Generation Interconnection Facilities Study Report

For

PJM Generation Interconnection Request Queue Position – AD2-048

Cynthiana Tie-Headquarters 69 kV Solar Project – 70 MW

August 2021

General

Blue Moon Solar LLC, the Interconnection Customer, has proposed a solar generating facility located in Harrison County, Kentucky. This solar facility will have a total capability of 70 MW with 46.7 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is June 1, 2022. **This study does not imply an East Kentucky Power Cooperative commitment to this in-service date.**

Point of Interconnection

AD2-048 will interconnect with the East Kentucky Power Cooperative ("EKPC") transmission system at the new proposed East Harrison 69 kV Substation, located along the EKPC Cynthiana Tie-Headquarters 69 kV line near Cynthiana, KY.

Cost Summary

The AD2-048 project shall be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$ 1,000,000
Direct Connection Network Upgrades	$ 3,325,000
Non Direct Connection Network Upgrades	$ 1,855,000
Allocation for System Upgrades	$ 0
EKPC Network Upgrades	$ 760,000
Total Costs	**$ 6,940,000**

A. Transmission Owner Facilities Study Summary

1. General Description of Project

Blue Moon Solar LLC ("Blue Moon Solar"), the Interconnection Customer ("IC"), has proposed a 70 MW solar generating facility located near Cynthiana, in Harrison County, Kentucky. PJM studied AD2-048 as a 70 MW injection into the EKPC transmission system at a newly constructed 69 kV switching station ("East Harrison Switching"), and evaluated it for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). The proposed in-service date is June 1, 2022.

The intent of this study is to develop detailed engineering cost estimates and construction schedules for necessary EKPC transmission facilities and system reinforcements, and protection requirements to accommodate this Generator Interconnection Request.

2. Amendments to the System Impact Study Data or System Impact Study Results

The project costs and construction schedule have been refined in this report for increased accuracy and thereby differ from that which was presented in the Feasibility and System Impact Study reports. All estimates have been created based on meeting the earliest in-service date possible at the request of the IC. EKPC estimates a twenty-one (21) month implementation duration after a project kickoff meeting is held. Therefore, the requested in-service date of June 1, 2022 (and associated backfeed date of March 1, 2022) may be possible if an Interconnection Construction Service Agreement ("ICSA") is executed in an expedient manner. Any delay in the execution of this ICSA could result in a delay in the projected in-service date for EKPC's required facilities.

3. Interconnection Customer's Milestone Schedule

The IC's requested Commercial Operation Date ("COD") for the Blue Moon Solar generation facility is **June 1, 2022**. The requested backfeed date for the project is March 1, 2022. Milestone details have not been provided for the IC's schedule.

4. Scope of Interconnection Customer's Work

The Point of Interconnection ("POI") will be the IC side of a 69 kV disconnect switch to be installed by EKPC at the interface between the IC-owned substation facilities and EKPC's substation facilities at the new East Harrison Switching 69 kV substation. The exact location of this switch will be determined during project scoping, and EKPC may require that this switch be located in the IC's substation, although EKPC will install, own, operate, and maintain it. The IC substation will be constructed in the vicinity of the new EKPC East Harrison Switching 69 kV substation. The IC will install necessary 69 kV equipment (bus conductors, jumpers, etc.) from this 69 kV disconnect switch to its substation equipment. The IC will be responsible for acquiring all rights-of-way, easements, and environmental approvals and permits for its facilities. The IC will be responsible for constructing, owning, operating, and maintaining its facilities, and EKPC will have no responsibility for any of these activities.

The IC will acquire sufficient property that is suitable for EKPC's new 69 kV switching substation and will grant ownership of this property to EKPC at no cost. Prior to taking ownership, EKPC will perform all necessary engineering and environmental reviews to ensure that the site is suitable. EKPC will have the right to request modifications to the site or to reject the site if it is not suitable for EKPC's needs.

5. Description of Facilities Included in Facilities Study

This report describes the EKPC transmission system additions and upgrades necessary to support the IC's project.

EKPC will construct a 69 kV switching station and a new 69 kV loop-in tap from the EKPC Cynthiana Tie-Headquarters 69 kV line section to accommodate the direct connection of the IC's substation facilities to the EKPC transmission system. EKPC will also construct a 69 kV disconnect switch structure which will be the POI interface. A proposed one-line diagram and draft geographical footprint of the EKPC substation are included as Attachments 1 and 2 of this study.

