TRANSMISSION LINE & SUBSTATION PROJECTS

COMPANY: ENOI & ELL, LLC

CUSTOMER: PID 228

FACILITIES STUDY

EJO# F4PPNP0616

PID 228 GENERATOR INTERCONNECTION

Revision: 2

Rev	Issue Date	Description of Revision	Prepared By	Approved By
A	10-27-09	1st Draft for TPD review	RP	RG
B	11-23-09	2nd Draft, based on new planning criteria for TPD review	RP	RG
C	12-02-09	3rd Draft for JET Approval and TPD Review	RP	RG
0	12-31-09	4th Revision with JET comments included for submittal to TPD	RP	RG
1	1-13-10	Revised to new Facilities Study Format	SB	BW
2	1-28-10	ICT Review and Classification	BF	JDH

** Note: All required JET approvals and other stakeholder concurrences are shown in the voting polls in eRoom.*

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1. PROJECT SUMMARY

1.1. Background and Project Need

The purpose of this Facilities Study is to determine the availability to connect a new generation facility and provide the transfer capability at the point of interconnection. Also increased load flows, produced by making this interconnection, will be identified. This facility study will evaluate PID 228 request for interconnection of a total of 114.8 MW of combined cycle generation.

To evaluate this request, a study was performed on the latest available summer peak cases, using PSS/E and MUST software by Power Technologies Incorporated (PTI).

The facilities study will identify the transmission interconnection requirements, any transmission constraints resulting from the requested power transfer, and cost estimates to correct any transmission constraints.
The customer has requested Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The upgrades identified for ERIS are detailed below. The upgrades identified for NRIS are shown below.

1.2. Customer Facilities

The customer intends to install a 114.8MW gas fired boiler– steam turbine unit located on the customer's site at 5900 Jourdan Rd. in New Orleans east. The proposed interconnection on to Entergy's Transmission grid system will be through a tap which is located 1.25 miles from the Patterson 115kV Substation on the 115kV Claiborne to Patterson Line.

1.3. Scope Summary

1.3.1. Scope for NRIS:

- Jordan Road Substation – a 115kV 4 breaker ring bus station will be built on the customer site adjacent to the customer's generator
- Transmission Line Cut-in – a 115kV interconnecting (cut-in) line will be built to tie in the 4 breaker ring bus station on the customer's site.
- Construct a new 230kV transmission line from Bayou Steel to Tezcuco.
  - The Belle Point-Little Gypsy 230kV transmission line overloads for the loss of the Waterford-Tezcuco-Frisco 230kV transmission line. Also, the Waterford-Tezcuco 230kV transmission line overloads for the loss of the Belle Point-Little Gypsy 230kV transmission line. To alleviate these constraints, construct approximately 9 miles of 230kV line rated at 435MVA (1092A) from Bayou Steel to Tezcuco.
- Upgrade the Terrebonne-Greenwood 115kV transmission line.
  - The Terrebonne-Greenwood 115V transmission line overloads for the loss of the Wells-Webre 500kV transmission line. It is required that the Terrebonne-Greenwood 115kV transmission line be upgraded from a capacity of 227MVA to at least 279MVA (1361A). The conductor is to be upgraded to single bundled 1590 ACSR. Line equipment at Terrebonne 115kV and

Greenwood (LAGN) 115kV substations, rated at 1200A, will also need to be upgraded

- Protective Relaying – Remote end protective relaying upgrades will be required at the Patterson, Delta, Tezcuco, Bayou Steel (Iron Man) and Market Street substations.

1.3.2. Scope for ERIS:

- Jordan Road Substation – a 115kV 4 breaker ring bus station will be built on the customer site adjacent to the customer's generator
- Transmission Line Cut-in – a 115kV interconnecting (cut-in) line will be built to tie in the 4 breaker ring bus station on the customer's site.
- Protective Relaying – Remote end protective relaying upgrades will be required at the Patterson, Delta, and Market Street substations.

1.4. Cost Summary

1.4.1. NRIS Cost Summary

- The estimated total project cost is **$84,122,735**. This cost does not include Tax Gross Up which may apply.
- The estimate is reflective of labor and overhead rates as of 10-29-09. Any assumptions made regarding scoping and estimating are explained in the specific portions of the facility study.
- Nothing in this Facilities Study addresses the funding for the facilities identified herein. Cost allocation for the upgrades will be pursuant to Attachment T to Entergy's OATT.

1.4.2. ERIS Cost Summary

- The estimated total project cost is **$9,800,019**. This cost does not include Tax Gross Up which may apply.
- The estimate is reflective of labor and overhead rates as of 10-29-09. Any assumptions made regarding scoping and estimating are explained in the specific portions of the facility study.
- Nothing in this Facilities Study addresses the funding for the facilities identified herein. Cost allocation for the upgrades will be pursuant to Attachment T to Entergy's OATT.

1.5. Schedule Summary

The in service dates (ISD's) are based on a preliminary (un-base lined) project schedule, with assumptions on the timing of funding authorizations, outage approvals, ROW/permitting, etc.

Based on an assumed start date June 1, 2010 the estimated completion date of the project is December 30, 2012. Estimate work order completions are shown in the table below.

WO Name	Requested ISD	Estimated ISD
Terrebonne-Greenwood	April 30, 2011	December 30, 2012
Bayou Steel – Tezcuco 230 kV Line	April 30, 2011	December 30, 2012
Jordan Road Substation 115kV T-line Cut-in	April 30, 2011	December 30, 2011
Jordan Road 115kV Substation	April 30, 2011	December 30, 2011

1.6. Automatic Generation Control

Upgrades required by Entergy for AGC service are discussed in Entergy's OASIS posting "Entergy Transmission Guidelines for Automatic Generator Control Applications". See link below:

http://oasis.e-terrasolutions.com/documents/EES/AGC%20Guidelines%20for%20Entergy%20Transmission.pdf

2. SAFETY

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.

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

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

3. GENERAL ASSUMPTIONS

- Upon receipt of formal approval from customer authorizing design and construction, Entergy will prepare a detailed project execution plan.
- All permits will be attainable in a reasonable period.
- Due to timing and/or funding constraints, site visits, surveys, and soil borings were not performed in order to develop this facility study.
- All costs above represent good faith estimates in today's dollars. Price escalation for work in future years has not been included.

4. SCOPE OF WORK

4.1. Interconnection Facilities [common to both ERIS & NRIS]

4.1.1. Jordan Road 115kV Switchyard

- **General:**

- Build new 4-breaker ring bus substation with high voltage metering equipment for customer interconnection.
- Substation is located in New Orleans next to Jordan Rd. Substation site is outside floodwall protection area; therefore, control house and HV breakers will be elevated.
- See drawing Jordan Road_EA1.pdf for substation layout.
- The customer to provide high side protection of their transformers in the form of circuit breakers. Additionally, their source will need to be in a grounded "Y" configuration.

