



**TRANSMISSION LINE & SUBSTATION PROJECTS**

**COMPANY: ENTERGY SERVICES, INC.**

**CUSTOMER: PID 287**

**FACILITIES STUDY**

**EJO # F4PPTX0093**

**PID 287 GENERATOR INTERCONNECTION**

**Revision:  
0**

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A	05/09/12	Shell for team input	KC	ED
B	5/17/12	Updated scopes	KC	ED
C	6/4/12	JET review/vote	KC	ED
D	6/12/12	Including Planning input – submission to PD	KC	ED
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## 1. PROJECT SUMMARY

### 1.1 Background and Project Need

The purpose of this Facilities Study is to identify Entergy system requirements enabling 340 MW of generation to be connected at 138 kV to Entergy system via two (2) 138 kV lines connecting to two (2) generator transformers. Two (2) generators (218, 168 MVA @ 0.85 power factor) will be connected to two (2) 18/138 kV, 236.2 and 183.4 MVA transformers. Back feed from the 138 kV line connected to the larger unit will be used for station service when the unit is out of service.

To evaluate this request, a study was performed on the latest available 2021 summer peak cases, using PSS/E and MUST software by Power Technologies Incorporated (PTI). The Facilities Study identifies the transmission interconnection requirements, any transmission constraints resulting from the requested power transfer, and provides cost estimates to correct any transmission constraints.

The customer originally requested Network Resource Interconnection Service (NRIS) for 340 MW. The customer has additionally requested interconnection costs associated with Energy Resource Interconnection Service (ERIS). Upgrades and corresponding costs associated with ERIS have been provided in Attachment 10.6.

The customer has requested a 20% estimate. Based on available time to complete the Facilities Study and in light of lack of survey, soil borings, environmental permitting, property owner's issues, etc., a good faith estimate has been provided. Many assumptions had to be made which could affect the overall accuracy of this estimate.

The requested in-service date is May 2017. This date is viable.

### 1.2 Customer facilities required for NRIS

At the customer's premises (called plant from here onward), the customer will provide means to connect two (2) 138 kV lines from the Lewis Creek Substation.

The customer will provide line breakers and motorized switches to isolate the line.

In addition, the customer will design, procure, and install line relaying meeting Entergy specifications, along with communications using fiber optic installed on lines.

Customer will comply with Entergy specification for large generators including providing generator data before and after the commissioning of units, under and over frequency relaying, stabilizers, etc.

### 1.3 Scope Summary

#### a) Scope for NRIS: Lewis Creek 138 kV Substation:

- Expand existing substation and north and south buses. Add two (2) more bays (2 breakers each 138 kV, IPOs, 40 kA, 3 cycles, 2000A) with dead-end structures from nodes connecting to lines from two (2) generator step-up transformers.
- In addition, replace breakers 1655 and 1660 connected to Caney Creek line with 138 kV, IPOs, 40 kA, 3 cycles, and 2000A breakers. Also, replace risers and disconnect jumper wires to be at least capable of carrying 1665A.
- Build two (2) 138 kV lines between the power plant and the Lewis Creek Substation
- Replace breakers 1625, 1630, 1635, and 1650 with 138 kV, IPOs, 40 kA, 3 cycles, and 2000A

#### c) Upgrades required for NRIS:

##### • Upgrade five (5) breakers at Lewis Creek 138 kV Substation

- The addition of PID 287 caused the following breakers to become underrated: breakers #1625, #1630, #1635, #1650, and #1660 at Lewis Creek 138 kV.
- Replace the five (5) Lewis Creek 138 kV breakers (1625, 1630, 1635, 1650, and 1660) with a minimum of 1600A, IPO, with interrupter rating of at least 40kA.
- The required completion date is May 1, 2017.

##### • Upgrade Lewis Creek-Caney Creek 138 kV transmission line

- The Lewis Creek-Caney Creek 138 kV transmission line overloads for the loss of the Lewis Creek-Alden 138 kV transmission line. The conductor is sufficiently rated for the required 398 MVA, however it is required that the Lewis Creek-Caney Creek 138 kV transmission line be upgraded from a capacity of 382 MVA to at least 398 MVA. This is accomplished by upgrading breakers #1655 and #1660 at Lewis Creek 138 kV using Independent Pole Operated (IPO), 2000A and 40 kA breakers. The proposed upgrade rating is 411 MVA.
- The amount of capacity created by this upgrade is 29 MW, and the customer's use of the capacity created is 0 MW.
- In accordance with Entergy OATT, the need for the breakers #1655 and #1660 at Lewis Creek 138 kV to be upgraded has been identified through an AC analysis study. The customer's use of the

capacity created is calculated using a DC analysis, which is a strictly MW and 1.0 p.u. bus voltage study. Therefore, it is determined that this customer is responsible for the upgrade of breakers #1655 and #1660 at Lewis Creek 138 kV as indicated by the AC analysis but will not for purposes of calculating FFRs be considered to use any of the excess capacity created by this upgrade.

## 1.4 Cost Summary

### NRIS

- The estimated total project cost is \$9,919,904 Full Financial. This cost does not include Tax Gross Up which may apply. Should customer elect to sign a prepayment agreement, AFUDC will be waived.
- The ICT has assigned \$9,919,904 as Supplemental Upgrade based on Attachment "T" of Entergy's ICT (Independent Coordinator of Transmission) filing to the FERC.

## 1.5 Schedule Summary

A milestone schedule is developed assuming approval to proceed with the development of PEP/Estimates by November 30, 2014. See attachment for details.

## 2. SAFETY REQUIREMENTS

Safety is a priority with 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.

All employees working directly or indirectly for Entergy shall adhere to all rules and regulations outlined within the Entergy Safety manual. Entergy requires safety to be the highest priority for all projects. All Entergy and contract employees must follow all applicable safe work procedures.

Should the work contained within this Facility Study be approved, Entergy's participation would generally adhere to the motto described above and reflect in their finished product and expect the same from the applicant in their product.

## 3. GENERAL ASSUMPTIONS:

- Sufficient time will be allowed in approving the project enabling Entergy to prepare a Project Execution Plan (PEP) and be able to complete the project as per outlined in the schedule described provided below.
- Assumptions have been made in developing estimates without performing site visits, surveys, and soil borings. During the PEP stage, these tasks will be completed and could have an impact on estimates and schedule.
- 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 PEP stage to identify requirements for relay/CT 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 RTU 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.
- Facilities Studies are done without the advantage of having relay impact studies.
- Transmission Engineering Services shall coordinate all setting changes in the project with the 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).

**Customer premise:**

- Customer will provide line protection, metering, communication to TOC, SOC 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 Lewis Creek 138 kV Substation Expansion****Expansion for connecting lines from generators:**

The layout of the substation is currently a breaker and a half configuration. In order to facilitate interconnection of the proposed customer generators, two (2) additional bays must be added. The site will need to be expanded toward the east to accommodate the additional bays with four (4) breakers for termination of two

(2) lines from generator step-up transformers. For reference see the one-line and electrical arrangement.

