Summary

Summary Points:

UNDERSTANDING ENERGY IN MONTANA

A GUIDE TO ELECTRICITY,
NATURAL GAS, COAL AND PETROLEUM
PRODUCED AND CONSUMED IN MONTANA

These lists of points summarize the guide prepared for the Environmental Quality Council. They cover the status of electricity, natural gas, coal, and petroleum supply and demand in Montana and the Montana electric transmission grid. The reader should consult the guide itself for detailed explanations of technical points and to see the data tables that underpin these summaries.

Summary

Electricity Supply and Demand in Montana

- Montana generates more electricity than it consumes. Montana generating plants have the capacity to produce 5,100 MW of electricity. An annual average of 3,000 aMW (1 aMW=8,760 MWh) was produced in the period 1999-2003. During that time, Montana consumption accounted for slightly more than half of production, with Montana sales and transmission losses averaging less than 1,600 aMW. (p. I-1)
- Montana straddles the two major electric interconnections in the country. Most of Montana is in the western interconnection, which covers all or most of 11 states, two Canadian provinces and a bit of northern Mexico. Only about 7 percent of Montana's load is in the eastern interconnection, along with about 2 percent of the electricity generated in-state. (p. I-2)
- Montana is a small player in the western electricity market. The 2003 Montana load (sales plus transmission losses) was equivalent to less than 2 percent of the 90,772-aMW load in the entire western interconnection. Montana generation accounted for over 3 percent of total west-wide generation that year. (p. I-2)
- There are 44 electric generating facilities in Montana. The largest facility is the four privately owned coal-fired plants at Colstrip, which have a combined capability of 2,094 MW. The largest hydroelectric plant is the U.S. Corps of Engineers' Libby Dam with a capability of 598 MW. (p. I-2)
- Two plants have come on line this decade: Montana Dakota Utilities' Glendive #2 43.0 MW natural gas turbine (2003) and Tiber Montana LLC's 7.5 MW hydro plant at Tiber Dam (2004). The only electric generation plants of any size coming on line in the 1990's were two qualifying facilities (QFs): Montana One waste coal plant (41.5 MW) and BGI petroleum coke-fired plant (65 MW). These two combined now account for about 92 percent of the electricity output of QFs in Montana. (p. I-3)
- PPL Montana's facilities, previously owned by Montana Power Company, produced over 30 percent of the total generated in Montana in the period 1999-2003, making PPL the largest generating company in the state. Puget Power was the second largest producer with 18 percent. Federal agencies—the Bonneville Power Administration and Western Area Power Administration—collectively produced 18 percent of the electricity generated in Montana. (p. I-3)

- Montana generation is powered almost entirely by coal (63 percent) and hydro (35 percent) (1995-2003 average). Until 1986, hydro was the dominant source of electric generation in Montana. Over the last 15 years, about 25 percent of Montana coal production has gone to generate electricity in Montana. (p. I-3)
- Montanans are served by 32 distribution utilities: 2 investor-owned, 26 rural electric cooperatives, 3 federal agencies and 1 municipal. (Two additional investor-owned utilities and four additional co-ops based in other states serve a handful of Montanans.) (p. I-4)
- In 2002, investor-owned utilities made 43 percent of the electricity sales in Montana, co-ops 26 percent, federal agencies 4 percent and power marketers 27 percent. (p. I-4)
- Reported sales in 2003 were 12.2 billion kWh. (Unreported power marketer sales may have been around 0.3 billion kWh.) The residential, commercial and industrial sectors each accounted for about one-third of sales. (p. I-5)
- Sales tripled between 1960 and 2000, then dropped by over 15 percent as industrial loads tumbled following the electricity crisis of 2000-2001. (p. I-5)
- The cost of electricity changed dramatically following 2000. The average price per kWh for residential customers was 7.6 cents in 2003, up from 6.5 cents in 2000. The average price per kWh for commercial customers was 6.5 cents in 2003, up from 5.6 cents in 2000; for industrial, the comparable figures are 4.5 cents and 4.0 cents. (p. I-5)
- In 2003, Montana prices averaged 6.3 cents/kWh vs. 7.4 cents/kWh nationally. (p. I-5)
- Plants under construction include Thompson River Co-gen plant, a 16.5 MW coal or biomass-fired fluidized bed plant and Rocky Mountain Power, a 116 MW pulverized coal plant near Hardin. (p. I-6)
- There are no comprehensive estimates of the potential for efficiency improvements. However, it is reasonable to assume potential reductions are in a range around 10 percent. (p. I-7)
- During the electricity crisis of 2000-2001, the Pacific Northwest ultimately reduced its demand by around 20 percent. Most of that came from business suspensions, primarily in response to payments from their electricity providers. This reduction would not be advisable or cost-effective under normal conditions, but does indicate the ability of consumers to change their usage in the face of higher prices, either in terms of what they pay or what they're offered to forego using electricity. (p. I-8)