- **Site:**

  - The overall site will be approximately 280' by 185'. The substation site location will be off of Jordan Rd in New Orleans, LA. It is estimated that the site will be filled 2' above existing grade. It is also assumed that our site will be inside of a flood wall that will be built by the customer. The customer owned and operated flood wall will be constructed in such a way that it provides equivalent or better flood protection as the existing Corps of Engineers floodwall. It is unknown what the Base Flood Elevation is for this area.
  - Topographic and boundary surveys will be needed in order to properly design the site. This information has not been obtained prior to completing the facilities study. The following quantities will be based off of assumptions. In order for a survey to be taken, a property description will need to be written to tell the surveyor what property to survey.
  - Two soil borings will be needed in order to adequately design the foundations for the Substation. These borings have not been taken. We will be assuming pile supported foundation for the structures and equipment.
  - All appropriate permits and licenses will be obtained prior to construction.
  - The site will be approximately 1.19 acres. A SWPPP will be needed. This work shall be contracted out to a qualified contractor. The Project Manager shall ensure this work is completed prior to the start of the bid process. This will allow the contractors bidding on the site work to understand and plan for Entergy's expectations.
  - The entire proposed area will be developed. This will include fill, limestone, access roads, and fencing.
  - The proposed drainage in the substation will be surface drainage. The customer will need to make provisions in the overall site plan for the runoff of our station to be directed to their main drainage system.
  - Due to the lack of soil boring and survey data, the following quantities are based off of assumptions. It is assumed the substation will be accessed off of Jordan Rd through an entrance provided by the customer. The site is assumed to contain medium brush. The site will need stripping and grubbing of the top surface. It is estimated that 1 foot of top soil will be removed during the stripping and grubbing. The debris and spoil from stripping and foundation installation will need to be hauled off site.
  - The following quantities are based on the assumptions above.
    - 2 EA Soil Borings
    - 1 EA Soil Resistivity Test

- 2 EA Surveys (Topographic & Boundary)
- 1 LOT Environmental permits and licenses
- 1 EA Soil Testing
- 1 EA SWPPP
- 1.19 ACRES Medium brush
- 2700 CYDS Stripping of top soil
- 1.19 ACRES Sterilize Soil
- 8100 CYDS Structural Fill
- 2700 TONS Limestone
- 900 FT Access road
- 930 FT Fence
- 3000 CYDS Hauling Spoil
- 3700 TONS Disposing of debris and spoils

- **Foundations:**

  - The foundations listed below will be pile supported. It is estimated that 50' Class "B" treated timber piles will be used and are included in the foundation concrete cost. The control house and breaker foundations will be raised so that the bottom of the control house and breaker control cabinet will be 7' above final design grade.
  - Foundations required:
    - (2) Full tension dead-end structure
    - (2) Shield mast
    - (12) 1-phase low bus support
    - (8) 1-phase high bus support
    - (8) Low bus switch support
    - (2) High bus switch support
    - (12) CCVT pedestals
    - (6) CT pedestals
    - (1) SSVT pedestal
    - (6) Surge arrester pedestal
    - (4) 115kV circuit breaker elevated foundations with platform for personnel access
    - (4) Yard lights
    - (1) Demarcation Box
  - Conduit & cable trough
    - Install 100' of cable trough with helical anchors.
    - Install 1350' of underground PVC conduit for the following equipment: circuit breakers, bus & line potential devices, metering CTs and yard lights
  - Ground grid
    - Install 4350ft of grounding conductor
    - Ground grid as per latest Entergy Standard: 4/0 copper for all underground conductor and 19/9 copper clad conductor for all above ground connections.

- **Electrical:**

  - Install the following structures and electrical equipment:

- (2) Full tension dead-end structures
- (2) Shield masts
- (12) single phase low bus supports
- (8) single phase high bus supports
- (8) Low bus switch supports
- (2) High bus switch supports
- (12) CCVT pedestals
- (6) CT pedestals
- (1) SSVT Pedestal
- (6) Surge arrester structures
- (4) 115kV 3000A 40kA circuit breakers
- (10) 115kV 2000A disconnect switches
- (2) Ground switch attachments for 115kV gang operated switches
- (6) Polymer station class arresters
- (1) 100kVA Station Service Voltage Transformer (SSVT)

- Station Service: it is assumed the station will receive one feed from a nearby distribution circuit and one SSVT.
- All bus and conductor in the ring bus to be sized for 2000A rating.
- Install one 20'x36' prefabricated control house
- Install platforms for control building main and battery room access
- Install platforms for breakers

- **Relay:**

  - The scope of this project is to build a new 115kV substation to serve the customer. The customer proposes to install 114.8MW of generation at their Gasification Facility in New Orleans.
  - Jordan Road 115kV Switchyard will connect into the Paterson-Claiborne-Delta line. Claiborne Substation has one of its transformers tapped off this line. The transformer is isolated from the rest of the substation by an open switch. The assumption is this operating configuration will remain the same after the completion of this project.
  - The proposed interconnection point for Jordan Road 115kV Switchyard will be on the Paterson side of the Claiborne Substation tap creating the new Delta/Claiborne-Jordan Road line and Paterson-Jordan Road line.
  - The high voltage configuration at Jordan Road 115kV Switchyard will be a four-breaker ring bus. Two nodes of the ring will be for the Delta and Paterson lines with the other two nodes serving the customer.
  - The customer's facility will be constructed in the same yard as Jordan Road 115kV Switchyard but with a demarcation point between the two facilities. This scope assumes the substation ground grids will be connected together which will allow metallic cables to be used between the two substations. High side metering will be installed on the two lines going to the customer. The metering instruments and meter panels will be located at customer substation. The meter information must be sent to the TOC and the SOC via the RTU. Coordinate with the telecom group to install these communication circuits.
  - The existing relaying between Delta and Paterson substations is the Entergy standard SEL 421 primary with the SEL 311C backup. The SEL 421 relay

communicates over fiber via a channel bank using the Entergy backbone circuits. These relays will remain in place with the same Entergy standard relay panels installed at Jordan Road 115kV Switchyard. Coordination will be required with the telecom group to get the backbone fiber installed into Jordan Road 115kV Switchyard. This scope will assume there are backbone circuits available for the new relaying at Jordan Road 115kV Switchyard.

- Build a new control house to accommodate relay and control house equipment at Jordan Road 115kV Switchyard. Coordination with the telecom group will be required to accommodate the communication needs at Jordan Road 115kV Switchyard.
  - Purchase, design and install two (2) Entergy standard line panels with the SEL 421 primary, SEL 311C backup relays on the Delta/Claiborne and Paterson Line panels. Coordination will be required with the telecom group in order to connect the primary relay to the Entergy's backbone circuits.
  - Purchase, design and install four (4) Entergy standard breaker control panels using the SEL 451 relay
  - Purchase, design and install two (2) Entergy standard bus differential panels using the SEL 487B relay to protect the nodes between Entergy and the customer's transformers.
  - Install four (4) 230kV high voltage breakers
  - Purchase and install six (6) 115kV CCVT's for the Delta/Claiborne and Paterson lines
  - Purchase and install two (2) Entergy standard High Voltage PT junction boxes
  - Purchase and install two (2) patch panels for fiber connections. Coordinate with telecom to get these panels ordered
  - Purchase and install a channel bank to accommodate the new substations communication needs.
- New Control House Miscellaneous Equipment
  - Purchase and install a 130 volts DC battery set with rack. Size batteries by referencing Entergy Standard PM0203 Rev. 00 "Lead-Acid Storage Battery Sizing Guideline".
  - Purchase, and install a DC battery charger. Battery charger will be sized referencing Entergy Standard PM0302, Rev. 00 "Battery Charger Sizing Guideline".
  - Purchase and install a DC battery switching panel
  - Purchase, design and install a stand-alone AC panel.
  - Purchase, design and install a stand-alone DC panel.
  - Purchase and install an indoor AC transfer switch.
  - Purchase and install an 115kV SSVT. This scope assumes station service will come from the SSVT and a feed from the customer.
  - Purchase and install GE Harris D20 RTU, LP&L design
  - Purchase, design and install all communications equipment to line, breaker and meter panels for metering data.
  - Meter information must go to the TOC and the SOC. Coordinate with the telecom group to establish these circuits.
  - Purchase and install Teletone Gauntlet (SLSS)

