THE ECONOMIC IMPACT OF THE EARLY RETIREMENT OF COLSTRIP UNITS 3 AND 4

FINAL REPORT

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1. Executive Summary: The Economic Impact of Early Retirement of Colstrip Units 3 and 4

In July of 2016 the owners of Units 1 and 2 of the coal-fired Colstrip Electric Generating Station in Rosebud County, Montana, agreed to shut those units down no later than July 2022. The agreement was reached as a settlement from a lawsuit alleging violations of the Clean Air Act brought by the Montana Environmental Information Center and the Sierra Club in 2013. While this agreement said nothing about the future of the two larger, newer generating units in operation at Colstrip since the 1980s, it underscored the seriousness of the challenges faced by coal-fired power plants in general – and Colstrip in particular -- as they face a future of uncertain markets, technologies and policies.

While that future might be in doubt, there is no doubt that the path of actions and policies that frame that future has economic implications that extend well beyond communities such as Colstrip. That is particularly true for a state like Montana. Not only has the significant export of electrical power to neighboring states supported jobs, incomes and tax revenue in our state since the mid-1980s, but the outsized tax contributions of the coal industry to the revenue base of state government gives communities across the state a stake in outcomes affecting Colstrip.

This study reports on the implications for the state economy of circumstances or actions that would bring about the closure of the remaining Units 3 and 4 of the Colstrip Electric Generating Station earlier than their physical and economic viability would support. Specifically, we examine the consequences for jobs, income, population, economic output and other measures of economic activity for the state economy in the event that Units 3 and 4 are shut down in the year 2027. The goal of the analysis is to provide information to decision makers and other affected parties on the potential economic implications of decisions that impact the future of Colstrip.

Markets for power, the regulatory environment, and the circumstances at Colstrip itself have all changed considerably in the three years since the BBER examined the economic consequences of the currently suspended Clean Power Plan (CPP) Final Rule – which envisioned a shutdown of all four units of Colstrip by year 2030 (Bureau of Business and Economic Research, University of Montana, 2015). Those changes include:

- the closures of Units 1 and 2 by year 2022, which are now incorporated in the baseline scenario for this analysis. All impacts reported here are relative to a (lower) level of economic activity where Units 1 and 2 are not present.

- the potential for continued softness in wholesale electric power prices in regional markets, particularly during mid-afternoon hours of peak solar energy production. These have necessitated the use of Colstrip, to the extent practicable, as a ramping as well as a baseload resource.

- the growing political consensus (still unspecified economically) to keep the 500 KV transmission line between Colstrip and the BPA junction near Townsend that is currently owned jointly by the Colstrip owners in operation beyond the end of operations of the Colstrip station. The continued existence of the 500 KV line changes the kinds of new investments that would be needed to maintain adequacy and reliability of power to Montana customers in the early retirement scenario.

Summary of Results

The precise set of actions and investments that might occur in a scenario where Colstrip Units 3 and 4 were to retire early is difficult to fully specify. But in the broader picture, an early retirement of these units would involve three basic events:

- cessation of production at both the Colstrip generating station and the adjacent Westmoreland Mine, the latter owing to the lack of transportation infrastructure to economically serve other potential customers. Remediation activities would commence at both sites.

- the construction and operation of other generation, storage and/or transmission assets which may be necessitated by the loss of the nearly 1,500 MW of capacity represented by the two larger units being retired.

- the implications of the changes above for market prices paid by Montana customers.

The BBER used its economic model (leased from Regional Economic Models, Inc. – REMI) to make two projections of the Montana economy. One future envisions no changes beyond the announced closures of Units 1 and 2 in year 2022. This is the baseline scenario. The second future is one that in addition to this, also closes the two remaining units in year 2027, with all of the remediation, new investment, and price impacts those closures could bring about. In this early retirement scenario, the changes in spending, jobs, income and population that occur propagate throughout the economy and ultimately bring the economy to a new resting point. Thus the difference in these two projections represents the economic impact of early retirement of Colstrip Units 3 and 4.

TABLE 1.1

The Economic Impact of Early Retirement of Colstrip Units 3 & 4
Impacts Summary

Category	Units	Impact for the Year		Full Period*
		2028	2043	2028-43
Total Employment	Jobs	-3,078	-2,840	-3,280
Personal Income	$ Millions	-253.2	-348.6	-5,233.9
Disposable Pers. Income	$ Millions	-218.3	-305.3	-4,559.2
Selected State Revenues	$ Millions	-60.5	-81.7	-1,242.5
Output	$ Millions	-700.4	-779.4	-12,503.3
Population	People	-1,715	-7,016	-5,960

*Full period impacts for employment and population are averages of the annual impacts, 2028-43. Full period impact for income, output and revenues are the sum of the annual impacts.

Our basic finding is that there is a considerable economic cost, in terms of jobs, income, spending, population and tax revenues that occurs over the years 2028-43 from any decision that would retire Colstrip Units 3 and 4 in 2027 – well before the end of their economic lives.

The early retirement of Colstrip Units 3 and 4 would ultimately produce:

- an economy with, on average, almost 3,300 fewer jobs than would have been present if the units continued to operate through the 2028-43 period;

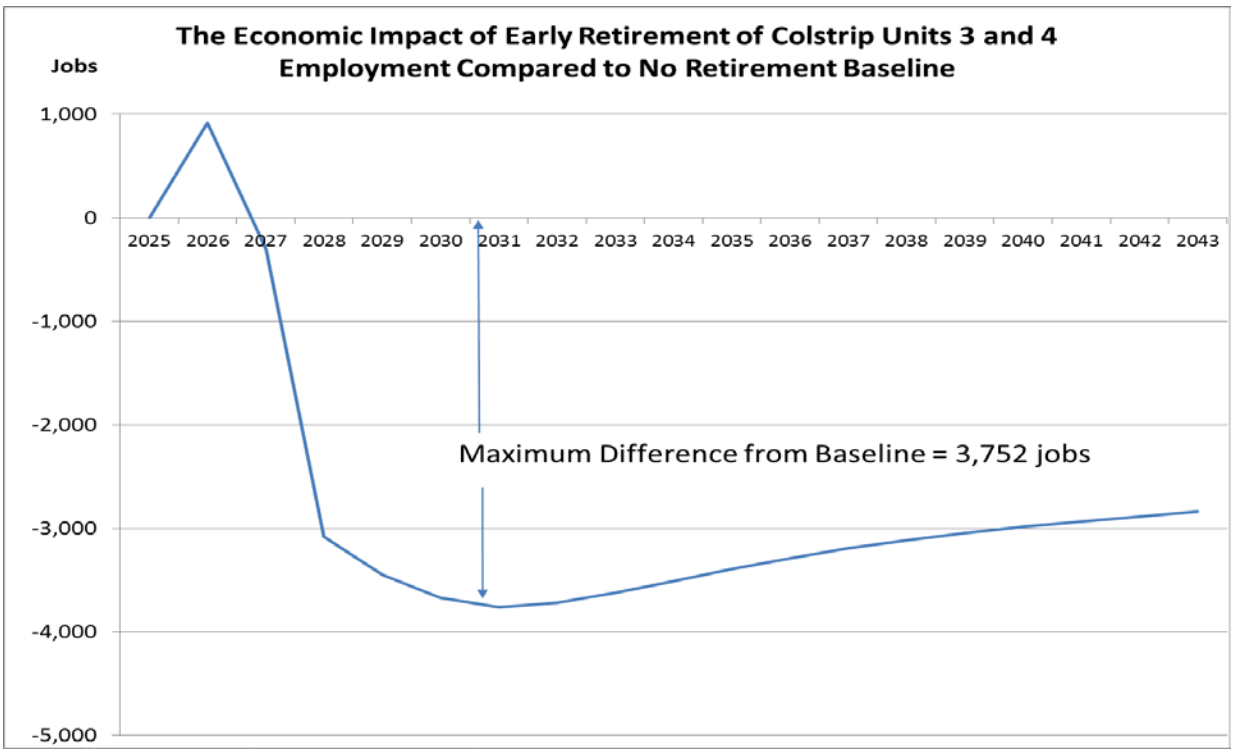
- a loss of income received by Montana households varying between $250 and $350 million per year, adding up to a total of about $5.2 billion over the full 16 year period 2028-43. Losses in after-tax income, which is a better proxy of spending power, for Montana households would total almost $4.6 billion over the same period.

- declines in annual gross sales by businesses and other organizations, or economic output, between $700 and $800 million, cumulating to $12.5 billion over the full sixteen year period.

- a decline in population which occurs as workers and families migrate to other economic opportunities, growing to more than 7,000 people by year 2043.

Of particular note is the impact that early retirement of Colstrip Units 3 and 4 has on state revenues. Of the more than $1.2 billion dollars in Montana tax and nontax revenues that are not collected over the 2028-43 period due to the early retirement of Colstrip Units 3 and 4, roughly two thirds represent declines which relate generally to the smaller size of the economy. The remaining one third of the total comes from taxes which pertain specifically to energy and coal industries. These include the coal severance tax, the state's share of federal royalties and the electrical energy tax. Not included in the state revenue impact are taxes directed to local governments, including property taxes and the coal gross proceeds taxes.

FIGURE 1.1

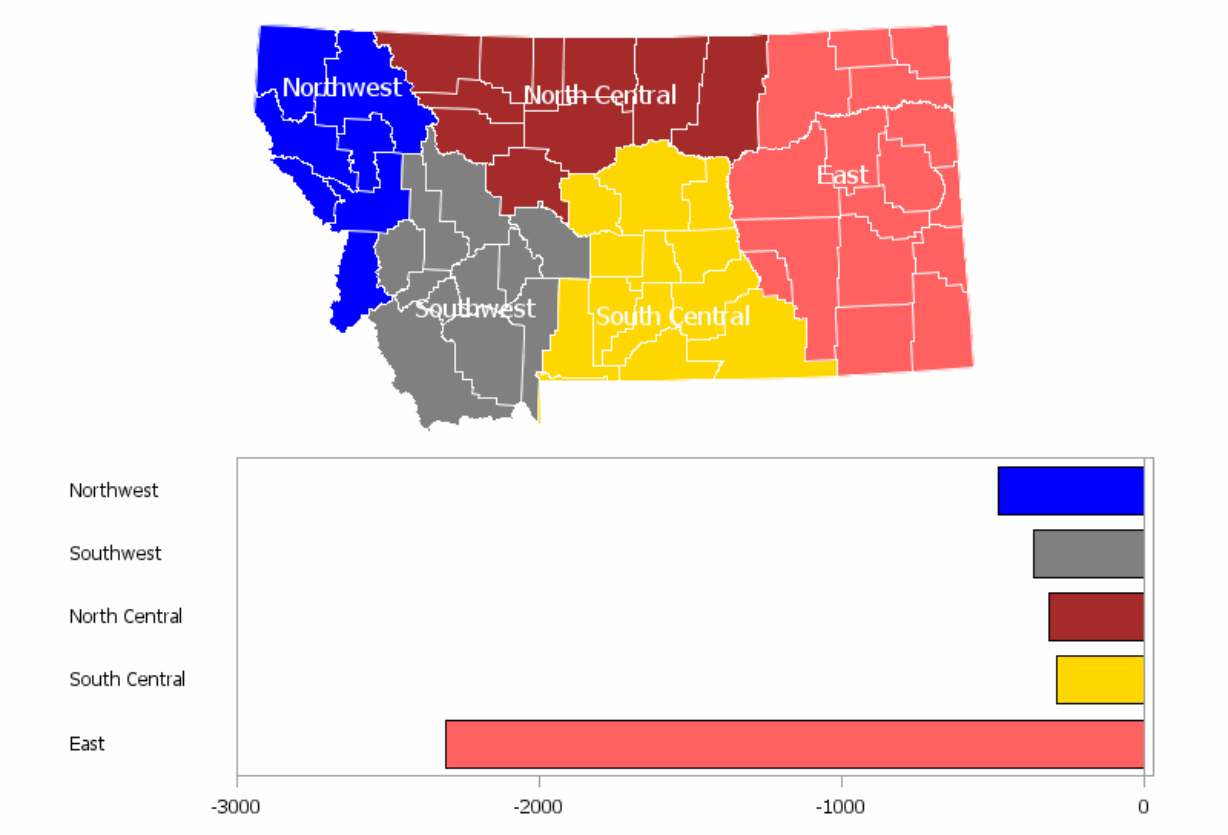


Employment Impacts

The activities associated with the early retirement of Colstrip Units 3 and 4 produce temporary gains in employment and other measures of economic activity in the years before and immediately after the closure. These are primarily due to (a) the construction of new generation capacity to address the shortfall in capacity created by the Colstrip closures, and (b) remediation activities at both the generating facility as well as the Westmoreland mine. The construction is financed in part by ratepayers of NorthWestern Energy, raising electricity prices above the baseline for a twenty year period. The costs of remediation activities are largely (but not totally) borne by out-of-state owners with minimal impacts on the Montana economy.

The pattern of employment impacts over time underscores some of the factors at work affecting economic activity. Employment losses continue to widen slightly beyond the closure date as construction activities fall more precipitously than other sectors of the economy, to correct for the surplus of residential and nonresidential capital in the immediate wake of the Colstrip closure. The slight narrowing of job impacts further into the 2030's reflects, in part, some new investment that could be expected to flow into the economy that is attracted by lower wages rates and capital costs.

FIGURE 1.2 THE ECONOMIC IMPACT OF EARLY RETIREMENT OF COLSTRIP UNITS 3 AND 4 EMPLOYMENT IMPACTS BY REGION, 2031

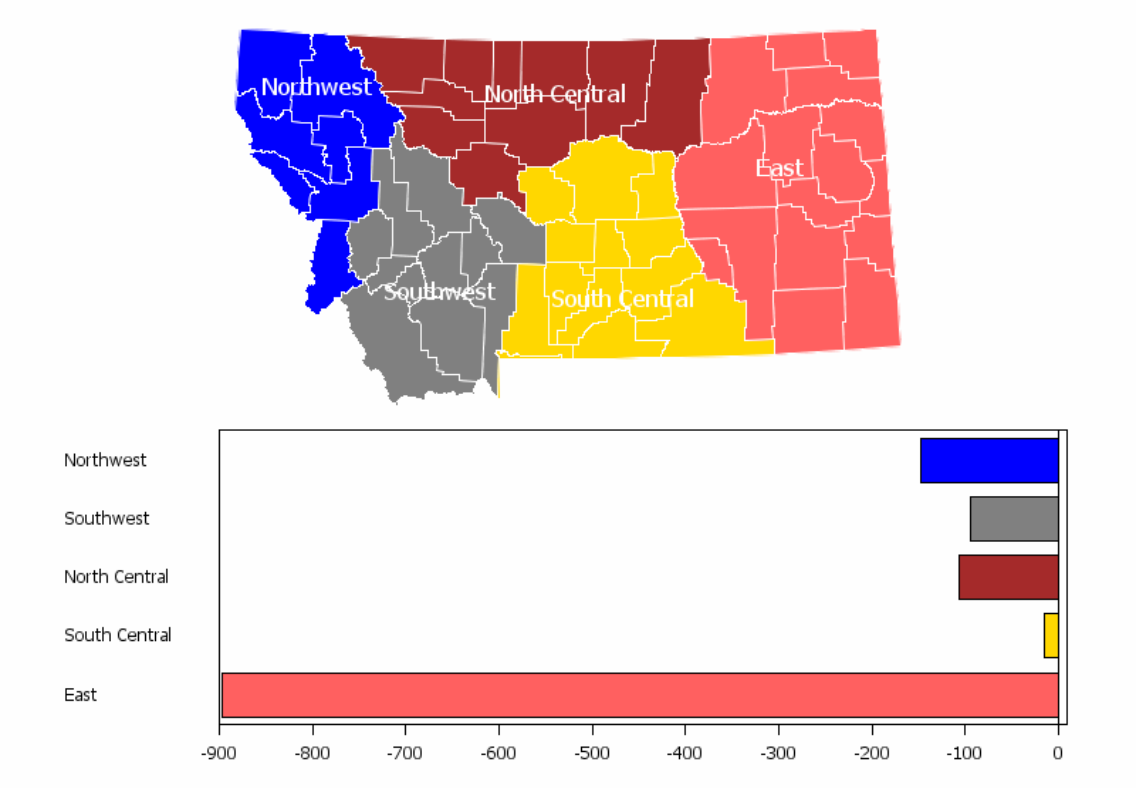


The geographic profile of the economic impacts shows more pronounced effects of Colstrip's early retirement in the eastern Montana region that contains Rosebud County, as might be expected. As shown above, in terms of employment, the closure causes a decline of about 2,300 jobs in the year 2031 in eastern Montana. This is about 4.2 percent of employment in the region.

