February 23, 2001

SUMMARY OF ALUMINUM INDUSTRY STUDIES

Introduction

During the consideration of Bonneville Power Administration rates and subscriptions for the 2001-2006 contract period, a number of issues arose relating to the region's Direct Service aluminum smelters. The issues included: the value of the aluminum producers (and other industries) to the region both in terms of state and local economies and the stability of the Northwest power and transmission system; the risk of the region's aluminum plants to shutting down absent regional action; and if so, what (if anything) could be done about it by the Region or BPA. In order to examine these issues, a Northwest Aluminum Industry Study Team was formed in July 2000. Two studies were commissioned to help inform the Northwest Aluminum Industry Study Team. One study addressed the survivability of Northwest aluminum smelters and one addressed the economic impact of aluminum smelters. In addition, four other economic impact studies were recently sponsored by others and incorporated in this study effort. No recent studies have been done that address the effect of the smelters on the regional electricity system.

This Review was commissioned by the Study Team to summarize the findings of the studies that have been done and to suggest what the studies as a group might tell the region about the role of the aluminum industry for future policy deliberations. This Review has been lead by Terry Morlan of the Northwest Power Planning Council with assistance from Paul Murphy, Murphy and Buchal, LLP, Thomas Power, University of Montana, and Howard Schwartz, Washington CTED.

The six studies are listed below with their titles and authors. This paper first summarizes the findings of the Metal Strategies study, which assesses the position and vulnerability of each Northwest aluminum smelter. That is followed by a summary of the rest of the studies, all of which address the economic impact of the aluminum industry in some way. In the last section we attempt to draw some useful conclusions from the combined information in all of the studies.

Authors	Title
Metal Strategies, LLC	*The Survivability of the Pacific Northwest Aluminum Smelters*
Policy Assessment Corp.	*Impacts of Aluminum Industry Closings on the Pacific Northwest*
Dick Conway & Associates	*The Washington State Aluminum Industry Economic Impact Study*
Dick Conway & Associates	*The Oregon State Aluminum Industry Economic Impact Study*
Dick Conway & Associates	*The Montana State Aluminum Industry Economic Impact Study*
Mid-Columbia Economic Development District	*An Assessment of the Employment and Income Impacts of the Primary Metals Industry in Wasco and Klickitat Counties*

Aluminum Industry Vulnerability

The Metal Strategies study examined *The Survivability of the Pacific Northwest Aluminum Smelters.* The Pacific Northwest aluminum smelters compete within a world aluminum market. That is where the price of the product is determined, while the plant's technology and local conditions determine many of the costs of production. Although world aluminum production capacity has been growing, the rate of growth has slowed in the last couple of decades. None of the new capacity has been located in the Pacific Northwest since the early 1980s. At the same time, however, none of the existing capacity in the region has been permanently closed either. The analysis attributes this to the

fact that old plants can remain competitive with new plants in spite of the fact that newer plants are more electricity and labor efficient. Part of the reason is that the annual capital repayment costs of old plants are much lower than new plants. Another important factor is that the costs of closing a plant can be very substantial so that it is relatively rare for old plants to be closed permanently.

The report describes the factors that are most likely to affect the economic viability of aluminum smelters. In addition to aluminum and electricity prices, other important factors include electricity and labor efficiency, plant location, which affects shipping costs, and the costs of closing a plant temporarily or permanently.

The analysis shows that the Pacific Northwest smelters are not among the least expensive plants in the world, but that they are competitive with some new plants whose capital recovery cost are still high. Generally, the plants are spread throughout the highest cost half of the world's aluminum smelting capacity. During the 1990s, half of the region's smelters operated as swing plants and the other half operated mostly at full capacity.

The approach of the study was to examine the financial position of each of the region's ten aluminum smelters. Each smelter, and individual potlines within the smelter, was evaluated by comparing its aluminum production costs to assumed market values of aluminum. Because aluminum is a commodity that varies in price with conditions in the world market for aluminum, a wide range of world aluminum prices were tested during the rate period 2001-2006.

The total aluminum smelting capacity in the region is 1,663 thousand tonnes per year. When all of that capacity is operating it requires about 3,145 megawatts of electricity. The analysis assumed that about 1,400 megawatts of BPA electricity would be made available to the region's aluminum smelters. The rest of their electricity needs would have to be met from other sources.