EKPC will also complete the required non-direct connection network upgrades at existing EKPC substations, which are system protection changes necessary at the Renaker and Headquarters switching stations to accommodate the addition of this new facility.

6. Total Costs of Transmission Owner Facilities included in Facilities Study

The costs estimated below are in 2020 dollars and do not include a Contribution in Aid of Construction ("CIAC") Federal Income Tax Gross Up charge. This tax may or may not be charged based on IRS requirements.

Description	Total Cost	
Attachment Facilities	$	1,000,000
Direct Connection Network Upgrades	$	3,325,000
Non Direct Connection Network Upgrades	$	1,855,000
EKPC Network Upgrades	$	760,000
Total Costs	**$**	**6,940,000**

7. Summary of Milestone Schedules for Completion of Work Included in Facilities Study:

A twenty-one (21) month construction schedule is estimated from the date of a fully executed ICSA to complete construction of necessary EKPC facilities. This schedule is dependent on several factors, including convening a construction kickoff meeting immediately after execution of the Interconnection Service Agreement ("ISA"). A more detailed construction schedule will be developed for the ICSA. EKPC's construction shall not begin until all applicable permits, easements and land rights have been obtained.

This proposed schedule assumes the following:

1. Required transmission line outages can be scheduled as planned. Transmission line outages are:

a. typically not taken in the summer (June-August) or winter (December-February) periods,
b. cancelled during extreme weather conditions, and
c. in some cases, required to be scheduled twelve (12) months or more in advance.

2. No delays due to equipment delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
3. No significant sub-surface rock is encountered during construction, and soil conditions are suitable for EKPC standard ground grid and foundation installations.
4. Required easements for line installation and access to facilities can be acquired by EKPC in a timely manner.
5. Suitable and adequate substation property is provided to EKPC by the IC in a timely manner.
6. Necessary permits can be acquired and environmental reviews can be completed in a timely manner.

If any of these assumptions are not correct, the schedule is likely to be negatively impacted. EKPC's preliminary milestone schedule beginning from the project kickoff meeting month is shown below.

Description	Start Month	Completion Month
Project Kickoff Meeting	Month 0	Month 0
Transmission Line Design	Month 1	Month 1
Substation Design (Including Site Grading Design)	Month 1	Month 3
Procure Materials and Equipment	Month 2	Month 16
Headquarters-Snow Hill-Murphysville 69 kV Line Conductor Temperature Upgrade	Month 10	Month 11
Site Preparation	Month 10	Month 15
Renaker-3M-Cynthiana Tie 69 kV Transmission Line OPGW Installation	Month 11	Month 13
Substation Construction	Month 16	Month 20
Cynthiana Tie-Headquarters 69 kV Transmission Line Loop-In Construction	Month 20	Month 20

Description	Start Month	Completion Month
Commissioning and Testing	Month 20	Month 21

8. Technical Considerations/Requirements:

The proposed Blue Moon Solar facility will be located within close proximity (approximately 2.8 miles) to EKPC's existing 3M distribution substation. This facility serves an industrial facility that is potentially sensitive to extreme fluctuations in voltages and power harmonics. Therefore, EKPC performed flicker analysis to determine if the Blue Moon Solar facility could have detrimental power quality impacts on the customers served from the 3M substation.

EKPC evaluated four transmission topology scenarios utilizing powerflow models representing 2021 Light Load, 2021 Summer peak and 2021/22 Winter peak conditions. The four scenarios analyzed were:

- No transmission outages
- East Harrison Switching-Cynthiana Tie 69 kV line section out of service
- East Harrison Switching-Headquarters 69 kV line section out of service
- Renaker-3M 69 kV line section out of service

For each scenario, three levels of real-power output from the Hummingbird Solar facility were evaluated – 0 MW, 35 MW, and 70 MW. The intent of this analysis is to determine the change in voltages at nearby distribution substations serving sensitive customers due to sudden changes in the real-power output at the proposed solar facility.

