Constructability Analysis of Artificial Island Delmarva Peninsula Project Proposals

Prepared for PJM Interconnection, LLC

UC Synergetic, LLC

4/30/2014

Transmission Line Proposals Reviewed:
L.S. Power 230kV Option 5A – "Silver Run 230kV Overhead / Underground Submarine line"
L.S. Power 230kV Option 5A Alternate – "Silver Run 230kV Overhead Only line"
Transource 230kV Option 2A – "Salem / Cedar Creek Overhead / Underground Submarine Line"
Transource 230kV Option 2B – "Salem / North Cedar Creek Overhead / Underground Submarine line"
Dominion 500kV Option 1B – "Salem to Delaware Overhead line"

REVIEW OF REPORT

Project Owner: PJM Interconnection, LLC
Project Type: Detailed Constructability Analysis
Project Name: Artificial Island Window 230kV Delmarva Peninsula Project Proposals
Revision Number: 0
Revision Date: 4/30/14

In accord with established procedures, the quality of this report has been reviewed. The signatures below verify that UC Synergetics reviewed the data and information supplied by others such as PJM, a Regional Transmission Organization. UCS compiled the information below from both referenced and unreferenced sources in order to prepare this Detailed Constructability Analysis Report and the opinions stated and expressed are based on standard industry practices and experience.

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1.0 Executive Summary:

UC Synergetic ("UCS") conducted an in-depth quality review of the constructability data provided by various entities proposing projects for the PJM Artificial Island RTEP Proposal Window. This constructability analysis did not include electrical system analysis, a review of system need or an evaluation of electrical performance of the proposed projects as related to solving the PJM identified problem in the area. This analysis looked at the proposed route, the noted siting and permitting requirements, the estimated costs, the expected schedule, and the overall ability to actually execute and construct what is being proposed within the cost and timeline proposed. This overall report summarizes and compares alternatives.

Within the package of information sent to PJM and provided to UCS, there are five (5) different options presented by three (3) different companies as follows:

Northeast Transmission Development, LLC, a member of the LS Power Group will be referred to as "LS Power" throughout this report. LS Power proposed two (2) options for a new 230 kV Transmission Line connecting Salem substation to the existing 230kV "Red Lion" Transmission lines in Delaware with to the new "Silver Run" switchyard.

- Option 5A – Approximately 5.6 miles of new 230 kV Transmission Line. Approximately 2.0 miles of overhead (OH) 230 kV Transmission Line on mono-pole structures with 3.6 miles of Submarine 230kV cable crossing under the Delaware River.
- Option 5A Alternate – Approximately 5.6 miles of new 230 kV Transmission Line. Approximately 2.1 miles of OH 230 kV Transmission Line on mono-pole structures with 3.5 miles of 230 kV Transmission Line on four-legged tower structures crossing over the Delaware River.

Transource Energy, LLC, which was formed specifically as a joint venture between subsidiaries of American Electric Power Company (AEP, 86.5%) and Great Plains Energy Incorporated (GPE, 13.5%), will be referred to as "Transource" throughout this report. Transource proposed two (2) options for a new 230 kV Transmission Line that would connect the Salem substation to the existing 230kV "Red Lion" transmission lines in Delaware.

- Option 2A – Approximately 8.4 miles of new 230 kV Transmission Line connecting into the existing Cedar Creek substation site in Delaware. Approximately 2.7 miles of OH 230 kV Transmission Line on mono-pole structures with 5.7 miles of Submarine 230kV cable crossing under the Delaware River.
- Option 2B – Approximately 5.7 miles of new 230 kV Transmission Line connecting into a new substation site. Approximately 2.4 miles of OH 230 kV Transmission Line on mono-pole structures with 3.3 miles of Submarine 230kV cable crossing under the Delaware River.

Dominion Virginia Power will be referred to as "Dominion" throughout this report.

Dominion proposed to construct, own and operate a new transmission line emanating from Salem station to a new station in Delaware across the Delaware River.

- Option 1B – Approximately 6.2 miles of OH 500 kV transmission line from the Salem Station in New Jersey to a new step-down substation and switching station in Delaware at the existing 230kV Red Lion transmission line.

The overall estimated costs between the five options presented varied substantially between companies and between proposals. The estimated cost range went from a low of $116.3 Million to a high of $269.2 Million. These cost estimates can be compared to Standard Industry Unit Measures shown in the table below. The submarine river crossing options were the most expensive options presented and will be the more difficult options to obtain necessary permits. However, it's UCS's opinion that the submarine crossing options will provide the most publicly acceptable solutions.

Cost Estimates of Industry Standard Unit Measures:

Transmission Components	Dollars	Units
230kV overhead transmission	$3,500,000	per mile
230kV underground transmission	$10,500,000	per mile
230kV submarine transmission	$35,000,000	per mile
230kV transmission line dead-end structures	$300,000	per unit
Aerial Delaware river crossing	$100,000,000	per crossing (Cost supplied by PJM)

* Notes:
- Costs can vary widely based on actual site specific locations, requirements and conditions.
- Cost estimates are budgetary installation costs only based on past projects and experience.
- Factors that may significantly increase these installation costs include:
  - Environmental, Regulatory Licensing Costs
  - Permitting costs
  - Land purchase costs
  - Civil work including site preparation, grading, wetland mitigation, and other encountered conditions
  - Rock excavation.

UCS's research indicates that all three of the submarine river crossing options presented may be low on their estimated overall cost, particularly in regard to the submarine cable pricing included in the proposals.

In regard to comparing the overhead transmission options, four of the five proposals listed plans for the 230 kV Transmission Lines over land to be installed on steel monopole structures. The exception will be Dominion which plans for a 500kV transmission line on four-legged towers verses the 230kV on monopoles. Both of the overhead transmission line river crossings are proposed as four-legged towers.

LS Power's proposals state that they have already acquired all the necessary land options (right-of-way and land for a substation) from private landowners needed for their project. Their schedule

includes 9 months for right-of-way and land acquisition. Transource's proposals plan to acquire private right-of-ways as needed, but they have only scheduled 12 months for this task. Dominion's proposal did not speak to their exact right-of-way requirements; however, Dominion allotted 57 months in their project plan for right-of-way and land acquisition. Eminent domain authority is not available for electric transmission line projects in Delaware.

In regard to comparing the in-service dates between the five proposals, four of the five proposals were consistent and had an anticipated in-service date of June 2017 (approximately 3 ½ years in total project duration). Dominion was an outlier with an in-service date of December, 2021 (approximately 8 years in duration). From reviewing the schedules in regard to permitting requirements and material acquisition, it is our opinion that June 2017 is aggressive but December 2021 is conservative. It is also our opinion that right-of-way and land acquisition in Delaware, permitting requirements, and obtaining necessary approvals for crossing the Delaware River either overhead or through submarine cable will be the most difficult aspect of the proposed projects and has the most risk for adverse impact to the schedule. From reviewing similar projects in the region, it is our opinion that the overall duration of this project will be five to six years from Notice to Proceed.

2.0 Project Overview

There were five (5) different options presented to solve the electrical needs of the Delmarva Peninsula area. They each will be summarized and discussed in the sections below.

2.1 Overall Description of Proposed Project

LS Power Group proposed two (2) options for a new 230 kV Transmission Line connecting Salem substation to the existing 230kV "Red Lion" Transmission lines in Delaware with to the new "Silver Run" switchyard.

- Option 5A – Approximately 5.6 miles of new 230 kV Transmission Line. Approximately 2.0 miles of overhead (OH) 230 kV Transmission Line on mono-pole structures with 3.6 miles of Submarine 230kV cable crossing under the Delaware River.
- Option 5A Alternate – Approximately 5.6 miles of new 230 kV Transmission Line. Approximately 2.1 miles of OH 230 kV Transmission Line on mono-pole structures with 3.5 miles of 230 kV Transmission Line on four-legged tower structures crossing over the Delaware River.

Transource proposed two (2) options for a new 230 kV Transmission Line that would connect the Salem substation to the existing 230kV "Red Lion" transmission lines in Delaware.

- Option 2A – Approximately 8.4 miles of new 230 kV Transmission Line connecting into the existing Cedar Creek substation site in Delaware. Approximately 2.7 miles of OH 230 kV Transmission Line on mono-pole structures with 5.7 miles of Submarine 230 kV cable crossing under the Delaware River.

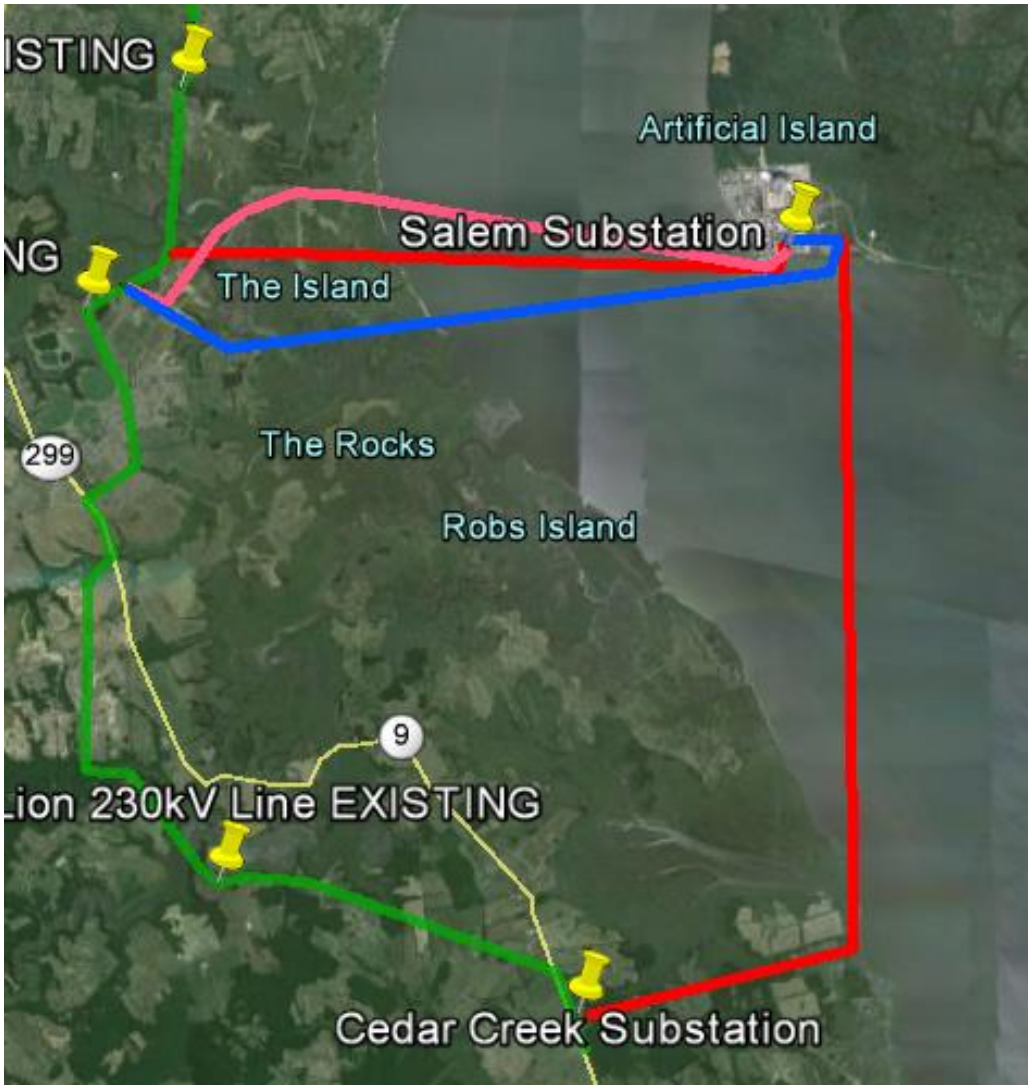
- Option 2B – Approximately 5.7 miles of new 230 kV Transmission Line connecting into a new substation site. Approximately 2.4 miles of OH 230 kV Transmission Line on mono-pole structures with 3.3 miles of Submarine 230 kV cable crossing under the Delaware River.

Dominion Virginia Power proposed to construct, own and operate a new transmission line emanating from Salem station to a new station in Delaware across the Delaware River.

- Option 1B – Approximately 6.2 miles of OH 500 kV transmission line from the Salem Station in New Jersey to a new step-down substation and switching station in Delaware at the existing 230 kV Red Lion transmission line.

2.1.1 Scope of Work

The overall scope of work for the five different transmission line options and proposals reviewed are summarized graphically on the following aerial maps:




LS Power 5A
Dominion 1B
Transource 2B
Salem Station
Existing Cedar Creek
230 kV Substation
Artificial Island Window 230kV Delmarva Peninsula Project
Detailed Constructability Analysis Report
N
W
E
S
0
2,000
4,000
6,000
8,000 Feet
Legend
NRHP Sites
Hope Creek Switching Station (3 Alternates)
Silver Run Switchyard
North Cedar Creek Substation
New 500/230 kV Substation
Airstrip
Dominion Route 1B
LS Power Route 5A
Transource Route 2A
Transource Route 2B
Cantanza-Red Lion 230 kV
Cedar Creek-Red Lion 230 kV
Property Line
Emergent
Estuarine
Forested/Shrub
Freshwater Pond
Lake
Other(PUS)
Riverine
Scrub/Shrub

The detailed scope of work for each option is summarized in the table below:

Overall Scope of Work	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only	Units
Point A: Salem Nuclear Plant, NJ:						
500/230 kV Substation at Salem Nuclear Plant:	Expand Existing	Expand Existing	New	New	Not Needed	
500/230kV Transformer:	1	1	0	0	0	Each
OH 230kV Transmission Line:	2.0	2.1	2.7	2.4	0	Miles
OH 230kV Delaware River Crossing:	0	3.5	0	0	0	Miles
UG Submarine Cable under Delaware River:	3.6	0	5.7	3.3	0	Miles
OH 500kV Transmission Line:	0	0	0	0	3.0	Miles
OH 500kV Delaware River Crossing:	0	0	0	0	3.0	Miles
Total Transmission Line Length	5.6	5.6	8.4	5.7	6.0	Miles
Point B: Existing Red Lion 230kV Trans Line:						
500/230 kV Substation:	Not Needed	Not Needed	Not Needed	Not Needed	New Substation	
500/230 kV Transformer:	0	0	0	0	1	Each
230 kV Switchyard	1	1	1	1	1	Each

As can be seen in from the table above, the proposals vary in both scope and magnitude with the overall length of new transmission line between 5.6 miles and 8.4 miles. The longest proposed option (Transource Option 2A) involves a submarine 230 kV transmission crossing running north to south down the Delaware River bottom for 5.7 miles. The least detailed option, Dominion 1B involved only a "high level review of routing" and used more of a straight line approach.