There were four specific sources of electricity considered in the analysis. The 1,400 megawatts of BPA electricity was assumed to be available under long-term take-or-pay contracts at 29.5 mills per kilowatt-hour. Additional long-term take-or-pay contract electricity is assumed to be available from the wholesale market at two alternative price levels, 42 and 87 mills per kilowatt-hour. As a third source of electricity, it is assumed that plants could acquire short-term electricity supplies from the spot market at 35 mills per kilowatt-hour after 2002. No smelters were expected to be able to operate at spot market electricity prices that are expected during 2001 and 2002. The fourth source of electricity is 214 megawatts that is generated at Rocky Reach dam and owned by the Wenatchee smelter. It is always found to be economically attractive.

The analysis attempts to answer three questions:

(1) The amount of electricity likely to be acquired under 5 year BPA take-or-pay electricity supply contracts;
(2) The amount of electricity likely to be acquired from other suppliers under 5 year take-or-pay contracts; and
(3) The amount of electricity that might be acquired under short term arrangements at 35 mills per kilowatt-hour.

The analysis also examined the effects of remarketing provisions in BPA's contracts. There are no remarketing provisions assumed during the 2001-2006 contract period. At issue, is how any

remarketing revenues during the January 2001 through September 2001 period might be credited in the BPA contracts. Three cases were analyzed. In the base case, remarketing credits did not affect either the tariff or the take-or-pay obligations in the BPA contracts. If aluminum plants that accepted the contract were closed in this case, they would continue to pay for their contract demands. In Case 2, half of any electricity remarketing revenues during January 2001 through September 2001 could be credited to reduce the BPA take-or-pay contract price for the 2001-2006 rate period. In this case, the contract price for each smelter can vary depending on remarketing credits and the amount of BPA electricity in current contracts. In Case 3, half of the remarketing revenues can be used to pay for take-or-pay costs in the event that the smelter closes during the contract period. One quarter can be applied to BPA take-or-pay costs, and one quarter can be applied to take-or-pay costs for other suppliers.

In summary the base case analysis shows that 1,155 megawatts of available BPA contract power will be used to operate aluminum smelters during the contract period from 2001 to 2006. This amounts to 83 percent of the 1,400 megawatts that is assumed to be available from BPA. In addition, 214 megawatts of the Wenatchee plant's own supplies is likely to be used continuously during the contract period. Together, these suggest that 1,369 megawatts of electricity are likely to be used to run aluminum smelters on a fairly stable basis during the 2001 to 2006 period. This accounts for 44 percent of the aluminum capacity in the region. Any additional operation and electricity use by smelters would occur using short-term electricity supplies when spot prices reach 35 mills and aluminum prices are at high levels. These results are discussed further below.

The discussion of the analysis results will be simplified by noting at the beginning that no aluminum plant in the region is expected to sign up for long-term take-or-pay contracts from non-BPA suppliers at either 42 or 87 mills regardless of aluminum prices. Smelter operations are only based on BPA contract electricity, spot market purchases at 35 mills, and one Wenatchee-owned share of the Rocky Reach dam.

In the base case, 83 percent of BPA's current aluminum smelter contracts would sign up for take-or-pay contracts for the 2001-2006 contract period. This would amount to 1,155 megawatts out of the 3,145 total electricity using capacity of all Northwest smelters.

Only 2 plants are predicted to operate at full capacity during the 2001-2006 period with long-term take-or-pay contract electricity. The Bellingham smelter and the Tacoma smelter are expected to be able to operate at full plant capacity using only BPA contract power by transferring some of the owners' contract allocations from their other smelters. These two plants are predicted to operate at full capacity regardless of the assumptions about remarketing credits.

On the other end of the scale are 5 plants that are not expected to sign on for long-term BPA take-or-pay contracts in the base case. These include Troutdale, Columbia Falls, Mead, Vancouver, and The Dalles. Troutdale, Vancouver, and The Dalles are not expected to operate under long-term contracts regardless of the remarketing credit assumptions.

The Longview and Goldendale smelters are expected to accept BPA contracts to the extent of their allocations regardless of remarketing credit provisions. The Wenatchee smelter always uses its ownership share of the Rocky Reach dam (214 MW), but does not use its full allocation of BPA electricity in any of the Cases.

