Environmental Impacts of Montana's RPS
Follow-up to November 2013 Report
March 2014
Prepared by ETIC Staff

At the November 2013 Energy and Telecommunications Interim Committee meeting, the committee focused on a discussion of the environmental benefits of Montana's Renewable Portfolio Standard (RPS). The committee was presented with reports prepared by ETIC staff and a report from the Montana Department of Environmental Quality (DEQ). In addition, the committee heard a presentation on the environmental impacts of a state-level RPS from the Department of Energy's National Renewable Energy Laboratory. Utilities were also invited to share there perspectives on the environmental impacts.

The November reports were provided using Senate Joint Resolution No. 6 as a guideline. SJ 6 requested a review of "the environmental benefits of the renewable portfolio standard by analyzing the standard's contribution to diversified generation in Montana and to reduced dependence on fossil fuels; the types of renewable energy generation used in meeting the standard; and potential contributions to air quality improvements attributable to the standard."

Committee members requested additional information related to the environmental impacts of Montana's RPS, beyond the boundaries of SJ 6, be developed for the March 2014 meeting. The committee specifically requested information concerning:

- health benefits, primarily in relation to air quality improvements, that could be attributable to an RPS;
- an overview of climate change studies conducted by the DEQ and the Environmental Quality Council during the 2007-08 interim as they may relate to the RPS study;
- the environmental disadvantages that may be attributable to an RPS or an increase in renewable resource usage; and
- a comparison of the taxes paid by wind-powered and coal-fired electricity generation plants.

The information provided below offers a snapshot of those issues. This report, after being reviewed by the ETIC, will be blended with the November 2013 report to represent the overall environmental overview of the RPS.

Health Impacts

During the November 2013 ETIC meeting, the committee heard public testimony from Dr. Robert Shepard of Helena. Dr. Shepard focused on the health effects of coal-fired power plants. His testimony then related those findings to the reduction in air emissions that can be attributed to the use of renewable resources. In addition, the Montana Environmental Information Center submitted written public comment requesting the ETIC examine the avoided health impacts associated with renewable energy used to meet Montana's RPS.

The health benefits of a renewable portfolio standard are mainly associated with the benefits of

avoiding the use of fossil fuel generation which emit regulated air pollutants. Fossil fuel generation contributes to carbon dioxide (CO2) emissions, nitrogen oxide (NOx) emissions, sulfur dioxide (SO2) emissions, mercury emissions, particulates (PM 2.5), and volatile organic compounds. For the purposes of this portion of the ETIC study, in evaluating air quality, emissions are discussed using a one-to-one ratio in terms of emissions that are displaced by renewable generation as opposed to emissions that are eliminated by most renewable generation.[1] Using the one-to-one ratio, the 542 megawatts of renewable energy certified for use in meeting Montana's RPS, offset 542 megawatts of nonrenewable energy.

The health benefits of a renewable portfolio standard are mainly associated with the benefits of avoiding the use of fossil fuel generation which emit regulated air pollutants.

"Power generation is a significant source of pollutants that can impair human health and the environment, including sulfur dioxide, nitrogen oxide, and mercury. The Clean Air Act has been successful in reducing these emissions, but power generation still contributes approximately 70 percent of SO2, 20 percent of NOx, and 40 percent of mercury emissions into the environment. These emissions from power generation contribute to a range of human health and environmental problems, and interstate and long range transport of emissions continue to play significant roles in these problems."[2]

According to the Environmental Protection Agency (EPA), the health effects of (PM 2.5) include:

- increased incidence of premature death, primarily in the elderly and those with heart or lung disease;
- Aggravation of respiratory and cardiovascular illness, leading to hospitalization and emergency room visits for children and individuals with heart or lung disease;
- decreased lung function and symptomatic effects, including acute bronchitis, particularly in children and asthmatics;
- new cases of bronchitis; and
- increased work loss days, school absences, and emergency room visits.

Volatile organic compounds and NOx also react to form ground-level ozone, a component of smog. According to the EPA, ground-level ozone has been linked to respiratory illness and other

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[1] The use of biomass facilities, which are not zero-emission facilities are not included in the calculations. There are no biomass facilities currently certified by the PSC as eligible renewable resources in meeting Montana's RPS.

[2] "Human Health and Environmental Effects of Emissions from Power Generation," Environmental Protection Agency, Clean Air Market Programs.

health problems including:

- decreases in lung function, resulting in difficulty breathing and other symptoms;
- respiratory symptoms including bronchitis, aggravated coughing, and chest pain;
- increased incidence and severity of respiratory problems; and
- chronic inflamation and irreversible structural changes in the lungs, that, with repeated exposure, can lead to premature aging of the lungs and other respiratory problems.

There are generally air quality improvements when renewable generation reduces fossil fuel combustion at an existing plant or reduces or eliminates the need to build or operate new fossil fueled power plants.[3] Electricity produced by a renewable resource, such as wind, is matched by an equivalent decrease in electricity generation at another resource -- simply because a utility must balance supply with demand at all times. With this offset, the emissions associated with those nonrenewable resources would decrease and there is a potential reduction in the negative health effects attributable to those emissions.

