Regional Employment and Economic Impact Study

Prepared for

The Bonneville Power Administration

by

William B. Beyers, Dept. of Geography, University of Washington

Lloyd T. O'Carroll CFA

Davenport & Company LLC

Paul Sorensen

BST Associates

Goals Of This Study

- To draw conclusions regarding economic impacts of benefits to DSI aluminum smelters located in Washington and Montana over the 2011-2027 time period
- To use “source material” provided by Bonneville to draw these conclusions
- To use Bonneville’s alternative scenarios for energy costs in drawing these conclusions

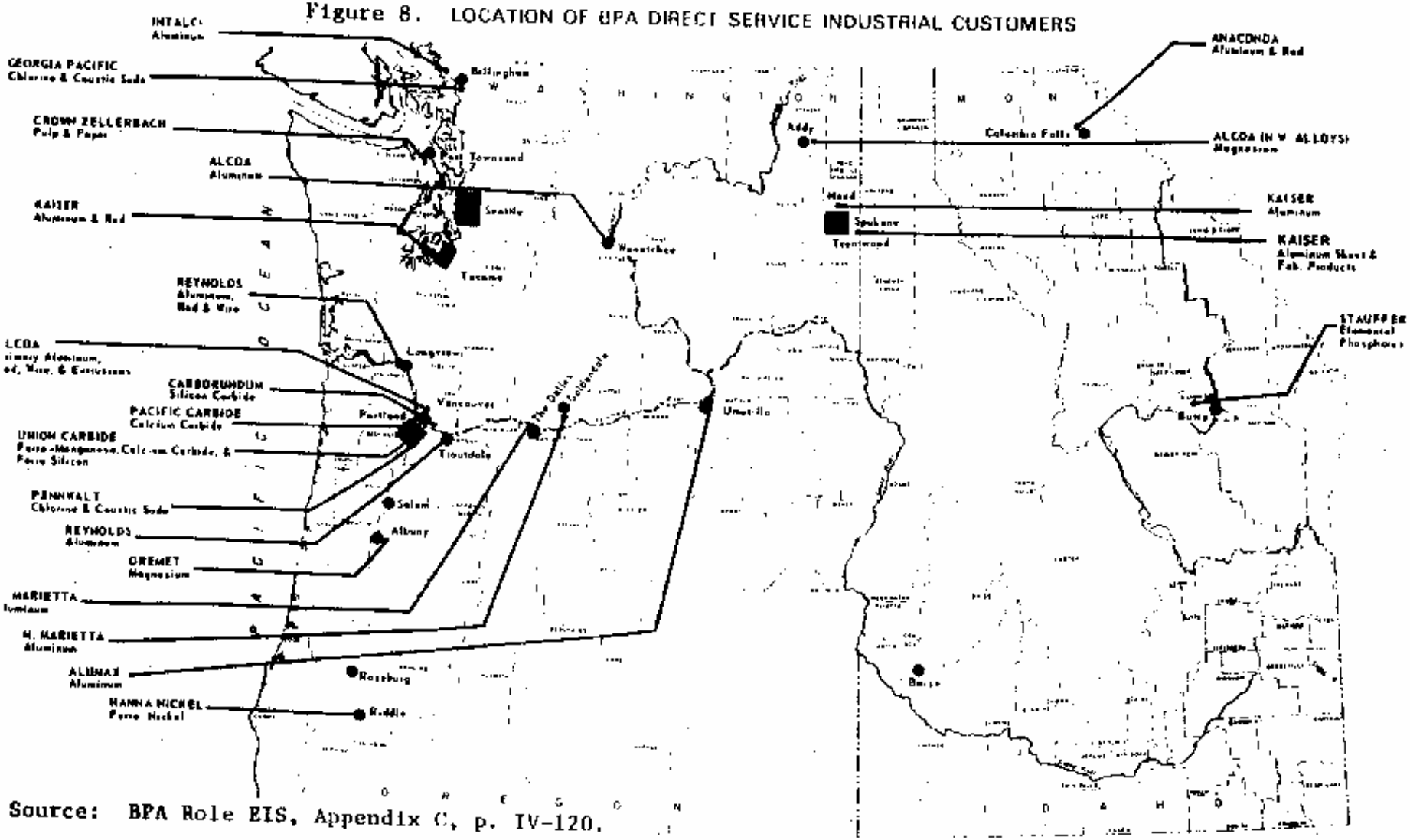
Organization of Report

- Executive Summary – *Not addressed here*
- Background
- Discussion of Scenarios and Bonneville's Proposed Allocation of Energy
- Aluminum Smelter Economics and Available Source Material
- Operational Conclusions and Recommendations

