Interconnection System Impact Re-Study Final Report – April 2, 2018

Generator Interconnection Request No. TI-15-0832
150 MW Solar Photovoltaic (PV) Energy Generating Facility
In Hidalgo County, New Mexico

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1.0 EXECUTIVE SUMMARY

This System Impact Re-Study (SIRS) is for Generator Interconnection Request No. TI-15-0832, a proposed 150 MW solar photovoltaic Generating Facility (GF) located in Hidalgo County, New Mexico. This SIRS was conducted for the Transmission Provider, Tri-State Generation and Transmission Association, Inc., (Tri-State) in accordance with its Generator Interconnection Procedures, and includes steady-state power flow (PF), dynamic stability, short-circuit, cost and schedule analyses for interconnection as either a Network Resource or Non-Network Resource.

In its application, the Interconnecting Customer proposed an energization in-service date of September 2019 and a commercial operation date of September 2019. Cost and schedule estimates are as provided by Tri-State, and are good faith estimates only (typically +/-30% accuracy). Higher accuracy (+/- 20%) will be provided as part of an Interconnection Facilities Study.

The proposed Project consists of 180 SMA 0.85 (revised inverter for transient stability analysis, 38 GE LV5 4 MW) solar inverters with one 34.5-115 kV, 100/133/167 MVA transformer at the main solar energy Generating Facility. The Facility is located approximately 1 mile west of the Pyramid 115 kV Substation which is the Point of Interconnection (POI) to the Transmission Provider's system (see Figures 1 and 2 for reference). In addition, a sensitivity to determine maximum generation output at this location was simulated.

Steady-state power flow results:

> Since area facility ratings have not changed and no new projects have occurred in this area, power flow results from the initial study are still valid. As a result, only transient stability simulations were studied. However, a summary of results is provided in the Executive Study.
>
> Single contingency analysis was completed using 2017 heavy summer load and dispatch conditions with and without the planned Project. To stress the system in the area local to the proposed project, generation at Lordsburg, Pyramid and Afton was modeled at full output. Study results indicate that loss of the Hidalgo - Pyramid 115kV line results in the Hidalgo - Pyramid_T - Pyramid 115 kV line loading to 138.8% of its emergency thermal limit (215 MVA) in the post-Project case. Therefore, the maximum Project output as a Network Resource is 64 MW.
>
> If loading on the Hidalgo - Pyramid 115 kV lines are mitigated; the next limiting element is the Hidalgo 345/115 kV transformer for loss of the parallel Hidalgo 345/115 kV transformer. Reducing the Project output to 125 MW will alleviate this thermal overload.
>
> Under normal system conditions (all lines and transformers in-service) the Project generation can be added with no thermal or voltage violations and may use the existing firm or non-firm capacity of the Transmission System on an as available basis as a Non-Network Resource.

Reactive power / voltage regulation:

> The collector system model provided by the Interconnecting Customer shows that this GF cannot meet Tri-State's 0.95 p.f. lag (producing) criteria at the POI and is deficient for Project output greater than 112.5 MW. In addition, the study determined that the GF cannot meet Tri-State's 0.95 p.f. lead (absorbing) criteria at the POI and is deficient for Project

output less than 75 MW. Therefore, supplemental reactive power equipment of 12 MVAr of switched shunt capacitors during lag conditions and 6 MVAr of switched shunt reactors during lead conditions will be required to meet the net 0.95 p.f. criteria at the POI. The 6 MVAr of reactive power equipment will also be required on the 34.5 kV bus to offset the collector system VARs and meet Tri-State's VAR neutral requirement when the plant is not generating.

Transient stability results:

The transient stability analysis studied the Project as an: 1) Non-Network Resource and a 2) Network Resource.

As a Non-Network Resource, the following local generation dispatch was modeled:

Pyramid generation:	Unit 1: 40 MW and Unit 2: 35 MW, Unit 3 and 4: Off
Project generation:	150 MW Equivalent Unit.

Total of 225 MW interconnected to the Pyramid 115kV substation. Maximum generation was limited by the Hidalgo - Pyramid No.2 115kV line for loss of the Hidalgo - Pyramid No.1 115kV line.

As a Network Resource, the case modeled a Hidalgo - Pyramid No.3 115kV transmission line (16 miles) and the following local generation dispatch:

Pyramid generation:	Units 1, 2, 3 and 4: 40 MW each
Project generation:	125 MW Equivalent Unit.

Total of 285 MW interconnected to the Pyramid 115kV substation. Maximum generation was limited by the Hidalgo 345/115kV No.2 transformer for loss of the Hidalgo 345/115kV No.1 transformer.

The full Project output of 150 MW was not modeled since a third Hidalgo 345/115kV transformer would be required. The cost of adding a third 224 MVA transformer is not practical for a 25 MW increase.

