

## Nowakowski, Sonja

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**From:** Susan Petty <spetty@HOTROCKENERGY.ORG>  
**Sent:** Monday, July 11, 2016 4:40 PM  
**To:** Nowakowski, Sonja  
**Cc:** Britt Ide; Andersen, Laura  
**Subject:** Meeting of Energy and Telecommunications Committee July 14-15th  
**Attachments:** draft-agenda-july14-15.pdf; HateCoal\_LoveHotrocks.Steve Klein spv2.pdf; Geothermal for Colstrip.pdf

Sonja – Laura Andersen let me know that the ETIC is meeting July 14-15<sup>th</sup>. I'm attaching my comments which I would like to submit to the committee as well as an article written by Steve Klein, one of HERO's board members, for Cleantech Alliance newsletter.

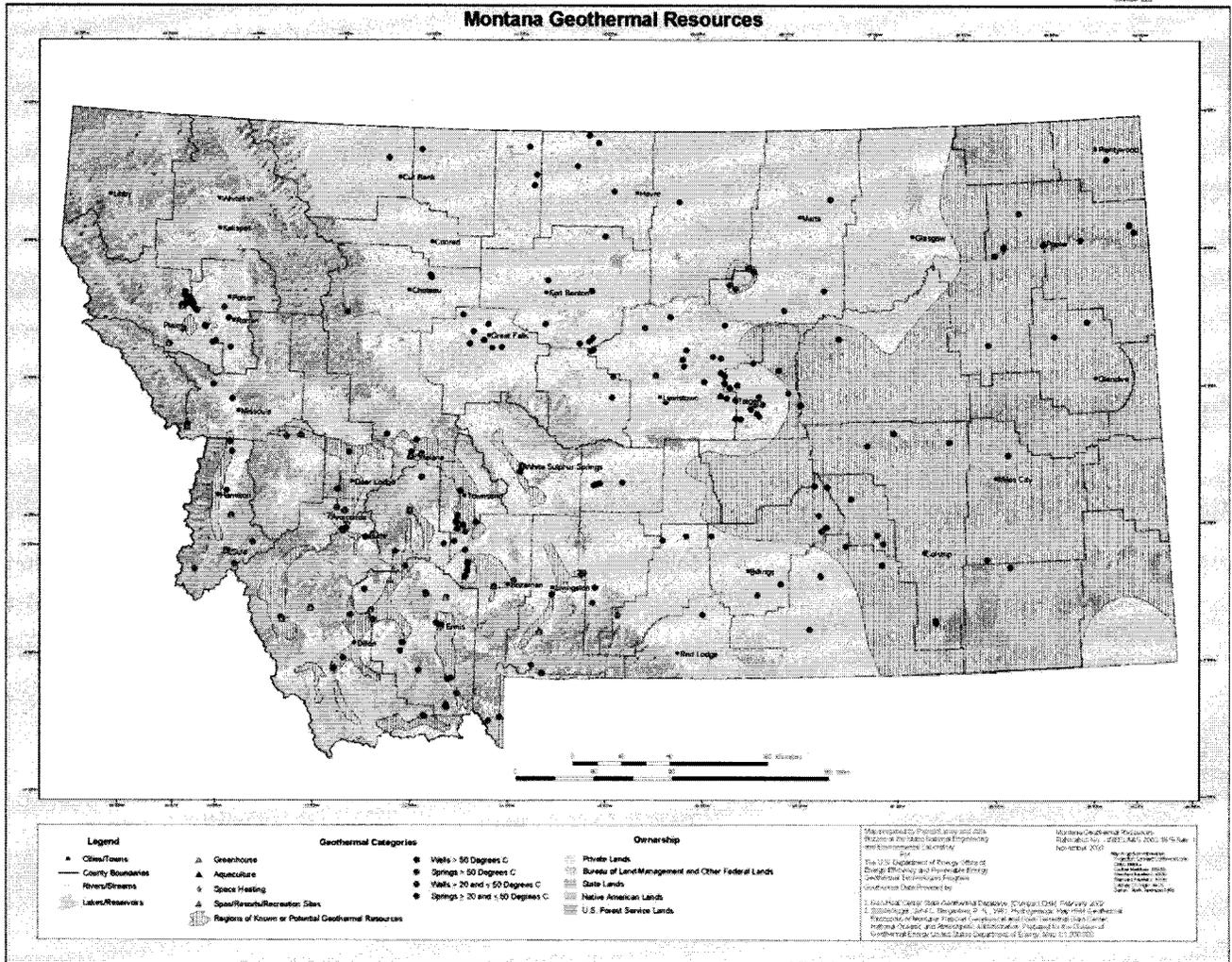
I know that time is limited, but if there is any way to fit me in, I'd like to be able to testify on the topic of geothermal energy for Colstrip.

