PINE MOUNTAIN REGIONAL INDUSTRIAL PARK
BELL COUNTY

ENERGY PROJECT SITE SUITABILITY
2009

Kentucky
Department of Energy Development and Independence
Energy and Environment Cabinet
Commonwealth of Kentucky
FOREWORD

On behalf of the Pine Mountain Regional Industrial Development Authority, the Cumberland Valley Area Development District submitted this site for evaluation for potential development as an alternative energy facility. The site was evaluated against preliminary criteria which identifies characteristics beneficial for development of a wind, solar, biomass, nuclear, or coal-to liquid (CTL)/coal-to-gas (CTG) facility. This site benefits from a location in the Eastern Kentucky Coal Fields, access to substantial water resources and flexible transportation options.

Cover photo (2007) - Proposed development site
The Cumberland Valley Area Development District, on behalf of the Pine Mountain Regional Industrial Development Authority (PMRIDA) representing Bell, Harlan, Letcher, Whitley and Knox Counties, has offered the Pine Mountain Regional Industrial Park property to be evaluated as a potential energy facility. The development of an energy facility, whether for CTL/CTG, wind, nuclear, solar or biomass, must consider basic common factors which include assets like access to transportation, general topography, proximity to public access areas, and available utilities.

**GENERAL SITE CONSIDERATIONS**

**Ownership**
The surface and coal under the property are owned by PMRIDA; oil and gas are owned by Asher Land & Minerals, LTD.

Aerial photograph of development site
Size
The site consists of approximately 500 acres located about 7 miles to the southeast of Pineville, Bell County, in the area known as Hances Ridge (United States Geological Survey (USGS) Varilla, Kentucky Topographic Quadrangle). The proposed site is a former surface mine that was developed utilizing drag lines. Mine spoil has been returned to the ridge to form a fairly flat development area.

Topography
Of the 500 acres offered, over 300 are considered appropriate for development. Mining and reclamation are completed at the site, and mine spoil has been replaced in depths ranging from 80 to 130’ with little compaction or engineered fill. Significant ground work or special foundation design will be necessary to address the uncompacted fill. A preliminary geotechnical study has been conducted by Stantec (formerly Fuller, Mossbarger, Scott & May) to help determine what the approach and cost will be to support development of a facility at this site. The study has identified spoil depths at the test site of up to 130’ with the overburden consisting of a fairly consistent mix of soils, rocks and boulders, appropriate for a reclaimed surface mine site.

Floodplain and Wetlands
The site is not within the floodplain because of its location along a ridge, and it is several hundred feet above the streams and rivers in the area. The elevation at the site is approximately 1,800’ Above Mean Sea Level (AMSL). The Cumberland River, located at the base of the hill, has an elevation in this area of approximately 1,140’ AMSL. No wetlands are documented within the development site. A pond of several acres is located in the north end of the development area.
Site Hazards
Environmental databases were reviewed to determine if there is regulatory evidence that the site or nearby property has been impacted by environmental issues. According to a 2008 FirstSearch Technology Corporation Environmental Database Report, the Pine Mountain Regional Industrial Park nor any other sites within a designated search radius were identified on any of the environmental databases searched. The Environmental Protection Agency’s (EPA) Enviromapper also indicates that there are no hazardous facilities within five miles of the site. The site sponsor has stated that there are no hazardous or radioactive materials and wastes at the site. There are also no landfills on the site or adjacent to it. No identified state, county, or municipal zoning restrictions apply to the area.

Oil and Gas Wells
The surrounding area is used for oil and gas exploration and mining with active and reclaimed mines. The site is ringed with gas wells and gathering lines. The site developer may have to relocate some gathering lines while developing a CTL/CTG, nuclear, solar, or biomass facility. No residential development was noted during site observations.
Recently installed well - drilled to a depth of over 5,000'

**Sensitive Areas**

The proximity of non-attainment areas and Class I Visibility Areas to the site was examined for potential impacts to air quality or limitations on a required air permit for a CTL/CTG or biomass facility. The nearest non-attainment area for air pollutants is the Knoxville, Tennessee area, which is listed as non-attainment for 8-hour ozone and PM 2.5. This area is less than 50-miles distant to the south. The site is also approximately 70-miles northwest of Great Smoky Mountain National Park and 140-miles east of Mammoth Cave National Park, the two Class I Visibility Areas closest to the site.

State water data was searched to determine if designated impaired streams in the area might affect discharge requirements for an energy facility. The Cumberland River at this location is not on the 303(d) List of Surface Waters for any impaired uses or habitats of threatened/endangered species. The use designations for the Cumberland River in accordance with 401 KAR 10:026 are warm water aquatic habitat, primary contact
recreation, secondary contact recreation, and drinking water source. There are no public water intakes within 21 miles downstream of the site.