- Purchase and install a SEL 2032
- Purchase and install a SEL 2407 for relay time sync.
- Coordinate with the Communications Group to provide telephone circuits and data circuits for the substation. These circuits maybe established over the channel banks installed by telecom. A circuit must also be established to SOC.
- Purchase and install demarcation box for relay interlocks contacts shared between Entergy and the customer
- Complete design and installation will be required for the electrical power supplies, controls, monitoring alarms, analog data and communications for the following devices, as applicable:
  - (2) – Line Panels
  - (4) – Breaker control panels
  - (2) - Meter panel
  - (4) – High Voltage Breakers
  - (2) – Bus Differential panels

- **Relay Settings:**

  - Relay settings will be required for the following relays
    - Schweitzer Type SEL-421 Distance relay
    - Schweitzer Type SEL-311C Distance relay
    - Schweitzer Type SEL-487B Bus Differential relay
  - A GE Harris D20 RTU will be installed and require a configuration package. The customer line metering data will be brought into the RTU via DNP protocol from the meter panel.

- **Metering:**

  - Purchase, design and install one (1) 2 transformer meter panel. Designer should determine what tele-metering information would be needed by the customer. All communication between the Customer an Entergy can be accomplished over the new fiber optics connections
  - Purchase and install six (6) free standing metering accuracy 115kV CT's to be used on the two customer nodes in the ring. CT's ratio to be determined by relay designer
  - Purchase and install six (6) metering accuracy 115kV CCVT's to be used on the two customer nodes in the ring
  - Purchase, design and install two (2) metering CT junction boxes
  - Purchase, design and install two (2) metering CCVT junction boxes

4.1.2. Jordan Road 115kV Switchyard transmission line cut-in

- **General:**

  - Between structures 39 and 38 on the Claiborne-Paterson 115kV line Entergy will build approximately 0.5 miles of new 115kV line to Jordan Road 115kV Switchyard using 4 tubular steel self-supporting dead-end structures. The steel dead-end structures will use vibratory pile with base plate caisson foundations.

- The proposed transmission line cut-in will be constructed with single 1780 ACSR 84/19 “Chukar” conductor.

Quantity	Material Description	*Lead Time (weeks)
4	Steel Poles	18
4	Vibe Pile w/Base Plate Caisson	18
17,297 Lbs	1780 ACSR “Chukar” Conductor	20
24	Insulators 230kV	18

4.1.3. Remote end protective relaying upgrades at Jordan Road, Paterson, Delta, and Market Street substations

- Jordan Road 115kV Switchyard
  - Provide RTU Configuration for new RTU/Communications Processors.
- Jordan Road - Paterson 115KV Line/ Breaker Control Panel.
  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Perform relay impact studies on affected lines and buses in the remote stations.
  - Review/Revise the settings and possibly upgrade the firmware at Avenue C - Paterson panel.
  - Review/Revise the settings and possibly upgrade the firmware at Michoud - Paterson Line panel.
  - Review/Revise the settings and possibly upgrade the firmware at Chalmette - Paterson Line panel.
  - Model the new Customer - Paterson 115KV Line in to ASPEN One-Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
  - Develop new relay settings and prepare test plan for Jordan Road - Paterson 115KV Line panel. The relay scheme shall use a 421/311L and match the Patterson end.
  - Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
  - Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
  - Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.
- Jordan Road - Delta 115KV Line/ Breaker Control Panel.
  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Perform relay impact studies on affected lines and buses in the remote stations.

- Review/Revise the settings and possibly upgrade the firmware at Market Street – Delta L98 line panel.
- Review/Revise the settings and possibly upgrade the firmware at Market Street – Delta Line 91 Line panel.
- Review/Revise the settings and possibly upgrade the firmware at Claiborne – Delta Line 98 Line panel.
- Model the new Jordan Road - Delta 115KV Line in to ASPEN One-Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
- Develop new relay settings and prepare test plan for Jordan Road - Delta 115KV Line panel. The relay scheme shall use a 421/311L and match the Delta end.
- Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
- Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
- Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.

- Paterson Substation

  - Provide RTU Configuration for revised line panel.

- Paterson – Jordan Road 115 kV Line/ Breaker Control Panel.

  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Develop revised relay settings and prepare test plan for Paterson – Jordan Road 115KV Line panel.
  - Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
  - Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
  - Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.

- Delta Substation

  - Provide RTU Configuration for revised line panel.

- Delta – Jordan Road 115 kV Line/ Breaker Control Panel.

  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Develop revised relay settings and prepare test plan for Delta – Jordan Road 115KV Line panel.

- Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
- Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
- Perform relay settings corrections and issue revised As-built settings and keep them in the data base.

- Market Street 230/115kV Substation

  - Review/Revise modeling for Autotransformer TT-1 in Aspen
  - Provide relay settings for new SEL487E differential relay ensuring compliance with the most current autotransformer standard
  - Provide breaker failure relay settings ensuring compliance with the most current breaker control standard for 230 kV Breakers N2111, N2117 and 115 kV breaker N2106. Standard must ensure a total clearing time of 12 cycles or less for a stuck breaker following a three phase fault on the autotransformer. This may necessitate substituting a relay with a quicker dropout time (i.e. SEL451).
  - Remove Tie Transformer #1 BDD transformer differential relays
  - Purchase, design and install a SEL 487E relay for Tie Transformer #1 differential protection (relay pending approval)
  - Market Street substation 115 and 230kV breaker failure schemes use a common timer for all breakers located on their respected buses. These schemes do not meet the required 12 cycle clearing time for a three phase Tie Transformer fault. The proposed solution is to remove the Tie Transformer #1 115kV breaker N2106 and the 230kV breakers N2111 and N2117 from the common breaker schemes and install separate breaker failure relays for these breakers
  - Purchase, design and Install three (3) SEL 451 relays (relay pending approval) for breaker failure protection on breakers N2111, N2117 and N2106.
  - Purchase and install three (3) lockout relays (86BF)
  - Purchase and install three (3) 10 pole current test switches
  - Purchase and install two (2) 10 pole trip test switches
  - No auxiliary tripping relays (94BF) will be installed. Breaker failure trip contacts will come from the new breaker failure relays. This should help achieve the required trip time.

4.2. T-Line Task 1: Iron Man to Tezcuco 230kV Transmission Line – Build New Transmission Line

- **General:**

  - A line route study will be performed to determine the exact route for the proposed transmission line.
  - The new transmission line will be approximately 10 miles long.
  - Design/boundary surveys and soil borings will be order when the line route study is complete and detailed scoping has begun.

- **Structures and Foundations:**
  - The types of structures and foundations used for the proposed transmission line will be determined when the line route study is complete.

- **Conductor and Shield Wire:**
  - The proposed transmission line will be constructed with 1272ACSR “Bittern” conductor.
  - 48-fiber OPGW shield wire with splice boxes will be installed at each station and at intermediate locations that will be determined during detailed design.

