PJM Generator Interconnection Request
Queue #AA2-116
Cook-East Elkhart 345 kV
Facilities Study

January 2017

Revised (06/09/2017)

AA2-116 Cook-East Elkhart (Indeck Energy Services) 345 kV

Facilities Study Report

A. Facilities Study Summary

1. Project Description

Indeck Energy Services proposes to interconnect a 994 MW (994 MW Capacity) natural gas generating facility to the American Electric Power (AEP) Transmission System. The point of interconnection is located approximately 1 mile west of the existing Kenzie Creek 345/138 kV substation as shown in Figures 1 and 2. This Point of interconnection will tie together the Cook – Kenzie Creek 345 kV circuit section and the Cook – East Elkhart 345 kV circuit section via a new switching station, named Thomson Switch station, as shown in Figure 1. The proposed PJM Project #AA2-116 is located in Cass County, Michigan State.

The requested in-service date is 04/01/2020.

2. Amendments/Changes to the Impact Study Report

3. Interconnection Customer Schedule

PJM and AEP understand that Indeck Energy Services has established the following schedule dates:

Receive back feed from AEP: 6/03/2019
Commercial Operation Date: 4/01/2020

4. AEP's Scope of Work to Facilitate Interconnection

- Construct a new six (6) breaker 345 kV switching station laid out in a breaker and half arrangement including installation of associated disconnect switches, bus work, SCADA and 345 kV revenue metering. Line protection and controls will also need to be installed at the new 345 kV switching station. (Network Upgrade **n5021**)
- Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation will need to be changed to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5023**)
- Line protection and controls at the Kenzie Creek 345/138 kV Substation will need to be upgraded to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5024**)
- Line protection and controls settings at the East Elkhart 345/138 kV Substation will need to be changed to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5025**)

- Indeck Energy Services is expected to obtain, at its cost, a station site for the AEP facilities. Indeck Energy Services shall obtain all necessary permits and provisions for access to the station site. Fee Simple ownership of the site should be transferred to AEP prior to the start of construction.

- It is understood that Indeck Energy Services is responsible for all the connection costs associated with interconnecting the PJM project AA2-116 to the AEP transmission system. The costs above are reimbursable to AEP. The cost of Indeck Energy resources' generating plant and the costs for the line connecting the generating plant to the new AEP switching station are not included in this report; these are assumed to be Indeck Energy Resources' responsibility.

5. Description of Transmission Owner Facilities Included in the Facilities Study

Direct Connection Work

AEP shall construct a new in-line 345 kV switching station approximately 1 mile west from the existing Kenzie Creek 345/138 kV substation in Cass County, Michigan. This new station will tie together the Cook – Kenzie Creek 345-kV circuit section and the Cook – East Elkhart 345-kV circuit section as shown in Figure 1. The new switching station is to consist of six (6) 345 kV circuit breakers physically configured to provide for future expansion to a breaker and half bus arrangement, but initially operated as a ring-bus (Figure 1). The station will also include 345 kV metering, SCADA, and associated equipment. (Network Upgrade **n5021, n5021.2, n5021.3, and n5021.4)**

AEP shall install line protection and controls at the new 345 kV in-line switching station.

AEP shall install ADSS fiber from new AEP switchyard to first collector line structure outside the new AEP switchyard. AEP will install ADSS fiber connecting the Corey St.-Pokagon fiber line to the new AEP switchyard.

Network Upgrade Work

Protection relays in the surrounding area will need to be upgraded to accommodate the addition of the new generating station.

Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation (Network Upgrade **n5023**)

Line protection and controls at the Kenzie Creek 345/138 kV Substation (Network Upgrade **n5024**)

Line protection and controls settings at the East Elkhart 345/138 kV Substation (Network Upgrade **n5025**)

6. Total Cost of Transmission Owner Facilities Included in the Facilities Study:

Direct Connection facilities	$17,284,700
Network Upgrade facilities	$135,600
Total Cost	**$17,420,300**

The estimates do not include the impact that delays in obtaining ROW, permits or other approvals may have.

7. Summary of Schedule Milestones for Completion of Transmission Owner Work Included in Facilities Study:

Task	**Dates**
Engineering Start	Third Quarter of 2017
Material Ordered	First Quarter 2018
Construction Start (Grading & Below Grade)	Second Quarter of 2018
Construction Start (Above Grade)	Fourth quarter 2018
Outage requests made by	First quarter 2018
Outage (Structure Foundations)	Fourth quarter of 2018
Outage (Cut-In & Testing)	Second quarter of 2019
Ready for back feed	June 3, 2019
In-Service Date	April 1, 2020

Assumptions

- **ISA and ICSA executed by March 1, 2017**
- **System conditions allow scheduled outages to occur.**
- **Indeck Energy Services will have their construction and required checkout completed by June 3, 2019.**

B. Transmission Owner Facilities Study Results

1. Transmission Lines – New

AEP shall install 0.25 miles of line cutting the existing Cook – East Elkhart 345kV transmission line into the new AEP switchyard.

