TRANSMISSION / DISTRIBUTION PROJECTS

COMPANY:EMI

FACILITIES STUDY

EJO # F4PPMS0217

PID 207
ADDITION OF GENERATION AT GRAND GULF

Revision: 2B

Rev	Issue Date	Description of Revision	Revised By	Project Manager
A	02/12/08	Shell for engineering team input	Ibrahim Khan	Charles Newell
B	03/04/08	Reviewed engineers input and edited for Construction input	Ibrahim Khan	Charles Newell
C	03/07/08	Construction/RTU configuration/Settings added their material	Ibrahim Khan	Charles Newell
0	03/10/08	Cost assembled, edited and submitted to PD	Ibrahim Khan	Charles Newell
1	3/10/08	Submitted to Lanigan and ICT	Rick Bewley	Tom Lanigan
1A	3/23/08	Revised based on action items from ICT meeting 03/21/08	Ibrahim Khan	Charles Newell
1B	03/26/08	Submitted to Lanigan and ICT	Rick Bewley	Tom Lanigan
1C	04/28/08	Submitted to construction for input on Webre	Ibrahim Khan	Charles Newell
2	5/16/08	Submitted to PD	Ibrahim Khan	Charles Newell
2A	5/16/08	Submitted to ICT	Rick Bewley	Brian Warwick
2B	5/20/08	ICT Classified Upgrades	Daniel Epperson	Jody Holland

EXECUTIVE SUMMARY

This facility study is in response to system improvements identified in System Impact Study PID 207 for connecting addition of 1594 MW generation at Grand Gulf 500 kV substation by 01 January 2015.

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

No write-up and details are being provided relating to ROW acquisition and environmental permitting issues considering that no assessment or detailed study has been done. However, the estimates for lines and substations are based on their qualified input and would be refined upon approval of the project.

The facility study describes scope, estimates, and duration for engineering, construction and other details for various substations including Grand Gulf, new and existing lines. While drawings and other documents prepared by ICT consultants were referred to in preparing the facility study, the finish product of this study reflects Entergy team's perspective and was not intended for comparison of any sort to that of ICT consultant's reports.

The target for accuracy of estimates is +/- 20%. The estimates developed are of the order of magnitude based on experience and expertise of engineering and construction professionals in Entergy – Transmission System. Time allowed to develop the scope and estimates does not allow field visits, site selection for new substation and lines, study of environmental and permitting issues, survey and soil boring, etc. 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.

Recommendation of this study (see page 57 for more elaboration) is to commence work as soon as possible with due consideration for availability of Contract labor in the market, delivery of material, available manpower in Entergy to undertake work and supervise contractors, etc; especially with due consideration for additional work of even higher magnitude to be done for adding generation at River Bend for the same period of time – January 2015.

The duration of work associate with Grand Gulf addition is determined is 5 years and 8 months at a cost of $673,331,243. Please note these are 2008 dollars and do not include tax gross-up if and where applicable (generally in the range of 36%).

SAFETY AWARENESS

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.

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

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.

SCOPE SUMMARY

The System Impact Study PID 207 has identified the following substation and line work:

3.1 Substations:

3.1.1 Grand Gulf 500 kV substation expansion:

Expand 500 kV yard adding 6 breakers to existing buses consisting of 3 bays (2 breakers each bay). One breaker node will be connected to line from new generator transformer, second node will be connected to line from station service and auxiliary transformer, and the third node will be connected to new 500 kV line to Baxter Wilson Substation.

3.1.2 Lakeover 115 kV:

Replace J3208 and J3210 – Upgrade breakers to meet and exceed 40,940A interrupting capability

3.1.3 Lakeover 500 kV and 115 kV:

Add breakers to terminate new line from Baxter Wilson

3.1.4 Sterlington 500 kV:

Convert open air 4-breaker ring bus into a 5-breaker ring bus, add one 500/115 kV 3 phase transformer and connect it to 115 kV substation

3.1.5 Sterlington 115 kV:

Split 115 kV bus, add breakers to terminate new 500/115kV autotransformer, relocate Walnut Grove/Monroe to bus #2, and relocate line Drew/Frostkraft to bus #1.

3.1.6 Ray Braswell 500 kV:

Revise relay settings on two line panels

3.1.7 Baxter Wilson 500 kV:

Noting that the line between Baxter Wilson and Ray Braswell is being removed and new line is being built between Baxter Wilson and Lakeover,
Revise relay settings on two line panels

3.1.8 Webre 500 kV:

Add breaker to terminate new line from Richard

3.1.9 Richard 500 kV:

Add breakers to terminate new line from Webre

3.1.10 Drew 115kV:

Replace line switch

3.2 Lines

3.2.1 At Baxter Wilson Substation - Remove connection of 500 kV line from Ray Braswell and extend it to Lakeover:

Remove termination of line from Baxter Wilson at Ray Braswell and build new line extending it by 22 miles to connect to Lakeover substation. Vacated line bay will be termination point of new line from Grand Gulf Generator.

3.2.2 New Line between Grand Gulf and Ray Braswell:

Build new 48 miles of 500 kV line connecting Grand Gulf and Ray Braswell 500 kV substations. At Ray Braswell new line will terminate in vacated Baxter Wilson line bay.

3.2.3 New 500 kV line between Richard and Webre 500 kV:

Build new 56 miles of 500 kV line connecting Richard and Webre 500 kV substations

3.2.4 New 115 kV line between Sterlington 500 and 115 kV substations:

Build new 115 kV line connecting secondary of 4th 500/115 kV transformer to 115 kV existing bus

3.2.5 New 500 kV line between Grand Gulf Substation and Generator Transformer at Grand Gulf Power Plant

Build new line approximately 4700’ between generator transformer and power plant.

3.2.6 New 500 kV line between Grand Gulf Substation and Station Service Transformer at Grand Gulf Power Plant

Build new lines approximately 2800' between station service and power plant

3.2.7 Upgrade 115 kV Line between Sterlington and Drew

Upgrade capacity of Drew line from 185 MVA to 228 MVA or greater

3.2.8 Upgrade 115 kV Line between Walnut Grove and Swartz

Requirement is to increase capacity from 228 MVA to 267 MVA or greater

3.2.9 Re-terminate Perryville 500 kV Line on new dead-end structure at Sterlington

Remove line from existing dead-end structure; terminate it on the new dead-end structure on the new bay. Relocate existing 115kV underbuild line to by-pass proposed 500kV construction.

3.2.10 Relocate Walnut Grove to new bay – 115 kV at Sterlington

Remove line from existing dead-end structure, terminate line on new rigid bus with a flying pass and make connection to structure on the new bay. A low profile rigid bus will be built by Substations by extending the fence and grounding.

3.2.11 Relocate Frostkraft line to bus #1 (bay 13)

Relocate line from bay 5 (bus#2) to bay 13 (bus#1)

SCOPE DETAILS

4.1 Transmission Substations

4.1.1 Grand Gulf 500 kV Substation:

Expand 500 kV yard adding 6 breakers to existing buses consisting of 3 bays (2 breakers each bay). One breaker node will be connected to line from new generator transformer, second node will be connected to line from station service and auxiliary transformer, and the third node will be connected to new 500 kV line to Baxter Wilson Substation. The existing Baxter Wilson line termination shall become the new Ray Braswell line termination. See drawing M3470S05. The following work will be required in Grand Gulf 500kV switchyard:

4.1.1.1 Site

Site work for expanding the substation will require extensive grading. Assume approximately 3 ft of cut and fill required. From satellite images it appears the area is

wooded. The material required to expand the substation 575 ft to the North are as follows:

- Clear-cut 18 acres of wooded land
- Excavate and grade 100,000 cu. yard of soil
- Compact and grade 100,000 cu. Yards of fill
- Sterilize 18 acres
- Place 27,000 tons of limestone surface
- Install 2000 ft of new access roadway
- Install 2000 ft of new fence
- Remove 1000 ft of existing fence
- Place 600 tons of limestone around new foundations
- Add 70 ft of new roadway

4.1.1.2 Foundation

Install the following foundations involving a total of 384 cu. Yards of concrete:

- (6) 500kV dead tank breaker foundation
- (9) 500kV surge arrester support foundations
- (14) 500kV CT & CVT support foundations
- (150) 500kV high elevation bus support foundations
- (170) 500kV low elevation bus support foundations
- (72) 500kV low elevation switch support foundations
- (6) 500kV high elevation switch support foundations
- (6) type “J” shield wire mast 125’ foundation
- (3) 500kV full tension dead-end foundation

(1) Lot of poured in place cable trench extend from the new bays and route to the existing control house
(1) Lot of grounding to significantly expand the ground grid and bond all structures and electrical equipment to that grid

4.1.1.3 Electrical

Three bays will be installed on the North end of the 500kV switchyard. The east and west operating bus will be extended in the fashion of a double bus double breaker scheme as shown on M3470S05. The following electrical material will be installed:
(3) 500kV dead end structures
(6) 500kV Breakers
(13) 500kV disconnect switches, including (3) with ground switches and all motor operated
(72) 500kV switch support structures, high (6 per switch)
(6) 500kV switch support structures, low (6 per switch)
(170) 500kV bus supports, low
(150) 500kV bus supports, high
(9) Surge arresters
(6) 500kV CT support structures
(8) 500kV CVT support structures

(6) 500kV shield wire structures
(1) Lot of shield wire
(1) Lot of buswork
(1) Lot of insulators

4.1.1.4 Relay

Baxter Wilson line:

- Install two (2) Line Relay Panel 28". The panel will use an SEL 421 for primary digital and an SEL 421 for digital backup step distance protection.

Ray Braswell line:

- Install two (2) Line Relay Panel 28". The panel will use an SEL 421 for primary digital and an SEL 421 for digital backup step distance protection.

RAT line:

- Install two (2) Line DIFFERENTIAL Relay Panel 28". The panel will use an SEL 311-L for primary digital and an SEL 311-L for digital backup step distance protection.

PID line:

- Install two (2) Line DIFFERENTIAL Relay Panel 28". The panel will use an SEL 311-L for primary digital and an SEL 311-L for digital backup step distance protection.

East Bus:

- Install two (2) Bus Differential Relay Panel 28". The panel will use an SEL 487B for primary low impedance and an SEL 487B backup impedance protection.

West Bus:

- Install two (2) Bus Differential Relay Panel 28". The panel will use an SEL 487B for primary low impedance and an SEL 487B backup impedance protection.

Breaker Control:

- Install six (6) Breaker Control Panel The panel will use an SEL 351 for sync, re-close, and breaker failure.
- Install shielded control cables to breaker.
- Install an indoor potential /current distribution box.

Motor Control:

  - Install five (5) Motor Operator Control Panel The panels will be used to control motor operated switches on line and ring bus Install new shielded control cables to operators
  - Kirk key Interlock between breaker & switches
- Install four (4) Differential Panels with fiber optic SEL-311L Relays
- Install eight (8) CVT, 500kv
- Install six (6) CT, 500kv

- Install two (2) Junction Box, Termination, Shield Cable
- Install two (2) Junction Box, CVT

Control House Equipment:

- Replace two (2) Batteries and Rack
- Install two (2) Junction Box, Metering (Pt/Ct)
- Install one (1) Metering Panel, Dual meters
- Upgrade RTU And Termination Cabinet Status cards & Control cards
- Install two (2) Communications Racks with Costcom Communication Channel Bank, Fiber Optic Misc (Patch Panel/Splice Box/Patch /Cords/Connectors)
- Install one (1) Communications Processor, SEL 2032
- Install one (1) Communications Processor, Orion 5r
- Install two (2) Fiber Optic ADSS, 24-Fiber
- One Lot of Control Cable
- One Lot of Shielded Control Cable

4.1.1.5 Relay Settings

New relaying to set

SEL-421 Baxter Wilson Line (2)
SEL-421 Ray Braswell Line (2)
SEL-311L Rat Line (2)
SEL-311L PID Line (2)
SEL-487B East Bus Line (2)
SEL-487B West Bus Line (2)
SEL-487B Bus Protection (4)
SEL-351 Breaker Control (6)

A study must be done to determine what relaying at remote stations will be affected

4.1.1.6 SCADA

RTU configuration will be required for Grand Gulf. A configuration for the SEL2032 will be required. A configuration will be required for the Orion.

4.1.1.7 Construction Strategy and timing of outages:

- Upon receipt of site, foundation, electrical and relaying design packages, through bidding process Entergy approved contractors will be hired to undertake the substation construction. A site office with security guard will be established.
- All material will be delivered to the site – therefore engineering will be requested to insure that the material is delivered after the fence is installed, and security is in place
- Construction of substation will not require any outages; however tying in to existing buses, relocating bay for Baxter Wilson existing line will require outages

- Sequence of construction would be to complete all new bus work, relaying, settings, RTU configuration, etc for the new addition. Then, take 1 week or lesser outage on existing east and west 500 kV buses individually and tie in the new buses and Commission the breaker control, status, bus protection, etc resulting in integration and energization of new and existing buses.
- Take 1 week or lesser outage of line to Baxter Wilson (breakers 2240/2244 at BW and 5216/5244 at GG), and terminate it on new node and complete end to end testing working at BW end and energize the line
- Upon completion of removal of line from Baxter Wilson at Ray Braswell and having done all work necessary to terminate new line from Grand Gulf, take outage of breakers assigned for line to Grand Gulf at Ray B (4920/4928) and breakers 5216/5224 at Grand Gulf for 1 week or lesser. Terminate line at both ends, apply settings, perform end to end testing and energize the line
- Coordinating with the Power Plant authorities, take outage of breakers for line to Generator transformer breaker. Terminate lines at both ends. Apply relay settings, perform end to end testing and energize the line.
- Coordinating with the Power Plant authorities, take outage of breakers for line to Station Service Transformer breaker. Terminate lines at both ends. Apply relay settings, perform end to end testing and energize the line.
- Complete the yard clean up, as built drawings, payments to contractors, enter data in SWMS, remove security from site and vacate the site handing over operation of substation to AM

Note: 500 kV outages require reservations one year in advance and the outages are not guaranteed and can be cancelled on the day outage was supposed to Commence. Therefore, assurance to complete construction as per baseline schedule is subject to this limitation.