Summary

The Montana Electric Transmission Grid: Operation, Congestion and Issues

- Montana's strongest electrical interconnections with other regions are: the Colstrip 500 kV line which connects as far as Spokane and then into the BPA northwest grid; the BPA 230 kV lines heading west from Hot Springs; PacifiCorp's interconnection from Yellowtail south to Wyoming; WAPA's DC tie to the east at Miles City; and the AMPS line running south from Anaconda parallel to the Grace line to Idaho. (p. II-1)
- The western United States is a single, interconnected, and synchronous electric system. It is not closely connected with the eastern part of the country. The interconnections are only weakly tied to each other with AC/DC/AC converter stations. One such station connecting the eastern and western grids is located at Miles City, with 200 MW capability in either direction. Also, a limited amount of additional power can be moved from one grid to the other by shifting units at Fort Peck Dam. (p. II-1)
- The transmission system is managed differently than the way it operates physically. (p. II-3)
- The physical reality of electricity (electrons) is that power sent from one point to another flows over all transmission lines in the interconnected system. Actual flows at any time are the net result of all transactions, and are the same for any given pattern of generation and load, regardless of transactions. (p. II-4)
- Management of the grid is different from where the electricity actually flows. Grid management requires a single "contract path" for each scheduled transaction. A "contract path" is permission to use a route across separately owned transmission systems from a point to origin to a point of delivery. It does not have to be the major route taken by the actual power flows that occur, which could happen over multiple routes. (p. II-4)
- Power flows are managed on a limited number of "rated paths." Each path consists of a number of more-or-less parallel transmission lines that together can be constrained under some patterns of generation and loads. (p. II-6)
- Path ratings are set to provide reliability by ensuring sufficient redundant capacity to allow for outages of some of the facilities comprising the path. Path ratings may be reduced if reliability standards are tightened. The West of Hatwai path currently has a

rating of 2800 MW east to west. The Montana-Northwest path has a rating of 2200 MW east to west and 1350 MW west to east. (p. II-6)

- Schedules are only accepted up to the limit of rated capacity. Netting of schedules is allowed only for a single scheduler. Netting against other's schedules is not allowed. (p. II-5)
- Scheduling rights across rated paths are generally owned by the transmission owners and holders of long-term contracts for power delivery. (p. II-7)
- In 1996, FERC ordered transmission owners to separate marketing and transmission operations and to maintain web sites ("OASIS" sites) on which "available capacity" is posted and offered for use by others. "Available capacity" is total transfer capacity less committed uses and existing contracts. Almost no available capacity ever is listed on paths from Montana to the West Coast. (p. II-7)
- Non-firm access is available on uncongested paths but only at the last minute. (p. II-7)
- A path may be fully scheduled, and therefore congested, even though the actual flow may be considerably less than the path capacity. For example the West of Hatwai path was deemed congested and some schedules had to be rejected 8 percent of the time during a period in 2001 during which the path was never actually loaded more than about 90 percent of capacity. (p. II-8)
- FERC is promoting independent organizations ("Regional Transmission Organizations" or RTOs) to operate and manage the transmission grid. RTO management would allow for regional management of path congestion and scheduling for better utilization and availability of the transfer capacity of the grid. (p. II-9)
- An organization—Grid West—has been proposed to conduct the RTO negotiations in the West. (p. II-10)
- Issues involved in the amount and availability of capacity include the need of utilities to withhold capacity because of uncertainty, the way reliability criteria are set, the limited number of hours that transmission paths are congested, and the challenges and costs of siting and building new transmission lines. (p. II-10)
- In 2004, the Governors of Utah and Wyoming convened the Rocky Mountain Transmission Study (RMATS) as a followup to transmission studies sponsored by the Western Governors' Association. RMATS was given the task of identifying transmission that would enable the development of coal and wind generation resources in the Rocky Mountain west and carry the power to markets on the West Coast, California, and the Denver area. (p. II-14)

Summary

Natural Gas in Montana: Current Trends, Forecasts and the Connection with Electric Generation

