TRANSMISSION LINE & SUBSTATION PROJECTS

COMPANY:ETI

CUSTOMER: PID 211

FACILITIES STUDY

EJO # F4PPTX0018

PID 211 INTERCONNECTION
LEWIS CREEK 138 KV

Revision:
1

Rev	Issue Date	Description of Revision	Prepared By	Approved By
A	12/14/08	1st Draft	Ibrahim Khan	Elaine Dearbonne
B	12/17/08	Shell revised based on rev 3 solution	Ibrahim Khan	Elaine Dearbonne
C	01/09/09	Construction input & submission to JET	Ibrahim Khan	Elaine Dearbonne
0	01/09/09	Submitted to PD	Ibrahim Khan	Elaine Dearbonne
1	1/15/09	ICT Upgrade Classification & Posting	Daniel Epperson	Jody Holland

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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 537 MW (570 MW gross) of generation to be connected at 138 kV to Entergy system via three 138 kV lines connecting to three generator transformers. Two combustion type generators (CT – 179.35 MW) are connected to 211 MVA, 18/138 kV transformers and one Steam Turbine driven generator (ST – 211.65 MW) is connected to one 249 MVA, 18/138 kV transformer. At the Lewis Creek 138kV substation, the 138 kV breaker arrangement and lines to the transformers will be to the east of existing substation requiring clearing of warehouse, etc.

A solution set has been created identifying the system requirements to connect the generators to Lewis Creek and the associated constraints that are required to be mitigated.

Work defined in this facility study is contingent upon completion of a portion of the Western Region Reliability Improvement 3-I Project *(Convert Jacinto - Lewis Creek to 230 kV)*. The completion date has been set to June 2012 and needs to be concurrently constructed in order to meet with PID 211 requirements.

Revision 3 of solution set is attached for reference.

The facility study has been prepared in consultation with Entergy's expertise in the areas of environmental permitting, right of way (ROW) acquisition, construction and engineering.

No write-up or details are being provided relating to ROW acquisition or environmental permitting issues since no formal assessments or detailed studies were prepared. However, the estimates included in this facility study for transmission lines and substations include input from Entergy ROW and environmental subject matter experts. Their qualified input will be refined upon approval of the project.

The facility study describes scope, estimates, and duration for engineering, construction and other details for various substations. The substations and associated work required includes:

1. Expansion of Lewis Creek 230 kV yard by adding 2 breakers (contingent upon Western Region Reliability Improvement project)
2. Expansion of Lewis Creek 138 kV substation adding 6 breakers for generator circuits and replacement of 11 breakers with 138 kV class, Independent Pole Operated (IPO), 3 cycle breakers (contingent upon Western Region Reliability Improvement project)
3. Development and construction of new 230 kV Conroe Bulk substation and demolition of existing substation (contingent on acquisition of land for development of substation)
4. Addition of 2 breakers at JeffCon substation and minor work at Grimes, and Goslin.

5. Construction of 17.5 miles of new 230 kV line between Lewis Creek and New Conroe Bulk (contingent on outage of adjacent line in the right of way enabling line construction; otherwise new ROW would be required)
6. Relocation and termination of lines from existing Conroe Bulk substation to new Conroe Bulk substation.
7. Estimates exclude work identified for (New) Caney Creek and Security substations and expected to be funded by respective owners

The target for accuracy of estimates is +/- 20%. The estimates developed are based upon the experience and expertise of Entergy transmission engineering and construction professionals. For the purposes of this study, best judgment of expertise in the field has been employed and where possible assumptions have been made and documented. Should the assumptions of availability of land for the new Conroe Bulk substation prove invalid or the inability to secure outages to construct the 17.5 miles of new 230 kV line in existing ROW, it will require a full CCN application process resulting in overall increase in cost and schedule for the entire project.

The requested in-service date is 01 July 2012. The duration of work is determined to be 32 months starting from 01 March 2009 completing by November 2011 and at a cost of $83,283,692. Please note these are 2008 dollars and do not include tax gross-up if and where applicable (generally in the range of 35%).

1.2 Scope Summary

The Solution set for PID 211 has identified the following substation and line work:

1.2.1 Lewis Creek 138 kV Substation:

Expand existing substation and north and south buses. Add three more bays (2 breaker each 138 kV, IPOs, 63 kA, 3 cycles, 3000A) with dead-end structures from nodes connecting to lines from three generator step-up transformers.

In addition, replace 11 breakers (1600, 1605, 1625, 1630, 1635, 1640, 1645, 1650, 1655, 1660, and 26225) by 138 kV, IPOs, 63 kA, 3 cycles, 3000A. Breakers 1610, 1615 and 1620 will be replaced under the Western Region Reliability Improvement project.

Also required is to change CT ratios on breaker 1665 to 1200/5.

1.2.2 Lewis Creek 230 kV expansion:

On the heels of Western Region Reliability Improvement project completion or concurrently, add two more 230 kV IPOs, 63 kA, 2 cycle, 3000A breakers completing the ring for termination of new 230 kV line to new Conroe Substation.

1.2.3 New Conroe Bulk Substation:

Develop site to add a 138/230kV yard at Conroe Bulk. Arrange 138kV bus for ultimate breaker-and-a-half scheme as identified in solution set. Arrange 230 kV

bus for ultimately 4 breaker ring bus. Install four 100/133/167 MVA 230/138kV autotransformers and transfer all transmission elements from Conroe substation leaving behind distribution elements and capacitor banks. Standard 3 pole breakers are required. Re-route 4 existing transmission lines, L-112 to Grimes, L-820 to Goslin, L-886 to Tamina, and L-587 to Lewis Creek, into the new 138/230kV yard. Provide 2 new 138kV lines with OPGW to connect the existing 138kV yard to the new 138/230kV yard.

1.2.4 Close normally open switch at JeffCon:

Close a normally open switch at JeffCon, a substation between Conair and Conroe Bulk, which ties JeffCon to the Lewis Creek-Sheawill-Ft. Worth Pipe-Crystal 138kV line.

Install a 2-breaker bus at JeffCon, which creates two 3-terminal lines (Fort Pipe-JeffCon-Crystal and Conair-JeffCon-Conroe Bulk). Relay work will be required. Replace the existing shieldwire on L-523 between JeffCon and the L-587 tap point with 2 OPGW shieldwires.

1.2.5 Construct 230 kV line between Lewis Creek and new Conroe Bulk:

Construct approximately 17.5 miles of new line carrying 901 MVA using 1590 ACSS “Lapwing” on existing ROW minimizing double circuiting as much as possible (however 230/138 kV circuits could be combined on common structures). OPGW would be used for shield wire.

1.2.6 Construct 3- 138 kV lines between Lewis Creek and Power Plant:

Construct 3-138 kV lines from Lewis Creek 138 kV new bays to dead-end structures of generator step up transformers at the Power Plant. Approximate length of each line would be 450’. Install OPGW for communication.

1.2.7 Re-route 4- 138 kV lines from existing Conroe Bulk to New Conroe Bulk

Re-route four existing lines from the existing Conroe Bulk Substation to the new 138/230kV Conroe Bulk yard. The lines that will need to be moved are L-112 to Grimes, L-820 to Goslin, L-886 to Tamina, and L-587 to Lewis Creek. Two new 138kV lines with OPGW must also be provided to connect the existing 138kV yard to the new 138/230kV yard.

1.2.8 Replace existing static shieldwire with OPGW on L-587 & L-523

Direct fiber will be installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. Another OPGW shield wire will be installed out of JeffCon to (New) Caney Creek substation.

1.2. Cost Summary

- The estimated total project cost is **$83,283,692** including 35% indirect costs**.** This cost does not include Tax Gross Up which may apply.
- The ICT has assigned $ 0 as Base Plan upgrades and $ 83,283,692 as Supplemental Upgrade based on Attachment "T" of Entergy's ICT (Independent Coordinator of Transmission) filing to the FERC.

1.3. Schedule Summary

A milestone schedule is developed assuming approval to proceed with the development of PEP/Estimates by 02 March 2009. 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. SCOPE OF WORK

3.1 Lewis Creek 138 kV Substation Expansion:

Expand existing site to the east to add 3 bays for termination of 3 lines from generator step up transformers and replace existing 11 breakers by IPO, 138 kV, 3 cycle, 3000A, 63 kA breakers. Change CT taps on breaker 1665 and Line 596 relay settings from 800/5 to 1200/5. Revise settings for all elements as required due to change in current ratings.

3.1.1 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 ft. x 160 ft. 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 SL 1201, SL 1202, SL 1204, TE 0101 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 1.2 Acres
- Removal of topsoil and disposal to within the Site area as directed by the Entergy field representative. Estimated volume 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 4000 CY.
- Stabilize existing sub-grade base to comply with the compaction requirements (95% ASTM D698). Estimated volume 4000 CY.
- Supply and install Select Fill Material and compact to 95% ASTM D698 on the Yard and Access Road. Estimated volume 8,000 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 2,000 TONS.
- Install subsurface drainage culverts. Estimated Length 300 LINEAR FT.
- Supply and apply fertilizer and seeds to disturbed areas and new sloped embankments. Estimated Area 1.0 Acre
- Install approximately 600 LINEAR FT of 7 ft high chain link fence around expanded substation property. Remove approximately 300 LINEAR FT of 7 feet chain link fence.
- Installation of temporary silt fence to minimize spread of silt/contamination during construction. Estimated Length: 1000 LINEAR FT.

Foundations:

The foundation work shall be supplied, installed and built in accordance with Entergy Standards TO 0117, TO 0123 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:

- Six (6) foundations will be installed for the new 138kV gas circuit breaker.

- Twenty four (24) foundations will be installed for the new 138kV switch racks. Each switch rack foundation has two footers.
- Six (6) foundations will be installed for the new 138kV H-frame substation dead end structures. Each dead end structure has two footers.
- Sixty three (63) foundations will be installed for the new bus supports.
- Nine (9) foundations will be installed for the new 138kV lightning arrester supports.
- Nine (9) foundations will be installed for the new 138kV CVT's supports.
- Six (6) 2" PVC conduits will be installed from each of the circuit breakers to the new cable trench. Three (3) 2" PVC conduits will be installed from each of the new CVT's junction box to the new cable trench. One (1) 2" PVC conduit will be installed from the CVT junction box to each of the appropriate CVT's.
- Install approximately 3000' of substation ground wire including pig tails to new equipment and structures.
- Approximately 2500' of new cable trench will be installed from the control house to the existing and new breakers.

3.1.2 Electrical

All equipment shall be installed in accordance with Entergy Specifications SB0701 and SL0206. All structures shall be erected and installed in accordance to Entergy Specification SL0201.

The electrical scope of work includes:

- Six (6) 138kV, 3000A, 63kA, 3 cycles IPO gas circuit breakers will be installed as per the preliminary electrical arrangement.
- Twelve (12) 138kV 3000A vertical break horizontal mount disconnect switches will be installed as per the preliminary electrical arrangement. The switches will be mounted on standard high bus switch racks.
- Three (3) H-frame dead end towers will be installed as per the preliminary electrical arrangement.
- Nine (9) CVT's will be mounted under the new H-frame substation dead ends as per the preliminary electrical arrangement. The CVT's will be mounted on standard low bus equipment pedestal.
- Nine (9) lightning arresters will be mounted under the new H-frame substation dead ends as per the preliminary electrical arrangement. The arresters will be mounted on standard low bus equipment pedestal.
- All new hard bus will be 4" SCH 80 Aluminum tubing. All new strain bus will be bundled 1590MCM Aluminum conductor.
- Twenty three (23) single phase 138kV low bus supports will be installed as per the preliminary electrical arrangement. The supports will match existing construction.

- Forty (40) single phase 138kV high bus supports will be installed as per the preliminary electrical arrangement. The supports will match existing construction.
- Eleven (11) existing 138kV 40kA breakers will be replaced with new 138kV, 3000A, 63kA, 3 cycles, IPO breakers. New breakers will be installed on existing foundations.
- Replace CT ratios on breaker 1665 from 800/5 to 1200/5.

Long Delivery Material:

Description	Quantity	Delivery period
138KV 3000A 63KA Gas Operated Circuit Breaker	17	20-22 wks
138KV 3000A Vertical Break Gang Operated Switch	12	16-18 wks
138KV Surge Arrester	9	14-16 wks
138KV Dead-end Structure	3	16-20 wks
138KV Switch Support	12	16-20 wks
138KV CVT Support	9	16-20 wks
138KV Station Post Porcelain Insulator	180	10-12 wks
161KV Suspension Polymer Insulator	9	10-12 wks
138KV Single Phase Bus Support	63	16-20 wks

Assumptions made in developing scope/estimates:

None reported

3.1.3 Relay Design

Three new double breaker bays will be installed to accept new generator input from Lewis Creek Generating station. Eleven other circuit breakers within Lewis Creek 138kV 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 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 138kV 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.
- Purchase and install one (1) battery monitoring device.
- Purchase and install two (2) D20 S card kits for new breaker and line relay alarm/indication.
- Purchase and install one (1) D20 KI-2 card kit for new breaker control.
- Fiber Optic telecommunication equipment will be needed for installation of protective relay circuits to Lewis Creek Generating station. This equipment shall include a channel bank, patch panels, splice boxes, patch cords, and connectors.
- Purchase and install one SEL 2032, one Teltone Gauntlet port switcher and mounting bracket, one Starcomm modem, one AC adapter, and one SEL 2407 satellite synchronized clock with antenna. Mount all new equipment in available space on existing 19" communication racks. It is assumed there is adequate space on existing racks for this new equipment.
- Design, purchase, and install one (1) High Voltage Metering Panel for HV applications referencing Entergy Standard #MI0301. The panel will include three (3) 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 low impedance SEL 487B bus differential relays with one relay per phase. Two Bus Differential panels will be installed on the North bus and two will be installed on the South Bus. This will allow for a bus differential primary and backup protection on each of the 138kV busses in the 138kV yard to address short stability margins and provide increased reliability.

New Double Breaker Bays for Lewis Creek Generating Plant Lines to CT #1, CT #2, & ST #1

- Purchase, design and install three (3) new Line/Breaker Control 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 using Schweitzer Engineering Lab model SEL 421 relay. The panel uses a SEL model 311L 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 three (3) 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 138kV 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, CT #2, & ST #1) will use transmission line OPGW shield wire to provide alternate paths for communication links.
- Design, purchase and install three (3) High Voltage Breaker Control panels using the SEL 351-7 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision.
- Purchase and install nine (9) metering accuracy dual winding capacitive voltage transformers (CVTs) for line and metering potential per Entergy Standard PN0201, latest revision. All CVTs to be purchased with carrier accessories for coordination and ease of construction purposes. Three CVTs will be installed on each line node with one CVT per phase.
- Purchase and install nine (9) Extended Range Current Transformers (CTs) for metering the Lewis Creek Generating lines. Three CTs will be installed on each line to Lewis Creek Generating plant with one CT per phase.
- Purchase and install three (3) metering (potential & current) junction boxes.

Existing 138kV Line 503 to Security (future 3 terminal line to Security and JeffCon)

- It is assumed that the communication circuit to Security is via digital microwave.
- Three terminal lines are not common. Care must be taken to identify this rare configuration and limit safety concerns. The “hot line indication alarm” must be utilized.
- Install the following equipment on the 138kV L-503 line:

    - One line trap
    - One line tuner
    - One single phase CVT junction box
    - One 138kV CVT

- Remove all existing relaying equipment associated with 138kV Line 503 located inside the 138kV control house. This includes the Line 503 primary relay panel and tone equipment, along with all backup relaying.
- Purchase, design and install one (1) 28” Line/Breaker Control Panel using Pulsar/Ametek TC-10B On/Off Blocking powerline carrier system application for primary relaying communication referencing Entergy standard PM1803, option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital

communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with a compatible relays and blocking carrier sets installed at Security and JeffCon Substations. Security Substation is a SHECO owned station. The SEL 311L will interface with identical relays installed at JeffCon and Security 138kV substations. A digital link with JeffCon will be made via the fiber installed on the 230kV line from Lewis Creek to Conroe and new fiber that will be installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. This panel will be used for protection and control of 138kV circuit breaker #1650.

Long Delivery Material:

Quantity	***Material Description***	****Lead Time (Weeks)***
3	HV Breaker Control Panel	14 Weeks
4	HV Line/breaker Control Panel	14 Weeks
4	Bus Differential Panel	14 Weeks
1	Stand Alone DC Panel	12 Weeks
1	Metering Panel	14 Weeks
10	230kV CCVTs	28 Weeks
9	230kV CTs	40 Weeks
1 set	Batteries	24 Weeks
1	Line Trap & Tuner set	30 Weeks

Assumptions made in developing scope/estimates:

- The present control house is of adequate size to accept all new required equipment and panels.
- The interior of the control house will be modified to provide a second battery room with proper ventilation.
- A Blocking carrier primary relay communication scheme will adequately protect a three terminal line.
- (New) Caney Creek 138kV substation will be constructed and in-service on line 587. See Western Region for project details.
- Stability margin will be achieved with single primary scheme on all two-terminal lines out of Lewis Creek.
- It is assumed that the communication circuit to Security is via digital microwave and this circuit will be used for the 311L primary #2 communication scheme.
- Three terminal lines are not common. Care must be taken to identify this rare configuration and limit safety concerns. The “hot line indication alarm” must be utilized.

3.1.4 Relay Settings and RTU configuration:

<u>Relay Settings:</u>

- Review and revise relay settings for L-596—Lewis Creek to Longmire.
- Develop new settings for four (4) bus differential panels in accordance with PM0602.

- Develop new settings for three (3) line panels protecting three new lines to Lewis Creek Generating Plant in accordance with option B-2 of PM1803.
- Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configurations for Lewis Creek-JeffCon-Security (SHECO) substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.
- Develop new settings for three (3) High Voltage Breaker Control panels in accordance with PM0501.
- Perform a thorough ground overcurrent study at Lewis Creek 138 kV substation and surrounding substations.

