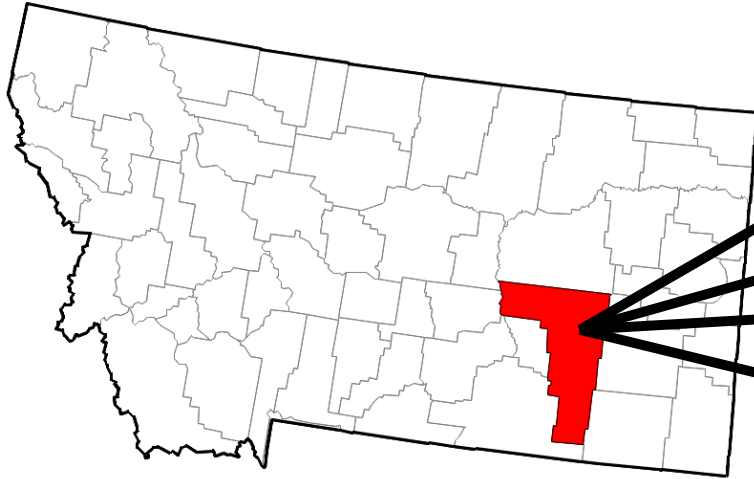




Assessing Early Retirement of Coal Generation

Patrick Barkey, Bureau of Business and Economic Research, University of Montana

The Colstrip Steam Electric Station Today



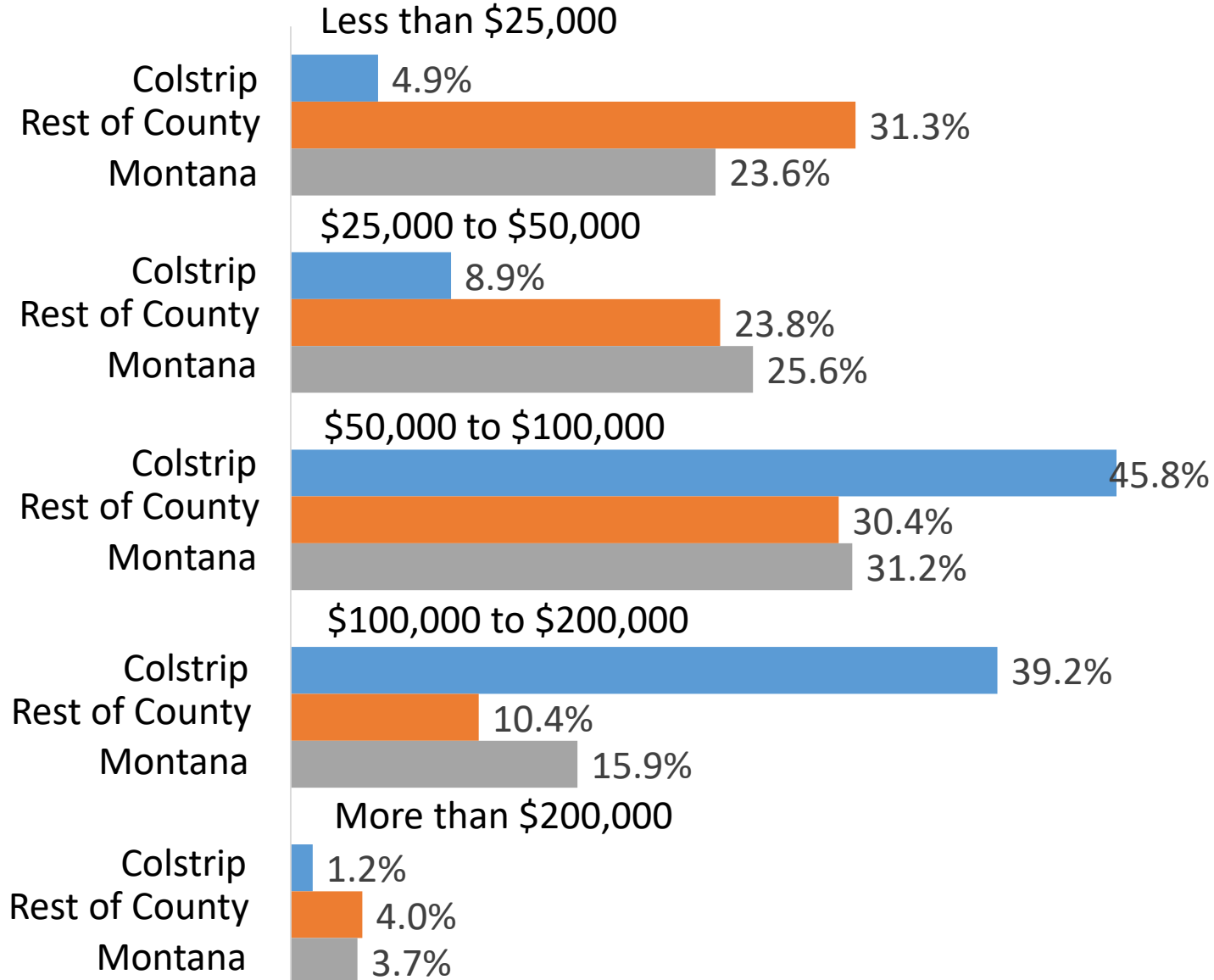