Health impacts also are often linked to climate change activities. The electric power sector accounted for 33 percent of U.S. total greenhouse gas emissions and 60 percent of U.S. stationary source greenhouse gas emissions in 2011. Fossil fuel-fired power plants are the largest source of U.S. CO2 emissions. Significant changes in climate can create public health risks including increased smog, heat waves and drought, and increasingly intense extreme weather events.
This information attempts to focus more directly on the health effects of emissions from power generation and the potential benefits of reducing those emissions.

Health impacts related to renewable energy also are often examined as economic impacts as opposed to environmental impacts. A recent study titled "Economic Value of U.S. Fossil Fuel Electricity Health Impacts", published online in *Environment International* found that replacing fossil fuels with renewable energy reduces premature mortality and lost workdays, and reduce overall healthcare costs. The aggregate national economic impact associated with these health impacts of fossil fuels is between $361.7 and $886.5 billion, or between 2.5 percent and 6 percent of gross domestic product (GDP).[4] The economic value was based on premature mortality, lost workdays, and other direct costs to the healthcare system as a result of emissions of PM 2.5, NOx and SO2. Impacts resulting from extraction and transportation of fossil fuels and impacts of climate change and human welfare were not included.

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[3]"Weighting the Costs and Benefits of State Renewables Portfolio Standards: A Comparative Analysis of State-Level Policy Impact Projections," Cliff Chen, Ryan Wiser, and Mark Bolinger, Environmental Energy Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory, March 2007, executive summary, page 6.

[4] Economic Value of U.S. fossil fuel electricity health impacts, Machol, Rizk, 2013, Clean Energy and Climate Change Office, U.S. Environmental Protection Agency Region 9, San Francisco, CA, pages 75-80.

Climate Change

The Environmental Quality Council (EQC) dedicated the largest portion of its time during the 2007-08 interim to a study of issues related to climate change. The EQC was not assigned the study in the form of a bill or resolution, but instead took up the topic as a member-suggested study, authorized in 75-1-324, MCA--general oversight authority. The study required examination of the overall subject of climate change and how other states, at the time, were addressing the issue. A large portion of the study focused on a review of the Montana Climate Change Advisory Committee (MCCAC) report. The report that was released by the Department of Environmental Quality (DEQ) at the same time the EQC was conducting its review.

The information provided here offers a summary of the report completed by the EQC, and the work that was done by the MCCAC. During the November ETIC meeting, committee members requested a brief review of the EQC study and MCCAC report, *Montana Climate Change Action Plan: Report of the Governor's Climate Change Advisory Committee*, with a focus on aspects of the study and report that could be useful to the ETIC in conducting its study of the Montana RPS and the environmental impacts of the RPS. The full MCCAC report is available at: http://deq.mt.gov/ClimateChange/default.mcpx. The EQC's final report to the 2009 Legislature is available here: http://leg.mt.gov/css/Committees/interim/2007_2008/environmental_quality_council/staff_reports/reports.asp#climate.

Climate change is a term that includes any significant change in measures of climate, such as temperature, precipitation, or wind that lasts for several decades or longer. Climate change may result from:

- natural factors, such as changes in the sun's intensity or slow changes in the earth's orbit around the sun;
- natural processes within the climate system, such as changes in ocean circulation; and
- human activities that change the atmosphere's composition, including the burning of fossil fuels, or changes to the land surface, such as deforestation, reforestation, urbanization, or desertification.[5]

Although the greenhouse effect is necessary for the planet to be warm enough to be livable, there are concerns that an increasing accumulation of greenhouse gases is causing an increase in global temperatures. Debates about climate change are scientific, economic, political, and rife with complexities. That said, points of contention include to what degree are human-produced greenhouse gases affecting the climate and those effects.

Former Governor Brian Schweitzer in 2005 asked Montana's DEQ to form a climate change advisory committee to thoroughly study the impact of climate change in Montana. The MCCAC was formed and included 18 members who represented industry, the environment, local and tribal governments, transportation, and agriculture. The DEQ also contracted with the Center

[5] Environmental Protection Agency. www.epa.gov/climatechange/basicinfo.html

for Climate Strategies (CCS), a nonprofit organization discussed more indepth below, to develop a comprehensive inventory and forecast of greenhouse gas emissions in Montana from 1990 to 2020, as well as to develop policy options for reducing greenhouse emissions.

The CCS is a nonprofit organization that works with groups like the MCCAC to design and implement policies that address climate mitigation. The inventory provides a thorough look at emissions in Montana and was offered to the MCCAC to assist the group in its efforts.

The inventory includes carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Aerosol emissions, including "black carbon" from fossil fuel combustion, also were included. Emissions inventoried in the report do not solely include carbon dioxide but instead include a common metric, CO_2 equivalent.

Montana's gross greenhouse gas emissions are rising at about the same rate as the nation's on the whole.[6] Montana's emissions per capita are higher, primarily because of the state's fossil fuel production industry, agricultural industry, large distances for transportation, and low population density. Forestry activities are estimated to be net sinks for emissions, and agricultural soils are estimated to sequester additional gases.

