TRANSMISSION LINE & SUBSTATION PROJECTS

COMPANY:ENTERGY SERVICES, INC

CUSTOMER: PID 221

FACILITIES STUDY

EJO # F4PPMS0231

GENERATOR INTERCONNECTION FACILITIES STUDY

PID 221

Revision:
6

Rev	Issue Date	Description of Revision	Project Manager	Program Manager
A	2/10/09	Initial Draft for team input	BCM	CWN
B	3/9/09	PM input	BCM	CWN
C	3/13/09	Issue for JET approval	BCM	CWN
D	3/17/09	TPD review for approval	JRB	BKW
1	3/27/09	Revisions for TPD	BCM	CWN
2	4/3/09	ICT Classification of Upgrades	BEF	JDH
3	5/4/09	Customer Comments	BEF	JDH
4A	1/15/10	Scope revision to (planned) as-built	BCM	CWN
4	3/12/10	ICT Classification of Upgrades	MEC	JDH
5	4/8/10	Edit to Section 2.1 per Customer Inst.	MEC	JDH
6	4/23/10	Section 9 (Notes) Added	MEC	JDH

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1. EXECUTIVE SUMMARY

The proposed scope of work in PID 221 Rev. 1 was to install a new 500/230kV autotransformer (3 single phase units) at McAdams substation. Following publication of PID 221, it was determined that an existing autotransformer will be relocated to McAdams Substation rather than purchasing a new autotransformer. Rev. 2 includes revisions to the project scope, cost, and schedule associated with this change to relocate the 500/230kV spare autotransformer from Hartburg Substation (TX) to McAdams substation. Each affected section of PID 221 has been revised below.

2. PROJECT SUMMARY

2.1. Background and Project Need

The purpose of this Facilities Study is to determine the availability to connect an existing facility consisting of three (3) combustion turbines and one (1) steam turbine. The requestor has a dual electric interconnection located at Wolf Creek with Entergy and at French Camp with TVA. The study evaluates connection of 875MW to the Entergy Transmission System.

The Facilities Study identifies any transmission constraints resulting from the requested power transfer. The Facilities Study also includes cost estimates to correct any transmission constraints.

This connection will require installation of a 2nd 615MVA, 500/230kV autotransformer at McAdams substation to eliminate the following constraints:

The McAdams 500/230kV autotransformer overloads for the loss of the Choctaw-West Point (TVA) 500kV, Lakeover-McAdams 500kV, and Lakeover-Charity Church 230kV transmission lines. It is required that a 2nd 615MVA, 500/230kV autotransformer at McAdams be installed.

Completion of the upgrades (2nd McAdams auto and Sterlington upgrades) is required before NRIS is granted.

2.2. Scope Summary

The overall scope of this project is summarized as follows:

- The spare 500/230kV autotransformer that is located in the Hartburg Substation (TX) will be relocated to the McAdams substation to be used as a second autotransformer bank. The three (3) relocated units will be installed as well as all foundations, bus work etc. for a 4th unit (future spare to be purchased and installed at a later date but not as part of this project). Three (3) shunt reactors shall be installed on the tertiary of the relocated autotransformer bank that have similar ratings (35MVAR) to the existing reactors on the existing autotransformer.

- Based on anticipated NERC TPL Planning Standard requirements, the 500kV ring bus must be configured such that the 500kV line to Lakeover does not share a breaker with either the existing 500/230kV autotransformer or the new autotransformer. The existing 500kV Lakeover line termination will be abandoned. The equipment, structures, deadend, and buswork of existing Lakeover line termination will remain in place for future use. A new node in the 500kV ring bus will be developed for the Lakeover termination. This node will be located between the existing Wolf Creek and Attala Generation nodes on the ring bus.
- McAdams 500kV Substation – Add 2nd Autotransformer
- Reroute Lakeover 500kV Line #8 into new node at McAdams – Disconnect Lakeover line from existing substation deadend node and reroute two (2) spans (approximately 2000' to a new node to be constructed in substation).

2.3. Cost Summary

- The estimated total project cost is **$20,525,000.** This cost does not include Tax Gross Up. This is a good faith 20% estimate based on current conditions and the time frame allowed to complete the study.
- The ICT has assigned **$20,525,000** as Base Plan Upgrades based on Attachment "T" of Entergy's ICT (Independent Coordinator of Transmission) filing to the FERC.

2.4. Schedule Summary

- A summary task schedule is provided for establishing a path forward toward; however, Entergy does not guarantee completion of a project on the targeted or any other In-Service Date (ISD).
- Based on the proposed task duration with a start date of 6/1/2009, the overall project ISD is expected to be 06/1/2011. The task durations and proposed ISD will be confirmed during project scoping and definition.
- Refer to section 7 of this document for a more details description of project tasks and schedule durations.

2.5. Long Lead and Major Material/Equipment

Quantity	Material Description	Lead Time (Weeks)
	McAdams 500 kV Substation	
11	Arresters	14
2	Breakers 500kV	28
1 lot	Bus/Conductor	12
7	CCVT 230kV & 500kV	30
1 lot	Insulators	14
3	Line Traps 500kV & 230kV	32
6	Switches 500kV & 230kV	22
1 lot	Steel Lattice	20

Quantity	Material Description	Lead Time (Weeks)
	500 kV Lakeover Reroute	
2	Steel structures (1 HF, 1 Three pole)	20
9	500kV Insulators	14
21,000 lb	954 ACSR “Rail” conductor	22

3. SAFETY REQUIREMENTS

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

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

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

4. GENERAL ASSUMPTIONS

A common assumption across all projects is that adequate space is available in all substation sites. When necessary work order specific assumptions will be included in the scope of work section below; otherwise

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

5. SCOPE OF WORK

5.1. T-Line Task 1 Attala 230kV Line – Change line bays at McAdams Substation

This scope of work is included below.

5.2. T-Substation Task 1 McAdams Substation – Add 2nd autotransformer & reroute Lakeover 500kV line

General

A second autotransformer bank will be installed at McAdams 500kV Substation as shown on electrical arrangement M3920EA2 and station onelines M3920SO5 and M3920SO6. Installing a second autotransformer bank will prevent overloading the existing 500/230kV auto transformer bank during various line outage contingencies including the loss of the McAdams - Lakeover 500kV line. The second autotransformer bank will require reactor banks on the 13.8kV tertiary similar to the first autotransformer bank. The 500kV bus is a folded ring bus with provisions for expansion to a breaker and a half bus arrangement. The 230kV bus was previously a ring bus, but converted to a breaker and a half bus arrangement in the last 230kV expansion. The existing autotransformer bank consists of single phase autotransformers.

Fault contingencies with two (2) banks in service requires the relocation of the existing Lakeover 500kV line termination to a new node on the ring bus between the existing Wolf Creek and Attala Generation terminations on the 500kV ring bus.