Outage Element	**Duration**	**Comments**
500 kV East Bus – Grand Gulf S/S	2 week	Non-crippling / risk of tripping bus connected breakers after connecting new and existing bus together due to error with bus Differential relaying
500 kV West Bus – Grand Gulf S/S	2 week	Non-crippling / risk of tripping bus connected breakers after connecting new and existing bus together due to error with bus Differential relaying
Breakers E,F, 5524 and 5216 at Grand Gulf S/S Breakers 2240 and 2244 at BW taking the line out of service	2 week	Crippling as the load on line is interrupted and once work Commences the line can not be returned to service in short notice / to re-terminate line to BW on new node and Commission protection
Breakers 5524 and 5216 at Grand Gulf S/S, 4920 and 4928 at Ray Braswell	2 week	Non – crippling / for termination of new line at Ray B and Grand Gulf

Breakers A,B at Grand Gulf S/S and generator transformer breaker at Power Plant	2 week	Non – crippling / to terminate new line to generator transformer
Breakers C,D at Grand Gulf S/S and Station Service transformer breaker at Power Plant	2 week	Non – crippling / to terminate new line to generator transformer

4.1.1.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
6	500kV Breaker	26
	500kV Switch	26
9	surge arresters	18
1 lot	Steel Structures	20
1 lot	500kV insulators	20
1 lot	EHV buswork	20
6	500 KV Breaker control panel	16
4	Line Panels Primary 1 And Primary 2	16
8	500 kV CCVT	16
5	MOS Panel	10
4	500 KV Differential panel East/West	16
4	Line Differential Panels Primary 1 And Primary 2 (PID/RAT)	16

4.1.1.9 Assumptions:

None provided by the team

4.1.2 Lakeover 115 and 500 kV Substation:

Replace two 115 kV breakers and expand 500 kV to add line from Baxter Wilson. The Ray Braswell line termination shall be relocated in the ring and the new Baxter Wilson Line shall terminate on the existing Ray Braswell node as shown on station oneline M3805S06.

4.1.2.1 Site

Site work for expanding the substation will require stripping away the limestone surface in areas where new equipment will go. In addition, culverts and catch basins will need to be placed to match the existing drainage. Site work will include:

- Stripping 450 cu yards of topsoil
- Place 600 tons of limestone around new foundations
- Add 70 ft of new roadway

4.1.2.2 Foundation

Lake over 115kV yard:

In order to minimize foundation work, install ABB gas circuit breakers to match the existing foundations.

Lakeover 500kV yard:

Install the following foundations involving a total of 384 cu. Yards of concrete:

- One (1) 500kV dead tank breaker foundation
- Six (6) 500kV equipment support foundations for arresters & CVTs
- Twenty-seven (27) 500kV high elevation bus support foundations
- Seventy-two (72) 500kV low elevation bus support foundations
- Six (6) 500kV low elevation switch support foundations
- One (1) type “J” shield wire mast 125’ foundation
- One (1) 500kV full tension dead-end foundation

4.1.2.3 Electrical

Lakeover 115kV yard:

Replace breaker J3210 and J3208. In order to minimize foundation work, install ABB gas circuit breakers to match the existing foundations. Replace bus work as required.

Lakeover 500kV yard:

Install a new breaker and switch in the ring adjacent to switch J9231. Relocate the existing Ray Braswell line termination by extending the substation bus and termination the bus between the new switch and switch J9225 in the ring bus. Install a new Baxter Wilson line termination at the existing Ray Braswell node. The expansion will require the following work:

Remove (9)”B” tower bus supports and associated bus work
Install (1) 500kV breaker
Install (2) 500kV switches included one with ground
Install (3) surge arresters
Install (6) equipment support structures for arresters and CVTs
Install (99) bus supports
Install (6) switch support towers for one switch
Install (1) deadend tower
Install (1) shield tower
Install (1) lot of insulators and buswork

4.1.2.4 Relay

Lakeover 115 kV Substation Relay Design:

The scope of this project is to replace three (2) 115kV breakers at Lakeover. The existing breakers are underrated and will be replaced with 3000A, 63KA breakers. The existing line and breaker control panels will be used with the new breakers.

- Install three (2) 3000A 115kV breakers. Install new control cables to each breaker if the old cable can not be reused. No control panels will be replaced during this project
- Control house equipment is adequate
- AC and DC panels are adequate
- One lot of shielded cable
- Install One (1) D-20 S cards with accessories to the RTU
- A GE Harris D20 RTU will require a configuration package

A. RTU configuration: Some alarms may be added as a result configuration for new cards and reassignment of existing points may be required.

Lakeover 500kV Substation Relay Design

The scope of this project is to add one (1) 3000A 500kV breaker for the Baxter Wilson line.

Baxter Wilson line:

- Install Two (2) 28” line panel. The panel will use an SEL 421 for primary digital and an SEL 421 for digital backup step distance protection.
- Install three (3) 500kV CVT. Install new shielded cables Junction Box.
- Install two (2) 500kv CVT junction Box

Breaker Control:

- Install One (1) breaker control panel. The panel will use an SEL 351 for sync, re-close, and breaker failure.
- Install shielded control cables to breaker.
- Install an indoor potential /current distribution box.

Motor Control:

- Install One (1) MOS control panel. The panels will be used to control motor operated switches on line and ring bus Install new shielded control cables to operators
- Kirk key Interlock between breaker & switches

Control House Equipment:

- Install One (1) Coastcom Communications Channel Bank

- Install One (1) Communications equipment – Mux/ Splice Box/ Coastcom/ Rack/ for connection to SCADANET/ and line protection
- Install One (1) Fiber Optic ADSS from Dead End tower into control house.
- AC and DC panels are adequate
- Install One (1) S and One (1) K cards with accessories to the RTU
- A GE Harris D20 RTU will require a configuration package
- Install One (1) Communications Processor, SEL 2032
- Install One (1) Lot Control Cable
- Install One (1) Lot Shielded Control Cable

4.1.2.5 Relay Settings

For 115 kV breaker replacement no setting work will be required as the CT ratios will remain to be 3000/5

500 kV:

- New relaying to set
  SEL-421 Baxter Wilson Line (2)
  SEL-351 Breaker Control (1)

- Existing Relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.2.6 SCADA

For 115 kV breaker replacement some alarms may be added as a result configuration for new cards and reassignment of existing points will be required.

New 500 kV breaker would require additional status, control and alarms.

4.1.2.7 Construction Strategy and timing of outages:

115 kV:

- Take two week outage on each of J3208 and J3210 to install and Commission replacement breakers. Due to alternate bus arrangement, lines connecting to these breakers will continue to be in service.

500 kV:

- In order to add one breaker and switch between switches J9231 and J9225, complete foundation work with an outage of less than one week. No load is interrupted.

- In another one week outage of switches J9231/J9225 and breaker J9214, install new switch, breaker, tie with the existing bus, and complete all steel work for tying new node to line switch J9220 and rewire CTs for McAdams line protection from new breaker instead of J9214 and connect CTs from J9214 to new line protection for line to Ray Braswell. Apply relay settings, complete RTU configuration, and perform end to end testing on McAdams line. In this scenario, it is assumed that McAdam line outage would not be required and breakers.
- Take one week of outage on Ray B line (breakers new breaker, J9218/J9234 at Lakeover and J4908/J4928 at Ray B). Remove line from node J9218/J9234. Close breaker J9234 and J9218. Open new breaker and J9214 for one week and re-terminate between new line breaker and J9214. Energize line and perform end to end testing.
- Continue outage of J9234 and J9218 for additional one week. Take outage of breakers J2230/J2233 at BW and terminate new line at both ends. Apply settings, complete RTU configuration, energize line and perform end to end testing.

Outage Element	**Duration**	**Comments**
115 kV – J3208	2 weeks	Non-crippling
115 kV – J3210	2 weeks	Non-crippling
500 kV – J9231 and J9225	1 week	Non-crippling – for breaker and switch foundation work
500 kV – J9218, J9234 at Lakeover and J4908/J4928 at Ray Braswell After J9218/J9234 have been restored to service, take an outage on new breaker and J9214 for terminating Ray B line	2 weeks	for relocating node from J9218/J9234 to new breaker/J9214 After line is disconnected from node, return J9218/J9234 to service
500 kV – J9218, J9234 at Lakeover and J2230/J2233 at BW	2 weeks	for terminating line from BW on J9218/J9234

4.1.2.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
3	CVT	6 – 8
1	500 kV Breakers	26
2	115 kV breakers	20
2	500 kV Switches	26
3	500 kV CCVTs	36
3	surge arresters	18
1 lot	Steel Structures	20
1 lot	500kV insulators	20
1 lot	EHV buswork	20
1	500 KV Brk cntl panel	16
3	500 kV CCVT	16
1	MOS Panel	10
2	Line Panels Primary 1 And Primary 2	16

4.1.2.9 Assumptions:

The Ray Braswell line termination will be relocated to a different node in the ring bus. The 115kV breakers will be replace with ABB breakers that match the existing foundations.

4.1.3 Baxter Wilson 500 kV Substation:

As a result of revising destination of new line from Ray Braswell to Lakeover, undertake the following work as described below:

4.1.3.1 Site

None

4.1.3.2 Foundation

None

4.1.3.3 Electrical

Install grounding on the transmission line dead-end as required to accommodate the fiber installation.

None

4.13.4 Relay

None

It is assumed that upon approval of project, during definition phase for preparing Project Execution Plan and estimates, a determination will be made if the new line panels at Grand Gulf and the communication system still allows existing relays at BW to be compatible and provide reliable and high speed protection needed for the 500 kV system. If not, new panels will be installed.

4.13.5 Relay Settings

- Existing Relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.3.6 SCADA

4.1.3.7 Construction Strategy and timing of outages:

- Pre-requisite for work at this substation is completion of line construction to extend line from BW to Lakeover and completion of removal of termination at Ray Braswell end (presently it goes to Ray B)
- During 2 week outage identified in Grand Gulf section for line between GG and BW, install new settings perform tests and energize line with new panels. Perform end to end testing. Submit revised one line diagrams and as-built relaying and other drawings.
- Take two week outage on line between Baxter Wilson (J2233/J2230), Ray Braswell (J4908/J4928) and breakers J9218/J9235 at Lakeover. During this time connect new 22 mile section of line to existing line from BW removed from Ray Braswell end and terminate it at Lakeover. Complete application of settings at both ends, as well as RTU configuration work and energize the line and complete end to end testing

Outage Element	**Duration**	**Comments**
Breakers E,F, 5524 and 5216 at Grand Gulf S/S Breakers 2240 and 2244 at BW taking the line out of service	2 weeks	Crippling as the load on line is interrupted and once work Commences the line can not be returned to service in short notice / to re-terminate line to BW on new node and Commission protection
Breakers J2233, J2230 at BW, J4908, J4928 at Ray B and J9218 and J9235 at Lakeover – for removal of line at Ray B and termination at Lakeover	2 weeks	Crippling as the load on line is interrupted and once work Commences the line can not be returned to service in short notice

4.1.3.8 Substation long delivery items:

None

4.1.3.9 Assumptions:

Minor electrical, foundation and site work will be required to accommodate the new fiber installation

4.1.4 Sterlington 500 kV Substation:

4.1.4.1 Site

The area required for the expansion of the 500kV yard is approximately 5.4 acre. Due to the poor soil conditions, geotextile fabric is required across the entire site. In addition approximately 3-5 ft of fill will be required to bring the new portion of the site up to the elevation of the existing 500kV substation. It is assumed that the site is heavily wooded and approximately 2' of soil will need to be excavated to ensure the removal of all tree stumps and roots. Approximately 10,000 tons of limestone and 50,000 cu. yards of fill will be required for site prep.

4.1.4.2 Foundation

1000' Cable trough – poured in place
1000' 2" PVC Conduit
15,000ft of grounding
Foundations for the following equipment will use similar to existing designs.
(1) auto-transformer w/oil containment
(2) dead-tank breakers
(1) Full tension dead-end structure
(1) Autotransformer dead-end structure
(53) Low bus support
(42) High bus support
(24) Low switch support
(27) High switch support
(12) Equipment pedestals (CCVT or surge arrester)
(4) Shield wire structures
(14) Yard lights
1320ft of pile driving for autotransformer foundation

4.1.4.3 Electrical

Add a second 500/115kV, 396/492/616 MVA, 7.92% impedance autotransformer with buried tertiary in the new 500 kV outdoor 500 kV substation for paralleling with the existing unit.

To add the new autotransformer it is necessary to expand the ring bus towards Old Sterlington Road to add one more node and relocate Perryville line 2 to prevent autotransformer #3 & #4 from sharing a breaker

The 115 kV will tie via overhead line to the 115kV yard. A separate line WO will be used.

Electrical Equipment:
(1) 500/115kV autotransformer
(2) 500kV breakers
(6) 500kV Switches 3000A with motor operator
(2) 500kV Ground Switches
(1) Full tension dead-end structure
(1) Autotransformer dead-end structure
(53) Low bus support
(42) High bus support
(24) Low switch supports
(27) High switch supports
(12) Equipment Pedestals (CCVT or Surge Arrester)
(4) Shield wire structures
165 Post insulators
6200ft 500kV aluminum bus with damper conductor
3000ft Shield wire
(12) Yard lights

4.1.4.4 Relay

500/115kV Autotransformer #4 Protection

- Dual SEL-387 transformer Differential relays with CT inputs from the high-side breakers and the autotransformer low side will be used for Auto #4 Differential protection. A SEL 311L will be used to protect the low side of Auto #4.
- 500/115kV Perryville #2 Line Protection; CT inputs from the new breakers will need to be wired to the existing Perryville 2 line panel.
- The existing bus Differential scheme will not need revision.
- 500kV Breaker Control & Protection (Qty =2)
  Breaker failure, reclosing, and sync will be handled a by SEL-351relay.
- The supervisory control switches (43SUPV) are not needed on the relay panels, since this function is handled centrally near the RTU.
- 500kV Motor Operated Switch Control (Qty=5) Interlocks (52b contacts) from associated breakers are required.
- The supervisory control switch (43SUPV) is not needed on the relay panels, since this function is handled centrally near the RTU. These controls will be centrally located on a single panel.

- 500kV Instrument Transformers - Three (3) Perryville 2 line CCVTs will be relocated to reflect the line movement. The Auto #4 CCVT will be installed.

Relay Communications

- Two (2) fiber-optic ADSS cables, enclosed in inner-duct, routed in existing cable Trenches are required between Sterlington 500kV and 115kV switchyard control houses.
- Two (2) SEL-2506 fiber-optic remote I/O modules are required to dually transmit/receive trip, breaker failure initiate, and lockout for the breakers associated with the 500/115kV Autotransformer #4.
- One (1) SEL-2032 will be required to support Communications (dialup, SCADA, etc.) with the new relays.