The inventory showed that activities in Montana account for about 37 million metric tons of carbon dioxide equivalent emissions or 0.6 percent of all greenhouse gas emissions in the United States. Electricity use, transportation, and agriculture are the principal emissions sources. The combustion of fossil fuels for generating electricity used in Montana combined with the transportation sector accounted for about 50 percent of the gross greenhouse gas emissions in the state.[7] Agricultural emissions are primarily methane and nitrous oxide from manure management, fertilizer use, and livestock. Other types of emissions are from households, large industry, commercial business, wastewater treatment operations, and the oil and gas industry. A look at greenhouse gas emissions by sector is included in **Figure 1**.

The inventory included projections that show reference case emissions increasing to 42 million metric tons by 2020, about 30 percent above 1990 levels. The majority of the increase is expected to come from the transportation sector. The report also reviewed carbon sinks or sequestration, like forests and soil, decreasing the gross estimates annually by about 25 million metric tons of CO_2 equivalent. With the sinks calculation, the net increase by 2020 is estimated at 16.3 million metric tons, in the reference case projections.

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[6] *Montana GHG Inventory and Reference Case Projections 1990-2020*, Center for Climate Strategies, principal authors: Alison Bailie, Stephen Roe, Holly Lindquist, and Alison Jamison, page 4, September 2007.

[7] Ibid. page 5.

Figure ES-2. Montana gross GHG emissions by sector, 1990-2020: historical and reference case projection

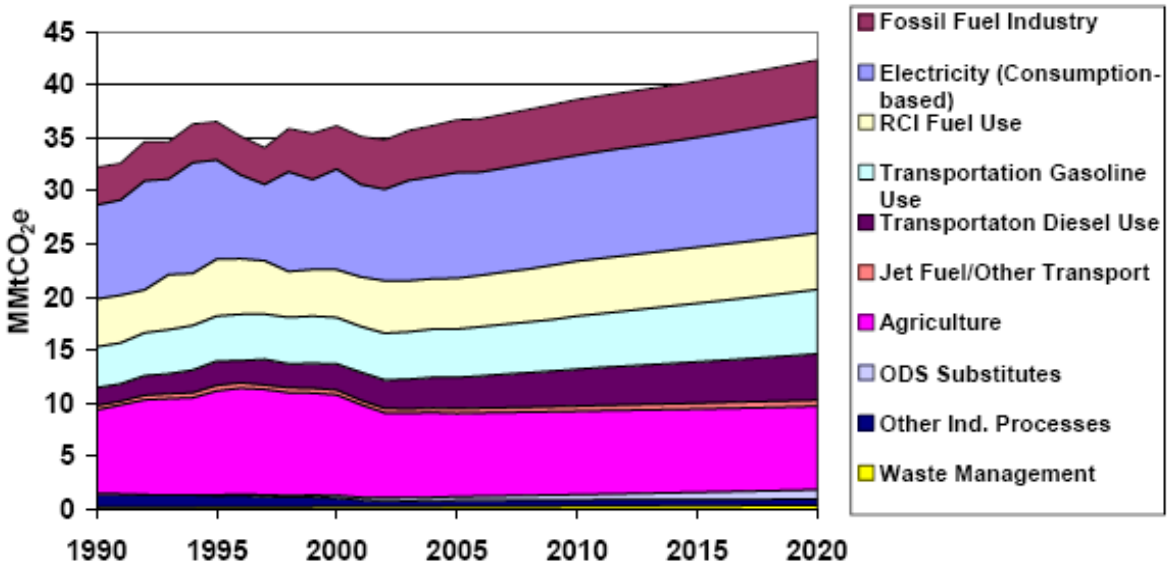

Figure 1
Source: *Montana Climate Change Action Plan: Report of the Governor's Climate Change Advisory Committee.*

Using that data, the CCS assisted the MCCAC in identifying a range of greenhouse gas mitigation options, using a combination of more that 250 existing state actions from across the country and Montana-specific actions, as determined by the MCCAC. The MCCAC concluded its work in 2007, and final recommendations were released in November 2007. The MCCAC offered 54 recommendations. In the report, the 54 recommendations were broken down into five categories: Residential, Commercial, Institutional, and Industrial (RCII); Energy Supply (ES); Transportation and Land Use (TLU); Agriculture, Forestry, and Waste Management (AFW); and Cross-Cutting Issues (CC). The CCAC's overall recommendations document the opportunities for the state to continue strong economic growth by being more energy efficient, using more renewable energy sources, and increasing the use of cleaner transportation modes, technologies, and fuels.[8] Some of the recommendations would have been implemented administratively, and some would have required legislation. Since the report was published, there has been limited action in implementing the recommendations, with a general focus on the need for legislation.

The CCAC unanimously recommended that Montana extend the existing RPS to include requirements for 2020 and 2025.

