

# PJM 2016 RTEP Proposal Window 2 DEOK/AEP Competitive Cluster Independent Constructability Review White Paper

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Version 1  
January 11, 2017

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## 1. Executive Summary

The PJM 2016 Proposal Window 2 was opened to solve reliability criteria violations. This whitepaper summarizes the independent cost, schedule, and constructability analyses completed for the evaluation of reliability projects that were proposed to mitigate the flowgate violations identified as the proposal window 2 DEOK/AEP competitive cluster. The required in service date is June 2021 to resolve multiple identified violations.

In this study, PJM has verified proposed schedule durations and examined other risks to both cost and schedule.

Table 1 summarizes the cost estimates for the projects and the differences between the proposed costs provided by the Proposing Entity and the independent estimated costs developed by PJM's consultant.

Project	Proposed Cost Estimate (Millions)	Independent Cost Estimate (Millions)	Difference
1A	\$18.7	\$15.1	-19%
1C	\$10.5	\$8.8	-16%
3C	\$19	\$24.2	+27%
		\$31.6 (Option B)	+66%
6A	\$17.1	\$22.3	+30%
9J	\$17	\$23.2	+37%
9R	\$18.7	\$19.1	+2%

**Table 1:** Project Cost Estimate Summary

Table 2 summarizes the independent project schedule estimates.

Project	1A	1C	3C	6A	9J	9R
<b>Independent Schedule Estimate (Months)</b>	28	32	28	28	29	28

**Table 2:** Independent Project Schedule Estimate Summary

No significant permitting or siting risks were identified for the evaluated projects.

## 2. Methodology

The study analyzed the proposed projects for cost, schedule, and constructability.

Cost estimates were performed at a conceptual level based upon the current and recent transmission line and substation design experience of the engineer of choice.

Schedules were generated by identifying the high-level milestones of all major task required to complete the project. Timeframes and project sequencing are based on the contractor's experience on similar projects and are consistent with general industry duration.

The constructability review was completed as a high-level desktop analysis utilizing publically available data leveraging the expertise of the engineer of choice.

### 3. Project Scope Descriptions

The scope of work for each of the analyzed projects is summarized in Table 3.

Project Number	Project Description
2016_2-1A	Expand Garver 345kV substation to include 138kV. Connect local 138kV circuits from Todhunter, Rockies Express, and Union substations.
2016_2-1C	Reconductor the 138kV circuit between Nickel and Warren substations, replacing the existing wooden structures with steel poles.
2016_2-3C	Build the new 345/138 kV Russ substation tapping the Stuart to Clinton 345 kV line and interconnecting the Hillsboro to Clinton County and Middleboro to Hillsboro 138 kV lines.
2016_2-6A	Construct the new 345/138 kV Salem substation looping in the Foster to Bath 345 kV line, Foster to Sugar 345 kV line, and the Warren to Clinton 138 kV line.
2016_2-9J	Build a 345 kV line from the existing Garver substation to the new 345/138 kV Greentree substation. Interconnect Greentree with the existing 138 kV Rockies Express substation using a new 138 kV connection.
2016_2-9R	Build the new 345/138 kV Paddys Run substation interconnecting the Miami Fort to West Milton 345 kV line, the Morgan to Fairfield 138 kV line and the Willey to Fairfield 138 kV line.

**Table 3:** Project Scope Summary

## 4. Summary of Study Findings

### 4.1. Project 1A

The project scope is to expand the existing Garver substation and install a new 345kV breaker to incorporate a new 345/138kV transformer. Three lines from the Todhunter, Rockies Express and Union substations will be brought into the new 138kV yard.

The project cost estimate provided in the proposal was \$18.7 million and the project completion date was specified as 6/1/2021. The independent cost was 19% less than what was proposed. The schedule was found to support a 2021 completion date. This project is

considered a Transmission Owner upgrade project and cost details are not required to be provided.

#### *4.1.1. Project Cost Estimate*

The independent project cost estimate is \$15.1 million.

#### *4.1.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 28 months to complete, from initiation to energization.

#### *4.1.3. Constructability Summary*

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and endangered species located within the study area identified the Indiana bat and northern long-eared bat as potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the Garver substation expansion, it appears that any tree clearing for the project can be avoided. Potential wetland and stream impacts could also be avoided. If these impacts can be realized by project design, the need for surveys and time-of-year restrictions associated with the listed bats could become void. For these reasons, wetland and stream avoidance should be a key factor in the final design of the substation.

## **4.2. Project 1C**

The project scope is the reconductor of the 138kV circuit between Nickel and Warren substations, replacing the existing wooden structures with steel poles.

The project cost estimate provided in the proposal was \$10.5 million and the project completion date was specified as 12/31/2018. The independent cost was 16.2% less than what was proposed. Given the current selection timeframe and the independent schedule estimate, the 12/31/2018 target completion date appears to be in jeopardy, but the schedule duration would be sufficient to meet the required in-service date of 2021. This project is considered a Transmission Owner upgrade project and cost details are not required to be provided.

#### *4.2.1. Project Cost Estimate*

The independent project cost estimate is \$8.8 million.