Background

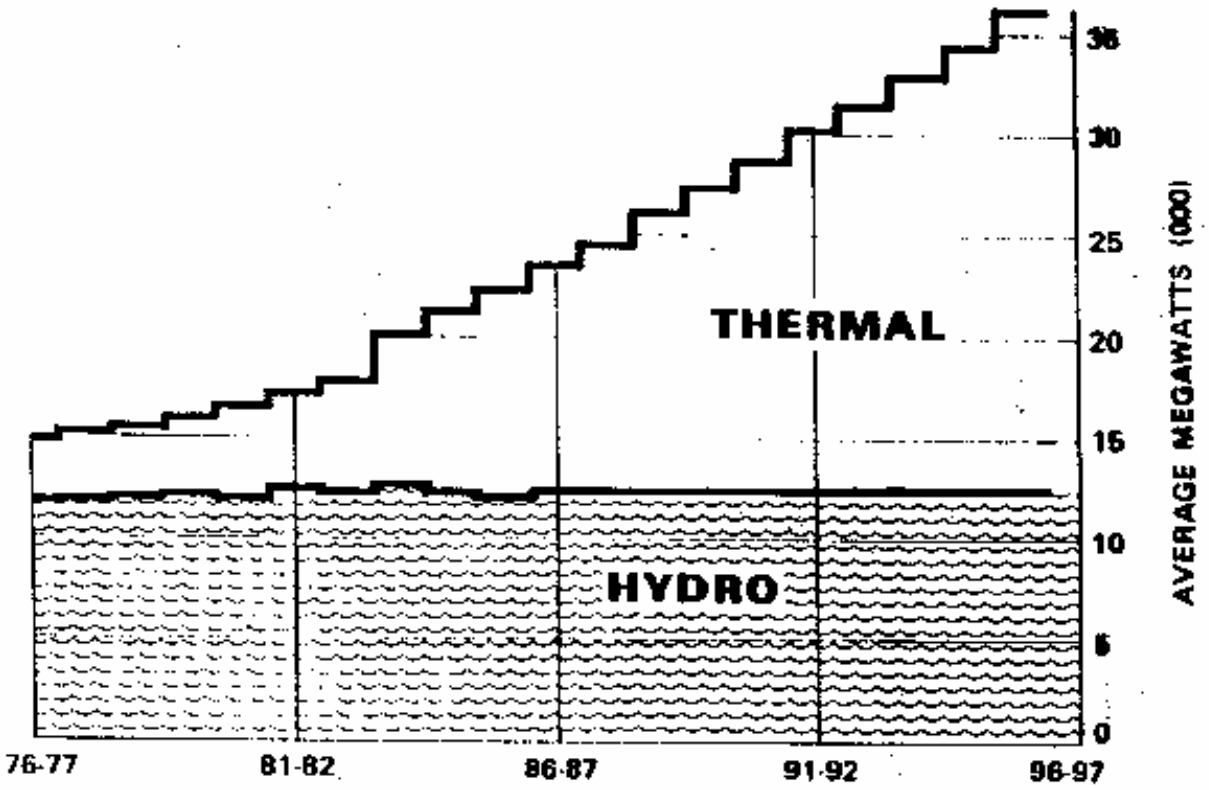
- The DSI concept – Bonneville Power Act of 1937 – classes of preference customers
- Historic purpose for DSI's
- The expansion of DSI's in the region from the 1930's through the 1970's
- Historic visions of growth of DSI's & regional energy demand, the hydro-thermal program, and dramatic shifts in energy forecasting methods

Figure 8. LOCATION OF BPA DIRECT SERVICE INDUSTRIAL CUSTOMERS



Source: BPA Role EIS, Appendix C, p. IV-120.

Figure 11. *Projected Additions to Electric Energy Supply in the West Group Area.*



Source: *The Electric Energy Picture in the Pacific Northwest* (Portland: BPA, 1976).

The flow of water can be adjusted within seconds, as penstocks are opened or closed. The environmental im