[8]Ibid, page 1-7

The 54 MCCAC policy recommendations also did not reduce greenhouse gas emissions from electricity that is generated in Montana and exported out of state. The focus was based on consupmtion. Reductions in greenhouse gases based on consumption show the following reductions:

- 34.5 percent would come from the energy supply sector;
- 29 percent would come from the residential, commercial, industrial, and institutional sector;
- 26.9 percent would come from the agriculture, forestry, and waste sector; and
- 9.6 percent would come from the transportation and land use sector.[9]

For the purposes of meeting the ETIC's November 2013 request, this summary focuses on the MCCAC recommendations related to electricity supply and renewable energy requirements. The report noted that in addition to an RPS, Montana provides tax incentives and financing mechanisms for conservation and renewable energy and the opportunity for consumers to purchase “green power” from utility companies. The report, again focusing on the consumption not production scenario notes, "Fortunately, there are significant opportunities to reduce GHG emissions growth attributable to energy production and supply. The GHG emissions of electricity generation can be addressed through: greater use of renewable energy; recapture of waste energy through combined heat and power; carbon capture and storage; and other technologies." The Energy Supply (ES) recommendations included efforts to increase the supply of renewable
energy (ES-1 and ES-2), decrease the emission intensity of fossil-fuel–generated electricity (ES-5), reduce the average emissions of new utility resource acquisitions (ES-10), increase distributed generation (ES-4), and reduce demand. If all of the CCAC’s recommendations were fully implemented, the ES recommendations could result in cumulative GHG emissions reductions of about 16 MMtCO_2e through 2020 at a cumulative net present value cost of about $270 million.[10]

The CCAC unanimously recommended that Montana extend the existing RPS to include requirements for 2020 and 2025 and require utilities to pursue cost-effective end-use energy conservation (both electricity and natural gas). The CCAC report found that each investor-owned and public utility (including member-owned electric cooperatives) should:

- meet 20% of its load using renewable energy resources by 2020, increasing to 25% by 2025;
- implement a plan to obtain 100% of achievable cost-effective energy conservation by 2025;
- by 2010, identify its achievable cost-effective energy conservation for the subsequent 10 years; and

[9] Ibid, page EX-4.

[10] Ibid, page 4-5

• update these energy efficiency assessments and plans regularly, possibly every 2 years.

As part of its interim work, the EQC reviewed all 54 recommendations included in the *Montana Climate Change Action Plan: Final Report of the Governor's Climate Change Advisory Committee*. In conducting its 2007-08 study and gathering public opinion on the subject, the EQC hosted a climate change survey, inviting the public to rank and comment on the MCCAC's 54 recommendations. The survey garnered nearly 2,000 responses, and using that information, the EQC selected 15 of the recommendations for further study and discussion.

The 15 recommendations further reviewed by the EQC did not include any energy supply recommendations from the report. The committee did look at an RCII recommendation (RCII-8) to support renewable energy applications. The recommendation would have provided for 470 MW of Combined Heat and Power, 4.5 MW of solar PV, and 30 MW of small wind by 2020. It included improving incentives and removing barriers to Interconnection Rules and Net Metering Arrangements) for Combined Heat and Power and Clean Distributed Energy

After a thorough review of the 15 recommendations, EQC members reached a consensus on a series of topics to review even more indepth, but those topics did not include a focus on renewable energy or small renewable applications. EQC members focused on topics that included enhancing solid waste recovery or recycling opportunities; promoting local food and fiber; improving transportation system management or efforts to enhance mass transit and ensure adequate transportation planning; providing additional opportunities for low-income and rental housing energy efficiency and weatherization; expanding biomass opportunities; and reviewing requirements that new state buildings exceed current building codes or standards.

Environmental Disadvantages

All energy generation has some impact on the environment, including wind generation. Because wind is the predominate resource used in meeting Montana's standard with about 234 megawatts of wind, located in Montana, used to meet the RPS, the information in this overview will focus on wind. Additional wind resources outside the state, including Klondike III, a 200-megawatt wind farm located in Sherman County, Oregon and owned by Iberdrola Renewables are also used to meet the standard.

One environmental concern is bird and bat mortality. Flight patterns may take birds and bats into wind turbines and towers. For example, when birds are hunting they keep their eyes on the ground and don't see the turbines. Most bats migrate at night increasing potential collisions with wind turbines. Bats, in some cases, have also shown to be attracted to the moving blade of a wind turbine. "Wildlife mortality from collisions with wind turbines is the most direct, visible, and well-documented impact of wind energy development. However, conclusions about rates and impacts of collisions on bird populations are tentative because most of the mortality data is in industry reports that are not subjected to scientific peer review or available to the public."[4]

[4]"Estimates of bird collision mortality at wind facilities in the contiguous United States," Loss, Will, and Marra, Biological Conservation 168 (2013) 201-209.