2. Transmission Lines – Upgrades

None

3. Substation Facilities – New

AEP shall construct a new in-line 345 kV switching station approximately 1 mile west from the existing Kenzie Creek 345/138 kV substation in Cass County, Michigan. This new station will tie together the Cook – Kenzie Creek 345-kV circuit section and the Cook – East Elkhart 345-kV circuit section as shown in Figure 1. The new switching station is to consist of six (6) 345 kV circuit breakers physically configured to provide for future expansion to a breaker and half bus arrangement, but initially operated as a ring- bus (Figure 1). The station will also include 345 kV metering, SCADA, and associated equipment. AEP shall install line protection and controls at the new 345 kV in-line switching station. (Network Upgrades **n5021, n5021.2, n5021.3, and n5021.4**)

4. Substation Facilities – Upgrades

Protection relays in the surrounding area will need to be upgraded to accommodate the addition of the new generating station.

Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation (Network Upgrade **n5023**)

Line protection and controls at the Kenzie Creek 345/138 kV Substation (Network Upgrade **n5024**)

Line protection and controls settings at the East Elkhart 345/138 kV Substation (Network Upgrade **n5025**)

5. Metering & Communications

Standard 345 kV metering will be installed at the new switching station. A standard station communication scheme will be used. All metering equipment to be installed at the AEP Interconnect Station and the Indeck Energy Services generation station shall meet the requirements as specified by AEP in the "AEP Metering and Telemetering Requirements for AEP Transmission Customers" document (SS-490011). Communication requirements are published in the "AEP SCADA RTU Requirements at Transmission Interconnection Facilities" (document SS-500000). The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. The metering work above and cost indicated below does not include any potential work or cost to address metering requirements of the local service provider. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

6. Environmental, Real Estate and Permitting Issues

Indeck Energy Services is expected to obtain, at its cost, a station site for the AEP facilities. Indeck Energy Services shall obtain all necessary permits and provisions for access to the station site. Fee Simple ownership of the site should be transferred to AEP prior to the start of construction.

A direct drive path to the new in-line switching station will be provided by Indeck Energy Services.

Drainage easements for the station run offs will also be provided by Indeck Energy.

7. Summary of Results of Study

Cost Estimates for AEP

Task	Network Upgrade Number	Engineering	Material	Construction	Other	Total
ADSS Fiber	**n5021.4**	$25,700	$83,500	$181,500	$2,500	**$293,200**
Cook – East Elkhart 345 kV T-Line Cut In	**n5021.3**	$50,300	$451,700	$1,247,300	$220,200	**$1,969,500**
New AEP 345 kV Switchyard	**n5021**	$153,900	$5,354,700	$7,591,500	$1,501,500	**$14,601,600**
345 kV Metering	**n5021.1**	$10,700	$155,600	$187,800	$66,300	**$420,400**
Cook – Remove Metering	**n5021.2**	$1,500	$0	$11,000	$2,500	**$15,000**
Cook Relay Settings	**n5023**	$2,900	$0	$21,000	$16,300	**$40,200**
Kenzie Creek Relay Settings	**n5024**	$2,900	$0	$21,000	$16,300	**$40,200**
East Elkhart Relay Settings	**n5025**	$2,900	$0	$21,000	$16,300	**$40,200**
Total		**$250,800**	**$6,045,500**	**$9,282,100**	**$1,841,900**	**$17,420,300**

8. Information Required for Interconnection Service Agreement

	Direct Interconnection Costs	Network Upgrades	Total
Direct Material	$6,045,500	$0	**$6,045,500**
Direct Labor	$9,448,700	$84,200	**$9,532,900**
Indirect Material	$1,102,600	$0	**$1,102,600**
Indirect Labor	$687,900	$51,400	**$739,300**
Total	**$17,284,700**	**$135,600**	**$17,420,300**