This analysis assumed that the proposed solar facility can operate in the reactive range of 95% leading to 95% lagging power factor. However, for the 0 MW level, the initial assumption was that the facility would not provide any reactive power injection into the system. This was updated to include continuous operation of the inverters associated with the facility within the +/- 95% power factor range for the 2021 Summer peak load analysis, since this scenario appeared to represent the most likely case where the facility could swing from full output to no output at peak-load conditions.

The tables below summarize the results of the analysis.

2021 Light Load Power Flow Analysis – Bus Voltages				
Transmission Outage Scenario	**Distribution Substation Monitored**	**70 MW Solar Facility Output Level**	**35 MW Solar Facility Output Level**	**0 MW Solar Facility Output Level With No Reactive Injection**
No outages	3M	99.7%	98.7%	100.2%
East Harrison Switching-Cynthiana Tie 69 kV line section	3M	99.5%	99.7%	99.8%
East Harrison Switching-Headquarters 69 kV line section	3M	98.0%	98.6%	99.8%
Renaker-3M 69 kV line section	3M	102.4%	98.7%	100.6%

2021/22 Winter Power Flow Analysis – Bus Voltages				
Transmission Outage Scenario	**Distribution Substation Monitored**	**70 MW Solar Facility Output Level**	**35 MW Solar Facility Output Level**	**0 MW Solar Facility Output Level With No Reactive Injection**
No outages	3M	99.7%	98.7%	100.2%
East Harrison Switching-Cynthiana Tie 69 kV line section	3M	99.5%	99.7%	99.8%
East Harrison Switching-Headquarters 69 kV line section	3M	98.0%	98.6%	99.8%
Renaker-3M 69 kV line section	3M	102.4%	98.7%	100.6%

2021 Summer Peak Power Flow Analysis – Bus Voltages					
Transmission Outage Scenario	**Distribution Substation Monitored**	**70 MW Solar Facility Output Level**	**35 MW Solar Facility Output Level**	**0 MW Solar Facility Output Level With No Reactive Injection**	**0 MW Solar Facility Output Level With Reactive Injection**
No outages	3M	99.7%	98.7%	100.2%	98.9%

East Harrison Switching-Cynthiana Tie 69 kV line section	3M	99.5%	99.7%	99.8%	99.8%
East Harrison Switching-Headquarters 69 kV line section	3M	98.0%	98.6%	99.8%	98.9%
Renaker-3M 69 kV line section	3M	102.4%	98.7%	100.6%	98.6%

These results indicate that without the inverters continuing to provide reactive support if the real power output drops to zero, possible excessive voltage swings could be experienced at the 3M substation. Therefore, EKPC will require that the proposed solar facility be capable of providing at least 90 seconds of reactive support when real-power output ceases. This will provide sufficient time for EKPC transmission capacitor banks in the area to switch online, plus allow distribution substation voltage regulators to adjust to maintain consistent voltage on the distribution system.

The proposed facility must meet EKPC's published facility connection requirements. The latest version of these requirements can be accessed via the following link:

https://www.pjm.com/planning/design-engineering/to-tech-standards/ekpc.aspx

The following discussion of requirements regarding connection of inverter-based generating facilities to the EKPC system is excerpted from this document (section 5.9).

A Generating Facility comprising static inverters shall utilize inverters that have been tested and certified to UL 1741 with Advanced Inverter functionality (UL 1741 SA or subsequent UL equivalent), by a NRTL certified by OSHA to perform the UL 1741 SA test standard. The programming/set points to be determined per EKPC recommendations and proof such shall be provided by the IC (i.e. certified test report, inverter settings print-out, and/or EKPC inspection/validation). Unity power factor shall be the default mode unless otherwise determined by mutual consent between EKPC and the IC. At a minimum, the following grid support features are required unless otherwise specified by EKPC:

a) *Anti-Islanding – Support anti-islanding to trip off under extended anomalous conditions*
b) *Volt/Var Mode – Voltage/Var control through dynamic reactive power injection through autonomous responses to local voltage measurement*
c) *Volt/Watt Mode – Voltage/Watt control through dynamic reactive power injection through autonomous responses to local voltage measurement*
d) *Fixed Power Factor Mode – Reactive Power by fixed power factor*
e) *Constant Reactive Power Mode – Reactive power by a fixed percentage of kVA rating of the inverter nameplate*
f) *Frequency/Watt Mode – Frequency/Watt control to counteract frequency excursions beyond normal limits by decreasing or increasing real power*
g) *Low/High Voltage Ride-Through (LHVRT) – Ride-through of low/high voltage excursions beyond normal limits*

h) Low/High Frequency Ride-Through (LHFRT) - Ride-through of low/high frequency excursions beyond normal limits
i) Ramping – Capability to define active and reactive power ramp rates
j) Soft-Start Reconnection – Reconnect after grid power is restored
k) Cease to Energize – Capability to remotely turn off active power delivery
l) Power Curtailment – Capability to remotely curtail the active power production within the range of 0% to 100%