532 workers

\$77.4 mill. payroll

\$187 mill. of coal purchased

\$25 mill. property taxes paid

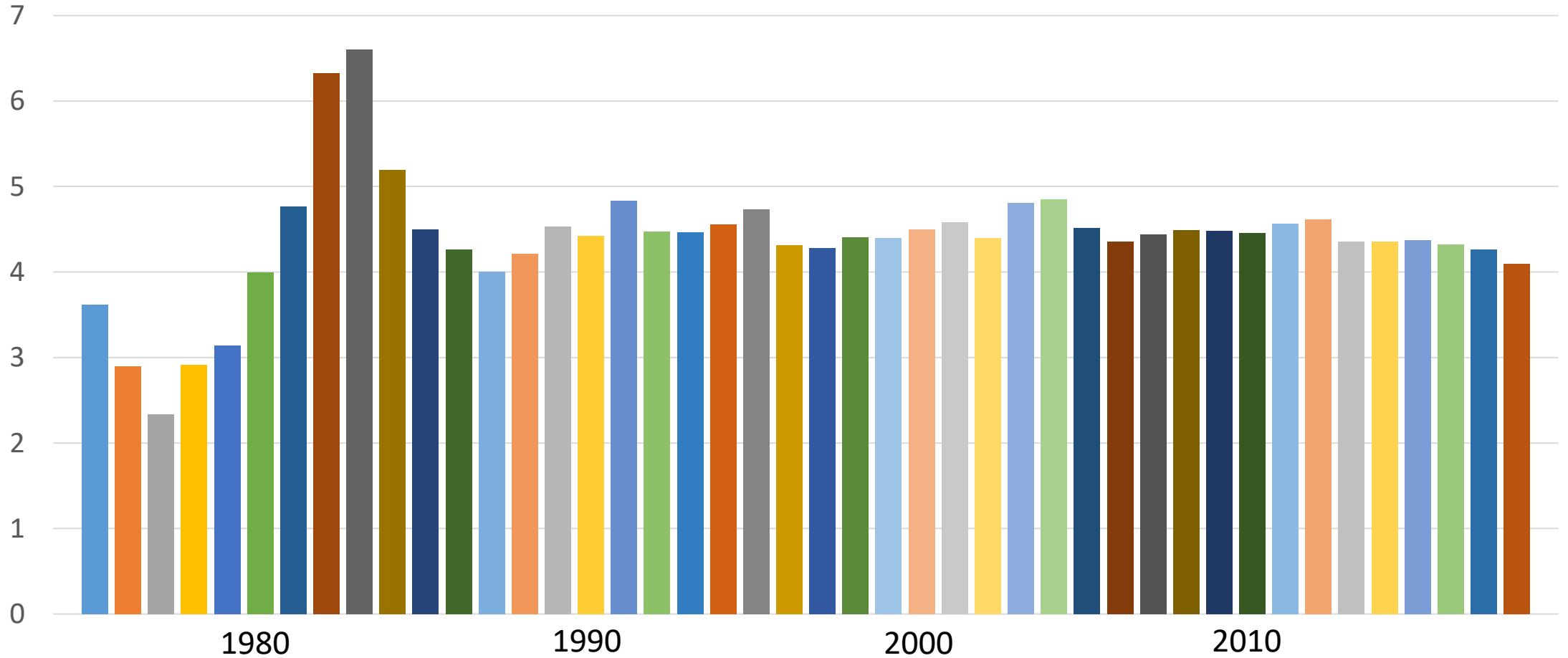
Annual Household Income



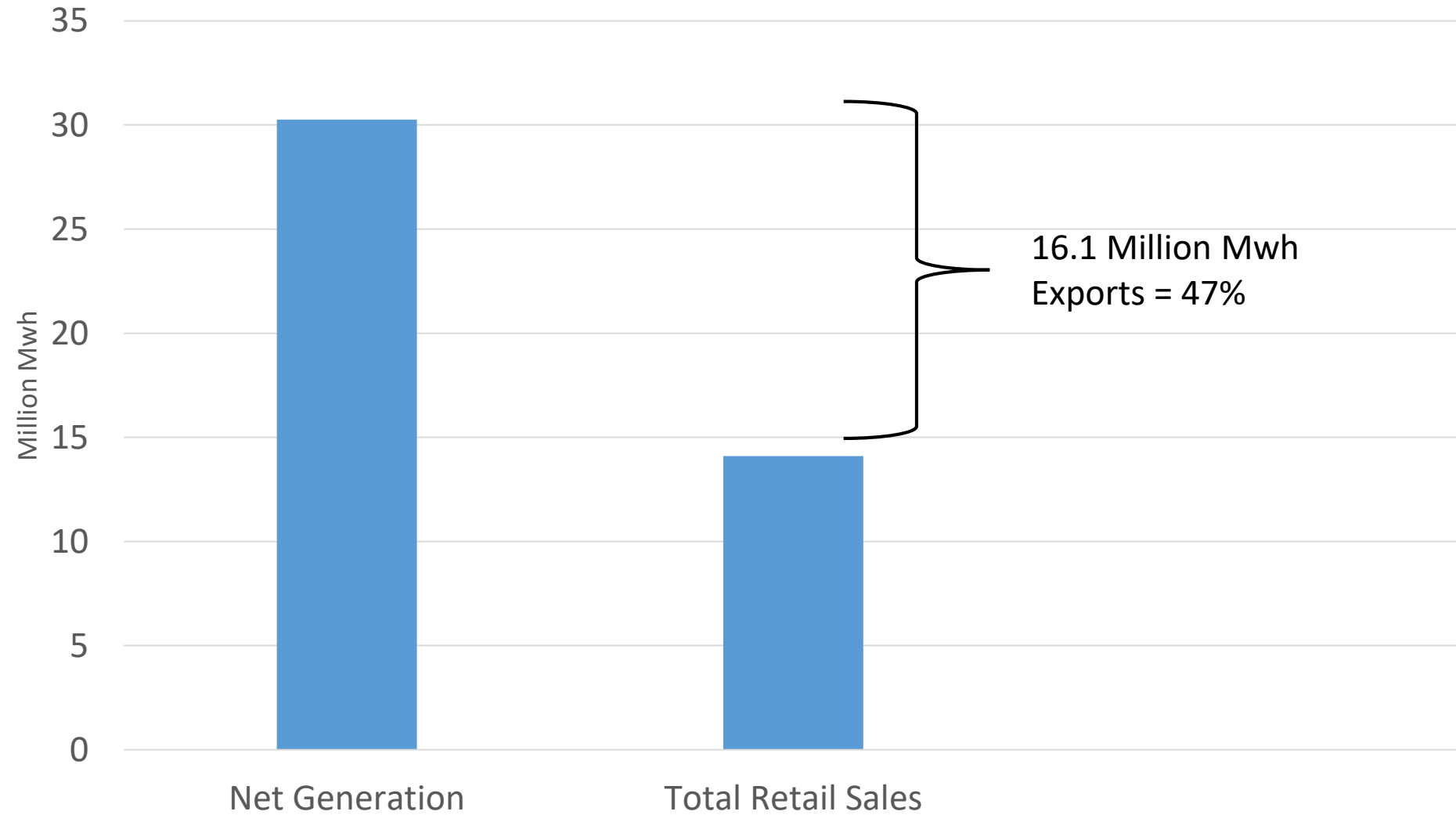
Source: 2017 American Community Survey 5-year Estimates

