Energy Resource Development
September 2012

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The Energy and Telecommunications Interim Committee of the Legislature (ETIC) agreed to dedicate a portion of their time during the 2011-2012 interim to tracking a variety of issues related to the development of energy resources in Montana.

ETIC members organized site visits to a number of energy-related facilities and heard presentations by a number of developers and researchers to learn more about the generation of energy using different resources and technologies, the high-voltage transmission of electricity to bring electricity from power plants to end-use markets, and the distribution of electricity to end users. Many aspects of the ETIC's efforts in this area were discussed during tours of individual facilities and during meetings with representatives of the energy industry. The focus of the ETIC's work was to learn more about the energy used for the home--electricity, natural gas, propane, etc., and the fuels used for transportation--gasoline, diesel, and aviation fuels.

Members of the 2011-2012 ETIC include: Sen. Alan Olson, R-Roundup, presiding officer; Rep. Tony Belcourt, D-Box Elder, vice presiding officer; Sen. Verdell Jackson, R-Kalispell; Sen. Jim Keane, D-Butte; Sen. Cliff Larsen, D-Missoula; Rep. Robyn Driscoll, D-Billings; Rep. Harry Klock, R-Harlowton; and Rep. Austin Knudsen, R-Culbertson.

The following information offers a snapshot of the ETIC's efforts to learn more about energy development from generation to distribution in Montana.

September 2011

Hydraulic Fracturing Rules

The ETIC learned about new rules regarding hydraulic fracturing. The Montana Board of Oil and Gas Conservation (BOGC) has developed rules requiring disclosure of chemicals used in hydraulic fracturing, a process used in deep-well oil and gas drilling.

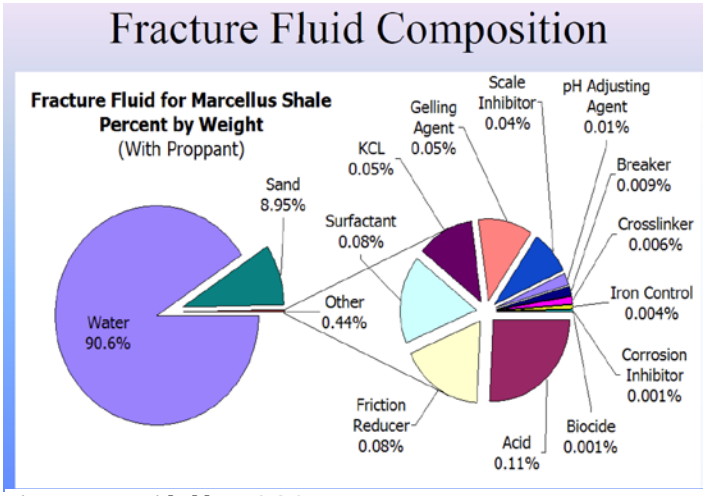

Figure 1: Provided by BOGC

Under the new rules, producers can voluntarily list the chemicals used in hydraulic fracturing with FracFocus, a national website, or disclose the chemicals to the Montana BOGC. In permit applications, well operators provide information about the amount of fracturing fluid that will be used and the trade names of

components of the fluids. Specific disclosures are required on a well-by-well basis after completion. The well operator provides the board staff with the volume and type of fluid used in fracturing, the type and volume of each additive, and the name of each chemical. In both the permit application and completion report, the operator must also provide information on the well design and maximum pressure used during fracturing.[1]

Pipeline Project

ONEOK Partners updated the ETIC on the Bakken Pipeline project. The Bakken Pipeline is a proposed 525-mile natural gas liquids pipeline that would transport raw, unfractionated natural gas liquids (NGLs) from the Bakken south to the Overland Pass Pipeline. The pipeline would originate near Sidney, go through eastern Montana and Wyoming into northern Colorado, and connect with the Overland Pass Pipeline. The Overland Pass Pipeline is a 760-mile NGL pipeline from Opal, Wyoming, to the mid-continent NGL market center in Conway, Kansas.