4.1.4.5 Relay Settings

- New Relaying to set
  SEL-387 Transformer Protection (2)
  SEL-311L Low side of Auto #4 (1)
  SEL-351 Breaker Control (2)

- Existing Relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.4.6 SCADA

An RTU configuration will be required at this station. There is also a configuration required for the SEL2032 being installed at this station.

4.1.4.7 Construction Strategy and timing of outages:

The substation will have to be expanded on the south end. The substation addition that was installed two years ago required extensive work on the substation pad requiring the installation of two types of filter fabric to help stabilize the soil. Also an iron ore type fill was used to help strengthen the fill materials. This will require a little more time on the site grading work but should not cause any unforeseen problems. The foundation work may require some concrete to be poured utilizing slurry materials. This will most likely be limited to the deeper piers used for shield wire and dead end structures. Oil containment will be provided underneath the autotransformer. Outages will be required on two points on the ring bus during foundation construction. Electrical and relay work will require some non outage construction work followed by outages on the ring bus. The Perryville No. 2 line will be relocated to a different node on the ring bus and will require a outage. Also an outage on Autotransformer No. 3 will be required to tie in the new construction.

All work will be coordinated with work in the 115 kV yard. Work will likely take approximately one year to complete from grading work to commissioning of new facilities.

4.1.4.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
1	500/115kV Autotransformer	104 - 116
2	500kV Breaker	26
6	500kV Switch	26
3	surge arresters	18
1 lot	500kV Steel Structures	20
1 lot	500kV insulators	20
1 lot	EHV buswork	20
2	500 KV Brk cntl panel	16
1	500 kV CCVT	16
2	MOS Panel	10
2	Auto Differential panel	16

4.1.4.9 ASSUMPTIONS:

None provided by the team

4.1.5 Sterlington 115 kV:

4.1.5.1 Site

The area required for the expansion of the 115kV yard is approximately 1 acre. Due to the poor soil conditions, geotextile fabric is required across the entire site. In addition approximately 3-5 ft of fill will be required to bring the new portion of the site up to the elevation of the existing 115kV substation. Approximately 1,900 tons of limestone and 7,500 cu. yards of fill will be required for site prep.

4.1.5.2 Foundation

1000ft of 2” PVC conduit
3500ft of grounding conductor
Foundations for the 2-level dead end will be a new design; all others will be similar to existing foundations already installed:
(4) Circuit breaker dead-tank
(9) CCVT pedestal
(12) High bus support
(69) Low bus support
(4) CE switch support
(1) Full tension two-level Dead-end structure
(3) Reduced tension Dead-end structure

4.1.5.3 Electrical

BUS SPLIT
It is required that the Sterlington 115kV bus be split in order to place the existing 4th Sterlington autotransformer in-service. The bus needs to be physically cut between bays 5 and 6 (bay numbering per drawing L0090EA2); tie breaker is not required. See table below for final configuration.

SPLIT BUS #1	**SPLIT BUS #2**
Walnut Grove (Swartz)	Downsville
Oak Ridge	Marion
IPCO	Meridian
Selman	N. Crossett
Drew (Frostkraft),	Walnut Grove (Monroe)
500/115kV Autotransformer #3	500/115kV Autotransformer #1
500/115kV Autotransformer #4	500/115kV Autotransformer #2

RELOCATE WALNUT GROVE (MONROE) T-LINE
Relocate this line from bay 13 to bay 4 by building bus from the transmission dead-end structure to a new dead-end located in front of bay 4. The existing T-line dead end will remain in place and taps will connect line conductor to bus below. Work in Bay 4 includes new equipment and structures to tie the line to both north and south buses.
The substation WO will allocate the bus work required for the line relocation and the transmission line WO will cover removal from existing bay, termination of line on to bus using a flying tap and termination from dead-end to the new bay.

RELOCATE DREW (FROSTKRAFT) T-LINE
Replace line trap, relocate CCVT pedestal to C phase and terminate line.

AUTOTRANSFORMER #4 TIE BAY
Bay 7 will tie the new 500/115kV autotransformer with a new 2-level dead-end structure to terminate the Bastrop line on top and transformer tie on bottom. Work includes new equipment and structures to tie the autotransformer to both north and south buses.

The relay room will be expanded to accommodate additional panels.

Electrical Equipment:
(4) 115kV breakers 3000A 63kA
(4) Switches 115kV 2000A
(4) Switches 115kV 3000A
(2) Ground Switches 115kV
(3) AX2E DE structure
(8) CE Switch support
(69) 115kV low bus supports
(12) 115kV high bus supports
(8) E pedestals
(1) Dead-end structure two-level
(165) 115kV post insulators
2500 ft of rigid bus
1000 square ft control house extension

4.1.5.4 Relay

500/115kV Autotransformer #4 Low side Protection

- Primary protection will be a SEL-311L line current differential relay.
- Backup protection will be a SEL-421 line distance relay,The supervisory control switches (43SUPV) for these breakers are not needed on the relay panel, since this function is handled centrally near the RTU.
- Install one (1) CVT on the with junction Box

Bus 115kv Split Control:

- Install one (1) Bus Potential transfer panel
- Install Bus Differential Protection for the both North Bus #2 & South Bus #2 utilizing the SEL-487
- Install three (3) CVT on the North Bus#2 with junction Box
- Install three (3) CVT on the South Bus #2 with junction Box
- Existing North Bus #1 & South Bus #1 bus differential scheme rework.

Breaker Control:

- Install four (4) Breaker Control Panel The panel will use an SEL 351 for sync, re-close, and breaker failure. Breaker failure, reclosing, and synch will be handled by a SEL-351 relay.

Walnut Grove to new bay – 115 kV at Sterlington

- Install one (1) Line Relay Panel 28”. The panel will use an SEL421 for primary digital and an SEL311-C for digital backup step distance protection.
- Install one (1) CVT on the with junction Box

.Frostkraft line to bus #1 (bay 13)

- Rework existing Monroe “Walnut Grove” Line panel. The panel uses an SEL421 for primary and an SEL311-C for backup step distance protection. Install Pulars to for PLC.
- Install one (1) CVT on the with junction Box
- Install one (1) Line Trap the with Tuner
- Install one (1) Orion Com Processor to support communications
- Install one (1) SEL2032 for RTU IED
- Install two (2) Fiber Optic ADSS, 24-Fiber
- One Lot of Control Cable

Long Delivery items with lead times:

Equipment	Quantity	Lead
115KV Brk cntl panel	4	16 weeks
115KV Bus Diff panel	2	16 weeks
Potential Transfer Panel	2	10 weeks
115KV Line panel	1	16 weeks

Relay Communications

Two (2) fiber-optic ADSS cables enclosed inner duct routed in existing cable trench are required between Sterlington 500kV and 115kV switchyard control houses
Two (2) SEL-2506 fiber-optic remote I/O modules are required to dually transmit/receive trip, breaker failure initiate, and lockout Commands for the breakers associated with the 500/115kV Autotransformer #4.

4.1.5.5 Relay Settings

New relaying to set

Existing relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.5.6 SCADA

A configuration for the RTU will be required. There will also be a configuration required for the SEL2032 being installed at this station.

4.1.5.7 Construction Strategy and timing of outages:

A small amount of grading work and fence relocation will be required to relocate Walnut Grove/Monroe 115 kV line. Outages will likely be required on South Bus No. 1 & No. 2 and North Bus No. 1 & No. 2 in order to perform foundation work. Control house is expected to be enlarged and should not require any outages. Electrical and relay work will require some non outage construction work followed by an outage on the North & South Busses to install new PT's needed to split the bus. Also outages will be required on each of the busses to connect in new construction. An outage will be required to tie in the relocated bus work on the Walnut Grove/Monroe 115 kV line. Relay testing and checkout will be required on the new Walnut Grove/Monroe line terminal, new bus differential, new autotransformer connection and all other associated breakers,

equipment, etc. All work will be coordinated with work in the 500 kV yard which will drive the duration of this project. Work will likely take approximately one year to complete from grading work to commissioning of new facilities.

4.1.5.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
4	115kV circuit breaker	22
8	115kV disconnect switch	18
165	115kV insulators	14
1 lot	Steel structures	20
1 lot	115kV buswork	14
2	115 KV Brk cntl panel	16
2	Bus Differential panel	16
1	Potential transfer panel	16

4.1.5.9 Assumptions:

None provided by the team

4.1.6 Ray Braswell 500 kV Substation:

As a result of removing line from Baxter Wilson and terminating line from Grand Gulf, the following work would be required:

4.1.6.1 Site

None

4.1.6.2 Foundation

None

4.1.6.3 Electrical

None

4.1.6.4 Relay

None

It is assumed that upon approval of project, during definition phase for preparing Project Execution Plan and estimates, a determination will be made if the new line panels at Grand Gulf and the communication system still allows existing relays at BW to be

compatible and provide reliable and high speed protection needed for the 500 kV system. If not, new panels will be installed.

4.1.6.5 Relay Settings

Existing relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.6.6 SCADA

Because of the line being removed from this station a modification to the RTU configuration will be required.

4.1.6.7 Construction Strategy and timing of outages:

- Lakeover line - New node has been at Lakeover has been designated for line coming from Ray Braswell. Please refer to work and outages described in Lakeover section
- Grand Gulf line – See Grand Gulf section for work details and outages for terminating new line at Grand Gulf and Ray Braswell
- In order to comply with work identified in two bullets above, all relaying work including settings and RTU configuration has to be completed and after each line is energized, end to end testing should be done.

4.1.6.8 Substation long delivery items:

None

4.1.6.9 Assumptions:

None

4.1.7 Richard 500 kV Substation:

As a result of adding a new line between Richard and Webre, the following work would be required as shown on drawing G8168S08:

4.1.7.1 Site

The proposed expansion of the site will be 150’ by 675’.
A topographic and boundary survey will be needed in order to property design the site. This information has not been obtained prior to completing the scope and the following quantities will be based off of assumption made from existing drawings and pictures of the site.

Soil borings will be needed in order to adequately design the foundations. These borings have not been taken. We will be assuming drill piers for the structures and pad with out piles for transformers, breakers and control house.

All appropriate permits and licenses will need to be obtained prior to construction.

The site is will be approximately 2.5 acres. A SWPPP will be needed. This work should be contracted out to the qualified contractor. The project manager shall insure 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 our expectations.

Due to the lack of soil boring and survey information the following quantities are based on assumptions that were made from existing drawings and pictures of the site. The drainage of the expansion area will be surface drainage routed back into the existing drainage in the station. We will elevate the site approximately 1.5 feet above the existing grade to allow for the drainage. It is assumed that the site is heavily wooded. Grubbing and de-stumping will be needed in order to properly prepare the site. Due to the amount of site and foundation work, we will have a large amount of spoil to remove during the construction. It is assumed that spoil removed during foundation installation can not be used as structural fill and spread across the site. Therefore, it will need to be removed from the site. The soil at the site will need to be tested and the proper disposal will need to be determined prior to start of construction. The cost for disposing the spoil will not be able to be accurately determined until we know what the proper process will be of disposing it. This will be determined during the soil testing.

1	EA	Topographic and boundary survey
1	EA	Soil borings including soil resistivity test
1	EA	Environmental impact study, permits and licenses
1	EA	SWPPP
1	EA	Soil Testing
10500	CYD	Stripping, grubbing and de-stumping
2.5	ACRE	Wooded areas (Grubbing and De-stumping)
2.5	ACRE	Wooded areas (Disposal)
19000	CYD	Structural fill (Raise site 1.5 feet above existing elevation)
2.5	ACRE	Soil Sterilization
5250	TON	Limestone surface
975	FT	7’ fence with 1’ of barb wire
675	FT	Removal of fence
.25	ACRE	Seed and mulch

11000 CYD Hauling of spoil dirt

4.1.7.2 Foundation

Install 350 cubic yards of concrete including foundations for one 500kV deadend tower, one shield tower, one breaker, and several switch support and bus support structures. Expand the existing ground grid to include the 150' x 675' area of expansion and install ground leads to new structures and equipment. Install conduit from existing cable trench to new breakers, CVT's, and motor operators.

4.1.7.3 Electrical

Install one breaker in the existing ring bus between breaker 13000 and the Nelson line termination as shown on oneline G8168S08. Install the new Webre line termination between the new breaker and breaker 13000. The following equipment shall be installed:
(1) Shield Tower, type J and associated shield wire to adjacent towers
(1) 500kV Breaker
(1) 500kV line disconnect switch with ground switch and motor operators
(2) 500kV disconnect switches with motor operators for breaker isolation in the ring and mounted on existing structures
(3) Surge arresters
(1) 500kV deadend
(29) 500kV "A" tower bus supports
(15) 500kV "B" tower bus supports
(6) 500kV "C" tower bus supports
(4) "F" tower CVT support structures
(3) Arrester support structures
(1) Lot of insulators, bus, and associated hardware

4.1.7.4 Relay

Weber Line:

- Install Two (2) 28" line panel. The panel will use an SEL 421 for primary digital and an SEL 421 for digital backup step distance protection. .
- Install three (3) CVT with carrier accessories.
- Install a Three-phase potential junction box for the line CVT.
- Install a line trap and a line tuner on A phase. Relay settings will provide appropriate carrier frequencies.

Breaker Control:

- Install One (1) breaker control panel. The panel will use an SEL 351 for sync, re-close, and breaker failure.
- Install an indoor potential /current distribution box.

Motor Control:

- Install One (1) MOS control panel. The panels will be used to control motor operated switches on line and ring bus

Control House Equipment:

- Install Two (2) Coastcom communication Channel Bank
- Install Two (2) Fiber Optic Misc (Patch Panel/Splice Box/Patch Cords/Connectors)
- Install One (1) Communications Processor, SEL2032
- Install One (1) Communications Processor, Orion 5r
- Install One (1) Junction Box, Potential
- Install ADSS fiber from Dead End tower into control house.
- Install One (1) Lot Control Cable
- Install One (1) Lot Shielded Control Cable

4.1.7.5 Relay Settings

- New relaying to set
  SEL-421 Weber Line (2)
  SEL-351 Breaker Control (1)

Existing relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.7.6 SCADA

With the installation of a new breaker and relays a new RTU configuration will be required.

4.1.7.7 Construction Strategy and timing of outages:

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 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.