The analysis of smelters' ability to use short-term spot market electricity to run their plants can be thought of as a measure of conditions under which plants might operate on a swing basis, but not be willing to undertake a take-or-pay obligation. The analysis assumes that no plant would find it profitable to operate with spot market electricity prices that are expected in the 2001 to 2002 period. After 2003 it is assumed that spot market electricity might be available for 35 mills. All smelters, except Bellingham and Tacoma, which are assumed to operate at full capacity using only BPA electricity, would find it profitable to operate using spot price power at 35 mills under some conditions. Those conditions are high aluminum prices. At aluminum prices above $2000 per tonne (91 cents a pound) all of the plants would find it worthwhile to buy 35 mill electricity. $2000 per tonne is about the peak aluminum price during the 1990s. At $2000 per tonne and above, it is estimated that 1,777 megawatts of spot market electricity would be bought for Northwest aluminum smelters in the base case. Basically, at aluminum prices of $2000 a tonne or higher all aluminum smelting capacity in the region would operate. The ability to profitably use 35 mill spot market electricity falls off quickly as the aluminum price drops below $2000 a tonne. When the aluminum price falls below $1650 a tonne (75 cents a pound), no smelter would purchase 35 mill spot market electricity. The trough of aluminum prices during the 1990s was $1,342 per tonne.

Figures 1 through 3 show total electricity used by Northwest smelters under different aluminum prices for each of the cases analyzed. The effects of the remarketing assumptions are relatively modest. In Case 2, where half of the remarketing revenues can be used to lower the contract price for BPA electricity, the BPA contracts are 203 megawatts higher than the base case. The effects of Case 3, where some of the remarketing revenue can also be applied to non-BPA take-or-pay electricity, are about the same as the Base Case except when aluminum prices are low. At aluminum prices below $1250 a tonne, smelter acceptance of BPA take-or-pay contracts decreases.