Studies estimate between 10,000 and 573,000 annual fatal bird collisions with wind turbines in the United States. A 2013 study conducted by researchers at the Migratory Bird Center and U.S. Fish and Wildlife Service estimates that between 140,000 and 328,000 birds are killed annually by collisions with monopole turbines in the contiguous United States.[5]

Earlier this year Duke Energy Renewables pleaded guilty to the deaths of more than 15 protected birds at two of its wind farms in Wyoming. The company faces $1 million in fines. It was the first time a wind company was prosecuted under the Migratory Bird Treaty Act. The eagle deaths are a violation of the federal Bald and Golden Eagle Protection Act. Between 2008 and 2012, 14 golden eagles and 149 other birds, including hawks, larks, sparrows, wrens, and blackbirds were killed at two Wyoming facilities.[6]

In September 2013 a report published in the Journal of Raptor Research found that since 1997 wind farms in 10 states have killed at least 85 eagles. The majority of the deaths occurred between 2008 and 2013 in 10 states. Montana was not included. The study was conducted by U.S. Fish and Wildlife Service researchers.

“Our findings of the reported mortalities likely underestimate, perhaps substantially, the number of eagles killed at wind facilities in the United States. Given the projected growth in wind resource development in habitat frequented by bald eagles and golden eagles, estimation of total mortality and better understanding of factors associated with injury and death at wind facilities through robust and peer-reviewed research and monitoring should be a high priority.”[7]

The Interior Department has recently proposed a rule that would grant wind farms 30-year permits to take golden and bald eagles, if companies take additional steps to protect raptors. Permit holders are exempt from prosecution under the Bald and Golden Eagle Protection Act. The rule previously allowed for 5-year permits.

A 2007 study prepared by TRC Solutions in Laramie, Wyo., found that 1,206 bats and 406 birds were killed by the turbines at Judith Gap.[8] It was the first post-construction avian and bat fatality monitoring and grassland bird displacement surveys conducted at the site. The study indicated that there were between 7 and 13 bat fatalities per turbine per year. Environmental studies done

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[5]Ibid.

[6]http://www.duke-energy.com/news/releases/2013112203.asp

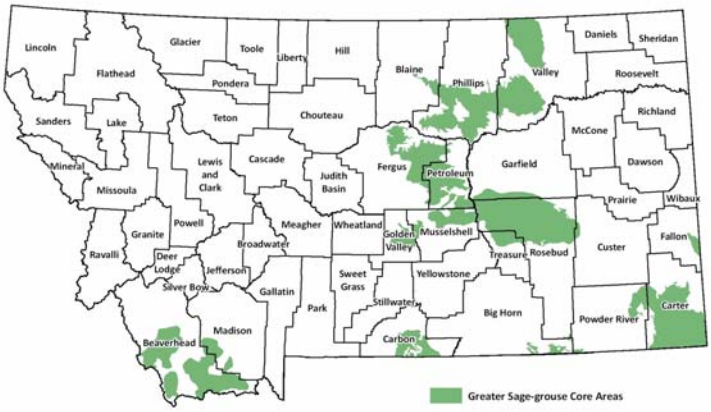
[7]"Bald Eagle and Golden Eagle Mortalities at Wind Energy Facilities in the Contiguous United States," Pagel, Kritz, Millsap, Murphy, Kershner, and Covington, Journal of Raptor Research, 47(3):311-315, 2013.

[8] "Post-Construction Avian and Bat Fatality Monitoring and Grassland Bird Displacement Surveys at the Judith Gap Wind Energy Project, Wheatland County, Montana", TRC Environmental Corporation, January 2008.

before construction predicted 4 bat fatalities per turbine per year. The higher than expected findings were followed by a study released in 2010 by West, Inc. The earlier study focused on fatalities over a seven month period in late summer and fall and again in spring. The later study was conducted during five months in summer and fall. During the 2006-2007 study bat fatalities were estimated at 8.9/MW/study period and in the 2009 study, the fatality rate was at 4.80 fatalities/MW/year. "The estimated bird fatality rate was 3.01/MW/period of study in 2006-2007 and 2.22/MW/period of study in 2009. These bird fatality rates are similar to other wind energy facilities in the Plains states and Midwest."[9]

Wind development has been a consideration as Montana examines Greater Sage-grouse habitat. In 2013 Governor Bullock established the Greater Sage-grouse Habitat Conservation Advisory Council. The council was created "to gather information, furnish advice, and provide to the Governor recommendations on policies and actions for a statewide strategy to preclude the need to list the Greater Sage-grouse under the Endangered Species Act". There are two statements specific to wind development in the strategy prepared by the council and submitted to the Governor in January.