Figure 2: Map of Bakken Pipeline through Montana. Provided by ONEOK Partners

The Bakken pipeline is needed for takeaway capacity required to transport associated NGLs from natural gas processing plants, according to ONEOK Partners. Currently about 25% to 30% of total natural gas production in the Bakken is being flared, a tremendous loss of value.[2]

ONEOK owns and operates assets in the midstream natural gas and natural gas liquids business. The company reported having 46 employees in Montana, with a 2010 payroll of about $3 million and paying about $400,000 in Montana property taxes.[3]

Montana Operations include:

- about 1,300 miles of natural gas gathering pipelines;
- a 50% interest in 180 miles of interstate natural gas pipelines (Northern Border);
- a rail facility at Sidney; and
- a natural gas processing plant near Baker.

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[1] Information provided by Tom Richmond, Administrator, Board of Oil and Gas Conservation, September 2011.

[2] http://www.oneokpartners.com/~/media/ONEOKPartners/NewsRoom/PressKits/Bakken/Bakken%20Pipeline%20FAQ.ashx

[3] https://leg.mt.gov/content/Committees/Interim/2011-2012/Energy-and-Telecommunications/Meeting-Documents/September-2011/ONEOK.pdf

November 2011

Battery Storage

Zinc Air, a Columbia Falls company that has developed a one-of-a-kind grid energy storage system, appeared before the ETIC in November 2011. Zinc Air has developed the "Zinc Redox" grid storage technology. The company employs about 34 people and is located on U.S. Highway 2 West, north of Glacier Park International Airport.

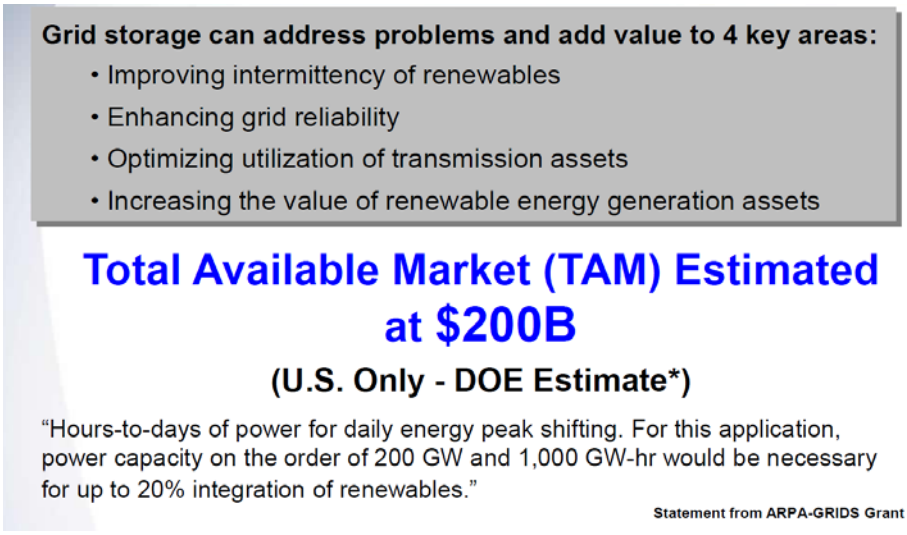

Figure 3: Provided by Zinc Air

Zinc Air Redox Energy Storage Systems are being developed for grid storage applications, like energy peak shifting and better integration of wind and solar energy into the grid. The "battery" technology is designed to address the issues of matching demand with supply and variability.[4]

January 2012

Hydrogen

Hydrogen, according to a growing number of researchers, has an important place in the energy portfolio. Fuel cell technologies for hydrogen conversion to electricity are being developed, and much research is taking place right in Montana. The ETIC heard a presentation by Professor John Peters, who is conducting research at Montana State University-Bozeman. The research is part of an Air Force Office of Scientific Research project. The project is focused on optimizing certain hydrogen production for alternative energy. Researchers are focusing on hydrogen production in algae and bacteria. MSU researchers are studying the microbes of Yellowstone National Park to better understand how they produce hydrogen. Microorganisms produce hydrogen as part of their metabolism and the organisms can be harnessed to produce hydrogen efficiently in controlled environments. "The environments in Yellowstone National Park and the Great Salt Lake represent a wide range of environmental systems that have been implicated in harboring superior biotechnological solutions for hydrogen production."[5]