A redundant over/undervoltage relay will be required for static inverters with an AC output nominal rating of ≥1000 kW, or whenever the aggregate inverter AC output nominal rating of a Generating Facility ≥1000 kW. For installations ≥10 MW redundant over/undervoltage and over/underfrequency protection will be required. Such protection shall be applied to one or more breakers external to the inverter(s).

The IC shall ensure, at a minimum, that the inverter performance tests specified below are performed and certified by a NRTL to ensure compliance with the following sections of IEEE1547-2018 Section 7.0 Power Quality

a. Section 7.1 Limitation of DC Injection
b. Section 7.2 Limitation of Voltage Fluctuations induced by the DER
c. Section 7.3 Limitation of Current Distortion
d. Section 7.4 Limitation of Overvoltage Contribution

The IC shall provide EKPC with a copy of the test results and certification from the NRTL, for EKPC review and approval.

B. Transmission Owner Facilities Study Results

The facilities identified to be installed, replaced, and/or upgraded by EKPC to accommodate the proposed project are described in this section. During detailed design and analysis, other components may be identified for installation or replacement due to this project.

1. Transmission Lines – New

A new loop-in tap line will be constructed from EKPC's existing Cynthiana Tie-Headquarters 69 kV transmission line to the new East Harrison Switching 69 kV substation as shown in Attachment 1 of this study. The new transmission line loop-in facilities will be owned, operated, and maintained by EKPC. Several new transmission poles will be installed to facilitate the connection to the existing line section and looping the line into the new switching station. The loop from the Cynthiana Tie to Headquarters 69 kV line to the new substation is expected to extend approximately 250 feet **(PJM ID n6676.3)**

The estimated cost for the new line construction for this project is $355,000.

Transmission Line Assumptions:

The following general assumptions have been included for the transmission line information provided:

1. Required transmission line outages can be scheduled as planned. Transmission line outages are:
    a. typically not taken in the summer (June-August) or winter (December-February),
    b. cancelled during extreme weather conditions, and
    c. in some cases, required to be scheduled twelve (12) or more months in advance.
2. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
3. No significant sub-surface rock encountered during construction, and soil conditions are suitable for standard foundation installations.

The following engineering assumptions have been included for the transmission line information provided:

1. Neither foundation nor transmission pole structural analyses have been performed. Information provided assumes that no significant foundation or structural issues are present.
2. Construction will be scheduled to avoid winter peak load periods (December - February).
3. The preliminary schedule assumes that transmission line outages can be obtained as necessary.
4. Material and equipment costs are based on current (May 2020) pricing.
5. Easements, if necessary, shall be acquired by EKPC.
6. Environmental permits and reviews shall be completed by EKPC, and can be completed in a timely manner.

2. Transmission Line – Upgrades

An upgrade of the maximum operating temperature of the 3/0 ACSR conductor in the Headquarters-Snow Hill (**PJM ID N5858**, 3.8 miles) and Snow Hill-Murphysville (**PJM ID N5859**, 16.1 miles) 69 kV line sections is required to address overloads of these line sections identified in the System Impact Study for this project. EKPC determined that the conductor operating temperature will need to be upgraded to 212 degrees Fahrenheit in order to provide adequate ratings of the line sections.

The estimated cost for the maximum conductor operating temperature increase is $190,000 for the Headquarters-Snow Hill line section and $570,000 for the Snow Hill-Murphysville line section.

Overhead optical ground wire ("OPGW") installation will be required to meet communications requirements for the new EKPC East Harrison Switching substation. EKPC will need to establish

a fiber-optic communications path to its nearest microwave tower site. Therefore, OPGW installation on the Renaker-3M-Cynthiana Tie 69 kV line section (8.5 miles) is required **(PJM IDn6676.6).** OPGW is currently installed from the Cynthiana Tie location to the proposed East Harrison Switching site. EKPC would connect that existing OPGW with the new OPGW to be installed for the AD2-048 project.