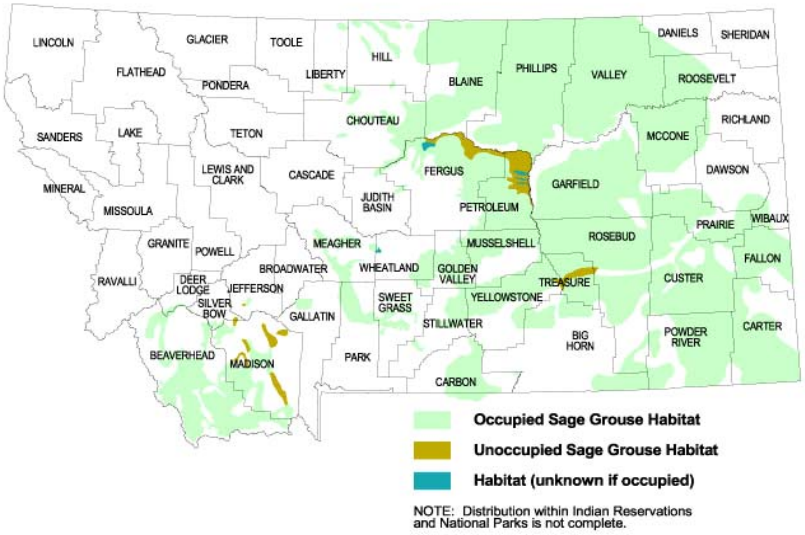
Figure 2



- In sage-grouse habitat identified as core areas (**Figure 2**), wind energy development would not be allowed. The strategy states that this provision would be reevaluated on a continuous basis as new science, information, and data emerges. The core areas were delineated by the Department of Fish, Wildlife and Parks in cooperation with federal and non-governmental partners to include areas with the greatest number of displaying male sage-grouse and their associated habitat.
- In general habitat, new wind energy facilities would not be recommended within 4 miles of the perimeter of active sage-grouse leks. The strategy states the following efforts should be undertaken in these areas:
    - work cooperatively with agencies, utilities, and landowners to use topography, vegetative cover, site distance, etc. to protect identified sage-grouse habitat.
    - adhere to the U.S. Fish and Wildlife Service land-based wind energy guidelines.

[9]"Post-Construction Bat and Bird Fatality Study Judith Gap Wind Farm Wheatland County, Montana", West, Inc., March 2010.

Figure 3



For non-regulated activities, such as wind development, the strategy says “state agencies shall adhere to the stipulations and management recommendations outlined in this strategy when providing consultation, technical, financial, or other assistance for those non-regulated activities.” **Figure 3** provides additional detail.

Environmental concerns can also include different aspects of land use, including aesthetics, location, and size. The National Renewable Energy Laboratory examined the land use associated with modern large wind power plants constructed after 2000. "Continued growth is anticipated due to renewable portfolio standards and expected constrains on carbon emissions in the electric sector. One of the concerns regarding large-scale deployment of wind energy is its potentially significant land use."[10] They evaluated 172 existing or proposed projects, representing about 26 gigawatts of capacity. The study looked at both direct impact area, or the land disturbed due to plant construction and infrastructure, and the total area of the wind power plant.

The study found direct impacts were mostly caused by road development, as opposed to the turbine pads and electrical support equipment. A total direct impact area (both temporary and permanently disturbed land) was found to be about 1 to 0.7 hectare/MW, but with a wide variation depending on the project. The average value for the total project area was about 34 to 22 hectares/MW.[11] This translates to between 30 and 141 acres per megawatt of power output capacity, with, less than 1 acre per megawatt disturbed permanently.

The results also provided some caveats, "A wind plant in an agricultural area with low population and minimum avian impacts would have a much lower damage function than an area mined for coal or flooded by a hydropower project, for example. As a result, using the total area metric with qualifications may significantly overstate the land impacts of wind power compared

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[10]"Land-Use Requirements of Modern Wind Power Plants in the United States," Denholm, Hand, Jackson, and Ong, National Renewable Energy Laboratory, August 2009, page 1.

[11]Ibid, page 22.

to other sources. Alternatively, wind power projects should consider the impacts associated with habitat disruption, avian impacts, and aesthetics. Ultimately, the actual quality of impacts, captured in a damage function, is needed to compare the land impacts of wind to other sources."[12]

A similar study conducted by Rutgers University researchers took a closer look at alternative energy sources and land use. They examined an overall footprint that would include transportation routes, including transmission, mined resources, and waste depositories. They looked at how much land would be needed to generate all of the world's current energy demand with one type of energy source and how much land would be needed to meet 10 percent. They then placed energy resources into three categories.

They found that geothermal and solar thermal belong in the same "small-footprint" impact category as nuclear, coal, and natural gas. The "medium-footprint" land impact category included petroleum, hydropower, solar photovoltaics, and wind. The report notes, "wind needs twice as much land area to generate the same amount of energy as solar photovoltaics and varies even more by location. . . In sum, rooftop solar panels can make a contribution to the global energy supply, but both solar and wind technologies will more often be deployed in remote locates where the resources are better, more land is available, and siting conflicts are less severe. Getting the energy back to consumers is the looming challenge." The third category with the greatest footprint was bioenergy.[13]

As noted in the examples above, it is difficult to compare land-use, in terms of acres per megawatt, for different types of energy generation. Land requirements go far beyond just on-site infrastructure. In determining land use, it is important to consider geographic variations, land suitability, extraction activities, potential for conflicts, distances between energy supply and demand, and the long-lasting footprint.

State and Local Taxes Paid by Wind and Coal-Fired Generation

The ETIC requested information from the Department of Revenue on taxes paid by wind facilities and coal-fired generation plants. An analysis prepared by the Department of Revenue is included in **Appendix A**. The department notes that the taxes paid by the owner of a power plant would depend on the plant's location, ownership, and financing for the facility. A range of taxes per megawatt-hour of electricity produced by hypothetical new wind facilities and coal-fired power plants is included in the analysis. "Applying the same assumptions to both power plants, the coal plant would generally pay about $3 per megawatt-hour more in state and local taxes." Cl0124 4058slxa.

