



**TRANSMISSION LINE & SUBSTATION PROJECTS**

**COMPANY: ENTERGY SERVICES, INC.**

**CUSTOMER: PID 271**

**FACILITIES STUDY**

**EJO NO. F4PPGS0505**

**PID 271 GENERATOR INTERCONNECTION**

Revision:  
0

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## 1. PROJECT SUMMARY

### 1.1 Background and Project Need

The purpose of this Facilities Study is to identify the requirements necessary to connect 19.75 MW of photovoltaic generation to Entergy System through existing 69 kV line L-739 between Turnerville and Addis. The location of line cut-in required is on section of line between switches 21858 and 20103 (close to switch 21858 on line towards LAGen Diamond) and between switches 21857 and 21852 (line section tapping to feed Sawmill and Babin). The requested completion date is December 2014.

The customer has requested Energy Resource Interconnection Service (ERIS) only. The System Impact Study indicated that under ERIS, the additional generation due to PID 271 generator **does not** cause an unacceptable increase in short circuit current or any stability violations.

The Facilities Study will identify the transmission interconnection requirements, any transmission constraints resulting from the requested power transfer, and includes corresponding cost estimates.

The customer has requested a good faith estimate. This is valid based on available time to complete the facility study and in light of lack of survey, soil borings, environmental permitting, property owner's issues, etc.

### 1.2 Customer Facilities

PID 271 intends to install 19.75 MW of photovoltaic generators connecting to 69kV Entergy Turnerville to Addis line L-739. In this study, this facility would be referred to as "Plant".

For interconnection, Customer would build a substation adjacent to Entergy Substation with a step down transformer 69/4.14 kV using a circuit switcher.

Relaying would encompass step down transformer and Entergy substation's current transformers and control cables for tripping circuit switcher. In addition, customer would provide a remote terminal unit (RTU) based on Entergy specification to send metering data (kV, MW, MVAR per generator and MWhr, MVARhr and breaker status). A dedicated phone circuit would be required to connect RTU and System Operation Center (Pine Bluff, Arkansas) as well as to Transmission Operation Center (TOC) in Beaumont, TX to communicate status of circuit switcher and generator breakers.

In-Service date is December, 2014.

### 1.3 Scope Summary

#### A. Scope for NRIS:

None

**B. Scope for ERIS:****Entergy New Substation and lines:**

Entergy will construct a new 69 kV, 3 breaker ring bus substation and build two lines connecting to this substation and line L-739 and one breaker node will be dedicated to connect line to the customer's step down transformer substation.

The new line from Addis will be 1.4 miles and will be connected on LAGen Diamond side of line switch 21858 (L-739) , and the new line from Turnerville will be 0.05 miles and will be connected to the node of switch 21857 and 21852. Switch 21852 is one of the 3 way switches feeding Sawmill and Babin Substations.

In addition, settings will be revised at Addis and Turnerville substations

**Customer Substation and interconnection:**

Customer will construct a substation adjacent to Entergy's substation (common fence). It will consist of a circuit switcher connecting to Entergy substation and customer's generator. Current transformer (CT) and control cables will be connected between two substations for developing relaying scheme and tripping of circuit switcher.

Customer would provide backup station service by terminating 120/240V cables in the junction box mounted on the common fence

Customer will be required to provide four pigtailed from their grounding grid to connect to that of Entergy substation. In addition, for facilitating cables for backup station service (120/240V) a junction box will be mounted on the common fence to terminate the power cable. Also, for terminating CT and control cables, another junction box will be mounted on the common fence.

Disconnect switch on circuit switcher towards Entergy line would be the interconnection point.

**1.4 Cost Summary**

The customer has requested a good faith estimate. Based on available time to complete the facility study and in light of lack of survey, soil borings, environmental permitting, property owner's issues, etc, a good faith estimate has been provided. A 10% contingency has been added to minimize the risk.

**A. For NRIS:**

None.

**B. For ERIS:**

- The estimated total project cost is \$9,153,825 Full Financial. This cost does not include Tax Gross Up which may apply. Customer will be required to pre-pay for the work being performed thus AFUDC has been excluded from the estimate.
- The ICT has assigned \$9,153,825 as Supplemental Upgrades based on Attachment "T" of Entergy's ICT (Independent Coordinator of Transmission) filing to the FERC.

**1.5 Schedule Summary**

Customer's requested in service date is December, 2014.

Based on an assumed start date of June 2012 (customer & Funding Project approval), the estimated completion date of the project is December 2014. Please refer to section 7.0 for details.

**2. SAFETY REQUIREMENTS**

Safety is a core value at Entergy. Safety will be designed into substations and lines. The designs will be done with the utmost safety for personnel in mind for construction, operation, and maintenance of the equipment.

The National Electric Safety Code and the National Electrical Code will be used as the standards in the design & construction of the identified projects.

Should the work contained within this Facility Study be approved, a detailed Safety Plan will be formulated and incorporated within the project plan.

**3. GENERAL ASSUMPTIONS:**

- Sufficient time will be allowed in approving the project enabling Entergy to prepare a Project Execution Plan and be able to complete the project as per outlined in the schedule described provided below. Entergy is not recommending development of a contract with customer using facility study and estimates; instead recommend use of Project Execution Plan and the estimates.
- Assumptions have been made in developing estimates without performing site visits, surveys, and soil borings. During Project Execution Plan these tasks will be completed and could have an impact on estimates and schedule.
- ROW wetland mitigation cost will be evaluated during the permitting process.
- All permits will be attainable in a reasonable period.
- Due to timing and/or funding constraints, topographic surveys and soil borings were not performed in order to develop this facility study.
- System changes will be modeled in ASPEN. Relay Impact Analysis will be performed by a settings engineer during Project Execution Plan stage to identify requirements for relay/current transformer replacement and settings revisions at the local and remote

stations in the area. For example, affected elements include Z2, Z3, and ground over current settings, and so on. Some obsolete relays may need to be replaced.