Figure 1: Electricity Use and Sources, Base Case

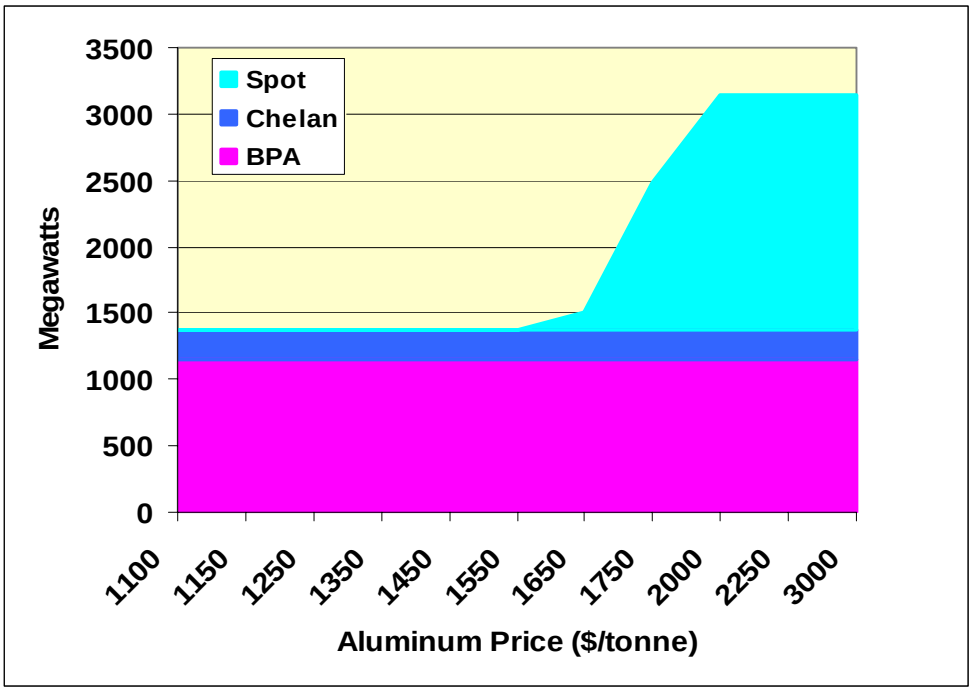


Figure 2: Electricity Use and Sources, Case 2

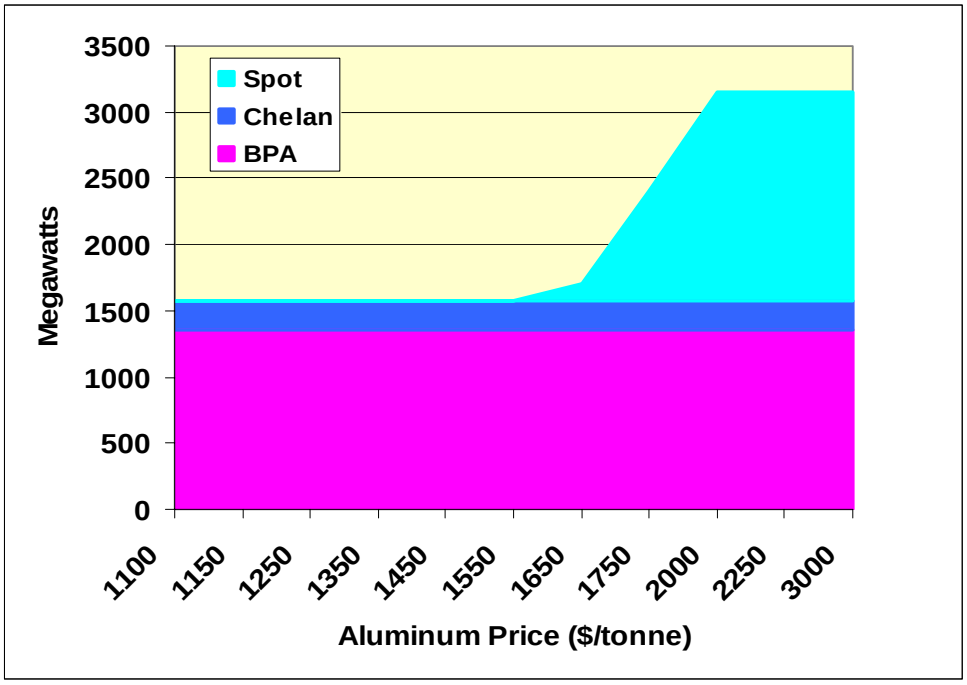
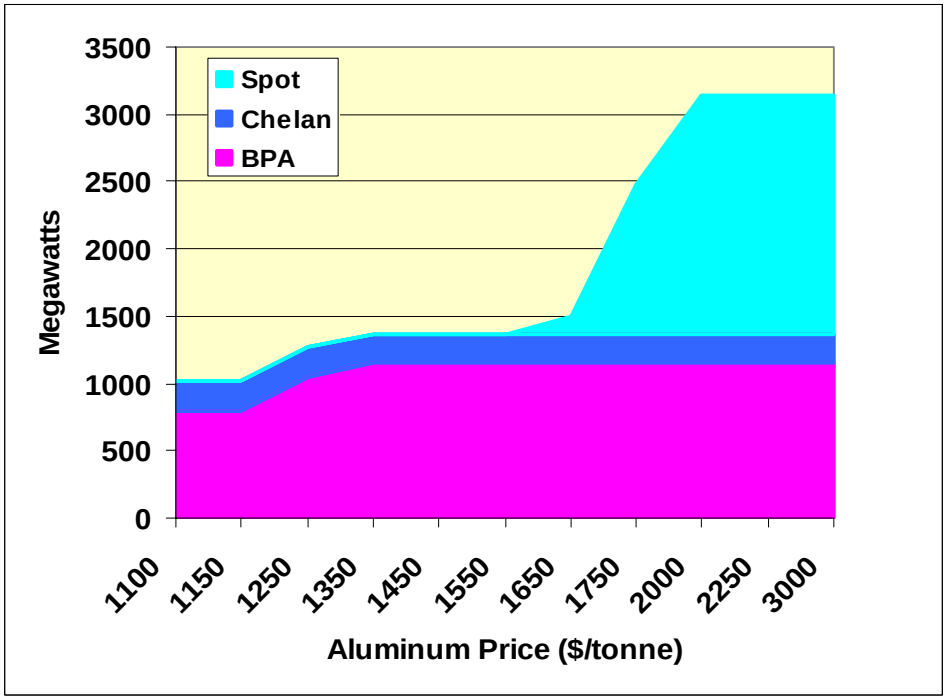


Figure 3: Electricity Use and Sources, Case 3



Economic Role

The other studies done as part of the aluminum industry review were various forms of economic impact assessments. The basic topic of these studies was what role the aluminum industry plays in the regional and local economies. To help think about economic impacts of potential aluminum plant closures, it is useful to distinguish four levels of effects:

(1) the direct loss of jobs at the smelters;
(2) the loss of sales by industries that supply inputs to the smelting process;
(3) the loss to local businesses as a result of reduced income and expenditures of aluminum plant and related industry employees; and
(4) the changes to population migration, business location, and consumer and business substitutions among alternative expenditures or inputs.