**Site:**

The site preparation work is within existing property owned by Entergy and shall include the furnishing of all labor, material, transportation, tools, utilities, equipment, appurtenances, and performance of all operations necessary for filling and grading for the development of an area approximately 320' x 80' with finish grade elevations to match the existing grade elevations of the substation. The new expansion shall be surfaced with crushed limestone rock. The site shall be built in accordance with Entergy standards and design drawings. Site grading installation recommendations specified in the Geotechnical Soils Report shall also form part of the installation requirement.

The site scope of work includes:

- Removal and disposal from the site of all excess material or material designated as unsuitable by the Entergy field representative, including trees, shrubs, and roots. Estimated area is one (1) acre.
- Removal of topsoil and disposal to within the site area as directed by the Entergy field representative. Estimated volume is 1,000 CY.
- Excavation and disposal of existing soil as required complying with the site grading and drainage design to within the site area as directed by Entergy field representative. Estimated volume is 2,000 CY.
- Stabilize existing sub-grade base to comply with the compaction requirements (95% ASTM D698). Estimated volume is 2,000 CY.
- Supply and install select fill material and compact to 95% ASTM D698 on the yard and access road. Estimated volume is 6,000 CY.
- Supply and install surfacing material crushed rock fill material (#610 or approved equal) compacted to 95% ASTM D698 on the yard and access road. Estimated quantity required is 2,000 TONS.
- Install subsurface drainage culverts. Estimated length is 200 LINEAR FT.
- Supply and apply fertilizer and seeds to disturbed areas and new sloped embankments. Estimated area is one (1) acre.
- Install approximately 480 LINEAR FT of 7' high chain link fence around expanded substation property. Remove approximately 320 LINEAR FT of 7' chain link fence.

**Foundations:**

The foundation work shall be supplied, installed, and built in accordance with Entergy specification and design drawings. Foundation installation recommendation specified in the Geotechnical Soils Report shall also form part of the installation requirement.

The foundation scope of work includes design and constructs the following:

- Two (2) foundations will be installed for the new 138 kV H-frame substation dead-end structures. Each dead-end structure has two (2) footers.
- Four (4) foundations will be installed for the new 138 kV gas circuit breaker.
- Eight (8) foundations will be installed for the new 138 kV switch stands. Each switch stand foundation has two (2) footers.
- Forty three (43) foundations will be installed for the new single-phase bus supports.
- Six (6) foundations will be installed for the new 138 kV lightning arrester supports.
- Six (12) foundations will be installed for the new 138 kV CTs/PTs supports.
- Six (6) 2" PVC conduits will be installed from each of the circuit breakers to the new cable trough. Two (2) 2" PVC conduits will be installed from each of the new CTs/PTs junction box to the new cable trough. One (1) 2" PVC conduit will be installed from the CTs/PTs junction box to each of the appropriate CTs/PTs. Approximately 240' of new conduits will be installed from the cable trough to the new breakers.
- Install approximately 3,000' of substation ground wire including pigtailed to new equipment and structures. All new ground grid will be installed with 4/0 copper conductor. All new construction including 19 #9 copperweld pigtailed will be tied to the new ground grid as per Entergy grounding standards.
- Approximately 300' of new cable trough will be installed from the existing cable trough to the new breakers.
- Control house foundation will need to be expanded to accept all new required equipment and panels.



**Electrical:**

All equipment and structures shall be installed in accordance with Entergy specification and design drawings.

The new expansion will connect to the existing buses and build out to match existing scheme by adding two (2) additional circuit breakers and the associated disconnect switches in each bay.

The electrical scope of work includes design and constructs the following:

- Two (2) H-frame dead-end structures.
- Four (4) 138 kV, 3,000A, 63kA IPO gas circuit breakers.
- Eight (8) 138 kV 2,000A vertical break horizontal mount disconnect switches. The switches will be mounted on standard high-bus switch stand.
- Six (6) CTs will be mounted under the new H-frame substation dead-end. The CTs will be mounted on standard low bus equipment pedestal. A CT junction box will be mounted on one of the CT pedestal.
- Six (6) PTs will be mounted under the new H-frame substation dead-end. The PTs will be mounted on standard low-bus equipment pedestal. A PT junction box will be mounted on one of the PT pedestal.
- Six (6) lightning arresters will be mounted under the new H-frame substation dead-end. The arresters will be mounted on standard low-bus equipment pedestal.
- All new hard bus will be 4" SCH 40 Aluminum tubing. All new strain-bus will be bundled 954MCM Aluminum conductor.
- Twenty five (25) single-phase 138 kV low-bus supports. The supports will match existing construction.
- Eighteen (18) single-phase 138 kV high-bus supports.
- Expand existing control house by 20' X 32' on the west side.

**Long Delivery Material:**

Description	Quantity	Lead Time (weeks)*
138kV 3000A 63KA Gas Operated Circuit Breaker	4 ea.	20-22
138kV 2000A Vertical Break Gang Operated Switch	8 ea.	14-16
138kV Surge Arrester	6 ea.	14-16
138kV Substation Steels	1 Lots	10-12
138kV Station Post Insulator	115 ea.	10-12

\*As of 6/28/2012

**Relay Design:**

Two (2) new double-breaker bays will be installed to accept new generator input from Lewis Creek Generating station. Six (6) other circuit breakers within Lewis Creek 138 kV Substation are identified as underrated breakers and will be replaced with breakers of greater interrupting rating.

**Control House General Equipment**

- Consult with Asset Management to ensure panel layout is in the best ergonomic configuration. It is assumed that the present control house is NOT of adequate size to accept all new required equipment and panels.
- Size, purchase, and install one (1) 125VDC Lead Acid Battery set including 2-step rack rated for a seismic zone 1. It is estimated that a 350Ah set will be required. Reference Entergy Standard PM020300. This will allow for a second DC source inside the 138 kV control house for increased reliability due to the requirement for IPO breakers. It is assumed that the interior of the control house will be modified to provide a second battery room with proper ventilation.
- Size, purchase, and install one (1) 130V battery charger. Reference Entergy Standard PM0302, latest revision, for sizing guidelines. It is estimated that a 50A battery charger will be needed.
- Purchase, design, and install one (1) battery switch panel per Entergy Standard PN0103, latest revision. It is estimated that a 200A panel will be needed.
- Purchase, design, and install one (1) stand alone DC panel per Entergy Standard PM0101, latest revision.
- Design, purchase, and install one (1) High Voltage Metering Panel for HV applications referencing Entergy Standard #MI0301. The panel will include two (2) four quadrant three-phase meters for the lines to Lewis

Creek generating station. This meter panel will account for power input to the transmission grid. The retail metering group must provide and install metering equipment at auxiliary load points within Lewis Creek generating station.