Siting considerations for any energy facility include the presence of Threatened and Endangered (T&E) species in the area, the presence of significant cultural or historical resources in and around the project area, and proximity to public access areas and airports. The Cumberland Gap National Historic Park and Pine Mountain State Park are located within 5-miles and 10-miles, respectively, of the proposed site. Additional investigation may be required to characterize and determine or mitigate the impact of development at the site. No other public access areas, such as trails or nature preserves were identified in the area. The nearest airport is the Middlesboro Bell County Airport for general aviation, which is located at a distance of 10-miles. The nearest commercial/passenger airport is the McGhee Tyson airport located in Knoxville, Tennessee. The height and activity of required equipment for CTL/CTG or an alternative energy facility can present a hazard to air traffic.
Listings for National Register Properties, National Register Districts, and Inventoried (potentially eligible) Sites were reviewed and no historic, eligible or potentially eligible sites were identified at or within 100 meters of the project area.

The Blackside Dace (fish) and the Gray Myotis (bat) have both a Federal and Kentucky status of threatened and have been documented on the Varilla topographic map. The site sponsor reported none were captured during field testing for an Environmental Assessment for this site. Species listed as endangered by the Kentucky Fish and Wildlife (F&W) service include Bachman’s sparrow, the brown creeper and the crayfish. Species listed by Kentucky F&W as threatened include the Blackburnian warbler, common raven, eastern small-footed myotis (bat), golden wing warbler and the northern harrier. It is unlikely that any critical habitat will be disturbed as the site is a former surface mine. Water discharge may be carefully monitored to avoid impacting the blackside dace and crayfish. These issues may require additional investigation and/or planning associated with development activities.

### Geological Assets

Siting considerations for a biomass or CTL/CTG process must take into account available geological assets for potential sequestration. Analysis by the Kentucky Geologic Survey (KGS) ranked the geologic assets for the site as fair. The following graphic depicts geologic assets within a 15 mile radius of the site, indicating substantial development of both oil and gas in the region. The site is labeled 2.02 on the graphic map. Devonian shale is present with the average depth to the top of this structure being about 3,500’. The average depth to the Knox, the primary sequestration target in the area, is identified as about 6,600’. Deep, un-mineable coal beds are not identified in the immediate area. Both deep (>2,500’) and shallow (<2,500’) oil fields are present within 20 miles of the subject site, providing a potential resource for enhanced oil recovery by CO₂ injection in the area.

The proximity of faults to a site may impact the development of a nuclear, biomass, or CTL/CTG facility. A substantial fault system is identified both north and to the west of
the site. Based on mapping from the KGS, the seismic risk at the proposed site is quite low.

Utilities

Based on information from PMRIDA, potable water and sewer are not currently available. Potable water is available along US 119 for domestic service, but supply is not large enough to support an energy facility. Natural gas and basic electrical service are available at the site. Broadband internet access provided by BellSouth and Worldwide Gap is available in the County.
Transportation

Road access is essential for any large industrial facility and particularly so for an energy facility that brings in its fuel or trucks out its product. Roads are constructed into the site although interior roads will need to be developed. Current access to the site includes haul roads, and KY 987, which is not listed as a State maintained coal haul route. The primary access is by a new bridge providing access over the Cumberland River from US 119, a paved road listed as a coal haul road, making the site accessible directly from US 119 without using any minor State or County routes. Recent improvements have enhanced turning sight distance at the US 119 and Industrial Park Access Road intersection.

Access bridge from US 119 across the Cumberland River and CSX main rail line

Although not a significant siting consideration for a nuclear, solar or wind facility, a biomass or CTL/CTG facility will require several transportation options due to the
substantial feedstock required for these technologies. Coal or other material transport by rail is not currently directly accessible to the site; however, PMRIDA is in discussions with CSX about the development of sidings and a rail load out along the existing track north of the development site. An engineering report addressing rail siding design is included with this report. Coal or other materials would have to be belted or trucked from the track up to the development site. An existing coal handling facility exists at Calvin, approximately 2-miles to the west of the site. No barge access is available at the proposed site or in the surrounding vicinity.

Transmission
Any energy facility will require access to electric transmission points. A 69kV line should be an adequate capacity to carry generated power from a solar facility in Kentucky. A nuclear, biomass, wind or CTL/CTG facility would require access to larger electric transmission points. The closest existing substation is the Calloway substation, located about 3.5 miles to the northeast. In addition, the site sponsor reports that Kentucky Utilities previously purchased a tract of land at the site for the purpose of
constructing a substation. Large voltage (161kV and 345kV) transmission lines from E-ON – Kentucky Utilities, AEP and TVA are located approximately 5 miles north of the site near Cary and converge at a significant substation area approximately 10 miles to the northwest of the site. A 69 kV line crosses the property north of the development site and may provide a route to access high voltage power and transmission. Consultation with E-ON -Kentucky Utilities, the utility supplying service to this area, would be required to determine how the site will be able to access high voltage lines.