The studies described below do not all address all of these elements of change. The set of studies by Dick Conway & Associates and the Mid-Columbia Economic Development District study primarily address only the first three elements of effects. Thus they are mostly static analyses and are likely to overstate the ultimate economic impacts of changes in the aluminum industry. One way to think about these studies is that they define the magnitude of the adjustment that might have to take place as a result of the change in aluminum activity. The Policy Assessment Corporation study is far more comprehensive and attempts to capture the dynamics of change that would result from changes in the aluminum industry. The distinction between static and dynamic analyses is further described in the following two paragraphs.

Economists and politicians alike understand that the economic effects of large manufacturing industries like aluminum extend well beyond their direct employment, income and production. Other businesses supply products or services used in aluminum production, and yet others use aluminum as input to their production processes. Aluminum employees spend their income for a variety of goods and services in the local economy. Economic impact studies attempt to measure these indirect economic effects. The indirect economic effects can be measured in different ways but their importance can be summarized in what is called a multiplier effect. An employment multiplier, for example, would measure the total employment in a geographic area that is dependent is some way on an aluminum smelter compared to the smelter's direct employment. For example, if a smelter directly employed 200 people, but indirectly supported an additional 200 jobs in other industries, it would have an employment multiplier of 2.0 (400 total/200 direct).

Economists, but fewer politicians, also understand that the economy is extremely dynamic. Employees change jobs and relocate continuously. Without such a dynamic workforce our economy would be far less robust. Similarly, businesses and their associated jobs are created and destroyed continuously. Production strategies change as economic conditions change. Businesses shift production geographically, change products, and shift their purchases of inputs. Thus, were an aluminum smelter to close, it would set in motion a series of adjustments in the economic structure of the economy. This is the fourth level of effects described above. The resulting change in the economy would reflect dynamic economic forces that evolve over time, and will be very different from what would be predicted by a static look at the existing relationships in the economy at one point in time.

The following paragraphs briefly describe the scope and methods of each of the impact studies. The rest of the section summarizes the impacts, drawing from all of the studies. The underlying data about employment, population, and income is common to all of the studies. The main differences relate to the description or modeling of the interrelationships among industries in a regional economy.

Dick Conway & Associates did three studies, one for Montana, one for Oregon, and one for Washington. In each, they assessed impacts at the state level and also at the county level for counties that contain aluminum facilities. The study documents the current size (in 1998) of the aluminum industry in terms of employment and output compared to the state and county economies. It then explores the indirect effects of the aluminum industry on other segments of the economy using a variety of methods for estimating economic impact multipliers. The Conway study also estimates the effects of the aluminum industry on the tax revenues of state and local governments. The Washington State impact is the most sophisticated in terms of methodology using a combined econometric and input-output model called the Washington Projection and Simulation Model (WPSM). Input-output models explicitly trace the purchases and sales among all industries and final consumers at one point in time. Oregon and Montana state level impacts were simply calculated using multipliers from previous studies. All of the county level impacts were estimated using an economic base model to derive estimated multipliers. Economic base models are a simpler approach than input-output to evaluating the relationship among economic sectors. Economic base models assume a constant relationship between basic industries (ones that export products out of the region) and supporting economic activities in the region.

The Policy Assessment Corporation (PAC) analyzed economic impacts of the aluminum industry for a larger number of geographic areas. They also evaluated the impacts over a 20-year period using a dynamic modeling approach that addressed all four of the elements of economic impact described above. The methodology of the PAC study was the most comprehensive of all of the studies. The analysis was done using dynamic models of interacting national, state and county economies. The economic model was used in conjunction with a comprehensive energy model that captured the effect of reduced electricity consumption by aluminum smelters on electricity prices over time. The effects on energy consumption and prices feed back to affect the general economy. For the PAC study the base case assumed closure of the Troutdale smelter. Three scenarios are compared to the base case for their impacts on Gross Regional Product, employment, population and personal income. Results are calculated for the region, states (including Idaho and California), and selected counties.