Employment, Rosebud County, 1975-2018

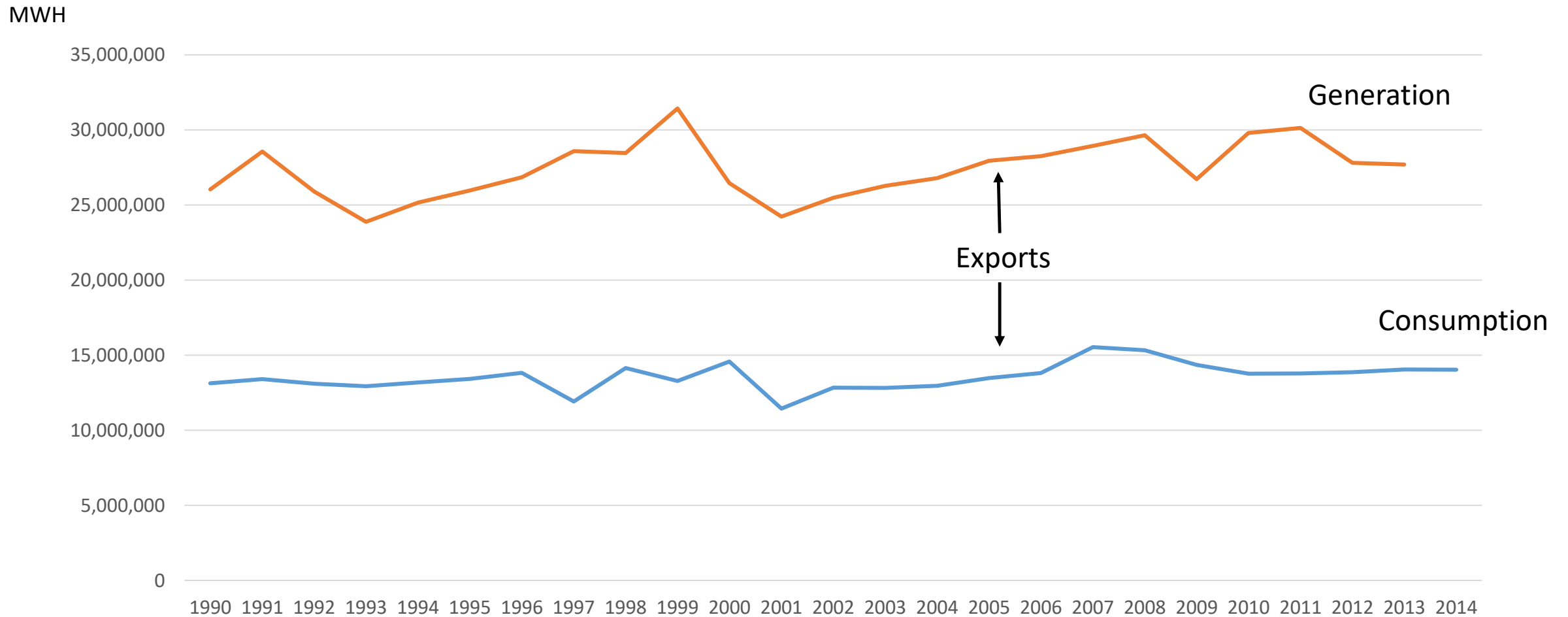
Thousands



Montana is a Significant Electricity Exporter

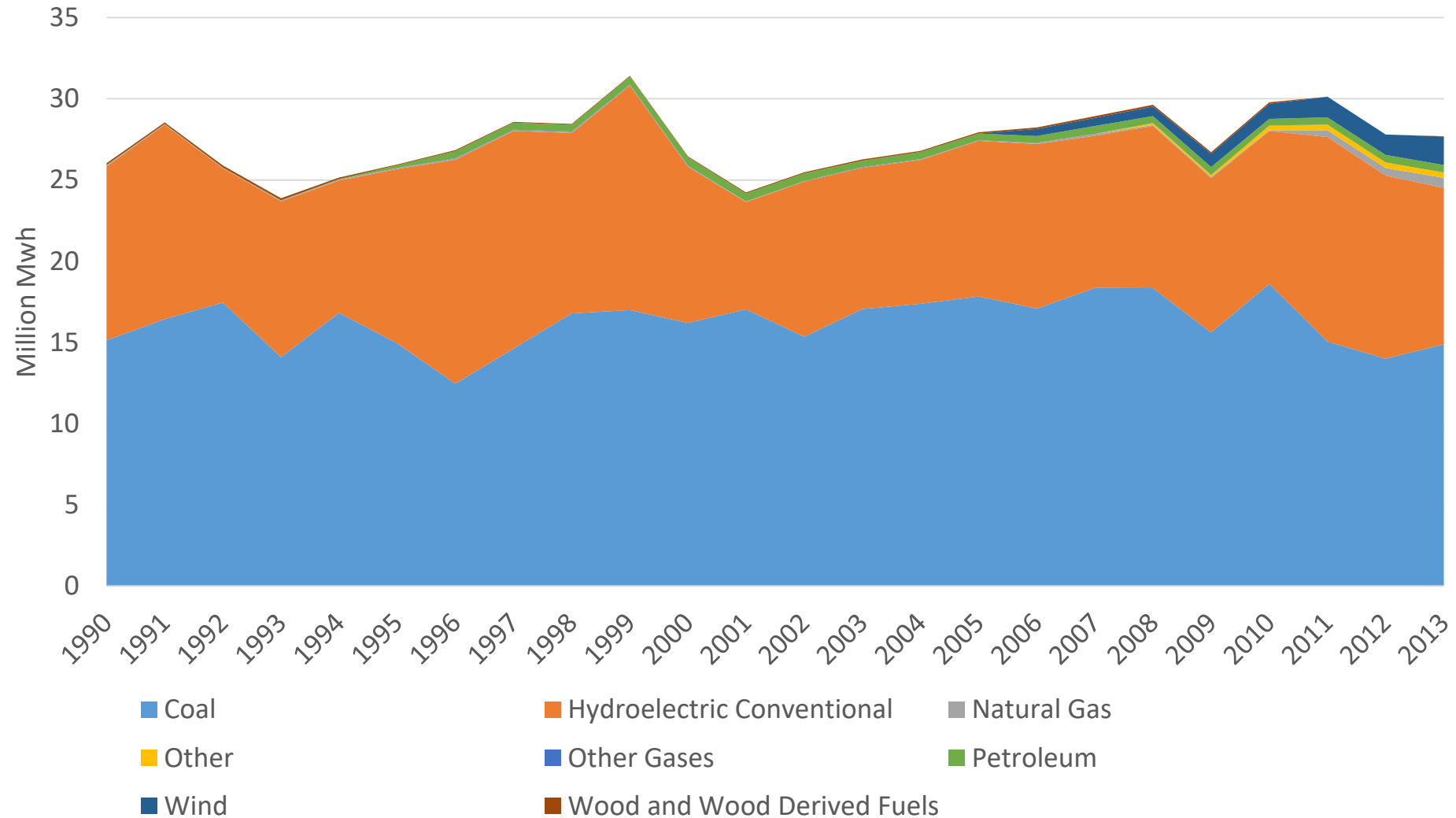


Montana Electricity Generation vs. Consumption, 1990-2014

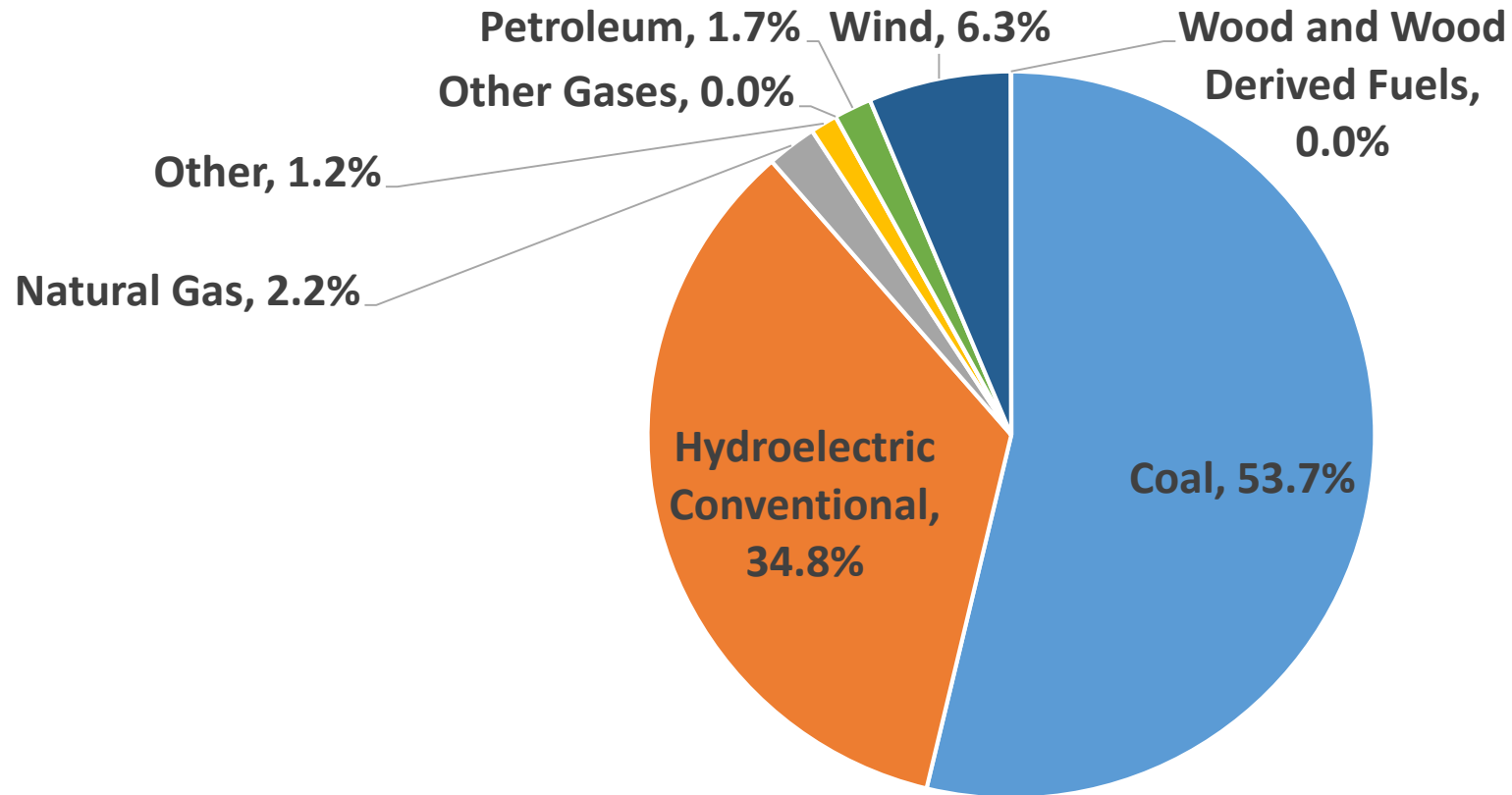