- Design, purchase, and install four (4) Bus Differential panels referencing Entergy Standard #PM0602. These panels will include three (3) low-impedance SEL 487B bus differential relays with one (1) relay per phase. Two (2) Bus Differential panels will be installed on the north bus and two (2) will be installed on the south bus. This will allow for a bus differential primary and backup protection on each of the 138 kV busses in the 138 kV yard to address short stability margins and provide increased reliability.

### **New Double Breaker Bays for Lewis Creek Generating Plant Lines to CT #1 & ST #1**

- Purchase, design, and install two (2) new line relay panels referencing Entergy standard PM1803, option B2, latest revision. This panel uses SEL Mirrored Bits communication via direct fiber optics for primary #1 relaying communication. The panel uses a SEL model Current Differential relay via direct fiber optics for primary #2 relaying. Each panel will interface with an identical new panel installed within the Lewis Creek generating plant control location.
- Install two (2) fiber optic patch panels for communications with Lewis Creek generating plant. Purchase and install additional fiber equipment as dictated by the Telecom group needed to interface with fiber optic cables and relaying circuits.
- Entergy will install ADSS fiber optic cable from the final line splice boxes on the line termination towers and the fiber optic termination panels in the control house. Direct fiber will be installed from Lewis Creek 138 kV to Lewis Creek generating plant to provide high-speed direct communications links. Coordination with the T-line group is required to ensure that the direct fiber runs to Lewis Creek generating plant are taken into account when determining minimum clearance requirements on the transmission line. Each line to Lewis Creek generating plant (CT #1 & ST #1) will use transmission line OPGW shield wire to provide alternate paths for communication links.
- Design, purchase, and install four (4) High Voltage Breaker Control panels using the SEL 451 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision.
- Purchase and install six (6) metering accuracy three-winding PTs for line and metering potential per Entergy standard. Three (3) PTs will be installed on each line node with one (1) PT per phase.

- Purchase and install six (6) Extended Range Current Transformers (CTs) for metering the Lewis Creek generating lines. Three (3) CTs will be installed on each line to Lewis Creek generating plant with one (1) CT per phase.
- Purchase and install two (2) metering (potential & current) junction boxes.

#### Long Delivery Material:

Material Description	Quantity	Lead Time (weeks)*
HV Breaker Control Panel	4	14
HV Line/breaker Control Panel	2	14
Bus Differential Panel	4	14
Stand Alone DC Panel	1	12
Metering Panel	1	14
230kV CCVTs	6	28
230kV CTs	6	40
Batteries	1 set	24

\*As of 6/28/2012

#### Assumptions made in developing scope/estimates:

- The present control house is NOT of adequate size to accept all new required equipment and panels.
- Existing cable trough has adequate space to accept all new cables from the new construction back to the control house.

#### Relay Settings and RTU configuration:

##### Relay Settings

- Develop relay settings for four (4) Bus Differential panels referencing Entergy Standard #PM0602. Each panel will include three (3) low-impedance SEL 487B bus differential relays with one (1) relay per phase for a total of 12 relays.
- Develop relay settings for two (2) new line relay panels utilizing SEL 421/311L microprocessor relays and referencing Entergy standard PM1803, option B2, latest revision.

- Develop relay settings for four (4) High Voltage Breaker Control panels per Entergy Standard PM0501, latest revision.
- Review relay settings of all lines leaving Lewis Creek due to change of fault current created by new generation.
- Review relay settings of remote stations due to change of fault current in area caused by new generation
- Complete a thorough ground overcurrent (GOC) coordination study for Lewis Creek area.
- Follow PRC-023 and PRC-001 requirements for NERC.

### **RTU Configuration**

Edit RTU configurations to provide new inputs from bus differential, line, and breaker control panels.

### **Construction Methodology:**

If this project is approved and enters the Transmission Business's (PM&C) process for executing projects, there will be constructability reviews performed during the definition phase. These reviews will try to incorporate any known hazards from a safety perspective, as well as any obstacles that could/would be experienced during the construction and installation process. After receipt of the final design drawings and details for each discipline of work, a determination will be made to either perform a competitive bid process to award the work to an Entergy approved contractor, or, to allow internal Entergy Resources to perform the work.

The normal process would be to perform all of the site, foundation, grounding and conduit work with a single source. The two (2) new bay additions to substation will require no outages to build out, with tie in outages incorporated into the bus protection scheme outages. Normally outages on 230 kV facilities require a three (3) week advance notice, with no guarantee that said outage will be granted at the time requested. This poses a risk to all schedules.

Upon completion of the two (2) new bay proposed additions to the Lewis Creek sub, all preliminary check out and commissioning components that can be made at this juncture will be done, with the exception of the activities that must take place upon final energization (outages required) during both a north and south bus tie in.

Upon completion of the new facilities and breaker replacement steps, final commissioning and checkout will be performed on each node. This will also include end to end checkouts, and remote settings.

It will require approximately six (6) months to complete this project.

SWPPP implementation, monitoring, site security, and storage are considered in the estimates.

### **Outage Requirements and durations:**

All outage durations are approximate.

After both new generation bays are built to completion a two (2) week outage for breakers 1625 and 1650 replacement will commence. When the new field equipment and relay panels are ready for checkout, a two (2) week north bus outage will commence for north side bus connection of the two (2) new bays and the two (2) new breakers 1625 & 1650 to the bus scheme – no line cutover to new breaker panels included in this work. The north bus outage will include L596 and the cap bank connection nodes, so mild loading may be required.

After the north bus is ready for service, it will be put back in service while a two (2) week L503 outage commences. New breaker 1625 will stay out of service during the L503 work. Breaker 1655 will be replaced and both it and the new 1650 will be introduced into L503 protection scheme.

After L503 is ready for service, it will be put back in service, fed by the north bus tie only through the new 1650 while a two (2) week L487 and L648 outage commences. Breaker 1630 and 1660 will be replaced, with line protection for both L487 and L648 being completed and commissioned. After this step, Lines 487, 503, and 648 will be complete and tied to new control panels through new breakers. Only new breaker 1630 will be left out of service for the last step.

The final two (2) week outage is for south bus and RSS node. This work will include replacement of breaker 1635, connection of the south bus to the two (2) new generation nodes, and connection of new breakers 1660 and 1635 into the south bus protection scheme. Cut over of new protection schemes will include south bus differential and RSS protection.

Tabular outage summary:

- 2 week - Bkr 1625 and 1650
- 2 week - North Bus, L596 and Cap bank (Bkr 26225)
- 2 week – L503 and Bkr 1625
- 2 week – L487 and L648 \*
- 2 week – RSS and South Bus

\* Lines 487 and 648 can be split into separate two (2) week sequential outages if required, with L648 being south bus fed through breaker 1660 only while L487 is commissioned. New breaker 1630 would need to stay out of service until the RSS node outage is undertaken.

