Teco Coal - Premier Elkhorn Mine
Pike COUNTY

ENERGY PROJECT SITE SUITABILITY
2009

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

On behalf of the Premier Elkhorn Mine, the TECO Coal Corporation 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, reliable coal-haul access roads, and adequate access to electric utilities.

Cover photo (2006) - Proposed development site
TECO Coal, through its Premier Elkhorn Coal Company, has offered property near Myra in Pike County 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 in fee by TECO’s land company, Pike-Letcher Land.
**Size**
The site consists of more than 500 acres located near Myra in Pike County, in the area shown on the USGS Jenkins East (KY, VA) Topographic Quadrangle.

**Topography**
The proposed 500 acre site is a former surface mine and is associated with an active coal mining operation which produces over 3,000,000 tons of coal each year and has proven reserves to produce coal at this rate for 20 years. The topography is rolling with stripped benches and smoothed off ridge tops. There are flat portions of the property that may be suitable for construction, but not all areas of the site are contiguous. A significant amount of groundwork would be required for construction. Additionally, site design should take into account areas which may have mine spoil or overburden to ensure and adequate foundation design. A developer will need to conduct a geotechnical study of the site to ensure ground stability is sufficient for constructing an energy facility.

**Floodplain and Wetlands**
The site is not within the floodplain because of its location along a ridge several hundred feet above the streams and rivers in the area. Based upon the USGS Jenkins East (KY, VA) Topographic Quadrangle Map, the site elevation is approximately 1,800 to 2,200 feet above mean sea level (AMSL). According to the Flood Insurance Rate Map (FIRM), Map Number 21195C0555 F, Panel Number 555 of 585, dated September 21, 1998, the entire site property is in Zone X. This is a zone with which lies outside of the 100-year floodplain. Wetlands do not appear to be an issue at the site. A map generated from the US Fish and Wildlife digital wetlands data shows no wetlands identified at the site.


Site Hazards

The TECO Premier Elkhorn site is not identified on any 2006 environmental databases searched, and no other sites were identified in the area within the search radius. The Environmental Protection Agency’s (EPA) Enviromapper indicates that there are no hazardous facilities within five miles of 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. Based upon site observations, interviews with site contacts, and information obtained from the Kentucky Geological Survey (KGS), there are less than 10 gas wells onsite, and several reported dry and abandoned wells identified by the KGS Petroleum Geology Map. A tank battery was observed at the head of Marshall Branch, associated with a well in the area. Several old Quonset huts were also located in the area. The site developer may have to relocate some gathering lines and close or relocate wells while developing a CTL/CTG, nuclear, solar, or biomass facility.
Zoning of the site is not an issue. The site has been utilized for surface coal mining operations. It is located in a remote area and is surrounded by other mining interests, undeveloped land and scattered rural residences.

**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 air pollution non-attainment area is Ashland, KY which is greater than 50 miles from the site. The site is 123 miles north of the Great Smoky Mountains National Park and 192 miles east of Mammoth Cave National Park. These areas are Class I Visibility areas. The location of these sensitive assets is not likely to have an impact on air pollution permit conditions.
State water data was searched to determine if designated impaired streams in the area might affect discharge requirements for an energy facility. Site drainage takes a long path through the mountains of Eastern Kentucky before reaching the Big Sandy River. The site drains into Booker Branch to the north and Marshall Branch to the south. Booker Branch drains into Beefhide Creek and then into Shelby Creek, Russell Fork and Levisa Fork consecutively before entering the Big Sandy River at Louisa. Marshall Branch drainage flows into Elkhorn Creek, then into Russell Fork (at Elkhorn City) and the Levisa Fork before entering the Big Sandy River. Both of these drainage pathways have streams that are designated impaired on the 2008 303(d) list including the following: Shelby Creek is listed for aquatic habitat; Russell Fork is listed for primary contact recreation; Levisa Fork is listed for aquatic habitat, primary contact recreation and fish consumption; Elkhorn Creek is listed for aquatic habitat; and the Big Sandy River is listed for warm water and aquatic habitat.