Transient stability results were similar for the Project studied as a Non-Network or Network Resource Project. Results from the study follow:

1. With the GE LV5 Photovoltaic Inverters, the Project did not trip during any contingencies and had acceptable voltage levels.
2. Pyramid generators experienced rotor angle instability for loss of the Projects one mile transmission line when line clearing was greater than 10 cycles. Addition of the Project with a longer clearing time will result in the Pyramid units tripping off-line due to rotor angle instability. As a result, it is important that the near and far end clearing time must be less than 10 cycles.
3. Acceptable damping and voltage recovery was observed.

The estimated cost for interconnecting the proposed Project at the 115 kV POI is as follows (refer to Figure 2):

- Network Upgrade Costs (Reimbursable): $ 1.19 M
- Interconnection Facilities Costs (Non-Reimbursable) [1]: $ 1.68 M
- TOTAL Cost (2018 dollars) for Interconnection: $ 2.87 M

The in-service date for this GF will depend on construction of the Interconnection Facilities and Network Upgrades, and be a minimum of 24 months after the execution of a Generator Interconnection Agreement or Engineering and Procurement contract.

NOTE: Pursuant to Section 3.2.2.4 of the Tri-State's GIP, "Interconnection Service does not convey the right to deliver electricity to any customer or point of delivery. In order for an Interconnection Customer to obtain the right to deliver or inject energy beyond the Generating Facility Point of Interconnection or to improve its ability to do so, transmission service must be obtained pursuant to the provisions of Transmission Provider's Tariff by either Interconnection Customer or the purchaser(s) of the output of the Generating facility." See Tri-State's Open Access Same Time Information System (OASIS) web site for information regarding requests for transmission service, related requirements and contact information.

[1] *Note: Network upgrade costs are reimbursed only when payments are made to the Transmission Provider under its Tariff for transmission services with respect to the Generating Facility. Network upgrade costs are not reimbursed if transmission services are not secured from the Transmission Provider.*

