might Think

Frequency (per year) of outages > N

Data from NERC

N = # of customers affected by outage

26

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Similar Types of Events That Have Huge Societal Impact - Also Not that Rare

Hurricane and Earthquake Losses 1900-1989
Flood Losses 1986-1992

Cumulative Number of Events / Year

Loss Per Event (million 1990 dollars)

Hurricanes D = -0.98
Floods D = -0.74
Earthquakes D = -0.41

27

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System Stress

How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
 - Gaming may occur which could be detrimental to system
- The western interconnection's energy crisis isn't just a generation issue -- it's the transmission system to move it around too
- We've used controls and communications to safely use the margin that was built in, but we've taken this about as far as we can
- California Market conditions are stressing the interties and existing congested paths

28

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Regional Transmission Is Not Keeping Up With Needs

(From NW Power Pool 10 - YR Forecast)

	1998	2008	% Increase
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

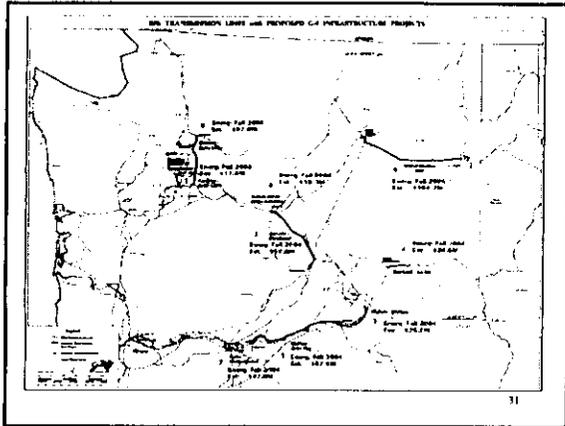
29

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Solution?

- The Projects on the Following Map Represent Our Proposed Solution to The Four Issues:
 - Reinforcement of the Load Centers
 - Integration of Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relief of Crippling Congestion
 - Compare Proposed Projects with NW Constrained Path Map
 - Reduces Price Volatility
 - Puts A Little Reliability Margin Back Into the Grid
 - Reduces Vulnerability to Cascading Electrical Outages
 - Allows Outages for O&M

30



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We Need A Bunch of Wire

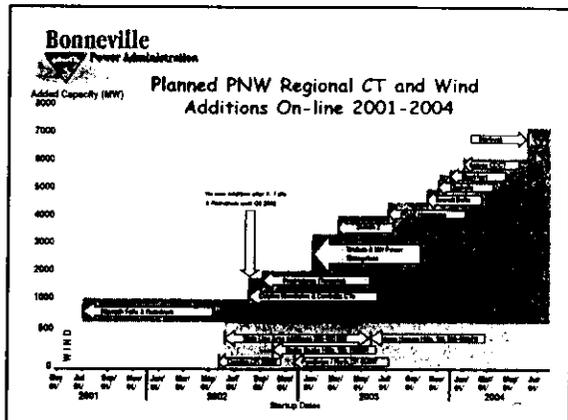
Infrastructure Proposal

- Puget Sound I-5 Corridor
 - Seattle Area Load Service
 - Canadian Entitlement
- North of John Day Relief
 - Allows Use of Southern Intertie
 - Bi-Op Commitment
 - Adds Flexibility for Low Water Years
- West of McNary
 - Somebody Will Site Near Hermiston
- West of Hatwai and Idaho to the NW
 - California Won't Help Us Any Time Soon, Making Montana and Idaho Imports More Critical To Meeting Regional Winter Peak
- De-Couple From Sub-Grid
 - Minimizes Effects of Main Grid Outages on Underlying Sub-Grid and distribution Systems

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We Need A Bunch of Wire

- Infrastructure Proposal (continued)
 - Proposal Assumes Some Generators Integrate -- But Not All
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15
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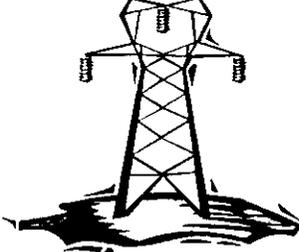
Bonneville
Power Administration

Transmission Briefing
for Micron Technology
By
Vickie VanZandt
VP, Transmission Operations & Planning
June 20, 2001

1

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Transmission Assessment



2

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BPA Transmission System

- BPA operates 80% of the high-voltage grid in its service area (OR, WA, ID and western MT).
 - More than 15,000 miles of line
 - Two fully redundant control centers
 - Over \$5 billion federal investment
 - About \$540 million in annual revenues
- About 50% of the grid looking at the U.S. portion of the NW Power Pool (add eastern MT, WY and UT).
- BPA voluntarily complies with FERC open access rules.

3

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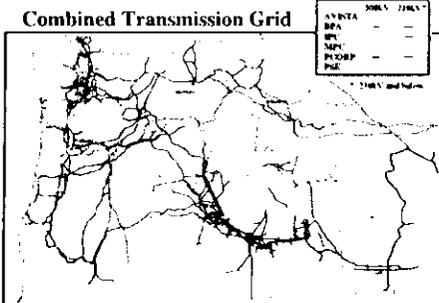
Fragmentation of the NW Grid

- Five investor-owned utilities also own NW transmission facilities.
- In addition, some consumer-owned utilities own transmission and 10 operate control areas.
- Fragmented ownership and "parallel paths" have made it difficult to fix some transmission bottlenecks, and certainly leads to less than optimal solutions.

4

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Combined Transmission Grid



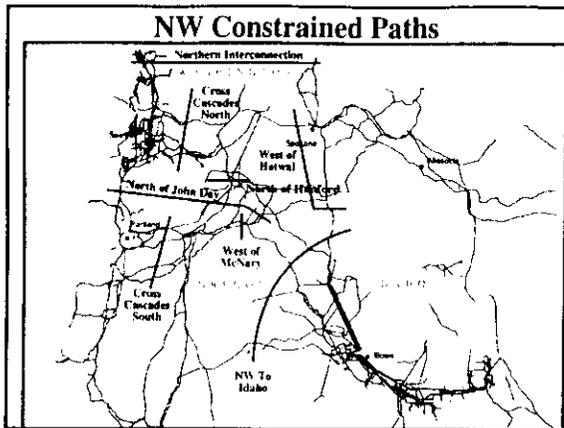
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Current Situation

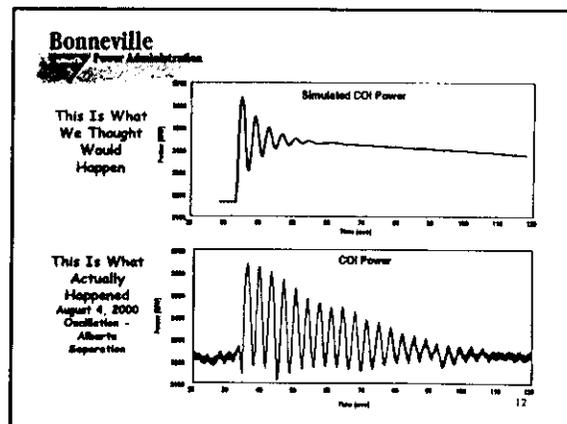
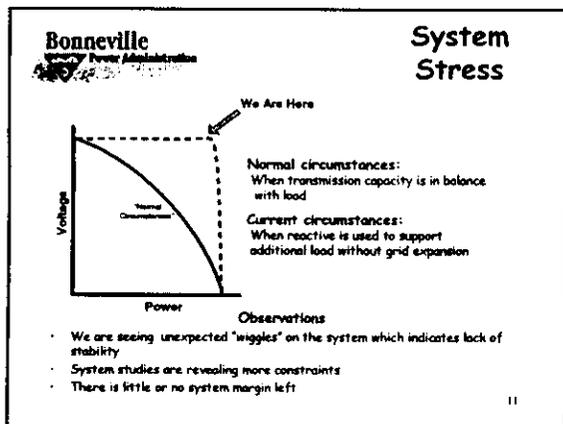
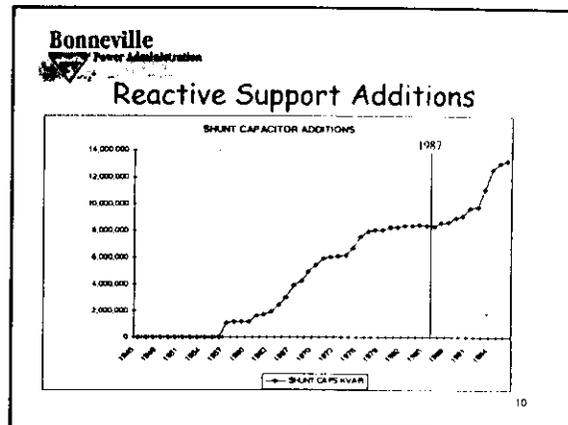
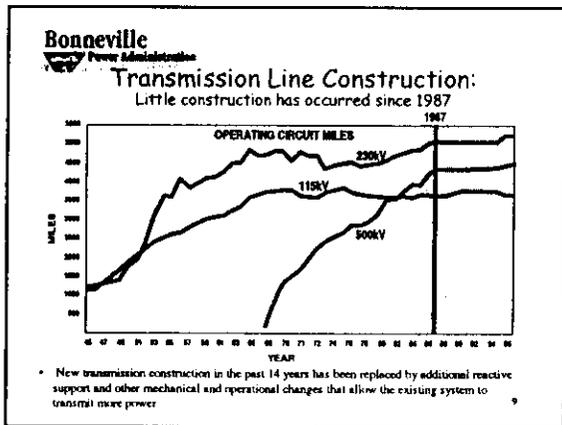
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- Likelihood of system failure is increasing
 - The system facilities are aging (500kv grid is over 30 years old)

6



Bonneville Power Administration Current Situation

- Approximately 27,000 MW of generation is potentially being sited in the Northwest
 - The Transmission System will become more stressed with the addition of generation if nothing is done to reinforce the existing network
- RTO will begin operation in FY04, at the earliest (sets time baseline)



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System Stress

How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
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14

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Solutions

- Recognize that transmission investments are needed now
- Encourage Generation be built near load or uncongested paths as possible
- Seek all conservation & renewable resources available to reduce & manage loads
- Understand the problem has been building over the last decade and there are no quick fixes.
 - It takes two to five years to plan, site & build a major transmission line.
- Seek cooperation and support of other transmission owners (IOU's & Publics) in the Pacific Northwest to meet this challenge

15

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We Need A Bunch of Wire

- Infrastructure Proposal
 - Puget Sound I-5 Corridor
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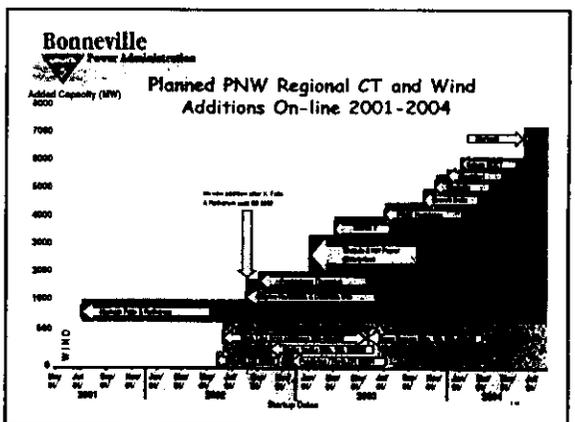
16

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Power Administration

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17



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How Does This Get Paid For?