Susan Petty  
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ENERGY &  
TELECOMMUNICATIONS  
INTERIM COMMITTEE 2015-2016



EGS technology for geothermal projects allows the use of the heat resource anywhere. The reservoir is enhanced or engineered to mine the heat by creating a network of fractures, then drilling into these created fractures. Cool water is injected down injection wells and produced up production wells hot to supply a binary power plant with zero emissions. The binary plant could use the cooling tower from the existing coal plant, the transmission interconnect and the site as well as transition workers to operate the new geothermal project. The geothermal project could be scaled up gradually to meet the need for baseload power as the coal plant was ramped down.

Geothermal has no CO<sub>2</sub> emissions, or any other emissions for that matter. Locating a geothermal project at the site of a coal plant using EGS technology is made more economic through the use of existing transmission facilities and other infrastructure. Waste water from the coal plant can be used to fill the EGS reservoir. Workers can transition from operating and maintaining the coal plant to constructing, growing and running the geothermal project. Fossil-fuel investment fuels climate change. Our environmental future and our financial future are tied to investment in the transition from fossil fuels to renewables. We can make this transition by building utility scale geothermal projects at the site of coal plants. HERO can make that transition happen through education and outreach, research



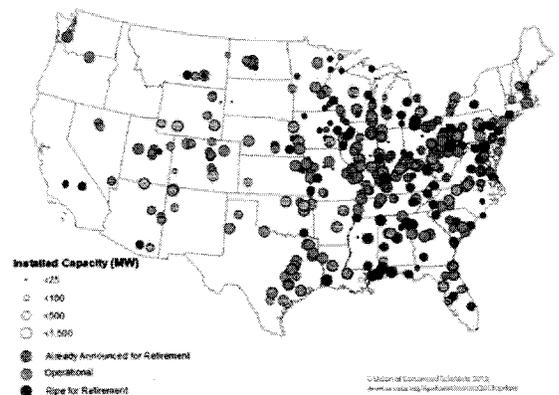
## What if...

**... we could advance in Education, Energy and Finance, altogether and all at once, by transitioning coal-fired power plants into engineered geothermal systems?**

Hotrock Energy Research Organization (HERO) was established to move geothermal technology forward to reduce risk and cost of Engineered Geothermal Systems (EGS) and replace coal fired power.

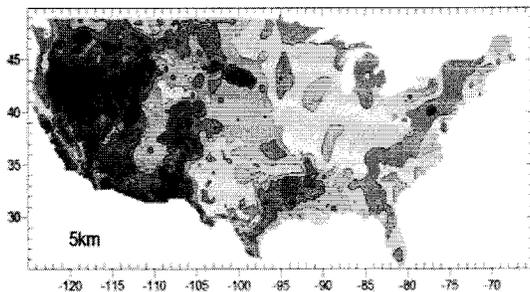
Over the next ten years, 50,000 MW of aging coal-fired generation needs to be repowered or shut down because it can't meet current emissions standards. Repowering with natural gas doesn't solve the problem of greenhouse gas emissions, and many of these plants need expensive gas pipelines to provide enough supply. Repowering with engineered geothermal systems (EGS) takes advantage of existing infrastructure, means zero emissions with very low cost to operate, keeps jobs and helps support communities that rely on coal and coal plants.