The third study was done by the Mid-Columbia Economic Development District and only addresses two counties, Klickitat County in Washington and Wasco County in Oregon. Each county contains an aluminum smelter and the study evaluates the smelters' roles in the county economy and the impact that either partial or full closure of the plants would have in the county. The analysis uses the IMPLAN model, a well established input-output modeling system that can be applied at the county level. IMPLAN is a model that has been applied frequently for impact studies in the region, including the regional assessment of the economic impacts of removing the lower Snake River dams in the Corps of Engineers' Lower Snake River Juvenile Salmon Migration Feasibility Study. The method of analysis does not address the dynamic component of economic impacts.

Direct Role of Aluminum Smelters

The Conway studies combined estimated that direct employment by the aluminum industry in 1998 was 10,370. The aluminum industry in Conway's studies, however, includes more than just the primary aluminum smelters; it includes various aluminum processing industries that add roughly 3,300 employees. So the direct employment by aluminum smelters is about 7,100. This is small (0.12 percent) relative to the regional and state level employment.

Seven of the region's ten aluminum smelters are located in Washington. Conway estimates that 1998 employment in the Washington aluminum sector was 7,510, which includes aluminum activities besides the primary aluminum smelters. This accounted for about 0.2 percent of Washington's total employment. In Oregon, which has only two smelters, primary aluminum employment was 0.05 percent of the state total. Other, non-smelting, aluminum sector activities provided about an equal amount of Oregon employment. Montana has only one smelter and its employment was 0.1 percent of the state total.

The aluminum smelters pay high wages and salaries relative to the overall economy of the region. As a result, the smelter state shares of labor income and Gross Regional Product tend to be higher than the share of employment. For example, in Washington aluminum industry labor income accounted for 0.4 percent of the state total compared to 0.2 percent of the employment. Similar patterns hold true for Oregon and Montana.

The economic role of aluminum plants can be much more significant when looked at from a local level, such as a county. This is especially true when the smelter is located in a relatively rural or small town setting. By far, the most significant smelters in terms of their impact on the economy of the county they operate in are the Goldendale and The Dalles smelters. The smelter at Goldendale accounts for about 8 percent of Klickitat County Washington employment. The Dalles smelter accounts for over 4 percent of employment in Wasco County Oregon. These two counties were the focus of the Mid-Columbia Economic Development District study. Smelters in Longview, Columbia Falls, Wenatchee, Bellingham, and Spokane account for between 1 and 2 percent of their counties' employment. Smelters at Vancouver, Troutdale and Tacoma, however, are located in major metropolitan areas and are well under 1 percent of county employment.

Indirect Economic Effects

Conway estimates that the 10,370 aluminum industry jobs support a total of 39,550 job in the region. Thus the regional employment multiplier in the Conway studies is 3.8. A normal estimate of employment multipliers is in the neighborhood of 2.0, but they vary depending of the size of the region and the structure of its economy. Conway explains the high multipliers in his study by the relatively high wages and salaries in the aluminum industry and the fact that a large share of the industry inputs, 67 percent, are purchased locally.

The 39,550 estimate of aluminum industry and indirectly related jobs in 1998 amounts to 0.65 percent of regional employment. This the hypothetical impact if all of this employment were to disappear overnight, along with the related businesses and employees. To put this number in perspective, note that between 1990 and 1998 regional employment grew at 2.6 percent annually adding 153,000 net jobs each year on average, so the hypothetical impact would amount to about one fourth of the new jobs added in a typical year during the 1990s.

As in the case of direct employment, the estimated impacts can be far more significant at the local county level. Estimated employment multipliers tend to be smaller for smaller geographic areas because more of the purchases of inputs and employees come from outside of the area. More self sufficient counties tend to have larger multipliers, while rural isolated areas tend to have smaller multipliers. For example, the smallest county employment multiplier estimated by Conway was 1.8 for Klickitat County, Washington. Nevertheless, with direct and indirect effects considered, Klickitat County is still by far the most vulnerable to loss of aluminum smelting jobs. Conway estimates that nearly 15 percent of the total jobs in the county would be affected by closure of the Goldendale smelter. The Mid-Columbia Economic Development District estimate for Klickitat County is even higher at nearly 20 percent of jobs affected.