- This infrastructure plan reflects an additional \$775M over our current expenditure plan for 2002-2006 of \$1.3B
- The integration of between 5000 - 5500 MW of generation -- and corresponding use of the transmission system recovers the cost of the new wires
- More generation than that should lower rates

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Expenditure Plans

BPA's Current Capital Budget requests total \$1.53 Billion

BPA will need an additional \$775 Million

Total Capital Needs

Combined Capital Needs will be \$2.2 Billion

20

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Bonneville's Remaining Borrowing Authority

21

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Bonneville Power Administration

G-9

1. Puget Sound Area
2. North of Hanford/ N. of John Day
3. West of McNary
4. Starbuck Generation
5. Lower Monument & McNary Area
6. Cross Cascades North
7. Celilo
8. I-5 Corridor
9. Spokane Area

22

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Bonneville Power Administration

Our Concerns

- Resource Requirements will be large
 - Capital - BPA will need access to additional borrowing authority
 - Staff
 - System & Processes
- Keeping the system going as we address these issues will be difficult
- The system may fail before we can act

23

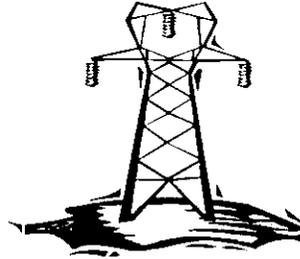
Transmission Infrastructure Briefing

For
Congressional Staff

By
Vickie VanZandt
VP, Transmission Operations & Planning
August 21, 2001

1

Transmission Assessment



2

Summary

Current Situation

- Loads growing steadily at 1.8% per year
- Little new transmission since 1987
- Transmission use growing steadily at 2% per year

Objectives

- Keep the lights on — reinforce the system to comply with national reliability standards
- Interconnect needed new generation
- Remove constraints that limit economic trade & our ability to maintain the system

3

Infrastructure Proposal

Additional Borrowing Authority Will Allow Completion of Transmission Infrastructure Additions to Accomplish 3 Main Objectives:

1 - Assures Service for Existing Firm Transmission Contracts & Reduces Bottlenecks.

2 - Reinforcements to Assure Minimal Conformance with Reliability Standards for Major Load Centers

- New Reliability Standards have reduced the available transmission capacity on certain paths in our interconnected systems (BPA-SCL, BPA-Avista, BPA-PGE/PacificCorp) (analogous to introducing a restriction in a pipeline).
- Adding transmission lines to these interconnected systems increases reliability (decreases probability of blackouts) and allows maintenance without interruption to service.

3 - Interconnects New Generators into BPA Grid

4

BPA Transmission System

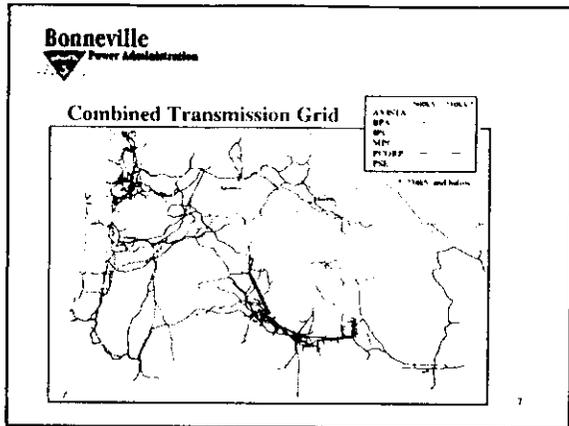
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Fragmentation of the NW Grid

- Five investor-owned utilities also own NW transmission facilities.
- In addition, some consumer-owned utilities own transmission and 10 operate control areas.
- Fragmented ownership and "parallel paths" have made it difficult to fix some transmission bottlenecks, and certainly leads to less than optimal solutions.

6



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The Need for Transmission

Infrastructure Proposal

- Reinforces Load Centers
- Integrates Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated (30 to 50 New Plants)
- Relieves Crippling Congestion
 - We Don't Want Our Own Path 15 (Constraint in Central California)
- Puts A Little Reliability Margin Back Into the Grid
 - To Reduce Exposure to Cascading Electrical Outages with Big Impacts
 - Needed For A Competitive Wholesale Market To Work
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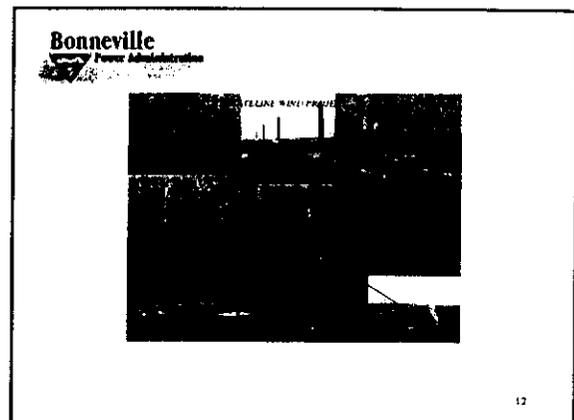
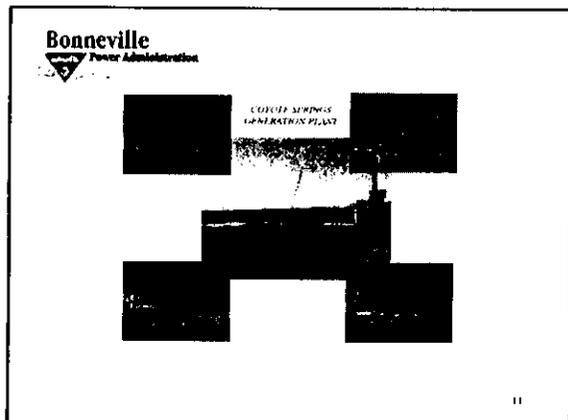
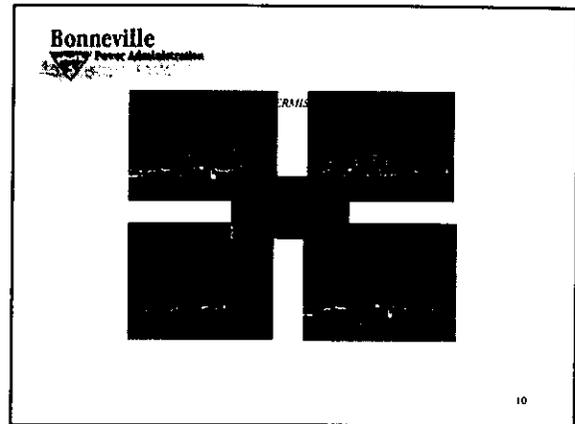
8

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Why Is This Necessary Now?

- We Need to Restore Some Margin (Especially for Summer Grid Operations)
 - Curtailments needed to Maintain Margin
 - Vulnerable to Cascading Electrical Outages
 - Ability to Maintain the System Seriously Impaired
- We Don't Want to Delay Integration of Needed Resources
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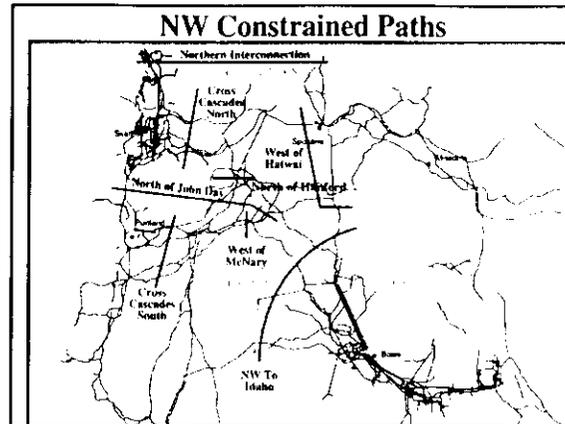


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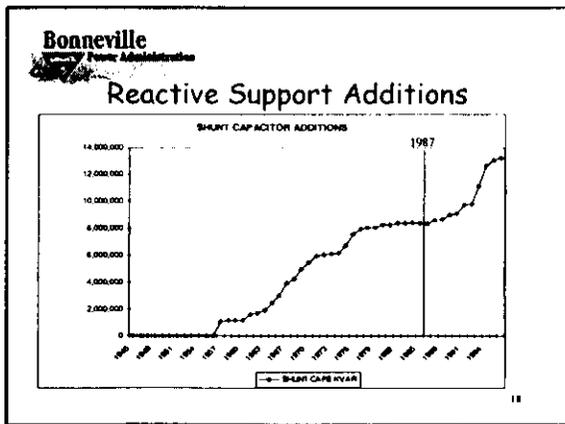
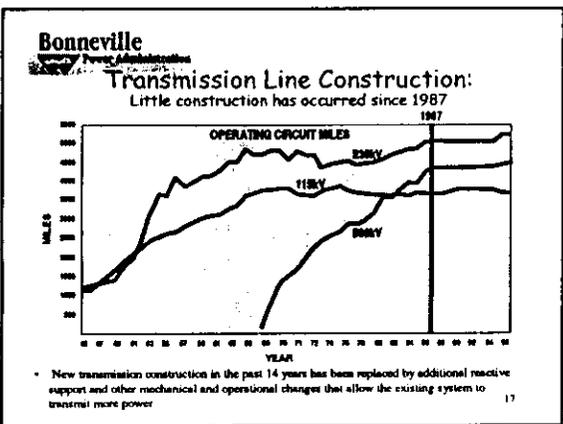
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16



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System Stress

Normal Circumstances:
When transmission capacity is in balance with load

Current Circumstances:
When reactive is used to support additional load without grid expansion

Observations

- We are seeing unexpected "wiggles" on the system which indicates lack of stability
- System studies are revealing more constraints
- There is little or no system margin left

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Power Administration

Reliability?