- New remote terminal unit configurations or revisions will be necessary to communicate the project and protection coordination with nuclear, generation plants, load customers and other interconnected utilities as appropriate.
- Comply with PRC-001, PRC-023 and relevant procedures, standards and guidelines as appropriate.
- Reclosing philosophy shall be decided during the Project Execution Plan stage, as per Transmission Planning's direction.
- Facility studies are done without the advantage of having relay impact studies.
- Transmission Engineering Services shall coordinate all setting changes in the project with Generator interconnection plant as per PRC-001 (power plant protection and related control elements must be set and configured to prevent unnecessarily tripping the generator prior to any transmission protection and related control systems acting first, unless the generator is in jeopardy by exceeding its design limits due to operating conditions, generator system faults, or other adverse potentially damaging conditions.)
- All costs above represent good faith estimates in 2011 dollars and are based on existing data and could change considerably after development of a detailed project execution plan. Price escalation for work in future years has not been included.

**Customer premise:**

- Customer will build the line from Entergy substation to their substation and their step down transformer configuration will be star connected towards the transmission line.
- Customer will provide line protection, metering, communication to Transmission Operation Center, System Operations Center at their substation meeting with Entergy requirements.
- Customer will comply with requirements of Entergy to provide generator data before and after installation of unit(s) and install stabilizer, etc as specified.
- The connection of the generator must adhere to the latest Generator Interconnection Customer Requirements Standard PM3901.

## **4. SCOPE OF WORK**

### **4.1 Interconnection Facilities (ERIS)**

#### **4.1.1 New Substation (NSS) – 69 kV:**

Build a new 69 kV three breaker ring bus substation. Connect two nodes to Entergy lines (one from LAGen Diamond tap and the other from Turnerville tap to Sawmill and Babin substations). Third node will connect customer's step down transformer via circuit switcher.

Refer to the Attachment B - One line & Substation Layout Drawing.

**ROW requirements:**

New substation site (200' X 300') would be located 1.4 miles south, southwest from switch 21858. 1.4 miles of new ROW (50' width) for line will be required.

**Environmental Assessment and Permitting activities:**

Based on the project assumptions to install a new approximately 1.4 acre substation and 1.4 miles of transmission line with 50 ft ROW, the anticipated environmental assessment and permitting activities that will be required for this project are as follows:

- Phase I Environmental Site Assessment.
- Agency contacts for letters of no objection from:
  - US Fish and Wildlife Service LA Department of Wildlife and Fisheries State Historic Preservation Office Iberville Parish
- Environmental soil sampling will be conducted within the footprint of the substation site to determine handling and exposure concerns of excavated soil.
- Wetland delineation will be performed on the substation and transmission line footprint to determine permitting and mitigation requirements from the Corps. For this IP study it is assumed that approximately 50% of the project area will require wetland permitting and mitigation.
- A Storm Water Pollution Prevention plan(s) (SWPPP) will be required for the substation and transmission line. It is assumed that the substation and transmission line will be installed as separate construction projects and will require separate SWPPPs. The construction interval for each project is assumed to be 20 weeks.
- Avian issues, if any, will be addressed after design is complete.

Wetlands delineation will need to be performed and a permit application submitted to the USACE. In addition, it is assumed that the entire new substation along with line cut-ins will require mitigation. A SWPPP will be required for the entire project area. Soil sampling will be required in order to allow for disposal of any dirt that may be removed from the site.

Permitting and SWPPP preparation will need to be worked in conjunction with current site permitting and SWPPP plan.

Wetland delineation and permitting will include both substation and line work.

**Substation design:**

The following are the assumptions made in developing the scope:

1. The customer's equipment was not specified at the time this document was written.

2. The available fault current at this new substation is 40 kA or less.
3. Actual shielding requirements will not be known until a full shielding analysis is completed during the detailed design phase. The amount of shield mast/towers may change depending on the results of the shield analysis.
4. This facility study assumes relaying will utilize fiber optics. If fiber optics is not used then additional line tuners and traps and their associated structures and foundation will have to be added to the project.
5. Station service (120/240 VAC) will be supplied from a distribution line and the backup will be provided by the customer.
6. The overhead conductor size for the customer's feed is assumed to be rated the same as the ring bus at 1200A continuous. This requires 1272 kCMIL "Bittern" ACSR rated at 1303A.
7. The final layout of this substation may change from what is shown on the preliminary electrical arrangement depending on site and drainage requirements.
8. The substation will have a perimeter ground grid 3'-0" on the outside of the substation perimeter fence.
9. Steel structures are based on Entergy standard 69 kV tubular steel structures.
10. Civil engineer to determine if piles are needed to support the foundations (during Project Execution Plan stage).
11. Shield wires into the substation will be specified by Entergy Transmission lines department. The shield wire material for the Entergy transmission line deadends will be specified and procured by Entergy transmission lines.
12. Grounding conductor, conduit, rigid bus and cable quantities are approximate based on the preliminary substation layout for PID 271.



## NEW 69kV SUBSTATION PROPOSED SITE LOCATION



### Site Work

- A topographic survey has not been performed at the time of this study.
- The New 69kV Substation site must be built to an elevation that meets or exceeds the 100 year flood plain. Survey data has determined that the station is in Flood Zone “X”.
- Approximate site dimensions within the proposed substation perimeter fence are 173 feet by 235 feet. The total site footprint, however, will extend beyond the perimeter fence as needed to achieve the required 8H:1V slopes along the edges of the property to stabilize the embankment and to install perimeter grounding. It is estimated that on an average the site will need to be raised about 2 ft above existing grade to allow sufficient burial depth for subsurface drainage. There will be a 5’ area provided outside of the fence prior to sloping back to natural grade for personnel to traverse the outside perimeter of the yard and will allow room for the perimeter ground grid. Based off of the amount of fill needed, the total footprint of the site is 215’ by 277’.
- The New 69kV Substation site preparation shall conform to Entergy Design Standard SL1202, Rev 02 and current Entergy practices. This standard addresses

clearing/grubbing, excavation, fill selection, compaction requirements and site drainage.