4.3. T-Line Task 2: Little Gypsy to Bayou Steel 230kV Transmission Line – Iron Man 230kV Substation Cut In

- **General:**
  - Refer to attached sketch showing proposed Iron Man 230kV Switchyard location adjacent to the existing transmission line.
  - Soil borings and survey will be required at the proposed transmission line cut-in location.

- **Structures and Foundations:**
  - The transmission line cut-in will be constructed with two steel self-supporting dead-ends in the existing ROW along the railroad tracks and two additional dead-ends immediately outside the station fence.

- **Conductor and Shield Wire:**
  - The conductor used for the proposed transmission line cut in will match the conductor on the existing transmission line. This conductor is assumed to be 1780ACSR.
  - 7#7 shield wire will be used on both sides of the transmission line cut-in.

4.4. T-Line Task 3: Terrebonne – Greenwood 115kV Transmission Line - Upgrade from a capacity of 227MVA to 279MVA

- **General:**
  - Due to unavailability of line outage, this line will be built on a new 50’ ROW adjacent to the existing line. New line will be built for 230 kV but operated at 115 kV. Upon completion of construction of new line, the existing line will be disconnected from the substation ends and new line will be terminated in its place. Subsequently, the existing line will be dismantled and parts disposed and ROW cleared and left in safe condition.

Line Data	**MVA**
Existing Line Rating	227
Required Line Rating (Minimum)	279
Proposed Line Rating (based on Equipment to be installed)	352
Affected line length	10.1

- Remove approximately 10.1 miles of existing bundled 336 ACSR conductor, insulator assemblies, and 104 wood structures. Install approximately 10.1 miles (107 structures) using approximately 302,000 lbs of 1590 ACSR conductor, 17,900 meters of 0.528 24-fiber OPGW, and 393 polymer insulator assemblies. The structures will be single circuit, single pole structures with vibratory pile foundations.

    - 10.1 miles
    - Install Double Bundled 666.6 ACSR "Flamingo" conductor
    - Install 95 steel tangent with socket pile foundations
    - Install 12 steel dead-ends with base-plated caisson foundations
    - Install 58,661 ft of OPGW 24 fiber shield wire
    - Install 393 Polymer insulator assemblies 230 kV
    - Remove 104 wooden structures

- **Long Lead Material**

Quantity	Material Description	*Lead Time (weeks)
12	Steel dead-ends with base-plated caisson fdns	18
95	Steel tangents in socket piles	18
58,661 ft	OPGW 24 fiber shield wire	18
393	Polymer insulator assemblies	18
302,303 lbs	1590 ACSR Conductor	16

- **ROW Acquisition:**

    - Without any information regarding number of landowner tracts, real estate values, and type of land impacted (i.e. commercial, residential, open acreage, marsh), the costs and timeframes for each service/cost item cannot be accurately determined without further research.

- **Permits:**

    - The following environmental assessment activities will be conducted.

        - Phase I and Phase II ESA
        - Wetlands Delineation, Permitting, Mitigation
        - Wildlife Habitat Assessment
        - Regulatory Agency Contacts
        - Storm Water Pollution Prevention Plan, Installation, Monitoring

- **Vegetation:**
  - The estimate for the work on new 50' ROW is based on limited knowledge of the landscape in the project area and with no current knowledge of the amount/type of wetlands or potential habitat impact along the route, or the cost for mitigation in this area. Also assumed for the entire length of line between Terrebonne – Greenwood – Humphrey – Gibson (22m), 100 acres of forested wetland impact and a 3:1 ratio for mitigation at $40,000 per acre.

4.5. Substation Task 1: Iron Man 230kV Switchyard: Build New Station

- **General:**
  - Refer to attached drawings and photos for the proposed switchyard site location adjacent to Bayou Steel.
  - Refer to Attachment for a proposed one-line drawing of Iron Man 230kV Swithcyard.
  - Iron Man 230kV Switchyard will be designed as a 3-breaker ring bus that will be expandable to a 4 breaker ring bus configuration.

- **Site/Foundation:**
  - An access road will be built from River Road to Iron Man 230kV Switchyard.
  - Soil borings, a topographical and boundary survey, and soil resistivity testing will be required to perform the site and foundation design of Iron Man 230kV Switchyard.
  - A Phase 2 ESA will be performed to determine how spoils from the work site will be handled.

- **Steel/Electrical:**
  - Please see Attachment for the preliminary routing of the incoming transmission lines.
  - A station service voltage transformer (SSVT) will be used for primary station service. A local distribution feeder will be used for backup station service.

- **Relay/Communications/SCADA/Metering:**
  - Bayou Steel line – impedance relaying, similar to existing relaying at LG.
  - Little Gypsy line – standard line panel w/carrier communications,
  - Tezcuco line – standard line panel w/fiber communications.
  - Special relaying considerations may be required to accommodate the nature of the plant load in the area.
  - Utilize the new fiber between Iron Man 230kV Switchyard and Tezcuco 230kV Substation for voice and data communications circuits.
  - Existing revenue metering on the Little Gypsy-Bayou Steel transmission line is on the customer's transformers and should not be impacted.

4.6. Substation Task 2: Tezcuco 230kV Substation: Add Transmission Line Bay

- **General:**
  - Expand Tezcuco 230kV Substation to the east.
  - Depending upon results of line route study, may need to relocate Belle Point line to new Bay 5, and bring Iron Man line into existing Bay 4.
  - Relocate the 34.5kV distribution feeder that runs outside of the east fence.
  - Third party security features installed on or near Tezcuco 230kV Substation's east fence and gate will be modified to accommodate the expansion.

- **Site/Foundation:**
  - No new soil borings will be required. The proposed foundation design will match the existing foundation design.
  - Topographical and boundary surveys of the proposed expansion area will be required.
  - Previous site preparation work performed in the proposed expansion area will be verified prior to design and construction.
  - Drainage requirements will be verified prior to design and construction.
  - Soil disposal location will be verified prior to design and construction.

- **Steel/Electrical:**
  - The new transmission line bay will have two breakers located in the center and south positions. The proposed breakers will rated at 3000A continuous and 63kA interrupting.
  - Four new 3000A vertical break, horizontal mount switches will be installed in the new transmission line bay.
  - Install appropriately rated line arresters and a CVT in the new transmission line bay.

- **Relay/Communications/SCADA/Metering:**
  - Tezcuco line – standard line panel with fiber communications.
  - Tie the new breakers to the existing bus differential relaying.

4.7. Substation Task 3: Little Gypsy 230kV Substation: Modify Protective Relaying for Bayou Steel Transmission Line

- **General:**
  - Convert Bayou Steel line to Iron Man line.

- **Site/Foundation:**

- No site preparation required except for dressing disturbed area after construction.
- A foundation will be required for the new CVT.
- Availability of existing conduits for CVT/carrier wiring will be determined prior to design and construction.

- **Steel/Electrical:**

  - Install new line trap and CVT in transmission line bay.

- **Relay/Communications/SCADA/Metering:**

  - Iron Man line – modify the existing Bayou Steel line relay panel to look at Iron Man 230kV Switchyard. Add carrier and enable pilot relaying.
  - Install line trap, tuner, and CVT in line bay.

