Assessing Early Retirement of Coal Generation
Patrick Barkey, Bureau of Business and Economic Research, University of Montana
The Colstrip Steam Electric Station Today

- 532 workers
- $77.4 mill. payroll
- $187 mill. of coal purchased
- $25 mill. property taxes paid
Annual Household Income

- Colstrip:
  - Less than $25,000: 4.9%
  - $25,000 to $50,000: 8.9%
  - $50,000 to $100,000: 45.8%
  - $100,000 to $200,000: 39.2%
  - More than $200,000: 1.2%

- Rest of County:
  - Less than $25,000: 31.3%
  - $25,000 to $50,000: 23.8%
  - $50,000 to $100,000: 30.4%
  - $100,000 to $200,000: 10.4%
  - More than $200,000: 4.0%

- Montana:
  - Less than $25,000: 23.6%
  - $25,000 to $50,000: 25.6%
  - $50,000 to $100,000: 31.2%
  - $100,000 to $200,000: 15.9%
  - More than $200,000: 3.7%

Source: 2017 American Community Survey 5-year Estimates
GDP Per Capita by County, 2015

Source: U.S. Bureau of Economic Analysis
Montana is a Significant Electricity Exporter

- Net Generation: 30 Million Mwh
- Total Retail Sales: 16.1 Million Mwh
- Exports: 47%
Montana Electricity Generation vs. Consumption, 1990-2014

Source: U.S. Energy Information Administration
Electricity Generation by Energy Source, Montana, 2013

- **Coal, 53.7%**
- **Hydroelectric, 34.8%**
- **Conventional, 34.8%**
- **Natural Gas, 2.2%**
- **Petroleum, 1.7%**
- **Wind, 6.3%**
- **Other Gases, 0.0%**
- **Wood and Wood Derived Fuels, 0.0%**
- **Other, 1.2%**

Source: U.S. Energy Information Administration
Basic Facts About the Colstrip Steam Electric Station

- Located in Rosebud County in eastern Montana
- Employs 532 workers (including contractors), supports $77.4 million payroll, purchases $187 million in coal annually
- Produced 13,338 GWH of electricity in 2017
- Receives coal via a 4.2 mile conveyor belt from the adjacent Rosebud mine owned by Westmoreland Coal Company
- Consists of Units 1 and 2, constructed in the 1970s, with 307 MW capacity each, and Units 3 and 4, completed in the 1980s, with 740 MW of capacity each
<table>
<thead>
<tr>
<th></th>
<th>2010 Study</th>
<th>CPP Study (2015)</th>
<th>2018 Study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Considered impacts of ongoing operations</td>
<td>• Examined impact of policy targeting coal-fired electric plants nationwide</td>
<td>• Closure of Units 1 and 2 now in the baseline</td>
</tr>
<tr>
<td></td>
<td>• Close linkages to the Westmoreland mine</td>
<td>• Considered shutdown scenario for Colstrip</td>
<td>• Options for remaining Colstrip units not embedded in national policy</td>
</tr>
<tr>
<td></td>
<td>• 3,740 jobs</td>
<td>• Significant new investment</td>
<td>• Replacement generation scenarios changing</td>
</tr>
<tr>
<td></td>
<td>• $362 million in personal income</td>
<td>• Job impacts peak at more than 7,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• $94.6 million in state and local tax revenue</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Explaining Colstrip’s Outsized Economic Role

• Because of Colstrip, Montana is a significant energy exporter
• Colstrip employees are highly productive, highly compensated
• Colstrip spends a high fraction of its budget on a made-in-Montana product, namely, coal
• Coal and energy production/transmission have an outsized impact on state and local tax revenues
• Colstrip’s role in the electric grid is not easily replaced
Six Owners: One Montana, One Unregulated
Analysis of the Future of Colstrip

- Units 1-4
- Units 3 & 4 Only
- All Units Shut Down

Today 2022 2027 2043

Compare these two
What’s Changed About Colstrip’s Future Economic Role?