- The New 69kV Substation erosion control measures shall conform to Entergy Standard ES0101, Rev 00 and current Entergy practices. This standard addresses best management practices to minimize storm water runoff.
- The New 69kV Substation perimeter fence shall conform to Entergy Design Standard SL0701, Rev 03 and current Entergy practices. This standard addresses material quality, fabric type, security wire, tension wire, posts/rails and access gates.
- The New 69kV Substation signage shall conform to Entergy Design Standard SL1302, Rev 00 and Entergy Purchase Standard SL1301, Rev 04 and current Entergy practices. This standard addresses signage requirements, to include station identification and public safety markers.
- The New 69kV Substation ground cover and access roads shall conform to Entergy Design Standard SL1201, Rev 05 and current Entergy practices. This standard addresses sterilization, stabilization, ground cover specifications and access road specifications.
- The New 69kV Substation vegetation treatment and control shall conform to Entergy Design Standard SL1204, Rev 00 and current Entergy practices. This standard addresses treatment type for specific applications.
- During all phases of construction, the Entergy Construction Standard AL1201, Rev 01 regarding General Contractor Requirements for Major Substation Construction shall be conformed to.
- The following items are minimum requirements that must be included in the site design package and construction efforts at the New 69kV Substation Site:
  1. A topographic survey and boundary survey will be required for this site and will be used to prepare the scope and design.
  2. Soil borings and soil resistivity studies shall be performed on the site to be used to prepare the design of the site; borings were not available for the scope and estimate.
  3. The soil borings shall include, but not limited to, site development and grading, excavation and trenching, shallow and deep foundations recommendations, soil resistivity and boring logs.
  4. All appropriate environmental assessments, permits and licenses will be needed to start of construction.
  5. The proposed development will disturb 2.00 acres. A Storm Water Pollution and Prevention Plan (SWMPPP) is required regardless of the site dimensions, however a Department of Environmental Quality (DEQ) Notice of Intent is not required. The SWMPPP plan will be executed by a qualified contractor. The contractor shall ensure this work is completed prior to the start of the bid process. This will allow the contractors performing the work to understand Entergy and LADEQ expectations for best management practices.

6. The existing site is an agricultural field. The entire area of the proposed site will be cleared, grubbed, stripped of top soil, proof rolled, mucked out, and fully prepared as per the final design.
7. All embankments including the substation and driveway to the station shall maintain an 8H:1V slopes.
8. If slope stabilization is required, the Entergy approved stabilization method is #125 man size rip rap, limestone, and geotextile fabric. This may be needed along the driveway and will be evaluated during detailed design.
9. The drainage in the station will be subsurface drainage and will drain toward an open ditch along the highway ROW.
10. Subsurface drainage shall incorporate 3'x3' catch basins, 18" diameter concrete culverts and pre-cast headwalls at each outfall location.
11. Soil within the entire substation site shall be sterilized prior to installation of limestone groundcover.
12. The access roads within the substation fence shall consist of 12 inches of #610 gray limestone, shall be 20 feet wide, shall incorporate geotextile fabric and shall have a minimum turn radius of 40 feet.
13. Any non-roadway areas inside the substation shall be covered with 6 inches of #610 gray limestone.
14. Contractor shall install 7' perimeter fence around the substation with an additional 1' of three stranded barb wire.
15. During site construction, the actual amount of site stripping may vary marginally pending compaction results. Once the soils have been stripped and organic material has been removed, the contractor shall proof roll the site to determine if the site has been stripped to an adequate elevation before fill material is installed. If poor soil conditions are encountered when proof rolling the site, the contractor shall strip those areas further and re-compact the area with structural fill.
16. It is assumed that the spoils cannot be disposed of on site.
17. The following items are the units to be installed for the New 69kV Substation:
  - 2 EA Soil borings
  - 1 EA Soil Resistivity Test
  - 1 EA Topographic and Boundary Survey
  - 1 LOT Environmental Permits and Licenses
  - 1 EA Soil Testing
  - 2200 CYDS Stripping of Top Soil (12 inches)
  - 6600 CYDS Fill Material (Qty includes 1.4 compaction factor)
  - 2.00 ACRE Soil Sterilization

- 4 EA 3' x 3' Catch Basins
- 2 EA Pre-cast Concrete Headwall
- 650 FT R.C.P. Culverts
- 1970 TON Limestone Surface (Qty includes 1.2 compaction factor)
- 1130 FT Access Road
- 816 FT Fence

### **Foundation Work:**

Foundations are assumed to be supported on 45' class b timber piles pending the results of soil borings.

### **Foundation Work will include installation of the following:**

#### **Steel structure & equipment foundations:**

- One (1) 20' x 36' Control house foundation
- One (1) 75' Shield wire mast foundation (Actual lightning mast requirements to be determined during detailed design)
- Three (3) 69 kV Deadend structure foundations
- Four (4) 69 kV Breaker foundations (cross trough type) with trough covers
- Eight (8) 69 kV Low switch support structure foundations
- One (1) 69 kV High switch support structures foundation
- Four (4) 69 kV Bus support foundations, 3 $\Phi$  low
- Two (2) 69 kV Bus support foundations, 3 $\Phi$  high
- Six (6) 69 kV Equipment pedestals, surge arresters, three per line node
- Nine (9) 69 kV Equipment pedestals, Capacitor Voltage Transformers (CVTs), three per node
- Six (6) Yard light foundations
- One (1) Demarcation junction box foundation

#### **Conduit and grounding:**

- 1000' of below grade 2" sch.40 Rigid PVC conduit
- 4500' feet of 4/0 AWG 7-strand BSD copper conductor for below grade grounding. 20' x 20' mesh on a 173' x 245' area
- 2000' 19#9 CopperWeld grounding conductor for above grade connections to the station ground grid

**Cable trough:**

- 200' Poured in place cable trough with ¼" plate steel covers

The Foundation work shall be built in accordance with the Foundation Package Design drawings and the following Entergy Standards:

SF0202, Substation Grounding Spec & Design Guide  
SL0205, Conduits and Duct banks Construction Guide

**Electrical Work:**

Electrical Work will include installation of the following:

**Structures:**

- Three (3) 69 kV Deadend structures (Structure type as per Entergy drawings G7441SD1 through G7441SD5)
- Six (6) 69 kV Low switch support structures (w/o 'BK1' bracket)
- Two (2) 69 kV Low switch support structures (with 'BK1' brackets to be used to support bus in empty breaker position)
- One (1) 69 kV High switch support structures (w/o 'BK1' bracket)
- Four (4) 69 kV Bus support structures, 3Φ low
- Two (2) 69 kV Bus support structures, 3Φ high
- Six (6) 69 kV Equipment pedestal structures, surge arresters
- Nine (9) 69 kV Equipment pedestal structures, Capacitor Voltage Transformers (CVTs)
- One (1) 75' Shield wire mast
- One (1) telecommunications demarcation box support structure

**Equipment:**

- Three (3) Outdoor dead tank SF6 puffer circuit breaker having 72.5 kV maximum voltage, 2000A max continuous current, 40kA max symmetrical interrupting current, 350 kV BIL, 60 Hz. 5-cycle interrupting time meeting Entergy standard SD0202 rev. 4 or latest.
- Four (4) 72.5 kV, 1200A manually operated, horizontally mounted, vertical break disconnect switches, less insulators.
- Two (2) 72.5 kV, 1200A manually operated, horizontally mounted, vertical break disconnect switches with integral ground switch, less insulators.
- Six (6) 69 kV nominal, 72.5 kV maximum system voltage, station class polymer surge arresters rated at 60 kV / 48 kV MCOV.