The scope of the project includes the work to relocate the 500kV Lakeover line termination in the 500kV ring bus, terminate the second autotransformer bank to the ring bus, install the second autotransformer bank with reactors, and terminate the second autotransformer bank in the 230kV Attala bay.

Relocate the 500kV Lakeover line termination in the 500kV ring bus

The existing 500kV Lakeover line termination will be abandoned. The equipment, structures, deadend, and buswork of existing Lakeover line termination will remain in place for future use. Breaker J3924 will be removed and replaced with buswork. The transmission line will be removed between the existing deadend tower in the station and tower (#304) outside the station. New wire will be strung from the existing lattice tower (#304) to a new 3-pole self supporting tubular deadends location near the north end of the station.

A new node in the 500kV ring bus will be developed for the Lakeover termination. This node will be located between the existing Wolf Creek and Attala Generation nodes on the ring bus. A new breaker J3916 will be installed adjacent to switch J3917 and a new switch J3927 will be installed adjacent to this breaker.

The new Lakeover line will terminate between new switch J3927 and existing switch J3913. The new Lakeover line termination will be built similar to the adjacent Wolf Creek line termination, extending bus work from the new node parallel to the Wolf Creek termination. Line traps and line tuning units will be installed on B phase and C phase. Three (3) CVT’s, motor operated line switch J3926 with ground switch K1579 and polymer line arresters will be installed. After the switch, turn the bus run 90 degrees counter clockwise.

Extend the buswork to meet the new 3-pole self supporting tubular deadends location near the north end of the station.

Terminate the second autotransformer bank to the 500kV ring bus

A new node in the 500kV ring bus will be developed for the second autotransformer bank termination. The new node will be located between the existing autotransformer node and the Wolf Creek node. A new breaker J3904 will be installed adjacent to switch J3903 and two (2) new switches J3905 and J3907 will be installed between the new breaker J3904 and existing breaker J3908.

The second autotransformer bank will terminate between new switches J3905 and J3907. Buswork from the new node will be installed parallel to the Attala termination. The bus run turns 90 degrees clockwise and extends to the second autotransformer bank. This buswork includes a switch J3902, ground switch K1529, and an A phase CVT. It also includes provisions for a future breaker and switches to eventually convert the 500kV yard to a breaker and a half bus scheme.

Install the second autotransformer bank

The spare 500/230kV autotransformer that is located in the Hartburg (TX) substation will be relocated to the McAdams substation to be used as a second autotransformer bank. The three (3) relocated units will be installed as well as all foundations, bus work etc. for a 4th unit (future spare to be purchased and installed at a later date but not as part of this project). Three (3) shunt reactors shall be installed on the tertiary of the relocated autotransformer bank that have similar ratings (35MVAR) to the existing reactors on the existing autotransformer.

Terminate the second autotransformer bank to the 230kV Attala bay

The 230kV yard is configured into a breaker and a half bus scheme. The second autotransformer bank will connect to the 230kV bus in the Attala bay on the south end of the yard.

The 230kV conductors from the single phase autotransformers will be gathered to a 2F-55 structure and drop down to buswork, a motor operated switch with ground, and three (3) CVTs. Risers will connect to strung bus between the 2F-55 structure and the closest deadend structure in the Attala bay which is a 2ESW-55 structure. The 230kV Attala line presently terminates to that 2ESW-55 structure, but the termination will be relocated to the adjacent 2E-75 structure in that bay. This design will be identical to first autotransformer bank connection to the 230kV Indianola bay.

The strung bus between the 2ESW-55 structure and the 2E-75 structure deadend will be removed as well as all carrier equipment and structures below the 2ESW-55. The 2ESW-55 structure must be reconfigured to terminate conductors on the north side of the tower.

The 230kV Attala line termination at from the 2ESW-55 deadend will be relocated to the adjacent 2E-75 deadend. Presently the strung bus passes through the top "pull off" of this 2E-75 deadend. The strung bus will be re-terminated to on the bottom "pull-off" of this 2E-75 structure. A line trap and line tuning unit will be installed to function with existing CVT.

The equipment below the first 2-E75 Structure, located at N. 962, is no longer needed and will be remove.

Site

The project requires expansion of the site in two (2) separate areas. The northern most corner of the yard will be expanded by an area approximately 150' x 170'. In this area there is approximately a 7' change in elevation; therefore, significant fill is required in this area. For the second area of expansion along the Southeast fence line, the yard will expand by an area approximately 580' x 180'. There is a substantial change in elevation which will require significant amounts of cut and fill to bring the site to the desired grade. The estimate includes $283,000 for soil disposal. If the excavated material can be disposed of somewhere on site, significant savings can be realized. There is a ditch along the SE fence line that will have to be relocated to accommodate the site expansion. The existing drain pipes that run to this ditch will need to be extended. In addition to the limestone required to cover the areas of expansion, 22,000 tons of limestone was included to improve the existing ground cover in a large portion of the station. The following materials are required to complete the site work of this project:

- 3 acres of brush clearing and disposal
- 7,050 cu yds of excavation
- 2,400 cu yds of stripping of top soil
- 9,450 cu yds of soil disposal
- 13,900 cu yds of fill dirt
- 3 acres of soil sterilization
- 1 acre of seed and mulch
- 23,870 tons of limestone
- 750 ft of access road
- 400 ft of drain pipe
- 1190 ft of new fence
- 750 ft of existing fence removal

Foundations

500kV Yard – Lakeover termination

The Lakeover line relocation in the 500kV ring will require the following foundation work.

- Convert the foundation of breaker J3924 to three (3) "A" type bus support foundations.

- Convert the existing “A” type bus supports to breaker J3916 foundation. Remaining foundations are to be removed 6” below grade and covered with limestone.
- Install approximately 360 cu yds of concrete for the following foundations
  - One (1) 500kV breaker foundation, 6 cu yds each, for breaker J3916
  - Thirteen (13) A type bus supports foundation per drawing M3920050, 2.4 cu yds each
  - Twenty-nine (29) B type bus supports foundation per drawing M3920050, 5.7cu yds each
  - Three (3) line trap G structure foundation per M3920050, 9.2 cu yds each
  - Three (3) arrester E structure foundation per M3920050, 2.4 cu yds each
  - Six (6) high switch D structures foundation per M3920050, 6.9 cu yds each
  - Three (3) CVT F structures foundation per M3920050, 2.4 cu yds each
- Extend existing “poured in place” cable trough from switch J3913 to both breaker J3916 and switch J3926 parallel to the buswork. From this cable trough, install three (3) conduits to each motor operator for switches J3926 and J3927, install three (3) conduits to each line tuning unit, and install three (3) conduits to the CVT junction box. Install one (1) conduit from each CVT to the junction box. At breaker J3916, this cable trough will turn 90 degrees clockwise and extend to all 3-pole units of the breaker. The breaker control cabinet to will be mounted over this trough. To each breaker pole unit install one (1) 3” conduit as well as two (2) 4” conduits with stub-ups to weather heads for breaker plug in play cables. Cables must be plug-in-play on only one end. This design will be identical to breaker J4928 at Ray Braswell shown on drawing M4160C01 and M4160C02.
- Extend the existing ground grid to the fenced area around the new Lakeover transmission line deadend tower. Provide a minimum of two (2) ground leads to all new structures and equipment.