The estimated cost for the new OPGW installation necessary to facilitate this project is $1,230,000.

3. New Substation/Switchyard Facilities

EKPC will build a new 69 kV switching station ("East Harrison Switching") in the vicinity of the IC's substation for interconnection of the new generating facility. The new switching station will be constructed near EKPC's Cynthiana Tie-Headquarters 69 kV transmission line, approximately 1.6 miles from the Cynthiana Tie location and 8.8 miles from the Headquarters transmission substation. This new 69 kV switching station will be owned, operated, and maintained by EKPC. **(PJM ID n6676.2)**

The major equipment and material associated with the new switching station is listed below:

QTY	Unit	DESCRIPTION
1	Each	69 kV High Profile Substation Structure
4	Each	69 kV, 2000 Amp Circuit Breakers
15	Each	69 kV GOAB Switches
1	Lot	Electrical Material (insulators, terminals, etc.)
1	Each	Station Service Transformer, 100 KVA (40 kV-120/240V)
9	Each	Arresters, Lightning 108 kV Station 88 MCOV Polymer
3	Each	CT's, 69 kV
3	Each	PT's, 69 kV

For attachment facilities, EKPC will also construct a 69 kV switch structure to provide a single stand-alone isolation point between the EKPC switching station and the IC substation. The POI between EKPC and the IC will be the 4-hole pad on the disconnect switch on this structure. The IC will build its bus conductors from its facilities to this demarcation point. The exact location of the switch structure will be determined at project scoping, and it may be determined that the location should be in the IC's substation. Regardless of location, EKPC will own, operate, and maintain this switch and its associated structure. EKPC will require permanent 24/7 access to the IC substation for this switch if the switch is located in the IC substation. The attachment facilities also include the required interconnection metering facilities and telecommunications facilities installed by EKPC on the connection facilities between the new EKPC substation and the IC substation. **(PJM ID n6676.1)**

The IC is responsible for construction of all of the facilities on its side of the POI, as shown in the attached one-line diagram.

The IC is responsible for obtaining property rights for the EKPC switching station site and deeding the property to EKPC. EKPC also assumes that the IC will provide all necessary easements for a permanent road to provide substation access. This substation access shall be from an existing county or state road. The IC will convey these rights to EKPC if they own the property on which the substation access road will be located. Otherwise, EKPC will need to acquire the access rights from the owner of the property.

System Protection

The following system protection scope of work applies for this project. All system protection equipment described in this section will be owned, operated, and maintained by EKPC.

Control House: EKPC shall procure and install a drop-in style control building fully furnished and complete with one bus differential panel, two transmission line panels, one transfer breaker panel, (option of a transformer differential panel, bus differential panel or another line panel for the connection to the solar facility), two 125V DC battery banks, and all required operating equipment.

Relay Panels: EKPC shall install a standard bus panel complete with P1 SEL-587Z and P2 SEL-487B relays tripping P1 & P2 lock out relays. Line Transfer Panel (619) – EKPC shall install a standard transfer line panel with P1 & P2 SEL-421 relays. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing. The line panel shall have the capability to transfer breakers 634, 644, & 654. Line Panel (634) – EKPC shall install either (a standard line panel with P1 & P2 SEL-421 relays, standard bus panel with P1 SEL-587Z & P2 SEL-487B relays, or standard transformer panel with P1 SEL 787 & P2 SEL 487E relays). Line option relays shall utilize step distance protection to reach into the customer solar transformer impedance with an instantaneous zone 1 whereas a bus option will use differential protection and a transformer option will also use differential protection. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing. Line Panel (644) – EKPC shall install a standard line panel with P1 & P2 SEL-421 relays. The P1 relay shall utilize a high speed POTT scheme over fiber. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing. Line Panel (654) – EKPC shall install a standard line panel with P1 & P2 SEL-421 relays. The P1 relay shall utilize a high speed POTT scheme over fiber. A SEL-451 relay shall be utilized for breaker control, breaker failure, and reclosing.