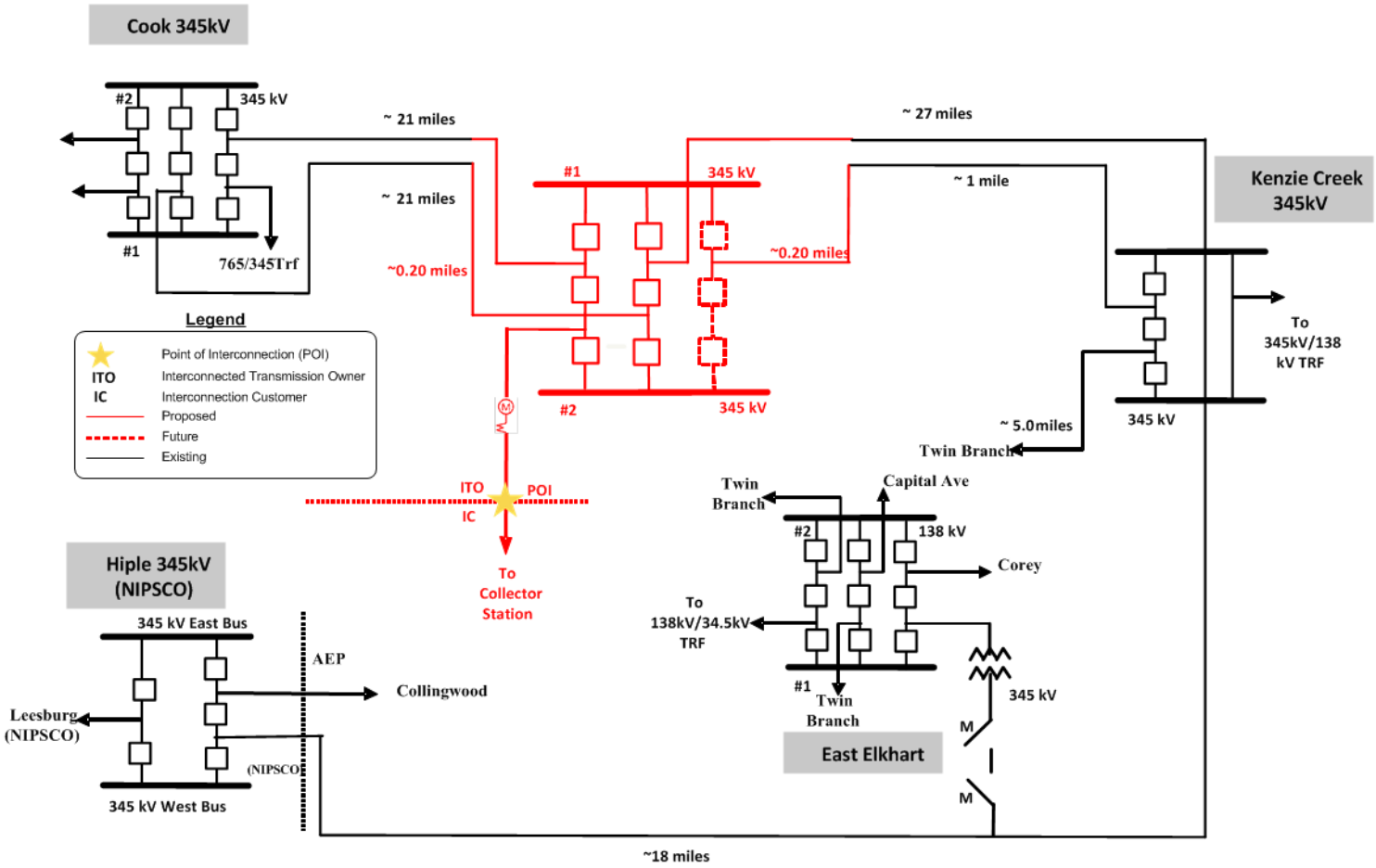

Figure 1: Single-Line Diagram

The Point of Interconnection is at the first structure outside of the new 345 kV switching station with the Interconnected Transmission Owner owning the first span out of its switching station and the Interconnection Customer owning the first structure and remaining conductors back to its generation collector station.