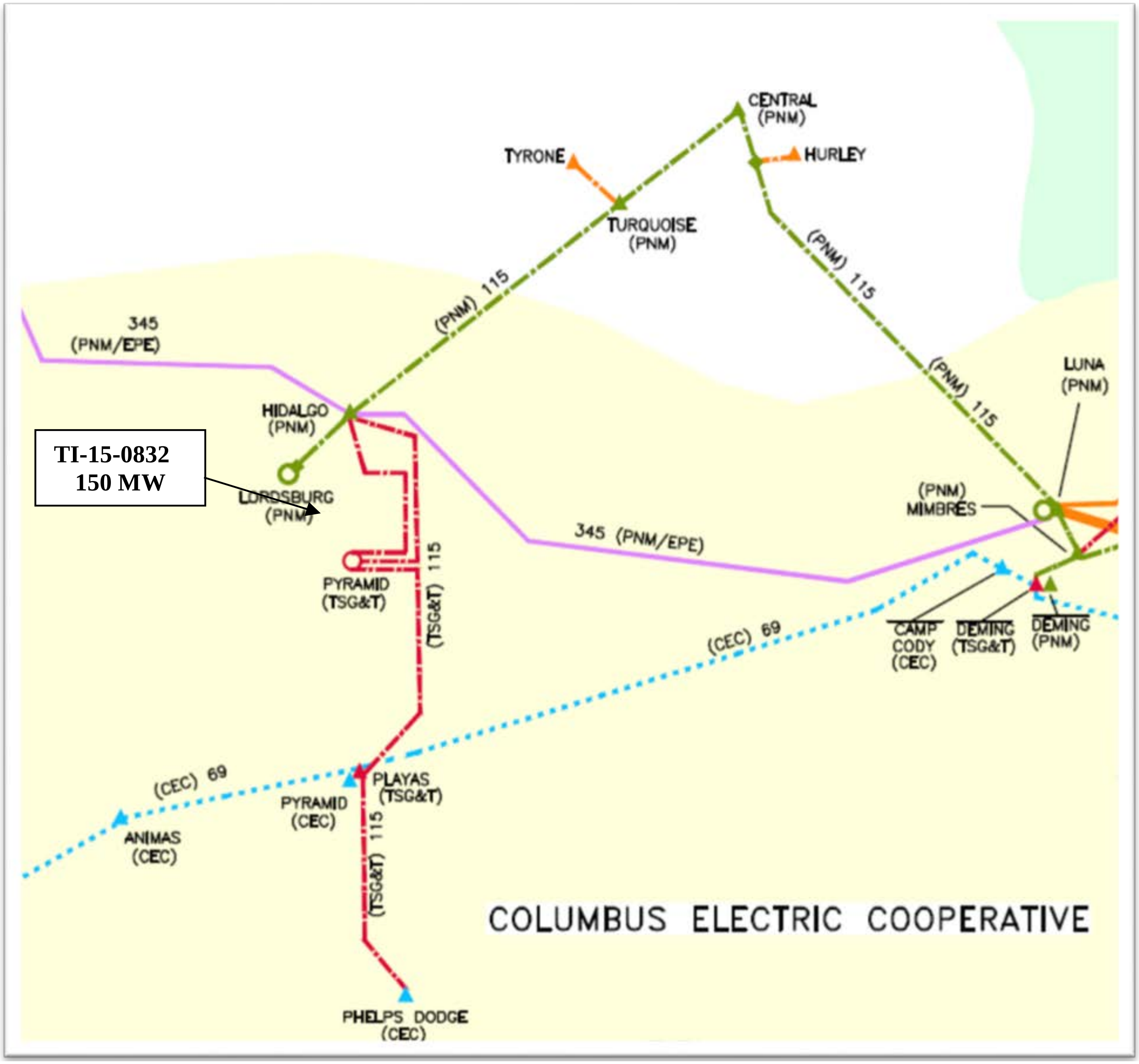
2.0 BACKGROUND AND SCOPE

On August 31, 2015 the Interconnecting Customer submitted a Generator Interconnection Request for a 150 MW solar energy GF to be located approximately 1 mile west of the existing Pyramid 115 kV Substation. An Interconnection System Impact Study Agreement was executed on October 7, 2015. The inverter model data used in this study is that which was provided by the Customer in its Generator Interconnection Request.

On September 11, 2017, the Interconnecting Customer submitted a request that the Generator Interconnection Request for a 150 MW solar energy GF to be located approximately 1 mile west of the existing Pyramid 115 kV Substation be moved out of deferral and proceed with the Interconnection Request. The inverter model data used in this study is that which was initially provided by the Customer in its Generator Interconnection Request.

This System Impact Re-Study was prepared in accordance with Tri-State's Generator Interconnection Procedures and relevant FERC, NERC, WECC and Tri-State guidelines. The objectives are: 1) to evaluate the steady state performance of the system with the proposed project, 2) identify Interconnection Facilities and Network Upgrades, 3) check the GF's ability to meet Tri-State's voltage regulation and reactive power criteria, 4) assess the dynamic performance of the transmission system under specified stability contingencies, 5) perform a basic short circuit analysis to provide the estimated maximum (N-0) and minimum (N-1) short circuit currents, and 6) provide a preliminary estimate of the costs and schedule for all necessary Interconnection Facilities and Network Upgrades, subject to refinement in a Facilities Study.

Figure 1- Area Map One-Line Diagram Of Study Area And Location of GF



3.0 GF MODELING DATA

The model consists of a 150 MW equivalent solar inverter with one 34.5-115 kV transformer to be located approximately 1 mile west of the Pyramid 115 kV Substation. Model data is based upon information provided by the Interconnecting Customer (IC). The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting this project, and ultimately prior to the IC's GF being deemed by Tri-State as suitable for commercial operation.

Generator Data: The study modeled an equivalent generator with a Pmax of 150 MW and reactive capability of 0.95 lag and 0.95 lead, 49.3 and -49.3 MVAR, respectively.

Table 1 - Generator Data for Steady-State Power Flow Analyses

Unit	Description	
Pmax	Name plate rating (lumped equivalent generator model)	150 MW
Qmin, Qmax	Reactive capability	0.95 lag to 0.95 lead
Et	Terminal voltage	0.550 kV
RSORCE	Synchronous resistance	0.0000 p.u.
XSORCE	Synchronous reactance	9999 p.u.

Table 2 - Inverter Trip Settings, GE LV5 Inverter

High Voltage Ride Through		Low Voltage Ride Through	
Voltage (pu)	Time (seconds)	Voltage (pu)	Time (seconds)
1.24	0.25	0.89	999
1.2	0.60	0.73	3.10
1.18	1.10	0.63	2.10
1.11	999	0.43	0.40
		0.00	0.20

34.5 kV Collector System: The medium voltage collector system was modeled with data provided by the IC. The solar inverters interconnect to the POI via one 34.5-115 kV transformer and an equivalent feeder circuit.

In addition, a 12 MVAR switchable shunt capacitor was modeled as described in the Interconnection Request.

Main GF Substation Transformer: The substation transformer was modeled with ratings of 100/133/167 MVA and a voltage ratio of 34.5 kV (gnd-wye) - 115 kV (gnd-wye). The transformer impedance is 8.5% on the 100 MVA base FA rating with X/R of 31.1.