The Policy Assessment Corporation (PAC) study is a much more complex approach to the effects of the potential loss of aluminum smelters. The effects are difficult to compare directly to the other studies because of the dynamic nature of the estimated impacts and the fact that the Troutdale smelter is assumed closed in the base case, so its impacts are not included. As a rough estimate, one could say that the regional employment impact estimated by the PAC study is about half of the impact estimated by Dick Conway & Associates, although for Montana and some specific counties the impacts are very similar. The PAC employment impacts decline only moderately over time. This is partly due to an assumption that regional aluminum production would have grown by 33 percent over the next 20 years if the smelters continued to operate. Therefore, the estimated long-term effects of closing smelters includes some lost growth as well as lost current employment. The effects of this growth are somewhat offset by assumed reductions in labor requirements over time due to improved smelter technology.

The estimated effects on population in the PAC study have a different pattern than the employment effects. The initial effects are very small, minus 0.05 percent loss in 2001, but the reductions grow over time to 0.24 percent by 2020. The larger reductions over time reflect outmigration of some displaced workers, a depressing effect of higher unemployment on economic growth, and reduced birth rates due to the younger age of outmigrants. The basic message, however, is still that the effects are small. A reduction of 0.24 percent in the level of 2020 population, for example, could be compared to an average annual regional population growth during the 1990s of 1.9 percent per year.

As in the Dick Conway & Associates study, the impact on gross regional product in the PAC study is higher than on employment. The effect on personal income is dampened, relative to that on gross regional product, by the role of transfer payments, including unemployment benefits. Per capita income decreases initially by about $43 per person, or 0.16 percent, but it increases in the long term partly due to reduced population levels.

The impacts in employment and dollar terms are by far the largest in Washington. Washington was predicted to sustain over 70 percent of the employment effects and about half of the gross state product effects. On a percentage impact basis, however, the impacts on Montana were larger than for Washington. As in the Conway studies, the largest county impact on a percentage basis was Klickitat County in Washington, followed by Wasco County in Oregon. One of the interesting results of the PAC analysis is that the counties that lost the most personal income per capita initially, also have the largest long term gain in per capita income. This is apparently due to the initial large loss of population, which depresses land and property values along with wage rates, which in turn stimulate the location of new businesses in the area over time. PAC points out that this is consistent with the patterns observed following loss of timber industry jobs.

Summary

The studies done to assess economic impacts have found that the economic impacts at the state and regional levels are very small relative to the size of the economy. The total direct and indirect economic impacts are substantially less than the net gains that might be expected based on a typical year's growth in the economy. Even so, the estimates provided by Dick Conway & Associates and the Mid-Columbia Economic Development District substantially overstate the potential impacts. Input-output models reflect a snapshot of economic interrelationships at a point in time. But they are not an accurate indicator of the changes that will occur in response to something like the loss of aluminum smelters. First, as shown in the Metals Strategies study, not all aluminum smelters are at great risk of closing. Losses, if they occur, will be more gradual than the study assumptions that the employment suddenly disappears. Further, even if the aluminum employment ended suddenly, as assumed in the studies, the impacts implied by the analysis will not occur in the short term because former employees will remain in the area and continue to spend, perhaps at reduced rates from severance pay, unemployment benefits and savings. The full estimated impacts will not occur in the long run either because of the adjustments that will be made by businesses and people. Industries that sold and bought from aluminum smelters will to some degree find other customers and suppliers. For example, the simple impact studies assume that the electricity bought locally by smelters would go unused if the smelters closed, but that is unlikely.