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 Webre 500kV T-Line, an outage consisting of several weeks duration will be required on the affected section of the Richard 500kV Ring Bus. This outage will require the section of the Richard 500kV Ring Bus between Switch # 13072, and Switch # 18416 to be switched out, tested, and grounded. This will facilitate the removal and installation process in order to terminate the new proposed Webre 500kV T-Line.

Upon completion of the proposed additions to the Richard 500kV 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 first span of the new proposed Webre 500kV T-Line could be terminated into the newly established portion of the node with a point of isolation to allow the Richard 500kV Ring 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 Webre/Richard 500kV T-Line, final commissioning and checkout will be performed. This will also include end to end checkouts, and Remote Settings.

Required Outages:

Richard 500kV Ring Bus, between Sw. # 18416, and Sw. # 13072 must be isolated.
Note: This will require an outage on the Richard/Nelson L-620 500kV Line.

4.1.7.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
1	500kV Breaker	26
1	500kV line disconnect switch with ground switch and motor operators	26
2	500kV disconnect switches with motor operators	26
3	surge arresters	18
1 lot	Steel Structures	20
1 lot	500kV insulators	20
1 lot	EHV buswork	20
1	500 KV Brk cntl panel	16
2	500 KV Line panel P1/P2	16
3	500 kV CCVT	16
1	MOS Panel	10

4.1.7.9 Assumptions:

None provided by the team

4.1.8 Webre 500 kV Substation:

Install a new breaker and line position in the existing ITE GIS equipment for a line to Richard as shown on the Webre electrical plan and drawing G7198S06. The following work would be required:

4.1.8.1 Site

The proposed expansion of the site will be 350’ x 200’.
A topographic and boundary survey will be needed in order to proper design the site. This information has not been obtained prior to completing the scope and the following quantities will be based off of assumption made from existing drawings and pictures of the site.

Soil borings will be needed in order to adequately design the foundations. These borings have not been taken. We will be assuming drill piers for the structures and pad with out piles for transformers, breakers and control house.

All appropriate permits and licenses will need to be obtained prior to construction.

The site expansion will be approximately 1.6 acres. A SWPPP will be needed. This work should be contracted out to the qualified contractor. The project manager shall insure 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 our expectations.

Due to the lack of soil boring and survey information the following quantities are based on assumptions that were made from existing drawings and pictures of the site. The drainage of the expansion area will be surface drainage routed back into the existing drainage in the station. We will elevate the site approximately 2.0 feet above the existing grade to allow for the subsurface drainage. It is assumed that the site is light brush. Stripping and grubbing will be needed in order to properly prepare the site. Due to the amount of site and foundation work, we will have a large amount of spoil to remove during the construction. It is assumed that spoil removed during foundation installation can not be used as structural fill and spread across the site. Therefore, it will need to be removed from the site. The soil at the site will need to be tested and the proper disposal will need to be determined prior to start of construction. The cost for disposing the spoil will not be able to be accurately determined until we know what the proper process will be of disposing it. This will be determined during the soil testing.

1	EA	Topographic and boundary survey
1	EA	Soil borings including soil resistivity test
1	EA	Environmental impact study, permits and licenses
1	EA	SWPPP
1	EA	Soil Testing
8,000	CYD	Stripping, grubbing and de-stumping
1.6	ACRE	Light brush and grubbing
1.6	ACRE	Light brush and grubbing (Disposal)
6	EA	Catch Basins
400	FT	24” R.C.P. Culvert
16,100	CYD	Structural fill (Raise site 2.0 feet above existing elevation)
1.6	ACRE	Soil Sterilization
600	FT	Access Roadways
4,500	TON	Limestone surface
1100	FT	7’ fence with 1’ of barb wire
1100	FT	Removal of fence
.25	ACRE	Seed and mulch
8,750	CYD	Hauling of spoil dirt

4.1.8.2 Foundation

Install the following foundations for a new open air position ring bus:

(1)-500kV Breaker Foundations
(3)-500kV Equipment Support Structure Foundations for surge arresters
(3)-500kV Equipment Support structure foundations for CVTs
(30)-500kV Bus Support foundations for single phase bus supports
(6)-500kV Switch Support foundations for high elevation
(1)-500kV Dead-end, Full Tension foundations
(1)-500kV Type "J" Shield Wire Mast Foundations
(5) - yard light foundations
(1) Lot of grounding to significantly expand the ground grid and bond all structures and electrical equipment to that grid

4.1.8.3 Electrical

Install a new breaker and line position in the existing ITE GIS equipment for a line to Richard as shown on the Webre electrical plan and drawing G7198S06. The following work would be required:
(1) 500kV deadend structures for the new Richard transmission lines
(1) 500kV breakers
(2) Gas insulated 500kV disconnect switches, with ground blades
(1) 500kV air break disconnect switches, with ground blades and both with motor operators
(6) 500kV switch structures, six per switch
(3) Arresters, three for each line
(3) Arrester support structures
(3) 500kV CVT support structures

Several bus supports to support air insulated buswork and gas insulated buswork expanding the ring and connecting to the transmission line terminations
(1) Lot of bus work
(1) Lot of insulators
(1) 500kV shield wire support structure
(1) Lot of shield wire

4.1.8.4 Relay

Wells Line:

- Upgrade line panel. The panel will use digital backup step distance protection.

Richard Line:

- Install two (2) 28" line panel. The panel will use an SEL 421 for primary digital and an SEL 421 for digital backup step distance protection. .
- Install three (3) CVT with carrier accessories.
- Install a Three-phase potential junction box for the line CVT.
- Install a A phase line trap and a line tuner. Relay settings will provide appropriate carrier frequencies.

Breaker Control:

- Install one (1) breaker control panels. The panel will use an SEL 351 for sync, re-close, and breaker failure.
- Install an indoor potential /current distribution box.

Motor Control:

- Install one (1) MOS control panels. The panels will be used to control motor operated switches on line and ring bus

Control House Equipment:

- Upgrade Harris D20 RTU – mother board, cards for control, status, analog, and software. In addition to the data from Entergy's equipment, status from the customer circuit switchers will be routed to the RTU.
- Install two (2) SEL 2032.
- Install one (1) Orion Comm Processor
- Install wall mounted AC panel.
- Install wall mounted DC panels.
- Install two (2) Fiber communication racks for dual OPGW fiber, mux, channel bank, patch panel, 48volt converter
- Install two (2) fiber slice box. The box will be located on dead end tower
- A dedicated four-wire data circuit will be installed for SCADA communication between the substation and the TOC.
- RTU configuration will be required.
- Relay settings will be required.
- Host database changes will be required.
- Install a one lot of shielded cable
- Install a one lot of cable

- Install a one lot of ADSS fiber optic cable

4.1.8.5 Relay Settings

- New relaying to set

  SEL-421 Richard (2)
  SEL-351 Breaker Control (1)

Existing relaying to set

A study must be done to determine what relaying at remote stations will be affected

4.1.8.6 SCADA

A configuration for the new RTU will be required. There will also be 2 SEL2032 configuration required at this station.

4.1.8.7 Construction Strategy and timing of outages:

The proposed method to perform the installation of the new 500kV GIS breaker will be to sole source the entire installation of the breaker and associated equipment to the breaker vendor (ABB). This method of installation will require close coordination with the Entergy design and construction management departments. All methods of installation and the materials used will be required to meet Entergy standards and specifications.

Entergy personnel will oversee all construction activities to ensure every effort is made to utilize construction methods that will minimize outages, such as low profile excavation equipment. 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 the outage will be granted at the time requested. This poses risk to all schedules.

The actual sequence of the 500kV T-Line outages will have to be determined at a later time in order to coincide with system constraints at that point in time The new proposed Richard 500kV T-Line component could be terminated without requiring an outage, whereas this is a green-field T-Line, terminating into a green-field Substation.

Upon completion of the proposed 500kV GIS Breaker installation, 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 of each component. All checkouts and commissioning will be performed by Entergy personnel.

Required Outages:

Webre/Wells 500kV, L-345
Webre/Willow Glenn, L-346
Webre/Big Cajun #2, L-745

4.1.8.8 Substation long delivery items:

Quantity	Material Description	*Lead Time (weeks)
1 lot	Gas insulated expansion buswork	78
1	500kV Breaker	26
1	500kV Switch	26
3	Arresters	18
1 lot	500kV Steel Structures	20
1 lot	500kV insulators	20
1 lot	EHV buswork	20
1	500 KV Breaker control panel	16
2	500 KV Line panel P1/P2	16
3	500 kV CCVT	16
1	MOS Panel	10

4.1.8.9 Assumptions:

Site assumptions are noted in the site work description. In an effort to minimize construction outages, new electrical equipment shall be installed instead of re-using existing material. This applies to the control house as well, but the size must be determined. Some of the existing 500kV bus work and structures will be removed to facilitate the new construction, but the cost of removing the existing gas bus is not known at this time. Assume the GIS will be abandoned in place.

4.1.9 Drew 115kV Substation

Site
No site work required

Foundation
Install new conduit for motor operator

Electrical
Replace line switch R0459 and ground switch N7024 with new 2000A with motor operator. Replace taps to bus and riser with 2 ½" Schedule 80 aluminum bus.

4.2 Transmission lines

4.2.1 Baxter Wilson to Ray Braswell to Lakeover – 500 kV line

The following work is required to remove line termination of the Baxter Wilson 500kv line at Ray Braswell and extended it approximately 22 miles to the Lakeover 500 kV. The line will then run from Baxter Wilson to Lakeover passing near Ray Braswell. The first part of the line from Baxter Wilson to Ray Braswell will use existing structures and wires.

4.2.1.1 Scope:

Build approximately 22 miles of new 500kV line using tubular H-frame tangent structures and 3 pole angle and dead-end structures.
180' Right of Way required for entire length. H-frames will use vibratory socket pile foundations. The 3 pole angle and dead-end structures will use drilled pier foundations. Triple bundled 954 ACSR 45/7 "Rail" conductor. Two Fiber optic (24) OPGW shield wires used, one per peak for entire line length.

Quantity	Material Description	*Lead Time (weeks)
280	Steel Poles	18
220	Vibratory Steel Caissons	18
1,180,040 lbs	954 ACSR "Rail" Conductor	20
74352 meters	24 fiber OPGW	24
486	Insulators	18

4.2.1.2 Line Construction and outages:

1) Complete expansion of Lakeover Substation to add new 500kV terminal bay.
2) Build approximately 22 miles of new 500kV line in two separate sections. One section of the new line will be used for relocating the Ray Braswell-Lakeover 500kV line to its new bay position in Lakeover. The other section of new line will be used to reroute the Baxter Wilson-Ray Braswell 500kV line to Lakeover Substation creating the Baxter Wilson-Lakeover 500kV line.

Outages:

Two week outage required on Ray Braswell-Lakeover 500kV line to move line termination over to new bay position in Lakeover Substation.

Two week outage on Baxter Wilson-Ray Braswell 500kV line to move line termination from Ray Braswell Substation to vacated terminal bay in Lakeover Substation. The Baxter Wilson-Ray Braswell 500kV line goes away and the Baxter Wilson-Lakeover 500kV line is created.

3) Total construction duration – 42 weeks

4.2.1.3 Assumptions:

- Necessary outages are obtainable
- No major environmental issues
- No problems with crossing permits
- 900’ average spans used in estimate
- Estimated route length is 22 miles
- Estimated material costs are based on today’s costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.2 Grand Gulf to Ray Braswell new line – 500 kV

4.2.2.1 Scope

Build approximately 48 miles of new 500kV line using tubular H-frame tangent structures and 3 pole angle and dead-end structures.
180’ Right of Way required for 31 miles of the length. 17 miles of unused 200’ wide existing ROW will also be used. H-frames will use vibratory socket pile foundations. The 3 pole angle and dead-end structures will use drilled pier foundations.
Triple bundled 954 ACSR 45/7 “Rail” conductor. Two Fiber optic (24) OPGW shield wires used, one per peak for entire line length.

Quantity	Material Description	*Lead Time (weeks)
599	Steel Poles	18
500	Vibratory Steel Caissons	18
2,574,634 lbs	954 ACSR “Rail” Conductor	20
162,222 meters	24 fiber OPGW	24
1011	Insulators	18

4.2.2.2 Line Construction and outages:

1) Complete expansion of Grand Gulf 500kV Switch Yard to add new 500kV terminal bays.
2) Build short section of line to relocate the Baxter Wilson 500kV line to its new bay position in Grand Gulf 500kV switch yard. Outage**:** Two week outage on Grand Gulf-Baxter Wilson 500kV line.
3) Build approximately 48 miles of new 500kV line from the vacated terminal bay at Grand Gulf to the de-energized section of existing line out of Ray Braswell that was created when the Baxter Wilson-Ray Braswell 500kV line was rerouted to Lakeover Substation. No outages necessary for this work.
4) Total construction duration – Approx. 75 weeks

Note: All necessary permitting and requirements needed to work on the Grand Gulf Nuclear Station site will be handled prior to starting construction.

4.2.2.3 Assumptions:

No major environmental issues
No problems with crossing permits
900' average spans used in estimate
Estimated route length is 48 miles
Estimated material costs are based on today's costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.3 Richard to Webre – 500 kV new line

4.2.3.1 Scope:

Build approximately 56 miles of new 500kV line using tubular H-frame tangent structures and 3 pole angle and dead-end structures.
180' Right of Way required for entire length. H-frames will use vibratory socket pile foundations for 34 miles. The H-Frames for the other 22 miles going through the Atchafalaya basin will use base plated pile foundations. The 3 pole angle and deadend structures will use base plated pile foundations. 2 lattice towers and their foundations for the Atchafalaya river crossing will also need to install.
Triple bundled 954 ACSR 45/7 "Rail" conductor. Two Fiber optic (24) OPGW shield wires used, one per peak for entire line length.

Quantity	Material Description	*Lead Time (weeks)
721	Steel Poles	18
721	Vibratory Steel Caissons	18
3,003,739 Lbs	954 ACSR "Rail" Conductor	20
189,259 meters	24 fiber OPGW	24
1173	Insulators	18
2	Lattice Towers River Crossing	30
75,609 Lbs	3070 kcmil 140/91 for River Crossing	36

4.2.3.2 Line Construction and outages:

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 stormwater pollution prevention controls, perform all of the clearing, establish strategically located laydown 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 the new proposed Richard/Webre 500kV T-Line, and/or any required modifications to collateral facilities due to system constraints. This too poses risk to all schedules.