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[12]Ibid, page 4.

[13]"Climate Change and Land Policies", proceedings of the 2010 Land Policy Conference, Lincoln Institute of Land Policy, "Alternative Energy Sources and Land Use", Andrews, Dewey-Mattia, Schechtman, and Mayr, pages 91-100.

Appendix A

Montana Department of Revenue

Mike Kadas
Director

Steve Bullock
Governor

Memorandum

To: Energy and Telecommunications Interim Committee

From: Dan Dodds, Senior Economist

Date: December 3, 2013

Subject: State and Local Taxes Paid by Wind and Coal-Fired Generation

At its November meeting, the committee requested information on the taxes paid by wind-powered and coal-fired electricity generation plants. The taxes paid by a power plant would depend on where it is located, who owns it, and how it is financed. Table 1 shows the range of taxes per megawatt-hour of electricity produced by hypothetical new wind-powered and coal-fired generation. Applying the same assumptions to both power plants, the coal plant would generally pay about $3 per megawatt-hour more in state and local taxes.

Table 1. Range of Possible Tax Revenue per MWh from New Electricity Generation

	Wind	Coal
Electrical Energy Producers License Tax	$0.200	$0.200
Wholesale Energy Transaction Tax	$0.150	$0.150
Coal Severance Tax	-	$0.954
Coal Gross Proceeds Tax	-	$0.318
Resource Indemnity Tax	-	$0.025
Property Tax		
State	$1.546	$2.078
County & Special District	$0.413 - $2.679	$1.111 - $3.6
Schools, District & County-wide	$0.467 - $3.215	$1.255 - $4.321
Corporate Income Tax	$0 - $4.134	$0 - $3.044
Total	$2.777 - $11.925	$6.091 - $14.69

The range of property taxes reflects the range of mill levies in places a power plant might be located and whether local governments grant the wind-powered plant a partial

abatement of local property taxes. The range of corporate income tax reflects differences in ownership and financing of the plant.

Table 2 shows how revenue from these taxes would be distributed.

Table 2. Distribution of Potential Revenue per MWh from New Generation

	Wind		Coal	
	Low Case	High Case	Low Case	High Case
State				
General Fund	$1.804	$5.937	$2.711	$5.755
Special Revenue	$0.093	$0.093	$0.353	$0.353
Trust Funds	$0.000	$0.000	$0.495	$0.495
Local				
County & Special Districts	$0.413	$2.679	$1.184	$3.674
Schools	$0.467	$3.215	$1.347	$4.413
Total	$2.777	$11.925	$6.091	$14.690

Detailed explanations of how each tax is distributed are in the department's Biennial Report, which can be downloaded at this address http://revenue.mt.gov/content/publications/biennial_reports/2010-2012/Biennial-Report-2010-2012.pdf.

Revenue from the electrical energy producers license tax, the wholesale energy transactions tax and the corporate income tax is deposited in the state general fund.

The coal severance tax is split between state trust funds, the state general fund, and state special revenue funds that pay for state buildings and local coal impacts.

Property taxes are divided between the state general fund, local governments, local special districts, school districts and the university system,. The coal gross proceeds tax is property tax on coal and is distributed to the same taxing units as other property taxes.

Revenue from the resource indemnity tax is allocated to state special revenue funds and is used for natural resource related programs.

The rest of this memo explains the assumptions behind the numbers in Tables 1 and 2 and why there is a range of possible taxes.

Power Plant Assumptions
Table 3 shows characteristics of the two facilities that would affect their taxes.

Table 3. Power Plant Assumptions

	Wind	Coal
Nominal Capacity, MW	100	450
Capacity Factor	0.38	0.85
Annual Production, MWh	333,108	3,352,995
Plant Cost		
$/kW Capacity	$1,700	$2,800
Total, $ million	$170	$1,260
Heat Rate, Btu/kWh		9,000
Coal Heat Content, mmBtu/Ton		16.99
Coal Contract Sales Price, $/Ton		$6.3567

Costs and operating characteristics of the two generation facilities are based on information from Appendix 1 of the Sixth Northwest Conservation and Electric Power Plan developed by the Northwest Power and Conservation Council. Coal heat content is the average for coal delivered to Montana power plants published by the Energy Information Administration the last twelve months in Electric Power Monthly. The contract sales price is the average for surface mines reported on coal severance tax returns for the last four quarters.

Electricity Taxes
Montana imposes two taxes on electricity. The electrical energy producers license tax is a tax of $.0002 per kilowatt-hour on electricity generated in the state. The wholesale energy transactions tax is a tax of $.00015 per kilowatt-hour on electricity sent over transmission lines in the state. These taxes are the same for any type of power plant.