500kV Yard –Bank#2 termination

The second autotransformer bank connection to the ring bus will require the following foundation work.

- Convert the existing “A” type bus supports to breaker J3903 foundation. Remaining foundations are to be removed 6” below grade and covered with limestone.
- Install approximately 376 cu yds of concrete for the following foundations
  - One (1) 500kV breaker foundation, 6 cu yds each, for breaker J3903

- Twelve (12) A type bus supports foundations per drawing M3920050, 2.4 cu yds each
- Thirty-three (33) B type bus supports foundations per drawing M3920050, 5.7 cu yds each
- Twelve (12) low switch C structures foundations per M3920050, 3 cu yds each
- Six (6) high switch D structures foundations per M3920050, 6.9 cu yds each
- One (1) CVT F structures foundation per M3920050, 2.4 cu yds each
- Two (2) J shield towers foundations per M3920050, 16 cu yds each

- The existing cable trough near breaker J3904 runs parallel to the bus. From this cable trough, install three (3) conduits to each motor operator for switches J3905 and J3907. At breaker J3904, install “poured in place” cable trough and conduit identical to breaker J3916. The breaker control cabinet to will be mounted over this trough. Install three (3) conduits from switch J3902 and two (2) conduits from CVT junction under the road to the nearest cable trough. These conduits shall be encased in concrete under the road.
- Extend the existing ground grid to the new fenced area. Provide a minimum of two (2) ground leads to all new structures and equipment.

Second Autotransformer Bank

Installing the second autotransformer banks will require the following foundation work.

- Install approximately 1300 cu yds of concrete for the following foundations
  - Four (4) 2BM pedestal bus support foundations per drawing M3920028, 3.2 cu yds each
  - Five (5) B1 pedestal bus support foundation, 4 cu yds each
  - Four (4) H3M fire barrier & pull off structure foundations per drawing M3920032, 100 cu yds each
  - Four (4) P transformer foundations (assume 32 cu yds, but based on transformer selection)
  - Four (4) transformer oil containment pits (detailed design needs to be performed)
  - Nine (9) Q shunt reactor foundations per drawing M3920034, 15 cu yds each
  - Three (3) R vacuum circuit breaker foundations per drawing M3920056, 2 cu yds each
  - Three (3) S switch support foundations per drawing M3920056, 7 cu yds each with fiber glass rebar
  - Nine (9) T1 tertiary bus support foundations per drawing M3920033, 6 cu yds each

- Twelve (12) T2 tertiary bus support foundations per drawing M3920033, 6.2 cu yds each
- Twenty-one (21) V1M reactor bus support foundations per drawing M3920033, 1 cu yds each
- Twenty-one (21) V2M reactor bus support foundations per drawing M3920033, 1 cu yds each
- One (1) W equipment support structure foundation per drawing M3920056, 9.5 cu yds each
- Four (4) X neutral bus support structure foundation per drawing M3920033, 2 cu yds each
- One (1) station service line up similar to M4160F05, estimated at 10 cu yds

- Install 250 ft of trough by extend existing “poured in place” cable trough from transformer bank #1 to transformer bank #2. Install ten (10) runs of conduits to each autotransformer.
- Extend the existing ground grid to the new fenced area. Provide a minimum of two (2) ground leads to all new structures and equipment.

230kV Yard

Terminating the second autotransformer bank connection to the 230kV yard will require the following foundation work.

Install approximately 60 cu yds of concrete for the following foundations:

- One (1) V 2F-55 structure foundation per M3920052, 29 cu yds each
- Six (6) 2B bus supports foundations per M3920081, 2.4 cu yds each
- One (1) 2C switch support foundation per M3902052, 2.4 cu yds each
- Three (3) 230kV F structure foundations per M3920081, 2.4 cu yds each

Install two (2) conduits from the J5302 motor operator to the nearest cable trough. Three (3) CVTs will be installed near switch J5302. Install one (1) conduit from each CVT to a junction box mounted on the A phase CVT support structure. Install two (2) conduits from the CVT junction box to the nearest cable trough.

Electrical

500kV yard - The following material will be purchased and installed in the 500kV yard

The following electrical work will be required:

- Two (2) 500kV circuit breaker, 3000A, 40kA short circuit current, 2 cycles interrupting time, 1800kV BIL, per Entergy Standard SD0203 Rev. 2. Additional details include 120/240 AC Supply Voltage, Dual Voltage 240 VAC / 125 VDC for spring charge mechanism motors on hot stand-by, 125 VDC Control Voltage;

Two (2) sets of 3000:5 multi-ratio relay accuracy current transformers per bushing. ABB Circuit Breaker Sentinel monitoring device. Phase to phase spacing is 25 ft. Provide cables with plug-n-play on only one end to route cables through trough, conduits and weather heads. Control cabinet will be located as shown on drawing M4160C04, mounted over a 4 ft wide cable trough. Since the cabinet bottom is open, provide secondary side panels to fit cabinet flush to trough. Breaker numbers are J3904 and J3916.

- Three (3) 500kV disconnect switch, air break, three-phase, group operated switch with 125VDC motor, Torsional Gear Box Drive System, mounted on C tower per drawing C-F22, Sheet 25, with phase to phase spacing of 35 ft, and top of terminal pad is 29 ft and 6 inches from bottom of steel. Switch numbers are J3927, J3905 and J3907. Duplicate Southern States Job Order # 30118 per Entergy Standard SD1502 Rev. 2
- Two (2) 500kV disconnect switch, air break, three-phase, group operated switch with 125VDC motor, Torsional Gear Box Drive System, with ground switch that is gear driven with hand operated crank and Kirk key interlocks between switch operator pipe and ground operator pipe. Ground switch will be located on the jaw end of the switch. Switch numbers are J3902 with attached ground switch K1529 and J3926 with attached ground switch K1579. Both are mounted on D tower per drawing C-F22, Sheet 26, with phase to phase spacing of 35 ft, and top of terminal pad is 54 ft and 6 inches from bottom of steel. Duplicate Southern States Job Order # 30118 per Entergy Standard SD1502 Rev. 2.
- Insulators, Station Post, Porcelain, standard glaze, 500kV rated voltage, 1800kV BIL, TR No. TR-391, 5" top bolt circle and 7" bottom bolt circle per Entergy Standard SA0501, pre-assembled
- Three (3) 500kV Surge Arresters, station class, polymer, 335 MCOV
- Twenty-five (25) A type bus support structures per drawings M3920SD1 and M3920SD2
- Sixty-two (62) B type bus support structures per drawings M3920SD1, M3920SD3 and M3920SD4
- Twelve (12) C low switch support structures per drawing M3920SD5
- Twelve (12) L2 spacer structure per drawing M3920SD17 to convert C switch support structure to bus support structure called C1
- Twelve (12) D high switch support structures per drawing M3920SD6
- Three (3) E arrester support structures per drawing M3920SD7
- Four (4) F CVT support structures per drawing M3920SD7
- Three (3) G line trap support structures per drawings M3920SD8 and M3920SD9