But the impacts are not confined to the immediate vicinity of the facility itself. There are sizable employment impacts of an early Colstrip retirement felt in all parts of the state. Some of these impacts are due to the trade flows that exist within Montana for all goods and services – which contract as the spending power of businesses and households in eastern Montana is disrupted by the Colstrip closure. But the impacts shown above reflect two other aspects of Colstrip's economic contribution as well: state tax impacts and electricity markets.

The early closure of Colstrip Units 3 and 4 impact electricity prices – and hence business investment and consumer spending throughout the state – through a number of mechanisms. The first are charges to Northwestern Energy customers for everything from remediation and stranded capital costs to the costs of replacing the 220 MW of capacity lost from the closure. A second is the impact on "choice" customers – industrial and large commercial users who buy their power directly from merchant providers. With the complete closure of Colstrip, the price discount these customers currently enjoy from their proximity to a large generation resource is transformed into a price penalty caused by what becomes a larger distance to sources of power. Finally, the loss of nearly 1,500 MW of baseload capacity from the regional market can be expected to have an upward impact on electric rates.

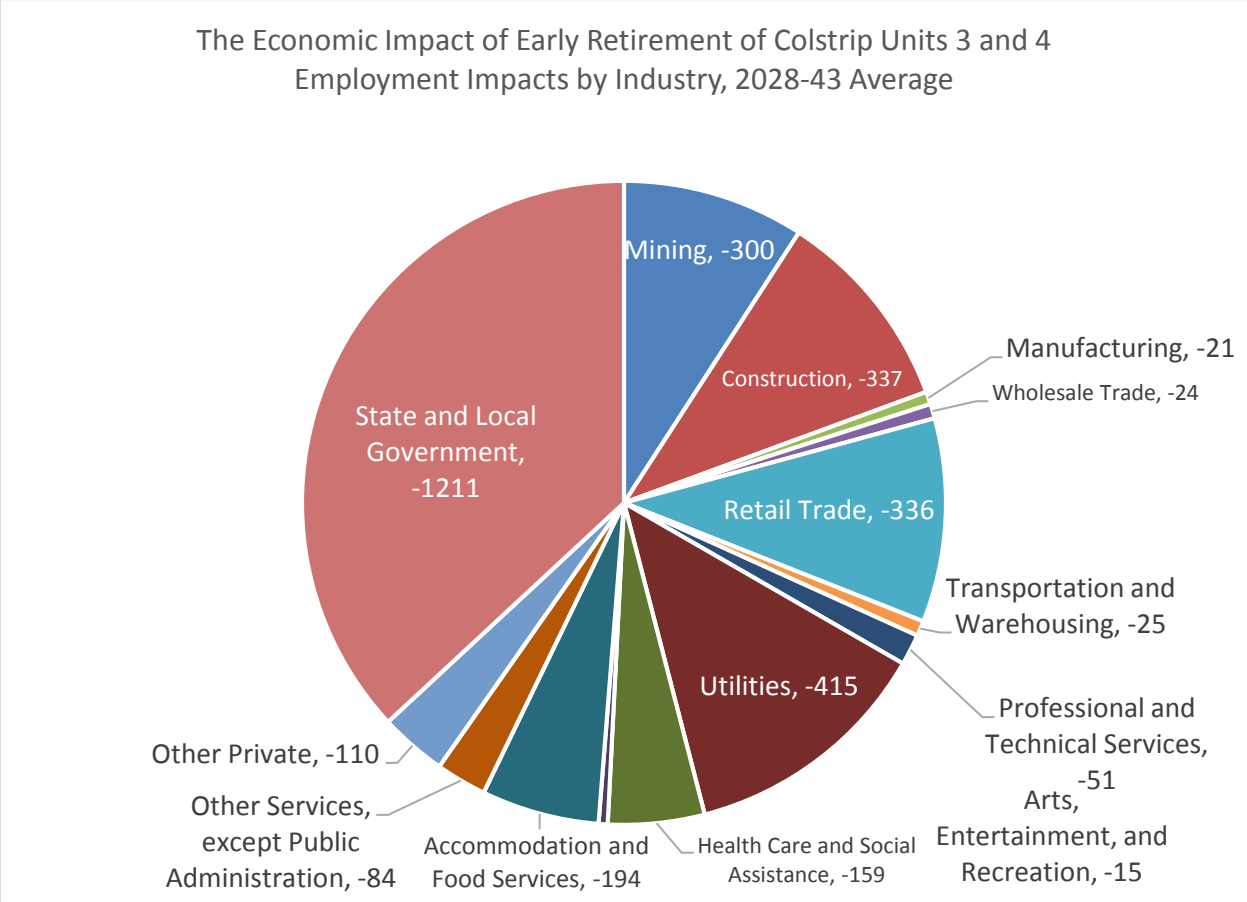
FIGURE 1.3 THE ECONOMIC IMPACT OF EARLY RETIREMENT OF COLSTRIP UNITS 3 AND 4 STATE AND LOCAL GOVERNMENT EMPLOYMENT IMPACTS, 2031



State tax impacts are a second, significant reason why the impacts of the early retirement of Colstrip are felt in other regions of the state. Taken together, state and local government job impacts account for about 35 percent of the net decline in employment in the state economy that is attributable to the Colstrip closure. While the bulk of the local government job impacts are in eastern Montana (see figure above), state government impacts are spread throughout the more populous regions of the state.

The employment impacts are also evidenced in many industries, as the average employment impacts for the years 2028-43 in the pie chart below makes clear. The spending of businesses, employees and governments that are directly impacted by Colstrip's early retirement show up as revenues and ultimately employment losses of Montana organizations across nearly the entire spectrum of the economy.

FIGURE 1.4



Other Impacts

The early retirement of Colstrip induces changes in economic activity beyond the employment impacts detailed above. Some of these, such as negative impacts on wage rates in eastern Montana brought on by the exit of high-paying employers, are slight in magnitude, but potentially significant. Some are immediate, such as the negative impacts on tax revenues and spending of businesses and households. Others, including the negative impacts on

population that occur as some households move away to pursue other economic opportunities, manifest themselves more slowly over time.

The analysis shows, in particular that:

- on average, the jobs lost by the economy due to the early closure of Colstrip pay considerably above the state average. Over the full period 2028-43, the earnings per lost job is almost $79,000 in terms of today's dollars.

- population impacts are concentrated on the most mobile age cohorts in the overall population, who tend to be younger and have (or will have) school-aged children. Thus the impacts on government services such as K-12 schools will be more pronounced.

- Impacts on gross revenues for seemingly unrelated industries, such as health care and professional services, due to the Colstrip closures are $30 million per year or higher, due to reduced incomes and population.

- Impacts on the construction industry will be the most volatile over time, reflecting higher demand from activities like new facility construction and remediation, and sharper reduction in demand caused by slack in the marketplace in the years immediately following the closures.

It is important to recognize that impacts are not a prediction of the economic concepts – jobs, income, revenues, population, and so forth. Rather they are the difference between the levels of economic activity that are expected to take place in the event that Colstrip Units 3 and 4 are retired in year 2027, compared to the levels that would have taken place in the baseline, no early retirement, scenario. All of the impacts described here are additional to those that will take place when Units 1 and 2 close, since those are embedded in the baseline.

Assumptions of this Study

The project has estimated and presented the impacts on the Montana economy that would come about if the two newer, larger units of the Colstrip generating station were to be closed in 2027, instead of being operated to the end of their economic lives. The results were derived with the use of the BBER's regional economic impact model (REMI), which has been constructed and calibrated for this use. Since this early retirement scenario presented to the economic model to derive these results is a projection of the future, it is important to document and support the assumptions included in the scenario under consideration.

Specific assumptions – from the timing of events to the specific investment types and costs – that are included in the early retirement scenario may differ from what actually takes place if early retirement occurs and that particular future arrives. We would argue that those differences, while affecting the numerical estimates of impact, do not change the broad conclusions of this report.

The assumptions of the early retirement scenario considered in this study can be gathered into three groups:

Shutdown Assumptions:	Colstrip Units 3 & 4 close in mid-2027 Westmoreland Mine closes in mid-2027 Remediation at both sites commences Tax revenues from operations cease NorthWestern Energy Stranded Capital Costs passed on to ratepayers
Replacement Assumptions:	500 KV transmission line Colstrip-Townsend remains open 220 MW of Reciprocating Internal Combustion Engine generation capacity is constructed and brought online
Market Assumptions:	Electricity prices paid by larger industrial and commercial customers increase by 10 percent

Further support and sensitivity analyses for these and other specific assumptions are included in the full report.

Summary

This study has examined the economic consequences of a hypothetical decision to close the two newer, larger units of coal-fired Colstrip electric generating station in Rosebud County, Montana, in the year 2027, years earlier than what the economic and physical attributes of those facilities would support. The results of the analysis show that this early retirement would produce a state economy with fewer jobs, less income, reduced state tax revenues and a small population than would be the case if the facilities remained open. All of these changes take place relative to an economy that already reflects the impacts of the closure of Colstrip Units 1 and 2 by the year 2022.

Specifically we find that the early retirement of Units 3 and 4 at Colstrip produce a state economy that:

- has, on average, almost 3,300 fewer jobs over the sixteen year period 2028-43 following the closure with average earnings of $79,000 for each lost job;
- reduces the income receive collectively by all Montana households by $325 million per year, adding up to $5.2 billion over the 2028-43 span;
- experiences lower state tax and nontax revenue collections on the order of $80 million per year;
- has a population loss of 7,080 people by year 2043, including almost 2,200 school aged children;
- sees reduced economic activity in every region of the state, due to the higher electricity prices, reduced inter-region trade and lower state government spending that would occur.

How do the changes that directly affect roughly 800 jobs at the generating station and the adjacent mine contained in a few square miles of land in Rosebud County produce such outsized effects? One reason is the nature of the jobs and the production activities associated with coal-fired electricity generation. The jobs pay much more than the average, reflecting the highly-capitalized, high value added nature of their work. Unlike many other businesses, the Colstrip facility spends an enormous portion of its budget on a made-in-Montana product, namely, coal. And it exports most of that product to buyers in other states.

A second factor amplifying the impact of Colstrip is the facility's role in the electric power grid. While technology and competition (some of which is supported by subsidies) have changed its once-exclusive use as a baseload generation resource, it remains an asset whose removal would require new investment that entails costs.

A third factor is the outsized role of energy and natural resource activities in the revenue base of the state of Montana. In a state with no general sales tax that by necessity relies more on property taxes (which largely go to local governments) and natural resource taxes, an industrial facility the size of Colstrip represents a sizable source of government support. We estimate that Montana's special taxes on energy and natural resources make the tax impact of Colstrip's early closure at least a third larger than they would be on a non-energy related business.

The last factor we can mention is the product produced by Colstrip – reliable, baseload electrical energy. Policies or actions that produce higher electricity prices are felt across nearly every productive sector of the economy.

The basic finding of this report is that the early retirement of Colstrip Units 3 and 4 would produce significant, negative impacts to the state economy, and that decisions on the future of that facility should take those impacts into account.

2. Introduction and Overview

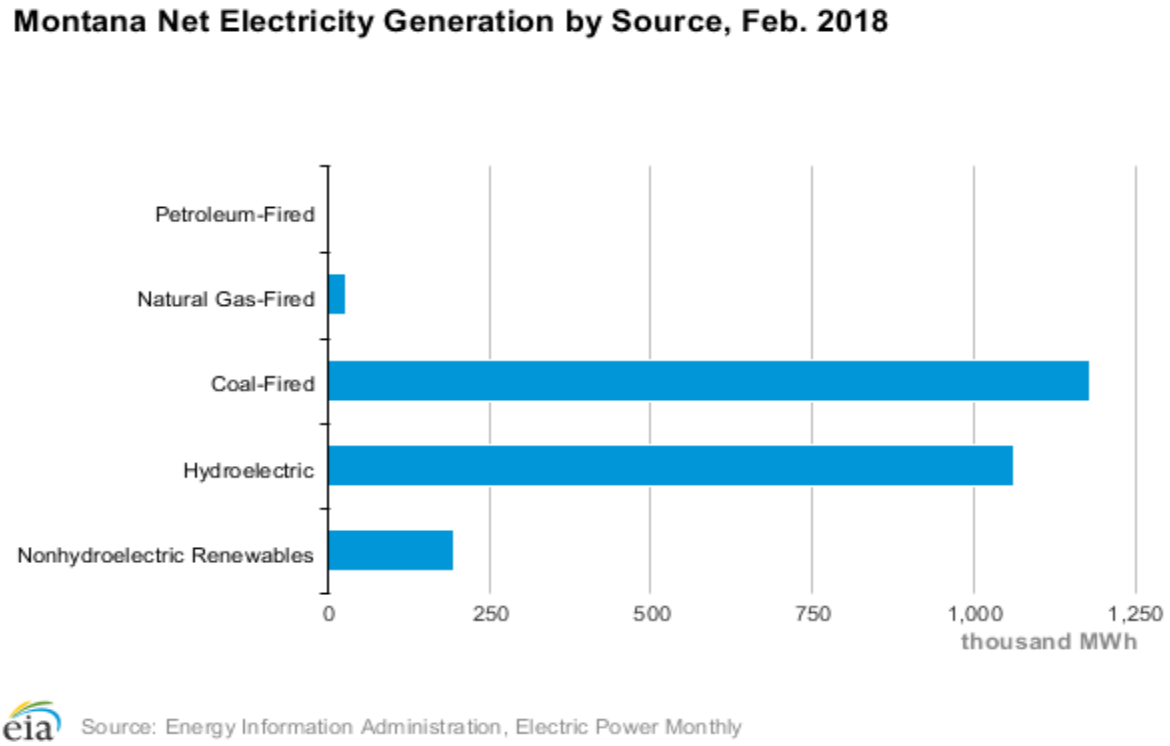
This reports examines the economic implications of policy options for the Colstrip Steam Electric Station (SES), a four-unit, coal-fired electric generating station located in Rosebud County, Montana. Specifically, we study how policy options which would bring about a full closure of the facility in the year 2027 would impact the economy of the state of Montana. As we demonstrate in this report, the closure is likely to bring about a level of economic activity that is substantially lower than what would occur if the facility were to remain in operation.

A broader awareness of electricity markets in Montana in general, and the role of the Colstrip SES in those markets in particular, is useful to appreciate the factors at work that produce this outcome. We present some background information in this section, along with a summary of the events that have led to the policy debate on Colstrip that is the backdrop for this study.

Montana Electricity Market Profile

Montana is a sparsely populated state with considerable natural resources, which is physically distant from major population centers in the rest of the country. In terms of electricity generation, since the 1980s its primary source of generation has been coal, with hydroelectric power generated from dams coming in a close second. The recent mild declines in coal-fired generation and the growth in non-hydroelectric renewable generation – primarily from wind – have not changed that ranking. The share of electricity generated from natural gas-fired generation in the state is very small. There are currently five coal-fired generating plants operating in Montana, but the four-unit Colstrip SES accounts for approximately 95 percent of the electricity generated from coal (U.S. Energy Information Administration, 2018).

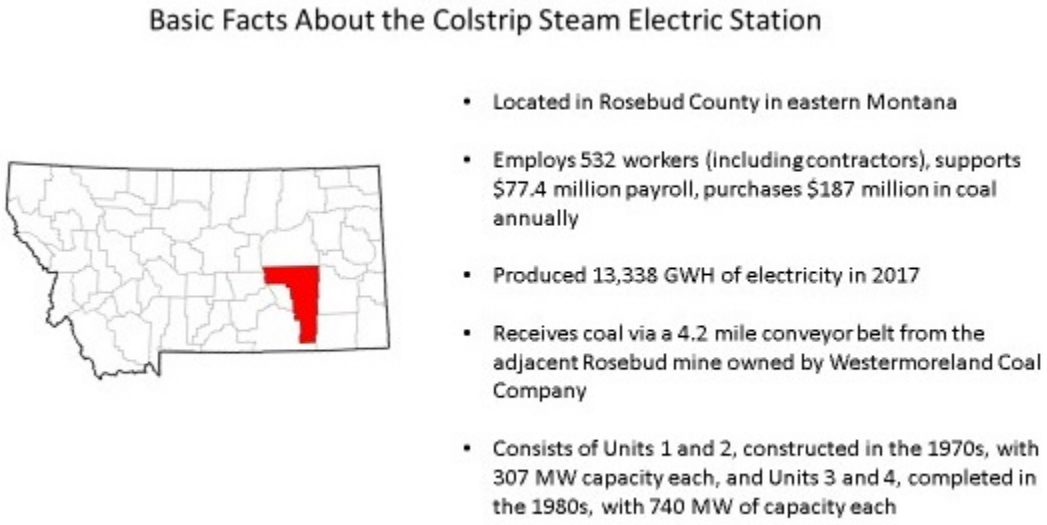
FIGURE 2.1



Since the completion of the larger Units 3 and 4 of the Colstrip SES in the early 1980s, Montana has been a significant exporter of electric power to other states and provinces. In 2016 the state's net generation of 27,783,529 megawatt-hours (MWH) was considerably greater than the 14,100,601 MWH of retail sales to Montana customers over the same period. Until recently the only significant path for electricity exports was the 500 KV transmission line stretching west from Colstrip to Townsend, in south central Montana, which links up with a 500 KV transmission line owned by Bonneville Power Administration which travels on to the west coast. The Montana-Alberta Tie Line (MATL), a merchant-owned 230 KV line connecting north central Montana to Alberta, came online in 2013.