Current economic conditions and the need to meet clean air requirements and renewable portfolio standards mean that the schedule for retiring coal plants is being accelerated. Colstrip Units 1 & 2 are now planned for retirement sooner than anticipated. Investors need to divest from fossil fuels and invest in clean, renewable energy. However, currently there is no clear direction for transitioning these plants to something else.



*The emphasis now is on divestment. We need a transition:*

- *Transition to investment in clean, renewable energy*
- *Transition engineers and geologists, workers and skilled tradesmen to new jobs*
- *Transition coal to geothermal*



The geothermal resource is enormous and everywhere. For instance, on the US map shown here, any area with yellow or warmer colors has geothermal potential. Colstrip lies in one of these orange areas. The earth's heat is available 24/7. Solar and wind are excellent sources of clean energy. Their prices have dropped as more capacity goes on line. However, they can't replace base load coal power since solar and wind are intermittent.

The geothermal map of Montana shows Colstrip in an area with known geothermal resources. Studies show that geothermal projects using EGS technology are economic if located in areas with geothermal gradient above 50°C/km. There is a deep well drilled at the Colstrip project area with a geothermal gradient of 38°C/km, lower than would be economic today. However, current drilling costs are much lower than in the past and we can expect cost to come down significantly if we build out a utility scale power plant. Also of benefit to Colstrip is the fact that the waste water from the remaining operating units can be managed by injecting it into the EGS resource, both to fill it up initially during creation, and long term as make-up for water lost to the rock.



to improve economics and demonstrating EGS feasibility through pilot projects. Contributing to HERO can make this transition happen.

# Hate the Coal – But Love the Workers and Assets?

## Re-energize Coal Plants with Hot Rocks!

No, I am not talking about Mick Jagger and the Rolling Stones' monumental and enduring compilation album titled "Hot Rocks," but rather the real, sizzling-hot rocks deep beneath all our feet that can be used to replace coal-fired power with renewable geothermal energy, while reusing valuable infrastructure and employees at existing coal plants.

Multiple economic, social and regulatory trends are forcing the shutdown of coal plants, which brings a cheer from most everyone, not just environmental activists. But while the environment will reap a benefit, the usual approaches for replacing the lost power—such as simply repowering the plant with natural gas or replacing the output with a new generating resource elsewhere—have their own set of negative consequences that are difficult to avoid.

Consider, for example, the Navajo Generating Station near Page, Arizona, on the Navajo Nation. It currently generates tens of millions of dollars in annual taxes and royalties to the Navajo Tribe and provides much-needed jobs in an area where unemployment often exceeds 50 percent. Shutting down and demolishing this coal plant will clean up the air but will also have detrimental economic and social effects on the tribe and the broader community.

Natural gas will play a role in transitioning away from coal but potential over-reliance on another fossil fuel can lead to other problems. Besides the continued carbon contribution, there are limits to the transportation and storage capacity of the nation's gas system, and once that capacity is exhausted the price and availability to consumers will change significantly. Let's face it, relying too heavily on natural gas for base-load power is a risk associated with the decline in the number of coal-fired power plants.

There are many other examples, including several in the greater Northwest--Centralia, Colstrip, Boardman, and Valmy--where existing coal plants are likely to be shut down in the near future or continue to be on the chopping block due to their carbon-heavy impact on climate change. These plants contribute to the economic vitality of their neighboring communities, and represent an infrastructure asset that ratepayers like you and me have invested in over the years. In a world where we like to focus on sustainable local community sourcing and reuse, you would hope there would be a solution that could retain local jobs and reuse the infrastructure that already exists.

There is a solution that sounds too good to be true and can work virtually anywhere a coal plant is located. It is clean and renewable, economic, safe and reliable, and allows the reuse of valuable infrastructure and employees at existing coal plants. That solution is replacing the heat produced from burning coal with heat emanating from hot rocks deep beneath the Earth's surface by developing an engineered geothermal system, or EGS.