BPA Role EIS Forecast & Actual Use

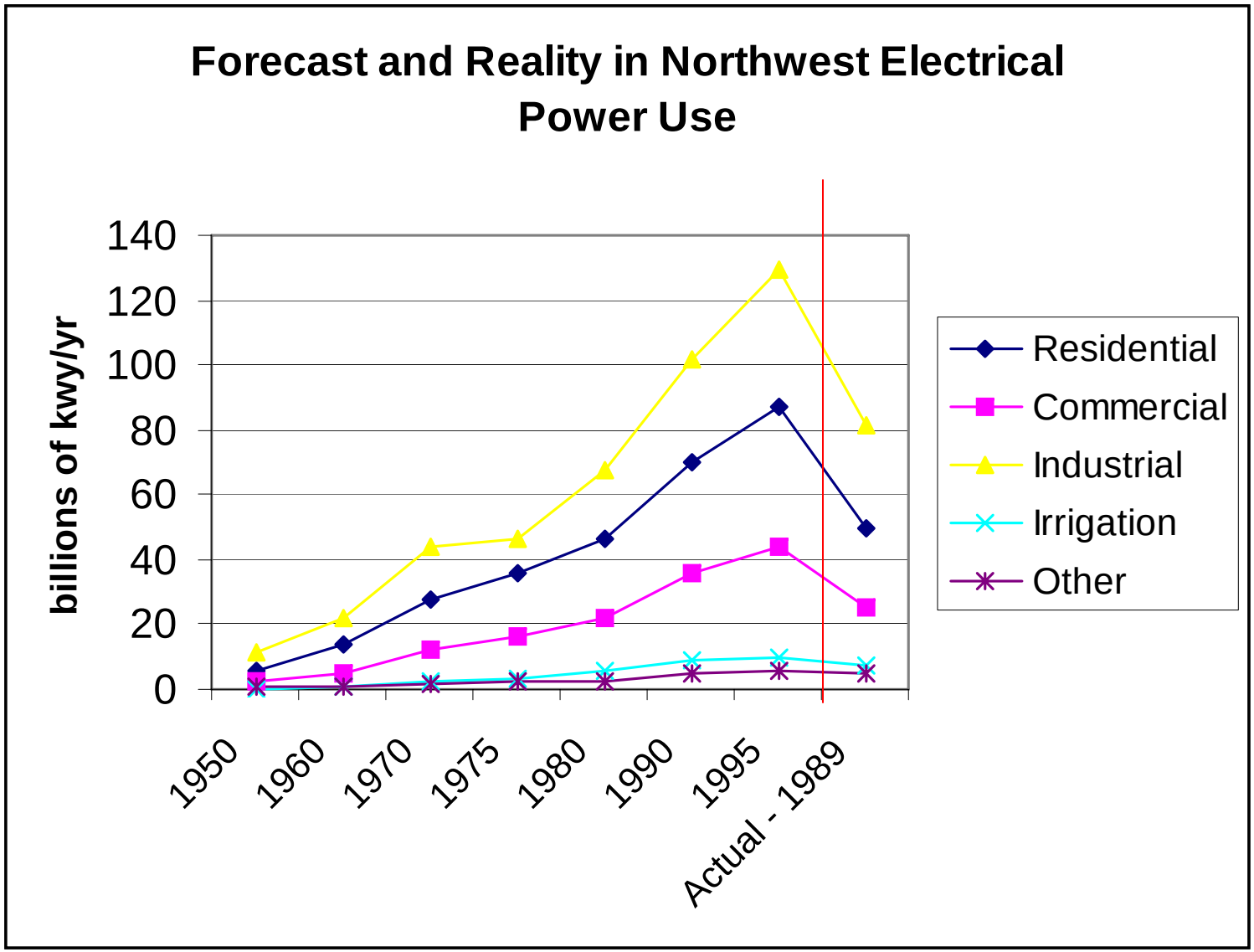


Table 1 Aluminum Industry Plants and Economic Impacts (Data are related to full production)

						Employment		Income ($mils)	
Owner	**Plants**	**State**	**County**	**Capacity (M tons/yr.)**	**Electricity Demand (MW)**	**Direct**	**Total**	**Direct**	**Total**
Plants that are closed									
Alcoa	Troutdale	OR	Multnomah	130	279	520	1,200	$28.3	$31.7
Golden Northwest	The Dalles	OR	Wasco	84	167	530	1,320	$28.8	$51.0
Glencore	Vancouver	WA	Clark	119	228	610	1,230	$35.9	$48.2
Longview Aluminum	Longview	WA	Cowlitz	210	417	880	2,040	$46.6	$71.1
Kaiser	Tacoma	WA	Pierce	71	140	350	850	$19.1	$31.8
Kaiser	Mead	WA	Spokane	209	390	2,180	7,820	$152.1	$304.2
			subtotal	823	1,621	5,070	14,460	$310.8	$538.0
Plants that could operate									
Glencore	Columbia Falls	MT	Flathead	163	324	610	1,980	$28.7	$65.5
Alcoa	Wenatchee	WA	Chelan	229	428	580	1,590	$37.0	$45.8
Golden Northwest	Goldendale	WA	Klickitat	166	317	700	1,290	$37.8	$40.4
Alcoa	Bellingham	WA	Whatcom	282	457	1,130	3,870	$66.2	$145.4
			subtotal	840	1,526	3,020	8,730	$169.7	$297.1
			% of Total	51%	48%	37%	38%	35%	36%
			Total all	1,663	3,147	8,090	23,190	$480.5	$835.1