Relay Settings:

- Relays will be ordered according to Entergy standard part numbers and SVN numbers. Relays not standard will be upgraded to Entergy standards.
- Design will not deviate from standard.

3.1.5 Construction considerations and outage duration requirements:

If this project is approved and enters the Transmission Business's (EMCC) 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. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of any proposed foundations. Efforts will be made to utilize low profile excavation equipment as part of the installation process for any foundations that will be under, near, adjacent too, or in close proximity of energized conductors that could be determined to be a safety risk. In the instances that this is not attainable, outages will be required. Normally outages on 138 kV facilities require a 2-3 months advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules.

Upon completion of the site and foundation installations including all associated conduit and grounding installations, Steel and Electrical installations as well as Protection & Control Installations will commence. For the installation of the proposed components to terminate the Lewis Creek 138 kV modification to existing facilities and proposed new addition to the existing bay, several outages consisting of several weeks duration will be required on the affected section of the Lewis Creek 138 kV ring bus.

Upon completion of the proposed additions to the Lewis Creek 138 kV ring bus, all preliminary checkouts and commissioning components that can be made at this juncture

will be made, with the exception of the activities that must take place upon final energization.

Upon completion of the new proposed Lewis Creek 138 kV facility, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

It will require approximately four months completing this project.

SWPPP implementation, monitoring, security guard and storage are considered in the estimate.

3.1.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.2 Lewis Creek 230 kV Substation Expansion:

Add two 230 kV IPO, 2 cycle, 3000A, 63 kA breakers for termination of 230 kV line to new Conroe Bulk Substation.

3.2.1 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 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 SL 1201, SL 1202, SL 1204, TE 0101 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:

- 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 500 TONS.
- Final dress and clean up of area impacted by construction.

Foundations:

The foundation work shall be supplied, installed and built in accordance with Entergy Standards TO 0117, TO 0123 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:

- Two (2) foundations will be installed for the new 230kV gas circuit breaker.
- Twenty (20) foundations will be installed for the new 230kV switch racks. Each switch rack foundation has two footers.
- Two (2) foundations will be required for the new 230kV H-frame substation dead end structures. Dead end structure has two footers.
- Thirty (30) foundations will be installed for the new 230kV bus supports.
- Three (3) foundations will be installed for the new 230kV lightning arrester supports.
- Three (3) foundations will be installed for the new 230kV CVT supports.
- Six (6) 2” PVC conduits will be installed from each of the new circuit breaker to the existing cable trench. Three (3) 2” PVC conduits will be installed from the new CVT junction box to the existing cable trench. One (1) 2” PVC conduit will be installed from the CVT junction box to each of the appropriate CVT’s.

- Install approximately 600' of substation ground wire including pig tails to the new equipment and structures.

3.2.2 Electrical

All equipment shall be installed in accordance with Entergy Specifications SB0701 and SL0206. All structures shall be erected and installed in accordance to Entergy Specification SL0201.

The electrical scope of work includes:

- A new line bay will be installed to the north of the existing line bay creating a 3 breaker ring bus and ultimately a breaker and a half configuration. See the preliminary electrical arrangement for the proposed layout.
- Two (2) 230kV, 3000A, 63kA, 2 cycle IPO gas circuit breakers will be installed as per the preliminary electrical arrangement.
- Ten (10) 230kV 3000A vertical break horizontal mount disconnect switches will be installed as per the preliminary electrical arrangement. Two of the switches (one for future) associated with the new line terminal will be equipped with a ground switch attachment. The switches will be mounted on standard low bus switch racks to match existing construction.
- One (1) H-frame dead end tower will be installed as per the preliminary electrical arrangement.
- Three (3) CVT's will be installed as per the preliminary electrical arrangement. The CVT's will be mounted on standard low bus equipment pedestals. A CVT junction box will be mounted on the center phase CVT pedestal.
- Three (3) lightning arresters will be installed on the new 230kV transmission line. The arresters will be mounted under the new substation dead end tower as per the preliminary electrical arrangement. The lightning arresters will be mounted on standard low bus equipment pedestals.
- All new hard bus will be 4" SCH 80 Aluminum tubing. All new strain bus will be bundled 1590MCM Aluminum conductor.
- Sixteen (16) single phase low bus supports will be installed as per the preliminary electrical arrangement.
- Fourteen (14) single phase high bus supports will be installed as per the preliminary electrical arrangement.

Long Delivery Material:

Description	Quantity	Delivery period
230KV 3000A 63KA Gas Operated Circuit Breaker	2	20-22 wks
230KV 3000A Vertical Break Gang Operated Switch	10	16-18 wks
230KV Surge Arrester	3	14-16 wks
230KV Dead-end Structure	1	16-20 wks

230KV Switch Support	10	16-20 wks
230KV CVT Support	3	16-20 wks
230KV Surge Arrester Support	3	16-20 wks
230KV Station Post Porcelain Insulator	123	10-12 wks
230KV Suspension Polymer Insulator	3	10-12 wks
230KV Single Phase Bus Support	30	16-20 wks

Assumptions made in developing scope/estimates:

None reported

3.2.3 Relay Design

New 230kV Control House General Equipment

- Install one (1) fiber optic patch panel for communications with Conroe Bulk 230kV substation. Purchase and install additional fiber equipment as dictated by the Telecom group. This equipment shall include a channel bank, patch panels, splice boxes, patch cords, and connectors.
- Entergy will install ADSS fiber optic cable from the final line splice box on the line termination towers and the fiber optic termination panels in the control house. Direct fiber will be installed from Lewis Creek 230V to Conroe Bulk 230kV to provide a high speed direct communications link. Coordination with the T-line group is required to ensure that the direct fiber run to Conroe Bulk 230kV is taken into account when determining minimum clearance requirements on the transmission line.
- Design, purchase and install one (1) 24" High Voltage Breaker Control Panel using the SEL 351-7 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision.

New 230kV Substation Yard Relaying Equipment

- Purchase and install three (3) relaying accuracy dual winding capacitive voltage transformers (CVTs) for line and bus relaying potential per Entergy Standard PN0201, latest revision. All CVTs to be purchased with carrier accessories for coordination and ease of construction purposes.
- Purchase and install one (1) three phase CVT junction boxes per Entergy Standard PM2402, latest revision.

230kV/138kV Autotransformer Protection

- Modify the existing Backup Autotransformer Panel. This panel uses a Schweitzer Engineering Labs SEL 387 transformer differential relay for protection. The protected zone will wrap from the line side CTs of each

associated 230kV circuit breaker to the 138kV bushing CTs of the autotransformer.

- Modify the existing 30" Bus Differential Panel referencing Entergy standard PM0602, latest revision. This panel incorporates either a Schweitzer Engineering Lab model SEL 487B or an ERL-phase B-pro relay for current differential protection. The protected zone will wrap from the 230kV CTs of the autotransformer to the line side CTs of each associated 230kV circuit breaker.
- Any differential trip will trip the 230kV breakers and transfer trip the 138kV breakers located in the 138kV yard. Indication of which device/differential initiates the trip will be provided.

New 230kV Line to Conroe Bulk

- Purchase, design and install one (1) new Line/Breaker Control 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 using Schweitzer Engineering Lab model SEL 421 relay. The panel uses a SEL model 311L Current Differential relay via direct fiber optics for primary #2 relaying. This panel will interface with a new Line Panel installed at Conroe Bulk substation. This panel will also be used for control of the 230kv circuit breaker associated with the new 230kV line from Conroe Bulk. Option B2 will be used to take advantage of redundant communication circuits available once the 230kV line to Conroe Bulk is built.

Long Delivery Material:

Quantity	***Material Description***	****Lead Time (Weeks)***
1	HV Breaker Control Panel	14 Weeks
1	HV Line/breaker Control Panel	14 Weeks
3	230kV CCVTs	28 Weeks

Assumptions made in developing scope/estimates:

- Lewis Creek 230kV will be constructed prior to the work detailed above. Refer to Western Region PEP for Lewis Creek 230kV construction details.
- SEL 421/311L Option will be used to take advantage of redundant communication circuits available once the 230kV line to Conroe Bulk is built. Present digital communication circuits will remain in service and will be utilized for redundant communications for the 230kV line.

3.2.4 Relay Settings and RTU configuration:

Relay Settings:

- Develop new settings for one (1) High Voltage Breaker Control panel in accordance with PM0501.
- Develop new settings for one (1) Backup Autotransformer Panel using SEL 387.
- Develop new settings for one (1) Bus Differential Panel in accordance with PM0602.
- Develop new settings for one (1) line panel protecting the new 230kV line to Conroe Bulk in accordance with option B-2 of PM1803.
- Perform a thorough ground overcurrent study at Lewis Creek 230 kV substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Relays will be ordered according to Entergy standard part numbers and SVN numbers. Relays not standard will be upgraded to Entergy standards.
- Design will not deviate from standard.

3.2.5 Construction considerations and outage duration requirements:

If this project is approved and enters the Transmission Business's (EMCC) 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. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of any proposed foundations. Efforts will be made to utilize low profile excavation equipment as part of the installation process for any foundations that will be under, near, adjacent too, or in close proximity of energized conductors that could be determined to be a safety risk. In the instances that this is not attainable, outages will be required. Normally outages on 230 kV require a 3-4 months advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules.

Upon completion of the site and foundation installations including all associated conduit and grounding installations, Steel and Electrical installations as well as Protection & Control Installations will commence. For the installation of the proposed components to terminate the Lewis Creek 138 kV station and 230 kV new station, an outage consisting of few weeks duration will be required on the affected section of the Peach Creek 230kV kV station bus.

Upon completion of the proposed additions to the Lewis Creek 230 kV station, all preliminary checkouts and commissioning components that can be made at this juncture will be made, with the exception of the activities that must take place upon final energization.

Upon completion of the new proposed Lewis Creek 230 kV, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

SWPPP implementation, monitoring, security guard and storage is considered in the estimate.

It will require approximately four months completing this project.

Assumptions made in developing scope/estimates:

None reported

3.2.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.3 New Conroe Bulk Substation:

Construct new substation adjacent to existing Conroe bulk with 138 kV ultimate arrangement of breaker and a half and 4 breaker ring bus for 230 kV. Use standard breaker specification. Install 4 -Single phase 100/133/167 MVA 230/138 kV transformers with a station service and alternate feed from Distribution source. Terminate new 230 kV line from Lewis Creek. Relocate all existing elements from Conroe bulk leaving behind Distribution system.

3.3.1 Site:

The site preparation work is within existing property to be purchased 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 a new substation approximately 1000 ft. x 700 ft. with finish grade elevations to be above the established 100-year Base Flood Elevation (BFE). The substation shall be surfaced with crushed limestone rock. The site shall be built in accordance with Entergy Standards SL 1201, SL 1202, SL 1204, TE 0101 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 approximately 20 Acres
- Removal of topsoil and disposal to within the Site area as directed by the Entergy field representative. Estimated volume 17,000 CY.
- Excavation and disposal of existing soil as required to comply with the site grading and drainage design to within the Site area as directed by Entergy field representative. Estimated volume 34,000 CY.
- Stabilize existing sub-grade base to comply with the compaction requirements (95% ASTM D698). Estimated volume 34,000 CY.
- Supply and install Select Fill Material and compacted to 95% ASTM D698 on the Yard and Access Road. Estimated volume 140,000 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 31,000 TONS.
- Supply and install surfacing material (#610 or approved equal) compacted to 95% ASTM D698 for the construction of the access roads. Estimated length 6000 LINEAR FT.
- Install subsurface drainage culverts. Estimated Length 3200 LINEAR FT.
- Supply and apply fertilizer and seeds to disturbed areas and new sloped embankments. Estimated Area 5 Acres
- Install approximately 3400 LINEAR FT of 7 ft high chain link fence around expanded substation property. Installation of temporary silt fence to minimize

spread of silt/contamination during construction. Estimated Length: 4000 LINEAR FT.

Foundations:

The foundation work shall be supplied, installed and built in accordance with Entergy Standards TO 0117, TO 0123 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:

- Four (4) foundations will be installed for the new single phase auto-transformer units and the spare.
- An auto transformer oil containment pit will be installed as required.
- Two (2) foundations will be installed for the new 125' shield masts.
- One (1) foundation will be installed for the new 25' x 70' control house.
- Approximately 600' of new cable trench will be installed from the control house to the auto transformer bank and to the new gas circuit breaker.
- Six (6) 2" PVC conduits will be installed from each of the new circuit breaker to the new cable trench. Three (3) 2" PVC conduits will be installed from each of the new CVT junction boxes to the new cable trench. One (1) 2" PVC conduit will be installed from the CVT junction box to each of the appropriate CVT's. Six (6) 2" PVC conduits will be installed from the cable trench to each of the new single phase auto transformers. Two (2) 2" PVC conduits will be installed from the auto transformer installation to the oil containment pit as required.
- Install approximately 50000' of substation ground grid including pig tails to equipment and structures.
- Sixteen (16) foundations will be installed for the new yard lights.
- One (1) foundation will be installed for the demarcation box.
- Ten (10) foundations will be installed for new autotransformer box bay structure.

<u>230KV</u>

- One (1) foundation will be installed for the new 230kV gas circuit breaker.
- Four (4) foundations will be installed for the new 230kV switch racks. Each switch rack foundation has two footers.
- Two (2) foundations will be installed for the new 230kV H-frame substation dead end structures. Each dead end structure has two footers.
- Three (3) foundations will be installed for the new 230kV lightning arrester supports.
- Four (4) foundations will be installed for the new 230kV CVT supports.
- Six (6) foundations will be installed for the new 230kV single bus supports.

138kV

- Eleven (11) foundations will be installed for the new 138kV gas circuit breaker.
- Forty eight (48) foundations will be installed for the new 138kV switch racks. Each switch rack foundation has two footers.
- Fourteen (14) foundations will be required for the new 138kV H-frame substation dead end structures. Each dead end structure has two footers.
- Twelve (12) foundations will be installed for the new 138kV lightning arrester supports.
- Twenty one (21) foundations will be installed for the new 138kV CVT supports.
- Twenty four (24) foundations will be installed for the new 138kV single bus supports.
- Thirty two (32) foundations will be installed for the new three phase bus supports. Each three phase bus support has two footers.
- One (1) foundation will be required for the new 138kV SSVT supports

3.3.2 Electrical

All equipment shall be installed in accordance with Entergy Specifications SB0701 and SL0206. All structures shall be erected and installed in accordance to Entergy Specification SL0201.

The electrical scope of work includes:

- Four (4) single phase 100/133/167 MVA autotransformers will be installed in the new yard. Additionally, fire walls will be required between each unit and on the outside of the entire bank.
- Two (2) 125' shield masts will be installed for lightning protection. A shielding study will be performed during detailed design to determine specific shield mast requirement.
- A new 25' x 70' prefabricated control house will be installed as per the preliminary electrical arrangement.
- All new hard bus will be 4" SCH 80 Aluminum tubing. All new strain bus will be bundled 1590MCM Aluminum conductor.
- Sixteen (16) yard lights will be installed for lightning in the new yard.

230KV

- The new 230kV will be designed to be expandable to a 4 breaker ring bus. Only one breaker will be installed between the new 230kV line and the auto transformer bank. Please see the preliminary electrical arrangement for the proposed station layout.
- One (1) 230kV 3000A 40kA gas circuit breaker will be installed as per the preliminary electrical arrangement.

- Two (2) 230kV 3000A vertical break horizontal mount disconnect switches will be installed as per the preliminary electrical arrangement. The switches will be mounted on standard switch racks.
- Two (2) H-frame dead end towers will be installed as per the preliminary electrical arrangement.
- Four (4) CVT's will be installed as per the preliminary electrical arrangement. The CVT's will be mounted on standard equipment pedestals. A CVT junction box will be mounted on the center phase CVT pedestal.
- Three (3) lightning arresters will be installed on the new 230kV transmission line. The arresters will be mounted under the new substation dead end tower as per the preliminary electrical arrangement. The lightning arresters will be mounted on standard equipment pedestals.
- Six (6) single phase bus supports will be installed as per the preliminary electrical arrangement.

138KV

- The new 138kV will be designed to be a breaker and a half scheme. Please see the preliminary electrical arrangement for the proposed station layout.
- Eleven (11) 138kV 3000A 40kA gas circuit breakers will be installed as per the preliminary electrical arrangement.
- Twenty four (24) 138kV 3000A vertical break horizontal mount disconnect switches will be installed as per the preliminary electrical arrangement. Five of the switches (one for future) associated with the new line terminal will be equipped with a ground switch attachment. The switches will be mounted on standard switch racks.
- Eight (8) H-frame dead end towers will be installed as per the preliminary electrical arrangement.
- Twenty seven (27) CVT's will be installed as per the preliminary electrical arrangement. The CVT's will be mounted on standard equipment pedestals. A CVT junction box will be mounted on the center phase CVT pedestal.
- Twelve (12) lightning arresters will be installed on the new 138kV transmission lines. The arresters will be mounted under the new substation dead end tower as per the preliminary electrical arrangement. The lightning arresters will be mounted on standard equipment pedestals.
- Twenty four (24) single phase bus supports will be installed as per the preliminary electrical arrangement.
- Sixteen (16) three phase bus supports will be installed as per the preliminary electrical arrangement.
- One (1) line trap will be installed on the B phase of Tamina and JeffCon/ (New) Caney Creek line.
- The station service will be provided as backup from a distribution feeder at the existing Conroe Bulk and the primary supply will be provided by a 138kV 100kA station service voltage transformer. The SSVT will be mounted on a

single phase structure and electrically connected to the 138kV autotransformer bus.