- Alberta provides the largest supply of natural gas for Montana customers and will likely continue to do so in the years to come. (p. III-1)
- Most gas produced in Montana comes from the north-central portion of the state. The bulk of what Montana produces is exported. In-state gas production has been increasing in recent years, standing at 86.1 billion cubic feet in 2003. (p. III-1)
- Recent Montana natural gas consumption has averaged 60-70 billion cubic feet per year. Future Montana natural gas consumption is expected to increase slowly at less than 1 percent annually. (p. III-4)
- Over the past two decades, a number of changes in energy markets, policies, and technologies have combined to spur an increase in the total usage of natural gas in the U.S. These include deregulation of the natural gas industry starting in 1978, air quality regulations that favor natural gas, deregulation of wholesale electricity markets, improvements in exploration and production technologies, and investment in major pipeline construction expansion projects. (p. III-5)
- Three distribution utilities and two transmission pipelines handle over 99 percent of the natural gas consumed in Montana. The distribution utilities are NorthWestern Energy, Montana-Dakota Utilities Co. (MDU), and Energy West of Great Falls, which uses NWE for gas transmission. NWE and the Williston Basin Interstate pipeline (affiliated with MDU) provide transmission service for in-state consumers and export Montana natural gas. (p. III-6)
- Northwestern Energy is the largest provider of natural gas in Montana, serving about 162,000 customers in the western two-thirds of the state. Montana-Dakota Utilities Co. is the second largest, serving the eastern third of the state. (pp. III-6, III-8)
- The delivered price of natural gas to homes and businesses includes the wellhead price of gas (price of the gas itself out of the ground), plus transmission and delivery fees, plus other miscellaneous charges. Wellhead prices are set in a continent-wide market. The natural gas transmission and delivery fees are set by utilities and/or pipelines, under regulation by state and federal agencies. (p. III-10)

- The wellhead price for natural gas in Montana is based on the AECOC index. This index, named after the AECO C storage hub in Alberta, is the equivalent in this area of the New York Mercantile Exchange. The wellhead price of Alberta natural gas is determined largely by the North American free market, with adjustments for transportation costs. (p. III-10)
- Natural gas customers in Montana and in the Pacific Northwest have historically paid relatively low gas rates compared to the rest of the U.S. In the past few years, however, gas prices across this region have risen to be more in line with the rest of the nation. In 2004, the prices are above $8.00/dkt. (p. III-11)
- The average U.S. wellhead price of gas as of May 2004 was about $6.00/dkt which is well above historical norms. These prices are expected to stay high until at least the end of 2004. (p. III-11)
- Although average gas prices are expected to increase slowly in the long run, Montanans may be subject to increasing gas price volatility from extreme or unexpected events. The increasing convergence of the electricity and natural gas markets means that extreme events like the California energy crisis are likely to affect both electricity and gas markets simultaneously. (p. III-13)
- Recent high natural gas prices in the past few years point out three lessons for Montana. First, our natural gas prices are affected by a number of factors beyond any one entity's or state's control. Second, the growing use of natural gas for electricity generation may lead to high and volatile gas prices not experienced before in Montana. Finally, to the extent that the western United States depends on natural gas for new electricity generation, the price of natural gas will be a key determinant of future electricity prices. (p. III-15)

Summary

Coal in Montana

- Montana is the sixth largest producer of coal in the United States, with over 37 million tons mined in 2002. Almost all the mining occurs in the Powder River Basin south and east of Billings. (p. IV-1)
- In 1958, after almost a century of mining, Montana production bottomed at 305,000 tons, an amount equivalent to less than 1 percent of current output. As Montana mines began supplying electric generating plants in Montana and the Midwest in the late 1960's, coal production jumped. Production in 1969 was 1 million tons; ten years later, it was 32.7 million tons. Since the end of the 1970's, production has increased gradually to around 40 million tons. (p. IV-1 and 2)
- Over the past decade Montana has produced a little less than 4 percent of the coal mined each year in the U.S., more or less maintaining its share of the national market. In comparison most eastern states lost market share during this decade, primarily to Wyoming. Western states other than Wyoming followed a path similar to Montana, more or less maintaining market share. (p. IV-2)
- The price of Montana coal averaged $9.27 per ton at the mine in 2002, including taxes and royalties. The price of coal has been on a downward trend since the early 1980's, when the average price of coal peaked at $14.22 per ton ($22.67 in 2002 dollars). By 2002 that price had fallen 60 percent in real terms. The decline in Montana prices mirrors the decline in prices nationally. (p. IV-2)
- In 2001 over 55 percent of Montana coal came from federal lands and under 15 percent from reservation lands. (p. IV-3)
- Montana had eight coal mines in operation in 2003. The largest was Westmoreland's Rosebud Mine at Colstrip, producing 10-11 million tons per year. No major new mines have opened since 1980, though the West Decker and Spring Creek mines have expanded significantly. (p. IV-3)
- Westmoreland is the largest producer in Montana, accounting for 47 percent of 2001 production. Kennecott is the second largest, accounting for 24 percent of coal production outright and holding a half-interest in mines producing an additional 22 percent of Montana coal. (p. IV-3)