- Two (2) J shield towers per drawings M3920SD10, M3920SD11 and M3920SD12
- 500kV Rigid bus, aluminum tubing, 5", Schedule 40, EHV, 40 lengths, 6063-T65. All bus shall include 1272 kcmil ACSR damping cable.
- 500kV equipment jumpers, tri-conductor 954 kcmil ACSR with EHV spacers

Relocate the 500kV Lakeover line termination in the 500kV ring bus

Relocating the 500kV line termination in the ring bus will require the following electrical work:

- The existing 500kV Lakeover line termination will be abandoned. The equipment, structures, deadend and buswork of existing Lakeover line termination will remain in place for future use. Breaker J3924 will be removed and replaced with buswork. This breaker has chronic leaks and will require high maintenance. Since it will not be used in the ring, it will not be replaced. The transmission line will be removed between the existing deadend tower in the station and tower (#304) outside the station. New wire will be strung from the existing lattice deadend tower (#304) to a new 3-pole self supporting tubular deadend location near the north end of the station.
- A new node in the 500kV ring bus will be developed for the Lakeover termination. This node will be located between the existing Wolf Creek and Attala Generation nodes on the ring bus. The type A bus supports adjacent to switch J3917 will be replaced with a new breaker J3916. The type C1 bus supports will be converted to C switch support structures by removing the L2 spacer structures. A new switch J3927 will be installed on this switch support structure. Exercise caution while installing the switch because an existing J type shield tower is adjacent to the C phase.
- The new Lakeover line will terminate between switch J3927 and J3913. The new Lakeover line termination will be built similar to the adjacent Wolf Creek line termination, extending bus work from the new node parallel to the Wolf Creek termination. Install two (2) line traps and line tuning units on B phase and C phase. The line trap will be mounted on G structures. A third G structure will be installed as a bus support on A phase. Install CVT's on all three (3) phases. CVT's will be mounted on F structures. A junction box will be mounted on the center phase F structure with one (1) conduit to each of the three (3) CVTs and two (2) conduits to the cable trough. Install one (1) motor operated line switch J3926 with attached ground switch K1579. The switch will be mounted on type D support structures. Install three (3) polymer line arresters mounted on type E structures. After the switch, turn the bus run 90 degrees counter clockwise. Extend the buswork to meet the new 3-pole self supporting

tubular deadends near the north end of the station. The bus run will turn 90 degrees by connecting a 55 ft elevation bus to A-frames mounting on type A bus supports. Create a phasing transition in this turn by swapping A and C phase in order to moving C phase to the center phase. After the turn the 30 ft bus elevation will transition to a 55 ft elevation and extend over the main roadway entrance in the substation. The bus will run perpendicular to the new transmission line and tap up to the line. There is a distribution line outside the fence that may need to be relocated.

Terminate the second autotransformer bank to the 500kV ring bus

Terminating the second autotransformer bank to the 500kV ring bus will require the following electrical work:

- Develop a new node in the 500kV ring bus for the second autotransformer bank. Remove the type A bus supports adjacent to switch J3903 and install a new breaker J3904. Between new breaker J3904 and existing breaker J3908 there are C1 bus supports. Convert these C1 bus supports to C switch support structures and install two (2) new switches J3905 and J3907. Remove L2 spacer structures to convert C1 to a switch support structure. Exercise caution while installing the switch because an existing J type shield tower is adjacent to the C phase.
- Install A frames on existing A towers between new switches J3905 and J3907. Install new buswork from the new node parallel to the Attala termination at a 55 ft elevation. The bus run turns 90 degrees clockwise and extends to the second autotransformer bank. This buswork includes a switch J3902, ground switch K1529, and an A phase CVT. It also includes provisions for a future breaker and switches to eventually convert the 500kV ring bus to a breaker and a half bus arrangement. Install two (2) J shielding towers and shield wire along the bus run to the transformer bank to provide shielding. This shieldwire will connect to nearby existing J towers and the new 2F-55 structure in the 230kV yard.

Second Autotransformer Bank - The following material will be purchased and installed:

The spare 500/230kV autotransformer that is located in the Hartburg (TX) substation will be relocated to the McAdams substation to be used as a second autotransformer bank. Install the three (3) relocated units and include provisions for a 4th unit (future spare to be purchased and installed at a later date but not as part of this project). Install three (3) shunt reactor banks off the 13.8kV tertiary.

The following material will be required for the second autotransformer bank

- Three (3) 500kV surge arresters, station class, polymer, 335kV MCOV
- Three (3) 230kV surge arresters, station class, polymer, 152kV MCOV
- Six (6) 15kV surge arresters, station class, polymer, (designer to select rating)
- Nine (9) 13.8kV shunt reactors with 9 ft fiberglass elevation pedestal (identical to units supplied in 2008 Trench WO#C080631)
- Three (3) 15kV disconnect switches, manually operated
- Four (4) 2BM pedestal bus supports
- Five (5) B1 pedestal bus supports
- Four (4) H3M pull off structures
- Three (3) vacuum circuit breakers
- Three (3) S switch supports
- Nine (9) T1 tertiary bus support
- Twelve (12) T2 tertiary bus support
- Twenty-one (21) V1M reactor bus support
- Twenty-one (21) V2M reactor bus support
- One (1) W equipment support structure
- Four (4) X neutral bus support structures
- Three (3) grounding transformers
- One (1) grounding resistor
- One (1) lot of insulators and buswork
- One (1) station service line up with pad mounted 500kV transformer

Install 500kV surge arresters on H3M pull off structures. Install 500kV spare bus and 230kV spare bus for connecting the future 4th autotransformer as a spare. The second bank will be installed similar to the first bank including provision for the fourth transformer.

The cost for relocation, re-installation, and refurbishment of three (3) single-phase autotransformers from Entergy's Hartburg Substation (Texas) to Entergy's McAdams Substation is included in the cost estimates in this Addendum.

230kV yard - The following electrical material will be purchased and installed in the 230kV yard

- One (1) 230kV disconnect switch, air break, three-phase, group operated switch with 125VDC motor, with manually operated ground switch on jaw end. Switch will be mounted on 2C switch support structure per drawing MSSTD216, with phase to phase spacing of 16 ft. The top of terminal pad will be 29 ft and 6 inches from bottom of steel. Switch numbers are J5302 with attached ground switch K5387. Switch will be provided per Entergy Standards SD1501, Rev. 6 and SD1601.