Table 2 Bonneville's Proposed Allocation of Energy

Alcoa (Whatcom and Chelan counties in Washington State)	320 aMW
Columbia Falls (Flathead County in Montana)	140 aMW
Goldendale (Klickitat County in Washington State)	100 aMW
Port Townsend Paper (Jefferson County in Washington State)	17 aMW
Total	577 aMW

- Alcoa could operate one potline at Ferndale,
  two potlines at Wenatchee
- Glencore could operate two potlines in Columbia Falls
- Golden Northwest could operate one potline in Goldendale

- Alcoa has an alternative power source in Wenatchee

Table 3: BPA's Projected Power Rates in FY 2012 (Rates in MWh)

Alternative	Description	Change in Priority Firm	Change in Industrial Power Rate
Alt. #1	Base Case - $0 DSI Benefits	$0.00	NA
Alt. #2	Current Proposed Financial Benefits of $59 million	$1.00	NA
Alt. #3a	560MW Sale at IP Rate (7(b)(2) triggered)	$0.40	$15.00 *
Alt. #3b	560 MW Sale at IP Rate (7(b)(2) not triggered)	$1.50	$1.50
Alt. #4	560MW Federal Power System Sale at equivalent to lowest cost priority firm power rate	$1.50	NA

Calculating Rates Under Alternative 2

If all 560MW were purchased year round, this would be:
365 days x 24 hours/day x 560MW = 4,905,600 megawatt-hours

Dividing $59 million by 4,905,600 MwH = $12.03/MwH

If the market price = $50 / MwH, then $50-$12.03 = $37.97 would be the DSI price.

If less than 560MW were purchased, the $59 million in benefits would still be available, effectively reducing the price per MwH.

The lowest price allowed would be the priority firm power rate, or $31 per MwH. Clearly, there are a variety of combinations of production possibilities & rates under this alternative

Aluminum Smelter Economics and Source Material

- Ideal situation: hard facts about market conditions and costs of production between 2011 and 2027.
- Reality: we lack these hard facts
- So, we have tried to use data at our disposal and our knowledge of the industry to forecast impacts under the various energy supply scenarios

Source Materials – Table 4

Author and Study #	Title
(1) Metal Strategies LLC (2000) (Moison 2000)	The Survivability of the Pacific Northwest Aluminum Smelters
(2) Policy Assessment Corporation (Backus and Kleeman 2000)	Impacts of Aluminum Industry Closings on the Pacific Northwest
(3) Dick Conway & Associates (2000) (Conway Jr. 2000)	The Washington State Aluminum Industry Economic impact Study
(4) Dick Conway & Associates (2000) (Conway Jr. 2000)	The Oregon State Aluminum Industry Economic Impact Study
(5) Dick Conway & Associates (2000) (Conway Jr. 2000)	The Montana State Aluminum Industry Economic Impact Study
(6) Mid-Columbia Economic Development District (2000) (District 2000)	An Assessment of the Employment and Income Impacts of the Primary Metals Industry in Wasco and Klickitat Counties
(7) Hamilton Water Economics and Economic Modeling Specialists Inc. (2006) (Hamilton and Robison 2006)	Economic Impacts from Rate Increases to Non-DSI Federal Power Customers Resulting from Concessional Rates to the DSI's.
(8) Dick Conway & Associates (2006) (Conway Jr. 2006)	The Economic Impact of the Washington State Aluminum Industry
(9) CRU Strategies Ltd. (2006) (CRU Strategies 2006)	Northwest Smelter Operating Outlook

BPA invited interested parties to provide new source material by May 31, 2006

Table 5 Relevance of Source Material to this Analysis

Author	Does the Report Address Conditions in 2011-2027	Are the data useful for addressing conditions in 2011-2027
(1) Metal Strategies LLC (2000)	NO	Somewhat
(2) Policy Assessment Corporation (2000)	YES, partially	Somewhat
(3) Dick Conway & Associates (2000)	NO	Somewhat
(4) Dick Conway & Associates (2000)	NO	Somewhat
(5) Dick Conway & Associates (2000)	NO	Somewhat
(6) Mid-Columbia Economic Development District (2000)	NO	Somewhat
(7) Hamilton Water Economics and Economic Modeling Specialists Inc. (2006)	YES, partially	Somewhat
(8) Dick Conway & Associates (2006)	NO	Somewhat
(9) CRU Strategies Ltd. (2006)	Yes, partially	Yes, partially

"The main point that we would make is that these studies have relied on data that is not relevant to the current question at hand, or is only marginally relevant."

