Cooper Station Unit 2 Co-Fire Project Scoping Report

East Kentucky Power Cooperative

Cooper Unit 2 Co-Fire PSR
Project No. 164713

Revision 5
October 2024

Cooper Station Unit 2 Co-Fire Project Scoping Report

prepared for

East Kentucky Power Cooperative
Cooper Unit 2 Co-Fire PSR
Somerset, Kentucky

Project No. 164713

Revision 5
October 2024

prepared by

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Kansas City, Missouri

INDEX AND CERTIFICATION

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Certification

I hereby certify, as a Professional Engineer in the state of Kentucky, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by East Kentucky Power Cooperative or others without specific verification or adaptation by the Engineer.

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Zachary S. Crane, P.E. (KY 34547)

Date: 10/24/2024

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ABB	Asea Brown Boveri
AHJ	Authority Having Jurisdiction
AQCS	Air Quality Control System
ASME	American Society of Mechanical Engineers
BMcD	Burns & McDonnell Engineering Company, Inc.
BMS	Burner Management System
BOP	Balance of Plant
B&W	Babcock & Wilcox
CCS	Combustion Control System
CDS	Circulating Semi-Dry Scrubber
CFD	Computational Fluid Dynamics
COD	Commercial Operation Date
DCS	Distributed Control System
DOR	Division Of Responsibility
DRB	Dual Register Burner
Dth	Dekatherm
EA	Environmental Assessment
EKPC	East Kentucky Power Cooperative
ESV	Emergency Shutoff Valve
FD	Forced Draft
FF	Fabric Filter

Abbreviation	Term/Phrase/Name
FG	Fuel Gas
FGC	Fuel Gas Conditioning
FO	Fuel Oil
FPS	Fossil Power System
HAC	Hazardous Area Classification
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HP	High Pressure
HVAC	Heating, Ventilation and Air Conditioning
ID	Induced Draft
IG	Igniter Gas
I/O	Input/Output
LP	Low Pressure
MCC	Motor Control Center
MCR	Maximum Continuous Rating
MFT	Master Fuel Trip
MV	Medium Voltage
M&R	Metering and Regulation
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NOx	Nitrogen Oxides
OE	Owner's Engineer

Abbreviation	Term/Phrase/Name
OEM	Original Equipment Manufacturer
O&M	Operation and Maintenance
PA	Primary Air
PDC	Power Distribution Center
PLC	Programmable Logic Controller
PM	Particulate Matter
PO	Purchase Order
PSIG	Pounds per Square Inch Gauge
PSR	Project Scoping Report
P&IDs	Piping and Instrumentation Diagrams
RUS	Rural Utilities Service
SCR	Selective Catalytic Reduction
SO_2	Sulfur Dioxide
SSO	Safety Shut Off
UPS	Uninterrupted Power Supply

1.0 EXECUTIVE SUMMARY

East Kentucky Power Cooperative (EKPC; Owner) is considering modifying Unit 2 at their John Sherman Cooper Power Station (Cooper; Plant) from a 100% pulverized coal fired boiler to a co-fired boiler that can utilize pulverized coal and/or natural gas. The project will provide operational flexibility by allowing for firing on 100% coal, 100% natural gas, and co-firing on a blended fuel depending on which coal mills are in service. The existing fuel oil (FO) system capacity will also be retained to allow for startup on FO.

Located near Somerset, KY, the Cooper Power Station currently has two pulverized coal generating units rated at 116 net MW (Unit 1) and 225 net MW (Unit 2) for a total active net capacity of 341 MW. Both units are wholly owned and operated by EKPC. EKPC has retained Burns & McDonnell Engineering Corp. Inc. (BMcD; Engineer) to assist with reviewing the feasibility of converting Cooper Unit 2 from 100% pulverized coal fired operation to co-firing operation and to support potential project development costs, schedule, and upfront permitting requirements. This report summarizes the project definition and presents the project feasibility inputs for use in EKPC production cost modeling and other evaluations. Further, this report provides a basis document for obtaining Rural Utilities Servies (RUS) funding, preparing the Kentucky Department of Environmental Protection Division of Air Quality permit application, and providing input to preparation of the Environmental Assessment (EA), project definition, cost estimate, and milestone schedule.

The proposed modifications for Cooper Unit 2 include adding fuel gas (FG) capabilities to all eighteen (18) existing burners and replacing the existing FO fired igniters with dual FO and FG fired igniters. To support these modifications, a new FG metering and regulation (M&R) yard will be procured by EKPC and the FG will be fed to a fuel gas conditioning (FGC) yard prior to being supplied to Unit 2.

1.1 Purpose

The purpose of this report is to define the overall scope, schedule, performance, capital costs and operating and maintenance costs of the Cooper Unit 2 Co-fire Project and provide general information to support the following activities:

- Permitting.
- Internal budget appropriations.
- Approval from the RUS for project financing.

1.2 Project Configuration Summary

The Plant consists of one 116 net MW (Unit 1) and one 225 net MW (Unit 2) Babcock & Wilcox (B&W) pulverized coal wall fired boiler. Unit 1 is currently being operated but is not planned for modification for co-firing capabilities as part of this project. Unit 2 is a single front wall fired boiler designed by B&W and placed into commercial operation in 1969. Unit 2 currently utilizes eighteen (18) B&W dual register burner (DRB) coal fired burners and fossil power system (FPS) Class I FO fired igniters. Coal is pulverized in six (6) B&W EL-76 coal mills. Unit 2 was originally designed as a forced draft unit but was subsequently converted to balanced draft. The current configuration includes low nitrogen oxide (NOx) burners, selective catalytic reduction (SCR) system, circulating semi-dry scrubber (CDS), fabric filter (FF) and induced draft (ID) fan. Each burner and igniter will be upgraded to include FG firing capabilities. Each burner will be operable up to 100% of the required heat input and each igniter will be capable of supporting Class I heat input.

The FG system will be supplied by a new M&R yard (by Others) that will be located west of the Plant in an unoccupied area near the main entrance. This M&R yard will supply 600 pounds per square inch gauge (psig) (average) FG at an assumed temperature of 40 ºF to 80 ºF to the FGC yard. The FGC yard will consist of a knockout drum, filter-coalescer, drains tank, FG heater, and a high pressure (HP) regulating skid. The knockout drum is provided for removal of solids and heavy bulk liquids from the FG stream that is common with HP transport lines that are regularly cleaned or subject to variable pressures. Removal of smaller particulates and water is then performed in the filter-coalescer. Byproducts from both are sent to the drains tank for removal by a disposal contractor. The FG heater is then incorporated to dry the FG and hold it above dew point after pressure regulation at the HP Skid. Pressure is then dropped from 600 psig down to 200 psig. The HP skid monitors pressure at the FGC yard and the Unit to maintain the pressure at the inlet of the FG low pressure (LP) regulating skid at, or near, 200 psig.

FG at Unit 2 will then be regulated to the required pressure and flow rate needed for the boiler demand. A single LP FG Header control system will be provided for the burners and a single LP Igniter Gas (IG) Header control system will be provided for the igniters. The LP control system for the burners and the LP control system for the igniters will be located on a single combined skid. The eighteen (18) burners will be grouped such that three (3) burners are operated simultaneously. Each grouping will align with the current coal mill arrangement and will receive a Safety Shut Off (SSO) skid. The igniters will be arranged in a similar configuration.

FO will be supplied to all eighteen (18) igniters and each igniter will have a single SSO skid. Controls for each FO igniter will be interfaced with the burner management system (BMS) such that only the igniters

aligned with the group(s) of burners being brought online will operate. FO supply to the igniters will not be modified as the existing igniter system capacity is not being changed.

The compressed air system is currently not being modified as part of the co-firing project. Air consumption at each burner and igniter is not anticipated to change as the air users will either be on the coal burner or on the FG burner, but not on both at the same time. It is assumed both users require the same instrument air pressure and approximate volumetric flow rate. The air consumption rates will be provided by B&W during detailed design and will be evaluated against the existing system capacity at that time.

The existing air pollution control devices downstream of the Unit 2 boiler include an SCR, a CDS, and a FF. Each of these systems will remain in the gas path while firing on any blend of coal and natural gas. The SCR will be utilized to reduce nitrogen oxides (NOx) emissions while firing on all fuels. The CDS/FF will be utilized to reduce sulfur dioxide (SO_2) while firing most coal blends. However, it is anticipated that at high blends of natural gas co-firing the uncontrolled SO_2 emission rate will be below the permit limit and the effectiveness of the CDS/FF will be greatly reduced or cease removing SO_2. Under these higher gas blends the CDS will remain in the gas path but may not utilize a bed to control SO_2 emissions. The FF is expected to remove particulate matter (PM) with all fuel blends.

Control of the new equipment will primarily be accomplished through an expanded distributed control system (DCS). Programmable logic controllers (PLC's) for the M&R yard and gas conditioning equipment will be provided with foreign device interfaces to allow operators to monitor from the control room screens. High-fidelity simulator updates will be included and integral to the training program to prepare operators and plant staff for the new controls.

1.3 Contracting Approach

The selected contracting strategy for this report and basis for the estimate is an Owner's Engineer (OE) contracting approach. Under this approach, Owner will hire an OE to perform detailed design, develop procurement packages and administer them after award, and assist in management of on-site construction activities, including management of startup and commissioning activities. All procurements will be by Owner on Owner's paper.

In the OE approach, the Owner and OE work together to procure the project equipment, construction, and site services contracts. The procurement of long lead equipment such as the gas firing system (burners) and DCS equipment is needed early in the project to support plant detailed design and permitting efforts. The estimate is based on procuring this major equipment under separate procurement contracts.

The OE contracting approach includes an estimated 15 equipment and material supply contracts, 2 furnish and erect contracts (pre-engineered metal buildings and cathodic protection), 3 construction contracts, and 10 service contracts (for example, subsurface investigation, performance and emissions testing, etc.). A listing of the anticipated equipment, furnish and erect, construction, and service contracts is included in Appendix C to this report.

1.4 Schedule

For an estimated commercial operation date (COD) in May 2029, the critical path of the project is based on obtaining the Rural Utility Service (RUS) National Environmental Policy Act (NEPA) Environmental Assessment (EA) approval by May 2027. This path of activities commences with issuing the NEPA EA application by October 2025. Table 1-1 reflects the major milestones for the project. The complete schedule is shown in Appendix Q.

Table 1-1: Cooper Unit 2 Co-Fire Project Milestones

Permitting Activities	**Date**
Submit Air Permit	December 2024
CPCN Advance Notice	November 2024
Submit RUS NEPA EA Application	August 2025
Engineering/Procurement	
NTP Engineering	March 2025
Gas Firing System Contract Award	April 2026
DCS Contract Award	February 2027
Construction/Startup Period – 16 Months	
Start Construction	February 2028
Start Major Equipment Erection	June 2028
Start BOP Mech. and Elec. Const.	February 2028
Begin Startup / Commissioning	February 2029
Commercial Operation	May 2029

1.5 Cost Estimate

The estimated capital cost for the project is approximately $73.8 million, excluding escalation. This equates to approximately $328/kW, with an average annual output of 225 MW (net). Escalation is

estimated to be $5.1 million assuming the project started in August 2024 and has a COD of late 2028. Escalation is estimated to be $14.1 million assuming full project schedule with COD in 2029.

To reduce the risk of project cost overruns, a contingency of nearly $6.0 million is included in this estimate, equating to 10% of the estimated capital cost. This contingency is expected to account for variations in pricing accuracy or minor scope changes. However, it does not account for major project scope changes, nor does it account for the impact of major shifts in market conditions which may be experienced prior to the COD.

1.6 Performance and Emissions Estimates

Cooper Unit 2 will have the option of operating with either coal or gas or a combination of both and is not anticipated to have a change in rated capacity with the addition of FG firing. Table 1-2 indicates the current and estimated future gross unit heat rates for Unit 2 with coal and FG.

Table 1-2: Plant Performance Summary

	Coal @ 18 Burners	Fuel Gas @ 18 Burners	Coal @ 9 Burners	Fuel Gas @ 9 Burners
Fired Performance	100%	100%	50%	50%
Gross Output, kW	240,000	240,000	120,000	120,000
Gross Heat Rate (HHV), Btu/kWh	9,850	10,138	10,750	11,064
Net Output, kW	225,000	225,000	112,500	112,500
Net Heat Rate (HHV), Btu/kWh	10,507	10,814	11,467	11,774

The Plant will meet emissions criteria through use of an SCR system and a CDS. In general, firing on 100% natural gas or co-firing is expected to maintain or reduce emissions currently being measured. The SCR will utilize an ammonia injection grid and the current catalyst configuration to decrease NOx emission to a preliminary expected emission rate of 0.1 lb/mmBtu or lower. A future study of boiler outlet conditions and SCR operating conditions will be required to identify future minimum load operating limitations to support maintaining the current emission limits.

1.7 Project Risks

Project risks which can affect scope, schedule, budget, safety, or quality can be subdivided into three categories which include design/engineering risks, procurement risks, and construction/startup risks. Each category of risk is listed below for consideration with some key risks identified. The complete risk matrix is included in Appendix P.

1.7.1 Design/Engineering Risks

Some key design and engineering risks identified include the following:

- Design basis changes after design begins including, but not limited to site plan and layout, design standard, and deliverables.
- Changes to project schedule (accelerated or delayed).
- Existing plant documents are found to be inaccurate or are unavailable.
- Permitting taking longer than expected. Although EKPC and BMcD have general "rule of thumb" durations for the major permit applications and processes, ultimately these timelines are controlled by the permitted authorities and can vary dramatically by State or Individual.
- Lack of detailed subsurface data. Although the project utilized the preliminary subsurface report and reviewed test borings from the Cooper Combined Cycle Project Scoping Report (PSR), a more thorough investigation will need to be completed to confirm soil variability, depth of bedrock, and locations of karst. Existing underground utilities in areas of new foundations and underground utility corridors will need to be investigated during detailed design. For the purposes of this PSR, estimated costs for pilot trenching have been included.
- Owner support not available when required for reviews and / or walkdowns.
- A computational fluid dynamics (CFD) model was not performed as part of this PSR. Therefore, predicted behavior of this particular boiler for the expected future operating conditions (including, but not limited to, existing fan performance) has not been investigated or confirmed. It has also not been confirmed that the Unit can reach full design load on 100% natural gas operation. Costs have been included in the estimate for CFD modeling during detailed design to confirm and refine conceptual design.
- Project standards are not clear, change, or conflict with Owner standards.
- Scope/design changes or scope gaps not identified during PSR. Any design or scope changes could impact project costs and may affect multiple systems throughout the project. Additionally, should any scope gaps become apparent during detailed design, these could impact project cost and schedule to properly incorporate.

- Several studies and evaluations will be performed as part of detailed design that are excluded from this PSR effort. These studies could result in additional and / or modified scope to what forms the basis of this report and cost estimate. These studies include, but are not limited to: Lighting study, noise study, master fuel trip (MFT) study, ventilation study, uninterrupted power supply (UPS) study, DCS capacity study, instrument study, transportation study, dispersion modeling, National Fire Protection Association (NFPA) 85 study, implosion / draft study, air heater study, condition assessment, baseline testing and CFD modeling, pilot trenching, grounding study, load flow and short circuit study, hazardous area classification (HAC) study, and existing steel evaluation.

1.7.2 Procurement Risks

Some key procurement risks include:

- Late major equipment award or design changes. Key design deliverables are based on receiving certain submittals and input data from the major equipment and will be delayed if these contracts are awarded late. In addition, late design changes by these manufacturers will have ripple effects on the BOP design that could affect the project schedule and cost. Finally, late award or design changes could affect scheduled delivery dates and may impact the construction schedule.

- Price escalation for equipment. As the COD is not until 2029, the long project development and permitting schedule will make it more difficult to lock in equipment costs early and increase the risk of price escalation.

- Poor quality and / or manufacturing design flaws.

- Unplanned buyouts to meet schedule demands.

- High turnover and / or supplier representative changes mid-project.

- Misunderstood and / or overlooked specification requirements.

- Late submittals.

- Late fabrication at shop and / or late sub supplier parts and materials.

1.7.3 Construction/Startup Risks

Some key construction and startup related risks to consider are:

- Interferences in the existing boiler house structure and with existing underground utilities.
- Wage rate increases and/or labor issues with contractors. Similar to equipment price escalation, due to the long project duration local wage rate increases are possible. Additionally, the local labor pool may be affected by other capital projects in the area which are out of EKPC's control.
- Unexpected soil conditions and / or water table.
- Change in construction sequence due to engineering changes or late equipment deliveries. Design changes or late equipment deliveries may force the construction team to revise sequences to less favorable activities which may impact costs or schedule.
- Equipment does not fit in planned location or through corridors.
- Lack of commodity materials or price escalation. Commodity prices and lead time can be affected by other projects in the region outside of EKPC's control which can impact project schedule or costs.
- Late pipe fabrication.
- Equipment/systems do not operate as designed or needs to be repaired/replaced. Equipment malfunctioning or systems not behaving as expected can delay startup as these issues are resolved. Lack of timely vendor corrections to improperly performing equipment can negatively impact the project schedule.
- Flex hose tie-points misalign.
- Flushing and cleaning take longer than expected. A host of variables such as pipe manufacturing, proper storage and handling, and quality of installation can affect the speed and efficiency of cleaning out the various systems to prepare for operation. In addition, some equipment vendors have very strict cleanliness requirements and procedures which must be followed and approved by the vendor's field representatives prior to proceeding to the subsequent steps.
- Unrelated furnace problems: Air leaks, water / steam leaks, etc.
- Failure of existing equipment/systems to perform as expected. Examples of systems include, but are not limited to, coal gravimetric feeders and pulverizers, ID and FD fans, SCR catalyst effectiveness, FO pump performance, air heater performance.

- Delay in gas lateral arrival and gas availability on site could impact gas co-fire project construction, startup, and commissioning schedule.

1.8 Conclusions & Recommendations

Burns & McDonnell recommends Owner evaluate the project economics based on cost and performances presented in this report. If Plant economics are favorable, Burns & McDonnell recommends Owner proceed/continue with necessary project execution activities in order to meet a Substantial Completion date as determined by Owner.

Burns & McDonnell recommends Owner negotiate firm gas contract with gas supplier for ignition capacity, at a minimum, and for enough gas to achieve full baseload capacity.

2.0 INTRODUCTION

2.1 Background

East Kentucky Power Cooperative is converting Unit 2 at their existing Cooper Power Station near Somerset, Kentucky from a 100% pulverized coal fired boiler to a co-fired boiler that can utilize pulverized coal and natural gas. The project design basis is for Unit 2 to operate on 100% coal, 100% natural gas, and co-fire on these fuels on a mill grouping basis. The existing FO capacity will also be retained to allow for startup on FO as well as natural gas. The project will consist of modifying all eighteen (18) existing coal fired burners for dual fuel operation. Each of the existing FO igniters will be replaced with dual fuel igniters.

The project also includes the addition of FGC equipment to provide the required pressure and quality of natural gas for use at the burner fronts. No provisions have been included for future additional capacity or infrastructure.

This Project Scoping Report is to summarize the scope of the proposed Cooper Unit 2 Co-fire Project, present the capital cost estimate, O&M cost estimate, and performance estimate.

2.2 Scope of Study

The scope of work included preparing the following major items:

1. Project Site Design Criteria.
2. Division of Responsibility (DOR).
3. Key Conceptual Design Documents.
4. Permit Matrix.
5. Risk Matrix.
6. Project Execution Schedule.
7. Capital Cost Estimate.
8. Owner’s Cost Estimate.
9. Project Annual Cash Flow.
10. Operations and Maintenance (O&M) Cost Estimate.

2.3 Objectives

The objectives of this study were to establish the preliminary design parameters of major components of the Project to provide adequate information to support the following activities:

1. Evaluation of the economics of the Project.
2. Preparation of a Project schedule.
3. Certificate of Public Convenience (CPCN) Application and Public Service Commission (PSC) Approval process.
4. Required federal and state permitting process.

2.4 Limitations and Qualifications

The costs presented within this report are subject to:

- Final negotiation of the terms and conditions with the major equipment suppliers and construction contractors.
- Final geotechnical report findings and final foundation design.
- Final site survey and topographic information.
- Final results of studies to be performed during detailed design. Refer to Section 1.7.1 for partial list.
- Final determination/negotiation of the project schedule.
- Final selection of the engineered equipment and construction contractors.
- Final permitting requirements.
- Events prior to Full Notice-to-Proceed (FNTP) that may cause price escalation in equipment, materials, or labor beyond that included in the costs.

Estimates and projections prepared by BMcD relating to schedules, performance, construction costs, and operating and maintenance costs are based on professional experience, qualifications and judgment as a professional consultant. Since BMcD has no control over weather, cost and availability of labor, material and equipment, labor productivity, energy or commodity pricing, demand or usage, population demographics, changes in technology, construction contractor's procedures and methods, unavoidable delays, construction contractor's method of determining prices, economic conditions, government regulations and laws (including interpretation thereof), competitive bidding and market conditions or other factors affecting such estimates or projections, BMcD does not guarantee or warranty (actual, expressed, or implied) that actual results, rates, costs, performance, schedules, etc., will not vary from the estimates, analysis, projections, and recommendations prepared by BMcD and contained herein.

3.0 PROJECT DEFINITION

3.1 Project Overview

The Cooper Unit 2 Gas Co-fire project includes converting Unit 2 at EKPC's John Sherman Cooper Power Station from 100% pulverized coal operation to co-fire operation. Unit 2 is an existing 225 net MW B&W pulverized coal steam generator. This Project scope is to convert the existing Unit to provide coal and gas firing capability. This includes the capabilities to operate on 100% coal, 100% natural gas, or co-firing on these two fuels. Co-firing is defined as the combustion of two different fuels in the same combustion system. Each burner will be capable of utilizing FG and pulverized coal, but not both fuels simultaneously. The fuel source for the burners will be selected on a mill grouping basis. If a mill group is selected for FG operation, it will only use FG, but the remaining mill groups may choose from either FG or pulverized coal. Similarly, igniters may be operated on a mill group basis to either use IG or FO.

The project's major components will include a below grade gas line from an M&R yard (by Others), a FGC yard, an LP control skid at the existing Unit, SSO skids with double isolation and vents, and modified burners for new B&W Super spuds. The project will also include replacement of the existing FO igniters with new dual fuel igniters. The existing FO capacity will also be retained to allow for startup on FO. This capability provides protection in the event natural gas is curtailed.

The new M&R station (by Others) will be located at the northwest corner of the property. Redundant medium voltage (MV) power feeds will be installed in ductbank from existing 13.8kV switchgear in the existing electrical power distribution center (PDC) located east of the Unit 2 boiler building to the FGC yard and on to the M&R yard. A carbon steel gas line will connect to a flanged custody point at the M&R yard and run below grade along existing Access Road No. 2. The below grade piping and ductbank will be routed in a common utility trench. Gas will be provided at a minimum pressure of 600 psig from the M&R station. The gas supply temperature is expected to be between 40 degrees Fahrenheit and 80 degrees Fahrenheit. New FGC equipment will be provided to clean, dry and reduce pressure of the gas being delivered to the LP regulating skid within Unit 2. The FGC equipment will consist of a knock-out drum, filter separator, drains tank, FG heater, and HP regulating skid. This equipment is sized for a gas flow of approximately 62,000 Dth/day at 600 psig and is designed to reduce pressure to 200 psig at the LP regulating skid.

The gas line will run below grade from the FGC yard to the northeastern corner of the existing Unit 2 turbine building. Upon stubbing above grade, the gas pipe will be supported on a new structure along the eastern wall of the Unit 2 turbine and boiler buildings. The pipe will penetrate the existing boiler wall

and connect to the new LP skid at the ground floor elevation. A header from the LP skid will convey the gas to the four existing burner elevations. Cooper Unit 2 is a single front wall fired boiler with a total of eighteen (18) burners. Two (2) burners are located at elevation 836'-0", four (4) burners are located at elevation 844'-0", four (4) burners are located at elevation 852'-0", and four (4) burners are located at elevation 860'-0". Each of the existing burners will be modified with the addition of a retractable B&W Low NOx Super Spud assembly inserted through the existing burner guide tube. This will allow gas to be injected into the furnace at the existing burner locations. It should be noted that the B&W Super Spud design allows the modified burner to fire on coal or gas, but not on coal and gas at each individual burner at the same time. New flame detectors will also be added to the existing burners to detect flame when operating on coal or gas. Each coal elbow will be replaced with a new coal elbow designed for incorporating the B&W Super Spud gas lance. A new FG SSO assembly, or skid, will be provided for each mill grouping of three (3) burners. This SSO skid will be used to turn the burners off and on. Also housed on this skid will be the SSO assembly for the same mill grouping of igniters, but for the IG only. A new igniter oil SSO skid will be provided for each igniter based on the currently installed arrangement.

A study of the existing combustion air system has not been performed at this time and will be part of detailed design. However, a new duplex blower skid has been included in the cost estimate for providing combustion/cooling air to the igniters and scanners. Vent piping for HP FG, LP FG and SSO FG and IG skids will be provided in accordance with NFPA 85. Where allowed by NFPA 85, vents have been manifolded together for cost efficiency. A HAC study has not been performed at this time. Gas detection and alarming will be evaluated as part of the hazardous area identification and classification study being included in the detailed design portion of the project. An allowance has been included in the cost estimate to account for potential ventilation modifications to the existing Unit 2 boiler building based on past project experience.

A permanent nitrogen purge system (new nitrogen tank, hard piping, etc.) has not been included in the cost estimate. However, a conceptual nitrogen purge scheme was developed to account for piping and valving required to isolate and purge sections of piping and equipment for startup and maintenance.

A preliminary high-level review of the existing primary air (PA), forced draft (FD), and ID fans was performed to determine whether modifications or replacement was expected to support the gas co-firing project. Based on the existing Owner-provided fan curves, modifications and / or replacement of the existing PA, FD, or ID fans are not anticipated at this time and have not been included in the cost estimate.

A lighting study was not conducted as part of the PSR effort but will be performed during detailed design. However, upgrades to lighting around the boiler front have been included in the cost estimate based on past similar project experience to account for the addition of new lighting fixtures, receptacles, conduit, and contactors around the boiler deck area.

It is assumed that no upgrades or modifications to the existing compressed air system will be required for this project and are not currently included in the cost estimate. It is anticipated that the air consumption for the existing coal burners will be similar to the air consumption required for the modified FG burners. The igniters will utilize less air when operating on FG as atomization of the FO is not being performed. Ancillary users of instrument and service air will be evaluated during detailed design once data is provided by the gas firing system equipment supplier.

No additional use of service water is planned for the co-fire modifications. Flue gas recirculation is not included. The bottom ash water system is not planned for any modifications as it is required for coal firing operations. During 100% FG operations, the bottom ash system will be circulated as needed to maintain water level with the bottom ash hoppers and seal trough.

No modifications to the auxiliary systems for the boiler, such as soot blowing, are planned for modification as they are needed for coal firing operations. This includes the air heaters and any associated cleaning mechanisms, bag house cleaning systems, or fly ash removal systems.

Two redundant 13.8kV switchgear feeds were utilized to provide power to the FGC and M&R area. The voltage is stepped down to 480VAC and then 120/208VAC at each area using step-down transformers. The 13.8kV transformers are 225kVA pad mounted type and all 480VAC transformers are dry-type. The FGC and M&R area also includes a packaged UPS system to provide uninterruptable power supply to all critical 120VAC powered equipment.

New auxiliary electrical equipment was added to supply new loads around the boiler area. A 480VAC 400A feeder was utilized from existing General Service #2 Unit SUB #1 Switchgear. This powers a new 480VAC 400A power panelboard located near the boiler on the turbine deck level. This panel will feed power to two (2) new local starters for the new Scanner/Igniter Cooling Combustion Air Blower motors and two (2) new 120/208VAC Power panelboards and transformers. One (1) new 120V 100A UPS panelboard was included to provide power to the new DCS cabinets and provide future UPS capacity for the plant.

All new heat trace, duct bank, conduit and cable tray were assumed for this project. New grounding systems will tie into the existing plant grounding grid.

Physical modifications to the control system will be required to incorporate the input/output (I/O) for gas yard and burner front equipment. A new gas BMS BRC410 controller (redundant pair) will be added to Unit 2 PCU 4, which will be connected to new remote I/O cabinets located on the operating floor for burner front I/O. Unit 2 PCU 2 will also require a new BRC410 controller pair with a new remote I/O cabinet at the gas yard electrical enclosure. Additionally, existing controllers in PCU's 2 and 4 will be upgraded to BRC410 controllers to accommodate the updated BMS and combustion control system (CCS) paradigm.

Software updates for the updated BMS and CCS will be provided by Asea Brown Boveri (ABB), including new and updated logic and graphics and datalink configuration providing indication to control room operators for gas yard and M&R yard PLC's. ABB's scope also includes training and field services for commissioning the new system and boiler tuning. Simulator updates by Simgenics have been included for the new gas yard and gas-firing controls into the existing simulator. This will include physical model fidelity incorporation of the dual-fuel burners, gas-fired igniters, FGC, and FG train equipment. This scope includes programming and configuration updates, simulator hardware updates (if required), training, and field services to commission the updated system.

3.2 Project Scope and Design Assumptions

3.2.1 Project Scope

The site design criteria and project scope matrix included in Appendices A and B form the basis of the FG co-firing project development effort. The site design criteria and scope matrix provide general design conditions for the plant including plant operational characteristics as well as engineering discipline (Architectural, Civil, Structural, Mechanical, Electrical, and Instrument and Control) design criteria. These documents were developed, reviewed, and revised in coordination with the Owner to provide a clear and consistent understanding of the major underlying assumptions used in the development of this project.

3.2.2 Key Design Documents

In addition to the design criteria and scope matrix, the following preliminary design documents were developed to form the basis of the project preliminary design and are included in the Appendices attached to this report. These documents were reviewed with the Owner to confirm the basis of understanding of the Project.

- Appendix A: Site Design Criteria
- Appendix B: Scope Matrix
- Appendix C: Project Division of Responsibility Matrix
- Appendix D: Equipment List
- Appendix E: Preliminary Project Scoping Drawings
    - Site and General Arrangement Drawings
    - Electrical Single Line Diagrams
    - Mechanical/Process Piping & Instrument Diagrams
    - Control System Architecture
- Appendix F: Heat Balance Diagrams – NOT USED
- Appendix G: Water Balance Diagrams – NOT USED
- Appendix H: Preliminary Subsurface Investigation – NOT USED
- Appendix I: Noise Assessment – NOT USED
- Appendix J: Permit Matrix
- Appendix K: Tie-In List and Locations
- Appendix L: Design Fuel Basis
- Appendix M: Water Quality Basis – NOT USED
- Appendix N: Preliminary Fire Protection Design Basis – NOT USED
- Appendix O: Life Safety Code and Criteria – NOT USED
- Appendix P: Risk Matrix
- Appendix Q: Project Schedule
- Appendix R: Capital Cost Estimate
- Appendix S: Cash Flow
- Appendix T: O&M Cost Estimate – NOT USED

3.3 General Design Criteria

The following criteria were used as the basis for the plant preliminary design.

3.3.1 Operating and Control Philosophy

Cooper Unit 2 is currently configured to operate solely on pulverized coal to generate electricity. The modifications proposed will allow for the use of natural gas (FG) in replacement of or in conjunction with pulverized coal to generate the same electrical output. FG operations rely on a stable fuel supply from the selected gas utility company that is of clean and consistent heating value. Operationally, this change will require a modified BMS that will monitor the use of the pulverized coal system as well as the FG system. This operation, referred to as co-firing, will fundamentally change the burner management and combustion control systems at Cooper Unit 2. Plant Operators will require training on how to monitor both fuels and how to modify boiler load and/or how to switch fuels.

The FG system will be controlled by the BMS and CCS. Prior to entering Unit 2, the FG is regulated to 600 psig from the gas utility M&R yard. This high pressure is required to gain access to the higher volume transport line that is in proximity to the Plant. Once within the custody of EKPC, the FG is filtered for particulates and moisture. This filtered FG is processed in a FG heater to further remove water vapor. FG then is regulated down to 200 psig and transported through an underground line to the Plant. This is controlled independently of the Unit 2 load demand, burner management, and combustion control systems. This is separate as the controls for FGC need to be suitable to supply FG at all times and trips of a particular burner or igniter should not impact FG supply. The pressure regulator dropping the pressure from 600 psig to 200 psig will modulate only as needed.

The burners are currently operated based on the coal mill that supplies them. Of the eighteen (18) burners, there are three (3) burners assigned to each mill. The six (6) mills operate independently and are selected by the operator based on desired boiler load. When switching to natural gas operations, the burners will still be arranged in a three (3) burner arrangement with their respective mill. Mill grouping is required as switching fuels requires either a group to use coal or FG. The alternative configuration would be to fire each burner individually on FG. However, this would still preclude the use of the associated mill when FG is selected. Each mill group of burners will be supplied with a FG SSO Skid and an IG SSO Skid. The preliminary design intent is to combine both SSO skids into a single assembly based on limited installation space on each burner deck elevation.

Co-firing of the boiler is performed utilizing FG and pulverized coal. A mill grouping is selected for either FG or coal fuel source operation. Operations has the ability to select either fuel for any mill. BMcD's industry experience is that the upper burner mill groups would be operated on FG while the lower elevations are operated on coal when in co-fire mode.

The existing air pollution control systems will remain in the gas path while firing on any blend of coal and natural gas. The SCR will be utilized to reduce NOx emissions while firing on all fuels. The CDS/FF will be utilized to reduce SO_2 while firing most coal blends. The FF is expected to remove PM with all fuel blends.

The Plant will have dedicated full-time operations and maintenance staff. The Plant staffing is expected to remain largely unchanged from current levels.

3.3.2 Plant Location and Layout

The John Sherman Cooper Power Station is located approximately 13 miles south of Somerset, Kentucky. Access to site is from KY-1247 N or US Hwy 27 N.

The M&R yard will be located in the northwest area of the plant property and will be furnished and installed by the gas utility. Power to the M&R yard will be supplied by EKPC to provide a non-interruptible power source, mitigating the risk of a loss of gas supply to Cooper Generating Station. A flanged terminal point will be provided by the M&R yard supplier for connection by EKPC. Outside of the limits of the M&R yard there will be an isolation valve for manual shutoff of FG supply by EKPC as well as connections for a pipeline pigging station (temporary). Piping will be routed underground from the EKPC owned portion of the M&R yard to the FGC yard.

Once above ground at the FGC yard, the piping will terminate into another pigging station. Equipment for pigging the piping is designed for receiving only and will be supplied by EKPC on an as-needed basis. Isolation valves will be provided as well as purge and vent connections. The gas then passes through the FGC knockout drum, filter-coalescer, FG heater, and the HP regulating station prior to going back underground and supplying Unit 2.

At Unit 2, the FG pipe comes above ground at the northeast corner of the turbine building and passes through the emergency shutoff valve (ESV) station where it is then metered for flowrate. The FG then branches to the FG LP Burner Skid and the IG LP Igniter Skid. The LP Skids are used for regulating the pressure and flow to the burners and igniters as defined by B&W and the required boiler demand.

Individual headers for the FG and IG are routed up the side of the unit to each burner elevation. A sub-header at each burner elevation will support the required flowrate for all four burners on each elevation. The burners are arranged in groups of three (3). A SSO skid will be included that houses the FG SSO system for the burner grouping and the IG SSO assembly for the igniter grouping. At the top of the FG and IG headers there is an automated safety vent valve that is operated only when the associated FG or IG

LP skid trips and the emergency isolation valve on the skid closes. On each SSO station, there is an automated vent valve for discharge of FG to the atmosphere above the roofline of Unit 2 when a burner, or igniter, pair trips. Gas vents are manifolded together based on type. There will be one (1) burner vent manifold and one (1) igniter vent manifold. In total, there will be four (4) vent manifolds, the two manifolds from the SSO stations and the two (2) vent headers from the main gas header vent valves. These vents will terminate above the roofline per NFPA 85 requirements.

Purging of the FG system will be accomplished utilizing two different methods. The piping from the M&R yard to the ESV station will be purged primarily using a sweep purge approach. A connection is provided at the M&R yard tie-point near the anticipated pigging connections that will purge the piping above and below ground to the terminal connection above ground at the FGC yard. A sweep purge uses an inert gas, such as nitrogen, at a high velocity and large volume to force the natural gas out of the piping at the opposite end. It is similar to pigging. This same approach is used for the segment of piping downstream of the HP regulating station at the FGC yard and discharging near the ESV station at Unit 2. The FGC yard itself that is above ground will utilize a pressure purge fed from either inert gas bottles or a tanker truck. Purging within Unit 2 itself will be developed during detailed design, but is intended to utilize a pressure purge system fed from temporary inert gas bottles or tanker truck. Purging of individual burners and igniters will be accomplished using portable inert gas bottles.

Refer to Appendix E Site Arrangement drawings for additional information.

3.3.3 Design Conditions

The following site ambient conditions were used as the basis for preliminary design.

1) Site Elevation: 825 feet above mean sea level (MSL)
2) Ambient Design Conditions:
    a) Extreme Summer Maximum: 108.2°F dry bulb (db)
    Applicable design conditions for the following:
        (1) Equipment cooling.
        (2) Motor design.
    b) Summer Design (1% Wet Bulb, °Fdb / °Fwb): 86.6°F / 76.1°F
    Applicable design conditions for the following:
        (1) Building enclosure cooling and ventilation.
    c) Winter Design – 99.6 % of time above (°Fdb): 11.8°F
    Applicable design conditions for the following:
        (1) HVAC heating systems.

d) Extreme Winter Minimum (°Fdb): -13.1°F

Applicable design conditions for the following:

(1) Freeze Protection (design conditions assume -20°F with 20 mph coincident wind).

(2) Heating of heated areas.

(3) Material compatibility of outdoor located equipment.

The following gas firing conditions were used as the basis for preliminary design.

1)	Existing DRB Coal Heat Input	131 MMBtu/hr
2)	Number of Burners	18
3)	Assumed Efficiency Loss for FG Plus 5% Contingency	8%
4)	FG Burner Required Heat Input	135 MMBtu/hr
5)	FG HHV	23,415 Btu/lb
6)	FG Specific Volume	19.62 ft^3/lb
7)	Existing FO Igniter Heat Input	12 MMBtu/hr
8)	Number of Igniters	18
9)	Class of Igniters	Class I / 10%
10)	Assumed Efficiency Loss for FG Plus 5% Contingency	8%
11)	Igniter Required Heat Input on IG	13 MMBtu/hr
12)	Assumed FG Heater Consumption	11 MMbtu/hr
13)	Assumed Required FG Flow	114,243 lb/hr
14)	Margin for Fuel Constituency Variance	10%
15)	Total Design Gas Flow	125,667 lb/hr

3.3.4 Redundancy

Overall redundancy within the FG system is not currently included nor determined to be required on a permanently installed basis. The FGC yard includes bypasses around all equipment except the HP regulating station. This station is assumed to have a low flow train and a high flow train for split-range operation of the FG. This allows for replacement or maintenance of valves with a pre-arranged de-rate of Unit 2. Operation of the knockout drum, drains tank, filter-coalescer, and FG heater could be bypassed on a short-term basis with proper use of provided drains and monitoring of boiler load and flame stability.