4.0 STEADY-STATE POWER FLOW ANALYSIS

Since area facility ratings have not changed and no new projects have occurred in this area, power flow results from the initial study are still valid and are provided in the initial study report. As a result, only transient stability simulations are provided in this report.

5.0 DYNAMIC STABILITY ANALYSIS

5.1 Criteria and Assumptions

5.1.1 NERC/WECC Dynamic Criteria

PSSE version 33.7.0 was used for dynamic stability analysis. Dynamic stability analysis was performed in accordance with the dynamic performance criteria shown in Figures W-1 and W-2 from the NERC/WECC TPL-001-WECC-CRT-3 Transmission System Planning Performance Criteria.

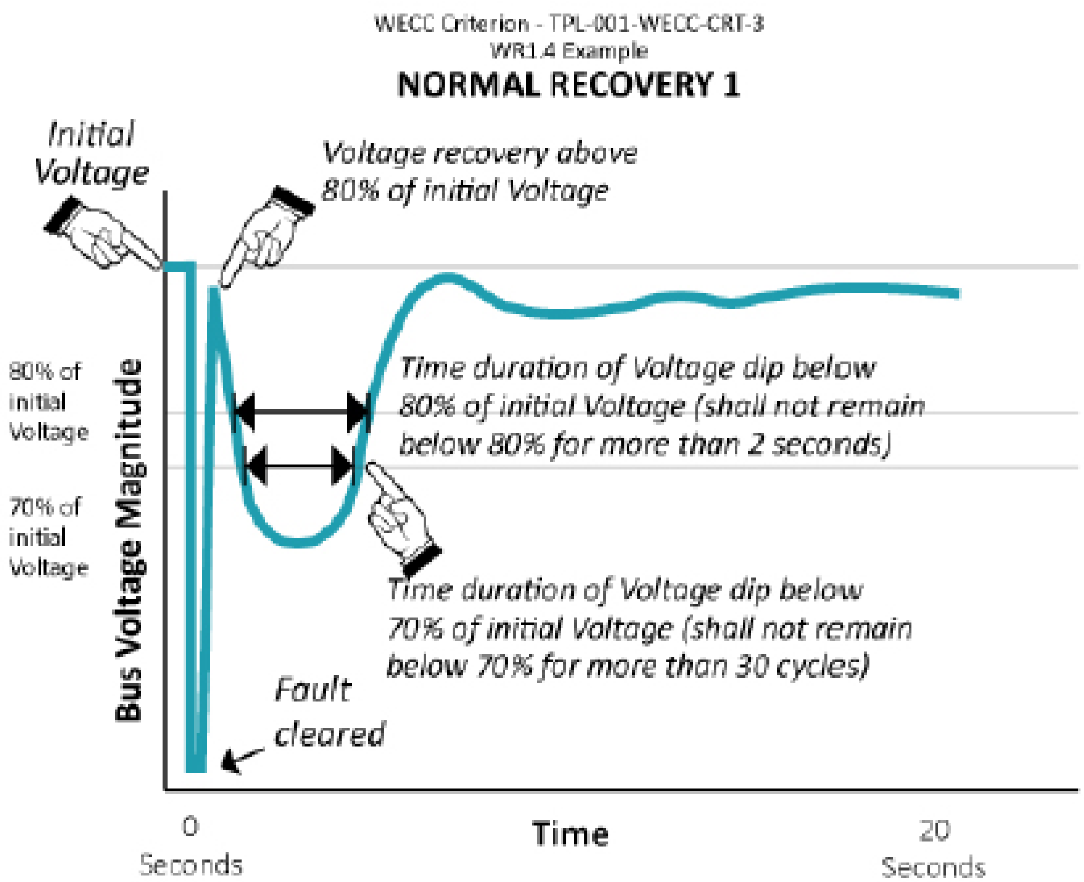


Figure W-1 Bus Voltage Normal Recovery 1

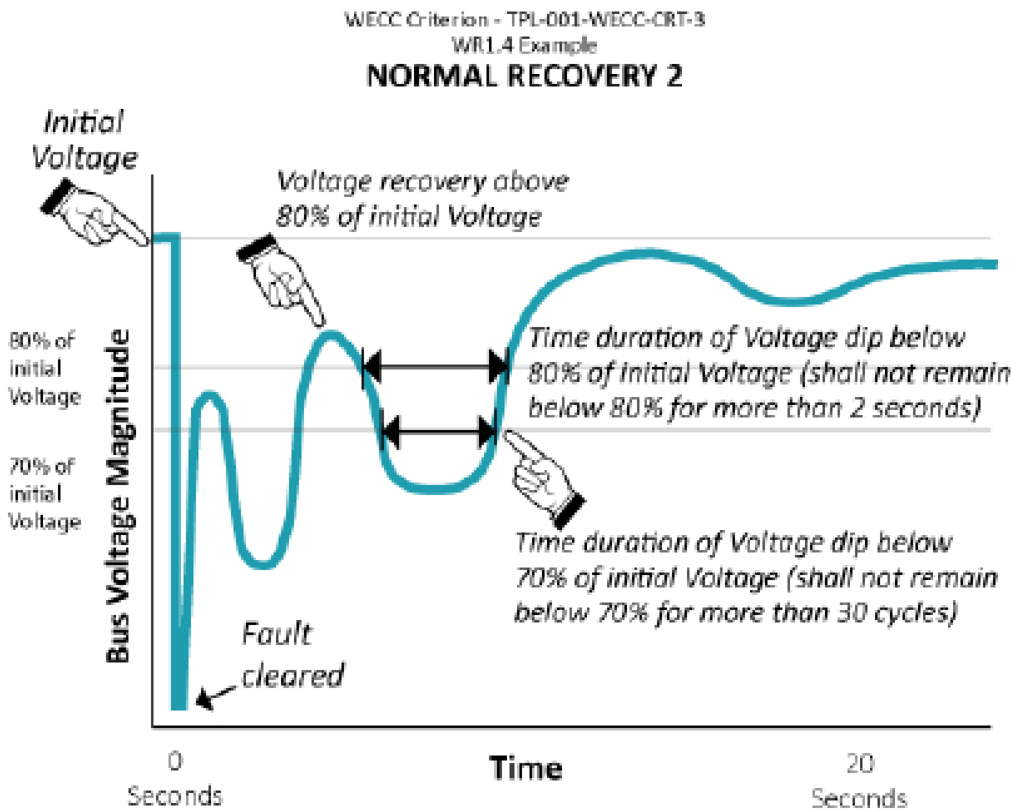


Figure W-1 Bus Voltage Normal Recovery 2

In addition, the NERC/WECC standard states that "[r]elay action, fault clearing time, and reclosing practice should be represented in simulations according to the planning and operation of the actual or planned systems. When simulating post transient conditions, actions are limited to automatic devices and no manual action is to be assumed."

5.1.2 Voltage Ride-Through Requirements

1. The GF shall be able to meet the dynamic response Low Voltage Ride Through (LVRT) requirements consistent with the latest proposed WECC / NERC criteria, in particular, as per the Tri-State GIP, Appendix G and FERC Order 661a for LVRT.

2. Generating plants are required to remain in service during faults, three-phase or single line-to-ground (SLG) whichever is worse, with normal clearing times of approximately 4 to 9 cycles, SLG faults with delayed clearing, and subsequent post-fault voltage recovery to pre-fault voltage unless clearing the fault effectively disconnects the generator from the system. The clearing time requirement for a three-phase fault will be specific to the circuit breaker clearing times of the effected system to which the IC facilities are interconnecting. The maximum clearing time the PV inverter generating plant shall be required to withstand for a fault shall be 9 cycles after which, if the fault remains following