2.1.2 Description of Upgrade Facilities

The transmission lines being proposed in all five options reviewed are new facilities, involving new construction along a green field route. However, for each of these proposals there are upgrades required and included to existing facilities; primarily at the Salem substation and at the interconnection points to the 230 kV Red Lion transmission lines in Delaware. The substation alterations proposed at Salem and the substation site constructability are being reviewed in more detail in Section 3 and under a separate project. At a high level, below is a listing of the expected system upgrades at each location.

At the Salem substation in New Jersey:

- LS Power 's Option 5A and 5A Alternate (Overhead only) both involve expanding the existing Salem 500 kV switchyard to accommodate a new 500/230 kV transformer and new 230 kV Transmission Line.
- Transource's Options 2A and 2B both involve a short 500 kV line at the Salem substation with a new 500/230 kV step-down substation green-field site.
- Dominion's Option 1B involves some minor modification at Salem substation by adding two (2) breakers.

2.1.3 Description of New Facilities

The transmission lines being proposed in all five options reviewed are new facilities involving new construction along a green field route. The transmission options are being compared and contrasted throughout this report. However, for each of the new transmission line proposals, there are new facilities required and included in each proposal in order to attach the new transmission lines into to existing 230 kV facilities.

At the Red Lion to Cedar Creek and Red Lion to Cartanza 230 kV Transmission Lines in Delaware:

- LS Power 's Option 5A and 5A Alternate (overhead only) both involve adding a new 230 kV switchyard called "Silver Run" to interconnect to the existing Red Lion – Cedar Creek and Red Lion – Cartanza 230 kV Transmission Lines.
- Transource Option 2A involves interconnecting their proposed overhead and underground 230 kV Transmission Line into the existing Cedar Creek 230 kV substation and expanding the substation to loop in the Red Lion to Cartanza 230 kV Transmission Line.
- Transource Option 2B involves interconnecting their proposed overhead 230 kV Transmission Line into a New 230 kV North Cedar Creek Substation north of the existing Cedar Creek substation.
- Dominion's Option 1B involves adding a new 500/230 kV step-down and switching substation to connect into the two existing 230 kV lines.

2.2 Milestone Schedule

Four of the milestone schedules proposed in the five options evaluated are similar with one outlier. The milestone schedules are summarized below:

Topics	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Start Date:	2014	2014	2014	2014	2014
Permitting:	30	30	24	24	30
R/W Acquisition:	9	9	12	12	57
Engineering:	24	24	12	12	14
Construction:	18	18	15	15	12
In Service Date:	Jun-2017	Jun-2017	Jun-2017	Jun-2017	Dec-2021
Total Project Duration:	42	42	42	42	96

As can be seen above, permitting varies between 24 and 30 months depending on the company submitting the proposal. Based on the permitting requirements for the Delaware / New Jersey area, 24 to 30 months is aggressive. As will be covered in the permitting section of this report, some permits may require before and after "studies" in order to determine the environmental impacts of the new transmission line installation.

Right-of-way acquisition varies between proposals between 9 to 57 months. Two of the five proposals, LS Power Option 5A and 5A Alternate estimated 9 months for right-of-way acquisition. Two of the proposals, Transource 2A and 2B estimated 12 months for right-of-way acquisition. Dominion estimates 57 months (almost 5 years) for right-of-way acquisition.

2.3 Overall Estimated Project Cost

The overall estimated project costs for the five different options reviewed are summarized in the table below:

Overall Estimated Costs	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Cost Range Provided			$213,448,679 to $269,200,200	$164,849,211 - $207,906,840	
Estimated Cost (or Median of Range):	$148,300,000	$116,300,000	$241,324,445	186,378,026	142,200,000

As can be seen in the table above, costs vary greatly between the various proposals with the most expensive options involving the submarine cable river crossings.

The two overhead only options range from $116 to $141 Million and are the most economical solutions.

The three options involving both overhead transmission line and an underground submarine river crossing vary between a low of $148 Million to a potential high of $269 Million.

For detailed cost analysis, refer to Section 6.0.

3.0 Detailed Scope and Physical Constructability

The detailed scope section below will discuss and compare various detailed aspects of each project. This section is intended to further explore and contrast some of the general information presented in section 2 of this report.

3.1 Upgrades

The following section discusses the detailed components of system upgrades associated with this project.

3.1.1 Transmission Line

The transmission lines proposed in all five options presented are new transmission facilities along a green-field route. However, each proposal requires some level of upgrades to existing transmission facilities and lines; primarily at the Salem substation

and at the interconnection points to the 230 kV Red Lion transmission lines in Delaware.

3.1.2 Expansion Work at Existing Substations

For each of these proposals there are upgrades required and included at both the Salem and Cedar Creek substations. Below is a listing of the expected system upgrades.

At the Salem Power Station in New Jersey:

- LS Power 's Option 5A and 5A Alternate (overhead only) both involve expanding the existing Salem 500 kV switchyard to accommodate a new 500/230 kV transformer and new 230 kV Transmission Line. The 500 kV main busses in the existing switchyard will be extended to the south to accommodate the proposed 1200 MVA, 500/230 kV step-down transformer bay. A 500 kV breaker-and-a-half configuration will service three (3), 400 MVA, single phase transformers banked together and connected to provide the proper synchronization. A fourth single phase transformer will be stored as a spare.
- Transource's Options 2A and 2B both involve a short 500 kV line at the Salem substation with a new 500/230kV step-down substation green field site. The new substation would have two new 500/230 kV 900 MVA transformers in parallel configuration. At the existing Salem substation, a new line termination point will be created by tapping the 500 kV west bus and installing a 500 kV breaker.
- Dominion's Option 1B involves the minor modification at Salem substation of adding two (2) additional 500 kV breakers for the new 500 kV circuits.

At the interconnection in Delaware, Transource Option 2A includes expansion of the existing Cedar Creek substation by modifying the existing ring bus to accommodate three additional 230 kV line positions.

3.2 New Transmission Facilities

3.2.1 Transmission Line

LS Power Group proposed two (2) options for a new 230 kV Transmission Line connecting Salem substation to the existing 230 kV "Red Lion" transmission lines in Delaware to the new "Silver Run" switchyard.

Option 5A consists of a total of 5.6 miles of new 230 kV Transmission Line with an overhead and underground design.

- This option is similar to the LS Power 5A Alternate proposal except that the overhead river crossing towers have been replaced by an underground submarine cable design consisting of two (2) 230 kV 2500 kcmil XLPE

armored submarine cables per phase that are jet plowed eight (8) feet deep into the river bed.

- The submarine design calls for one submarine-conductor per trench spaced approximately between 20' to 60' apart (one to two times the water depth) in order to facilitate safe installation, maintenance, recovery and repair purposes. The net result is a cable route that is 440' wide at the deepest point of the crossing.
- The 5A proposal states that they will add a loop in the cable at the bottom of the river to facilitate cable repair. This is not feasible considering the stiffness of this armored cable (more like pipe than cable). If a cable loop is potentially an option, we would suggest getting LS Power to provide more details or actual examples of where this has been deployed.
- LS Power also identified the use of a spare cable reel as another repair / maintenance option. This practice is predominately used for similar projects as protection against cable failure and other contingencies for quicker restoration of service.

Option 5A Alternate consists of a total of 5.6 miles of new transmission line from Salem – Silver Run.

- This line would include 3.5 miles of overhead line on a standard single circuit horizontal configuration on lattice towers with driven piles and pile caps crossing the Delaware River. Also, there would be 2.1 miles of overhead line on single self- supporting steel poles on drilled pier foundations. The steel poles show a vertical phase spacing of 21', 21', 10' with a 16 unit insulator suspension assembly. This configuration should be sufficient for PJM reliability and performance requirements.
- The 230 kV single circuit line uses two (2) bundled 1033.5 ACSS curlew conductors for the overhead line, two (2) 48 fiber OPGW wires for the river crossing and one (1) OPGW and one (1) OHGW for the land portion. The river crossing section calls for 200 feet of right-of-way and the land portion calls for 125 feet of right-of-way. This proposal does not call for any upgrades to existing transmission lines in the area.

Transource proposed two (2) options for a new 230 kV Transmission Line that would connect the Salem substation to the existing 230 kV "Red Lion" transmission lines in Delaware.

- Option 2A includes approximately 8.4 miles of new 230 kV Transmission Line connecting into the existing Cedar Creek substation site in Delaware. Approximately 2.7 miles of overhead 230 kV Transmission Line on mono-pole structures with 5.7 miles of submarine 230 kV cable crossing under the Delaware River.

- Option 2B – Approximately 5.7 miles of new 230 kV Transmission Line connecting into a new substation site. Approximately 2.4 miles of overhead 230 kV Transmission Line on mono-pole structures with 3.3 miles of submarine 230 kV cable crossing under the Delaware River.
- The Transource proposals 2A and 2B are very similar in that they both include a submarine and overhead land option at 230 kV but the submarine option for 2A is much longer as it heads south toward the existing Cedar Creek substation location. In our opinion the extra cost and exposure of the longer submarine cable route across the river is not worth the risk or the cost savings associated with reduced station modifications.
- Transource proposes to use a double circuit, steel pole configuration with two (2) bundled 959 kcmil ACSS/TW conductors to make a quad bundled, 6-wired configuration. They do this by tying the adjacent phases together electrically before they get to the submarine XLPE cable section. We are not sure of the benefits of this 6-wire configuration. We suggest it increases cost and schedule while it decreases aesthetics. This is an area where we feel more justification should be provided.
- In addition, the vertical phase spacing used on the Transource proposed steel pole is 15', 15', 10' with a 7'6" insulator string. In UCS's opinion, this configuration may not meet the Transmission Owner's reliability and performance requirements. The right-of-way width for this overhead transmission line section is proposed to be 130'.
- Transource proposes a two (2) bundle 1400 mm squared XLPE armored submarine cable that is jet plowed into the river bed at a depth of 10 feet to 15 feet below the mud line. The submarine conductors for each phase will be in the same trench spaced two (2) to three (3) feet apart between same phases. Each phase will be spaced twenty (20) to thirty (30) feet apart. This is dramatically different than the LS Power proposal. We could not find a specific code requiring this type of spacing.

Dominion Virginia Power proposed to construct, own and operate a new transmission line emanating from Salem substation to a new station in Delaware across the Delaware River.

- Option 1B – Approximately 6.2 miles of Overhead 500 kV transmission line from the Salem substation in New Jersey to a new step-down substation and switching station in Delaware at the existing 230 kV Red Lion transmission lines.
- Based on the cost estimate included in their appendix, it appears that Dominion plans to use their standard four-legged tower structure arrangement for this transmission line along with standard materials and equipment

- Dominion's proposal did not include details concerning how their lines would be engineered, designed or constructed.

Overall Scope of Work	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only	Units
Point A: Salem Nuclear Plant, NJ:						
OH 230kV Transmission Line:	2.0	2.1	2.7	2.4	0	Miles
OH 230kV Delaware River Crossing:	0	3.5	0	0	0	Miles
UG Submarine Cable under Delaware River:	3.6	0	5.7	3.3	0	Miles
OH 500kV Transmission Line:	0	0	0	0	3.0	Miles
OH 500kV Delaware River Crossing:	0	0	0	0	3.0	Miles
Total Transmission Line Length	5.6	5.6	8.4	5.7	6.0	Miles
Point B: Existing Red Lion 230kV Trans Line:						

Also, while this scope of work did not require determining whether the options presented would provide an electrical solution to the problems being experienced within the Delmarva area, UCS did make some electrical notes for consideration by PJM. As examples, on the submarine cable crossing the Delaware River, UCS is concerned about the ratings for the PJM Artificial Island Proposals. The overhead 230 kV lines and equipment ratings are based on 3000 amperes. This is equivalent to around 1195 MVA. The underground cables are rated at a lower level. For example the LS Power proposal uses 940 MVA summer rating (2360 amps) for the underground cables and Transource uses 780 MVA normal summer rating (1958 amps) with an emergency rating of 960 MVA (2420 amps).

Using the IEEE Standard Power Cable Ampacity Tables as a reference, the cables selected do not provide the capacity to match that of the overhead cables. Both proposals call for two (2) runs of underground cables to be installed direct buried under the river transitioning to direct buried conduit and then into duct bank before getting to the risers.

Using the IEEE Standard Power Cable Ampacity Tables for Copper Shielded Single Conductor Filled XLPE or EPR Power Cable as a guide, UCS makes the following observations:

- Cable installed in Duct Bank may need to be de-rated from an ampacity standpoint based on the quantity of conductors and conductor spacing.

- Direct buried cables, as long as they have adequate spacing, are not de-rated from an ampacity standpoint.

The underground cable ratings may be limited in the duct bank portion below the design rating. A detailed ampacity study will be required to determine the actual cable ratings for each proposal to verify that the cable sizes are adequate.

