Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AA2-084

Lappans Road 12.5 kV

(Revised)

July 2016

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate Interconnected Transmission Owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation, if any, is included in the System Impact Study.

The Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs associated with them will be addressed when seeking an Interconnection Agreement as outlined below. Developer will also be responsible for providing and installing metering equipment in compliance with applicable PJM and Transmission Owner standards.

General

CERSM, LLC has proposed a solar generating facility located at Route 65 & 68, Boonsboro, Maryland. The installed facilities will have a total capability of 4 MW with 1.5 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is November 2, 2016. **This study does not imply a Potomac Edison Company commitment to this in-service date.**

Point of Interconnection (POI)

For AA2-084 project, the connection from the Potomac Edison distribution system to CERSM's facilities will be provided by tapping the nearby Lappans – South 12.5 kV line and constructing a radial attachment connection line to the Point of Interconnection as shown in Appendix 2. POI coordinates: 39°33'8.76"N, 77°44'5.68"W. This project's POI is FERC jurisdictional.

Transmission Owner Scope of Work and Costs Estimation

The Potomac attachment facilities and network upgrades as well as related costs estimates required for AA2-084 interconnection project are shown in below table. Please note that these costs do not include CIAC Tax Gross-up:

Project Costs Description	Amount
Attachment Facilities *Metering* *Install 12.5 kV metering package inside CERSM's facilities.* *Cost estimate: $33,000.* *Attachment Facilities* *Install (1)-12.5 kV 300A disconnect switch and one span 336 ACSR span to dead end.* *Cost estimate: $22,000*	$ 55,000
Direct Connection Network Upgrades None.	$ 0
Non-Direct Connection Network Upgrades None.	$ 0
Direct Connection Local Upgrades None.	$ 0
Non-Direct Connection Local Upgrades *NUN* — Description* *n4870 — Upgrade substation recloser to Viper recloser with electronic control. Cost estimate: $50,000.* *n4871 — Relocate hydraulic line recloser; see single line diagram in Appendix 2 for details. Cost estimate: $2,000* *n4872 — Change the No. 1 12.6 kV bus B and C phase regulator controllers and add SCADA to Lappans Substation. Cost estimate: $222,800.* *n4873 — Change settings on the No. 1 12.5 kV bus A phase regulator. Cost estimate: $1,000.*	$ 275,800

Project Costs Description	Amount
Contributions for Previously Identified Upgrades None.	$ 0
Total Costs	**$ 330,800**

* NUN means Network Upgrade Number

Interconnection Customer Requirements

CERSM, LLC will be responsible for meeting all criteria as specified in the applicable sections of the Interconnected Transmission Owner "Requirements for Transmission Connected Facilities" document including:

1. The purchase and installation of a fully rated 12.5 kV circuit breaker or fuse to permit tripping of the entire plant.
2. The purchase and installation of the minimum required Potomac Edison generation interconnection relaying and control facilities. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
3. The purchase and installation of supervisory control and data acquisition (SCADA) equipment.
4. The establishment of dedicated communication circuits for SCADA.
5. Compliance with the Interconnected Transmission Owner and PJM generator power factor and voltage control requirements.
6. The execution of a back-up service agreement to serve the customer load supplied from the (AA2-084) plant when the Project is out-of-service. This assumes the intent of CERSM, LLC is to net the generation with the load.

The above requirements are in addition to any metering or other requirements imposed by PJM.

Schedule of Work

Based on the scope of interconnection attachment facilities, direct and non-direct system upgrades, it is expected to take a minimum of twelve (12) months from the date of a fully executed Interconnection Construction Service Agreement to complete the installation. This includes a preliminary payment that compensates the Interconnected Transmission Owner for the first three months of the engineering design work that is related to the interconnection facilities of the Project. It also assumes that the Interconnection Customer will provide the property for the Project direct connection facilities and all right-of-way, permits, easements, etc. that will be needed. A further assumption is that there will be no environmental issues with any of the new properties associated with this project, that there will be no delays in acquiring the necessary permits for implementing the defined direct connection facilities and that transmission system outages will be possible when requested.