Assumptions made in developing scope/estimates:
None reported

Long Delivery Material:

Description	Quantity	Delivery period
Single Phase 100/133/167MVA Autotransformer 230/138KV	4	24-26 Month
SSVT 138 kV/ 120-240V	1	38-40 weeks
230KV 3000A 63KA Gas Operated Circuit Breaker	1	20-22 wks
230KV 3000A Vertical Break Gang Operated Switch	2	16-18 wks
230KV Surge Arrester	3	14-16 wks
138KV 3000A 40KA Gas Operated Circuit Breaker	11	20-22 wks
138KV 3000A Vertical Break Gang Operated Switch	24	16-18 wks
138KV Surge Arrester	15	14-16 wks
Single Phase Autotransformer Bus Support/Firewall Support Structure	10	16-20 wks
230KV Dead-end Structure	2	16-20 wks
230KV Single Phase Bus Support	6	16-20 wks
230KV Switch Support	2	16-20 wks
230KV CVT Support	4	16-20 wks
230KV Surge Arrester Support	3	16-20 wks
138KV Single Phase Bus Support	24	16-20 wks
138KV Three Phase Bus Support	16	16-20 wks
138KV Switch Support	24	16-20 wks
138KV CVT Support	21	16-20 wks
138KV Surge Arrester Support	12	16-20 wks
138KV Dead-end Structure	7	16-20 wks
Shield/Lightning Mast Structure	2	16-20 wks
230KV Station Post Porcelain Insulator	38	10-12 wks
230KV Suspension Polymer Insulator	17	10-12 wks
138KV Station Post Porcelain Insulator	320	10-12 wks
138KV Suspension Polymer Insulator	54	10-12 wks
25ft X 70ft Site Erected Control House	1	24-28 wks
138kV 100KA SSVT	1	38-40wks

3.3.3 Relay Design

New 138/230kV Control House General Equipment

- One new control house will be required for this project. Consult with Asset Management to ensure Panel Layout is in the best ergonomic configuration. This control house will accommodate all new 138kV and 230kV relaying and controls.
- Size, purchase and install one (1) 125VDC Lead Acid Battery set including 2 step rack rated for a seismic zone 1, per Entergy Standard PM0203, latest revision. It is estimated that a 350Ah set will be required.
- 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 and install one (1) 400A, 240V AC switching panel (flip flop).
- Purchase, design and install one (1) stand alone AC panel per Entergy Standard PM0101, latest revision.
- Purchase, design and install one (1) stand alone DC panel per Entergy Standard PM0101, latest revision.
- Purchase and install one (1) battery monitoring device.
- Size, purchase and install one (1) GE Harris D20 Remote Terminal Unit per Entergy Standard PM300200. The RTU is to be installed inside a cabinet with Weidmeuller terminal blocks for analog and status points. It is estimated that Entergy configuration number 1A/6S/1K/4KI/ID/125/ID will be required.
- Telecommunications equipment will be needed for installation of one (1) TOC data circuit and one (1) POTS voice circuit. Install one (1) channel bank configured as dictated by Telecom group.
- Purchase and install one 19” Communications Rack containing an SEL 2032, one Teltone Gauntlet port switcher and mounting bracket, one SEL 2407 satellite clock, one Starcomm modem model number 240-0199 and one AC adapter.
- Install one (1) fiber optic patch panel for communications with Lewis Creek 230kV substation. Purchase and install additional fiber equipment as dictated by the Telecom group needed to interface with fiber optic cables and relaying circuits.
- Install one (1) fiber optic patch panel for communications with JeffCon and (New) Caney Creek Substation. Purchase and install additional fiber equipment as dictated by the Telecom group needed to interface with fiber optic cables and relaying circuits.
- Install two (2) fiber optic patch panels for communications with the old Conroe Bulk 138kV substation. Each line to old Conroe Bulk 138kV yard will use transmission line OPGW shield wire to provide alternate paths for

communication links. 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 box on the line termination towers and the fiber optic termination panels in the control house. Direct fiber will be installed from Lewis Creek 230V to Conroe Bulk 230kV to provide a high speed direct communications link. Coordination with the T-line group is required to ensure that the direct fiber run to Lewis Creek 230kV is taken into account when determining minimum clearance requirements on the transmission line.
- Design, purchase and install five (5) 24" High Voltage Breaker Control Panels using the SEL 351-7 relay for all breaker protection and control functions per Entergy Standard PM0501, latest revision.
- Design, purchase, and install two (2) Bus Differential panels referencing Entergy Standard #PM0602. This panel incorporates either a Schweitzer Engineering Lab model SEL 487B or an ERL-phase B-pro relay for current differential protection. Consult with Asset Maintenance for relay selection. One bus differential panel will be installed on the North 138kV bus and one bus differential panel will be installed on the 138kV South Bus.

New 138/230kV Substation Yard Relaying Equipment

- Purchase and install thirty-one (31) relaying accuracy dual winding capacitive voltage transformers (CVTs) for line and bus relaying potential per Entergy Standard PN0201, latest revision. All CVTs to be purchased with carrier accessories for coordination and ease of construction purposes.
- Purchase and install eight (8) three phase CVT junction boxes per Entergy Standard PM2402, latest revision.
- Purchase and install one (1) single phase CVT junction box per Entergy Standard.
- Purchase and install two (2) bus potential junction boxes per Entergy Standard.
- Purchase and install four (4) bus potential distribution boxes box per Entergy Standard within the control house for supply of X and Y winding bus potential to all panels.

230kV/138kV Autotransformer Protection

- Purchase, design and install one (1) Primary Autotransformer Panel using Porter Substation in The Woodlands, TX, as a go-by. This panel uses an Nxtphase T-Pro 8700 transformer differential relay for protection. The protected zone wraps from the 230kV CTs of the transformer bushings to the 138kV CTs of the transformer bushings.
- Purchase, design and install one (1) Backup Autotransformer Panel using Porter Substation in The Woodlands, TX, as a go-by. This panel uses a Schweitzer Engineering Labs SEL 387 transformer differential relay for

protection. The protected zone wraps from the line side CTs of the 230kV circuit breaker to the 138kV bushing CTs of the 138kV breakers.

- Purchase, design and install one (1) 30" Bus Differential Panel referencing Entergy standard PM0602, latest revision. This panel incorporates either a Schweitzer Engineering Lab model SEL 487B or an ERL-phase B-pro relay for current differential protection. Consult with Asset Maintenance for relay selection. The protected zone will wrap from the 230kV CTs of the autotransformer to the line side CTs of the 230kV circuit breaker.
- Purchase, design and install one (1) 30" Bus Differential Panel referencing Entergy standard PM0602, latest revision. This panel incorporates either a Schweitzer Engineering Lab model SEL 487B or an ERL-phase B-pro relay for current differential protection. Consult with Asset Maintenance for relay selection. The protected zone will wrap from the 138kV CTs of the autotransformer to the CTs of the 138kV circuit breakers.
- Any differential trip will trip the new 230kV breaker and the 138kV breakers. Indication of which device/differential initiates the trip will be provided.
- This scope assumes that the tertiary will be buried within the autotransformer and not brought out. No protection is provided for the tertiary. Significant additions to the scope and estimate will be required if the tertiary is brought out.

New 230kV Line to Lewis Creek

- Purchase, design and install one (1) new Line/Breaker Control 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 using Schweitzer Engineering Lab model SEL 421 relay. The panel uses a SEL model 311L Current Differential relay via direct fiber optics for primary #2 relaying. This panel will interface with a new Line Panel installed at Lewis Creek 230kV substation. This panel will also be used for control of the 230kv circuit breaker associated with the new 230kV line from Lewis Creek. Option B2 will be used to take advantage of redundant communication circuits available once the 230kV line to Lewis Creek 230kV is built.

Existing 138kV Line to Grimes 138kV & 138kV Line to Goslin

- Purchase, design and install two (2) Line /Breaker control panels using SEL Mirrored Bits via digital communication links for primary relaying communication referencing Entergy standard PM1803, option B, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and an SEL model 311C for backup step distance relaying. These panels will also be used for control of the new 138kv circuit breakers associated with the Grimes & Goslin 138kV lines. These panels will interface with retrofit relays installed at Grimes and Goslin substations.

- Remove all existing relaying equipment associated with 138kV lines to Grimes & Goslin located inside the old 138kV control house. This includes the primary relay panels, tone equipment, and all backup relaying.

Existing 138kV Line to Tamina

- Install the following equipment on the 138kV L-886 line:

  - One line trap
  - One line tuner
  - One single phase CVT junction box
  - One 138kV CVT mention below installed on line side of trap

- Remove all existing relaying equipment associated with 138kV Line 886 located inside the old 138kV control house. This includes the Line 886 primary relay panel, tone equipment, and all backup relaying.
- Purchase, design and install one (1) 30" Line/Breaker Control Panel using RFL model 9780 FSK powerline carrier system for primary relaying communication referencing Entergy standard PM1803, option K, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions, and an SEL model 311C for backup step distance relaying. This panel will also be used for control of the new 138kV circuit breaker associated with the Tamina 138kV line. The SEL 421 will interface with a SEL 421 relay and RFL 6780 unblocking carrier set installed at Tamina substation.
- It is assumed that no changes will be required at Tamina substation.

Existing 138kV Line 587 to Lewis Creek (future feed to (New) Caney Creek (SHECO) & future 3 terminal line to (New) Caney Creek (SHECO) and JeffCon)

- Three terminal lines are not common. Care must be taken to identify this rare configuration and limit safety concerns. The "hot line indication alarm" must be utilized.
- Install the following equipment on the 138kV L-587 line:

  - One line trap
  - One line tuner
  - One single phase CVT junction box
  - One 138kV CVT mentioned above installed on line side of trap

- Remove all existing relaying equipment associated with 138kV Line 587 located inside the old 138kV control house. This includes the Line 587 primary relay panel and tone equipment, along with all backup relaying.
- Purchase, design and install one (1) 30" Line/Breaker Control Panel using Pulsar/Ametek TC-10B On/Off Blocking powerline carrier system application for primary relaying communication referencing Entergy standard PM1803,

option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with compatible relays and blocking carrier sets installed at (New) Caney Creek and JeffCon Substations. (New) Caney Creek Substation is a SHECO owned station. The SEL 311L will interface with identical relays installed at JeffCon and (New) Caney Creek 138kV substations. A digital link with JeffCon will be made via new fiber installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. This panel will also be used for protection and control of the new 138kV circuit breaker associated with line 587.

138kV lines from old Conroe Bulk 138kV to new Conroe Bulk 138/230kV

- Purchase, design and install two (2) new Line/Breaker Control 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 using Schweitzer Engineering Lab model SEL 421 relay. The panel uses a SEL model 311L Current Differential relay via direct fiber optics for primary #2 relaying. Each panel will interface with an identical new panel installed at old Conroe Bulk 138kV substation. The panels will also be used to control the new 138kV breakers associated with the tie lines to old Conroe Bulk 138kV.

Long Delivery Material:

Quantity	***Material Description***	****Lead Time (Weeks)***
5	HV Breaker Control Panel	14 Weeks
7	HV Line/breaker Control Panel	14 Weeks
4	Bus Differential Panel	14 Weeks
2	AutoXfmr Differential Panel	14 Weeks
1	Stand Alone DC Panel	12 Weeks
1	Stand Alone AC Panel	12 Weeks
4	230kV CCVTs	28 Weeks
27	138kV CCVTs	28 Weeks
1 set	Batteries	24 Weeks
1	RTU	12 Weeks

Assumptions made in developing scope/estimates:

- OPGW Fiber optic cable will be used on the entire length of the new 230kV line from Lewis Creek to Conroe Bulk.

- OPGW Fiber optic cable will be installed on L 587 and run on the T-line tap to JeffCon. It will then be installed on the line from JeffCon to (New) Caney Creek Substation.
- The SEL 421 at Conroe Bulk will interface with a SEL 421 relay and RFL 6780 unblocking carrier set installed at Tamina substation. It is assumed that no changes will be required at Tamina substation.
- This scope assumes that the tertiary will be buried within the autotransformer and not brought out. No protection is provided for the tertiary. Significant additions to the scope and estimate will be required if the tertiary is brought out.
- A Blocking carrier primary relay communication scheme will adequately protect a three terminal line.
- SEL 421/311L Option will be used to take advantage of redundant communication circuits available once the 230kV line to Lewis Creek is built. Present digital communication circuits will remain in service and will be utilized for redundant communications for the 230kV line.
- Communication from Conroe to Goslin is via direct fiber. Communication from Conroe to Grimes is via a combination of digital spread spectrum and direct fiber.

3.3.4 Relay Settings and RTU configuration:

Relay Settings:

- Develop new settings for five (5) High Voltage Breaker Control panels in accordance with PM0501.
- Develop new settings for two (2) bus differential panels in accordance with PM0602 for the North and South busses.
- Develop new settings for one (1) Primary Autotransformer Panel and one (1) Backup Autotransformer Panel using Porter Substation as a go-by.
- Develop new settings for one (1) bus differential panel in accordance with PM0602. Zone of protection will wrap from the 230 kV CT's of autotransformer to the line side CT's of the 230kV circuit breaker.
- Develop new settings for one (1) bus differential panel in accordance with PM0602. Zone of protection will wrap from the 138 kV CT's of autotransformer to the line side CT's of the 138 kV circuit breaker.
- Develop new settings for one (1) Line/Breaker Control Panel protecting the new 230kV line to Lewis Creek in accordance with option B-2 of PM1803.
- Develop new settings for one (1) Line/Breaker Control Panel protecting the 138 kV line to Tamina substation in accordance with option K of PM1803.
- Review settings at Tamina substation for the New Conroe Bulk line.
- Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configuration for Conroe- (New) Caney Creek (SHECO)-JeffCon substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.
- Develop new settings for two (2) Line/Breaker Control Panels protecting the lines to Old Conroe Bulk 138 kV substation in accordance with option B-2 of PM1803.
- Perform a thorough ground overcurrent study at New Conroe substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Relays will be ordered according to Entergy standard part numbers and SVN numbers. Relays not standard will be upgraded to Entergy standards.
- Three terminal design will deviate from standard; all other designs will not deviate from standard.
- Settings at Tamina substation will need to be reviewed.

3.3.5 Construction considerations and outage duration requirements:

If this project is approved and enters the Transmission Business's (EMCC) 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. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of any proposed foundations. Efforts will be made to utilize low profile excavation equipment as part of the installation process for any foundations that will be under, near, adjacent too, or in close proximity of energized conductors that could be determined to be a safety risk. In the instances that this is not attainable, outages will be required. Normally outages on 230 kV facilities require a 3-4 months advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules.

Upon completion of the site and foundation installations including all associated conduit and grounding installations, Steel and Electrical installations as well as Protection & Control Installations will commence. For the installation of the proposed components to terminate the new 230 kV substation and several 138 kV T-Lines, several outages consisting of few days to week long duration will be required on the affected section of the Conroe bulk 138 kV Ring Bus.

Upon completion of the proposed additions to the Conroe Bulk 230 kV and 138 kVRing Bus, all preliminary checkouts and commissioning components that can be made at this juncture will be made, with the exception of the activities that must take place upon final energization.

Preferably, if the final design will allow, the new proposed Conroe 230kV T-Line could be terminated into the newly established portion of the node with a point of isolation to allow the Lewis Creek bus to be closed. If possible, the proper temporary Protection and Control Settings may be installed to facilitate this action as an interim measure.

Upon completion of the new proposed Conroe Bulk 230 kV station, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

SWPPP implementation, monitoring, security guard and storage are considered in the estimate.

It will require approximately five months completing this project.

Assumptions made in developing scope/estimates:

None reported

3.3.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.4 Existing Conroe Bulk Substation:

Relocate existing lines to new substation leaving behind only Distribution equipment.

Site:
N/A

Foundations:

The foundation work shall be supplied, installed, and built in accordance with Entergy Standards TO 0117, TO 0123 and design drawings.

The foundation scope of work includes:

- One (1) foundation will be installed for the 138kV CVT support.

3.4.1 Electrical

All equipment shall be installed in accordance with Entergy Specifications SB0701 and SL0206.

The electrical scope of work includes:

- Four (4) existing 138kV lines will be rerouted to the new 230/138kV yard. Two new 138kV lines from the new yard will be terminated onto the existing Plantation/Tamina and Grimes dead end structure at the existing Conroe Bulk substation for distribution equipment.
- One (1) existing 138kV CVT and support structure from the Goslin lines will be relocated to one of the new 138kV line.
- Two (2) existing breakers (#26230 & #6385) and associated equipment will be removed and transported to the warehouse for storage.
- One (1) existing line trap and one (1) existing bushing potential device from the existing Plantation/Tamina line will be removed and transported to the warehouse for storage.

Assumptions made in developing scope/estimates:

3.4.2 Relay Design

Existing 138kV Control House Modification

- The existing 138kV control house will be left in place. All distribution relay equipment will be left as-is in place. Transformer differential relay equipment

associated with transformers #1, #2, #3, & #4 will be left in place. Capacitor bank relaying associated with capacitor bank #1 and #2 will be left in place.