- 2001 marked the end of over 40 years of utility ownership of operating coalfields in Montana. Utility-owned production had been substantial in past years. (p. IV-3)
- About 95 percent of the coal consumed in Montana is used to generate electricity. Montana coal consumption has been more or less stable since the late 1980's, after Colstrip 4 came on line. (p. IV-3 and 4)
- Almost all of Montana coal production is used to generate electricity. In recent years, about three-quarters of production has been shipped by rail to out-of-state utilities and the rest burned in-state to produce electricity, with over half that electricity going to out-of-state utilities. (p. IV-4)
- Over the last decade, Michigan, Minnesota, and Montana have each taken about a quarter of all the coal produced in Montana. The rest has gone to numerous other states. (p. IV-4)
- The Montana industry, like the coal industry nationwide, has become more productive, with the number of employees dropping even while the amount of coal mined increased. (p. IV-4)
- Taxes on coal, despite decreases from historical highs, remain a major source of revenue for Montana, with $30.1 million collected in state fiscal year 2003, about one-third in nominal terms the amount collected in 1984. Coal severance tax collections dropped due to changes in the tax laws that began with the 1987 Legislature and due to the declining price of coal. Production has risen modestly since the cut in taxes. (p. IV-4 and 5)
- Montana's output is dwarfed by Wyoming's, which produced 34.1 percent of the country's output in 2002. This is ten times as much coal as Montana produced. This is due to a combination of geologic, geographic and economic factors that tend to make Montana coal less attractive than coal from Wyoming. (p. IV-5)

Summary

Petroleum in Montana

- The first oil wells in Montana were drilled in 1889 near Red Lodge, but weren't very successful. Cat Creek, near Winnett, was the first commercially successful field discovered in Montana (1920). (p. V-1)
- Montana production peaked in 1968 at 48.5 million barrels. In 2003, production was 19.3 million barrels. (p. V-1)
- The average price of Montana crude peaked in 1981 at almost $35 per barrel. (p. V-2)
- Petroleum pipelines serving Montana consist of three separate systems. One bridges the Williston and Powder River basins in the east and the other two link the Sweetgrass Arch, Big Snowy and Big Horn producing areas in central Montana. All these systems also move crude oil from Canada to Montana and Wyoming. (A fourth—Express—primarily carries Canadian crude through Montana.) (p. V-2 and 3)
- In recent years, around 90 percent of crude oil production has been exported. (p. V-3)
- Montana has four refineries, with a combined capacity of 181,200 barrels/day: ConocoPhillips (60,000 bbl/day) and ExxonMobil (58,000 bbl/day) in Billings, Cenex (55,000 bbl/day) in Laurel, and Montana Refining (8,200 bbl/day) in Great Falls. (p. V-4)
- Montana refineries now use around 60 million barrels of crude a year. In the last decade on average, less than 5 percent of that came from Montana crude, with around 75 percent from Canada and around 20 percent from Wyoming. (p. V-4)
- The four refineries provided almost all of the petroleum products consumed in Montana. Beyond that, around 55 percent of the liquid fuel produced at the refineries is exported. (p. V-5)
- In 2003, 23 million barrels of product were shipped out of state, with nearly half heading south and the remainder split roughly between east and west. (p. V-5)
- Petroleum product consumption in Montana peaked at 33 million barrels in 1979. Present consumption is around 30 million barrels per year. (p. V-5)
- The transportation sector is the single largest user of petroleum. In 2001, 38 percent of petroleum consumption was in the form of motor gasoline and 28 percent was distillate, mostly diesel fuel. (p. V-5)

- Gasoline use peaked at over half a billion gallons in 1978, dropped and then has almost returned to that level in 2002. (p. V-6) Diesel use is at an all-time high of about 350 million gallons.
- Fuel use shows a cyclical rise and fall through the year, tending to rise during the summer months and taper off during the winter. The winter trough in fuel use is a third lower from the summer peak. (p. V-6)
- Gasoline prices (not adjusted for inflation) are at all-time highs in 2004. Average price in March was $1.687/gallon and has climbed about $0.30/gallon since then. (p. V-6)