Source: U.S. Energy Information Administration

Montana Electricity Generation by Source

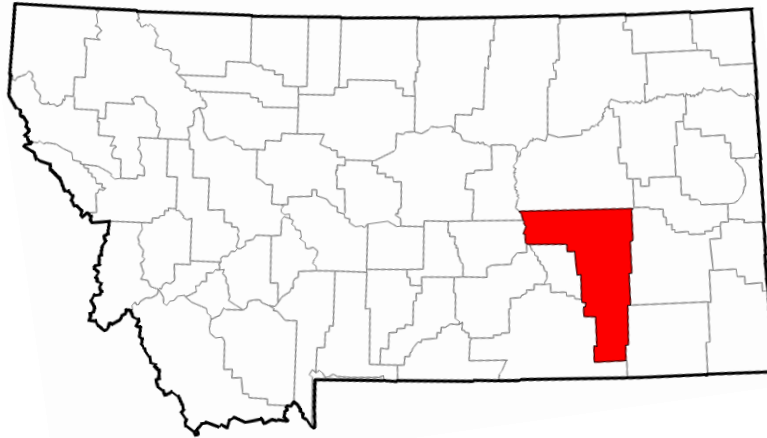


Electricity Generation by Energy Source, Montana, 2013



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 Westermoreland 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