- Bus #6 using CA-16 percentage differential relays will be modified to include transformer #2, transformer #4, cap bank #1, bus tie breaker #26260, and 138kV line feed from the new 138kV yard. The 138kV line feed will tap bus #6 through one existing breaker 6385 or 6390. The other breaker and line tapped on bus #6 will be removed.
- Bus #5 using CA-16 percentage differential relays will be modified to include transformer #1, transformer #3, cap bank #2, bus tie breaker # 6380, and 138kV line feed from the new 138kV yard. The 138kV line feed will tap bus #5 through one existing breaker 26230 or 16250. The other breaker and line tapped on bus #5 will be removed.
- Bus #7 will be left in place to continue loop service to all transformers at Conroe Bulk 138kV substation.
- Station communications requires upgrade of the existing SEL 2030 to SEL 2032, replacement of the Teltone port switcher to the Gauntlet model, and installation of one SEL 2407 satellite synchronized clock.
- Install two (2) fiber optic patch panels for communications with the new Conroe Bulk 138/230kV substation. Purchase and install additional fiber equipment as dictated by the Telecom group needed to interface with fiber optic cables and relaying circuits. Fiber Optic telecommunication equipment will be needed for installation of protective relay circuits to the new 138/230kV Conroe Bulk substation. This equipment shall include a channel bank, patch panels, splice boxes, patch cords, and connectors.
- Entergy will install ADSS fiber optic cable from the final line splice box on the line termination towers and the fiber optic termination panels in the control house. Direct fiber will be installed from old Conroe Bulk 138kV to new Conroe Bulk 138/230kV to provide a high speed direct communications link. Coordination with the T-line group is required to ensure that the direct fiber run to Conroe Bulk 138/230kV is taken into account when determining minimum clearance requirements on the transmission line including circuit requirements for new Conroe Substation.
- Purchase, design and install two (2) new Line/Breaker Control 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 using Schweitzer Engineering Lab model SEL 421 relay. The panel uses a SEL model 311L Current Differential relay via direct fiber optics for primary #2 relaying. Each panel will interface with an identical new panel installed at new Conroe Bulk 138/230kV substation. The panels will also be used to control the existing 138kV breakers selected to tie old Conroe Bulk 138kV to new Conroe Bulk 138/230kV. Also required will be single phase sync potential on the lines to new Conroe Bulk 138/230kV. Breakers with single phase CVTs already in place on the line side include breaker 26230 and breaker 6390.

Long Delivery Material:

Quantity	***Material Description***	****Lead Time (Weeks)***
2	HV Line/breaker Control Panel	14 Weeks

Assumptions made in developing scope/estimates:

- The existing 138kV control house will be left in place. All distribution relay equipment will be left as-is in place. Transformer differential relay equipment associated with transformers #1, #2, #3, & #4 will be left in place. Capacitor bank relaying associated with capacitor bank #1 and #2 will be left in place.
- There is existing capacity on Telecom equipment within old Conroe Bulk substation for new communication equipment installation.
- Transmission line design will have input and help select the best and most cost effective terminals for tying Conroe Bulk 138kV substation to New Conroe Bulk 138/230kV substation.

3.4.3 Relay settings and RTU work

Relay Settings:

- Revise Bus #6 differential relay settings.
- Revise Bus #5 differential relay settings.
- Develop new settings for two (2) Line/Breaker Control Panels protecting the lines to New Conroe Bulk 138 kV substation in accordance with option B-2 of PM1803.
- Perform a thorough ground overcurrent study at Existing Conroe substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Relays will be ordered according to Entergy standard part numbers and SVN numbers. Relays not standard will be upgraded to Entergy standards.
- Existing relays panels for the bus differentials will be left as is. New panel designs will not deviate from standard.

3.4.4 Construction considerations and outage duration requirements:

If this project is approved and enters the Transmission Business's (EMCC) 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. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of any proposed foundations. Efforts will be made to utilize low profile excavation equipment as part of the installation process for any foundations that will be under, near, adjacent too, or in close proximity of energized conductors that could be determined to be a safety risk. In the instances that this is not attainable, outages will be required. Normally outages on 138 kV facilities require 2-3 months advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules.

Upon completion of the site and foundation installations including all associated conduit and grounding installations, Steel and Electrical installations as well as Protection & Control Installations will commence. For the installation of the proposed components to terminate the 138 kV T-Lines, several outages consisting of few days to week long duration will be required on the affected section of the Conroe bulk 138 kV Ring Bus.

Upon completion of the proposed additions to the Conroe Bulk 138 kV ring Bus, all preliminary checkouts and commissioning components that can be made at this juncture will be made, with the exception of the activities that must take place upon final energization.

Preferably, if the final design will allow, the new proposed Conroe 230kV T-Line could be terminated into the newly established portion of the node with a point of isolation to allow the Lewis Creek bus to be closed. If possible, the proper temporary Protection and Control Settings may be installed to facilitate this action as an interim measure.

Upon completion of the new proposed Conroe Bulk 230 kV station, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

It will require approximately three months to complete this project.

3.5 JeffCon Substation:

Install 2 breaker bus at JeffCon which creates two 3-terminal lines (Fort Worth Pipe-JeffCon-Crystal and Conair-JeffCon-Conroe Bulk). Relay work will be required.

The two 3-terminal lines will be defined by their breaker to breaker segments. One 3-terminal line will be (New) Caney Creek-JeffCon-Conroe Bulk 138/230kV. The second 3-terminal line will be Lewis Creek-JeffCon-Security. (New) Caney Creek and Security are SHECO owned stations.

3.5.1 Site:

The site preparation work (minimal) 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 to match the existing grade elevations of the substation. The finished grade shall be surfaced with crushed limestone rock.

The site scope of work includes:

- 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 50 TONS.
- Final dress and clean up of area impacted by construction.

Foundations:

The foundation work shall be supplied, installed and built in accordance with Entergy Standards TO0117, TO0123 and design drawings.

The foundation scope of work includes:

- Two (2) foundations will be installed for the new 138kV gas circuit breakers.
- Five (5) foundations will be installed for the new 138kV CVT's.
- Two (2) foundations will be installed for the new line traps.
- One (1) foundation will be installed for the new control house.
- Six (6) 2" PVC conduits will be installed from each of the new circuit breaker to the new pull box and routed to the new control house. Three (3) 2" PVC conduits will be installed from the new CVT junction box to the pull box and routed to the new control house. One (1) 2" PVC conduit will be installed from the CVT junction box to each of the appropriate CVT's.
- Install approximately 400' of substation ground wire including pig tails to the new equipment and structures.

3.5.2 Electrical

All equipment shall be installed in accordance with Entergy Specifications SB0701 and SL0206. All structures shall be erected and installed in accordance to Entergy Specification SL0201.

The electrical scope of work includes:

- Two (2) 138kV disconnect switches equipped with vacuum interrupters, two (2) motor operators, two (2) 138kV PT's with structures and battery enclosure will be removed and transported to warehouse for storage.
- Two (2) 138kV, 3000A, 40kA gas circuit breakers will be installed underneath the standard GSU box structures.
- Four (4) 138kV 2000A vertical break vertical mount disconnect switches will be installed on standard GSU box structures.
- Five (5) CVT's will be installed as per preliminary one line. The CVT's will be mounted on standard low bus equipment pedestals. A CVT junction box will be mounted on the center phase CVT pedestal.
- One (1) 16'x24' control house will be installed in the southeast corner of the substation yard.
- All new strain bus will be single 750MCM Cu. conductor (4/0 Cu. conductor for CVT jumpers).

Assumptions made in developing scope/estimates:

None reported

Long Delivery Material:

Description	Quantity	Delivery period
138KV 3000A 40KA Gas Operated Circuit Breaker	2	20-22 wks
138KV 2000A Vertical Break Gang Operated Switch	4	16-18 wks
138KV Single Phase Bus Support	7	10-12 wks
16ft X 24ft Control House	1	24-28 wks

3.5.3 Relay Design

New 138kV Control House General Equipment

- One new control house will be required for this project. Consult with Asset Maintenance to ensure Panel Layout is in the best ergonomic configuration. This control house will accommodate all new 138kV relaying and controls.

- Size, purchase and install one (1) 125VDC Lead Acid Battery set including 2 step rack rated for a seismic zone 1, per Entergy Standard PM0203, latest revision. It is estimated that a 200Ah set will be required.
- Size, purchase and install one (1) 130V battery charger. Reference Entergy Standard PM0302, latest revision, for sizing guidelines. It is estimated that a 25A 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 and install one (1) battery monitoring device.
- Size, purchase and install one (1) GE Harris D20 Remote Terminal Unit per Entergy Standard PM300200. The RTU is to be installed inside a cabinet with Weidmeuller terminal blocks for analog and status points.
- Purchase and install one 19" Communications Rack containing an SEL 2032, one Teltone Gauntlet port switcher and mounting bracket, one SEL 2407 satellite clock, one Starcomm modem model number 240-0199 and one AC adapter.
- Design, purchase, and install one (1) Bus Differential panels referencing Entergy Standard #PM0602. This panel incorporates either a Schweitzer Engineering Lab model SEL 487B or an ERL-phase B-pro relay for current differential protection. Consult with Asset Maintenance for relay selection.
- A new communications circuit will be required. Fiber Optic telecommunication equipment will be needed for installation of protective relay and communications circuits to JeffCon substation. This equipment shall include a channel bank, patch panels, splice boxes, patch cords, and connectors.

New 138kV Substation Yard Relaying Equipment

- Purchase and install five (5) relaying accuracy dual winding capacitive voltage transformers (CVTs) for line and bus relaying potential per Entergy Standard PN0201, latest revision. All CVTs to be purchased with carrier accessories for coordination and ease of construction purposes.
- Purchase and install two (2) single phase CVT junction box per Entergy Standard.
- Purchase and install one (1) bus potential junction boxes per Entergy Standard.
- Purchase and install one (1) bus potential distribution boxes box per Entergy Standard within the control house for supply of bus potential to all panels.
- Purchase and install one (1) station service AC panel and safety disconnect.
- Transformer #1 is a fused transformer without bushing mounted CTs. In order to provide bus differential protection, one set of slipover CTs will be required for the high side bushings of each transformer. In addition, mounting bracket assemblies will be provided for each CT in order to provide access to the test points on the transformer bushings. Close co-ordination with the substation design group will be required to size the CTs correctly.

Existing 138kV Line 587/523 to New Conroe Bulk (future feed to (New) Caney Creek (SHECO) & future 3 terminal line to (New) Caney Creek (SHECO) and New Conroe Bulk)

- Three terminal lines are not common. Care must be taken to identify this rare configuration and limit safety concerns. The "hot line indication alarm" must be utilized.
- Install the following equipment on the 138kV L-583/523 line:
  - One line trap
  - One line tuner
  - One single phase CVT junction box
  - One 138kV CVT mention above installed on line side of trap

- Purchase, design and install one (1) 30" Line/Breaker Control Panel using Pulsar/Ametek TC-10B On/Off Blocking powerline carrier system application for primary relaying communication referencing Entergy standard PM1803, option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with compatible relays and blocking carrier sets installed at (New) Caney Creek and New Conroe Bulk Substations. (New) Caney Creek Substation is a SHECO owned station. The SEL 311L will interface with identical relays installed at (New) Caney Creek and Conroe Bulk 138/230kV substations. Direct fiber will be installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. Another OPGW shield wire will be installed out of JeffCon to (New) Caney Creek Substation. This panel will also be used for protection and control of the new 138kV circuit breaker associated with line 587/523.

Existing 138kV Line 555/503 to Lewis Creek & future 3 terminal line to Security (SHECO) and Lewis Creek)

- Three terminal lines are not common. Care must be taken to identify this rare configuration and limit safety concerns. The "hot line indication alarm" must be utilized.
- Install the following equipment on the 138kV L-555/503 line:
  - One line trap
  - One line tuner
  - One single phase CVT junction box
  - One 138kV CVT mention above installed on line side of trap

- Purchase, design and install one (1) 30" Line/Breaker Control Panel using Pulsar/Ametek TC-10B On/Off Blocking powerline carrier system application

for primary relaying communication referencing Entergy standard PM1803, option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with compatible relays and blocking carrier sets installed at Security and Lewis Creek Substations. Security Substation is a SHECO owned station. The SEL 311L will interface with identical relays installed at Security and Lewis Creek 138kV substations. A digital link with Lewis Creek will be made via new fiber installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. Conroe Bulk and Lewis Creek will be linked together via OPGW shield installed on the new 230kV line. This panel will also be used for protection and control of the new 138kV circuit breaker associated with line 555/503.

- Three terminal lines are very difficult to protect. Depending on the location of the line tap, 2nd and 3rd zone backup protection must be compromised. Therefore, dual primary relaying protection using one Directional Comparison Blocking scheme and one Current Differential Scheme will be required for protection of these new line configurations.

Note: Required material with indicated lead times:

Quantity (Each)	Material Description	Lead Time (weeks)
	JeffCon Substation Relay Equipment	
2	Blocking & 311L current diff line/breaker panels	14
5	138kV Capacitive Voltage Transformer w/ carrier equipment	28
1	Stand Alone split AC/DC Panel	12
1	GE Harris D20 RTU	12
1	Bus Differential Panel	14
1	Battery set, charger, and DC switch panel	16

Assumptions made in developing scope/estimates:

None reported

3.5.4 Relay Settings and RTU configuration:

Relay Settings:

- Develop new settings for one (1) bus differential panels in accordance with PM0602.
- L-587/523—Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configuration for Conroe- (New) Caney Creek

(SHECO)-JeffCon substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.

- L-555/503—Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configuration for Conroe- (New) Caney Creek (SHECO)-JeffCon substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.
- Perform a thorough ground overcurrent study at JeffCon substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Relays will be ordered according to Entergy standard part numbers and SVN numbers. Relays not standard will be upgraded to Entergy standards.
- Bus differential design will not deviate from standard.
- Three terminal design will deviate from standard.

3.5.5 Construction considerations and outage duration requirements:

If this project is approved and enters the Transmission Business's (EMCC) 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. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of any proposed foundations. Efforts will be made to utilize low profile excavation equipment as part of the installation process for any foundations that will be under, near, adjacent too, or in close proximity of energized conductors that could be determined to be a safety risk. In the instances that this is not attainable, outages will be required. Normally outages on 138 kV facilities require a 2-3 months advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules.

Upon completion of the site and foundation installations including all associated conduit and grounding installations, Steel and Electrical installations as well as Protection & Control Installations will commence. For the installation of the proposed components at JeffCon 138 kV station, an outages consisting of several days duration will be required on the affected section of the JeffCon station 138 kV bus. These outages will require the section of the line L-555. L-503 and L-523, L-587 Bus.

Upon completion of the proposed additions to the JeffCon modification bus, all preliminary checkouts and commissioning components that can be made at this juncture will be made, with the exception of the activities that must take place upon final energization.

Upon completion of the new proposed JeffCon 138 kV bus, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

It will require approximately three months completing this project.

Assumptions made in developing scope/estimates:

None reported

3.4.5 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.6 (New) Caney Creek (SHECO) Substation:

The solution set calls for closure of the normally open switch at JeffCon, a substation between Lewis Creek and Conroe Bulk, which ties JeffCon to the Lewis Creek-Security 138kV line. Two breakers will be installed at JeffCon. This creates two 3-terminal lines (New) Caney Creek – JeffCon- Security (SHECO) and Lewis Creek/ (New) Caney Creek (SHECO) - JeffCon – New Conroe Bulk.

Cost for this substation will be borne by customer and not included in Entergy estimate.

3.6.1 Site:

N/A

3.6.2 Electrical

N/A

3.6.3 Relay Design

- Line relaying on the (New) Caney Creek (SHECO)-JeffCon-Conroe Bulk line will require adherence to Entergy standard PM1803 option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with compatible relays and blocking carrier sets installed at JeffCon and Conroe Bulk Substations. The SEL 311L will interface with identical relays installed at JeffCon and Conroe Bulk 138/230kV substations. Direct fiber will be installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. Another OPGW shield wire will be installed out of JeffCon to (New) Caney Creek Substation. All necessary relay work will be performed by SHECO.

Assumptions made in developing scope/estimates:

- A Blocking carrier primary relay communication scheme will adequately protect a three terminal line.
- OPGW shield wire will be installed from Conroe Bulk to JeffCon and from JeffCon to (New) Caney Creek.

3.6.4 Relay Settings and RTU configuration:

<u>Relay Settings:</u>

- Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configuration for Conroe- (New) Caney Creek (SHECO)-JeffCon

substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.

- Perform a thorough ground overcurrent study at (New) Caney substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Three terminal design will deviate from standard.

3.6.5 Construction considerations and outage duration requirements:

Most probably no outage is required.

AM resources will be used to complete relay work as proposed.

It will require two weeks to complete this project.

3.6.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.7 Security (SHECO) Substation:

The solution set calls for closure of the normally open switch at JeffCon, a substation between Lewis Creek and Conroe Bulk, which ties JeffCon to the Lewis Creek-Security 138kV line. Two breakers will be installed at JeffCon. This creates two 3-terminal lines Lewis Creek-JeffCon -Security (SHECO) and (New) Caney Creek (SHECO)-JeffCon-Conroe Bulk.

Cost for this substation will be borne by customer and not included in Entergy estimate.

3.7.1 Site:

N/A

3.7.2 Electrical

N/A

3.7.3 Relay Design

- Line relaying on the Lewis Creek-JeffCon-Security (SHECO) line will require adherence to Entergy standard PM1803 option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection, an SEL model 311C for backup step distance relaying and a Pulsar/Ametek model TC-10B on/off blocking power line carrier system. All necessary relay work will be performed by the Customer.
- Line relaying on the Lewis Creek-JeffCon-Security (SHECO) line will require adherence to Entergy standard PM1803 option N, latest revision. This panel incorporates a Schweitzer Engineering Lab model SEL 421 relay for primary protection and breaker control functions. The standard panel calls for an SEL model 311C for backup step distance relaying. However, the SEL model 311C will be replaced with an SEL 311L for primary #2 relaying via digital communications and will reference PM1803, option B2, latest revision. The SEL 421 will interface with compatible relays and blocking carrier sets installed at JeffCon and Lewis Creek Substations. The SEL 311L will interface with identical relays installed at JeffCon and Lewis Creek substations. Direct fiber will be installed in the shield position on line 587 out of Conroe to the tap point of the JeffCon line and continued into JeffCon substation. The new 230kV line from Conroe Bulk to Lewis Creek will provide a digital link between Lewis Creek and JeffCon substations. All necessary relay work will be performed by SHECO.

Assumptions made in developing scope/estimates:

- A Blocking carrier primary relay communication scheme will adequately protect a three terminal line.
- OPGW shield wire will be installed from Conroe Bulk to JeffCon. The new 230kV line from Conroe Bulk to Lewis Creek will provide a digital link between Lewis Creek and JeffCon substations.