Also, the type of soil in the riverbed floor will impact the ampacity rating of the submarine cables. If the soil is comprised of either silt or clay (verses loose sand) the heat from the cable will dry out the soil turning it into a form of insulation causing the submarine cable to be de-rated in this area. A soil thermal resistivity survey of this portion of the line should be performed prior to final design of the conductor.

3.2.2 New Substation Work

For the five proposals, there are new substation facilities required at either the Salem substation or at the interconnection points to the 230 kV Red Lion Transmission Lines in Delaware.

At the Red Lion to Cedar Creek and Red Lion to Cartanza 230 kV Transmission Lines in Delaware:

- LS Power 's Option 5A and 5A Alternate (overhead only) both involve adding a new 230 kV switchyard called "Silver Run" to interconnect to the existing Red Lion – Cedar Creek and Red Lion – Cartanza 230 kV Transmission Lines. The new Silver Run 230kV switchyard is planned to be located on a 15-acre parcel in New Castle County Delaware. LS Power acquired exclusive rights to this parcel of property.
- Transource Option 2A involves interconnecting their proposed overhead 230 kV Transmission Line into the existing Cedar Creek 230 kV substation. In addition, the existing Red Lion – Cartanza 230 kV Transmission Line would need to be extended into the Cedar Creek substation.
- Transource Option 2B involves interconnecting their proposed Overhead 230 kV Transmission Line into a new 230 kV North Cedar Creek substation. In addition, the existing Red Lion – Cartanza 230 kV Transmission Line and Red Lion – Cedar Creek 230 kV lines would need to be extended into the new North Cedar Creek 230 kV substation.
- Dominion's Option 1B involves adding a new 500/230 kV step-down and switching substation to connect into the two existing 230 kV lines; Red Lion – Cedar Creek and Red Lion – Cartanza. Dominion proposes installing two (2) parallel 500/230 kV 840 MVA transformers, eight (8) 230 kV breakers and two (2) 500 kV breakers at this new substation.

Four of the five proposals introduce transmission lines that cross the Delaware River and tie into new substations at 230kV.

LS Power purchased an option on 15 acres for the Silver Run Switching Station and 5 acres for a laydown area, totaling 20 acres which appears to be more than adequate for their proposal. This Silver Run Switching Station is required for both LS Power Options 5A and 5A Alternate.

Transource 2B proposed a new substation in Delaware, North Cedar Creek, with a breaker and a half switchyard. Based on the proposal sketch, this appears to be about a 6 acre fenced area which should be adequate for their needs. Transource 2B did not state that they had secured any land rights or options for their proposal. The location of the North Cedar Creek Substation necessitates the construction of four (4) transmission lines across Delaware Route 9. Delaware Route 9 is a registered as a Delaware Scenic Highway. Additionally, this substation site is less than 1000 feet from a registered historic building. Because of these environmental and visual conflicts, it is likely this proposed location will need to be adjusted.

Dominion will need a step-down substation, Hope Creek Switching Station, with 500 and 230 kV line terminations. In their proposal, Dominion listed three general substation locations; one of which would necessitate the crossing of Delaware Route 9 with transmission lines similar to the Transource proposal discussed above. UCS estimates that Dominion will need approximately 25 acres for this substation. Dominion was silent in their proposal regarding land acquisition rights.

Catagories	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
New Substation Work	Secured an Option to Purchase a 15 acre lot	Secured an Option to Purchase a 15 acre lot	No Substation Proposed in Delaware	No land secured.	No land secured.
	Proposed Silver Run Switching Station	Proposed Silver Run Switching Station	NA	Proposed North Cedar Creek Substation	Proposed Hope Creek Switching Station
	Secured an additional 5 acre option for a lay down area.	Secured an additional 5 acre option for a lay down area.	NA	Proposed 6 acre fenced area but no land rights secured.	Will need approximately 25 acres for this substation. Dominion was silent in their proposal regarding land acquisition rights.
	Appears to be adequate for their needs	Appears to be adequate for their needs	NA	Proposed site adequately sized but has environmental and visual conflicts. Will likely need to be relocated.	In their proposal, Dominion listed three general substation locations; one of which would necessitate the crossing of Delaware Route 9 with transmission lines similar to the Transource proposal.

4.0 Regulatory and Land Acquisition Risk

There are many potential risks to the successful completion of any of the project proposals reviewed. The following discussion will highlight the most significant risks.

Right-of-way Acquisition in Delaware

It is UCS's opinion that one of the highest risks involves the acquisition of right-of-way in Delaware. For all proposals, there will be new right-of-way required along the project routes. Transource stated plans to negotiate with land owners as a first step to obtain private right-of-ways for new lines. However, as a last resort, they mention using eminent domain authority. Even though not specifically stated in their proposal, Dominion seemed to assume that no eminent domain authority was available in Delaware because they allow 3-5 years for land acquisition in their project schedule. LS Power's proposal specifically stated that Delaware did not afford eminent domain power. UCS contacted the Delaware Public Service Commission and spoke with Mr. Robert Howatt, Executive Director. Per Mr. Howatt, Electric Utilities do not have eminent domain authority, subject to state law. Electric Utilities must negotiate with private property owners for easements for electric power lines. The lack of eminent domain authority must be addressed in budget and timeline assumptions.

LS Power's two options follow the same overhead route once landfall is made on the Delaware side of the river. They cross only Delaware State owned land until they reach State Highway 9. Their route then proceeds to use the existing Highway 9 road right-of-way until it reaches the tract of land where they propose to locate a new substation ("Silver Run") adjacent to the existing electric transmission grid. LS Power states that they have secured options on the private property needed for the new 230 kV line and the new Silver Run substation, which shortens their schedule for right-of-way acquisition.

Note: All the projects begin in New Jersey within the Salem/Hope Creek Nuclear Station property and then cross the Delaware River either by an overhead or submarine lines. No other private property is impacted in New Jersey.

Delaware River Crossing

Another high risk item that applies to all five proposals will be the permitting required to cross the Delaware River. This process will apply to an overhead or underground river crossing and the filing of a Section 10 permit with the United States Army Corp of Engineers (USACE). Fortunately, the USACE approved the installation of a 34 5kV submarine cable (Hudson Transmission Project, between NJ and NY) in 2010 and a 230 kV submarine cable in 2011 (Bayonne Energy Center, between NJ and NY), which implies that there should be precedent cases in the area along with some permitting and installation information publically available for application and permitting of this project. Federal jurisdiction applies the same rules to all navigable waterways. The Hudson project took over 6 years to complete and the Bayonne

project was completed in about 5 years. These two projects are the closest examples we could find to Artificial Island (i.e., a submarine cable). As an overhead river crossing example, the rebuild of an 85-year old power line over the Delaware River, in the northern PA/NJ area, was recently given final approval by the National Park Service. This four mile section of a much longer transmission line project, which is being built almost entirely on existing right-of-way, took almost 4 years just to gain all the necessary approvals and permits. The river crossing risk is primarily in regard to completing any of the projects on schedule.

The Delaware River crossing will also have to be approved by the Delaware River Basin Commission (DRBC), which is made of the Governors of Delaware, New Jersey, New York, and Pennsylvania and the head of the USACE Philadelphia office. Public opposition and other political pressure on this board could cause a risk to the project schedule, particularly if an aerial crossing option is pursued because of the visual impacts to the scenic river views.

The federal navigation channel in the Delaware River, which was dredged/deepened to 45' in 2013 in the Artificial Island area, will also involve consultation and agreements with the USACE and the U.S. Coast Guard, which could impact the project schedule.

The Delaware River is also an important flyway for migratory birds. Any of the options that involve an overhead line and tall towers in the river would cause more of a potential impact to these birds. Bird diversion devises placed on the towers and conductors would mostly likely be required through the consultation/permitting process with federal agencies such as the USACE and the U.S. Fish and Wildlife Service (Migratory Bird Treaty Act). Project cost and schedule could be affected.

Federal Aviation Administration permitting could also be necessary for any of the overhead crossings of the river, depending on the engineering design height of the towers. Again, project cost and schedule could be affected.

<u>Delaware State Highway 9</u>

Highway 9, a narrow two-lane road, is classified as a "Coastal Heritage Scenic Byway" by the State of Delaware. The Delaware DOT website describes it as follows:

"*Route 9 Coastal Heritage Byway is a Delaware treasure - a scenic, two-lane road that follows along the Delaware River and Bay Estuary. It offers visitors an intimate experience with the largest preserved coastal marshland on the east coast…… a road of rhythm and rhyme. It offers a connection to all that is Delaware; history, open space, fresh and saltwater marshes, small towns and large farms, rivers and the bay, lighthouses and dark skies, historic mansions and migrant shacks, and water birds and watermen.*"

Both LS Power options include an overhead route within the Highway 9 right-of-way for about 1.4 miles. Two other proposer's routes (Dominion and Transource 2B) cross over the highway

at approximately 60 to 90 degrees. Transource 2A ties into the existing Cedar Creek substation that sits on the eastern edge of Highway 9.

Delaware Department of Natural Resources and Environmental Control reviews of the project will likely give increased scrutiny to the impact on this scenic highway. At the very least this highway designation will add to the level of public opposition, which could in turn impact the project schedule.

LS Power's proposed co-location of their overhead route within the Highway 9 right-of-way is also an increased risk based on engineering design concerns noted earlier. Typically, key 230 kV interconnections do not encroach on DOT rights-of-way.

Existing Land Easements

Private lands in Delaware might be encumbered by U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Farm and Ranch Protection Program (FRPP) easements, which prohibit transmission line crossings. The most current information available, which is at least two years old, shows that no FRPP easements are crossed by any of the proposed routes. But this situation could have changed since this data was last updated by the USDA/NRCS. These types of easements would throw a major roadblock to a route if encountered, causing re-routes and significant schedule delays.

Wetlands/Endangered Species

All of the proposed routes will involve crossing wetlands and could possibly impact threatened or endangered plants and animals. Wetland impacts will involve USACE permitting and possibly mitigation. Federal and state agencies will need to be consulted in regard to threatened and endangered species. In some cases, especially within the Delaware River, before and after environmental studies might need to be conducted and documented, some of which could take several months up to two (2) years of studies before approval.

Cultural Resources

All proposing entities would need to work together with the New Jersey and Delaware State Historic Protection offices and implement any cultural resources studies requested, in addition to filing for the necessary permits. Any cultural resources found during fieldwork would have to be marked thoroughly and avoided through pole relocation and/or re-alignment of the route. If any Native American consultations are deemed prudent, the proposing entity would have to work with the tribal community allowing time in the schedule for risk mitigation.

State Regulations

All the alternate project proposals involve both the States of New Jersey and Delaware, which have many regulations, especially environmental, that must be successfully navigated to acquire the necessary permits. The state agencies, primarily the New Jersey Department of Environmental Protection (NJDEP) and the Delaware Department of Natural Resources and

Environmental Control (DEDNREC) work with the federal agencies on things such as water quality, wetlands, rare species, coastal zone impacts, cultural resources and land use regulations. Coordination between several Federal agencies and two States must be handled proactively and efficiently in order for the projects to proceed in a timely manner.

Local Ordinances

Every municipal entity that the proposed transmission line passes through may conduct public zoning hearings and require zoning variances due to the height of the structures. These public hearings require notice to abutters, public meetings and continuances, before final approvals are issued. These permitting processes can be quite lengthy and will potentially stir up public opposition.

Fishing and Oyster Industries

The Delaware River begins to widen and transition into the Delaware Bay just southeast of Artificial Island. This is an important commercial fishing area. Oysters are also a very important commodity for the local economy. Any of the submarine routes could potentially disrupt oyster beds.

The Delaware Bay is part of the U. S. Environment Protection Agency's National Estuary Program through an organization called "Partnership for the Delaware Estuary." This group is a member of the Delaware Bay Oyster Restoration Task Force, a coalition of organizations working to restore and revitalize the fledgling oyster population in the Delaware Bay. Other key members of the restoration group include the USACE, NJDEP, DEDNREC, DRBC, local universities, and other regional and local organizations and municipalities.

Public opposition to this project could be intensified from the fishing and oyster industries, impacting the project schedule. Transource option 2A, which includes an almost 6 mile submarine route travelling south from Artificial Island would in our opinion cause the most opposition from the fishing and oyster interests.

Submarine Cable Risks

The risks associated with submarine cables are as follows:

- Long lead times associated with cable production and delivery.
- Availability of multiple submarine cable suppliers.
- Availability of installers.
- Material price volatility and the potential for material price escalation.
- If oyster beds are encountered, they may cause significant issues during permitting and installation.
- Certain silt/mud backfill sections may dry out due to the heating of the XLPE cable during operation causing it to retain rather than dissipate heat from around the cable further lowering the electrical capacity of the cable.

- The ramifications of USACE's dredging activities both on-going and future should be better addressed in the final proposals.
- Approvals from some of the political and environmental agencies like "The Delaware River Basin Commission" are a risk to schedule.

State Public Utility Commissions

It is UCS's opinion that this is a minor risk. Delaware Public Service Commission approval is not needed for this project and New Jersey Board of Public Utilities approval is typically required only when an electric transmission line must cross more than one municipality or where a utility is unable to garner necessary local approvals. The transmission line in New Jersey is within Lower Alloways Township and only involves one property owner at the Salem/Hope Creek Nuclear Power Stations. The local tax records identify the parcel owner as PSEG Services Corporation. The Environmental Impact Statement issued in 2011 for the relicensing of the two nuclear power plants lists the parcel owner as Public Service Enterprise Group Incorporated Nuclear, LLC (PSEG). The two power plants on Artificial Island are by far the largest employers in Lower Alloways Township and pay large amounts of property taxes. It is our opinion that the township leaders will strongly support any changes or improvements to the electric transmission system. The nuclear industry is vital to the local economy.