The ownership structure of the Colstrip SES reflects this export orientation. Four owners are regulated electric and/or gas utilities whose customers are located in states to the west of Montana (with one tiny exception). A fifth owner, Talen Energy, who is also the operator of the plant, is a merchant power provider selling into the unregulated market. The sixth owner, NorthWestern Energy, is a regulated electric and gas utility headquartered in South Dakota, but has most of its customers and load in Montana since acquiring the transmission and distribution assets of the now-defunct Montana Power Company in 2002.

FIGURE 2.2



Since 2010 BBER personnel have performed two studies which examined the role of the Colstrip SES in the Montana economy. A study in 2010 performed for all of the Colstrip owners considered the ongoing contribution of the facility to the rest of the state. It did not envision a shutdown of the facility, nor did it examine the plant's role in supporting the grid and serving regional electricity demand (Barkey & Polzin, 2010). It asked, as a hypothetical question, what would the economy look like if the plant did not exist? The primary finding of the 2010 study was that activity at the Colstrip SES supported 3,740 jobs and $370 million in personal income across the state.

In the 2016 the BBER performed a study for NorthWestern Energy to consider the implications for the EPA's now suspended Clean Power Plan (CPP) for the Montana economy. While the CPP made a number of options available for states to meet CO2 emissions reduction goals, our study argued that in Montana the most likely outcome for compliance would have been a closure of the entire facility. The CPP study examined the impact of a

closure, together with replacement investment, in the contest of a national policy which would have caused early retirement of many coal-fired generators throughout the region and the country.

This study re-examines the issues involving the Colstrip SES in light of the circumstances which have changed since only two years ago. These include:

- The resolution of a lawsuit brought by the Montana Environmental Information Center and the Sierra Club against the owners of Colstrip Units 1 and 2 (Talen Energy and Puget Sound Electric) in which the owners agreed to shut down those units by no later than July 1, 2002.

- The increasing output of renewable power generators on in the regional marketplace, including solar generation from California, which have frequently driven hourly spot prices for wholesale power down below the operating costs of even very efficient coal-fired generators such as the Colstrip SES, causing operators of those generators to seek to ramp the output of those facilities up and down in a manner that differs sharply from their baseload generation heritage.

- The increased political pressure from states like Washington and Oregon to remove coal from the generation portfolio that serves customers in their states.

Thus the relevant policy question concerning the Colstrip SES has changed to: in a post-Unit 1 and Unit 2 world, what are the consequences of closing the remaining two newer, larger units of the Colstrip SES? The question presumes the closure of Units 1 and 2, which remain in operation today, and thus considers a change to Colstrip relative to a lower baseline which incorporates the impacts of those closures. It also takes place in a Montana-specific context, instead of in the context of a national CO2 emission policy that aimed to impact CO2 emissions and thus coal fired generators across the region and country. Both of these considerations suggest that the closure of Units 3 and 4 would be somehow smaller and easier to implement than the full closure of the facility that just two years ago some critics of BBER's 2016 study called "a doomsday scenario."

A full examination of the economic consequences of the early closures of Units 3 and 4, which is presented in this report, makes it clear that despite these changed circumstances, the retirement of Units 3 and 4 before the end of their economic lives would remain a singularly painful economic event. The remainder of this report presents these findings in full detail. But broadly speaking, the results underscore one thing that has not changed about the Colstrip SES and the Westmoreland mine which is so closely integrated into its operations. And that is the economic value-add of taking a relatively low cost Montana resource – Powder River Basin coal – and turning it into dispatchable, reliable, abundant, and thus valuable electric power that is exported to customers across the region.

About the Bureau of Business and Economic Research

The Bureau of Business and Economic Research (BBER) was founded as the research arm of The University of Montana's School of Business Administration in 1948. As set forth in its mission statement,

"The purpose of the Bureau is to serve the general public, as well as people in business, labor, and government, by providing an understanding of the economic environment in which Montanans live and work."

BBER has developed over the years to become one of the most sought-after sources of information and analysis on the Montana economy. It has published the Montana Business Quarterly, its award-winning business periodical, since 1962, and has conducted the Montana Poll, a quarterly sentiment survey of the Montana adult population, since 1980.

3. Policy Analysis with the REMI Model

Economic impacts occur because of events or activities that create new expenditures. Spending which is new – which is over and above existing expenditures and does not simply displace spending elsewhere in the region – not only adds to economic activity in its own right, but it also induces further spending as the recipients of wages, sales, and tax revenues spend a portion of their income in the local economy. Changes in the path of investment, migration, and prices and wages are possible as well.

The basic tool used in this study to assess the economic impacts of the early retirement of Colstrip Units 3 and 4 is an economic model, calibrated to represent the interactions in the Montana economy, leased from Regional Economic Models, Inc. The REMI model is one of the best known and most respected analytical tools in the policy analysis arena and has been used in more than 100 previous studies as well as dozens of peer-reviewed articles in scholarly journals. It is a state-of-the-art econometric forecasting model that incorporates dynamic feedbacks between economic and demographic variables. The REMI model forecasts employment, income, expenditures, and populations for counties and regions based on a model containing over 100 stochastic and dynamic relationships as well as a number of identities. A full explanation of the design and operation of the model can be found in Treyz (Treyz, 1993).

The model used in this study disaggregated the state economy into five regions: Northwest, Southwest, North Central, South Central, and Eastern. It explicitly recognizes trade flows that exist between these regions, as well as between the regions and the rest of the world. Statewide impacts reported here represent the totals for the five regions. The definition of the regions is shown in Figure 3.1 below.

FIGURE 3.1 ECONOMIC REGIONS

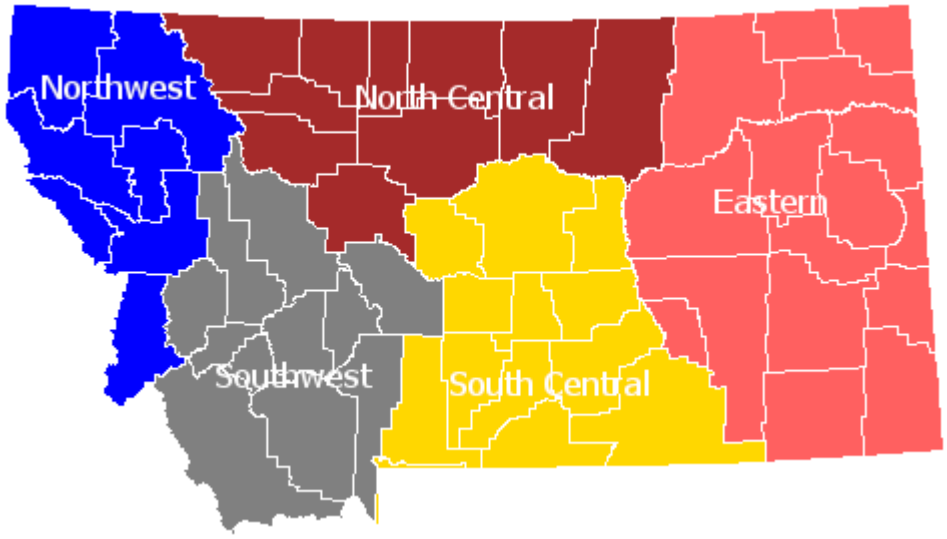
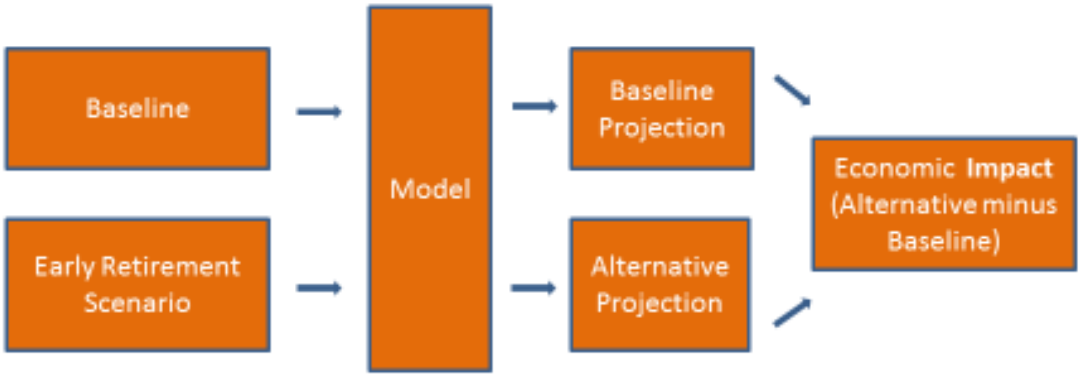


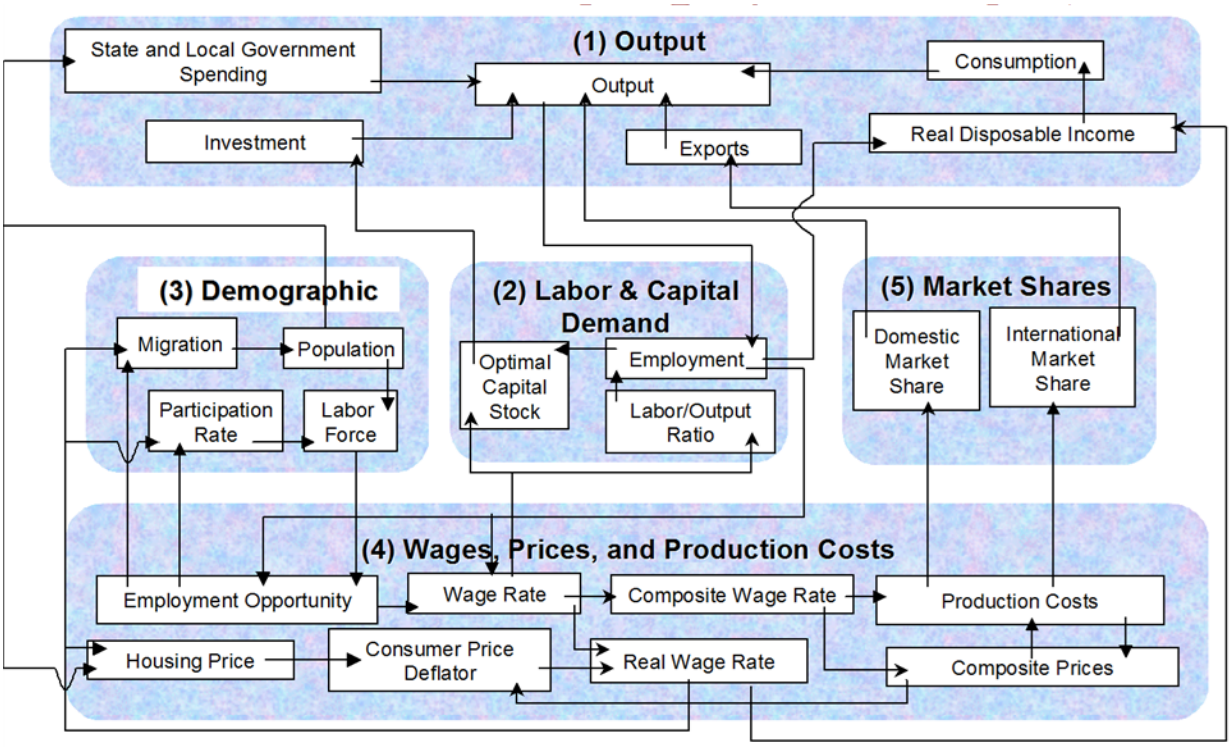
FIGURE 3.2 POLICY ANALYSIS WITH THE REMI MODEL



The use of the model to derive the results of this study is illustrated graphically in Figure 3.2. First, a baseline projection for the economy is made using status quo assumptions that have Colstrip Units 3 and 4 continuing to operate (although Units 1 and 2 are shutdown). The model is then used a second time, with identical inputs – except that in this alternative scenario, early retirement takes place, with all of the associated events described in the next section. Thus changes in the economy that take place in the event of a retirement of Units 3 and 4 is a (negative) stimulus that ultimately brings the economy to a new level of activity, reflecting not only the direct impacts of the shutdowns, but how the rest of the economy reacts to those changes. The difference between the baseline and alternative scenarios of the economy represents the economic impact of the early retirement of Colstrip Units 3 and 4.

The model utilizes historical data on production, prices, trade flows, migration, and technological change to calibrate the relationship between five basic blocks of the regional economy as depicted in the figure on the following page: output, labor and capital demand, population and labor force, wages and prices, and market shares. The changes in production, labor demand and intermediate demand caused by the events associated with early retirements at Colstrip causes these blocks of the economy to react and adjust to a new equilibrium. As described above, the difference between the baseline and the alternate scenario is the ultimate impact of the early retirement of Colstrip Units 3 and 4.

FIGURE 3.3 REMI MODEL LINKAGES



The essential philosophy of the model is that regions throughout the country compete for investment, jobs, and people. When events occur in a region they set off a chain reaction of actions causing dollar flows toward better investment and production opportunities, followed over time by a flow of workers and households toward employment opportunities and higher wages. The model embodies an 82-sector input-output matrix that describes the technological interdependence of production sectors of the economy, as well as extensive trade and capital flow data to determine the share of each sector's demand that can be met by local production.

As powerful and flexible as this tool is, the answers it provides are only as good as the questions posed to it. The majority of work in this study is carefully crafting the inputs used to construct a scenario of the economy that faithfully represents all of the events, income flows, and other direct and indirect impacts that would result from an early retirement of Colstrip Units 3 and 4. We now turn to this task.

4. The Direct and Indirect Economic Contributions of Colstrip Units 3 and 4

The analysis of the economic impact of the early retirement of Units 3 and 4 of the Colstrip SES can be conceptually broken into three separate and distinct components:

(i) the direct effects – the payroll, vendor purchases, tax payments and other economic flows that come from the operations of the facility itself;

(ii) the indirect effects, which comprise other economic activities, such as the Westmoreland mine, which are connected to Colstrip but are not part of the facility itself; and

(iii) the induced effects, where direct and indirect spending is received as income by individuals, businesses and governments within the state and re-spent in the economy, supporting additional jobs and income streams.

The total impacts, representing the sum of these three components, are reported in the next section of this report.

As described in the previous section, the REMI model is used to estimate the difference in economic activity that can be expected to occur in Montana under two different scenarios concerning the future of the Colstrip SES: the baseline, no-retirement scenario, and the alternate scenario where Units 3 and 4 are shutdown in 2027. The difference between these two outcomes for the economy – in terms of employment, income, sales and other economic metrics – is the economic impact of the early retirement, which subsumes all three components enumerated above.

The construction of the scenarios that form the basis for the analysis presented in this study is described in this section of the report. As described below, the scenarios reflect (i) the ongoing economic activity of the Colstrip SES, (ii) the activity of other entities that are closely associated with the generation of electric power at Colstrip but are not a part of the facility itself, and (iii) the kinds of spending and investments that would occur as part of the shutdown, both at the facility itself as well as elsewhere in the economy.

The Direct Impact of Early Retirement of Units 3 and 4

The Colstrip SES operates today as an integrated, four unit generating station, with a capacity of approximately 2,100 MW, employing 328 full time and 20 part time plant workers, in addition to a year-round equivalent of 164 contractors working at the site. With the closure of the older Units 1 and 2 by the year 2022, mandated by a legal settlement, that economic footprint will change. The direct impact of the early retirement of Units 3 and 4 thus is different, and somewhat lower, than what we observe today. Since this study addresses the impact of this decision – the retirement of the two larger units of the Colstrip SES before the end of the economic lives – we consider a scenario where the economic contributions of those two units are lost.

The closure of Units 1 and 2 of the Colstrip SES removes about 614 MW of generating capacity from the facility, which is about 29 percent of the total. The generation data from 2017 indicate that the two older units accounted for 3,600 GWH, or 27 percent, of the energy produced in that year.

We estimate that the direct impact of early retirement of Units 3 and 4 would be:

- a loss of 279 plant jobs, with total compensation of $39.9 million;
- the loss of 125 year-round equivalent contractor jobs, with total compensation of $16.9 million;
- a decline in the output of electric power of approximately 9,750 GWH per year, with gross value of about $280 million;
- a decline in purchases of coal of $140 million per year;
- declines in purchases of labor and materials from vendors and suppliers;
- reductions in tax revenues to federal, state and local governments paid by the facility.

Of particular note is the decline in the property tax paid to local governments in Rosebud County, which we estimate to be approximately $25 million per year.

