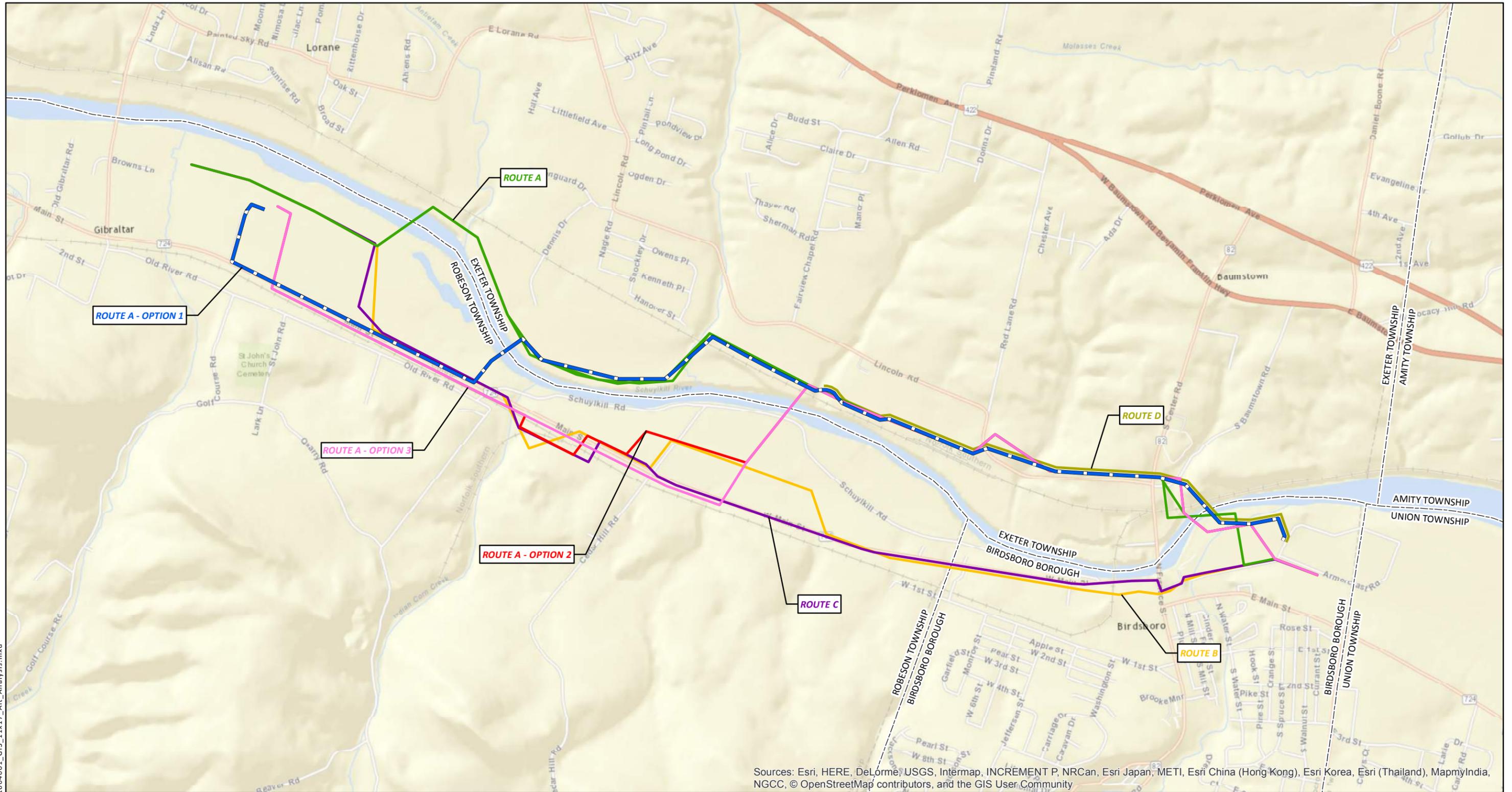


REQUIREMENT S
ALTERNATIVE ANALYSIS



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LEGEND:

 ROUTE A - OPTION 1	 ROUTE A - OPTION 2	 ROUTE B	 ROUTE D
 ROUTE A	 ROUTE A - OPTION 3	 ROUTE C	

**BIRDSBORO
TRANSMISSION LINE ROUTE**

ALTERNATIVES ANALYSIS

BERKS COUNTY, PENNSYLVANIA

DATE: 05/01/2017
PROJECT NUMBER: 216040.01
DRAWN BY: TRW
REVIEWED BY: JMG
APPROVED BY: KRR
SHEET: 1 OF 1

SCALE: 1" = 1,500'



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The Birdsboro 230 kV Transmission Line Project (“Project”) consists of constructing a new 230 kV Transmission Line (“Line”) that will originate at a new natural-gas fired generating plant which is to be located on the old Armorcast site within the Borough of Birdsboro, Berks County Pennsylvania. A total of 7 potential alignments were evaluated for the electric transmission line during the routing portion of the project. The major encumbrance for the majority of the routes was property acquisition as numerous residents, business owners, and stake holders denied the request to access their properties to conduct various surveys including wetland and watercourse field delineations. Engineering issues related to existing utilities present in the general vicinity of the project area and exorbitant expense also limited viability of some of the routes analyzed. A general discussion of each route is presented.

Route A:

This route would originate at the new generating facility and head in a generally northwest direction for approximately 0.72 miles. The line will turn in a generally western direction, traverse the Schuylkill River, and continue for approximately 2.69 miles. The line would then turn and head in a generally southwest direction for approximately 0.21 miles to cross the Schuylkill River a second time. The line would turn and head in a western direction for approximately 0.6 miles before terminating at the new 230 kV ring bus station.

A preliminary engineering review determined that line-to-line and line-to-ground clearance issues would likely exist at the point at which the new line(s) cross under the existing Three Mile Island - Hosensack 500 kV line, therefore First Energy has requested that the crossing section be buried. Right of survey permissions were denied by three key parcel owners in the vicinity of the second Schuylkill River crossing. For these reasons, it was determined that this route was not viable. General characteristics of the route are as follows:

Total Length: 4.25 miles
of State Road Crossings: 2
of Local Road Crossings: 2
of RR Crossings: 2
of Parcel Crossings: 31
of NHD Stream Crossings: 8
of NWI wetlands within a 100’ of route centerline: 7

The following routes were assessed as alternatives to Route A and adjusted as required based on right of survey permissions acquired in the general area. The location of the second Schuylkill River crossing was moved to the east from the location proposed for the original Route A for these alternatives. Options 2 and 3 cross the river at the same location while Option 1 crosses at a point between Options 2/3 and the original Route A proposed crossing. Other minor changes, of little consequence, were also included along eastern portions of the line. Each alternative differs from Option A as described below.

A-Option 1:

Option 1 would cross the Schuylkill River approximately 0.5 mile east/southeast of the Route A proposed crossing location. This crossing location avoids the 3 parcels along Route A that refused survey permission and is a potentially viable route. The route continues approximately 0.2 mile in the southwest direction, crossing the Schuylkill River, in an overhead configuration prior to a pivot to the northwest and transition to underground configuration within SR 724 right-of-way. The remaining 0.95 mile of the route will remain underground and proceed to the tie-in location generally northwest. Water resources delineation field work has been conducted along this route

and disturbance to wetlands and watercourses is minimal because poles can be spaced up to 1000' to avoid impacts. This route is the second shortest option of the 7, wetland and watercourse impacts are minimized to the extent practicable, and no property acquisition issues are anticipated. **Route A Option 1 is the preferred route for the project.** General characteristics of the route are as follows:

- Total Length: 3.86 miles
- # of State Road Crossings: 2
- # of Local Road Crossings: 1
- # of RR Crossings: 2
- # of Parcel Crossings: 28
- # of NHD Stream Crossings: 9
- # of NWI wetlands within a 100' of route: 5

A-Option 2:

Option 2 would cross the Schuylkill River approximately 1.52 miles southeast of the Route A proposed crossing location. This crossing location avoids the 3 parcels along Route A that refused survey permission but introduces numerous parcels south of the Schuylkill River that have also refused survey permission. This route is not a viable route. General characteristics of the route are as follows:

- Total Length: 4.11 miles
- # of State Road Crossings: 4
- # of Local Road Crossings: 5
- # of RR Crossings: 4
- # of Parcel Crossings: 32
- # of NHD Stream Crossings: 8
- # of NWI wetlands within a 100' of route: 6

A-Option 3:

Option 3 also would cross the Schuylkill River approximately 1.52 miles southeast of the Route A proposed crossing location. This crossing location avoids the 3 parcels along Route A that refused survey permission but also introduces numerous parcels south of the Schuylkill River that have refused survey permission. This route is not a viable route. General characteristics of the route are as follows:

- Total Length: 4.08 miles
- # of State Road Crossings: 4
- # of Local Road Crossings: 5
- # of RR Crossings: 2
- # of Parcel Crossings: 28
- # of NHD Stream Crossings: 10
- # of NWI wetlands within a 100' of route: 5

Route B:

Route B leaves the Armorcast site in an overhead configuration and heads in a western direction for approximately 0.4 miles. The line would continue over Hay Creek to the northwest along W. Main Street for approximately 3.74 miles till it reaches the ring bus station. This route follows the same general path as Route C.

The line would consist of 230 kV single circuit self-weathering steel monopoles which will require a 150-foot-wide right-of-way. The height of the poles will range between 110 feet - 150 feet above ground. Typical span lengths will vary between 500 and 1000 feet.

A preliminary engineering review determined that line-to-line and line-to-ground clearance issues would exist at the point at which the new line(s) cross under an existing 500 kV line from the Three Mile Island Nuclear Facility. It was also determined that due to existing building and overhead utility locations within the center of Birdsboro, locating new structures would be extremely difficult or impossible. Additionally, numerous parcel owners along SR 724 denied access for survey. For these reasons it was determined that this route is not a viable option. General characteristics of the route are as follows:

Total Length: 4.14 miles
of State Road Crossings: 4
of Local Road Crossings: 6
of RR Crossings: 3
of Parcel Crossings: 42
of NHD Stream Crossings: 6
of NWI wetlands within a 100' of route: 5

Route C

Route C leaves the Armorcast site in an overhead configuration and heads in a western direction for approximately 0.4 miles. Once over Hay Creek the line will transition to an underground configuration and continue in to the northwest along W. Main Street for approximately 1.73 miles. Once across Cedar Hill Road the Line will transition to an overhead configuration once more and continue its generally northwest direction till it reaches the ring bus station approximately 1.94 miles away.

The circuit would consist of approximately 1.73 miles of underground 230 kV XLPE cable installed within a concrete encased duct bank. The underground cable will be located within the road right-of-way of W. Main Street.

The remaining 2.34 miles of the Line would consist of 230 kV single circuit self-weathering steel monopoles which will require a right-of-way width of 150 feet. The height of the poles will range between 110 feet - 140 feet above ground. Typical span lengths will vary between 500 and 1000 feet.

Numerous parcel owners along SR 724 denied access for survey and increased expense associated with this option is seemingly cost prohibitive when compared to the more viable Route A Option 1. For these reasons it was determined that this route is not a viable option. General characteristics of the route are as follows:

Total Length: 4.07 miles
of State Road Crossings: 3 (runs down SR 724)
of Local Road Crossings: 4
of RR Crossings: 3
of Parcel Crossings: 19
of NHD Stream Crossings: 6
of NWI wetlands within a 100' of route: 1

Route D

This route would originate at the new generating facility and head in a generally northwest direction across the Schuylkill River and continue approximately 0.6 miles. The line would turn in a generally western direction, and proceed for approximately 1.2 miles and tie into the grid via the existing Three Mile Island - Hosensack 500 kV line. The tie in location would be about 1.3 miles closer to the power plant than the selected 230kV line currently being utilized by the project. However, as noted in our feasibility studies, the benefits that may be realized by proximity of the line were overshadowed by other aspects of the tie in.