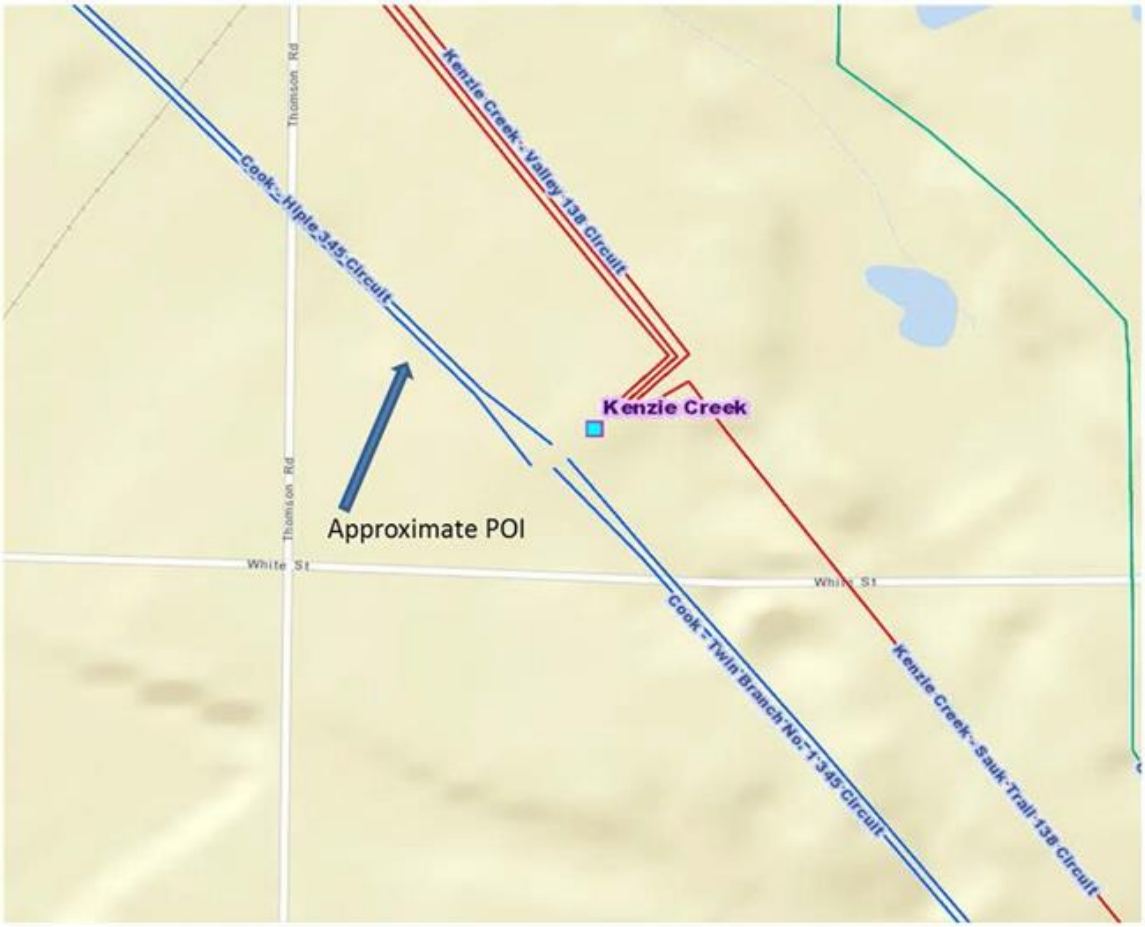

Figure 2: Customer Facility Location/Site Plan

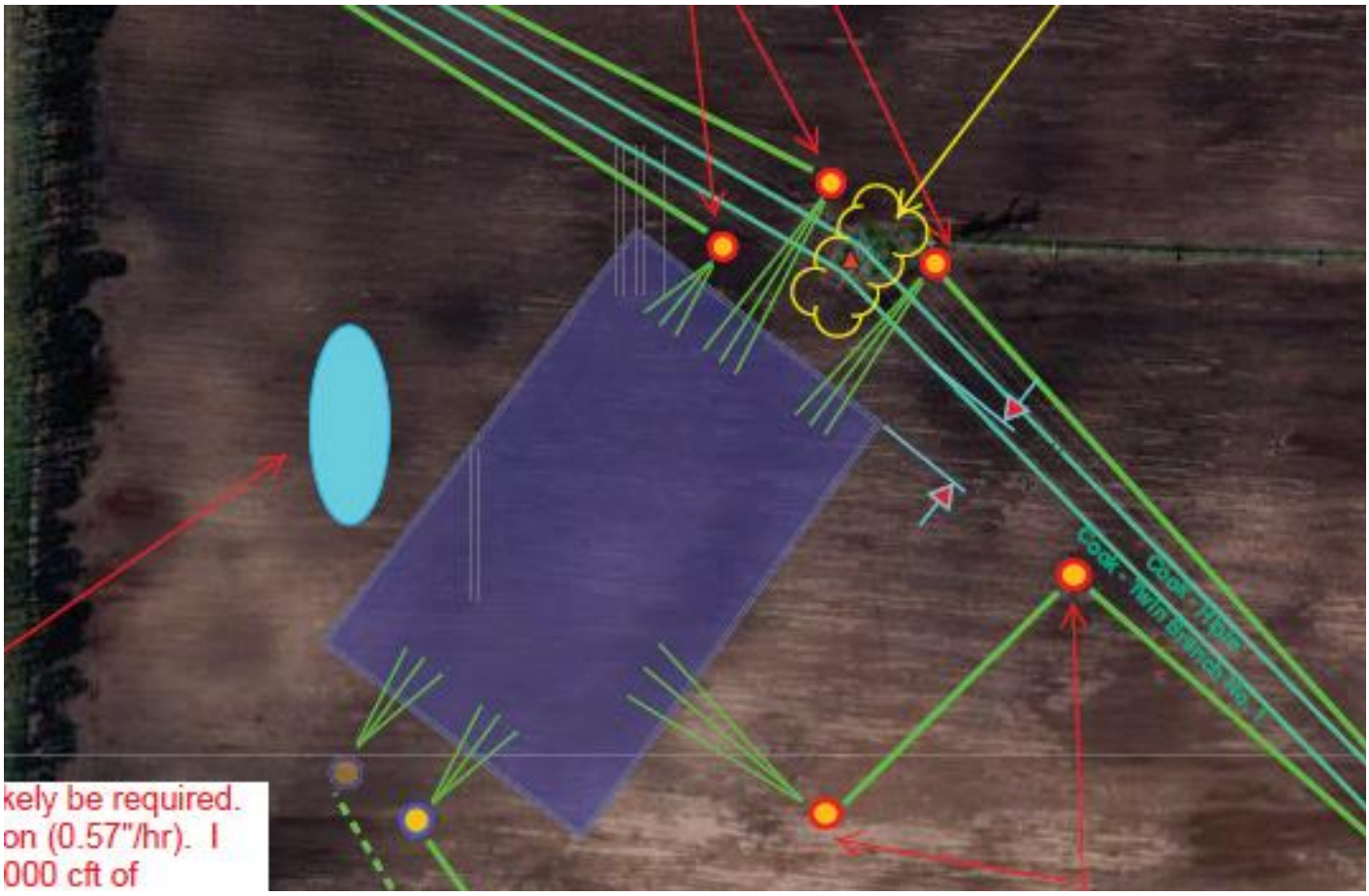

Figure 3: Proposed Station Site

PJM Generator Interconnection Request
Queue #AA2-116
Cook-East Elkhart 345 kV
Facilities Study

January 2017

AA2-116 Cook-East Elkhart (Indeck Energy Services) 345 kV

Facilities Study Report

A. Facilities Study Summary

1. Project Description

Indeck Energy Services proposes to interconnect a 994 MW (994 MW Capacity) natural gas generating facility to the American Electric Power (AEP) Transmission System. The point of interconnection is located approximately 1 mile west of the existing Kenzie Creek 345/138 kV substation as shown in Figures 1 and 2. This Point of interconnection will tie together the Cook – Kenzie Creek 345 kV circuit section and the Cook – East Elkhart 345 kV circuit section via a new switching station, named Thomson Switch station, as shown in Figure 1. The proposed PJM Project #AA2-116 is located in Cass County, Michigan State.