The Indirect Impacts of Early Retirement of Units 3 and 4

Indirect impacts are the changes in economic activity that are linked to the early retirement of Units 3 and 4, but are not part of the facility's economic activity itself. These are both upstream from the facility – e.g., the adjacent Westmoreland coal mine – and downstream, in terms of both electricity markets and environmental remediation activities.

The Westmoreland Coal Mine

The 25,000 acre Western Energy Company - Rosebud Mine, operated by Westmoreland Coal Company, is immediately adjacent to the Colstrip SES. It delivers coal to the facility via conveyor belt. The Colstrip SES accounts for nearly all of the mine's 10-13 million tons of annual coal production. Without access to rail transport, the mine's output follows the fortunes of the generating station.

We estimate that the early retirement of Units 3 and 4 (from a baseline which already reflects the closure of Units 1 and 2) of the SES would result in:

- a decline in employment of 289, representing an annual payroll of $32 million;
- a reduction of coal production/sales of $140 million annually;
- reductions in federal, state and local taxes paid, including $23.2 million in coal severance taxes paid annually to the state of Montana as well as $7.7 million paid annually to local governments in gross proceeds taxes.

Remediation and Replacement

Remediation

The retirement of Units 3 and 4 of the Colstrip SES would represent the complete closure of what currently is Montana's largest industrial facility. It would be a significant event, both from the point of view of environmental remediation as well as the activities that would have to be carried out in order to maintain the adequacy and reliability of the electricity grid.

The remediation of the Colstrip SES site is represented in this analysis as demand for construction and remedial services. The estimate for the cost of remediation is $200 million. Additionally, a $50 million water treatment facility would need to be built to replace the treatment services to the community that the plant itself now provides. It is assumed that these projects would be carried out in the ten year period after the facility's closure, with most of the spending taking place in the first two years.

The cost of remediation would be borne by the owners of Colstrip. In the case of the five out-of-state owners – Talen Energy, Avista, Puget Sound Energy, Portland General Electric and Pacificorp – it is assumed that these costs are born by stockholders or ratepayers outside the state with negligible impact on the Montana economy. The 11 percent cost share of the sixth owner, NorthWestern Energy, is assumed to be paid for by Montana customers in the form of higher rates.

Remediation would also take place at the Rosebud Mine, paid for by the Westmoreland Coal Company. It is estimated to create $72 million in demand for construction and remediation services, to be carried out in the years after the mine's closure. Remediation activities at both the generating plant site and the coal mine can be expected to support jobs and income streams relative to the baseline, no-retirement, scenario, and thus can be expected to offset some of the negative impact of the facility closures, at least for a few years.

Replacement

Replacement activities, broadly speaking, are the investments and modifications that may be required downstream from Colstrip to render the electric grid acceptably adequate and reliable in the wake of the permanent removal of Units 3 and 4 from the stock of generating assets serving the needs of customers. This is not an attempt to carry out generation and/or transmission planning – such an analysis lies outside the scope of this report. Rather, it is a recognition that from the point of view of the state's largest public utility, NorthWestern Energy, some kind of action will be needed to replace the loss of the 222 MW which is NorthWestern's share of Unit 3 of Colstrip when that unit is retired. And that the costs of that action, even if approximate, should be recognized in this analysis as a consequence of the early retirement of Units 3 and 4.

We make the assumption for this study that the early retirement of Units 3 and 4 will cause NorthWestern Energy to construct (and Montana ratepayers to partially pay for) 220 MW of new generation, to come online in the year that the Colstrip units are retired. Specifically, we assume that this generation will be natural gas-fired, consisting of Reciprocating Internal Combustion Engine (RICE) generators which jointly provide that capacity.

Other assumptions are possible, and we would expect a comprehensive generation planning process to identify all of the specifics of the investments and actions that are best for ratepayers and stockholders. The reason why we have made very specific assumptions on the replacement investment is to be able to assess the costs and, ultimately, the impacts of those costs (due to early retirement of Units 3 and 4) on the state economy.

We would argue that this replacement scenario – the construction and operation of 220 MW of RICE generation – makes sense because:

- New generation will be needed. Not only is NorthWestern Energy currently in deficit for all but light-load days for its service territory, but the likelihood that the company will become part of a Regional Transmission Organization (RTO) along with others in the northwest region in the next ten years is very high. The rules of those organizations preclude structural deficits for power delivery.

- Natural gas-fired generation options are most attractive. The need for dispatchable, quickly rampable power generation on the NorthWestern system will grow more acute with the loss of NorthWestern's share of Colstrip Unit 3. Wind and solar generated power do not address that need. Other options, such as battery units and/or pumped storage are possible, but much more difficult to assess costs, particularly at the scale involved.

Using capital cost estimates published by the U.S. Energy Information Agency, we estimate that this replacement capacity will create new demand for construction and equipment of approximately $295 million, with the project to be carried out such that the new capacity is available when Units 3 and 4 are shutdown.

No major transmission investments are assumed as part of the replacement actions that are part of this analysis. This implicitly assumes that the 500 KV transmission line that travels east from Colstrip to Townsend in southwest Montana – and which is owned by the Colstrip SES owners – remains operational. This likewise assumes that some economic model is created to pay the costs of operating this line in a post-Colstrip scenario when the current owners have exited the market. To the extent that these costs are borne by Montana ratepayers, customers or taxpayers, their economic impacts should be considered, but without more specifics we have no way of estimating what those impacts would be.

Likewise no new gas transmission investments are included in the replacement investments. This is, in one sense, inconsistent with the assumed introduction of 220 MW of natural gas-fired generation capacity as a consequence of the early retirement of Colstrip Units 3 and 4. We justify this omission because the circumstances of Montana's natural gas markets support the case for new gas transmission investments with or without the addition of new demand for natural gas-fired RICE generators, and so the allocation of those costs to the new generators would be difficult.

Impacts on Markets

The early withdrawal of the 1,480 MW of baseload generation capacity from the electric power marketplace which is the current contribution of Units 3 and 4, even if partially offset by 220 MW of new generation as described above, will be a major event on wholesale and retail markets in the region. It can be expected to have impacts on prices through three different mechanisms: changes in rates paid by customers of NorthWestern Energy reflecting changes in the rate base, changes in prices paid by large industrial and commercial customers in the state who currently purchase power on the unregulated marketplace, and changes in wholesale prices generally, reflecting the decreases in baseload generation.

NorthWestern Rates

In this analysis, actions which affect the rate base of the state's largest regulated electric utility, NorthWestern Energy, are assumed to be reflected in rates, or prices charged for electric energy. In cases where costs are recovered in rates in incurred in a short time, the effect on rates is spread over a 20-year period. As with any price change, these can be expected to change the income available for other kinds of spending, as well as altering future investment and consumption decisions that involve the use of electric power.

Rate increases due to the early retirement of Units 3 and 4 come about from:

- The share of Colstrip remediation costs borne by NorthWestern;
- The stranded capital cost of $225 million borne by NorthWestern that reflects the loss of a productive asset before the end of its economic life;
- The costs of 220 MW of gas-fired generation brought online to replace NorthWestern's share of Colstrip Unit 3.

There are also smaller changes in Northwestern Energy rates made to reflect changes in its property tax liabilities, reflecting both reductions (NWE share of Colstrip SES, 500 KV line) and additions (RICE generation).

Prices Paid by Montana "Choice" Customers

When Montana re-regulated its electric marketplace in 2001, larger commercial and industrial customers retained the right to separately contract with merchant power providers of their own choice to secure their power needs, with NorthWestern Energy compensated only for delivery costs on its transmission and distribution systems. These include the oil refineries in Billings, the copper mine in Butte, and the hospital in Great Falls. These "choice" customers have historically enjoyed a discount with respect to regional wholesale prices quoted at the Northwest region's delivery point, located in the Mid-Columbian River basin (Mid-C) in southern Washington.

The discount comes about because of the relatively short distance involved between the source of power (Colstrip) and their own locations in the state which, in turn, results in lower transmission costs incurred that is reflected in the prices they pay. Data from the U.S. Energy Information Administration show that Montana industrial electricity prices were almost 29 percent lower than the national average.

The complete closure of the Colstrip SES changes this discount to a penalty. Not only is the short transmission path from Colstrip to the Montana industrial customer removed from the choice set, but the comparatively longer distance from those same customers from the Mid-C delivery point will add, instead of subtracting, from the regional reference price.

We estimate that the retirement of Units 3 and 4 will result in a 10 percent increase in prices paid by Montana industrial customers.

Wholesale Price Impacts

Wholesale prices for electricity vary tremendously by season, by day, by hour, and even by minute. In a three month period last spring, prices at the Mid-C delivery point varied from a high of $52.00 per MWH on a cold February weekday morning to a low of -$1.00 on a sunny spring afternoon when the hydro and solar facilities were flooding the market with energy (Northwest Power and Conservation Council, 2013). Other seasons and other parts of the country have seen even more extreme behavior.

Despite the variation and volatility, it remains a situation of prices balancing supply and demand, with movements in either producing changes in prices in the predicted direction. Thus the removal of Units 3 and 4 from the supply side of the marketplace can be expected to push prices upward. These increases will propagate into retail prices even for regulated customers, as spot purchases incur higher costs and long-term purchase agreements expire.

A projection of wholesale prices with and without Colstrip was performed as part of Avista Corporation's 2017 IRP (Avista Corporation, 2017). That report assumed early retirement in 2023, with significant replacement investment in natural gas-fired baseload and peaking generation, together with an expansion in wind generation. Their simulation suggested that in this scenario, wholesale prices would increase on the order of 2.7 percent.

Replacement investment on the scale envisioned in the Avista projection is not part of the replacement scenario in this report. We thus assumed that wholesale prices would increase by more what they projected. Our assumption was that prices would increase in Montana by 10 percent due to the early retirement of Units 3 and 4.

We tested the sensitivity of our results to this assumption – the results are shown in Figure 4.1. The outcomes for employment and personal income impacts over the year 2028-2043 in the aftermath of early retirement of Units 3 and 4 in year 2027 do vary according to the assumptions made concerning the reaction of wholesale prices to the change. The average job impacts are reduced by about 6 percent if wholesale prices are assumed to go up by only 5 percent, while the personal income impacts are reduced by 7.5 percent. Slightly larger percent differences occur in the opposite direction if wholesale prices instead go up by 15 percent.

FIGURE 4.1

Summary

The first step of assessing the economic impacts of early retirement of Colstrip Units 3 and 4, specifying the direct and indirect impacts of that event, has been described in this section of the report. In order to estimate the total impact of early retirement, we need to understand how these direct and indirect impacts propagate throughout the rest of the economy. This task is carried out with the aid of an economic model (REMI) which has been specifically constructed and calibrated for this purpose. Comparing the new "resting point" for the Montana economy that occurs when all of the changes associated with early retirement take place to the baseline, no-early retirement scenario for the state economy yields estimates of the total economic impact. We present those findings in the next section.

5. The Economic Impact of the Early Retirement of Colstrip Units 3 and 4

This analysis envisions two economic futures for Colstrip and the state of Montana. The baseline, no early retirement scenario, continues to have Units 3 and 4 of the Colstrip SES in operation (although the older Units 1 and 2 are closed) into the indefinite future. The second, alternative scenario, assumes the cessation of output from Units 3 and 4 in the year 2027. The projection for the early retirement scenario is made by making the changes described in the previous section – the direct and indirect impacts – in an economic model which accounts for how those changes affect the rest of the economy. The difference between the alternative and the baseline is the total impact of early retirement. We describe those impacts in this section.

The economic impacts reflect the new resting point the economy comes to after absorbing all of the changes that take place in the event that Colstrip Units 3 and 4 retire in year 2027. This includes the loss of jobs that currently exist in both the generation station and the coal mine in that year, as well as the increases in economic activity that come about from remediation activities and construction and operation of new generation. The results presented here are the net impacts of all of these changes for each year.

Results Summary

Ultimately, the early retirement of Colstrip Units 3 and 4 brings about a level of economic activity in the state economy that is substantially lower than what would occur if those units continued to operate. In the first full year that the units are shut down, statewide employment is projected to be 3,078 jobs lower than would have occurred if they had continued to operate. The decline in employment contributes to:

- a decline in income received by Montana households of a quarter billion dollars in the first year of closure,
- a loss of $700 million in gross receipts of Montana businesses, and
- a reduction of $60 million in selected state tax revenues,

compared to what would have occurred in the baseline, as shown in Table 5.1. The dollar figures presented in the Table, and in this entire report, are expressed in terms of 2018 purchasing power and thus do not include future inflation.

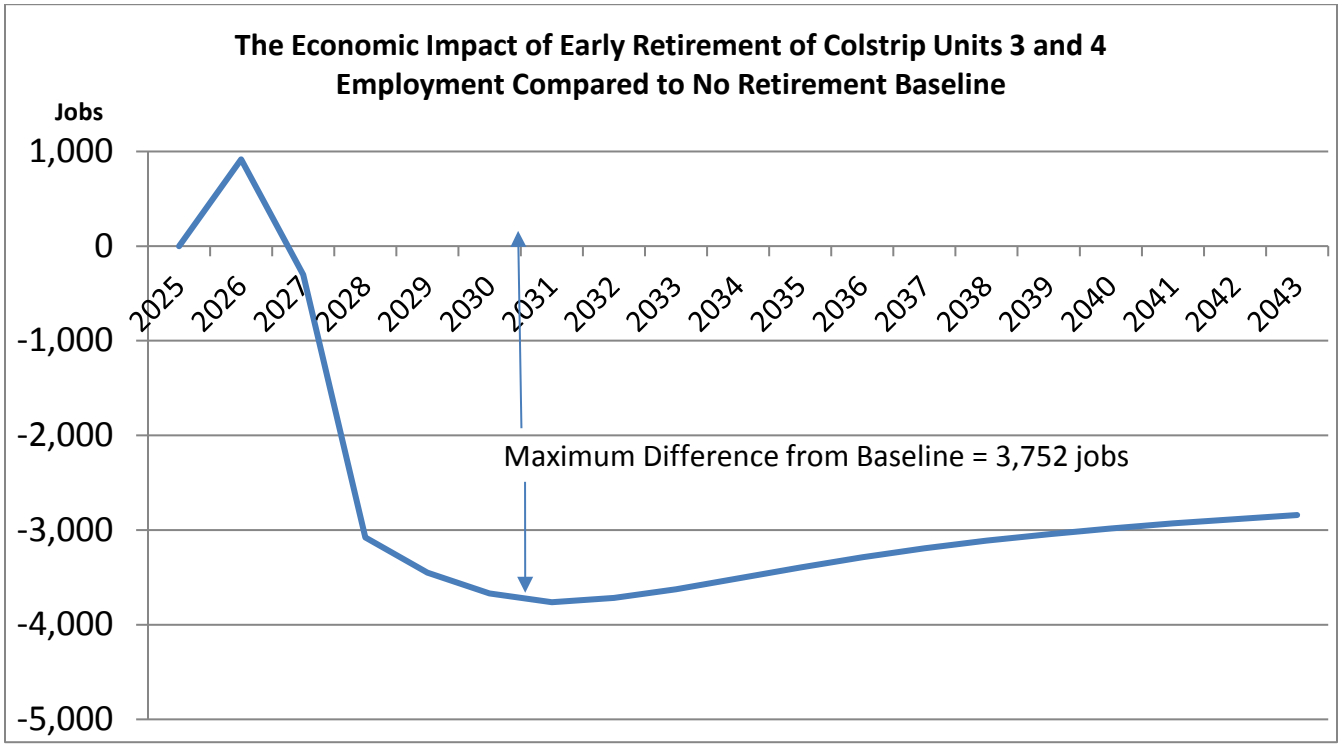
TABLE 5.1

The Economic Impact of Early Retirement of Colstrip Units 3 & 4 Impacts Summary

Category	Units	Impact for the Year		Full Period
		2028	2043	2028-43
Total Employment	Jobs	-3,078	-2,840	-3,280
Personal Income	$ Millions	-253.2	-348.6	-5,233.9
Disposable Pers. Income	$ Millions	-218.3	-305.3	-4,559.2
Selected State Revenues	$ Millions	-60.5	-81.7	-1,242.5
Output	$ Millions	-700.4	-779.4	-12,503.3
Population	People	-1,715	-7,016	-5,960

All of the changes in the economy noted in Table 5.1, and in all of the tables and charts presented in this section, are differences in two projections for the state economy. Note, in particular, that the negative figures in Table 5.1 are not a prediction that the state economy as a whole will show a net job loss in 2028 or in any other year. They are a difference in the level of employment attained by the economy that is due to the early retirement of Colstrip Units 3 and 4.