#### *4.2.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 32 months to complete, from initiation to energization.

#### *4.2.3. Constructability Summary*

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and endangered species located within the study area identified the Indiana bat and northern long-eared bat as potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the transmission line rebuild, it appears that tree clearing for the project may be required. Timelines for proposed construction should be a key factor in the project development for the transmission line rebuild.

### **4.3. Project 3C**

The project scope is the construction of the new 345/138 kV Russ substation tapping the Stuart to Clinton 345 kV line and interconnecting the Hillsboro to Clinton County and Middleboro to Hillsboro 138 kV lines.

The project cost estimate provided in the proposal was \$19 million and the project completion date was specified as Q2 2020. The independent cost was 27.4% greater than what was proposed. The schedule was found to support a 2020 completion date.

#### *4.3.1. Project Cost Estimate*

The independent project cost estimate is \$24.2 million. Additional potential project scope could include the re-arrangement of the Foster substation to a breaker-and-a-half configuration, which is estimated to be an additional \$7.4 million.

#### *4.3.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 28 months to complete, from initiation to energization.

#### *4.3.3. Constructability Summary*

The Foster substation's 345kV current configuration is a 7 position ring bus. The project is proposing to expand the ring by an additional position, which could be determined to require a rearrangement to a breaker-and-a-half scheme. The projected cost estimate for this risk item is \$7.4 million.

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and endangered species located within the study area identified the Indiana bat and northern long-eared bat as potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the new Russ substation, it appears that any tree clearing for the project can be avoided. Potential wetland and stream impacts could also be avoided. If these impacts can be realized by project design, the need for surveys and

time-of-year restrictions associated with the listed bats could become void. For these reasons, wetland and stream avoidance should be a key factor in the final design of the substation.

#### **4.4. Project 6A**

The project scope is the construction of the new 345/138 kV Salem substation looping in the Foster to Bath 345 kV line, Foster to Sugar 345 kV line, and the Warren to Clinton 138 kV line.

The project cost estimate provided in the proposal was \$17.1 million and the project duration was proposed as 24 months. The independent cost was 30.4% greater than what was proposed. The schedule was found to support a June 2021 completion date. The independent cost estimate for Salem substation was generally higher than the proposed cost while the independent cost estimate for the transmission line interconnection work was significantly greater than the proposed estimate.

##### *4.4.1. Project Cost Estimate*

The independent project cost estimate is \$22.3 million.

##### *4.4.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 28 months to complete, from initiation to energization.

##### *4.4.3. Constructability Summary*

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and endangered species located within the study area identified the Indiana bat and northern long-eared bat as potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the new Salem substation, it appears that any tree clearing for the project can be avoided. Potential wetland and stream impacts could also be avoided. If these impacts can be realized by project design, the need for surveys and time-of-year restrictions associated with the listed bats could become void. For these reasons, wetland and stream avoidance should be a key factor in the final design of the substation.

#### **4.5. Project 9J**

The project scope is to build a 345 kV line from the existing Garver substation to the new 345/138 kV Greentree substation. Greentree will interconnect with the existing 138 kV Rockies Express substation using a new 138 kV connection. The independent cost estimate includes additional scope for the installation of breakers at the Greentree substation.

The project cost estimate provided in the proposal was \$17 million and the project completion date was specified as 6/1/2020. The independent cost is 36.5% greater than what was proposed. The schedule was found to support a 2020 completion date.

#### *4.5.1. Project Cost Estimate*

The independent project cost estimate is \$23.2 million.

#### *4.5.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 29 months to complete, from initiation to energization.

#### *4.5.3. Constructability Summary*

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and endangered species located within the study area identified the Indiana bat and northern long-eared bat as a potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the new Greentree substation and transmission line, it appears that tree clearing for the project may be required. Timelines for proposed construction should be a key factor in the project development.

### **4.6. Project 9R**

The scope of the project is to build the new 345/138 kV Paddys Run substation interconnecting the Miami Fort to West Milton 345 kV line, the Morgan to Fairfield 138 kV line and the Willey to Fairfield 138 kV line.

The project cost estimate provided in the proposal was \$18.7 million and the project completion date was specified as 6/1/2020. The independent cost was verified to be in general agreement with what was proposed with a difference of 2.1%. The schedule was found to support a 2020 completion date.

#### *4.6.1. Project Cost Estimate*

The independent project cost estimate is \$19.1 million.

#### *4.6.2. Project Schedule*

The conceptual project schedule review indicates that the project will take approximately 28 months to complete, from initiation to energization.

#### *4.6.3. Constructability Summary*

One critical constraint was identified for the proposed project: surveys and consultations associated with listed bat species. Preliminary review of potential threatened and

endangered species located within the study area identified the Indiana bat and northern long-eared bat as potentially impacted species. Surveys required for mitigation of impacts to these species could implement time-of-year restrictions for tree clearing. Based on the area proposed for the new Paddy's Run substation, it appears that any tree clearing for the project can be avoided. Potential wetland and stream impacts could also be avoided. If these impacts can be realized by project design, the need for surveys and time-of-year restrictions associated with the listed bats could become void. For these reasons, wetland and stream avoidance should be a key factor in the final design of the substation.

Additionally, there is potential for additional studies or surveys to be required for this project due to its proximity to historic buildings. The independent estimated cost and project schedule do not reflect this additional risk.