The requested in-service date is 04/01/2020.

2. Amendments/Changes to the Impact Study Report

3. Interconnection Customer Schedule

PJM and AEP understand that Indeck Energy Services has established the following schedule dates:

Receive back feed from AEP: 6/03/2019
Commercial Operation Date: 4/01/2020

4. AEP's Scope of Work to Facilitate Interconnection

- Construct a new six (6) breaker 345 kV switching station laid out in a breaker and half arrangement including installation of associated disconnect switches, bus work, SCADA and 345 kV revenue metering. Line protection and controls will also need to be installed at the new 345 kV switching station. (Network Upgrade **n5021**)
- Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation will need to be changed to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5023**)
- Line protection and controls at the Kenzie Creek 345/138 kV Substation will need to be upgraded to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5024**)
- Line protection and controls settings at the East Elkhart 345/138 kV Substation will need to be changed to coordinate with the new 345 kV switching station due to the new generation added. (Network Upgrade **n5025**)

- Indeck Energy Services is expected to obtain, at its cost, a station site for the AEP facilities. Indeck Energy Services shall obtain all necessary permits and provisions for access to the station site. Fee Simple ownership of the site should be transferred to AEP prior to the start of construction.

- It is understood that Indeck Energy Services is responsible for all the connection costs associated with interconnecting the PJM project AA2-116 to the AEP transmission system. The costs above are reimbursable to AEP. The cost of Indeck Energy resources' generating plant and the costs for the line connecting the generating plant to the new AEP switching station are not included in this report; these are assumed to be Indeck Energy Resources' responsibility.

5. Description of Transmission Owner Facilities Included in the Facilities Study

Direct Connection Work

AEP shall construct a new in-line 345 kV switching station approximately 1 mile west from the existing Kenzie Creek 345/138 kV substation in Cass County, Michigan. This new station will tie together the Cook – Kenzie Creek 345-kV circuit section and the Cook – East Elkhart 345-kV circuit section as shown in Figure 1. The new switching station is to consist of six (6) 345 kV circuit breakers physically configured to provide for future expansion to a breaker and half bus arrangement, but initially operated as a ring-bus (Figure 1). The station will also include 345 kV metering, SCADA, and associated equipment. (Network Upgrade **n5021, n5021.2, n5021.3, and n5021.4)**

AEP shall install line protection and controls at the new 345 kV in-line switching station.

AEP shall install ADSS fiber from new AEP switchyard to first collector line structure outside the new AEP switchyard. AEP will install ADSS fiber connecting the Corey St.-Pokagon fiber line to the new AEP switchyard.

Network Upgrade Work

Protection relays in the surrounding area will need to be upgraded to accommodate the addition of the new generating station.

Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation (Network Upgrade **n5023**)

Line protection and controls at the Kenzie Creek 345/138 kV Substation (Network Upgrade **n5024**)

Line protection and controls settings at the East Elkhart 345/138 kV Substation (Network Upgrade **n5025**)

6. Total Cost of Transmission Owner Facilities Included in the Facilities Study:

Direct Connection facilities	$17,284,700
Network Upgrade facilities	$135,600
Total Cost	**$17,420,300**

The estimates do not include the impact that delays in obtaining ROW, permits or other approvals may have.

7. Summary of Schedule Milestones for Completion of Transmission Owner Work Included in Facilities Study:

Task	Dates
AEP Internal Funding Approval	May 1, 2017
Engineering Start	May 1, 2017
Material Ordered	June 1, 2017
Construction Start (Grading & Below Grade)	October 1, 2017
Construction Start (Above Grade)	March 2, 2018
Outage requests made by	January 31, 2018
Outage (Structure Foundations)	October 1-October 12, 2018
Outage (Cut-In & Testing)	April 1, 2019-May 31, 2019
Ready for back feed	June 3, 2019
In-Service Date	April 1, 2020

Assumptions

- **ISA and ICSA executed by March 1, 2017**
- **System conditions allow scheduled outages to occur.**
- **Indeck Energy Services will have their construction and required checkout completed by June 3, 2019.**

B. Transmission Owner Facilities Study Results

1. Transmission Lines – New

AEP shall install 0.25 miles of line cutting the existing Cook – East Elkhart 345kV transmission line into the new AEP switchyard.