Smelter Economics

- Key points – aluminum smelters operate continuously, historically they have been located in regions with low and predictable energy costs, technical change has reduced technical requirements for energy consumption, most Northwest smelters are old and relatively inefficient
- The CRU study advocates a pricing structure different than BPA, one that is cost-based and more predictable
- Potline startup and shutdown costs are high, reinforcing the need for predictable power rates
- Power rate structures need to be predictable, and the current BPA offers are problematic

Alcoa Plants

- The consultants have more information about Alcoa plants than others included in the BPA offer
- The Ferndale plant is the most efficient in the region
- The Wenatchee plant has energy options that would allow it to partially operate without BPA energy
- We have estimated from the CRU study breakeven costs for the Alcoa plants under several operating options (See Table 6)
- This analysis indicates that the Ferndale plant could operate fully if power rates were low and partial operations could be undertaken in some of the Bonneville scenarios.

Extensions to Other Smelters

- We did not have current data for the Columbia Falls and Goldendale Smelters of a quality similar to the CRU study.
- The Metal Strategies study gives some clues about possible extensions of Alcoa data to them
- We tentatively conclude that these other smelters may not survive with power costs above $31/MwH

Economic Impacts of Alternatives

- The source material provides historic multiplier estimates
- These estimates may not be relevant to the time period 2011-2027
- There are no forecasts of multipliers that could be used this far in the future, or even for shorter time periods
- We have used existing models to estimate likely economic impacts of alternative estimates of plant operations

Short-term Multipliers versus Long-run Impact Measures

- Short-run multipliers are typically from impact models such as input-output based models
- Long-run “multiplier” models are based on visions of other activities entering regional economies that “replace” industries that are lost.
- We could not fully estimate long-run impacts in this study.
- We used the short-run multipliers from the Source Material to make estimates of economic impacts. Clearly, these are subject to change as better data become available regarding the industry

Table 9 Short-Term Multiplier Comparisons

	Estimated Direct Employment	**Conway Jobs Multiplier State**	Conway Jobs Multiplier County	Conway Income Multiplier State	Conway Income Multiplier County	Conway Output Multiplier State	**PA Jobs Multiplier State***
Alcoa Wenatchee – 2 Potlines	380	**3.94**	2.74	3.13	1.24	1.71	**2.46**
Alcoa Ferndale (INTALCO)– 1 Potline	460	**3.94**	3.42	3.13	2.2	1.71	**2.46**
Columbia Falls – 2 Potlines	277	**Not Reported**	3.25	2.68	2.28	Not reported	**4.05****
Goldendale – 1 potline	249	**3.94**	1.84	3.13	1.07	1.71	**2.46**

* Employment impact multiplier in 2001 (short-term multiplier)

** Reflects impact of losing a relatively large employer in a small county

Operational Conclusions and Recommendations

- This section of the report presents conclusions based on:
  - BPA source material
  - Assumes that Chelan County will continue to supply Alcoa-Wenatchee with energy to run two potlines
  - We present economic impact estimates based on various scenarios

Table 10 Likely Operating Scenarios in FY2012 (number of potlines operating)

	Current Situation	Alt 1	Alt 2	Alt 3a	Alt 3b	Alt 4
Wenatchee	2	2	2	2	2	2
Alcoa Ferndale (INTALCO)	1	Shut down	1 or 2	Shut down	1 or 2	1 or 2
Goldendale	Shut down	shut down	0 or 1	Shut down	0 or 1	0 or 1
Columbia Falls	1	Shut down	Possibly 2	Shut down	1 or 2	1 or 2

- Uncertainties in alternative 2 due to varying price of energy depending upon how many smelters go after the 560MW of energy

Table 11 Short-term Economic Impacts of Aluminum Reduction Plants Operating Under Benchmark Scenarios

(Includes Goldendale Operating one potline)
Income impacts in millions $2006

	Direct Jobs	State Job Impacts	Local Job Impacts	Income Impact State	Income Impact Local
Alcoa Wenatchee	380	1497	1042	$102.60	$40.70
Alcoa Ferndale 1 potline	460	**1812**	1575	114	80.2
Alcoa Ferndale 2 potlines	750	**2955**	2569	185.9	130.7
Columbia Falls 1 potline	140	Not reported	**447**	27.9	20.3
Columbia Falls 2 potlines	277	Not reported	**885**	47.3	40.2
Goldendale	249	**981**	459	55.8	19.1