3.7.4 Relay Settings and RTU configuration:

Relay Settings:

- Develop new settings for one (1) Line/Breaker Control Panel protecting the three terminal configuration for Lewis Creek-JeffCon-Security (SHECO) substations. Option N will be used for the SEL 421 and Option B-2 will be used for the 311L.
- Perform a thorough ground overcurrent study at New Conroe substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- Three terminal design will deviate from standard.

3.7.5 Construction considerations and outage duration requirements:

Most probably no outage is required.

AM resources will be used to complete relay work as proposed.

It will require two weeks to complete this project.

Assumptions made in developing scope/estimates:

None reported

3.7.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.8 Goslin Substation:

The existing Conroe Bulk to Goslin line will be reterminated at the new Conroe Bulk substation.

3.8.1 Site:

N/A

3.8.2 Electrical

N/A

3.8.3 Relay Design

Existing 138kV Line to Goslin 138kV

- Design modifications necessary to convert L-820 relaying at Goslin from Optimho primary relay over digital tone to SEL 421 primary relay using Mirrored Bits via digital communication links for primary relaying communication referencing Entergy standard PM1803, option B, latest revision. The existing line relay panels incorporate an Optimho relay for primary protection and an SEL model 311C for backup step distance relaying. The modified panel will interface with new line panels at the new Conroe Bulk 138/230kV substation.

Assumptions made in developing scope/estimates:

- The SEL 421 relay will be installed to take advantage of the digital communication between Goslin and Conroe Bulk using Mirrored Bits via digital communication links for primary relaying communication referencing Entergy standard PM1803, option B, latest revision. Implementation of the standard will save the cost of a new dual DTT/POTT tone relay set at Conroe Bulk 138/230kV substation. The existing primary relay scheme is over tone relay and is dual DTT/POTT. Standard PM1803 contains no dual DTT/POTT option.
- Perform a thorough ground overcurrent study at Goslin substation and surrounding substations.

3.8.4 Relay Settings and RTU configuration:

Relay Settings:

- Develop new settings for one (1) Line/Breaker Control Panel protecting the Goslin-Conroe line according to Option B of PM1803.

Assumptions made in developing scope/estimates:

Relay Settings:

- The existing SEL 311C will be upgraded to the standard part number and firmware version.

3.8.5 Construction considerations and outage duration requirements:

Most probably no outage is required.

AM resources will be used to complete relay work as proposed.

It will require two weeks to complete this project.

Assumptions made in developing scope/estimates:

None reported

3.8.6 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.9 Grimes Substation:

The existing Conroe Bulk to Grimes line will be re-terminated at the new Conroe Bulk substation.

3.9.1 Site:

N/A

3.9.2 Electrical

N/A

3.9.3 Relay Design

Existing 138kV Line to Grimes 138kV

- Design modifications necessary to convert L-112 relaying at Grimes dual DTT/POTT over digital tone to SEL 421 primary relay using Mirrored Bits via digital communication links for primary relaying communication referencing Entergy standard PM1803, option B, latest revision. The existing line relay panels a dual DTT/POTT tone relay for primary protection and an SEL model 311C for backup step distance relaying. The modified panel will interface with new line panels at the new Conroe Bulk 138/230kV substation.

Assumptions made in developing scope/estimates:

- The SEL 421 relay scheme will be modified to take advantage of the digital communication between Grimes and Conroe Bulk using Mirrored Bits via digital communication links for primary relaying communication referencing Entergy standard PM1803, option B, latest revision. Implementation of the standard will save the cost of a new dual DTT/POTT tone relay set at Conroe Bulk 138/230kV substation. The existing primary relay scheme is over tone relay and is dual DTT/POTT. Standard PM1803 contains no dual DTT/POTT option.

3.9.4 Relay Settings and RTU configuration:

Relay Settings:

- Revise settings for one (1) Line/Breaker Control Panel protecting the Grimes-Conroe line according to Option B of PM1803.
- Perform a thorough ground overcurrent study at Grimes substation and surrounding substations.

Assumptions made in developing scope/estimates:

Relay Settings:

- The existing SEL 311C will be upgraded to the standard part number and firmware version if not already made compliant.

3.9.5 Construction considerations and outage duration requirements:

Most probably no outage is required.

AM resources will be used to complete relay work as proposed.

It will require two weeks to complete this project.

Assumptions made in developing scope/estimates:

None reported

3.9.5 Risks and safety issues noted with cost and timing for mitigation:

None reported

3.10 Transmission Line Scope

- **Construct 230 kV line between Lewis Creek and new Conroe Bulk**
- **Re-route 4- existing 138kV lines at Conroe Bulk**
- **Provide 2- 138kV lines to attach old Conroe Bulk to new Conroe Bulk**
- **Provide 3- 138kV generator connection lines at Lewis Creek**
- **Replace static shield wire with Fiber on L- 587 and L- 523**

3.10.1 Project Description

Construct a new 230 kV line on existing ROW connecting Lewis Creek to new Conroe bulk substation. The approximate length of the new line would be 17.5 miles. For the first 5.4 miles of the line between Conroe Bulk and existing Str. 62 of L-587, it would be built as single circuit on an existing undeveloped 75' GSU Easement adjacent to L-587.

For the next 1.1 miles between Str. 62 and Conair substation, the line must share the existing 150' ROW with several Distribution circuits, L-587 and L-503. In this section, L-587 will be rebuilt on the West side of the corridor and will carry distribution under build, and the new 230 kV Line will be built as a double circuit with L-503.

For the next 6.6 miles between Conair Substation and existing Str. 503/530 (Congested corner East of Lewis Creek near Sheawill Substation where several transmission lines meet) the new 230kV Line will be built as a double circuit with L-503 in the existing 150' ROW.

The new 230kV Line will then cross L-824, L-487 and L-87 and end up northwest of each of these lines. By this time, L-824 will have been moved to a position on the south side of the corridor as part of the Western Region Reliability Improvement Project, Phase 3I. Therefore, for the next 3.7 miles, it will be built as a double circuit with L-87. At this point, the existing plan for the Western Region project calls for L-824 to cross over to the north side of the corridor double-circuit with L-87 for the remaining 7 spans into Lewis Creek. In order to install the new 230 kV line associated with this project, either new ROW will have to be acquired to the north for the new line, some or all of the existing lines in the ROW will have to be adjusted to make room for the new line on the north side of the corridor. Formulating a detailed design plan is beyond the scope of this facility study, therefore assumptions had to be made and are documented in Section 3.10.8 below.

For the final 0.7 miles into Lewis Creek, it has been assumed that the new line will be double-circuited. It may be with L-87 or L-824, depending upon the final design plans for L-824, which should be better known by the time this project reaches the design phase.

The project solution also calls for re-routing four existing lines from the existing Conroe Bulk Substation to the new 138/230kV Conroe Bulk yard. The lines that will need to be moved are L-112 to Grimes, L-820 to Goslin, L-886 to Tamina, and L-587 to Lewis Creek. Two new 138kV lines with OPGW must also be provided to connect the existing 138kV yard to the new 138/230kV yard.

Additionally, three new 138kV lines are needed to connect the new generator step-up transformers to the new portion of the 138kV yard at Lewis Creek.

Finally, the existing static shield wire will be replaced with OPGW on L-587 between Conroe Bulk and the (New) Caney Creek Substation, which will be located near Sheawill, and on L-523 between JeffCon and the L-587 tap.

3.10.2 Geotechnical Report (Soil Borings)

Approximately 23 soil borings will be required to design foundations for this project. The breakdown is as follows: 16 for new 230kV Line, 4 for connections at Conroe Bulk, and 3 for generator connections at Lewis Creek. In general, soil borings will be located at anticipated deadend locations.

3.10.3 Survey and Plan & Profile Drawings

a topographical survey of the T-line alignment will be required. Drafting services will be required to complete the Plan & Profile drawings and Phasing diagrams.

3.10.4 Line Route

The new line will follow the same general route as the existing L-587.

3.10.5 Right of Way (ROW)

It is anticipated that the new line can be built entirely within existing Entergy ROW, existing Entergy property at the Lewis Creek Site, and property that Entergy will purchase to build the new 138/230 yard at Conroe Bulk Substation. It is possible that the project cost could be reduced by purchasing additional ROW in some locations. However, that may affect the level of regulatory approval that would be needed in order to proceed with this project. Therefore, this estimate was based on no additional ROW being needed.

3.10.6 Permits & Wetlands Mitigation

Based on inspection of street mapping software, it appears that the proposed transmission line route crosses the following major roads and highways: FM-1314, State Highway 105, FM-1484, N 336 Loop, N FM 3083 Rd. E, County Line Rd., E FM 1097, State Highway 75, I-45. Further investigation would be required to determine which of these crossings require permits from the Texas Department of Transportation. There is no application fee for a highway permit; however there are added costs associated with generating the required drawings and paperwork. For the purposes of this facility study, a nominal fee has been added to the estimate to account for these administrative costs.

The transmission line route also crosses the following waterways: Lewis Creek, Stewarts Creek (2 times) (New) Caney Creek (3 times), Camp Creek (2 times). Presumably, these creeks are small enough to not require any special clearance or attention, however

further investigation and surveying would be required to make that determination. No additional cost is assumed for these crossings.

The proposed line route also contains at least two railroad crossings. One parallels East Davis St., near the point where L-503 joins the L-587 right-of-way. The other is approximately 3 spans east of State Highway 75 on the north leg of the route.

For the purposes of this facility study, it has been assumed that 100% of the ROW for the first 5.4 miles of the route out of Conroe Bulk, which is being built on an undeveloped 75' wide section of an existing 150' easement, will have to be cleared of vegetation. It is further assumed that 50% of the land that will have to be cleared will require wetlands mitigation at a cost of $15,000 per acre.

Construction of this transmission line project will require the design, implementation and monitoring of a Storm water Pollution Prevention Plan.

3.10.7 Design

The entire line route for the new 230kV Line and the portions of the lines that must be moved near Conroe Bulk fall within Montgomery County, TX. The new line and 138kV re-routes will be designed per Entergy 230kV and 138kV Standards, respectively. Also per Entergy Standards, Montgomery County's NESC Medium Loading Criteria, Extreme Wind of 110 mph, and Extreme Ice load of 0.5 inches will also be factored into the design. Sections of 138kV L-587, 138kV L-503 and 138kV L-87 that are being double-circuited with the new 230kV line will be designed to 230kV standards.

3.10.8 Structures

It is estimated that this project will require 248 steel poles. Single circuit portions have been estimated assuming the tangents would be in a delta configuration, use LD7 class poles approximately 95-105 ft long and direct embedded 15', and be spaced approximately 475 ft. apart. The estimate for the double circuit portions were based on the tangents being in a single pole-double circuit braced post configuration using LD10 class poles 115-120 ft long and spaced approximately 500 ft apart. All deadend structures will be self-supporting custom steel poles. It is possible that cost could be reduced in some locations by using guyed dead ends. However, given the congestion of having several circuits in the ROW, several lines crossing each other, and running through sub-urban areas, it is impossible to know at this point where guy wires are a feasible solution. Therefore, all dead ends have been assumed to be self-supporting.

At the congested corner just to the north of Sheawill Substation east of Lewis Creek, several lines must be crossed. In order to cross these lines and keep all structures within the existing ROW, some of other circuits that are being crossed will likely have to be moved or adjusted. The cost of three additional 140' self-supporting steel deadend poles with drilled pier foundations has been added to this estimate to account for any structure moves that are required.

In the transmission corridor immediately to the north of Lewis Creek, the design plans for the new 230kV Line and the L-824 upgrade as part of the WRRIP 3I project conflict. In order to make room for both lines in the corridor, existing lines and/or structures will likely have to shift to the south. To accommodate this, it has been assumed that 6 new self-supporting deadend structures on drilled pier foundations and 5 new tangent structures will be required in order to move the other lines within the corridor.

Three new 138kV lines will have to be built between the new generator step-up transformers at Lewis Creek and the expanded 138kV yard. The new lines will be approximately 450 ft. each. Without knowing any other details at this point, it will be assumed that this will require 6 new self-supporting steel deadend structures in drilled pier foundations.

Four existing lines 138kV lines must also be re-routed from the existing Conroe Bulk Substation to the new 138/230kV Conroe Bulk yard. Two new 138kV lines must also be provided to connect the existing 138kV yard to the new 138/230kV yard. Without having detailed knowledge of the soil conditions in the immediate area or the specific layout of the new substation, it has been assumed that moving these four lines and providing the two interconnect lines will require 14 85' self-supporting steel deadend poles on drilled pier foundations.

3.10.9 Foundations

Based on general knowledge of soil conditions in the Conroe area rather than site-specific soil boring information, it has been assumed that tangent structures for this project will be direct-embedded 15 ft with concrete or crushed rock backfill and that self-supporting deadend structures will require drilled pier foundations.

3.10.10 Conductor

The new 230kV line will use 1590 ACSS "Lapwing" conductor, which will provide for an ampacity of 2262 Amps, or 901 MVA.

The re-built sections of L-587 and L-503 will utilize 954 ACSS "Cardinal" conductor, which provides for an ampacity of 1606 Amps and matches the peak ampacity currently installed on the line.

Stringing and sag allowances were estimated at 5% of line length

Shieldwire

24 fiber 0.524 OPGW will be used as the shieldwire for the new 230kV Transmission line between Conroe Bulk and Lewis Creek (17.5 miles). Relay Design also calls for the replacement of the existing static shieldwire on L-587 with OPGW between Conroe Bulk and the (New) Caney Creek Substation (12.7 miles), and two OPGW shieldwires on L-523 between JeffCon Substation and the L-587 tap (2.2 miles each). OPGW is also required on the two interconnect lines between the existing Conroe Bulk substation and

the new 138/230 kV yard. OPGW is required on the three new 138kv lines interconnecting the new generators at Lewis Creek.

3.10.11

3.10.12 Insulators

It is estimated that this project will require 1434 insulator assemblies. All insulators and conductor hardware are provided by Maclean. 230kV insulator assemblies will be used on the new 230kV line as well as on the sections of 138kV L-587, L-503 and L-87 that are being double-circuited with the new 230kV line. 161kV insulator assemblies will be used on the four 138kV lines that are being re-routed at Conroe Bulk, on the two 138kV interconnect lines at Conroe Bulk, and on any 138kV line that needs to be moved to make room for the new 230kV line at any point in the ROW.

3.10.13 Grounding / Cathodic Protection

Steel poles are bonded to the shield wire by a copper weld jumper. The pole then acts as a ground rod to the ground line. Grounding is done with a 10 ft. copper clad steel rod driven into the earth and bonded to the pole. Refer to Std. Dwgs. TMD295, TMD296, TMD297 and TMD301 for details.

As per Entergy's standard practice, anodes will not be installed on tangent structures. It has been assumed that each deadend and angle structure will require 3 anodes.

3.10.14 Long Delivery Material:

Description	Quantity	Delivery period
Steel Poles (ea)	259	16 – 18 weeks
Conductor (lbs)	815074	20 – 22 weeks
OPGW (ft)	192870	12 – 16 weeks
Insulator Assemblies (ea)	1434	10 – 12 weeks

3.10.15 Construction considerations and outage duration requirements

Construct a new 230 kV line on existing ROW connecting Lewis Creek to new Conroe bulk substation. The approximate length of the new line would be 17.5 miles. For the first 5.4 miles of the line between Conroe Bulk and existing Str. 62 of L-587, it would be built as single circuit on an existing undeveloped 75' GSU Easement adjacent to L-587.

It will require four weeks to clear ROW and ROW damages of 5.4 miles.

It will require approximately 11 weeks constructing line of 5.4 miles.

Outages can not be determined at this time as this is a new line.

For the next 1.1 miles between Str. 62 and Conair substation, the line must share the existing 150' ROW with several Distribution circuits, L-587 and L-503. In this section, L-

587 will be rebuilt on the West side of the corridor and will carry distribution underbuild, and the new 230 kV Line will be built as a double circuit with L-503.

It will require approximately three weeks constructing line of 1.1 miles.

Outages can not be determined at this time as this is a new line.

For the next 6.6 miles between Conair Substation and existing Str. 503/530 (Congested corner East of Lewis Creek near Sheawill Substation where several transmission lines meet) the new 230kV Line will be built as a double circuit with L-503 in the existing 150' ROW.

Outages can not be determined at this time as this is a new line.

The new 230kV Line will then cross L-824, L-487 and L-87 and end up northwest of each of these lines. By this time, L-824 will have been moved to a position on the south side of the corridor as part of the Western Region Reliability Improvement Project, Phase 3I. Therefore, for the next 3.7 miles, it will be built as a double circuit with L-87. At this point, the existing plan for the Western Region project calls for L-824 to cross over to the north side of the corridor double-circuit with L-87 for the remaining 7 spans into Lewis Creek. In order to install the new 230 kV line associated with this project, either new ROW will have to be acquired to the north for the new line, some or all of the existing lines in the ROW will have to be adjusted to make room for the new line on the north side of the corridor. Formulating a detailed design plan is beyond the scope of this facility study, therefore assumptions had to be made and are documented in Section 3.10.8 below.

Outages can not be determined at this time as this is a new line.

For the final 0.7 miles into Lewis Creek, it has been assumed that the new line will be double-circuited. It may be with L-87 or L-824, depending upon the final design plans for L-824, which should be better known by the time this project reaches the design phase.

Outages can not be determined at this time as this is a new line.

The project solution also calls for re-routing four existing lines from the existing Conroe Bulk Substation to the new 138/230kV Conroe Bulk yard. The lines that will need to be moved are L-112 to Grimes, L-820 to Goslin, L-886 to Tamina, and L-587 to Lewis Creek. Two new 138kV lines with OPGW must also be provided to connect the existing 138kV yard to the new 138/230kV yard.

Outages can not be determined at this time as this is a new line.

Additionally, three new 138kV lines are needed to connect the new generator step-up transformers to the new portion of the 138kV yard at Lewis Creek.

Outages can not be determined at this time as this is a new line.