- Nine (9) 72.5 kV CVTs (specified and procured by the relay design engineer).
- One (1) 25 kVA station service transformer xx kV/ 120/240VAC (primary voltage of distribution line unknown at this time).
- One (1) SMD-20 station class fuse disconnect switch.
- One (1) 200A Outdoor 200A main breaker AC distribution panel (coordinate final current capacity with relay engineer).
- One (1) 200A safety disconnect switches.
- Three (3) CVT junction boxes, one for each node (Specified and ordered by the relay engineer).
- Six (6) double fixture yard lights, 125 VAC.

**Bus and Insulators:**

- 850' of 4" schedule 80 aluminum pipe bus, rated at 3518A at 90°C (50°C over 40°C ambient)
- 850' of "Flamingo" 666 kCMIL ACSR damping cable
- 950' of "Bittern" 1272 kCMIL ACSR rated at 1303A at 100°C (60°C over 40°C ambient) for breaker, arrester and Capacitor Voltage Transformer (CVT) jumpers and strung bus to customer's structure.
- 350' of 7#7 Alumoweld shield wire
- Sixty-three (63) 69 kV porcelain high strength post type insulators (for switches)
- Twenty-four (24) 69 kV porcelain standard strength post type insulators (for bus supports)
- Nine (9) 69 kV polymer deadend suspension insulators assemblies

**Control House:**

- One (1) 20' x 36' prefabricated control house. Specifications to be determined during detailed design phase in conjunction with relay requirements.

The Electrical work shall be built in accordance with the Electrical Package Design drawings and the following Entergy Standards:

AL1021, General Contractor Requirements for Major Substation Construction  
AL1201, General Contractor Requirements for Minor Substation Construction  
SF0202, Substation Grounding Spec & Design Guide  
SL0205, Conduits and Duct banks Construction Guide  
SL0206, High Voltage Electrical Connections  
SL0201, Substation Steel Structure Erection Guidelines  
SB0701, Substation Minimum Clearances

**Long Lead Items:**

Material Description	Lead Time (Weeks)
69 kV Breakers	20
69kV Vertical Break Switch	22
69 kV Surge Arrestors	14
Steel Structures and poles	20
Control House	26
69kV Current Transformers / Potential Transformers	30

**Relay:**

- Customer's 69/34.5kV transformer is assumed to be grounded wye/grounded wye configuration. Entergy will need two current transformers per phase from the high side of the transformer this will be used for bus differential protection.
- Fibers will be installed on the line between Entergy's new station and the tap between Addis and Turnerville to be used for line relaying, metering, phone, and communications to Transmission Operations Center and System Operations Center.
- Entergy's new station relay equipment to be installed consists of the following:
  - nine (9) coupling capacity current transformers (CCVTs)
  - three (3) outdoor coupling capacity current transformers (CCVT) junction boxes
  - three (3) indoor potential distribution boxes
  - two (2) standard PM1803 option C2 line only panels (POTT/DTT Dual Channel Fiber via two SEL relays)
  - three (2) standard PM0501 option A breaker control panels
  - one (1) standard PM0602 option C Bus diff panel
  - standard metering panel
  - batteries & battery rack
  - battery charger
  - DC switching panel
  - automatic transfer switch
  - stand-alone AC panel
  - stand-alone DC panel
  - Remote terminal unit (LP&L design) GE D400S
  - communications panel
  - Fiber patch panel

- GPS antenna
- SEL cables
- relay fiber optic jumpers and associated orange innerduct  
Control cables

**Long Lead Items:**

Quantity	Description	Delivery time	Comment
9	Coupling Capacitor Voltage Transformer	20-32 weeks	
1	Line Trap	16-20 weeks	
1	Line Tuner	12-14 weeks	
1	Meter Panel	10-14 weeks	Meter panel to be installed at customer's station.
7	Relay Panel	10-14 weeks	One relay panel to be installed at customer's station.
1	Remote Terminal Unit	12-14 weeks	
1	Communications Rack	10-12 weeks	
1	AC Panel	10-12 weeks	
1	DC Panel	10-12 weeks	

**Telecommunication:**

1. Terminate fiber in new substation and existing splice can near GOAB.
  - Perform OPGW/ADSS transition splice inside new substation.
  - Terminate ADSS to new 48-fiber patch panel inside new substation.
  - Terminate OPGW in existing splice box on Structure 45 of Line 739. This will provide a communications path for this new substation back to Dow. Also note that there is an existing splice point on Structure 36 that would be significantly shorter.
2. Install telecom equipment at new substation to pick up needed circuits
  - Install optics at new substation.
  - Install channel bank at new substation
  - Install -48Vdc power at new substation.
  - Install cards in existing optics at Dow to pick up needed traffic.
  - Provision and test new circuits (System Operations Center SCADA, Transmission Operations Center SCADA, DFR, Metering, phone, etc)
  - Set up and test 8 new fibers from new substation to Addis for direct-fiber relaying.



**Telecommunication Requirements:**

- Need room in control house for two 19" equipment racks
- Will need two 30A AC feeds to one of the telecom racks for DC plant installation.

**Assumptions:**

- ADSS installation inside new substation will be performed by a contractor selected and coordinated by substation design.
- Fiber installation from new substation to existing Structure 45 will be done in the shield position and installation coordinated by transmission line designer.
- All OPGW fiber and hardware will be ordered by the transmission line designer.
- All ADSS fiber and fiber duct will be ordered by telecom engineer.
- Fiber jumpers needed for relaying will be ordered by relay designer, unless otherwise specified. Telecom engineer will order but will need to know connector type (ST, SC, etc) and length.
- No relaying will be done through a multiplexer.