2. Transmission Lines – Upgrades

None

3. Substation Facilities – New

AEP shall construct a new in-line 345 kV switching station approximately 1 mile west from the existing Kenzie Creek 345/138 kV substation in Cass County, Michigan. This new station will tie together the Cook – Kenzie Creek 345-kV circuit section and the Cook – East Elkhart 345-kV circuit section as shown in Figure 1. The new switching station is to consist of six (6) 345 kV circuit breakers physically configured to provide for future expansion to a breaker and half bus arrangement, but initially operated as a ring- bus (Figure 1). The station will also include 345 kV metering, SCADA, and associated equipment. AEP shall install line protection and controls at the new 345 kV in-line switching station. (Network Upgrades **n5021, n5021.2, n5021.3, and n5021.4**)

4. Substation Facilities – Upgrades

Protection relays in the surrounding area will need to be upgraded to accommodate the addition of the new generating station.

Line protection and controls settings at Cook Circuit # 1 and #2 at Cook 345 kV substation (Network Upgrade **n5023**)

Line protection and controls at the Kenzie Creek 345/138 kV Substation (Network Upgrade **n5024**)

Line protection and controls settings at the East Elkhart 345/138 kV Substation (Network Upgrade **n5025**)

5. Metering & Communications

Standard 345 kV metering will be installed at the new switching station. A standard station communication scheme will be used. All metering equipment to be installed at the AEP Interconnect Station and the Indeck Energy Services generation station shall meet the requirements as specified by AEP in the "AEP Metering and Telemetering Requirements for AEP Transmission Customers" document (SS-490011). Communication requirements are published in the "AEP SCADA RTU Requirements at Transmission Interconnection Facilities" (document SS-500000). The Generation Interconnection Agreement does not in or by itself establish a requirement for American Electric Power to provide power for consumption at the developer's facilities. A separate agreement may be reached with the local utility that provides service in the area to ensure that infrastructure is in place to meet this demand and proper metering equipment is installed. The metering work above and cost indicated below does not include any potential work or cost to address metering requirements of the local service provider. It is the responsibility of the developer to contact the local service provider to determine if a local service agreement is required.

6. Environmental, Real Estate and Permitting Issues

Indeck Energy Services is expected to obtain, at its cost, a station site for the AEP facilities. Indeck Energy Services shall obtain all necessary permits and provisions for access to the station site. Fee Simple ownership of the site should be transferred to AEP prior to the start of construction.

A direct drive path to the new in-line switching station will be provided by Indeck Energy Services.

Drainage easements for the station run offs will also be provided by Indeck Energy.

7. Summary of Results of Study

Cost Estimates for AEP

Task	Network Upgrade Number	Engineering	Material	Construction	Other	Total
ADSS Fiber	**n5021.4**	$25,700	$83,500	$181,500	$2,500	**$293,200**
Cook – East Elkhart 345 kV T-Line Cut In	**n5021.3**	$50,300	$451,700	$1,247,300	$220,200	**$1,969,500**
New AEP 345 kV Switchyard	**n5021**	$153,900	$5,354,700	$7,591,500	$1,501,500	**$14,601,600**
345 kV Metering	**n5021.1**	$10,700	$155,600	$187,800	$66,300	**$420,400**
Cook – Remove Metering	**n5021.2**	$1,500	$0	$11,000	$2,500	**$15,000**
Cook Relay Settings	**n5023**	$2,900	$0	$21,000	$16,300	**$40,200**
Kenzie Creek Relay Settings	**n5024**	$2,900	$0	$21,000	$16,300	**$40,200**
East Elkhart Relay Settings	**n5025**	$2,900	$0	$21,000	$16,300	**$40,200**
Total		**$250,800**	**$6,045,500**	**$9,282,100**	**$1,841,900**	**$17,420,300**

8. Information Required for Interconnection Service Agreement

	Direct Interconnection Costs	Network Upgrades	Total
Direct Material	$6,045,500	$0	**$6,045,500**
Direct Labor	$9,448,700	$84,200	**$9,532,900**
Indirect Material	$1,102,600	$0	**$1,102,600**
Indirect Labor	$687,900	$51,400	**$739,300**
Total	**$17,284,700**	**$135,600**	**$17,420,300**