EKPC requires the IC to utilize all Schweitzer Engineering Laboratories (SEL) relays and related protective equipment for facilities that will be interconnecting or communicating with EKPC relaying. EKPC reserves the right to specify relays or other protective equipment utilized in the IC substation as required based on the protection schemes utilized. All protection system designs shall be reviewed by EKPC System Protection during the design phase to ensure proper clearing times, coordination, and compliance with applicable NERC regulations.

Control cables shall be pulled from new breakers and other required equipment to the control house.

Commissioning: Each relay panel shall be fully commissioned prior to being placed in service. Commissioning shall include AC current and potential circuits, DC functional, relay testing, and end-to-end testing where required. Each of the remote line ends (Renaker and Headquarters substations) shall be commissioned using end-to-end testing prior to energizing the POTT scheme to the East Harrison Switching substation.

The estimated total cost for the East Harrison Switching substation and system protection construction for this project is $4,325,000. This estimate also includes costs for metering and telecommunications equipment that will be located inside the new EKPC substation. The estimated cost of $4,325,000 includes $1,000,000 for the attachment facilities between the IC substation and the new EKPC substation, as follows:

- $195,000 for the 69 kV switch structure and switch for isolation
- $115,000 for interconnection metering facilities
- $220,000 for telecommunications facilities between the EKPC substation and the IC substation
- $470,000 for the 69 kV circuit breaker, disconnect switches, and relay panel needed for connection of the lead line from the solar facility.

Substation & System Protection Assumptions:

The following general assumptions have been included for the substation information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, property/easement acquisitions, extreme weather, or similar events.
2. No significant sub-surface rock encountered during construction, and soil conditions suitable for standard ground-grid and foundation installations.
3. IC shall acquire an adequate and suitable site and grant ownership to EKPC to accommodate EKPC's interconnection substation, as mentioned above.
4. The IC will provide all necessary easements for a permanent road to provide substation access. This substation access shall be from an existing county or state road. The IC will convey these rights to EKPC if they own the property on which the substation access road will be located. Otherwise, EKPC will need to acquire the access rights from the owner of the property.

The following engineering assumptions have been included for the substation information provided:

1. Neither foundation nor structural analyses have been performed. Information provided assumes that no significant foundation or structural issues are present.
2. The schedule assumes no issues related to scheduling outages of existing transmission lines to terminate into the new substation.
3. Material and equipment-related costs are based on current (May 2020) pricing.
4. Environmental permits and reviews will be completed by EKPC and can be completed in a timely manner.

4. Upgrades to Substation/Switchyard Facilities

EKPC shall complete the required non-direct connection network substation upgrades, which will include system protection changes at both the existing Renaker and Headquarters 69 kV substations to accommodate the addition of this new facility.

Renaker – The relay panel will be replaced and relay settings reviewed for the Renaker-Headquarters 69 kV line to accommodate the new East Harrison Switching station, and relay files will be updated accordingly. The estimated total cost of this work at Renaker is $135,000. **(PJM ID n6676.4)**

Headquarters – The relay panel will be replaced and relay settings shall be reviewed for the Renaker-Headquarters 69 kV line to accommodate the new East Harrison Switching station, and relay files will be updated accordingly. The estimated total cost of this work at Headquarters is $135,000. **(PJM ID n6676.5)**

Therefore, the estimated total cost for the relay upgrades and settings changes at the existing remote ends of the lines to be connected to the East Harrison Switching substation is $270,000.

5. Metering & Communications

EKPC Metering:

Metering requirements for this facility include the installation of EKPC's standard revenue quality metering package, including potential transformers, current transformers, remote-terminal unit and associated SCADA equipment.

The cost for installation of the metering facilities contained in the new EKPC substation are included in the substation costs provided in Section 3 above.

Metering Assumptions:

The following assumptions have been included for the metering information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
2. Fiber-optic cable and associated equipment installation is completed as scheduled.
3. Material and equipment-related costs are based on current (May 2020) pricing.
4. Once fiber-optic cable installation is complete, the fiber will not be damaged.

Communications:

EKPC shall use telecommunications equipment that matches its current network and equipment requirements.

A 48-count ADSS fiber will be installed between the EKPC substation control house and the IC facility for relaying, metering, and SCADA circuit requirements. The exact details and installation plans for this fiber will be developed during project scoping.

The cost for installation of the telecommunications facilities contained in the new EKPC substation are included in the substation costs provided in Section 3 above.