BBER Colstrip Studies

2010 Study

- Considered impacts of ongoing operations
- Close linkages to the Westmoreland mine
- 3,740 jobs
- \$362 million in personal income
- \$94.6 million in state and local tax revenue

CPP Study (2015)

- Examined impact of policy targeting coal-fired electric plants nationwide
- Considered shutdown scenario for Colstrip
- Significant new investment
- Job impacts peak at more than 7,000

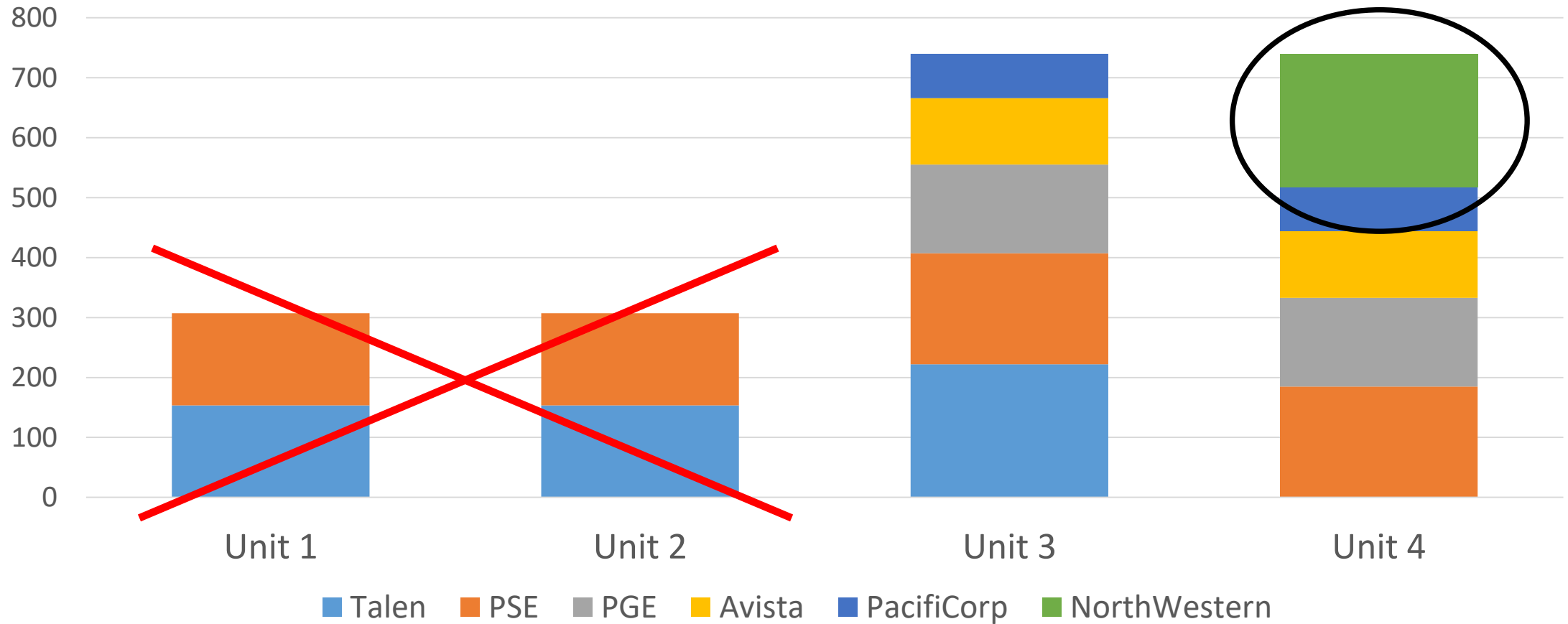
2018 Study

- Closure of Units 1 and 2 now in the baseline
- Options for remaining Colstrip units not embedded in national policy
- Replacement generation scenarios changing

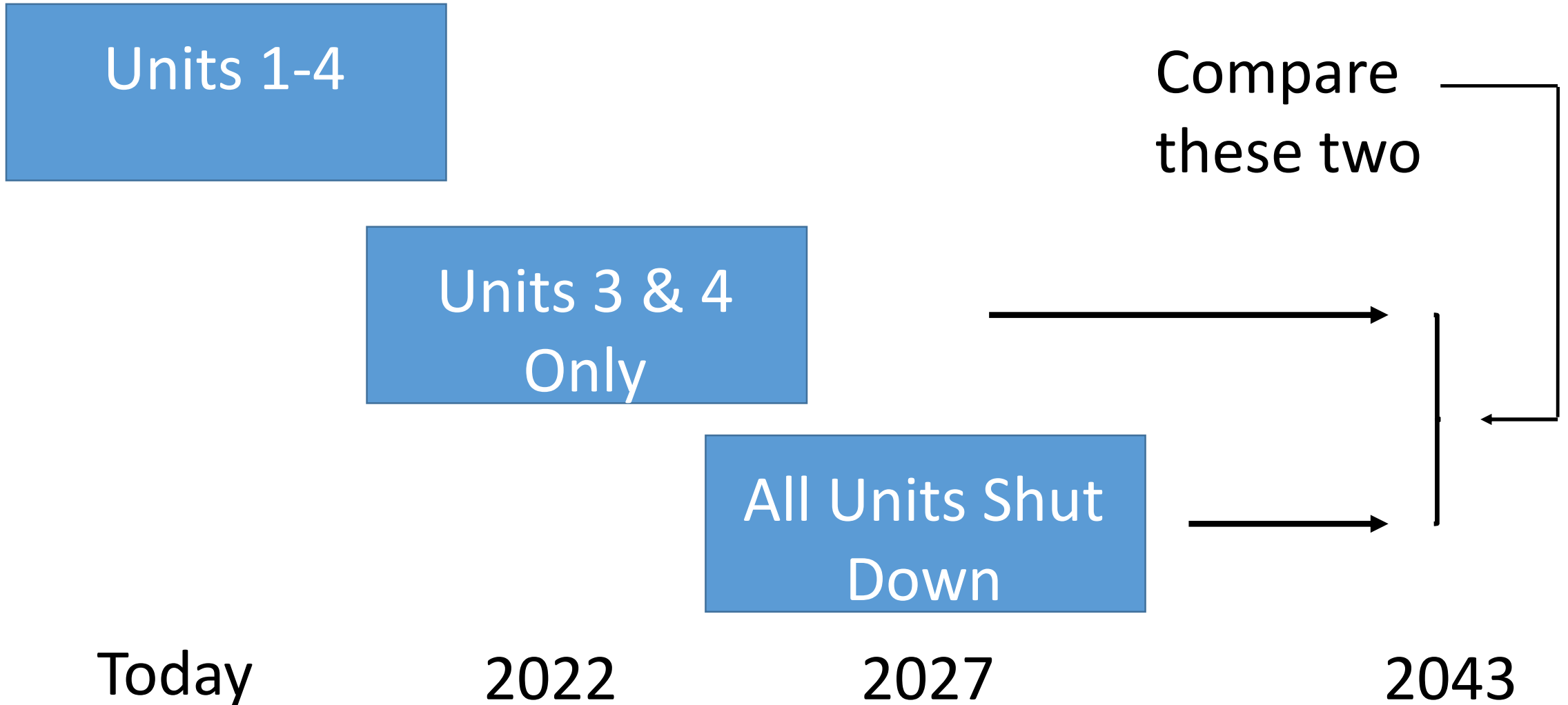
Explaining Colstrip's Outsized Economic Role