- Rolling-Blackout Reliability Problem?**
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Power Administration

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21

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This Is What We Thought Would Happen

This Is What Actually Happened August 4, 2000
Oscillation - Alberta Separation

22

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Reliability?

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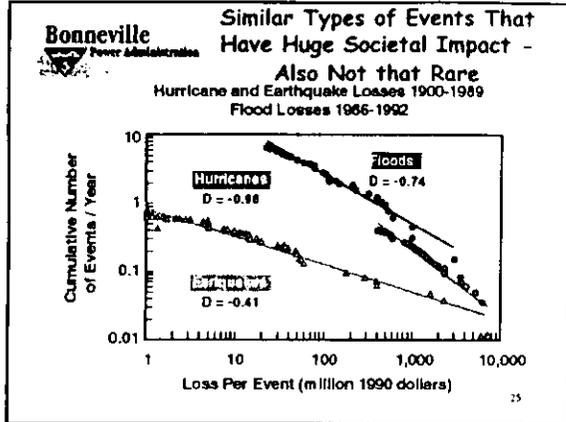
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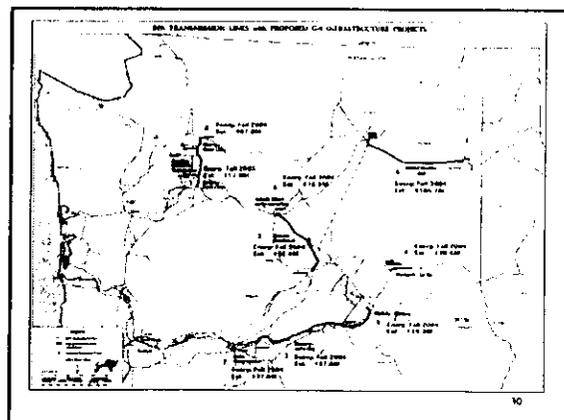
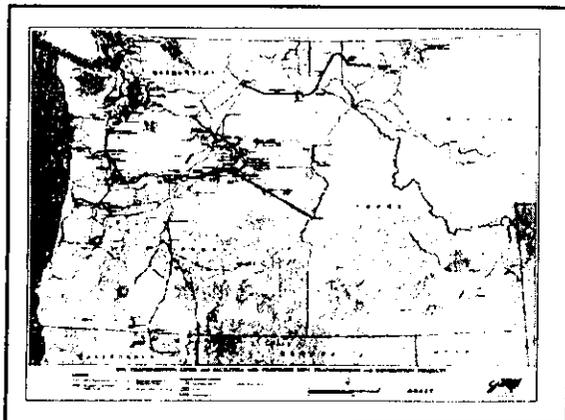
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- 28



What Happens to Transmission Rates?

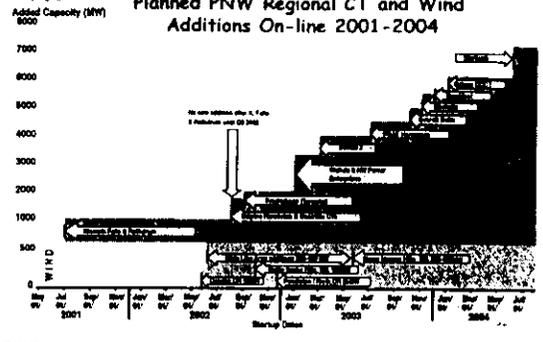
Question:

- How Does This Infrastructure Proposal (\$775M) Get Paid For?

Answer:

- New transmission revenues are expected to at least offset incremental costs
 - Transmission contracts have already been signed that will recover 20% of the 5-year incremental annual costs of \$80 million
 - The remaining amount of 5-year incremental costs will be recovered by contracts with less than 1/6 of the proposed new generation and other sales
 - If more new generation or additional use from congestion relief occurs, the pressure on rates would decline

Planned PNW Regional CT and Wind Additions On-line 2001-2004



Why Is This Necessary Now?

- We Can't Start Construction Projects That We're Not Sure We Can Finish
- Our Management Plan to Accomplish this Infrastructure Proposal Requires Solicitation for Major Materials and Construction Contracts in October 2001

Lack of Capital Certainty Will Cause:

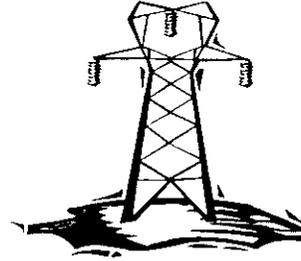
- **Everything to Slow Down**
 - Generators Get Integrated Later
 - Crippling Congestion Remains or Increases
 - Causing Load Curtailment & Zonal Price Volatility
 - Continued or Worsening Vulnerability to Voltage Collapse
- **Inability to Meet Commitments**
 - Canadian Entitlement Return
 - '99 Biological Opinion Obligations
 - Firm Transmission Service Sold Across Constrained Paths
 - Financial Exposure to Redispatch Risks
- **Prolonged Price Volatility**

Transmission Briefing for Micron Technology

By
Vickie VanZandt
VP, Transmission Operations & Planning
June 20, 2001

1

Transmission Assessment



2

BPA Transmission System

- BPA operates 80% of the high-voltage grid in its service area (OR, WA, ID and western MT).
 - More than 15,000 miles of line
 - Two fully redundant control centers
 - Over \$5 billion federal investment
 - About \$540 million in annual revenues
- About 50% of the grid looking at the U.S. portion of the NW Power Pool (add eastern MT, WY and UT).
- BPA voluntarily complies with FERC open access rules.

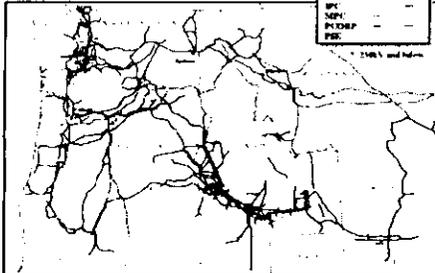
3

Fragmentation of the NW Grid

- Five investor-owned utilities also own NW transmission facilities.
- In addition, some consumer-owned utilities own transmission and 10 operate control areas.
- Fragmented ownership and "parallel paths" have made it difficult to fix some transmission bottlenecks, and certainly leads to less than optimal solutions.

4

Combined Transmission Grid

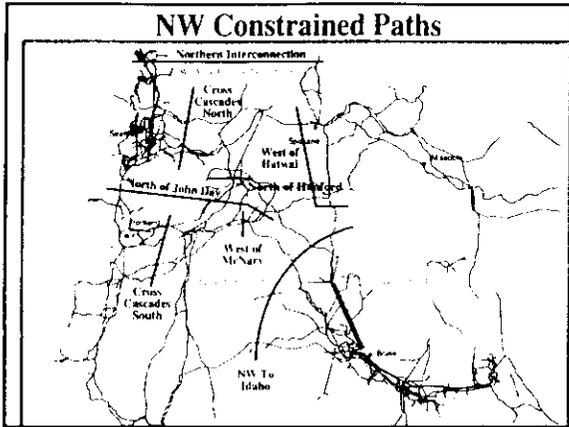


5

Current Situation

- The system is under stress because it is operating at or near capacity
- System constraints are affecting our ability to use & care for the system
 - Availability pressures exists to run the system harder
 - Outages for Maintenance & Construction are more difficult to obtain and are compressed in time, due to high utilization by the markets.
- Likelihood of system failure is increasing
 - The system facilities are aging (500kv grid is over 30 years old)

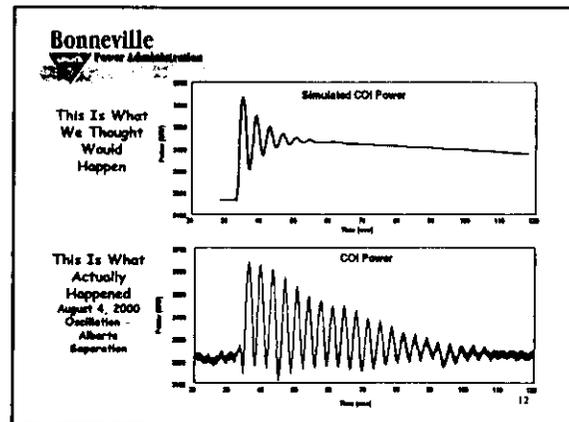
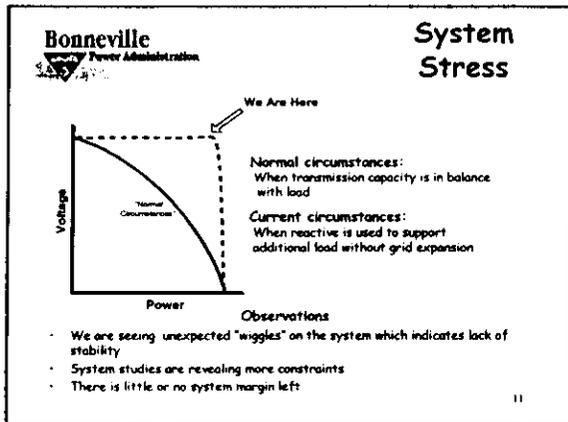
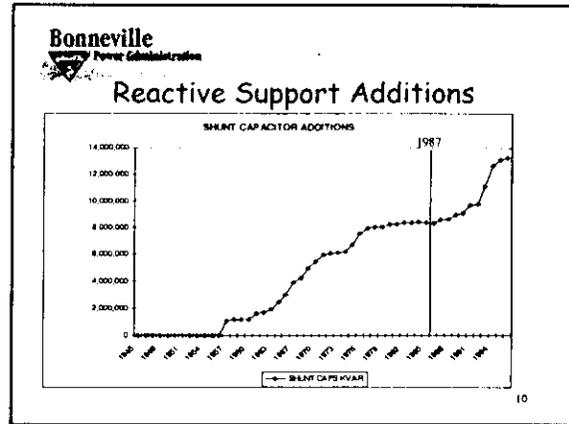
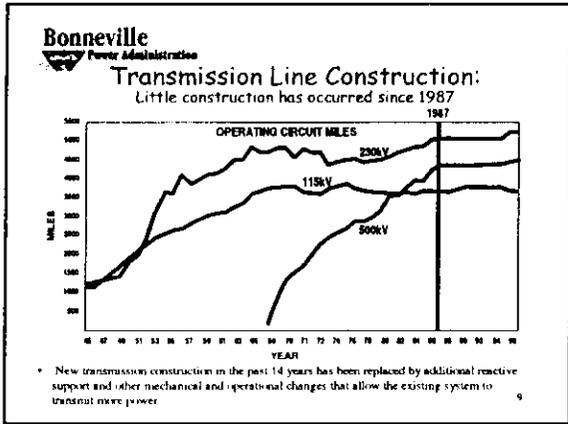
6