Communications Assumptions:

The following assumptions have been included for the telecommunications information provided:

1. No delays due to equipment or material delivery, environmental, regulatory, permitting, real estate, extreme weather, or similar events.
2. Material and equipment-related costs are based on current (May 2020) pricing.
3. Once fiber-optic cable installation is complete, the fiber will not be damaged.

6. Other Required Upgrades

No other required upgrades were identified on the EKPC transmission system.

7. Environmental, Real Estate and Permitting Issues

The IC is responsible for obtaining all of the required property rights to provide EKPC ownership of the new switching station site, as well as any other property ownership needed for the switching station access road and the transmission tap line, if appropriate. The IC shall convey the necessary property rights to EKPC for construction of its facilities. The IC shall work directly with EKPC when acquiring these rights to ensure that they meet EKPC requirements and standards.

EKPC will perform all necessary environmental assessments and obtain all necessary permits/approvals associated with construction of all EKPC facilities required to facilitate the interconnection of the new generating facility.

The following general assumptions have been included for environmental permitting requirements:

1. For the IC's project, there are no "federal actions" (i.e. federal financial assistance or grants; or federal permit, license or approval) present that would trigger NEPA compliance obligations for the EKPC facilities as a connected action.
2. Substation location will remain in the currently identified location, which is approximately 4,000 feet west of the point where EKPC's Cynthiana Tie-Headquarters 69 kV transmission line crosses Ruddles Mill Road (see Attachment 2). Relocation of the substation site would require a re-evaluation of the permitting obligations.

8. Cost Summary

The necessary projects and estimated costs to facilitate interconnection of the AD2-048 queue project (Blue Moon Solar) are summarized in the tables below:

Description	Direct Labor	Direct Material	Indirect Labor	Indirect Material	Total
Attachment Facilities					
EKPC to install necessary equipment (a 69 kV isolation switch structure and associated switch, plus interconnection metering, fiber-optic connection and telecommunications equipment, circuit breaker and associated switches, and relay panel) at the new East Harrison Switching station to accept the IC generator lead line/bus **(PJM ID n6676.1)**	$365,000	$375,000	$130,000	$130,000	$1,000,000
Direct Connection					
EKPC to construct a new 69 kV switching station (East Harrison Switching) to facilitate connection of the Blue Moon Solar generation project **(PJM ID n6676.2)**	$1,225,000	$1,250,000	$425,000	$425,000	$3,325,000
Non-Direct Connection					
EKPC to construct facilities (~250 feet) to loop the existing Cynthiana Tie-Headquarters 69 kV line section into the new East Harrison Switching substation **(PJM ID n6676.3)**	$190,000	$60,000	$95,000	$10,000	$355,000
EKPC to replace relay panel and modify relay settings at Renaker substation for existing line to East Harrison Switching station **(PJM ID n6676.4)**	$40,000	$50,000	$30,000	$15,000	$135,000

Description	Direct Labor	Direct Material	Indirect Labor	Indirect Material	Total
EKPC to replace relay panel and modify relay settings at Headquarters substation for existing line to East Harrison Switching substation **(PJM ID n6676.5)**	$40,000	$50,000	$30,000	$15,000	$135,000
EKPC to install OPGW in the Renaker-3M-Cynthiana Tie 69 kV line sections (9.3 miles) **(PJM ID n6676.6)**	$630,000	$305,000	$255,000	$40,000	$1,230,000
EKPC Network Upgrades					
EKPC to upgrade the maximum operating temperature of the 3/0 ACSR conductor in the Headquarters-Snow Hill 69 kV line section (3.8 miles) to 212 degrees F. **(PJM ID n5858)**	$105,000	$30,000	$50,000	$5,000	$190,000
EKPC to upgrade the maximum operating temperature of the 3/0 ACSR conductor in the Snow Hill-Murphysville 69 kV line section (16.1 miles) to 212 degrees F. **(PJM ID n5859)**	$310,000	$110,000	$130,000	$20,000	$570,000
Total Estimated Facility Costs	$2,905,000	$2,230,000	$1,145,000	$660,000	**$6,940,000**

Total Estimated Costs of Facilities	
Description	**Total Cost**
Attachment Facilities	$ 1,000,000
Direct Connection Network Upgrades	$ 3,325,000
Non Direct Connection Network Upgrades	$ 1,855,000
EKPC Network Upgrades	$ 760,000
Total Costs	**$ 6,940,000**