## 4.2 Lewis Creek 138 kV Substation – replacement of breaker #1660

In addition to adding two (2) bays for connecting lines from the plant, replace breaker 1660 with IPO breaker rated minimum 2000A, 40 kA. For reference see the one-line and electrical arrangement.

**Site:** Not applicable

### Foundations:

The foundation work shall be supplied, installed, and built in accordance with Entergy specification and design drawings. Foundation installation recommendation specified in the Geotechnical Soils Report shall also form part of the installation requirement.

The foundation scope of work includes design and constructs the following:

- Existing breaker foundation will be expanded for the new breaker.
- Existing pigtails will be reused for grounding the new breaker.
- Six (6) 2" PVC conduits will be installed from the circuit breaker to the existing cable trough. Approximately 120' of new conduits will be installed from the existing cable trough to the new breaker.

### Electrical:

All equipment shall be installed in accordance with Entergy specification and design drawings.

The electrical scope of work includes design and constructs the following:

- One (1) existing underrated 138 kV breaker will be replaced with a new 138 kV, 3000A, 63kA IPO breaker. The new breaker will be installed on existing foundation.
- Bundled 954 kCMIL ACSR will be installed as jumper between the existing switches and new breaker.

### Long Delivery Material:

Description	Quantity	Lead Time (weeks)*
138kV 3000A 63KA Gas Operated Circuit Breaker	1 ea.	20-22

\*As of 6/28/2012

**Relay Design:**

Existing 138 kV Line 648 to Caney Creek

- All line relaying for the line 648 to Caney Creek was upgraded as part of the Western Region project. Line protection at this time uses SEL Mirrored Bit communication for primary #1 relaying communication. Line protection at this time uses a SEL model Current Differential relay via direct fiber optics for primary #2 relaying.
- A new breaker control panel was also installed for breaker 1660. New cables will be pulled to the new breaker and the existing panel will be used.

**Relay Settings and RTU configuration:****Relay Settings**

- Review/revise line and breaker control settings as necessary due to change in fault current and change breaker rating.
- Abide by PRC-023 and PRC-001 per NERC.

**RTU configuration**

- Edit RTU configuration if necessary.

**Construction Methodology:** Same as Section 4.1

**Outage Requirements and duration:** Same as Section 4.1

**4.3 Lewis Creek 138 kV Substation – replacement of breaker #1660 and 1655**

In addition to adding two (2) bays for connecting lines from the plant, replace breakers 1660 and 1655 with IPO breakers rated minimum 2000A, 40 kA. For reference see the one-line and electrical arrangement.

**Site:** Not applicable

**Foundations:**

The foundation work shall be supplied, installed, and built in accordance with Entergy specification and design drawings. Foundation installation recommendation specified in the Geotechnical Soils Report shall also form part of the installation requirement.

The foundation scope of work includes design and constructs the following:

- Existing breaker foundations will be expanded if for the new breakers.



- Existing pigtailed will be reused for grounding the new breakers.
- Six (6) 2" PVC conduits will be installed from the circuit breakers to the existing cable trough. Approximately 240' of new conduits will be installed from the existing cable trough to the new breakers.

**Electrical:**

All equipment shall be installed in accordance with Entergy specification and design drawings.

The electrical scope of work includes design and constructs the following:

- Two (2) existing underrated 138 kV breakers will be replaced with new 138 kV, 3000A, 63kA IPO breakers. New breakers will be installed on existing foundations.
- Bundled 954 kCMIL ACSR will be installed as jumper between the existing switches and new breakers.

**Long Delivery Material:**

Description	Quantity	Lead Time (weeks)*
138kV 3000A 63KA Gas Operated Circuit Breaker	2 ea.	20-22

\*As of 6/28/2012

**Relay Design:**

Five (5) other circuit breakers within Lewis Creek 138 kV substation are identified as underrated breakers and will be replaced with breakers of greater interrupting rating.

- Design, purchase, and install one (1) High Voltage Breaker Control panel using the SEL 451 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision. These panels will be used for all breaker protection and control functions per Entergy Standard PM0501, latest revision of IPO replacement breakers 1650.

**Existing 138 kV Line 648 to Caney Creek**

- All line relaying for the line 648 to Caney Creek was upgraded as part of the Western Region project. Line protection at this time is uses SEL Mirrored Bit communication for primary #1 relaying communication. Line protection at this time uses a SEL model Current Differential relay via direct fiber optics for primary #2 relaying.
- A new breaker control panel was also installed for breaker 1660. New cables will be pulled to the new breaker and the existing panel will be used.

**Long Delivery Material:**

Quantity	Material Description	Lead Time (weeks)*
1	HV Breaker Control Panel	14

\*As of 6/28/2012

**Relay Settings and RTU configuration:****Relay Settings**

- Develop relay settings for one (1) High Voltage Breaker Control panel per Entergy Standard PM0501, latest revision.
- Review/revise line relay settings as necessary due to change in fault current and change breaker rating.
- Abide by PRC-023 and PRC-001 per NERC.

**RTU configuration**

- Edit RTU configuration for new inputs of breaker control panel.

**Construction Methodology:** Same as Section 4.1**Outage Requirements and duration:** Same as Section 4.1**4.4 Lewis Creek 138 kV Substation – replacement of breaker #1625, 1630, 1635 and 1650**

In addition to adding two (2) bays for connecting lines from the plant, replace breakers 1625, 1630, 1635 and 1650 with IPO breakers rated minimum 1600A, 40 kA. For reference see the one-line and electrical arrangement.

**Site:** Not applicable**Foundations:**

The foundation work shall be supplied, installed, and built in accordance with Entergy specification and design drawings. Foundation installation recommendation specified in the Geotechnical Soils Report shall also form part of the installation requirement.

The foundation scope of work includes design and constructs the following:

- Existing breaker foundations will be expanded for the new breakers.
- Existing pigtails will be reused for grounding the new breakers.

- Six (6) 2” PVC conduits will be installed from the circuit breakers to the existing cable trough. Approximately 600’ of new conduits will be installed from the existing cable trough to the new breakers.

**Electrical:**

All equipment shall be installed in accordance with Entergy specification and design drawings.

The electrical scope of work includes design and constructs the following:

- Four (4) existing underrated 138 kV breakers will be replaced with new 138 kV, 3000A, 63kA IPO breakers. New breakers will be installed on existing foundations.
- Bundled 954 kCMIL ACSR will be installed as jumper between the existing switches and new breakers.

**Long Delivery Material:**

Description	Quantity	Lead Time (weeks)*
138kV 3000A 63KA Gas Operated Circuit Breaker	4 ea.	20-22

\*As of 6/28/2012

**Relay Design:**

Five (5) other circuit breakers within Lewis Creek 138 kV substation are identified as underrated breakers and will be replaced with breakers of greater interrupting rating.