- 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



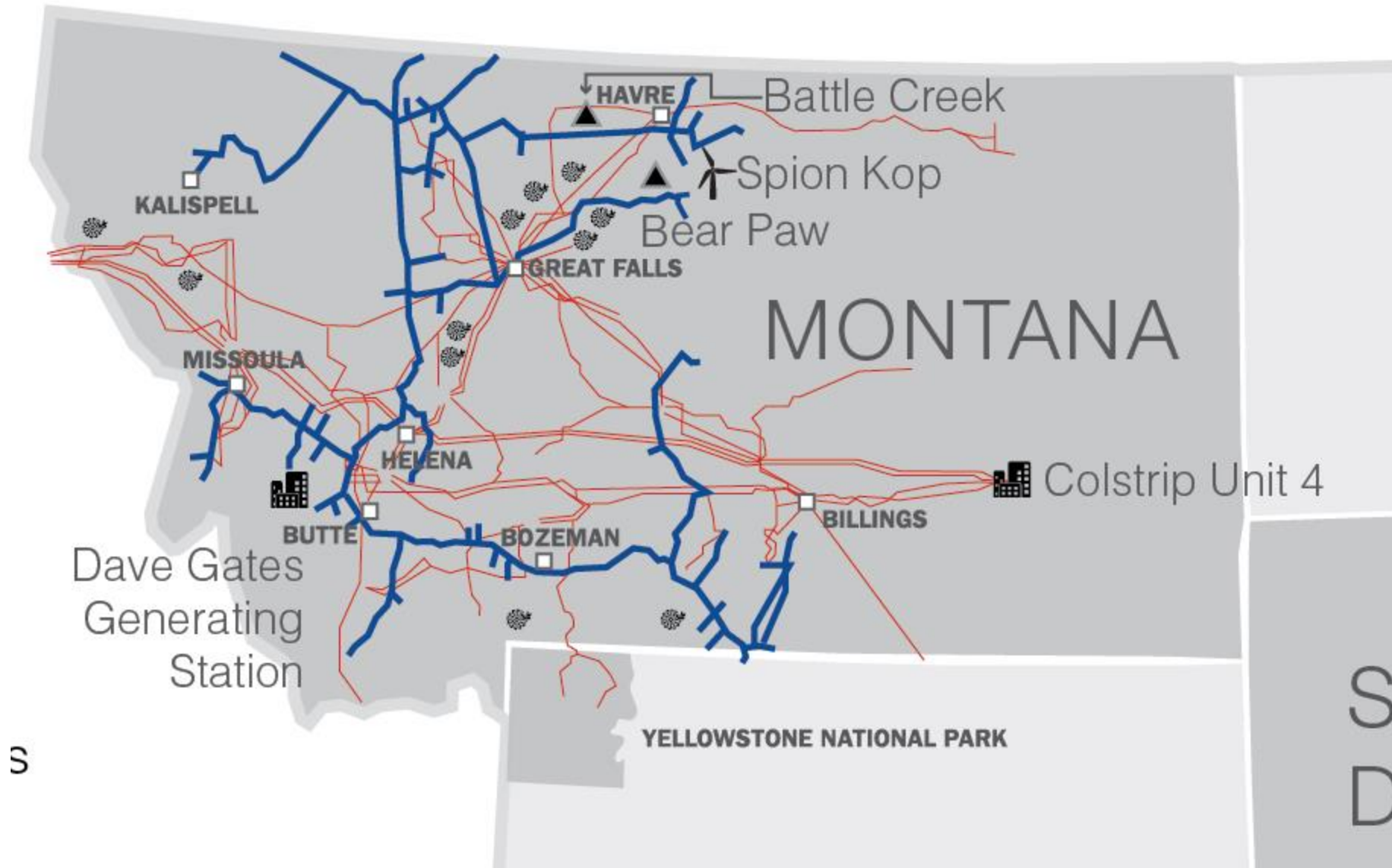
Analysis of the Future of Colstrip



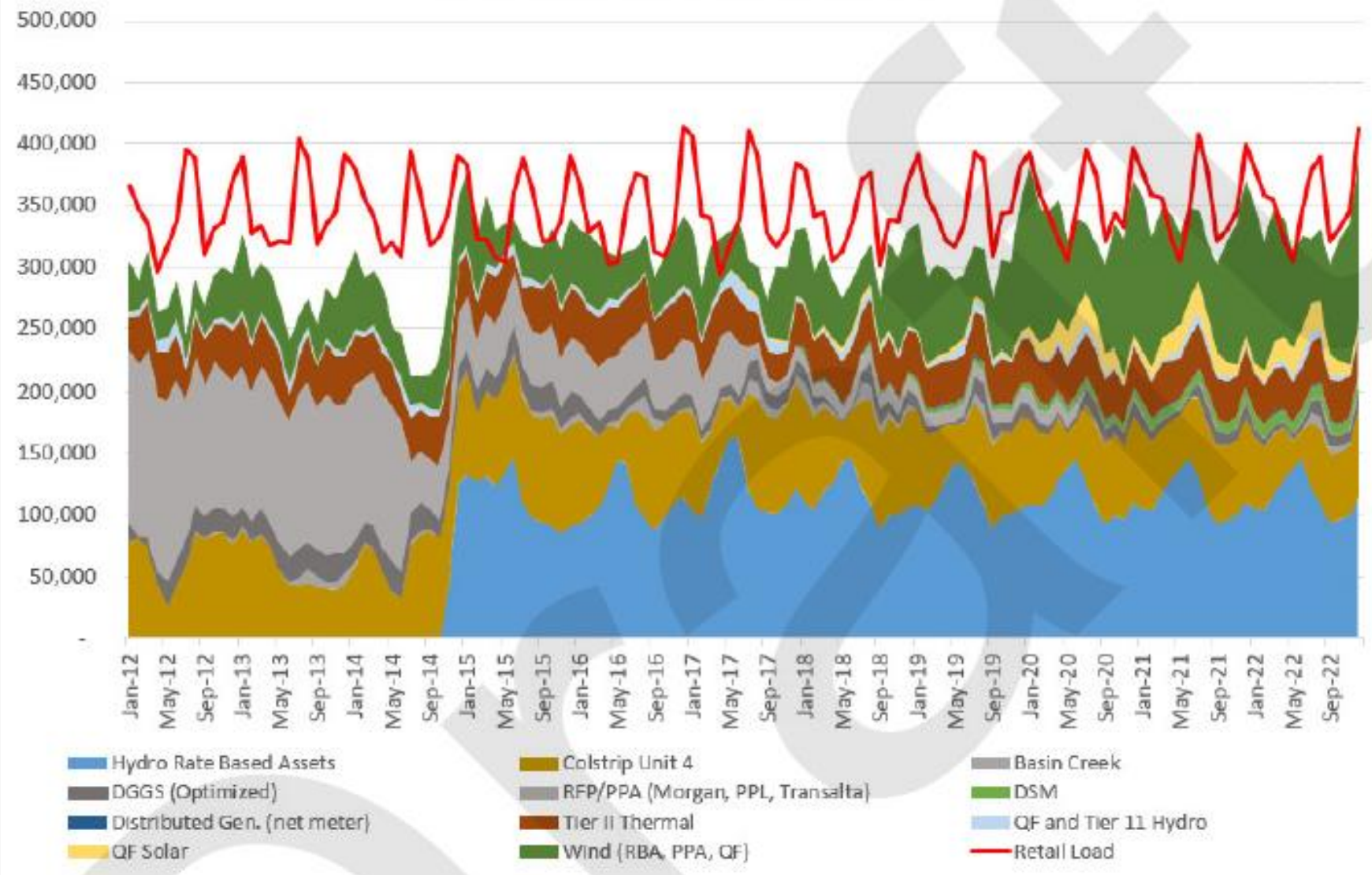
What's Changed About Colstrip's Future Economic Role?

- 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