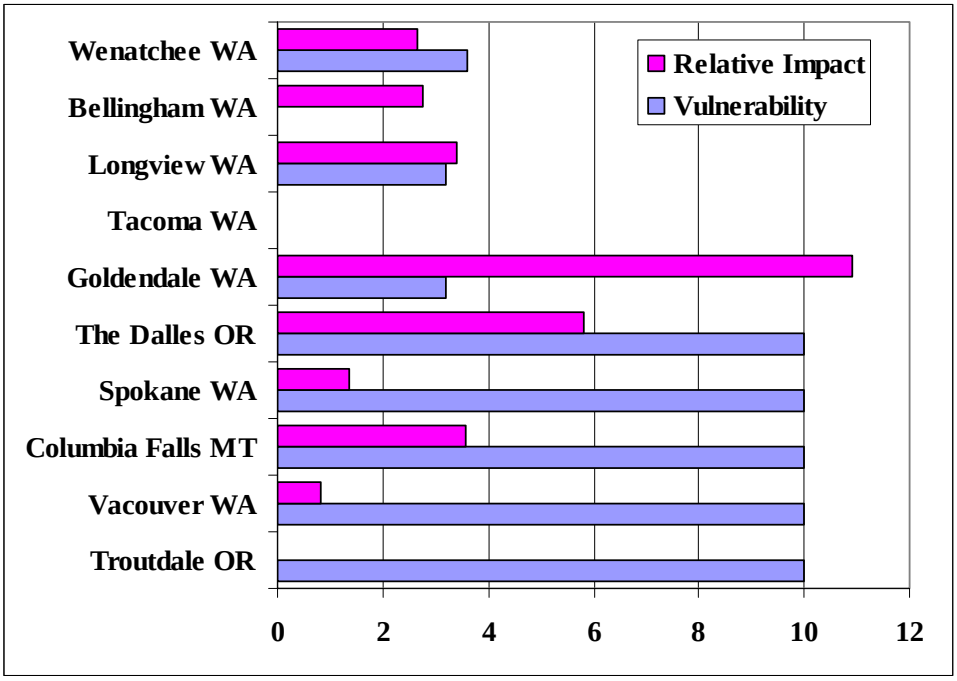
The PAC study is likely to be a more accurate description of the effects of smelter closure over time because it estimates the dynamic interactions and adjustments that would characterize the hypothesized changes. However, it may also overstate the effects for two reasons. First, like the other studies, it assumes sudden and permanent closure of smelters. In reality, the changes are likely to be partial and more gradual with some smelters operating for years as swing plants. In addition, by assuming sudden and complete closure of all smelters, all of the studies ignore the effect that partial closures could have on aluminum prices. Substantial reductions in smelting capacity would tend to increase world aluminum prices and make the remaining smelters more profitable. Second, the impacts of the smelter closure are likely overstated by including the assumption that regional aluminum production would grow substantially in the future if the plants were not closed. The region's smelters have not shared in the general aluminum industry growth for the past 20 years. It is unlikely that they would share in the industry's future growth because the regional advantage of extremely low electricity prices has been lost.

As simulated in the PAC study, a loss of the large electricity consumption of aluminum smelters will have the effect of reducing electricity prices. The Energy 2020 model that is used in the PAC study estimates that shutting down all smelters would decrease average summer wholesale electricity prices in the region by 10 percent in 2001. Lower electricity prices stimulate other sectors of the economy, especially other industries that use a lot of electricity.

Combining the plant specific analyses with the economic impact studies results yields some indication of local areas that are at highest risk. Figure 4 combines a measure of plant vulnerability with a measure of severity of county economic impacts from plant closure. Smelters that have either low vulnerability or have relatively small impacts on their county have the least risk of causing severe economic problems for their community. However, smelters that have both high vulnerability and high relative impacts are likely to pose substantial economic adjustment problems in their local area.

The measure of vulnerability in Figure 4 is the percent of a plants aluminum capacity that is predicted to be shut down in the base case at an aluminum price of $1,550 per tonne. $1,550 per tonne is near current aluminum prices. The actual measure plotted is the percent divided by 10, so that a plant that is completely closed is plotted as 10 rather than 100 percent. Relative local impacts are the percent of county employment estimated by the PAC study that would be impacted by plant closure. When both bars are long there is the most economic risk associated with the smelter.

Figure 3: Smelter Vulnerability and Relative Local Impact



The PAC study does not include estimates of county economic impacts for the Tacoma or the Troutdale smelters. However, both plants are located in major metropolitan areas with large diversified economies. The Conway analyses confirm that the relative impact on county employment for these two plants would be very small. Troutdale is probably the most vulnerable smelter in the region, but it would have little impact on its local area. Tacoma is neither considered vulnerable nor would it have a large impact on it local area.

The smelters at Wenatchee, Bellingham, and Longview would have noticeable impacts on their communities if they closed, but they are among the financially strongest smelters in the region and are likely to operate all, or a substantial portion, of their capacity. The smelter at Vancouver, WA is vulnerable, but like Troutdale and Tacoma, it is located in a large metropolitan area and would not have a large impact on the community. The Goldendale smelter would have a huge impact on Klickitat County if it closed. Fortunately it is one of the financially strong smelters and is likely to operate a substantial portion of its capacity. The Spokane smelter is vulnerable and would have a noticeable impact on the Spokane area if it closed, but the impact would not be disastrous because Spokane is a well-diversified metropolitan area.

The two smelters that appear to pose the greatest risk to their communities are the Columbia Falls plant in Montana and the smelter at The Dalles, Oregon. These plants have the second and third largest relative local impacts and are also financially vulnerable.

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