- Design, purchase, and install four (4) High Voltage Breaker Control panel using the SEL 451 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision. These panels will be used for all breaker protection and control functions per Entergy Standard PM0501, latest revision of IPO replacement breakers 1625, 1630, 1635, 1655, and 1650.

**Long Delivery Material:**

Quantity	Material Description	Lead Time (weeks)*
4	HV Breaker Control Panel	14 Weeks

\*As of 6/28/2012

**Relay Settings and RTU configuration:****Relay Settings**

- Develop relay settings for four (4) High Voltage Breaker Control panels per Entergy Standard PM0501, latest revision.
- Review/revise line relay settings as necessary due to change in fault current and change breaker rating.
- Abide by PRC-023 and PRC-001 per NERC.

**RTU configuration**

- Edit RTU configuration for new inputs of breaker control panels.

**Construction Methodology:** Same as Section 4.1

**Outage Requirements and duration:** Same as Section 4.1

**4.5 Transmission Lines between Plant and Lewis Creek 138kV Substation****General:**

Construct two (2) single circuit 138 kV lines between the plant and Lewis Creek substation and terminate at both ends. Length of each line would be approximately 300'. Because this estimate was performed without front-end loading, a 10% risk factor was added to account for potential unforeseen issues.

**ROW:**

This project is taking place on Entergy owned property; there should not be any Right of Way issues to contend with.

**Environmental Permits:**

No special permits will be required to install these lines.

**Foundations:**

Final foundation determination would be made during the design phase of this project. However, it is anticipated that the two (2) single-pole structures will be direct embedded 15' and backfilled with crushed rock.

**Conductors:**

Based on the provided one-line diagram, Line 1 must transfer 236.2 MVA and Line 2 must transfer 183.4 MVA. This equates to 988 and 766 Amps at 138 kV, respectively. 954 ACSR "Cardinal" conductor, which can accommodate 1,088

Amps at 212 °F, has been chosen for both lines. This project will require approximately 2,500 lb. of conductor.

#### **Shield wire and OPGW:**

48-Fiber 0.528" Alumacore OPGW and 7#7 Alumoweld will be the shield wires. Approximately 700' of each will be required. Four (4) splice boxes will be needed to terminate the OPGW.

#### **Insulators:**

This project will require six (6) 161 kV polymer braced-post insulator assemblies and twelve 161 kV polymer dead-end assemblies. Bolted dead-end clamps will be used.

#### **Structures:**

It is estimated that this project will require two (2) 90' B9B Concrete Poles, framed in a Tangent Delta configuration.

#### **Long Delivery Material:**

Description	Quantity	Lead Time (weeks)*
Concrete Poles	2	10
Polymer Insulator Assemblies	18	12
0.528" 48-Fiber OPGW	700 ft	14

\*As of 6/28/2012

#### **Construction Methodology:**

If this project is approved and enters the Transmission Business's (PM&C) process for executing projects, there will be constructability reviews performed during the definition phase. These reviews will try to incorporate any known hazards from a safety perspective, as well as any obstacles that could/would be experienced during the construction and installation process. After receipt of the final design drawings and details for each discipline of work, a determination will be made to either perform a competitive bid process or to award the work to an Entergy approved contractor.

#### **Outage requirements and duration:**

None – line connections to be made up to station dead ends prior to bus outage at substation for connection to operating bus.

## 5. 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.

### NRIS

	2015	2016	2017	Total
4.1 Lewis Creek Substation Expansion	\$ 118,661	\$ 4,163,296	\$ 1,725,840	\$ 6,007,797
4.3 Lewis Creek - replace breakers 1660 and 1655	\$ 30,444	\$ 888,907	\$ 304,649	\$ 1,223,999
4.4 Lewis Creek - replace breakers 1625, 1630, 1635 and 1650	\$ 62,344	\$ 1,787,230	\$ 453,350	\$ 2,302,924
4.5 Line between Plant and Lewis Creek	\$ 3,161	\$ 204,559	\$ 177,464	\$ 385,184
<b>Total</b>	<b>\$ 214,611</b>	<b>\$ 7,043,991</b>	<b>\$ 2,661,302</b>	<b>\$ 9,919,904</b>

## 6. 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

Task - NRIS	Total Cost	Base Plan	Supplemental	Reference
4.1 Lewis Creek Substation Expansion	\$ 6,007,797		\$ 6,007,797	4.1
4.3 Lewis Creek - replace breakers 1660 and 1655	\$ 1,223,999		\$ 1,223,999	4.3
4.4 Lewis Creek - replace breakers 1625, 1630, 1635 and 1650	\$ 2,302,924		\$ 2,302,924	4.4
4.5 Line between Plant and Lewis Creek	\$ 385,184		\$ 385,184	4.5
<b>Total</b>	<b>\$ 9,919,904</b>		<b>\$ 9,919,904</b>	

## 7. SCHEDULE

A detailed schedule will be prepared subsequent to customer approval to proceed with the project. Based on the task duration schedules listed below, should the approval to proceed be given by November 2014, work could be completed by May 2017 for connecting generators to Lewis Creek.

Summary:	Completed by end of
Submit Facilities Study	Jun-12
Receive permission to proceed with the project	Nov-14
Create FP/WO	Dec-14
Complete PEP/Estimates and submit to customer for approval to proceed with the project	Jun-15
Receive approval for proceeding with the project	Aug-15
Secure revised FP	Sep-15
Commence Substation and line design	Oct-15
Order Substation and line material	Dec-15
Issue SS and line design for Construction	May-16
Secure Easement for lines, SWMP, etc	Jun-16
Receive material	Aug-16
Commence construction at Lewis Creek and build new lines	Oct-16
Complete construction	May-17

## 8. 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
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.	**
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.	**
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