[4] http://www.zincairinc.com/zinc_redox.php
[5] http://hydrogen.montana.edu/ysmodule.html

May 2012

The ETIC hit the road in May, holding a meeting in Butte on the Montana Tech Campus. The meeting included a number of site visits.

Energy Markets

In Montana, PPL has two primary operating subsidiaries:

- PPL Montana, LLC, which has the capacity to generate about 1,200 megawatts of electricity in Montana; and
- PPL EnergyPlus, LLC, the marketing and trading arm that buys and resells the output of the PPL Montana facilities.

The ETIC learned more about both of these entities during the 2011-2012 interim. In May 2012, the committee visited PPL EnergyPlus and checked out the "trading floor". PPL EnergyPlus manages a retail customer portfolio that is about 240 megawatts, with customers ranging between 6 megawatts and 90 megawatts.

Figure 4: Rose Spear, Director of Trading and Marketing with PPL EnergyPlus, shows ETIC members the company's Butte office.

The price of electricity in Montana that is sold by PPL EnergyPlus to large customers at retail is based on the Mid-Columbia (Mid-C) market, a wholesale energy trading point in central Washington and the closest hub to Montana. The Mid-C prices are aggregated, averaged, and published by several reporting agencies, including both Dow Jones and Intercontinental Exchange.[6]

Transmission and Distribution

While in Butte, the committee also visited the NorthWestern Energy System Operations Control Center. At the center, dispatchers monitor and direct the operations of NorthWestern Energy's transmission system to ensure the grid is operated in a reliable and safe manner.

NorthWestern Energy operates 17,300 miles of distribution lines, 7,000 miles of transmission power lines, about 125,000 transmission poles, and 336 transmission and distribution substations.[7]

[6] http://www.pplenergyplus.com/Wholesale/Electric/products+and+services.htm
[7] http://www.northwesternenergy.com/display.aspx?Page=Company_Fact_Sheet&Item=68

Geothermal Development

Committee members went underground to check out the Orphan Girl and Orphan Boy Mine Geothermal Project Site. The site is part of the Underground Mine Education Center at Montana Tech. Tech is retrofitting the Natural Resources Building on campus and the mines to capture the warm water in the Orphan Boy to heat and potentially cool the building.

Figure 5: ETIC members examine the Orphan Girl and Orphan Boy Mine Geothermal Project Site.

Montana Tech received about $1 million in Recovery Act funding from the U.S. Department of Energy to add the geothermal system to campus. The project began with a feasibility study and included engineering design. Much of the work needed on the project is being done underground.[8]

Figure 6: ETIC Chairman Alan Olson checks out the mine water that will be used for the geothermal project.

Part of the geothermal retrofit includes connecting the Orphan Girl shaft to the Orphan Boy workings. Part of that "connecting" includes blasting through several feet of rock. Members of the ETIC were treated to a blast--from the detonation to the smoky fall-out.

The water in the Orphan Boy Mine is 78 degrees Fahrenheit, and 20 years of mine water pumping at the nearby mine indicates that the water temperatures are stable and suitable for long-term use. “The project will provide an opportunity to demonstrate potential geothermal benefits to Butte and other locations around the country.”[9]

[8] http://www.mbmg.mtech.edu/BiennialReport08/BiennialReport2010.pdf
[9] http://www.mtech.edu/research/newsletter/images/Winter2009-10/Winter2009-10-Newsletter.pdf

Natural Gas Operations

Members traveled to Mill Creek near Anaconda to see the Dave Gates Generating Station. The plant includes three 50-megawatt generating units, with a generating unit consisting of two combustion turbine engines and a common generator. The combustion turbines are similar to those used on commercial airliners.