Required Outages:

New Webre 500kV (4) Breaker Ring Bus Station: Section of the 500kV Ring Bus where the new Webre/Richard 500kV T-Line will terminate.
Richard 500kV Substation: Section of the Ring Bus where the new Webre/Richard 500kV T-Line will terminate.
The possibility and probability exists that multiple unidentified outages on other circuits, and or facilities "To Be Determined" will be required. This would include but not be limited too other Utilities, Cooperatives, Municipalities, etc….

4.2.3.3 Assumptions:

No major environmental issues
No problems with crossing permits
ROW will be attainable for $10,000/acre
850' average spans used in estimate
Estimated route length is 56 miles
Estimated material costs are based on today's costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.4 115 kV line between 115 kV and 500 kV S/Ss - Sterlington

4.2.4.1 Scope:

Build line connecting 115kV bus and 500Kv transformer. Line will be built using direct embedded single pole structures. Line length approximately 2300 ft

Quantity	Material Description	*Lead Time (weeks)
12	Concrete Poles	14
20,000 lbs	1780 ACSR “Chukar” Conductor	20
2300 ft	7#7 Shield Wire	Stores
45	Insulators	18

4.2.4.2 Line Construction and outages:

The construction and outage plan for this work will be determined during scoping and design. The area is very congested and the project could involve outages on adjacent line sections and a 115kV bus outage for terminating the tie line on the substation bay tower.

Total construction duration – Approx. 4 weeks

4.2.4.3 Assumptions:

ROW will not be required
No environmental issues
Routing into the 115kv yard can be done with minimal disruptions to the other overhead and underground facilities in the area
Estimated material costs are based on today’s costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.5 500 kV Line from Generator Transformer at Power Plant at Grand Gulf

4.2.5.1 Scope:

Build line approximately 4700' in length between Generator Transformer and power plant using tubular steel construction. Vibratory caissons will be used for tangent H-frame structure(s) and drilled pier foundations will be used at three pole angle and deadend structures. Line routing will require that sufficient clearance be maintained between this line and the new line to the station service.

Quantity	Material Description	*Lead Time (weeks)
23	Steel Poles	18
2	Steel Caissons	18
47,738 lbs	Conductor	20
3008 meters	24 fiber OPGW	24
60	Insulators	18

4.2.5.2 Line Construction and outages:

The construction plan for this line is very basic (build new line) and should not require any outages. Construction activities necessary to complete this work include installing concrete drilled pier foundations, installing vibratory caissons, structure framing and erection, and wire stringing. All necessary permitting and requirements needed to work on the Grand Gulf Nuclear Station site will be handled prior to starting construction.

Total outage duration – approximately 10 weeks

4.2.5.3 Assumptions:

ROW will not be required
No environmental issues
Route shown on drawing GGNS-CD-DWG-Y99-C-0211-01 is used for approximating routing and length
Routing can be done with minimal disruptions to the other overhead and underground facilities in the area
Estimated material costs are based on today's costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.6 500 kV Line to Station Service at Grand Gulf Power Plant

4.2.6.1 Scope:

Build line approximately 2800' in length between Station Service and power plant using tubular steel construction. Vibratory caissons will be used for tangent H-frame structure(s) and drilled pier foundations will be used at three pole angle and dead-end structures. Line routing will require that sufficient clearance be maintained between this line and the new line to the generator transformer.

Quantity	Material Description	*Lead Time (weeks)
17	Steel Poles	18
2	Steel Caissons	18
28,428 lbs	Conductor	20
1791 meters	24 fiber OPGW	24
45	Insulators	18

4.2.6.2 Line Construction and outages:

The construction plan for this line is very basic (build new line) and should not require any outages. Construction activities necessary to complete this work include installing concrete drilled pier foundations, installing vibratory caissons, structure framing and erection, and wire stringing. All necessary permitting and requirements needed to work on the Grand Gulf Nuclear Station site will be handled prior to starting construction.

Total outage duration – approximately 9 weeks

4.2.6.3 Assumptions:

ROW will not be required
No environmental issues
Route shown on drawing GGNS-CD-DWG-Y99-C-0211-01 is used for approximating routing and length
Routing can be done with minimal disruptions to the other overhead and underground facilities in the area
Estimated material costs are based on today's costs. Material adjustments may need to be made in the future as costs of steel, aluminum, and other components vary.

4.2.7 Upgrade 115 kV Line between Sterlington and Drew

Upgrade capacity of Drew line from185 MVA to 228 MVA or greater

- Remove 10.13 miles of 1027 ACSR conductor
- Remove 10.13 miles of existing shield wire
- Install 10.13 miles of 1272 ACSR Bittern on existing lattice pole structures
- Install 10.13 miles of 24 fiber 0.528" dia. OPGW
- Replace insulators and hardware

Long Delivery items with lead times:

Equipment	Quantity	Lead
1272 ACSR Bittern	253000 lbs	12 weeks
0.528 OPGW	59000 ft	14 weeks
7 no. 7 Alumoweld	21000 ft	12 weeks
Polymer Insulators	320 ea	10 weeks

4.2.7.2 Line Construction and outages:

- Mobilize line contractor and receive materials.
- Take a 12 week outage on Sterlington-Drew Line section.
- Replace insulators, install existing conductor and shield wire in blocks, and string in new conductor and OPGW shield wire.
- Total construction duration – approximately 16 weeks.

4.2.7.3 Assumptions:

- The estimates will be based on re-conductoring 10.13 miles of the 16.7 miles of line
- No Distribution under built
- No existing structures need to be replaced

4.2.8 Upgrade 115 kV Line between Walnut Grove and Swartz

Requirement is to increase capacity from 228 MVA to 267 MVA or greater.
The line length is 11.4 miles and will be rebuilt because the original construction was performed in 1965 and does not meet existing loading and clearance standards.

- Remove 11.4 miles of wood H-frame transmission line including poles, insulators, conductors, shield wire, guy wire, etc.
- Install 11.4 miles of single pole, single circuit transmission line using 1590 ACSR Lapwing conductor, polymer insulators, 24 fiber 0.528" dia. OPGW shield wire, and vibratory pile foundations where required.

Long Delivery items with lead times:

Equipment	Quantity	Lead
Poles	105 ea	16 weeks
Foundations	80 ea	16 weeks
1590 ACSR Lapwing	360000 lbs	12 weeks
0.528 OPGW	68000 ft	14 weeks
Polymer insulators	350 ea	10 weeks

4.2.8.2 Line Construction and outages:

- Mobilize line contractor and receive materials.
- Take a 22 week outage on Walnut Grove-Swartz line section.
- Rebuild line with new structures, insulators, conductor and OPGW shield wire.
- Total construction duration – approximately 26 weeks.

4.2.8.3 Assumptions:

- ROW or Permit issue not known
- No Distribution underbuild
- Foundations will be needed on approximately 75% of the structures

4.2.9 Re-terminate Perryville 500 kV Line on new dead-end structure at Sterlington

Remove line from existing dead-end structure; terminate it on the new dead-end structure on the new bay. Relocate existing 115kV underbuild line to by-pass proposed 500kV construction.

- Remove 0.1 mile of 500 kV transmission line.
- Install 0.1 mile of 500kV transmission line using 954 ACSR Rail conductor, polymer insulators, 7 no. 7 shield wire, and vibratory pile foundations where required.
- Relocate 1 span of 115 kV underbuild line using 1 new 3-pole dead-end structure and existing conductor.

Long Delivery items with lead times:

Equipment	Quantity	Lead
Poles	6 ea	16 weeks
Foundations	6 ea	16 weeks
954 ACSR Rail	11000 lbs	12 weeks
Polymer insulators	30 ea	10 weeks

4.2.9.2 Line Construction and outages:

- To be determined during scoping. A 1-2 week outage will be required on the Sterlington-Perryville 500kV line and on the Sterlington-Perryville IPCO 115kV line.

4.2.9.3 Assumptions:

Foundations will be needed for all structures
Existing 115kV conductor can be re-used

4.2.10 Relocate Walnut Grove to new bay – 115 kV at Sterlington

Remove line from existing dead-end structure, terminate line on new rigid bus with a flying pass and make connection to structure on the new bay. A low profile rigid bus will be built by Substations by extending the fence and grounding.

Remove 2 existing terminal structures and associated conductors, insulators, shield wire, etc. Install 2 new terminal structures and associated hardware to connect with proposed rigid bus and substation line bay dead end structures.

Long Delivery items with lead times:

Equipment	Quantity	Lead
Poles	6 ea	16 weeks
Foundations	6 ea	16 weeks
1780 ACSR Chukar	1000 lbs	12 weeks
Polymer insulators	20 ea	10 weeks
Polymer insulators	30 ea	10 weeks

4.2.10.2 Line Construction and outages:

- To be determined during scoping.

4.2.10.3 Assumptions:

- Existing DE str will need to be relocated
- Foundations will be needed on all of the structures

4.2.11 Relocate Frostkraft line to bay 13 - 115 kV at Sterlington

Relocate line from bay

COSTS

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 overheads and AFUDC, but do not include tax gross up that may apply to the project. The costs shown are considered to be accurate to within +/-20%. Costs shown in the table below are in 2008 dollars and do not reflect inflation.

Projected Costs in 2008 dollars w/o escalation

Lines / Substations	**Direct cost**	**Indirect cost with assumed 40% OH**	**Total**
	2008 $	**2008 $**	**amount**
Grand Gulf 500 kV Substation	$ 13,718,438	$ 5,487,375	$ 19,205,813
Lakeover 115 and 500 kV Substation	$ 3,427,573	$ 1,371,029	$ 4,798,602
Baxter Wilson 500 kV Substation	$ 49,687	$ 19,875	$ 69,562
Sterlington 500 kV Substation	$ 13,725,520	$ 5,490,208	$ 19,215,728
Sterlington 115 kV	$ 2,713,171	$ 1,085,268	$ 3,798,439
Ray Braswell 500 kV Substation	$ 50,284	$ 20,113	$ 70,397
Richard 500 kV Substation	$ 4,834,963	$ 1,933,985	$ 6,768,948
Webre 500 kV Substation	$ 13,653,010	$ 5,461,204	$ 19,114,213
Baxter Wilson to Ray Braswell to Lakeover – 500 kV line new section	$62,946,256	$ 25,178,502	$ 88,124,758
Grand Gulf to Ray Braswell new line – 500 kV	$ 122,167,850	$ 48,867,140	$ 171,034,989
Richard to Webre – 500 kV new line	$ 229,336,645	$ 91,734,658	$ 321,071,303
115 kV line between 115 kV and 500 kV S/Ss - Sterlington	$ 332,000	$ 132,800	$ 464,800
500 kV Line from Generator Transformer to Power Plant at Grand Gulf	$ 2,398,010	$ 959,204	$ 3,357,214
500 kV Line to Station Service at Grand Gulf Power Plant	$ 3,247,581	$ 1,299,032	$ 4,546,613
Upgrade 115 kV Line between Sterlington and Drew	$ 2,499,900	$ 999,960	$ 3,499,860
Upgrade 115 kV Line between Walnut Grove and Swartz	$ 5,288,000	$ 2,115,200	$ 7,403,200
Re-terminate Perryville 500 kV Line on new dead-end structure at Sterlington	$ 394,000	$ 157,600	$ 551,600
Relocate Walnut Grove to new bay – 115 kV at Sterlington	$ 168,000	$ 67,200	$ 235,200
Total	**$480,950,888**	**$192,380,355**	**$673,331,243**

UPGRADE CLASSIFICATION

The ICT has reviewed the projects identified and have determined that all projects are classified as Supplemental Upgrades. For more information on cost responsibility for Base Plan and Supplemental Upgrades, see Attachment T to Entergy's OATT.

Lines / Substations	**Base Plan**	**Supplemental Upgrades**	**Total Cost**
Grand Gulf 500 kV Substation		$ 19,205,813	$ 19,205,813
Lakeover 115 and 500 kV Substation		$ 4,798,602	$ 4,798,602
Baxter Wilson 500 kV Substation		$ 69,562	$ 69,562
Sterlington 500 kV Substation		$ 19,215,728	$ 19,215,728
Sterlington 115 kV		$ 3,798,439	$ 3,798,439
Ray Braswell 500 kV Substation		$ 70,397	$ 70,397
Richard 500 kV Substation		$ 6,768,948	$ 6,768,948
Webre 500 kV Substation*		$ 19,114,213	$ 19,114,213
Baxter Wilson to Ray Braswell to Lakeover – 500 kV line new section		$ 88,124,758	$ 88,124,758
Grand Gulf to Ray Braswell new line – 500 kV		$ 171,034,989	$ 171,034,989
Richard to Webre – 500 kV new line		$ 321,071,303	$ 321,071,303
115 kV line between 115 kV and 500 kV S/Ss – Sterlington		$ 464,800	$ 464,800
500 kV Line from Generator Transformer to Power Plant at Grand Gulf		$ 3,357,214	$ 3,357,214
500 kV Line to Station Service at Grand Gulf Power Plant		$ 4,546,613	$ 4,546,613
Upgrade 115 kV Line between Sterlington and Drew		$ 3,499,860	$ 3,499,860
Upgrade 115 kV Line between Walnut Grove and Swartz		$ 7,403,200	$ 7,403,200
Re-terminate Perryville 500 kV Line on new dead-end structure at Sterlington		$ 551,600	$ 551,600
Relocate Walnut Grove to new bay – 115 kV at Sterlington		$ 235,200	$ 235,200
Total	**0**	**$673,331,243**	**$673,331,243**

***** More detailed evaluation revealed that the substation could be expanded to accommodate the transmission line without the need to upgrade the entire substation. Because the revised cost reflects only the amount necessary to accommodate the interconnection request, the entire amount is classified Supplemental.
**The contingency upgrade of Ray Braswell – Baxter Wilson is no longer needed due to line rating verification.

SCHEDULE

1) Definition phase and development of PEP/Estimates – 24 months:

A detailed schedule will be prepared subsequent to completion of a detailed scope and study called Project Execution Plan (PEP). It will involve route selection for lines, site selection for substations, ROW analysis and identification of potential issues and duration it will take for purchase of properties from owners or through courts, also environmental assessment will be done with identification and time and cost for routing lines. In addition, survey and soil borings will be done depending on cooperation of property owners and some cases assumptions would have to be made if the owners won't give permission to go on their properties. The result this work will be finalization of approach to design, selection of equipment, identification of risks and mitigation methodology, identification of alternatives should the preferred plan not work, etc. The documents would be good for commencing engineering by Entergy team or for bidding outsiders to perform engineering, procurement and Construction. The duration of this study would be 24 months.