Revenue Metering and SCADA Requirements

PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

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Network Impacts

The Queue Project AA2-084 was evaluated as a 4.0 MW (Capacity 1.5 MW) injection at Marlowe 34.5 kV substation in the APS area. Project AA2-084 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AA2-084 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Case Study Year Summer Peak Analysis - 2019

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency
(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

Contribution to Previously Identified Overloads
(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Steady-State Voltage Requirements

None

Delivery of Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

None

Light Load Analysis - 2019

None

System Reinforcements

Short Circuit

None

Stability and Reactive Power Requirement

Not required

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

None

Light Load Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

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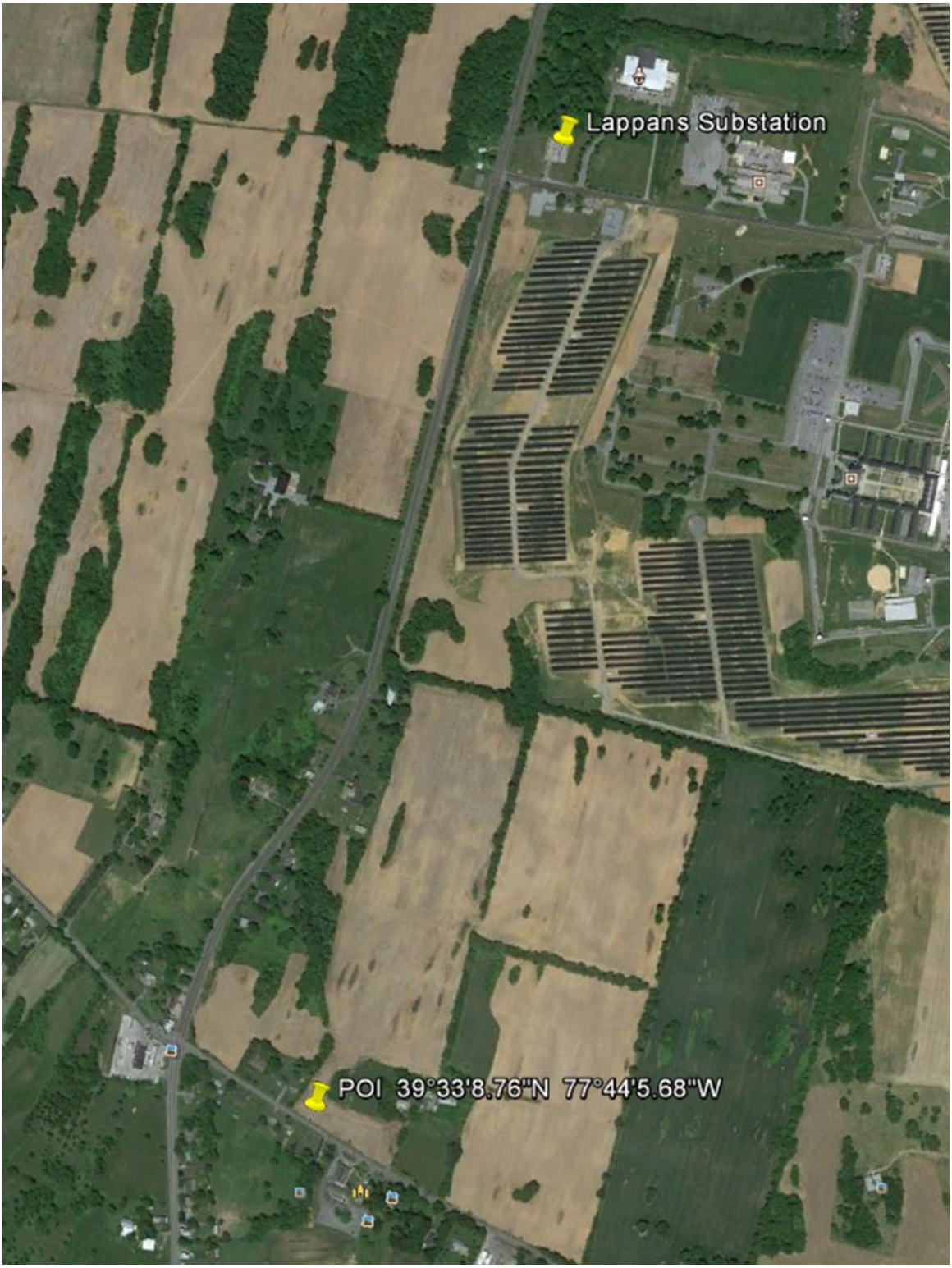
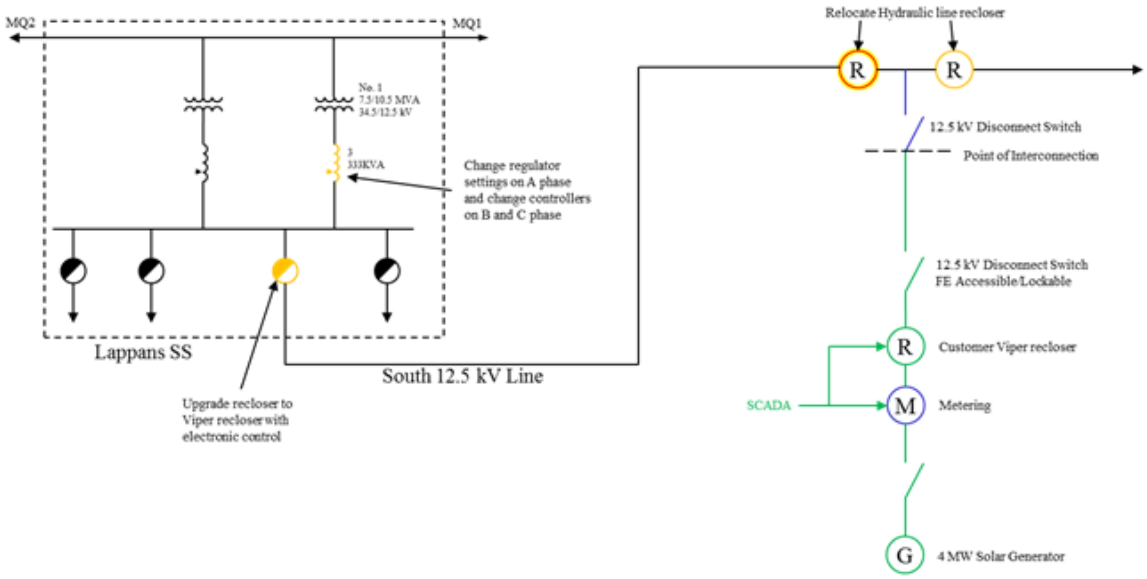
Appendix 1