- One (1) 2F-55 deadend structure with bus support per drawings M3920227, M3920228, M3920229, M3920230, and M3920231
- Six (6) 2B bus support structures, per drawing M3920215
- One (1) 2C switch support structure per drawings M3920216, M3920217, and M3920218
- 3F CVT support structure (current 230kV standard structure)
- Insulators, 230kV station post, high strength, TR-308, 900KV BIL, ANSI 70 GRAY, 80" high, 5" bolt circle, one (1) piece
- Insulators, 230kV suspension
- 230kV Rigid bus, aluminum tubing, 5", Schedule 40, 6063-T65. All bus shall include 1272 kcmil ACSR damping cable
- 230kV strung bus to autotransformer will be 1780 kcmil ACSR Chuckar
- 230kV strung bus for Attala 230kV conductor will be 1272 kcmil ACSR Bittern
- 230kV equipment jumpers, tri-conductor 666 kcmil ACSR

Terminate the second autotransformer bank to the 230kV bus

Terminating the second autotransformer bank to the 230kV yard will require the following electrical work in the 230kV Attala line bay.

- The 230kV conductors from the single-phase autotransformers will be gathered to a 2F-55 structure and will drop down to buswork, a switch with ground and three (3) CVT. On the opposite side of the switch, risers will connect to strung bus between the 2F-55 structure and the closest deadend structure in the Attala bay which is a 2ESW-55 structure. This requires relocating the 230kV Attala line termination to the adjacent 2E-75 structure that bay.
- Install one (1) 2F-55 structure with optional bus support bracket. Install 300 ft of 230kV strung from the single-phase autotransformers to the 2F-55 structure and drop down to rigid bus. 230kV Strung bus will include 1780 kcmil Chuckar and nine (9) suspension insulators. Install buswork below the structure including one (1) motor operated switch J5302 with ground K5387, one (1) 2C switch support structure, six (6) 2B bus supports with insulators, and 90 ft of rigid bus. Install three (3) CVT's below buswork after switch J5302. Mount CVT on 230kV F structure and mount a junction box on the center phase structure.
- Remove the strung bus between the 2ESW – 55 structure and the 2E-75 structure deadend. Below 2ESW-55, remove risers, one (1) line trap, one (1) CVT, and one (1) F tower. The 2ESW-55 is not designed to terminate strung bus on the north side of the structure. Structure will be reconfigured by relocating/rotating the structure or parts of the structure 180 degrees. Some disassembling and reassembling of the 2ESW-55 structure will be requires or the structure will need to be replaced with a 2E-55 structure.

- Install 630 ft of strung bus between the 2ESW-55 structure and the 2F-55 structure with risers at each structure. At the 2F-55 structure, these risers will tap up from the buswork located on the south side switch J5302. Risers located on the north side of switch J5302 will connect to stung bus from autotransformers. 230kV Strung bus will include 1780kcmil ACSR Chuckar and nine (9) suspension insulators.
- Remove 912 ft of the strung bus between the two (2) 2E-75 structure deadends. This includes two (2) sets of three-phase strung bus at 75 ft and 55 ft elevations. The shieldwires between the two structures will remain. The first structure is located at N.962 and the second structure is at N.1114. Install 500 ft strung bus, 1272kcmil ACSR Bittern, from the 75 ft high pull-off of the first structure to the 55 ft pull off of the second structure. The estimate includes new conductor since the existing strung bus at the 75 ft elevation may not be long enough to reach the second structures at the 55 ft pull-off. The second 2E-75 structure will become the new Attala line termination deadend. The existing three-phase set of CVT will remain. A new line trap will be installed on the A phase riser. A new line tuning unit, junction box and conduit will be mounted on the center phase structure of the CVT. Install cable from the existing CVT to the line tuning unit with offset insulators mounted on the CVT structure for carrier functions.
- Remove equipment below the first 2-E75 Structure, located at N. 962, including three (3) metering CT's, three (3) F structures, three (3) 2B bus support structures, six (6) insulators, and associate buswork. The metering current transformers will be returned to spare equipment.

Relay

The 500kV ring bus will be adding two (2) new breakers nodes, removal of breaker node J3924 and relocating the Lakeover Line bay to a new bay to make room for new autotransformer. The breakers in the autotransformer bay will wrap around the autotransformer to create the auto differential zone. The Attalla LLC protection will be configured for the bay

- Install primary and back-up autotransformer differential panel. Tied to the 500kV ring bus between J3908 and the new breaker.
- Install two (2) 500kV Bus diff panel SEL-487B Pri/Bu for high side bus to transformer
- Install four (4) 500kV breaker control panels
- Upgrade Lakeover line protection with dual SEL-421 P1 & P2 PLC pilot scheme (Panel w/o relays)
- Install one (1) MOS control panel (upgrade existing to handle new MOS)
- Install one (1) DC panel
- Install four (4) 500kV CVT

- Install two (2) 500kV line trap

The 230kV system will be swapping the Attalla Line bay with abandoned TPS bay to make room for new autotransformer. The second autotransformer bank will connect to the 230kV yard in the Attala bay. The breakers in the autotransformer bay will wrap around the autotransformer to create the auto differential zone. The Attalla Line protection will be configured for the new location.

- Install three (3) 500kV breaker control panels
- Install one (1) 230kV Bus diff panel SEL -487B lowside bus to transformer
- Install one (1) Attalla Line protection – SEL-421 / 311-C
- Install one (1) 19" rack
- Install one (1) A.C. Auto-Transfer Switch
- Install two (2) Station Service AC 480V & 240/120V panels
- Install one (1) Orion
- Install one (1) SEL 2407
- Install one (1) 351SEL relay for Auto Tertiary
- Install two (2) tuner
- Install three (3) 230kV CVTs
- Install one (1) 230 kV line trap
- Install one (1) tuner
- Install one (1) Bus Potential junction box
- Install three (3) CVT junction boxes
- Install three (3) current transformers 13.8kV, 800A for ground detection transformers
- Install three (3) current limiting reactors, 13.8kV ground detection transformers
- Install one (1) grounding resistor - ground detection transformers
- Install one (1) lot of Shielded Control Cable
- Install one (1) 125V, 250 AH, Z 1 Batteries set
- Install one (1) Batteries charger
- Install one (1) DC switching panel
- Control, indication, alarms, and analog will have to be wired up, configured, and programmed for the RTU.
- The RTU is a Harris D20 unit that will have to be upgraded with the latest software and expanded with S cards and possible control cards.
- Upgrade existing motor control panel to accommodate new motor controlled switches.
- Upgrade existing DRF panel to accommodate new autotransformer.

Relay Settings

- Model new 500/230kV Auto in Aspen using test data from vendor.
- Provide settings for new primary and backup autotransformer differential relay panel.