4.8. Substation Task 4: Iron Man 230kV Switchyard – Provide RTU Configuration for New Line Panel

- **Bayou Steel - Tezcuco 230 kV Line/ Breaker Control Panel:**

  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Perform relay impact studies on affected lines and buses in the remote stations.
  - Review/Revise the settings and possibly upgrade the firmware at Little Gypsy – Bayou Steel 230 kV line panel.
  - Model the new Bayou Steel - Tezcuco 230KV Line in to ASPEN One-Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
  - Develop new relay settings and prepare test plan for Bayou Steel - Tezcuco 230KV Line panel. The relay scheme shall be selected after coordination with relay design.
  - Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
  - Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
  - Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.

4.9. Substation Task 5: Tezcuco 230kV Substation – Provide RTU Configuration for New Line Panel

- **Tezcuco – Bayou Steel 230 kV Line/ Breaker Control Panel:**

  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.

- Perform relay impact studies on affected lines and buses in the remote stations.
- Review/Revise the settings and possibly upgrade the firmware at Frisco – Tezcuco line 259 line panel.
- Review/Revise the settings and possibly upgrade the firmware at Frisco – Tezcuco line 183 line panel.
- Review/Revise the settings and possibly upgrade the firmware at Waterford - Tezcuco Line panel.
- Review/Revise the settings and possibly upgrade the firmware at Belle Point - Tezcuco Line panel.
- Model the new Tezcuco- Bayou Steel 230KV Line in to ASPEN One-Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
- Develop new relay settings and prepare test plan for Tezcuco – Bayou Steel 230KV Line panel. The relay scheme shall be selected after coordination with relay design.
- Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
- Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
- Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.

4.10. Substation Task 6: Terrebonne 115kV Substation – Upgrade Disconnect Switch and Perform Relay Settings Upgrades

- **Electrical:**
  - Replace breaker disconnect switches (and associated ground switch) on Humphrey line bay with 2000A rated equipment (bay #4). Replace approximately 200’ of bus conductor. Connect all new equipment to ground per Entergy standards.

- **Relay Settings:**
  - Model upgraded line in Aspen utilizing new impedance data obtained from Transmission design.
  - Review/Revise line relay settings on both the primary and backup Quadramho relays for new line ampacity of 1767 amps. CT ratio is currently 2000/5 and will not need to be changed.

- **Remote End Relay Settings:**
  - Terrebonne - Humphrey 115 kV Line/Breaker Control Panel
    - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.

- Model the upgraded Terrebonne - Humphrey 115 KV Line into ASPEN One- Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
- Develop revised relay settings and prepare test plan for Terrebonne - Humphrey 115KV Line panel.
- Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
- Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
- Perform relay settings corrections and issue revised As-built Settings and keep them in the data base

4.11. Substation Task 7: LAGEN Greenwood 115kV Substation – Verify Substation Equipment Ratings

- **Electrical:**
  - LA Gen owns this substation. Ratings for switches and breakers associated with Terrebonne and Humphrey lines are unknown. Should these be less than 1400A, LAGen would have to replace them.

4.12. Substation Task 8: Humphrey 115kV Substation –Perform Relay Settings Upgrades

- **Humphrey - Terrebonne 115 kV Line/ Breaker Control Panel:**
  - The regulatory and Entergy Standard compliance shall be studied and applied for setting revisions and setting updates.
  - Model the upgraded Humphrey – Terrebonne 115 KV Line in to ASPEN One-Liner based on Transmission Plans and Profiles and specific to PID 228 Project.
  - Develop revised relay settings and prepare test plan for Humphrey – Terrebonne 115KV Line panel.
  - Provide off site/on site setting supports during construction for setting database issues, relay software and firmware compatibility.
  - Perform setting logistic such as relay date base (.rdbs or mdbs), relay viewable documents (.xls), project work folders for web posting (Documentum), and relay modeling in ASPEN.
  - Perform relay settings corrections and issue revised As-built Settings and keep them in the data base.

4.13. Construction and Outages

- **Bid Process:**

- All construction for each discipline will begin once all design packages have been received and reviewed. The Entergy Asset Management Organization will be given the first right of refusal for completing all required construction. In the event that Asset Management declines their right to complete as designed, construction management will utilize the competitive bidding process to award contracts for construction completion, utilizing only vendors that qualify to perform work on Entergy property whom have successfully completed all Entergy requirements as well as the CVM process. Sole Source justification should not be considered as a viable contracting strategy. Supply Chain Vice President Approval will be required in order to complete any work on a Time and Material basis with a preferred vendor. All construction will be completed as per current Entergy standards and requirements. All transmission line construction will be completed utilizing EPZ grounding principles and 100% fall protection.

- **Construction Process:**

  - 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, a competitive bid process to award the work to an Entergy approved contractor will be performed.
  - The normal process would be to identify all hazards, identify all rights of access and egress, install storm water pollution prevention controls, perform all of the clearing, establish strategically located lay down yards, receive the materials and equipment, install foundations & structures, and then subsequently perform the wire stringing. These components could be contracted between multiple sources for execution. Dependant on the final design a determination will be made to address any system outages that may be required to perform the installations of all proposed facilities. Efforts will be made to utilize low profile equipment where reasonable and practical as part of the installation process for the facilities to be installed that will be under, near, adjacent too, or in close proximity of energized facilities/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 500kV facilities require a year's advanced notice, with no guarantees that said outage will be granted at the time requested. This poses risk to all schedules. Also for a T-Line construction of this magnitude there could/would be the possibility that other Utilities, Cooperatives, Municipalities, etc… may have multiple facilities that may have to be modified, such as the removal, or retrofitting of shield wires, structures, conductors, etc…. During the definition phase of the Transmission Business's (EMCC) process these facilities should be identified, and subsequently the appropriate request will be made through the proper channels to have these obstacles addressed on an as needed basis. These types of activities would/could require outages that are yet to be

identified, and could also impact the construction and installations of other facilities and/or any required modifications to collateral facilities due to system constraints. This too poses risk to all schedules.

5. COST & UPGRADE CLASSIFICATION

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.

The costs shown in the table include all applicable overheads but do not include tax gross up. Entergy incurs a tax liability proportional to the amount of customer contributions.

Description	TOTAL	Base Plan	Supplemental
Bayou Steel – Tezcuco 230 kV Line (Includes new transmission line, Iron Man 230kV Switchyard, and all remote end work)	$40,741,181	$40,741,181	
Terrebonne-Greenwood, 10.1 mi	$33,980,557		$33,980,557
Terrebonne Substation	$167,978		$167,978
Jordan Road 115kV T-line Cut-in	$2,504,721		$2,504,721
Jordan Road115kV Substation (Includes remote end work at Paterson and Delta Substations)	$7,141,417		$7,141,417
Relaying Upgrades Market St. Substation	$153,881		$153,881
Total Cost	**$84,122,737**	**$40,741,181**	**$43,948,554**

6. SCHEDULE

A detailed schedule will be prepared subsequent to customer approval to proceed with the project. Based on the Task duration schedules listed below, the overall project in-service date is projected to be December 30, 2012. The following are rough durations:

Task Name	Proposed Start Date	Proposed ISD
Terrebonne-Greenwood, 10.1 mi	June 1st 2010	December 30th 2012
Bayou Steel – Tezcuco 230 kV Line (all associated upgrades)	June 1st 2010	December 30th 2012
Jordan Road 115kV T-line Cut-in	June 1st 2010	December 30th 2011
Jordan Road 115kV Substation	June 1st 2010	December 30th 2011

The table above will be the Milestone dates for the LGIA Appendix B.