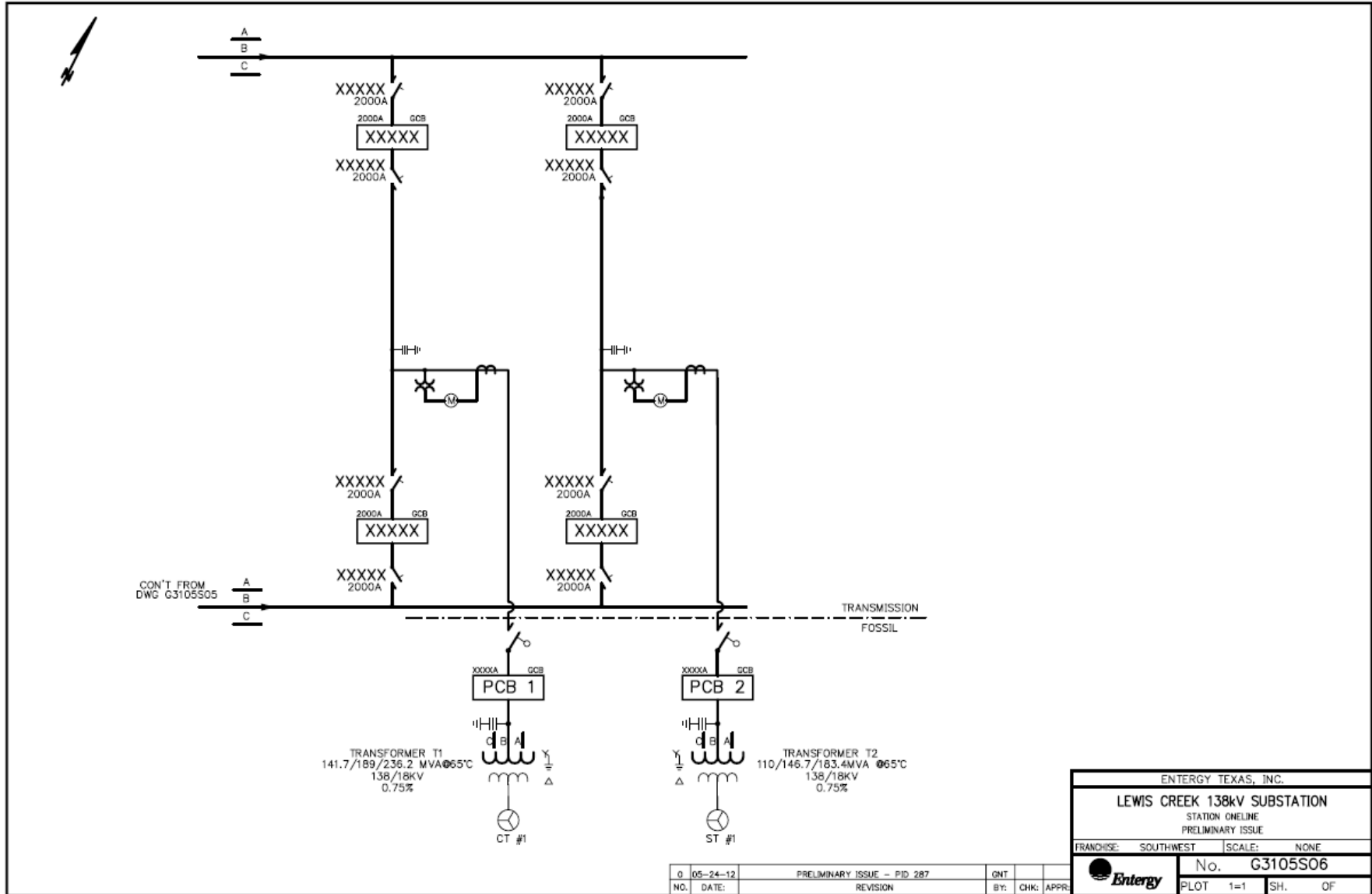


## 10. ATTACHMENTS

### 10.1 Schedule

<b>Summary:</b>	<b>Completed by end of</b>
Submit facility Study	Jun-12
Receive permission to proceed with the project	Nov-14
Create FP/WO	Dec-14
Complete PEP/Estimates and submit to customer for approval to proceed with the project	Jun-15
Receive approval for proceeding with the project	Aug-15
Secure revised FP	Sep-15
Commence Substation and line design	Oct-15
Order Substation and line material	Dec-15
Issue SS and line design for Construction	May-16
Secure Easement for lines, SWMP, etc	Jun-16
Receive material	Aug-16
Commence construction at Lewis Creek and build new lines	Oct-16
Complete construction	May-17