Bonneville Power Administration

Current Situation

- Approximately 27,000 MW of generation is potentially being sited in the Northwest
 - The Transmission System will become more stressed with the addition of generation if nothing is done to reinforce the existing network
- RTO will begin operation in FY04, at the earliest (sets time baseline)



How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
 - Gaming may occur which could be detrimental to system
- The western interconnection's energy crisis isn't just a generation issue -- it's the transmission system to move it around too
- We've used controls and communications to safely use the margin that was built in, but we've taken this about as far as we can
- California Market conditions are stressing the interties and existing congested paths

Regional Transmission Is Not Keeping Up With Needs

(From NW Power Pool 10 - YR Forecast)

	1998	2008	% Increase
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

- Recognize that transmission investments are needed now
- Encourage Generation be built near load or uncongested paths as possible
- Seek all conservation & renewable resources available to reduce & manage loads
- Understand the problem has been building over the last decade and there are no quick fixes.
 - It takes two to five years to plan, site & build a major transmission line
- Seek cooperation and support of other transmission owners (IOU's & Publics) in the Pacific Northwest to meet this challenge

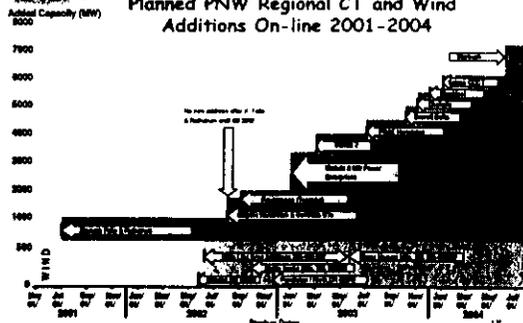
We Need A Bunch of Wire

- Infrastructure Proposal
 - Puget Sound I-5 Corridor
 - Seattle Area Load Service
 - Canadian Entitlement
 - North of John Day Relief
 - Allows Use of Southern Intertie
 - Bi-Op Commitment
 - Adds Flexibility for Low Water Years
 - West of McNary
 - Somebody Will Site Near Hermiston
 - West of Hatwai and Idaho to the NW
 - California Won't Help Us Any Time Soon, Making Montana and Idaho Imports More Critical To Meeting Regional Winter Peak
 - De-Couple From Sub-Grid
 - Minimizes Effects of Main Grid Outages on Underlying Sub-Grid and distribution Systems

We Need A Bunch of Wire

- Infrastructure Proposal (continued)
 - Proposal Assumes Some Generators Integrate -- But Not All
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15
- Puts A Little Margin Back Into the Grid
 - Needed For A Competitive Market To Work
 - So We Can Meet Regional Load During Outages
 - So We Can Meet Load and Move Power When Load Goes Away
 - So We Can Actually Do Some Maintenance Without Harming the Market
 - So the RTO Doesn't Start with the Regional Grid heavily congested.

Planned PNW Regional CT and Wind Additions On-line 2001-2004

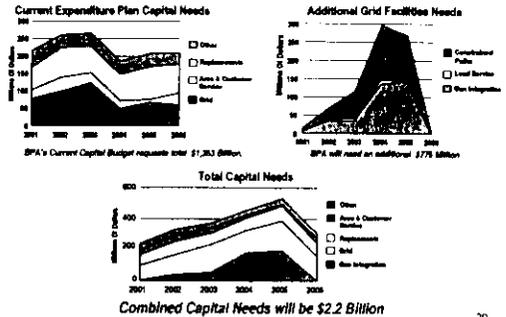


How Does This Get Paid For?

- This infrastructure plan reflects an additional \$775M over our current expenditure plan for 2002-2006 of \$1.3B
- The integration of between 5000 - 5500 MW of generation -- and corresponding use of the transmission system recovers the cost of the new wires
- More generation than that should lower rates

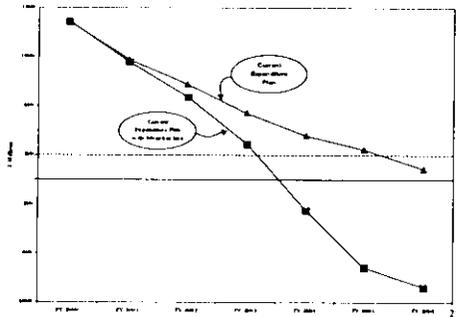
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Expenditure Plans



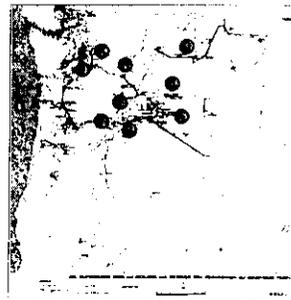
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Bonneville's Remaining Borrowing Authority



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G-9



1. Puget Sound Area
2. North of Hanford/
N. of John Day
3. West of McNary
4. Starbuck Generation
5. Lower Monument &
McNary Area
6. Cross Cascades
North
7. Celilo
8. I-5 Corridor
9. Spokane Area

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Our Concerns

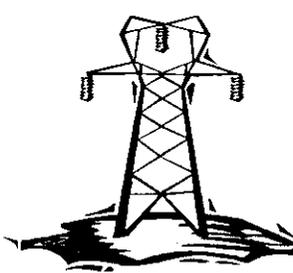
- Resource Requirements will be large
 - Capital - BPA will need access to additional borrowing authority
 - Staff
 - System & Processes
- Keeping the system going as we address these issues will be difficult
- The system may fail before we can act

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Regional Energy Forum in Spokane WA - Oct 23, 2001

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Transmission Assessment



1

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Summary

- **Current Situation**
 - Loads growing steadily at 1.8% per year
 - Little new transmission since 1987
 - Transmission use growing steadily at 2% per year
- **Objectives**
 - Keep the lights on — reinforce the system to comply with national reliability standards
 - Interconnect needed new generation
 - Remove constraints that limit economic trade & our ability to maintain the system

2

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Power Administration

Infrastructure Proposal

- Requested Borrowing Authority Will Allow Completion of Transmission Infrastructure Additions to Accomplish 3 Main Objectives:
 - 1 Assures Service for Existing Firm Transmission Contracts & Reduces Bottlenecks.
 - Load growth in region has been occurring steadily at 1.8 percent per year over the past decade.
 - Little new transmission has been constructed since 1987.
 - Congestion points (called outplanes) are increasing to the point BPA is having to curtail firm power deliveries.
 - Examples:
 - Colstrip generation into Washington and Oregon since late May
 - Curtailment scheme into Puget Sound Area within this next year.
 - Inability to get exports to intertie because of congestion within BPA's network.

3

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Infrastructure Proposal

- 2 Reinforcements of Transmission to Assure Minimal Conformance with Reliability Standards for Major Load Centers (Seattle, Portland, Spokane)
 - Increased Reliability Standards imposed by NERC and WSCC as a result of 1996 outages have reduced the available transmission capacity on certain paths in our interconnected systems (BPA-SCL, BPA-Avista, BPA-PGE/PacificCorp) (analogous to introducing a restriction in a pipeline).
 - Adding transmission lines to these interconnected systems increases reliability (decreases probability of blackouts) and allows maintenance without interruption to service.
- 3 Interconnect New Generators into BPA Grid
 - 28,000 MWs of new generation requests (50+ generators)
 - Only 1/4 to 1/3 of these will probably materialize
 - Generators pay for interconnections, however "downstream" transmission will become more congested

4

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The Need for Transmission

- Infrastructure Proposal
 - Reinforces Load Centers
 - Integrates Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated (30 to 50 New Plants)
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15 (Constraint in Central California)
 - Puts A Little Reliability Margin Back Into the Grid
 - To Reduce Exposure to Cascading Electrical Outages with Big Impacts
 - Needed For A Competitive Wholesale Market To Work
 - So We Can Meet Regional Load During Outages
 - So We Can Meet Load and Move Power When Large Load shut Down
 - So We Can Actually Do Some Maintenance Without Harming the Market
 - So the RTO Doesn't Start with the Regional Grid heavily congested.

5

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The Need for Transmission

- Market Effects
 - Unregulated Generators Can Exercise Local Market Power if Transmission Is Constrained
 - Transmission Represents Only 3-10% of the Total Cost of Wholesale Power Transactions and Represents Cheap Insurance Against the Potential Abuse of Market Power
 - Such Transfers of Wealth Become Significant Losses to Society - Potentially Eliminating the Benefits of Deregulation for Consumers and the Economy
 - Transmission Can Play a Vital Role in Ensuring These Benefits of Competition

6

Bonneville Power Administration

Why Is This Necessary Now?

- We Need to Restore Some Margin (Especially for Summer Grid Operations)
 - Curtailments needed to Maintain Margin
 - Vulnerable to Cascading Electrical Outages
 - Ability to Maintain the System Seriously Impaired
- We Don't Want to Delay Integration of Needed Resources
 - Major Transmission Facilities Take 3-5 Years
 - Generators Can Be Up in 18 Months
 - Even with Aggressive Schedule Planned (2002-2006), We Will Not Accommodate Some Generators' On-Line Dates

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Northwest Load Growth

- Over the past 10 years, Northwest Load has grown and needs reinforcement:
 - Winter Peak Demand - 1.5% Compounded Annually
 - for a maximum of 59,972 MW
 - Energy (aMW) - 1.8% Compounded Annually

(data from Northwest Power Pool)

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Regional Transmission Is Not Keeping Up With Needs

(From NW Power Pool 10 - YR Forecast)

	1998	2008	% Increase
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

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Transmission Line Construction: Little construction has occurred since 1987

OPERATING CIRCUIT MILES

115KV, 230KV, 500KV

1987

YEARS

• New transmission construction in the past 14 years has been replaced by additional reactive support and other mechanical and operational changes that allow the existing system to transmit more power

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Planned PNW Regional CT and Wind Additions On-line 2001-2004