the location-specific normal clearing time for faults, the PV generating plant may disconnect from the transmission system. A PV generating plant shall remain interconnected during such a fault on the transmission system for a voltage level as low as zero volts, as measured at the POI. The IC may not disable low voltage ride through equipment while the plant is in-service.

3. This requirement does not apply to faults that may occur between the PV inverter generator terminals and the POI.
4. PV generating plants may meet the LVRT requirements by the performance of the generators or by installing additional equipment, e.g., Static VAR Compensator, or by a combination of generator performance and additional equipment.

5.2 Base Case Model Assumptions

1. The inverter model was provided in GE PSLF format from the IC. As a result, the model was converted to PSS/E format. The regc_a, reec_a and repc_a models were converted to REGCAU1, REECAU1 and REPCAU1, respectively. All parameters were identifiable between the programs.
2. The Non-Network Resource base case backed down Pyramid generation to accommodate Project generation. Pyramid generation output was modeled at 75 MW and the Project generation output at 150 MW.
3. The Network Resource base case modeled Pyramid generation at its full output. In addition, a third Hidalgo - Pyramid 115kV line and a Project output of 125 MW was modeled. The full Project output of 150 MW was not modeled since a third Hidalgo 345/115kV transformer would be required. The cost of adding a third 224 MVA transformer is not practical for a 25 MW increase.
4. The collector system was modeled with an equivalent collector system and one 115/34.5 kV substation transformer.
5. Lordsburg generators were modeled at 40 MW each in the 2020 heavy summer case and off-line in the 2020 light winter case.

5.3 Methodology

Dynamic stability was evaluated as follows:

1. The 2020 HS base case was utilized with the GF in service.
2. System stability is observed by monitoring the voltage, frequency and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Two contingencies were simulated for each line: a fault was applied at the near end and then applied at the far end of the transmission line. The corresponding stability contingencies to evaluate the solar farm’s compliance with NERC/WECC criteria for dynamic stability are listed in the following table.