FIGURE 5.1



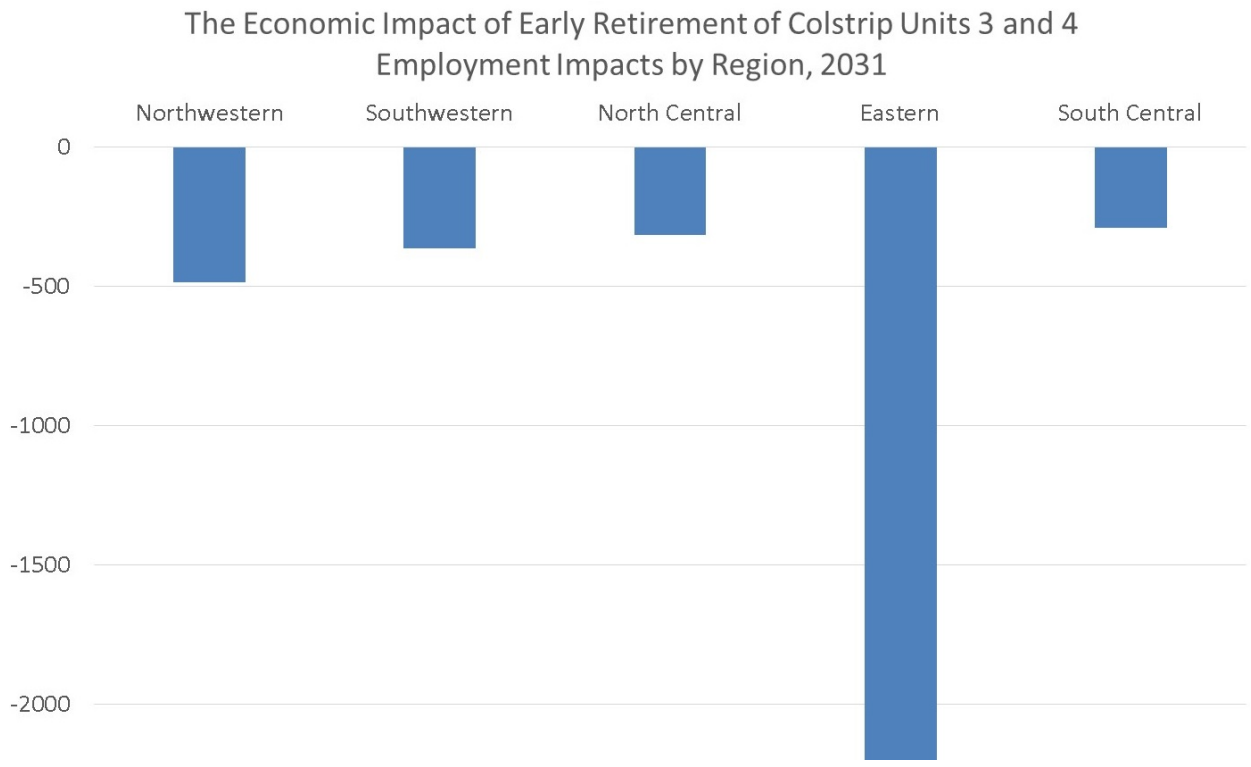
As can be seen from the Table, the impacts of early retirement vary over the time span 2028-43. This is easier to appreciate in the graph of total employment impacts shown in Figure 5.1. Broadly speaking, there are three different forces at work explaining these variations. The first and most important is the timing of the events associated with the early retirement scenario. In the years just before the shutdown, for instance, there are positive impacts, due to the construction of replacement generation. Remediation spending also provides a boost to employment in the years immediately following the shutdown.

Another explanation for changes in impacts over time is the increasing productivity that is assumed over the 2028-2043 period shown. This tends to make the job loss associated with the shutdowns of the generating station and the coal mine slightly less over time, because slightly fewer jobs would exist in those facilities in future years.

Finally, the dynamics of economic adjustment to an event of the magnitude of a shutdown of Colstrip Units 3 and 4 involves swings in construction activity and population migration that exhibit differing behavior over time. Residential and commercial construction can be expected to initially drop off to very low levels in the early years of the post-retirement period, gradually recovering to sustainable levels. Outmigration of working age families in response to diminished economic opportunities, on the other hand, takes more time to occur.

Job losses due to the retirement of Units 3 and 4 peak in year 2031 at roughly 3,750 jobs. Over the 2028-2043 period, the early retirement causes an average job shortfall of 3,280 jobs, relative to the no-early retirement economy.

FIGURE 5.2



The economic impacts fall heaviest, but not exclusively, on the eastern Montana region that is home to the Colstrip SES and the Westmoreland mine, as can be seen from the geographic pattern of job impacts for year 2031 shown in Figure 5.2. Given the preponderance of direct impacts located in Rosebud County, that is not a surprise.

What is perhaps more surprising is the significant numbers of jobs that are impacted by the early retirement of Units 3 and 4 in other parts of the state. These come about because of the impacts on (a) state tax revenues, which in turn have impacts on the places where taxpayers live and do business, and (b) the impacts on electricity prices, which affect investment and incomes statewide.

Personal income impacts of Colstrip early retirement actually grow slightly over the sixteen year period 2028-2043, averaging $327 million annually. Rising income impacts is in part due to the increase in population impacts over time, as well as the rising compensation levels of the high value added jobs which are lost. Over the sixteen year period about $5.2 billion in income received by Montana households, $4.6 billion of which is after-tax income, is lost due to early retirement of Units 3 and 4.

Output, or gross receipts of Montana businesses and non-business organizations, is reduced in an early retirement economic future as well, relative to a future where Units 3 and 4 continue to operate. Impacts range between $700 million and $780 on sales, cumulating to $12.5 billion over the years 2028-43. These declines not only reflect the declines in consumer purchases, but also the substantial sales that come from businesses and governments.

The decline in state tax and non-tax revenues due to early Colstrip shutdowns is significant – especially in comparison to the decline in household income. On average, the state loses one dollar in revenue for every $4.23 lost in personal income, an average rate much higher than, say, the average individual income tax rate in the state would suggest. This is largely due to the larger footprint of natural resource and energy industries, especially coal, in the state's revenue base.

There is a feedback between changes in economic opportunity and population changes that can be expected to occur with the early retirement of Colstrip Units 3 and 4. Loss of economic opportunity caused by job loss will gradually induce some to migrate outside the regions. The resulting population loss reduces demand for private and publicly provided goods (particularly K-12 schools), which causes additional, modest job losses, particularly in government employment.

A more detailed discussion of these impacts yields important insights on the scope and magnitude of the overall impacts. We turn to that discussion now.

Employment Impacts

The breakdown of employment impacts of the early retirement of Colstrip Units 3 and 4 reveal the breadth and scope of what would be an important economic event. One striking aspect of the job impacts, as shown in Table 5.2, is how prevalent they are outside of the immediately affected industries.

TABLE 5.2

The Economic Impact of Early Retirement of Colstrip Units 3 & 4
Employment Impacts

Industry	Impact for the Year		Full Period
	2028	2043	2028-43
Mining	-309	-289	-300
Construction	-408	-132	-337
Manufacturing	-19	-14	-21
Wholesale Trade	-23	-19	-24
Retail Trade	-303	-289	-336
Transportation and Warehousing	-33	-23	-25
Professional and Technical Services	-42	-48	-51
Utilities	-419	-412	-415
Health Care and Social Assistance	-144	-149	-159
Arts, Entertainment, and Recreation	-17	-6	-15
Accommodation and Food Services	-148	-170	-194
Other Services, except Public Administration	-98	-64	-84
Other Private	-90	-72	-110
State and Local Government	-1022	-1153	-1211
TOTAL	-3,078	-2,840	-3,280

Of the 3,280 jobs that are lost to the economy, on average, due to the early retirement of Colstrip Units 3 and 4, only 715 jobs – less than a quarter – are in utilities and mining. The remaining jobs are spread across the entire spectrum of economic activity, from goods producing to services producing industries. The largest employment impact is felt in state and local government, which is 1,211 jobs lower as a result of early retirement, on average, for the years examined.

Part of the explanation for this outcome is the capital-intensive nature of the mining and utility industries which are directly affected by early retirement. The footprint of these industries is larger than their employment headcounts would suggest. On the other side of the spectrum, retail trade and construction, both of which bear

significant impacts from early retirement of Colstrip, are relatively labor intensive industries, with headcount impacts relatively high with industry contraction.

The government impacts, on the other hand, speak to the unique circumstances for state and local government that can be expected to occur in a shutdown of Units 3 and 4. As noted above, the impact for state tax and non-tax revenues from an early retirement of Units 3 and 4 is outsized, due to the importance of coal and energy industries in the revenue base. Additionally, the capital intensity of the industries directly affected by the closures translates into outsized impacts on local tax revenues as well, especially property tax revenues. Together with the labor intensity of state and local government services, these cuts translate into significant reductions in state and local government employment.

Health care, Accommodations and Food Services and Retail Trade industry employment impacts underscore how the declines in population and personal income affect industries which serve local economies around the state.

Personal Income and Compensation Impacts

The impacts on income received by Montana households, or personal income, are also broader than the direct impact of closing a power generation station and a coal mine would seem to suggest. The direct connection with job loss is with the impact on wage and salary income, which as can be seen from Table 5.3, do account for about $3 billion of the $5.2 billion in income that is lost to the economy over the years 2028-43 due to the early retirement of Colstrip Units 3 and 4.

But as the gap between those two numbers suggests, other factors contribute to the income loss as well. On the earnings side, business proprietor income and business pension contributions add nearly $1 billion to the income lost. Many of the jobs involved at the generating station and at the mine pay significant benefits.

There is also a significant loss in unearned income. A total of $800 million in property income is affected by the early retirement of Units 3 and 4 over the 16 year period. These losses consist of impacts on rental income, dividend income and interest income. The primary mechanism that causes the loss of property income to the economy is the out-migration of households due to the events in Colstrip. These impacts reveal another way in which the losses suffered in Colstrip propagate to the rest of the economy.

TABLE 5.3

The Economic Impact of Early Retirement of Colstrip Units 3 & 4
Personal Income Impacts ($ millions)

Category	Impact for the Year		Full Period
	2028	2043	2028-43
Total Earnings by Place of Work	-252.8	-227.8	-4,135.0
Total Wage and Salary Disbursements	-176.2	-169.7	-2,972.1
Supplements to Wages and Salaries	-53.0	-60.6	-989.8
Employer contributions for employee pension and insurance funds	-34.3	-39.1	-638.8
Employer contributions for government social insurance	-18.8	-21.5	-351.1
Proprietors' income with inventory valuation and capital consumption adjustments	-23.5	2.5	-173.1
Less: Contributions for government social insurance	-35.2	-35.7	-614.2
Employee and self-employed contributions for government social insurance	-16.4	-14.2	-263.1
Employer contributions for government social insurance	-18.8	-21.5	-351.1
Plus: Adjustment for residence	2.7	-4.5	-13.5
Gross In	-5.6	-10.4	-134.4
Gross Out	-8.3	-5.9	-121.0
Equals: Net earnings by place of residence	-215.0	-196.6	-3,534.3
Plus: Property Income	-22.0	-67.5	-811.9
Personal Dividend Income	-6.7	-21.2	-251.1
Personal Interest Income	-11.3	-37.0	-434.4
Rental Income of Persons	-4.0	-9.3	-126.4
Plus: Personal current transfer receipts	-16.2	-84.5	-887.6
Equals: Personal Income	-253.2	-348.6	-5,233.9
Less: Personal current taxes	-34.9	-43.3	-674.7
Equals: Disposable personal income	-218.3	-305.3	-4,559.2

A closer examination of the earnings and compensation impacts of the early retirement of Colstrip Units 3 and 4 reveals another factor at work in explaining the size and breadth of the total impacts on the state economy. In terms of total earnings, which includes wages and salaries, benefits, and business proprietor income, the average earnings per job lost because of the early retirements is $82,150 in year 2028. This is 70 percent higher than the state average of $48,011 expected for that year in the baseline. The fact that the direct impacts of early retirement affect jobs paying much higher than average is one explanation for the extent to which other, unrelated businesses are affected by the disruption in spending.

TABLE 5.4

Economic Impact of Early Retirement of Colstrip Units 3-4
Compensation Impacts ($ mill.)

Category	Units	Impact for the Year		Full Period
		2028	2043	2028-43
Wages and Salaries	$ Millions	-176.2	-169.7	-2972.1
Compensation	$ Millions	-229.3	-230.2	-3962.0
Earnings	$ Millions	-252.8	-227.8	-4135.0
Earnings per Job, Lost Jobs	$ Dollars	$82,150	$80,203	$78,860

Output Impacts

Reductions in income across the economy produce lower sales and output for Montana businesses and non-business organizations. Additionally, there is substantial curtailment in those sales from declines in business to business commerce affected by the early retirement of Units 3 and 4 as well. An examination of these impacts reveals how Colstrip closures are likely to be felt by Montana business owners and operators.

The REMI model provides estimates of gross receipts impacts for major industries. For retail and wholesale trade, however, the impacts reflect the markup component of gross receipts only. Because of this mixed definition, we label these impacts as output impacts.

These output impacts once again reveal the broad pattern of impacts across the entire economy. Unlike employment impacts, however, which reflected in part the capital-intensity of the different industries, the output impacts clearly reveal the sizable losses suffered by the utility and mining industries, as seen in Table 5.5. Together those two industries – which are directly impacted by Colstrip early retirements – account for roughly half of the cumulative total of $12.5 billion in output which is lost statewide due to the early retirement of Units 3 and 4.

Other significant impacts are felt by construction businesses, state and local governments, retailers and real estate and leasing companies. The falloff in sales reflects both consumer and non-consumer spending.

TABLE 5.5

The Economic Impact of Early Retirement of Colstrip Units 3 & 4
Output Impacts, $ Millions

Industry	Impact for the Year		Full Period
	2028	2043	2028-43
Construction	-55.9	-39.7	-946.8
Wholesale Trade	-5.9	-8.8	-133.2
Retail Trade	-28.4	-45.2	-653.6
Real Estate and Rental and Leasing	-14.3	-19.3	-329.8
Professional, Scientific, and Technical Services	-5.4	-9.6	-133.2
Mining	-154.6	-152.4	-2458.6
Health Care and Social Assistance	-15.9	-28.3	-379.1
Utilities	-268.6	-266.1	-4271.0
Accommodation and Food Services	-10.1	-19.3	-275.0
Other Services, except Public Administration	-7.1	-8.1	-126.5
State and Local Government	-102.0	-137.6	-2119.6
TOTAL	-700.4	-779.4	-12503.3

Population Impacts

The impacts of early retirement of Colstrip Units 3 and 4 on population follow a more complex dynamic pattern than some of the economic impacts described thus far. Broadly speaking, population impacts take longer to unfold, both in terms of the outmigration of families and individuals in response to economic events, as well as the ultimate impacts on the age structure of the remaining population. Businesses with sensitivity to the local population base – especially schools and local governments – will see these impacts on their revenues.

As can be seen from Table 5.6, the immediate impact on state population of the early retirement is most prominent in those of working age, ages 25-64. Those who leave take their children and their yet-to-be born children with them. It is this economic migration – relocation of individuals and families in search of economic opportunities – that sets off a chain of events that eventually impacts all of the age cohorts.

TABLE 5.6

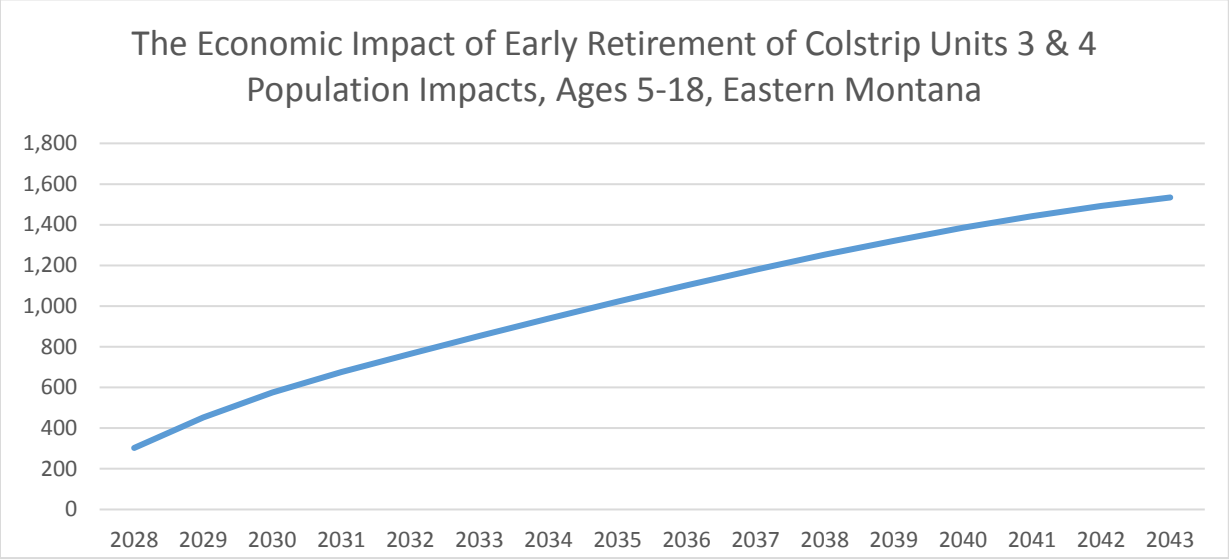
The Economic Impact of Early Retirement of Colstrip Units 3 & 4 Population Impacts

Age Cohort	Impact for the Year		Full Period
	2028	2043	2028-43
Ages 0-14	-426	-2,149	-1,755
Ages 15-24	-386	-830	-760
Ages 25-64	-904	-3,685	-3,292
Ages 65+	1	-353	-153
TOTAL	-1,715	-7,016	-5,960

By year 2043, the reductions in population are larger and more evenly distributed across the age cohorts. The total population impact of 7,000 people appears modest in a state with what is expected to have a population of over 1.1 million by that year. But with a preponderance of impacts occurring in the sparsely populated eastern portion of the state, they are more significant than that comparison suggests. In eastern Montana the impact on population is more than 6 percent of the total.