EGS should not be confused with the relatively small number of conventional geothermal plants built at a limited number of naturally occurring unique sites that are often near thermal features such as hot springs or geysers. These locations have hot water close enough to the surface to allow the economic production of electricity or direct use for heating.

Instead, an engineered geothermal system mimics nature and can be created almost anywhere by enhancing pre-existing fracture networks in deep hot rocks and circulating water in them. After the introduced water is heated, it is drawn back to the surface, where the heat is extracted to generate power. It can be a closed loop system that uses the water source that cooled the coal plant. It can also use the wastewater produced from years of operating the coal plant that is collecting in surface ponds. And unlike intermittent renewables such as wind and solar, EGS power plants can function as baseload resources that produce power 24 hours a day, and can also have some ability to ramp their output to match peak demands.

There are several EGS plants successfully operating in other parts of the world but none in the United States. Work is underway to change that and bring that technology home. Interestingly, AltaRock Energy, a leader in providing advanced geothermal energy technology and services, was formed and located in Seattle, Washington, in 2007 with funding from clean technology investors such as Khosla Ventures, Kleiner Perkins, Google, Vulcan Capital and Advanced Technology Ventures, along with grant funding from the Department of Energy.

AltaRock is led by Susan Petty, who was part of the seminal study on the future of geothermal energy performed by the Massachusetts Institute of Technology in 2007. That study found that the thermal energy available in the hot rocks below the U.S. is nearly 140,000 times greater than the country's entire energy consumption.

In 2013, AltaRock did a study for the Electric Power Research Institute (EPRI) on the use of EGS to both manage waste water and generate clean power at coal plants such as Colstrip. Colstrip is located in Montana but produces power that serves the entire Northwest, including the Puget Sound area. This study showed that EGS co-located with coal takes advantage of existing infrastructure and workforce, produces zero emissions, can use waste water to transfer heat from the hot rocks, and--importantly--be cost competitive.

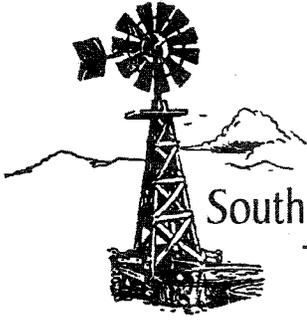
Recently, Ms. Petty founded Hotrock Energy Research Organization (HERO), a 501c3 nonprofit to continue research and development in geothermal technology. Its aims include advancing education and outreach about EGS, and performing feasibility studies and pilot projects demonstrating that the technology can be used to generate geothermal power anywhere, including at existing coal plants.

When you think about solutions to our energy challenges in the United States, it is likely to be a combination of approaches and technologies rather than a single silver bullet. EGS is a solution that deserves more consideration and attention. For example, a recent bill introduced into the Washington State Legislature to encourage conversion of the state's lone coal plant in Centralia listed natural gas and biomass as the only qualifying alternatives.

This EGS solution has not been well-known, understood or appreciated, but as we face the environmental, economic, operational and social consequences of closing coal plants, EGS should come to the forefront of the discussion of alternatives. Please join me in raising awareness of this alternative with legislators, regulators, media, Bill Gates and other influential technology advocates, and the public in general. Let's ensure that EGS is on the table with other viable options, where its value can be comparatively measured and factored into our decision-making, rather than ignored.

Steve Klein

**Note: Steve Klein is a retired Electric Utility Executive who is a recognized leader in the research and development of clean energy technologies and is currently a Principle with Klein Tech Advisors Group. Mr. Klein is also Chairman of the Board of the Clean Tech Alliance of Washington State and an uncompensated Board Member of the nonprofit Hotrock Energy Research Organization (HERO).**



## SouthEastern Montana Development Corporation

*Growing Montana ~ One Job at a Time*

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July 13, 2016

MT Legislative Energy & Telecommunications Interim Committee  
PO Box 201706  
Helena, MT 59620-1706

**Re: Public Comment on Agenda Item: "Future of Colstrip Units 1 and 2" - From SEMDC**

Dear Chairman Regier and ETIC Committee Members:

As the Executive Director of Southeastern Montana Development (SEMDC) and an economic development professional for the past 15 years, I would like to express my strong concerns for the economic future of Montana due to the recent Legal Decision to Shut Down Colstrip Units #1 and #2.