**Relay settings:**

- Develop new relay settings for (1) New Station looking towards Addis 69kV line relay panel per Entergy Standard PM1803, Option C2 for SEL421 and SEL311C.
- Develop new relay settings for (1) New Station looking towards Turnerville 69kV line per Entergy standard PM1803 Option C2 for SEL421 and Option C2 for SEL311L.
- Develop new relay settings for (2) new SEL 351 BKR CTRL panels for breakers connected to the line panels per Entergy standard PM0501 Option A.
- Develop new relay settings for (1) Bus Differential panel at New Substation per Entergy Standard PM0602 Option C.
- Coordinate and communicate the settings as per PRC-001.
- The settings work for Generation Interconnection Transformer and all other equipment in customer's facility is not covered under Entergy's scope.

**Communications and SCADA:**

- Configure GE D400S and other SCADA equipment.

**Construction methodology:**

- The substation contractor(s) may be required to have full-time safety specialist on the project.
- A security detail will be deployed at the New Substation and its Lay down yards for the construction.

- Project Emergency Info will need to be obtain prior to starting construction.
- All Substation Site, and Foundation construction for the New Substation will be contracted out. The Protocol is to competitively bid this work simultaneously. There will be one bid/contract written for this work.
- It is currently assumed that all Substation Steel/Electrical and Relay construction will also be contracted out. However, AM (Maintenance/Asset Management) may be given the opportunity to perform some of this work with in-house crews, providing there is adequate assurance they can work within our schedule and budget requirements.
- The site and foundation contractor for the New Substation will be responsible for the Storm Water Pollution Prevention Plan (SWPPP) control implementation and maintaining the SWPPP controls for the work being performed at the substation sites.
  - Entergy's Environmental Management Department will contract with a consultant to develop the SWPPP plan as well as to provide our weekly SWPPP monitoring and response monitoring after any rain event that of a ½ inch or greater within a 24 hour period.
  - The contractor responsible for maintaining the SWPPP controls will be responsible for making any adjustments to the controls identified in the inspections.
- If fiber optic wires are installed, Telecom will be responsible for installation and checkout of all substation fiber/communications equipment including all splicing/testing of all fiber in the stations.
- Contract Inspectors may be utilized to provide field oversight of some Substation Construction.
- AM will perform all switching (Maintenance or Asset Management).
- Construction work sequence will depend upon design deliverables such as design/construction packages, material availability, and sourcing plans. A tentative sequence has been developed as shown in the attached preliminary project schedule, and is summarized below.
- As long as material and outages are approved the following work will occur in the following sequence. Each crew mobilizing to the site will be given 1 week to mobile and prepare for their outages.
- Site and Foundation Construction New Substation  
Site and foundation work is estimated to take 4 months. This work will include filling, installing roadway, drainage improvements, limestone surfacing, installing piles, concrete caps, conduit and grounding.
- Steel and Electrical Construction New Substation  
The steel and electrical work is anticipated to take 4 months. This work will include setting structures, installing tubing, switches, breakers, jumpers, transformer, pulling control cables, panels etc.
- Protection and Control Construction New Substation

The relay work associated with this job will be about 3 months. This work will follow the Steel and Electrical work. This work will include terminating cable and testing equipment.

In general, most substation materials should be shipped to the Hammond Storeroom. The following are exceptions: Breakers, Dead End Towers and Transmission line Structures.

- **New Substation**

The 69 kV breakers & the substation dead end structure for the new line bay should be able to be staged at the New Substation Site.

### **Outage Requirements:**

Outage requests will be submitted in TAORS for all transmission line/bus/equipment outages

- It is assumed that the outages cannot be performed during the summer months. Multiple outages may be needed in order to complete the construction work.
- A 3 week outage will be needed to perform the cut-in and the associated relay work on the Addis to Turnerville transmission line

#### **4.1.2 Customer's Substation at the "Plant": [ERIS]**

- Relaying shall be designed, installed and set as per Entergy specification matching with relaying installed at Entergy's new substation.
- Metering and status of generator breaker(s) at PID 271 will be transmitted to System Operations Center via dedicated phone circuit.
- Specification of substation equipment including apparatus, relaying, metering and remote terminal unit and substation design drawings/settings/configuration shall be reviewed and consented by Entergy and prior to energization of customer step down transformer substation.
- Entergy Construction would inspect (participate in testing of relays if required) the facility to ensure compliance with the design. Switching and tagging procedures to connect and isolate PID 271 to Entergy system have to be developed jointly and approved prior to energization of customer substation.
- Formal arrangement with Entergy will have to be made for injecting power into Entergy system for generator testing purposes. An hourly schedule will have to be submitted and permission secured with Entergy Operations.

### **Customer's Generator Data**

Customer is required to provide metering data and generator breaker status to the System Operations Center in Pine Bluff, AR via a dedicated communication circuit.

Customer will provide generator modeling data to Entergy before and after the generators are commissioned and tested.

Customer will adhere to all Entergy requirements per agreement relating to under/over frequency relay settings, installation of stabilizer, etc.

SOC will develop one line diagrams for the SCADA system for the generating station showing breaker and metered quantities. Use of New Substation Work Order will be used and the estimate for New Substation will include estimate for this work.

**4.1.3 Addis Substation:**

**Foundation:**

None

**Electrical:**

None

**Relay:**

- The Turnerville line/breaker relaying will be replaced with Entergy’s standard PM1803 option B2 line/breaker panel.
- It will be assumed that new control cables will be installed to the panel.
- Until control house space can be confirmed, it will be assumed that the new panel can fit into the existing panel space in the control house, and/or that there is enough space in the control house for this panel to be installed.
- According to the edit sheets and existing drawings there are spare status points and we can reuse the existing communication processor (SEL 2032) points.
- Until the AC and DC panels can be field verified, it is assumed that the AC and DC panels have spare breakers for the new panel.

**Long Lead Items:**

Quantity	Description	Delivery time	Comment
1	Relay Panel	10-14 weeks	

**Relay settings:**

- Develop new relay settings for (1) Addis substation looking towards new station 69kV line per Entergy Standard PM1803 Option B2-1 for SEL421 and SEL311C.
- Perform GOC coordination studies.