Finally, the existing static shield wire will be replaced with OPGW on L-587 between Conroe Bulk and the (New) Caney Creek Substation, which will be located near Sheawill, and on L-523 between JeffCon and the L-587 tap.

Outages can not be determined at this time as this is a new line.

3.10.16 Risks and safety issues noted with cost and timing for mitigation

Risk/Safety issue	Means of mitigating	Cost associated with the risk/safety issue	Completion of event after which the risk will not exist	Comments
Soil conditions will not support direct embedded tangent structures	Use caissons / drilled pier foundations	$20K per structure	Obtain soil borings and analyze ground line reactions	Based on experience working in the Conroe Area, the risk is relatively low.
New 230kV line requires entry into CCN Process	Enter CCN Process	~$1 million plus delay in schedule of 1 year +	Lawyers review rules and formulate company position	Initial opinion from CCN coordinator is that if we can build on existing ROW, we do not need to enter CCN Process

3.11 Western Region Reliability Improvement Project

The projects included in the Western Region Reliability Improvement Plan Phase 3 Interim are:

- Convert Jacinto-Lewis Creek 138kV line to 230kV operation.
- Convert Peach Creek substation from 138kV to 230kV operation.
- Relocate (New) Caney Creek load delivery point to new location on Lewis Creek-Conroe 138kV line.
- Install 230kV substation at Lewis Creek including a 500MVA, 230/138kV autotransformer.

The Western Region Reliability Improvement project is scheduled to be complete by June 2012.

Interconnection at Lewis Creek 138 kV under PID 211 requires a completion date of 1 July 2012. Therefore, the requirement for Western Region Reliability Improvement Project would be to work concurrently with PID 211 and finish some portions of it ahead of PID 211.

Consideration should be given to work simultaneously on design, material procurement, and construction of Lewis Creek 230 and 138 kV substations for both projects.

4. COST

The costs shown in the table include overheads and AFUDC, but do not include tax gross up. Entergy incurs a tax liability proportional to the amount of customer contributions. In addition to proposed project costs, the customer may be charged a "Tax gross-up" at applicable rates. Rates are subject to change. Current rate for Entergy Texas Inc. is 24.12 % and is not included in any of the estimates.

Projected Costs (includes indirect cost but not TGU)

	TOTAL (with 35% indirect)	Comment
Lewis Creek 138 kV	$11,276,827	See risk section – Western Region Reliability project
Lewis Creek 230 kV	$2,649,734	See risk section – Western Region Reliability project
New Conroe Bulk	$32,155,692	See risk section – Western Region Reliability project
Existing Conroe Bulk	$644,873	
JeffCon Substation	$1,695,766	
Goslin Substation	$124,299	
Grimes Substation	$92,545	
(New) Caney Creek	0	Owned by others & See risk section – Western Region Reliability project
Security	0	Owned by others
230 kV line between Lewis Creek and Conroe	$28,309,194	Extra $9m to build line on new ROW (if outage is not available) – see risk section below
3 -138 kV line to Power Plant	$877,761	
Add OPGW to L587	$2,632,779	
Relocate lines at Conroe	$2,824,223	
Total	$ 83,283,692	Should we need to build Lewis Creek – New Conroe line on new ROW, the total cost of project would be $92,283,692

Note: (New) Caney Creek and Security substations are owned by customer and the estimate for work identified here is not included in the estimates shown above. It is assumed that customer will undertake the work and pay for it.

5. UPGRADES CLASSIFIED

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

	TOTAL (with 35% indirect)	Base Plan	Supplemental
Lewis Creek 138 kV	$11,276,827	N/A	$11,276,827
Lewis Creek 230 kV	$2,649,734	N/A	$2,649,734
New Conroe Bulk	$32,155,692	N/A	$32,155,692
Existing Conroe Bulk	$644,873	N/A	$644,873
JeffCon Substation	$1,695,766	N/A	$1,695,766
Goslin Substation	$124,299	N/A	$124,299
Grimes Substation	$92,545	N/A	$92,545
(New) Caney Creek	0	N/A	0
Security	0	N/A	0
230 kV line between Lewis Creek and Conroe	$28,309,194	N/A	$28,309,194
3 -138 kV line to Power Plant	$877,761	N/A	$877,761
Add OPGW to L587	$2,632,779	N/A	$2,632,779
Relocate lines at Conroe	$2,824,223	N/A	$2,824,223
Total	$ 83,283,692	N/A	$ 83,283,692

6. SCHEDULE

1) Definition phase and development of PEP/Estimates – 3 months starting from 01 March 2009:

During this phase a detailed project execution plan and estimates will be prepared. It will be based on assumptions as the soil boring, survey, property acquisition information, etc would not be available. This work will be done subsequent to approval of funding in design phase.

A detailed schedule will be prepared identifying various activities to be completed during design, construction and closeout phases.

Transformer should be ordered in this phase.

2) Design / Acquisition/Procurement phase: 26 months starting from 01 July 2009

During this phase, site acquisition will be completed including completion of survey and soil boring. Work on regulatory approvals for line construction, highway crossing, wetland and storm water management plan, etc will be done. Standard material with

longest lead time would be ordered for substations prior to start of the design. However, line material is ordered after a constructability review of design is performed.

Substation and line design would be completed in less than 12 months and issued for construction by 1 July 2010. By this time, the substation site should have been acquired and permits obtained for transmission lines.

Longest duration for delivery of line material is 18 weeks; however some substation material could take 52 weeks except for transformer – it takes 26 months or 82 weeks. Considering that it take 3 -4 months in bidding and award of transformer, the transformer should be ordered immediately after the approval of project while work on definition phase is progressing. If done so, it would arrive on site by August 2011 or earlier.

3) Construction phase:

Construction would commence at various locations immediately after the issuance of design packages. Assuming that all permits and ownership of properties has been completed by 31 July 2010, construction could begin on substations and line. Outages for line (may be installments) could be secured during September 2010 and October 2011 and all work should be completed by 01 November 2011.

Completion by November 2011 - Total duration = 2 years and 8 months starting from 01 March 2009

For details and exact dates, please see attached Primavera schedule

Recommendations:

1) Immediately after receiving approval to proceed with the preparation of project execution plan, proceed with substation site acquisition
2) Immediately after securing the properties, perform survey and soil borings and commence environmental assessment and permit procedures
3) Order transformer immediately after approval of the project before starting work on project execution plan

7. RISK ASSESSMENT

1. Line outage – If adjacent line outage is not granted, new 230 kV line would have to be built on new ROW that would take extra $9m in cost and 6-8 months in completing the project (instead of November 2011, it would go to June 2012)
2. New Conroe Substation site – A site adjacent to existing Conroe Substation has been selected for the study. For some reason if this site could not be acquired and we need to select another site, it would have serious impact on project cost

and duration including the need to select new route for 230 kV line. Planning may have to restudy the solution and the rerouting of lines from existing Conroe and work at JeffCon, etc could be affected. It is not possible to identify cost and schedule impact.

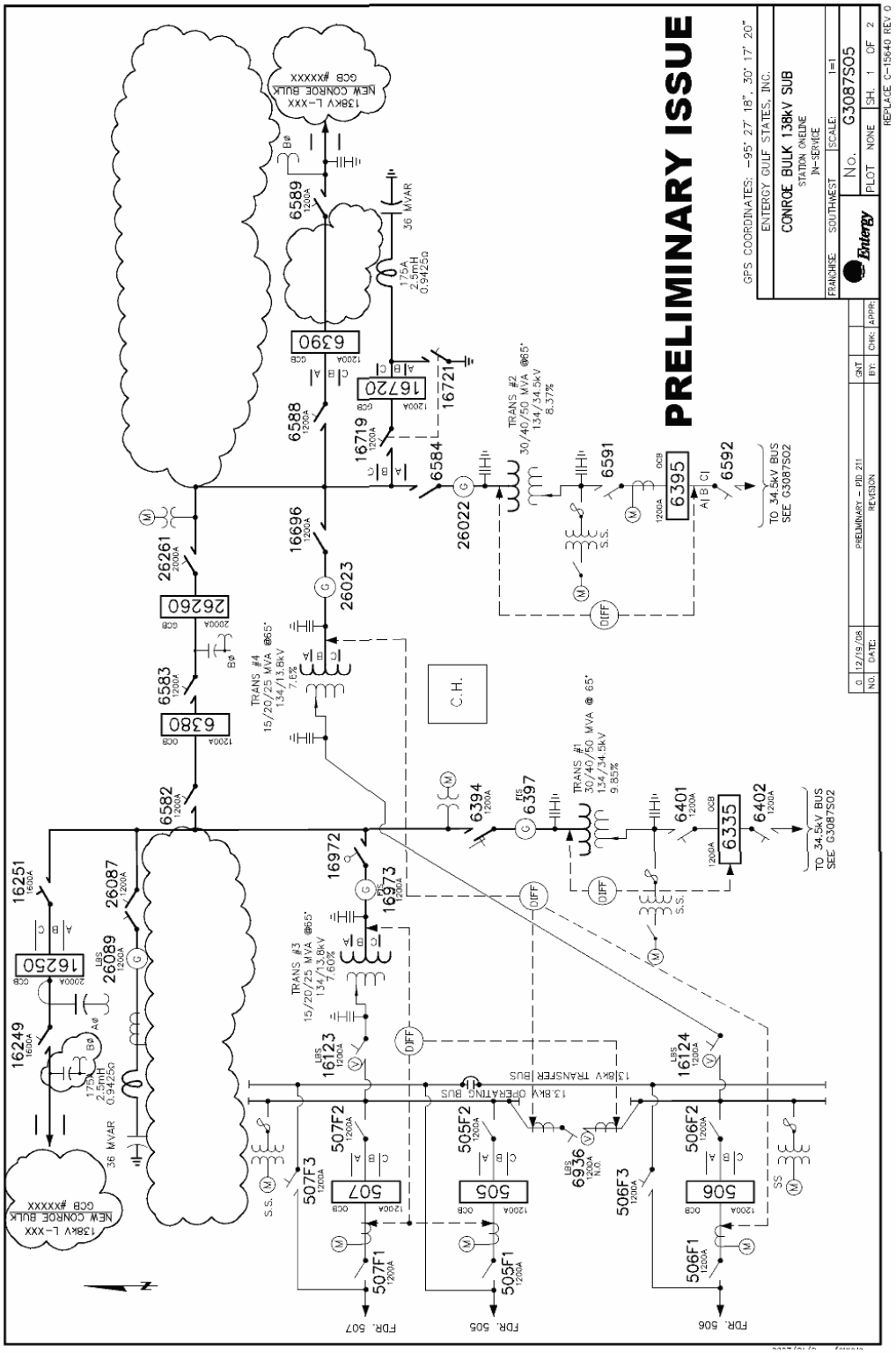
3. Western Reliability Project – Should this project be delayed or cancelled, the cost for 230 and 138 kV Lewis Creek substation would increase. In addition, it may have an impact from Planning study point of view resulting in revised solution set. Therefore, it is not possible to identify cost and schedule impact.
4. CCN Exemption Assumed – The new 230 kV line from Lewis Creek to the Conroe Bulk 230 kV Expansion is assumed to be grandfathered under existing CCN guidelines. If the commission fails to agree with our interpretation of the guidelines and a new CCN is required there will be substantial variances to the schedule and estimates in this study. A CCN application may delay the project from 18-24 months and the cost impact will be substantial and will vary significantly depending on the approved certificated route.
5. Microwave Tower – For the purposes of this study it is assumed that the MW tower and guy cables and Conroe Bulk will not encumber construction for the new 230 kV Conroe substation site.

8. ATTACHMENTS

Attachment 1: Existing Conroe Bulk SO5
Attachment 2: New Conroe Bulk 230 kV SO5
Attachment 3: New Conroe Bulk 230 kV EA
Attachment 4: Jeffcon 138 kV SO5
Attachment 5: Lewis Creek 138 kV SO5
Attachment 6: Lewis Creek 138 kV EA
Attachment 7: Lewis Creek 138 kV SO6
Attachment 8: Lewis Creek 230 kV SO7
Attachment 9: Lewis Creek 230 kV EA
Attachment 10: Generation Plant Including development
Attachment 11: Generation Station General Arrangement
Attachment 12: Revised solution set