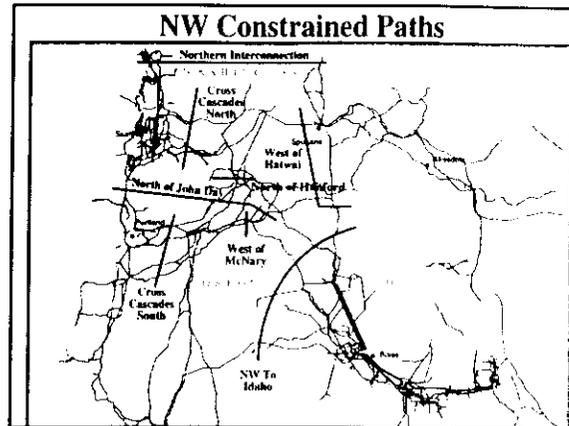
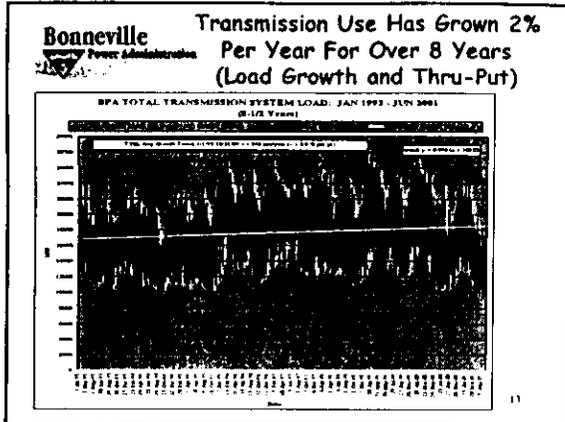
Additions On-line (MW)

No new additions after 1/1/04

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Constraints

- The Transmission System Is Heavily Congested
 - Little transmission has been built since 1987
 - East to West paths are constrained in the fall and winter as eastern generation serves western load center peaks
 - North to South paths are used up in the spring and summer as loads go down in the NW and pick up in the SW
 - The margin that was built into the transmission has been used up as regional loads and through-transactions have grown (transmission system load up by 2% per year for over 8 years - see data next page)
 - Outages for Maintenance and New Construction Seriously Hampered



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How Constrained Is The System?

- **North of John Day**
 - Transmission Service Requests In Hand Exceed Capacity by 1700MW by 2001
 - Deficit Grows to Over 5000 MW by 2004
- **Cross-Cascades North**
 - Only 200 MW Left on 10,000 MW Path
 - Requests Exceed Capacity by 400 MW in 2004
 - Deficit Grows to Over 750 MW by 2005
- **West of McNary**
 - Sold Out
 - Over 5000 MW of Generation Waiting in the Queue - Some Under Construction Now
 - The First Line Will Allow About 2800 MW to Connect

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How Constrained Is The System?

- **West of Hatwai**
 - Path Limits Reduced by WSCC Review This Spring - More Firm Rights Than Firm Capacity
 - 700 MW of Actual Schedules Cut on May 22
 - Firm Contract Holders Are Restricted in Pre-Schedule Every Day Since Then
- **Idaho to the Northwest**
 - 25 MW Deficit Today
 - Requests Exceed Capacity by 97 MW by October
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Reliability?

- **Rolling-Blackout Reliability Problem?**
 - Constrained Transmission Means Curtailment of Transfers
 - Generation May not be Available where Needed
 - Result is a Rolling Blackout - Manageable Load Reduction Actions by System Operator
 - Some Warning, Limited in Scope and Duration
 - What Happens Too Often in California
- **Cascading Reliability Problem?**
 - Operation at Risk May be Unavoidable
 - Exposure to Voltage Collapse or Loss of Synchronism
 - Sudden - Generally Only System Restoration Manageable
 - Widespread Load and Generation Loss, Equipment Damage Possible

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Increased Risk?

- **Line Maintenance Compromised**
- **Reduced Transmission Capacity Reserve Increases Risk of Operating Outside Safe Limits**
- **Greater Vulnerability to Unexpected Events**
- **Greater Difficulty in Managing Schedules to Maintain Reliability Margins**
- **Loss of Operational Flexibility Leads to Operating at Risk**

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Reliability?

- System Damping is a Good Indicator of the Grid's Ability to Withstand and Recover from Problems Without Cascading Electrical Outages
 - Lightning Strikes, Equipment Outages or Failures
- The Next Slide Demonstrates that the Western Transmission System is Not Very Well-Damped Anymore (particularly in the summer)
 - Upper Graph - Well Damped (Simulation of Event)
 - Lower Graph - Not Well Damped (Actual Response to Event)
 - Like a Car With Worn Out Shocks going Over a Bump

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This Is What We Thought Would Happen (Simulation)

This Is What Actually Happened August 4, 2000 Oscillation - Alberta Separation

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Reliability?

- The Most Important Reason for the Infrastructure Proposal is to Reduce the Risk of Rolling Blackouts and Sudden, Cascading Electrical Outages with Big Societal Impacts
- These Events are Rare, But Historical US Data (through 1996) in the Next Slides Indicate Not THAT Rare. Events Affecting Over 1,000,000 Customers Occur About Once Per Year.
- These Events Will Become More Frequent Absent Intervention with Infrastructure

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Big Power System Disturbances Are Not As Rare As You Might Think

Data from NERC

22

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Similar Types of Events That Have Huge Societal Impact - Also Not that Rare

Hurricane and Earthquake Losses 1900-1989
Flood Losses 1966-1992

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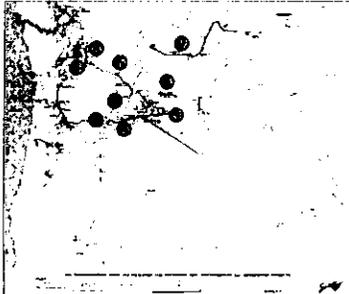
Solution?

- The Projects on the Following Map Represent Our Proposed Solution to The Four Issues:
 - Reinforcement of the Load Centers
 - Integration of Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relief of Crippling Congestion
 - Compare Proposed Projects with NW Constrained Path Map
 - Reduces Price Volatility
 - Puts A Little Reliability Margin Back Into the Grid
 - Reduces Vulnerability to Cascading Electrical Outages
 - Allows Outages for O&M

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Highest Priority Projects



1. Puget Sound Area
2. North of Hanford/
N. of John Day
3. West of McNary
4. Starbuck
Generation
5. Lower Monumental
& McNary Area
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25

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26

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- **Objectives**
 - Keep the lights on — reinforce the system to comply with national reliability standards
 - Interconnect needed new generation
 - Remove constraints that limit economic trade & our ability to maintain the system
- **Desired Outcome**
 - Increased borrowing authority so BPA can proceed with it's Transmission Infrastructure

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Transmission Infrastructure Briefing

For Idaho Local Government Energy Committee Conference

By
Vickie VanZandt
VP, Transmission Operations & Planning
Nov. 28, 2001

1

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Infrastructure Proposal

- Additional Borrowing Authority Will Allow Completion of Transmission Infrastructure Additions to Accomplish 3 Main Objectives:

- 1 - Assures Service for Existing Firm Transmission Contracts & Reduces Bottlenecks
- 2 - Reinforcements to Assure Minimal Conformance with Reliability Standards for Major Load Centers
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Combined Transmission Grid

6

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8

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10

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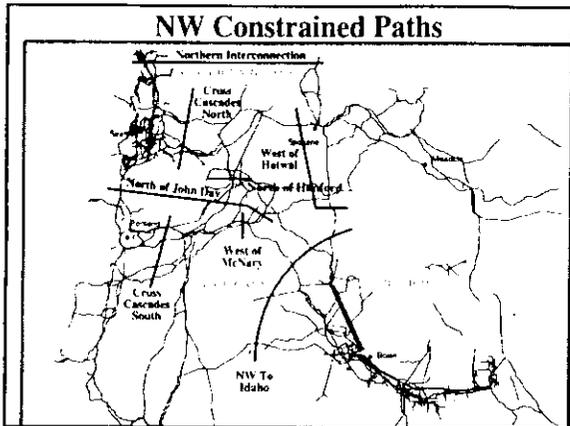
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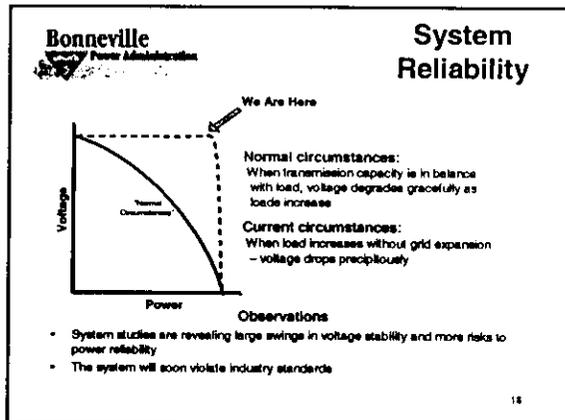
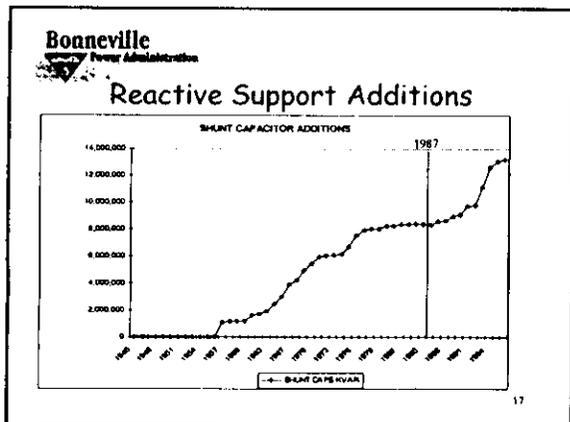
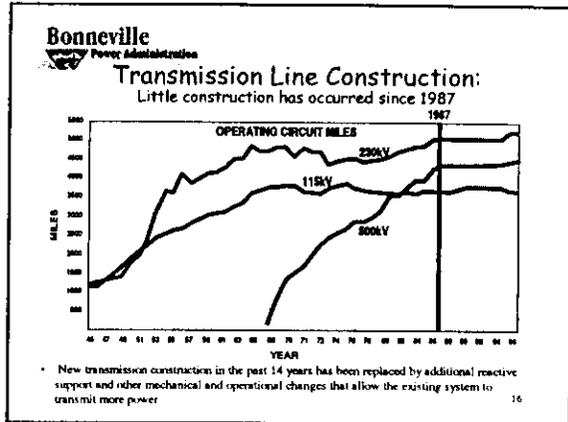
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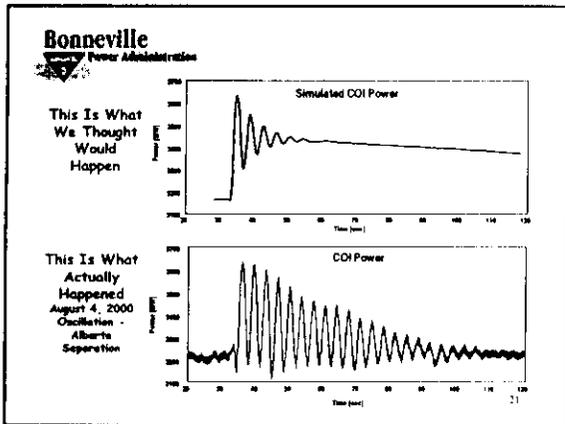
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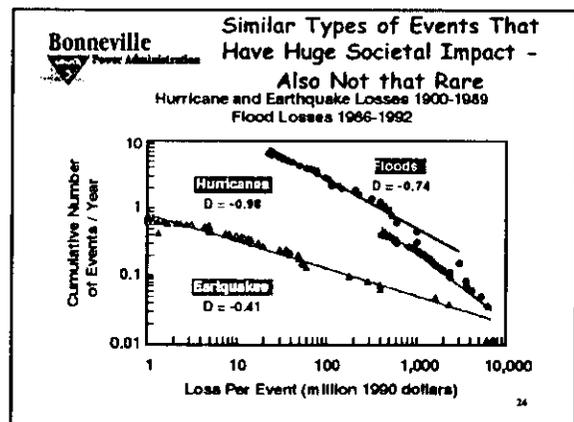
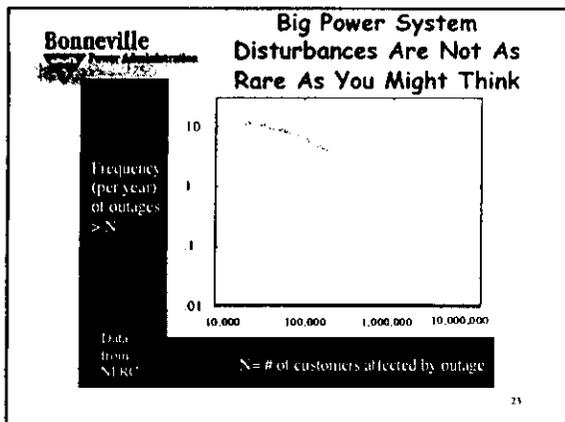