Natural gas is used as a feedstock and fuel in CTL/CTG and for some biomass facilities, making access to a supply important. Additionally, if the facility makes synthetic natural gas, access to a transmission pipeline will be important in getting products to market. According to representatives from Asher Land & Minerals, there are several gathering gas pipelines around the site. The sizes of these lines were not determined, but following the industry standard, these lines should be small in diameter. A Delta Natural Gas 6 inch line is located in the area, serving the Kettle Island - Pioneer gas storage area.

**Water Supply**

Available water supply is a critical project component for the development of a CTL/CTG, biomass or nuclear facility. The Pine Mountain Regional Industrial site is in the Upper Cumberland River Basin and the Hydrologic Unit Codes (HUC) 11 at the site is 05130101080. The Cumberland River lies at the base of the hill, one to two miles northwest of the center of the development site, at the location of the access bridge from US 119. The annual flow of the Cumberland River at this location is 525 million gallons per day (MGD). The low-flow 7Q10 is 14.9 MGD and the low-flow 7Q2 is 30.4 MGD for the Cumberland River at this location. The low-flow 7Q10 is the lowest mean flow during seven consecutive days over a ten-year period. The low-flow 7Q2 is the lowest mean flow during seven consecutive days over a two year period. Station 03401000 at Harlan is the nearest USGS gauging station and is 45-miles upstream from the site. The lowest annual mean flow at the station during the last ten years is 271 MGD. The Cumberland River should provide adequate raw water supply for a
CTL/CTG facility, which will need in excess of 2,500 gallons per minute (gpm) or 3.6 MGD for a facility making 10,000 barrels of liquid fuel per day or for a biomass facility that may have cooling water needs. The Cumberland River may also provide the minimum adequate raw water supply for a nuclear facility, which would need in excess of 8,000 gpm or 11.5 MGD for cooling purposes. Evaluation of downstream uses and commitments for the Cumberland River would be required in order to reliably determine if adequate water would be available for a nuclear facility. As the facility expands, the water needs will expand as well, making on-site storage and the identification of additional water supply an important issue related to that potential expansion. Holding basins from former mining activity located around the property may provide an opportunity to retain excess water on site to assist with expanded needs.

Looking across development site towards Pine Mountain

**Workforce Availability**

Development of a CTL/CTG, biomass, or nuclear facility would require access to an adequate supply of construction and skilled labor. The labor market area for the proposed site would include Clay, Leslie, Harlan, Whitley, Bell, and Knox counties in Kentucky, Lee County in Virginia and Claiborne and Grainger counties in Tennessee.
Based on information developed by the Kentucky Economic Development Cabinet in October 2008, these nine counties have a civilian workforce of approximately 90,000.

![Bell County labor market map]

Source: [www.thinkkentucky.com](http://www.thinkkentucky.com)

<table>
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<th>Civilian Labor Force</th>
<th>Bell County</th>
<th>Labor Market Area</th>
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<td>Unemployment Rate (%)</td>
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Source: U.S. Department of Labor, Bureau of Labor Statistics

**Other General Characteristics**

The proximity to military sites was reviewed in order to consider the potential impact of an energy facility to military training routes or long range radar. Based upon information produced by the Federal Aviation Administration’s Department of Defense Screening Tool, the proposed site is greater than 5 miles from any military site or long range radar.
Atmospheric extremes, such as tornadoes, are capable of structurally damaging a facility and must be considered particularly during siting for a solar, nuclear, or wind facility. Based upon Federal Emergency Management Agency mapping, the site is at a low risk for tornado activity.

**TECHNOLOGY SPECIFIC CONSIDERATIONS**

**CTL/CTG**

In addition to the common factors described above for energy site development, unique factors specific to a particular technology must be considered. For a CTL/CTG facility, access to coal resources is important. For this proposed site, coal resources are adequate, although transportation would be limited to road until rail access is developed or cross-county conveyor belting is established. The Eastern Kentucky Coal Field covers approximately 10,500 square miles and contains approximately 51.9 billion tons of remaining resources. Bell County has an annual production of approximately 1.5 million tons per year with adjacent Harlan County producing more than 5 million tons annually. In May 2007, regional offices of the Kentucky Office of Mine Safety and Licensing listed 19 active mining operations in Bell County and 59 operations in adjacent Harlan County.