• Closure of Units 1 and 2 by year 2022 reduce the size of the facility by about 35 percent
• Wholesale electricity markets reflect increased penetration of power from renewables
• Political consensus (without an economic model) to keep 500 kv transmission line from Colstrip to Townsend open
• Nature of new investments needed in a post-Colstrip era continues to evolve
• Nothing has changed about the basic facts of the facility’s outsized economic contributions
Montana's Power Geography

NorthWestern Energy Transmission Assets

[Map showing transmission assets in Montana]
Colstrip 3 & 4 Early Retirement Scenario

• Units 3 & 4 close July 2027:
  279 Talen employees
  125 Contractors
  $56.7 mill. Total compensation
  $277.6 mill. Output

• Westmoreland Mine Closes July 2027
  289 employees and contractors
  $32 mill. Compensation
  $140 mill. Output
Colstrip 3 & 4 Early Retirement Scenario

- Tax Contributions of the Facilities
- Site remediation
- Replacement Investment
- Impacts on large “choice” customers in Montana
- Impacts on regional electricity prices
## REMI Policy Variables (example)

<table>
<thead>
<tr>
<th>Active</th>
<th>Edit</th>
<th>Category</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td></td>
<td>Composite (1 PV-s)</td>
<td>Loss of Colstrip Output</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (3 PV-s)</td>
<td>Calibration of Employment and Compensation</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (2 PV-s)</td>
<td>Colstrip contractors</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (1 PV-s)</td>
<td>Output loss of coal mine</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (3 PV-s)</td>
<td>Calibration of Employment and Comp for Mine</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (11 PV-s)</td>
<td>Remediation in Colstrip site</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (14 PV-s)</td>
<td>New CCCT Construction and Operation</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (10 PV-s)</td>
<td>Stranded capital of Colstrip passed to ratepayers</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (12 PV-s)</td>
<td>Pipeline to serve gas turbine in Billings</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (11 PV-s)</td>
<td>Colstrip Local Property Taxes</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (5 PV-s)</td>
<td>Effect of reduced property taxes from al res and norres capital</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (15 PV-s)</td>
<td>MT net Electricity Price after policy</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (15 PV-s)</td>
<td>Loss of 500 kV transmission line property tax payments</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (10 PV-s)</td>
<td>Increased Electric Prices due to loss of Off-System Wheeling Revenue (Colstrip and Hardin)</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (12 PV-s)</td>
<td>230 kV Transmission Line between Three Rivers and Great Falls</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (11 PV-s)</td>
<td>New Billings Steam 230 kV substation</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (12 PV-s)</td>
<td>230 kV transmission line property tax payments</td>
</tr>
<tr>
<td>☑</td>
<td></td>
<td>Composite (10 PV-s)</td>
<td>Stranded Capital from 500kV line</td>
</tr>
</tbody>
</table>
The Economic Impact of Early Retirement of Colstrip Units 3 and 4 Employment Compared to No Retirement Baseline

Maximum Difference from Baseline = 3,752 jobs
# The Economic Impact of Early Retirement of Colstrip Units 3 & 4

## Impacts Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
<th>Impact for the Year</th>
<th>Full Period*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2028</td>
<td>2043</td>
</tr>
<tr>
<td>Total Employment</td>
<td>Jobs</td>
<td>-3,078</td>
<td>-2,840</td>
</tr>
<tr>
<td>Personal Income</td>
<td>$ Millions</td>
<td>-253.2</td>
<td>-348.6</td>
</tr>
<tr>
<td>Disposable Pers. Income</td>
<td>$ Millions</td>
<td>-218.3</td>
<td>-305.3</td>
</tr>
<tr>
<td>Selected State Revenues</td>
<td>$ Millions</td>
<td>-60.5</td>
<td>-81.7</td>
</tr>
<tr>
<td>Output</td>
<td>$ Millions</td>
<td>-700.4</td>
<td>-779.4</td>
</tr>
<tr>
<td>Population</td>
<td>People</td>
<td>-1,715</td>
<td>-7,016</td>
</tr>
</tbody>
</table>

*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.
The Economic Impact of Early Retirement of Colstrip Units 3 and 4 Employment Impacts by Industry, 2028-2043 Average
Implications for the Future

• Coal-fired electricity generation is a big economic driver for Montana
• The future of coal – what is the baseline?
• Integration of individual facilities into the systems need to be considered