The different dynamic pattern of population impacts can be seen from the graph of population impacts for school-aged children, aged 5-18 years, in the eastern Montana region shown in Figure 5.3. The impacts grow steadily over the years 2028-2043, with a shortfall of more than 1,500 children for the end year, relative to the scenario where Units 3 and 4 continued to operate. This change is one explanation for the large employment impacts on state and local government employment reported above.

FIGURE 5.3



State Revenue Impacts

Lower levels of economic activity that are estimated for the early retirement scenario, relative to the no-retirement baseline case, result in lower base for state tax and non-tax revenues. This impact is particularly important in this study because of the reliance of Montana's revenue base on energy and natural resource activities.

There are a number of significant federal, state and local taxes that would be directly affected by the early retirement of Colstrip Units 3 and 4. These include:

- the state Wholesale Energy Tax (WET) imposed on electricity transmitted within the state, imposed at a rate of 0.015 cent per kilowatt hour transmitted by a transmission services provider (Montana Department of Revenue, 2016);
- the Electrical Energy Tax, a state license tax levied on electricity producers amounting to 0.02 cents per kilowatt hour of electricity generated;
- the Coal Severance Tax, a state production tax of 15 percent on the contract sales price of coal production;
- the Gross Proceeds Tax, a local government tax of 5 percent on the contract sales price of coal production;
- the Resource Indemnity and Ground Water Assessment Tax (RIGWAT), a state tax of 0.4% of the contract sales price of coal production;
- a state royalty assessment set by the Montana DNRC for coal production on state lands;
- a federal royalty assessment remitted to the Federal Government (shared partially with the state) of 12.5 percent of the contract sales price of coal production on Federal Government land;
- the federal Black Lung and Reclamation taxes, consisting of $0.55 and $0.28 per ton of coal produced on Federal Government land.

Additionally, the Colstrip SES is a major property taxpayer to local governments in Rosebud County, remitting approximately $25 million in tax payments in the most recent report on centrally assessed property published by the Montana Department of Revenue (Montana Department of Revenue, 2017). In addition to the $8 million paid to Rosebud County in Gross Proceeds taxes, the Rosebud mine remitted $1 million in local property taxes for mining activities in 2017.

A substantial portion of those tax payments would be lost in the event that Colstrip Units 3 and 4 are retired in the year 2027. There is also a broad spectrum of tax and non-tax revenue impacts that come about because of the more generalized reduction of economic activity in the early retirement scenario. Those impacts are summarized for state revenues in Table 5.7.

TABLE 5.7

Economic Impact of Early Retirement of Colstrip Units 3-4
State Revenue Impacts, $ Millions

Category	Impact for the Year		Full Period
	2028	2043	2028-43
Intergovernmental Revenue	-3.9	-16.0	-216.8
Selective Sales Tax	-3.0	-4.7	-69.0
License Taxes	-0.8	-1.2	-18.1
Individual Income Tax	-7.0	-7.8	-128.2
Corporate Income Tax	-2.1	-2.1	-34.0
Other Taxes	-20.7	-21.0	-345.9
Current Charges	-3.5	-4.9	-73.4
Miscellaneous General Revenue	-9.1	-9.5	-161.1
Utility Revenue	-4.1	-4.1	-66.6
Liquor Store Revenue	-0.5	-0.7	-11.0
Insurance Trust Revenue	-5.7	-7.9	-118.5
TOTAL	-60.5	-79.9	-1242.5

The state revenue impacts shown in the Table encompass all of the changes in the economy that would occur if Colstrip Units 3 and 4 retired in 2027. Intergovernmental revenue, for instance, consists of all of the Federal revenue distributions for everything from Medicaid to highway construction. Many of these are population-based, and thus the population impacts of early Colstrip shutdowns translate into less Federal revenue received.

The revenue impacts are classified into what is used by the Census Bureau's Census of Governments database. They include the energy and coal specific taxes described above.

The impacts on state revenues from the early retirement of Colstrip Units 3 and 4, as can be seen, are substantial. They amount to a $1 dollar loss in state revenue for every $4.23 reduction in income received by Montana households as a result of the retirements.

Summary

The total economic impacts of the early retirement of Colstrip Units 3 and 4 is estimated by comparing how the economy would evolved in the event that those retirements occur to a baseline, no-retirement scenario for the state economy. This estimation was carried out for this study by means of an economic model that was constructed and calibrated specifically for this use. The results show that shutting down Colstrip Units 3 and 4 in 2027, well before the end of their economic lives, would be a significant, negative event for economy of the state. Even after accounting for the gains that would occur from construction and operation of replacement capacity, as well as the remediation investments that would be made at the generation station and the adjacent coal mine, the economy would have fewer jobs, less income, lower sales and output, fewer people, and lower state government revenues than would occur if the facilities remained in operation.

6. Summary and Conclusions

This report has presented the findings of an analysis of the impacts on the economy of the state of Montana that would occur if the two larger, newer units of the Colstrip coal-fired electric generating station in eastern Montana were to retire before the end of their economic lives. The analysis is built on three foundations.

The first consists of the operating parameters of the facility itself. These are a matter of no debate – the employment, wages, vendor purchases, tax payments and other economic aspects of these long-running facilities are recorded facts, and the cessation of production there clearly removes those activities from the economy.

The second foundation of this study is the set of assumptions concerning what would happen in the event that the facility was completely closed and that the output of Colstrip was no longer available to markets and to the economy overall. These encompass everything from the scale, timing, and scope of remediation activities, to the replacement investments needed to preserve system reliability, to the likely changes in the marketplace as reflected by changes in wholesale electricity prices. The kinds of investments needed to replace Colstrip's role in the Montana electricity marketplace has already changed in the last two year, and it is quite likely to change again in the near future as technology and markets evolve. But the changing nature of those investments does not change the fact that investments will be needed, and the need becomes more acute as the date for these facilities' proposed closure grows closer.

The third foundation of this analysis is the interrelationships between businesses, households, governments and regions – which is to say, the inner-workings of the economy itself. Loss of high paying jobs, such as those at the Colstrip SES and the adjacent Rosebud mind, has important impacts on the spending flows, and the income and jobs supported by those flows, across the entire economy. Those relationships are represented in this analysis by a mathematical model, but in fact they affect people and their livelihoods just as much as anything else.

The results of this study have shown that whatever the merits may be of closing Colstrip's Units 3 and 4 in the near future may be, doing so would have a significant negative impact on the Montana economy. The loss of thousands of high paying jobs, the billions of dollars of lost income, sales, and tax revenues that would result should be taken into account in any decisions concerning its future.

7. References

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8. Appendix

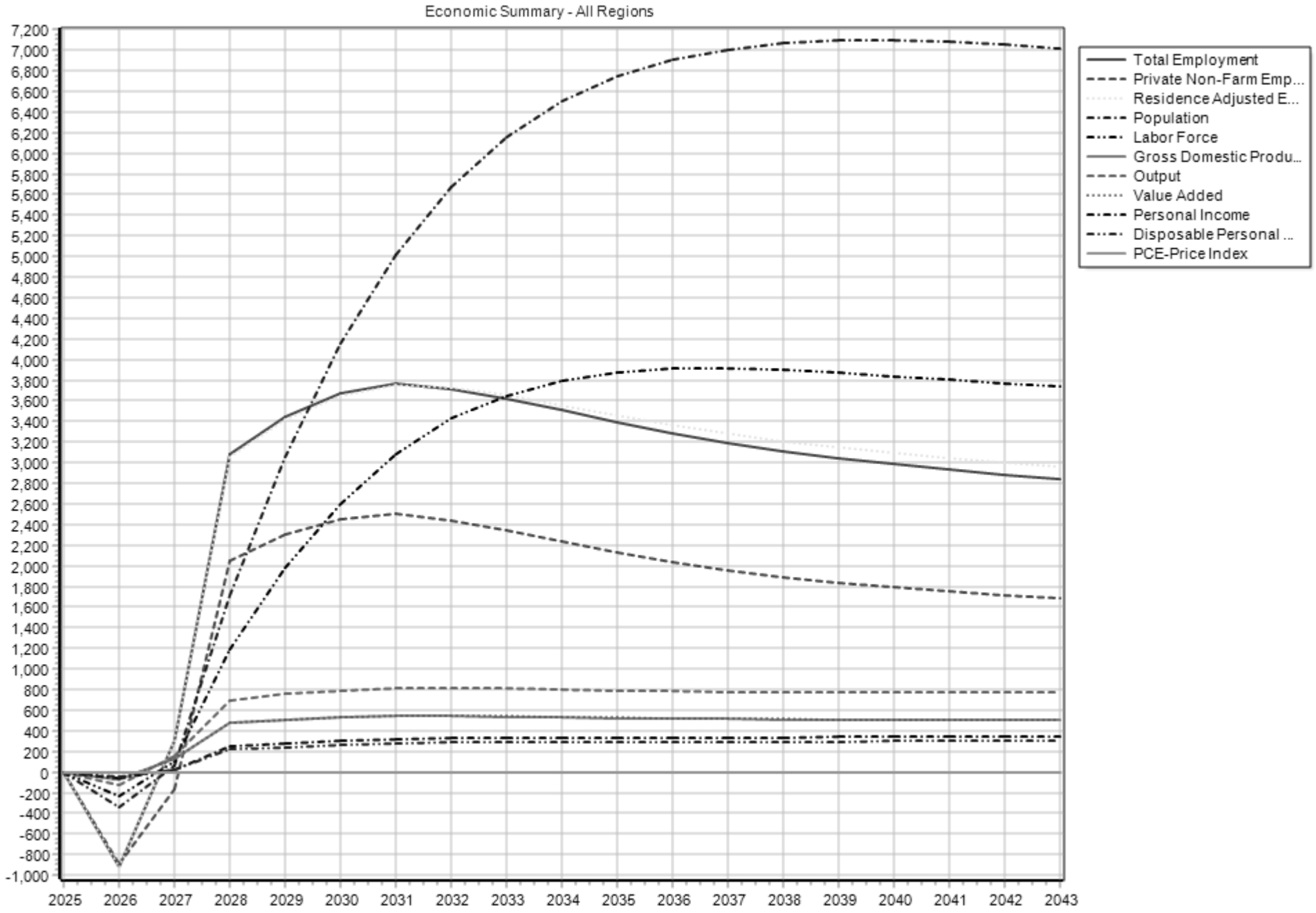
Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Economic Summary

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total Employment	Individuals (Jobs)	0.000	-916.849	+301.752	+3077.601	+3449.183	+3670.122	+3762.349	+3717.954	+3624.375
Private Non-Farm Employment	Individuals (Jobs)	0.000	-887.685	-163.237	+2055.205	+2300.936	+2448.574	+2500.018	+2438.774	+2342.819
Residence Adjusted Employment	Individuals	0.000	-911.923	+300.514	+3056.694	+3422.084	+3652.563	+3758.430	+3730.481	+3653.971
Population	Individuals	0.000	-344.576	+68.349	+1714.760	+3050.991	+4150.946	+5022.064	+5678.674	+6162.933
Labor Force	Individuals	0.000	-228.136	+101.523	+1187.178	+1977.610	+2600.722	+3081.700	+3425.171	+3650.708
Gross Domestic Product	Millions of Fixed (2016) Dollars	0.000	-72.800	+136.444	+478.249	+508.976	+529.727	+540.788	+540.914	+536.894
Output	Millions of Fixed (2016) Dollars	0.000	-129.783	+159.676	+700.446	+755.178	+792.245	+813.300	+814.834	+809.427
Value Added	Millions of Fixed (2016) Dollars	0.000	-75.192	+134.245	+479.638	+511.301	+532.581	+543.863	+543.967	+539.815
Personal Income	Millions of Fixed (2016) Dollars	0.000	-52.180	+28.711	+253.159	+281.596	+307.030	+323.490	+331.315	+335.249
Disposable Personal Income	Millions of Fixed (2016) Dollars	0.000	-44.873	+24.331	+218.272	+243.178	+265.628	+280.305	+287.538	+291.402
PCE-Price Index	2009=100 (Nation)	0.000	-0.001	-0.011	-0.165	-0.137	-0.133	-0.131	-0.131	-0.133

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Economic Summary

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+3510.551	+3395.244	+3287.763	+3193.295	+3112.077	+3043.464	+2984.418	+2930.666	+2883.996	+2839.843
+2235.299	+2130.715	+2036.390	+1955.783	+1888.915	+1834.520	+1789.335	+1750.159	+1717.346	+1687.169
+3556.383	+3455.866	+3361.432	+3278.404	+3207.027	+3146.733	+3094.788	+3047.087	+3005.698	+2966.162
+6508.529	+6747.989	+6906.772	+7005.798	+7064.061	+7091.531	+7095.845	+7082.437	+7056.218	+7016.444
+3793.164	+3872.103	+3909.594	+3913.756	+3895.076	+3870.460	+3839.496	+3807.986	+3771.758	+3738.902
+531.136	+525.163	+519.754	+515.313	+511.949	+509.721	+508.239	+507.135	+506.677	+506.412
+801.247	+792.813	+785.489	+779.969	+776.423	+774.927	+774.828	+775.458	+777.252	+779.437
+533.883	+527.732	+522.168	+517.603	+514.151	+511.866	+510.352	+509.232	+508.776	+508.521
+336.680	+336.931	+336.791	+336.868	+337.639	+338.974	+340.741	+343.021	+345.745	+348.637
+293.060	+293.652	+293.853	+294.200	+295.120	+296.474	+298.163	+300.266	+302.731	+305.307
-0.136	-0.140	-0.144	-0.148	-0.153	-0.156	-0.160	-0.164	-0.167	-0.170

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference



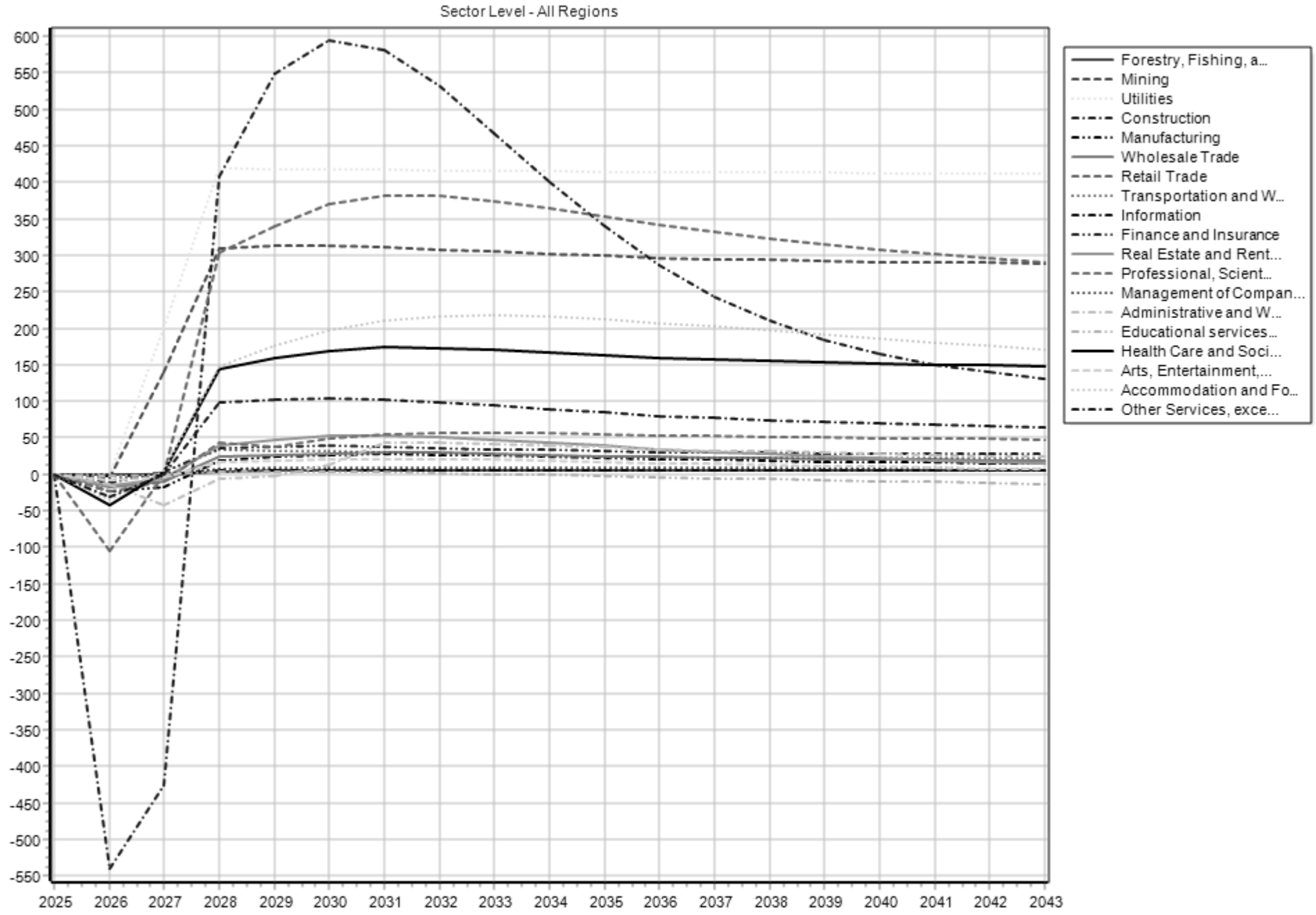
Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Employment\Industry\Private Non-Farm\Private Non-Farm Employment\Sector Level