Table 3 - List of Dynamic Stability Contingencies

Dynamic Stability Contingencies		
No.	Description	Bus Numbers
1	28-cycle 3-phase fault at POI 15-0832 115 kV, trip Pyramid - POI 15-0832 115 kV line	12093 - 12300
2	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Pyramid 115 kV line	13007 - 12093
3	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Turquois 115 kV line	13007 - 13014
4	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Greenlee 345 kV line	11080 - 16101
5	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Luna 345 kV line	11080 - 11093
6	3-cycle 3-phase fault at Luna 345 kV, trip Luna - Macho Springs 345 kV line	11093 - 11047
7	3-cycle 3-phase fault at Luna 345 kV, trip Luna 345/115 kV No.1 Transformer	11080-13007

5.4 Results

Transient stability results identified that the project does not require additional mitigation and is compliant with the NERC/WECC criteria for the GE LV5 inverters. Two studies were simulated: 1) Non-Network and 2) Network Resource.

Non-Network Resource simulations studied the system with the following generation dispatch:

Pyramid generation: Unit 1: 40 MW and Unit 2: 35 MW, Unit 3 and 4: Off
Project generation: 150 MW Equivalent Unit.

Total of 225 MW interconnected to the Pyramid 115kV substation. Maximum generation was limited by the Hidalgo - Pyramid No.2 115kV line for loss of the Hidalgo - Pyramid No.1 115kV line.

Simulation results for summer system conditions show that:

1. With the GE LV5 Photovoltaic Inverters (150 MW), the Project did not trip during any contingencies and had acceptable voltage levels. In addition, the GF was able to operate at full capacity.
2. Pyramid generators experienced rotor angle instability for loss of the Projects one-mile transmission line when line clearing was greater than 12 cycles. Addition of the Project with a longer clearing time will result in the Pyramid units tripping off-line due to rotor angle instability. As a result, it is important that the near and far end clearing time must be less than 12 cycles.
3. Acceptable damping and voltage recovery was observed.
4. Study conclusions for the summer case are shown in the following table.

Table 4 - Dynamic Stability Results, Non-Network Resource - 2020 Heavy Summer

Dynamic Stability Contingencies		2020 Heavy Summer
No.	Description	
1	28-cycle 3-phase fault at POI 15-0832 115 kV, trip Pyramid - POI 15-0832 115 kV line	Unstable for clearing times > 12 cycles
2	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Pyramid 115 kV line	Stable
3	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Turquois 115 kV line	Stable
4	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Greenlee 345 kV line	Stable
5	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Luna 345 kV line	Stable
6	3-cycle 3-phase fault at Luna 345 kV, trip Luna - Macho Springs 345 kV line	Stable
7	3-cycle 3-phase fault at Hidalgo 345 kV, trip Luna 345/115 kV No.1 Transformer	Stable

Network Resource simulations studied the system with a Hidalgo - Pyramid No.3 115kV transmission line (16 miles) and the following local generation dispatch:

Pyramid generation: Units 1, 2, 3 and 4: 40 MW each
Project generation: 125 MW Equivalent Unit.

Total of 285 MW interconnected to the Pyramid 115kV substation. Maximum generation was limited by the Hidalgo 345/115kV No.2 transformer for loss of the Hidalgo 345/115kV No.1 transformer.

Simulation results for summer system conditions show that:

1. With the GE LV5 Photovoltaic Inverters (125 MW), the Project did not trip during any contingencies and had acceptable voltage levels. In addition, the GF was able to operate at full capacity.
2. Pyramid generators experienced rotor angle instability for loss of the Projects one-mile transmission line when line clearing was greater than 10 cycles. Addition of the Project with a longer clearing time will result in the Pyramid units tripping off-line due to rotor angle instability. As a result, it is important that the near and far end clearing time must be less than 10 cycles.
3. Acceptable damping and voltage recovery was observed.
4. Study conclusions for the summer cases are shown in the following table.

Table 5 - Dynamic Stability Results, Network Resource - 2020 Heavy Summer

Dynamic Stability Contingencies		2020 Heavy Summer
No.	Description	
1	28-cycle 3-phase fault at POI 15-0832 115 kV, trip Pyramid - POI 15-0832 115 kV line	Unstable for clearing times > 10 cycles
2	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Pyramid 115 kV line	Stable
3	28-cycle 3-phase fault at Hidalgo 115 kV, trip Hidalgo - Turquois 115 kV line	Stable
4	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Greenlee 345 kV line	Stable
5	3-cycle 3-phase fault at Hidalgo 345 kV, trip Hidalgo - Luna 345 kV line	Stable
6	3-cycle 3-phase fault at Luna 345 kV, trip Luna - Macho Springs 345 kV line	Stable

Dynamic Stability Contingencies		2020 Heavy Summer
No.	Description	
7	3-cycle 3-phase fault at Hidalgo 345 kV, trip Luna 345/115 kV No.1 Transformer	Stable

6.0 SHORT-CIRCUIT ANALYSIS

Since area facilities have not changed and no new projects have occurred in this area, short-circuit results from the initial study are still valid and are provided in the initial study report.