Figure 7: An example of the turbines used at the Dave Gates Generating Station.

NorthWestern Energy serves 182,100 natural gas customers in 105 Montana communities. The Dave Gates Generating Station was built as a "regulating reserve" plant. It offers flexible capacity and is used for electrical transmission grid regulation. It went online in January 2011.[10]

Figure 8: ETIC members and staff at the Dave Gates Generating Station.

In 2007 the Montana Legislature passed House Bill No. 25, which allowed NorthWestern Energy to add new generation to its rate base, as part of the state's effort to partially reregulate utilities in Montana. The legislation allowed NorthWestern Energy to pursue construction of the plant to meet a growing need for regulating reserve power.

Frac Sand Lab

The Petroleum Engineering Department at Montana Tech includes a Proppant Research Division that is focused on advancing hydraulic fracturing technologies. Part of the work done there includes evaluating material used in the fracturing process. The material required--as much as 4 million pounds per well--is called frac sand, or “fracture proppant”. The sand can be difficult to find, and many in the industry are importing it or relying on a more costly ceramic proppant.

[10] http://www.northwesternenergy.com/documents/millcreek/DGGS.pdf

There is a demand to find new proppant sources, and researchers at Tech are able to analyze the characteristics of different sands and materials to determine if the material can be used for hydraulic fracturing.

July 2012

The ETIC's July meeting was held in Billings at the Montana Board of Oil and Gas Conservation office. The meeting included several tours and was largely focused on aspects of energy generation.

Figure 9: A look at the Corette Plant.

Coal-Fired Power

Montana's electricity market includes coal-fired power plants, accounting for about two-thirds of the state's electricity generation. NorthWestern Energy, which serves 320,000 electric and natural gas customers in Montana, gets a substantial amount of its power from coal-fired power plants—about 60%. Montana currently has four coal-fired power plants, including J.E. Corette in Billings. Montana's plants provide about 911 thousand MWh in net electricity generation—this compares to 1,174 thousand MWh from hydroelectric power.[11]

The J.E. Corette Plant in Billings is a one-unit, coal-fired plant that started commercial operation in 1968. It employs about 35 people and is owned and operated by PPL Montana LLC, a subsidiary of PPL Generation LLC. In Yellowstone County, the plant pays about $3.4 million in property taxes.

Figure 10: ETIC members and guests learn more about plant operations.

It is capable of generating about 153 megawatts. The plant consumes about 700,000 tons of coal per year--or about 20 railcars full of coal per day.

Corette uses low-sulfur coal and a low-nitrogen oxides burner system. The plant uses about one rail car's worth of coal every hour, compared to the Colstrip coal-fired plant, which uses one rail car's worth of coal every five minutes.

[11] http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=MT

Coal Train Traffic

The committee heard from the Yellowstone County Commission and the Missoula City Commission concerning recent decisions related to coal train traffic in Montana. In June of 2012 the Yellowstone County Commission adopted a resolution declaring its support for coal and coal-based power and the expansion of ports along the West Coast to accommodate sales of Montana coal to Pacific Rim nations.

The Missoula City Commission in May 2012 adopted a resolution requesting that the U.S. Army Corps of Engineers conduct a "programmatic environmental impact statement" on the cumulative effects of air pollutants, traffic delays, coal dust, and noise pollution related to the construction of ports for coal exports and related train traffic.

After accepting lengthy public testimony in Billings, the ETIC voted to send a letter to the U.S. Army Corps of Engineers supporting an increase in the export of U.S. coal. The letter encouraged the Corps to prepare individual, site-specific environmental analyses for the export terminal proposals and noted that a programmatic environmental impact statement is inappropriate. The ETIC also sent letters to Montana Rail Link and BNSF Railway Company requesting the companies examine opportunities for reopening abandoned rail lines through Butte and rerouting proposed rail traffic through the community.[12]

Petroleum Refinery

The Phillips 66 Billings Refinery in Billings began operations in 1949 and is an active petroleum refinery. The refinery currently converts crude oil, condensate, and field butane, by various processes, into liquid petroleum gases, gasoline, jet fuel, diesel oil, fuel oils, and petroleum coke.