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 closest state park, Kingdom Come, is approximately 30 miles from the site property.
View of the site looking toward Pine Mountain

The site is located greater than 8 miles from Hatcher Field, the Pike County Airport. Additionally, based upon site observations, review of the Jenkins East topographic map, and the site's location, the probability of an air landing strip within 10 miles of the site is unlikely. 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. There were no historic landmarks identified within a one mile radius of the site and review of published information indicates that there are no apparent historic landmarks within proximity of the site. The presence of a permitted surface mine also indicates that the site has been
reviewed for cultural assets. It is unlikely that any significant archaeological sites remain at this property.

Federal and state lists of threatened and endangered species were reviewed to determine if there is documented evidence of the occurrence of a sensitive species on the Jenkins East topographic quadrangle. No listed Federal species were identified. State threatened and endangered species listed included the Common Raven and Golden-Winged Warbler. The site is currently covered by an active coal mine permit. This means the site has been investigated and cleared for impacts to sensitive species and has an approved Kentucky Pollutant Discharge Elimination System (KPDES) discharge permit.

**Geological Assets**

Siting considerations for a biomass or CTL/CTG process must take into account available geological assets for potential sequestration. Analysis by the KGS ranked the geologic assets for this site as good. The graphic on the following page depicts geologic assets within a 15 mile radius of the site, indicating development of both oil and gas in the region. The site is labeled T on the graphic map. Devonian shale is present with the average depth to the top of this structure being about 4,200 feet. The average depth to the Knox, the primary sequestration target in the area, is identified as about 7,700 feet. 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 CO\textsubscript{2} injection in the area.

The proximity of faults to a site may impact the development of a nuclear, biomass, or CTL/CTG facility. The Pine Mountain Fault is located 2.85 miles southeast of the site. However, based on mapping from the KGS, the seismic risk at the proposed site is quite low.
Utilities

Broadband is not currently available on site but could be made available in the future. There is a 138 kV transmission line maintained by American Electric Power (AEP) that crosses the site. A gas line operated by Equitable and Columbia Gas is reportedly located approximately 6,800 feet northeast of the site. Available potable water supply is located along US 23, about 1.5 miles west of site. The site is accessible via road (gravel and asphalt). There are adjacent available areas for construction of an impoundment to provide water supply.

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 on or adjacent to the site include US 23 west of the site with wide gravel road access into the heart of the site, and SR 119 which is located to the south of the site with access by an asphalt-paved Marshall Branch Road.
Although not a significant siting consideration for a solar, nuclear 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. An old rail bed is present along SR 197, northeast of Jenkins, KY, and an abandoned rail spur is present along the site's access road, Marshall Branch. Because the rail service is currently abandoned, this site has been ranked as having the potential to construct. There are no navigable waterways within proximity to the site. Barge transportation is not an option at this site.

**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. Adequate electrical service can be provided by the 138 kV
transmission line that crosses the site. This transmission line should help provide both
power and access to an appropriate transmission point for excess electricity generated
in the gasification process.

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. A
12 inch gas transmission line is reportedly located approximately 6,800 feet northeast of
the site. The feasibility of obtaining right-of-way and constructing a pipeline to connect
to the transmission line should be part of the planning process.

**Water Supply**
Available water supply is a critical project component for the development of a
CTL/CTG, biomass or nuclear facility. The site has access to a municipal water supply
at US 23, but the distance to any significant natural body of water makes obtaining
adequate surface water uneconomical. The site contains several small sediment
ponds, but no large impoundment is present on the site. A more viable option for water
supply may be the closed underground mines in the immediate vicinity that have the
potential to contain substantial amounts of water. This possibility should be investigated
to determine if this source can provide adequate water for process and cooling required
for a CTL/CTG, biomass or nuclear facility. The site may fare better if it can
demonstrate a subsurface supply of water, or as a site for an air cooled process, rather
than water cooled.