Project Location



Appendix 2

System Configuration – Single Line Diagram



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Lappans Road 12.5 kV

(Revised)

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<u>Inline facilities from tap point to POI</u>: Cost estimate: $22,000</i>
- <i>Install attachment line (one 336 ACSR span) from tap point at Lappans-South 12.5 kV line to POI.</i>
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Project Costs Description	Amount
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None

Light Load Analysis - 2019

None

System Reinforcements

Short Circuit

None

Stability and Reactive Power Requirement

Not required

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

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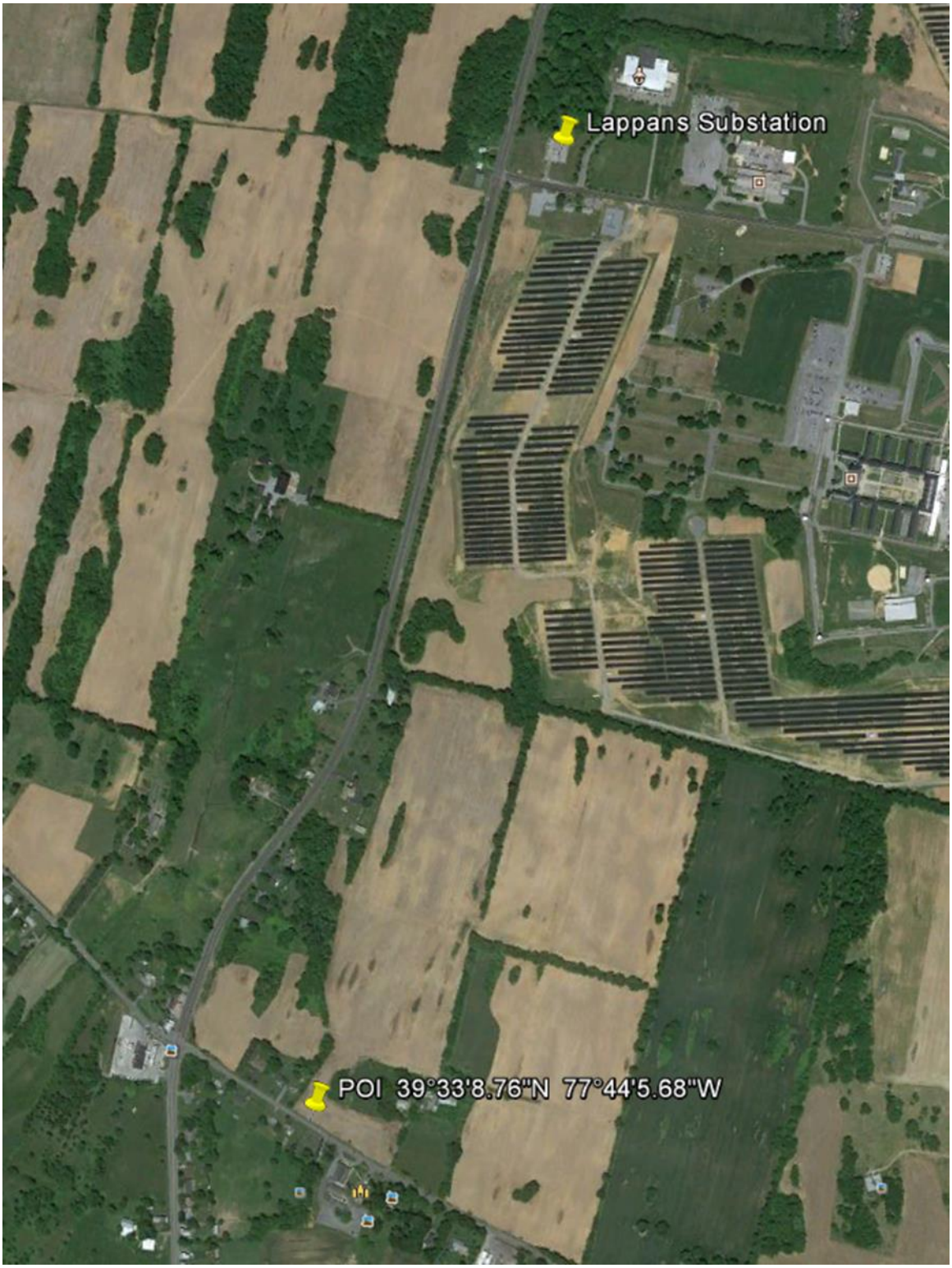

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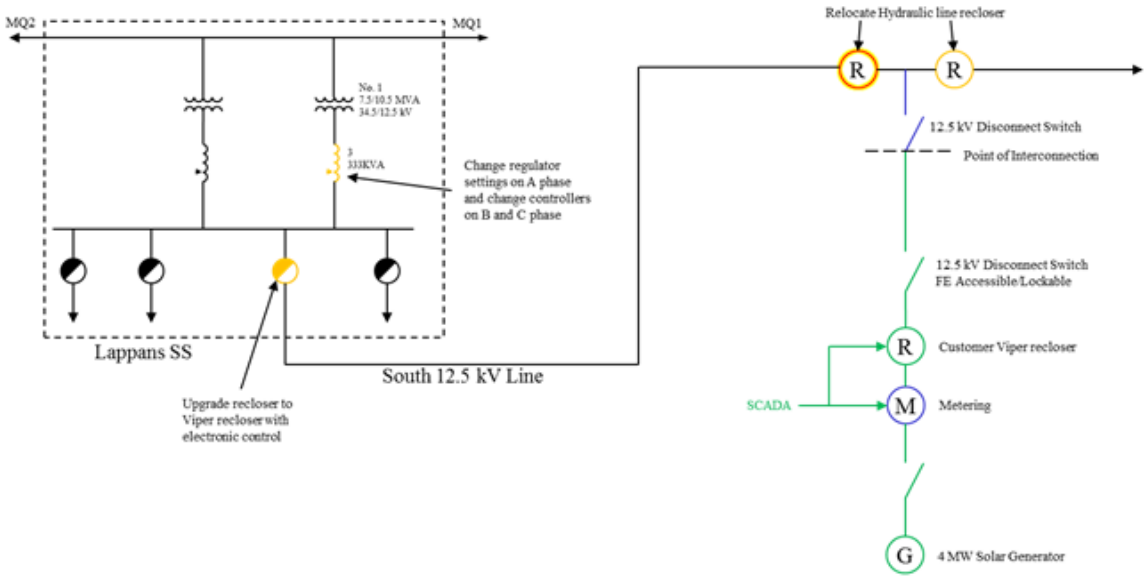