Most of this time would be for completing the property acquisition and getting permits and there is no assurance that it could go even longer should Entergy need to go through courts to secure properties or line route involves any complicated environmental issues.

2) Design / procurement phase: 18 months

Subsequent to definition phase should the funding be approved to move into the design and procurement phase, depending on availability of data for secured line routes and substation sites, and availability of survey and soil data, the design and delivery of material would take 18 months. The 500 kV transformers are the longest delivery items.

3) Construction phase: **26 months**

Assuming that all permits and ownership of properties has been completed, and certainty of material arriving to site has been secured, the longest line work in LA will take approximately 100 weeks. It is assumed that work on other lines in MS will be simultaneously progressing and the contract labor is available to simultaneously work on all lines (with a shift of few months depending on the schedule).

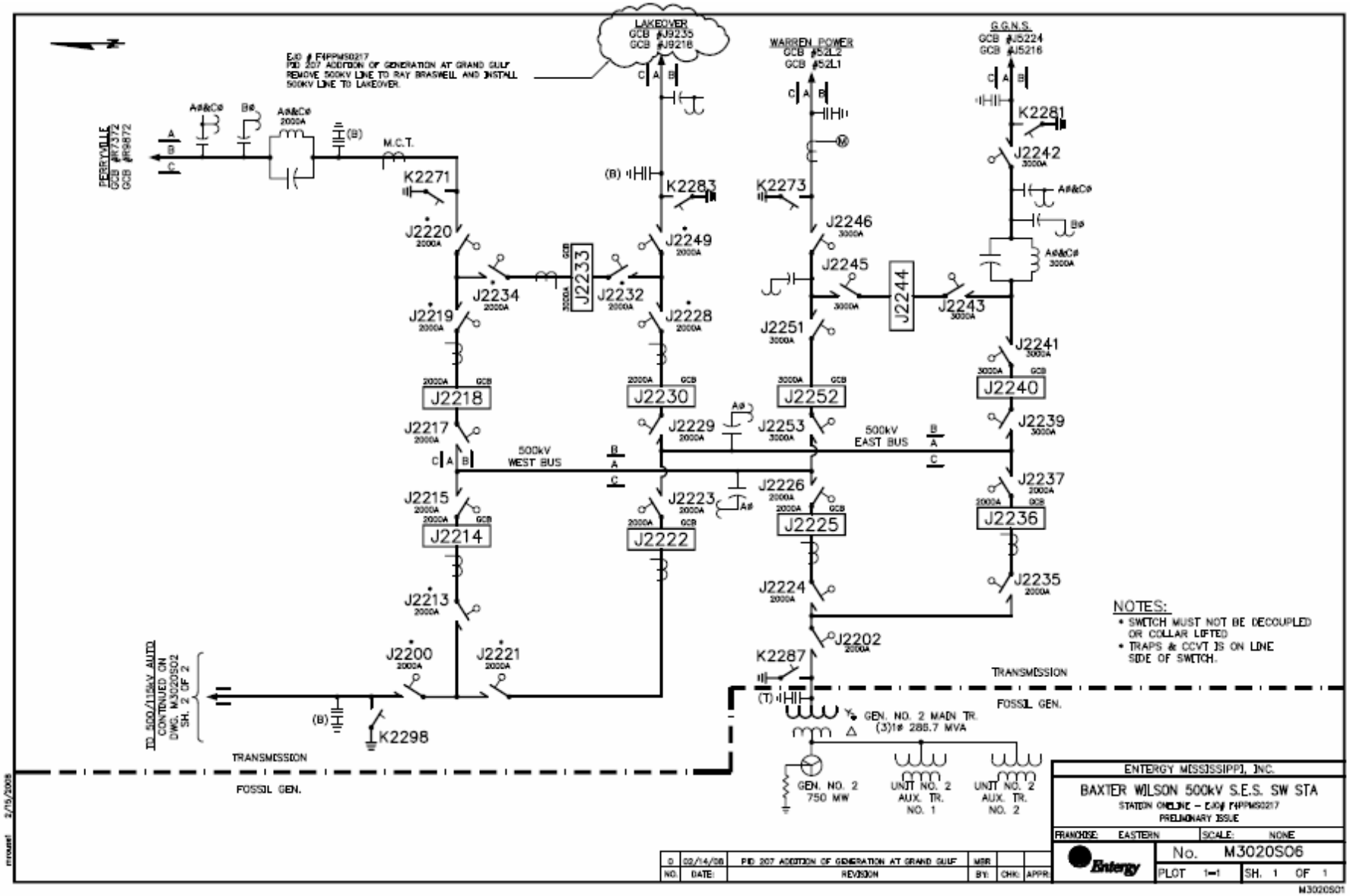
Total duration = 5 years and 8 months

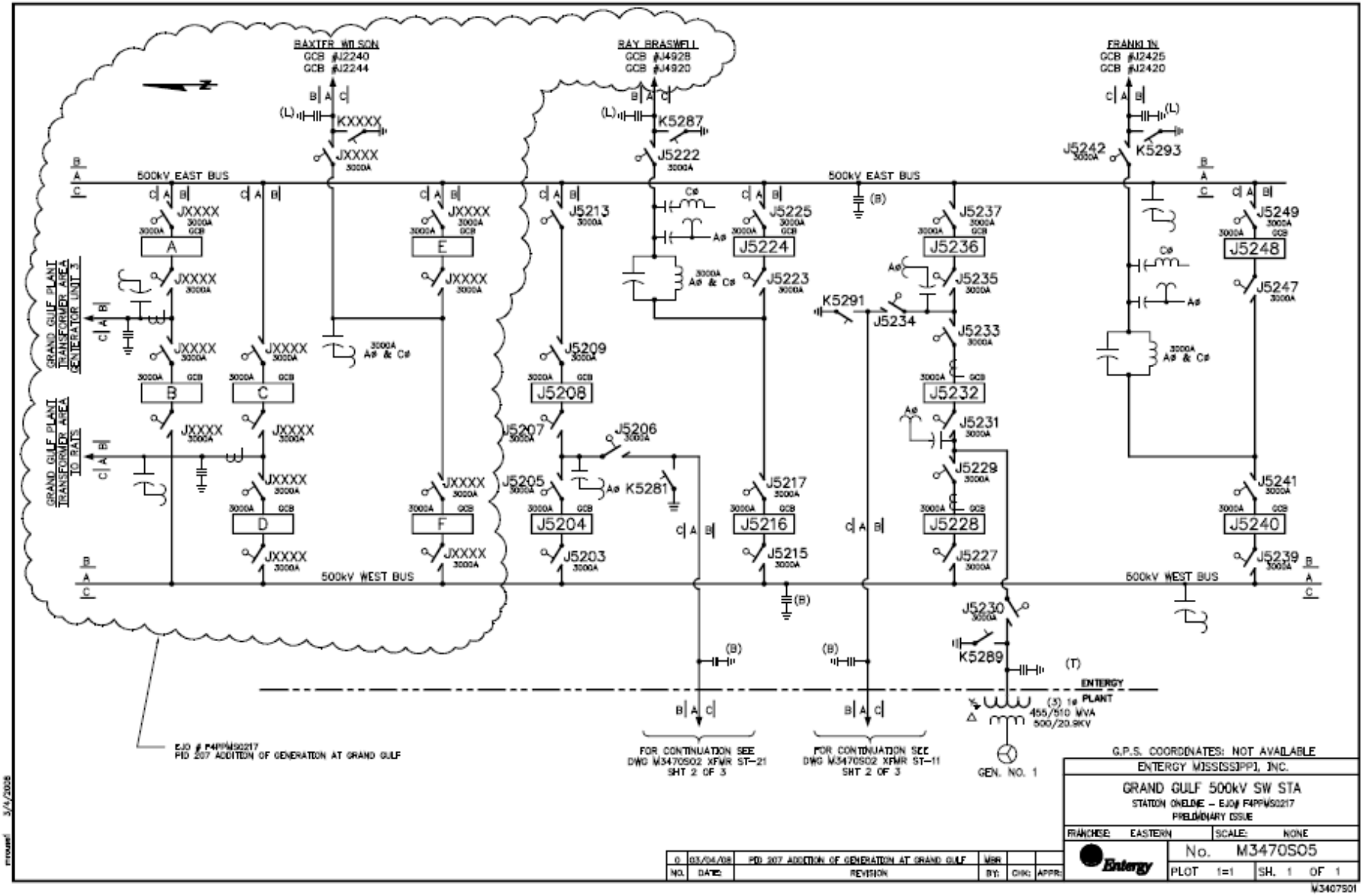
Recommendations:

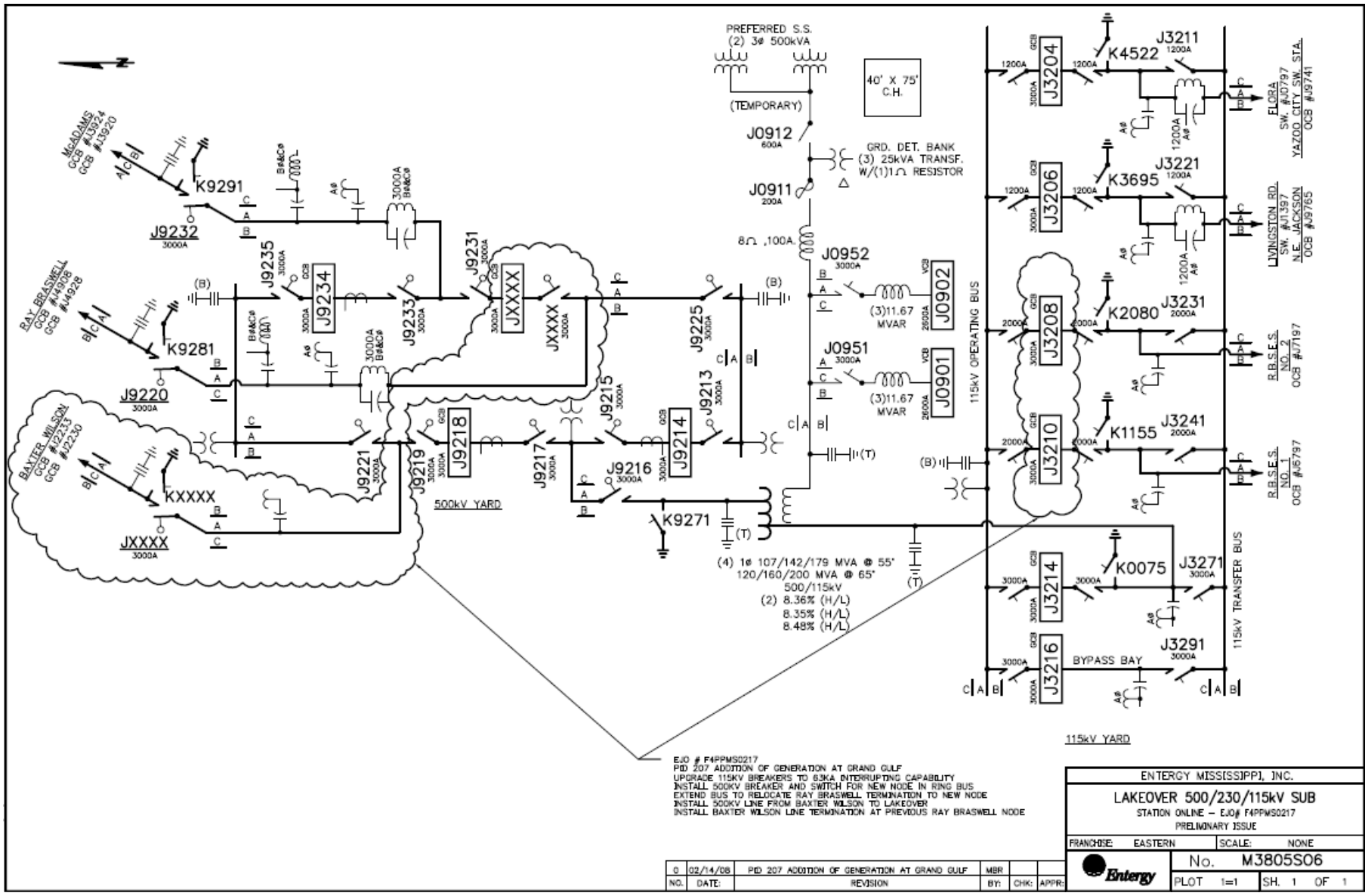
1) Commence line and substation route selection in 2008
2) Subsequent to agreement to the selected route and substation sites, commence purchase or easement of properties and complete it as soon as possible
3) Immediately after securing the properties, perform survey and soil borings and commence environmental assessment and permit procedures
4) Perform a detailed scope and estimate (PEP) immediately after having some degree of certainty about the routes, permitting, etc and having received survey and soil boring data
5) Decide what portion of work should be done inside Entergy and what should be sent to outside companies for engineering, procuring and construction (EPC) and accordingly get the quotes and finalize the decision
6) Develop a schedule that will cater for available construction contract labor so that all work does not have to be done simultaneously. Take into consideration that even a bigger project is being planned **(River Bend generation addition)** for same in-service date in 2015. If not planned properly, the cost will go up and there may not be right number of contract labor available for working simultaneously on two projects.
7) Complete all line and substation work one to two years before the new generating unit comes on line providing contingency for work that could be running behind for completion as well as providing operation experience of the newly installed system. Should problems be discovered there would be enough time to model the system and come up with remedies and yet have some time to apply the solutions such as building a section of line or adding an element to a substation or two.