As you may know, SEMDC is a regional non-profit economic development group that was established in 1997 to simulate and encourage economic activity in the four (4) Counties of **Custer, Powder River, Rosebud and Treasure**. Today, SEMDC continues to work with the private, public and non-profit sectors to help create and retain jobs in these four counties. Our track record has documented over 1,007 jobs created or retained and nearly \$37 million dollars in project assistance since 1997. SEMDC has been designated by the State of Montana as a Certified Regional Development Corporation (CRDC) and the federal Economic Development Administration (EDA) as an Economic Development District.

As we all know, COAL PAYS A LOT OF BILLS IN MONTANA and could pay more. Years ago, our state was appropriately nicknamed the Treasure State. But, the stakes have never been higher for our State's future. I am concerned about numerous issues related to Coal Country but mostly about our decreasing state revenue from coal operations and the upcoming tax and utility rate increases.

As our current Affordable and Reliable power source from Coal is in jeopardy, it's easy to say "let's kick out the big out-of-state corporations or sue the wealthy radical environmental groups or shut off their power supply." But, not too realistic. It's really not about pollution, is it? It's really about control, power and money. Powerful outside interests continue to call the shots.

Simply put, Montana needs to find Solutions to our Montana Challenges, by Montanans and for Montanans. Somehow . . . . . Someway . . . . ., we need to turn this Lemon situation into Lemonade.

Concerned in Coal Country,

Jim Atchison  
Executive Director



July 11, 2016

Montana Energy and Telecommunications Interim Committee  
P.O. Box 201706  
Helena, MT 59620-1706

Dear Chairman Regier and ETIC Committee Members,

Recently the Billings Chamber of Commerce, Big Sky Economic Development, Beartooth RC&D, South Eastern Montana Development Corporation (SEMDC) and Snowy Mountain Development Corporation, plus leaders from Yellowstone County, Billings and Colstrip met in Colstrip to learn first-hand about how the Colstrip power plant and the Western Coal mine are being impacted by recent regional and federal decisions regarding power produced by coal. This was an important, eye-opening experience that now begs our collective action.

Our group of over 40 leaders from South Central and Eastern Montana are exploring and encouraging possible solutions to ensure that our energy supply meets current and future energy demands. We also want a solution that supports the energy needs of the large-supply users in our community. These industrial users provide many jobs and economic impact to our regional economy, and they cannot be left to fend for themselves absent a comprehensive Montana energy plan that supports industrial growth.

This is not a Colstrip problem, but rather a Montana problem. The loss of Colstrip 1 & 2 will lead to higher costs for ratepayers and ultimately a reduction in economic output for the entire state. The more ironic aspect of shuttering Colstrip units 1 & 2 is that, relative to other coal plants in the U.S., they are two of the cleanest in terms of emissions.

We understand that this is a complex issue with many unknowns, but we also understand that it is our responsibility to provide a portfolio of energy to our citizens and businesses that is clean, affordable and reliable. Right now, and many years in to the future, our ability to do that relies on coal for base-load power. Coal has been powering our state for over a century, we have state of the art facilities and enough natural resources to maintain the affordability and consistency in power delivery.

We realize Talen Energy and Puget Sound Energy view Colstrip 1 & 2 as a liability. We would argue that this presents an opportunity and incentive for Montanans to take control of our power generation future. We want to communicate to your Committee that we are ready and willing to look at all options and assist in securing our energy future through a diverse portfolio of resources, including our base-load provider, coal.

Thank you for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "John Brewer".