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Light Load Analysis - 2019

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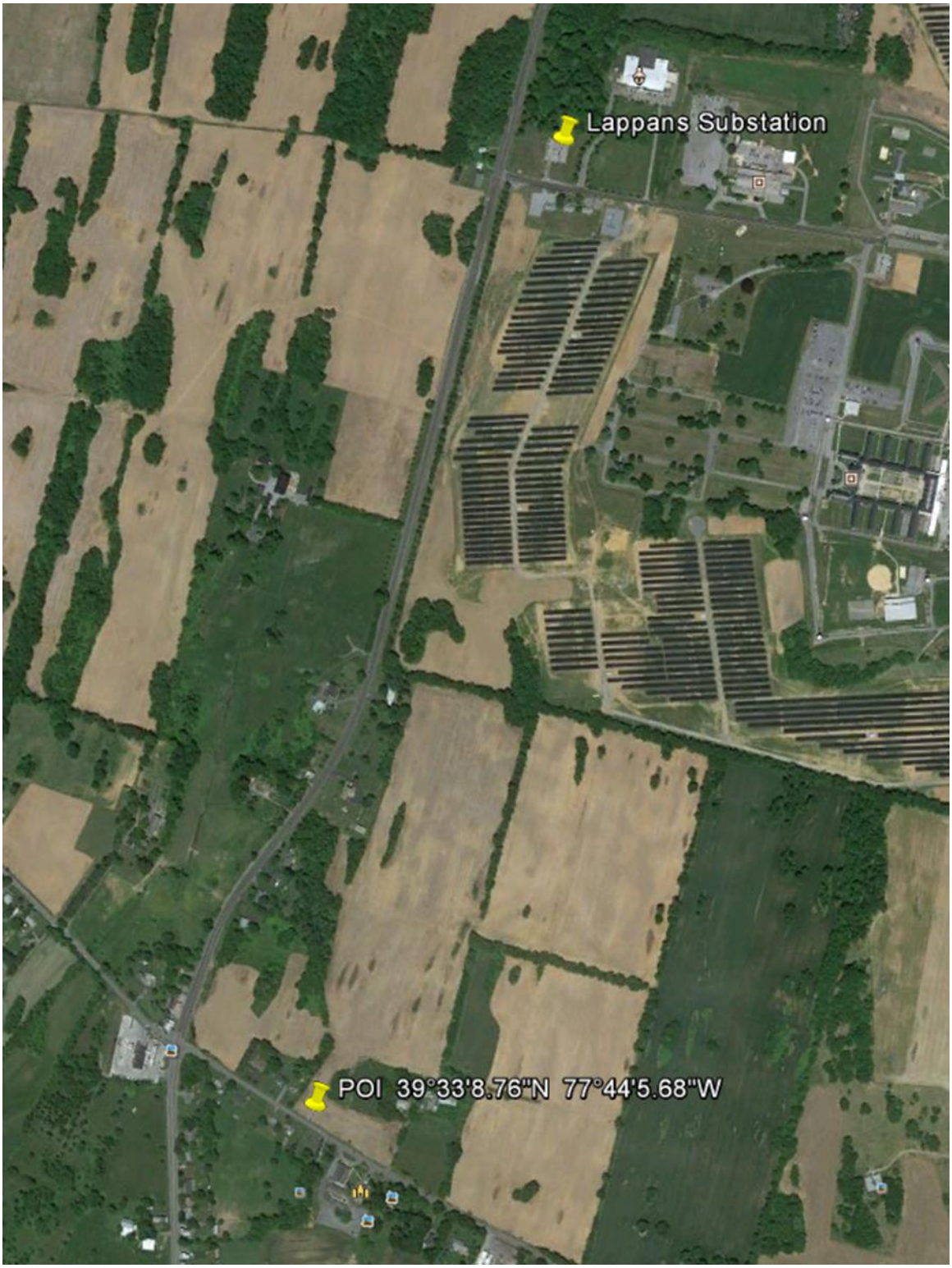

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