The bolded values are used in the subsequent analysis

Table 12 Short Term State Economic Impacts of Alternative Scenarios

	Alt 1	Alt 2	Alt 3a	Alt 3b	Alt 4
Employment Impact State					
Alcoa Ferndale (INTALCO)	0	0 or 1812 or 2955	0	1812 or 2955	1812 or 2955
Goldendale	0	0 or 981	0	0 or 981	0 or 981
Columbia Falls	0	0 or 447 or 885	0	447 or 885	447 or 885
Region Total	0	0 to 4821	0	2259 to 4821	2259 to 4821
Income Impact State ($ Millions)					
Alcoa Ferndale (INTALCO)	0	0 or 114 or 185.9	0	114 or 185.9	114 or 185.9
Goldendale	0	0 or 55.8	0	0 or 55.8	0 or 55.8
Columbia Falls	0	0 or 27.9 or 47.3	0	27.9 or 47.3	27.9 or 47.3
Region Total	0	0 to 289	0	141.9 to 289	141.9 to 289

The values depend upon which combinations of smelters choose to operate under the various scenarios.

The Non-DSI Study and its Implications

- Modeled a $150 million rate subsidy in its base case, and assumed that households would have increase energy costs, and less income available for other types of consumption
- The study predicts short-run impacts of 2,235 jobs, and long run impacts of 2,823 jobs.

Table 13 Estimated Impacts to non-DSI's from DSI Subsidies using $50 market prices

	Hamilton	BPA Alternative		
	Robison	**Alt 2**	**Alt 3a**	**Alt 3b/Alt 4**
Subsidy to DSIs				
Change in priority firm power rate ($/MWh)		**$1.00**	**$0.40**	**$1.50**
Annual subsidy ($millions)	**$150**	**$59**	**$24**	**$89**
Impacts				
Short-run				
Value added ($millions)	($182.80)	($71.90)	($28.80)	($107.90)
Employment (# of jobs)	-2,235	-879	-352	-1,319
Long-run				
Value added ($millions)	($160.00)	($62.90)	($25.20)	($94.40)
Employment (# of jobs)	-2,823	-1,110	-444	-1,666

- The alternative non-DSI job impacts are less than the job impacts from the DSI's in each scenario
- It is odd for long-run impacts to be greater than short-run impacts

Sensitivity Analysis for Short-term Impacts

- Table 12 shows various possible impact levels, depending upon how many potlines operate
- In the case of Scenario 2, we evaluated break even costs for the 3 smelters (Table 14), and alternative effective power rates to the DSI's (Table 15)
- This leads to various operating decisions, and Table 17 & 18 report the short-run employment and income impacts

Table 16- Operational Decision (1=operate)

Price of electricity $/MWH	**40**	**45**	**50**	**55**	**60**	**70**
Alcoa Ferndale (INTALCO)	1	1	1	0	0	0
Columbia Falls	1	1	0	0	0	0
Goldendale	1	1	0	0	0	0

Sensitivity Analysis for Short-term impacts, continued

- Alternatives 3 and 4 are based on a fixed power rate ($31.50 per MWh).
- Demand for power at Ferndale and Columbia Falls were estimated, subtracted BPA's cost for providing the power (net of DSI payments to Bonneville)
- Table 18a shows BPA exposure at various market rates

Table 19 Short-term impact on employment in Scenarios 3 and 4

Market price	40	45	50	55	60	70
DSI Direct Impact						
Alcoa Ferndale (INTALCO)	753	753	753	753	753	753
Columbia Falls	244	244	244	244	244	244
Goldendale	233	233	233	233	233	233
Total	**1,231**	**1,231**	**1,231**	**1,231**	**1,231**	**1,231**
Indirect Impact						
With a 2.5 Multiplier	1,846	1,846	1,846	1,846	1,846	1,846
With a 3.9 Multiplier	3,569	3,569	3,569	3,569	3,569	3,569
Average	**2,707**	**2,707**	**2,707**	**2,707**	**2,707**	**2,707**
Non-DSI Impact	**-599**	**-951**	**-1,304**	**-1,656**	**-2,008**	**-2,713**
Net Employment Impact	**3,339**	**2,987**	**2,635**	**2,282**	**1,930**	**1,225**
BPA cost per net employment impact $	**12,040**	**21,378**	**33,214**	**48,704**	**69,850**	**148,629**