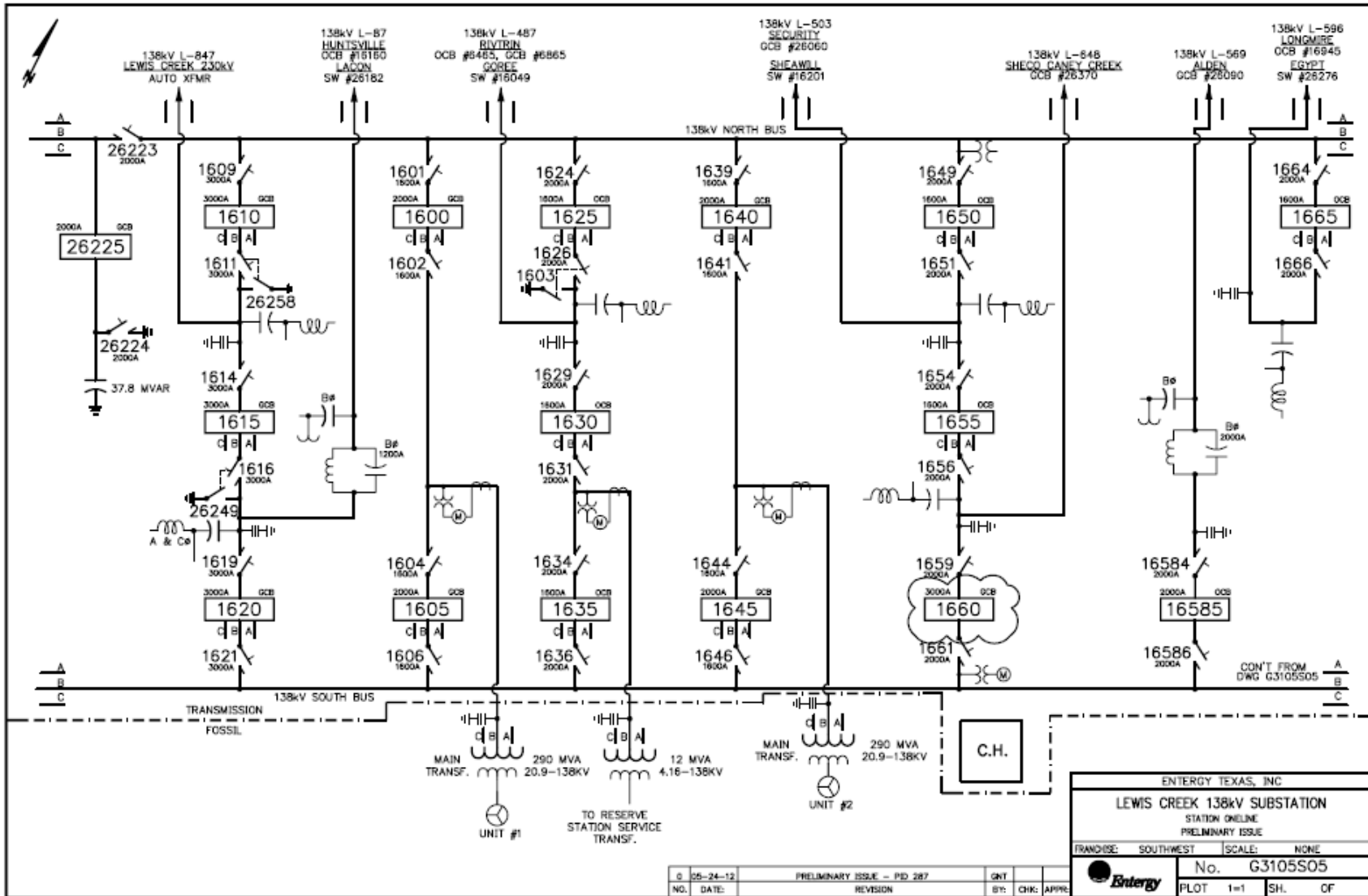
10.2 Lewis Creek Substation Expansion



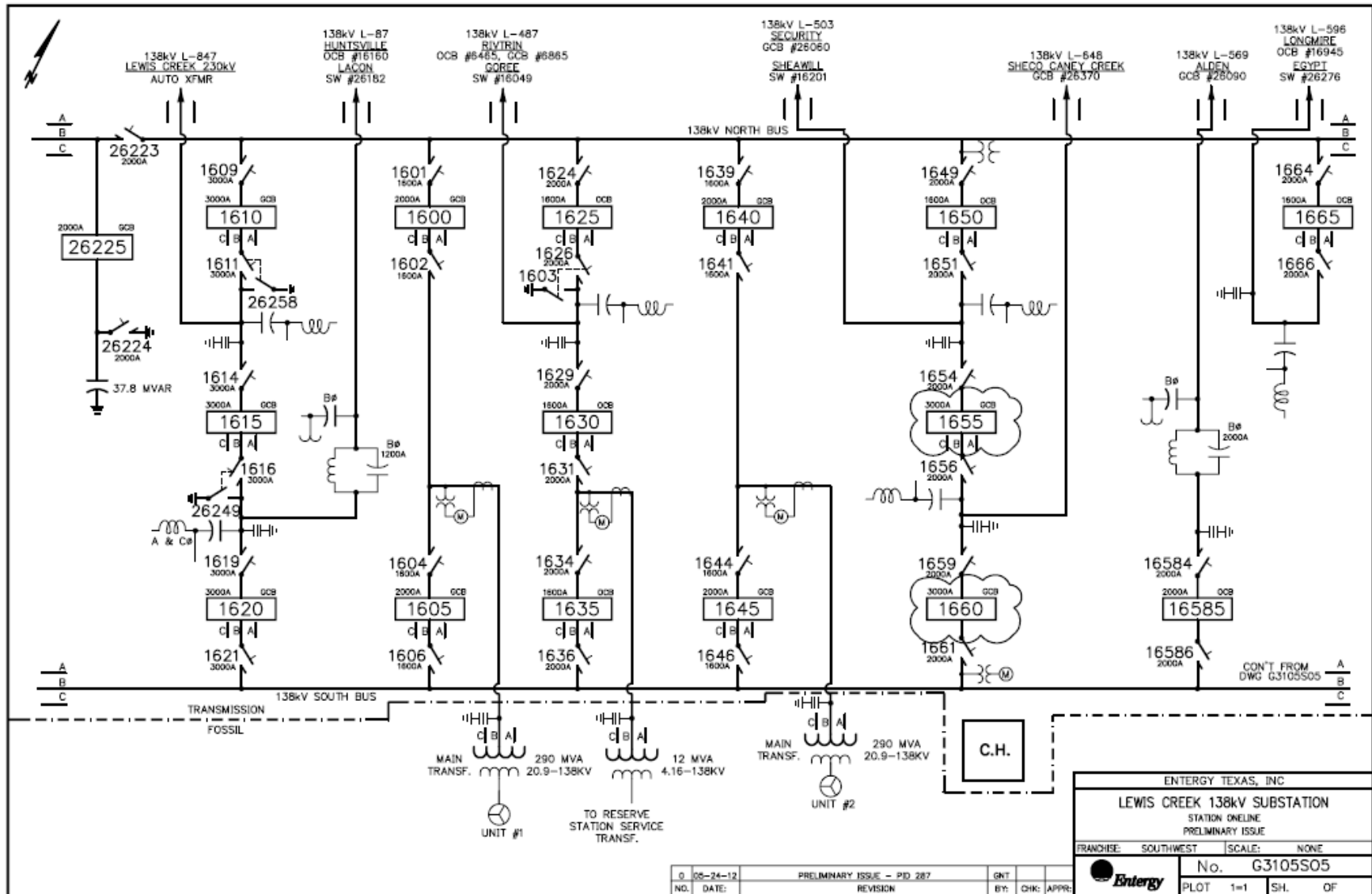
ENTERGY TEXAS, INC.	
LEWIS CREEK 138kV SUBSTATION	
STATION ONELINE	
PRELIMINARY ISSUE	
FRANCHISE: SOUTHWEST	SCALE: NONE
No. G3105S06	
PLOT 1=1	SH. OF

0	05-24-12	PRELIMINARY ISSUE - PID 287	GNT		
NO.	DATE:	REVISION	BY:	CHK:	APPR:

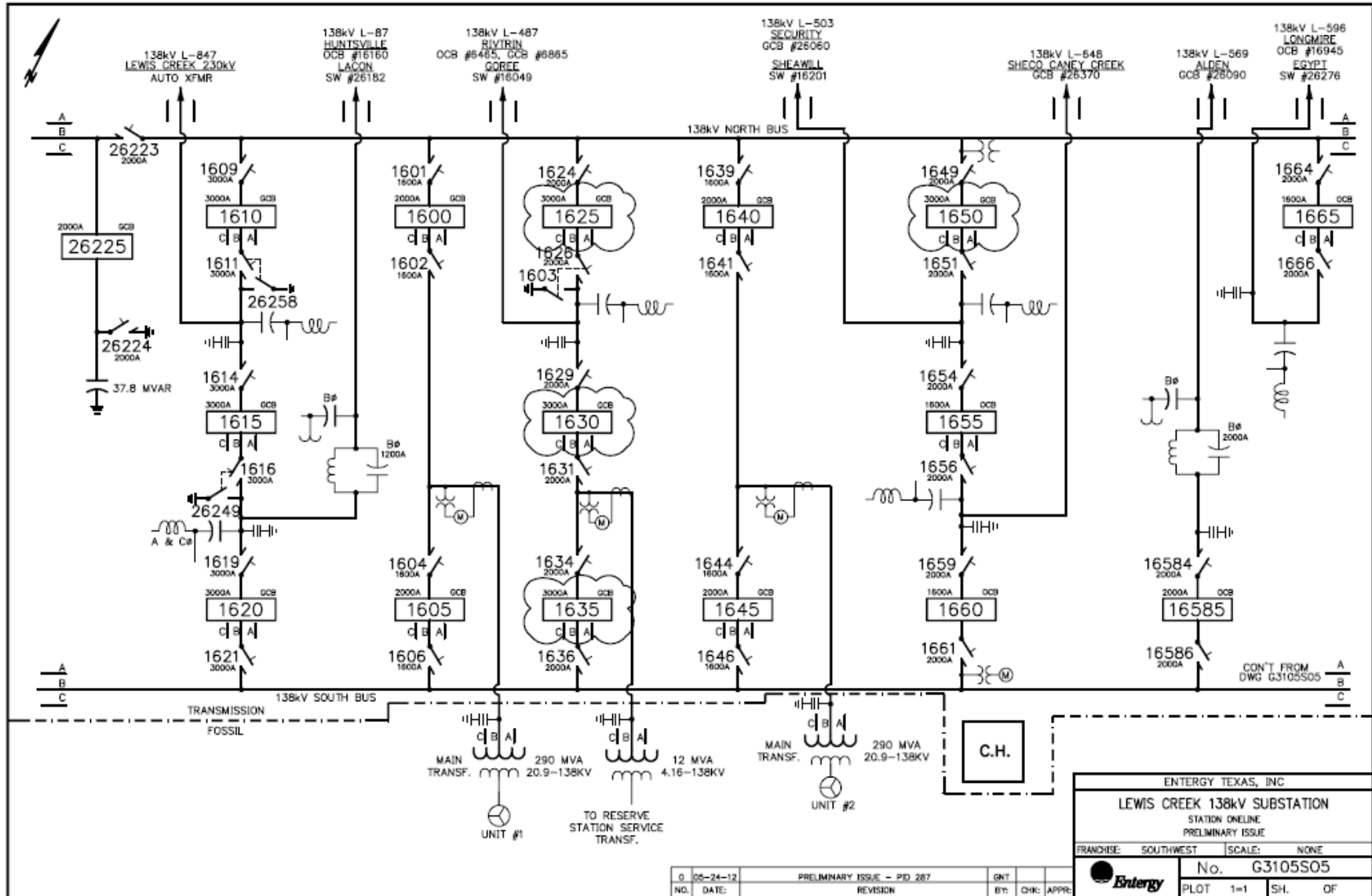
10.3 Lewis Creek replace breaker 1660



10.4 Lewis Creek - replace breakers 1660 and 1655



10.5 Lewis Creek - replace breakers 1625, 1630, 1635 and 1650



## 10.6 ERIS Interconnection Costs

### Customer facilities required for ERIS

At the customer's premises (called plant from here onward), the customer will provide means to connect two (2) 138 kV lines from the Lewis Creek Substation.

The customer will provide line breakers and motorized switches to isolate the line.

In addition, the customer will design, procure, and install line relaying meeting Entergy specifications, along with communications using fiber optic installed on lines.

Customer will comply with Entergy specification for large generators including providing generator data before and after the commissioning of units, under and over frequency relaying, stabilizers, etc.

### Scope Summary

#### Lewis Creek 138 kV Substation (reference Section 4.1):

- Expand existing substation and north and south buses. Add two (2) more bays (2 breakers each 138 kV, IPOs, 40 kA, 3 cycles, 2,000A) with dead-end structures from nodes connecting to lines from two (2) generator step-up transformers.
- Replace breaker 1660 connected to Caney Creek line with a 138 kV, IPOs, 40 kA, 3 cycles, and 2,000A breaker.
- Replace breakers 1625, 1630, 1635, and 1650 with 138 kV, IPOs, 40 kA, 3 cycles, and 2,000A breakers.
- Build two (2) 138 kV lines between the power plant and the Lewis Creek Substation

#### Upgrade five (5) breakers at Lewis Creek 138 kV Substation (reference Sections 4.2 & 4.4)

- The addition of PID 287 caused the following breakers to become underrated: breakers #1625, #1630, #1635, #1650, and #1660 at Lewis Creek 138 kV.
- Replace the five (5) Lewis Creek 138 kV breakers (1625, 1630, 1635, 1650, and 1660) with a minimum of 1600A, IPO, with interrupter rating of at least 40kA.
- The required completion date is May 1, 2017.

#### Upgrade Lewis Creek-Caney Creek 138 kV transmission line (reference Section 4.5)

- The Lewis Creek-Caney Creek 138 kV transmission line overloads for the loss of the Lewis Creek-Alden 138 kV transmission line. The conductor is sufficiently rated for the required 398 MVA, however it is required that the Lewis Creek-Caney Creek 138 kV transmission line be upgraded from a capacity of 382 MVA to at least 398 MVA. This is accomplished by upgrading breakers #1655 and #1660 at Lewis Creek

138 kV using Independent Pole Operated (IPO), 2,000A and 40 kA breakers. The proposed upgrade rating is 411 MVA.

- The amount of capacity created by this upgrade is 29 MW, and the customer’s use of the capacity created is 0 MW.
- In accordance with Entergy OATT, the need for the breakers #1655 and #1660 at Lewis Creek 138 kV to be upgraded has been identified through an AC analysis study. The customer’s use of the capacity created is calculated using a DC analysis, which is a strictly MW and 1.0 p.u. bus voltage study. Therefore, it is determined that this customer is responsible for the upgrade of breakers #1655 and #1660 at Lewis Creek 138 kV as indicated by the AC analysis but will not for purposes of calculating FFRs be considered to use any of the excess capacity created by this upgrade.

**Cost Summary**

**ERIS**

- The estimated total project cost is \$9,465,330 Full Financial. This cost does not include Tax Gross Up which may apply. Should customer elect to sign a prepayment agreement, AFUDC will be waived.
- The ICT has assigned \$9,465,330 as Supplemental Upgrade based on Attachment “T” of Entergy’s ICT (Independent Coordinator of Transmission) filing to the FERC.

**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.

**ERIS**

	2015	2016	2017	Total
4.1 Lewis Creek Substation Expansion	\$ 118,661	\$ 4,163,296	\$ 1,725,840	\$ 6,007,797
4.2 Lewis Creek - replace breaker 1660	\$ 28,428	\$ 512,638	\$ 228,359	\$ 769,425
4.4 Lewis Creek - replace breakers 1625, 1630, 1635 and 1650	\$ 62,344	\$ 1,787,230	\$ 453,350	\$ 2,302,924
4.5 Line between Plant and Lewis Creek	\$ 3,161	\$ 204,559	\$ 177,464	\$ 385,184
<b>Total</b>	<b>\$ 212,595</b>	<b>\$ 6,667,722</b>	<b>\$ 2,585,012</b>	<b>\$ 9,465,330</b>

**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.

<b>Task</b>	<b>Total Cost</b>	<b>Base Plan</b>	<b>Supplemental</b>	<b>Reference</b>
4.1 Lewis Creek Substation Expansion	\$ 6,007,797		\$ 6,007,797	4.1
4.2 Lewis Creek - replace breaker 1660	\$ 769,425		\$ 769,425	4.2
4.4 Lewis Creek - replace breakers 1625, 1630, 1635 and 1650	\$ 2,302,924		\$ 2,302,924	4.4
4.5 Line between Plant and Lewis Creek	\$ 385,184		\$ 385,184	4.5
<b>Total</b>	<b>\$ 9,465,330</b>		<b>\$ 9,465,330</b>	