NorthWestern Energy Transmission Assets



NorthWestern Energy Supply Portfolio HL Hours Generation Actual to 2018 Forecast to 2023





















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

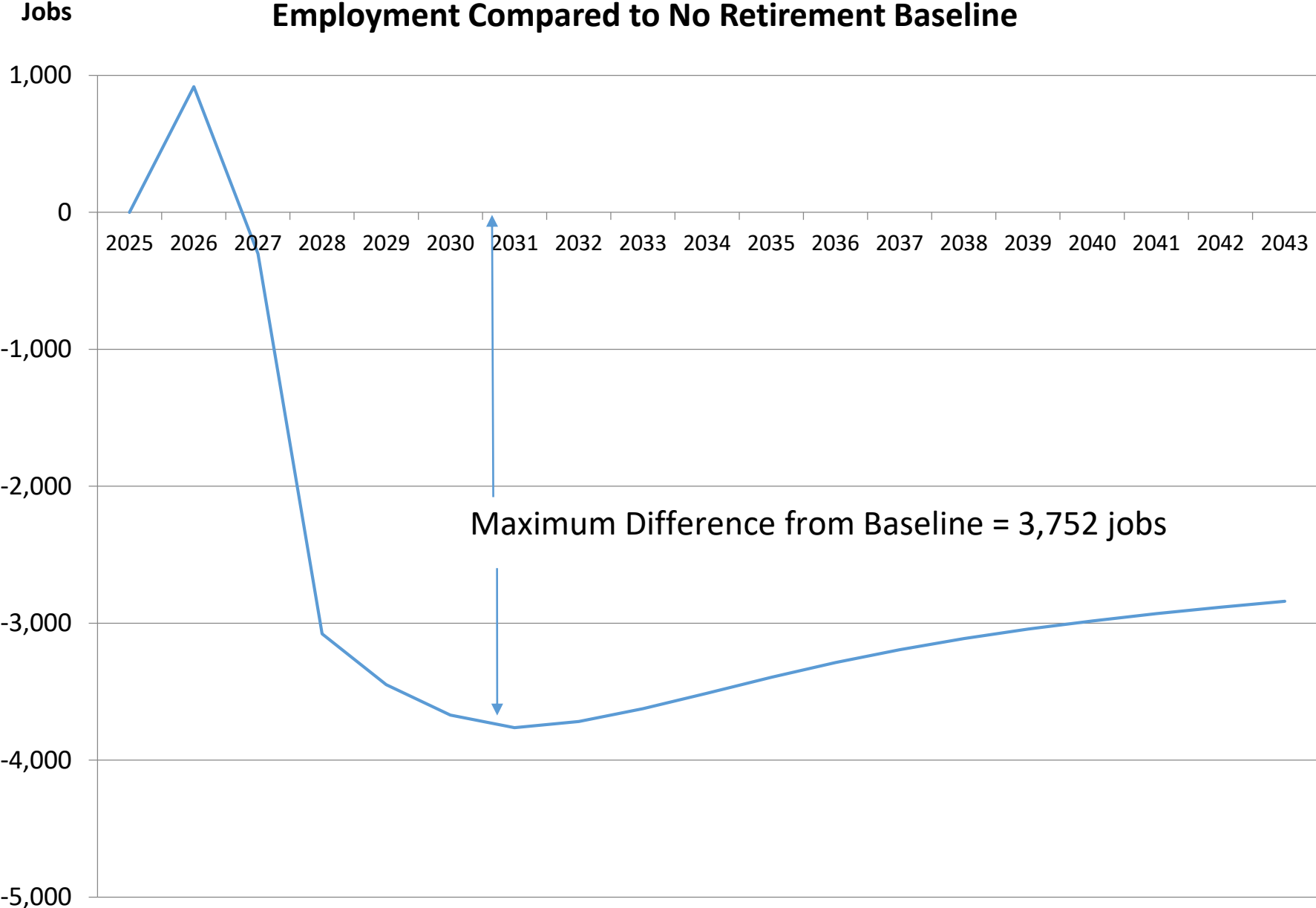
Colstrip 3 & 4 Early Retirement Scenario