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.
Workforce Availability

Development of a CTL/CTG, biomass, or nuclear facility would require access to an adequate supply of construction and skilled labor. According to information provided by the site sponsor, the Big Sandy employment area includes approximately 57,000 people. Information from the Kentucky Economic Development website concerning the civilian labor force for 2008 indicates the Pike County labor market has a workforce of nearly 25,000. Additional workforce from surrounding counties could increase the available workforce to over 75,000.

<table>
<thead>
<tr>
<th>Civilian Labor Force</th>
<th>Pike County</th>
<th>Labor Market Area</th>
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<tbody>
<tr>
<td>Civilian Labor Force</td>
<td>25,358</td>
<td>24,907</td>
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<tr>
<td>Employed</td>
<td>23,833</td>
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<tr>
<td>Unemployed</td>
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<td>1,416</td>
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<tr>
<td>Unemployment Rate (%)</td>
<td>6.0</td>
<td>5.7</td>
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</tbody>
</table>

Source: U.S. Department of Labor, Bureau or 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 may have a potential impact on military training routes and special use airspace. An aeronautical study will likely be required to determine any potential impacts that may be posed to Air Defense and Homeland Security.

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. The site is associated with an active coal mining operation which produces over 3,000,000 tons of coal each year and has proven reserves to produce coal at this rate for 20 years. Pike County is one of the eastern coal fields most prolific coal producing counties. In addition to the significant volume of coal currently produced by the on-site active mine, there are other sources of coal in close proximity and from the surrounding counties. Transportation for fuel (coal) will be by road. Rebuilding the rail would add another transportation option and increase the efficiency of the site. Access to adequate cooling water remains a concern for the site.
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 TECO Premier Elkhorn site has an average direct normal solar radiation of 3.42 KWh/m²/day and an annual solar radiation for two-axis flat plates of 5.76 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 and current coal mining operations on the property, the site is relatively 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. The town of Jenkins, Kentucky is the closest corporate city boundary and is located approximately 4 miles to the southwest of the site.
**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 3.7 m/s. Wind speed measurements to accurately assess the available resource at any potential development site would be required prior to final planning.

![Mean wind speed – 3.7 m/s](image)

**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 Pike County is 72,671 tonnes/year. Biomass in Pike and its surrounding Counties is 300,761 tonnes/year. Depending on the type of material utilized, the supplies for Pike County may not provide adequate feedstock; further investigation would be required. 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 the availability of a dependable water supply. A minimum of 8,000 gallons per minute or 11.5 MGD of water is required to meet basic facility needs. Unfortunately, the distance from this site to the nearest substantial surface water body is too far to be considered a feasible resource. A more viable option for water supply may be the closed underground mines in the immediate vicinity that could potentially provide substantial and dependable amounts of water. The potential for these underground reservoirs needs to be investigated for utilization in the process and cooling requirements of a nuclear facility. The TECO Premier Elkhorn site may fare better if it can demonstrate long-term viability of utilizing subsurface water reservoirs or turning to alternative systems using air cooling processes.

**Suitability**

In summary, the TECO Premier Elkhorn site, located within the Eastern Kentucky Coal Fields, has some attributes that make it a potentially viable location for an alternative energy facility and unanswered questions that may limit its potential. The site scored a total of 832 points for a CTL/CTG facility and 870 points for a biomass, which represents 69% of the total available points for each of these facility types. This site benefits from a large acreage in an area suitable for development with good road
access, but the site needs to be further evaluated to determine the feasibility of accessing adequate water supply and rail for transportation needs. The workforce in the area appears to be adequate to support a facility. Adequate electrical service is present on site as a 138 kV transmission line crosses the site. It will be important to develop plans for rail access, as well as to further investigate available biomass resources in the area.

The site scored a total of 622 points for a solar facility representing 67% of the total available points. Land free of cover and distance from residential or commercial areas makes this site fairly desirable for solar panel placement; however, direct normal solar radiation values are too low for any utility scale solar facility.

Due to a low average mean wind speed, this location is not a viable location for a utility scale wind facility. An existing and dependable source of water for cooling processes currently prevents consideration of a nuclear facility for this site.