Notes to Duration Schedules:

- All construction work requiring outages will be performed during acceptable periods of system load flow, which most often is the off-peak load season. Line outages will be discussed with the SOC and TOC and the assumption is made that line outages will be executed as planned. However, last minute denial of outages by the SOC/TOC along with resulting schedule delay is possible.
- Substation construction will be coordinated with the transmission line outages when possible.
- Construction resources are available when required.
- Transmission Line and Substation projects will begin subsequent to Definition phase Project Execution Plan.
- This schedule does not account for non-typical adverse weather conditions.
- Schedule durations are high level estimates at this time. A detailed schedule will be prepared upon project approval.

7. INTERCONNECTION STANDARDS

Standard: PM3901, Rev 7 (Generator Interconnection Customer Requirements Standard), December 2007
Standard: SL1904, latest rev. (Voltage Fluctuations Operation Guideline), July 30, 1996
Standard: SF0201, latest rev. (Substation Grounding Design Guideline), March 22, 2000
Standard: SF0202, latest rev. (Substation Grounding Specification & Design Guide), December 2005
Standard: SF010100 (Ground Grid Acceptance and Maintenance), December 27, 1996
Standard: SL0002, latest rev. (Customer–Built Substation Design Standard), April 2006
Standard: SL0001, latest rev. (Substation Design Parameters Standard), March 1, 2003
Standard: SA0102, latest rev. (Substation Surge Arresters Purchase Specification), June, 2006
Standard: TF0401, latest rev. (Shield Wire Application Guideline), December 2005
Standard: TF0501, latest rev. (Cathodic Protection Application Guideline), February 1, 1996
Standard: AM3901, latest rev. (Guideline for Affected System Issues)

8. RISK ASSESSMENT

The following risk events may impact cost and/or schedule during execution of the project.

Risk	Comment	Impact
Underground site issues (Pipelines, wells, containments)	Unknown underground factors will add mitigation costs and may impact schedule	***
Substation Site will require substantial site work	Site may be in flood plain, wetlands, Soil Contamination	***
Material transportation could affect cost/schedule	Large transformers(other equipment) may require special transport to substation site	**
Material costs steel & Equipment	Rising steel, copper, fuel and other market conditions could greatly affect estimated cost.	****
Lay-down areas	Cost to be determined during detailed scoping.	*
Storm-water plan implementation	Best guess on SWPPP creation, implementation and monitoring can vary greatly dependant on outcome of environmental study.	**
Weather & Equipment Lead Times (Transformer, Poles)	Unexpected delays on material lead times, unusually inclement weather will impact schedule but might impact AFUDC costs as well.	**
Wetland mitigation	Undetermined until environmental analysis is complete.	***
T-Line Route can change	Estimate based on one route. Upon funding CCN may identify alternate route.	****

T-Line Structures Count can change	Scope based on preliminary structure count.	***
Outages may not be available	Preliminary schedule only considers general outage constraints. Specific project schedule may be delayed by days, weeks or months dependant on system conditions. Delays of months = increased project costs.	**
Scope based on design assumptions which may change	Varied impact on cost and schedule.	***

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

9. CONFIRMED RESERVATIONS

The following modifications were made to the base cases to reflect the latest information available:

- Confirmed firm transmission reservations were modeled.
- Approved transmission reliability upgrades for 2009 – 2011 were included in the base case. These upgrades can be found at Entergy's OASIS web page, http://oasis.e-terrasolutions.com/OASIS/EES, under ICT Planning Studies and Related Documents.

Prior generator interconnection NRIS requests that were included in this study:

PID	Substation	MW	In Service Date
PID 211	Lewis Creek	570	6/1/2011
PID 221	Wolf Creek	875	In-Service
PID 223	PID-223 Tap	125	10/1/2010
PID 224	PID-224 Tap	100	12/1/2009
PID 225	Big Cajun 2 Unit 3	13	7/31/2009

Prior transmission service requests that were included in this study:

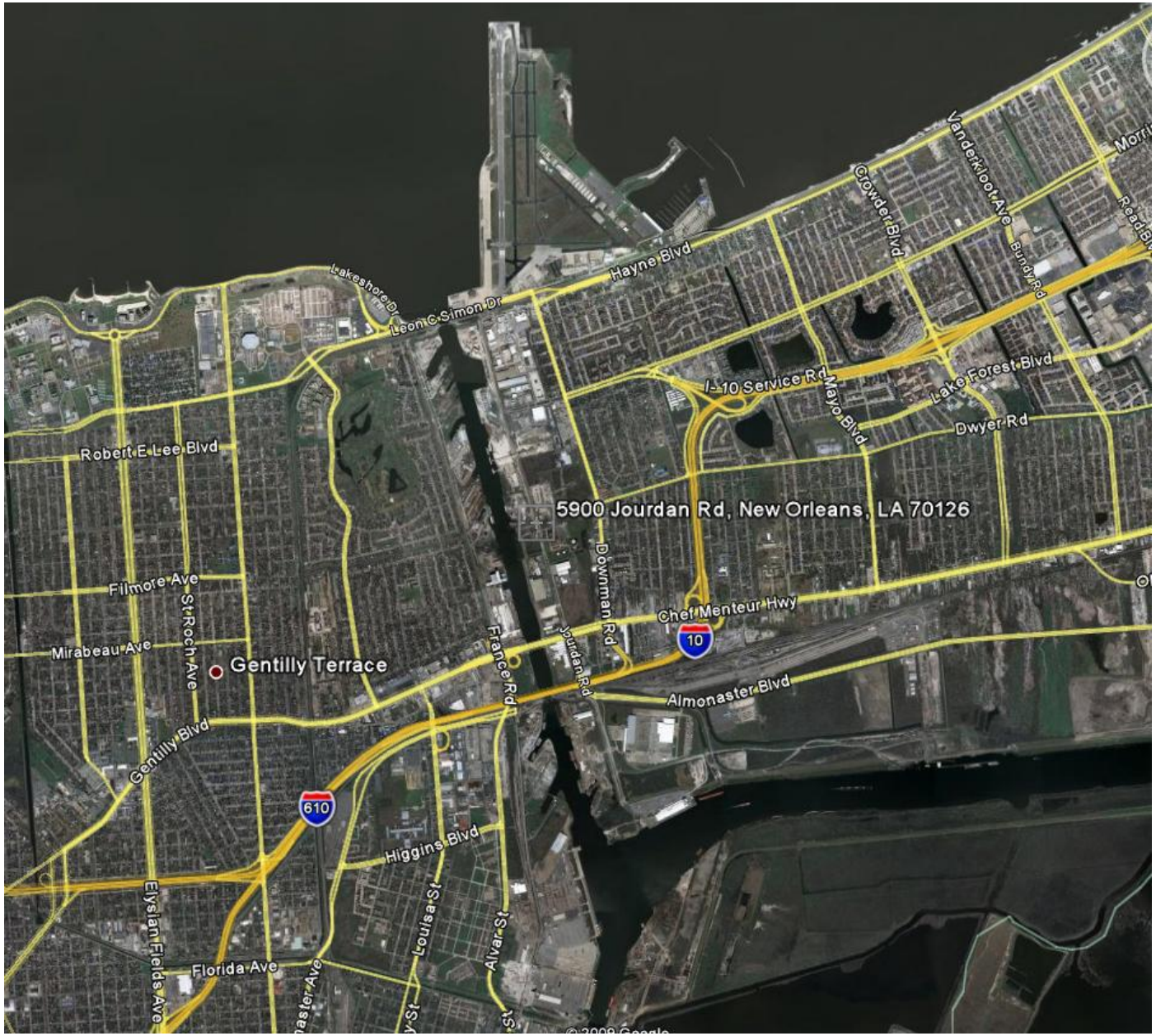
OASIS #	PSE	MW	Begin	End
1604055	Westar Energy Gen & Mktg	15	6/1/2010	6/1/2015
1628473	NRG Power Marketing	100	1/1/2011	1/1/2020
1628474	NRG Power Marketing	100	1/1/2011	1/1/2020
1631134	NRG Power Marketing	103	1/1/2011	1/1/2016
1631135	NRG Power Marketing	206	1/1/2011	1/1/2016
1632265	Merrill Lynch	1	4/1/2009	4/1/2014
1632268	Merrill Lynch	25	4/1/2009	4/1/2014
1633701	NRG Power Marketing	20	1/1/2010	1/1/2019
1633702	NRG Power Marketing	20	1/1/2010	1/1/2019
1633703	NRG Power Marketing	20	1/1/2010	1/1/2019