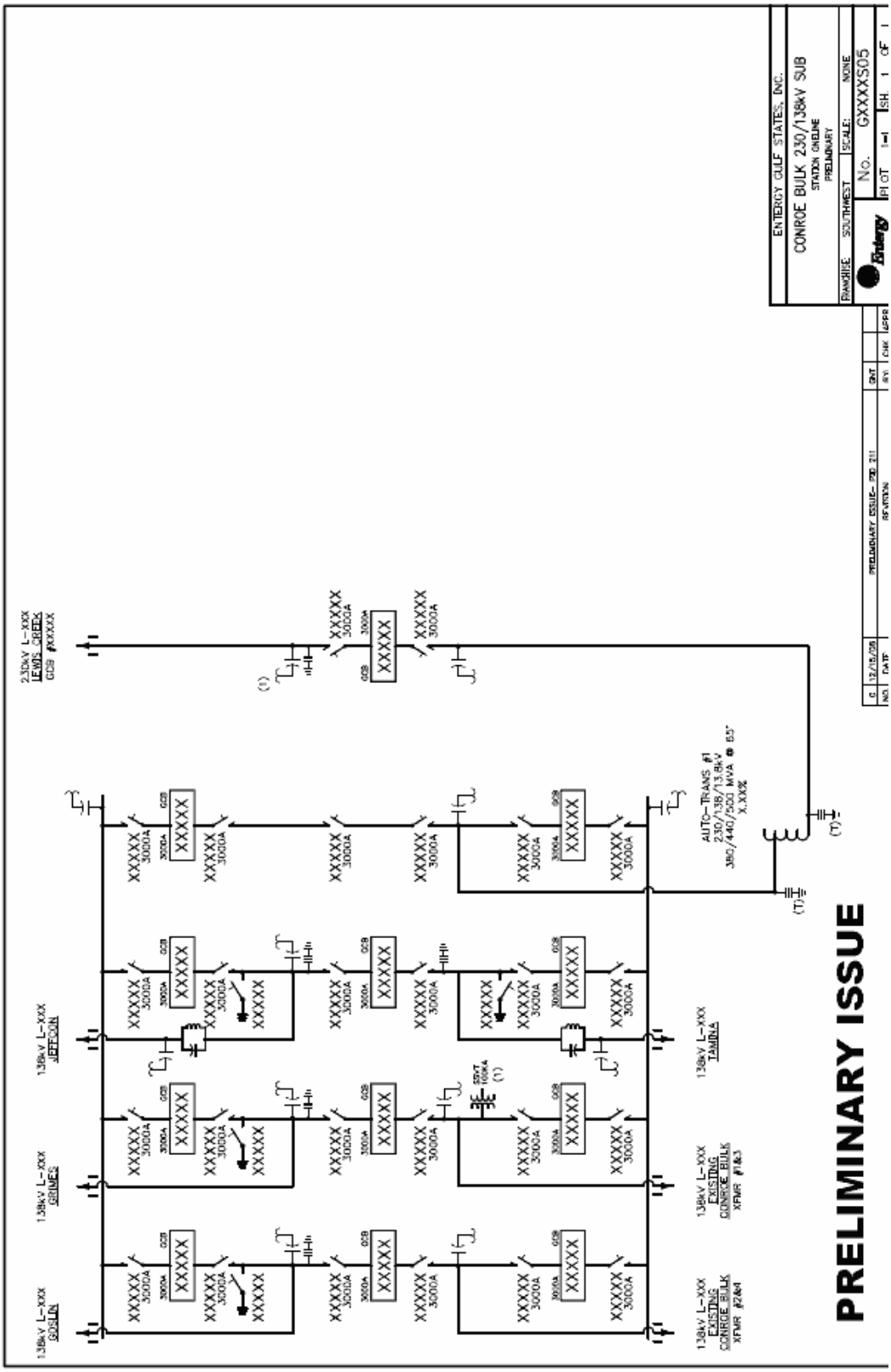
Attachment 1

Existing Conroe Bulk 138 kV SO5



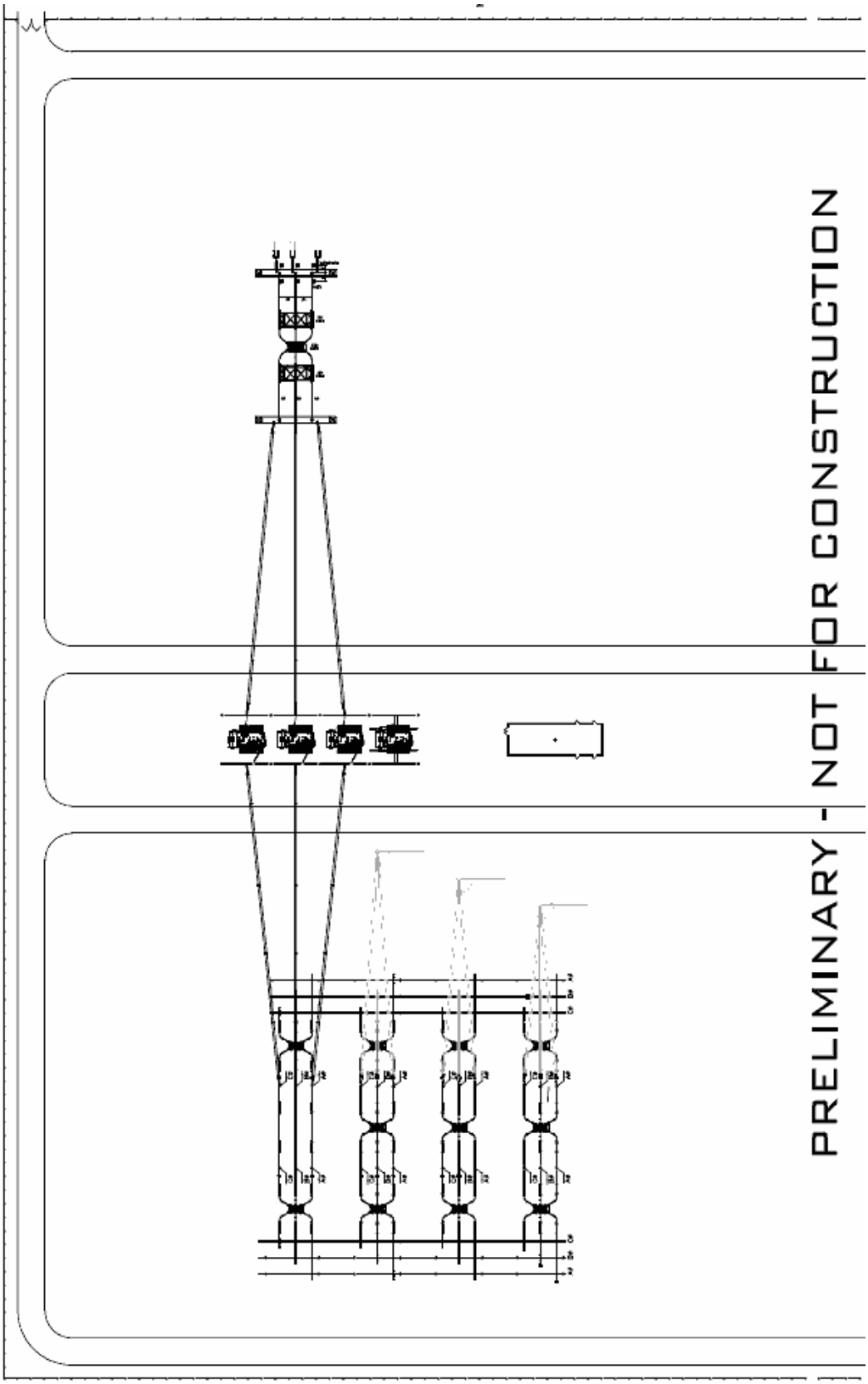
Attachment 2

New Conroe Bulk 230 kV SO5



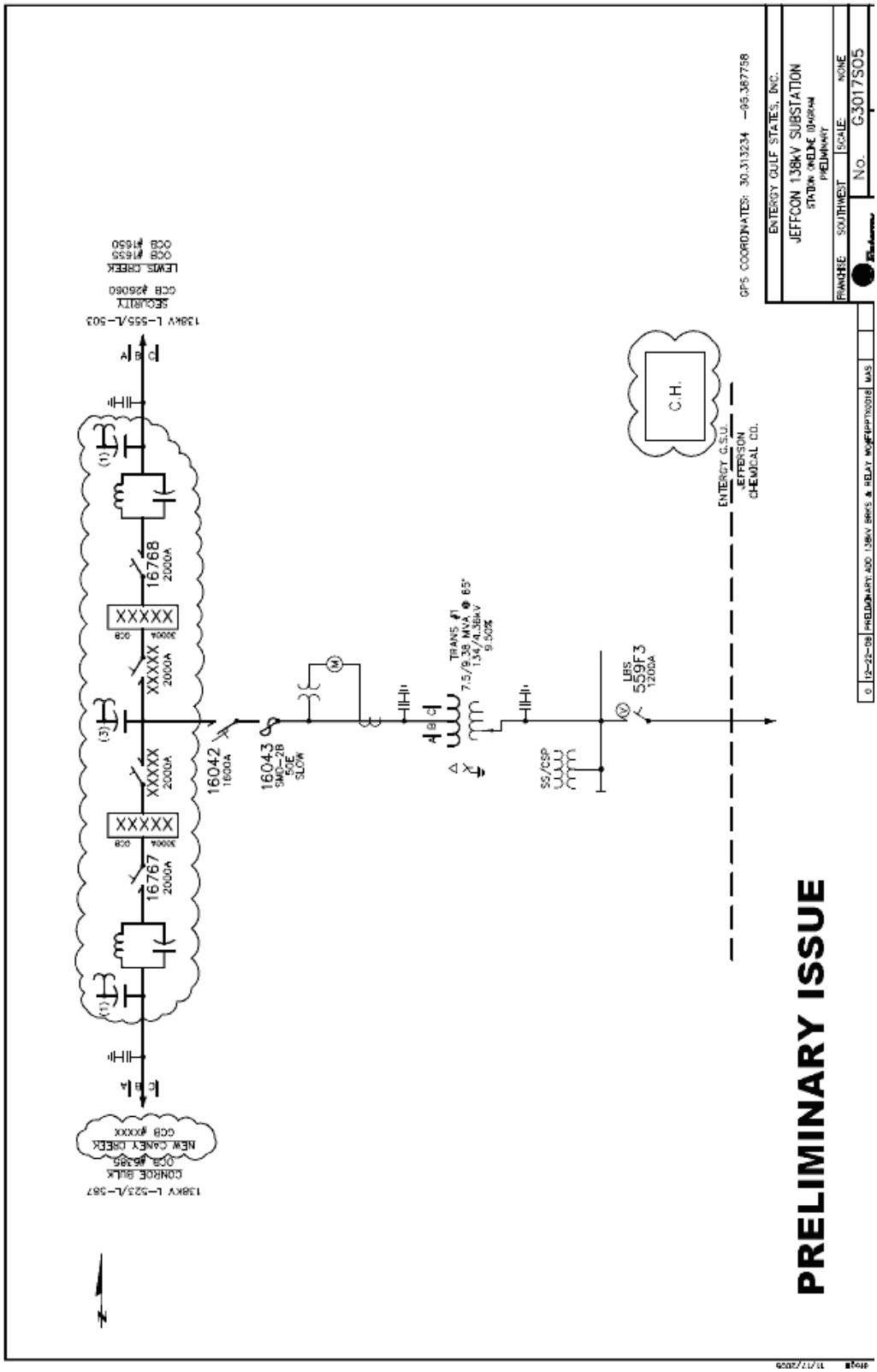
Attachment 3

New Conroe Bulk 230 kV EA



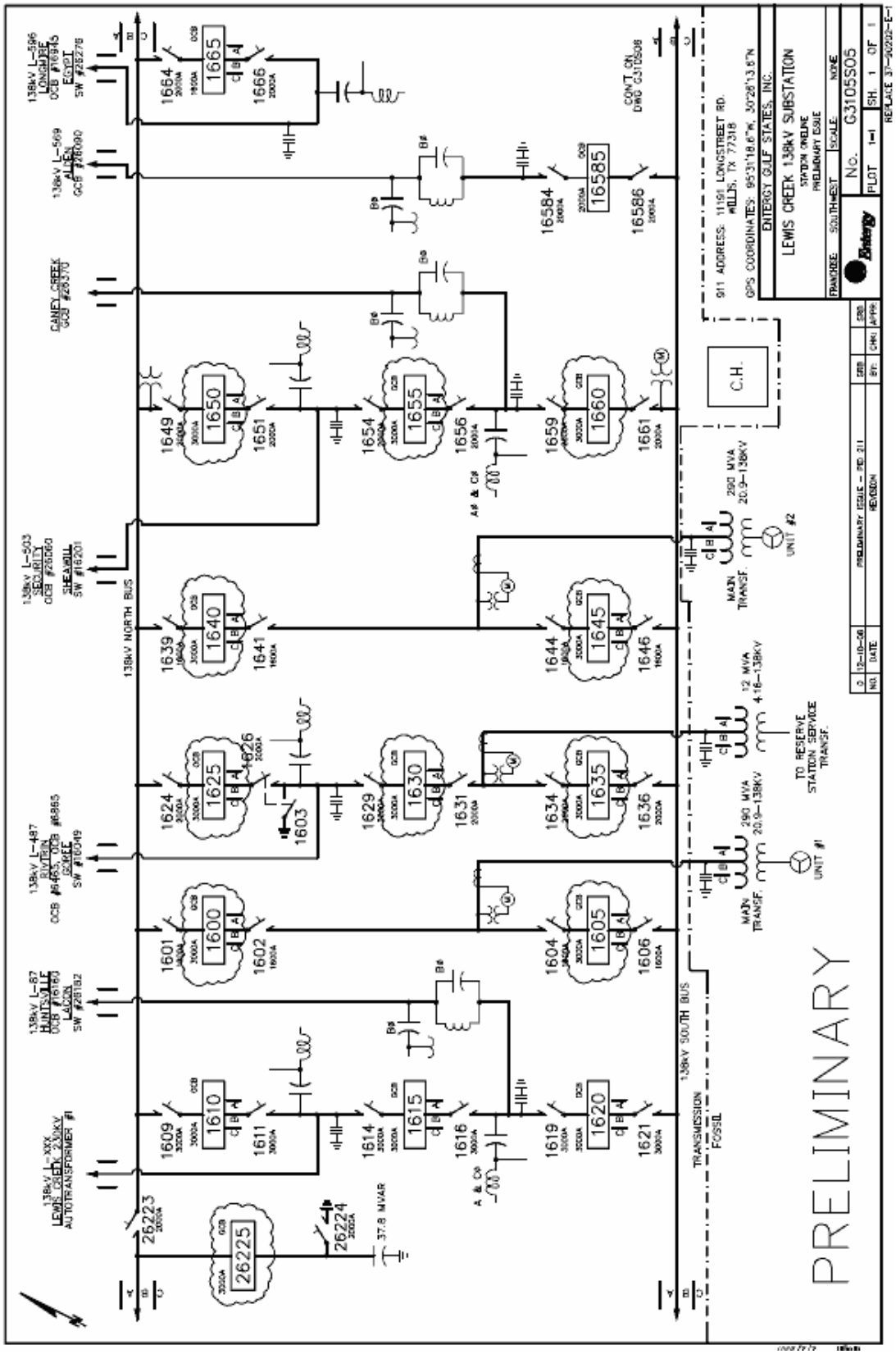
Attachment 4

Jeffcon 138 kV SO5



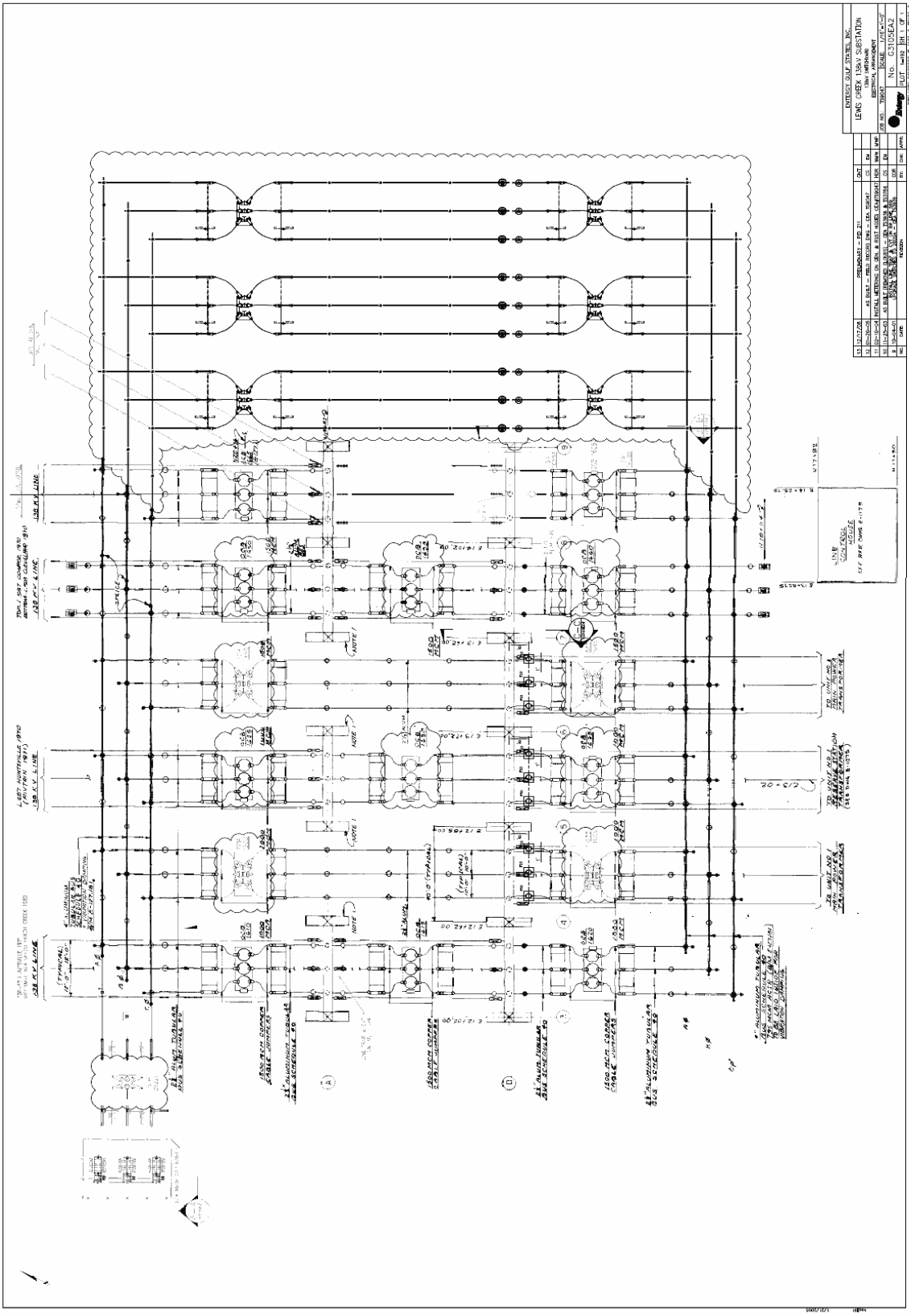
Attachment 5

Lewis Creek 138 kV SO5



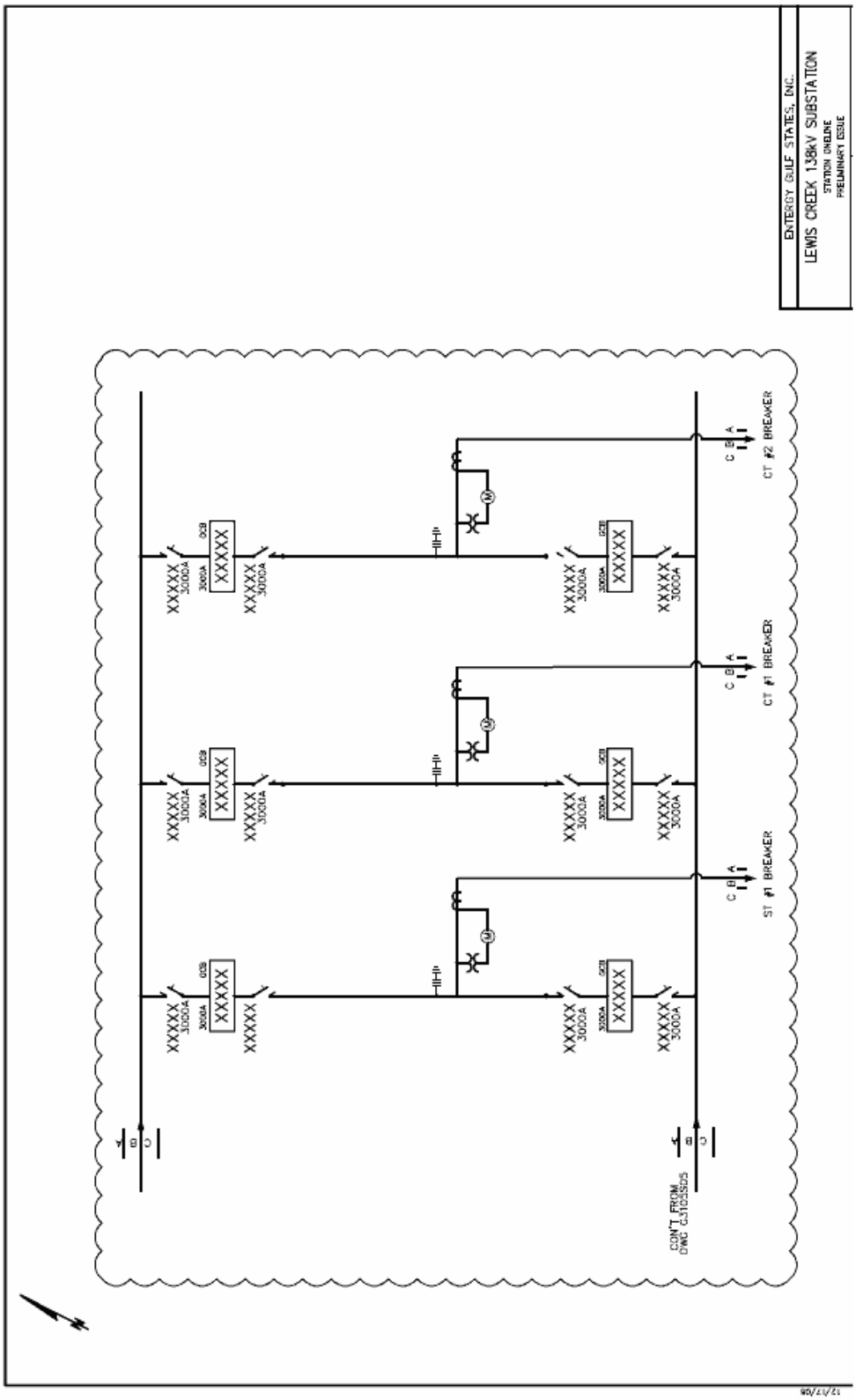
Attachment 6

Lewis Creek 138 kV EA



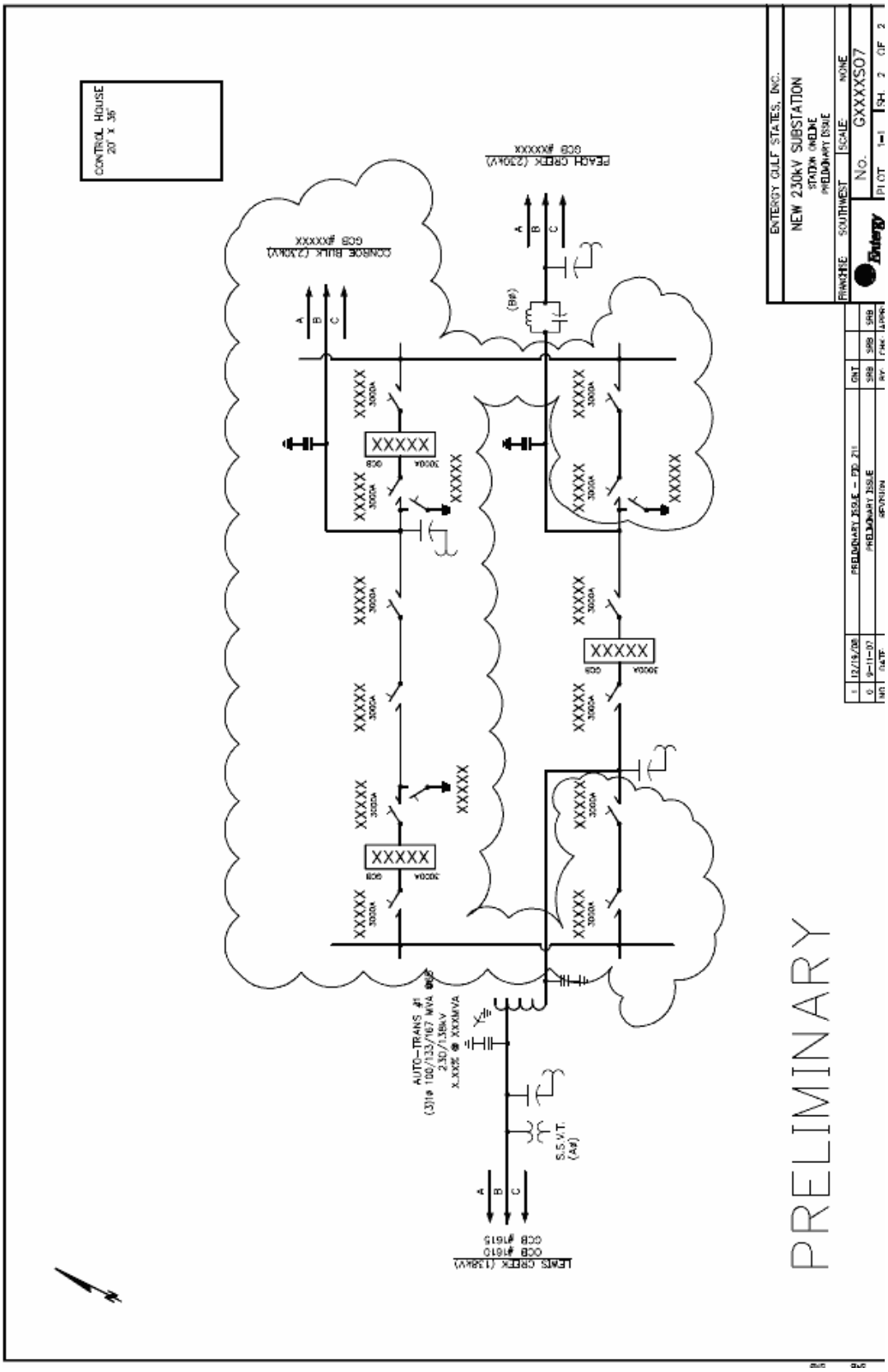
Attachment 7

Lewis Creek 138 kV SO6



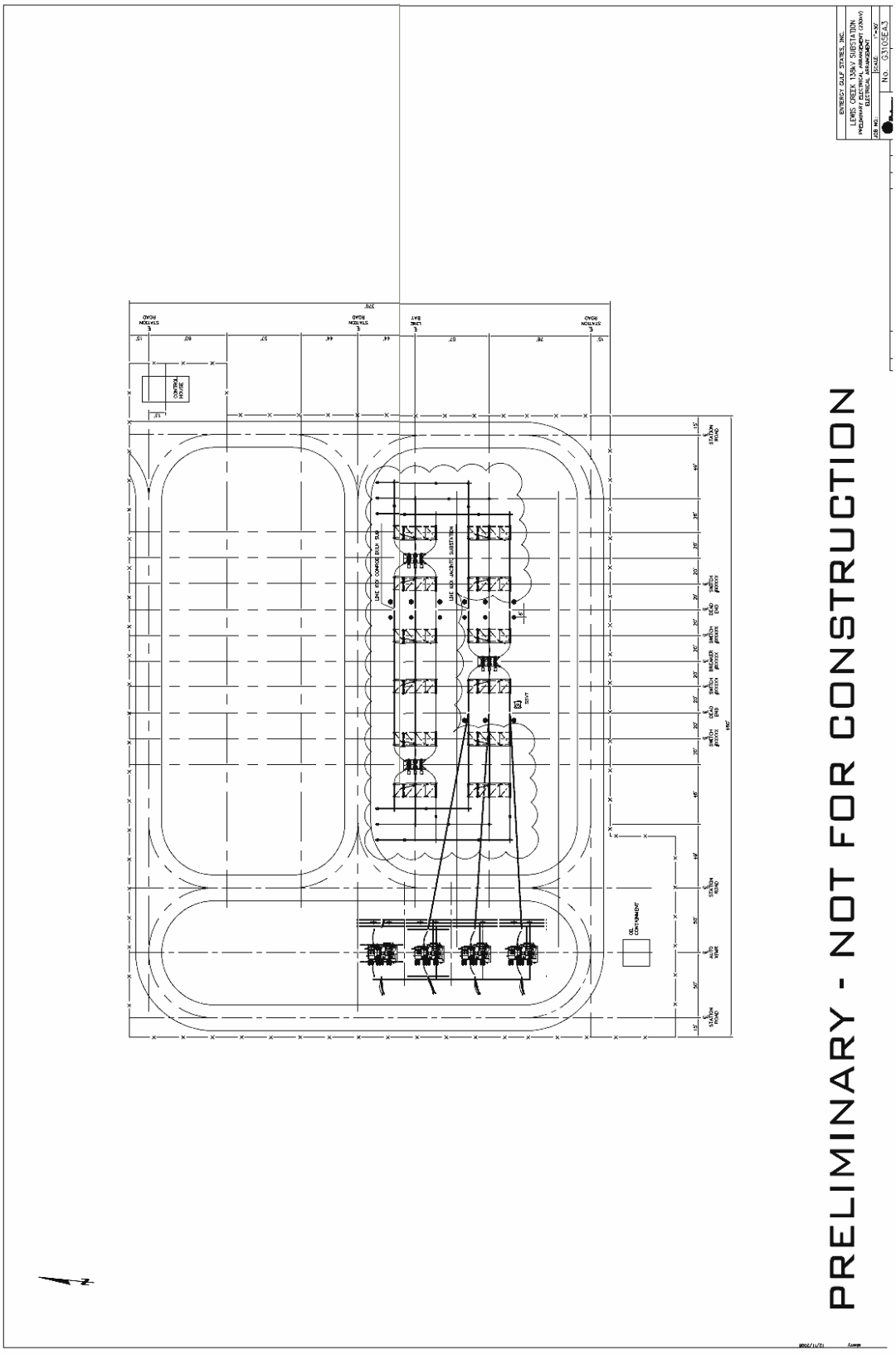
Attachment 8

Lewis Creek 230 kV SO7



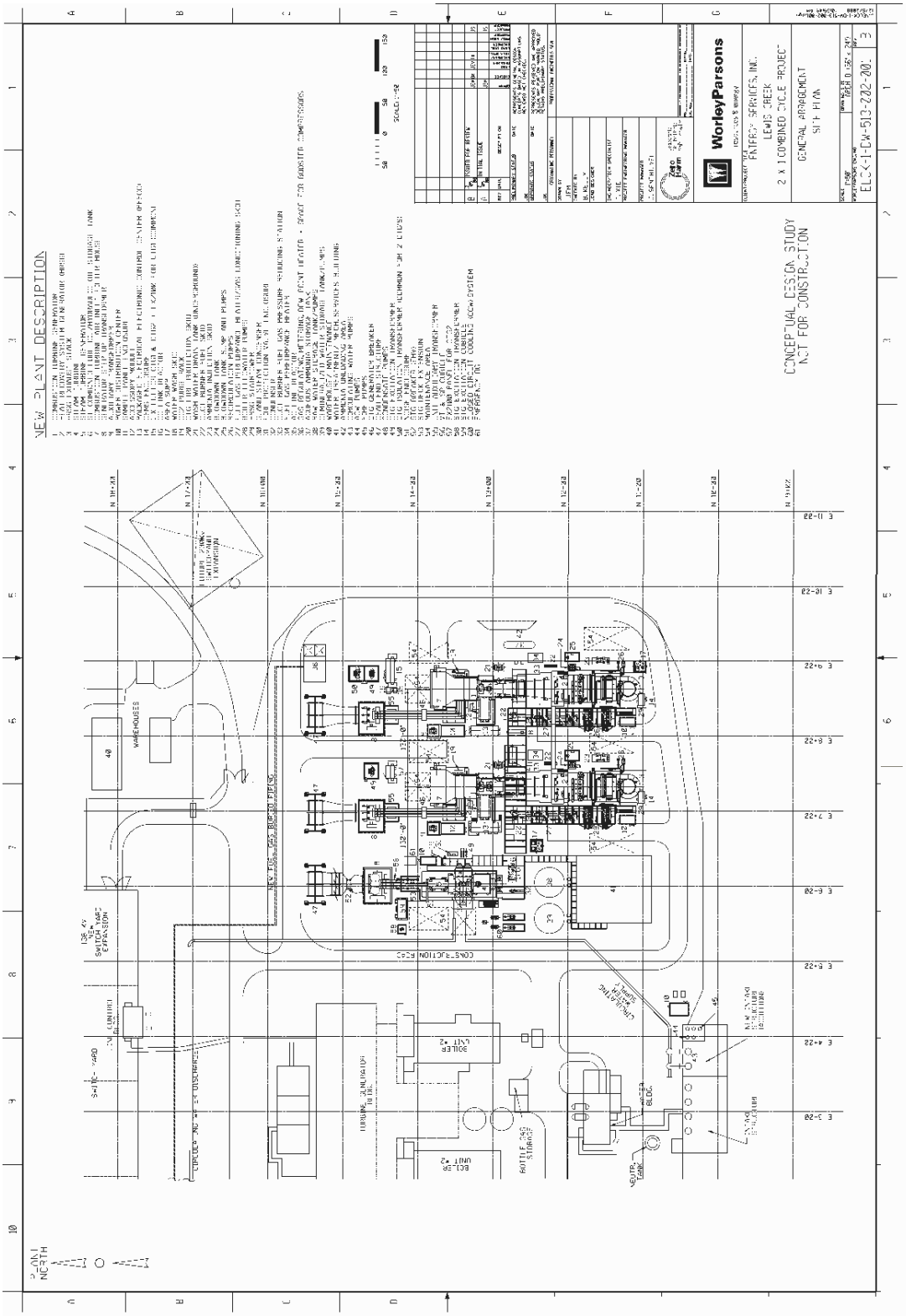
Attachment 9

Lewis Creek 230 kV EA



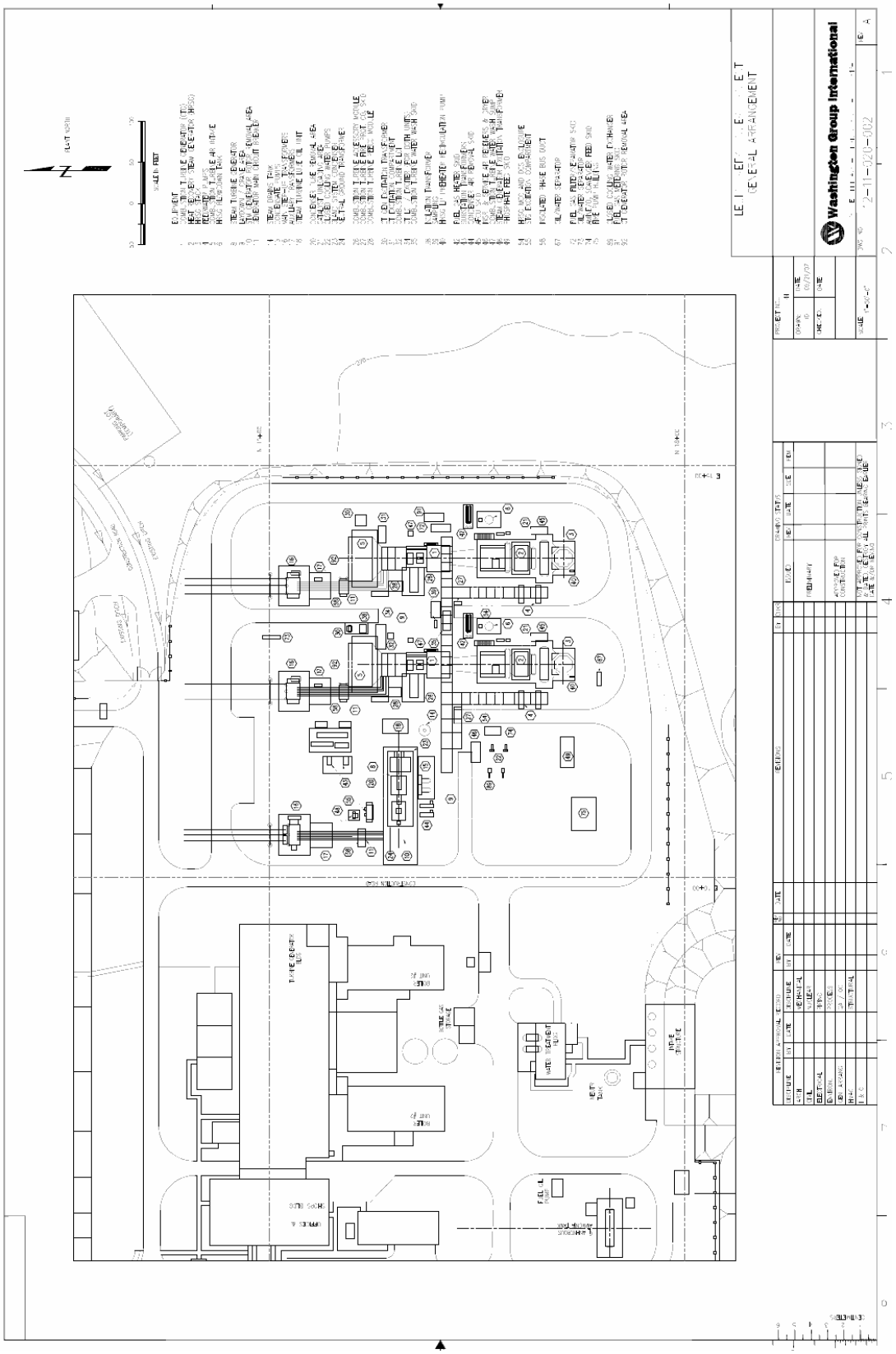
Attachment 10

Generation Plant Including Lewis Creek Development



Attachment 11

Generation Station General Arrangement



Attachment 12

Revision 3 Solution Set for PID 211

Option #1

2. Western Reliability Improvement Plan Phase 3 Interim

The projects included in the Western Reliability Improvement Plan Phase 3 Interim are:

- Convert Jacinto-Lewis Creek 138 kV line to 230 kV operations.
- Convert Peach Creek substation from 138 kV to 230 kV operations.
- Relocate Caney Creek load delivery point to new location on Lewis Creek-Conroe 138 kV line.
- Install 230 kV substation at Lewis Creek including a 500 MVA, 230/138 kV autotransformer.

This project has an expected in-service date of 2012. For generator interconnection, the customer may be required to fund 1 year of acceleration costs.

3. Construct a new 230 kV transmission line from Lewis Creek to Conroe Bulk.