John Brewer, CAE  
President and CEO  
Billings Chamber of Commerce

A handwritten signature in black ink, appearing to read "Steve Arveschoug".

Steve Arveschoug  
Executive Director  
Big Sky Economic Development Authority



# MONTANA LEGISLATIVE BRANCH

## Legislative Fiscal Division

Room 110 Capitol Building \* P.O. Box 201711 \* Helena, MT 59620-1711 \* (406) 444-2986 \* FAX (406) 444-3036

Director  
AMY CARLSON

DATE: June 17, 2016  
TO: Senator Duane Ankney  
FROM: Nick VanBrown and Sam Schaefer, LFD  
RE: Direct tax impacts of closing Colstrip units 1 and 2

This analysis provides information on the direct tax impacts of closing Colstrip units 1 & 2. It does not analyze the indirect effects of these units closure such as other electrical generation coming online or the loss of service jobs in the Colstrip area. This paper is divided into impacted tax types that the Legislative Fiscal Division tracks at a statewide level, along with the corresponding local impacts. However, due to confidentiality for the owners of units 1 & 2, the corporation tax effect was not estimated in this analysis. The analysis results found that combined state and local tax reductions from the closure amount to \$17.1 million when compared to the FY 2015 baseline. In addition, general fund tax reductions amount to \$7.2 million when compared to the FY 2015 baseline.

The Colstrip power plant has a generation capacity of 2094 MW. Colstrip units 1 and 2 each have a capacity of 307 MW, totaling 614 MW or 29% of the plants total generating capacity. For the purposes of this analysis, it was assumed that 29% of the total electrical generation, transmission, and coal mined at the Rosebud mine would be lost. It was also assumed that 29% of the workforce at the Colstrip facility and the Rosebud mine would be lost.

### Coal Severance Tax

Current estimates show that if units 1 and 2 closed, coal severance tax collections would decrease by \$3.9 million. Of this amount, \$1.0 million would have went to the state's general fund while the remainder would have been deposited into a variety of state special revenue funds and trust funds. The total coal severance tax impact is shown in the table below.

| Coal Severance Tax Impacts                                    | Amount             |
|---|--------------------|
| General Fund  | \$1,045,480        |
| Coal Trust Principle  | \$1,981,620        |
| Long-range Building Program                                   | \$475,589          |
| Coal Natural Resource Account                                 | \$114,934          |
| Shared Account (Agriculture, Conservation Districts, Library) | \$216,393          |
| State Parks Trust Principle                                   | \$50,333           |
| Renewable Resource Debt Service                               | \$37,658           |
| Cultural Trust Principle                                      | \$24,968           |
| <b>Coal Severance Tax Total Impact</b>                        | <b>\$3,946,975</b> |

**U.S. Mineral Royalties**

Decreased mining activity will also impact revenues that the state receives from U.S. mineral royalties. Less activity at the Rosebud mine would cause an estimated decrease in U.S. mineral royalty collections of \$1.1 million. Of this \$1.1 million, the general fund may lose \$0.8 million while the mineral impact fund which would be distributed to counties may see a loss of the remaining \$0.3 million.

**Electrical Generation & Transmission**

The state of Montana has a tax on both electrical generation and transmission. These taxes are currently deposited into the state's general fund. Closures of plants 1 and 2 are estimated to decrease electrical generation taxes by \$0.8 million and wholesale transmission taxes by \$0.6 million.

**Individual Income Tax**

Under the assumption that 29% of the workforce would be lost, individual income taxes to the general fund would decrease. Using the Quarterly Census of Employment and Wages (QCEW) data, an average salary of \$75,000 was used for workers that would lose employment. Using these data and assumptions, the effect on the general fund may be a decrease of \$0.8 million.

**Coal Gross Proceeds**

State and local governments do not levy or assess any mills against the reported gross proceeds of coal. Instead, a flat tax is levied against the reported gross proceeds of coal mines. This tax contributes to the state's general fund, local governments, and the 6-mill levy. Closure of units 1 and 2 could decrease the general fund portion by \$1.1 million, the local government portion by \$1.0 million, and the 6-mill revenue by \$0.2 million.