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Reliability?

- The Most Important Reason for the Infrastructure Proposal is to Reduce the Risk of Rolling Blackouts and Sudden, Cascading Electrical Outages with Big Societal Impacts
- These Events are Rare, But Historical US Data (through 1996) in the Next Slides Indicate Not THAT Rare. Events Affecting Over 1,000,000 Customers Occur About Once Per Year.
- These Events Will Become More Frequent Absent Intervention with Infrastructure

22



System Stress

How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
 - Gaming may occur which could be detrimental to system
- The western interconnection's energy crisis isn't just a generation issue -- it's the transmission system to move it around too
- We've used controls and communications to safely use the margin that was built in, but we've taken this about as far as we can
- California Market conditions are stressing the interties and existing congested paths

25

Regional Transmission Is Not Keeping Up With Needs

(From NW Power Pool 10 - YR Forecast)

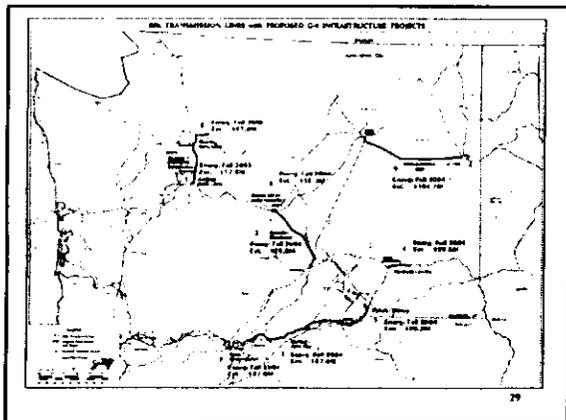
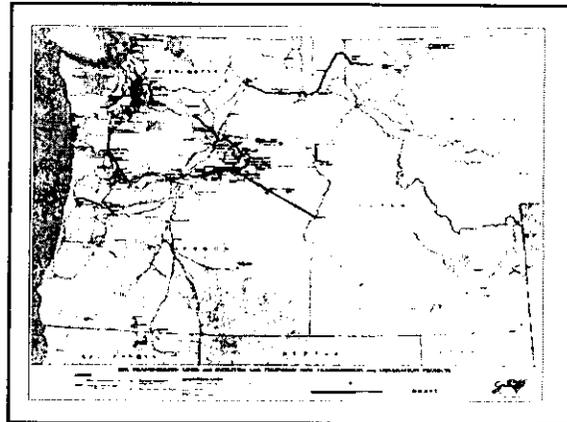
	1998	2008	% Increase
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

26

Solution?

- The Projects on the Following Map Represent Our Proposed Solution to The Four Issues:
 - Reinforcement of the Load Centers
 - Integration of Needed Generation Resources
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relief of Crippling Congestion
 - Compare Proposed Projects with NW Constrained Path Map
 - Reduces Price Volatility
 - Puts A Little Reliability Margin Back Into the Grid
 - Reduces Vulnerability to Cascading Electrical Outages
 - Allows Outages for O&M

27



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What Happens to Transmission Rates?

Question:

- How Does This Infrastructure Proposal (\$775M) Get Paid For?

Answer:

- New transmission revenues are expected to at least offset incremental costs
 - Transmission contracts have already been signed that will recover 20% of the 5-year incremental annual costs of \$80 million
 - The remaining amount of 5-year incremental costs will be recovered by contracts with less than 1/6 of the proposed new generation and other sales
 - If more new generation or additional use from congestion relief occurs, the pressure on rates would decline

30

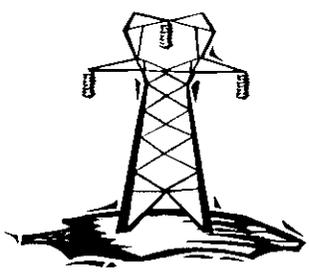
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Power Administration

**Montana
Transition Advisory Committee
Transmission Subcommittee**

Vickie VanZandt
VP, Transmission Operations and Planning
January 24, 2002

Bonneville
Power Administration

Transmission Assessment



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Power Administration

Summary

- **Current Situation**
 - Loads growing steadily at 1.8% per year
 - Little new transmission since 1987
 - Transmission use growing steadily at 2% per year
- **Objectives**
 - Keep the lights on – reinforce the system to comply with national reliability standards
 - Interconnect needed new generation
 - Remove constraints that limit economic trade & our ability to maintain the system

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The Need for Transmission

- **Infrastructure Proposal**
 - Reinforces Load Centers
 - Integrates Needed Generation Resources
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15 (Constraint in Central California)
 - Puts A Little Reliability Margin Back Into the Grid
 - To Reduce Exposure to Cascading Electrical Outages with Big Impacts
 - Needed For A Competitive Wholesale Market To Work
 - So We Can Meet Regional Load During Outages
 - So We Can Meet Load and Move Power When Large Load Shuts Down
 - So We Can Actually Do Some Maintenance Without Harming the Market
 - So the RTO Doesn't Start with the Regional Grid heavily congested.

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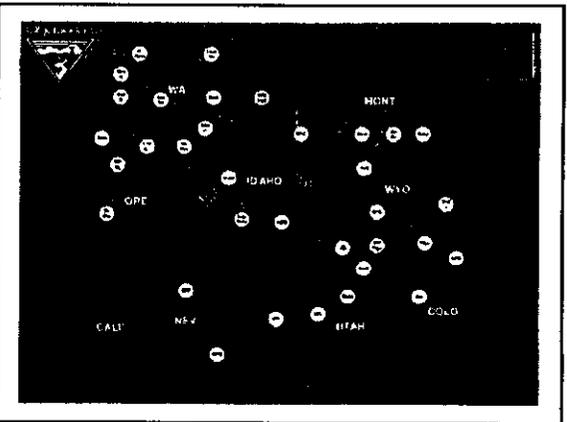
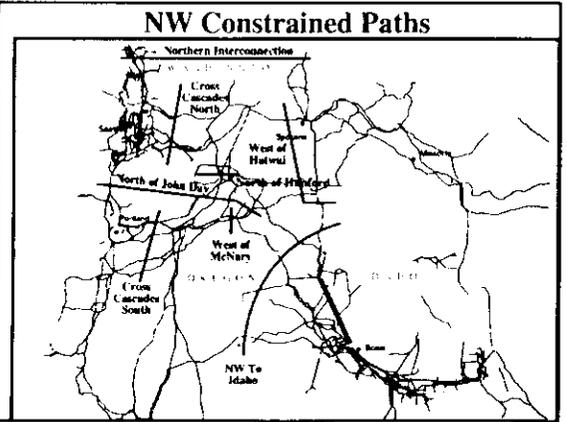
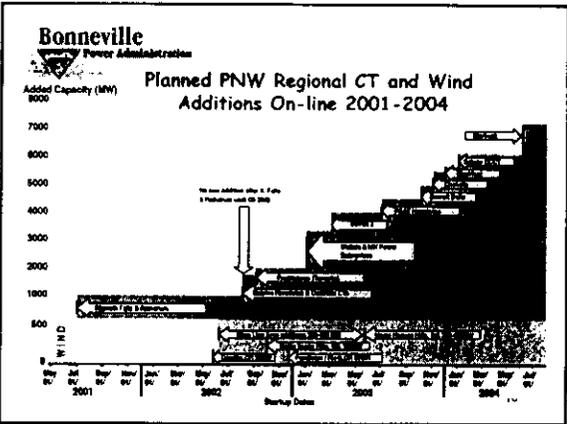
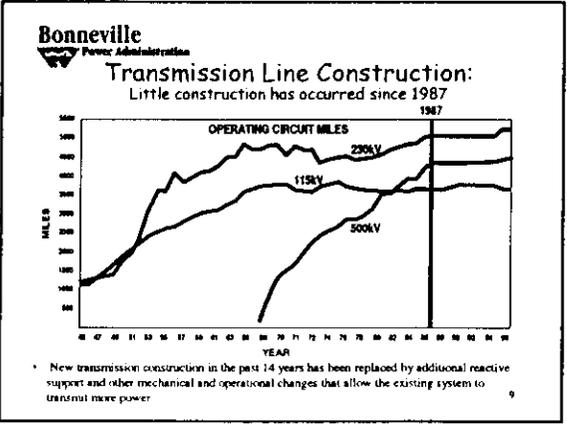
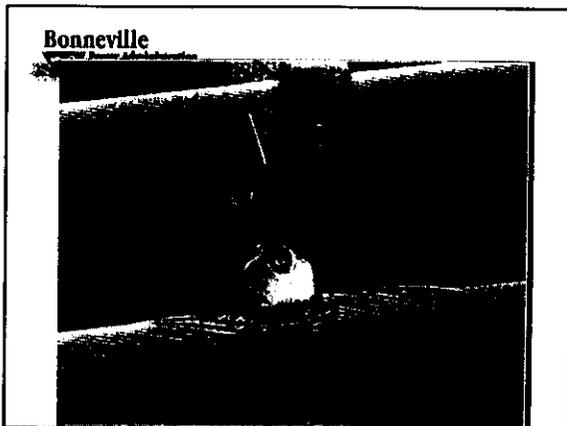
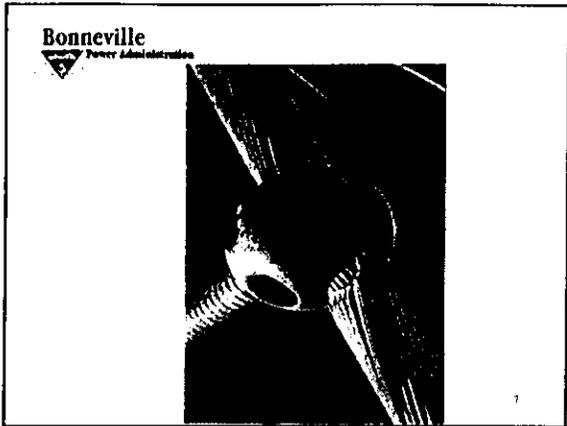
Why Is This Necessary Now?