In the initial interconnection feasibility study, the 500 kV connection was studied as a POI (Point of Interconnection). The use of the 500 kV facility would impact several other interconnected transmission systems and require Birdsboro to mitigate impacts to these users. The users identified in the report are: LGEE, MISO, Duke, Progress, TVA, OVEC, and NYISO. These users are all electric transmission providers and this increase in power flow on their supply facility would potentially have impacts to their operation and require Birdsboro to face changes in many of their facilities.

The 230 kV connection only required a mitigation of local impacts on the line segment near the plant and these were primarily existing units in the system. These impacts were easily identified and required only coordination with one transmission provider, First Energy, the owner and operator of the transmission line.

In addition to impacts on other interconnected systems, further evaluation of the 500 kV option indicated that the connection point would also require a new substation with step up transformers and controls. This configuration would take up much more space with more complex yard facilities than a simple switchyard necessary for the 230 kV connection. The substation would be much more visible and potentially complicate cultural resources studies due to the increased aesthetic impact. The location and larger footprint of the substation would also likely increase impacts to archeologic and water resources associated with the project.

The 500 kV option was eliminated based on these reasons.

Co-location of utility lines

Co-location of the proposed electric line both with the existing transmission lines in the area as well as with the proposed natural gas line were evaluated. These options are not feasible. First Energy and Met-Ed have crossed the river at two locations near the site, but these lines have their own easements. The proposed lines are not permitted within those easements, so separate buffered easements are required. In addition, colocation of the electric line and natural gas pipeline is not feasible. While these lines originate and terminate respectively at the same location, they do not share any other routing. The TETCO natural gas pipeline, which supplies the facility, is approximately 13 miles north of the proposed powerplant while the required tie-in location to the electric grid is approximately 4 miles west of the plant. At no point is it feasible for those lines to be collocated. Furthermore, the transmission line tie-in location with the electric grid is determined by the independent public utility, and it was their transmission feasibility and impact studies that required the Birdsboro plant to connect to the 230 kV transmission system located west of the plant.

Resource Specific Avoidance and Minimization

Hay Creek

An evaluation of Route B and C included opportunities to cross Hay Creek at 90 degrees. If structure 4 was relocated further south from its current location in order to cross the creek at 90 degrees, it would create undesirable scenic impacts. The increased distance between structure 4 and 5 would increase the structure heights in excess of 10 feet. Additionally, the increased distance between structure 4 and 5 increases the amount of ROW needed. As a result, overall land impact would be increased when adjusting structure 4 south and additional tree clearing would be needed along the extra required ROW. Adjusting the location of structure 4 would increase the amount of riparian areas cleared, even though a perpendicular crossing reduces the near-bank clearing efforts. Keeping the existing structure location provides readily available access to an existing access road which does not need improvements for project buildout. Lastly, the angle of structures could change if structure 4 were to move south. The angle change could alter blowout distances, further increasing tree clearing requirements.

Riparian Buffers

The ROW/LOD has been reduced to 100' width or less in the riparian buffer areas. Potential construction challenges in these areas preclude any further ROW reduction. Pole configuration and span lengths (blow out calculations), existing utilities, and railroads are all factors that limit the extent to which the ROW can be reduced. The following portions of the ROW were reduced to 100' or slightly less to limit riparian impacts and tree clearing.

Station 17+00 to 19+00

Station 23+00 to 24+50

Station 61+00 to 64+00

Streambank Clearing and Grubbing

No clearing and grubbing of streambanks will be permitted within 50' of any stream top of bank. Trees will be cut close to the ground and stumps will remain and allowed to re-sprout. All tree clearing in these areas will be conducted by hand and equipment will not be allowed to access these areas to alleviate earth disturbance. Construction fencing will be erected to prohibit equipment from accessing these areas inadvertently. Woody growth is expected to establish over time and will be managed in accordance with the vegetative maintenance plan to ensure there is no contact with overhead wires.