7.0 SCOPE, COST AND SCHEDULE

This project will interconnect to the Pyramid 115 kV substation via a Customer owned 1 mile radial transmission line. (Figure 2, One-Line Diagram).

The cost estimate is broken out into two categories: 1) Interconnection Facilities which include all equipment installed between the POI on the main 115 kV bus and the Point of Change of Ownership (PCO) at the line dead-end structure, and 2) Network Upgrades consisting of the rest of the facilities installed in the Pyramid Substation to accommodate the interconnection.

The estimate does not include costs to mitigate transmission line thermal overloads discussed in this report for operation of the Project as a Network Resource above 64MW.

Note that the Interconnecting Customer will be responsible for constructing the radial 115 kV tie line to the GF site and for providing the primary protection (relaying and interrupting device) for the Customer's step-up transformer located in its 115-34.5 kV substation yard. Equipment at the Pyramid 115 kV Substation will only provide backup protection for the Customer's 115-34.5 kV main transformer in the event of equipment failure or malfunction at the Customer's facility.

The Interconnecting Customer is responsible for providing a communication channel, such as fiber optic cable (OPGW) on its radial 115 kV transmission line to provide for SCADA, metering, and protective relaying. The Interconnecting Customer must also provide access to analog, indicating, control and data circuits, as required to integrate the Project into the design and operation of the Tri-State control system.

All costs are good faith estimates based on assumptions as stated in this SIRS report. All estimates are in 2018 dollars.

The estimated cost for interconnecting the proposed Project to the Pyramid 115 kV POI is as follows (refer to Figure 2):

- Network Upgrade Costs (Reimbursable): $ 1.19 M
- Interconnection Facilities Costs (Non-Reimbursable) [2]: $ 1.68 M

[2] *Note: Network upgrade costs are reimbursed only when payments are made to the Transmission Provider under its Tariff for transmission services with respect to the Generating*

- TOTAL Cost (2018 dollars) for Interconnection: $ 2.87 M

It is estimated that it will take approximately 24 months after receiving authorization to proceed for Tri-State to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work for this Project.

Figure 2 – One-Line Diagram Showing 115 kV POI Interconnection

Facility. Network upgrade costs are <u>not</u> reimbursed if transmission services are not secured from the Transmission Provider.

