Energy data archived, organized, integrated and accessible

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Outline of Presentation

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- Downloadable Data and the Interactive Map
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- Oil and Gas
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Much of the information in the energy map product is based on published data that can be found elsewhere, but is not assembled together in one place in a way that clarifies what the energy potential looks like.

For the WLCI long-term, science-based effort, a comprehensive inventory of geologic energy data needs to be available as an online resource so that the information is easily accessible in Geographic Information Systems (GIS) and other research-related software, as well as by a variety of disciplines.

The Wyoming Landscape Conservation Initiative (WLCI) focuses on conserving world-class wildlife resources while facilitating responsible energy development.
• The energy map is built using GIS techniques and expertise.

• The energy data are provided in a geodatabase and interactive maps; pertinent layers are displayed on a PDF map.

The work completed to date focuses primarily on the electrical power sources of coal (including coalbed methane), and wind energy (Biewick and Jones, 2012), published as Part A.

• Planned for Part B is oil and gas, oil shale, uranium, and solar data; as well as infrastructure associated with exploration, production and development; and the extent and nature of restrictions or impediments to energy-resources development.
Electrical Energy Sources: Coal and Wind

as of November, 2010 (Biewick and Jones, 2012)

- roughly 79 percent coal (3,024 MW)
- roughly 18 percent wind (674 MW)
- roughly 3 percent hydro (100 MW)
Kemmerer Mine
Ranked 40th
4.8 million short tons (EIA, 2010)

Powder River Basin Mines
ranked 1st – 8th, 12th, 13th, 26th, 35th (EIA, 2010)
Combined 428.3 million short tons (roughly 97 percent)

Bighorn Basin
Wind River Basin
Greater Green River Basin

Surface Coal Mine
In 2010, about 14 million short tons of coal were produced from mines within the WLCI area (EIA, 2010)

Wyoming produced 443 million short tons of coal in 2010; almost 41 percent of the coal mined in the United States (U.S. Energy Information Administration, 2011a).

From U.S. Energy Information Administration (EIA), 2010
Throughout much of the Cretaceous Period, a good portion of the area that is today Wyoming was at or near sea level. The climate was tropical to subtropical and a vast seaway occupied the Western Interior of North America. The body of water is known most commonly as the Western Interior Cretaceous Seaway. Vegetation grew in coastal wetlands bordering the seaway, and extensive deposits of organic material accumulated in lower coastal plain depositional settings (Roberts and others, 1995).
Over time, the seaway retreated, and marine and coastal-plain environments became restricted to areas north and east of Wyoming, in what is now North and South Dakota. During the Paleocene Epoch (about 65 to 56 million years ago), wetlands in Wyoming developed in low lying floodplains and along fluvial corridors.
The sedimentary basins in Wyoming contain some of the largest fossil fuel deposits in the United States (U.S. Energy Information Administration, 2010). These basins developed throughout the Late Cretaceous-early Tertiary during the Laramide orogeny. Uplift during the Laramide orogeny divided the area into structural basins and intervening highlands.

Dinosaurs became extinct at the end of the Cretaceous Period.

Earliest evidence of complex forms of animal life.
Great volumes of erosional debris were carried from the uplands by rivers and streams and deposited in the subsiding basins. These sediments buried and preserved the organic material, where it eventually was transformed into oil, gas, and coal.
Some coals contain enough gas to be potentially economic. In 2002 and 2003, the USGS assessed coalbed gas resources in the Southwestern Wyoming and the Wyoming Thrust Belt Provinces, and estimated a mean of 1.89 trillion cubic feet (TCF) of undiscovered coalbed gas in seven coalbed gas assessment units (Kirschbaum and others, 2002; 2004). Although these Assessment Units (AUs) extend beyond the boundary of the WLCI, 74 percent of the area covered by these AUs is within the WLCI.

According to the U.S. Bureau of Land Management, 2011, no new wells had been drilled since 2008 at the Atlantic Rim. The departure from the predicted drilling rate is generally attributed to the decline in natural gas prices, and wells that are not economical to operate at current natural gas prices have been shut-in or temporarily abandoned.
One of the most favorable locations for wind-power development in the Nation is located in southern Wyoming. Across southern Wyoming from the Utah border on the west to the Nebraska border on the east, a gap in the Rocky Mountains channels strong winds generated from across the plains, making this area ideally suited for wind-power development (U.S. Energy Information Administration, 2011b).

The wind-resource map shows the predicted mean annual wind speeds at an 80-meter (m) height. Utility-scale, land-based wind turbines are typically installed between 80-100 m. Areas with annual average wind speeds around 6.5 m/second (s) and greater at an 80-m height are generally considered to have a resource suitable for wind development.
In 2010, Wyoming ranked second (only to Texas) in natural gas marketed production of 2.3 TCF (U.S. Energy Information Administration, 2011b). Southwestern Wyoming has 15 of the Nation’s largest oil and gas fields, including the Pinedale (third largest) and Jonah (seventh largest) natural gas fields (U.S. Energy Information Administration, 2009).

Fogarty Creek – 14th largest
Powder River Basin – 17th largest
Lake Ridge – 19th largest
Pinedale – 49th largest (oil)
Click on this map graphic to open the historical drilling activity slideshow. Press Esc key to return.

The most recent USGS assessments of the potential for undiscovered oil and gas estimate combined resources of a mean of 85.8 TCF of undiscovered natural gas, a mean of 264 million barrels of undiscovered oil, and a mean of 2.7 billion barrels of undiscovered natural gas liquids, most of which are in the Southwestern Wyoming Province (Kirschbaum and others, 2002; 2004; Dyman and others, 2006).
The Eocene Green River Formation contains the largest known oil shale deposits in the world. Wyoming’s oil shale deposits are generally lower grade and less favorable for commercial extraction than those in Utah and Colorado.

Total in-place resources are estimated at 1.44 trillion barrels of oil (Johnson and others, 2011).

There is, at present, no economic method to extract oil from the Green River Formation oil shale. A ton of oil shale may produce about one third of the energy as a ton of coal, it requires temperatures ranging from 280–400 degrees C to extract the oil from the shale, and there are additional environmental problems as well (Johnson and others, 2009).
The State of Wyoming is a transportation crossroads for Canadian crude oil imports and local Rocky Mountain production flowing to Midwest and Mountain markets in the United States (U.S. EIA, 2011b). A major pipeline corridor that extends across the WLCI area and is roughly parallel to U.S. Interstate 80 transports the majority of Wyoming's gas supply from large fields to the north and the south, to in-state and out-of-state markets in the Midwest and California. Mapped pipelines, oil refineries, and natural gas processing plants are from the oil and gas fields map of Wyoming (DeBruin, 2007). Oil produced in the area is processed both out of state and at the refinery in Sinclair, Wyoming (DeBruin, 2007).
Solar-resource map products provide visual presentations of the solar resource and can be used to identify areas rich in solar resources within the WLCI. The solar-data layer included in the interactive map provides monthly average and annual average daily total solar resource averaged over surface cells of 0.1 degrees in both latitude and longitude, or about 10 kilometers (km) in size (U.S. Department of Energy, National Renewable Energy Laboratory, 2010b).
References Cited