Pipelines transport most of the refined products to markets in Montana, Wyoming, Idaho, and Washington. The refinery's total capacity is 65 million barrels per day.[13]

The tour focused on the chemistry and business of refining. Officials discussed efforts to reduce emissions from the facility. The refinery has significantly reduced both its CO_2 and SO_2 emissions in the last 20 years. "This is complex," noted a representative from the company. "This plant is configured to take the heaviest, nastiest crude and turn it into something useable."

The committee also viewed the nearly $50 million coke drums that were a controversial part of recent upgrades at the refinery. A coker allows the refinery to refine sour crude oil into gasoline, diesel, jet fuel and other products. The new coke drums became known as the "megaloads" as they traveled Montana's back roads. The drums went by barge to the Port of Lewiston, Idaho, in

[12] http://leg.mt.gov/content/Committees/Interim/2011-2012/Energy-and-Telecommunications/Meeting-Documents/September-2012/CorpsCoal.pdf
[13] http://www.phillips66.com/EN/about/our-businesses/refining-marketing/refining/Pages/index.aspx

January 2011 and arrived in Billings in the spring of 2011. The old coke drums, in operation since the early 1990s, had met their shelf life.

MSTI Review Project

The committee learned more about the Mountain States Transmission Intertie (MSTI) Review Project, a collaboration between county commissioners and local nongovernmental organizations.

MSTI, a 500 kV transmission line project, was proposed by Northwestern Energy in 2009 to transport electricity generated from wind and other sources in Montana to potential customers in Nevada and California.[14] The line would pass through 15 counties in Montana and Idaho. It would start about 5 miles south of Townsend and proceed south to Jerome, Idaho.

At the request of Madison County, a team made up of five nonprofit conservation organizations analyzed the proposed transmission routes and completed an economic analysis of the costs and benefits of the project to counties and landowners. They examined routes and the potential impacts to wildlife, engineering, and community values. The analysis has now been expanded to include all other affected counties.[15]

The MSTI Review Group has included Madison County, Jefferson County, the Western Environmental Law Center, Headwaters Economics, the Sonoran Institute, the Craighead Institute, and Future West. The Montana Department of Environmental Quality and the Bureau of Land Management are continuing to develop the Draft Environmental Impact Statement for the MSTI line, which is expected to be published in 2012.

Sanjel Training Facility

Sanjel is a privately owned oilfield service company based in Calgary, Alberta. Sanjel employs about 3,000 people in 30 field districts, 11 laboratories, 11 regional maintenance facilities, and 3 training centers across the world. [16]

In Montana, Sanjel operates the training and maintenance facility in Billings, a cementing and coiled tubing operation in Chinook, and an operation focused on fracturing,

Figure 11: ETIC members at the Sanjel Training and Maintenance Facility.

[14] http://www.msti500kv.com/
[15] http://www.mstireviewproject.org/
[16] http://www.sanjel.com/

cementing, and acidizing in Miles City.

Sanjel provides two specialized product offerings, pressure pumping and completions. Sanjel has developed custom-designed equipment to facilitate its pumping services. Much of that equipment is maintained in Billings.

Figure 12: Trainees at the Sanjel Training and Maintenance Facility.

The training and maintenance facility in Billings is also used to train Sanjel crews how to repair and operate equipment used in oil operations. Employees spend about 2 weeks at the facility before entering the field. Trainees learn everything from how to chain up the tires on a vehicle in adverse weather to how to repair equipment that's used in the company's operations in Wyoming, Montana, and North Dakota.

After the training, most employees join fracking crews in the field. Many of the trainees will then operate the complex equipment that pumps sand and chemicals into oil wells to stimulate recovery.