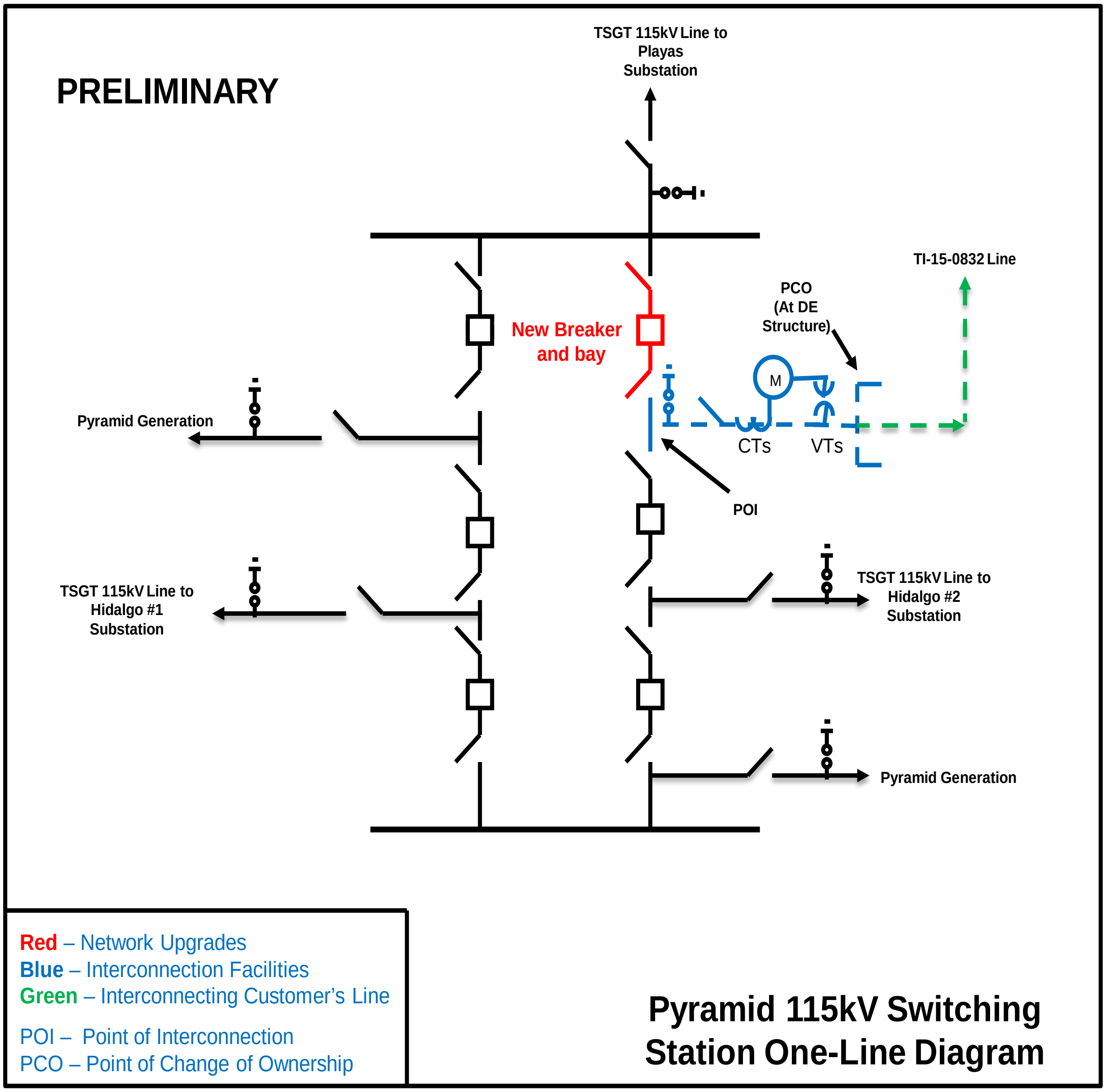

PRELIMINARY
TSGT 115kV Line to Playas Substation
TI-15-0832 Line
PCO (At DE Structure)
New Breaker and bay
M
CTs
VTs
POI
Pyramid Generation
TSGT 115kV Line to Hidalgo #1 Substation
TSGT 115kV Line to Hidalgo #2 Substation
Pyramid Generation
Red – Network Upgrades
Blue – Interconnection Facilities
Green – Interconnecting Customer's Line
POI – Point of Interconnection
PCO – Point of Change of Ownership
Pyramid 115kV Switching Station One-Line Diagram

Table 6: Summary Cost Estimate Details – Interconnection Facilities (Non-Reimbursable)

Element	Description	Cost Est. Millions
Pyramid 115kV Substation **115 kV line termination equipment between PCO and POI**	Engineer, purchase, construct / install and test all equipment installed at the Pyramid Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 115 kV line dead-end structure • 115 kV slack span from monopole to existing structure at Pyramid Station • One (1) 115 kV 3-ph gang line end disconnect switch and associated structure • *Three (3) 115 kV metering current transformers, high accuracy class, extended range • *Three (3) 115 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units • PQ metering panel including SEL-735 Rev/PQ meter, line meters, testing, checkout and commissioning • Relaying for the Interconnecting Customer's radial 115 kV line protection (SEL-311C primary, secondary and SEL-501 breaker-failure) • Three (3) 115 kV surge arresters • Line termination SCADA and telemetry communication equipment additions to substation RTU • Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	**$1.19 M**

Table 7: Summary Cost Estimate Details – Network Upgrades (Reimbursable)[3]

Element	Description	Cost Est. Millions
Pyramid 115 kV Substation	Expand Pyramid 115 kV five breaker bus arrangement to include an additional circuit breaker and bay position (see Figure 2, One-line Diagram). Scope includes typical testing, checkout and commissioning. • One (1) 115 kV power circuit breaker • Two (2) 115 kV 3-ph gang operated disconnect switches and associated structures (for breaker and bus) • Circuit breaker station control panel • Other associated required substation equipment including but not limited to grounding conductor, conduit and cable, insulators, foundations, support steel and tubular and cable bus	**$1.68 M**
Pyramid Substation– Relaying Mods	• Relay settings changes (labor) for new POI line termination protection.	**(Minimal)**
Hidalgo Substation– Relaying Mods	• Relay settings changes (labor) for new POI line termination protection.	**(Minimal)**

[3] *Note: Network upgrade costs are reimbursed only when payments are made to the Transmission Provider under its Tariff for transmission services with respect to the Generating Facility. Network upgrade costs are not reimbursed if transmission services are not secured from the Transmission Provider.*

8.0 LIST OF APPENDICES

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Appendix D: Dynamic Stability Study – Waveform Plots