**Communications and SCADA:**

- Modify necessary remote terminal unit and other SCADA configurations

**Construction methodology:**

- The substation contractor(s) may be required to have full-time safety specialist on the project.
- A security detail will be deployed at the New Substation and its Lay down yards for the construction.
- Project Emergency Info will need to be obtained prior to starting construction.
- It is currently assumed that all Substation Steel/Electrical and Relay construction will also be contracted out. However, AM (Maintenance/Asset Management) may be given the opportunity to perform some of this work with in-house crews, providing there is adequate assurance they can work within our schedule and budget requirements.
- Contract Inspectors may be utilized to provide field oversight of some Substation Construction.
- AM will perform all switching.
- Construction work sequence will depend upon design deliverables such as design/construction packages, material availability, and sourcing plans. A tentative sequence has been developed as shown in the attached preliminary project schedule, and is summarized below.
- As long as material and outages are approved the following work will occur in the following sequence. Each crew mobilizing to the site will be given 1 week to mobilize and prepare for their outages.
- Addis --- Upgrade Relaying for Cut in of new Tap Transmission Line (3 week)
- Install new Line/Breaker panel on the Turnerville line, pull new control cables, and change the settings.
- Outages will be needed on the Turnerville to Addis transmission line.
- In general, most substation materials should be shipped to the Hammond Storeroom.

**Outage Requirements:**

Outage requests will be submitted in TAORS for all transmission line/bus/equipment outages.

- It is assumed that the outages can not be performed during the summer months. Multiple outages may be needed in order to complete the construction work.
- A 3 week outage will be needed to perform the cut-in and the associated relay work on the Addis to Turnerville transmission line.

**4.1.4 Turnerville Substation:**

**Foundation:**

N/A

**Electrical:**

N/A

**Relay:**

- The Addis Line/Breaker relaying will be replaced with Entergy’s standard PM1803 option B2 line/breaker panel.
- It will be assumed that new control cables will be installed to the panel.
- Until control house space can be confirmed, it will be assumed that the new panel can fit into the existing panel space in the control house, and/or that there is enough space in the control house for this panel to be installed.
- According to the edit sheets and existing drawings there are spare status points and we can reuse the existing communication processor (SEL 2032) points.
- Until the AC and DC panels can be field verified, it is assumed that the AC and DC panels have spare breakers for the new panel.

**Long Lead Items:**

Quantity	Description	Delivery time	Comment
1	Relay Panel	10-14 weeks	

**Relay settings:**

- Develop new relay settings for (1) Turnerville substation looking towards new station 69kV line per Entergy Standard PM1803 Option B2-1 for SEL421 and Option B2-1 for SEL311L.
- Revise Z2, Z3 and GOC settings for Copol-Turnerville 69kV line panel.
- Review/Revise Turnerville Bus Diff (CO8) settings.
- Perform GOC coordination studies.

**Communications and SCADA:**

- Modify necessary remote terminal unit and other SCADA configurations.

**Construction methodology:**

- The substation contractor(s) may be required to have full-time safety specialist on the project.
- A security detail will be deployed at the New Substation and its Lay down yards for the construction.
- Project Emergency Info will need to be obtain prior to starting construction.
- It is currently assumed that all Substation Steel/Electrical and Relay construction will also be contracted out. However, AM (Maintenance/Asset Management) may be given the opportunity to perform some of this work with in-house crews, providing there is adequate assurance they can work within our schedule and budget requirements.
- Contract Inspectors may be utilized to provide field oversight of some Substation Construction.
- AM will perform all switching.
- Construction work sequence will depend upon design deliverables such as design/construction packages, material availability, and sourcing plans. A tentative sequence has been developed as shown in the attached preliminary project schedule, and is summarized below.
- As long as material and outages are approved the following work will occur in the following sequence. Each crew mobilizing to the site will be given 1 week to mobile and prepare for their outages.
- Turnerville --- Upgrade Relaying for Cut in of new Tap Transmission Line (3 weeks)
- Install new Line/Breaker panel on the Addis line, pull new control cables, and change the settings
- In general, most substation materials should be shipped to the Hammond Storeroom.

**Outage Requirements:**

Outage requests will be submitted in TAORS for all transmission line/bus/equipment outages.

- It is assumed that the outages can not be performed during the summer months. Multiple outages may be needed in order to complete the construction work.
- A 3 week outage will be needed to perform the cut-in and the associated relay work on the Addis to Turnerville Transmission Line.

**4.1.5 New 69 kV line cut-in to New Substation from Addis – LAGen tap**



The above drawing shows the location of the new 69kV sub along with the proposed new lines from LA Gen tap and line section from Turnerville feeding Sawmill and Babin Substations.

New line number will be assigned to section of line from Turnerville but L-739 will be maintained for line to LaGen Diamond and Addis.

The LAGen tap to NSS (new substation) 69 kV line data:

Line Data	
Existing line rating	120 MVA
Line rating with new section	120 MVA
Line length from NSS to point of line cut-in	1.4 miles



**Line route:**

1.4 miles of new ROW (50’ width) adjacent to Entergy’s existing line will be built. It will be connected to the existing line near switch 21858 towards LAGen Diamond tap and to the breaker node in New Substation (NSS).

**Structures and Foundations:**

- Install two (2) self supported base plated steel dead-end in new ROW.
- Install three (2) 3-pole self supported base plated steel dead-end in new ROW.
- Install eleven (11) base plated caisson foundations approximately 35ft in depth.
- Install seventeen (17) direct embed concrete tangent and small angle structures in new ROW.

**Conductor and Insulators:**

- The line will require the installation of approximately 84 insulator assemblies.
- The line will require the installation of approximately 28,640 lbs 954 ACSR “Cardinal” conductor.
- OPGW AC-64/528 48 fiber will be used as the shield wire on all spans. Approximately 7,762 ft will be installed.

**ROW:**

1.4 miles of new ROW (50’ width) adjacent to Entergy’s existing line will be built. It will be connected to existing line near switch 21858 towards LAGen Diamond tap and to the breaker node in New Substation (NSS).

Permits

Time required for ROW agent to update property ownership, negotiate with impacted landowners, and secure necessary permits - four to five months once data received from Design Department.

**Environmental Permits**

Please refer to new substation section 4.1.1 above.