Develop site to add a new 138 kV yard at Conroe Bulk arranged in a breaker-and-a-half scheme (see attached schematic). All 138 kV elements will be moved to the new substation except for distribution facilities and capacitor banks which will remain at the existing substation.

Develop site to add a new 230 kV yard at Conroe Bulk for termination of the 230/138 kV autotransformer and Lewis Creek-Conroe Bulk 230 kV transmission line. Obtain land for future expansion of 230 kV yard to a 4-breaker ring bus scheme.

Install a 230/138 kV autotransformer at Conroe Bulk sized to at least 500 MVA.

Construct approximately 13.5 miles of 230 kV line with single-bundled 1590 ACSS Lapwing conductor rated at 906 MVA from Lewis Creek to Conroe Bulk.

4. Close normally open switch at Jeffcon substation.

Close a normally open switch at Jeffcon, a substation between Conair and Conroe Bulk, which ties Jeffcon to the Lewis Creek-Sheawill-Ft. Worth Pipe-Crystal 138 kV line.

Install a 2-breaker bus at Jeffcon, which creates two 3-terminal lines (Fort Pipe-Jeffcon-Crystal and Conair-Jeffcon-Conroe Bulk). Relay work will be required.

5. Upgrade line equipment at Lewis Creek 138 kV substation.

The Lewis Creek-Egypt 138 kV transmission line overloads for the loss of the Grimes-Frontier 345 kV transmission line. The Lewis Creek-Egypt 138 kV transmission line needs to have a capacity of 194 MVA or greater on all components. The line conductor has a rated capacity of 282 MVA, but the CT ratio at Lewis Creek limits the current flow to 800A and needs to be upgraded.

Replace 14 breakers (1600, 1605, 1610, 1615, 1620, 1625, 1630, 1635, 1640, 1645, 1650, 1655, 1660, and 26225) with an interrupter rating of at least 41 kA. Upgrade to 63 kA breakers.

Conroe Bulk 138 kV substation re-arrangement (Option #1)