National Environment Policy Act (NEPA)

The level of environmental review under NEPA guidelines is determined by the lead federal agency, which will probably be the USACE for this project. At the minimum an Environmental Assessment (EA) report would be prepared in conjunction with other federal and state agencies to determine if "significant" environmental impacts may occur. Significant impact determination can be subjective and could be interpreted differently by different agencies in different parts of the country. A full Environmental Impact Statement (EIS) would be prepared if the lead agency decides that significant impacts could result from this project. An EIS would extend the schedule from one to two years in our opinion.

Two similar submarine river crossings in the vicinity of New York City (Hudson Transmission Project and Bayonne Energy Center) have not required EIS's. The USACE has, after preliminary study, ruled that an EIS is not needed for a proposed overhead crossing of the James River near Williamsburg, VA, but many national, regional and local organizations are strongly lobbying the USACE to require an EIS before they issue any necessary permits for the project.

It is our opinion that an EIS is a possibility for this project, given the political nature of the Delaware River Basin Commission, the rural and scenic environment of the Delaware coastal farmland and marshland that all the routes would cross, and the anticipated high level of public opposition that this project will generate.

4.1 General Path Feasibility

In order to determine if there are significant barriers to the proposed project paths that would add additional risk to the project, UCS examined the available public sector data, aerial photographs, real estate records, navigational waterway charts and other data and offers the following opinions on the proposed project path options presented.

The paths for the five (5) different proposals are shown on the Google Earth image below:

Salem substation is located on the New Jersey side of the Delaware River; the 230kV Red Lion transmission line is located going north to south on the Delaware side of the Delaware River.

The following sections look into the factors impacting the general path feasibility of the presented options.

The lead federal agency, which will probably be the U. S. Army Corps of Engineers, must follow the National Environmental Policy Act (NEPA) process. This will have a major impact on the path feasibility. The NEPA process evaluates the environmental effects of a project requiring a federal permit, such as a navigable water crossing. Once the NEPA process is initiated it

triggers consultation with other agencies which in turn leads to other federal permitting requirements.

There are three levels of analysis: categorical exclusion determination; preparation of an environmental assessment/finding of no significant impact (EA/FONSI); and preparation of an environmental impact statement (EIS).

- Categorical Exclusion: At the first level, an undertaking may be categorically excluded from a detailed environmental analysis if it meets certain criteria which a federal agency has previously determined as having no significant environmental impact. A number of agencies have developed lists of actions which are normally categorically excluded from environmental evaluation under their NEPA regulations.

- Environmental Assessment (EA)/Finding of No Significant Impact (FONSI): At the second level of analysis, a federal agency prepares a written EA to determine whether or not a federal undertaking would significantly affect the environment. If the answer is no, the agency issues a FONSI. The FONSI may address measures which an agency will take to mitigate potentially significant impacts.

- Environmental Impact Statement (EIS): If the EA determines that the environmental consequences of a proposed federal undertaking may be significant, an EIS is prepared. An EIS is a more detailed evaluation of the proposed action and alternatives. The public, other federal agencies and outside parties may provide input into the preparation of an EIS and then comment on the draft EIS when it is completed.

If a federal agency anticipates that an undertaking may significantly impact the environment, or if a project is environmentally controversial, a federal agency may choose to prepare an EIS without having to first prepare an EA.

After a final EIS is prepared and at the time of its decision, a federal agency will prepare a public record of its decision addressing how the findings of the EIS, including consideration of alternatives, were incorporated into the agency's decision-making process.

Using the Dominion James River Crossing project discussed previously and the Champlain Hudson Power Express Project (CHPE) as examples, UCS considers it to be a possibility that any of the options that involve either an overhead or submarine Delaware River crossing will require the completion of an EIS. The Department of Energy (DOE) is the lead federal agency for the CHPE project and determined that an EIS was the appropriate method to review the project. The CHPE project involves submarine cable under Lake Champlain and portions of the Hudson River (navigable waters of the US), travelling south from the Canadian border across New York State to its end point in New York City. The segments of this line that are not submarine will also be buried underground. The EIS documentation was started by DOE in 2010 and is still on-going. Overhead and/or underwater construction will require at a minimum an EA and all wetland impacts will have to be mitigated. Per the NEPA process, completion of an EA may find the potential for 'significant' environmental impact, which would then trigger the completion of an EIS.

An EIS requires that the right-of-way (route) that is being assessed is either obtained or will not change. Thus the acquisition of right-of-way and NEPA activities cannot be done simultaneously. If the NEPA process is complete and the route changes, an EIS revision will be required. The sequential nature of these activities will most certainly impact the schedule of the options requiring an EIS.

It would appear that the majority of the overhead routes involve crossing wetland or marsh areas. Wetland impacts will need to be mitigated. This will be discussed further in the cost analysis and assessment section of the report.

In addition, the Order of Conditions of any EA or EIS for an approved route may impose severe limitations on the seasons that construction activity can take place in order to avoid impacts to spawning and nesting.

In UCS's opinion, another major risk for the Transource proposals are that all new right-of-way will be required for the transmission lines and new substations or switchyards but no land options or right-of-ways have been secured. With a lack of eminent domain authority in Delaware, Transource has both a schedule and budgetary risk not accounted for in their proposals. Route relocations can drive up project costs substantially along with adding significant schedule delays.

4.2 Public Opposition

As part of the research performed to estimate the level of public opposition to this project, UCS looked at recently completed and on-going infrastructure projects, both overhead and submarine river crossings, in the regional vicinity of the proposed alignments to see what level of public opposition they have encountered.

About 115 miles north of Artificial Island, a project involving an overhead line crossing the Delaware River between northern Pennsylvania and New Jersey has faced coordinated public opposition from almost a dozen national, state, and local environmental groups, including PA and NJ Chapters of the Sierra Club, the Delaware Riverkeeper Network, the Appalachian Mountain Club, and the NJ Highlands Coalition, among others. Local opponents have included some municipalities and some homeowners associations that are crossed by the route. The Susquehanna-Roseland project (PP&L in PA and PSE&G in NJ), currently under construction, will traverse approximately 100 miles in northeastern PA and 45 miles in northern New Jersey. It is replacing an 85-year old 230 kV lattice tower line with single pole construction for a new 500 kV line in addition to the existing 230 kV line. The existing towers average about 100' tall and the new towers would almost double in height to approximately 195' tall. Almost 95% of the line will be built on existing electric utility rights-of-way.

The focal point of most of the organized public opposition centers on about 4 miles of the line where it crosses of the Delaware Water Gap National Recreation Area, The Appalachian Trail and the Middle Delaware National Scenic and Recreational River. The right-of-way width would need to be expanded from 100' to 150' on a 0.7 mile segment of the line on this land managed by the National Park Service. The most visceral opposition seems to be the view shed

impacts from the taller structures, but opponents also point out other environmental impacts such as wetlands and threatened and endangered species. They also claim that the project will carry 'dirty coal' produced power from Pennsylvania and points west into New Jersey and the New York City area. The project actually starts at the PP&L Susquehanna Nuclear Power Plant near Berwick, PA. Opposition also claims that the project is not necessary because of lessening electric power demand in the region.

The utilities filed applications with the respective utility commissions in PA and NJ in early 2009, which were approved by late 2009 (PA) and early 2010 (NJ). However, The U.S. National Park Service had to grant a right-of-way and special use permit because of the route crossing federally controlled land. The environment review process by the Park Service started in 2010 and by the time a Draft EIS and Final EIS were completed nearly three years had passed. On October 1, 2012, the National Park Service issued a Record of Decision affirming the utility-chosen route. As part of the environmental mitigation negotiation between PP&L/PSE&G and the Park Service, the utilities will pay approximately $56 million into a fund administered by a non-profit organization to buy and or preserve thousands of acres of land adjacent to the Delaware Water Gap National Recreation Area and other federally managed lands in the vicinity. A coalition of environmental groups filed lawsuits to stop the project in late 2012, but they have been unsuccessful. According to PP&L/PSE&G, the construction in the Delaware River crossing area is underway and should be completed in by mid-2014 and the entire 145-mile line is expected to be energized by the middle of 2015.

An overhead crossing of the Delaware River near Artificial Island will most likely face similar organized opposition as discussed in the previous paragraphs concerning the 500 kV line under construction in the Delaware Water Gap National Recreation Area. Impacts to the scenic river landscape and aquatic habitats along with safety concerns of commercial shipping traffic and recreational watercraft will in our opinion be the biggest objections to an overhead crossing. However, in UCS's 25 years of experience siting and permitting overhead electric transmission lines, visual impacts routinely cause some of the highest levels of public opposition.

It is also our opinion that visual impacts could lead to significant organized public opposition to the overhead segments of the proposed project in Delaware. The various proposal's alternate routes for the line would traverse large wetland areas and rural farmland for the approximately 1.8 to 2.7 miles from the edge of the Delaware River to the proposed substation options that tie to the existing transmission system. This area of Delaware is sparsely populated, has flat topography and is characterized by many scenic vistas of the farmland and marshland that make up the majority of the land use. There is minimal tree cover, which occurs on some of the narrow strips of land that separate the wetlands/streams and the farmland. Some newer subdivisions have been built in the vicinity of the existing 230 kV Transmission Lines that would interconnect with the proposed project. State Highway 9, a narrow two-lane road which runs north/south through the area, is a designated "Coastal Heritage Scenic Byway" by the State of Delaware. LS Power's proposed routing encroaches in the Highway 9 right-of-way for 1.4 miles of the approximate 2.4 miles that this alternate line runs west of the Delaware River to their proposed Silver Run substation. The other proposed alternate routes cross over Highway 9, except Transource 2A, which ties into the existing Cedar Creek substation that sits on the eastern edge of Highway 9.

Visual impacts to the residences that dot the landscape could also potentially ramp up opposition to the project. In our opinion, this would be especially true for the approximately two dozen houses that are very close (less than 100' to about 800') to the LS Power alignment as it follows within Delaware Highway 9 right-of-way for almost 1 ½ miles. We estimate that most of them would be subject to 'very high' visual impacts. The proposed alternate switching station or substation sites, which would each encompass about 10-25 acres, could also intensify public opposition because of their potential effects to the scenic vistas that the residents of the area enjoy.

One recent project in the vicinity, which all of the proposed routes will come in direct contact with, is the dredging (deepening) of the Delaware River Shipping Channel. The U.S. Army Corp of Engineers (USACE) commissioned to have the river dredged in order to increase the floor depth from a minimum depth of 40 feet to a minimum depth of 45 feet deep. This overall project (approximately 103 miles in length) was first proposed for study in 1983, but actual dredging operations did not begin until 2010 with an expected completion date of 2017.

There has been much public opposition and legal challenges to this project over the years. As late as 2009 the New Jersey Department of Environment Protection (NJDEP), Delaware Department of Natural Resources and Environmental Control (DEDNREC), and a coalition of five environment groups (Delaware Riverkeeper Network, National Wildlife Federation, NJ Environment Federation, Delaware Nature Society, and Clean Water Action in PA) filed lawsuits in NJ and DE against the USACE to stop them from awarding the first construction contract, which was scheduled for 2010. The legal challenges were not successful and the deepening of other sections of the Delaware River shipping channel is on-going. The NJDEP and the DEDNREC are agencies that will be directly involved in various permits, consultations, and compliance issues for any of the proposed projects. The Port Penn/Reedy Island to Woodland Beach reach of the dredging project (approximately 14 miles) encompassed the shipping channel that passes by the Artificial Island area. This section of dredging was completed in 2013. Since some proposals being reviewed involve buried cables and there was public opposition to the river dredging project, UCS's opinion is that there could be significant opposition to jet plowing the river bottom and burying cables under that same river.

About 15 miles to the northwest of the Artificial Island area in Newark, Delaware, a project to develop a large computer server data center along with a natural gas-fired power plant has been proposed and is drawing considerable public opposition. Many speakers crowded into Newark's city council chambers in October 2013 to comment on this project. Newspaper articles stated that opponents outnumbered backers. One news article stated that "The ferocity of the opposition has led some business and government leaders to worry that the state now has the reputation of being 'closed for business' during a period of slow economic growth." To our knowledge, approval for this project has not yet occurred.

Since all of the proposed options reviewed and evaluated in this project include a crossing of the Delaware River by either overhead or submarine cables, we fully expect that there will be public opposition to any crossing. The Delaware River is viewed as an extremely valuable resource in the eyes of many of the residents of Delaware, New Jersey, Pennsylvania and New York. Also, the coastal area along the Delaware side of the river includes large expanses of wetlands and many braided stream channels. This area is part of the largest preserved coastal marshland, nearly 50,000 acres, on the east coast.

As stated previously, we anticipate that any of the overhead river crossing options will generate more public opposition than the submarine options. The regional and local opposition will, in our opinion be spearheaded by numerous environmental advocacy groups.

We expect the Delaware Riverkeeper Network (DRN) to be at the forefront of public opposition, vigorously objecting to any of the options that could potentially impact the river visually or environmentally. The Delaware Riverkeeper Network are a group of attorneys extremely outspoken and heavily involved in the public arena concerning any perceived threat to the Delaware River or its tributaries. Since the DRN began over 25 years ago, the DRN staff has grown to include four attorneys. This organization differentiates itself from other advocacy groups through a focus on litigation. At the end of 2013, the DNR had more than 3 dozen ongoing litigations. And since 2007 they have trained 65 watershed groups and over 700 local residents on how to test the water in their local streams along the Delaware River basin.

The Delaware Nature Society (DNS), founded 50 years ago, works to improve the environment through conservation, advocacy and education. As the state affiliate for the National Wildlife Federation, the DNS addresses more than 50 environmental issues on the federal, state and local level. It is our opinion that they would be concerned with the potential effects to the river bottom ecosystem and general water quality issues stirred up by the installation of an underground cable. In comparison, they may see the temporary impacts from submarine cable construction as less than the potential permanent impacts to the migratory bird flyways from an overhead river crossing.