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Forestry, Fishing, and Related Activities	Individuals (Jobs)	0.000	-0.605	+0.265	+3.890	+5.087	+5.636	+5.779	+5.681	+5.491
Mining	Individuals (Jobs)	0.000	-4.294	+139.883	+308.994	+312.853	+313.060	+311.274	+308.205	+304.922
Utilities	Individuals (Jobs)	0.000	-1.034	+200.310	+419.129	+418.269	+417.585	+416.877	+416.139	+415.483
Construction	Individuals (Jobs)	0.000	-540.233	-425.269	+408.444	+548.659	+594.369	+581.544	+531.643	+467.355
Manufacturing	Individuals (Jobs)	0.000	-22.816	-17.690	+19.080	+23.701	+26.535	+27.314	+26.702	+25.407
Wholesale Trade	Individuals (Jobs)	0.000	-17.201	-9.752	+23.452	+25.937	+28.687	+29.545	+29.008	+27.883
Retail Trade	Individuals (Jobs)	0.000	-105.937	+0.243	+303.147	+340.471	+369.274	+382.180	+381.457	+374.370
Transportation and Warehousing	Individuals (Jobs)	0.000	-8.591	+3.412	+33.180	+32.205	+31.209	+29.549	+27.396	+25.459
Information	Individuals (Jobs)	0.000	-2.948	-0.974	+5.642	+5.330	+5.906	+6.095	+6.001	+5.802
Finance and Insurance	Individuals (Jobs)	0.000	-11.275	+2.958	+36.522	+37.924	+38.573	+37.940	+36.324	+34.575
Real Estate and Rental and Leasing	Individuals (Jobs)	0.000	-15.060	-6.768	+38.680	+47.373	+52.409	+53.223	+51.009	+47.343
Professional, Scientific, and Technical Serv	Individuals (Jobs)	0.000	-23.886	-10.662	+42.368	+38.471	+49.418	+55.302	+57.385	+57.427
Management of Companies and Enterprise	Individuals (Jobs)	0.000	-1.723	+1.059	+7.945	+8.622	+9.281	+9.662	+9.635	+9.490
Administrative and Waste Management Se	Individuals (Jobs)	0.000	-13.690	-42.674	-6.668	-2.627	+12.025	+43.012	+42.344	+40.785
Educational services; private	Individuals (Jobs)	0.000	-1.987	-1.023	+3.594	+3.741	+3.510	+2.775	+1.673	+0.374
Health Care and Social Assistance	Individuals (Jobs)	0.000	-43.171	+3.157	+144.192	+158.837	+169.331	+173.577	+172.859	+170.132
Arts, Entertainment, and Recreation	Individuals (Jobs)	0.000	-7.433	-3.740	+17.015	+19.039	+20.860	+21.249	+20.628	+19.511
Accommodation and Food Services	Individuals (Jobs)	0.000	-35.537	+4.991	+148.355	+175.548	+197.062	+210.445	+216.163	+217.367
Other Services, except Public Administratic	Individuals (Jobs)	0.000	-30.263	-0.964	+98.246	+101.496	+103.844	+102.679	+98.520	+93.645

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Employment\Industry\Private Non-Farm\Private Non-Farm Employment\Sector Level

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+5.279	+5.094	+4.955	+4.868	+4.822	+4.797	+4.794	+4.801	+4.812	+4.820
+301.856	+299.126	+296.793	+294.836	+293.272	+292.079	+291.102	+290.328	+289.706	+289.175
+414.906	+414.418	+413.998	+413.639	+413.328	+413.054	+412.813	+412.586	+412.369	+412.166
+401.183	+339.807	+286.872	+243.576	+209.876	+184.174	+164.874	+150.582	+139.913	+131.560
+23.818	+22.245	+20.820	+19.553	+18.421	+17.441	+16.586	+15.763	+15.009	+14.290
+26.518	+25.160	+23.915	+22.830	+21.910	+21.140	+20.473	+19.861	+19.337	+18.844
+364.049	+352.743	+341.571	+331.419	+322.368	+314.638	+307.679	+300.908	+295.066	+289.359
+23.902	+22.786	+22.082	+21.713	+21.612	+21.723	+21.951	+22.227	+22.543	+22.857
+5.568	+5.351	+5.171	+5.033	+4.935	+4.870	+4.827	+4.795	+4.778	+4.762
+32.922	+31.536	+30.457	+29.700	+29.211	+28.941	+28.808	+28.751	+28.782	+28.818
+43.020	+38.599	+34.404	+30.597	+27.235	+24.298	+21.715	+19.406	+17.366	+15.485
+56.370	+54.974	+53.572	+52.316	+51.284	+50.418	+49.690	+49.026	+48.431	+47.838
+9.288	+9.079	+8.880	+8.703	+8.544	+8.398	+8.261	+8.123	+7.991	+7.856
+38.783	+36.658	+34.585	+32.652	+30.874	+29.241	+27.725	+26.285	+24.937	+23.624
-1.036	-2.494	-3.952	-5.385	-6.770	-8.111	-9.398	-10.618	-11.794	-12.918
+166.473	+162.756	+159.396	+156.678	+154.499	+152.921	+151.673	+150.458	+149.606	+148.629
+18.141	+16.689	+15.243	+13.847	+12.505	+11.219	+9.970	+8.750	+7.572	+6.393
+215.576	+212.086	+207.555	+202.553	+197.232	+191.942	+186.593	+180.927	+175.476	+169.892
+88.685	+84.103	+80.073	+76.655	+73.755	+71.335	+69.197	+67.201	+65.445	+63.720

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference



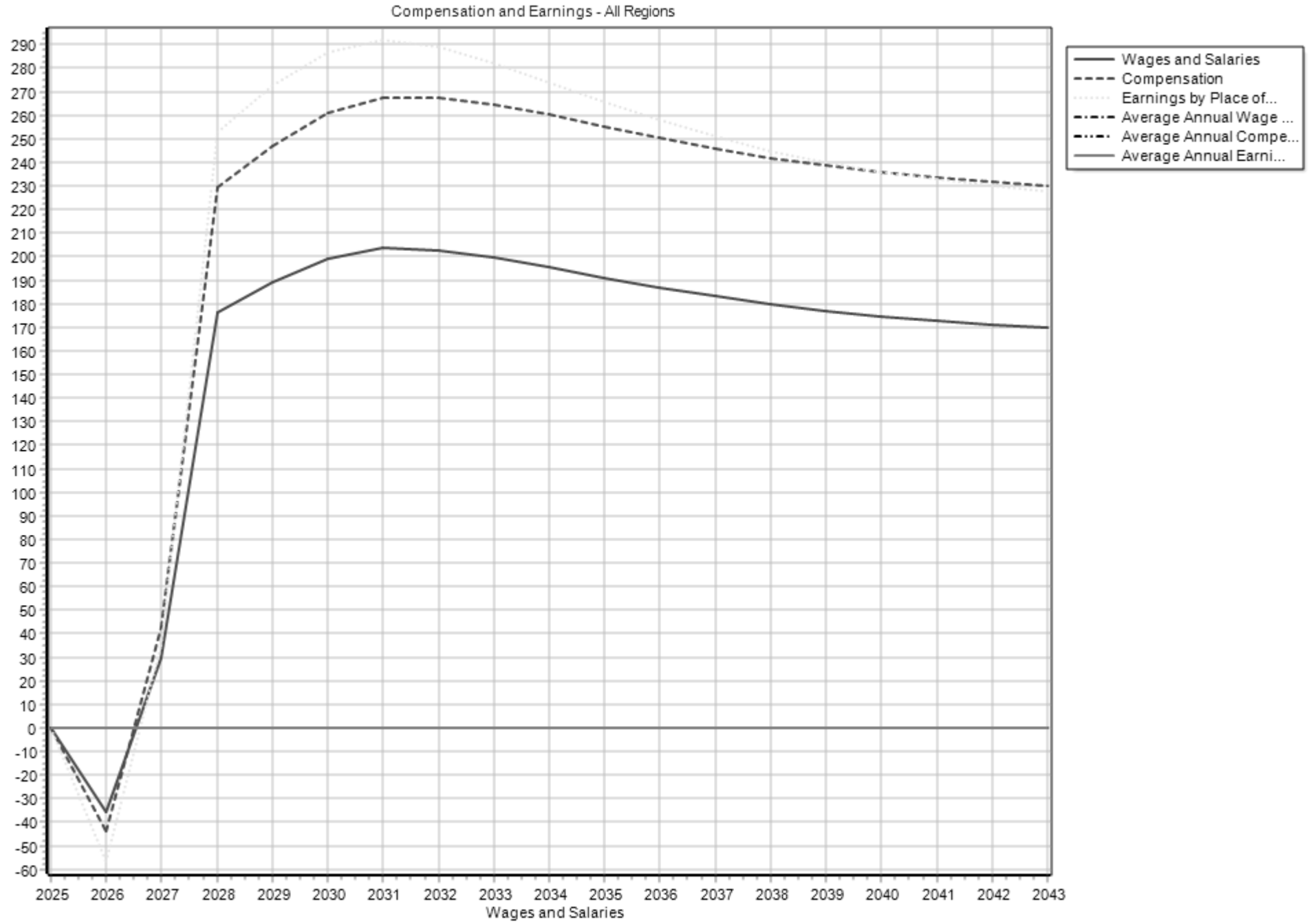
Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Compensation and Earnings

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Wages and Salaries	Millions of Fixed (2016) Dollars	0.000	-35.636	+30.018	+176.248	+189.128	+198.980	+203.571	+202.746	+199.735
Compensation	Millions of Fixed (2016) Dollars	0.000	-43.854	+42.331	+229.286	+247.057	+260.751	+267.678	+267.683	+264.769
Earnings by Place of Work	Millions of Fixed (2016) Dollars	0.000	-56.677	+35.131	+252.824	+272.759	+286.727	+291.961	+288.766	+282.206
Average Annual Wage Rate	Thousands of Fixed (2016) Doll	0.000	-0.009	+0.029	+0.110	+0.109	+0.111	+0.112	+0.111	+0.109
Average Annual Compensation Rate	Thousands of Fixed (2016) Doll	0.000	-0.011	+0.043	+0.149	+0.150	+0.155	+0.157	+0.157	+0.156
Average Annual Earnings Rate	Thousands of Fixed (2016) Doll	0.000	-0.019	+0.030	+0.150	+0.150	+0.152	+0.151	+0.146	+0.141

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Compensation and Earnings

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+195.612	+191.202	+186.945	+183.067	+179.741	+176.981	+174.679	+172.725	+171.100	+169.674
+260.296	+255.320	+250.422	+245.908	+242.018	+238.780	+236.079	+233.792	+231.898	+230.239
+274.077	+265.719	+257.843	+250.799	+244.855	+240.001	+235.996	+232.705	+230.037	+227.765
+0.107	+0.105	+0.102	+0.100	+0.097	+0.095	+0.093	+0.091	+0.089	+0.088
+0.154	+0.152	+0.150	+0.147	+0.144	+0.142	+0.139	+0.137	+0.135	+0.133
+0.135	+0.128	+0.122	+0.117	+0.111	+0.107	+0.103	+0.099	+0.096	+0.093

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference



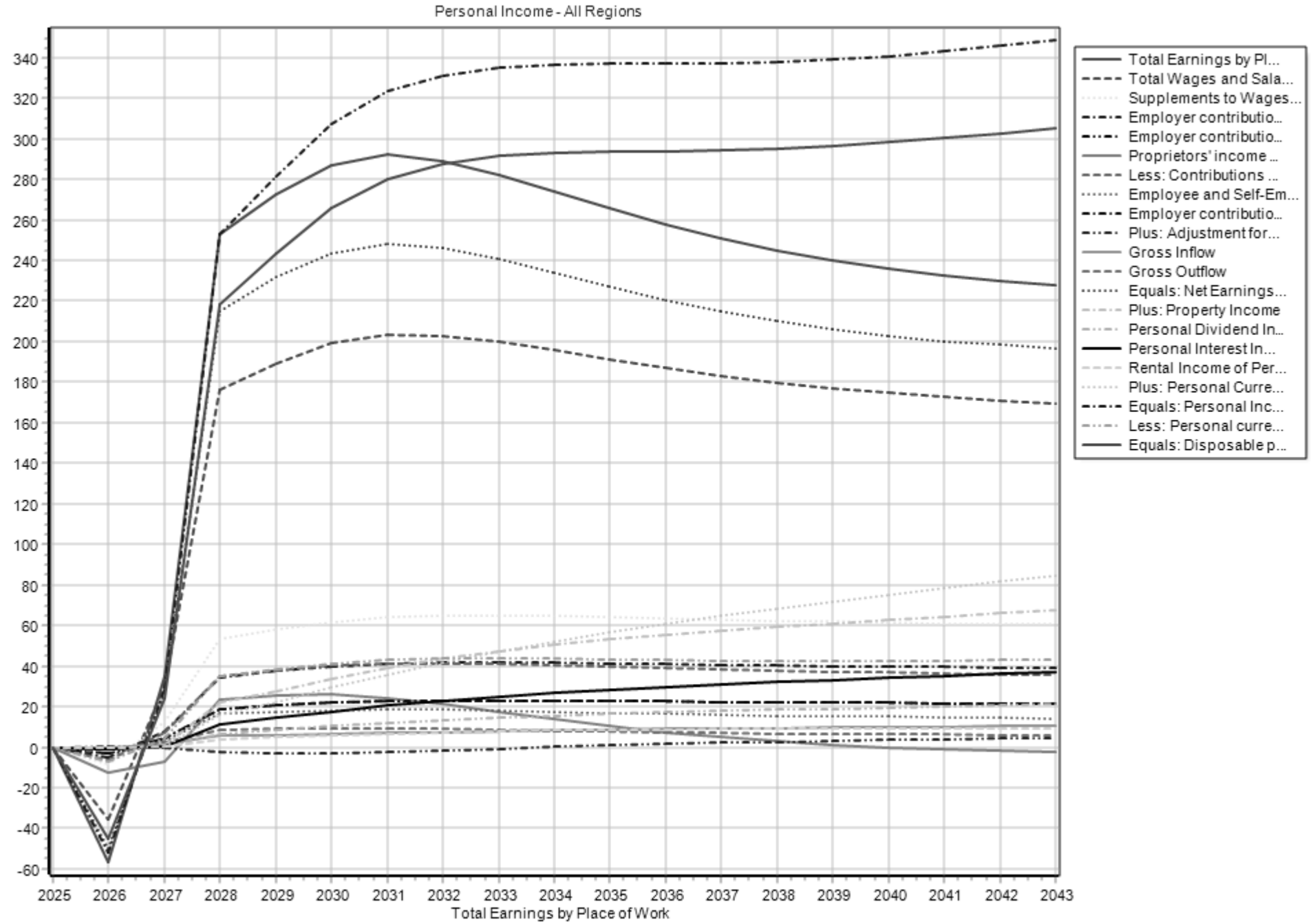
Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Personal Income