**Long Delivery Items:**

Quantity	Material Description	*Lead Time (weeks)
2 ea	Steel Self supporting Structures	20
2 ea	3-Pole Steel Self supporting Structures	20

17 ea	Concrete tangent structures	12
28,640 Lbs	954 ACSR "Cardinal" Conductor	24
7,762 ft	Fiber Optic Shield Wire	18
84 ea	69kV Insulators	12

**Construction methodology for new line construction:**

- Prior to the start of Construction, all 911 Addresses will be communicated to the crew. These addresses should be already established since all work to be performed is within existing stations.
- Close coordination with Distribution will be required during the new transmission line construction. The existing line has an under build that may need to be modified in order to install the new transmission line.
- Close coordination with the LADOTD may be required while working along the highway.
- Close coordination with the Railroads may be required during construction of the transmission line. A Flagman and other safety measures may be utilized as appropriate.
- Coordination will be required with the Transmission Operations Center and System Operations Center to schedule outages for cutting in the new transmission taps into the Turnerville to Addis 69 kV line.
- The transmission line contractor(s) may be required to have full-time safety specialist on the project.
- A security detail will be deployed at the Lay down yards for the transmission line construction
- Project Emergency Info will need to be obtained prior to starting construction
- It is currently assumed that all transmission line work will also be contracted out. The Protocol is to competitively bid all of this work.
- The initial Storm Water Pollution Prevention Plan (SWMPP) control installed along the transmission line route will be installed by the vegetation contractor. This contractor will also be responsible for maintaining these controls.
- The transmission line contractor may be required to install additional SWMPPP controls near their work locations for the installing on the new structures.
- SWPPP
  - Entergy’s Environmental Management Department will contract with a consultant to develop the SWPPP plan as well as to provide our weekly SWPPP monitoring and response monitoring after any rain event that of a ½ inch or greater within a 24 hour period.
  - The contractor responsible for maintaining the SWPPP controls will be responsible for making any adjustments to the controls identified in the inspections.

- If a SWMPPP plan is needed for the transmission line structures, the plan shall be completed in such a way that each structure is addressed independently of each other. Specific information shall be presented on how to install the controls at each specific structure location. The reason for this is due to the different types of structures, foundations, terrain, equipment usage, spoil disposal/smearing etc. that may occur throughout construction. The plan shall include the type of controls needed where ingress and egress will occur along the ROW.
- If fiber optic wires are installed, Telecom will be responsible for installation and checkout of all substation fiber/communications equipment including all splicing/testing of all fiber in the stations.
- Contract Inspectors may be utilized to provide field oversight of some transmission line work.
- AM (Maintenance/Asset Management ) will perform all switching.
- Construction work sequence will depend upon design deliverables such as design/construction packages, material availability, and sourcing plans. A tentative sequence has been developed as shown in the attached preliminary project schedule, and is summarized below.
- As long as material and outages are approved the following work will occur in the following sequence. Each crew mobilizing to the site will be given 1 week to mobilize and prepare for their outages.
- Build (2) new transmission line Taps to New Substation (Green field Sections)
  - The work is anticipated to take 3 months. This work will include setting foundations and structures, framing poles, installing conductor and shield wire, grounding, and cathodic protection.
- Cut-In (2) transmission line Taps --- (3 weeks)
  - Install new foundation, poles, framing, installing conductors and shield wires
- Outages will be needed on the Turnerville to Addis transmission line
- Outages on various distribution lines may be required in order to perform the cut-in of the transmission line safely. This will be coordinated with distribution at the time of construction.
- If distribution lines will be attached to the new structures the transmission line designer will need to make provisions for dead ending the distribution underbuilds on the new structures. This work will be performed during the re-route of the transmission line.
- If there are any railroads to be crossed or worked around during this construction the proper permits and coordination will need to be done.
- In general, most transmission line materials should be shipped to the Hammond Storeroom. The following are exceptions transmission line Structures.

**Outage Planning:**

Outage requests will be submitted in TAORS for all transmission line/bus/equipment outages.

- It is assumed that the outages can not be performed during the summer months. Multiple outages may be needed in order to complete the construction work.
- A 3 week outage will be needed to perform the cut-in and the associated relay work on the Addis to Turnerville transmission line.

**4.1.6 New 69 kV line cut-in to New Substation from Turnerville**



The above drawing shows the location of the new 69kV sub along with the proposed new line from Turnerville tap to Sawmill and Babin Substations.

The Turnerville to New Substation 69 kV line data:

Line Data	
Existing line rating	120 MVA
Line rating with new section	120 MVA
Line length from New Substation to point of line cut-in	0.05 miles

**Line route:**

No new ROW is required for tapping line.

**Structures and Foundations**

- Install three (1) 3-pole self supported base plated steel dead-end in new ROW.

**Conductor and Insulators**

- The line will require the installation of approximately 12 insulator assemblies.
- The line will require the installation of approximately 1,023 lbs 954 ACSR “Cardinal” conductor.
- 7 NO.7 will be used as the shield wire on all spans. Approximately 277 ft will be installed.

**ROW**

No new ROW is required for tapping line.

**Permits**

Time required for ROW agent to update property ownership, negotiate with impacted landowners and time to secure necessary permits requires four to five months once data received from Design Department.

**Environmental Permits**

Please refer to new substation 4.1.1 above.

**Long Delivery Items:**

Quantity	Material Description	*Lead Time (weeks)
1 ea	3-Pole Steel Self supporting Structures	20
1,023 Lbs	954 ACSR “Cardinal” Conductor	24
277 ft	7 NO.7 Shield Wire	12
12 ea	69kV Insulators	12

\*As of 2/13/2012

**Construction methodology for new line construction:**

See line section 4.1.5 above.

**Outage Planning:**

See line section 4.1.5 above.

## 4. COST

The costs shown in the table include all applicable overheads but do not include tax gross up. Entergy incurs a tax liability proportional to the amount of customer contributions. Customer will be required to fund any tax liabilities Entergy incurs.

Customer will be required to pre-pay for the work being performed thus AFUDC has been excluded from the estimate.

### Estimated Task Costs

	2012	2013	2014	Total
4.1.1 New Substation	\$ 140,200	\$ 1,774,935	\$ 3,029,032	\$ 4,944,167
4.1.3 Addis SS	\$ 30,566	\$ 100,188	\$ 155,008	\$ 285,763
4.1.4 Turnerville SS	\$ 17,947	\$ 90,794	\$ 162,888	\$ 271,629
4.1.5 Line from Addis SS	\$ 604,841	\$ 1,785,013	\$ 880,902	\$ 3,270,756
4.1.6 Line from Turnerville SS	\$ 21,803	\$ 265,329	\$ 94,378	\$ 381,510
Total	\$ 815,358	\$ 4,016,260	\$ 4,322,208	\$ 9,153,825

## 5. UPGRADE CLASSIFICATION

The ICT has reviewed and determined whether each required upgrade will be considered a Supplemental Upgrade. For more information on cost responsibility for Base Plan and Supplemental Upgrades, see Attachment T to Entergy's OATT.