Another organization, the Delaware Audubon Society (DAS), is dedicated to preserving the natural environment and working for species and habitat conservation. We feel they would be more concerned about how the migratory bird paths could be affected by the height of the structures on any of the overhead river crossing options. The DAS, over the last 30 years, has focused on protection of the Delaware Bay and the Coastal Zone. In recent years, as the result of controversial projects like the previously discussed power plant proposed in nearby Newark, Delaware, they have seen a surge in membership of about 10%. They believe that an increasing percentage of the general population share their conservation concerns.

The Delaware Chapter of the Sierra Club has been active in protecting Delaware's environment for close to 50 years. Through their work on water and habitat protection, they have been staunch opponents of a number of major projects, including the ongoing dredging of the Delaware River shipping channel, often becoming a party to legal challenges.

A relatively new organization less than 20 years old, Green Delaware is a grassroots organization concerned with environmental and public health issues in Delaware and surrounding states. They are very social media savvy and have a robust internet based blog that they use to rally public opposition to various projects affecting the Delaware River and the coastal zone.

For over 50 years, Delaware Wild Lands (DWL) has been working to protect and restore Delaware's important natural areas through the purchase and management of strategic parcels of land. This group worked in earnest alongside former Governor Russell Peterson toward the passage of The Delaware Coastal Zone Act of 1971. To date, DWL owns or helps manage and protect about 30,000 acres of land, including tracts in Delaware's coastal areas and the Great Cypress Swamp. In our opinion they would be more concerned about the line route options as they make landfall on the western side of the Delaware River. But as we have come to realize how the residents of the region look at the river and the adjacent tidal wetlands and uplands as one ecosystem, it is our opinion that DWL will be equally engaged and concerned with the Delaware River crossing itself. We feel that on balance they would prefer a submarine option for the river crossing, siting the lesser visual impacts. Interestingly, the DWL office is located in the historic town of Odessa, Delaware, less than 3 miles from any of the proposed line routes or substations associated with the five proposals UCS is evaluating.

4.3 Permitting

The proposals vary widely in their respect to their listings of required permits. As summary:

- LS Power - lists six (6) Federal permits / agencies, thirteen (13) State permits/agencies, and four (4) Local permits/agencies
- Transource - lists eight (8) Federal permits/agencies, nineteen (19) State permits/agencies, and twenty (20) Local permits/agencies
- Dominion - lists seven (7) Federal permits/agencies, eleven (11) State permits/agencies, and zero (0) Local permits/agencies

The total time allowed or included for permitting for each proposing entity is fairly consistent between the proposals.

- LS Power lists approximately 30 months for permitting and siting which they say can be done concurrently.
- Transource lists approximate 39 months total for permitting and state siting requirements.
- Dominion lists approximately 30 months for permitting and siting which they too say can be done concurrently.

When reviewing the number of permits and agencies involved from the states, federal, and local counties, there will be upwards of 40-50 different permits and agencies involved. Given the magnitude of this number along with the depth of information and or studies that may be required, we would tend to be much more conservative in our estimate of the time frame required for permitting and siting. Also, we would be cautious to state that these tasks could be accomplished concurrently. A more realistic schedule would include 36 to 48 months in the schedule for permitting and siting.

Also, there are many risks that could influence the time frame for permitting activities including the level of opposition to the project from private individuals, groups and/or governmental agencies. It is well documented that there was and continues to be much opposition to the

ongoing dredging of the Delaware River shipping channel, including opposition from the current Governor of New Jersey.

Another entity that could potentially delay the project is the Delaware River Basin Commission (DRBC), which is comprised of the Governors of Delaware, New Jersey, New York, and Pennsylvania, and one Federal Official, the Division Engineer, North Atlantic Division, U.S. Army Corps of Engineers.

The introduction in the Comprehensive Plan, Delaware River Basin Commission, July 2001 states: "Section 3.8 of the DRBC's Compact also requires any project having a substantial effect on the water resources of the Basin to be approved by the Commission before it is undertaken by any person, corporation or governmental authority. The Commission must approve a project whenever it finds and determines that such project would not substantially impair or conflict with the Comprehensive Plan and may modify and approve as modified, or may disapprove any project whenever it finds and determines that the project would substantially impair or conflict with the Plan."

Only one of the projects submitted, LS Power 5A has the DRBC listed in the permitting section. If the other proposals had included the DRBC, our opinion is that it possibly would have changed their permitting/timeline.

The other federal permits are fairly standard ones that all the project proposals identified, like the US Army Corps of Engineers, USFWS, NOAA, and the U.S. Coast Guard.

The key players on the State level would be the ones dealing with historic resources and threatened and endangered species consultation and coordination with the federal agencies that deal with these resources.

Also on the State level, Delaware has had an extremely strict coastal protection law in force since 1971, the Delaware Coastal Zone Act. It was set up to regulate existing heavy industrial activities, as well as new and existing manufacturing activities in Delaware's Coastal Zone. Certain new activities, such as the bulk transfer of raw materials, are not allowed in the Coastal Zone, which runs the length of the state. It is anticipated that the landfall structures (for the submarine options) and the 230 kV or 500 kV overhead structures would be carefully scrutinized by the Delaware authorities, who are extremely protective of their coastal areas.

Since the shipping channel dredging in the project proposal areas has already been completed, future maintenance of the shipping channel should not be an issue. With proper consultation from the Coast Guard and other regulatory agencies about performing a submarine cable crossing, it is our opinion that shipping channel issues should be minimal. The only potential problem could be the normal waterway activities such as fishing, anchors and other new installations.

PERMITTING TABLES:

The following "tables" list and summarize the permits that were included in each of the proposal submitted. The "x" in each of the columns indicates that the proposing entity included this permit in their documentation of required permits. UCS has included a column showing the permits that are believed to be required for all of the various options evaluated.

Table A – Federal Permits:

Responsible Agency	Permit/Certificate/Clearance/Compliance	Required Permits Based on UCS Research	LS Power - 5A (OH / UG)	LS Power - 5A Alternate (OH Only)	Transource-2A (OH / UG)	Transource-2B (OH / UG)	Dominion-1B (OH Only)
Federal							
Delaware River Basin Commission	Approval for construction crossing the Delaware River	X	x	x			
USACE	Section 404 of the Clean Water Act	X	x	x	x	x	x
USACE	Section 10 of the Rivers and Harbors Act	X	x	x	x	x	x
USFWS and NOAA	Threatened & Endangered Species - Section 7 Consultation	X	x	x	x	x	x
USFWS	Migratory Bird Treaty Act (MBTA) & Bald and Golden Eagle Prote	X			x	x	
NOAA/National Marine Fisheries Service and	Fish & Wildlife Coordination Act	X			x	x	x
NOAA/National Marine Fisheries Service	Magnuson-Stevens Fisheries Conservation and Management Act	X			x	x	x
NOAA/NOS/OCRM	Coastal Zone Management Act coordination with states and cons	X	x	x			
US Coast Guard	Permit/Authorization; Aid to Navigation	X	x	x			x
US EPA	National Env Policy Act (NEPA) - compliance	X			x	x	x
FAA Regional Office	Obstruction to Air Navigation	X			x	x	
Advisory Council on Historic Preservation	Section 106 - National Historic Preservation Act Compliance	X	x	x	x	x	x

Table B – New Jersey State Permits:

Responsible Agency	Permit/Certificate/Clearance/Compliance	Required Permits Based on UCS Research	LS Power - 5A (OH / UG)	LS Power - 5A Alternate (OH Only)	Transource-2A (OH / UG)	Transource-2B (OH / UG)	Dominion-1B (OH Only)
New Jersey State							
New Jersey Board of Public Utilities	Review/Approval	*N/A*			x	x	
NJ DEP - Historic Preservation Office (SHPO)	Section 106 - National Historic Preservation Act Compliance	X	x	x	x	x	x
NJ DEP - Division of Land Use Regulation	Utility Line Crossing Permit (General Permit 2)	X			x	x	
NJ DEP - Division of Land Use Regulation	Underground Utility Line (General Permit 7)	X			x	x	
NJ DOT	Temporary Road Crossing Permit	X			x	x	
NJ DEP - Division of Water Quality	Section 401 Water Quality Certification (WQC)	X			x	x	
NJ DEP - Division of Water Quality	Section 402 New Jersey National Pollutant Discharge Eliminatior	X			x	x	
NJ DEP - Division of Fish & Wildlife	Threatened & Endangered (T&E) Species Consultation	X	x	x	x	x	x
NJ DEP - Division of Land Use Regulation	Flood Hazard Area Permits	X			x	x	
NJ DEP - Division of Land Use Regulation	Waterfront Development/Coastal Wetlands Permit	X			x	x	x
NJ DEP - Division of Land Use Regulation	Tidelands Conveyance - License or Grant	X	x	x	x	x	
NJ DEP - Division of Land Use Regulation	Federal Coastal Zone Consistency Review / CAFRA permit	X	x	x	x	x	x
NJ DEP - Green Acres Program	Farmland and open space impacts/preservation	X					x
Cumberland Salem Conservation District	Soil Erosion and Sediment Control Plan / Construction permit	X	x	x			

Table C – New Jersey Local Permits:

Responsible Agency	Permit/Certificate/Clearance/Compliance	Required Permits Based on UCS Research	LS Power - 5A (OH / UG)	LS Power - 5A Alternate (OH Only)	Transource-2A (OH / UG)	Transource-2B (OH / UG)	Dominion-1B (OH Only)
New Jersey Local							
County or Municipality (Salem Co; LAC Twp)	Road Crossing	X			x	x	
LAC Twp - Lower Alloways Creek Township							
County or Municipality (Salem Co; LAC Twp)	Hauling	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Utility Permit	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Floodplain Development Permit	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Soil Erosion & Sediment Control Certification	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Zoning Permit	X	x	x	x	x	
County or Municipality (Salem Co; LAC Twp)	Building Permit	X	x	x	x	x	
County or Municipality (Salem Co; LAC Twp)	Electrical Permit	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Noise Regulation Compliance	X			x	x	
County or Municipality (Salem Co; LAC Twp)	Dust Control Permit	X			x	x	

Table D – Delaware State Permits:

Responsible Agency	Permit/Certificate/Clearance/Compliance	Required Permits Based on UCS Research	LS Power - 5A (OH / UG)	LS Power - 5A Alternate (OH Only)	Transource-2A (OH / UG)	Transource-2B (OH / UG)	Dominion-1B (OH Only)
Delaware State							
Delaware Public Service Commission	Review/Approval	*N/A*	x	x	x	x	
Delaware Dept of State - Division of Historica	Section 106 - National Historic Preservation Act Compliance	X	x	x	x	x	x
Delaware DNREC - Office of the Secretary	Coastal Zone Act Determination	X	x	x	x	x	x
Delaware DNREC - Office of the Secretary	Federal Coastal Zone Consistency Review/Coordination	X	x	x	x	x	x
Delaware DNREC - Division of Watershed Ste	Sediment and Stormwater Management Plan	X	x	x			
Delaware DNREC - Division of Water	Section 402 Delaware National Pollutant Discharge Elimination S	X			x	x	
Delaware DNREC - Division of Water	Wetlands and Subaqueous Lands Section Permit	X	x	x	x	x	x
Delaware DOT	Highway Crossing, Occupancy, and Road Turnout Permits	X	x	x	x	x	
Delaware DNREC - Division of Fish & Wildlife	Threatened & Endangered (T&E) Species Consultation	X	x	x	x	x	x
Delaware Dept of Agriculture	Farmland and open space impacts/preservation	X					x

Table E – Delaware Local Permits:

Responsible Agency	Permit/Certificate/Clearance/Compliance	Required Permits Based on UCS Research	LS Power - 5A (OH / UG)	LS Power - 5A Alternate (OH Only)	Transource-2A (OH / UG)	Transource-2B (OH / UG)	Dominion-1B (OH Only)
Delaware Local							
County or Municipality (New Castle County)	Utility Permit	X			x	x	
County or Municipality (New Castle County)	Floodplain Development Permit	X			x	x	
New Castle County Soil Conservation District	Soil Erosion & Sediment Control Certification	X			x	x	
County or Municipality (New Castle County)	Zoning Permit	X	x	x	x	x	
County or Municipality (New Castle County)	Building Permit	X	x	x	x	x	
County or Municipality (New Castle County)	Electrical Permit	X			x	x	
County or Municipality (New Castle County)	Noise Regulation Compliance	X			x	x	
County or Municipality (New Castle County)	Dust Control Permit	X			x	x	
County or Municipality (New Castle County)	Road Crossing	X			x	x	
County or Municipality (New Castle County)	Hauling	X			x	x	

PERMITTING SUMMARY:

The following list summarizes the major permits that UCS considers as required by Federal, State and local groups for constructing any of these new transmission line options.

Key Federal Permits/Compliance:

Delaware River Basin Commission – Approval for construction in Delaware River (Corps of Engineers Official and Governors of DE, NJ, NY and PA make up this commission)

- The Delaware River Basin Compact provides that no project having a substantial effect on the water resources of the basin shall be undertaken unless it shall have been first submitted to and approved by the commission (Compact, §3.8). In accordance with Section 3.8 of the Compact, the commission is required to approve a project whenever it finds and determines that the project would not substantially impair or conflict with the Comprehensive Plan. The commission provides by regulation for the procedure of submission, review and consideration of projects and for its determinations pursuant to Section 3.8.
- DRBC approves docket applications (in accordance with Section 3.8 of the Delaware River Basin Compact) and permit applications (in accordance with Section 10.3 of the Compact and the commission's Southeastern Pennsylvania Ground Water Protected Area Regulations). Docket and permit applications are reviewed by the DRBC Water Resources Management and Modeling, Monitoring and Assessment Branches.