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Total Earnings by Place of Work	Millions of Fixed (2016) Dollars	0.000	-56.677	+35.131	+252.824	+272.759	+286.727	+291.961	+288.766	+282.206
Total Wages and Salaries	Millions of Fixed (2016) Dollars	0.000	-35.636	+30.018	+176.248	+189.128	+198.980	+203.571	+202.746	+199.735
Supplements to Wages and Salaries	Millions of Fixed (2016) Dollars	0.000	-8.218	+12.314	+53.038	+57.929	+61.771	+64.106	+64.937	+65.033
Employer contributions for employee pe	Millions of Fixed (2016) Dollars	0.000	-5.163	+8.113	+34.251	+37.394	+39.856	+41.354	+41.886	+41.949
Employer contributions for government s	Millions of Fixed (2016) Dollars	0.000	-3.055	+4.201	+18.787	+20.535	+21.915	+22.753	+23.051	+23.085
Proprietors' income with inventory valuat	Millions of Fixed (2016) Dollars	0.000	-12.823	-7.200	+23.538	+25.702	+25.976	+24.283	+21.082	+17.437
Less: Contributions for Government Social	Millions of Fixed (2016) Dollars	0.000	-6.360	+7.056	+35.178	+38.012	+40.180	+41.315	+41.415	+41.054
Employee and Self-Employed Contributior	Millions of Fixed (2016) Dollars	0.000	-3.305	+2.855	+16.392	+17.477	+18.265	+18.563	+18.364	+17.970
Employer contributions for government so	Millions of Fixed (2016) Dollars	0.000	-3.055	+4.201	+18.787	+20.535	+21.915	+22.753	+23.051	+23.085
Plus: Adjustment for Residence	Millions of Fixed (2016) Dollars	0.000	+0.526	-0.639	-2.679	-3.155	-2.808	-2.232	-1.492	-0.689
Gross Inflow	Millions of Fixed (2016) Dollars	0.000	-0.360	+1.788	+5.580	+5.804	+6.383	+6.939	+7.403	+7.833
Gross Outflow	Millions of Fixed (2016) Dollars	0.000	-0.886	+2.427	+8.259	+8.958	+9.191	+9.171	+8.895	+8.522
Equals: Net Earnings by Place of Residenc	Millions of Fixed (2016) Dollars	0.000	-49.790	+27.437	+214.967	+231.592	+243.739	+248.413	+245.859	+240.463
Plus: Property Income	Millions of Fixed (2016) Dollars	0.000	-1.728	+1.111	+22.000	+27.697	+33.897	+39.221	+43.693	+47.492
Personal Dividend Income	Millions of Fixed (2016) Dollars	0.000	-0.522	+0.337	+6.675	+8.420	+10.327	+11.974	+13.367	+14.561
Personal Interest Income	Millions of Fixed (2016) Dollars	0.000	-0.880	+0.569	+11.321	+14.325	+17.619	+20.484	+22.927	+25.034
Rental Income of Persons	Millions of Fixed (2016) Dollars	0.000	-0.326	+0.206	+4.004	+4.951	+5.952	+6.764	+7.399	+7.897
Plus: Personal Current Transfer Receipts	Millions of Fixed (2016) Dollars	0.000	-0.662	+0.163	+16.192	+22.306	+29.394	+35.856	+41.763	+47.295
Equals: Personal Income	Millions of Fixed (2016) Dollars	0.000	-52.180	+28.711	+253.159	+281.596	+307.030	+323.490	+331.315	+335.249
Less: Personal current taxes	Millions of Fixed (2016) Dollars	0.000	-7.307	+4.380	+34.887	+38.418	+41.402	+43.185	+43.777	+43.847
Equals: Disposable personal income	Millions of Fixed (2016) Dollars	0.000	-44.873	+24.331	+218.272	+243.178	+265.628	+280.305	+287.538	+291.402

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Personal Income

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+274.077	+265.719	+257.843	+250.799	+244.855	+240.001	+235.996	+232.705	+230.037	+227.765
+195.612	+191.202	+186.945	+183.067	+179.741	+176.981	+174.679	+172.725	+171.100	+169.674
+64.684	+64.119	+63.477	+62.841	+62.278	+61.799	+61.400	+61.067	+60.798	+60.565
+41.726	+41.365	+40.956	+40.550	+40.191	+39.886	+39.632	+39.420	+39.249	+39.101
+22.958	+22.753	+22.521	+22.291	+22.087	+21.913	+21.768	+21.647	+21.549	+21.464
+13.781	+10.398	+7.421	+4.891	+2.836	+1.221	-0.083	-1.087	-1.861	-2.474
+40.437	+39.720	+38.995	+38.309	+37.701	+37.176	+36.721	+36.323	+35.977	+35.662
+17.479	+16.967	+16.474	+16.018	+15.614	+15.263	+14.953	+14.676	+14.427	+14.197
+22.958	+22.753	+22.521	+22.291	+22.087	+21.913	+21.768	+21.647	+21.549	+21.464
+0.101	+0.844	+1.517	+2.122	+2.656	+3.122	+3.532	+3.897	+4.225	+4.521
+8.218	+8.565	+8.876	+9.159	+9.416	+9.651	+9.867	+10.067	+10.254	+10.430
+8.117	+7.722	+7.359	+7.037	+6.760	+6.529	+6.335	+6.169	+6.030	+5.908
+233.741	+226.842	+220.365	+214.612	+209.810	+205.946	+202.807	+200.280	+198.285	+196.624
+50.654	+53.276	+55.511	+57.497	+59.344	+61.081	+62.711	+64.345	+65.938	+67.521
+15.565	+16.407	+17.134	+17.788	+18.403	+18.987	+19.541	+20.100	+20.649	+21.199
+26.820	+28.330	+29.643	+30.829	+31.947	+33.009	+34.017	+35.030	+36.024	+37.015
+8.270	+8.539	+8.734	+8.879	+8.995	+9.085	+9.153	+9.215	+9.265	+9.307
+52.285	+56.813	+60.915	+64.759	+68.485	+71.947	+75.223	+78.396	+81.522	+84.492
+336.680	+336.931	+336.791	+336.868	+337.639	+338.974	+340.741	+343.021	+345.745	+348.637
+43.620	+43.279	+42.939	+42.667	+42.519	+42.500	+42.578	+42.756	+43.015	+43.330
+293.060	+293.652	+293.853	+294.200	+295.120	+296.474	+298.163	+300.266	+302.731	+305.307

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference



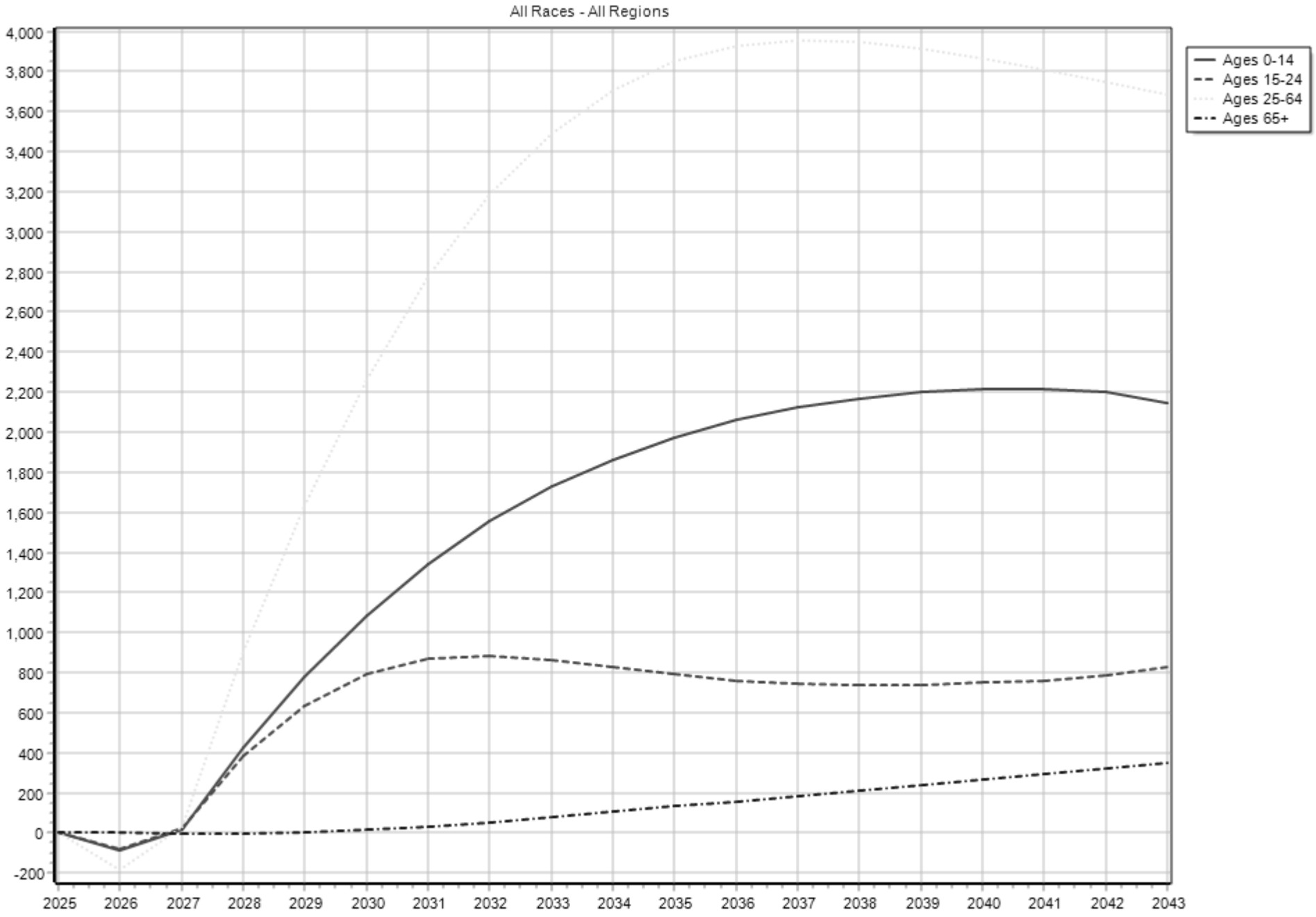
Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Population\Four Age Groups\All Races

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Ages 0-14	Individuals	0.000	-84.275	+16.039	+425.901	+776.887	+1082.774	+1341.767	+1553.982	+1726.477
Ages 15-24	Individuals	0.000	-76.580	+23.961	+385.991	+633.353	+790.902	+869.014	+885.301	+865.602
Ages 25-64	Individuals	0.000	-183.721	+29.649	+904.013	+1635.616	+2260.589	+2778.047	+3184.988	+3491.933
Ages 65+	Individuals	0.000	0.000	-1.299	-1.144	+5.134	+16.681	+33.236	+54.402	+78.921

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Population\Four Age Groups\All Races

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+1864.690	+1974.207	+2059.277	+2123.428	+2169.681	+2198.997	+2212.594	+2216.353	+2199.095	+2148.532
+829.937	+791.667	+760.744	+742.788	+737.447	+740.824	+751.262	+762.255	+785.049	+830.107
+3708.836	+3850.351	+3928.520	+3955.148	+3946.145	+3913.996	+3866.730	+3810.339	+3749.540	+3685.274
+105.066	+131.764	+158.230	+184.434	+210.787	+237.715	+265.259	+293.490	+322.534	+352.532

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference



Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Output and Demand\Output\Private Non-Farm\Sector Level

Category	Units	2025	2026	2027	2028	2029	2030	2031	2032	2033
Forestry, Fishing, and Related Activities	Millions of Fixed (2016) Dollars	0.000	-0.068	+0.029	+0.452	+0.609	+0.717	+0.791	+0.841	+0.877
Mining	Millions of Fixed (2016) Dollars	0.000	-1.595	+73.511	+154.601	+155.700	+155.971	+155.771	+155.210	+154.566
Utilities	Millions of Fixed (2016) Dollars	0.000	-0.621	+119.813	+268.614	+268.285	+268.042	+267.760	+267.440	+267.152
Construction	Millions of Fixed (2016) Dollars	0.000	-76.629	-62.439	+55.885	+77.682	+86.726	+87.509	+82.834	+75.711
Manufacturing	Millions of Fixed (2016) Dollars	0.000	-7.944	-2.256	+16.493	+18.944	+20.275	+20.568	+20.213	+19.594
Wholesale Trade	Millions of Fixed (2016) Dollars	0.000	-4.427	-2.802	+5.861	+6.841	+7.940	+8.545	+8.774	+8.816
Retail Trade	Millions of Fixed (2016) Dollars	0.000	-9.191	+0.220	+28.424	+33.074	+37.102	+39.716	+41.061	+41.734
Transportation and Warehousing	Millions of Fixed (2016) Dollars	0.000	-1.489	+0.778	+6.772	+6.073	+5.416	+4.701	+3.980	+3.379
Information	Millions of Fixed (2016) Dollars	0.000	-1.442	-0.470	+2.960	+3.108	+3.488	+3.692	+3.755	+3.759
Finance and Insurance	Millions of Fixed (2016) Dollars	0.000	-2.372	-0.153	+6.314	+6.787	+7.159	+7.261	+7.154	+6.986
Real Estate and Rental and Leasing	Millions of Fixed (2016) Dollars	0.000	-6.284	-3.506	+14.299	+18.525	+21.629	+23.175	+23.563	+23.312
Professional, Scientific, and Technical Serv	Millions of Fixed (2016) Dollars	0.000	-3.461	-1.925	+5.380	+4.865	+6.669	+7.793	+8.396	+8.693
Management of Companies and Enterprise	Millions of Fixed (2016) Dollars	0.000	-0.395	+0.225	+1.824	+2.036	+2.256	+2.416	+2.484	+2.520
Administrative and Waste Management Se	Millions of Fixed (2016) Dollars	0.000	-1.103	-7.040	-4.008	-3.534	-1.113	+4.629	+4.795	+4.871
Educational services; private	Millions of Fixed (2016) Dollars	0.000	-0.103	-0.059	+0.270	+0.378	+0.468	+0.531	+0.572	+0.598
Health Care and Social Assistance	Millions of Fixed (2016) Dollars	0.000	-5.030	-0.364	+15.879	+18.336	+20.410	+21.776	+22.583	+23.117
Arts, Entertainment, and Recreation	Millions of Fixed (2016) Dollars	0.000	-0.333	-0.120	+1.191	+1.526	+1.810	+2.008	+2.141	+2.235
Accommodation and Food Services	Millions of Fixed (2016) Dollars	0.000	-2.286	+0.262	+10.064	+12.363	+14.345	+15.815	+16.793	+17.459
Other Services, except Public Administratic	Millions of Fixed (2016) Dollars	0.000	-2.000	+0.163	+7.143	+7.598	+8.029	+8.225	+8.198	+8.104

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference
Region = All Regions
Output and Demand\Output\Private Non-Farm\Sector Level

2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
+0.906	+0.934	+0.962	+0.993	+1.025	+1.056	+1.090	+1.122	+1.155	+1.188
+153.957	+153.427	+152.993	+152.659	+152.433	+152.295	+152.222	+152.215	+152.265	+152.353
+266.905	+266.704	+266.544	+266.419	+266.325	+266.257	+266.204	+266.163	+266.129	+266.097
+67.997	+60.652	+54.286	+49.153	+45.353	+42.696	+40.967	+40.005	+39.640	+39.666
+18.910	+18.347	+17.957	+17.742	+17.661	+17.695	+17.834	+17.996	+18.193	+18.407
+8.764	+8.686	+8.613	+8.565	+8.548	+8.564	+8.598	+8.638	+8.702	+8.769
+42.043	+42.198	+42.316	+42.491	+42.748	+43.156	+43.625	+44.075	+44.640	+45.209
+2.928	+2.626	+2.458	+2.390	+2.405	+2.494	+2.621	+2.766	+2.922	+3.081
+3.741	+3.727	+3.728	+3.752	+3.798	+3.868	+3.952	+4.044	+4.153	+4.264
+6.809	+6.662	+6.559	+6.509	+6.507	+6.551	+6.623	+6.710	+6.821	+6.937
+22.737	+22.049	+21.376	+20.790	+20.321	+19.982	+19.733	+19.533	+19.419	+19.329
+8.818	+8.877	+8.918	+8.969	+9.040	+9.133	+9.241	+9.350	+9.472	+9.590
+2.541	+2.557	+2.574	+2.594	+2.616	+2.641	+2.666	+2.689	+2.714	+2.736
+4.895	+4.898	+4.895	+4.895	+4.903	+4.919	+4.941	+4.962	+4.992	+5.021
+0.614	+0.624	+0.630	+0.634	+0.636	+0.639	+0.640	+0.640	+0.640	+0.639
+23.517	+23.885	+24.278	+24.727	+25.229	+25.818	+26.437	+27.040	+27.699	+28.342
+2.305	+2.364	+2.416	+2.466	+2.512	+2.559	+2.604	+2.641	+2.680	+2.714
+17.916	+18.246	+18.491	+18.685	+18.840	+18.995	+19.126	+19.204	+19.290	+19.348
+7.993	+7.898	+7.834	+7.807	+7.811	+7.853	+7.909	+7.966	+8.041	+8.113

Colstrip 3 and 4 shutdown in 2027.rwb
Early Retirement of Units 3 and 4 compared to Standard Regional Control - Difference