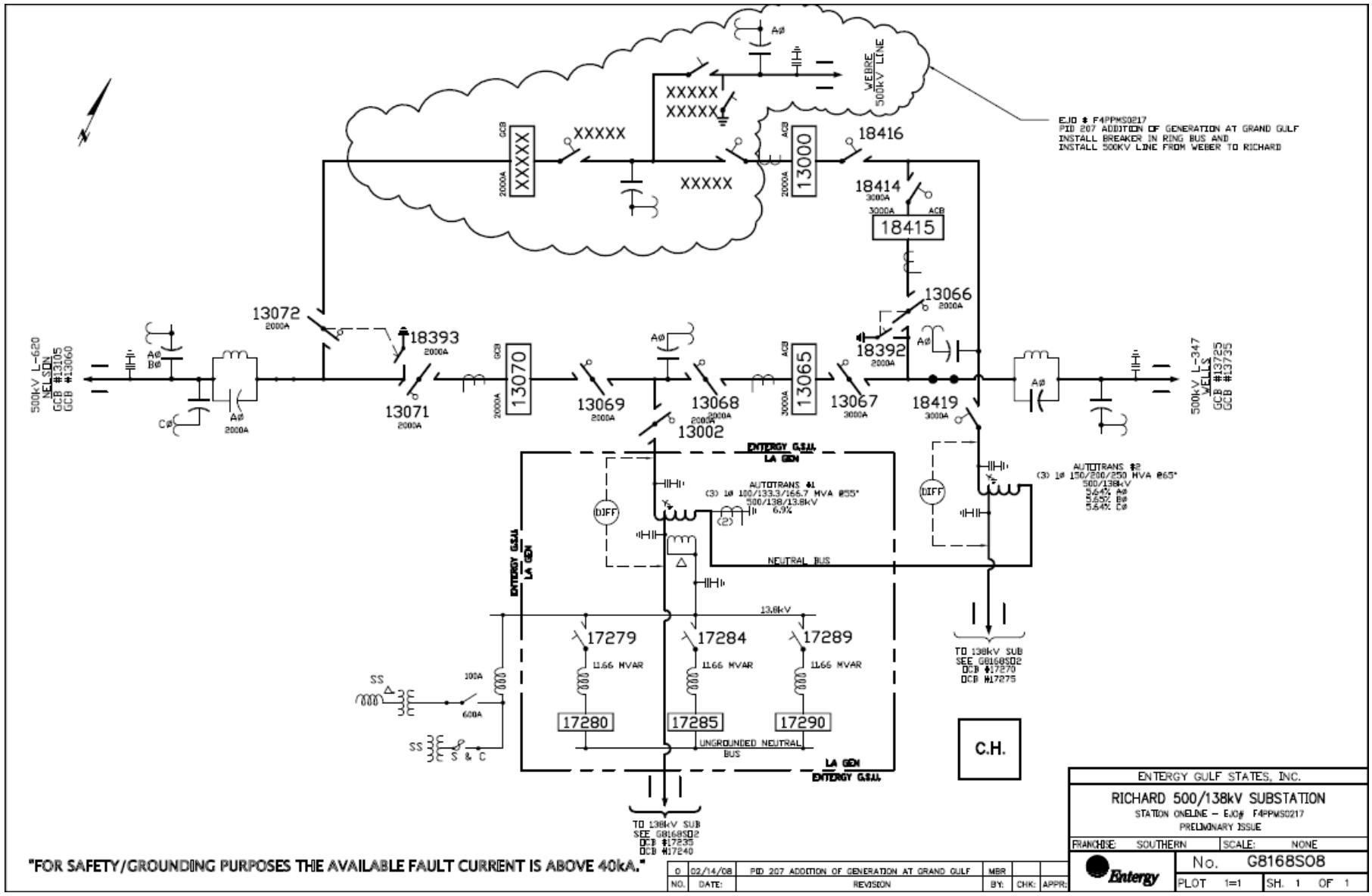
ATTACHMENTS

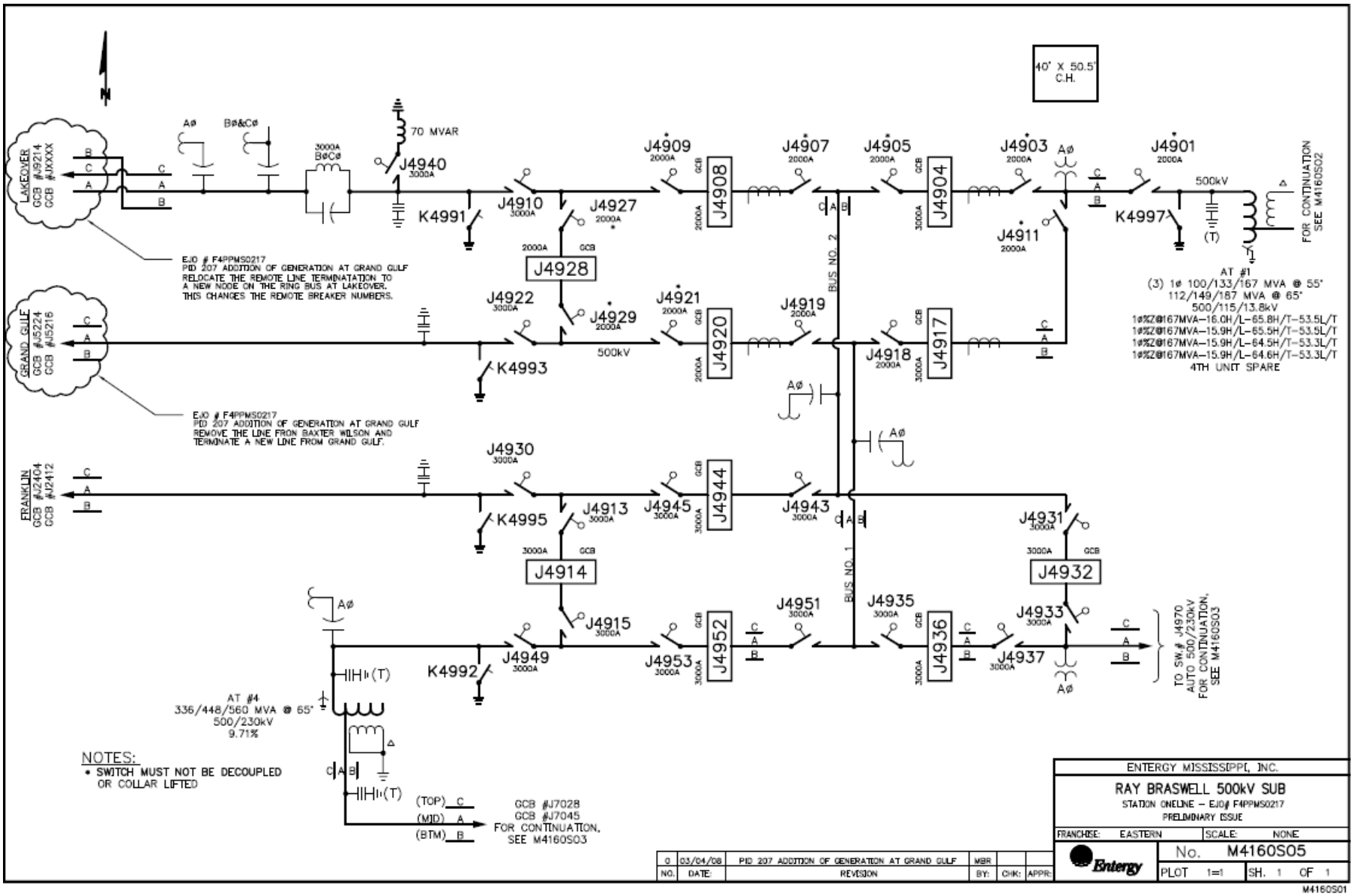
Substation One-Lines are attached below.


LAKEOVER
GCB #J9235
GCB #J9218
WARREN POWER
GCB #52L2
GCB #52L1
G.G.N.S.
GCB #J5224
GCB #J5216
EJO # FAPPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
REMOVE 500kV LINE TO RAY BRASWELL AND INSTALL
500kV LINE TO LAKEOVER.
PERRYVILLE
GCB #R7372
GCB #R9872
M.C.T.
K2271
K2283
K2273
K2281
J2220
J2249
J2246
J2242
J2233
J2234
J2232
J2245
J2244
J2243
J2219
J2228
J2251
J2241
J2218
J2230
J2252
J2240
J2217
J2229
J2253
J2239
500kV WEST BUS
500kV EAST BUS
J2215
J2223
J2226
J2237
J2214
J2222
J2225
J2236
J2213
J2224
J2235
J2200
J2221
J2202
K2287
K2298
TO 500/115kV AUTO
CONTINUED ON
DWG. M3020SO2
SH. 2 OF 2
TRANSMISSION
FOSSIL GEN.
GEN. NO. 2 MAIN TR.
(3)1# 285.7 MVA
GEN. NO. 2
750 MW
UNIT NO. 2
AUX. TR.
NO. 1
UNIT NO. 2
AUX. TR.
NO. 2
NOTES:
* SWITCH MUST NOT BE DECOUPLED OR COLLAR LIFTED
* TRAPS & CCVT IS ON LINE SIDE OF SWITCH.
ENTERGY MISSISSIPPI, INC.
BAXTER WILSON 500kV S.E.S. SW STA
STATION ONELINE – EJO# FAPPMS0217
PRELIMINARY ISSUE
FRANCHISE: EASTERN
SCALE: NONE
No. M3020SO6
PLOT 1=1
SH. 1 OF 1
0 02/14/08 PID 207 ADDITION OF GENERATION AT GRAND GULF MBR
NO. DATE: REVISION BY: CHK: APPR
M3020SO1

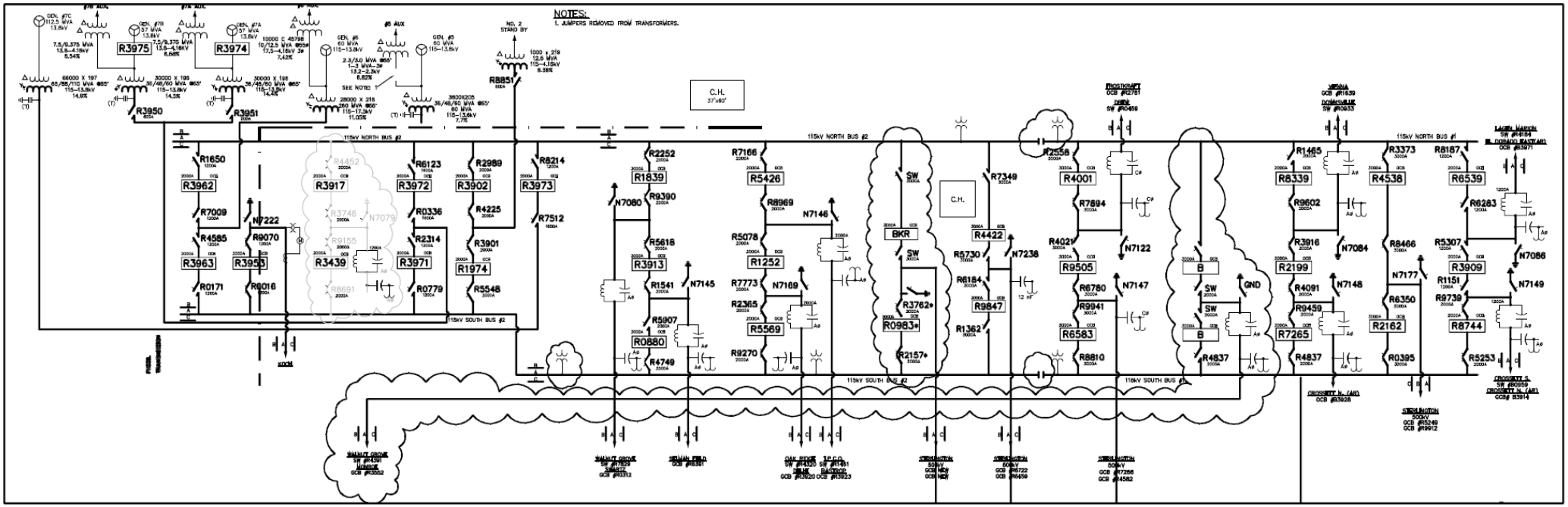

BAXTER WILSON
GCB #J2240
GCB #J2244
RAY BRASWELL
GCB #J4928
GCB #J4920
FRANKLIN
GCB #J2425
GCB #J2420
500kV EAST BUS
500kV WEST BUS
GRAND GULF PLANT TRANSFORMER AREA GENERATOR UNIT 3
GRAND GULF PLANT TRANSFORMER AREA TO RATS
K5287
J5222
K5293
J5242
J5213
J5225
J5224
J5223
J5237
J5236
J5235
J5234
K5291
J5233
J5232
J5231
J5229
J5228
J5227
J5249
J5248
J5247
J5241
J5240
J5239
J5209
J5208
J5207
J5206
J5205
K5281
J5204
J5203
J5217
J5216
J5215
J5230
K5289
ENTERGY
(3) 1ø PLANT
455/510 MVA
500/20.9KV
GEN. NO. 1
FOR CONTINUATION SEE DWG M3470S02 XFMR ST-21 SHT 2 OF 3
FOR CONTINUATION SEE DWG M3470S02 XFMR ST-11 SHT 2 OF 3
EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
G.P.S. COORDINATES: NOT AVAILABLE
ENTERGY MISSISSIPPI, INC.
GRAND GULF 500kV SW STA
STATION ONELINE – EJO# F4PPMS0217
PRELIMINARY ISSUE
FRANCHISE: EASTERN
SCALE: NONE
No. M3470S05
PLOT 1=1
SH. 1 OF 1
0 03/04/08 PID 207 ADDITION OF GENERATION AT GRAND GULF
NO. DATE: REVISION BY: CHK: APPR:
M3407S01