Corps of Engineers – Section 404 of the Clean Water Act

- Section 404 of the Clean Water Act (CWA) establishes programs to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities).
- The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded. In other words, when you apply for a permit, you must first show that steps have been taken to avoid impacts to wetlands, streams and other aquatic resources; that potential impacts have been minimized; and that compensation will be provided for all remaining unavoidable impacts.
- Proposed activities are regulated through a permit review process. An individual permit is required for potentially significant impacts. Individual permits are reviewed by the U.S. Army Corps of Engineers, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines, regulations promulgated by EPA. However, for most discharges that will have only minimal adverse effects, a general permit may be suitable. General permits are issued on a nationwide, regional, or State basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with

little or no delay, provided that the general or specific conditions for the general permit are met. For example, minor road activities, utility line backfill and bedding are activities that can be considered for a general permit. States also have a role in Section 404 decisions, through State program general permits, water quality certification, or program assumption.

Corps of Engineers – Section 10 of the River and Harbors Act

- Section 10 of the River and Harbors Act states that the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same.

USFWS – Endangered Species Act, Section 7 Consultation

- **The Endangered Species Act of 1973 (ESA)-** mandates all Federal departments and agencies to conserve listed species and to utilize their authorities in furtherance of the purposes of the ESA. The ESA provides specific mechanisms to achieve its purposes and Section 7 is one of those. Section 7 requires that Federal agencies develop a conservation program for listed species (i.e., Section 7(a)(1)) and that they avoid actions that will further harm species and their critical habitat (i.e., Section 7(a)(2)). The section 7 consultation process described here applies to the second requirement - Section 7(a)(2).

- **Section 7(a)(2) Mandate -** Section 7(a)(2) directs all Federal agencies to insure that any action they authorize, fund, or carry-out does not jeopardize the continued existence of an endangered or threatened species or designated or proposed critical habitat (collectively, referred to as protected resources). The implementing regulations, 50 CFR 402, specify how Federal agencies are to fulfill their section 7 consultation requirements.

- **Section 7(a)(2) Responsibilities-** Under the implementing regulations (50 CFR 402), Federal agencies must review their actions and determine whether the action may affect federally listed and proposed species or proposed or designated critical habitat. To accomplish this, Federal agencies must request from the Service a list of species and critical habitat that may be in the project area or they can request our concurrence with their species list. The Service must respond to either request within 30 days.

  Once a species list is obtained or verified as accurate, Federal agencies need to determine whether their actions may affect any of those species or their critical habitat. If no species or their critical habitat is affected, no further consultation is required. If they may be affected,

consultation with the Service is required. This consultation will conclude either informally with written concurrence from the Service or through formal consultation with a biological opinion provided to the Federal agency.

USFWS – Migratory Bird Treaty Act and Bald/Golden Eagle Protection Act

- **Migratory Bird Treaty Act -** The Migratory Bird Treaty Act is a Federal law that carries out the United States' commitment to four international conventions with Canada, Japan, Mexico and Russia. Those conventions protect birds that migrate across international borders. The take of all migratory birds, including bald eagles, is governed by the Migratory Birds Treaty Act's regulations. The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation and importation of migratory birds, their eggs, parts and nests except as authorized under a valid permit.

- **Bald and Golden Eagle Protection Act -** This law, passed in 1940, provides for the protection of the bald eagle and the golden eagle by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit . "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.

NOAA-National Marine Fisheries Service – Fish and Wildlife Coordination Act, Marine Mammal Protection Act and Magnuson-Stevens Act Compliance

- **Policy:** Habitat conservation activities will be responsive to the mission and programs of NMFS. The goal of NMFS' habitat conservation activities will be to maintain or enhance the capability of the environment to ensure the survival of marine mammals and endangered species and to maintain fish and shellfish populations which are used or are important to the survival and/or health of those used by individuals and industries for both public and private benefits - jobs, recreation, safe and wholesome food and products.

  NMFS will direct its habitat conservation activities to assist the Agency in (1) meeting its resource management conservation, protection, or development responsibilities contained in the Magnuson Act, the Marine Mammal Protection Act, and the Endangered Species Act, and (2) carrying out its responsibilities to the U.S. commercial and marine recreational fishing industry, including fishermen, and the States pursuant to programs carried out under other authorities.

  Since most of NMFS' programs under its broad mandates are influenced by habitat considerations, habitat conservation will be considered and included in the Agency's decision making and in all of its programs. NMFS will bring all of its authorities to bear in habitat conservation. These authorities include those which give NMFS an active participatory role and those particularly the FWCA, which gave NMFS an advisory role. In carrying out its programs, NMFS' activities will be conducted in a fashion designed to achieve necessary orderly coastal development in a timely fashion while the renewability and productivity of the Nation's living marine resources are maintained or, where possible, enhanced. This action will also benefit other wildlife resources, such as migratory birds. Also, NMFS will use its scientific capabilities to carry out the research necessary to support its habitat conservation objectives.

US Coast Guard -- permit/authorization, aid to navigation

- **The U.S. Coast Guard** is authorized to administer and enforce laws which preserve the public right of navigation on the navigable waters of the United States. A main component of this is the Coast Guard's authority to establish, maintain and operate aids to navigation. The U.S. Coast Guard presently operates and maintains some 47,000 short range aids to navigation, including visual, audio and radar navigation aids. Additionally, the Coast Guard supervises the placement and operation of some 36,000 private aids to navigation. The U.S. Coast Guard also operates and maintains the Loran-C and OMEGA systems. Many of the stations for these systems are operated by foreign governments.

  The Coast Guard promulgates and enforces a variety of navigation rules and directives commonly called the rules of the road and based on international standards. International rules apply and are enforced on all United States shipping seaward of established demarcation lines. Inland rules apply and are enforced in all United States harbors, rivers, and other inland waters.

  In response to growing traffic in major United States ports, the Coast Guard established a vessel traffic services program in 1968 which now operates in many of the major ports throughout the United States. Where the vessel traffic services system is in place, the Coast Guard has the authority to regulate specific types of vessel movement, routing schemes, operating conditions, constraints on size and speed, electronic device installations and pilotage.

FAA – obstruction to air navigation

- **Federal Aviation Administration** – Airport Airspace Analysis

  Aeronautical study involving multiple FAA Lines of Business coordination
  Evaluates the effect of the construction or alteration on operating procedures
  Determines the potential hazardous effect of the proposed construction on air navigation
  Identifies mitigating measures to enhance safe air navigation
  Charts of new objects

Advisory Council on Historic Preservation -- Section 106 - National Historic Preservation Act Compliance

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. Revised regulations, "Protection of Historic Properties" (36 CFR Part 800), became effective August 5, 2004, and are summarized below.

***Possible involvement*:**

FERC – Approval and Cost Recovery of project based on cost allocation and determination of revenue requirement and rate of return.

Key Delaware State Permits/Compliance:

- **DE Dept. of State** – Section 106 National Historic Preservation Act Compliance
- **DE DNREC** -- Threatened & Endangered (T&E) Species Consultation
- **DE DNREC** – Coastal Zone Act determination

Coastal Zone Management Federal Consistency is a process that requires Federal agencies to follow State coastal management policies when conducting a project or issuing a permit that could affect coastal resources. It also enables increased coordination between government agencies. The program was established by Congress in 1972 by the Coastal Zone Management Act. Every coastal state implements a Federal Consistency program.

Federal Consistency requires that projects conducted directly by a Federal agency, projects authorized by a Federal permit and some projects implemented with Federal funds be consistent with Delaware's Coastal Zone Management policies. Projects are reviewed by Delaware Coastal Management Program (DCMP) staff in close coordination with other agencies. If projects are consistent with the policies, Federal Consistency "concurrence" is issued.

Key New Jersey State Permits/Compliance:

- **NJ PUC / NJ BPU** – *(May or may not be involved)*
- **NJ DEP** -- Section 106 National Historic Preservation Act Compliance
- **NJ DEP** -- Threatened & Endangered (T&E) Species Consultation

4.4 Other

In our opinion, a "wild card" that could potentially delay the approval process is gaining the buy-in and agreement on a proposed solution from a political group, the Delaware River Basin Commission ("DRBC"). This group is comprised of the Governors of Delaware, New Jersey, New York, Pennsylvania and one Federal Official (the Division Engineer, North Atlantic Division, US Army Corps of Engineers). Only one of the proposing entities listed getting permits from this group; however, any project having a substantial effect on the water resources of the Basin has to be approved by the Commission before it is undertaken by any person, corporation or governmental authority.

Another factor that could impact the project schedule would be the presence or absence of significant cultural resources; either historic structures or archaeological sites and threatened or endangered species. The route, including the Delaware River crossing, would need to be surveyed for cultural resources. If any resources are found that are eligible for listing on the National Register of Historic Places, then this could cause an alignment shift and / or mitigation measures with consultation of the appropriate Federal and State agencies. This would impact schedule more than cost.

Typically, submarine cable installation activities begin with a pre-lay grapnel run (PLGR) along the route centerline to clear potential near-surface obstructions to installation of the cable such as debris, fishing nets, lines, towing cables and miscellaneous trash such as tires and

timbers. If the PLGR indicates a potential obstruction but is not able to remove the obstruction, diver investigations would be commenced, which could add weeks or months to the schedule. The Bayonne Energy Center project (BEC) was delayed approximately 4 months because of a situation like this.

The BEC submarine route was also adjusted in August 2010 because of newly discovered privately owned lands and bottom sediment conditions. While investigating the route deviations marine archaeologists discovered an area that they recommended avoiding. Minor route deviations were made again in February 2011.

BEC permits (New York State Department of Environmental Conservation) also limited construction activities within navigable waters to a 6 month window, June through November, of any calendar year. The potential for this kind of restrictions on construction in the Delaware River could affect the overall project schedule.

Biological surveys would need to occur before permitting can be completed. Depending on the survey, some biological surveys are sensitive to the season of the year. If any threatened or endangered species are located during the survey, this information could necessitate an alignment shift, a reroute and/or additional consultation with Federal and State agencies.

Comparison of Proposals – Siting and Permitting

Catagories	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Siting / Permitting	All projects require consultation with the Corps of Engineers (COE) because of the navigable waterway crossing. A full NEPA EIS report MAY be required.	All projects require consultation with the Corps of Engineers (COE) because of the navigable waterway crossing. A full NEPA EIS report MAY be required.	All projects require consultation with the Corps of Engineers (COE) because of the navigable waterway crossing. A full NEPA EIS report MAY be required.	All projects require consultation with the Corps of Engineers (COE) because of the navigable waterway crossing. A full NEPA EIS report MAY be required.	All projects require consultation with the Corps of Engineers (COE) because of the navigable waterway crossing. A full NEPA EIS report MAY be required.
	Appears that no forested wetlands would be cleared.	Appears that no forested wetlands would be cleared.	10 acres of forested wetland would be cleared.	1.1 acres of forested wetland would be cleared.	Appears that no forested wetlands would be cleared. .
	No recorded cultural resources appear to be effected.	No recorded cultural resources appear to be effected.	No recorded cultural resources appear to be effected.	Line Route and Switching station are within 1000 feet of a National Register (NR) historic site, and Switching station might effect an archaeology site (NR eligibility unknown)	One of the alternate substation sites might effect an archaeology site (NR eligibility unknown)
	Future deepening/dredging of shipping channel could affect UG cable.	OH route towers would not affect future shippng channel dredging but would require Coast Guard approvals/coordination.	Future deepening/dredging of shipping channel could affect UG cable.	Future deepening/dredging of shipping channel could affect UG cable.	OH route towers would not affect future shippng channel dredging but would require Coast Guard approvals/coordination.
	Appears no FAA permitting will be required.	If structures reach 200 feet above water level, FAA permitting will be required.	Appears no FAA permitting will be required.	Appears no FAA permitting will be required.	If structures reach 200 feet above water level, FAA permitting will be required.
	Lessor affects to migratory bird flyways since no tall structures in the Delaware River.	Tall structures in the Delaware River could require bird divertors because of migratory bird flyways.	Lessor affects to migratory bird flyways since no tall structures in the Delaware River.	Lessor affects to migratory bird flyways since no tall structures in the Delaware River.	Tall structures in the Delaware River could require bird divertors because of migratory bird flyways.
	Endangered species data could only be obtained for NJ; sevaral along the river edge; should be little impact.	Endangered species data could only be obtained for NJ; sevaral along the river edge; should be little impact.	Endangered species data could only be obtained for NJ; sevaral along the river edge; should be little impact.	Endangered species data could only be obtained for NJ; sevaral along the river edge; should be little impact.	Endangered species data could only be obtained for NJ; sevaral along the river edge; should be little impact.
	All private land needed is already under option, so FRPP easements on private land would not be an issue.	All private land needed is already under option. FRPP easements on private land would not be an issue.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.