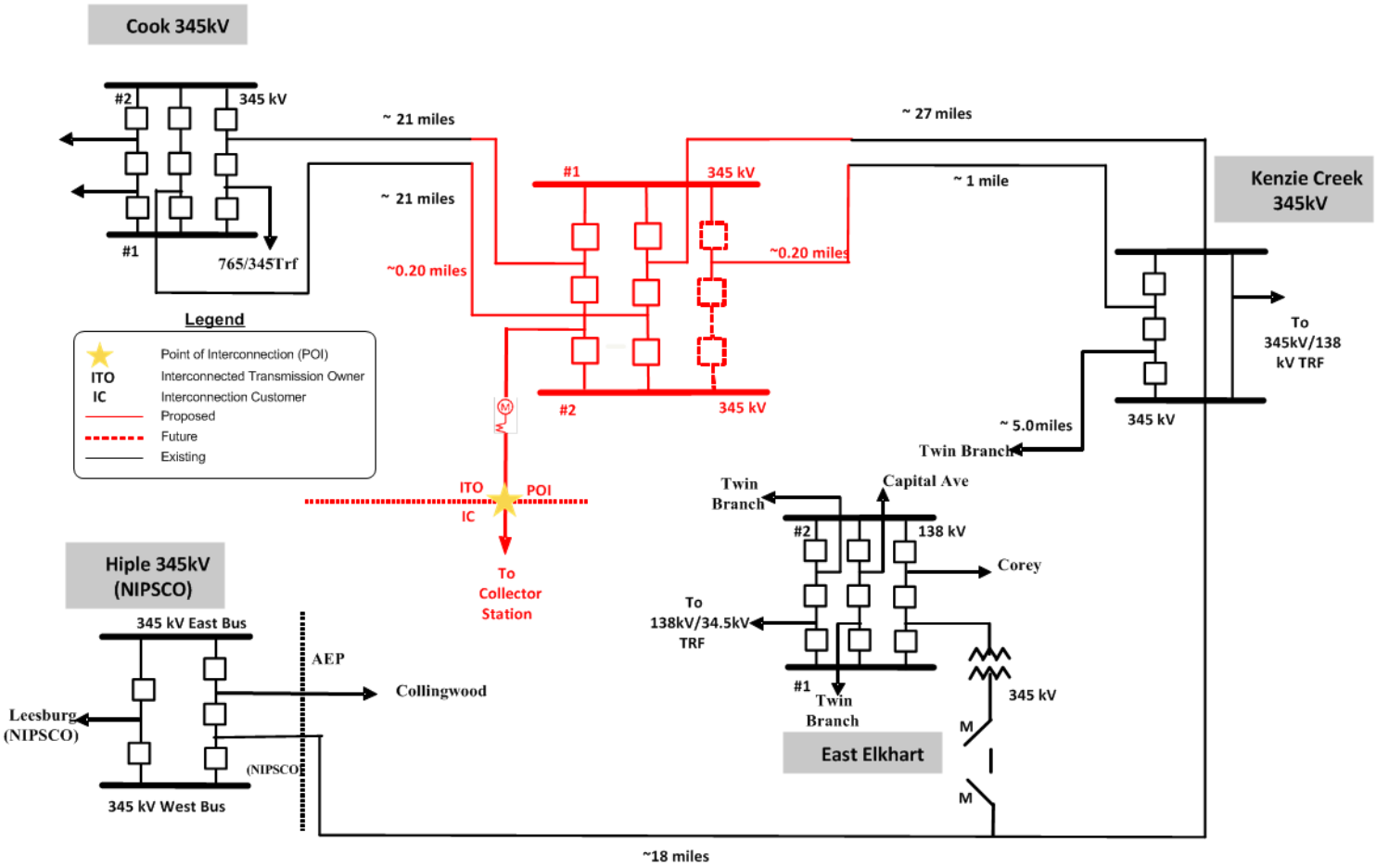

Figure 1: Single-Line Diagram

The Point of Interconnection is at the first structure outside of the new 345 kV switching station with the Interconnected Transmission Owner owning the first span out of its switching station and the Interconnection Customer owning the first structure and remaining conductors back to its generation collector station.