10. ATTACHMENTS

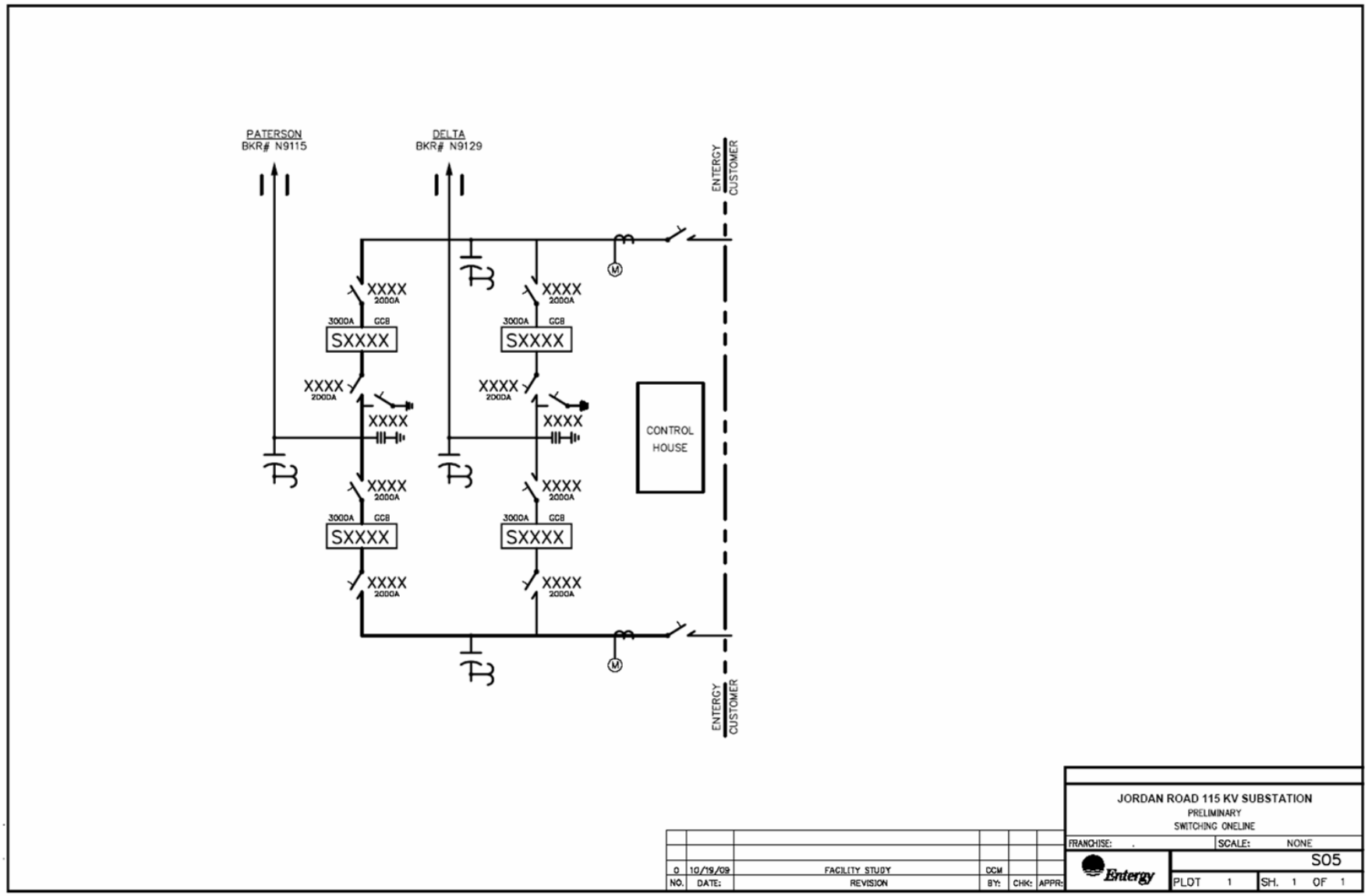
A. Table of Acronyms

ACSR	**Aluminum Conductor Steel Reinforced**
ACSS	**Aluminum Conductor Steel Supported**
ADEQ	**Arkansas Department of Environmental Quality**
AFUDC	**Allowance for Funds Used During Construction**
ATC	**Available Transfer Capability**
EES	**Entergy Control Area**
EHV	**Extra-High Voltage**
ERIS	**Energy Resource Interconnection Service**
ICT	**Independent Coordinator of Transmission**
kV	**Kilo-Volt**
MCM	**(M) Thousand Circular Mils**
MVA	**Mega-Volt Amp**
MW	**Mega-Watt**
NPDES	**National Pollution Discharge Elimination System**
NOI	**Notice of Intent**
NRIS	**Network Resource Interconnection Service**
OASIS	**Online Access and Same-time Information System**
OATT	**Open Access Transmission Tariff**
OG&E	**Oklahoma Gas & Electric**
POD	**Point of Delivery**
POR	**Point of Receipt**
SES	**Steam Electric Station**
SOC	**System Operations Center**
SHPO	**Arkansas State Historic Preservation Office**
SHV	**Super High Voltage**
SW	**Switch Station**
SWEPCO	**Southwest Electric Power Company**
TOC	**Transmission Operations Center**
WMUC	**City of West Memphis Control Area**