Comparison of Proposals – ROW Acquisition, Land Acquisition, Public Oppostion

Catagories	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
ROW Acquisition	Options secured on private ROW.	Options secured on private ROW.	No Private ROW secured.	No Private ROW secured.	No Private ROW information included in Proposal.
	Overhead Route in Delaware uses road ROW; this is not a typical practice with 230kV lines.	Overhead Route in Delaware uses road ROW; this is not a typical practice with 230kV lines.	Delaware does not have eminent domain so condemnation is not an option.	Delaware does not have eminent domain so condemnation is not an option.	Delaware does not have eminent domain so condemnation is not an option.
	Schedule for this task should not be an issue.	Schedule for this task should not be an issue.	Schedule does not allow for protracted negotiation.	Schedule does not allow for protracted negotiation.	Proposal schedule shows 57 months for this task, which is conservative.
	Almost 1 1/2 miles of road ROW paralleled.	Almost 1 1/2 miles of road ROW paralleled.	Roads crossed but routes do not parallel/use road ROW.	Roads crossed but routes do not parallel/use road ROW.	Roads crossed but routes do not parallel/use road ROW.
Land Acquisition	Substation site in Delaware has acquisition rights secured.	Substation site in Delaware has acquisition rights secured.	No land acquisition required in Delaware.	No Land Acquisition rights have been secured for the substation site in Delaware.	No Land Acquisition information included in proposal.
	Schedule for this task is not an issue.	Schedule for this task is not an issue.	Schedule for this task is not an issue.	Schedule does not allow for protracted negotiation.	Proposal schedule shows 57 months for this task, which is conservative.
Public Opposition	Mid-range to high public opposition; UG river crossing and the OH line runs along scenic Hwy 9 ROW for almost 1 1/2 miles. Very high visual impact to residences along Hwy 9.	Highest public opposition because of visual impacts of OH river crossing and OH line running along scenic Hwy 9 ROW for almost 1 1/2 miles. Very high visual impact to residences along Hwy 9.	Lowest public opposition because no new substation is needed in DE, scenic Hwy 9 is not crossed, there are more wooded areas to 'hide' view of line, and has the least visual impact to residences. Although, the longer UG river crossing could have more impact on oyster beds and fishing interests.	Mid-range public opposition; UG river crossing and the OH line crosses scenic Hwy 9. Lessor visual impact to residences. Although, this route and substation are within 1000' of a house listed on the National Register of Historic Places.	Mid-range to high public opposition; high visual impacts of OH river crossing and scenic Hwy 9 is crossed. Lessor visual impact to residences.

Comparison of Proposals – General Comments

Catagories	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Comments / Notes	Delaware River Basin Commission approval is required for all river crossings. 4 Governors and COE official must agree for crossing approval, which could negatively affect project schedule.	Delaware River Basin Commission approval is required for all river crossings. 4 Governors and COE official must agree for crossing approval, which could negatively affect project schedule.	Delaware River Basin Commission approval is required for all river crossings. 4 Governors and COE official must agree for crossing approval, which could negatively affect project schedule.	Delaware River Basin Commission approval is required for all river crossings. 4 Governors and COE official must agree for crossing approval, which could negatively affect project schedule.	Delaware River Basin Commission approval is required for all river crossings. 4 Governors and COE official must agree for crossing approval, but schedule is sufficiently conservative.
	Building a major 230 kV line along/within 1.5 miles of Hwy 9 ROW, plus dealing with the "scenic and historic highway" designation is one of the biggest risks.	Building a major 230 kV line along/within 1.5 miles of Hwy 9 ROW, plus dealing with the "scenic and historic highway" designation is one of the biggest risks.	Lack of eminent domain authority in Delaware is one of the biggest risks.	Lack of eminent domain authority in Delaware is one of the biggest risks.	Overall schedule is sufficiently conservative to deal with project risks, such as the lack of eminent domain authority in Delaware.
	LS Power's proposal, although not the most detailed, had adequate information for evaluation and comparison.	LS Power's proposal, although not the most detailed, had adequate information for evaluation and comparison.	The Transource proposal included the highest level of detail.	The Transource proposal included the highest level of detail.	Dominion's proposal had very little detail included and was difficult to compare to the others.

5.0 Schedule Analysis and Assessment

The following table compares the major milestones included in each proposing entities schedule.

Topics	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Start Date:	2014	2014	2014	2014	2014
Permitting:	30	30	24	24	30
R/W Acquisition:	9	9	12	12	57
Engineering:	24	24	12	12	14
Construction:	18	18	15	15	12
In Service Date:	Jun-2017	Jun-2017	Jun-2017	Jun-2017	Dec-2021
Total Project Duration:	42	42	42	42	96

In comparing proposals, all entities list performing permitting and sitting activities concurrently. It is UCS's opinion that the route (siting) needs to be finalized before you can begin permitting. The proposing entity should be communicating with Federal, State and Local officials along with the USACE during the right-of-way acquisition process; however, it is difficult to initiate the actual permitting process if the route is subject to change. In Delaware without condemnation authority, the route will be a moving target until all right-of-ways agreements are acquired.

- The schedule for LS Power Option 5A and 5A Alternate both show thirty (30) months for permitting and nine (9) months for right-of-way acquisition. These activities are stated to occur concurrently.
- The schedule for Transource Option 2A and 2B both show twenty-four (24) months for permitting and 12 months for right-of-way acquisition. These activities are stated to occur concurrently.
- The schedule for Dominion Option 1B shows thirty (30) months for permitting and fifty-seven months (57) months for right-of-way acquisition. Both activities are stated to occur concurrently. Given the level of detail provided by Dominion, it is difficult to evaluate this schedule.

Right-of-way acquisition is the biggest schedule variable between proposals. Depending on the company submitting the proposal, right-of-way acquisition varies between 9 to 57 months. Two of the five proposals, LS Power Option 5A and 5A Alternate estimated 9 months for right-of-way acquisition. In UCS's opinion this is reasonable because they report that they have already secured options to purchase both right-of-way for the 230 kV line and land for their Silver Run switchyard.

The remainder of LS Power's overland route in Delaware crosses either State of Delaware owned land or follows within the road right-of-way for State Highway 9 (a Scenic Highway).

In regard to LS Power's transmission line routes, a portion of the 230 kV overhead monopole structure route encroaches on state road DOT right-of-ways. In general, key 230 kV interconnects should not encroach on DOT right-of-ways. There are many reasons including future road widening, electrical clearances and outage risk from accidents. For example, if the Department of Transportation should decide to widen the road where encroached, absent an agreement to the contrary, the financial responsibility to move the line would fall to the utility. Also, line relocations require outages for the line construction work which may be difficult to coordinate on interconnection circuits. Additionally, typical right-of-way widths obtained by electric utilities for 230 kV lines vary between 150 feet to 200 feet. This width is needed for physical protection of the line from trees or other encumbrances. If any private right-of-ways are crossed with this 230 kV line, this width of clearances may also be difficult to execute and maintain going forward.
Two of the proposals, Transource 2A and 2B estimated 12 months for right-of-way acquisition. They have not secured any options in Delaware for line rights-of-way or the North Cedar Creek Substation property (proposal 2B only; proposal 2A does not require a new substation in Delaware). In their proposals they reference the ability to use eminent domain authority if necessary. USC's research has documented that eminent domain power is not available in Delaware for transmission lines. Therefore it is UCS's opinion that their 12 month schedule for this task is extremely aggressive and underestimated.

Dominion estimates 57 months (almost 5 years) for right-of-way acquisition. They do not mention any options for line right-of-way or land for their Hope Creek 500/230 kV Switching Station. It is our opinion that the Dominion proposal time frame for right-of-way acquisition is conservative.

It is UCS's opinion that the siting and permitting activities will take between thirty-six (36) to forty-eight (48) months to complete. Also, some parts of the siting and permitting activities may overlap.

For engineering activities including both Transmission Line and Substation:

- The schedule for LS Power Option 5A and 5A Alternate both show twenty-four (24) months for engineering.
- The schedule for Transource Option 2A and 2B both show twelve (12) months for engineering.
- The schedule for Dominion Option 1B shows fourteen (14) months for engineering.

In UCS's opinion the engineering duration included in the proposals for both transmission and substation engineering are realistic and reasonable. The longer engineering timeframe durations may include procurement of the submarine cable at an earlier point in the timeline which is a logical way to approach the project.

For Construction activities including both Transmission Line and Substation:

- The schedule for LS Power Option 5A and 5A Alternate both show eighteen (18) months for construction. Construction activities will be performed concurrently.
- The schedule for Transource Option 2A and 2B both show fifteen (15) months for construction. Construction activities will be performed concurrently.
- The schedule for Dominion Option 1B shows twelve (12) months for construction. Construction activities will be performed concurrently.

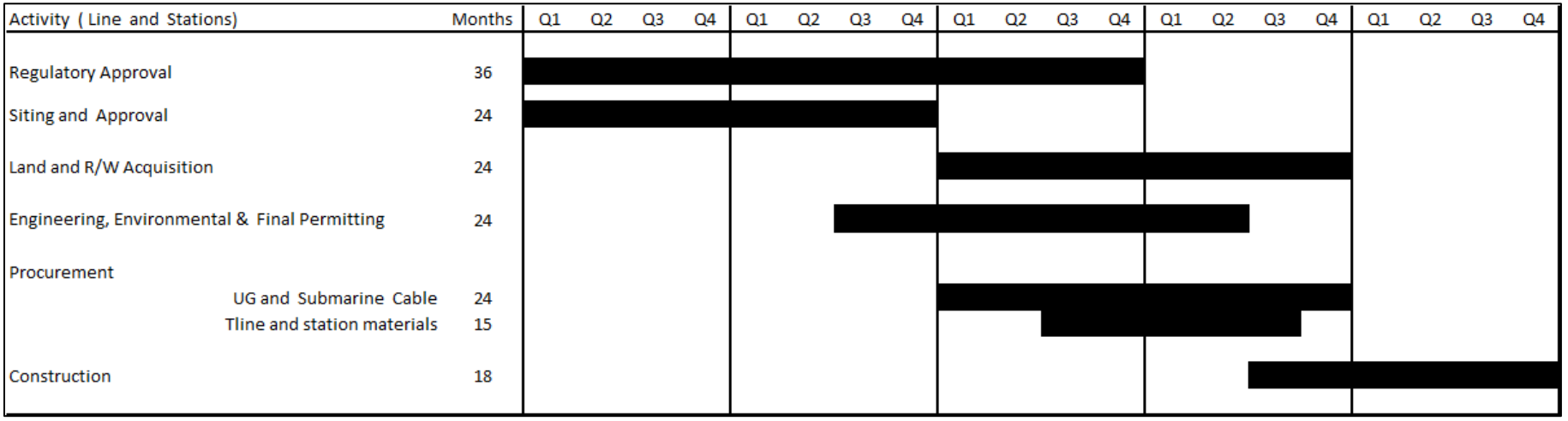
It is UCS's opinion that the overall construction schedule is reasonable based on each of the proposals. However, the construction schedule (particularly the hydro-plowing function) could experience seasonal impacts from storms, shipping traffic or fishing activities.

The longest lead time material item for three of the five proposals is the procurement of the submarine cable. The other two proposals are strictly overhead. Based on comments from material suppliers as noted earlier in this report, the lead time for XLPE submarine cable varies between 18 to 24 months or more from receipt of order. This cable procurement can have significant impacts to the overall project schedule.

Comparison of Proposals – Anticipated Schedule

Catagories	Topics	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Anticipated Schedule	Start Date:	2014	2014	2014	2014	2014
	Permitting:	30	30	24	24	30
	R/W Acquisition:	9	9	12	12	57
	Engineering:	24	24	12	12	14
	Construction:	18	18	15	15	12
	In Service Date:	Jun-2017	Jun-2017	Jun-2017	Jun-2017	Dec-2021
	Total Project Duration:	42	42	42	42	96
		Overall schedule is aggressive based on permitting and material aquisition schedules. Two recently completed, similar length submarine projects near New York City have each taken from 5-6 years to complete.	Overall schedule is aggressive based on permitting and material aquisition schedules. Two recently completed, similar length submarine projects near New York City have each taken from 5-6 years to complete.	Overall schedule is aggressive based on permitting, R/W acquisition, and material aquisition schedules. Two recently completed, similar length submarine projects near New York City have each taken from 5-6 years to complete.	Overall schedule is aggressive based on permitting, R/W acquisition, and material aquisition schedules. Two recently completed, similar length submarine projects near New York City have each taken from 5-6 years to complete.	Overall schedule is conservative based on 96 months. Two recently completed, similar length submarine projects near New York City have each taken from 5-6 years to complete.

UCS – Estimated Task and Project Durations



6.0 Cost Analysis and Assessment

We have reviewed the costs submitted by the various proposals and summarized them in Table 6.1.

There are significant differences in the substation costs for each of the proposals submitted. There are also significant differences in the miscellaneous cost sections of each of the proposals which are not explained. More clarification may be warranted during the final award period. One method of evaluating the cost estimates is to compare them to industry standard unit measures. UCS has researched standard industry unit measures and provided them in the table below. Cost Estimates of Industry Standard Unit Measures

Transmission Components	Dollars	Units	
230kV overhead transmission	$3,500,000	per mile	
230kV underground transmission	$10,500,000	per mile	
230kV submarine transmission	$35,000,000	per mile	
230kV transmission line dead-end structures	$300,000	per unit	
Aerial Delaware river crossing	$100,000,000	per crossing	(Figured Supplied by PJM)
* Notes:			
- Costs can vary widely based on actual site specific locations, requirements and conditions.			
- Cost estimates are budgetary installation costs only based on past projects and experience.			
- Factors that may significantly increase these installation costs include:			
Environmental, Regulatory Licensing Costs			
Permitting costs			
Land purchase costs			
Civil work including site preparation, grading, wetland mitigation, and other encountered conditions			
Rock excavation.			

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UCS's research indicates that all three of the submarine river crossing options presented may be low on their estimated overall cost, particularly in regard to the submarine cable pricing included in the proposals. Both LS Power and Transource specified that the submarine cable would be "XLPE – Submarine - 230kV, 900 mil cross-linked polyethylene, lead sheath, copper cable with armor coating". LS Power included an estimated cost of $290 / foot while Transource included an estimated cost of $250 / foot. From limited research by our purchasing group and obtaining some budgetary pricing from suppliers, it appears that armored XLPE submarine cable will be both a long lead time item and expensive in cost per foot.