The LP regulating skid provided by B&W for the burners and igniters is supplied with a similar split-range arrangement as the HP regulating skid. Replacement of valves could be accomplished with proper planning and de-rate of Unit 2.

The scanning cooling air blower skid is supplied by B&W and includes a 2x100% blower arrangement.

It is recommended that the highest wear parts for all equipment be stored as a spare within EKPC warehouses. Spare skids for the LP and HP regulating skids are not considered feasible as full replacement would necessitate a unit outage. High wear components are considered to be pressure reducing valves, flow control valves, flow metering orifices, pressure and temperature transmitters, thermowells, and gaskets.

3.3.5 Life Safety Considerations

Life and Safety requirements of the effective building code and fire protection code will set the minimum design considerations for the Unit 2 Gas Co-Fire Project.

The code requirements are dependent on location, occupancy, and expected hazards present. The M&R yard will be excluded from consideration as it is being supplied by the gas utility. Actual design codes utilized and life safety systems should be reviewed by EKPC for the M&R yard as it will reside on EKPC property, though it is not expected that EKPC personnel will frequently enter the M&R yard. Gas piping and equipment will be subject to the NFPA 85 boiler and combustion systems hazard code and will have venting as required for purging of FG and also be subject to a HAC study. The existing BMS will be updated to incorporate the new gas-firing equipment, including additional MFT relays to de-energize gas-firing equipment and prevent gas entry to the furnace when a hazard is present as outlined in NFPA 85. The FGC yard will include an electrical enclosure, which is intended to be located out of the hazardous areas, but will be evaluated further during the detailed design phase. All areas where FG can be discharged are subject to the HAC study. FG piping within the existing Unit 2 buildings will require review of all components near the piping and potential leak points. Within Unit 2, NFPA and the applicable building code(s) and OSHA will dictate the necessary life safety systems. The final determination of building occupancy classification, and approval of the planned design features for life & safety are the responsibility of the Authority Having Jurisdiction (AHJ). Therefore, BMcD recommends that EKPC communicate the project design concept to the AHJ early in the detailed design phase and seek preliminary approval of the planned basis of design.

Following completion of the preliminary site arrangement and Piping & Instrumentation Diagrams (P&IDs) during the detailed design stage of the project, a Hazard Identification (HAZID) workshop will be held to identify hazards and recommend improvements to the layout and/or process design to help mitigate the identified hazards. Recommendations from this HAZID will be incorporated into the design, including, but not limited to: additional process automation to minimize operator exposure to hazards,

enhanced site security through segregation of the third party M&R yard from the rest of the Plant, and the addition of an overall process E-stop located exterior to Unit 2. Following completion of the P&IDs during detailed design a more in-depth Hazard and Operability Study (HAZOP) will be held. This HAZOP, which may also incorporate major equipment suppliers, will seek to identify further hazards which can be mitigated through process design improvements.

3.3.6 Environmental Design Criteria

The addition of gas firing is not expected to require any additional air quality controls systems.

3.3.7 Fuel

Pipeline natural gas will be used to supply fuel to Cooper Unit 2. As a separate project, EKPC will bring a new gas pipeline to the site boundary with a new M&R station owned and operated by the gas pipeline company. A new FGC yard with new FG equipment will be constructed north of the existing switchyard. See Appendix E General Arrangement Drawings for location of the new M&R station and FGC yard.

It is expected that the FG supply pressure at the M&R yard will be an average of 600 psig and can vary up to 15%. HP FG is assumed as being supplied due to the proximity of the interstate pipelines. The FGC yard will include a HP FG regulating station that will accept up to 700 psig FG and regulate the pressure down to 200 psig. The regulated pressure will be based on as-received pressure at Unit 2. A benefit of HP FG supply is the ability to absorb variances in the pressure which are common in the Southern and Eastern United States in the colder months of the year.

A FG heater will be furnished to heat the FG above dew point during startup. During normal operation, a slip-stream of FG will be utilized to fire a water-bath heater. The FG heater will consist of a fired vessel that will heat a 50/50 water and glycol mixture. The glycol mixture will then pass into an expansion tank where it is then discharged into the heater vessel which is treated like a heat exchanger. FG passes through the exchanger portion of the heater and the temperature increased to approximately 130 ºF. A thermal bypass is supplied to allow cooler FG to mix the hot discharge gas with the incoming cold gas in the event of a lower desired outlet temperature.

FG is then lowered in pressure from 600 psig (average) to 200 psig (average). Pressure will be monitored and modulated at the inlet to the B&W LP burner and igniter skids to verify 200 psig is available.

3.3.8 Burner Modifications

The burner modifications required for co-firing Unit 2 will be designed by B&W. Preliminary designs provided, and BMcD's industry experience, indicate that the existing coal elbow on the burners will be

replaced with new spreader plate elbows that incorporates a guide tube for the B&W SuperSpud© FG burner. Modifications to the burner throat to support the FG burner are possible depending on the condition of the existing DRB burners.

New SSO skids will be provided for every three (3) burners. Burner coal vane spreaders will be modified as required to support the air flow patterns needed for the FG burner. This includes replacement of the existing linear actuator on the coal vane spreader.

The bottom six (6) burners include a coal vane impeller. This impeller will be reviewed and modified by B&W, as needed, to support firing activities on coal as well as FG. The impeller resides in the same location as the planned FG burner. Modifications to this impeller are under B&W review and are a potential risk to coal operations achieving similar results to current operations in the future. The impact of this modification will be determined during detailed design.

FG piping will be routed to the burner elevations from the ground level where the LP FG header (by B&W) will reside. The FG piping will have a single main riser that will feed every elevation. Each elevation will have a main branch that will go to each FG SSO for the burners. Isolation will be provided on an SSO basis. Isolation of entire elevations at the main riser is not included. Venting of the riser and SSO's will be provided and will be routed to the roof elevation through manifolded headers complying with NFPA 85.

Burner management and combustion control modifications will be provided by B&W and will be incorporated into the SSO skids and the LP FG header skid as well as the DCS.

3.3.9 Boiler Modifications

The addition of FG to the boiler will require potential modifications to Unit 2. The primary consideration is boiler pressure and explosion. A boiler explosion/implosion study was partially performed on Unit 2 in 2009 as part of the SCR retrofit project. This study will need to be reviewed, updated, and corrected for the addition of FG to Unit 2. Potential modifications include, but are not limited to, reinforcement of boiler beams and columns, replacement or reinforcement of boiler backstays, reinforcement of boiler waterwall panels, reinforcement of boiler ductwork, and/or modifications to existing FD/ID/PA fan logic and variable inlet vanes. Costs for boiler modifications are currently excluded from the estimate.

3.3.10 Boiler Air

High level reviews of the existing FD, ID, and PA fans were performed based on the provided fan curves, documented Unit 2 performance, and expected future Unit 2 performance. Each fan is described below.

The PA fans are currently operating below their maximum capacity during 100% coal operations. Under future conditions the load on the PA fans will either remain the same as current operation (when operating on 100% coal) or drop when FG operations are added. The provided PA fan curve is rated for down to 50% maximum continuous rating (MCR), which would apply to a 50% coal operating condition. A potential concern would be associated with operating the PA fans below 50% coal/MCR for extended periods of time. A further study of the PA fans would be required if this operating condition is needed.

The FD fans also appear sufficiently sized for the Unit 2 coal operations currently being performed. Data provided on the current FD fans indicate that the FD fan is operating near 86% of rated capacity on 100% coal. As coal operations shift to FG, the amount of primary air will decrease, which is fed by the FD fan. This will not change the air requirements to the boiler, however, as primary air is only used for coal mill operations. The amount of air when using 100% FG is assumed to increase the FD fan load by approximately 4% which is well within the current fan curve range. No changes to the FD fan are currently anticipated unless additional air requirements are identified by B&W during detailed design to meet emission requirements.

The ID fan is similar to the FD fan in terms of available operating ranges. The assumed system resistance curve for the ID fan is closer to the stall line as compared to the FD fan, but acceptable. The conversion to co-fire operations will increase the required flow and pressure from the ID fan by the same margins the FD fan will require. Variable inlet vanes may require modifications or verification that they can achieve the angles needed to meet performance based on the assumed operating points on the fan curve. This test should be performed during a planned outage to determine if the vanes are capable of operating between 40º and 70º in 1º increments.

3.3.11 Igniter Modifications

Unit 2 currently has FO supplied igniters. The igniters are assumed to be Class I igniters based on provided burner drawings showing that the heat input of the igniters is 10% of the burner heat input. Each igniter has an SSO station with atomization supplied by the instrument/service air system. The FO is #2 diesel. The conversion for co-fire operations will include removal of the existing igniter and replacement with a dual fuel igniter that can fire either FO or FG. This conversion is assumed to require the removal of the existing guide tube in the burner for the igniter with a larger tube to house both igniters. The igniter scanner will be replaced with a B&W/FPS flame detector (flame rod).

Igniter operations currently are performed on a mill grouping basis to match the burners. As previously stated, the igniters currently have a SSO for every FO igniter. This will not be changed as part of the co-

fire retrofits. The intent is to only replace the SSO valve station to meet current code requirements and leave all I/O and piping the same to minimize modifications and cost. On FO supply, the igniters will still operate in a mill grouping. When using IG operations, the igniters will fire in a mill grouping, but will isolate the FO and atomization system.

Initial discussions with B&W/FPS indicate that a combined dual fuel igniter is available, but requires further evaluation. There is a potential risk that this cannot be installed in the existing burners due to the required size of the guide tube affecting coal distribution. If that is the case, B&W/FPS have stated that the existing FO igniter will not be modified and the IG operated igniter will be installed in a new guide tube. Separating the igniters would require two (2) independent flame rod detectors and modifications to the existing logic for operation of the igniters with separate I/O.

Operations will select the fuel to be fired from the controls screen. Only one (1) fuel can be utilized per mill grouping. Swapping of fuels for a mill group will require the igniters to be stopped, purged, and then swapping will be allowed.

3.3.12 Flue Gas

No modifications are currently anticipated for the flue gas ductwork from the boiler to the air quality control system (AQCS) and from the AQCS to and including the stack. As coal operations will require the current conditions, no changes would be warranted. The flue gas operations on FG will have more gas flow and slightly higher pressure, but overall duct loading is expected to decrease due to the reduction in ash. The only potential modification would be reinforcement for boiler implosion as previously stated which will be evaluated during detailed design. Currently, no modifications to the flue gas ductwork are included in the cost estimate.

3.3.13 Ammonia Supply and Storage

Aqueous ammonia (19% solution) will continue to be delivered by truck to the site. Trucks will include unloading pumps to eliminate the need for an on-site unloading system. The ammonia storage area is located in the existing storage area which supports Unit 2. The existing area contains two (2) 39,000 gallon storage tanks and auxiliary equipment. The existing ammonia system will be maintained for operation of the SCR during co-firing. Modifications to the existing system will be implemented, as needed, for modulating and controlling flow during various fuel blends. These modifications could include addition of valves and updates to existing control logic. This will be further studied during detailed design. An allowance has been included in the cost estimate for ammonia control valve and logic modifications.

3.3.14 Existing AQCS

The existing air pollution control devices following the Unit 2 boiler include an SCR, a CDS, and a FF. Each of these systems will remain in the gas path while firing on any blend of coal and natural gas. The SCR will be utilized to reduce nitrogen oxides (NOx) emissions while firing on all fuels. The ammonia feed system is expected to be modified to allow for reduced ammonia feed rates during high blends of natural gas firing. The CDS/FF will be utilized to reduce SO_2 while firing most coal blends. Under higher natural gas blends the CDS will remain in the gas path but may not utilize a bed to control SO_2 emissions. The FF is expected to remove PM with all fuel blends. While no physical modifications to the CDS/FF are expected for co-firing natural gas, adjustments to the control system logic are anticipated.

3.3.15 Water Supply

The FGC yard will require two (2) sources of water. The first is a source of water for fire protection. The addition of the FG heater requires that a fire protection system or method of controlling a fire be provided. Included is a new fire hydrant that will be located in the northeast corner of the FGC yard within 100 feet of the FG heater. This hydrant will be supplied from the existing fire water supply loop. The actual location of the fire water supply loop is not known, but an existing hydrant was found to be present near the train coal dump bunker. Underground drawings were obtained, that were pre-Warehouse, and showed the fire water loop extending to the bunker. A new 4” HDPE pipe was included and routed to connect to the loop near the coal bunker.

The second source of water required is potable water. The FG heater includes a mixture of glycol and water. The actual type of glycol used is not currently known. Propylene glycol and ethylene glycol are both commonly used in water bath and helical FG heaters. Both require eyewash and safety shower stations to be located nearby. Ethylene glycol is considered more hazardous than propylene glycol and has a requirement to be flushed for a minimum of 15 minutes when in contact with skin or eyes. Connections to the potable water system are not known, but assumed to be located near the Unit 2 turbine building. The eye wash station used for preliminary design includes a supply and return nozzle to allow for continual circulation of water. This circulation is to prevent the potential for bacteria growth in stagnant water and to assist with freeze protection. All potable water piping is assumed to connect to the northeast corner of the Unit 2 turbine building and route to the eyewash station at the FGC yard. The piping is assumed to be 2” stainless steel piping.

3.3.16 Wastewater

No additional or new wastewater streams will be generated by the gas co-fire project. Dual fuel operation will utilize existing wastewater treatment systems and discharge points.

3.3.17 Noise Criteria

All equipment, skids, valves, and components installed as part of the co-fire project will be specified and designed to be compliant with a 85 dBaC free-field measurements 3'-0" away. Hearing protection is assumed to be required at all times. Additional secondary hearing protection is not assumed at this point and no noise mitigation is included.

3.3.18 Aesthetics and Landscaping

Landscaping consists of seeding for erosion control of disturbed areas only. No other effort is included to improve the aesthetics of the site.

3.3.19 Geotechnical Data

A geotechnical investigation has not been completed for the current phase of the project; however, the client has provided a subsurface investigation from April of 1992 provided by Fuller, Mossbacher, Scott & May for heavily loaded silo foundations. The report suggests that these heavily loaded foundations be supported with rock bearing foundation systems such as direct bearing footings or drilled piers. Also, the report recommends that the bottoms of foundations extend at least 24 inches below finished grade to provide frost protection. An additional preliminary geotechnical exploration has been completed by S&ME, Inc. for the proposed 2x1 Combined Cycle Power Plant at Cooper Generating Station. Borings were taken around the perimeter of the existing coal pile and to the northeast of the coal pile in the area of the proposed switchyard. The subsurface investigation concluded that lightly loaded features, such as office structures, storage and maintenance buildings and certain switchyard equipment may be supported on shallow foundations. Information presented in this preliminary investigation and the previous subsurface exploration have been used to make an estimate of the foundation design requirements for the mechanical and electrical equipment on site. It is expected that all foundations will be shallow soil-supported mat foundations under light loading. Over-excavation and re-compaction are not included for any of the foundations on site.

3.3.20 Structural

Existing plant structural steel framing plans were reviewed in the areas where new skids and major piping and electrical corridors are anticipated. Structural analysis and / or calculations were not performed as part of this conceptual design effort. However, past similar project experience and engineering judgment were used to identify exiting members that may likely require reinforcing for the new loading conditions. A preliminary conceptual basis was included in the cost estimate. The basis will be confirmed and adjusted during detailed design as actual equipment sizes, weights and locations could vary significantly

from original assumptions. The estimate assumes the existing structure is in good condition and that structural integrity has not been compromised by damage, corrosion, or any other means.

3.3.21 Construction Power

Construction power will come from a nearby distribution line approximately 200ft away from the construction trailer area. A new pole mounted transform will be used with a 480V panelboard mounted at the base. Feeder cabling will be routed in direct buried conduit to the construction trailer area. From there, the voltage will be stepped down and distributed to 120/208V panelboards at each trailer.

3.3.22 Electrical Power Systems

Redundancy will be designed into critical power systems where possible. Redundant 13.8kV power feeds will be used to feed power to the FGC and M&R area transformers. New 480V and 120/208V power panels will be added to the M&R, FGC, and boiler areas to support power needs. Power for these panelboards will be sourced from existing motor control center (MCC) buckets and existing switchgear. Spare capacity was considered for panel breakers and raceway. A new packaged UPS system will be added to the FGC area and a new UPS panel will be installed in the boiler area. These UPS systems will power the critical control systems and provide spare capacity for future plant use. New lighting will be added around the burner deck and at the new FGC area. Lighting fixtures were assumed to have a short pig-tail cable with a twist-lock receptacle system for an easy swap-out in case a light fixture needs to be replaced. Below grade grounding systems will be added to new areas such as duct bank runs and the FGC area. Above grade grounding will be added via grounding bus bars around the boiler area and surrounding the FGC yard. New grounding will tie into the existing grounding grid. The estimate assumes new cables, cable trays, and conduits.

3.3.23 Ventilation & Hazardous Area Classification

The addition of FG and IG to the Cooper Power Plant will require an evaluation of new hazards and processes inherent to natural gas being on site. The primary tool utilized for this effort is the HAZID process. During detailed design the HAZID will be performed to look at the P&ID's and apply NFPA required classifications to each potential emission source of natural gas. After each potential source is identified, a HAZOP study can be performed to determine the effects of each source as it relates to the area of the site in which it resides.

No changes to the currently installed components are included as the layouts of the piping system are preliminary and will change during detailed design. All components in the FG and IG systems are assumed to be NEMA 4 rated for a Class I Division I hazardous area. This includes the FG supply at the

M&R interface up to and including the burners and igniters. Existing instruments, junction boxes, and components not being replaced as part of the co-fire modifications by B&W on the boiler are assumed to be compliant, but will be evaluated during detailed design and are a risk to further modifications.

The highest risk to additional scope and cost to the project as it relates to HAZOP modifications are the instruments located in the basement near the planned FG and IG LP skid. There are expected to be several flanges and valves on the skid and each will have an exclusion zone that may encompass existing instruments, junction boxes, or other components that require modifications to comply with the HAZOP.

Gas detection and alarming inside the existing Unit 2 boiler building are included in the cost estimate. An allowance has also been included for modifications to the existing boiler building ventilation system, based on past similar project experience, to help mitigate the buildup of gas in the Unit surrounding area. The HAZOP will review these locations and determine if additional ventilation, detection, and/or alarming is required.

4.0 PLANT PERFORMANCE & EMISSIONS

Table 4-1 below shows the preliminary estimated performance of Cooper Unit 2 in different modes of co-firing operation.

Table 4-1: Preliminary Performance Estimates

Cooper Unit 2 Estimated Performance Summary (DRAFT)						
	100% Load			50% Load		
	100% Coal	50% Gas	100% Gas	100% Coal	50% Gas	100% Gas
Carbon (%)	69.59	69.59	69.59	69.59	69.59	69.59
Hydrogen (%)	4.47	4.47	4.47	4.47	4.47	4.47
Oxygen (%)	4.85	4.85	4.85	4.85	4.85	4.85
Nitrogen (%)	1.4	1.4	1.4	1.4	1.4	1.4
Sulfur (%)	3.51	3.51	3.51	3.51	3.51	3.51
Moisture (%)	6.62	6.62	6.62	6.62	6.62	6.62
Ash (%)	9.56	9.56	9.56	9.56	9.56	9.56
B&W Calc Heating Input (Btu/lb)	12,660	12,660	12,660	12,660	12,660	12,660
Measured Heating Value (Btu/lb)	12,434	12,434	12,434	12,434	12,434	12,434
Lower Heating Value (Btu/lb)	12,183	12,183	12,183	12,183	12,183	12,183
Theo Stoichio Ratio Coal	9.48	9.48	9.48	9.48	9.48	9.48
Natural Gas HHV (Btu/lb)	23,415	23,415	23,415	23,415	23,415	23,415
Heat input from NG (%)	0%	50%	100%	0%	50%	100%
Heat Input from Coal (%)	100%	50%	0%	100%	50%	0%
Total Heat Input (mmbtu/hr)	2,364	2,398	2,433	1,290	1,309	1,328
HI NG (mmbtu/hr)	0	1,199	2,433	0	654	1,328
Gas flow (scfh)	0	1,164	2,362	0	635	1,289
Total flue gas at Econ Exit (lb/hr)	2,390,682	2,257,120	2,119,654	1,629,929	1,538,788	1,444,982
SCR Leakage (5%) (lb/hr)	2,510,216	2,369,976	2,225,636	1,711,425	1,615,727	1,517,231
Baghouse Leakage (3%) (lb/hr)	2,585,522	2,324,834	2,183,243	1,762,768	1,584,952	1,488,332
Scrubber Leakage (0%) (lb/hr)	2,585,522	2,324,834	2,183,243	1,762,768	1,584,952	1,488,332
AirHeater Outlet Temp F	320	295	270	320	295	270
Gross MegaWatts	240	240	240	120	120	120
Gross Heat Rate HI/GMW (Btu/kwh)	9,850	9,992	10,138	10,750	10,905	11,064

4.1 Performance Estimate Basis

BMcD estimated new firing rates using performance data from similar retrofits. BMcD estimated that full load is achievable without using the PA fans in a 100% gas firing condition. The difference in performance is the difference in water being created when firing natural gas. It is expected to see a drop in boiler outlet temperature.

4.2 Performance Estimate Qualifications

Initial performance may vary as the unit is fired with different blends of gas and coal. The thermal resistance of the furnace walls will reduce with additional gas firing and less slag buildup.

4.3 Emissions Estimates

The unit will continue to meet applicable federal and state emission limits through the continued use of the existing air quality control equipment.

5.0 PROJECT EXECUTION PLAN

5.1 General Approach

The estimate is based on a multiple prime contracting approach by Owner. All procurements and contracts will be on Owner paper with support from the OE's engineering, procurement and construction staff. The estimate will be set up such that OE's cost for construction management, field engineering, and startup and commissioning can be removed from OE's cost and carried as an Owner cost, should Owner proceed as the construction manager for the project.

The contracting approach used as a basis for the Project cost estimate was a multiple contract approach. As shown in Table 5-1, the contracts were broken into two major categories: Equipment contracts and Construction contracts. The selected contracting strategy for the Project is a multiple prime contract approach. This approach was selected based on EKPC's input and past experience with recent projects. Under this approach, engineered equipment will be procured directly by EKPC and turned over to the appropriate installation contractors. This approach provides the following benefits:

- Cost savings to EKPC in return for manageable increased Owner's risk.
- Facilitates early award of major equipment procurements to allow detailed design engineering to proceed expeditiously to meet the Project schedule.
- Offers the greatest flexibility for EKPC to be involved in key decisions regarding design.

Table 5-1: Project Procurement Plan

EQUIPMENT AND MATERIALS	
CONTRACT NO.	**DESCRIPTION**
5.1240	Gas Firing System
5.2320	General Service Pipe
5.2490	Miscellaneous Piping Specials
5.2491	Below Grade Piping Specials
5.2521	Low Pressure Cast Steel Valves
5.2531	Special Service Control Valves
5.2550	Safety and Relief Valves
5.2570	Fuel Gas Ball Valves
5.2762	Fuel Gas Conditioning
5.2763	Fuel Gas Heating
5.4520	Fabricated Steel
5.5120	Unit Auxiliary Transformers
5.5330	480V Motor Control Centers & MV Switchgear
5.6110	Distributed Control System
5.6210	Instruments

CONSTRUCTION CONTRACTS	
CONTRACT NO.	**DESCRIPTION**
5.8110	Site Preparation / Foundation / UG Utilities
5.8320	Mechanical Construction
5.8410	Electrical Installation
5.8480	Cathodic Protection Furnish & Erect
5.8530	Pre-Engineered Metal Building Furnish & Erect
5.9010	Subsurface Investigation
5.9020	Surveying
5.9030	Pilot Trenching
5.9130	Medical Services
5.9230	Electrical Testing
5.9250	Performance Testing
5.9260	Emissions Testing
5.9270	Noise Testing
5.9400	O&M Manuals and Training
5.9610	Start-up Cleaning Services

In the multiple contract approach, Owner and OE will work together to procure the major equipment and construction contracts. The procurement of the long lead time equipment such as the gas firing system equipment and DCS equipment is necessary early in the Project to support detailed design. The contracting approach includes multiple equipment/material contracts and several construction contracts, as shown in Table 5-1. The equipment contracts allow Owner to reduce the cost of contractor markup via competitive bidding. There are alternate contracting approaches available, however, these may lead to additional markups on equipment/material contracts. Additionally, the multiple contracting approach allows Owner more input into the equipment selection for the Project and provides more control of the quality of materials purchased.

The equipment contracts were set up in recognition of long lead time items that will need to be ordered early in the Project to support the schedule and are not impacted by the selection of other contractors. For a more detailed list of the scope being provided with each contract, refer to Appendix D – Equipment List. To assist in understanding the coordination of work between the multiple contracts, including responsibilities for design, fabrication, delivery, receipt & protection, foundations, piping, wiring, erection, commissioning and startup interfaces, refer to Appendix C – Division of Responsibility.

5.2 Construction Management

5.2.1 Project Controls

Engineer will be responsible for developing the initial Level III Project Schedule in coordination with the Owner Scope including:

- Establish project schedule.
- Monitor design and procurement status and update accordingly.
- Develop construction and startup schedules and work with contractors to maintain in field during construction and commissioning activities.

5.2.2 Site Specific Project Documentation / Procedures

Engineer will coordinate with Owner to develop:

- Overall Project Quality Assurance Plan.
- Site Specific Safety and Security Plan.
- Inspection Test Plan.

5.2.3 Procurement & Materials Management

Engineer will create technical specifications, work with EKPC to develop approved vendors lists, issue contract specifications for bids, provide technical evaluation of bids, assist Owner in technical and commercial negotiation of contracts, expedite and track deliverables, document control of submittals, review submittals in parallel with Owner, and coordinate/assist Owner with reviewing invoices and managing change order processes.

Engineer will work with Owner to develop template front end commercial documents to issue with procurement packages.

Engineer will track and verify receipt of Owner procured equipment submittals. Logs will be issued to inform Owner of the receipt status.

Procurement packages will be issued for bid through Owner's processes and software tools.

5.2.4 Startup and Commissioning

The cost estimate assumes the start-up for the Project will be managed by BMcD, including an on-site Startup Manager and Field Engineers provided by BMcD. Vendor representatives, contractors, and Owner's operating personnel will provide assistance, technicians, and craft as needed. Startup and

commissioning includes work required to transition the project from construction to full operation and final Owner acceptance.

5.2.5 Performance and Emissions Testing

Overall net plant performance demonstrating output, heat rate, and functional tests will be managed by Owner and Engineer and performed by a third-party testing contractor. Plant emissions testing will be managed by Owner and Engineer and performed by a third-party testing contractor. Owner will witness all tests and agree to accepted results.

5.2.6 Engineering

BMcD will serve as the focal point for engineering and design coordination of the Project. BMcD's project manager, project engineering leads, and main support staff will be located in the Engineer's design office. Additionally, preliminary design, procurement specification development, detailed engineering, and modeling will be performed by BMcD. Field Engineering will be supplied by BMcD for the duration of the construction and startup schedule.

5.2.7 Safety & Environmental

The project will require on-site employees and contractors to comply with applicable governmental and local safety regulations, and the Cooper site-specific safety program. Measures will be taken to provide safe and quality work in a productive manner. The site-specific safety plan will take into consideration project conditions that are potentially hazardous and implement programs that are designed to mitigate safety risks. The Project will comply with local and governmental mandates for environmental controls. Fuel containment practices and spill prevention will be utilized. Prior to mobilization, site-specific safety and environmental plans will be developed specifically for the Project.

5.2.8 Quality

A Project Quality Plan specifically tailored to the Project will be established and implemented, complying with the Quality Program Manual. The Project Quality Plan will describe the quality assurance and quality control requirements, organization, and division of responsibility for the project and the procedures to be followed to meet those requirements. Quality audits will be conducted to verify that systems are followed and that the technical standards are achieved. The Project Quality Plan applies to all quality activities performed by the contractor's personnel in the management and control of facilities, products and services.

A focus on quality throughout the construction phase of this project will be critical to the successful achievement of project goals associated with operability, cost, and schedule.

5.2.9 Contracts

Contractors will be evaluated and prequalified by Owner and Engineer for safety performance, environmental performance, bonding ability and insurance required to be carried. Contractors that have questionable safety performance will not be selected. Multiple contract packages will be executed to perform the construction of the project. It is anticipated that specialty contract packages will be segregated by trade and generally follow the contracting plan. Major contracted scopes are:

- Site Preparation, Underground Utilities and Foundations Work.
- Mechanical Construction.
- Electrical Construction.
- Distributed Control System.
- Furnish and Erect Contracts:
    - Cathodic Protection.
- Site Service Contracts:
    - Subsurface investigation/geotechnical exploration.
    - Surveying.
    - Medical.
    - Testing.
        - Electrical.
        - Performance.
        - Emissions.
        - Noise.
    - Miscellaneous:
        - O&M Manuals & Training.
        - Start-up cleaning.
        - Control System Simulator Update.

5.3 Detailed Engineering

BMcD will execute engineering design as follows:

- During the engineering and procurement phase, Owner involvement is anticipated to understand and incorporate expectations into each phase and aspect of the project.

- Engineer will manage all aspects of technical procurement management. During detailed engineering, BMcD will review vendor engineering documentation and manage interfaces.
- Controlled project documents will be maintained in the Engineer's document management system. This enables all documents associated with the project to be filed in a standardized and accessible system.
- Design engineering results in finished designs, drawings, lists, and technical specifications for procurement and construction.

5.3.1 Architectural Design

The following architectural design engineering services will be performed:

- Design and coordination of pre-engineered metal buildings including plans, sections, elevations, and door schedules.
- Design and coordination of roofing and siding for custom engineered "stick built" buildings and enclosures including plans, sections, elevations, and door schedules.
- Design of interior finishes.
- Review vendor designs and drawings.
- Prepare technical specifications to support contracts.
- Existing wall penetration details.

5.3.2 Civil Design

The following civil design engineering services will be performed:

- Site preparation, fine grading, finish grading, site finishing and site drainage design including construction facilities, roads, parking lots, laydown areas, erosion control, fencing and security.
- Trenching for gas pipe, conduit, and duct bank.
- Restoration and seeding of temporary laydown areas.
- Preparation of pilot trenching investigations and a site survey to locate underground utilities.
- Analysis of geotechnical investigations and soil borings.
- Review vendor designs and drawings.
- Prepare technical specifications and drawings to support contracts.
- Existing road repair, as required.
- SWWP preparation.

5.3.3 Structural Design

The following structural design engineering services will be performed:

- Analysis of geotechnical investigations and soil borings for foundation design.
- Design of shallow foundations for equipment and structures.
- Design of structures in accordance with applicable code, wind, snow, and seismic design criteria.
- Analysis of existing structures for new loading conditions, as required.
- Design of structures including reinforcing steel, structural steel, platforms, stairs, and enclosures.
- Design of supplemental steel supports for piping and cable tray.
- Review vendor designs and drawings.
- Prepare technical specifications and drawings to support contracts.

5.3.4 Mechanical Design

The following mechanical engineering services will be performed:

- Finalize site plan and BOP equipment layout drawings.
- Develop demolition drawings and scopes of work.
- Prepare specifications for procuring equipment and materials.
- Perform process and system design.
- Design of cathodic protection.
- Finalize P&IDs for piping systems.
- Prepare line, manual valve, actuated valve, equipment, pipe support, and tie-in lists.
- Prepare detailed piping isometrics for large piping. Small-bore piping will be provided in "Recommended Routing" isometric form for FG piping. Instrument air, service air, service water, and drain piping will be field routed as indicated on drawings.
- Finalize and maintain General Arrangement drawings.
- Review vendor designs and drawings.
- Prepare technical specification and drawings for equipment procurement and contracts.

5.3.5 Electrical Design

The following electrical design engineering services will be performed:

- Finalize one-line diagrams.
- Prepare low- and medium-voltage auxiliary power system electrical one-line diagrams for metering and protective relaying systems.
- Prepare arrangement drawings for electrical cable trays, raceways, and equipment.
- Prepare grounding plans and details.
- Prepare raceway and circuit lists with the capability to provide interconnection drawings for electrical cable installation.

- Prepare schematic and interconnection diagrams for electrical equipment showing control circuits and equipment interconnections to be used to create a software database for generating circuit schedules and routing cable.
- Prepare lighting plans and details for permanent facilities.
- Prepare communication block diagram for permanent facilities.
- Prepare required load flow and fault calculations to design the power system and procure electrical equipment.
- Provide design of emergency power and essential service alternating current and DC systems.
- Provide lightning protection performance specification.
- Provide freeze protection performance specification.
- Perform arc flash study.
- Provide electrical area hazardous plans.
- Review vendor designs and drawings.
- Prepare technical specifications and drawings to support equipment procurement and contracts.

5.3.6 Instrumentation and Controls Design

The following instrumentation and controls engineering services will be performed:

- Finalize control system architecture drawing.
- Prepare control room layout drawing.
- Prepare instrument procurement list/datasheets for BOP instruments.
- Prepare instrument list for BOP instruments including sensors, transmitters, switches, and indicators.
- Prepare instrument installation details for BOP instruments.
- Prepare initial BOP control system I/O list including instrumentation and electrical system inputs and outputs.
- Prepare fiber-optic block and termination diagrams for interconnection of plant control system.
- Design field instrumentation cabling from the field devices to the plant control system.
- Review vendor designs and drawings.
- Prepare technical specifications and drawings to support equipment procurement and contracts.

5.3.7 Project Tools

Engineer will use its standard engineering tools to design the Cooper Unit 2 Gas Co-fire project. A three-dimensional computer model of the plant will be developed. Major original equipment manufacturer (OEM) models will be imported into the model as required to complete design. Laser scanning will also

be peformed in select areas of the existing Plant to aid in the routing and layout of new systems and strucutres and facilitate interaces with existing infrastructure. Physical drawings will be produced by extracting information from the model. The design tools will be utilized for review of potential physical interferences and checks for consistency between documents. The design tools will also create a useful tool for operation and constructability reviews througout the project allowing personnel to do a virtual walk through to view access availability for valves, operating areas, maintenance equipment and other similar characteristics. Drawings generated by Engineer will be provided in AutoCAD format to the Owner at the end of the project.

5.4 Constructability

Constructability reviews are an integral part of the overall project execution. Early involvement by the Owner and BMcD's construction management team provides for a solid integration of the design parameters and construction philosophy. The focus will be on project optimization and the following primary constructability issues:

- Master project schedule noting site area constraints, winter work, seasonal road and waterway restrictions, building enclosure, etc.
- Site access.
- Erection sequences.
- Safety during erection.
- Heavy lifts and construction access issues.
- Laydown requirements and areas needed.
- Delivery sequence of equipment.
- Prefabrication areas.
- Procurement procedures.
- Quality control.
- Inspections.
- Vendor services.

5.5 Contract List

Reference Appendix C – Project Division of Responsibility for a list of contracts, interface schedules and responsibilities.

5.6 Procurement Execution

Engineer procurement personnel will leverage recent experience with procuring equipment, materials, and contracts for other power plants of similar scope and size, with the goal of reducing timeframe necessary to conform and award contracts Owner's relationships and master purchase agreements with key suppliers will be leveraged when possible.

5.6.1 Critical Equipment & Materials

Owner will be responsible for procuring all materials and equipment. Significant procurement activities must occur immediately following the Full Notice to Proceed (FNTP), beginning with the procurement of the following equipment and materials:

- FG Burners and SSO Skids.
- FG Igniters and SSO Skids.
- FG Burner LP Skid.
- FG (IG) Igniter LP Skid.
- Emergency Safety Valve (ESV).
- FG Heater Package.
- FG HP Regulating Skid.
- HP (Class 600) FG Manual Valves.
- Pre-manufactured electrical enclosure.
- Medium Voltage Transformers.
- Packaged UPS System and Panelboards.
- DCS Equipment.

5.6.2 Procurement Summary

The procurement team will be responsible for daily execution of procurement activities throughout the course of the project. Major responsibilities of the team include:

- Provide technical specifications to bid procurements per plan.
- Provide technical evaluations of bid packages.
- Update procurement schedule.
- Coordinate supplier/contractor pre-qualifications.
- Support expediting, logistics and materials management functions.
- Provide quality support with shop inspections and pre-shipment delivery inspections.
- Tracking receipt and control of materials.
- Assist Owner in reviewing invoices.

5.6.3 Procurement Status Reporting

Engineer will use a procurement schedule which is integrated with the overall project schedule. Data reported in the procurement schedule includes specification/requisition dates, request for proposal (RFP) issuance, purchase order (PO) award, and fabrication/delivery durations for each procurement agreement. Initial input comes from integrated construction and engineering schedules and will be updated appropriately throughout the life of the project. All updates (actual dates achieved) are fed back to the Project Schedule, with any discrepancies addressed and resolved to support the needs of the project.

5.7 Construction Planning

BMcD will work with the Owner to develop a Construction Execution Plan to support the Spring 2029 COD date.

Project execution planning begins well before the construction contractors mobilize to the site. During detailed design and preparation of construction contracts, BMcD will engage its Pre-Construction team to begin reviewing the preliminary project documents as well as the project risks to begin looking for efficiencies to allow for safe and efficient execution of the project. The Pre-Construction team will work with the Owner and project team to aid in developing an optimized execution strategy for inclusion in the project design through the mobilization phase.

BMcD will participate in regular progress meetings with the Owner and each contractor. During the progress meetings, an in-depth review of the contractor metrics will be reviewed. Metrics include safety, quality, cost, and schedule performance. This time will also be used to follow-up on any outstanding action items required for the efficient execution of each contract. The Client will attend these update meetings and will have the opportunity to engage in the planning activities that occur.

5.7.1 Facility Logistics Plan

The proposed site facility layout drawing has been developed during the Project Definition Phase in a manner that allows for safe egress on to the site for all site personnel. Personnel walk paths have been laid out considering vehicular traffic and access to the site. The craft break trailer location is within proximity to the Workfront and will allow for efficient break times without having any of the craft workers walking long distances over break times.

Appendix E provides the general arrangement site layout for the Project.

5.7.1.1 Craft Parking

The craft parking lot was developed to allow direct access into the lot without driving through the project site near the craft work area. The layout will not include fencing around the parking lot. The full craft parking lot is shown on the site facility layout drawing.

5.7.1.2 Laydown Area

The proposed site facility layout drawing has been developed to allow for an unobstructed lane to and from the laydown yard. The laydown area was sized based on similar, historical projects. The laydown area has been laid out to include temporary power connections to allow the construction contractors to utilize this area for preservation activities as well as pre-fabrication activities off the site footprint. The laydown areas outlined in the site facility drawings are currently not enclosed with fencing as they are inside the overall plant fence.

5.7.2 Mobilization and Utilities

Mobilization will include the delivery and placement of the trailer courtyard area. The Owner will mobilize the trailer complex for the site staff team and will install their own craft break trailer. Contractors will provide their own office trailers and obtain written approval from Owner prior to staging trailers on site. Owner will supply electrical power disconnect at trailers for use by Contractors. As Contractors mobilize to site, Owner will assist in the placement of the trailers and will assign tool crib areas and lay down space, as required. Once the trailer complex is in place, the site preparation will begin, and power block & BOP underground activities will commence.

5.7.3 Civil Work

Civil work planned for this Project includes site preparation, fine grading, finished grading and site finishing. Prior to major civil work, a subgrade pilot trenching investigation and site survey will take place to identify existing utilities in the area of construction activities. Once utilities are identified, major civil work will start with site preparation. This work will include preparation of new temporary laydown areas, clearing and grubbing (stripping), minor cut/fill grading of the FGC yard, trenching, bedding, and backfill of FG and duct bank line, stockpiling associated spoils on site, and preparing the site roads for use during construction. Once the site is surfaced, temporary and permanent fencing will be installed to secure the project site.

After all major construction activities have been completed, the site finishing Contractor will mobilize to site to perform the final grade adjustments and restore the areas disturbed by the construction activities.

5.7.4 Structural

The foundation contractor will mobilize to site to begin installing foundations for the associated equipment and structures throughout the site. Soil-supported mat foundations will be placed for gas pipeline metering and maintenance equipment such as low point drains, filter/separator skid, knockout drum, pigging stations and emergency safety valve skids. Additionally, minor mat slab foundations will be placed for above grade piping and electrical cable supports exterior of the Unit 2 boiler building. After proper curing, relevant mechanical skids, equipment and structural steel supports for piping and cable tray will be installed. Small canopies will be provided where frequent access to gauges and instruments are required. A pre-engineered metal building will be provided for remote electrical equipment. On the existing Unit 2 boiler building's interior, new steel framing will be installed where necessary to support and provide access to new equipment. Equipment and supports placed on existing concrete slabs will be secured with post-installed anchors. Grating and guardrail on new and existing platforms will be added and modified, as necessary. Pipe penetrations through the existing wall paneling will be sealed by the mechanical construction contractor. Structural analysis will be performed on existing members where the addition of new equipment and materials results in increased loading. Existing steel members will be reinforced, as required, to support increased loading.

5.7.5 Major Equipment Installation

Structural steel and major pieces of equipment will be received and installed or temporarily stored. Smaller components, if not installed immediately, will be received, inventoried, and safely stored and maintained in one of the dedicated storage areas until they are to be installed. Foundations will be complete, tested, and cured before the site begins the receiving process for all major equipment. Major equipment will be planned to be delivered and immediately placed on the associated foundation to eliminate double handling. All major equipment is planned to be placed with a crane.

Burner equipment will be transported to site from the staging area and lifted to each burner deck by crane or mechanical hoist. The coal elbows will be replaced on each burner elevation and modifications will be made on each elevation prior to moving to the next elevation. The regulating skids (header skids) will be placed at the ground elevation and piping routed from the skids to the branch connection on each elevation. Gas supply piping from each burner and igniter will be routed from the respective equipment termination point to the vertical FG vertical distribution header to minimize stress on the connections.

5.7.6 Mechanical & Electrical BOP

After the Project P&IDs and Electrical One Line Diagrams are established, the Engineer and home office startup team will scope Mechanical and Electrical Systems and develop scoped packages for the

procurement and installation of the respective systems. The mechanical system will be assigned to the 5.8320 Contractor (8320) and the electrical system will be assigned to the 5.8410 Contractor (8410). Mechanical and Electrical system turnovers will be required to support the startup and commissioning schedule.

8320 will be provided P&ID's, isometrics for piping 4-inch NPS and larger, recommended routing drawings for piping under 4-inch NPS, general arrangements, and details as needed for the installation of the Owner-supplied equipment. Specifications, details, sketches, photos, and narratives will be supplied. Isometrics will be developed utilizing an assumed spooling approach. 8320 will make the final determination of spooling and field weld locations.

Major long lead electrical cable will be prioritized by system and procured to align with the 8410 construction turnover schedule. As cable tray and conduit raceway installations are completed, cable pulls will commence. A typical approach would be that cables will be installed by area until about sixty percent of the schedule is complete. Cable pulls would then shift to the systems required to support the startup and checkout schedule.

5.8 Start-up and Commissioning

Commissioning is one of the phases with the most risk. Planning for start-up and commissioning defines the systems or sub-systems to be commissioned by scope identification on the P&ID's and electrical one-lines. The Commissioning Manager works with engineering, contractors and OEM suppliers to define the isolations required to start up separate areas of the plant to sequence the workflow. During the planning stage, the Commissioning Manager, working with the OEM suppliers, would also define the processes for bringing auxiliary power and major flushing and cleaning, and would oversee the turnover process to make sure the facility turnover is documented in the turnover packages.

Project start-up and commissioning provides for documented, safe, timely, and orderly testing, start-up and transfer of packages, systems, and facilities. Engineering, procurement, and construction planning would support early commissioning of as many commissioning packages as practical. Early checkout and testing of as many packages as possible would distribute the commissioning workload more efficiently, reducing the risks and uncertainties associated with facility start-up and commissioning.

Checkout of each system or sub-system will be completed utilizing Owner Operations staff, and handed over to Operations, system-by-system. At this time, Owner will operate each system as permanent plant equipment with support from contractors on any issues that arise with the equipment. A critical component of the commissioning will be the tuning and testing phase. Tuning for the coal firing, gas

firing and co-firing will be critical for stable operation in all operating modes. Commissioning finishes when Performance Testing is completed, and Commercial Operation with full acceptance by the Owner is achieved. The principal commissioning phases include the following:

- Preparation and planning.
- Pre-Commissioning process.
- Commissioning, Tuning and Testing phase.
- Operator training.

5.9 Project Closeout Plan

5.9.1 Engineering Completion and Project Closeout

Field staff will maintain a set of construction drawings and lists and will require contractors to maintain a record of all field changes on the documents. At the completion of construction and startup, the field staff will return a copy of the record set to the design team along with the contractor's record sets. The design team will incorporate the changes into a set of Conformed to Construction Records documents.

6.0 PROJECT SCHEDULE

6.1 General

The project schedule is based on a COD of May 2029 and is included in Appendix Q to this report. The schedule encompasses activities from permitting through commercial operation. The schedule reflects a 16-month plan for the construction and commissioning period. The schedule reflects a multiple prime contracting approach. Table 6-1 reflects the major milestones for the project.

Table 6-1: Project Milestones

Permitting Activities	**Date**
Submit Air Permit	December 2024
CPCN Advance Notice	November 2024
Submit RUS NEPA EA Application	August 2025
Engineering/Procurement	
NTP Engineering	March 2025
Gas Firing System Contract Award	April 2026
DCS Contract Award	February 2027
Construction/Startup Period – 16 Months	
Start Construction	February 2028
Start Major Equipment Erection	June 2028
Start BOP Mechanical and Electrical Construction	February 2028
Begin Startup / Commissioning	February 2029
Commercial Operation	May 2029

6.2 Permitting

EKPC is responsible for permitting activities with BMcD's support. In general, the permitting critical path is through preparation and receipt of the EPA's Environmental Assessment (EA) application and approval. The NEPA EA must be received before engineering and procurement full notice to proceed (FNTP). Note that construction cannot break ground until the Air Permit is received, however, it is expected to be in hand well before construction commencement.

6.3 Engineering

The engineering for the project is outlined in Section 5.0. In general, an engineering timeframe has been included in the project schedule that supports issuing Issued for Construction drawings at construction contract award to minimize rework and revisions in the field.

6.4 Major Equipment

The project schedule is based on current delivery lead times including 18-20 months for the DCS equipment and 14-16 months for the gas firing (burner) equipment. The critical path of the project runs through the gas firing system and DCS equipment procurement and delivery, and then through erection and commissioning.

6.5 Construction

Construction is planned to begin with construction facilities, site prep, and underground utilities in February 2028. This work is expected to continue through Spring 2028. Foundation installation follows which is to be completed Summer 2028. Major equipment deliveries are scheduled for early 2028 with outage work to follow into Fall 2028. A Spring 2029 outage is planned for final tie-ins prior to commencing startup and commissioning once gas arrives on site in February 2029.

6.6 Commissioning

Preliminary commissioning activities will be performed using construction power which will be fed from the existing plant electrical system. The Plant electrical and mechanical systems are commissioned in a sequence to support tuning and testing of gas firing system for gas firing and co-firing operation. Initial testing and tuning will be performed at 100% gas firing operation at full load, then ramping to match existing boiler and turbine ramping rates. System operations continue with bringing in coal for tuning at various co-firing fuel ratios and load points. Tuning of existing AQCS equipment under various co-firing cases will also be performed to prepare for performance and emissions compliance testing. Once the Plant is capable of reliable full load operation on 100% gas and co-firing cases, performance testing is performed in accordance with the American Society of Mechanical Engineers (ASME) Performance Test Codes.

6.7 Critical Path

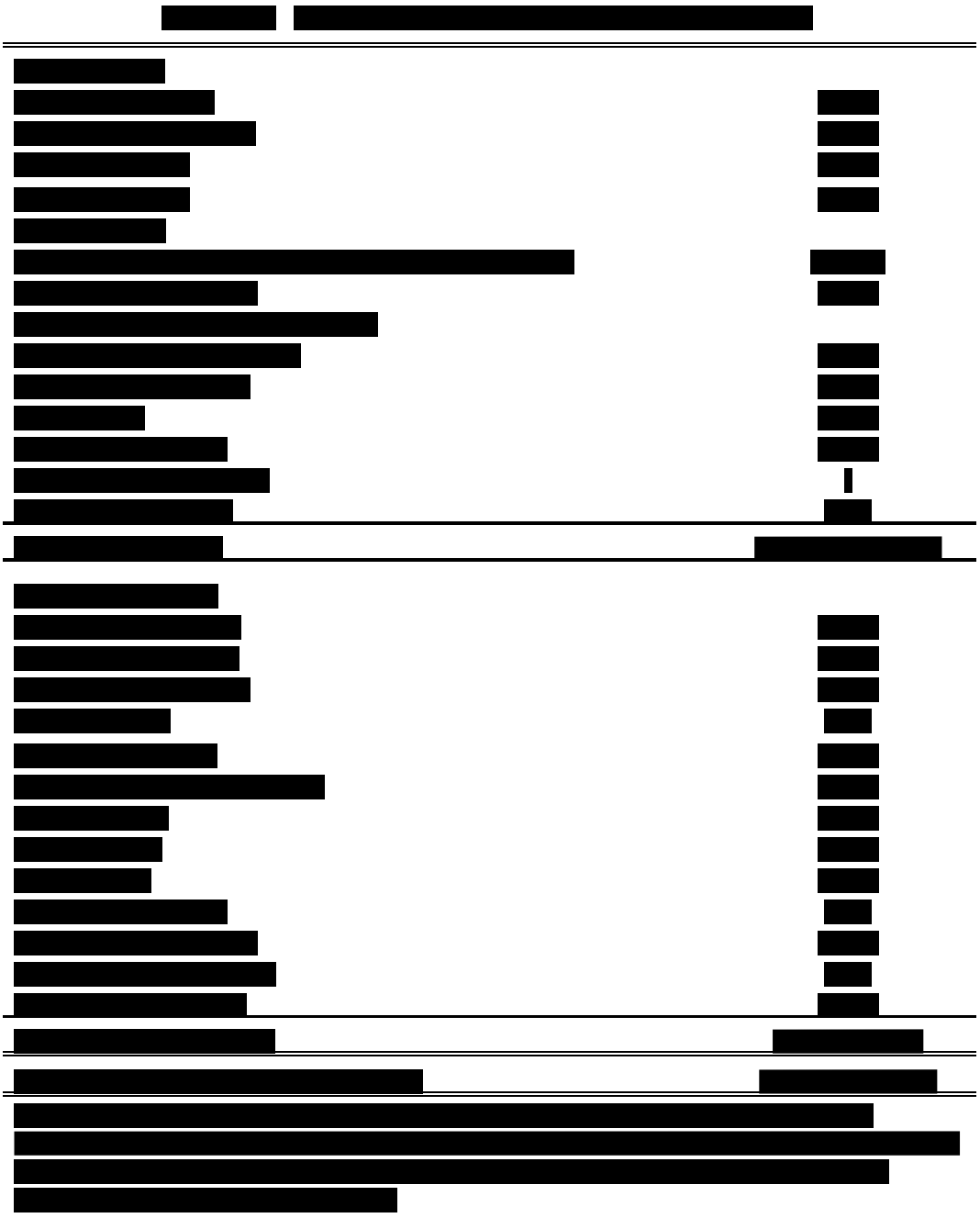
For a COD of May 2029 with the multiple prime construction contracting approach, the critical path is awarding the gas firing system and DCS equipment packages to support receipt of equipment vendor submittals to support detailed plant design and support construction package development. Preparation of site prep, foundation, mechanical, and electrical construction packages leads to award and mobilization

for construction. DCS equipment delivery and erection, and the checkout and commissioning of the FGC equipment and gas firing equipment to be used for commissioning of the plant is the critical path of construction. Check out and preliminary commissioning of each FO and FG igniter and burner component will be followed by a two month tuning and testing period prior to Substantial Completion and Commercial Operation.

7.0 CAPITAL COST ESTIMATES

7.1 General

The capital cost estimate for the proposed Cooper Unit 2 Gas Co-Fire is included in Appendix R. The estimated cost for this unit, inclusive of contingency and Owner's cost but excluding escalation, is $73.8 million ($2024). This equates to approximately $328 /kW. Table 7-1 provides a summary breakdown of the project estimated capital costs.



7.2 Cost Estimating Methodology and Assumptions

Burns & McDonnell performed a detailed cost estimate in a "bottoms up" fashion based on a multiple prime contracting methodology. The following describes the methodology used in the development of the cost estimate:

- Estimates are based on the assumptions and project scope described in this Report. Design parameters and scope typically defined by these studies are estimated based on information provided by EKPC, preliminary calculations and BMcD experience.
- Contracting Methodology: Estimate assumes a multi-prime contractor approach with all equipment procured by EKPC. Overhead and fees were estimated based on current market conditions and assuming all scope, schedule, performance, payment, and warranty risk will be covered by EKPC.
- Major Engineered and BOP Equipment: Budgetary quotes and in-house information from similar projects were utilized.
- Construction Estimates: Construction commodities were estimated using recent pricing from similar projects, and budgetary vendor quotes. Quantify take-offs were performed for each discipline specific to this project and supplied to a variety of contractors to confirm erection and installation pricing and approach.
- Project will be executed with durations similar to those shown on the Project schedule with the objective of achieving the Project milestone dates. It is assumed the Project will be executed with a schedule sufficient to minimize overtime. A 50-hour workweek was assumed as a means of providing an incentive to attract labor. This includes 40 hours of straight time and 10 hours of overtime for normal construction and outage periods. A 60-hour workweek was assumed during commissioning and start-up. No additional overtime is included to accommodate a compressed work schedule.
- Labor Rates: Labor rates and productivity factors were developed based on BMcD in-house information and contractor pricing the Lexington, KY area.
- Project Indirects: Estimates are based on Burns & McDonnell's experience and executing multiple prime projects of similar scope.
- Several major assumptions were used in developing the capital cost estimate. These assumptions include the following:
    - Commercial operation of the equipment is assumed to be May 2029.
    - Labor is assumed to be a combination of union and nonunion labor and available without excessive hourly incentives or incentive packages. However, per diem was included for several trades based on contractor feedback.

- Estimate is based on the availability of housing being in the Project area (e.g., trailer parks, campgrounds, local housing, and local hotels).
- Contingency is included at 10% for Project estimate contingency. Owner's contingency for discretionary expenditures is included in Owner's Costs.
- Cost for Builder's Risk Insurance was based on 1% of the total project costs.
- No sales tax was included.
- No financing fees or interest during construction was included.

7.3 Direct Cost Basis

The following methods were used for development of the direct cost.

- Internal development of quantities by discipline.
- Contractor pricing based on the quantities and information developed, reviewed against internal data.

7.3.1 Engineered Equipment

The equipment supply includes the procurement of all major equipment by the Owner. Refer to the Project Division of Responsibility (DOR) included in Appendix C for a listing of anticipated equipment and material supply contracts. The equipment supply cost includes the supply of specified equipment as well as the transportation cost to the site, technical field advisers, and training. Refer to Table 7-2 below for a listing of all contract packages utilized in development of the cost estimate including how each contract cost was sourced.

Table 7-2: Equipment and Subcontract Pricing Source

Contract No.	Contract Name	Target Price Source
5.1240	Gas Firing System	Bid - Budgetary
5.2490	Piping Specials	EQ (Email Quote)
5.2520	Manual and Actuated Valves	EQ (Email Quote)
5.2762	Fuel Gas Conditioning	Bid - Budgetary
5.4310	Pre-Engineered Metal Buildings	EQ (Email Quote)
5.4520	Fabricated Steel	EQ (Email Quote)
5.5680	Cathodic Protection	In-House
5.6110	Distributed Control System (DCS)	Bid - Budgetary
5.6210	Instruments	In-House
5.6220	Plant Simulator	EQ (Email Quote)
5.8320	Civil / Fdns / UG Utilities / Mech Construction	Bid - Budgetary
5.8410	Electrical Construction	Bid - Budgetary

5.9010	**Subsurface Investigation**	**In-House**
5.9020	**Surveying**	**In-House**
5.9230	**Electrical Testing**	**In-House**
5.9250	**Performance Testing**	**In-House**
5.9260	**Emissions Testing**	**In-House**
5.9400	**O&M Manuals / Training**	**In-House**
5.9610	**Startup Cleaning Services**	**In-House**

Equipment installation includes the receiving, initial inspection, and erection of all equipment, as well as the installation of vendor pipe supplied with the equipment.

Productivity factors for the equipment installation were derived from BMcD past project information and construction rates for the project area.

7.3.2 Site Development

The site development scope includes site preparation along with construction laydown, trailer, and parking areas. Excavation and backfill for underground utilities are included but underground pipe supply and installation is included elsewhere. This scope also includes estimated quantities for the structural excavation required for foundation construction. Concrete, formwork, and red powder is included in civil scope, but conduit and cables in duct bank are included elsewhere. Site finishes including paving and gravel are included. No costs for dewatering and disposing of groundwater were included.

The civil scope of work material quantities were derived from a preliminary site grading sketch developed from the site GA and general topography data. The labor rate, production rates, and material prices were constructed from BMcD previous project metrics and estimates for construction in the project area.

7.3.3 Concrete

The concrete scope includes cast-in-place concrete for the support of equipment, buildings, and miscellaneous utility supports. For reinforcing steel, a density of rebar per unit of concrete was provided by engineering for internal estimating purposes. For formwork quantities, basic quantity information was developed relative to the type of concrete such as mats, walls, slabs, etc. from which were estimated formwork quantities.

7.3.4 Structural Steel

The structural steel scope of work includes pipe support steel for the gas conditioning equipment, gas line feeding the unit, cable tray throughout the site, and vent lines routed throughout the unit. Additionally, the scope includes support steel for skids and a roof platform to access the vent lines. The existing structure may require reinforcing for new loading from the gas skids and mechanical pipeline installation. Potential reinforcement locations and quantities were estimated based on past projects. Miscellaneous steel such as platforms, grating, handrail, stairs and ladders are included for structure access that is not otherwise provided as part of the equipment contracts.

The structural steel scope of work was estimated from conceptual layout of equipment, skids, and piping. Platform areas based upon information shown or implied from the site GA. The structural productivity rates, wage rates, and material pricing were based on BMcD previous project history for construction in the area and verified using contractor pricing and input.

7.3.5 Painting & Coatings

The painting scope includes field touch up painting of factory coated equipment to repair damage during construction. Outdoor and indoor structural steel is finish painted to match existing coating system. Pipe priming and finish coating is assumed to be applied in the shop and estimated as material cost. Field coating at field welds and touch up is included. Pipe labeling is also included.

7.3.6 Piping

The piping scope of work includes above and below ground piping supply and installation. Vendor supplied pipe is included in the equipment installation cost. The piping scope covers purchase of pipe, fittings, flanges, valves, specials, bolt-up kits, supports, and pre-fabricated pipe. Purchase of piping specials and large valves is carried in the equipment pricing. Furnish and install costs for cathodic protection are carried in the equipment pricing. The piping scope of work is included elsewhere for trenches (civil scope), heat trace (electrical scope), insulation (insulation scope); touch up painting (painting) or pipe labeling (painting). The piping scope of work includes applicable non-destructive evaluation (NDE), pre and post weld heat treatment (PWHT), and hydrotesting.

The piping estimate was based on a takeoff from the general arrangement with P&IDs. Using these quantities, pricing for bulk material, valves, pipe fabrication was based on BMcD recent project pricing and budgetary quotes. The labor estimate was based on rates in the area and verified using contractor pricing and input.

7.3.7 Electrical

The electrical scope includes supply and installation of all raceway including cable and conduits in underground duct back (duct bank concrete in civil cost), above grade rigid conduit and cable tray systems with grounding and all required supports. It also includes the installation of all cable and terminations. Terminations include wire labels, cable tags, connectors, continuity testing, and Hi-Pot testing. Temporary construction power includes installation, lighting, and maintenance. Equipment includes transformers, heat trace, communications systems, and lightning protection.

The electrical estimate was completed using take off quantities that were derived from a combination of one line drawings and the equipment layout.

7.3.8 Instrumentation & Controls

The instrumentation scope of work includes a mix of electrical and mechanical installation costs. The instruments are supplied by the equipment vendors and by the mechanical installation contractor for the BOP systems (included in equipment pricing). The instrumentation estimate was completed based on installation rates in conjunction with instrument budgetary email quotes and in-house information from similar projects.

7.3.9 Miscellaneous Directs

Miscellaneous Directs include the following estimated costs:

- Geotechnical subsurface investigation.
- Initial surveying: Establishing site benchmarks.
- Start-up craft support: Craft labor required for all start-up activities
- Construction testing: soil compaction testing, concrete testing, etc.

7.4 Indirect Cost Estimate Basis

The following methods were used for indirects:

- The Construction Management (CM), Startup Management, and Construction Indirects were estimated based on the project field staffing plan, the project execution schedule, and project historical indirect costs. Construction Management excludes field engineering cost. Field engineering is included in Engineering cost. Construction management costs include escalation to support the project schedule. Also included are the CM staff expenses including travel, living expenses, and site offices.
- Engineering costs include escalation to support the project schedule. The engineering estimate includes home office engineering and field engineering.

- Construction permits including electrical and building permits are not included.
- It is assumed builders risk insurance is provided by Owner.

7.4.1 Taxes

Sales and use tax are not included in the estimate.

7.4.2 Construction Labor Basis

Labor rates and productivity factors were developed based on information from contractor feedback and Burns & McDonnell historical information.

7.4.2.1 Labor Wage Rates & Expenses

Wage rates were taken from building trade contracts through 2024 for the area and compared against budgetary pricing received for each scope of work. Labor costs include wages, fringes, payroll taxes and insurance. Also included are costs for small tools and consumables, temporary facilities, field supervision, scaffolding and construction equipment, per diems and retention incentives, as well as contractor overheads and profit.

7.4.2.2 Work Hours

The estimate assumes shifts are 50 hour work weeks with anything over 40 hours as premium time at 1.5 times the base wage rate to attract labor.

7.4.2.3 Labor Housing

The estimate is based on housing being available in the Project area (trailer parks, camp grounds, local housing, and local hotels).

7.4.2.4 Labor Per Diem

Craft per diem is included in the wage rate.

7.4.2.5 Retention Plan

Contractors will manage the labor turnover. No funds were added to the estimate for excessive labor turnover rate.

7.4.3 Escalation

Escalation was included at the following rates: engineered equipment – 5% per annum; construction labor – 5% per annum; materials – 5% per annum; construction equipment – 5% per annum; engineering / construction management – 5% per annum. Escalation has not been included but is shown as an estimated

value for two cases; an "overnight" escalation assuming the project started immediately, and the proposed preliminary schedule with a COD date of 2029.

7.4.4 Project Contingency

A Project estimate contingency of 10% of the overall Project cost was included. It is included to cover accuracy of pricing and commodity estimates for the defined Project scope. This contingency is not intended to cover changes in the general Project scope (i.e. addition of buildings, addition of redundant equipment, addition of systems, etc.) nor major shifts in market conditions that could result in significant increases in contractor margins, major shortages of qualified labor, significant increases in escalation, or major changes in the cost of money (interest rate on loans).

The overall level of contingency is considered adequate to cover normal deviations in pricing and normal deviations in the assumptions used to develop the project costs. However, it is likely not adequate to cover significant deviations from the project assumptions or major changes in market conditions. Deviations that may cause the project costs to exceed the estimated costs inclusive of contingency include excessive inflation (>3%), extreme high demand for major equipment due to proposed regulations, extreme shortage of qualified labor, extreme shortage of qualified construction contractors, change in contracting approach, and other similar changes. Such changes may be reflective of a moderate to high amount of new power plant or industrial plant construction or plant environmental retrofits.

7.4.5 Owner's Costs & Contingency

Owner's costs as provided by EKPC are included in the estimate. Table 7-1 includes a listing of Owner's costs included in the estimate. An Owner's contingency of 10% of total Owner's cost was included in the estimate.

7.5 Risk Analysis

A project risk matrix was developed to highlight potential risks to the project as well as assumed mitigation. Major risks include labor uncertainty, late equipment delivery, adverse weather conditions, etc. The risk matrix is shown in Appendix P.

7.6 Cash Flow

A cash flow based on the Project schedule, contracting approach, and the cost estimate was developed and is included in Appendix S.

7.7 Operations & Maintenance Estimates

The differential (new vs. existing) operating and maintenance (O&M) cost for Cooper Unit 2 was determined by comparing recent historical O&M costs to future estimated O&M costs based on plant operating experience. The Cooper Unit 2 Co-fire Project is estimated to reduce annual variable operating costs by approximately 49% and annual maintenance costs by approximately 7%.

7.8 Qualifications

BMcD's estimates, analysis, and recommendations contained in this report are based on professional experience, qualifications, and judgment. BMcD has no control over weather; cost and availability of labor, material, and equipment; labor productivity; energy or commodity pricing; demand or usage; population demographics; market conditions; changes in technology; and other economic or political factors affecting such estimates, analysis, and recommendations. Therefore, BMcD makes no guarantee or warranty (actual, expressed, or implied) that actual results will not vary, perhaps significantly, from the estimates, analysis, and recommendations contained herein.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The information and costs developed in this study will be used for EKPC board review of project viability. If the project is board approved, then Burns & McDonnell recommends the Owner proceed with Project execution activities in order to meet a COD as determined by the Owner. In effort to reduce Project cost and schedule risks, Burns & McDonnell recommends that the Owner consider the following activities prior to receiving RUS approval:

- Perform CFD modeling to finalize gas firing system design and configuration.
- Negotiate and award gas firing system contract to allow vendor design and submittals to progress.
- Monitor other major equipment lead-times.
- Continue preparation of air permitting and other permitting applications.
- Use geotechnical findings from the investigation to refine civil and structural design basis.

Burns & McDonnell recommends Owner evaluate the project economics based on cost and performances presented in this report. If Plant economics are favorable, Burns & McDonnell recommends Owner proceed/continue with necessary project execution activities in order to meet a Substantial Completion date as determined by Owner.

APPENDIX A - SITE DESIGN CONDITIONS

SECTION 1.1 – SITE DESIGN CRITERIA

1.01 SUMMARY:

A. This Section summarizes the design criteria and parameters for the Cooper Unit 2 Co-fire Project. Supplier shall use these criteria to develop budgetary pricing to furnish Equipment and Materials described herein.

B. The Materials specified are the minimum requirements and are not intended to limit to a single design approach. Supplier shall provide higher grade Materials where required to provide the specified service life.

C. Supplier shall provide Submittals sealed by a Professional Engineer, registered in the Commonwealth of Kentucky, as required by statute. This shall include, but is not limited to, structural drawings, calculations, and loads as required by Kentucky Building Code-2018.

1.02 SITE SPECIFIC DATA:

A. This Section includes the basic site/Project information and certain design criteria applicable to the Project. This information is general in nature and may be additionally defined within the Specifications. Where additionally defined or specified within the Specifications, the Specification criteria shall control. If additional specific information regarding the Site is required, Supplier shall obtain such information from Engineer.

B. Building Code of Record: All Work shall be in accordance with the Kentucky Building Code – 2018 including all appendices, amendments, reference standard(s), and the following:

1. Wind Design: Per Kentucky Building Code – 2018 and the following:
   a. Vult = 120 mph Basic Ground Wind Speed at 33 feet above ground (3-second gust) for Risk Category III and IV Building and other Structures.
   b. I_W = 1.00.
   c. Exposure C.
   d. No wind shielding shall be considered.
   e. Design to include Topographic K_{zt} and Directionality K_d Factors as applicable per code.
   f. Structures and equipment to be permanently located indoors shall be designed for no less than a 5 psf ‘wind’ load.
2. Snow Design: Per Kentucky Building Code – 2018 and the following:
   a. Ground snow load = 15 PSF.
   b. I_S = 1.1.
   c. Design to include Exposure C_e and Thermal C_t Factors as applicable per code.
   d. Design to include drifting increases when applicable due to adjacent structures.
   e. Include rain-on-snow load increase for ‘roof’ areas sloped less than ½ inch per foot.
3. Ice Loads: Per Kentucky Building Code – 2018 and the following:
   a. Nominal Ice Thickness t = 0.75 in.
   b. Concurrent Wind Speed V_c = 30 mph
   c. I_i = 1.25.
   d. I_W = 1.00.
4. Seismic Design: Per Kentucky Building Code – 2018 and the following:
   a. Seismic Importance Factor I_E = 1.25.
   b. Mapped Spectral Accelerations:
      (1) Short Period S_S = 0.200 g, S_{DS} = 0.16 g
      (2) 1-second Period S_1 = 0.100 g, S_{D1} = 0.113 g
   c. Site Class C.
5. Structures and Equipment shall be considered as Occupancy Category III.

C. Site Conditions:
1. Elevation:
a. Cooper Power Station: Approximately 825 ft above mean sea level (MSL).
2. Unless otherwise noted, criteria referenced below is based on ASHRAE 2021 edition of climatic data for Lake Cumberland, KY (Station #724354).
3. Plant Site Frost Depth: Per Kentucky Building Code – 2018, a minimum depth of 24 in. or erecting on solid rock.
4. Precipitation:
a. Average Annual Rainfall: 51 inches.
b. Design Storm (24-hour, 10-year): NOAA Atlas 14

Duration	1-year Return Period	10-year Return Period	25-year Return Period	100-year Return Period
24-hour	2.63 inches	4.37 inches	5.14 inches	6.42 inches
6-hour	1.79 inches	2.98 inches	3.55 inches	4.52 inches
1-hour	1.15 inches	1.97 inches	2.33 inches	3.13 inches*

* Includes KHBC Revisions

5. HVAC Outdoor Design Temperatures:

HVAC Design Conditions						
Location	Lake Cumberland, KY		2021 ASHRAE Weather Station (WMO#)			724354
Ambient Design Conditions						
Summer (F)		Winter (F)		50 Year Extreme Conditions (F)		
0.4%, DB/MCWB	1%, DB/MCWB	99.6%, DB	99%, DB	Min, DB	Max, DB	Max, WB
93.2/74.2	90.8/73.6	11.8	17.7	-13.1	108.2	84.0

D. Freeze protection design conditions: -20˚F with 20 mph coincident wind.
E. Noise control: All Equipment provided by Supplier shall be designed to comply with an average near-field noise requirement of 85 dBA measured 3 feet horizontally from the base of the equipment and 5 feet above floor level or personnel platform. Testing shall be performed in accordance with ASME PTC-36. In addition, provide octave band sound levels for each piece of Equipment furnished for Owner and Engineer review.

1.03 UTILITIES:

A. Compressed Air:

SERVICE	DEW POINT	PRESSURE	MAX. TEMP
Service Air	-40 °F	60 - 110 psig	125 °F
Instrument Air	-40 °F	60 - 110 psig	125 °F

B. Electrical Power:

VOLTAGE	PHASE	FREQUENCY HZ	USER

480 V	3	60	Motors (½ < HP ≤ 200)
120 V	1	60	Motors (≤ ½ HP)
120 V	1	60	Instrumentation
480 V	3	60	Welding Receptacles
208 V / 120 V	3	60	General Service / Lighting
120 V	1	60	Convenience receptacles
24 VDC	-	-	Controls – Digital Input
125 VDC	-	-	DC Power Supply

1.04 FUEL OIL SUPPLY:

A. Backup fuel: Ultra Low Sulphur Diesel

PRODUCT SPECIFICATIONS

3.23.1 **SPECIFICATIONS FOR FUNGIBLE 15 ppm SULFUR DIESEL FUEL GRADE 62**

EPA Designation: MVNRLM, Motor vehicle diesel fuel, 15 ppm sulfur

Cancels Previous Issues of Grade 62

PRODUCT PROPERTY	ASTM Test Method	Test Results Minimum	Maximum	Note
Gravity API	D4052	30		
Flash Point, °F				
Pensky-Martin	D93	130		
Physical Distillation, °C(°F)	D86			[W]54
50%			Report	
90%		282(540)	338(640)	
End Point			366(690)	
or Simulated Distillation, °C(°F)	D2887			[W]54
50% recovered			Report	
90% recovered		300(572)	356(673)	
End Point			421(790)	
Color ASTM	D6045		2.5	
Color Visual		Undyed		
Viscosity, cSt @ 40°C (104°F)	D445	1.9	4.1	
Pour Point	D97			2
Cloud Point	D2500			2

Corrosion, 3 hrs. @ 50°C (122°F)	D130		1		
Total Sulfur, ppmwt	D5453		11	Origin	3
			14	Delivery	
Cetane Number	D613	40			[C]4
Aromatics (Volume %)	D1319		31.7		
or Aromatics by Cetane Index	D976	40			
Ash, wt.%	D482		0.01		
Carbon Residue: Ramsbottom					
on 10% Bottom	D524		0.35		
BS&W, vol.%	D2709				
	or equivalent		< 0.05		
Thermal stability, 90 minutes					
150°CPad rating,					
DuPont scale			7		
OR					
Thermal stability	D6468				
Y/Green		73%			
W Unit		65%			
OR					
Oxidation stability, mg/100 ml	D2274		2.5		
Haze rating @ 25°C (77°F)	D4176				
	Procedure 2		2		
Nace Corrosion	TM0172	B+ (Origin)			
Electrical					
Conductivity, pS/m @ 21°C(70°F)	D2624		250		

1.05 GENERAL EQUIPMENT DESIGN CRITERIA:

A. Equipment shall be designed for a service life of not less than 30 years.

B. Equipment and components located outdoors or exposed to outdoor temperatures shall be designed for operation and start up under cold temperature conditions down to the site extreme ambient minimum dry bulb temperature. This shall include protection of temperature sensitive electrical components. Pressure piping, vessels, valves, or other pressure components located outdoors shall be designed to meet the minimum outdoor design temperature without the need for reliance on heat tracing. This may require using ASTM A-333 and selecting valves suitable for cold weather service. Consideration for low temperature service shall be given to all design aspects, including all steel, selection of gaskets and seals, drainage of condensate, as well as ensuring materials are of sufficient ductility.

C. All equipment and materials shall be assembled at the factory prior to shipment to the fullest extent practical. Equipment shall be skid mounted on common skids with interconnecting piping and control wiring to the extent allowed within shipping constraints.

D. Furnished Equipment, Materials, and skid assemblies shall be rated for operation in a Class 1, Division 2, Group D hazardous (classified) location, as defined by NEC Articles 500 and 501. Conduit sealing compound shall not be installed until after the successful completion of factory testing and Owner approval.

E. All Equipment and Materials for the Project shall comply with the Occupational Safety and Health Administration (OSHA) Regulations and Standards 29CFR1910. If conflicts between Kentucky Building – 2018 and OSHA occur, Kentucky Building Code – 2018 shall control. All Work performed on Site shall comply with OSHA Regulations and Standards 29CFR1926 and 29CFR1926 Subpart R, and Kentucky OSHA Regulations and Standards.

F. All Work shall be in compliance with local, county, state, federal regulations, codes, standards, laws, and ordinances.

G. Asbestos and lead containing material is strictly prohibited in the Equipment furnished under this Contract.

H. Coating/Painting: Unless specified more explicitly in the technical Specifications, all equipment and manufactured components (valves, instruments, electrical cabinets, etc.) shall be factory finished with manufacturer's standard coating system suitable for the intended final service conditions and environment without need for any additional field painting. All exterior and interior structural steel shall be hot dip galvanized.

I. Standards of Design and Workmanship:
   1. The finished Work and/or product shall be complete in all respects. All hardware shall be manufactured, fabricated, assembled, finished, and documented with the workmanship of the highest quality throughout, and all of the components shall be new.
   2. The Work shall be carried out in accordance with best recognized practices and customary industry quality unless otherwise specified within the technical sections of this specification.

PART 2 - PRODUCTS - NOT APPLICABLE.

PART 3 - EXECUTION – NOT APPLICABLE.

END OF SECTION 1.1

APPENDIX B - SCOPE MATRIX

East Kentucky Power Cooperative
Cooper Co-Fire Project
Appendix B - Scope Assumptions Matrix

BURNS McDONNELL

		Y/N	Number	% Capacity (per Unit)	Notes
GENERAL PROJECT INFORMATION					
Project Description		-	-	-	Dual fuel conversion to allow Unit 2 to operate on coal, natural gas, or a combination of both.
	Project Location	-	-	-	Pulaski County, KY.
	Site Description	-	-	-	Existing brownfield site at Cooper Power Station. Unit 1: 116-net MW pulverized coal; Unit 2: 225-net MW pulverized coal.
	Design Fuel	-	-	-	Current fuel: Eastern bituminous with low sulfur content New natural gas pipeline routed to site. Target 50% to 100% natural gas blending. Retain fuel oil ignitor capabilities (ultra low sulfur diesel).
	Heat Rejection	-	-	-	No changes to existing main cooling system.
	Operation	-	-	-	Baseloaded with outages for maintenance
	Capacity Factor	-	-	-	Pending air permit modification
	Contracting Approach	-	-	-	Multi-prime.
	Labor	-	-	-	Union or Non-Union.
	Project Liquidated Damages	-	-	-	Schedule and performance for each contract.
	Project Bonding /LOC	-	-	-	100% Bonding.
	Project COD Dates	-	-	-	May 2029
	Project Expansion	-	-	-	None considered. No interface with potentail future combined cycle facility considered.
MECHANICAL SYSTEMS/EQUIPMENT					
STG					
	Heat Balance Study	Y	-	-	Perform heat balance study during execution.
	TWIPS Study	N	-	-	TWIPS study not included.
SCR & AMMONIA SYSTEM					
	Ammonia Flow Control Study Analysis	Y	1	100%	Add one skid at Unit 2.
	SCR Catalyst Study	Y	1	100%	Study reactivity of catalyst. Catalyst replacement not included in cost estimate. Applicable to Unit 2 only. Economizer exit gas temperature prediction.
AUXILIARY STEAM					
	Aux Boiler	N	-	-	No existing aux boiler. No aux boiler to be included for black start. Have a diesel gen for black start. Can backfeed from dam for black start as well.
CIRCULATING WATER - N/A					
CLOSED COOLING WATER (CCW) - N/A					
COMPRESSED AIR					
	System Evaluation	Y	-	-	System evaluation included. No changes included or additional equipment. Compressed Air System currently supports Coal Firing Operations, Air Consumption during Fuel Gas Operations will be Similar.
CONDENSATE SYSTEM - N/A					
CHEMICAL FEED					
	Odorizer	N			Not included.
DEMINERALIZED WATER SYSTEM - N/A					
FEEDWATER SYSTEM - N/A					
FIRE PROTECTION					
	Design Basis	Y	-	-	NFPA 850 recommended practice.
	Insurer/special requirements	Y	-	-	FM Global
	Gas Detection and Fire Protection	Y	-	-	Gas detection and alarm to be evaluated in execution/Detailed Design phase.
	Hazardous Area Classification Study	Y	-	-	HAZID/HAZOP to be performed during execution/Detailed Design phase.
	Remote I/O Room / Building	Y	-	-	Per NFPA 13. Coordinate with existing fire protection system.
FUEL OIL					
	Storage Tanks	N	-	-	Retaining existing capacity.
	Dual Fuel Study	N	-	-	Duel fuel (Co-fire gas+oil, coal+oil, coal+gas+oil) not included.
	Ignitor & Warm-up Gun	Y	1	100%	No change to firing rate.
HVAC SYSTEMS					
	Remote I/O Room	Y	TBD	100%	As required for occupied buildings and electrical rooms
MAKE-UP WATER - N/A					
NATURAL GAS					
	General	Y	-	-	New off-site natural gas pipeline routed to site by Owner. No gas chromatograph.
	Compression	N	-	-	Not required. Minimum supply pressure to site is 600 psig.
	Metering & Regulation	N	-	-	Will be by gas supplier.
	Dew Point Heating	N	-	-	Included with Fuel Gas Conditioning Yard
	Fuel Gas Conditioning Yard	Y	1	100%	
	Fuel Gas Knockout Drum	Y	1	100%	
	Fuel Gas Drains Tank	Y	1	100%	
	Fuel Gas Filter-Coalescer	Y	1	100%	
	Fuel Gas Heater Skid	Y	1	100%	
	Full Safety Relief Valve	Y	1	100%	To protect gas equipment.
	Fuel Gas High Pressure Flow Control Skid	Y	1	100%	
	Low point drain(s)	Y	TBD		
	Building Heating	N	-	-	No building included in pricing at gas yard. Will include canopy.
COMBUSTION FIRING SYSTEM					
	Combustion Air Evaluation	Y	-	-	
	Unit 2	Y	-	-	
	Emergency Safety Valve (NFPA 850)	Y	1	100%	
	FG/IG LP (low pressure) Control Skid	Y	1	100%	
	FG/IG combined SSO (safety shutoff) Skid	Y	6	100%	Six (6) Fuel Gas SSO Skids are Included. Three (3) Burners per Fuel Gas SSO Skid. Burners are Aligned with the Coal Mills that Normally Supply Fuel. Six (6) Igniter Gas SSO Skids are Included. Three (3) Igniters per Igniter Gas SSO Skid. Igniters are Aligned with Burners.
	FG (Fuel Gas)/Coal Dual Fuel Burner	Y	18	100%	
	Flame Detectors	Y	36	100%	
	IG (Igniter Gas)/Oil Dual Fuel Igniter	Y	18	100%	
	Igniter Oil SSO (safety shutoff) Skid	Y	18	100%	
	Scanner/Igniter Cooling/Igniter Combustion Air Blower Skid (per vendor recommendation)	Y	1	100%	
	FG Flow Meter	Y	1	100%	
	IG Flow Meter	Y	1	100%	
	New Igniter Oil (IO) Equipment (per vendor recommendation)	Y	1	100%	Includes Atmoization System on Igniter SSO Skid Includes Hoses
POTABLE WATER - N/A					
SAMPLE ANALYSIS					

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		Y/N	Number	% Capacity (per Unit)	Notes
	Gas Chromatograph	N	-	-	Not included. Assumed will be M&R yard or gas supplier.
SANITARY SEWER - N/A					
STEAM					
	Steam Generator Heat Balance Evaluation	N	-	-	No expected change to steam cycle performance
STEAM BYPASS - N/A					
WASTEWATER - N/A					
COMPRESSED GAS - N/A					
	Nitrogen Purge System	Y	-	-	Underground/Outdoor piping will be sweep purged using a Rental Tanker Truck with Regulator on Tanker. Indoor Piping and Piping downstream of ESV will be pressure purged using portable Nitrogen Bottle Racks and Hoses.
CATHODIC PROTECTION					
	Underground Steel Piping	Y	-	-	Cathodic protection will be an impressed current system to match the existing on site. Actual requirements to be determined during execution/Detailed Design phase when Cathodic Protection Study can be performed.
	Underground Steel Tanks	N	-	-	
DEMOLITION		Y	-	-	TBD
FUTURE ACCOMMODATIONS		N	-	-	No consideration for interface with potential future CC project.
CONTROLS					
Equipment Control					
	Plant Control System (DCS)	Y	-	-	Modify existing ABB DCS as necessary utilizing S800 I/O and BRC410 controllers. Upgrade existing equipment as necessary i.e. existing controller is block limited and a newer controller is necessary for additional blocks.
	Remote I/O	Y	-	-	Remote IO rather than long runs when possible
	Plant Historian	Y	-	-	Add points to existing historian. Will increase license as necessary.
	Offsite Interfaces	Y	-	-	Will update existing interfaces as necessary.
Plant Simulator		Y	-	-	Include cost for upgrades.
Instrumentation					
	Redundancy	Y	-	-	Critical processes/instruments
	Transmitters	Y	-	-	Plant standard
	HART	Y	-	-	Hardwire feedback is used for control
	Performance Testing	Y	-	-	Will include as required.
Continuous Emissions Monitoring System		N	-	-	No change to exisitng.
Communication		Y	-	-	Datalinks possibly for DEW point heaters.
	Dispatching	N	-	-	Assume no changes.
NERC CIP Requirements		Y	-	-	Assumed CIP low
HMI		Y	-	-	No new HMI equipment. Modify existing graphics.
ELECTRICAL					
Generator Step-Up Transformers:					
	Steam Turbine	N	-	-	Assume we will utilize existing STG GSU transformers and they are in good working condition.
Auxiliary/Reserve Transformers:					
	Reserve Auxiliary Transformer	N	-	-	
	Auxiliary	N	-	-	Assume we will utilize existing auxiliary transformers and they are in good working condition.
Generator Buses:					
	Steam Turbine	N	-	-	Self-cooled, Isolated Phase Bus: 1x100% for STG. Size based on capacity. Assume we will utilize existing IPB and they are in good working condition.
Generator Circuit Breakers:					
	Steam Turbine	N	-	-	Generator Circuit Breaker in Isolated Phase Bus for Synchronization. Assume we will utilize existing GCBs and they are in good working condition.
Electrical Equipment Enclosures:		Y	-	-	New remote I/O room or enclosure due to limited space in existing DCS room.
Switchgear:					
	4160V Switchgear	N	-	-	Will need to perform tests to ensure existing equipment is in good working condition prior to adding/modifying loads. Breakers may need to be refurbished.
	480V Switchgear	N	-	-	Will need to perform tests to ensure existing equipment is in good working condition prior to adding/modifying loads. Breakers may need to be refurbished.
Motor Control Centers:					
	480 V MCCs	N	-	-	Will need to perform tests to ensure existing equipment is in good working condition prior to adding/modifying loads. Breakers/starters may need to be added through the course of the project depending on existing spare breaker/starter quantities.
Emergency Power:					
	Uninterruptible Power (UPS)	N	-	-	We will need to evaluate the condition of the UPS and capacity for any updates to existing system.
	DC System	N	-	-	We will need to evaluate the condition of the batteries and capacity for any updates to existing system.
Standby Diesel Generator		N	-	-	
Stand Alone Control Systems					
	Fire Protection/Detection	N	-	-	See fire protection section in Mechanical for details
	Plant HVAC	N	-	-	See HVAC section in Mechanical for details
	Building/Site Security	N	-	-	
	Plant Communications	N	-	-	
On-Line Battery Monitoring:		N	-	-	Assume an existing battery monitor is in place or is not desired.
Lighting					
	Normal	N	-	-	
	Emergency Egress	N	-	-	
Grounding		Y	-	-	Any new equipment will be grounding through existing system.
Lightning Protection - N/A		N	-	-	
Freeze Protection		Y	-	-	Heat tracing designed to maintain 40F for fluids subject to freezing based on size and service
Electrical Studies:					

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		Y/N	Number	% Capacity (per Unit)	Notes
	Load Flow, voltage drop, short circuit	Y	-	-	Will perform a complete evaluation of the auxiliary system with deleted and added loads. Need to ensure short circuit, loading, and motor starting acceptable with new design.
	Protective coordination/relay settings	Y	-	-	Will need to evaluate protective device coordination and perform updates to settings for proper coordination and to minimize arc flash impacts.
	Arc Flash	Y	-	-	Will perform a complete arc flash risk assessment for the site.
Cabling		Y	-	-	New cable tray and conduit as needed. Will evaluate existing cable tray system for reuse where possible.
Transmission / Interconnection:		N	-	-	Per EKPC
TRANSMISSION					
Switchyard - N/A					
CIVIL/STRUCTURAL					
Existing Facilities		Y	-	-	Brownfield site.
Layout Considerations		Y	-	-	Reuse part of existing infrastructure and road from previous coal plant construction
Guardshack		N			Existing Cooper guardshack used.
Site Security		-	-	-	Included in Owner's costs
Landscaping		N	-	-	Minimal landscaping included. Disturbed areas will be seeded for erosion control.
Fence		N	-	-	Assume existing perimeter security fence is adequate for new plant. Restore any disturbed fencing. Fencing around fuel gas conditioning yard not included. Assume fence around the M&R Yard is by Gas Utility.
Disposal of Spoils		-	-	-	Excess spoils will be stockpiled on site. Hazardous materials not accounted for in project estimate.
Soils Conditions / Stability		-	-	-	Use geotech report from previous projects (where available) as reference. No subsurface investigation is included in the scope of work for this PSR phase. Will incldue cost for investigation during execution.
Soil Improvement		N	-	-	No soil improvement is assumed. Use geotech report from previous projects (where available) as reference. No subsurface investigation is included in the scope of work for this PSR phase. Will include cost for investigation during execution.
Subsurface Rock		N	-	-	Assume no rock excavation required. Use geotech report from past projects as reference. No subsurface investigation is included in the scope of work for this PSR phase. Will incldue cost for investigation during execution.
Subsurface water		N	-	-	Assume no engineered dewatering (well points) required. Use geotech report from previous projects (where available) as reference. No subsurface investigation is included in the scope of work for this PSR phase. Will incldue cost for investigation during execution.
Cut/Fill		N	-	-	Use existing site materials to grade the site and avoid off-site borrow.
Disposal of debris		-	-	-	Disposed of off-site, as required. Assumed no hazardous material disposal required.
Permanent Stormwater		-	-	-	Existing. New surface water drainage ditches and piping to collect and direct to offsite outfall. Regrading as required to follow existing drainage paths.
Construction Stormwater		Y	-	-	Erosion control will be in accordance with state and local guidelines and regulations and will include best management practices such as silt fence, rock check dams, slope protection, construction exits, and stormwater pond(s) for construction and permanent. A SWPPP will be prepared during execution.
Roads		N	-	-	Existing plant roads to allow for deliveries via truck. Plan on new drive extension to M&R yard - rock surfacing.
Surfacing		N	-	-	It's assumed that no repaving will be required. If new maintenance roads are required, they will need to be covered with crushed rock.
Soil Bearing Capacity		N	-	-	Pressumptive soil bearing pressure values per IBC assumed for preliminary sizing during PSR. To be confirmed with subsurface investigation during execution.
Foundation type		Y	-	-	Shallow slab / mat foundations to frost depth assumed. Anticipating only lightly loaded foundations.
Demolition (Foundation)		N	-	-	Assuming no demolition of existing foundations or modifications to existing foundations will need to be made.
Steel Modifications (Wall and Roof)		Y	-	-	Pipe penetrations in wall and roof panels included. Steel modifications and replacement of paneling, girts, ect. for equipment installation excluded unless specifically indicated in PSR deliverables.
Steel Modifications (Grating & Guardrail)		Y			Grating and guardrail modifications for boiler deck venting and boiler pipe supports included, as required. Existing paint likely to contain lead. Include abatement in pricing.
Maintenance cranes		N	-	-	
Access Platforms		Y	-	-	Assuming pipe venting extends 15'-0" above topmost structural steel elevation. Will provide support and access to vent for maintenance. Access platforms included around gas skids, as required. Assuming stair access unless otherise indicated in PSR deliverables.
Column/Beam Reinforcement		Y	-	-	An allowance for modifications and / or reinforcing existing beams and columns is included in cost estimate based on past similar project experience. This assumption will be confirmed during execution.
Structural Steel Supports		Y	-	-	Structural steel supports included, as required, for venting and boiler pipes, cable trays and potential ductwork. Assuming non-stressed pipe supports. Assumed gas line below grade from custody transfer point to units. No above grade pipe racks incldued.
Boiler Wall Modifications		Y	-	-	Modifications to Boiler for Implosion to be Studied during Execution/Detailed Design phase.
Canopies / Enclosures		Y	-	-	Pre-Engineered Metal Building Included for Electrical Equipment at Fuel Gas Conditioning Yard.
CONSTRUCTION					
Utilities					
	Power	Y	-	-	Construction power from existing Cooper facility
	Communication	Y	-	-	Tie-in to existing system
	Construction Water	Y	-	-	Tie-in to existing Cooper facility service water system
	Potable Water	Y	-	-	Tie-in to existing Cooper facility potable water system
	Sanitary	Y	-	-	Portable facilities provided by construction contractors
Parking		Y	-	-	Temporary construction parking to be identified.
Gate Entry					
	Main	-	-	-	Existing Cooper guard shack.
	Personnel/Craft	-	-	-	Existing Cooper contractor entrance and guard shack.
	Delivery	-	-	-	Existing Cooper - coal haul road.
Construction Field Office / Trailers					
	Owner	Y	-	-	Trailers in Owners Costs.

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		Y/N	Number	% Capacity (per Unit)	Notes
	Engineer	Y	-	-	Trailers in Owners Costs.
	Vendors	Y	-	-	Trailers in Owners Costs.
	Contractors	Y	-	-	Trailers in Subcontractor Indirect Costs.
	Site Services	Y	-	-	Trailers in Owners Costs.
Laydown area		Y	-	-	On site areas to be identified
Warehouses		Y	-	-	One large warehouse adjacent to switchyard - full - assume no space available.
OWNER COSTS / MISC.					
Permits					
	See Permit Matrix	Y	-	-	EKPC w/ BMcD Support.
Owner's Costs					
	Project Development	Y	-	-	Allowance included in Owner Cost.
	Owner's Operations Personnel	Y	-	-	Allowance included in Owner Cost.
	Owner's Project Management	Y	-	-	Allowance included in Owner Cost.
	Owner's Engineer	N	-	-	
	Owner's Legal Counsel	Y	-	-	Allowance included in Owner Cost.
	Political Concessions / Area Development Fees	N	-	-	
	Permitting & License Fees	Y	-	-	Allowance included in Owner Cost.
	Land	N	-	-	Brownfield, existing
	Water Rights Costs	N	-	-	Existing
	Water Infrastructure and Supply to Site	N	-	-	Existing
	Natural Gas Infrastructure and Supply to Site	N	-	-	Cost carried in separate project.
	Labor Camp	N	-	-	
	Permanent Plant Operating Spare Parts	N	-	-	
	Maintenance Tools & Equipment	N	-	-	
	Permanent Plant Equipment & Furnishings	N	-	-	
	Sales Tax	N	-	-	Sales tax is excluded, other than for non-permanent consumables and supplies
	Escalation	Y	-	-	All escalation excluded (during execution and for future start and COD)
	Owner's Contingency	Y	-	-	Allowance included in Owner Cost.
	Interest During Construction	N	-	-	Excluded
	Temporary Utilities	Y	-	-	Included in capital costs.
	Startup Testing Fuels and Consumables	Y	-	-	Allowance included in Owner Cost.
	Operator training	Y	-	-	Allowance included in Owner Cost.
	Owner's Construction Trailer	Y	-	-	Allowance included in Owner Cost.
	Site Security	Y	-	-	By EKPC. Cost not included.
	Hazardous material abatement	Y	-	-	Sampling, testing, and abatement for lead paint. Allowance included in Owner Cost.
GENERAL ASSUMPTIONS					
	Reuse of Existing Equipment and Systems	Y	-	-	Existing equipment, piping, cables, etc. are in adequate working order and can be reused without modifications
EXCLUSIONS					
	Taxes	-	-	-	Sales, use, gross receipts, property, and other types.
	Insurance	-	-	-	Except Builder's Risk carried in Owner Cost.
	Sound abatement above normal supply	-	-	-	
	Aesthetic landscaping other than erosion control	-	-	-	
	High escalation assocated with extreme market conditions	-	-	-	
	Transmission / Interconnection	-	-	-	
	Financing fees	-	-	-	
	Interest during construction	-	-	-	

APPENDIX C – PROJECT DIVISION OF RESPONSIBILITY

East Kentucky Power Cooperative
Cooper Co-Fire Project
Appendix C - Division of Responsibility

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
BMcD	**BMcD (Engineer/Construction Manager)**													
	Temporary Services													
	Dumpsters / Refuse / Recyclables	-	-	-	BMcD	BMcD	BMcD	-	-	-	-	-	-	
	Temporary Toilets	-	-	-	BMcD	BMcD	BMcD	-	-	-	-	-	-	
	Construction Trailers	-	-	-	BMcD	BMcD	BMcD	-	-	-	-	-	-	Craft Break Trailers
	Electrical Distribution Panels to Work	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	Contractors	
	Parking	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	
	BMcD Construction Trailer	-	-	-	-	-	-	-	-	-	-	-	-	
	Trailer(s)				BMcD / Contractors	BMcD / Contractors	BMcD / Contractors							Contractors to provide trailers for their staff as necessary. Owner will provide trailers for BMcD and Owner's staff.
	Card Readers / Security Entrance and Exit				Owner	Owner	Owner							
	Badges				Contractors	Contractors	Contractors							Contractors to provide badges with appropriate contract tracing requirements
	Gate Access Equipment (including call box stand)				Owner	Owner	Owner							
	Communication Phone/Internet				BMcD / Contractors	BMcD / Contractors	BMcD / Contractors							Each contractor to provide hot spots as needed for their on-site staff.
	Janitorial Services				BMcD	BMcD	BMcD							
	Potable Water				BMcD / Contractors	BMcD / Contractors	BMcD / Contractors							Each to supply water for their own employees
	Office Consumables				BMcD / Contractors	BMcD / Contractors	BMcD / Contractors							Each to supply office supplies for their own staff employees
Common	**Common Areas - Shared Site Items and Services**													
	Temporary Services	-	-	-	-	-	-	-	-	-	-	-	-	
	Dumpsters / Refuse / Recyclables				8110 / 8320	8110 / 8320	8110 / 8320							8110 will supply and maintain for all Project Contractors until 8320 takes over and maintain for all Project Contractors until Substantial Completion
	Hand Wash Stations				BMcD	BMcD	BMcD							
	Temporary Toilets				BMcD	BMcD	BMcD							
	Heated Bathroom Trailer (by Break Trailers)				BMcD	BMcD	BMcD							
	Miscellaneous				-	-	-							
	Snow Removal				8110 / 8320	8110 / 8320	8110 / 8320							Common Areas Only, Work Areas by each Contractor
Owner	**Owner Supplied**													
	Taxes	-	-	-	-	-	-	-	-	-	-	-	-	Owner to provide tax exemption certificate to BMcD and BMcD to provide to Suppliers and Contractors
	Insurance	BMcD	-	-	Supplier / Contractor	Supplier / Contractor	-	-	-	-	-	-	-	Each Supplier and Contractor to provide their own insurance.
	Builders Risk	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	Owner	
	Permitting	-	-	-	-	-	-	-	-	-	-	-	-	
	Natural Gas Supply Permitting	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Water Rights	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Environmental Assessment		-	-	Owner	-	-	-	-	-	-	-	-	
	NPDES Mods		-	-	Owner	-	-	-	-	-	-	-	-	
	Building Permits	-	-	-	Owner	-	-	-	-	-	-	-	-	
	LOTO's	Owner / BMcD / Contractors	-	-	-	-	-	-	-	-	-	-	-	BMcD's LOTO program will be met until the system is turned over to the plant.
	Hot Work Permits	Owner / BMcD / Contractors	-	-	-	-	-	-	-	-	-	-	-	
	Initial Fills & Consumables	-	-	-	Owner	-	-	8320	-	-	-	-	-	8320 to Support first fills
	Lubricating Oil	-	-	-	Owner	-	-	8320	-	-	-	-	-	8320 to Support first fills
	Ethylene Glycol (Gas Heater)	-	-	-	Owner	-	-	8320	-	-	-	-	-	8320 to Support first fills
	Natural Gas	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Startup Power	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Startup Water	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Test Power Sales & Grid Coordination	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Natural Gas Supply Infrastructure (Metering Yard)	-	-	-	Owner	-	-	-	-	-	-	-	-	
	Communications / Security Equipment	-	-	-	Owner	-	-	-	-	-	-	-	-	See Site Security Below
	Conmunications / Security Infrastructure	-	-	-	Owner	-	-	-	-	-	-	-	-	See Site Security Below
	Operating Spare Parts	-	-	-	Owner	Owner	Owner	Owner	-	-	-	-	-	
	Landscaping	-	-	-	Owner	Owner	Owner	Owner	-	-	-	-	-	
	Signage (Plant exterior permanent signage)	-	-	-	Owner	Owner	Owner	Owner	-	-	-	-	-	
	Construction Power Cost (metered)		-	-	Owner	-	-	-	-	-	-	-	-	
1240	**Gas Firing System**													
	IG (Igniter Gas)/Oil Dual Fuel Igniter	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Igniter Oil SSO (safety shutoff) Skid	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	New Igniter Oil (IO) Equipment (per Vendor Recommendation)	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	

East Kentucky Power Cooperative
Cooper Co-Fire Project
Appendix C - Division of Responsibility

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	FG (Fuel Gas)/Coal Dual Fuel Burner	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Burner supports	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	Combustion air flow register	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	BMcD/1240	BMcD/1240	BMcD/1240	
	FG Flex Hoses	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	IG (igniter gas) Flex Hoses	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	Flame Detector	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Gaskets	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	Gas Spuds	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	BMcD/1240	BMcD/1240	BMcD/1240	
	High Energy Spark Igniters (HESI)	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Linear actuator for burner register modulation	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Sight Glass	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	Swirler	BMcD	BMcD	1240	1240	1240	8320	8320	-	-	-	-	-	
	FG/IG LP (low pressure) Control Skid	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Burner actuated shutoff valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Burner pressure regulating valve (PRV)	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Burner Automated Vent Valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Burner pressure indicating transmitter	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Igniter actuated shutoff valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Igniter automated vent valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Igniter pressure regulating valve (PRV)	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Igniter pressure indicating transmitter	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	FG/IG combined SSO (safety shutoff) Skid	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	FG Burner Gas Actuated Double Block Valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	FG Burner Gas Actuated Vent Valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	IG Actuated Double Block Valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	IG Actuated Vent Valve	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Scanner/Igniter Cooling/Combustion Air Blower Skid	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Scanner/Igniter Cooling/Combustion Air Blower A	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Scanner/Igniter Cooling/Combustion Air Blower B	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	Scanner/Igniter Cooling/Combustion Air Line Flex Hoses (per boiler)	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	FG Flow Meter	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
	IG Flow Meter	BMcD	BMcD	1240	1240	1240	8320	8320	8410	8410	BMcD/1240	BMcD/1240	BMcD/1240	
2320	**General Service Pipe**													
	Below Grade BOP Pipe	BMcD	BMcD	2320	2320	2320	8110	8110	-	-	8110	-	-	Cathodic Protection by 5.8480. Coordination for installation by 5.8110. Backfill by 8.8110 after Commissioning of 5.8480 Contract.
	Above Grade BOP Pipe	BMcD	BMcD	2320	2320	2320	8320	8320	-	-	8320	-	-	
2490	**Miscellaneous Piping Specials**													
	Burner Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Igniter Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Burner Stack Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Igniter Stack Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Burner LP Skid Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Burner LP Skid Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Igniter LP Skid Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Igniter LP Skid Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	ESV Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	FGC LP Sweep Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	FGC Heater Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	FGC Heater Bypass Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Filter-Separator Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Knockout Drum Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	M&R Sweep Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	Drain Tank Purge Hose	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	
	FGC Yard Eyewash Station and Safety Shower	BMcD	BMcD	2490	2490	2490	8320	8320	8410	8410	8320	BMcD	BMcD	
	Backflow Preventers	BMcD	BMcD	2490	2490	2490	8320	8320	-	-	-	-	-	Eye wash potable water connection
2491	**Below Grade Piping Specials**													
	Fire Hydrants	BMcD	BMcD	2491	2491	2491	8110	8110	-	-	-	-	-	8110 to excavate & backfill for installation
	Post Indicator Valves	BMcD	BMcD	2491	2491	2491	8110	8110	-	-	-	-	-	8110 to excavate & backfill for installation
	Buried Valves	BMcD	BMcD	2491	2491	2491	8110	8110	-	-	-	-	-	8110 to excavate & backfill for installation
2521	**Low Pressure Cast Steel Valves**													
	Low Pressure Cast Steel Valves	BMcD	BMcD	2521	2521	2521	8320	8320	-	-	2521	BMcD	BMcD	
2531	**Special Service Control Valves**													
	Emergency Safety Valve (NFPA 850)	BMcD	BMcD	2531	2531	2531	8320	8320	8410	8410	2531	BMcD	BMcD	
2550	**Safety and Relief Valves**													
	Safety and Relief Valves	BMcD	BMcD	2550	2550	2550	8320	8320	-	-	2550	BMcD	BMcD	HP Fuel Gas Relief Valves

East Kentucky Power Cooperative
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Appendix C - Division of Responsibility

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
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2570	**Fuel Gas Ball Valves**													
	High Pressure Fuel Gas Valves	BMcD	BMcD	2550	2550	2550	8320	8320	-	-	2550	BMcD	BMcD	High Pressure Fuel Gas Valves & Nitrogen Purge
2762	**Fuel Gas Conditioning**													
	Knock-Out Drum	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Knock-Out Drum Level Indicator with Switch	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Knockout Tank Automated Drain Valve	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Safety Relief Valve	BMcD	BMcD	2762	2762	2762	8320	8320	-	-	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Drains Tank	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Fuel Gas Drains Tank Flame Arrestor	BMcD	BMcD	2762	2762	2762	8320	8320	-	-	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Coalescing Filter-Separator	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Filter-Separator Sump/Drains Tank	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Sump/Drains Tank Automated Drain Valve	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Fuel Gas Pressure Regulating Skid	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure High Flow Worker	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure High Flow Monitor	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Low Flow Worker	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Low Flow Monitor	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Heat Trace PRV pilot and sensing lines	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Heat Trace SRV pilot and drain lines	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Fuel Gas Pressure Indicating Transmitters	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	Fuel Gas Temperature Indicating Transmitter	BMcD	BMcD	2762	2762	2762	8320	8320	8410	8410	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Relief Valve 1	BMcD	BMcD	2762	2762	2762	8320	8320	-	-	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Relief Valve 2	BMcD	BMcD	2762	2762	2762	8320	8320	-	-	2762 / BMcD	2762 / BMcD	2762 / BMcD	
	High Pressure Relief Valve 3	BMcD	BMcD	2762	2762	2762	8320	8320	-	-	2762 / BMcD	2762 / BMcD	2762 / BMcD	
2763	**Fuel Gas Heating**													
	Fuel Gas Heaters	BMcD	BMcD	2763	2763	2763	8323	8323	8410	8410	2763 / BMcD	2763 / BMcD	2763 / BMcD	
	Combustion Air Blower	BMcD	BMcD	2763	2763	2763	8323	8323	8410	8410	2763 / BMcD	2763 / BMcD	2763 / BMcD	
	Fuel Gas Heater Temperature Indicating Transmitter	BMcD	BMcD	2763	2763	2763	8323	8323	8410	8410	2763 / BMcD	2763 / BMcD	2763 / BMcD	
	Fuel Gas Heater Flex Hoses	BMcD	BMcD	2763	2763	2763	8323	8323	-	-	2763 / BMcD	2763 / BMcD	2763 / BMcD	
4520	**Fabricated Steel**													
	Pipe/Cable Tray rack and supports	BMcD	BMcD	BMcD	4520	4520	8320	8320	-	-	-	-	-	
	Equipment Support Framing & Access Grating Steel	BMcD	BMcD	BMcD	4520	4520	8320	8320	-	-	-	-	-	
	Existing Beam & Column Reinforcing	BMcD	BMcD	BMcD	4520	4520	8320	8320	-	-	-	-	-	
5120	**Auxiliary / Station Service Transformers, UPS, Panel Boards, ATS & MV Cable**													
	MV Transformer	BMcD	BMcD	BMcD	5120	5120	8410	8410	8410	8410	5120 / 8410	BMcD	BMcD	
	Packaged UPS	BMcD	BMcD	BMcD	5120	5120	8410	8410	8410	8410	5120 / 8410	BMcD	BMcD	
	MV Cabling	BMcD	BMcD	BMcD	5120	5120	8410	8410	8410	8410	5120 / 8410	BMcD	BMcD	
	Power panelboards	BMcD	BMcD	BMcD	5120	5120	8410	8410	8410	8410	5120 / 8410	BMcD	BMcD	
	Small Dry-type transformers	BMcD	BMcD	BMcD	5120	5120	8410	8410	8410	8410	5120 / 8410	BMcD	BMcD	
5330	**480V Motor Control Centers & MV Switchgear**													
	MCC Bucket retrofit, testing and PM work.	BMcD	BMcD	5330/BMCD	5330	5330	8410	8410	8410	8410	8410/ 5330	BMcD / 5330	BMcD / 5330	
	MV SWGR testing, retrofit and PM work.	BMcD	BMcD	5330/BMCD	5330	5330	8410	8410	8410	8410	8410/ 5330	BMcD / 5330	BMcD / 5330	
6110	**Distributed Control System**													
	BOP DCS	BMcD	BMcD	6110	6110	6110	8410	8410	8410	8410	BMcD / 6110	BMcD / 6110	BMcD / 6110	
	Controls Console	BMcD	BMcD	6110	6110	6110	8410	8410	8410	8410	BMcD	BMcD	BMcD	
6210	**Instruments**													
	Instruments	BMcD	BMcD	6210	6210	6210	8320	8320	8410	8410	BMcD / 6210	BMcD	BMcD	Calibrated in Factory
	Pressure/Temperature/Flow Transmitters	BMcD	BMcD	6210	6210	6210	8320	8320	8410	8410	BMcD / 6210	BMcD	BMcD	
	Pressure Gauges	BMcD	BMcD	6210	6210	6210	8320	8320	-	-	BMcD / 6210	BMcD	BMcD	
	Temperature Gauges	BMcD	BMcD	6210	6210	6210	8320	8320	-	-	BMcD / 6210	BMcD	BMcD	
	Flow Elements	BMcD	BMcD	6210	6210	6210	8320	8320	-	-	BMcD / 6210	BMcD	BMcD	
8110	**Site Preparation / Foundation / UG Utilities**													
	Temporary Services													
	Construction Water	-	-	-	8110	8110	8110	8110	-	-	-	-	-	for Contractors Work from Contractor furnished terminal point.
	Construction Temporary Power & Maintenance	-	-	-	8110	8110	8110	8110	-	-	-	-	-	Temporary Power to be provided by Contractor via generators until the temporary power is available from Owner. Temp Power will be shared by all Contractors onsite when they mobilize. Contractor is responsible for temp power for Contractors Work from Contractor furnished terminal point.
	Snow Removal	-	-	-	-	-	8110	8110	-	-	-	-	-	Main site entrance road, plant roads and for Contractors Work Snow Removal responsibility will be turned over to 8110 / 8320 following their mobilization.

East Kentucky Power Cooperative
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Appendix C - Division of Responsibility

Contract No. Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
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Barricades	-	-	-	8110	8110	8110	8110	-	-	-	-	-	
Construction Trailers	-	-	-	8110	8110	8110	-	-	-	-	-	-	
Site Maintenance		-	-	-	-	-	-	-	-	-	-	-	
Erosion control and SWPPP	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Dust Control	-	-	-	-	-	8110	8110	-	-	-	-	-	While onsite Responsibility will be turned over to 8320 following 8110 demobilization.
Miscellaneous		-	-	-	-	-	-	-	-	-	-	-	
Testing: Compaction, Concrete	BMcD	BMcD	-	8110	-	-	-	-	-	8110	-	-	
Licensing	-	-	-	8110	8110	8110	-	-	-	-	-	-	for Contractors Work
Vapor barrier(s)	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Survey & Layout including setting permanent benchmarks	BMcD	BMcD	8110	8110	8110	-	8110	-	-	-	-	-	Responsible for establishing site monuments & benchmarks. Establish one control drawing for project.
Civil Work		-	-	-	-	-	-	-	-	-	-	-	
Clearing, stripping, and stock piling - including all trees, limbs, stumps, and brush.	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Stabilized Construction Entrance(s)	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
Temporary Roads: Heavy Haul, Laydown, Parking, Trailers, Equipment storage, and assembly areas	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	To remain in place at end of project. All areas to be re-dressed, skimmed, leveled, and graded to drain (as required) upon completion.
Fencing - Temporary	BMcD	BMcD	BMcD	8110	8110	8110	8110						
Geotextile and 6" Aggregate Surfacing		-	-	-	-	-	-	-	-	-	-	-	
Laydown Areas		BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
Construction Parking		BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
Construction Trailer Area		BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
Earthwork, Grading, Trenching	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	Materials assumed to be non-hazardous.
Stormwater Drainage Piping		BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
Dewatering		-	-	-	-	-	-	-	-	-	-	-	
Stormwater Management during construction		BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Rough and Final Grading & Drainage	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	Materials assumed to be non-hazardous.
Site Security	-	-	-	-	-	-	-	-	-	-	-	-	
Security Panels (Large/Small)	Owner	BMcD	BMcD	Owner	Owner	8110	8110	8110	8110/Owner	Owner	Owner	Owner	
Large/Small Card Readers	Owner	Owner	Owner	Owner	Owner	Owner	Owner	8110	8110/Owner	Owner	Owner	Owner	8110 to install door security wiring per owner's typical install detail. Owner to provide card readers and install.
Security Servers & Licensing	Owner	Owner	Owner	Owner	Owner	Owner	Owner	-	-	Owner	Owner	Owner	
Communication Cabinets	Owner	Owner	Owner	8110	8110	8110	8110	8110	8110/Owner	-	-	-	8110 to procure the comms cabinets 8110 to terminate some fiber/Cat6a cables, owner to terminate some. Owner to provide equipment to be housed in communications cabinets.
Gate Phones	Owner	Owner	Owner	Owner	Owner	Owner	Owner	8110	8110	Owner	Owner	Owner	
Exit Loops	Owner	BMcD	BMcD	8110	8110	8110	8110	8110	8110	Owner	Owner	Owner	
NEMA 4X Enclosures/Backplates (gate closure system)	Owner	BMcD	BMcD	8110	8110	8110	8110	8110	8110/Owner	Owner	Owner	Owner	Owner to provide equipment to be located inside enclosures. BMCD to pull cables back to enclosure and provide power to enclosures.
Door Contacts (Overhead & Magnetic)	Owner	Owner	Owner	Owner	Owner	Owner	Owner	8110	8110/Owner	Owner	Owner	Owner	8110 to install door security wiring per owner's typical install detail. Owner to provide door contacts and install.
PTZ/Bullet/Dome Cameras and mounts	Owner	BMcD	BMcD	Owner	Owner	8110	8110	8110	8110	Owner	Owner	Owner	
Wall Mount Cabinets, rack angles, cable manager	Owner	BMcD	BMcD	8110	8110	8110	8110	8110	8110	Owner	Owner	Owner	These will be installed in Urea Storage Building, CEMs enclosures
Power transfer hinges	Owner	BMcD	BMcD	8110	8110	8110	8110	8110	8110	Owner	Owner	Owner	
Door TREX Motion Detectors	Owner	Owner	Owner	Owner	Owner	Owner	Owner	8410	8110/Owner	Owner	Owner	Owner	8110 to install door security wiring per owner's typical install detail. Owner to provide motion detectors and install.
Site Finishes		-	-	-	-	-	-	-	-	-	-	-	
Site Restoration including reseeding	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	All disturbed areas to be restored.
Remove Silt Fencing		BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Pipe Bollards	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Fencing - Permanent	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Concrete Surfacing, including sidewalks and curbs	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Repair to Ashpalt Road Surfaces		BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
Foundations - formwork, shoring/bracing, appurtenances, embeds, cast-in-place anchor bolts, curing, sealing	-	-	-	-	-	-	-	-	-	-	-	-	
Fuel Gas Conditioning Yard Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
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	Emergency Safety Valve Skid Foundation	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Flow Meter Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Low Point Drain Isolation Valve Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Nitrogen Purge Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Pigging Station Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Miscellaneous Pipe & Cable Tray Support Foundations	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Minor Foundations	-	-	-	-	-	-	-	-	-	-	-	-	
	Door Stoops and Approach Slabs	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	To be protected down below frost line.
	Ladder and Stair Landings	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	Not required to be protected down to frost
	Excavation, backfill and compaction for all civil, mech and elec	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	-	-	
	Mechanical Underground(s) - piping, fittings.	-	-	-	-	-	-	-	-	-	-	-	-	
	Potable Water System		BMcD	BMcD	2320	2320	8110	8110	-	-	8110	-	-	Cathodic Protection by 5.8480. Coordination for installation by 5.8110. Backfill by 8.8110 after Commissioning of 5.8480 Contract.
	Connection to Site Potable Water Main	BMcD	BMcD	BMcD	2320	2320	8110	8110	-	-	8110	BMcD	BMcD	Including Hot Tap; Inspection/permit cost by BMcD
	Fire Protection System		BMcD	BMcD	2320	2320	8110	8110	-	-	8110	BMcD	BMcD	Cathodic Protection by 5.8480. Coordination for installation by 5.8110. Backfill by 8.8110 after Commissioning of 5.8480 Contract.
	Connection to Site Fire Protection Water Main		BMcD	BMcD	2320	2320	8110	8110	-	-	8110	8110	8110	Including Hot Tap; Inspection/permit cost by BMcD
	Fuel Gas System		BMcD	BMcD	2320	2320	8110	8110	-	-	8110	BMcD	BMcD	Cathodic Protection by 5.8480. Coordination for installation by 5.8110. Backfill by 8.8110 after Commissioning of 5.8480 Contract.
	Electrical Underground(s)	-	-	-	-	-	-	-	-	-	-	-	-	
	Duct bank(s), electrical conduit, turn-ups, pull boxes	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	8410	8410	Concrete, reinforcing & embeds by 8110
	Handholes / Manholes	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	-	-	-	
	Grounding Grid	BMcD	BMcD	BMcD	8110	8110	8110	8110	-	-	8110	8410	8410	
8320	**Mechanical Construction**													
	Temporary Services													
	Construction Water	-	-	-	8320	8320	8320	8320	-	-	-	-	-	for Contractors Work from Contractor furnished terminal point.
	Construction Temporary Power & Maintenance	-	-	-	8320	8320	8320	8320	-	-	-	-	-	Temporary Power to be provided by Contractor via generators until the temporary power is available from Owner. Temp Power will be shared by all Contractors onsite when they mobilize. Contractor is responsible for temp power for Contractors Work from Contractor furnished terminal point.
	Construction Trailers	-	-	-	8320	8320	8320	-	-	-	-	-	-	
	Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	-	
	Survey & Layout	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	8320	8320	8320	
	Initial Fills & Consumables		-	-	Owner	-	8320	-	-	-	-	8320	8320	8320 to Support first fills for chemicals, oils, gases, and fuels
	Post-Installed Anchor Bolts	-	-	-	-	-	-	-	-	-	-	-	-	
	Equipment	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Pipe Supports & Supplemental Steel	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Electrical Supports		BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Building Penetrations (Interior & Exterior)	-	-	-	-	-	-	-	-	-	-	-	-	
	Misc exterior wall and roof penetrations sealing	BMcD	BMcD	N/A	8320 / 8410	8320 / 8410	8320 / 8410	8320 / 8410	-	-	-	-	-	All penetrations by other Contractors shall be sealed by the respective Contractor.
	Mechanical Aboveground(s) - piping, fittings, hardware to / from tie-in(s) to / from terminal point(s)	-	-	-	-	-	-	-	-	-	-	-	-	
	Instrument Air System	BMcD	BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Compressed Gas System		BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Fuel Gas System	BMcD	BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Fuel Oil System		BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Service Water System		BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Potable Water System	BMcD	BMcD	BMcD	2320	2320	8320	8320	-	-	8320	BMcD	BMcD	
	Miscellaneous Structural Steel Erection		-	-	-	-	-	-	-	-	-	-	-	
	Platform Structures		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Pipe Support Supplemental Steel		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Stairs		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Ladders		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Handrail		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Grating/Floor Plate		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Canopies		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	
	Existing Steel Framing Reinforcing		BMcD	BMcD	4520	4520	8320	8320	-	-	8320	-	-	

East Kentucky Power Cooperative
Cooper Co-Fire Project
Appendix C - Division of Responsibility

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
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	Instrument Tubing, fittings, valves	BMcD	BMcD	BMcD	6210	6210	8320	8320	-	-	8320	BMcD	BMcD	As required for Instrument and actuated valve installations.
	Grouting	-	-	-	-	-	-	-	-	-	-	-	-	
	Structural steel	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	8320	-	-	
	Pipe Supports	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	8320	-	-	
	Equipment	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	8320	-	-	
	Field Coating		-	-	-	-	-	-	-	-	-	-	-	
	Coating of all field welds	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Touch-up (All Pipe and Equipment)	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Insulation and Lagging		-	-	-	-	-	-	-	-	-	-	-	
	Equipment Insulation / Personnel Protection		BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Piping Insulation / Personnel Protection	BMcD	BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
	Scaffolding (areas as required for consturction activities)		BMcD	BMcD	8320	8320	8320	8320	-	-	-	-	-	
8410	**Electrical Installation**													
	Temporary Services	-	-	-	-	-	-	-	-	-	-	-	-	
	Construction Water	-	-	-	8410	8410	8410	8410	-	-	-	-	-	for Contractors Work from Contractor furnished terminal point.
	Construction Temporary Power & Maintenance	BMcD	BMcD	BMcD	8410	8410	8410	8410	8410	-	8410 (for initial main power connections)	BMcD (for initial main power connections)	BMcD (for initial main power connections)	Temp Power will be shared by all Contractors onsite when they mobilize. Contractor is responsible for temp power for Contractors Work from Contractor furnished terminal point.
	Construction Trailers	-	-	-	8410	8410	8410	-	-	-	-	-	-	
	Wiring / Raceway / Accessories & Appurtenances	-	-	-	-	-	-	-	-	-	-	-	-	
	Above Grade Conduit	BMcD	BMcD	BMcD	8410	8410	8410	8410	-	-	-	-	-	
	Cable Tray	BMcD	BMcD	8410	8410	8410	8410	8410	-	-	-	-	-	
	Medium Voltage Cable Pulls/Terminations	BMcD	BMcD	BMcD	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	600V Power Cable Pulls/Terminations		BMcD	BMcD	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	Instrumentation & Control Cable Pulls/Terminations		BMcD	BMcD	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	Network/Fiber Cable Pulls/Terminations	BMcD	BMcD	BMcD	8410	8410	8410	8410	8410	8410	-	-	-	
	Pull Boxes/Junction Boxes		BMcD	BMcD	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	Lighting & Devices (Fixtures, Receptacles, Contactors, Photocells, Disconnect Switches)	BMcD	BMcD	BMcD	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	Above Grade Grounding and bus bars	BMcD	BMcD	BMcD	8410	8410	8410	8410	-	-	8410	-	-	
	Power Distribution Equipment retrofit (MCC buckets)	BMcD	BMcD	BMcD	5330	5330	8410	8410	8410	8410	8410	BMcD	BMcD	
	Transformers	BMcD	BMcD	BMcD	5120 / 5130	5120 / 5130	8410	8410	8410	8410	8410	BMcD	BMcD	
	UPS Equipment (Packaged)	BMcD	BMcD	BMcD	5430	5430	8410	8410	8410	8410	8410	BMcD	BMcD	
	Panelboards													
	Lightning Protection		-	-	-	-	-	-	-	-	-	-	-	
	Lightning Protection		BMcD	8410	8410	8410	8410	8410	8410	-	-	-	-	
	Heat Trace		-	-	-	-	-	-	-	-	-	-	-	
	Heat Trace Cable, Junction Boxes, Disconnects, Etc.		BMcD	8410	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
	Instrumentation & Controls		-	-	-	-	-	-	-	-	-	-	-	
	Instrument Stands		BMcD	8410	8410	8410	8410	8410	-	-	-	-	-	
	Instrument Enclosures		BMcD	8410	8410	8410	8410	8410	8410	8410	8410	BMcD	BMcD	
8480	**Cathodic Protection Furnish & Erect**													
	Temporary Services	-	-	-	-	-	-	-	-	-	-	-	-	
	Construction Temporary Power & Maintenance	BMcD	BMcD	BMcD	8480	8480	8480	8480	8480	-	-	-	-	Temp Power will be shared by all Contractors onsite when they mobilize. Contractor is responsible for temp power for Contractors Work from Contractor furnished terminal point.
	Construction Trailers	-	-	-	8480	8480	8480	-	-	-	-	-	-	
	Cathodic Protection Systems		-	-	-	-	-	-	-	-	-	-	-	
	Cathodic Protection System & AC Mitigation	BMcD	BMcD	8480	8480	8480	8480	8480	8410	8410	8480	8480 / BMcD	8480 / BMcD	
	Rectifiers		BMcD	8480	8480	8480	8480	8480	8410	8410	8480	8480 / BMcD	8480 / BMcD	
	Cables		BMcD	8480	8480	8480	8480	8480	8410	8410	8480	8480 / BMcD	8480 / BMcD	
8530	**Pre-Engineered Metal Building Furnish & Erect**													
	Temporary Services													
	Construction Water	-	-	-	8530	8530	8530	8530	-	-	-	-	-	for Contractors Work from Contractor furnished terminal point.
	Construction Temporary Power & Maintenance	-	-	-	8530	8530	8530	8530	-	-	-	-	-	Temporary Power to be provided by Contractor via generators until the temporary power is available from Owner. Temp Power will be shared by all Contractors onsite when they mobilize. Contractor is responsible for temp power for Contractors Work from Contractor furnished terminal point.
	Construction Trailers	-	-	-	8530	8530	8530	-	-	-	-	-	-	

East Kentucky Power Cooperative
Cooper Co-Fire Project
Appendix C - Division of Responsibility

Contract No.	Description	Design Criteria / Functional Design	Technical Specification RFP	Detailed Design	Procure / Supply	Fabricate / Deliver	Receive / Maintenance	Erect / Install	Power Wiring	Control Wiring	Testing	Start-up	Commissioning	Remarks
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	Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	-	
	Survey & Layout	BMcD	BMcD	BMcD	8530	8530	8530	8530	-	-	8530	8530	8530	
	Fuel Gas Conditioning Yard Electrical Building		-	-	-	-	-	-	-	-	-	-	-	
	Main Frame Building Steel	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
	Metal Wall Panels	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
	Ancillary Building Steel	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
	Entry Door Canopies	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
	Standing Seam Metal Roof, Curbs, & Appurtenances	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
	Exterior Wall and Roof Openings per Contract Drawings	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	8320 is responsible for sealing and temporarily weather-protecting all penetrations as shown on the contract drawings.
	Gutter(s) & Downspout(s)	BMcD	BMcD	8530	8530	8530	8530	8530	-	-	-	-	-	
9010	**Subsurface Investigation**													
	Geotechnical Investigation	-	BMcD	-	-	-	-	-	-	-	9010	-	-	
9020	**Surveying**													
	Surveying	-	BMcD	-	-	-	-	-	-	-	9020	-	-	
9030	**Pilot Trenching**													
	Pilot Trenching	-	BMcD	-	-	-	-	-	-	-	9030	-	-	
9130	**Medical Services**													
	Medical Services	-	BMcD	-	-	-	-	-	-	-	9130	-	-	
9230	**Electrical Testing**													
	Electrical Testing	BMcD	BMcD	9230	-	-	-	-	-	-	9230	-	-	Detailed design referring to testing plans, procedures, etc. as required
9250	**Performance Testing**													
	Burners	BMcD	BMcD	BMcD	9250	9250	-	-	-	-	9250	9250	9250	Need to Review with CTG OEM
	Igniters		BMcD	BMcD	9250	9250	-	-	-	-	9250	9250	9250	Need to Review with HRSG OEM
	Fuel Gas Heaters		BMcD	BMcD	9250	9250	-	-	-	-	9250	9250	9250	Need to Review with STG OEM
	Emissions Testing	-	BMcD	BMcD	9250	9250	-	-	-	-	9250	9250	9250	
9260	**Emisions Testing**													
	Emissions Testing	BMcD	BMcD	BMcD	9260	9260	-	-	-	-	9260	9260	9260	
9270	**Noise Testing**													
	Noise Testing	BMcD	BMcD	BMcD	9270	9270	-	-	-	-	9270	9270	9270	
9400	**O&M Manuals and Training**													
	O&M Manuals / Training Manuals	BMcD	BMcD	BMcD	9400	9400	-	-	-	-	-	-	-	
	Training	BMcD	BMcD	BMcD	9400	9400	-	-	-	-	-	-	-	
9610	**Start-up Cleaning Services**													
	Fuel Gas Pipe Pigging	BMcD	BMcD	BMcD	9610	9610	9610	9610	-	-	9610 / BMcD	9610 / BMcD	9610 / BMcD	
	Fuel Gas Pipe Air Blows	BMcD	BMcD	BMcD	9610	9610	9610	9610	-	-	9610 / BMcD	9610 / BMcD	9610 / BMcD	

APPENDIX D – EQUIPMENT LIST

East Kentucky Power Cooperative
Cooper Unit 2 Co-Fire Project
Appendix D - Cooper Unit 2 Equipment list

Furnish By	Description	Contract Eng.	Tag No.	# Qty	Ins. Thick	Heat Trace	Recv'd By	Install By	Power Wiring By	Control Wiring	Anchor Bolts	Grout	Location	Component	Voltage	Phase	Motor HP	Notes
1240	**Gas Firing System**																	
	IG (Igniter Gas)/Oil Dual Fuel Igniter			18	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					
	Igniter Oil SSO (safety shutoff) Skid			18	0"	N	8320	8320	8410	8410	N/A	No	Unit 2					
	New Igniter Oil (IO) Equipment (per Vendor Recommendation)			18	0"	N	8320	8320	8410	8410	N/A	No	Unit 2					
	FG (Fuel Gas)/Coal Dual Fuel Burner			18	0"	N	8320	8320	8410	8410	N/A	No	Unit 2					
	Burner supports			18	0"	N	8320	8320	8410	8410		No	Unit 2					
	Combustion air flow register			18	0"	N	8320	8320	8410	8410		No	Unit 2					
	FG Flex Hoses			18	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					
	IG (igniter gas) Flex Hoses			18	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					
	Flame Detector			36	0"	N	8320	8320	8410	8410		No	Unit 2					1 flame detector per dual fuel burner = 18 flame detectors 1 flame detector per dual fuel igniter = 18 flame detectors 36 FLAME DETECTORS, TOTAL"
	Gaskets			18	0"	N	8320	8320	8410	8410		No	Unit 2					
	Gas Spuds			18	0"	N	8320	8320	8410	8410		No	Unit 2					
	High Energy Spark Igniters (HESI)			18	0"	N	8320	8320	8410	8410		No	Unit 2					
	Linear actuator for burner register modulation			18	0"	N	8320	8320	8410	8410	N/A	No	Unit 2				TBD	Will have separate junction box
	Sight Glass			18	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					
	Swirler			18	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					
	FG/IG LP (low pressure) Control Skid			1	0"	N	8320	8320	N/A	8410	Post-installed	1.5"	Unit 2					
	Burner actuated shutoff valve			2	0"	N	8320	8320	N/A	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve
	Burner pressure regulating valve (PRV)			2	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					Spring and diaphragm actuator with positioner
	Burner Automated Vent Valve			2	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	
	Burner pressure indicating transmitter			3	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2					
	Igniter actuated shutoff valve			2	0"	N	8320	8320	N/A	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve
	Igniter automated vent valve			2	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	
	Igniter pressure regulating valve (PRV)			2	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					
	Igniter pressure indicating transmitter			3	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2					
	FG/IG combined SSO (safety shutoff) Skid			6	0"	N	8320	8320	N/A	8410	Post-installed	1.5"	Unit 2					Each FG SSO Skid Shall Support Three (3) Burners Each IG SSO Skid Shall Support Three (3) Igniters Each are Mill Aligned
	FG Burner Gas Actuated Double Block Valve			4	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve One (1) Primary SSO Valve on SSO Skid One (1) Secondary SSO Valve at each Burner (Total of 3)
	FG Burner Gas Actuated Vent Valve			1	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve One (1) Vent Valve per SSO Skid, will Vent Three (3) Burners
	IG Actuated Double Block Valve			4	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve One (1) Primary SSO Valve on SSO Skid One (1) Secondary SSO Valve at each Igniter (Total of 3)
	IG Actuated Vent Valve			1	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Solenoid Valve	120		Estimate 0.1	Pneumatic actuator with 120 VAC solenoid valve One (1) Vent Valve per SSO Skid, will Vent Three (3) Igniters
	Scanner/Igniter Cooling/Combustion Air Blower Skid			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Unit 2					
	Scanner/Igniter Cooling/Combustion Air Blower A			1	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Motor	480	3	Estimate 10	
	Scanner/Igniter Cooling/Combustion Air Blower B			1	0"	N	8320	8320	8410	8410	N/A	N/A	Unit 2	Motor	480	3	Estimate 10	
	Scanner/Igniter Cooling/Combustion Air Line Flex Hoses (per boiler)			36	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					Include one (1) hose for combustion air and one (1) hose for scanner/igniter cooling.
	FG Flow Meter			1	0"	N	8320	8320	N/A	N/A	N/A	No	Unit 2					Shipped loose and installed in BOP piping
	IG Flow Meter			1	0"	N	8320	8320	N/A	8410	N/A	No	Unit 2					Shipped loose and installed in BOP piping
2490	**Piping Specials**																	
	Nitrogen Purge Hoses			1	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					
	Emergency Eye Wash Station			1	0"	Y	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard	Solenoid Valve	120		Estimate 0.1	Unit comes pre-heat traced.
2520	**Manual and Actuated Valves**																	
	Emergency Safety Valve (NFPA 850)			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Unit 2	Solenoid Valve	120		Estimate 1	Will have separate junction box
2762	**Fuel Gas Conditioning**																	
	Fuel Gas Heaters			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Combustion Air Blower			1	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard	Motor	480	3	Estimate 15	
	Fuel Gas Heater Temperature Indicating Transmitter			3	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard					
	Fuel Gas Heater Flex Hoses			2	0"	N	8320	8320	8410	N/A	N/A	N/A	Fuel Gas Conditioning Yard					
	Knock-Out Drum			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Knock-Out Drum Level Indicator with Switch			1	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard					
	Knockout Tank Automated Drain Valve			1	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard	Solenoid Valve	120		Estimate 0.1	
	Safety Relief Valve			1	0"	N	8320	8320	N/A	8410	N/A	N/A	Fuel Gas Conditioning Yard					on knockout tank
	Drains Tank			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Fuel Gas Drains Tank Flame Arrestor			1	0"	N	8320	8320	8410	N/A	N/A	N/A	Fuel Gas Conditioning Yard					
	Coalescing Filter-Separator			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Filter-Separator Sump/Drains Tank			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Sump/Drains Tank Automated Drain Valve			1	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard					
	High Pressure Fuel Gas Pressure Regulating Skid			1														
	High Pressure High Flow Worker			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	High Pressure High Flow Monitor			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	High Pressure Low Flow Worker			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	High Pressure Low Flow Monitor			1	0"	N	8320	8320	8410	8410	Post-installed	1.5"	Fuel Gas Conditioning Yard					
	Heat Trace PRV pilot and sensing lines			1	2"	Y	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard	Heat Trace	208		TBD	Maintain 40F
	Heat Trace SRV pilot and drain lines			1	2"	Y	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard	Heat Trace	208		TBD	Maintain 40F
	Fuel Gas Pressure Indicating Transmitters			3	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard					
	Fuel Gas Temperature Indicating Transmitter			1	0"	N	8320	8320	8410	8410	N/A	N/A	Fuel Gas Conditioning Yard					
	High Pressure Relief Valve 1			1	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					To Be Located on HP Regulating Skid
	High Pressure Relief Valve 2			1	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					To Be Located on HP Regulating Skid
	High Pressure Relief Valve 3			1	0"	N	8320	8320	N/A	N/A	N/A	N/A	Unit 2					To Be Located on HP Regulating Skid

APPENDIX E - PRELIMINARY PROJECT SCOPING DRAWINGS

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
C	9/24/24	AJV	ERA	ISSUED WITH PSR
B	03/08/24	AJV	ERA	ISSUED FOR BID
A	02/02/24	AJV	RNO	ISSUED FOR OWNER REVIEW

OVERALL SITE PLAN

0 200' 400'
SCALE IN FEET

NORTH

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
Burns & McDonnell Engineering Company, Inc
FIRM LICENSE NO. 43

designed E. LIEN | detailed A. BONECUTTER

EAST KENTUCKY POWER COOPERATIVE

PULASKI COUNTY, KENTUCKY

COOPER UNIT 2 CO-FIRE
CONSTRUCTION FACILITIES PLAN
OVERALL SITE PLAN

project 164713 | contract

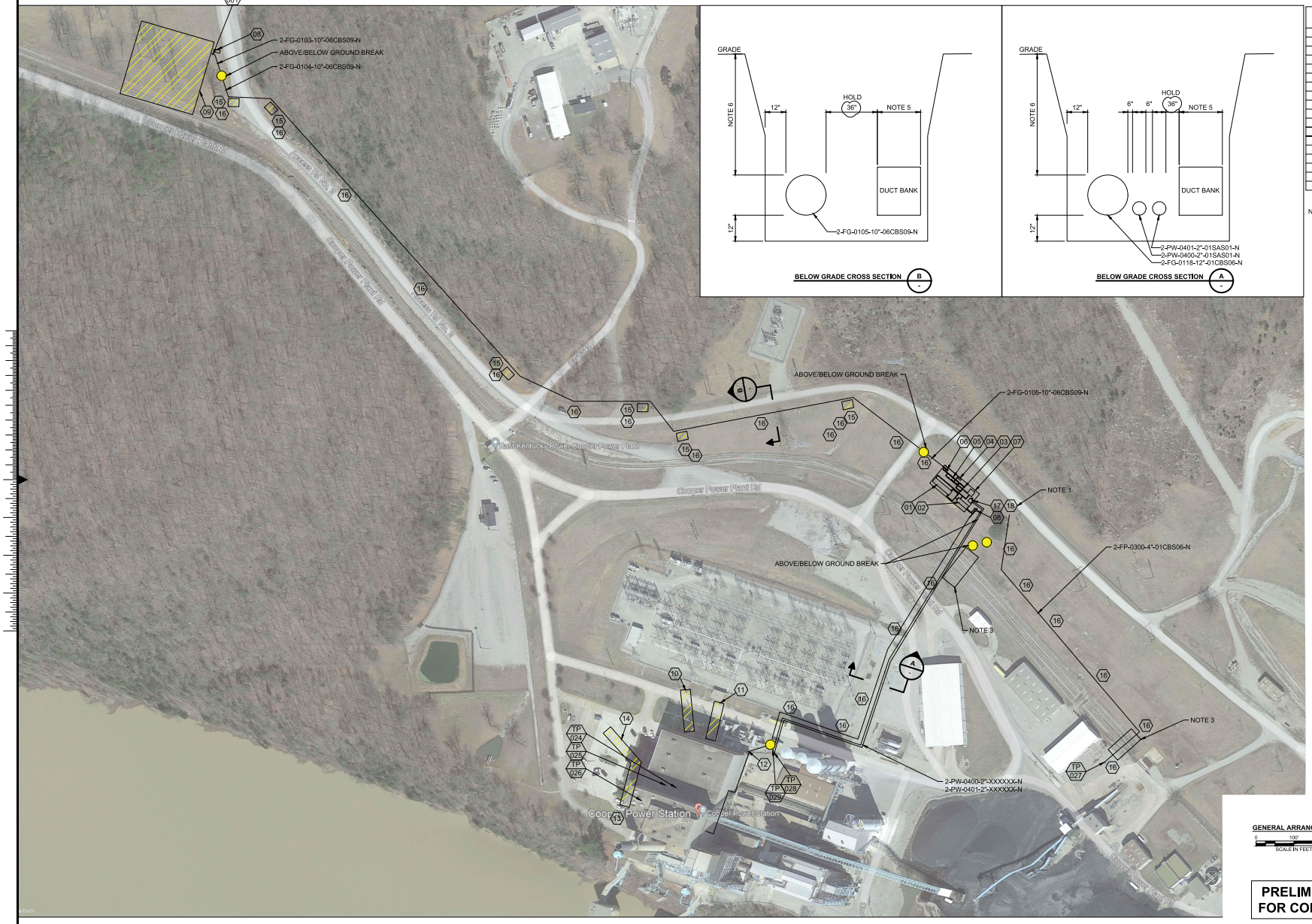
drawing **CS001** – rev. **C**

sheet of sheets

file 164713CS001.DGN

Z:\Clients\EKPC\164713_COOPERCONVPSR\2_Design\Civil\Dwgs\164713CS001.dgn

7/11/2024



SITE KEY	
01	FUEL GAS HEATER
02	HP CONTROL SKID
03	FILTER / SEPARATOR
04	DRAINS TANK
05	KNOCKOUT DRUM
06	PIGGING STATION - CATCH ONLY
07	FUEL GAS CONDITIONING YARD
08	PIGGING STATION - LAUNCH ONLY
09	M&R YARD
10	UNDERGROUND H2 AND CO2 PIPING
11	DUCT BANK NO. 2
12	ESV SKID
13	UNDERGROUND FUEL OIL STORAGE TANK
14	UNDERGROUND FUEL OIL TRANSFER LINE
15	PROPOSED LOW POINT DRAIN CLEANOUT
16	CATHODIC PROTECTION TEST STATION
17	EMERGENCY SAFETY SHOWER
18	FIRE HYDRANT

NOTES:

1. SEE DETAIL B1P FOR FIRE HYDRANT INSTALLATION DETAILS.
2. SEE DETAIL B12 FOR GALVANIC ANODE TEST STATION DETAILS.
3. SEE DETAIL B16 FOR RAILROAD UNDERGROUND CROSSING INSTALLATION DETAIL.
4. SEE DETAIL B25 FOR BELOW GRADE LOW POINT DRAIN CLEANOUT DETAIL. INCLUDE GOOSE NECK AND HOSE CONNECTION AT EACH LOCATION.
5. DUCT BANK DETAILS PER ELECTRICAL DETAILS
6. DEPTH PER CIVIL DRAWING DETAILS, DEPTH SHALL BE NO LESS THAN 36" UNLESS DIRECTED OTHERWISE.

GENERAL ARRANGEMENT

0 100' 200'

SCALE IN FEET

NORTH

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
D	9/24/24	SAH	SAH	ISSUED WITH PSR
C	04/04/24	SAH	SAH	REVISED FOR ESTIMATE BASIS
B	03/01/24	KJC	SAH	ISSUED FOR 5.8320 IFBQ
A	02/02/24	KJC	XXX	ISSUED FOR OWNER REVIEW

BURNS McDONNELL
Burns & McDonnell Engineering Company, Inc.
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed | detailed

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

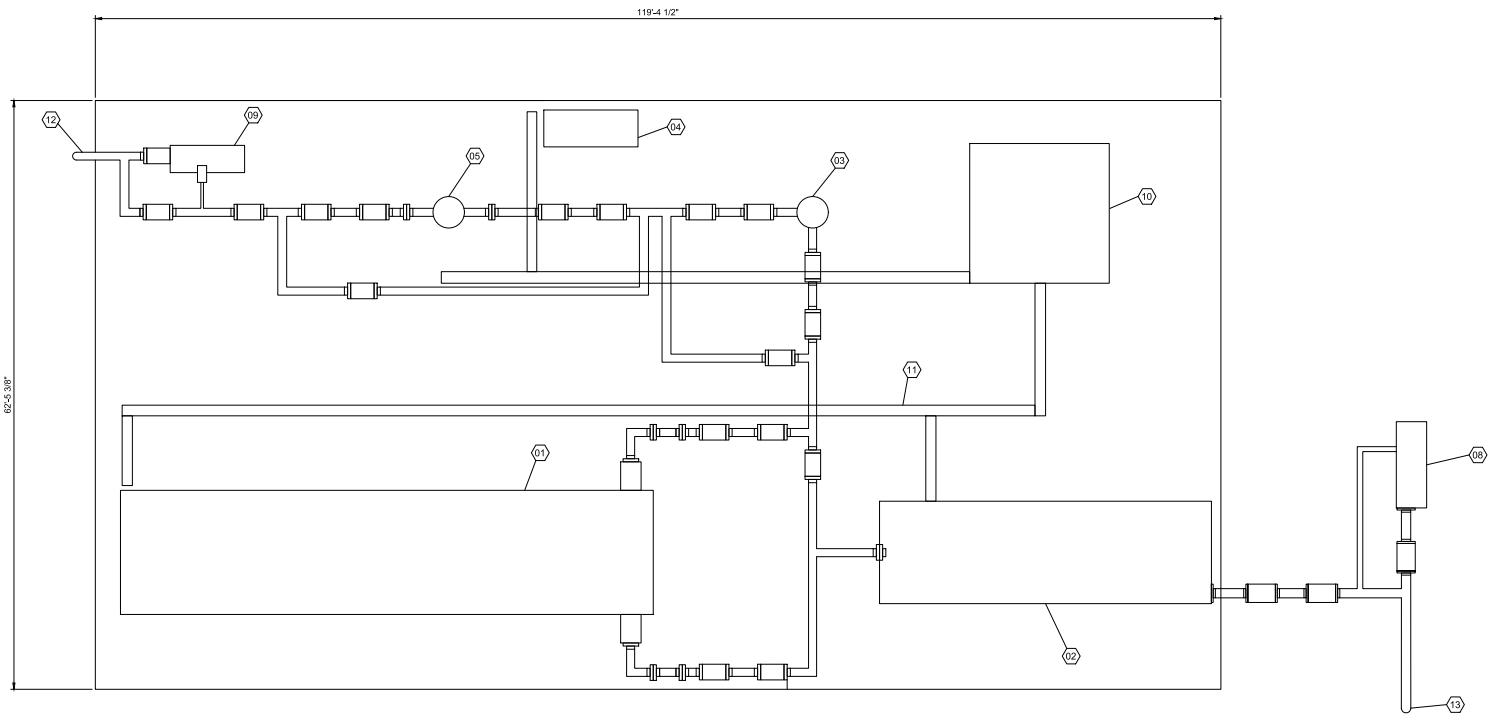
EKPC COOPER STATION
COOPER UNIT 2 CO-FIRE
OVERALL SITE PLAN

project 164713 | contract -

drawing GA001 | rev. D

sheet | of | sheets

file



SITE KEY

01	FUEL GAS HEATER
02	HP CONTROL SKID
03	FILTER / SEPARATOR
04	DRAINS TANK
05	KNOCKOUT DRUM
06	PIGGING STATION - CATCH ONLY
07	FUEL GAS CONDITIONING YARD
08	PIGGING STATION - LAUNCH TO UNIT 2
09	PIGGING STATION - RECEIPT FROM M&R YARD
10	ELECTRICAL/RIO ROOM
11	CABLE TRAY
12	SUPPLY FROM M&R YARD
13	SUPPLY TO UNIT 2

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
C	9/24/24	SAH	SAH	ISSUED WITH PSR
B	04/04/24	SAH	SAH	REVISED FOR ESTIMATE BASIS
A	02/02/24	KJC	XXX	ISSUED FOR OWNER REVIEW

SCALE 3/16" = 1'-0"

BURNS McDONNELL

Burns & McDonnell Engineering Company, Inc.
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

designed S. HUFF | detailed K. COSSETTE

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION
PULASKI COUNTY, KENTUCKY

EKPC COOPER STATION
COOPER UNIT 2 CO-FIRE
FUEL GAS CONDITIONING YARD PLAN

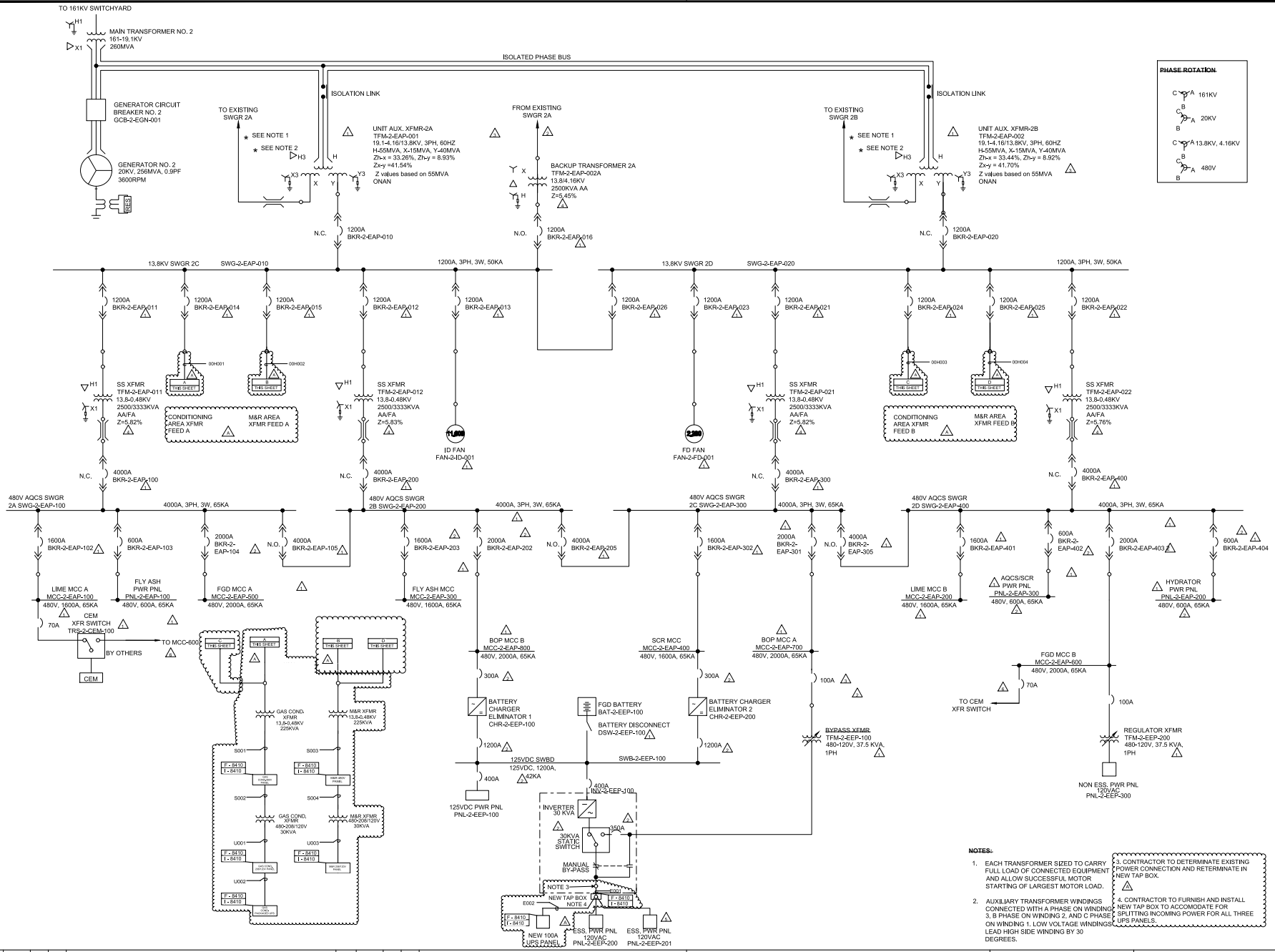
project 164713 | contract

drawing GA0002 | rev. C

sheet 1 of 1 sheets

file 164713GA0002

Z:\CLIENTS\ENR\EKPC\164713_COOPERCONV\PSR\2_DESIGN\MECH\DWGS\GNRL_ARRANGMNT\164713GA002.DWG 4/4/2024 SHUFF



no.	date	by	ckd	description
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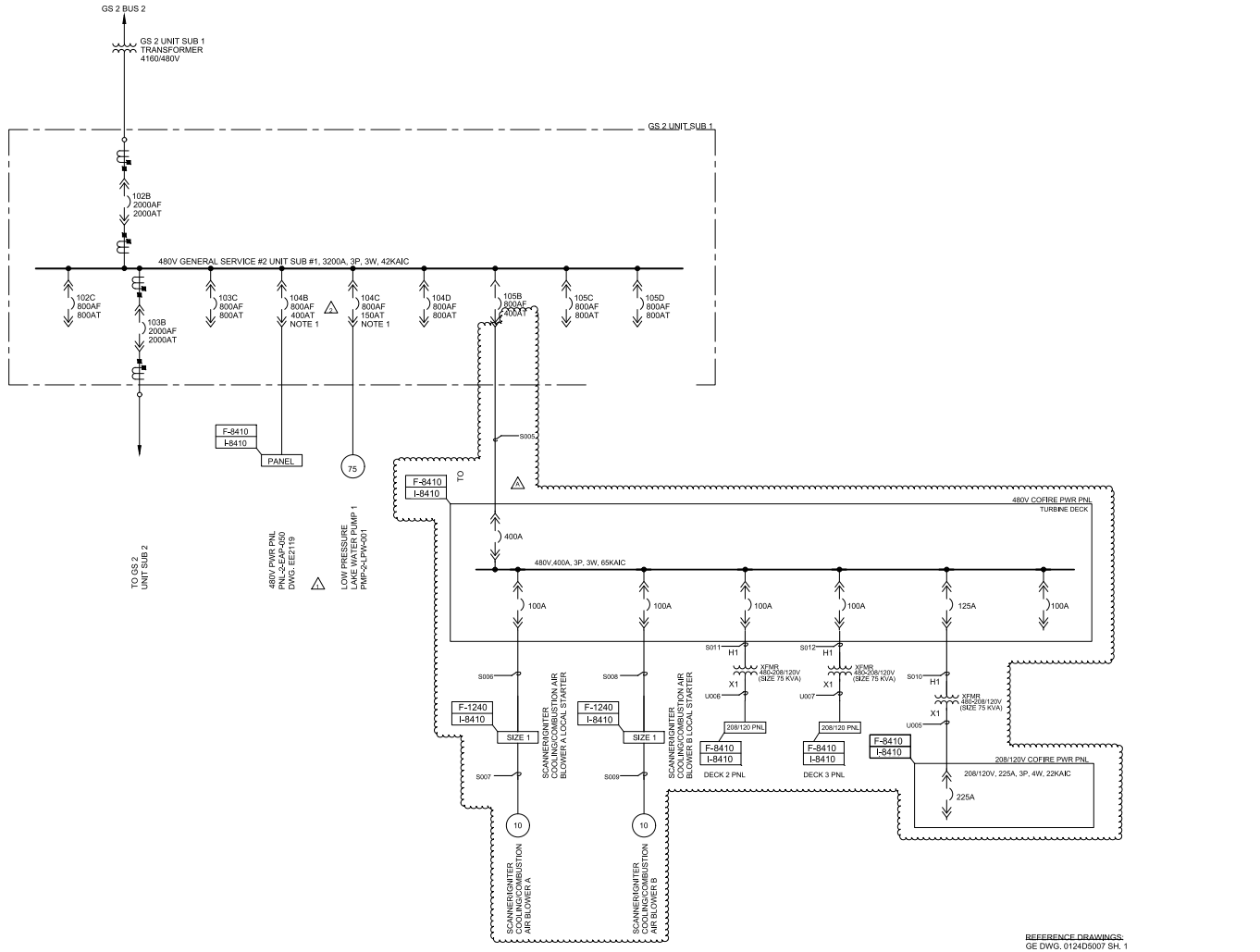
A	1/31/24	LDV	CDM	ISSUED FOR ESTIMATING

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed L. D. VO
detailed L. D. VO

EAST KENTUCKY POWER COOPERATIVE
COOPER UNIT 2 CO-FIRE
COOPER STATION
PULASKI COUNTY, KENTUCKY

COOPER POWER STATION
ELECTRICAL SKETCH
AQCS OVERALL ONE-LINE DIAGRAM

project 164713 | contract –
drawing SK-EE001 | rev. B
sheet 1 of 1 sheets
file 164713 SK-EE001



REFERENCE DRAWINGS:
GE DWG. 0124D5007 SH. 1

NOTES:
1. TRIP PLUGS TO BE SUPPLIED AND INSTALLED BY OWNER.

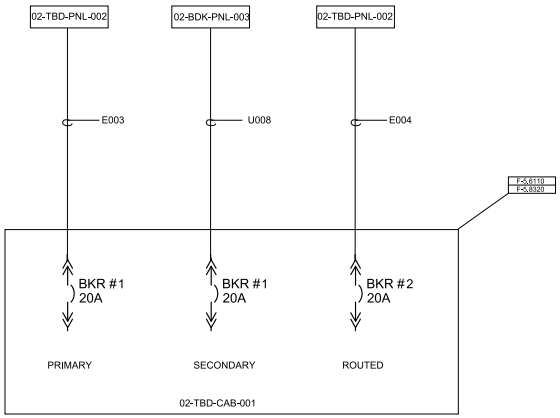
no.	date	by	ckd	description
B	9/24/24	LDV	CDM	ISSUED WITH PSR
A	1/31/24	LDV	CDM	ISSUED FOR ESTIMATING

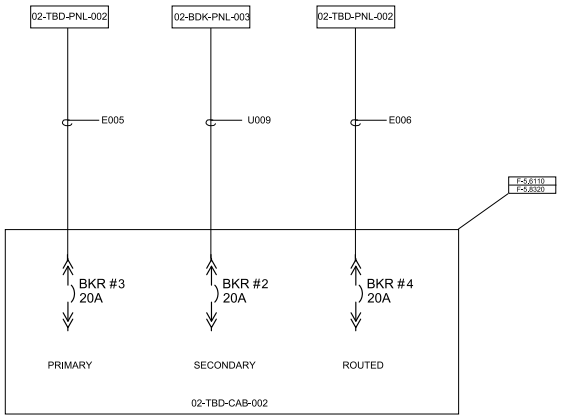
BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed L. D. VO
detailed L. D. VO

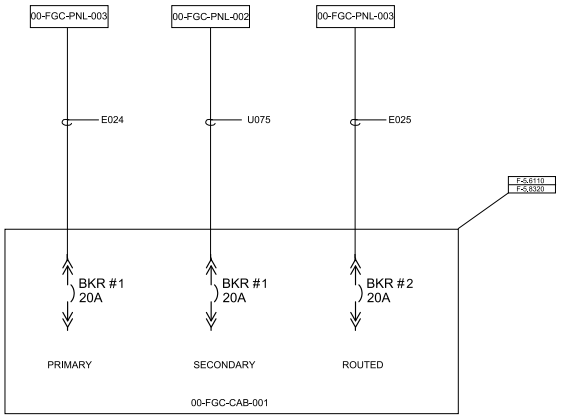
EAST KENTUCKY POWER COOPERATIVE
COOPER STATION
PULASKI COUNTY, KENTUCKY

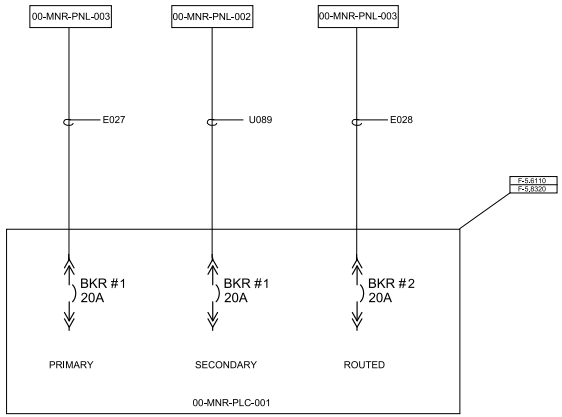
COOPER POWER STATION
ELECTRICAL SKETCH
480 VOLT SWITCHGEAR
GS 2 UNIT SUB 1
ONE-LINE DIAGRAM

project 164713 | contract —
drawing SK-EE002 | rev. B
sheet 1 of 1 sheets
file 164713 SK-EE002









no.	date	by	ckd	description
B	9/24/24	LDV	CDM	ISSUED WITH PSR
A	02/15/24	LDV	CDM	ISSUED FOR ESTIMATING

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed L. D. VO
detailed L. D. VO

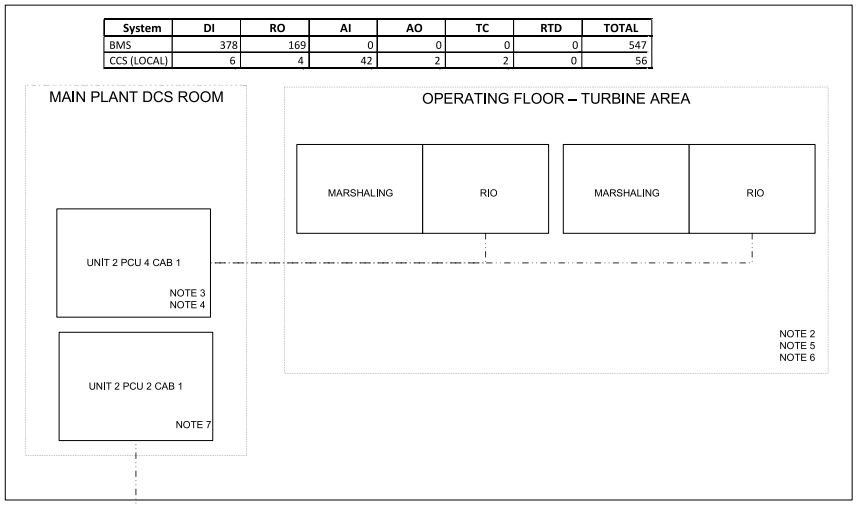
EAST KENTUCKY POWER COOPERATIVE
COOPER UNIT 2 CO-FIRE
COOPER STATION
PULASKI COUNTY, KENTUCKY

COOPER POWER STATION
ELECTRICAL SKETCH
COFIRE DCS CABINET
POWER

project 164713 | contract –
drawing SK-EE003 | rev. B
sheet 1 of 1 sheets
file 164713 SK-EE003

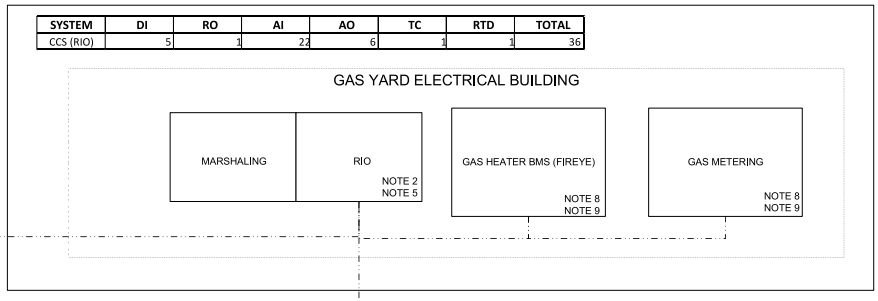
COOPER POWERHOUSE

System	DI	RO	AI	AO	TC	RTD	TOTAL
BMS	378	169	0	0	0	0	547
CCS (LOCAL)	6	4	42	2	2	0	56

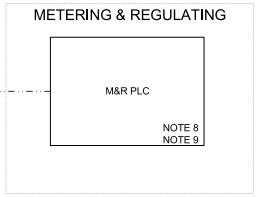


UNIT 2 FUEL GAS CONDITIONING AREA

SYSTEM	DI	RO	AI	AO	TC	RTD	TOTAL
CCS (RIO)	5	1	22	6	1	1	36



COOPER M&R BUILDING



no.	date	by	ckd	description
0	02/09/24	TD	CC	ISSUED FOR QOUTE
1	9/24/24	TD	CC	ISSUED WITH PSR

NOTES:

1. INTERNAL CONNECTIONS NOT SHOWN.
2. NEW EQUIPMENT.
3. EXISTING EQUIPMENT.
4. ADD NEW REDUNDANT BRC-410's AND ADD NEW REDUNDANT RIO MODULES.
5. S800 I/O.
6. INCLUDE MULTIPLYING MFT RELAYS DRIVEN FROM EXISTING MFT CABINET.
7. UTILIZE EXISTING SPARE FOR CCS I/O, REPLACE CCS (PCU2) BRC300's WITH REDUNDANT BRC410's, ADD REDUNDANT RIO MODULES FOR FUEL GAS CONDITIONING.
8. PLC BY OTHERS.
9. MODBUS TCP/IP DATALINK.

LEGEND:

REDUNDANT FIBEROPTIC CABLE: – · · – · · –

BURNS McDONNELL

date	detailed
02/09/2024	T. DORSNER
designed	checked
T. DORSNER	C. COONTS

EAST KENTUCKY POWER COOPERATIVE
A Touchstone Energy Cooperative

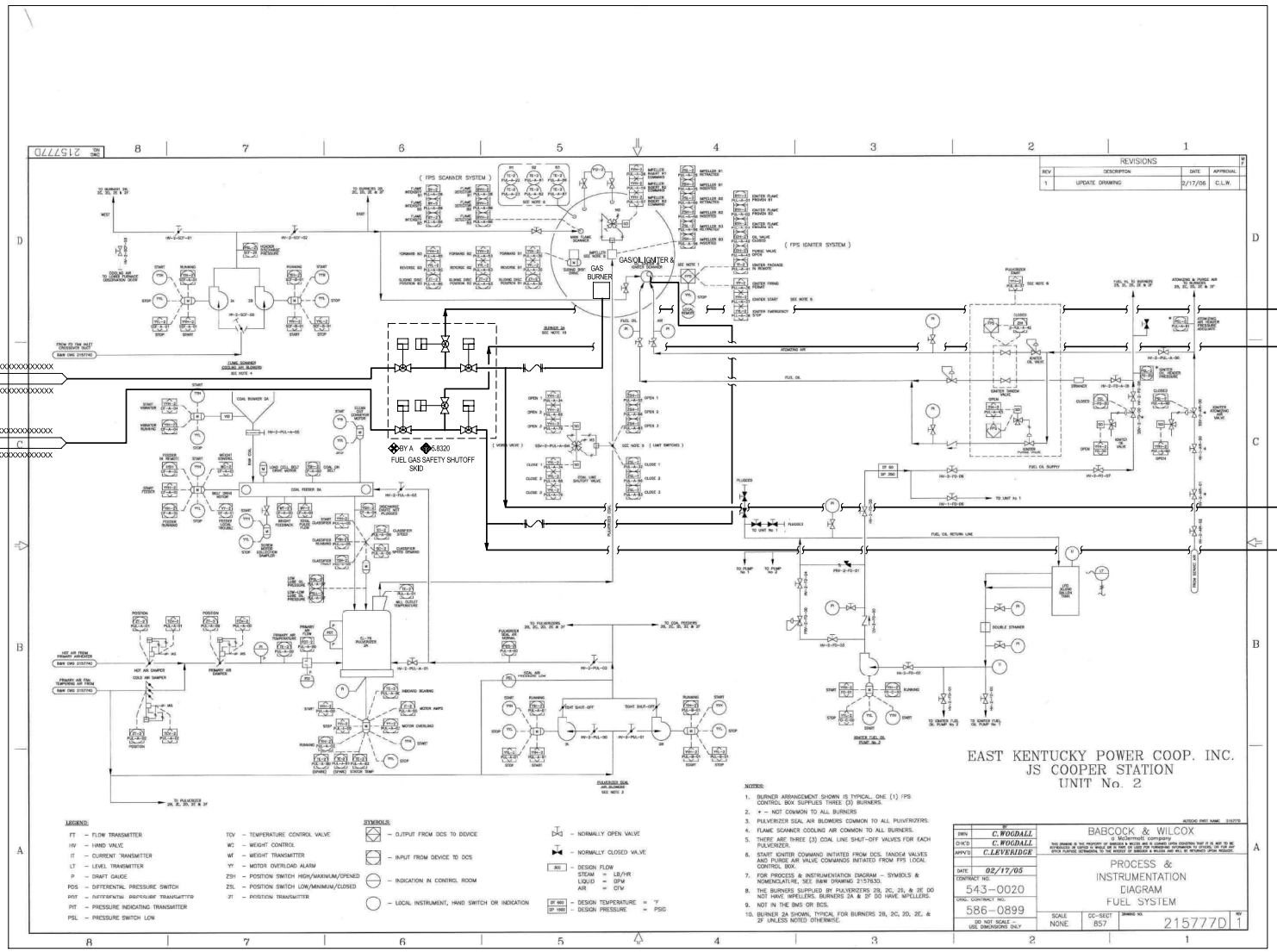
COOPER UNIT 2 CO-FIRE
PRELIMINARY
CONTROL SYSTEM ARCHITECTURE

project no.	contract no.
164713	5.6110

drawing no. SK-CSA-02 rev. 1

sheet 1 of 1 sheets

Millimeters
Scale For Microfilming
Inches



PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
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B	05/06/24	MMG	SAH	SCOPING UPDATE
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed S. Huff
detailed M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL SYSTEM P&ID

project 164713 | contract

drawing **215777D** | rev. **— C**

sheet | of | sheets

file 215777D.pid

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
B	9/24/24	MMG	SAH	ISSUED WITH PSR
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

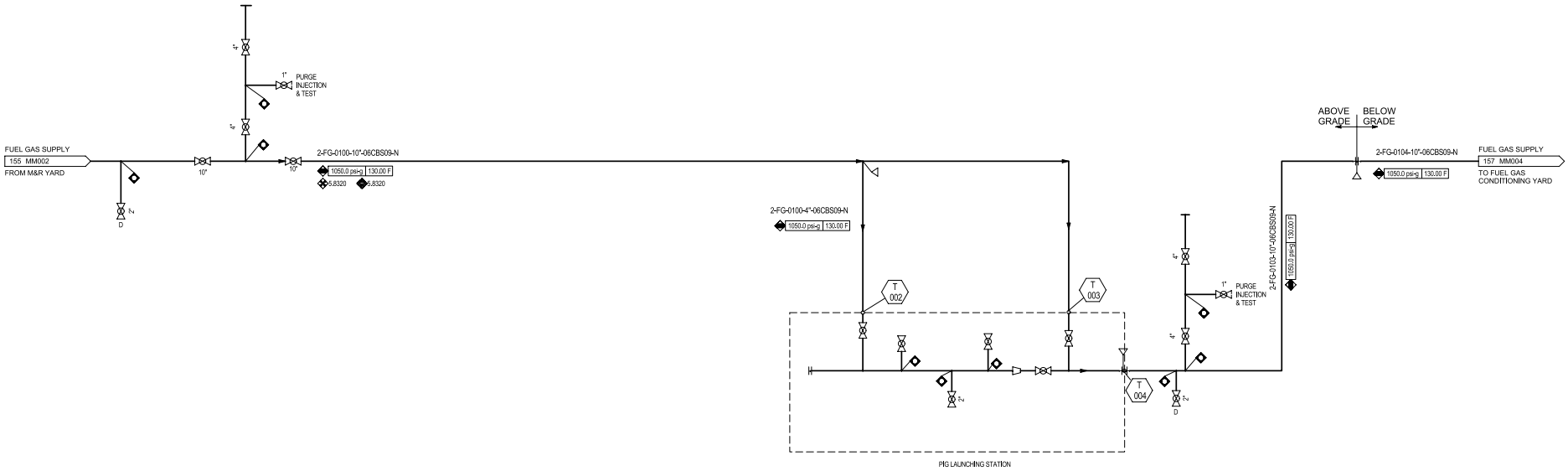
designed: S. Huff
detailed: M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION
PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL GAS METERING AND REGULATING STATION

project: 164713
contract:
drawing: MM002
rev.: – B
sheet: of: sheets:
file MM002.pid



Millimeters

Scale For Microfilming

Inches

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
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A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed S. Huff
detailed M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL GAS M&R PIGGING STATION

project 164713 | contract

drawing **MM003** | rev. **B**

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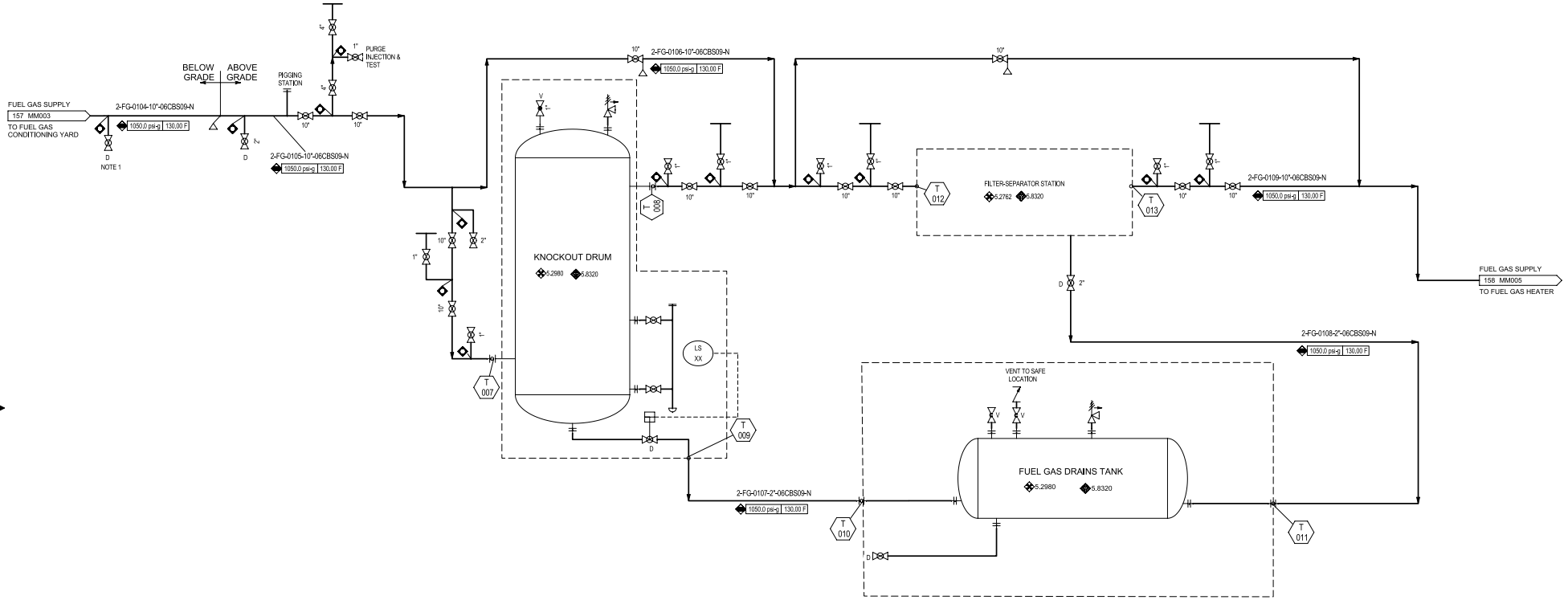
file MM003.pid



PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
B	9/24/24	MMG	SAH	ISSUED WITH PSR
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed S. Huff
detailed M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

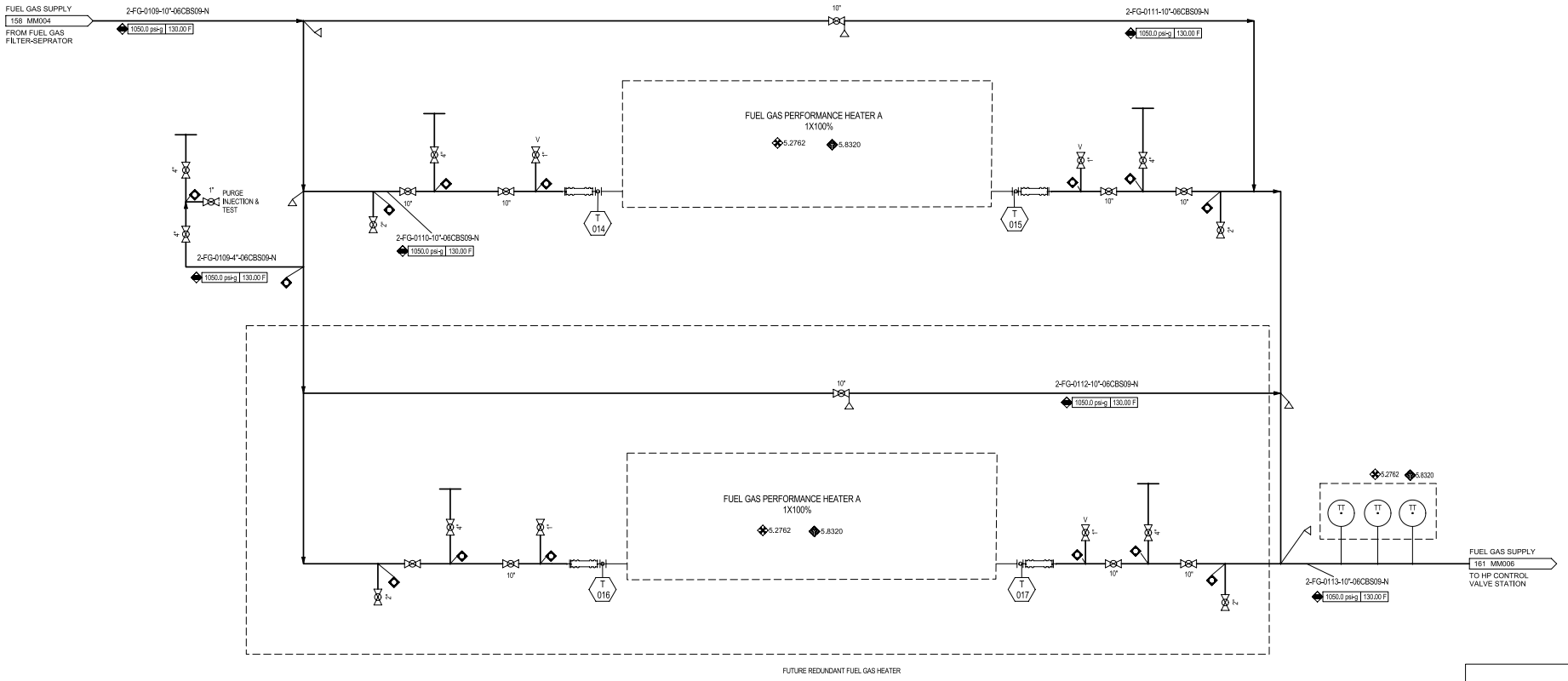
Piping & Instrumentation Diagram
FUEL GAS KNOCKOUT DRUM AND FILTER SEPARATOR

project 164713 | contract

drawing **MM004** | rev. **– B**

sheet | of | sheets

file MM004.pid



Millimeters

Scale For Microfilming

Inches

PRELIMINARY - NOT FOR CONSTRUCTION

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A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

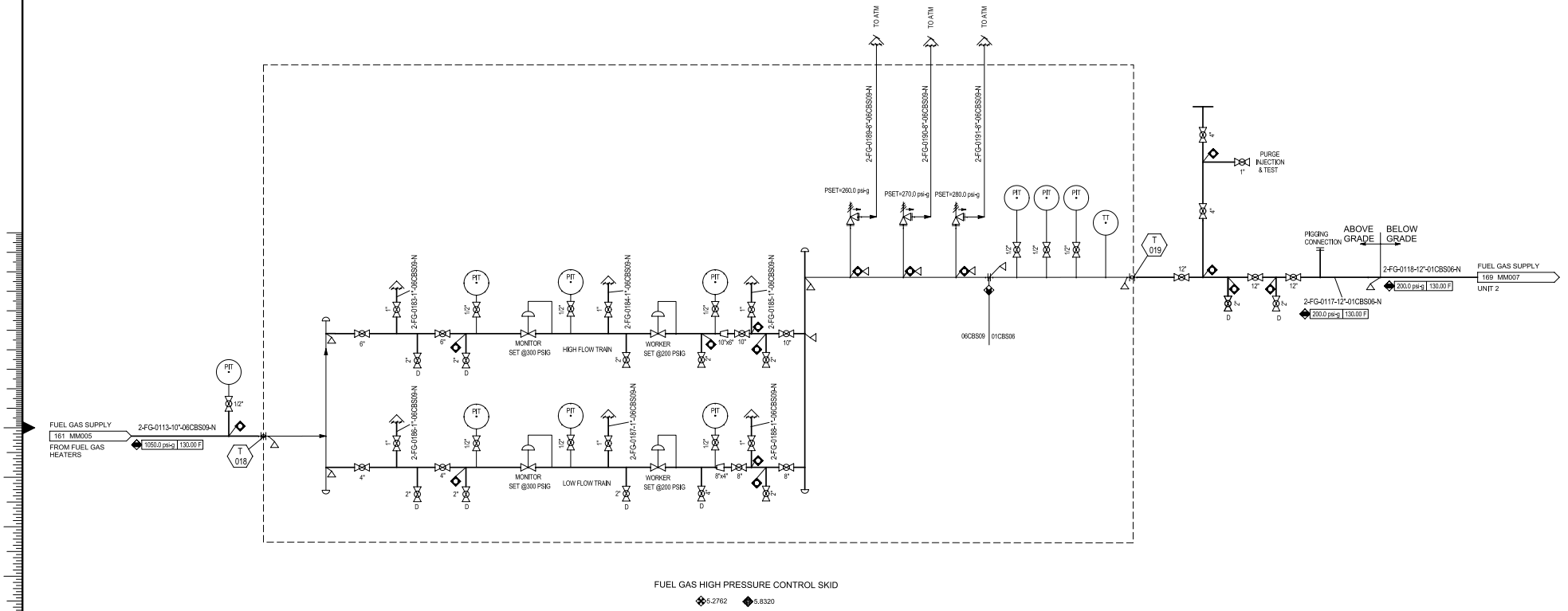
designed: S. Huff
detailed: M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION
PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL GAS DEW POINT HEATER P&ID

project: 164713
contract:
drawing: MM005
rev.: B
sheet: of sheets
file: MM005.pid



FUEL GAS HIGH PRESSURE CONTROL SKID

5.2762 5.8320

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
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A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed S. Huff
detailed M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL GAS HIGH PRESSURE CONTROL SKID P&ID

project 164713 | contract

drawing **MM006** | rev. **B**

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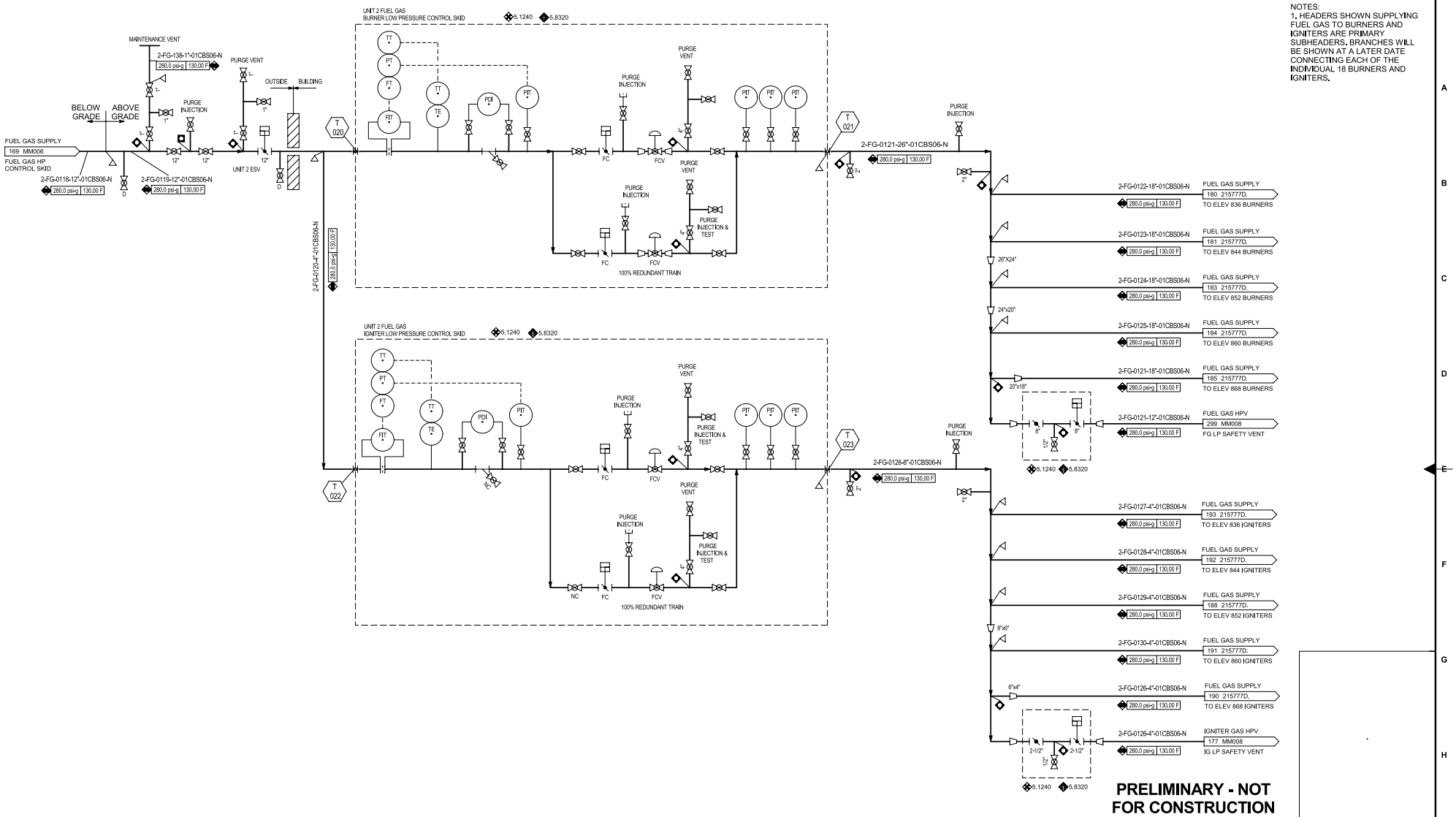
file MM006.pid



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B	05/06/24	MMG	SAH	SCOPING UPDATE
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

designed: S. Huff
detailed: M. Ghadigaonkar

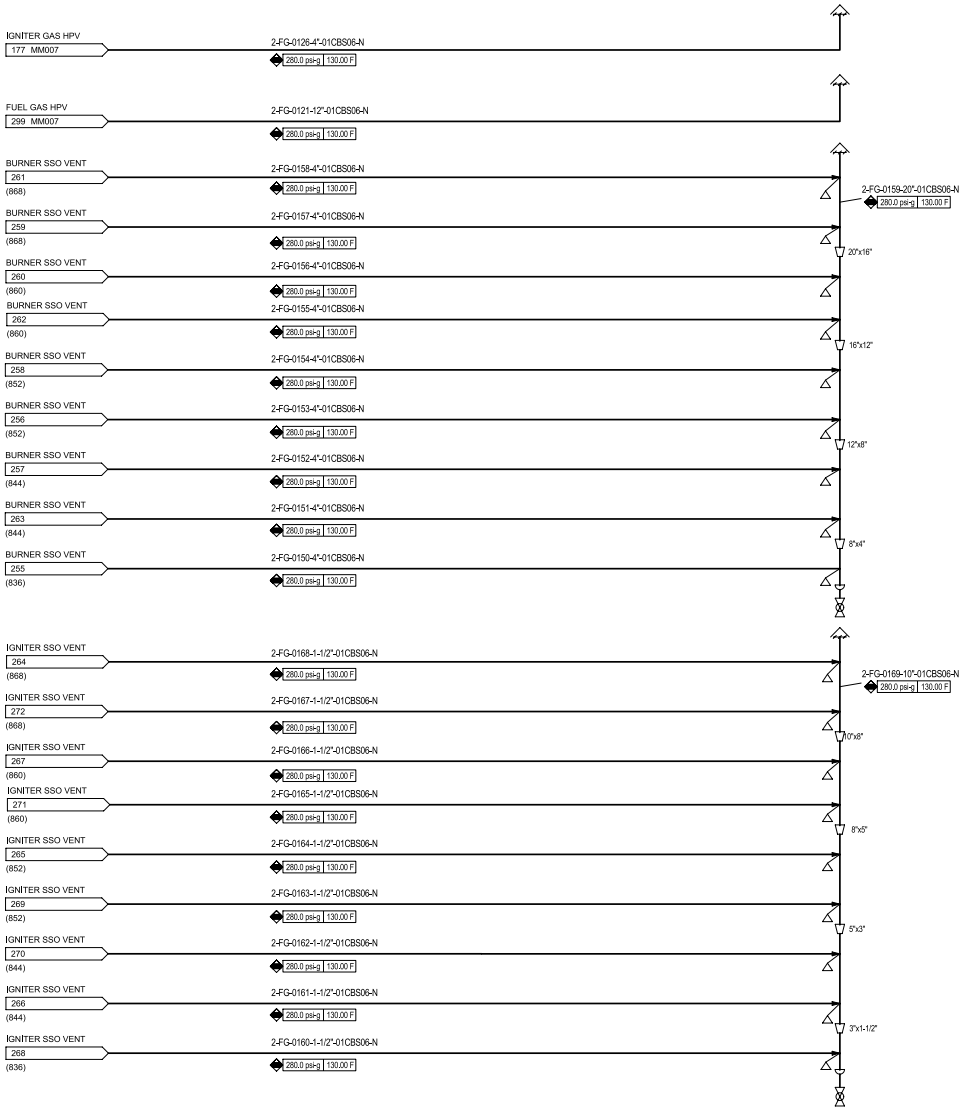
EAST KENTUCKY POWER COOPERATIVE

COOPER STATION
PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
FUEL GAS LOW PRESSURE CONTROL SKID P&ID

project: 164713
contract:
drawing: MM007
rev.: C
sheet: of sheets
file: MM007.pid

Millimeters
Scale For Microfilming
Inches



Millimeters

Inches

Scale For Microfilming

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
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B	05/06/24	MMG	SAH	SCOPING UPDATE
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

no.	date	by	ckd	description

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43
designed S. Huff
detailed M. Ghadigaonkar

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

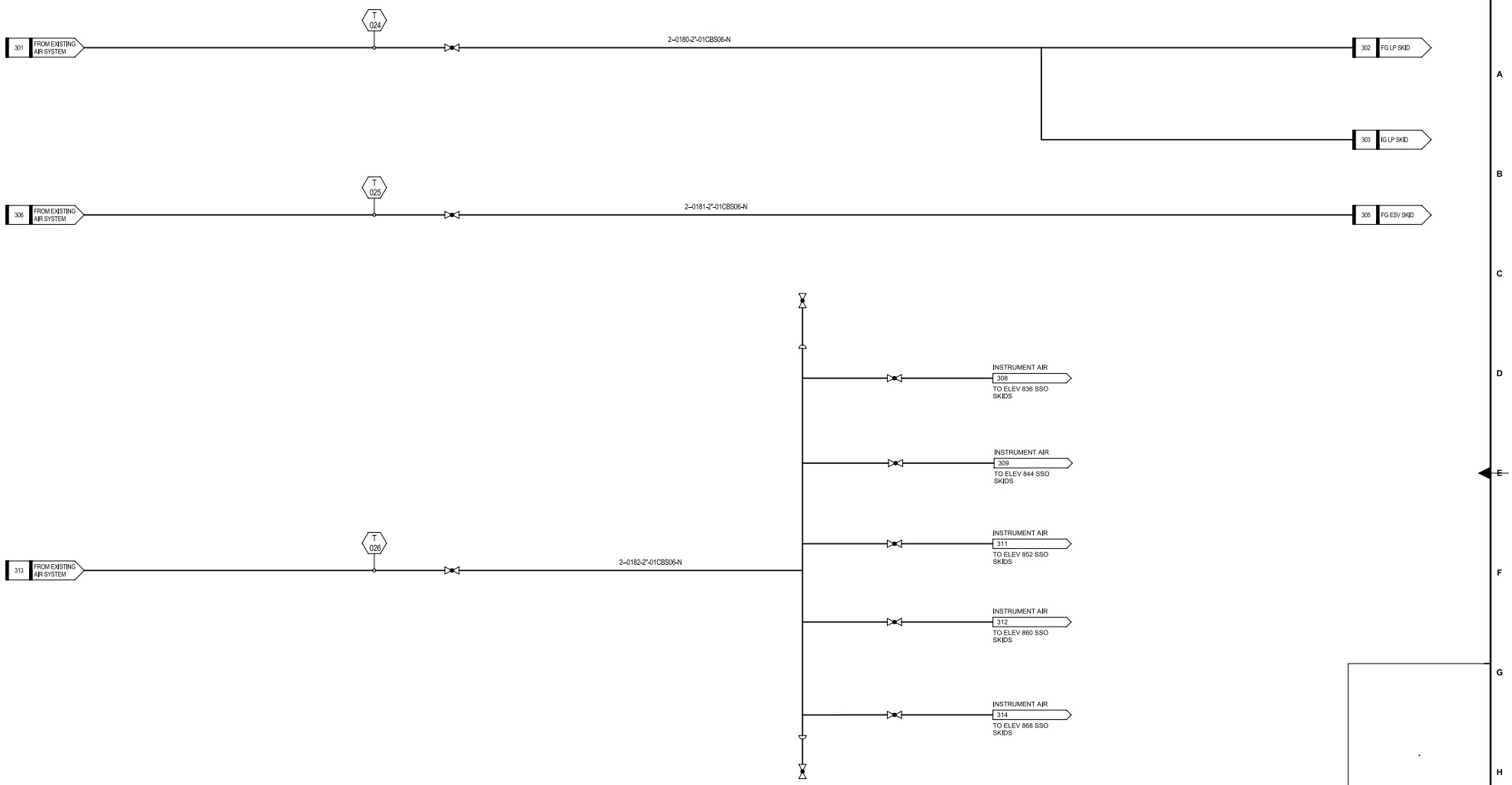
Piping & Instrumentation Diagram
FUEL GAS VENT

project 164713 | contract

drawing **MM008** | rev. **C**

sheet | of | sheets

file MM008.pid



Millimeters
Inches
Scale For Microfilming

PRELIMINARY - NOT FOR CONSTRUCTION

no.	date	by	ckd	description
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B	05/06/24	MMG	SAH	SCOPING UPDATE
A	02/23/24	MMG	SAH	ISSUED FOR BUDGETARY QUOTE

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
FIRM LICENSE NO. 43

designed S. HUFF | detailed A. KALE

EAST KENTUCKY POWER COOPERATIVE

COOPER STATION

PULASKI COUNTY, KENTUCKY

Piping & Instrumentation Diagram
COMPRESSED & INSTRUMENT AIR SYSTEM P&ID

project 164713 | contract

drawing **MM009** | rev. – C

sheet of sheets

file MM009.pid

APPENDIX F – HEAT BALANCE DIAGRAMS (NOT USED)

APPENDIX G – WATER BALANCE DIAGRAMS (NOT USED)

APPENDIX H – PRELIMINARY SUBSURFACE INVESTIGATION (NOT USED)

APPENDIX I – PRELIMINARY NOISE ASSESSMENT (NOT USED)

APPENDIX J – PERMITTING MATRIX

East Kentucky Power Cooperative (EKPC) Cooper Power Station
Coal to Gas Conversion and Addition of Natural Gas Combined Cycle (NGCC)
Permit Matrix

Item No.	Permit/Clearance	Regulatory Agency	Details	When Required	Comments
Federal					
1	Notice of Proposed Construction or Alteration	Federal Aviation Administration (FAA)	Must notify the FAA if structures will exceed 200 feet in height or if the structures (stacks & cranes) are located within the 100:1 (distance to height) ratio from the nearest point of the nearest FAA designated airport runway. Notifying the FAA includes completing Form 7460-1 for all required structures and providing a site layout map depicting structure locations.	Prior to construction	
2	Section 7 Threatened and Endangered Species Consultation and Clearance	U.S. Fish & Wildlife Service (FWS), Ecological Services	If the project will potentially impact protected species or their respective habitat, then the FWS must be contacted. The FWS will determine the level of effort needed for the project to proceed (e.g., habitat assessment, species surveys, avian impact studies, etc.).	Prior to construction	Because the facility site is previously disturbed, a habitat assessment may only be required, if routed through undisturbed areas. USFWS IPaC indicates that 14 Special Status species have potential to occur within Project Area. Habitat assessments and/or species surveys may be required to determine presence/absence of protected plant and wildlife species, including bats. Seasonal tree clearing restrictions may be imposed to avoid bat roosting periods.
3	Migratory Bird Treaty Act / Bald and Golden Eagle Protection Act Compliance	U.S. Fish & Wildlife Service (USFWS), Ecological Services	Required when construction or operation of a proposed facility could impact migratory birds and bald and golden eagles and/or their nests, and especially threatened or endangered species	Prior to construction	Because the facility site is previously disturbed, a habitat assessment may only be required, if routed through undisturbed areas. Nesting period for Migratory Birds within the Project Area is indicated by USFWS to be March 15 - August 31. If tree clearing must occur inside that window it is recommended that avian nest surveys be conducted no more than 5 days prior to clearing a given area. Bald Eagles are known to remain in nests year-round. Bald Eagle nests should be surveyed for during a site visit to determine if further consultation is required.
4	Spill Prevention, Control, and Countermeasure (SPCC) Plan	U.S. Environmental Protection Agency	Required if the facility will have 1,320 gallons or more of aboveground petroleum storage capacity in 55-gallon-sized or larger containers (or 42,000 gallons in underground storage not regulated by underground storage tank rules)	Prior to storage of petroleum products onsite in excess of SPCC thresholds	
5	Permits under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act	U.S. Army Corps of Engineers (USACE) Nashville District	Nationwide Permit: Less than or equal to 0.5 acre of wetland impacts Individual Permit: Greater than 0.5 acre of wetland or stream impacts Section 10 Authorization for any structures within or over any navigable waters of the U.S.	Prior to construction start and activities within wetland areas. Section 404 authorization required to dredge or place fill in a jurisdictional water, including wetlands. Section 10 authorization required for crossings/activities within any navigable waterways.	A wetland delineation will be required to determine the extent of wetland and stream impacts associated with the Project. If permanent impacts to wetlands and streams are less than 0.5-acre total, Project would qualify for a Nationwide Permit. Mitigation credits would be required for cumulative permanent impacts of 0.10 acre or greater of wetlands and waterbodies. A pre-construction notification (PCN) will likely be required.
6	Prime Farmland Consultation under the Farmland Protection Policy Act (FPPA)	U.S. Department of Agriculture- Farm Service Agency and Natural Resources Conservation Service (NRCS)	FPPA consultation form AD-1006; coordination on erosion and sedimentation controls (ESC) and seed mixes; potential NRCS consultation for Conservation and/or Wetland Reserve Programs	Prior to construction	Contractor will fill out form AD-1006 and submit to NRCS for review and scoring (NRCS has 45 days to make determination and return the form). For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).
State - Kentucky					
7	National Environmental Policy Act (NEPA) Review	Lead Federal agency	Required pursuant to NEPA for public disclosure of environmental impacts resulting from Federal actions. Process can be a phased approach. The applicant typically prepares a preliminary Environmental Assessment (EA). The agency reviews the document and can either attach a Finding of No Significant Impact or require the preparation of an Environmental Impact Statement (EIS).	Prior to construction	
8	Certificate of Public Convenience and Necessity	Kentucky Public Service Commission	Required for the construction of electric generating facilities	Prior to construction	A Notice of Intent must be submitted at least 30 days prior to submitting an application for a certificate.
9	Site Compatibility Certificate	Kentucky Public Service Commission	Required for the construction of electric generating facilities 10 MW or greater	Prior to construction	The site compatibility certificate application will include a site assessment report. Documentation of compliance with NEPA may be submitted in lieu of a site assessment report.
10	Air Quality Construction / Operating Permit (PSD and Title V permit Update)	Kentucky Department of Environmental Protection Division for Air Quality	New Source Review construction permit is required for new major stationary sources of air emissions, and Title V operating permit is required if more than 100 TPY of any non-hazardous regulated air pollutant is emitted	Prior to construction	Replacement of burner can only likely be accomplished with a State permit (Prevention of Significant Deterioration [PSD] minor). The addition of a new combined-cycle unit will likely trigger PSD major source permitting for at least one pollutant, although several pollutants should be able to "net out" of PSD. The existing Title V operating permit will need to be updated.
11	Noise Compliance	Kentucky Public Service Commission (as a part of a larger certificate application).	Required to demonstrate that facility operation will comply with State, county, and city noise regulations. The PSC may require/request additional noise mitigation measures.	Prior to construction	City has local regulations based on time of day and receiving land use that will need to be analyzed for the surrounding area and modeled to determine compliance. Review of County ordinances did not find any numerical noise limits. Any compressors along the pipeline and booster stations will be required to meet the FERC limit of an Ldn of 55 dBA.
12	Section 401 Water Quality Certification (WQC)	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	Authorizes work and placement of dredged or fill material within waters of the State. General 401 Certification with approved USACE Nationwide Permit assuming project meets conditions listed in the Kentucky Energy and Environment Cabinet DEP *General Certification--Nationwide Permit (NWP)* document for NWP 57. Individual 401 Certification required if Project is unable to meet conditions listed in the *General Certification--Nationwide Permit (NWP)* document.	Prior to construction	This permit provides Section 401 WQC and floodplain construction approval. The purpose of the WQC is to confirm that the discharge of fill materials will be in compliance with the State's applicable water quality standards. Assumes automatic Water Quality Certification authorization through a USACE Nationwide Permit. The permit application must be reviewed and signed by the local county floodplain coordinator(s) prior to submitting the application to the State.

East Kentucky Power Cooperative (EKPC) Cooper Power Station
Coal to Gas Conversion and Addition of Natural Gas Combined Cycle (NGCC)
Permit Matrix

Item No.	Permit/Clearance	Regulatory Agency	Details	When Required	Comments
13	Floodplain Development Permit	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	Authorizes construction and development activities along, or adjacent to a stream, or within a floodway. General Permit KY FPGP if Project meets eligibility requirements listed in Section 2.2 of KY FPGP and does not increase the Base Flood Elevation Individual Permit if Project is unable to meet eligibility requirements in Section 2.2 of KY FPGP or has potential to increase the Base Flood Elevation.	Prior to construction	
14	Groundwater Protection Plan	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	Required for activities that have the potential to pollute groundwater. The Groundwater Protection Plan must define best management practices for groundwater protection.	Prior to operation	The Groundwater Protection Plan is not submitted for review unless requested by the State.
15	One-Time/Temporary Discharge Request for Off-Permit Authorization (hydrostatic testing)	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	Required prior to discharging waters used for hydrostatic testing pipelines and/or tanks.	Prior to testing	
16	Water Withdrawal Permit **(NOT REQUIRED)**	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	According to the Kentucky Department of Environmental Protection, withdrawals of water greater than 10,000 gallons per day from any surface, spring, or groundwater source, with the exception of water required for steam-powered electrical generating plants whose retail rates are regulated by the Kentucky Public Service Commission or for which facilities a certificate of environmental compatibility from such commission is required by law, require a Water Withdrawal Permit.		
17	General Permit for Stormwater Discharges Associated with Construction Activities	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	Required for all stormwater discharges from construction activities which will disturb of one or more total acres of land. The General Permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP) prior to submitting a Notice of Intent for permit coverage.	Prior to construction	The permit also authorizes the discharge of construction dewatering waters if managed through the use of appropriate best management practices.
18	KPDES Operational Discharge Permit (Modification to KY0003611)	Kentucky Energy and Environment Cabinet Department of Environmental Protection Division of Water	A modification to NPDES Permit No. KY0003611 will be required if the quantity or quality of wastewater discharged from the plant site to Lake Cumberland will change as a result of project activities. Changes to existing outfalls or the need for additional outfalls would also require a permit modification.	Prior to operation	Project changes will also require a modification to the site's operational SWPPP.
19	National Historic Preservation Act (NHPA) – Section 106 Consultation	Kentucky Heritage Council - State Historic Preservation Office (SHPO)	Under Section 106 of the National Historic Preservation Act, Federal agencies must work with the State Historic Preservation Office to address historic preservation issues when planning projects or issuing funds or permits that may affect historic properties and archaeological resources listed in or determined eligible for the National Register of Historic Places.	Prior to approval of expenditure of federal funds or prior to issuance of a license	Because the facility site is previously disturbed, a Section 106 occurrence may only be required, if routed through undisturbed areas.
20	Threatened & Endangered Species Clearance (State)	Kentucky Department of Fish and Wildlife Resources, Office of Kentucky State Nature Preserves, Kentucky Energy and Environment Cabinet	Recommended for Projects with potential to impact state threatened and/or endangered species.	Prior to construction	Because the facility site is previously disturbed, a habitat assessment may only be required, if routed through undisturbed areas. Desktop review conducted, 2 special status species have been historically observed within the Project footprint; 8 special status species have been observed within 1-mile of the Project footprint.
21	Right-of-Way Certification	Kentucky Transportation Cabinet	Required if any part of the facility (including pipelines) will be constructed within State road rights-of-way.	Prior to construction	
County					
22	Building Permit	Pulaski County	Required for non-residential projects	Prior to construction	
Tribal Permits					
23	Section 106 of the National Historic Preservation Act	Tribal Consultations	Coordination with local tribes required as part of Section 106 consultation	Prior to approval of expenditure of federal funds or prior to issuance of a license	

APPENDIX K – TIE-IN LIST

Mechanical Interface List

COOPER STATION UNIT 2 CO-FIRE PROJECT

EAST KENTUCKY POWER COOPERATIVE

Project Number: 164713

ISSUED FOR PSR

Rev: A

3/1/2024

PRELIMINARY - NOT FOR CONSTRUCTION

				Approximate Coordinates									
Terminal Point Number (T)	System	Description/Comment	Drawing	Northing (ft)	Easting (ft)	Grade Status	Elevation from Grade (ft)	Expected Connection Size	Connection Type and Rating	Maximum Pressure (psig)	Maximum Temperature (F)	P&ID Drawing Number	Other requirements/ comments
T-001	FG	Fuel Gas Connection to M&R Yard. Assumed 6' outside the Fenceline	GA0001	TBD	TBD	AG	4	10	CL600 RFFE	1050	130	MM002	
T-024	ACA	CONNECTION TO EXISTING COMPRESSED AIR SYSTEM	GA0001	TBD	TBD	AG	10	2	CL150 BWE	150	120	MM009	
T-025	ACA	CONNECTION TO EXISTING COMPRESSED AIR SYSTEM	GA0001	TBD	TBD	AG	10	2	CL150 BWE	150	120	MM009	
T-026	ACA	CONNECTION TO EXISTING COMPRESSED AIR SYSTEM	GA0001	TBD	TBD	AG	10	2	CL150 BWE	150	120	MM009	
T-027	FP	CONNECTION TO EXISTING FIRE PROTECTION SYSTEM NEAR WAREHOUSE	GA0001	TBD	TBD	BG	-3	6	CL150 CAST IRON MECHANICAL COUPLING	175	110	N/A	
T-028	PW	POTABLE WATER SUPPLY TO EYE WASH STATION	GA0001	TBD	TBD	BG	-3	2	TBD	150	100	N/A	NSF-61 DRINKING WATER, REQUIREMENTS PROVIDED LATER
T-029	PW	POTABLE WATER RETURN FROM EYE WASH HEATER	GA0001	TBD	TBD	BG	-3	2	TBD	150	100	N/A	NSF-61 DRINKING WATER, REQUIREMENTS PROVIDED LATER

Notes:

BURNS McDONNELL

ELECTRICAL Interface List

COOPER STATION UNIT 2 CO-FIRE PROJECT

EAST KENTUCKY POWER COOPERATIVE

Project Number: 164713

ISSUED FOR ESTIMATING

Rev: A

7/11/2024

PRELIMINARY - NOT FOR CONSTRUCTION

						Approximate Coordinates				
Terminal Point Number (T)	System	Description/Comment	BREAKER	ASSOCIATED CABLE	Drawing	Northing (ft)	Easting (ft)	Grade Status	Expected CABLE Connection Size	Other requirements/ comments
T-001	FGC	480V SWITCH GEAR IN PDC: SWG-2-EAP-010	BKR-2-EAP-014	00H001 FEED TO FGC XFMR	164713 SK-EP304	TBD	TBD	AG	1-3/C#4/0AWG W/GND	REMOVED FOR 50%
T-002	M&R	480V SWITCH GEAR IN PDC: SWG-2-EAP-010	BKR-2-EAP-015	00H002 FEED TO M&R XFMR	164713 SK-EP304	TBD	TBD	AG	1-3/C#4/0AWG W/GND	REMOVED FOR 50%
T-003	FGC	480V SWITCH GEAR IN PDC: SWG-2-EAP-014	BKR-2-EAP-024	00H003 FEED TO FGC XFMR	164713 SK-EP304	TBD	TBD	AG	1-3/C#4/0AWG W/GND	REMOVED FOR 50%
T-004	M&R	480V SWITCH GEAR IN PDC: SWG-2-EAP-014	BKR-2-EAP-025	00H004 FEED TO M&R XFMR	164713 SK-EP304	TBD	TBD	AG	1-3/C#4/0AWG W/GND	REMOVED FOR 50%
T-005	TURBINE DECK UPS	EXISTING INVERTER IN PDC: INV-2-EEP-100	TBD	00E001 FEED TO UPS PANEL	164713 SK-EP304	TBD	TBD	AG	1-2/C#2AWG W/GND	REMOVED FOR 50%
T-006	TURBINE DECK POWER	EXISTING 480V GENERAL SERVICE #2 SUB #1 IN UNIT 2 BUILDING: 02-EXG-GS-001	BKR 105B	025005 TO 480V POWER PANEL	N/A	TBD	TBD	AG	3-1/C#750MCM	
T-007	FGC	EXISTING POLE DROP NORTH OF FGC: 00-EXG-PD-001	TBD	005032 FEED TO FGC XFMR	N/A	TBD	TBD	BG	1-3/C#1/0AWG W/GND	ADDED FOR 50%
T-008	TURBINE DECK COMMUNICATIONS	EXISTING DCS CABINET IN UNIT 2 DCS ROOM: 02-EXG-CAB-001	N/A	020001, COMMUNICATION TO M&R PLC	164713 SK-EP303	TBD	TBD	AG	1-12CT MULTI-MODE FIBER	
T-009	TURBINE DECK GROUNDING	EXOTHERMIC WELD FROM GROUND BAR TO EXISTING GROUNDED STEEL	N/A	N/A	164713 SK-EP200	TBD	TBD	AG	FT OF BC2 4/0 BARE COPPER GROUNDING	
T-010	DUCT BANK, FGC, AND M&R	EXOTHERMIC WELD FROM EXISTING UNIT 2 GROUNDED STEEL	N/A	N/A	164713 SK-EP304	TBD	TBD	BG	FT OF BC2 4/0 BARE COPPER GROUNDING	

Notes:

APPENDIX L – DESIGN FUEL BASIS

ADS 1B10-3

UTILITY BOILER PERFORMANCE SUMMARY

A — FUEL AS FIRED

		Design	Perf.
SAMPLES			
ANALYSES	Specified		
COAL — KIND			
ASTM — CLASS			
ASTM — GROUP			
ASTM — MINE			
SOURCE — SEAM			
SOURCE — DISTRICT			
SOURCE — COUNTY			
SOURCE — STATE		Kentucky	
SIZE		3/4"-0	3/4"-0
GRINDOABILITY		42	42
SURFACE MOISTURE, %		7	4
ASH SOFT. TEMP.. F (REDUCING)		2050	2200
PROX. ANAL. % — MOISTURE, TOTAL		8.0	5.0
PROX. ANAL. % — VOLATILE MATTER		33.0	35.5
PROX. ANAL. % — FIXED CARBON		46.5	50.0
PROX. ANAL. % — ASH		12.5	9.5
PROX. ANAL. % — TOTAL		100.0	100.0
ULTIMATE ANALYSIS — FUEL		Coal	Coal
% BY		Wt.	Wt.
ASH		12.5	9.5
S		4.5	3.0
H_2		4.2	4.6
C		63.5	69.8
CH_4			
C_2H_4			
C_2H_6			
C_3H_8			
C_4H_{10}			
C_5H_{12}			
C_6H_{14}			
CO			
CO_2			
SO_2			
H_2O		8.0	5.0
N_2		1.2	1.4
O_2		6.1	6.7
TOTAL		100.0	100.0
BTU/LB		11,600	12,600
BTU/CU FT AT 60F 30 IN. HG			

B — PREDICTED PERFORMANCE

STEAM LEAVING SH. M LB/HR	620	930	1240	1550
STEAM LEAVING RH1, M LB/HR	570	850	1120	1390
STEAM LEAVING RH2, M LB/HR				
TYPE OF FUEL	Coal	Coal	Coal	Coal
LOAD DURATION	Cont.	Cont.	Cont.	Max. Cont.
EXCESS AIR LEAVING ECON., %	49	46	24	18
NO. OF BURNERS IN OPERATION	9	12	15	18
FUEL INPUT, MKB/HR		1378	1755	2089
HEAT AVAIL. MKB/HR (FUEL & HEATED AIR)		1418	1811	2165
QUANTITY, M LB/HR — FUEL (MCFH-NAT. GAS)		109.6	139.2	165.7
QUANTITY, M LB/HR — FUEL GAS ENTERING AIR HEATER		1630	1775	2032
QUANTITY, M LB/HR — AIR LEAVING SEC. AH & PRI. AH		1415	1590	1822
QUANTITY, M LB/HR — AIR HEATER LEAKAGE		82	88	100
Recirculated Gas		0	0	0
PRESSURE, PSIG — STEAM AT SH OUTLET	1815	1832	1858	1890
PRESSURE, PSIG — STEAM AT RH_1 outlet	150	231	331	446
STEAM AT RH_2 outlet				
PRESSURE DROP — REHEATER 1		9	16	25
PRESSURE DROP — REHEATER 2				
PRESSURE DROP — ECONOMIZER		6	10	15
PRESSURE DROP — Drum TO SH OUTLET		26	77	120
TEMPERATURE, F — STEAM — LEAVING SUPERHEATER	1005	1005	1005	1005
TEMPERATURE, F — STEAM — LEAVING REHEATER 1	960	1005	1005	1005
TEMPERATURE, F — STEAM — ENTERING REHEATER 1	570	590	620	670
TEMPERATURE, F — STEAM — LEAVING REHEATER 2				
TEMPERATURE, F — STEAM — ENTERING REHEATER 2				
TEMPERATURE, F — FLUE GAS — LEAVING ECONOMIZER		595	615	645
TEMPERATURE, F — FLUE GAS — LEAVING AH (EXCL. LKG)		298	293	300
TEMPERATURE, F — FLUE GAS — LEAVING AH (INCL. LKG)		287	283	288
TEMPERATURE, F — FLUE GAS — WATER ENTERING ECONOMIZER	367	400	425	460
TEMPERATURE, F — AIR — ENTERING AIR HEATER Pri/Sec	105/90	105/90	105/90	105/90
TEMPERATURE, F — AIR — LEAVING AIR HEATER Sec		545	550	575
RESISTANCE, IN. OF WATER — GAS — FURNACE & CONVECTION BANKS		4.1	4.9	6.4
RESISTANCE, IN. OF WATER — GAS — FLUES TO AH OUTLET		0.8	0.9	1.2
RESISTANCE, IN. OF WATER — GAS — AIR HEATER		3.2	3.8	5.0
RESISTANCE, IN. OF WATER — GAS — Dust Collector		1.9	2.3	3.0
RESISTANCE, IN. OF WATER — AIR — FUEL BURNERS & WINDBOX		2.5	2.0	1.7
RESISTANCE, IN. OF WATER — AIR — DUCTS & FLOW METER & S.C.A.H		1.4	2.6	3.6
RESISTANCE, IN. OF WATER — AIR — AIR HEATER		2.4	3.1	4.0
TOT. FROM FD Fan Inlet To Stack		16.3	19.6	24.9
HEAT LOSS, % — DRY GAS		5.52	4.63	4.63
HEAT LOSS, % — H_2 & H_2O IN FUEL		4.16	4.16	4.15
HEAT LOSS, % — MOISTURE IN AIR		0.14	0.11	0.11
HEAT LOSS, % — UNBURNED COMBUSTIBLE		0.30	0.30	0.30
HEAT LOSS, % — RADIATION		0.32	0.24	0.19
HEAT LOSS, % — UNACC. FOR & MFRS. MARGIN		1.50	1.50	1.50
TOTAL HEAT LOSS		11.94	10.94	10.88
EFFICIENCY OF UNIT, %		88.06	89.06	89.12
PULV. & FEEDER — NO. IN USE PER BOILER	3	4	5	5 6
PULV. & FEEDER — TOTAL POWER, KW HR/TON MOTOR Input		12.7	12.6	11.6 12.7
PULV. & FEEDER — % THRU 200 U.S.S. SIEVE		75	75	70 75

PREDICTED PERFORMANCE IS BASED ON COMBUSTION AIR ENTERING UNIT WITH 0.013 LB MOISTURE/LB DRY AIR, ON 29.0 IN. HG. BAROMETRIC PRESSURE, ON CONDITIONS & EQUIPMENT GIVEN ON THIS SUMMARY SHEET & ON ARRANGEMENT SHOWN ON DRAWING P11-454-4X1

C — EQUIPMENT PER UNIT

TYPE	Radiant	
SIZE	RBC - 2 42 HR	
Design Pressure	2150 PSIG.	
PRESSURE PART HEATING SURFACE, SQ FT — FURNACE	WATER COOLED SCREEN (CIRCUMFERENTIAL)	
	WATER COOLED (PROJECTED)	21349
	SUPERHEATER (CIRCUMFERENTIAL)	5789
	SUPERHEATER (PROJECTED)	
	Roof Superheat (Projected)	752
	TOTAL FURNACE HEATING SURFACE	27890
CONVECTION	SATURATED (CIRCUMFERENTIAL)	4153
	SUPERHEATER (CIRCUMFERENTIAL)	86227
	REHEATER 1 (CIRCUMFERENTIAL))	30638
	REHEATER 2 (CIRCUMFERENTIAL)	
	ECONOMIZER (Circumferential)	40128
	TOTAL CONVECTION HEATING SURFACE	161146
TOTAL FURN. & CONV. PRESSURE PART. HTG. SURF.		189036
FLAT PROJECTED FURNACE HEATING SURFACE		
TO FACE OF PLATENS		21921
TO FACE OF CONVECTION SURFACE		22856
FURNACE VOLUME, CU FT		
AIR HEATER	TYPE Regenerative NO. Two (2)	
AIR HEATER	TOTAL HEATING SURFACE, SQ FT 216876	
FUEL BURNER	TYPE Circular PC	
FUEL BURNER	NO. 18	
PULVERIZER	TYPE EL 76 SIZE NO. 6	
PULVERIZER	CAPACITY OF 6 PULV. IS 1550 M LB STEAM/HR BASED ON 42 GRIND 12,600 BTU COAL AT 75 % THRU 200 U.S.S. SIEVE	
PULVERIZER	FOR 338 M LB COAL/PULV.-HR AT 70 % THRU 200 U.S.S. SIEVE. MIN. GRIND 42 MAXIMUM SURFACE MOISTURE IS 12 % REQUIRING 495 F AIR	
STEAM TEMP. CONTROL	Steam temperature control by excess air and spray attemperator.	
UNIT CONSTRUCTION FEATURES	Membrane Wall Indoor Pressurized	
	Solids in Steam - 1PPM	

REVISIONS

NO.	DESCRIPTION	BY	DATE

BY A.Z. APPO. [illegible] DATE 11-19-65

THE BABCOCK & WILCOX COMPANY

P11-454-4X1-1S0

EAST KENTUCKY RURAL ELECTRIC COOPERATIVE CORP.
COOPER STATION NO. 2

DESIGN FUEL BASIS

NATURAL GAS BASIS:

Constituent	Basis Value	Unit
CH4	89.633%	Mol %
C2H6	8.289%	Mol %
C3H8	0.348%	Mol %
i-C4H10	0.006%	Mol %
n-C4H10	0.011%	Mol %
i-C5H12	0.001%	Mol %
n-C5H12	0.001%	Mol %
n-C6H14	0.000%	Mol %
N2	1.323%	Mol %
CO2	0.388%	Mol %
Total Sulfur (Maximum)	<2.0	grain/100 SCF
Fuel LHV (Btu/lb)	20,680	Btu/lbm

BACKUP FUEL OIL BASIS:

Ultra Low Sulfur Diesel

Fuel LHV: 18,400 Btu/lb

PRODUCT SPECIFICATIONS

3.23.1 SPECIFICATIONS FOR FUNGIBLE 15 ppm SULFUR DIESEL FUEL GRADE 62

EPA Designation: MVNRLM, Motor vehicle diesel fuel, 15 ppm sulfur

Cancels Previous Issues of Grade 62

PRODUCT PROPERTY	ASTM Test Method	Test Results Minimum	Maximum		Note
Gravity API	D4052	30			
Flash Point, °F					
Pensky-Martin	D93	130			
Physical Distillation, °C(°F)	D86				[W]54
50%			Report		
90%		282(540)	338(640)		
End Point			366(690)		
or Simulated Distillation, °C(°F)	D2887				[W]54
50% recovered			Report		
90% recovered		300(572)	356(673)		
End Point			421(790)		
Color ASTM	D6045		2.5		
Color Visual		Undyed			
Viscosity, cSt @ 40°C (104°F)	D445	1.9	4.1		
Pour Point	D97				2
Cloud Point	D2500				2
Corrosion, 3 hrs. @ 50°C (122°F)	D130		1		
Total Sulfur, ppmwt	D5453		11	Origin	3
			14	Delivery	
Cetane Number	D613	40			[C]4
Aromatics (Volume %)	D1319		31.7		
or Aromatics by Cetane Index	D976	40			
Ash, wt.%	D482		0.01		
Carbon Residue: Ramsbottom					
on 10% Bottom	D524		0.35		
BS&W, vol.%	D2709				
	or equivalent		< 0.05		
Thermal stability, 90 minutes					
150°CPad rating,					
DuPont scale			7		
OR					
Thermal stability	D6468				
Y/Green		73%			
W Unit		65%			
OR					
Oxidation stability, mg/100 ml	D2274		2.5		
Haze rating @ 25°C (77°F)	D4176				
	Procedure 2		2		
Nace Corrosion	TM0172	B+ (Origin)			
Electrical					
Conductivity, pS/m @ 21°C(70°F)	D2624		250		

APPENDIX M – WATER QUALITY BASIS (NOT USED)

APPENDIX N – PRELIMINARY FIRE PROTECTION DESIGN BASIS (NOT USED)

APPENDIX O – LIFE SAFETY CODE AND CRITERIA (NOT USED)

APPENDIX P – RISK MATRIX

Cooper Unit 2 Co-Fire Gas - PROJECT RISK REGISTER - LEVEL 1 IDENTIFICATION

East Kentucky Power Cooperative

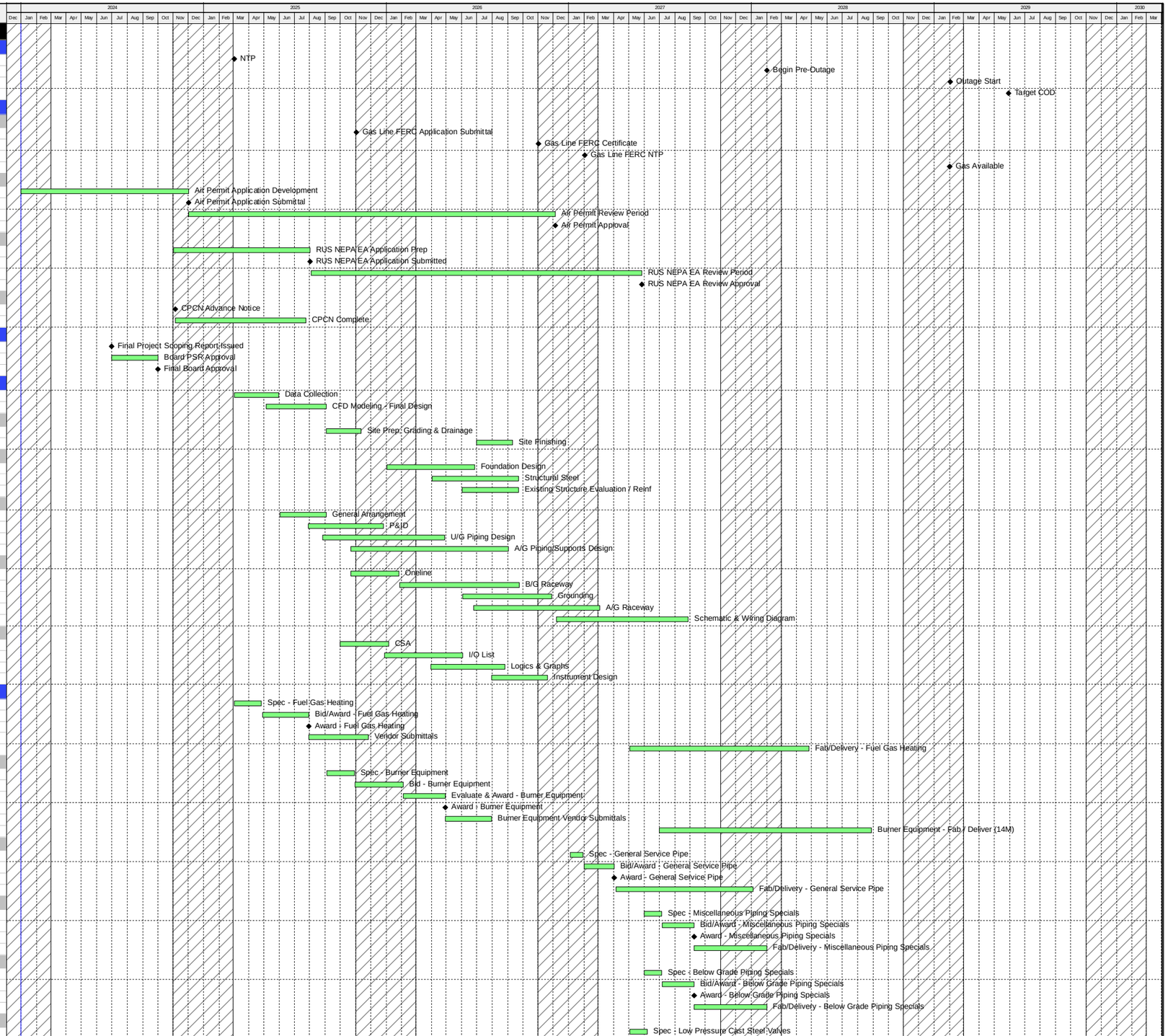
Risk ID No. (NNN)	Key Project Risk Factors (Circumstances) ("because of")	Is Risk Controlled or Uncontrolled?	Party in Control of Risk Event	What Category of Risk Event?	Likely Risk Events due to Risk Factors	Risk Event Details ("What Can Go Wrong?)	Anticipated Impacts of Risk Event ("Enter Y for YES Enter N for No Impact")								Impact Details ("Consequences")	Planned Mitigation Activities
							Health / Safety	Environmental	Quality	Performance	Claims / Litigation	Reputation	Schedule / Time	Cost / Finances ($		
001	Late Delivery of Gas Firing / FGC Equipment	Controlled	_3rd Party_Client	SCHEDULE RELATED	Change start/completion date	Due to logistic and manufacturing reasons, equipment delivered late pushing the schedule potentially 4 to 6 months.	N	N	N	N	Y	Y	Y	Y	Miss the COD date. Results in costs and due to not being able to provide power to grid.	Select supplier who can meet schedule. Involve Expediter throughout project timeline of manufacturing. Add time for shop inspections of all Equipment and Materials. Award contracts as early as possible, after RUS approval. Include contract clause for late delivery.
002	Late Delivery of Electrical / DCS Equipment	Controlled	_3rd Party_Client	SCHEDULE RELATED	Change start/completion date	Due to logistics reasons, equipment delivered late pushing the schedule potentially up to 4 months to complete electrical construction	N	N	N	N	Y	Y	Y	Y	Miss the COD date. Results in costs due to not being able to provide power to grid.	Select supplier who can meet schedule. Involve Expediter throughout project timeline of manufacturing. Add time for shop inspections of all Equipment and Materials. Award contracts as early as possible, after RUS approval.
003	Acoustic/Sound results exceed expected values	Controlled	_3rd Party_Client	PERFORMANCE RELATED	Design misjudgment, miscalculation, misinterpretation or oversight	Sound levels exceed predicted values	N	Y	N	N	Y	Y	Y	Y	Additional sound mitigation activities are required to be purchased and installed	Understand existing sound margin. Purchase low noise options when available.
004	Labor shortages due to other more attractive projects	Controlled	Client	SCHEDULE RELATED	Underestimate time required to perform work	Other Projects In The Area Make Labor Harder to Attract	Y	N	Y	Y	Y	Y	Y	Y	Falling Behind Schedule. Increased Cost.	Planned Per Diem Incentive. Perform a Labor Study in the area.
005	RUS approval delayed	Uncontrolled	Regulatory Authority	SCHEDULE RELATED	Suspend/stop work	RUS approval takes longer than anticipated	N	N	N	Y	Y	Y	Y	Y	Failure to meet COD date. Results in cost due to not being able to produce power. Delay to detailed design, award of equipment contracts (may require increased cost or different payment terms to makeup schedule)	Current project schedule assumes 24 months to approval after submitting application Oct. 2025, which should be conservative for an EA.
006	PSC delays or intervieners	Uncontrolled	Regulatory Authority	SCHEDULE RELATED	Suspend/stop work	Approval process takes longer than anticipated or separate party intervenes	N	N	N	Y	Y	Y	Y	Y	Failure to meet COD date due to delayed start date. Results in cost due to not being able to produce power.	PSC process planned to support submittal in October. Typical turnaround timeframe is 8 months based on past project experience. There are several months of margin between approval and project expenditures.
007	Executing A Project In An Enviornment of Inflation / Supply Chain Challenges	Uncontrolled	Uncontrolled	PRICING/FINANCIALS	Commodity/goods price increase	Due to supply chain issues, vendors might increase prices outside normal increase schedule	N	N	N	N	N	N	N	Y	Project goes over budget	Buy out as much as possible early in project. Continue managing procurements as conditions change. Look at other suppliers/methods to purchase equipment/commodities early. Break potential long lead items out into separate contracts. Include allowances for Field Service Time or perceived scope changes to mitigate costs.
008	Scope item not captured in PSR scope	Controlled	BMCD	PRICING/FINANCIALS	Underbid project	Scope change or additional scope required	N	N	Y	Y	Y	Y	Y	Y	Cost increase to project and potential schedule delays.	Define as much scope as possible in PSR and carry adequate contingency to cover realistic future scope changes/misses.
009	Shortages or delivery delays for wire, conduit, and products.	Controlled	BMCD	SCHEDULE RELATED	Change project sequence	Award materials too late	Y	N	Y	Y	Y	Y	Y	Y	Electrical Construction Falls Behind Schedule. Additonal Manpower Required LDs or additional TFA cost Miss the COD date. Results in costs due to not being able to provide power to grid.	Identify the long lead time materials during the design phase and buy them out prior to the award of the electrical consturction contract.
010	Can't staff site / recurring site shutdowns due to Force Majeure event	Controlled	BMCD	ENVIRONMENTAL EVENTS	Force Majeure	Direct or Indirect COVID exposure or other pandemic type event.	Y	N	Y	Y	Y	Y	Y	Y	Reduced resources throughout schedule	
011	Engineering is late due to submittal delays from suppliers	Controlled	_3rd Party_Client	SCHEDULE RELATED	Change project sequence	Engineering is late due to submittal delays from suppliers	N	N	N	N	Y	N	Y	N	compressed engineering schedule, missed IFC firewall dates	LDs on critical submittals, weekly coordination meetings with OEMs, visits to OEMs office (as required).
012	Housing Availibilty	Uncontrolled	BMCD	PERFORMANCE RELATED	Interfere with activities of others	No availibility of housing for staff and craft	N	N	N	N	N	N	Y	Y		Perform study of local housing availability during project execution. Per Diem included in cost estimate to help attract labor and cover costs for further travel distances.
013	Gas line and M&R station delayed	Controlled	_3rd Party_Client	SCHEDULE RELATED	Change project sequence	Gas line and M&R yard installed later than anticipated	N	N	N	Y	Y	N	Y	Y	Delays startup resulting in failure to meet COD date and/or impacts productivity of project contractors based on site access availability.	Coordinate with gas line supplier.
014	Geotech investigation finds karst or other challenges	Controlled	BMCD	PRICING/FINANCIALS	Underbid project	Piling and / or flow fill required, requires additional cost and schedule to install, potentially holding up downstream activities	N	N	N	Y	Y	Y	Y	Y	Must add piles which could also impact foundation dimensions	Release geotech investigation early in project. Conservative foundation quantities if dimensions need to increase.

015	OEM scope gap	Controlled	BMCD	PRICING/FINANCIALS	Underbid project	Required Equipment Is Not Delivered For Construction	Y	N	Y	N	Y	Y	Y	Y	Schedule Pushes Project Cost Impacts Miss the COD date. Results in costs due to not being able to provide power to grid	Align scopes between OEM scope and BOP scope. Collaboration in OEM Contract Negotiations and Developing the Division of Responsibility Matrix.
016	Delayed owner approval of engineering deliverables	Controlled	Client	SCHEDULE RELATED	Decide/deliver decision after due date	Rework after approvals/release	N	N	Y	Y	Y	Y	Y	Y	Schedule pushes	Provide adequate time for owner review, setup meetings to drive faster review/discussion
017	Value engineering / estimate reduction studies in parallel with detail design	Controlled	Client	SCHEDULE RELATED	Decide/deliver decision after due date	Need to evaluate many items for cost reduction opportunities	N	N	N	N	N	N	Y	Y	Engineering is delayed/late due to increased scope	PSR process has worked through a lot of options already. Manage cost reduction expectations.
018	Delayed air permit finalization	Uncontrolled	Regulatory Authority	SCHEDULE RELATED	Suspend/stop work	Permit process and approval takes longer than anticipated	N	N	N	Y	Y	Y	Y	Y	Cannot set emissions producing equipment without air permit.	Permit anticipated to be complete 2+ years prior to construction. EKPC will get extension from state to allow for construction after 18 months.
019	FM Global involvement / requirements not well defined	Controlled	Client	SCHEDULE RELATED	Change project scope	additional technical requirements and FM Global involvement	Y	N	N	Y	Y	Y	Y	Y	additional design & review requirements that could impact engineering schedule, and material/const costs	Proactive request to clarify FM Global requirements prior to detailed engineering.
020	Environmental impact due to release of chemical/waste	Controlled	Client	ENVIRONMENTAL EVENTS	Unplanned discharge of hazardous materials	Unexpected discharge of hazardous material	Y	Y	N	Y	Y	Y	Y	Y	Potential delay to schedule and hold on construction, increased costs for cleanup/remediation and for adjusted schedule	Develop detailed plan for handling of hazardous material and minimize interaction with existing materials/plant from new project.
021	Escalation for equipment, materials, and labor	Uncontrolled	Uncontrolled	PRICING/FINANCIALS	Price escalation	Costs for labor, equipment, and material escalates more than projected/anticipated based on current indices.	N	N	N	N	Y	Y	Y	Y	Cost increase due to higher costs for labor, material, and/or equipment.	Recommend carrying reasonable allowance in cost estimate for escalation. Communicate changes in escalation as they are discovered. PSR cost estimate does not include escalation. However, estimated values of escalation have been communicated which include 4 to 5% escalation per annum for labor, equipment and materials through execution, assuming project starts today as well as per the execution schedule.
022	Damage to Existing Property	Controlled	_3rd Party_Client	PRICING/FINANCIALS	Don't properly pay/withhold invoice	Contractor damages existing property	Y	N	N	Y	Y	Y	Y	Y	Existing property insurance deductible subcap coverage (TBD $$), Existing facility repairs likely to impact project schedule and costs.	Utilization of proper barricades, spotters, and other preventative measures to protect existing property in the vicinity of work areas. Coordinate work with Owner operations to avoid potential issues and interruptions. Develop plan for contractors' access and transportation around site.
023	Design changes for major equipment after award	Controlled	_3rd Party_Client	PERFORMANCE RELATED	Interfere with activities of others	OEM changes design or scope of supply after award.	N	N	Y	Y	Y	Y	Y	Y	Adjust project schedule which may impact COD date. May also result in increased cost for Equipment contract and contractor contracts.	Coordinate with OEMs prior to and shortly after award that scope and design are well understood by all parties.
024	Replacement / repair of equipment required after installation	Controlled	_3rd Party_Client	SCHEDULE RELATED	Deliver goods/work product after due date	Equipment requires repairs or replacement after installation	N	N	N	Y	Y	Y	Y	Y	Potential delay to schedule to wait on repair/replacement, if critical equipment, which could result in missing COD date. Cost increase for prolonged contractor onsite if issue not caused by OEM	Include adequate coverage in equipment contracts to cover expenses and delays caused by equipment issues.
025	Increased duration for flushes, chem cleaning, etc.	Uncontrolled	Uncontrolled	SCHEDULE RELATED	Underestimate time required to perform work	Duration to complete startup activities takes longer than anticipated such as air blows, line pigging, flushes, and chemical cleaning	N	Y	Y	N	Y	Y	Y	Y	Delays startup resulting in failure to meet Client's COD date and/or increases costs for startup activities.	Schedule includes 3 months of float for guarantee COD. Control work environmment and access during flushes, air blow, chem cleaning to reduce opportunity for interference.
026	Controls Integration	Controlled	BMCD	PERFORMANCE RELATED	Execute less efficiently than planned (poor productivity)	Delay in programming efforts, FATs, and/or startup and commissioning	N	N	Y	Y	Y	Y	Y	Y	Delays completion of construction and startup/commissioning resulting in failure to meet COD date and/or increases costs.	Hold regular design reviews with major suppliers to coordinate key interfaces. Require "readiness submittals" to facilitate productive FATs and confirm key documentation is available. Include field services / technician support from major suppliers during checkout, startup, and commissioning. Allow for sufficient float / margin in project schedule
027	Care, Custody, Control - Handoff of Materials delivered in boxes but not being opened until later date for Client provided Equipment	Controlled	Client	PRICING/FINANCIALS	Don't properly pay/withhold invoice	Material is not delivered as expected but is not discovered until shipments are opened upon needing to be used, not upon delivery	N	N	Y	Y	Y	Y	Y	Y	Increased cost to procure/expedite missing material and to cover cost of extended time onsite for contractors/staff	Open and inventory OEM Equipment under OEM supervision. Open boxes early enough that if materials aren't delivered that we can react accordingly to maintain schedule
028	Additional underground utilities require demolition or work-around	Controlled	Client	PERFORMANCE RELATED	Interfere with activities of others	Unanticipated utilities exist that need to be demo'd or avoided	Y	Y	Y	Y	Y	Y	Y	Y	Delay in schedule to complete additional work and increased cost for unanticipated work	Review all available underground utility drawings to confirm all have been accounted for in detailed design. Complete potholing as needed.
029	Existing equipment and systems that are re-used have failure	Uncontrolled	Client	SCHEDULE RELATED	Change project scope	Existing equipment that is used for new project has unexpected failure which needs to be resolved/replaced	Y	Y	Y	Y	Y	Y	Y	Y	Delay in schedule to repair/replace existing equipment and increased cost for work	Consider all existing equipment/systems being used and assess condition prior to project and consider contingency plans in case of failure
030	Shop Inspections	Controlled	BMCD	PERFORMANCE RELATED	Interfere with activities of others	Make suppliers be prepared for inspections to determine Equipment at shops and quality prior to shipment.	N	N	Y	Y	Y	Y	Y	Y	Cost and schedule impact to release of material later than planned. Additional and / or extended travel to facilities due to supplier not being ready for inspection	Defined plan for shop inspections and visits along with expected progress. Video inspection to verify proper progress prior to travel. Factor in rework for inspection findings.
031	Force Majeure weather delay	Uncontrolled	Uncontrolled	ENVIRONMENTAL EVENTS	Inclement Weather	Weather event interrupts work progress or damages equipment/material	Y	Y	Y	Y	Y	Y	Y	Y	Schedule delay that could result in misisng the COD date. Results in costs due to not being able to provide power to grid.	Include schedule margin (PSR includes 3 months of schedule margin)
032	Payment schedule of equipment and construction contracts	Controlled	Client	PRICING/FINANCIALS	Don't properly pay/withhold invoice	Equipment or Contractor payment schedule and terms are different than expected or different than typical	N	N	N	Y	Y	Y	Y	Y	May impact cashflow for project and ability to have net funds for invoices.	Confirm each contract payment terms align with EKPC and RUS requirements prior to award. Consider any contingency that should be included in PSR budget cost for additional cost needed to get supplier to accommodate payment terms.

033	Craft productivity and re-work	Controlled	_3rd Party_Client	PERFORMANCE RELATED	Execute less efficiently than planned (poor productivity)	Labor productivity worse than assumed or contractor requires re-work	N	N	Y	Y	Y	Y	Y	Y	Increased costs and potential schedule delays	Utilzing contractors with knowledge of the local area and labor market and scope. Contractors have indicated quality local labor available based on prevoius project history and budgetary bid process.
034	Specifications	Controlled	BMCD	CONTRACTING	Deliver goods/work product after due date	Engineered / Specified Equipments Cannot Be Purchased.	Y	N	Y	N	Y	Y	Y	Y	Schedule Delays / Cost Delays	Schedule sufficient time for proper internal and external reviews prior to issuing for bid. Perform biddability / constructability reviews as early as possible to help identify potential items that may present challenges for supply as specified. Allow for sufficient float / margin in project schedule.
035	Incomplete Deliveries	Controlled	BMCD	SCHEDULE RELATED	Deliver goods/work product after due date	We are unable to complete work on schedule because vendor components are not complete.	Y	N	Y	N	Y	Y	Y	Y	Schedule / Cost impacts	Develop and follow the material management plan and complete proper expiditing.
036	Safety incident, standdown, investigation, etc.	Uncontrolled	_3rd Party_Client	SCHEDULE RELATED	Change project sequence	Delay construction	Y	N	N	Y	Y	Y	Y	Y	Schedule / Cost impacts	Use contractors with good safety records and understanding of project scope. Safety oversight throughout project.
037	Theft	Controlled	BMCD	SCHEDULE RELATED	Deliver goods/work product after due date	Theft of equipment or material prevents work from being complete on schedule	Y	N	Y	N	Y	Y	Y	Y	Schedule / Cost impacts	Evaluate site for security deficiencies and develop plan to mitigate theft on work site.
038	Asbestos abatement	Controlled	Client	ENVIRONMENTAL EVENTS	Unplanned discharge of hazardous materials	Asbestos is unexpectedly encountered requiring abatement prior to work proceeding.	Y	Y	N	N	Y	N	Y	Y	Schedule / Cost impacts	Test early in project after scope is defined enough to determine whether abatement is required. Perform any required abatement well in advance of construction.
039	Missed COD may cause compliance issues with the Greenhouse Gas rule.	Controlled	Client	SCHEDULE RELATED	Change start/completion date	Project may take longer to achieve commercial operation than expected. If project COD is after January 2030 this may result in compliance issues with Greenhouse Gas rule.	N	N	N	Y	Y	Y	Y	Y	May result in action by regulatory body.	Allow for sufficient float / margin in project schedule.
040	Contractor delays	Controlled	Client	SCHEDULE RELATED	Change start/completion date	Contractor falls behind schedule due to poor performance and/or productivity, rework, etc.	N	N	N	Y	Y	Y	Y	Y	Increased costs and potential schedule delays. Potential impacts to follow-on work and / or checkout, startup, and commissioning.	Vet Contractors prior to bid / award. Regular planning and progress meetings after award and throughout project execution to identify schedule slips and possible impact mitigation as early as possible. Allow for sufficient float / margin in project schedule.
041	Commissioning delays and/or issues	Controlled	Client	SCHEDULE RELATED	Change start/completion date	Commissioning activities take longer than expected.	N	N	N	Y	Y	Y	Y	Y	Increased costs and potential schedule delays	Prepare a detailed outage schedule and startup and commissioning staffing plan. Provide startup management experienced with similar project scope. Allow for sufficient float / margin in project schedule.
042	Change management	Controlled	Client	PRICING/FINANCIALS	Don't properly pay/withhold invoice	Cost / schedule impacts not fully recognzied or communicated early.	N	N	N	N	Y	Y	Y	Y	Increased costs and potential schedule delays	Establish and follow defined change management process. Communicate potential changes early to facilitate informed decisions and mitigate impacts.

APPENDIX Q – PROJECT SCHEDULE

Activity ID	Activity Name	RD	Start	Finish
EKPC - Cooper Unit 2 Co-Fire L2		1375	01-Jan-24	29-May-29
Milestones		1078	03-Mar-25	29-May-29
MS-1000	NTP	0	03-Mar-25*	
MS-1030	Begin Pre-Outage	0	01-Feb-28	
MS-1040	Outage Start	0	02-Feb-29	
MS-1060	Target COD	0		29-May-29
Permitting		1293	01-Jan-24	01-Feb-29
Gas Line Permitting		824	01-Nov-25	01-Feb-29
A2100	Gas Line FERC Application Submittal	0		01-Nov-25*
A2110	Gas Line FERC Certificate	0		01-Nov-26*
A2120	Gas Line FERC NTP	0		01-Feb-27*
A2130	Gas Available	0		01-Feb-29*
Air Permitting		746	01-Jan-24	04-Dec-26
A2140	Air Permit Application Development	336	01-Jan-24*	01-Dec-24
A2040	Air Permit Application Submittal	0		01-Dec-24*
A2050	Air Permit Review Period	719	02-Dec-24	04-Dec-26
A2060	Air Permit Approval	0		04-Dec-26
RUS NEPA EA		652	01-Nov-24	27-May-27
A1980	RUS NEPA EA Application Prep	190	01-Nov-24*	01-Aug-25
A1990	RUS NEPA EA Application Submitted	0		01-Aug-25
A2010	RUS NEPA EA Review Period	462	04-Aug-25	27-May-27
A2000	RUS NEPA EA Review Approval	0		27-May-27
CPCN		181	04-Nov-24	23-Jul-25
A2020	CPCN Advance Notice	0		04-Nov-24*
A2030	CPCN Complete	181	05-Nov-24	23-Jul-25
Project Scoping		65	01-Jul-24	01-Oct-24
A2070	Final Project Scoping Report Issued	0		01-Jul-24*
A2080	Board PSR Approval	65	01-Jul-24	01-Oct-24
A2090	Final Board Approval	0		01-Oct-24
Engineering		634	03-Mar-25	27-Aug-27
EN-G-1020	Data Collection	64	03-Mar-25	30-May-25
EN-G-1000	CFD Modeling - Final Design	85	05-May-25	03-Sep-25
Civil		260	03-Sep-25	10-Sep-26
EN-C-1000	Site Prep, Grading & Drainage	50	03-Sep-25	11-Nov-25
EN-C-1010	Site Finishing	50	01-Jul-26*	10-Sep-26
Structural		185	02-Jan-26	22-Sep-26
EN-S-1000	Foundation Design	125	02-Jan-26	26-Jun-26
EN-S-1010	Structural Steel	120	03-Apr-26	22-Sep-26
EN-S-1020	Existing Structure Evaluation / Reinf	80	01-Jun-26	22-Sep-26
Mechanical		320	02-Jun-25	02-Sep-26
EN-M-1010	General Arrangement	65	02-Jun-25	02-Sep-25
EN-M-1000	P&ID	105	29-Jul-25	26-Dec-25
EN-M-1040	U/G Piping Design	170	26-Aug-25	27-Apr-26
EN-M-1050	A/G Piping/Supports Design	220	22-Oct-25	02-Sep-26
Electrical		470	22-Oct-25	27-Aug-27
EN-E-1000	Oneline	65	22-Oct-25	26-Jan-26
EN-E-1030	B/G Raceway	170	27-Jan-26	24-Sep-26
EN-E-1020	Grounding	125	03-Jun-26	27-Nov-26
EN-E-1040	A/G Raceway	175	24-Jun-26	03-Mar-27
EN-E-1070	Schematic & Wiring Diagram	185	07-Dec-26	27-Aug-27
I/C		290	01-Oct-25	19-Nov-26
EN-N-1020	CSA	65	01-Oct-25	05-Jan-26
EN-N-1030	I/O List	110	29-Dec-25	02-Jun-26
EN-N-1050	Logics & Graphs	105	31-Mar-26	26-Aug-26
EN-N-1040	Instrument Design	80	30-Jul-26	19-Nov-26
Procurement		890	28-Feb-25	29-Aug-28
PR-2763-000	Spec - Fuel Gas Heating	40	03-Mar-25	25-Apr-25
PR-2763-100	Bid/Award - Fuel Gas Heating	65	28-Apr-25	29-Jul-25
PR-2763-200	Award - Fuel Gas Heating	0		29-Jul-25
PR-2762-320	Vendor Submittals	85	30-Jul-25	26-Nov-25
PR-2763-300	Fab/Delivery - Fuel Gas Heating	250	03-May-27*	25-Apr-28
1240 - Burner (Safety Shuttoff/LP/Burners/Ignitors)		758	04-Sep-25	28-Aug-28
PR-1240-000	Spec - Burner Equipment	40	04-Sep-25	29-Oct-25
PR-1240-100	Bid - Burner Equipment	65	30-Oct-25	03-Feb-26
PR-1240-410	Evaluate & Award - Burner Equipment	60	04-Feb-26	28-Apr-26
PR-1240-200	Award - Burner Equipment	0		28-Apr-26
PR-1240-400	Burner Equipment Vendor Submittals	65	29-Apr-26	30-Jul-26
PR-1240-300	Burner Equipment - Fab / Deliver (14M)	295	01-Jul-27*	28-Aug-28
2320 - General Service Pipe		255	04-Jan-27	04-Jan-28
PR-2320-000	Spec - General Service Pipe	20	04-Jan-27*	29-Jan-27
PR-2320-100	Bid/Award - General Service Pipe	45	01-Feb-27	02-Apr-27
PR-2320-200	Award - General Service Pipe	0		02-Apr-27
PR-2320-310	Fab/Delivery - General Service Pipe	190	05-Apr-27	04-Jan-28
2490 - Miscellaneous Piping Specials		170	01-Jun-27	01-Feb-28
PR-2490-000	Spec - Miscellaneous Piping Specials	25	01-Jun-27	06-Jul-27
PR-2490-100	Bid/Award - Miscellaneous Piping Specials	45	07-Jul-27	08-Sep-27
PR-2490-200	Award - Miscellaneous Piping Specials	0		08-Sep-27
PR-2490-300	Fab/Delivery - Miscellaneous Piping Specials	100	09-Sep-27	01-Feb-28
2491 - Below Grade Piping Specials		170	01-Jun-27	01-Feb-28
PR-2491-000	Spec - Below Grade Piping Specials	25	01-Jun-27	06-Jul-27
PR-2491-100	Bid/Award - Below Grade Piping Specials	45	07-Jul-27	08-Sep-27
PR-2491-200	Award - Below Grade Piping Specials	0		08-Sep-27
PR-2491-300	Fab/Delivery - Below Grade Piping Specials	100	09-Sep-27	01-Feb-28
2521 - Low Pressure Cast Steel Valves		190	03-May-27	01-Feb-28
PR-2521-000	Spec - Low Pressure Cast Steel Valves	25	03-May-27	07-Jun-27



Start Date	01-Jan-24
Finish Date	29-May-29
Data Date	01-Jan-24
Run Date	23-Oct-24

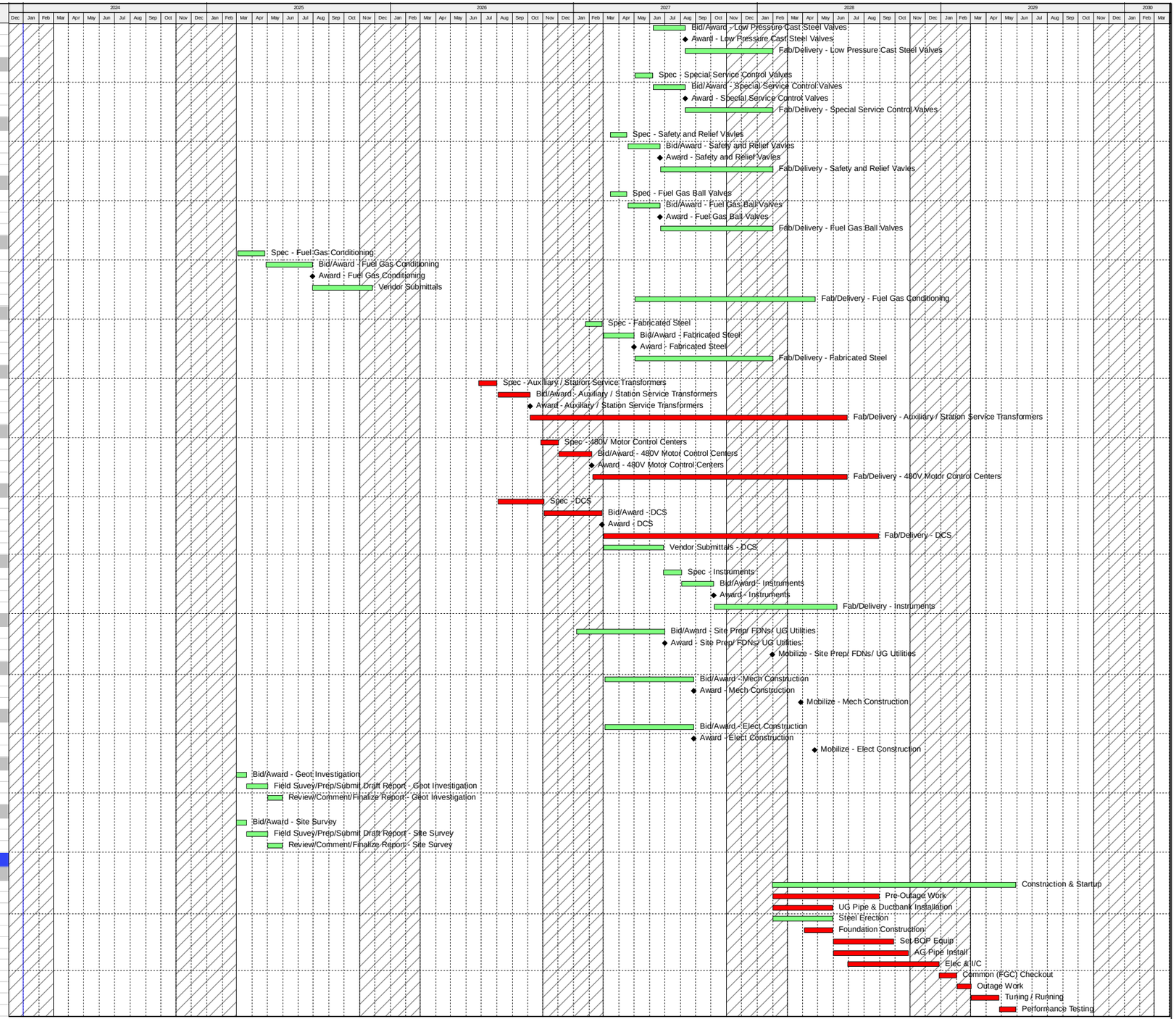
BURNS McDONNELL

EKPC - Cooper Unit 2 Co-Fire L2

Project Schedule

Date	Revision	Checked	Approved

Activity ID	Activity Name	RD	Start	Finish
PR-2521-100	Bid/Award - Low Pressure Cast Steel Valves	45	08-Jun-27	10-Aug-27
PR-2521-200	Award - Low Pressure Cast Steel Valves	0		10-Aug-27
PR-2521-300	Fab/Delivery - Low Pressure Cast Steel Valves	120	11-Aug-27	01-Feb-28
2531 - Special Service Control Valves		190	03-May-27	01-Feb-28
PR-2531-000	Spec - Special Service Control Valves	25	03-May-27	07-Jun-27
PR-2531-100	Bid/Award - Special Service Control Valves	45	08-Jun-27	10-Aug-27
PR-2531-200	Award - Special Service Control Valves	0		10-Aug-27
PR-2531-300	Fab/Delivery - Special Service Control Valves	120	11-Aug-27	01-Feb-28
2550 - Safety and Relief Valves		225	15-Mar-27	01-Feb-28
PR-2550-000	Spec - Safety and Relief Vavles	25	15-Mar-27	16-Apr-27
PR-2550-100	Bid/Award - Safety and Relief Vavles	45	19-Apr-27	21-Jun-27
PR-2550-200	Award - Safety and Relief Vavles	0		21-Jun-27
PR-2550-300	Fab/Delivery - Safety and Relief Vavles	155	22-Jun-27	01-Feb-28
2570 - Fuel Gas Ball Valves		225	15-Mar-27	01-Feb-28
PR-2570-000	Spec - Fuel Gas Ball Valves	25	15-Mar-27	16-Apr-27
PR-2570-100	Bid/Award - Fuel Gas Ball Valves	45	19-Apr-27	21-Jun-27
PR-2570-200	Award - Fuel Gas Ball Valves	0		21-Jun-27
PR-2570-300	Fab/Delivery - Fuel Gas Ball Valves	155	22-Jun-27	01-Feb-28
2762 - Fuel Gas Conditioning		801	03-Mar-25	25-Apr-28
PR-2762-000	Spec - Fuel Gas Conditioning	40	03-Mar-25	25-Apr-25
PR-2762-100	Bid/Award - Fuel Gas Conditioning	65	28-Apr-25	29-Jul-25
PR-2762-200	Award - Fuel Gas Conditioning	0		29-Jul-25
PR-2762-310	Vendor Submittals	85	30-Jul-25	26-Nov-25
PR-2762-300	Fab/Delivery - Fuel Gas Conditioning	250	03-May-27*	25-Apr-28
4520 - Fabricated Steel		260	25-Jan-27	01-Feb-28
PR-4520-000	Spec - Fabricated Steel	25	25-Jan-27	26-Feb-27
PR-4520-100	Bid/Award - Fabricated Steel	45	01-Mar-27	30-Apr-27
PR-4520-200	Award - Fabricated Steel	0		30-Apr-27
PR-4520-300	Fab/Delivery - Fabricated Steel	190	03-May-27	01-Feb-28
5120 - Auxiliary / Station Service Transfomers (Includes UPS, Panelboards, ATS, Cable)		510	26-Jun-26	28-Jun-28
PR-5120-000	Spec - Auxiliary / Station Service Transformers	25	26-Jun-26	31-Jul-26
PR-5120-100	Bid/Award - Auxiliary / Station Service Transformers	45	03-Aug-26	05-Oct-26
PR-5120-200	Award - Auxiliary / Station Service Transformers	0		05-Oct-26
PR-5120-300	Fab/Delivery - Auxiliary / Station Service Transformers	440	06-Oct-26	28-Jun-28
5330 - 480V Motor Control Centers		425	27-Oct-26	28-Jun-28
PR-5330-000	Spec - 480V Motor Control Centers	25	27-Oct-26	01-Dec-26
PR-5330-100	Bid/Award - 480V Motor Control Centers	45	02-Dec-26	05-Feb-27
PR-5330-200	Award - 480V Motor Control Centers	0		05-Feb-27
PR-5330-300	Fab/Delivery - 480V Motor Control Centers	355	08-Feb-27	28-Jun-28
6110 - DCS		528	03-Aug-26	29-Aug-28
PR-6110-000	Spec - DCS	65	03-Aug-26*	02-Nov-26
PR-6110-100	Bid/Award - DCS	80	03-Nov-26	26-Feb-27
PR-6110-200	Award - DCS	0		26-Feb-27
PR-6110-300	Fab/Delivery - DCS	383	01-Mar-27	29-Aug-28
PR-6110-310	Vendor Submittals - DCS	85	01-Mar-27	28-Jun-27
6210 - Instruments		240	29-Jun-27	07-Jun-28
PR-6210-000	Spec - Instruments	25	29-Jun-27	03-Aug-27
PR-6210-100	Bid/Award - Instruments	45	04-Aug-27	06-Oct-27
PR-6210-200	Award - Instruments	0		06-Oct-27
PR-6210-300	Fab/Delivery - Instruments	170	07-Oct-27	07-Jun-28
8110 - Site Prep / Foundations / UG Utilities		271	07-Jan-27	31-Jan-28
PR-8110-000	Bid/Award - Site Prep/ FDNs/ UG Utilities	125	07-Jan-27	01-Jul-27
PR-8110-200	Award - Site Prep/ FDNs/ UG Utilities	0		01-Jul-27
PR-8110-300	Mobilize - Site Prep/ FDNs/ UG Utilities	0		31-Jan-28
8320 - Mechanical Construction		271	04-Mar-27	27-Mar-28
PR-8320-000	Bid/Award - Mech Construction	125	04-Mar-27	27-Aug-27
PR-8320-200	Award - Mech Construction	0		27-Aug-27
PR-8320-400	Mobilize - Mech Construction	0		27-Mar-28
8410 - Electrical Construction		291	04-Mar-27	24-Apr-28
PR-8410-000	Bid/Award - Elect Construction	125	04-Mar-27*	27-Aug-27
PR-8410-200	Award - Elect Construction	0		27-Aug-27
PR-8410-300	Mobilize - Elect Construction	0		24-Apr-28
9010 - Geotech Investigation		65	28-Feb-25	30-May-25
PR-9010-000	Bid/Award - Geot Investigation	15	28-Feb-25	20-Mar-25
PR-9010-200	Field Suvey/Prep/Submit Draft Report - Geot Investigation	30	21-Mar-25	01-May-25
PR-9010-300	Review/Comment/Finalize Report - Geot Investigation	20	02-May-25	30-May-25
9020 - Site Survey		65	28-Feb-25	30-May-25
PR-9020-000	Bid/Award - Site Survey	15	28-Feb-25	20-Mar-25
PR-9020-200	Field Suvey/Prep/Submit Draft Report - Site Survey	30	21-Mar-25	01-May-25
PR-9020-300	Review/Comment/Finalize Report - Site Survey	20	02-May-25	30-May-25
Construction & Startup		338	31-Jan-28	29-May-29
CC Construction & Startup		338	31-Jan-28	29-May-29
C1050	Construction & Startup	338	31-Jan-28	29-May-29
C1000	Pre-Outage Work	150	01-Feb-28	30-Aug-28
C1060	UG Pipe & Ductbank Installation	85	01-Feb-28	30-May-28
C1070	Steel Erection	85	01-Feb-28	30-May-28
C1080	Foundation Construction	40	04-Apr-28	30-May-28
C1100	Set BOP Equip	85	31-May-28	28-Sep-28
C1090	AG Pipe Install	105	01-Jun-28	27-Oct-28
C1110	Elec & I/C	125	29-Jun-28	27-Dec-28
C1120	Common (FGC) Checkout	25	28-Dec-28	01-Feb-29
C1010	Outage Work	20	02-Feb-29	01-Mar-29
C1030	Tuning / Running	40	02-Mar-29	26-Apr-29
C1040	Performance Testing	22	27-Apr-29	29-May-29



Start Date	01-Jan-24
Finish Date	29-May-29
Data Date	01-Jan-24
Run Date	23-Oct-24

BURNS McDONNELL

EKPC - Cooper Unit 2 Co-Fire L2

Project Schedule

Date	Revision	Checked	Approved

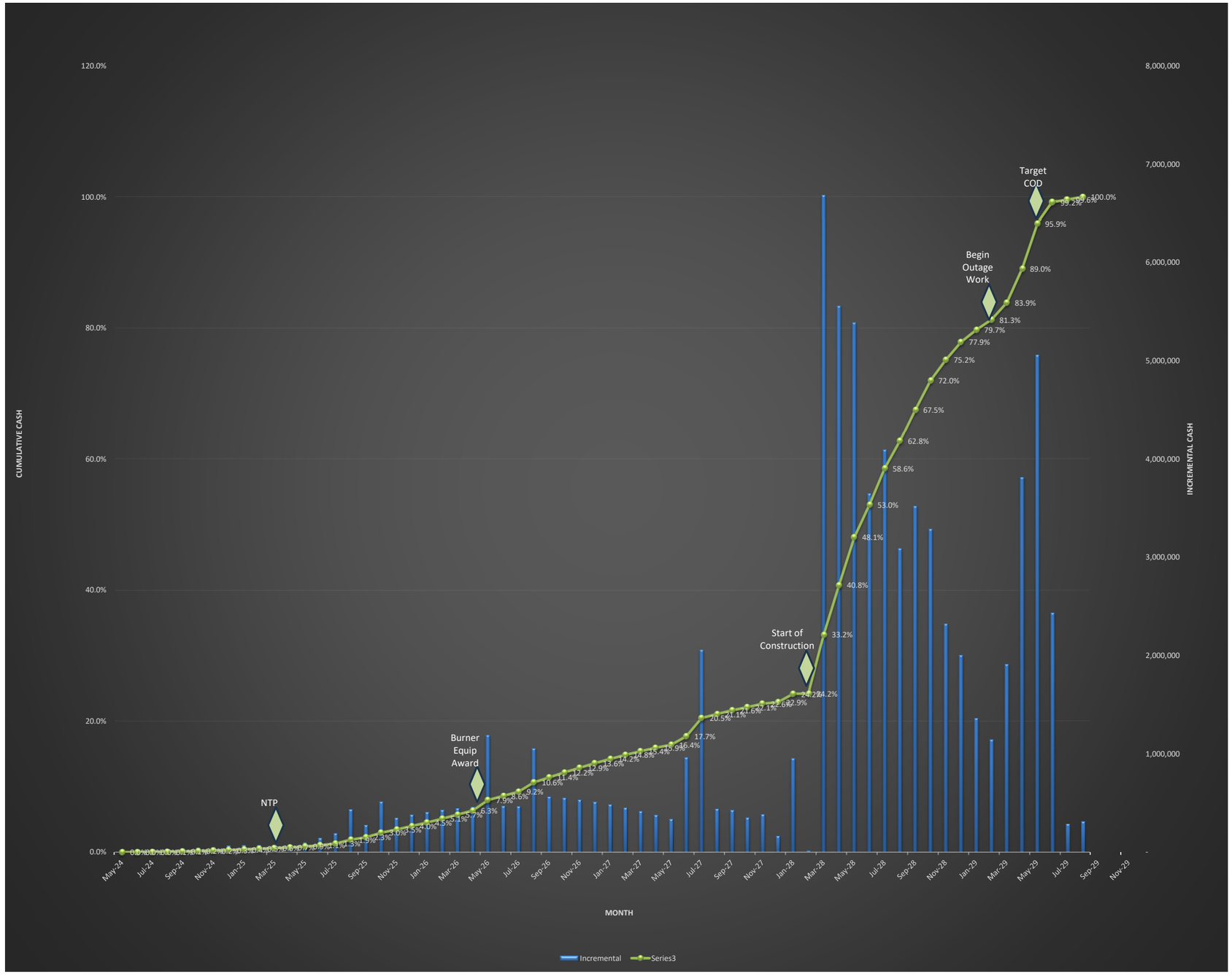
APPENDIX R – CAPITAL COST ESTIMATE

APPENDIX S – CASH FLOW

EKPC - Cooper U2 Co-Fire

Estimated Cash I

Month		Proposed	
		Incremental	Cumulative %
1	May-24	-	0.0%
2	Jun-24	-	0.0%
3	Jul-24	16,206	0.0%
4	Aug-24	29,496	0.1%
5	Sep-24	37,844	0.1%
6	Oct-24	44,193	0.2%
7	Nov-24	49,195	0.2%
8	Dec-24	67,136	0.3%
9	Jan-25	70,126	0.4%
10	Feb-25	72,262	0.5%
11	Mar-25	73,600	0.6%
12	Apr-25	74,181	0.7%
13	May-25	98,301	0.9%
14	Jun-25	145,709	1.1%
15	Jul-25	191,608	1.3%
16	Aug-25	435,668	1.9%
17	Sep-25	276,804	2.3%
18	Oct-25	515,315	3.0%
19	Nov-25	349,976	3.5%
20	Dec-25	380,963	4.0%
21	Jan-26	407,713	4.5%
22	Feb-26	429,910	5.1%
23	Mar-26	447,286	5.7%
24	Apr-26	459,630	6.3%
25	May-26	1,189,786	7.9%
26	Jun-26	468,663	8.6%
27	Jul-26	465,225	9.2%
28	Aug-26	1,054,551	10.6%
29	Sep-26	564,700	11.4%
30	Oct-26	551,718	12.2%
31	Nov-26	533,757	12.9%
32	Dec-26	511,027	13.6%
33	Jan-27	483,795	14.2%
34	Feb-27	452,380	14.8%
35	Mar-27	417,150	15.4%
36	Apr-27	378,519	15.9%
37	May-27	336,939	16.4%
38	Jun-27	962,709	17.7%
39	Jul-27	2,057,046	20.5%
40	Aug-27	441,708	21.1%
41	Sep-27	427,647	21.6%
42	Oct-27	352,008	22.1%
43	Nov-27	385,069	22.6%
44	Dec-27	165,623	22.9%
45	Jan-28	952,563	24.2%
46	Feb-28	14,016	24.2%
47	Mar-28	6,681,831	33.2%
48	Apr-28	5,556,600	40.8%
49	May-28	5,389,230	48.1%
50	Jun-28	3,649,045	53.0%
51	Jul-28	4,092,267	58.6%
52	Aug-28	3,092,626	62.8%
53	Sep-28	3,521,069	67.5%
54	Oct-28	3,289,326	72.0%
55	Nov-28	2,327,062	75.2%
56	Dec-28	2,002,922	77.9%
57	Jan-29	1,361,012	79.7%
58	Feb-29	1,143,978	81.3%
59	Mar-29	1,910,413	83.9%
60	Apr-29	3,813,723	89.0%
61	May-29	5,060,767	95.9%
62	Jun-29	2,435,176	99.2%
63	Jul-29	287,353	99.6%
64	Aug-29	312,838	100.0%
65	Sep-29		
66	Oct-29		
67	Nov-29		



APPENDIX T – O&M COST ESTIMATE (NOT USED)

BURNS McDONNELL

CREATE AMAZING.

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