**Solar**

Adequate solar radiation is critical to the successful generation of solar power. A successful site should be relatively free from land cover, and not within a mile of a corporate city boundary. The Pine Mountain Industrial Park has an average direct normal solar radiation of 3.56 KWh/m²/day and an annual solar radiation for two-axis flat plates of 5.89 KWh/m²/day. Based upon this average solar radiation, too much cloud cover and haze is present to be effective as a large scale facility. Due to former coal mining operations on the property, the site is free of trees or other land cover that could impact a solar facility. Solar installations in large mass can be a visual distraction to local communities although this site is greater than a mile from an urban community.
Wind

The most critical component for a successful wind facility is adequate and consistent wind speed. In order to generate enough power to be a utility class facility, a mean average wind speed at 60 meters of 5.6 meters per second (m/s) or greater is required. Information obtained from AWS Truewind, indicates that the average wind speed at 60 meters for the site is 3.87 m/s. Without adequate wind speed, other factors, such as foundational concerns, potential visual impacts, telecommunication interference, impacts to birds and bats, as well as operational concerns such as ice shedding, noise, blade drop and throw, and flicker are moot. Wind speed measurements to accurately assess the available resource at any potential development site would be required prior to final planning.
Biomass

An adequate feedstock supply environment includes available crop residues, animal manure, forest residues from former silviculture or clearing, primary and secondary mill residues, urban residues (i.e., wood scraps from local business such as lumberyards), landfill gas, domestic wastewater, or switchgrass. Information obtained from the National Renewable Energy Laboratory indicates that the total biomass available within Bell County is 25,850 tonnes/year. Biomass in Bell and its surrounding Counties is 424,551 tonnes/year. Depending upon variety and volume, these supplies (<500,000 tonnes/year) may or may not provide an adequate feedstock source. Analysis of the potential in the area to grow feedstock specifically for a biomass facility should also be part of the planning process.
Nuclear
A limiting factor to the development of a nuclear facility is available water supply. A minimum of 8,000 gallons per minute or 11.5 MGD of water is required to meet basic facility needs. The Cumberland River may serve as an adequate water supply for the development of a nuclear facility at this location, depending upon downstream water use and commitments.

Safety issues associated with nuclear facilities include ensuring an adequate controlled buffer zone of at least 2,000' radius around the facility and an effective emergency plan. These aspects mean that the best location for a nuclear facility is a rural, or undeveloped site. The Pine Mountain Industrial site has a controlled exclusion zone greater than 3,000' and is located more than 25 miles from a population center of 25,000 persons or more. The emergency plan should take into account egress limitations that could potentially impede emergency efforts. Slight impediments to egress are present within 10 miles of the site. Traffic congestion on US 25 and US 119
could pose transportation problems to the site should emergency procedures or evacuation be required.

Atmospheric considerations can be important for a nuclear facility to avoid the possibility for interaction of the nuclear cooling system plume with a plume containing noxious or toxic substances from a nearby facility. The nearest air pollutant discharge source, Straight Creek Coal Resources Company, is a source for air emissions less than five miles northwest of the site.

**SUITABILITY**

In summary, the Pine Mountain Industrial Park, located within the Eastern Kentucky Coal fields, is a viable site for a potential alternative energy facility, particularly a CTL/CTG facility. The site scored a total of 973 points, representing 81% of the total available points for a CTL/CTG facility. The site offers a large acreage in an area suitable for development with good road access, adequate water supply, and access to rail for transportation needs. The workforce in the area appears to be adequate to support a facility. The sponsors have performed substantial engineering studies, including a preliminary geotechnical study to identify the type of foundation that would adequately match site conditions and the needs of a facility, substantial portions of an Environmental Assessment, and an engineering study on rail siding and load-out design. Access to adequate electrical power will be important to develop as will the final plans for adjacent rail access and overland conveyor belt lines. Extra effort may be needed to address any potential impacts to documented T&E species within the quadrangle map and public access areas, such as the Cumberland Gap National Park and Pine Mountain State Resort Park, which are within close proximity to the site.

Due to a low average mean wind speed, this location is not a viable location for a utility scale wind facility. Additionally, available solar radiation at the site is too low to produce a significant source of energy for a utility solar facility alone, with a site score of 379 points, representing 41% of the total available points.
The site scored a total of 607 points for a potential nuclear facility, representing 63% of the total available points. Prior to development of a nuclear facility, foundation concerns and further geotechnical study would be required. Similarly, for a biomass facility, the site scored a total of 870 points, representing 69% of the total available points. Biomass availability for Bell and its surrounding counties may need to be further evaluated to determine supply adequacy and diversity.