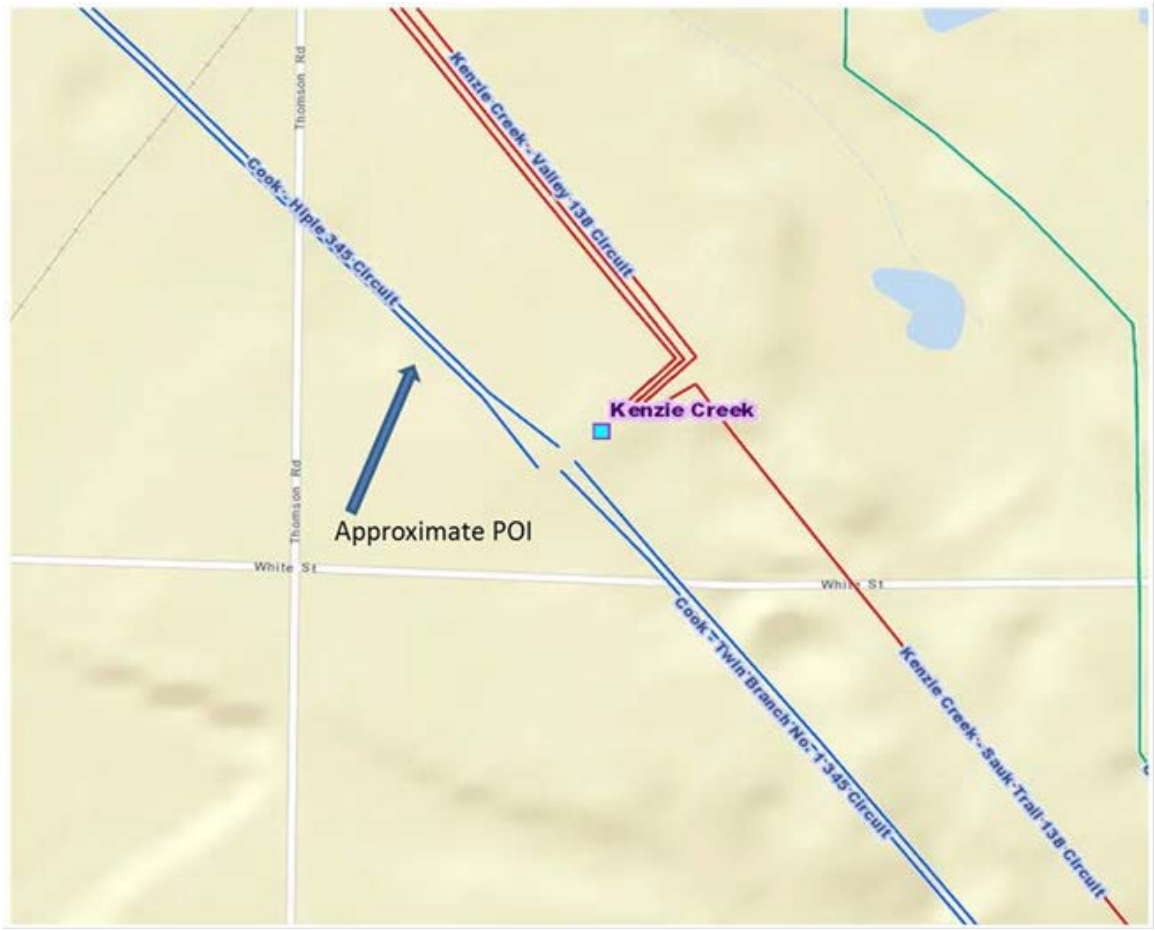

Figure 2: Customer Facility Location/Site Plan

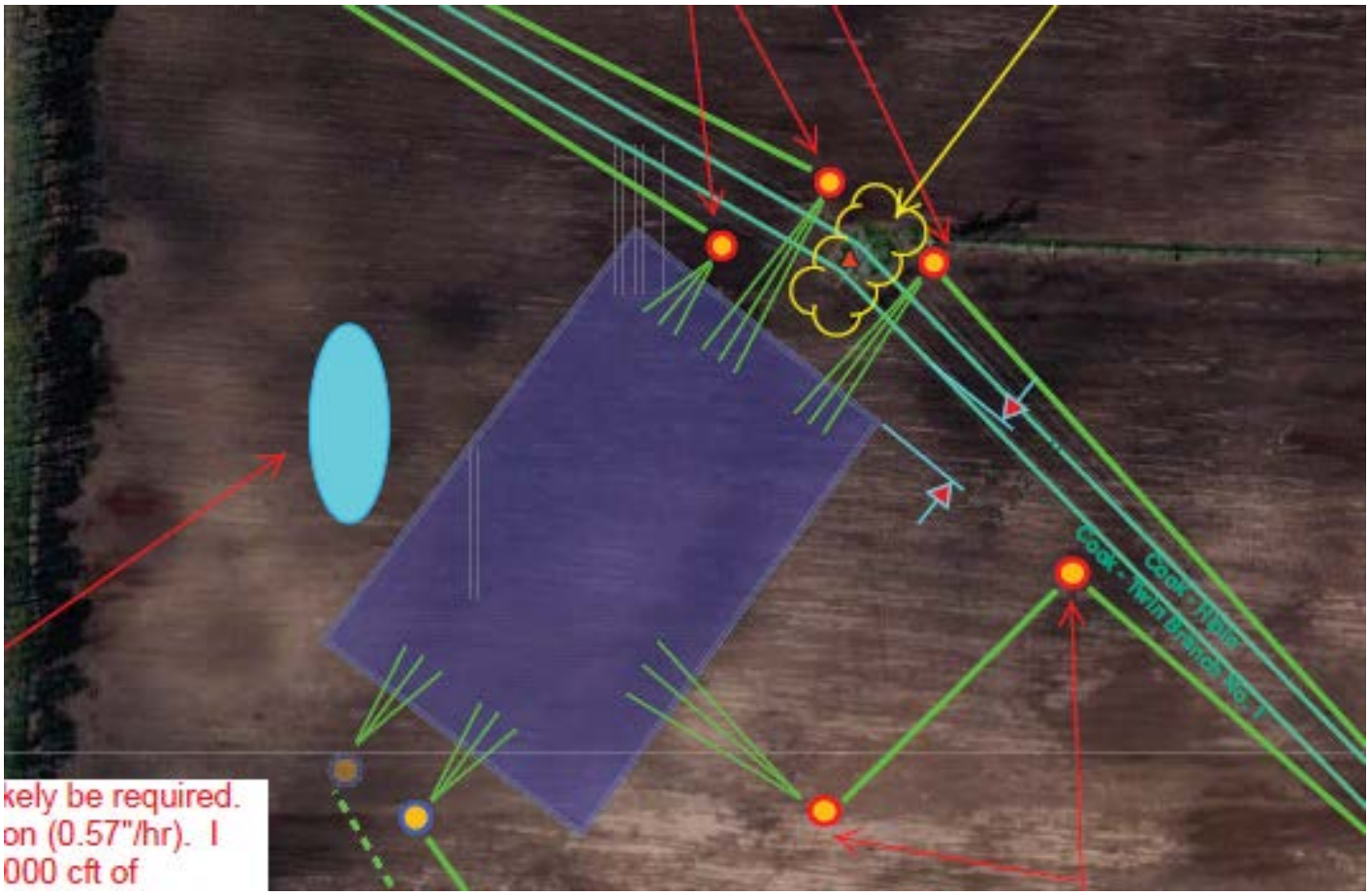

Figure 3: Proposed Station Site