The major submarine cable suppliers are ABB, Prysmian, Nexans, Sumitomo and Fujikura. We reached out to ABB, Prysmian and Nexans and were able to get a budgetary quote only from Prysmian. The ABB representative that we spoke with told us that their only plant that produces this XLPE Submarine cable is in Sweden and at this time, ABB was not interested in providing a budgetary quote on any additional

XLPE cable orders. Per the ABB rep, their Sweden plant's current backlog is over 2 years from receipt of order; much of that related to providing cable for off-shore oil platforms and off-shore wind farms. The ABB rep did say that in his opinion, $300 per foot was low as a budgetary price for this cable. The Prysmian cable representative said that $300 per foot was a reasonable budgetary figure but cautioned that they too have current lead times of 18 to 24 months after receipt of order for producing this particular cable. The Nexans rep said that they are not in a position to quote any new XLPE cable orders at this time.

A portion of LS Power's transmission line route encroaches on state road DOT right-of-ways. If the Department of Transportation should decide to widen the road where encroached, absent an agreement to the contrary, the financial responsibility to move the line would fall to the utility.

Focusing primarily on the Transmission line cost sections, the cost comparisons show the following:

1) The LS Power overhead option is overall least cost.
2) The Transource 2B options is the least cost submarine option.
3) There are significant differences between LS Power and Transource for the routing / permitting / land acquisition / wetland mitigation functions. It is UCS's opinion that the Transource cost estimates for these functions are low.
4) The overall line cost /mile range of $10-15 million/mile for all of the proposals is reasonable for a transmission line of this configuration and voltage.
5) The costs associated with Wetlands Mitigation were not detailed out in these proposals. It is difficult to say which one has the biggest difference.

Comparison of Proposals – Total Overall RTEP Costs

Catagories	Topics	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Total Overall RTEP Cost	Routing, siting, permitting	$5,000,000	$5,000,000	$690,000	$712,000	$5,866,125
	Wetland Mitigation	$10,000,000	$10,000,000	$4,725,000	$720,000	
	Land Acquisition	$2,500,000	$2,500,000	$751,000	$1,162,000	$8,522,976
	Tline EPC	$65,642,671	$38,984,188	$102,124,059	$62,577,799	$55,290,434
	Tline subtotal	$83,142,671	$56,484,188	$108,290,059	$65,171,799	$69,679,535
	Salem exp	see below	see below	$5,500,000	$5,500,000	see below
	New Salem			$40,500,000	$40,500,000	
	N Cedar creek			$5,000,000	$11,850,000	
	Substation subtotal	$28,944,339	$28,944,339	$51,000,000	$57,850,000	$71,500,000
	PM &CM (10-15%)	incl	incl	$19,911,255	$15,377,725	incl
	Owner Directs(5-8%)	$11,500,000	$11,500,000	$10,353,854	$7,996,417	not included
	Owner Intern OH (4-6%)	incl	incl	$7,964,503	$6,151,090	not included
	Contingency (20-27%)	$24,717,402	$19,385,705	$43,804,767	$33,830,995	not included
	Escalation (3-5% /year)	not included	not included	not included	not included	not included
	AFUDC (6-8% / year)	not included	not included	not included	not included	not included
	Misc Subtotal	$36,217,402	$30,885,705	$82,034,378	$63,356,227	$0
	Project total	$148,304,412	$116,314,232	$241,324,437	$186,378,026	$141,179,535

7.0 Detailed Summary

The three different proposing entities submitted documents that had distinctly different levels of detail, analysis, routing, design notes and explanations of the construction methodology to be employed. For example, Dominion only included a high level review of routing for their proposal. They had a general Point A and Point B approach and included 57 months (almost 5 years) in their project timeline for Right-of-way acquisition. LS Power on the other extreme had a detailed route, noted the number of property owners crossed, and had secured purchase options on private properties impacted by the project.

Two of the three companies submitting proposals utilized and provided information and details obtained from outside Engineering firms. L.S. Power included information provided by Power Engineers; Transource included information provided by Burns & McDonnell. Dominion did not discuss the details of how the line would be configured or the project would be engineered.

An overall summary of findings can be seen in the table below.

Catagories	Topics	LS Power 230kV 5A - OH/UG	LS Power Alternate 230kV 5A - Overhead Only	Transource 230kV 2A - OH/UG	Transource 230kV 2B - OH/UG	Dominion 500kV 1B - Overhead Only
Total Overall RTEP Cost	Transmission subtotal	$83,142,671	$56,484,188	$108,290,059	$65,171,799	$69,679,535
	Substation subtotal	$28,944,339	$28,944,339	$51,000,000	$57,850,000	$71,500,000
	Miscellaneous	$36,217,402	$30,885,705	$82,034,378	$63,356,227	$0
	Project total	$148,304,412	$116,314,232	$241,324,437	$186,378,026	$141,179,535
Anticipated Schedule	Start Date:	2014	2014	2014	2014	2014
	In Service Date:	Jun-2017	Jun-2017	Jun-2017	Jun-2017	Dec-2021
	Total Project Duration:	42	42	42	42	96
ROW Acquisition		Options secured on private ROW.	Options secured on private ROW.	No Private ROW secured.	No Private ROW secured.	No Private ROW information included in Proposal.
Land Acquisition		All private land needed is already under option, so FRPP easements on private land would not be an issue.	All private land needed is already under option. FRPP easements on private land would not be an issue.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.	FRPP easements on private land would be a major roadblock. Information available from USDA lists none but the data is over two years old.
Public Opposition		Mid-range to high public opposition	Highest public opposition	Lowest public opposition	Mid-range public opposition	Mid-range to high public opposition

The estimated cost range went from a low of $116.3 Million to a high of $269.2 Million. The submarine river crossing options were the most expensive options presented and will be the more difficult options to permit. However, it's UCS's opinion that the submarine crossing options will provide the most publicly acceptable solutions.

UCS's research indicates that all three of the submarine river crossing options presented may be low on their estimated overall cost, particularly in regard to the submarine cable pricing included in the proposals. Both LS Power and Transource specified that the submarine cable would be "XLPE – Submarine – 230 kV, 900 mil cross-linked polyethylene, lead sheath, and copper cable with armor coating". LS Power included an estimated cost of $290 / foot while Transource included an estimated cost of $250 / foot. From limited research by our purchasing group and obtaining some budgetary pricing from suppliers, it appears that armored XLPE submarine cable will be both a long lead time item and expensive in cost per foot.

The major submarine cable suppliers are ABB, Prysmian, Nexans, Sumitomo and Fujikura. We reached out to ABB, Prysmian and Nexans and were able to get a budgetary quote only from Prysmian. The ABB representative that we spoke with told us that their only plant that produces this XLPE Submarine cable is in Sweden and at this time, ABB was not interested in providing a budgetary quote on any additional XLPE cable orders. Per the ABB rep, their Sweden plant's current backlog is over 2 years from receipt of order; much of that related to providing cable for off-shore oil platforms and off-shore wind farms. The ABB rep did say that in his opinion, $300 per foot was low as a budgetary price for this cable. The Prysmian cable representative said that $300 per foot was a reasonable budgetary figure but cautioned that they too have current lead times of 18 to 24 months after receipt of order for producing this particular cable. The Nexans rep said that they are not in a position to quote any new XLPE cable orders at this time. The 2017 completion schedule is very aggressive with the procurement of the submarine cable proposed to start one year ahead of siting approval.

Also, the type of soil in the riverbed floor will impact the ampacity rating of the submarine cables. If the soil is comprised of either silt or clay (verses loose sand) the heat from the cable will dry out the soil turning it into a form of insulation causing the submarine cable to be de-rated in this area. Again, the electrical solution aspects of these proposals were out of our scope of work but we did feel compelled to make some notations.

The Transource Option 2A overhead and underground proposal has a much shorter submarine cable line section length than the Transource 2B option, but it does require the addition of a new North Cedar Creek substation. However, it is UCS's opinion that the benefits of the shorter submarine line section length are still preferred even if a new substation is required depending on the final environmental and permitting studies for the route.

Overall risks for any of the submarine proposals include:

- Long lead times.
- Availability of Suppliers.
- Material price volatility and the potential for material price escalation.
- If oyster beds are encountered, they may cause significant installation issues.
- Certain silt/mud backfill sections may dry out due to the heating of the XLPE cable during operation causing it to retain rather than dissipate heat from around the cable further lowering the electrical capacity of the cable.
- The ramifications of USACE's dredging activities both on-going and future should be better addressed in the final proposals.
- Approvals from some of the political and environmental agencies like "The Delaware River Basin Commission" are a risk to schedule.

In regard to transmission line routes, the 230 kV overhead monopole structure routes proposed by LS Power are partially encroached on state road DOT right-of-ways. In general, a key 230 kV interconnect should not encroach on a DOT right-of-way. For the electrical clearances required for 230 kV lines, this approach may also be difficult to execute. Transource's proposals plan to acquire private right-of-ways as needed. Dominion's proposal did not speak to their exact right-of-way requirements; however, Dominion allotted 57 months in their project plan for right-of-way and land acquisition. The Transource 2B option has a route alignment that crosses five (5) properties; three (3) private parcels and two (2) owned by the state of Delaware. This option has the new proposed North Cedar Creek substation shown to be located on a privately owned farm. However, the main house for this farm is listed on the National Register of Historic Places and is within 1000 feet of the proposed substation. This may be problematic.

In regard to comparing the in-service dates between the five proposals, four of the five proposals were consistent and had an anticipated in-service date of June 2017 (approximately 3 ½ years in total project duration). Dominion was an outlier with an in-service date of December, 2021 (approximately 8 years in duration). From reviewing the schedules in regard to right-of-way and land acquisition, permitting requirements, and material acquisition, it is our opinion that June 2017 is aggressive but December 2021 is conservative. It is also our opinion that the lack of eminent domain authority in Delaware along with permitting requirements and obtaining necessary approvals for crossing the Delaware River either overhead or through submarine cable will be the most difficult aspects of the proposed projects and have the most risk for adverse impact to the schedule. From reviewing similar projects in the region, it is our opinion that the overall duration of this project will be five to six years from Notice to Proceed.

After reviewing all of the options presented along with looking at other cases of river crossings in the northeast, we feel that the two (2) overhead river crossing options will be harder to get public and political approval. It is our opinion that the aerial options for crossing the Delaware River will meet more public opposition than the submarine crossings, specifically when dealing with the visual impacts of the structures in the river. Also, the Delaware River Basin Commission is primarily

comprised of politicians who will be influenced significantly by the general public and environmental groups would tend to fight against the overhead options even though the submarine options might cause more environment disturbance to the river bottom and potentially to water quality.

Dominion Virginia Power has a matter before the Virginia State Corporation Commission (SCC) to build a 500 kV transmission line over the James River near Williamsburg, Virginia. UCS's research has revealed that there continues to be intense public opposition to the project. One of the most controversial parts of the line route, according to a newspaper article, is that "as many as 17 towers – the largest being nearly as tall as the Statue of Liberty ……. would be visible from the tip of Jamestown Island and along the historic Williamsburg Colonial Parkway." Many of the projects opponents, including public officials and private organizations, have urged the SCC to force Dominion to come up with another alternative, such as providing a submarine crossing or taking a different route.

In regard to regulatory approval, it is unlikely that the Public Board of Utilities from New Jersey would express jurisdiction over any of these options as a single municipality would have final authority. However, the contractor has the ability to approach the Board to secure expedited approval authority and enhance right-of-way acquisition.

One of the benefits of the LS Power proposals is that they have secured an exclusive option to purchase land for the Silver Run switchyard and the transmission line from Silver Run to Delaware State Highway 9. The land right Options will help mitigate significant schedule and cost concerns for this portion of the project. However, LS Power proposes the use of right-of-way encroachments along Delaware State Highway 9. UCS's research into State Highway 9 discovered that this highway has been designated as a Delaware "Scenic and Historic" Highway by the Delaware Department of Transportation (DOT). The Delaware law that allowed for these highway designations also states that the DOT Secretary has the authority to promulgate regulations that may be necessary or desirable to "(6) Protect scenic, historical, natural, archaeological and cultural resources in areas adjacent to the highway". In our opinion, these factors will make right-of-way encroachment more difficult.

The LS Power proposal lists the procurement activity as 16 month duration. We feel that this is a schedule risk in that the other similar submarine proposals allow for a 36 month XLPE submarine cable procurement window and our subsequent conversations with cable vendors tend to corroborate the longer lead times required. The LS power construction schedule calls for a 12 month construction and testing window that we feel is reasonable for this length and type of line and should allow time to work around any seasonal shipping channel restrictions.

All the projects will encounter wetlands where they cross into the Delaware coastal zone. With careful planning of the routes and early consultation (prior to permit submittal) with the Corps of Engineers, the projects should be able to be permitted without significant delays. Mitigation and remediation strategies will be important considerations when consulting with the Corps. Pre-

application consultation usually involves one or several meetings between an applicant, the Corps district staff, interested resource agencies (Federal, state, or local), and sometimes the interested public. The basic purpose of such meetings is to provide for informal discussions about the pros and cons of a proposal before an applicant makes irreversible commitments of resources (funds, detailed designs, etc.). The process is designed to provide the applicant with an assessment of the viability of some of the more obvious alternatives available to accomplish the project purpose, to discuss measures for reducing the impacts of the project, and to inform them of the factors the Corps must consider in its decision making process. This early communication should be factored into the overall schedule for permitting.

8.0 Attachments

IEEE Standard 1120 – 2004 "IEEE Guide for the Planning, Design, Installation, and Repair of Submarine Power Cable Systems

9.0 Outside References

http://www.nepa.gov.jm/publications/guidelines/Underwater%20Cables%20&%20Pipelines/Undersea%20cables%20and%20pipelines%20-%20part%202.html

http://nepa-ru.com/brugg_files/02_hv_cable_xlpe/03_web_xlpe_guide_en.pdf

http://depsc.delaware.gov/electric.shtml