### Cost Analysis

Task	Total Cost	Base Plan	Supplemental	Reference
New Substation	\$ 4,944,167	--	\$ 4,944,167	4.1.1
Addis Substation	\$ 285,763	--	\$ 285,763	4.1.3
Turnerville Substation	\$ 271,629	--	\$ 271,629	4.1.4
Line cut-in from LAGen tap	\$ 3,270,756	--	\$ 3,270,756	4.1.5
Line cut-in from Turnerville tap	\$ 381,510	--	\$ 381,510	4.1.6
<b>Total</b>	<b>\$9,153,825</b>	--	<b>\$9,153,825</b>	

## 6. SCHEDULE

A detailed schedule will be prepared subsequent to customer approval to proceed with the project. Based on the Task duration schedules listed below, the overall project in-service date is projected to be December 2014. This is based on assumption that customer would render approval to commence project by June 2012 and ROW/Permits will be secured in 12 months or lesser.

<b>Summary:</b>	<b>Completed by end of</b>
Submit Facilities Study	01/31/12
Customer Approval and Executed SGIA	06/30/12
Complete Project Execution Plan	11/30/12
Customer approval and Revised Funding Project approval	12/30/12
Commence design/ROW/environmental permitting/order material	01/02/13
Issue design for construction	07/30/13
Receive material	08/30/13
Receive environmental permit, easements and other permits	10/30/13
Start New Substation construction	12/01/13
Start Line cut-in construction	07/30/14
Complete Line and New Substation construction	10/30/14
Start Addis/Turnerville relay panel replacement	11/30/14
Complete Construction including New Substation, line cut-in and setting revisions at Addis & Turnerville	12/30/14

### Notes to Duration Schedules:

- Pre-existing scheduled line outages may prevent the commencement of work. Scheduled outages cannot be confirmed until a firm construction schedule is submitted.
- All construction work requiring outages will be performed during off-peak load season. Line outages will be discussed with the System Operations System (SOC) and Transmission Operations System (TOC) and the assumption is made that line outages will be executed as planned. However, last minute denial of outages by the SOC/TOC along with resulting schedule delay is possible.
- Design and Construction resources are available when required.
- Different resource is used for each design, so all designs start at same time.
- Transmission Line and Substation projects will begin subsequent to completion of Definition phase preparing Project Execution Plan and having customer approval to proceed with the design/procurement and construction.
- This schedule does not account for adverse weather conditions.
- Schedule durations are high level estimates at this time. A detailed schedule will be prepared upon project approval.
- From environmental specialist learned that the land may be cultivated farm land and assume not much of clearing is required.

- Assumed duration for securing ROW and environmental assessment and permits would not take longer.
- Property would be available for easement or purchase to build the line cut-in and new substation.

**Additional assumptions made by Construction:**

- Methodology in document based on satellite photos and existing one-lines -no field or site visits performed. Durations based on conventional durations per mile or typical device replacement undertaken.
- All wood structures will be disposed of by either awarding to landowners or disposed of as regular creosote waste-no specially treated wood.
- ROW is accessible by conventional means, no specialty equipment or extensive matting. ROW is maintained to the extent clearing is not necessary and no reseeding will be warranted.
- Baseline or preferential contractors will be used eliminating the time required to competitively bid.

**7. INTERCONNECTION STANDARDS**

The interconnection standards are detailed at the link shown below.

[http://entergy.com/energydelivery/facility\\_requirements.aspx](http://entergy.com/energydelivery/facility_requirements.aspx)



## 9. RISK ASSESSMENT

Risk	Comment	Impact
ROW and Permits	Scope and estimate for new ROW is based on limited knowledge of individuals using the aerial views, etc on the internet and could vary considerably.	****
Material costs steel & Equipment	Rising steel, copper, fuel and other market conditions could greatly affect estimated cost.	****
Storm-water plan implementation	Best guess on SWPPP creation, implementation and monitoring can vary greatly dependant on outcome of environmental study.	**
Weather & Equipment Lead Times	Unexpected delays on material lead times, unusually inclement weather will impact schedule but might impact AFUDC costs as well.	**
Wetland mitigation	Undetermined until environmental analysis is complete.	***
Outages may not be available	Preliminary schedule only considers general outage constraints. Specific project schedule may be delayed by days, weeks or months dependant on system conditions. Delays of months = increased project costs.	**
Uncertainty of ability to secure substation site and line cut-in Row for new Substation	The selected site may not be available by the time easement or purchase of substation site is required. A new site may have to be picked impacting on the cost of Substation site, line cut-in ROW and increased length. Cost impact can not be absolutely determined at this time	***
CCN and other permitting could take longer than assumed in developing schedule	Need revision to schedule	*
Scope based on design assumptions which may change	Varied impact on cost and schedule.	***

\*-low impact to cost, \*\* - moderate impact to cost, \*\*\*- high impact to cost, \*\*\*\* - very high

## 10. CONFIRMED RESERVATIONS

None

## 11. ATTACHMENTS

### A. Table of Acronyms

Φ	Phase
ACSR	Aluminum Conductor Steel Reinforced
ACSS	Aluminum Conductor Steel Supported
ADEQ	Arkansas Department of Environmental Quality
AFUDC	Allowance for Funds Used During Construction
ATC	Available Transfer Capability
BIL	Basic Impulse Level
EES	Entergy Control Area
EHV	Extra-High Voltage
ERIS	Energy Resource Interconnection Service
ICT	Independent Coordinator of Transmission
IPO	Independent Pole operated
kV	Kilo-Volt
MCM	(M) Thousand Circular Mils
MVA	Mega-Volt Amp
MW	Mega-Watt
NPDES	National Pollution Discharge Elimination System
NOI	Notice of Intent
NRIS	Network Resource Interconnection Service
NSS	New Substation
OASIS	Online Access and Same-time Information System
OATT	Open Access Transmission Tariff
POD	Point of Delivery
POR	Point of Receipt
PV	Photovoltaic
SES	Steam Electric Station
SOC	System Operations Center
SHF	Sulphur Hexafluoride
SHV	Super High Voltage
SW	Switch
TOC	Transmission Operations Center
Z2	Zone 2
Z3	Zone 3



D. Customer Substation