- 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)

Active	Edit	Category	Notes
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (1 PV-s)	Loss of Colstrip Output
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (3 PV-s)	Calibration of Employment and Compensation
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (2 PV-s)	Colstrip contractors
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (1 PV-s)	Output loss of coal mine
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (3 PV-s)	Calibration of Employment and Comp for Mine
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (11 PV-s)	Remediation in Colstrip site
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (14 PV-s)	New CCCT Construction and Operation
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (10 PV-s)	Stranded capital of Colstrip passed to ratepayers
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (12 PV-s)	Pipeline to serve gas turbine in Billings
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (11 PV-s)	Colstrip Local Property Taxes
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (5 PV-s)	Effect of reduced property taxes from all res and nonres capital
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (15 PV-s)	MT net Electricity Price after policy
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (15 PV-s)	Loss of 500 kV transmission line property tax payments
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (10 PV-s)	Increased Electric Prices due to loss of Off-System Wheeling Revenue (Colstrip and Hardin)
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (12 PV-s)	230 kV Transmission Line between Three Rivers and Great Falls
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (11 PV-s)	New Billings Steam 230 kV substation
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (12 PV-s)	230 kV transmission line property tax payments
<input type="checkbox"/>	<input checked="" type="checkbox"/>	 Composite (10 PV-s)	Stranded Capital from 500kV line

The Economic Impact of Early Retirement of Colstrip Units 3 and 4 Employment Compared to No Retirement Baseline



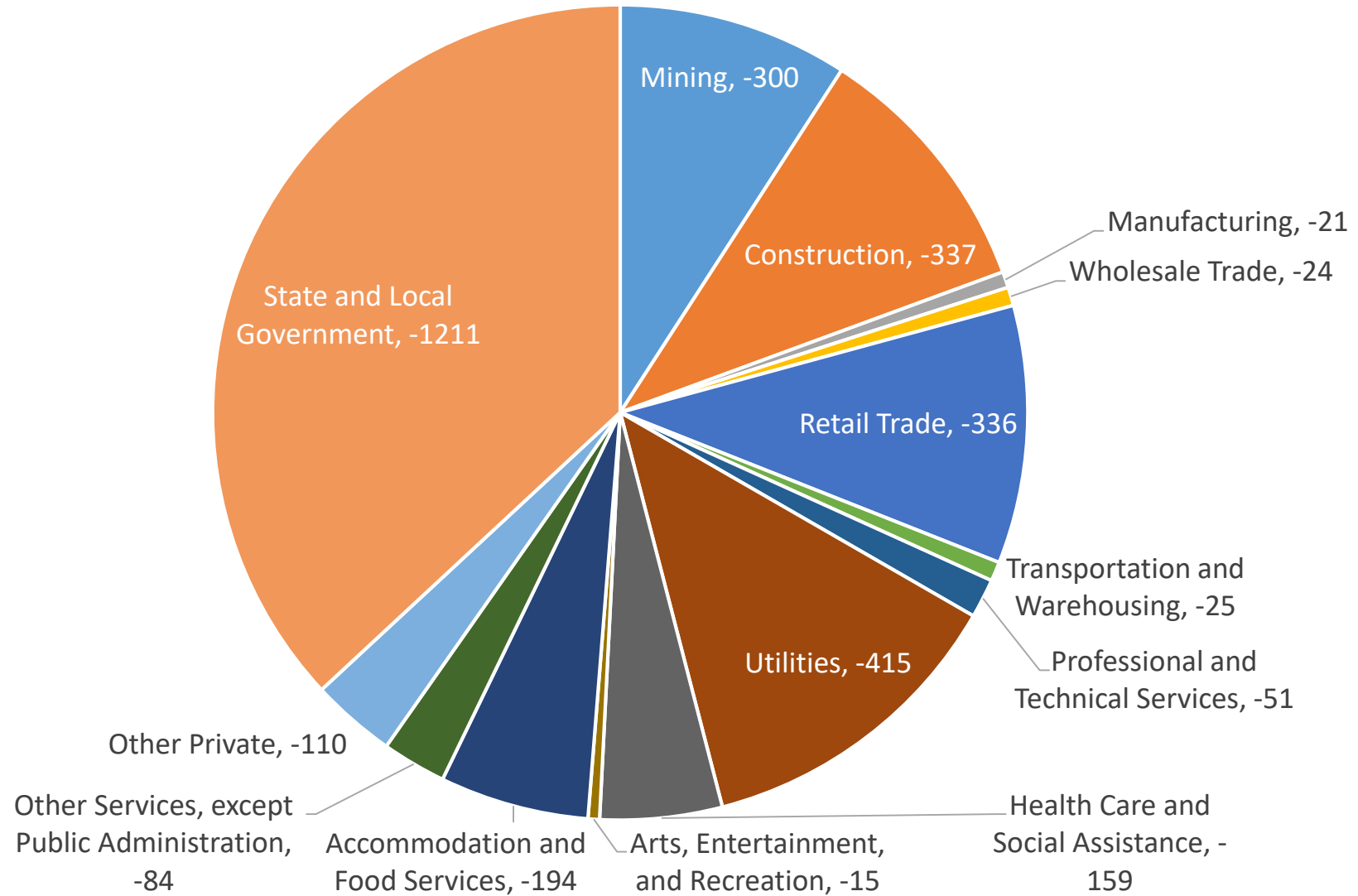
The Economic Impact of Early Retirement of Colstrip Units 3 & 4

Impacts Summary

Category	Units	<u>Impact for the</u> <u>Year</u>		<u>Full</u> <u>Period*</u>
		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.

The Economic Impact of Early Retirement of Colstrip Units 3 and 4
Employment Impacts by Industry, 2028-43 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**