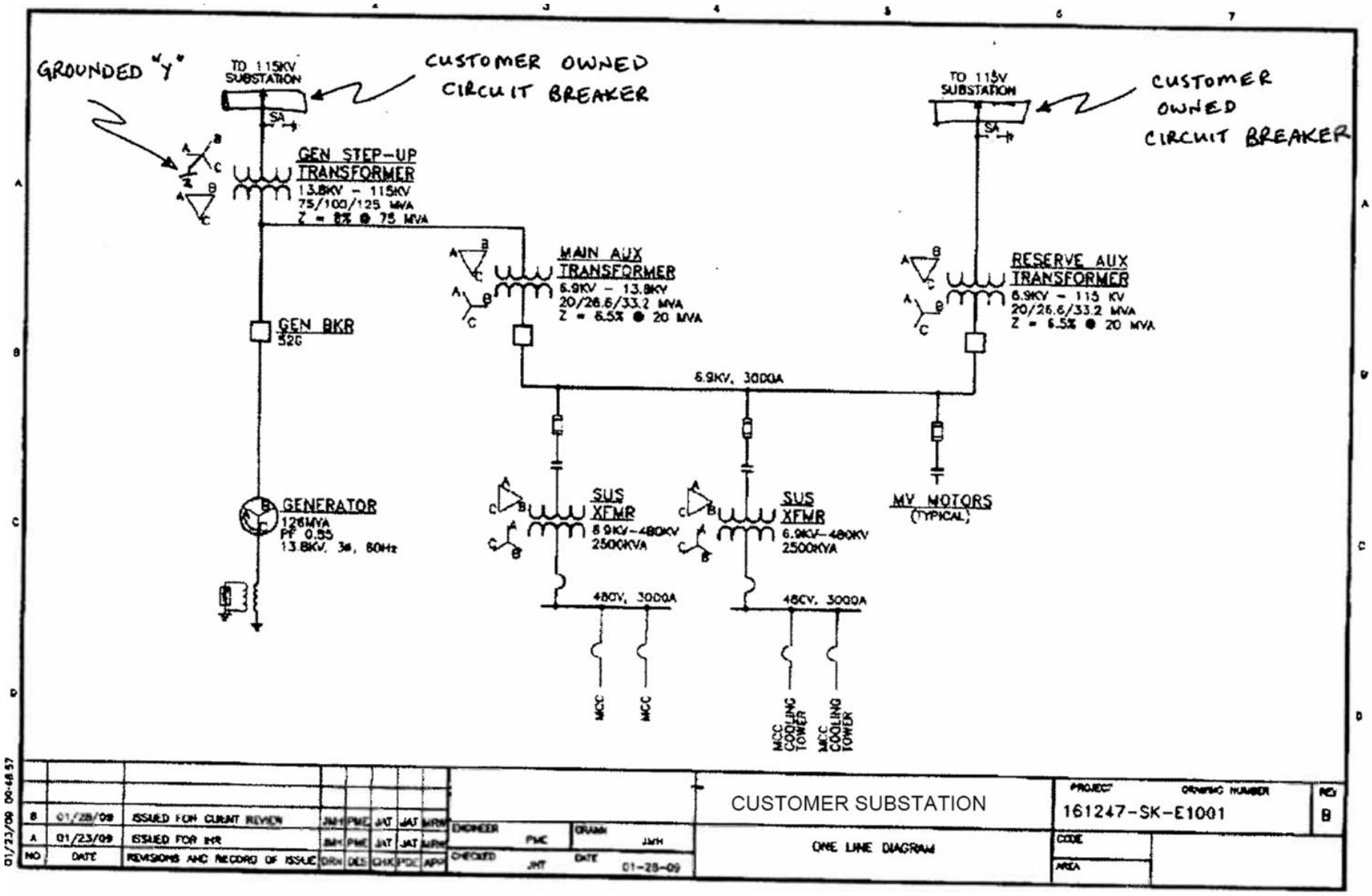
B. Scope Summary Diagram / Area Map



C. One Line Drawings

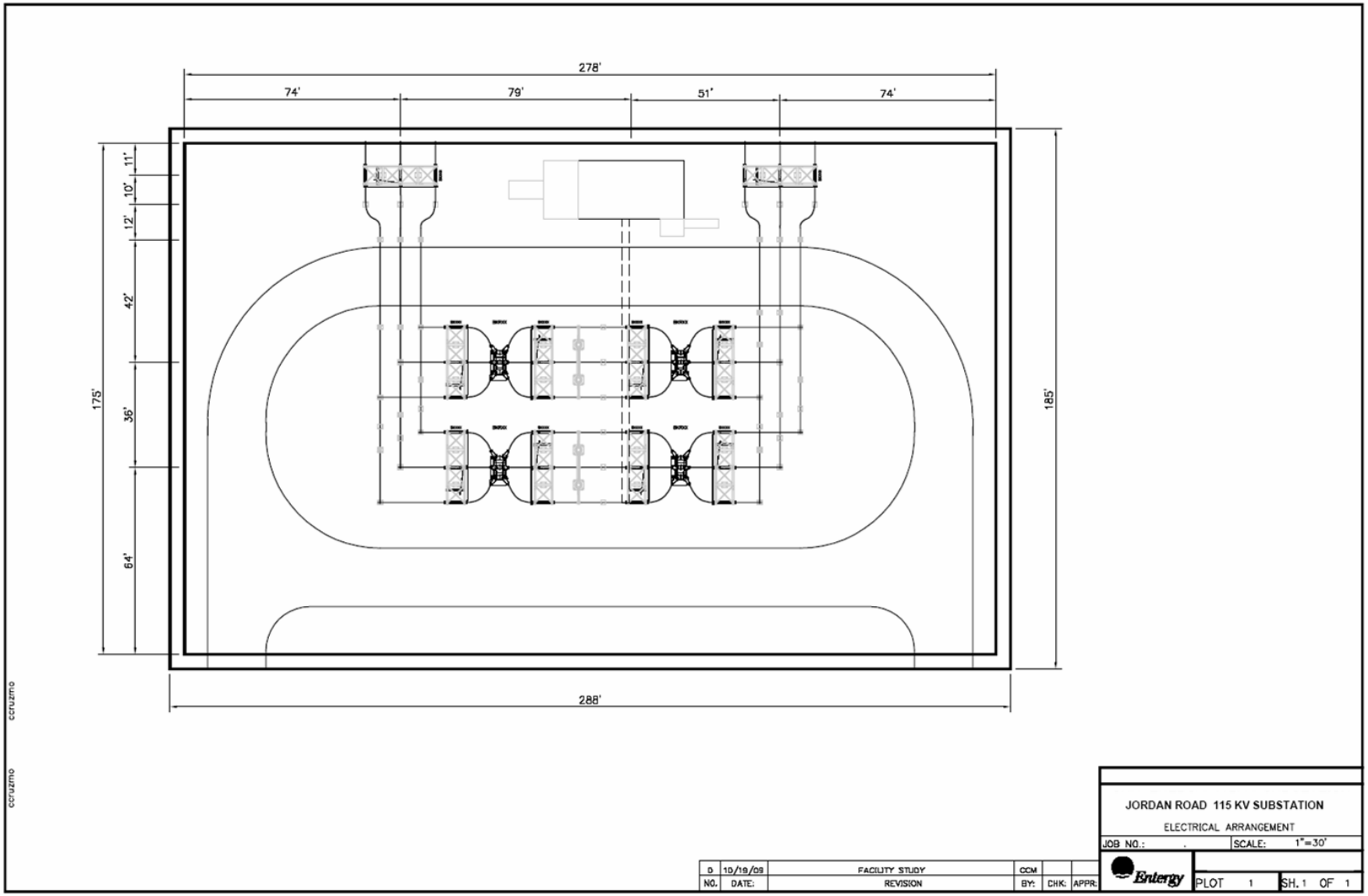


Jordan Road 115kV Substation



Customer Owned 115kV Substation

D. Electrical Arrangement



Jordan Road 115kV Substation