**RIGWA**

The state imposes a resource indemnity and ground water assessment (RIGWA) tax on the gross value of coal. This tax contributes to multiple natural resource and environmental quality state special revenue accounts and may decrease by approximately \$0.1 million if units 1 and 2 closed.

**Property Tax**

The following numbers represent the loss in tax dollars to various entities based on TY 2015 taxable values and mill rates. These numbers split the known taxable value and mill rates of the power plant property into units using company ownership percentages. A comparatively small amount of additional taxable value in non-telecom and non-pipeline property in class 9 electrical utilities, class 5 pollution control equipment, and class 13 telecom and electrical generation is proportioned out based on unit production capacity and simply split between county mills for Rosebud County.

Additionally, the combined taxable value for class 9, electrical transmission property, for Portland General Electric, Puget Sound Energy, PacifiCorp, and Avista Corporation, the majority owners of the transmission line from the Colstrip plant, was reduced proportional to the megawatt hour reduction from units 1 & 2. These transmission lines are what cause the property tax reduction outside Rosebud County. There is a level of uncertainty, especially with other counties, as the transmission lines are centrally assessed.

|                      | Rosebud Total | All Other Counties | Total       |
|----------------------|---------------|--------------------|-------------|
| State                | \$1,484,058   | \$631,006          | \$2,115,064 |
| City                 | \$826,567     | \$852              | \$827,419   |
| Countywide           | \$565,852     | \$904,353          | \$1,470,205 |
| Countywide Education | \$329,872     | \$262,380          | \$592,252   |
| Local Elementary     | \$296,518     | \$397,212          | \$693,730   |
| Local High School    | \$285,497     | \$734,740          | \$1,020,237 |
| Roads                | \$54,562      | \$179,980          | \$234,542   |
| All Other            | \$512,220     | \$46,130           | \$558,350   |
|                      | \$4,355,146   | \$3,156,653        | \$7,511,799 |

Appendix Table

| Source                                     | Effect              |
|--|---------------------|
| Coal Severance Tax                         |                     |
| General Fund                               | \$1,045,480         |
| Coal Trust Principle                       | \$1,981,620         |
| Long-range Building Program                | \$475,589           |
| Coal Natural Resource fund                 | \$114,934           |
| Shared Account (Ag, Conservation, Library) | \$216,393           |
| State Parks Trust Principle                | \$50,333            |
| Renewable Resource Debt Service            | \$37,658            |
| Cultural Trust Principle                   | <u>\$24,968</u>     |
| Coal Severance Tax Total                   | \$3,946,975         |
| Individual Income Tax                      |                     |
| General Fund                               | \$752,000           |
| Electrical Energy Tax                      |                     |
| General Fund                               | \$763,087           |
| Wholesale Energy Tax                       |                     |
| General Fund                               | \$572,315           |
| U.S. Mineral Royalties                     |                     |
| General Fund                               | \$842,638           |
| SSR Mineral Impact fund                    | <u>\$280,879</u>    |
| U.S. Mineral Royalties Total               | \$1,123,517         |
| Coal Gross Proceeds                        |                     |
| General Fund                               | \$1,132,830         |
| Local Government                           | \$1,006,990         |
| 6-mill                                     | <u>\$151,044</u>    |
| Coal Gross Proceeds Total                  | \$2,290,864         |
| Resource Indemnity Tax                     |                     |
| State Special Revenue                      | \$120,000           |
| Property Tax                               |                     |
| General Fund                               | \$2,115,064         |
| Local Governments & School Districts       | <u>\$5,396,736</u>  |
| Property Tax Total                         | \$7,511,800         |
| <u>General Fund Total</u>                  | <u>\$7,223,414</u>  |
| <u>Statewide Total</u>                     | <u>\$17,080,558</u> |