- **We Need to Restore Some Margin (Especially for Summer Grid Operations)**
 - Curtailments needed to Maintain Margin
 - Vulnerable to Cascading Electrical Outages
 - Ability to Maintain the System Seriously Impaired
- **We Don't Want to Delay Integration of Needed Resources**
 - Major Transmission Facilities Take 3-5 Years
 - Generators Can Be Up in 18 Months
 - Even with Aggressive Schedule Planned (2002-2006), We Will Not Accommodate Some Generators' On-Line Dates

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Power Administration

Regional Transmission Is Not Keeping Up With Needs
(From NW Power Pool 10 - YR Forecast)

	1998	2008	% Increase
Winter Peak Load - MW	59,972	66,952	12%
Transmission Circuit Miles	61,415	62,352	2%

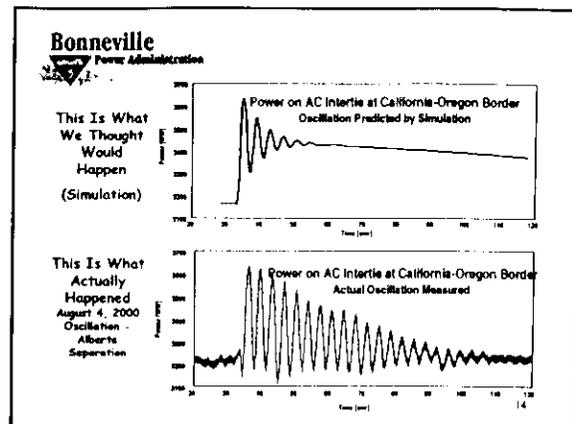


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Reliability?

- Enough Generation to Meet Load is One Measure of Reliability
- Resiliency - The Ability of the System to Withstand and Recover from Problems Without Cascading Electrical Outages - is Another Measure
 - Lightning Strikes, Equipment Outages or Failures Cause Bumps on the System
 - The Western Transmission System is Not Very Resilient (Well-Damped) Anymore
 - Like a Car With Worn Out Shocks going over a Bump

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Reliability?

- The Most Important Reason for the Infrastructure Proposal is to Reduce the Risk of Rolling Blackouts and Sudden, Cascading Electrical Outages with Big Societal Impacts
- These Events are Rare, But Historical US Data Indicate Not THAT Rare. Events Affecting Over 1,000,000 Customers Occur About Once Per Year.
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Solution?

- The Projects on the Following Map Represent Our Proposed Solution to The Four Issues:
 - Reinforcement of the Load Centers
 - Integration of Needed Generation Resources
 - Relief of Crippling Congestion
 - Puts A Little Reliability Margin Back Into the Grid

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Highest Priority Projects

1. Puget Sound Area
2. North of Hanford/
N. of John Day
3. West of McNary
4. Starbuck
Generation
5. Lower Monumental
& McNary Area
6. Cross Cascades
North
7. Celilo
8. I-5 Corridor
9. Spokane Area

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Transmission Infrastructure Briefing For NW Energy Coalition

By
Vickie VanZandt
VP, Transmission Operations & Planning
Bonneville Power Administration
October 5, 2001

1

Transmission Infrastructure

Current Situation

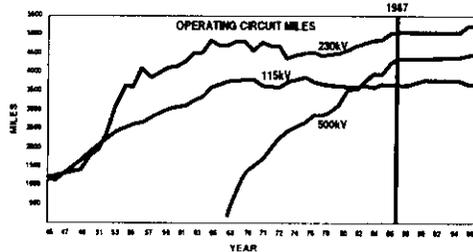
- Loads growing steadily at 1.8% per year
- Little transmission built since 1987

Objectives

- Keep the lights on — reinforce the system to comply with national reliability standards
- Interconnect needed new generation
- Remove constraints that limit economic trade and our ability to maintain the system
- Replace aging equipment

2

Transmission Line Construction: Little construction has occurred since 1987



- New transmission construction in the past 14 years has been replaced by additional reactive support and other mechanical and operational changes that allow the existing system to transmit more power

3

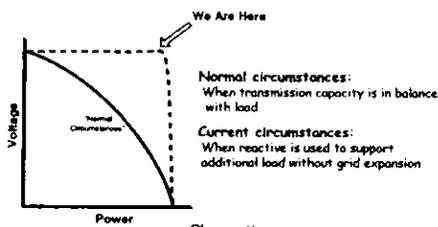
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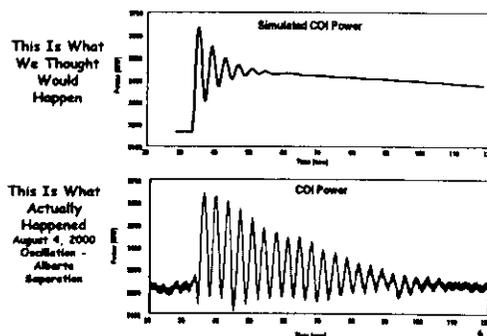
System Stress



- We are seeing unexpected "wiggles" on the system which indicates lack of stability
- System studies are revealing more constraints
- There is little or no system margin left

5

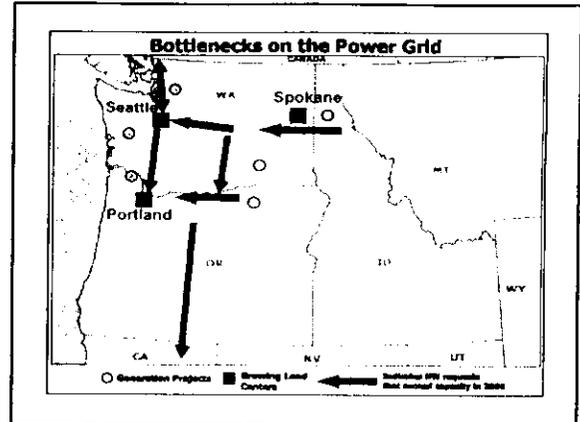
System Stress



Generation Projects Under Construction

<p>Cape Horn Nuclear Power Plant</p>  <p>Place: Umatilla, OR Mega-watt: 536 Emergence: March 2007</p>	<p>Crocker Springs 2</p>  <p>Place: Moscow, OR Mega-watt: 260 Emergence: December 2001</p>
<p>Haskell/ Nine Mile Wind</p>  <p>Place: Umatilla, OR Mega-watt: 50 Emergence: December 2001</p>	<div style="border: 1px solid black; padding: 5px;"> <p>> 7000 MW proposed through 2004.</p> <p>> Nearly 30,000 MW of requested interconnection.</p> </div>

7



Transmission Infrastructure

Non-transmission alternatives

- Non-transmission alternatives, such as pricing, conservation, demand side management, distributed generation, and better siting of large generators can defer or reduce the need for transmission.
 - We had a very successful experience with the Puget Sound Electric Reliability Plan in the early 1990's
 - Functional separation between power and transmission makes least cost planning somewhat more difficult today
- Contract underway with E3, Tom Foley and Eric Hirst to:
 - Develop a framework for planning and expansion
 - Review Phase 1 of the Infrastructure Proposal (6-9)
 - Prepare proposal for next steps
- Bonneville's transmission department is finalizing a FY 2002 target to develop least-cost fixes and appropriate funding mechanisms for non-transmission alternatives
- All alternatives must be considered in the EIS process

9

Transmission Infrastructure

Need for multi-year funding certainty *now*

- Major transmission projects take 3-5 years
 - 700 miles of new line
 - 3 major new substations
- Tight timeframes require funding commitment in October, 2001
 - Reserve factory capacity to ensure availability of materials
 - Innovative furnish & install contract for line and substation construction on multiple projects
 - Reserve scarce labor resources
 - Enables completion of projects within planned staffing levels
- Can not make commitments without full funding certainty

10

Transmission Infrastructure

Consequences of no borrowing authority increase

Delay needed reinforcements

- Critical load service and reliability projects only funded thru 2005
- Remaining constraints impede competition, raising consumer prices.
- Interconnection of new generation delayed up to 3 years and over 3000 MW
 - Prolongs Western energy crisis.
 - Frustrates billions of dollars in private sector development.
 - Potential litigation.
- Harder to take equipment out for maintenance.
- Defer some replacement of aging equipment
 - More frequent emergency outages due to failed equipment.
 - Higher maintenance costs.

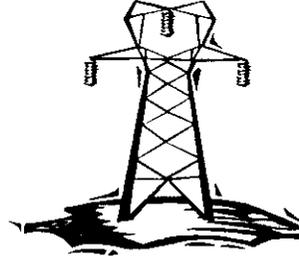
11

Transmission Infrastructure Briefing for Oregon PUC

By
Vickie VanZandt
VP, Transmission Operations & Planning
June 2001

1

Transmission Assessment



2

BPA Transmission System

- BPA operates 80% of the high-voltage grid in its service area (OR, WA, ID and western MT).
 - More than 15,000 miles of line
 - Two fully redundant control centers
 - Over \$5 billion federal investment
 - About \$540 million in annual revenues
- About 50% of the grid looking at the U.S. portion of the NW Power Pool (add eastern MT, WY and UT).
- BPA voluntarily complies with FERC open access rules.

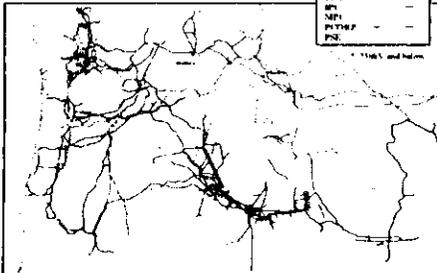
3

Fragmentation of the NW Grid

- Five investor-owned utilities also own NW transmission facilities.
- In addition, some consumer-owned utilities own transmission and 10 operate control areas.
- Fragmented ownership and "parallel paths" have made it difficult to fix some transmission bottlenecks, and certainly leads to less than optimal solutions.

4

Combined Transmission Grid

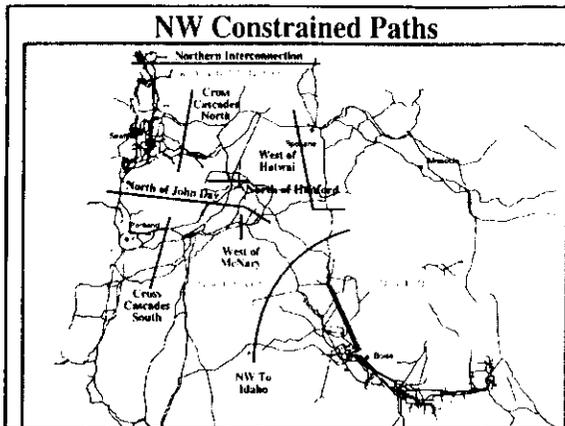


5

Current Situation

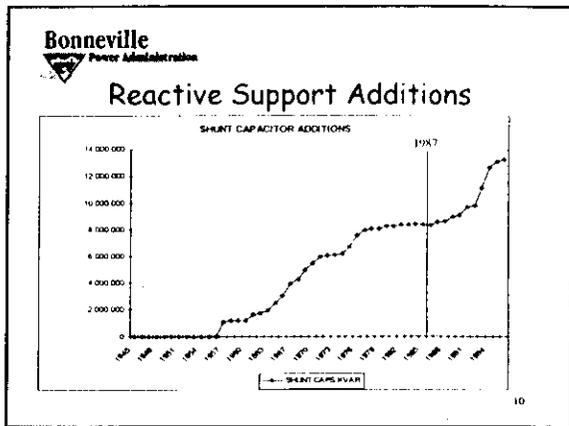
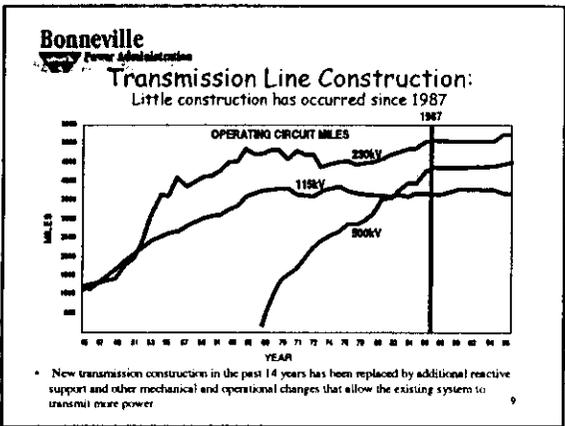
- The system is under stress because it is operating at or near capacity
- System constraints are affecting our ability to use & care for the system
 - Availability pressures exists to run the system harder
 - Outages for Maintenance & Construction are more difficult to obtain and are compressed in time, due to high utilization by the markets.
- Likelihood of system failure is increasing
 - The system facilities are aging (500kv grid is over 30 years old)

6



Bonneville Power Administration Current Situation

- Approximately 27,000 MW of generation is potentially being sited in the Northwest
 - The Transmission System will become more stressed with the addition of generation if nothing is done to reinforce the existing network
- RTO will begin operation in FY04, at the earliest (sets time baseline)



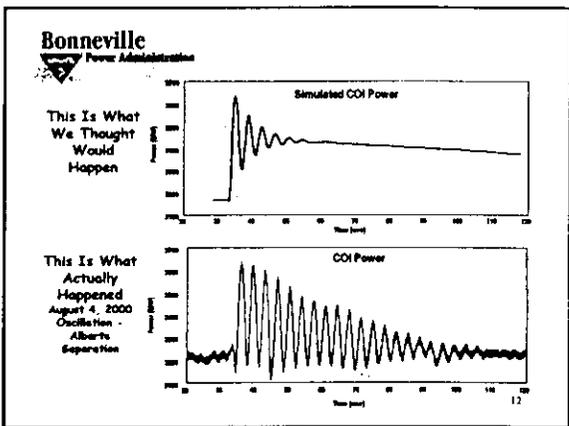
Bonneville Power Administration System Stress

Normal circumstances:
When transmission capacity is in balance with load

Current circumstances:
When reactive is used to support additional load without grid expansion

Observations:

- We are seeing unexpected "wiggles" on the system which indicates lack of stability
- System studies are revealing more constraints
- There is little or no system margin left



How Did We Get Here?

- Deregulation has created different users and results in unusual generation patterns
 - Reliability criteria changes due to market pressures
 - Gaming may occur which could be detrimental to system
- The western interconnection's energy crisis isn't just a generation issue -- it's the transmission system to move it around too
- We've used controls and communications to safely use the margin that was built in, but we've taken this about as far as we can
- California Market conditions are stressing the interties and existing congested paths

Regional Transmission Is Not Keeping Up With Needs

(From NW Power Pool 10 - YR Forecast)

	1998	2008	% Increase
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Transmission Circuit Miles	61,415	62,352	2%

- Recognize that transmission investments are needed now
- Encourage Generation be built near load or uncongested paths as possible
- Seek all conservation & renewable resources available to reduce & manage loads
- Understand the problem has been building over the last decade and there are no quick fixes.
 - It takes two to five years to plan, site & build a major transmission line.
- Seek cooperation and support of other transmission owners (IOU's & Publics) in the Pacific Northwest to meet this challenge

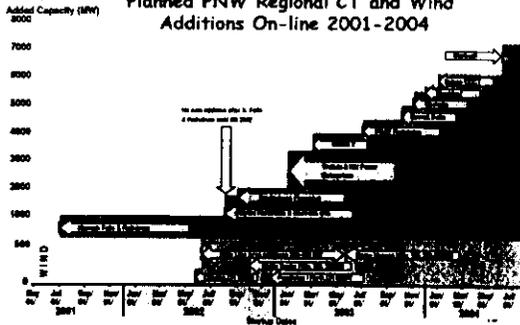
We Need A Bunch of Wire

- Infrastructure Proposal
 - Puget Sound I-5 Corridor
 - Seattle Area Load Service
 - Canadian Entitlement
 - North of John Day Relief
 - Allows Use of Southern Intertie
 - Bi-Op Commitment
 - Adds Flexibility for Low Water Years
 - West of McNary
 - Somebody Will Site Near Hermiston
 - West of Hatwai and Idaho to the NW
 - California Won't Help Us Any Time Soon, Making Montana and Idaho Imports More Critical To Meeting Regional Winter Peak
 - De-Couple From Sub-Grid
 - Minimizes Effects of Main Grid Outages on Underlying Sub-Grid and distribution Systems

We Need A Bunch of Wire

- Infrastructure Proposal (continued)
 - Proposal Assumes Some Generators Integrate -- But Not All
 - Depending on Which Ones Site and Their Location: between 8000 to 12000 MW Can Be Integrated
 - Relieves Crippling Congestion
 - We Don't Want Our Own Path 15
- Puts A Little Margin Back Into the Grid
 - Needed For A Competitive Market To Work
 - So We Can Meet Regional Load During Outages
 - So We Can Meet Load and Move Power When Load Goes Away
 - So We Can Actually Do Some Maintenance Without Harming the Market
 - So the RTO Doesn't Start with the Regional Grid heavily congested.

Planned PNW Regional CT and Wind Additions On-line 2001-2004

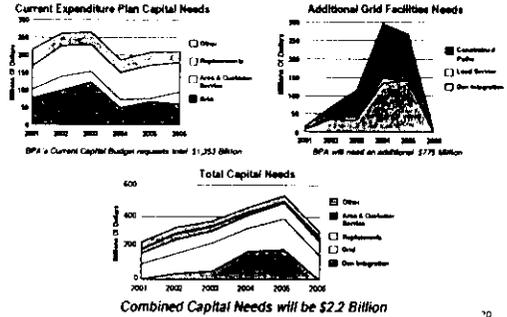


How Does This Get Paid For?

- This infrastructure plan reflects an additional \$775M over our current expenditure plan for 2002-2006 of \$1.3B
- The integration of between 5000 - 5500 MW of generation -- and corresponding use of the transmission system recovers the cost of the new wires
- More generation than that should lower rates

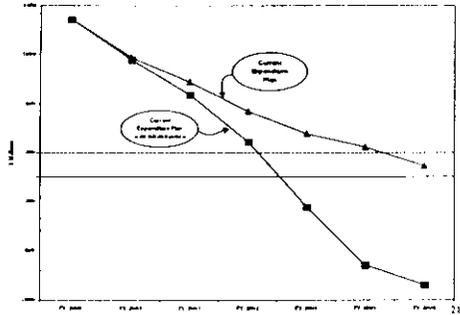
19

Expenditure Plans



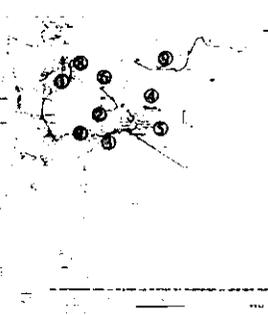
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Bonneville's Remaining Borrowing Authority



21

G-9



1. Puget Sound Area
2. North of Hanford/
N. of John Day
3. West of McNary
4. Starbuck Generation
5. Lower Monument &
McNary Area
6. Cross Cascades
North
7. Celilo
8. I-5 Corridor
9. Spokane Area

22

Our Concerns

- Resource Requirements will be large
 - Capital - BPA will need access to additional borrowing authority
 - Staff
 - System & Processes
- Keeping the system going as we address these issues will be difficult
- The system may fail before we can act

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