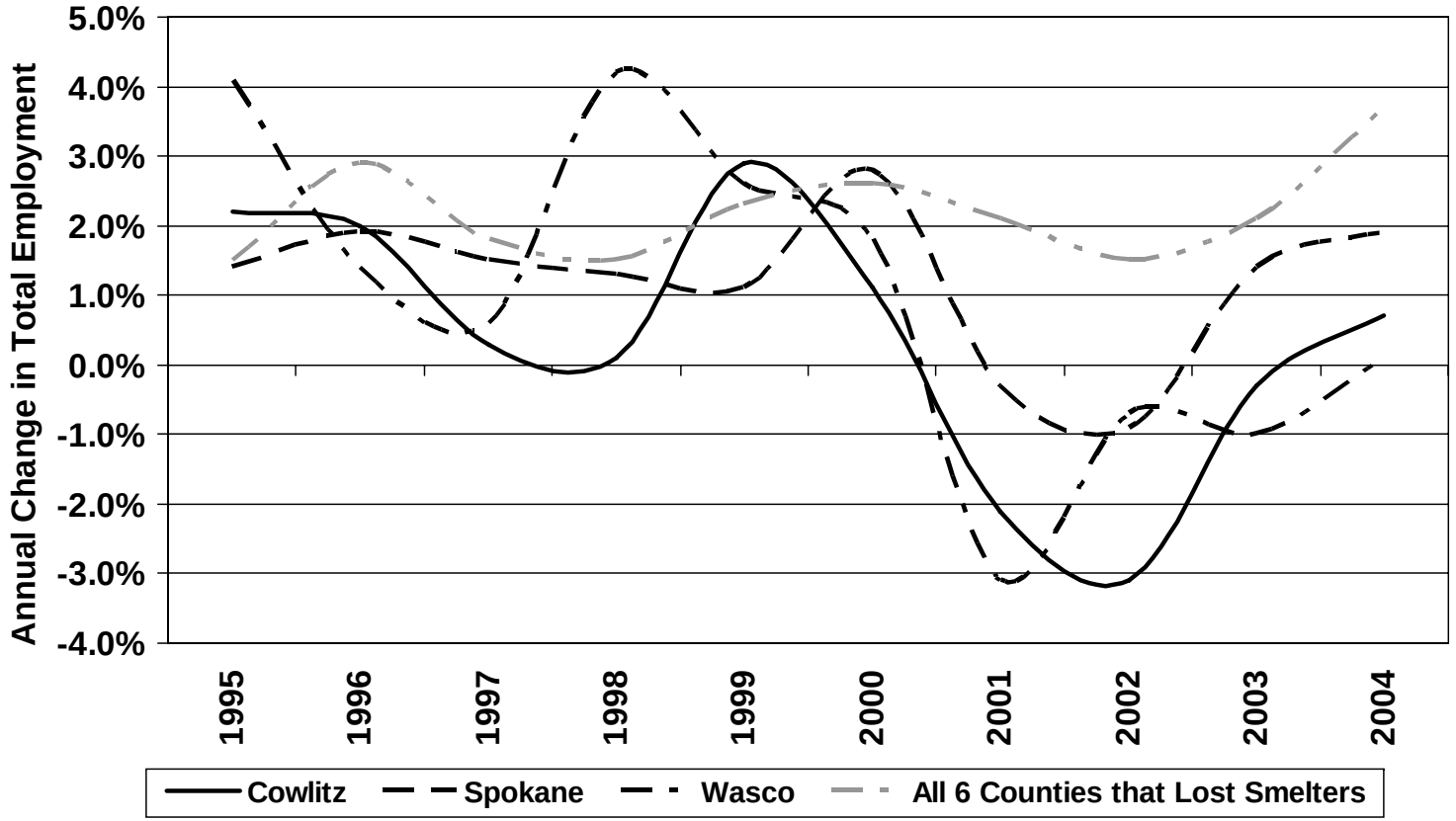
Table 21 Long-Run Employment and Income Impact of Alternative 2

Price of electricity $/MWH	**40**	**45**	**50**	**55**	**60**	**70**
Employment						
Direct DSI	732	732	377	-	-	-
Indirect DSI	1610	1610	829	0	0	0
Indirect non-DSI	-1,110	-1,110	-1,110	-	-	-
Total	**1232**	**1232**	**95**	**0**	**0**	**0**
Income (M$)						
Direct DSI	40	40	22	-	-	-
Indirect DSI	77	77	47	-	-	-
Indirect non-DSI	-63	-63	-63	-	-	-
Total	**55**	**55**	**6**	**0**	**0**	**0**