PREFERRED S.S.
(2) 3ø 500kVA
(TEMPORARY)
40' X 75' C.H.
J0912
600A
GRD. DET. BANK
(3) 25kVA TRANSF.
W/(1)1Ω RESISTOR
J0911
200A
8Ω ,100A.
J0952
3000A
(3)11.67 MVAR
J0902
J0951
3000A
(3)11.67 MVAR
J0901
115kV OPERATING BUS
McADAMS
GCB #J3924
GCB #J3920
K9291
J9232
3000A
J9235
J9234
J9231
J9233
JXXXX
JXXXX
J9225
J9213
RAY BRASWELL
GCB #J4908
GCB #J4928
K9281
J9220
3000A
J9215
J9214
J9221
J9219
J9218
J9217
J9216
BAXTER WILSON
GCB #J2233
GCB #J2230
KXXXX
JXXXX
500kV YARD
K9271
(4) 1ø 107/142/179 MVA @ 55°
120/160/200 MVA @ 65°
500/115kV
(2) 8.36% (H/L)
8.35% (H/L)
8.48% (H/L)
J3204
J3211
K4522
FLORA
SW. #J0797
YAZOO CITY SW. STA.
OCB #J9741
J3206
J3221
K3695
LIVINGSTON RD.
SW. #J1397
N.E. JACKSON
OCB #J9765
J3208
J3231
K2080
R.B.S.E.S.
NO. 2
OCB #J7197
J3210
J3241
K1155
R.B.S.E.S.
NO. 1
OCB #J6797
J3214
J3271
K0075
J3216
BYPASS BAY
J3291
115kV TRANSFER BUS
115kV YARD
EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
UPGRADE 115KV BREAKERS TO 63KA INTERRUPTING CAPABILITY
INSTALL 500KV BREAKER AND SWITCH FOR NEW NODE IN RING BUS
EXTEND BUS TO RELOCATE RAY BRASWELL TERMINATION TO NEW NODE
INSTALL 500KV LINE FROM BAXTER WILSON TO LAKEOVER
INSTALL BAXTER WILSON LINE TERMINATION AT PREVIOUS RAY BRASWELL NODE
0 02/14/08 PID 207 ADDITION OF GENERATION AT GRAND GULF MBR
NO. DATE: REVISION BY: CHK: APPR:
ENTERGY MISSISSIPPI, INC.
LAKEOVER 500/230/115kV SUB
STATION ONLINE – EJO# F4PPMS0217
PRELIMINARY ISSUE
FRANCHISE: EASTERN
SCALE: NONE
Entergy
No. M3805S06
PLOT 1=1
SH. 1 OF 1

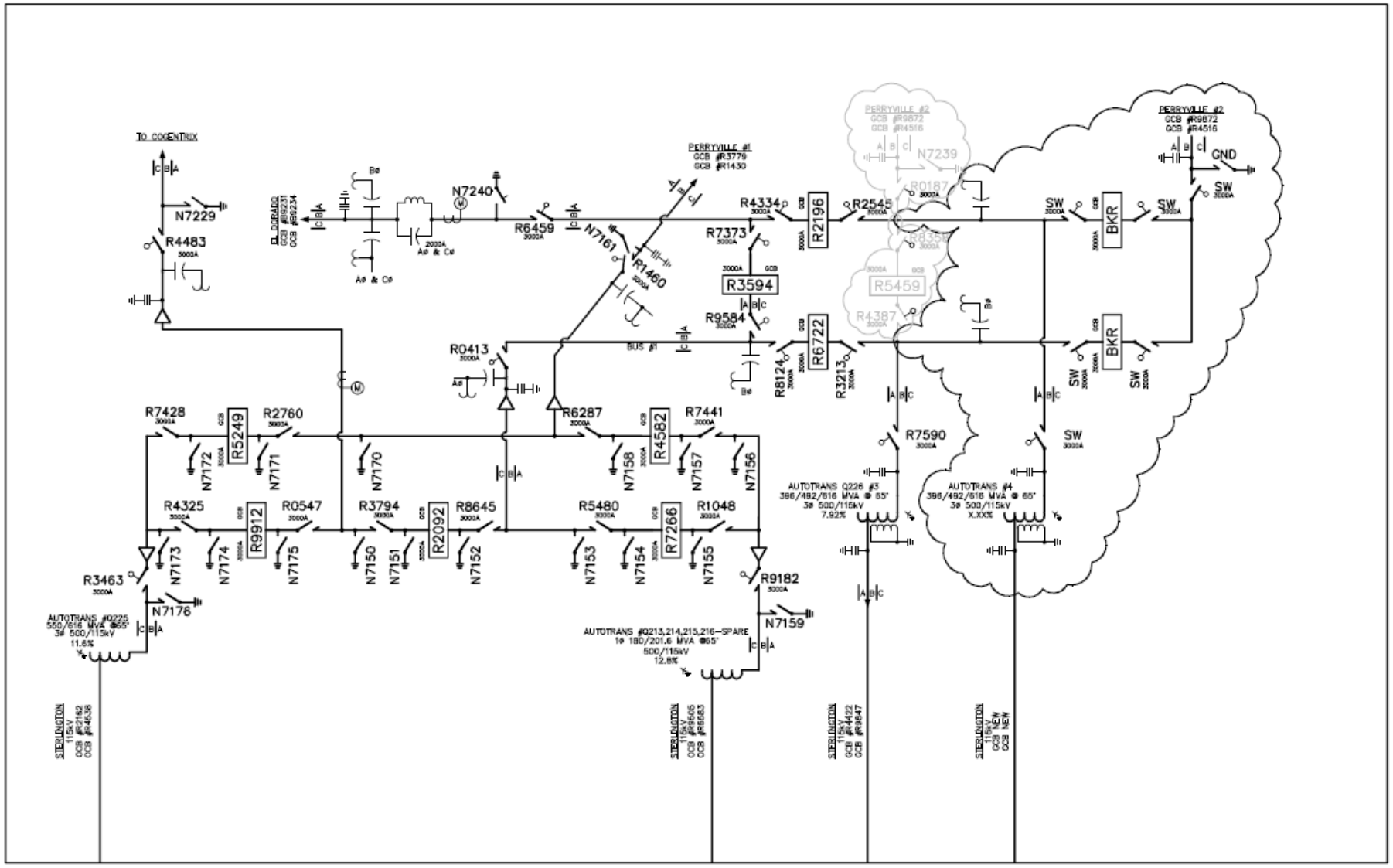

EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
INSTALL BREAKER IN RING BUS AND
INSTALL 500KV LINE FROM WEBER TO RICHARD
WEBRE 500kV LINE
XXXXX
18416
18414
18415
13066
13072
18393
13071
13070
13069
13068
13002
13065
13067
18392
18419
500kV L-620 NELSON GCB #13105 GCB #13060
500kV L-347 WELLS GCB #13725 GCB #13735
ENTERGY G.S.U. LA GEN
AUTOTRANS #1
(3) 1ø 100/133.3/166.7 MVA @55°
500/138/13.8kV
6.9%
AUTOTRANS #2
(3) 1ø 150/200/250 MVA @65°
500/138kV
5.64% Aø
5.65% Bø
5.64% Cø
DIFF
NEUTRAL BUS
13.8kV
17279
17284
17289
11.66 MVAR
17280
17285
17290
UNGROUNDED NEUTRAL BUS
100A
600A
S & C
TO 138kV SUB SEE G8168S02 DCB #17235 DCB #17240
TO 138kV SUB SEE G8168S02 DCB #17270 DCB #17275
C.H.
"FOR SAFETY/GROUNDING PURPOSES THE AVAILABLE FAULT CURRENT IS ABOVE 40kA."
ENTERGY GULF STATES, INC.
RICHARD 500/138kV SUBSTATION
STATION ONELINE – EJO# F4PPMS0217
PRELIMINARY ISSUE
FRANCHISE: SOUTHERN
SCALE: NONE
No. G8168S08
PLOT 1=1
SH. 1 OF 1
0 02/14/08 PID 207 ADDITION OF GENERATION AT GRAND GULF MBR
NO. DATE: REVISION BY: CHK: APPR:

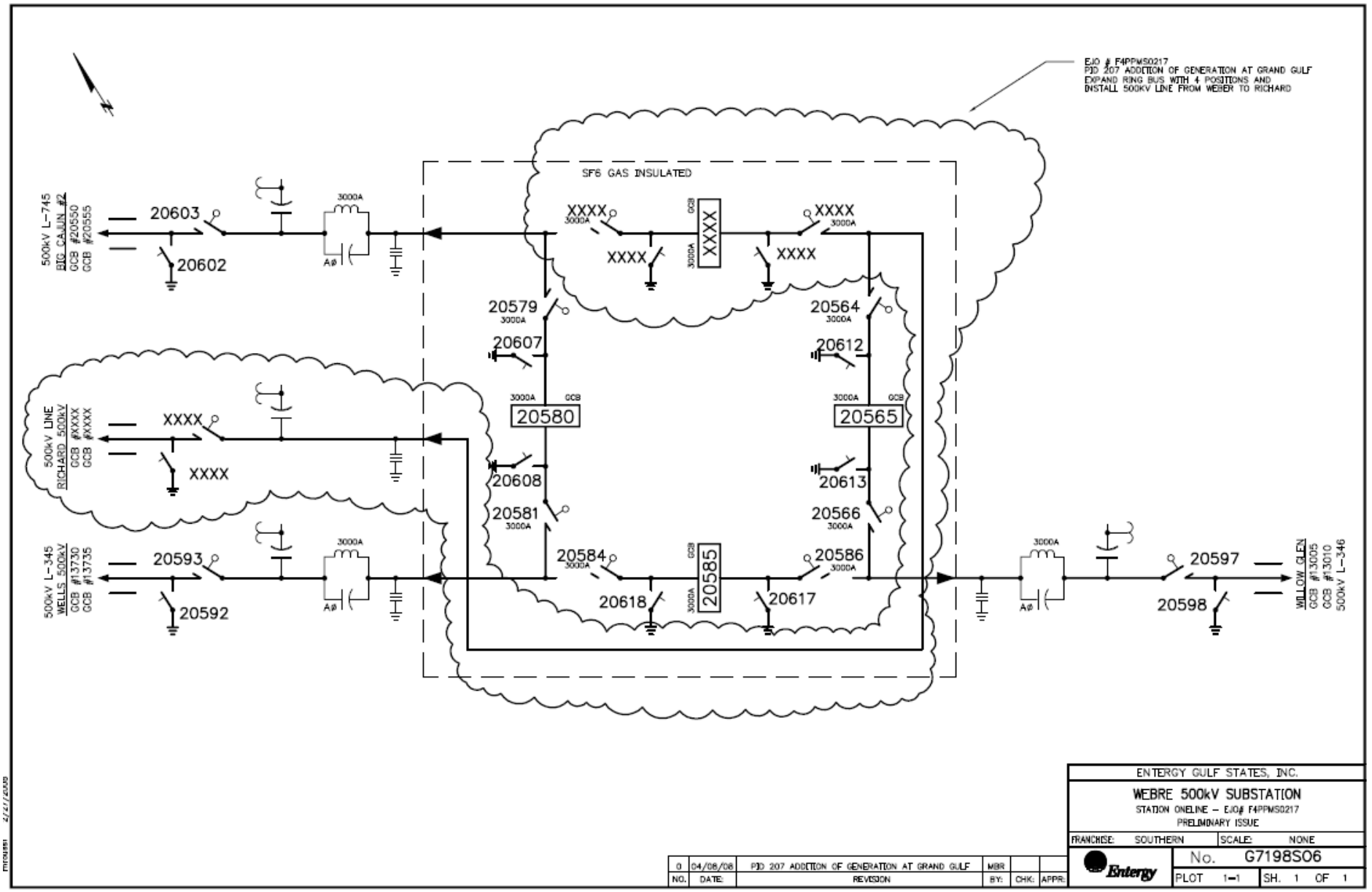

40' X 50.5' C.H.
LAKEOVER GCB #J9214 GCB #JXXXX
GRAND GULF GCB #J5224 GCB #J5216
FRANKLIN GCB #J2404 GCB #J2412
70 MVAR
J4940
K4991
J4910
J4927
J4928
J4922
J4929
K4993
J4921
J4920
J4919
J4909
J4908
J4907
J4905
J4904
J4903
J4911
J4901
K4997
500kV
(T)
FOR CONTINUATION SEE M4160S02
AT #1
(3) 1ø 100/133/167 MVA @ 55°
112/149/187 MVA @ 65°
500/115/13.8kV
1ø%Z@167MVA–16.0H/L–65.8H/T–53.5L/T
1ø%Z@167MVA–15.9H/L–65.5H/T–53.5L/T
1ø%Z@167MVA–15.9H/L–64.5H/T–53.3L/T
1ø%Z@167MVA–15.9H/L–64.6H/T–53.3L/T
4TH UNIT SPARE
EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
RELOCATE THE REMOTE LINE TERMINATATION TO A NEW NODE ON THE RING BUS AT LAKEOVER.
THIS CHANGES THE REMOTE BREAKER NUMBERS.
EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
REMOVE THE LINE FROM BAXTER WILSON AND TERMINATE A NEW LINE FROM GRAND GULF.
J4930
K4995
J4913
J4914
J4945
J4944
J4943
J4931
J4932
J4915
J4949
K4992
J4952
J4953
J4951
J4935
J4936
J4933
J4937
BUS NO. 2
BUS NO. 1
AT #4
336/448/560 MVA @ 65°
500/230kV
9.71%
NOTES:
• SWITCH MUST NOT BE DECOUPLED OR COLLAR LIFTED
(TOP) C
(MID) A
(BTM) B
GCB #J7028
GCB #J7045
FOR CONTINUATION, SEE M4160S03
TO SW.# J4970 AUTO 500/230kV FOR CONTINUATION, SEE M4160S03
ENTERGY MISSISSIPPI, INC.
RAY BRASWELL 500kV SUB
STATION ONELINE – EJO# F4PPMS0217
PRELIMINARY ISSUE
FRANCHISE: EASTERN
SCALE: NONE
No. M4160S05
PLOT 1=1
SH. 1 OF 1
0 03/04/08 PID 207 ADDITION OF GENERATION AT GRAND GULF MBR
NO. DATE: REVISION BY: CHK: APPR:
M4160S01

Sterlington 115 kV



Sterlington 500 kV




EJO # F4PPMS0217
PID 207 ADDITION OF GENERATION AT GRAND GULF
EXPAND RING BUS WITH 4 POSITIONS AND
INSTALL 500KV LINE FROM WEBRE TO RICHARD
SF6 GAS INSULATED
500kV L-745
BIG CAJUN #2
GCB #20550
GCB #20555
20603
20602
3000A
A∅
XXXX
GCB
20579
20607
20564
20612
20580
20565
20608
20613
20581
20566
20584
20586
20585
20618
20617
500kV LINE
RICHARD 500kV
GCB #XXXX
GCB #XXXX
XXXX
500kV L-345
WELLS 500kV
GCB #13730
GCB #13735
20593
20592
20597
20598
WILLOW GLEN
GCB #13005
GCB #13010
500kV L-346
ENTERGY GULF STATES, INC.
WEBRE 500kV SUBSTATION
STATION ONELINE – EJO# F4PPMS0217
PRELIMINARY ISSUE
FRANCHISE: SOUTHERN
SCALE: NONE
No. G7198S06
PLOT 1-1
SH. 1 OF 1
0 04/08/08 PID 207 ADDITION OF GENERATION AT GRAND GULF MBR
NO. DATE: REVISION BY: CHK: APPR: