TRANSMISSION LINE & SUBSTATION PROJECTS

COMPANY : EAI

CUSTOMER: PID 223

FACILITIES STUDY

EJO # F4PPAR0461

PID223 GENERATOR INTERCONNECTION

Revision: 1

Rev	Issue Date	Description of Revision	Project Manager	Program Manager
A	4/28/09	1st Draft	JMM	
B	5/12/09	Issued to JET for Approval	JMM	
0	5/16/09	Approved With JET Input	JMM	MPG
0A	5/21/09	Added PM3901 to Section 3.0	GWR	
1	6/3/2009	Classified Upgrade Costs	BEF	JDH

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

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1. PROJECT SUMMARY

1.1. Background and Project Need

The purpose of this Facilities Study is to determine the availability to connect a new generation facility and provide the transfer capability across Entergy's transmission system between Green Forest South and Harrison West. This facility study will evaluate the PID 223 request for interconnection of a total of 125MW of wind generation.

The Interconnection Point will be a three breaker ring bus switch station named Basin Spring Switch Station.

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

To identify the constraints a study was performed on the latest available December 2007 – May 2009, 2010-2018 summer peak cases, using PSS/E and MUST software by Power Technologies Incorporated (PTI).

PID223 did request ERIS and NRIS. No upgrades were identified for ERIS. No upgrades were identified for NRIS.

The cost associated with PID 223 is dependent on the possible interconnection of the prior PID 221 GI request. PID 221 identifies a supplemental upgrade of a 2nd 500/230kV autotransformer at McAdams. The deliverability of PID 223 utilizes additional capacity created by the upgrade and costs associated with financial transmission rights will be determined by the ICT. If PID 221 is withdrawn, no upgrade at McAdams is required.

1.2. Scope Summary

- The overall scope of this project is summarized as follows:
  - **Basin Spring 161kV Substation:** Provide a three breaker ring bus point of interconnection

1.3. Cost Summary

- The estimated total project cost is **$6,815,000.** This cost does not include Tax Gross Up which may apply. This is a Class 3 estimate (-20% + 20%) based on the time frame allowed to complete the study.

1.4. Schedule Summary

- A summary task schedule is provided for establishing a path forward; 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 12/29/2010. The task durations and proposed ISD will be confirmed during project scoping and definition**.**
- Refer to section 6.0 of this document for a more details description of project tasks and schedule durations.

1.5. Long Lead and Major Material/Equipment

Quantity	Material Description	**Lead Time (Weeks)**
3	161 kV, 40kA breakers	20
6	161kV vertical break switch	22
6	161 kV surge arrestors	14
1 lot	Steel structures	20
1	Control House	26
3	161kV breaker control panel	15
12	161kV CCVT	30
1	RTU – remote terminal unit	12
2	Line trap and tuner	30

2. SAFETY REQUIREMENTS

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

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

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

3. GENERAL ASSUMPTIONS

- The connection of the generator must adhere to the latest Generator Interconnection Customer Requirements Standard PM3901.
- Upon receipt of formal approval from customer authorizing design and construction, Entergy will prepare a detailed project execution plan.
- The ROW and substation land will be provided to Entergy by the customer.
- All permits will be attainable in a reasonable period.
- Due to timing and/or funding constraints, surveys, and soil borings were not performed in order to develop this facility study.
- All costs above represent good faith estimates in today's dollars. Price escalation for work in future years has not been included.

4. SCOPE OF WORK

4.1. Basin Spring Switching Station: Build new three (3) Element 161 kV Ring Bus.

- **General:** Build new 300' x 350', 161kV three element breakers Ring Bus rated at 2000A continuous and 40kA interrupting current.

- **Site:** A new switching substation site will be constructed. The proposed dimensions of the ring bus substation is 300' x 350'. The site will be developed in accordance the applicable Entergy Design Standards for site design. The following materials will be required to complete the site work:

    - One (1) soil boring
    - One (1) topographic survey
    - 1300 linear feet of new fence
    - 3.2 acres of brush clearing and removal
    - 2100 cu.yds. of Top Soil removal
    - 4200 cu.yds. of Excavation
    - 6300 cu.yds. of excavation and brush disposal
    - 2.6 acres of soil sterilization
    - One (1) acre of seed & mulch
    - 12000 cu.yds of structural fill
    - 4000 tons of limestone
    - 2000 linear ft of new access road
    - 100 ft of 24" culvert

- **Foundations:** Approximately 636 cu. yds of concrete will be required to complete the following foundations necessary for the project:

    - Three (3) 161kV Dead Tank Breaker Foundations
    - Nine (9) 161kV High Switch Stand Foundations
    - Four (4) 161kV Low Switch Stand Foundations
    - Eighteen (18) 161kV High Bus Support Foundations
    - Fourteen (14) 161kV Low Bus Support Foundations
    - Three (3) 161kV Deadend Tower Foundations
    - Nine (9) 161kV CVT Tower Foundations
    - Nine (9) 161kV Surge Arrester Pedestal Foundation.
    - Four (4) Shield Mast Foundations
    - One (1) 16' x 32' Control House
    - Four (4) Yard Light Foundations

Install approximately 2500 ft of grounding to extend the ground grid to the new fence line and provide ground leads for new structures and equipment.

Install approximately 200 ft of prefabricated cable trough with appropriate covers and approximately 1500 ft of conduit for electrical equipment.

- **Electrical:** Build new three element ring bus by purchasing and installing the following equipment, structures and other accessories to support a safe and reliable installation.

  - Three (3) 161kV, 2000A, 40kA Dead Tank Breakers
  - Nine (9) 161kV 2000A Vertical Break Disconnect Switch for Breaker Isolation
  - Two (2) 161kV 2000A Vertical Break Disconnect Switch for Line Isolation
  - Three (3) Motor Operating Device
  - Two (2) Interrupting Device to be mounted on the Line Switches
  - Four (4) 161kV Low Switch Support Structure
  - Six (6) 161kV High Switch Support Structure
  - Eighteen (18) High Bus Support Structure
  - Fourteen (14) Low Bus Support Structure
  - Three (3) Substation Dead-end Structure
  - Nine (9) CVT Support Pedestal
  - Nine (9) Surge Arresters
  - Four (4) Lightning Shield Tower
  - One 16’ x 32’ Pre-fabricated Control Building
  - One (1) Lot of 4” Aluminum Tubing
  - 666 MCM and 1590 MCM conductor with appropriate connectors and fittings.
  - Four sets of Yard Lights
  - Above ground conductor to safety ground the equipment and structures to the ground grid
  - Above ground conduit to connect the equipment to the Control House
  - One (1) Customer Demarcation Box

- **Relay:**

  Harrison East Node

- A blocking line relay protection panel with breaker control functions (Entergy PM1803 option N) looking towards Harrison East will be installed. Universal UPLC carrier sets will be installed to facilitate anticipated carrier scheme changes. The scheme will remain blocking since AECC sends a blocking signal for transformer low side faults at their AECC Harrison South tapped station. A new carrier frequency will be assigned to this line segment.
- Install line trap and line tuner to match the carrier frequency.
- Install a carrier coupling CCVT connected ahead of the line trap.
- Install a set of three CCVT's on the node of the ring.
- Install junction boxes for the CCVTs.

Eureka Springs Node

- A blocking line relay protection panel with breaker control functions (Entergy PM1803 option N) will be installed on the node looking towards Eureka Springs (SWEPCO). The line relaying at Eureka Springs will be upgraded to ensure blocking scheme compatibility with Entergy's Schweitzer 421 primary relay. The scheme will remain blocking since AECC sends a blocking signal for transformer low side faults at their AECC Osage Creek tapped station.
- Install line trap and line tuner to match the carrier frequency.
- Install a carrier coupling CCVT connected ahead of the line trap.
- Install a set of three CCVT's on the node of the ring.
- Install junction boxes for the CCVTs.

Customer Node

- On the ring bus node looking towards the customer's Moonlight Substation a 87L/POTT/DTT line relay protection panel with breaker control functions (Entergy PM1803 option B2 421/311L) over fiber optic cable will be installed.
- A revenue metering panel will be installed to meter the load flow of this line.
- Install a set of three metering CCVT's on the node of the ring for both metering and relaying purposes.
- Install a CCVT on the line side of the disconnect switch.
- Install three extending range metering CTs.
- Install junction boxes for the CCVTs and CTs.

AC/DC Systems

- AC and DC systems with corresponding equipment and panels will be installed.
- Install Station Service Voltage Transformer if 13.8 kV distribution circuits are not available.

Communication

- Install an RTU with communication ports to the TOC and SOC.

- Install voice and data telephone circuits.
- Install a communication processor.
- Install a satellite clock.

- **Relay Settings:**
  - Model the new substation (Basin Spring) and resulting new lines (3 new lines, new step-up transformer, new generator) into ASPEN ® OneLiner
  - Provide relay settings for new relay line panel with carrier and breaker control to Harrison East/Alpena Switch Station
  - Provide relay settings for new relay line panel with carrier and breaker control to Eureka Springs
  - Provide relay settings for new line panel with fiber and breaker control to Customer Sub (Moonlight substation)
  - Provide RTU configuration for new RTU and communications processor

- **Communications and SCADA:**

  RTU configuration will be required. A configuration for the Orion5R will also be required.

- **Metering:**

  Metering requirements will be evaluated.

  Customer shall complete and submit to Entergy the Transmission Metering Applications Requirements Form per Standard MI0301, latest revision.

4.2. Harrison East Substation:

- **Relay**
  - Replace the line relaying and breaker control panels with a blocking line relay protection panel with breaker control functions (Entergy PM1803 option N).
  - Replace line trap and line tuner to match new carrier frequency.
  - Install a new carrier CCVT.

- **Relay Settings**
  - Provide relay settings for new relay line panel for line to Alpena Switching/Basin Spring substation
  - Perform ground overcurrent relay coordination analysis

4.3. Eureka Springs Substation (By Others)

- **Relay**
  - Replace relaying to ensure blocking scheme compatibility with Entergy's Schweitzer 421 primary relay.

- **Relay Settings**

- Provide relay settings for new relay line panel for line to Basin Springs

5. 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. Current rate for EAI is 28.36% and is not included in any of the estimates.

Projected Costs

	2009	**2010**	**2011**	**Total**
Basin Spring Switching Station	$59,000	$6,410,000	$187,000	$6,656,000
Harrison East Substation	$1,000	$46,000	$112,000	$159,000
TOTAL	$60,000	$6,456,000	$299,000	$6,815,000

6. UPGRADE CLASSIFICATION

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

	Base Plan	**Supplemental**
Basin Springs Substation	N/A	$6,656,000
Harrison East Substation	N/A	$159,000
TOTAL	N/A	$6,815,000

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 12/29/2010. The following are rough durations:

Task Name	**Proposed Start Date**	**Proposed ISD**
Scope Definition Acceptance	July 10, 2009	January 20, 2010
Basin Spring Switch Station	January 20, 2010	December 29, 2010
Harrison East Relay	January 20, 2010	October 19, 2010

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	Considerable site work will be required. Rock excavation may be encountered.	***
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.

Risk dollars have not been added to the cost estimate and will be determined during the PEP after Front End Loading is completed.

9. 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 2009 – 2011 were included in the base case. These upgrades can be found at Entergy's OASIS web page, https://oasis.e-terrasolutions.com/OASIS/EES/, 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
PID 221	Wolfcreek	875	1/1/2009
PID 222	Nine Mile	570	10/1/2012

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
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
ASA-2008-001	TVA	724	1/1/2009	1/1/2011
ASA-2008-003	Empire District Electric Co.	100	11/1/2008	11/1/2028
1557602	East Texas Electric Coop	1	1/1/2009	1/1/2017

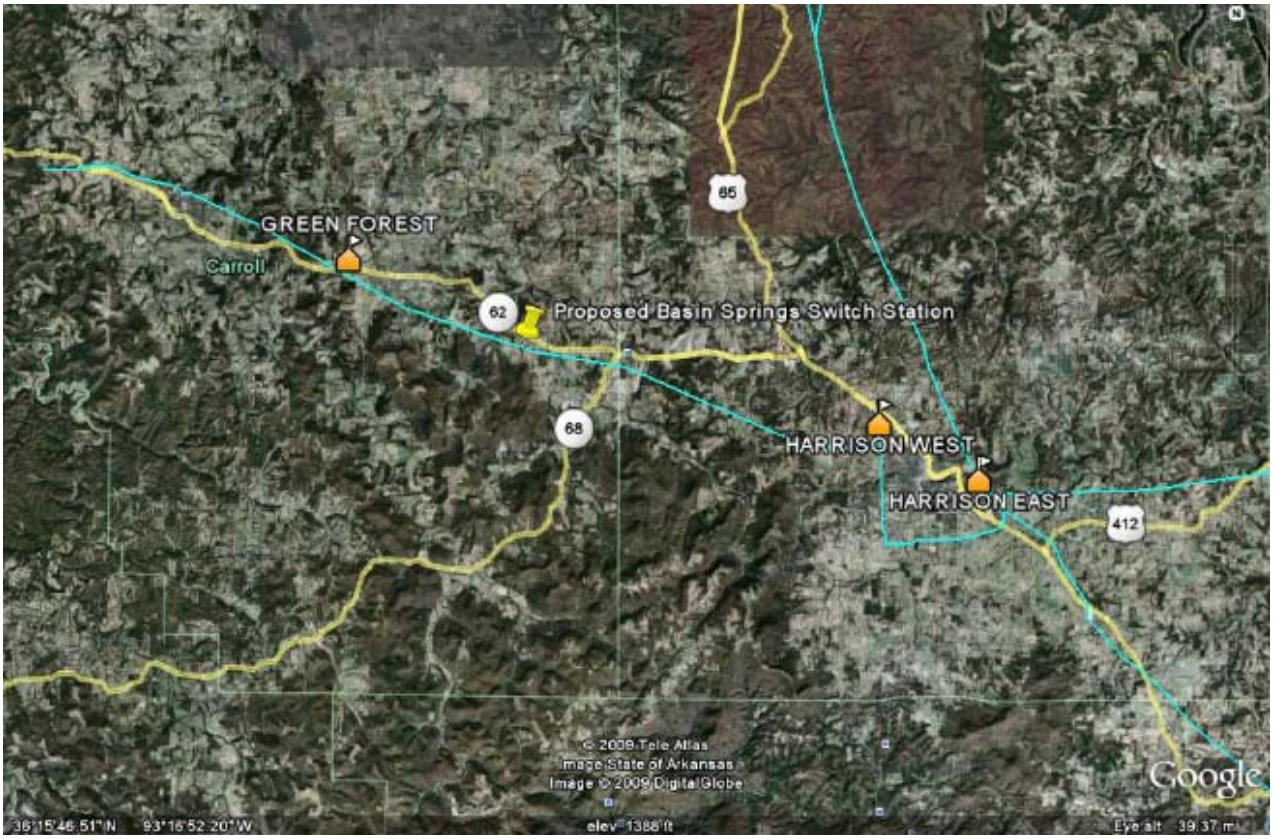
10. ATTACHMENTS

A. Table of Acronyms

ACSR	**Aluminum Conductor Steel Reinforced**
ACSS	**Aluminum Conductor Steel Supported**
ADEQ	**Arkansas Department of Environmental Quality**
AFUDC	**Allowance for Funds Used During Construction**
ATC	**Available Transfer Capability**
EES	**Entergy Control Area**
EHV	**Extra-High Voltage**
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**
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**
TOC	**Transmission Operations Center**

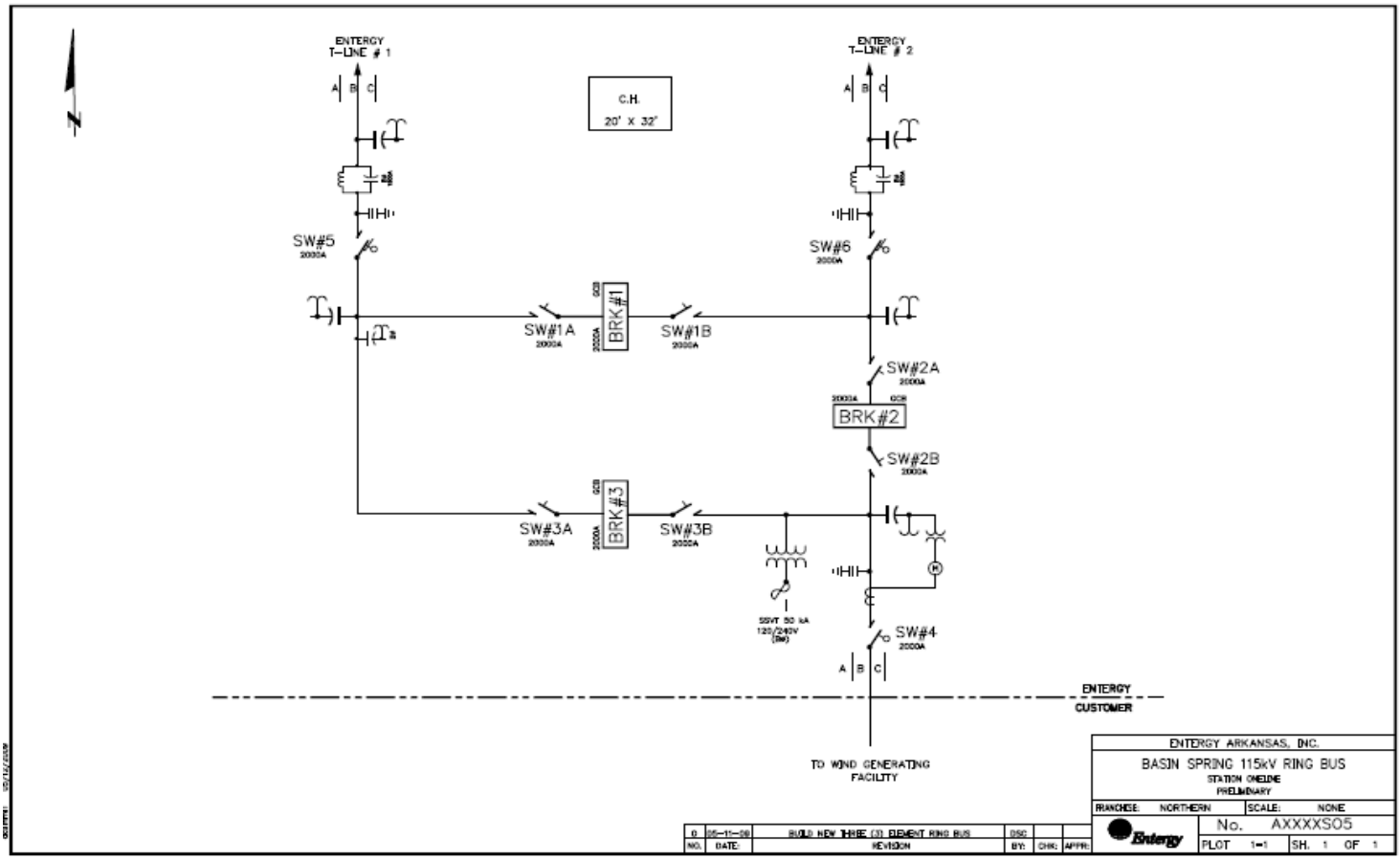
B. Scope Summary Diagram / Area Map

Basin Springs:



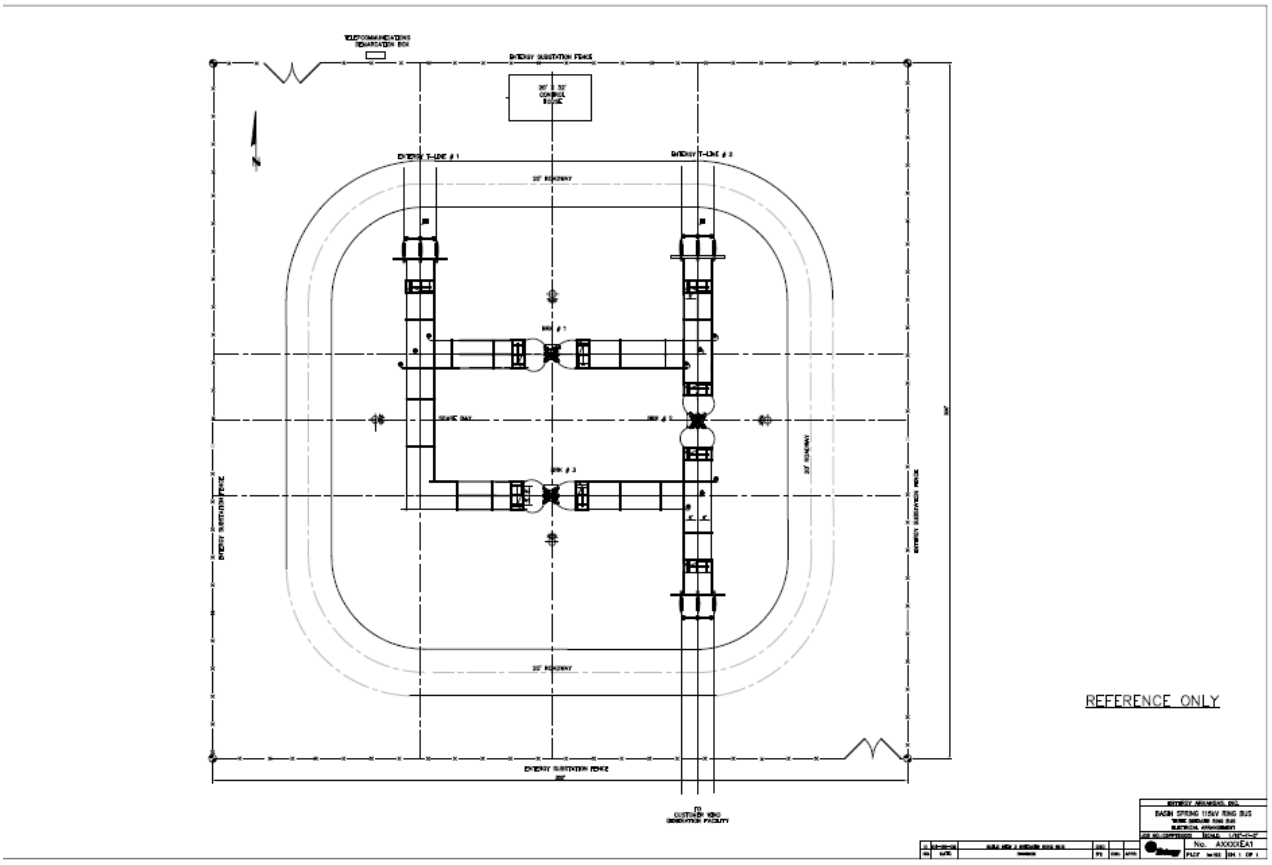
C. One Line Drawings

Basin Spring –



D. Electrical Arrangement

Basin Spring



E. Duration Schedule