Table 22 Long-Term Employment and Income Impacts Alternative 3

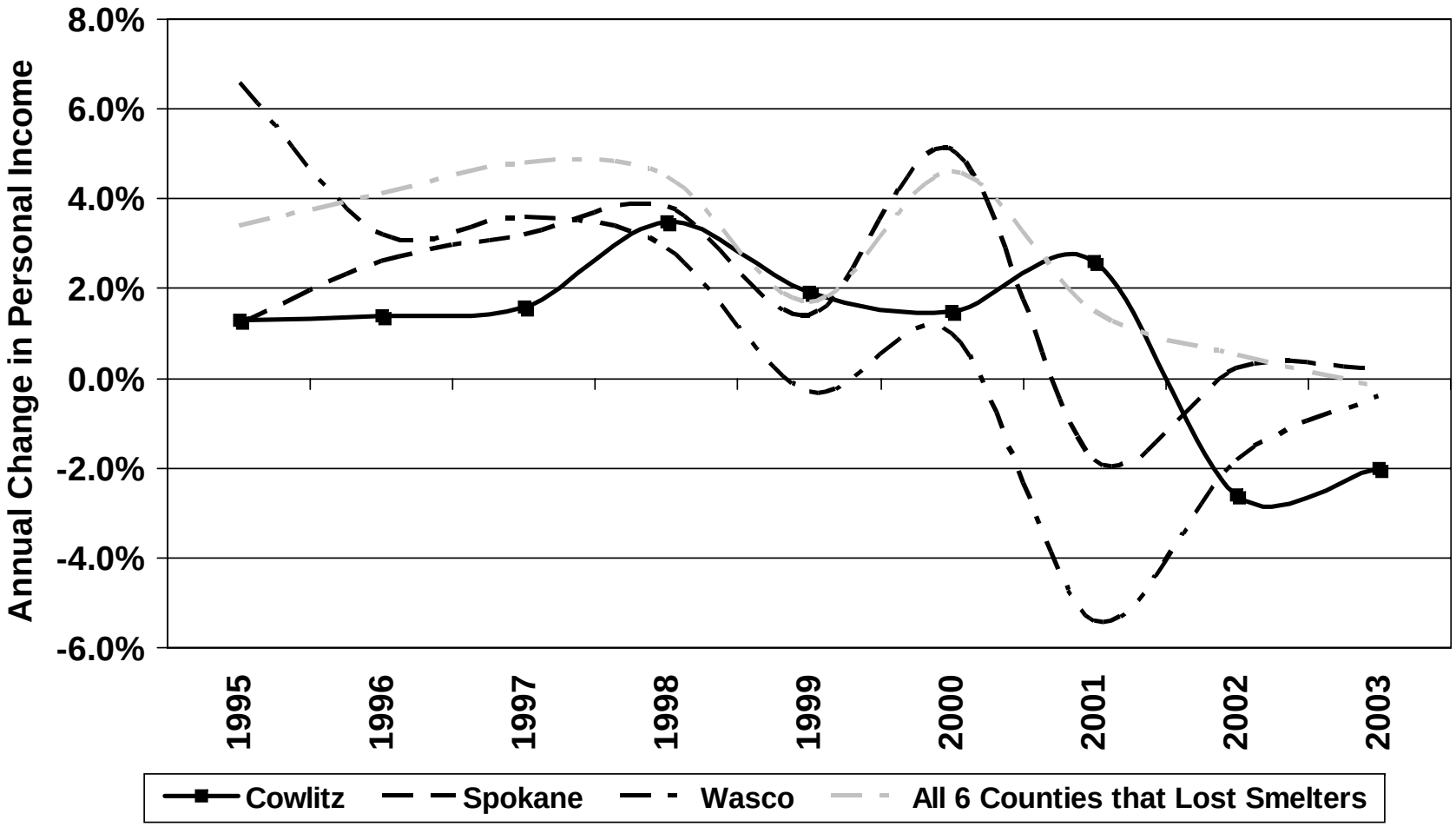
Price of electricity $/MWH	**40**	**45**	**50**	**55**	**60**	**70**
Employment Impact						
Direct DSI	1231	1231	1231	1231	1231	1231
Indirect DSI (average)	2707	2707	2707	2707	2707	2707
Non-DSI	-756	-1,201	-1,646	-2,091	-2,536	-3,426
Total	**3,182**	**2,737**	**2,292**	**1,847**	**1,402**	**512**
Income impact $M						
Direct DSI	68	68	68	68	68	68
Indirect DSI	134	134	134	134	134	134
Non-DSI	-43	-68	-93	-119	-144	-194
Total	**159**	**134**	**109**	**83**	**58**	**8**

Employment Trends in Counties with Losses of Smelters Since 2000



- Multnomah, Clark and Pierce counties are included in the all 6 counties that lost smelters curve in this and the next graph
- Multnomah –losses related to high-tech; Pierce & Clark had job creation offsetting smelter losses

Trends in Real Personal Income



Conclusions

- In the short-run there could be net job gains from operating the remaining smelters
- In the long-run other activities would offset losses of smelter jobs
- The long-run economic impacts are therefore lower than the short-term impacts for the remaining smelters.
- This analysis has been based on the best currently available data, and its conclusions could well be modified as economic conditions surrounding this industry and the supply of electric power change