- Provide settings for new primary and backup Entergy standard 500kV bus differential panel for high side bus to new autotransformer.
- Revise settings for existing Auto#1 protective relays including BDD, IAC53 tertiary, IAC53 neutral, and IAC53 ground relays.
- Provide settings for two (2) new 500kV breaker control panels.
- Revise settings for three (3) 500kV breaker control panels.
- Revise settings for Wolfe Creek to McAdams 500kV line panel.
- Revise settings for Attala to McAdams 500kV line panel.
- Revise settings for Lakeover to McAdams 500kV line panel.
- Provide settings for new Entergy standard 230kV bus differential panel for low side bus to new autotransformer.
- Provide settings for one (1) new Entergy standard line panel consisting of one (1) SEL 421 primary relay and one (1) SEL 311C backup relay.
- Revise settings for Indianola to McAdams 230kV line panel.
- Revise settings for Pickens to McAdams 230kV line panel.
- Provide settings for one (1) SEL351 for autotransformer tertiary.
- Provide settings for reactor protective relays on reactor 13.8kV breakers.

Communications and SCADA

- RTU is a Harris D20 unit that will have to be upgraded with the latest software and expanded with S cards /Host configuration changes.
- ADSS fiber, fiber-optic Junction box on dead end, & Channel Bank with fiber-optic systems and associated communications equipment.

6. COST

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. Entergy incurs a tax liability proportional to the amount of customer contributions. In addition to proposed project costs, the customer may be charged a "Tax gross-up" at applicable rates. Rates are subject to change.

Cost Analysis

Project/Station Description	Total	Base Plan	Supplemental	Reference
Add 2nd autotransformer at McAdams	$19,502,000	$19,502,000		5.2
Reroute Lakeover 500kV line at McAdams	$1,023,000	$1,023,000		5.2
Total	**$20,525,000**	**$20,525,000**		

Notes to Projected Costs:

- The project costs include all costs associated with transformer dismantling in TX, transportation, and installation at McAdams.
- The projected costs include all costs associated with transformer testing and reconditioning as required.
- The projected costs include all costs associated with accommodating a (future) spare unit at McAdams.

7. SCHEDULE

A detailed schedule will be prepared subsequent to customer approval to proceed with the project. Based on the Task duration schedules listed below, the overall project in-service date is projected to be 06/1/2011. The following are rough durations:

Task Name	Proposed Start Date	Proposed Duration
Project scoping & definition	6/1/2009	12 weeks
Design & procurement	9/1/2009	52 weeks
McAdams - Construction, site grading & fencing	5/1/2010	6 weeks
McAdams - Construction, foundation installation	6/15/2010	24 weeks
McAdams – Construction, Electrical	12/1/2010	26 weeks
McAdams – Construction, Relay	12/1/2010	26 weeks
Equipment checkout	5/15/2011	2 weeks

Notes to Duration Schedules:

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

8. RISK ASSESSMENT

Identify risk events that may impact cost and/or schedule during execution of the project.

Risk	Comment	Impact
Underground site issues (Pipelines, wells, containments)	Unknown underground factors will add mitigation costs and may impact schedule	***
Substation Site will require substantial site work	Site may be in flood plain, wetlands, Soil Contamination	***
Material transportation could affect cost/schedule	Large transformers(other equipment) may require special transport to substation site	**
Material costs steel & Equipment	Rising steel, copper, fuel and other market conditions could greatly affect estimated cost.	****
Lay-down areas	Cost to be determined during detailed scoping.	*
Storm-water plan implementation	Best guess on SWPPP creation, implementation and monitoring can vary greatly dependant on outcome of environmental study.	**
Weather & Equipment Lead Times (Transformer, Poles)	Unexpected delays on material lead times, unusually inclement weather will impact schedule but might impact AFUDC costs as well.	**
Wetland mitigation	Undetermined until environmental analysis is complete.	***
Outages may not be available	Preliminary schedule only considers general outage constraints. Specific project schedule may be delayed by days, weeks or months dependant on system conditions. Delays of months = increased project costs.	**
Scope based on design assumptions which may change	Varied impact on cost and schedule.	***

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

9. NOTES

Below is Entergy's response to the PID 221 customer question regarding the required Sterling Upgrades referenced in Section 2.1 of the Revised Draft Facilities Study Report posted on 3/12/10.

- The Sterlington Upgrades referenced in Section 2.1 of this report are part of the Ouachita Transmission Service project listed in Update 2 of the Entergy Construction Plan. The specific Sterlington Upgrades required for the service requested in the this study are as follows:
    - Split Sterlington 115kV buses
    - Replace 500-115 auto #2 with 750 MVA

- The in-service date (ISD) of the two upgrade projects listed above as indicated in the Update 2 of the Entergy Construction Plan is March 2012.

Below is Entergy's response to the PID 221 customer question regarding the availability of an optional study as defined in Section 10 of Attachment N of Entergy's OATT.

- It has been determined that an optional study may be performed at the request of the customer as pursuant to Appendix 5 of Section 10 of Attachment N of Entergy's OATT.

10. CONFIRMED RESERVATIONS

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

- Non-Firm IPPs within the local region of the study generator were turned off and other non-firm IPPs outside the local area were increased to make up the difference.
- Confirmed firm transmission reservations were modeled for the year 2009 - 2015.
- Approved transmission reliability upgrades for 2007 – 2010 were included in the base case. These upgrades can be found at Entergy's OASIS web page, http://www.oatioasis.com/EES/EESDocs/Disclaimer.html, under approved future projects.

PID	Substation	MW	In Service Date
PID 211	Lewis Creek	570	6/1/2011
PID 216	Wilton 230kV	251	1/1/2010

Prior transmission service requests that were included in this study:

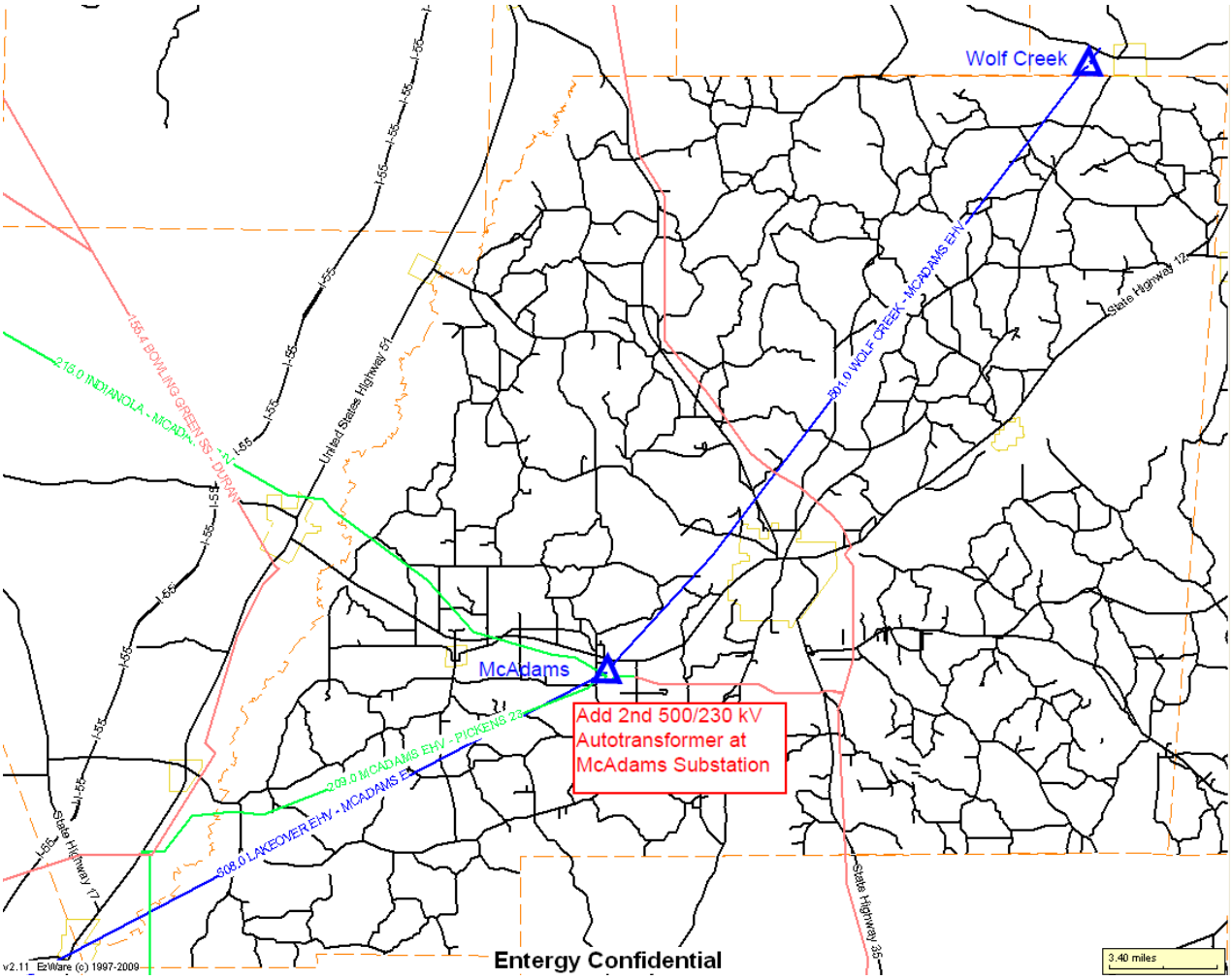
OASIS #	PSE	MW	Begin	End
1460900	Louisiana Energy & Power Authority	116	1/1/2009	1/1/2030
1478781	Entergy Services, Inc. (EMO)	804	1/1/2008	1/1/2058
1481059	Constellation Energy Group	60	2/1/2011	2/1/2030
1481111	City of Conway	50	2/1/2011	2/1/2046
1481119	Constellation Energy Group	30	2/1/2011	2/1/2030
1481235	Louisiana Energy & Power Authority	50	2/1/2011	2/1/2016
1481438	NRG Power Marketing	20	2/1/2011	2/1/2021
1483241	NRG Power Marketing	103	1/1/2010	1/1/2020
1483243	NRG Power Marketing	206	1/1/2010	1/1/2020
1483244	NRG Power Marketing	309	1/1/2010	1/1/2020
1520043	Municipal Energy Agency of Miss	20	1/1/2011	1/1/2026
1552148	Entergy Services (EMO)	1	1/1/2009	1/1/2014
1555717	East Texas Electric Coop	1	1/1/2010	1/1/2015
1555718	Entergy Services (EMO)	158	1/1/2010	1/1/2015
1557602	East Texas Electric Coop	1	1/1/2009	1/1/2017