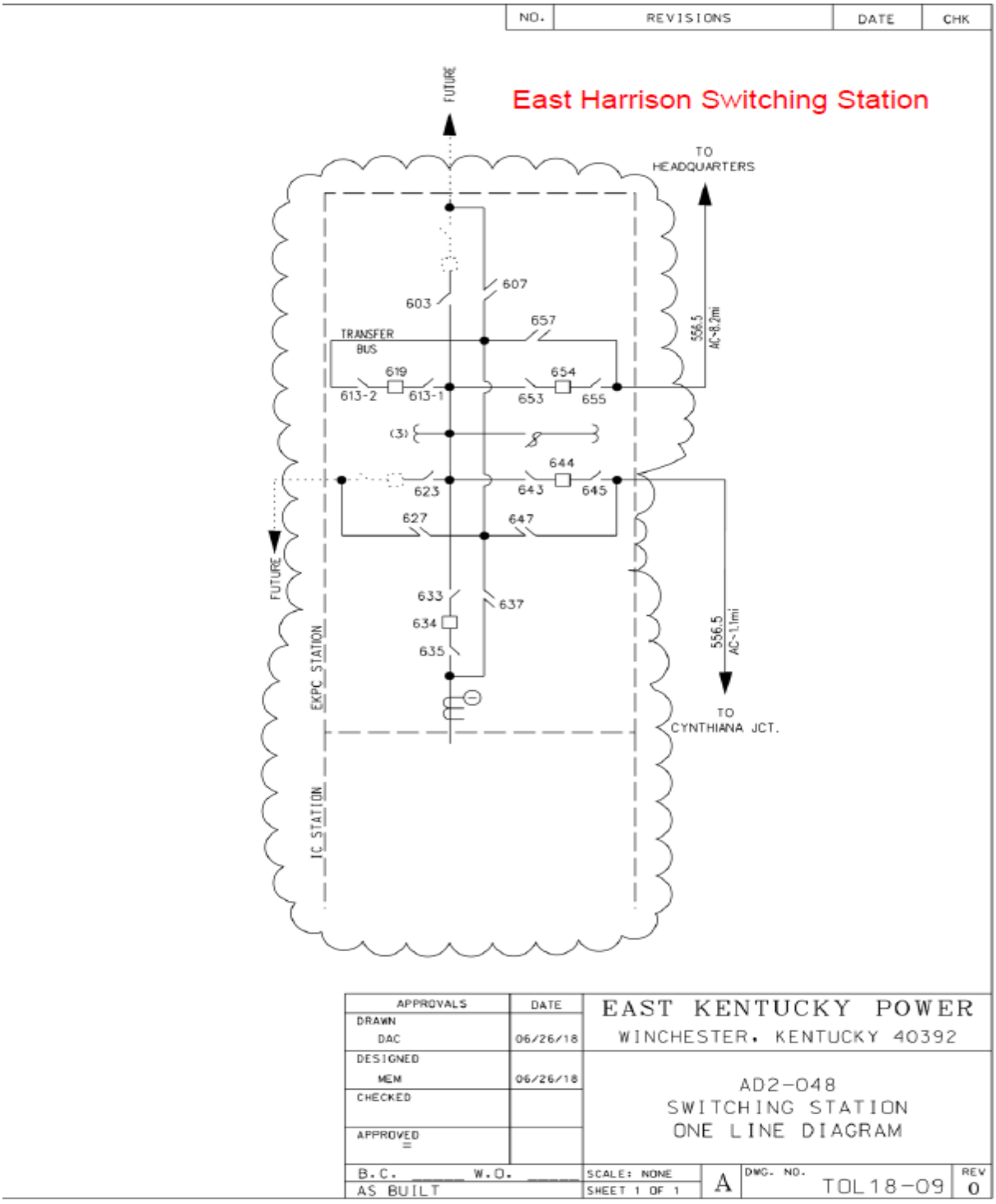
9. Attachments

Attachment 1 – EKPC Temporary One Line Diagram

Attachment 2 – EKPC General Substation Location/Layout

Attachment 1:

EKPC Temporary One Line Diagram



Attachment 2:

EKPC Station General Location/Layout