Coal Taxes
There are three taxes on coal production in Montana, the coal severance tax, the resource indemnity tax, and the coal gross proceeds tax. All three taxes are assessed on the contract sales price, which is the pre-tax mine-mouth price less any federal royalties over $0.15 per ton. For surface mined coal appropriate for use in a power plant, the rates are 15% for the severance tax, 0.4% for the resource indemnity tax and 5% for the gross proceeds tax. The coal gross proceeds tax is considered property tax on coal in the ground. The legislature has made it a general policy that property taxes on mineral rights should be paid once, when the mineral owner receives income from having the mineral extracted rather than every year. Over time, the legislature has also converted property

taxes on minerals to uniform state-wide rates rather than having them determined by local mill levies.

Property Taxes

The amount of property taxes a generation facility will pay is determined by its market value, the assessment ratio that is applied to the market value to give taxable value, and the mills that are levied against the taxable value.

The initial cost, as estimated in the Sixth Power Plan, is used as the market value for both plants. Market value of a power plant may change over time. It may go up or down as the price of electricity changes. It may go down as existing assets at the plant depreciate over time, and it may go up as new investments are made at the plant. Thus, the estimates in this memo are for the first few years of the plant's life.

All taxable property in Montana is assigned to a property class, which determines its assessment ratio, which is the ratio of taxable value to market value. Wind-powered electric generation facilities are in class 14, which is taxed at 3% of market value[1]. Most of the facilities at a coal-fired generation facility will be in class 13, which is taxed at 6% of market value, but the pollution control facilities will be in class 5, which is taxed at 3% of market value. Both facilities may include some class 4 real estate and some class 8 general business equipment, which are taxed at 3% of market value.

Local taxing jurisdictions can give a partial abatement to facilities that meet the definition of new or expanding industry. A new wind farm qualifies, but a new coal-fired power plant does not. If a local jurisdiction grants an abatement, its mill levies apply to 50% of the taxable value for the first five years of the facility's life. After five years, this percent increases by 10% a year until the facility is taxed at its full market value after 10 years.

In Montana, property taxes are levied by the state, by local governments, by local special districts such as fire districts, and by local school districts. The state levies 95 mills to help fund the state's share of local school district budgets and 6 mills to help fund the university system. Local governments, special districts and school districts set their mill levies annually by dividing the portion of their budget that will be funded by property taxes by the total taxable value in the jurisdiction.

Local mill levies vary widely across the state. The low case uses average rural mill levies for Rosebud county, which are among the lowest in the state. The high case uses state-wide average rural mill levies. In most areas where a power plant might be located, either a new coal plant or a new large wind farm would significantly increase the tax base allowing local governing bodies to reduce their mill levies. This effect would be largest in jurisdictions where a small tax base results in high mill levies. Thus, average mills give a better indication of the taxes a new power plant might face than the highest mills in the state.

[1] To qualify, the developer must have paid standard prevailing wages during construction.

Table 4 shows the assumptions behind the range of property tax estimates.

Table 4. Property Tax Assumptions

Market Value		
Wind Farm	$170,000,000	
Coal Plant	$1,260,000,000	
Property Classification and Assessment Ratio		
Wind Farm	Classes 4, 8 and 14, taxed at 3% or less of market value	
Coal Plant	82.5% Class 13, taxed at 6% of market value 17.5% Classes 4, 5 and 8, taxed at 3% or less of market value	
Local Abatement	Low Case	High Case
Wind Farm	none	50%
Coal Plant	none	none
Mill Levies	Low Case	High Case
State	101	101
County and Special Districts	54	175
Schools, District and Countywide	61	210

Corporate Income Tax

Corporate income tax is 6.75% of the part of a corporation's net income that is apportioned to Montana.

The high case assumes that the power plant is built and operated by a company that does business only in Montana so that 100% of its net income is apportioned to Montana, that the power plant is 100% equity financed, and that the company earns a 12% pre-tax return on its investment.

Actual corporate income tax would almost certainly be lower, for a number of reasons. If the power plant were owned by a multi-state corporation, revenue from the power plant would be combined with revenue from the rest of the company's operations. Except in the best years, income from profitable parts of a large company is likely to be partly, or even completely, offset by losses from other parts. If the plant is partly financed with debt, the company will deduct interest payments as a business expense, which will make its taxable income lower than with 100% equity financing. Federal depreciation and amortization schedules, which Montana follows, generally front-load these capital cost recovery deductions, which reduces taxable income in the early years of a plant's life.

The lowest case would occur when the power plant is owned by a multi-state corporation that has losses in other states that more than offset the income from the power plant or when it is owned by a company only doing business in Montana but where accelerated depreciation more than offset net income after interest deductions.

Table 5 shows the assumptions behind the range of corporate income tax assumptions.

Table 5. Corporate Income Tax Assumptions

Low Case	High Case
Parent Company has Zero Taxable Income or Accelerated Depreciation > Net Operating Revenue	100% Montana Company 100% Equity Financed 12% Pre-Tax Rate of Return

If the power plant were owned by a partnership, LLC, or S-corporation, the owners would pay individual income tax rather than corporate income tax, but the range of tax revenue would be approximately the same.