11. ATTACHMENTS

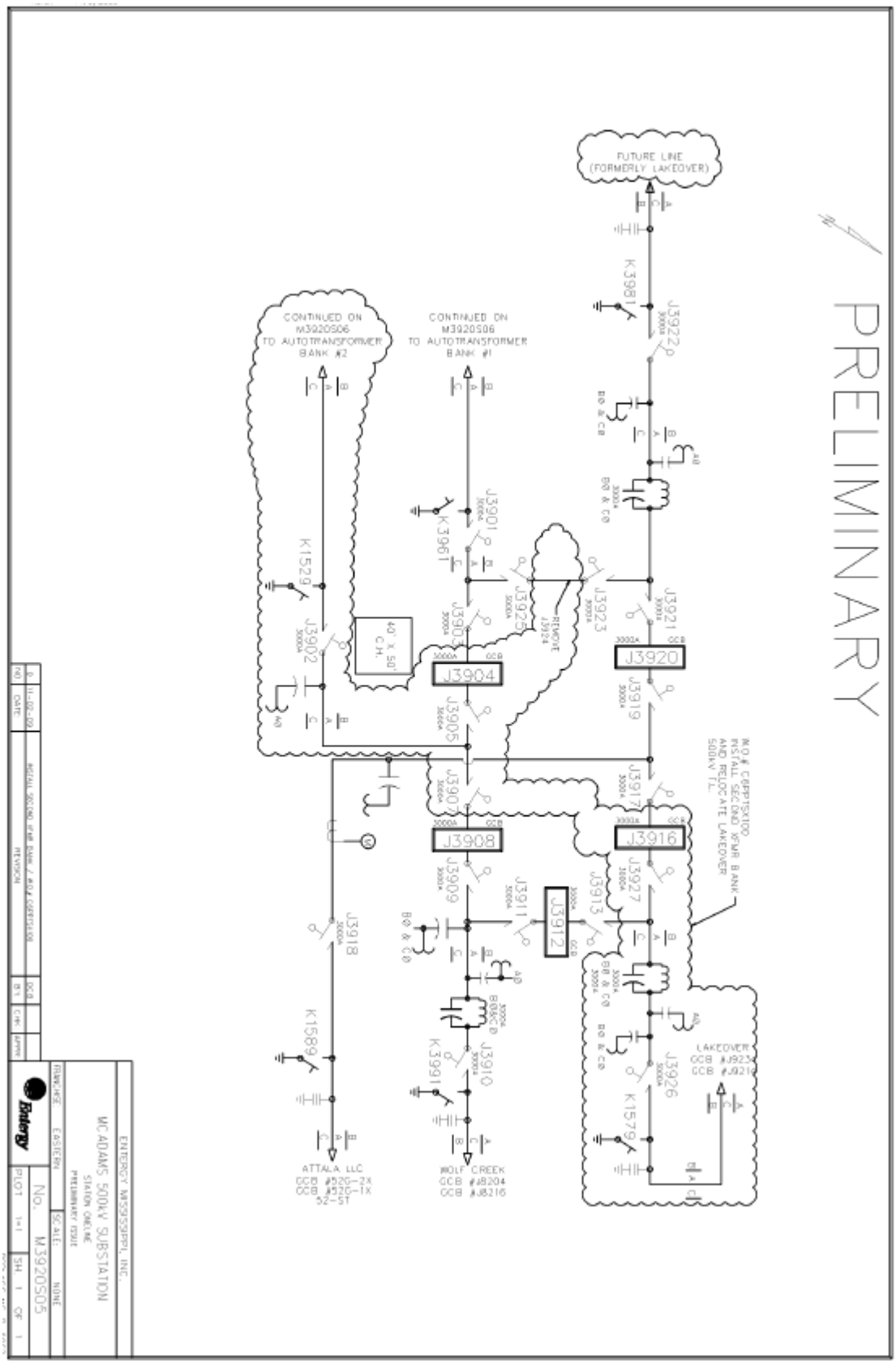
A. Table of Acronyms

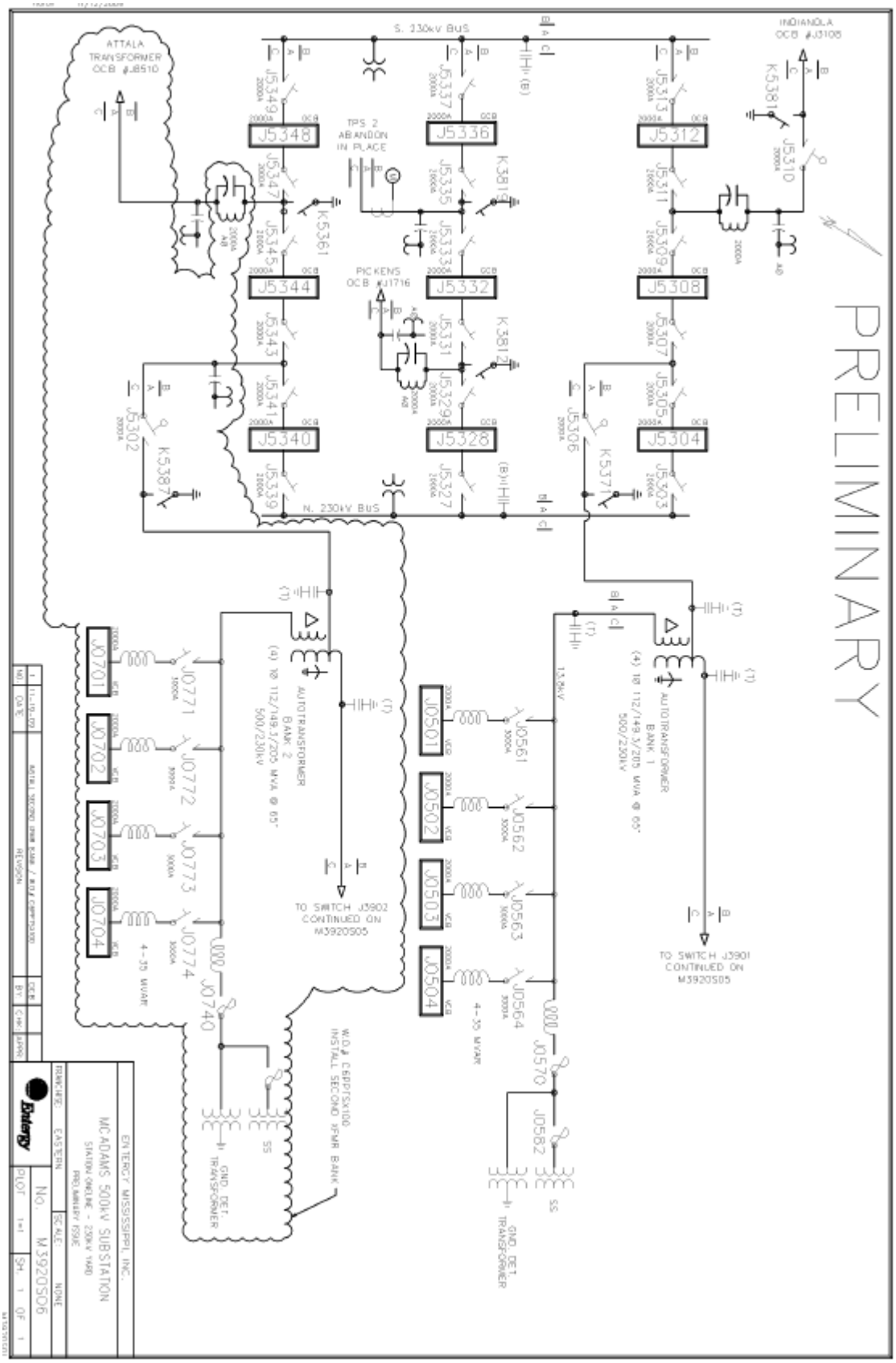
ACSR	Aluminum Conductor Steel Reinforced
ACSS	Aluminum Conductor Steel Supported
ADEQ	Arkansas Department of Environmental Quality
AFUDC	Allowance for Funds Used During Construction
ATC	Available Transfer Capability
EES	Entergy Control Area
EHV	Extra-High Voltage
ICT	Independent Coordinator of Transmission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

B. Scope Summary Diagram / Area Map



C. One Line Drawings M3920S05 & M3920S06




PRELIMINARY
S. 230kv BUS
N. 230kV BUS
ATTALA TRANSFORMER OCB #J8510
INDIANOLA OCB #J3105
PICKENS OCB #J1716
TPS 2 ABANDON IN PLACE
J5348
J5336
J5312
J5344
J5332
J5308
J5340
J5328
J5304
J5302
J5306
J5310
K5361
K5381
K5371
K5387
AUTOTRANSFORMER BANK 2 (4) 1Ø 112/149.3/205 MVA @ 65° 500/230kV
AUTOTRANSFORMER BANK 1 (4) 1Ø 112/149.3/205 MVA @ 65° 500/230kV
13.8kV
J0701
J0702
J0703
J0704
J0771
J0772
J0773
J0774
J0740
J0501
J0502
J0503
J0504
J0561
J0562
J0563
J0564
J0570
J0582
4-35 MVAR
TO SWITCH J3902 CONTINUED ON M3920905
TO SWITCH J3901 CONTINUED ON M3920S05
W.O.# CEPPTSX100 INSTALL SECOND XFMR BANK
GND. DET. TRANSFORMER
SS
ENTERGY MISSISSIPPI, INC.
MC ADAMS 500kV SUBSTATION
STATION ONELINE - 230kV (1Ø)
PRO MAINARY ISSUE
EASTERN
NONE
M3920S06
SH 1 OF 1

D. Electrical Arrangement Drawing M3920EA2