Appendix B-5

B-O-T Scope Book

For

2020 Request for Proposals for Combined-Cycle Gas Turbine Capacity and Energy Resources for Entergy Texas, Inc.

Entergy Services, LLC

April 28, 2020

Entergy Texas CCGT Plant
Phase 1 Scope Book

TABLE OF CONTENTS

ATTACHMENTS

* Entergy's requirements for this Attachment are included in this scope book

**Attachment to be inserted by Bidder as part of Proposal.

1 PROJECT SCOPE BOOK

This Appendix B-5 and its attachments form the Scope Book. This Scope Book describes certain requirements with respect to the Work. Notwithstanding anything to the contrary in the Scope Book, all Work to be performed by or for the Seller pursuant to the Scope Book shall be performed in accordance with the performance standard (as described in Section 11 of Appendix B-4 (B-O-T Term Sheet) to this RFP).

The Purchase Price set forth in the Agreement will be established based upon the total Project requirements for Work supplied by the Seller and is intended to include all Work requirements for the Project. This Scope Book is not intended to be a comprehensive list of every component or Work element required to complete the overall Project. The supplies or particular work elements that are not detailed in the Scope Book and any revisions to details that are not contained within the Scope Book, but that are agreed upon by the Parties with documented authority during the design review process, will not serve as a basis for adjustment to the Purchase Price.

1.1 PROJECT DESCRIPTION

The Project will be located on a site in the "Eastern Region" of ETI's service area.

The Project will consist of a Commercially-Proven CCGT between 1000 and 1200 MW at Summer Conditions. Operating parameters will include a maximum heat rate of 7,000 Btu/kWh at full output without supplemental duct-firing (if included as part of the facility). The Project will be fully Permitted, and the CTGs, STG and HRSGs will have the agreed upon equipment warranties.

The project will utilize natural gas as the only fuel. Pipeline-quality natural gas will be supplied via a lateral interconnection(s) with sufficient operating pressure to serve the project site. The Project shall be capable of running at full design capability utilizing the interconnection pipeline(s).

A more detailed description of the Project is contained in Attachment A-4 ("Design Basis").

1.2 PROJECT OBJECTIVES

The Seller shall work to complete the Project in accordance with the following "Project Objectives":

a. The Project will be designed taking into consideration the following objectives:
    1) Ensure safe operations, maintainability and construction.
    2) Achieve a thirty (30)-year life.
    3) Facilitate maintenance work and provide access to all equipment according to the Project Standard (including OSHA).
    4) Minimize operator surveillance.
    5) Provide reliable power to the grid meeting the latest NERC reliable power standards to minimize false trips.

b. Achieve compliance with all Permit requirements (including local, states and federal permits must be secured) and guarantees required by the Agreement, including this Appendix B-5.
c. Achieve specified requirements for Project output capacity, heat rate, reliability, emission limits, and noise limits.
d. Minimize adverse local community impacts.
e. Minimize changes throughout engineering, design, procurement, and construction.

1.3 PROJECT EXECUTION PLAN

The Project Execution Plan ("PEP") shall be prepared by the Seller, and will include the following:

a. Health, Safety, and Environmental Plan;
b. Quality Assurance/Quality Control Plan;
c. Project Site Security Plan;
d. Project Organization Plan;
e. Engineering Plan;
f. Contracting Plan;
g. Procurement Plan;
h. Construction Plan;
i. Document Control Plan;
j. Project Risk Register;
k. Schedule Management Plan;
l. Preliminary Baseline Level I and Level II Project Schedules and WBS; and
m. Performance Measure Baseline.

2 SCOPE BOOK

2.1 KEY PERSONNEL CHART

2.1.1 The document entitled "Key Personnel Chart," attached hereto as Attachment A-1, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.2 PROJECT EXECUTION PLAN REQUIREMENTS

2.2.1 The document entitled "Project Execution Plan Requirements," attached hereto as Attachment A-2, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.3 PROJECT PERFORMANCE TESTS

2.3.1 The document entitled "Project Performance Tests," attached hereto as

Attachment A-3, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.4 DESIGN BASIS

2.4.1 The document entitled "Design Basis," attached hereto as Attachment A-4, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.5 CIVIL/STRUCTURAL/ARCHITECTURAL DESIGN

2.5.1 The document entitled "Civil/Structural/Architectural Design," attached hereto as Attachment A-5, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.6 MECHANICAL DESIGN

2.6.1 The document entitled "Mechanical Design," attached hereto as Attachment A-6, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.7 ELECTRICAL DESIGN

2.7.1 The document entitled "Electrical Design," attached hereto as Attachment A-7, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.8 CONTROLS DESIGN

2.8.1 The document entitled "Controls Design," attached hereto as Attachment A-8, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.9 HIGH VOLTAGE INTERCONNECT FACILITY

2.9.1 The document entitled "High Voltage Interconnect Facility," attached hereto as Attachment A-9, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.10 OPERATION AND MAINTAINENCE REQUIREMENTS

2.10.1 The document entitled "Construction/Erection and Installation," attached hereto as Attachment A-10, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.11 TERMINAL POINTS

2.11.1 The document entitled "Terminal Points," attached hereto as Attachment A-

11, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.12 DIVISION OF RESPONSIBILITY

2.12.1 The document entitled "Division of Responsibility," attached hereto as Attachment A- 12, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.13 TAGGING PROCEDURE

2.13.1 The document entitled "Tagging Procedure," attached hereto as Attachment A-13, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.14 TRAINING

2.14.1 The document entitled "Training Procedure," attached hereto as Attachment A-14, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.15 DRAWING SPECIFICATION

2.15.1 The document entitled "Drawing Specification," attached hereto as Attachment A-15, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.16 APPROVED MANUFACTURERS LIST

2.16.1 The document entitled "Approved Manufacturers List," attached hereto as Attachment A-16, is adopted and fully incorporated by reference as if it were reproduced in its entirety.

2.17 MAJOR TECHNICAL SPECIFICATIONS

The following major equipment technical specifications are adopted and fully incorporated by reference as if it were reproduced in its entirety:

2.17.1 Attachment A-17 – Gas Turbine Technical Specification
2.17.2 Attachment A-18 – Turbine Driven Generator Technical Specification
2.17.3 Attachment A-19 – Steam Turbine Technical Specification
2.17.4 Attachment A-20 – HRSG Technical Specification
2.17.5 Attachment A-21 – GSU Transformer Specification
2.17.6 Attachment A-22 – Continuous Emission Monitoring System

3 ENGINEERING & DESIGN

Seller shall be responsible for all engineering and design of the Project in accordance with this

Scope Book and the remainder of the performance standard. If, during the Work, Seller discovers any conflicts between this Scope Book and the remainder of the performance standard, Seller shall promptly disclose to Buyer any such conflicts, which shall be resolved according to the Agreement. Seller shall cause all design and engineering materials, documents, drawings and calculations pertaining to the Project (collectively, the "Engineering Materials") to be prepared by qualified, licensed and authorized professional engineers, and, if required by applicable Laws, sealed by a professional licensed in Texas.

The Seller is responsible for assuring that the Scope Book for the Project, including the Seller's technical specifications referenced elsewhere in the Agreement or its attachments and any Owner's approved changes made by the Seller thereto, will provide adequate and accurate information, and the Seller is responsible for assuring that its Contractors and Subcontractors deliver their respective scopes of supply in a manner that will meet the Project Objectives set forth in Section 1.2 of this Appendix B-5 and will be consistent with the Project Warranty and Performance Guarantees.

3.1 DESIGN BASIS

Seller shall provide a design basis for the Project for Buyer's review and comment according to Sections 2.2 through 2.9. The design basis shall provide specific criteria for the Project, including minimum technical requirements and parameters, and, at a minimum, address the following:

a. Overall Project configuration;
b. Project operations basic control philosophy;
c. Project Site-specific conditions;
    i. Project Site location;
    ii. temperatures and humidity;
    iii. precipitation, wind, seismic;
    iv. lot restrictions;
    v. permit limitations;
d. Water supply (as required);
e. Estimated wastewater/stormwater streams and quality limits (as required);
f. Noise limits;
g. Subsurface conditions;
h. Project Site flooding/weather impacts;
i. Electrical/communication interconnection;
j. Building and enclosures;
k. Applicable standards;
l. Safety; and
m. Quality assurance/quality control (QA/QC).

The Seller shall also provide the discipline specific design criteria and address all items delineated in Attachments A-4 through A-9.

3.2 ENGINEERING MATERIALS REVIEW

All Engineering Materials (including the design basis and documents of conceptual, basic, and detailed design) must comply with this Scope Book (including the description in Section 1.1 above and the principles in Section 1.2 above) and otherwise with the performance standard. Engineering design packages for conceptual design related to the Project, including for major procurement selection ("Phase A Deliverable"), for Permit applications or submissions ("Phase B Deliverables"), and, prior to issuance thereof, drawings for construction ("Phase C Deliverables") shall be submitted for review and approval by Buyer in accordance with the dates therefor set forth in the Project Schedule. Within fifteen (15) Business Days after receipt of any Phase A Deliverable, and within ten (10) Business Days after receipt of any Phase B Deliverable, Phase C Deliverable, or subsequent revision to a Phase A Deliverable, Buyer may submit comments to Seller with respect to such Engineering Materials. In the event that Buyer does not provide comments within such ten (10) or fifteen (15) Business Day period, as applicable, such Engineering Materials shall be deemed approved. If Buyer provides comments within such ten (10) or fifteen (15) Business Day period, as applicable, Seller shall modify such Engineering Materials in response to any Buyer comments that identify errors or omissions in design or failures to comply with the performance standard, including this Scope Book, or the other terms of the Agreement, and Seller shall consider in good faith all other comments Buyer provides within such ten (10) or fifteen (15) Business Day period, as applicable. Seller shall resubmit the applicable revised Engineering Materials to Buyer within ten (10) Business Days after receiving Phase A comments from Buyer. Seller shall maintain a log of comments received from Buyer and how they have been addressed and shall submit such log to Buyer with the revised Engineering Materials. This procedure shall be repeated until such Engineering Materials are approved by Buyer. Seller shall not implement any portion of the Work based on any Engineering Materials until the same have been approved by Buyer; provided, however, that Seller shall be entitled to address issues identified in one design phase in the next subsequent design phase if necessary, for Seller to preserve the Project Schedule. Any change proposed to the Engineering Materials after approval thereof shall be subject to further approval by Buyer according to the process in this Section 3.2.

For the avoidance of doubt, and without limiting the performance standard, the Engineering Materials shall not include equipment that does not comply with Attachment A-16.

3.3 CERTAIN APPLICABLE STANDARDS

Without limiting any other aspect of the performance standard (including other standards that may be listed elsewhere in this Scope Book or the Agreement), the Project (including its design) shall comply with the standards of the following organizations, to the extent applicable to the Work being performed:

- AASHTO – American Association of State Highway and Transportation Officials

- ABMA – American Boiler Manufacturers Association
- ACI – American Concrete Institute
- ACMA – Air Moving and Conditioning Association
- ADC – Air Diffusion Council
- AFBMA – American Bearing Manufacturers Association
- AGMA – American Gear Manufacturers Association
- AISC – American Institute of Steel Construction
- AISI – American Iron and Steel Institute
- AMCA – Air Movement and Control Association, Inc.
- ANSI – American National Standards Institute
- API – American Petroleum Institute
- ARI – Air Conditioning Refrigeration Institute
- ASCE – American Society of Civil Engineers
- ASHRAE – American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc.
- ASME – American Society of Mechanical Engineers
- ASME PTC – American Society of Mechanical Engineers Performance Test Code
- ASNT – American Society for Nondestructive Testing
- ASTM – American Society of Testing and Materials
- ASTM-A615 – Deformed Billet Bars for Concrete Reinforcement
- AWS – American Welding Society
- AWWA – American Water Works Association
- BPVC – Boiler and Pressure Vessel Code
- CFR – United States Code of Federal Regulations
- CMAA – Crane Manufacturers Association of America
- CWA – Clean Water Act
- EJMA – Expansion Joint Manufacturing Association
- EPA – United States Environmental Protection Agency
- FAA – Federal Aviation Administration
- HI – Hydraulic Institute
- HIS – Hydraulic Institute Standards
- IBC – International Building Code
- ICEA – Insulated Cable Engineers Association
- IEEE – Institute of Electrical and Electronics Engineers
- ISA – International Society of Automation
- ISO – International Organization for Standardization
- MCAA - The Measurement, Control & Automation Association
- MSS – Manufacturers Standardization Society
- NAAMM – National Association of Architectural Metal Manufacturers

- NACE – National Association for Corrosion Engineers
- NBBI – National Board of Boiler and Pressure Vessel Inspectors
- NEC – National Electrical Code
- NECA – National Electric Contractors Association
- NEMA – National Electrical Manufacturers Association
- NESC – National Electrical Safety Code
- NFPA – National Fire Protection Association
- NFPA 70 – National Electrical Code
- NPDES – National Pollution Discharge Elimination System
- OSHA – Occupational Safety and Health Administration
- PFI – Pipe Fabrication Institute
- PPI – Plastics Pipe Institute
- PTC – Power Test Code
- PUCT – Public Utilities Commission of Texas
- SAMA – Scientific Apparatus Manufacturers Association
- SEG – EPA Steam Electric Effluent Guidelines (40 CFR 423)
- SMACNA – Sheet Metal and Air Conditioning Contractors National Association
- SSPC – Steel Structures Painting Council
- TEMA - Tubular Exchanger Manufacturer's Association
- TCEQ – Texas Commission on Environmental Quality
- TPWD – Texas Parks and Wildlife Department
- TxDOT – Texas State Department of Transportation
- UL – Underwriters Laboratories, Inc
- UPC – Uniform Plumbing Code

3.4 ENGINEERING DELIVERABLES

All engineering deliverables and services shall be provided by Seller to the Buyer in accordance with the Project Execution Plan and the remainder of the performance standard. The latest version of the following deliverables with respect to the Project shall be delivered to Buyer as provided below. Updates to any such deliverable shall be delivered to Buyer as completed (with the final version of each delivered to Buyer no later than Final Completion). Prior to the final versions, Seller shall provide such deliverables in native file format, if possible, but otherwise in PDF file format. The final version of all deliverables shall be provided (no later than Final Completion) in native file format. Final drawings must adhere to the Drawing Specification as shown in Attachment A-15. The listings in this Section 3.4 are not intended to and do not include all deliverables from Seller to Buyer required by this Scope Book or the Agreement. Nothing in this Section 3.4 shall limit Seller's obligation to provide to Buyer any additional deliverable that may be required by this Scope Book or the Agreement. Items denoted "X" must be completed/accepted by the Buyer to achieve the stated Contractual Milestones.

	Document Description	Mechanical Completion	Substantial Completion	Final Completion
a.	One line diagram	X	X	X
b.	Three line diagram	X	X	X
c.	P&IDs	X	X	X
d.	General arrangement drawings	X	X	X
e.	Terminal point list	X	X	X
f.	Underground features drawing	X	X	X
g.	Project plot plan	X	X	X
h.	Heat balances (OEM)	X	X	X
i.	OEM performance test reports (FAT, shop & field)	X	X	X
j.	Geotechnical investigation report	X	X	X
k.	Software licenses		X	X
l.	PE Stamped Foundation and Structural Steel Drawings	X	X	X
m.	Agreed-upon Punchlist -Mech Completion	X		
n.	Agreed-upon Punchlist - Substantial Completion		X	
o.	Instrument calibration list		X	X
p.	Protective relay settings list		X	X
q.	Equipment list	X	X	X
r.	Valve list	X	X	X
s.	Piping line list	X	X	X
t.	Red line drawings		X	X
u.	Plant Control Philosophy	X	X	X
v.	System Descriptions	X	X	X
w.	Equipment operation & maintenance manuals		X	X
x.	I/O list	X	X	X
y.	DCS factory acceptance test results		X	X
z.	Natural gas flow meter certification and calibration certificates		X	X
aa.	All Commissioning test results (including computer or software generated results and any necessary changes made to meet compliance requirements), bills of		X	X

	material, and drawings required to demonstrate compliance with applicable NERC standards.			
bb.	Project Performance Test results		X	X
cc.	Project performance correction curves		X	X
dd.	Reliability Test results		X	X
ee.	Demonstration test results		X	X
ff.	Operators and maintenance personnel training records			X
gg.	Final Project Site-specific operating procedures		X	X
hh.	Final Project Site-specific system descriptions			X
ii.	Calculations		X	X
1	Electrical load flow studies.		X	X
2	Electrical grounding calculations.		X	X
3	Protective relaying settings and coordination study.		X	X
4	Electrical short circuit analysis.		X	X
5	Arc flash study.		X	X
j.j	Environmental test reports			X
kk.	NERC test reports and calibration records			X
ll.	As-built technical documents (red lines incorporated)			X
mm.	Final equipment operations and maintenance manuals			X
nn.	3D model (Navisworks)			X
oo.	Final documentation in native format			X
pp.	Construction Rigging/Lifting Plans			X
qq.	Turnover Books/Manuals - shall include all construction, testing and commissioning records and forms, system and/or work package punch list, as-built drawings, preventative maintenance and non-conformance records, and vendor	X	X	X

	service reports and bulletins for each system and/or work package.			

3.5 SYSTEM DESCRIPTIONS

System descriptions of as-build systems, including the following, shall be provided by Seller to Buyer based on draft examples supplied by Buyer to Seller at Mechanical Completion, with the final version of such system descriptions provided to Buyer by Final Completion:

a. 138kV and/or 230 kV switchyard (depending on interconnection location)
b. 125 Volt DC distribution
c. MV distribution
d. LV distribution
e. Essential AC power distribution
f. Diesel Generator
g. DCS
h. Fuel gas system.
i. Steam Systems
j. Feedwater System
k. Condensate System
l. Cold Reheat System
m. Hot Reheat System
n. Circulating Water System
o. Fuel Gas System
p. Demineralized Water System
q. Heat Rejection System
r. Cooling Tower and Cooling Water System
s. Closed Cooling Water System
t. Aqueous Ammonia Unloading, Storage and Transfer System
u. Fire protection system
v. Fire detectionsystem
w. Service watersystem
x. Raw water intake system
y. Sanitary sewer system
z. Water treatment system
aa. Instrument and service air systems
bb. Storm Water Drainage
cc. Process Water Drainage
dd. Makeup water treatment
ee. Process water treatment system/OWS
ff. Chemical feed system
gg. Steam Sampling System
hh. Plant control philosophy
ii. Potable water system
jj. Compressed gas systems

Each system description shall include the following minimum elements:

a. The functions performed by the system and how the system contributes to implementation of the design criteria.
b. A description of the system and its major equipment and components, and each of their respective performance characteristics.
c. A detailed description of system operating limitations, setpoints, and precautions for each mode of operation (including startup, shutdown, and normal operations).
d. A description of system safety features and safety precautions for operation or maintenance required to prevent personnel injury.
e. A description of system boundaries.

The system descriptions shall be task-oriented procedures in Buyer's format. They shall be initially issued by Seller prior to Closing and reviewed with Buyer prior to initial issue. Following the Closing, the system descriptions shall be revised as necessary during the course of the Work to reflect the as-built status of Project systems and equipment and to take into account any comments from Buyer. The system descriptions shall be finalized by Final Completion and shall not be considered finalized until they reflect the final as-built status of Project systems and equipment and are approved by Buyer.

3.6 OPERATING PROCEDURES

Project-specific operating procedures shall be provided by Seller based on examples provided by Buyer of procedures currently in use at existing facilities. The operating procedures shall include the following with the X denoting the party responsible for development of the particular procedure:

Operating Procedure	SELLER	OWNER
Startup Procedure (Hot/Warm/Cold for 1x1, 2x1)	X	
Shutdown Procedure (Hot/Warm/Cold for 1x1, 2x1)	X	
Emergency Shutdown Procedure (Hot/Warm/Cold for 1x1, 2x1)	X	
HRSG Wet/Dry Layup Procedure	X	
Air Compressor Operation (including swapping air compressor)	X	
Water Processing/Treatment Equipment	X	
Closed Cooling Water	X	

Gas Turbine Fire Protection	X	
480V Electrical Switching	X	
480V Racking (remote and manual)	X	
Generator Breaker Operation	X	
Switchyard Breakers Operation	X	
Diesel Generator Operation/ Periodic Testing	X	
Gas Turbine & Steam Turbine Generator H2 Purge/Fill	X	
Gas Turbine Offline Water Wash		X
Gas Turbine Online Water Wash		X
Gas Turbine Valve Calibration		X
Gas Turbine IGV (inlet guide vane) Calibration		X
Fire Protection Operation/Weekly Testing		X
Gas Turbine Hazardous Gas Detection Calibration		X
Loss of Power Procedure (Black Plant)	X	
HRSG Operation (Steam/Feedwater/ Condensate)	X	
Steam Turbine Operation	X	
CEMS Daily Calibration	X	
CEMS Linearity	X	
Compressed Gas Systems	X	
Fuel Gas Purge	X	
H_2 Unloading		X
CO_2 Unloading		X
Ammonia Unloading	X	
Intake Screen Operation	X	

MV Switchgear Switching and Racking	X	
Loss of Power Operations (Islanding Operation)	X	
UPS/Essential Bus Operations	X	
Exciter Local/Manual Operation	X	
Oil/Water Separator	X	
Fuel Gas Supply	X	
Construction Rigging/Lifting Plans	X	
Surveillance		X

The operating procedures shall be task-oriented procedures in Buyer's format. They shall be initially issued by Seller prior to the Closing and reviewed with Buyer prior to initial issue. Following the Closing, the operating procedures shall be revised as necessary during the course of the Work to reflect the as-built status of Project systems and equipment and to take into account any comments from Buyer. The operating procedures shall by finalized by Final Completion and shall not be considered finalized until they reflect the final as-built status of Project systems and equipment and are approved by Buyer.

3.7 FIRE PROTECTION SYSTEM

Without limiting the performance standard, the Project (including facilities, systems, and equipment) shall have a fire protection system that meets all applicable Laws and Attachment A-23 Fire Protection

3.8 STORM WATER DRAINAGE SYSTEM

Without limiting the performance standard, the Project shall have a storm water drainage system that meets all applicable Laws (including local, state, and federal requirements) and permits. The storm water drainage system shall be a combination of piped storm water, catch basins, buried pipes, culverts, swales, and sheet flow.

4 ADDITIONAL REQUIREMENTS

This Section 4 describes certain general requirements for the Project. Such requirements are the sole responsibility of Seller to manage.

4.1 GENERAL

Seller shall furnish a safe, quality built, timely, complete, functional Project while safeguarding the environment and adhering to the performance standard, including all Laws and applicable Permits, Good Industry Practices, the standards in Section 3.3 above, and the other requirements of this

Scope Book and the Agreement. Seller shall utilize safe work practices throughout the Project's execution and have in place and maintain effective safety and quality control programs. Seller shall strictly follow all installation and instruction manuals of the OEMs in the performance of the Work.

4.2 PROCUREMENT PLAN

The Seller shall provide procurement of goods and services needed for the Project in accordance with the Project Procurement Plan described in Attachment A-2 ("Project Execution Plan Requirements"), Section 7 ("Procurement Plan") which addresses the purchase of equipment, material, goods and services.

4.3 SCOPE OF APPLICABILITY OF PROCUREMENT PLAN

The policies, responsibilities, standard procedures, and instructions included in the Procurement Plan shall apply to all procurement activities conducted by the Seller to fulfill its obligations as detailed in the Agreement.

4.4 CONSTRUCTION

The Seller shall (whether directly or otherwise through for example its EPC Contractor) arrange for and manage the construction of the Project in accordance with the Project Execution Plan and the Agreement.

The Seller will comply with the EPC Contractor's project health & safety plan, until Substantial Completion has been achieved and the facility is turned over to Buyer.

The Seller will liaise with representatives of the Buyer throughout the duration of the Project to demonstrate compliance with the PEP.

4.5 MOBILIZATION PLAN

The Seller is responsible for the mobilization of field forces and all necessary construction facilities at the Project Site, including temporary office trailers as necessary or advisable for completion of the Work. Seller shall provide a temporary area lighting system sufficient for construction activities at the Project Site and to provide safe access to the Work areas during early morning and late evening hours of operation.

The Seller is also responsible for the preparation and maintenance of unloading and laydown areas, Project Site craft parking areas, storage facilities, temporary buildings and other necessary facilities, as may be required.

The Seller shall adequately prepare the laydown/office/parking areas to minimize any adverse effects from weather or other hazards to facilities or stored materials. Where required by the equipment manufacturer(s), air-conditioned storage including provisions for heaters, and covered indoor climate-controlled storage shall be provided by the Seller. Any action taken by

Seller for Project Site preparation shall not increase the risk that the Project Site could cause flooding to the adjacent properties.

4.6 SITE CONDITIONS

Seller shall take appropriate surface water, erosion, and dust control measures for the Project Site and the other areas where Seller is performing Work, including Project access roads utilized to perform Work, laydown areas, and craft parking areas, in accordance with the erosion and sedimentation Permit issued by the local conservation district or other relevant Governmental Authority and the performance standard.

Hazardous Substances shall be stored in accordance with applicable federal and state EPA requirements and other Laws and applicable Permits, and Project Site spill control measures shall be implemented in accordance with the performance standard.

The Seller shall be responsible for all site development activities, including obtaining site survey, site preparation, necessary permits, and site security. Seller is responsible for all required construction power, potable water, and sanitary water supply and disposal.

4.7 RIGGING/EQUIPMENT PLANS

The Seller is responsible for lifting, rigging, unloading and transporting of all equipment associated with the Project.

The Seller shall prepare a comprehensive lifting and rigging plan for all major equipment/components lifts during construction. A rigging and lifting plan shall be developed an approved for all high-risk engineered lifts or critical lifts (including but not limited to lifting activity that requires the use of custom designed “below the hook” lifting devices, blind lifts, multiple cranes, lifts requiring greater than 75% of the lifting capacity, or establishment of safeguards to control movement in the vicinity of energized facilities) . Rigging and lifting plans for each high-risk engineered/critical lift shall be provided to the Buyer for approval at least four weeks in advance of when the lift is scheduled to take place. All rigging and lifting plans shall be prepared and sealed by a Professional Engineer.

The Seller shall evaluate any special equipment requirements, including major crane needs prior to mobilization.

4.8 GENEAL CLEANING

Through Substantial Completion, Seller shall maintain the Project Site in a clean and orderly state. Seller shall remove all excess materials and ensure that all Work and maintenance areas, and all Work area access paths, remain unobstructed and in good, safe condition. After Substantial Completion, Seller shall be responsible for ensuring that any area where it is performing Work is kept clean and orderly and returned to at least substantially the same condition as existed prior to its performance of such Work (excluding any condition whose repair was a part of the Work).

4.9 DEMOBILIZATION

Upon completion of all required Work, Seller shall completely demobilize trailers, equipment, and other construction facilities or items, remove all temporary service connections, protect all equipment, systems, connections, and property for future use, and, unless otherwise instructed by Buyer, remove any Hazardous Substances and all non-hazardous construction debris, chemical wastes, etc. in strict accordance with Laws and applicable Permits and otherwise with the performance standard. Any lay down, construction parking, and/or work areas constructed on a temporary basis shall be retained for future use.

4.10 SECURITY

Seller shall develop and implement the Project Site Security Plan as required by the Agreement. Without liming the foregoing, the Project Site Security Plan shall include:

a) Installing security gates at all Project entrances with signs indicating an emergency contact telephone number;
b) Plan and install permanent and temporary site security fencing and, as required, the Seller shall provide remaining perimeter fence around the construction laydown/parking areas and the construction offices area for the duration of construction and Commissioning.
c) Implementing a reasonably designed Project entrance gate procedure to provide controlled and monitored access;
d) Staffing Project gate entrance as required by gate guards who maintain a date-and-time sign-in log for all deliveries and visitors;
e) Providing security personnel with a telephone at the guard shacks and with mobile communication capability; and
f) Providing security with emergency contact information and with communication capability with local emergency and law enforcement agencies for assistance in the event of a construction emergency.

4.11 SITE WORK, EXCAVATION, FILL, and GRADING

Seller shall be responsible for the proper handling, storage (spoils pile(s)), and disposal, as applicable, of excavated soil materials in compliance with the procedures outlined in the Agreement for the handling and disposal of waste and/or contaminated Hazardous Substances.

All excavations shall be protected from the elements. Once foundations are stripped, Seller shall use all reasonable means to backfill the excavations adjacent to foundations. Any washouts or other deviations shall be immediately Remedied.

4.12 COMMUNITY RELATIONS

Seller shall make best efforts to manage for all community relations for and with respect to the Project through Substantial Completion. Seller shall use best efforts to undertake such works and

other activities as necessary or advisable to engender and maintain, and shall use best efforts perform the Work and its other obligations under the Agreement in a manner that is intended to engender and maintain, a positive perception of the Project within, and a harmonious relationship with, the surrounding community, such that Buyer could reasonably be expected to inherit that perception and relationship at the Closing and thereafter preserves the same through Substantial Completion and, to the extent based on Seller's or the Seller Service Providers' acts or omissions, thereafter.

4.13 FACILITIES FOR BUYER

Seller shall, starting at the start of physical construction on the Project Site and continuing until Substantial Completion, provide 2 x 6 trailers for the exclusive use of Buyer, sufficient to accommodate a minimum of thirty (30) Buyer Representatives. Seller shall be responsible for obtaining and providing all hookup and utilities (including electric power) for the trailer. Such trailer shall be located adjacent to Seller's trailers.

4.14 LESSONS LEARNED

Buyer shall supply a lessons learned knowledge database to the Seller.

The Seller shall evaluate and incorporate lessons learned into the planning, work processes and work activities of this project.

5 ACRONYMS

- AAAC – All aluminum alloy conductors
- AAC – All aluminum conductors
- AC – Alternating Current
- ACSR – Aluminum conductor, steel reinforced
- AGC – Automatic Generation Control
- Air Emissions Standards – Legal requirements governing air pollutants released into the atmosphere that set quantitative limits on the permissible amount of specific air pollutants that may be released from specific sources over specific timeframes. The Air Emissions Standards for the Project will be set forth in the federal/state air Permit(s) issued for the Project.
- Air Emissions Tests – The testing required to demonstrate that the Project's emissions are within the Air Emissions Standards as specified in the Project Permits and completed in accordance with the federal/state air Permit(s) specific conditions and in accordance with the specified methodology.
- Air Emissions Testing Procedures – The Air Emissions Test procedures to be developed by the Seller as set forth in Attachment A-3 ("Project Performance Tests").
- AML – Approved Manufacturers List in Attachment A-16

- Applicable Standards – As described in Section 3.3 above ("Certain Applicable Standards").
- AWG – American wire gauge
- Baseline Schedule – The Level III CPM Project Schedule to be prepared by the Seller.
- BEP – Boiler external piping
- BIL – Basic lightning impulse insulation level
- BNS – Batch Neutralization System
- BOP – Balance of Plant
- BTU – British Thermal Unit
- C_2H_2 – Acetylene
- C_2H_4 – Ethylene
- C_2H_6 – Ethane
- CAD – Computer-aided design
- CCVT – Coupling capacitor voltage transformer
- CCW – Closed cooling water
- CEMS – Continuous Emissions Monitoring System
- CH_4 – Methane
- CHDPE – Corrugated-high density polyethylene
- CO – Carbon monoxide
- CO_2 – Carbon dioxide
- Commissioning – All activities that occur on Project systems after the completion of construction, such as equipment checkout, testing, flushes, preliminary and initial operation, and Project functional testing prior to the Closing Date.
- CPE – Chlorinated polyethylene
- CPI or Critical Path Items – All activities with zero (0) or negative float in relation to the scheduled date for Substantial Completion.
- CPM – Critical Path Method
- CSA – Civil, Structural, Architectural
- CS – Carbon Steel
- CT(s) – Combustion turbine(s)
- CTG(s) – Combustion turbine generator(s)
- DAHS – Data acquisition and handling system
- DCS – Distributed Control System
- Demonstration Tests – As defined in the Technical Specifications A-17 through A-22

- DGA – Dissolved gas-in-oil analysis
- DL – Dead Loads
- DLN – Dry low NOx
- DPDT – Double pole, double throw
- DSP – Director-Strategic Procurement
- E&C – Engineering and construction
- Earned Value ("EV") and Earned Value Management ("EVM") – As defined in Attachment A-2 ("Project Execution Plan Requirements"),
- EMI – Electromagnetic Interference
- EMT - Electrical Metallic Tubing
- Entergy Standards – Entergy's design and/or operation requirements to be issued to the successful Seller
- EPC – Engineering, procurement and construction.
- EPC Contract –The Sellers Contract or Contracts with one or more Contractors for the performance of primary engineering, procurement and construction Work.
- EPC Contractor – The Contractor with responsibility for the primary engineering, procurement and construction Work.
- EPR – Ethylene propylene rubber
- ESALs – Equivalent single axle loads
- ETFE – Ethylene Tetrafluoroethylene
- ETMS – Electronic temperature monitoring system
- FACP – Fire alarm control panel
- FAT – Factory Acceptance Test
- FCN – Field Change Notice
- FM – Factory Mutual
- FNTP – Final notice to proceed
- FREP – Fire Risk Evaluation Plan
- FVNR – Full Voltage Non-Reversing
- Gas Turbine Generator and Accessories – As referenced in Attachment A-17 ("Gas Turbine Technical Specification").
- GCB – Generator Circuit Breaker
- GFCI – Ground fault current interrupter
- gpm – Gallons per minute
- GPR – Ground potential rise
- GSU – Generator step-up

- GT – Gas Turbine
- Guarantee Test Conditions – The conditions to which the as-tested Net Electrical Output and Net Heat Rate values will be determined during the Net Electrical Output and Net Heat Rate Test and shall be corrected as described in Attachment A-3 (“Project Performance Tests”).
- H2 – Hydrogen gas
- HCS – Hydrogen cooling system
- HDPE – High-density Polyethylene
- HHV – Higher Heating Value
- HMI – Human Machine Interface
- HP – High pressure or horse power, as applicable
- HRSG - Heat recovery steam generator
- HV - High voltage
- HVAC – Heating, ventilating, and air conditioning
- I&C – Instrumentation and controls
- I/O – Input/output
- IFA – Issued for Approval
- IFB – Issued for Bid
- IFC – Issued for Construction
- IFD– Issued for Design
- IFF – Issue for Fabrication
- IFI – Issued for Information
- IFP – Issued for Purchase
- IFRC – Issued for Review and Comment
- IGV – Inlet Guide Vane
- IMS – Integrated Master Schedule
- IP – Internet protocol or intermediate pressure, as applicable
- IPB – Isolated Phase Bus
- IT – Informational technology
- kcmil – One Thousand Circular Mil
- KIPs – 1000 pounds
- ksi – Kips per square inch
- kV – Kilovolt
- KVM – Keyboard video mouse

- kWh – Kilowatt Hour
- LCI – Load commutated inverter
- Level – Degree of detail of a particular Project Schedule, for example, a Level III Project Schedule
- LFACP – Local fire alarm control panels
- LHV - Lower Heating Value
- LOTO – Lock Out / Tag Out
- LP – Low Pressure
- LPDES – Louisiana Pollution Discharge Elimination System
- LV – Low voltage
- LVW – Low volume waste
- Maximum Limit – As defined in Attachment A-3 (“Project Performance Tests”) (“Reliability Test and Reliability Guarantee”).
- MCC – Motor Control Center
- MCCB – Molded-case circuit breakers
- Measurement Period – The period for the Reliability Test. Reference Attachment A-3 (“Project Performance Tests”).
- MECL - Minimum emission compliant load
- Metering – As described in Attachment A-9 (“High Voltage Interconnect Facility”).
- MFACP – Main fire alarm control panel
- MGD – Million Gallon per Day
- Minimum Limit – As defined in Attachment A-3 (“Project Performance Tests”) (“Reliability Test and Reliability Guarantee”).
- MOV - Motor Operated Valve
- MSDS – Material Safety Data Sheets
- MTBF – Mean time between failure
- MTTR – Mean time to repair
- MV – Medium voltage
- NBEP – Boiler external piping
- NDT/NDE – Nondestructive testing / nondestructive examination
- NECF – Net Electrical Capacity Factor
- Net Electrical Output – The net Project electrical output (kW) as measured in accordance with Attachment A-3 (“Project Performance Tests”). Refer to Attachment A-3 (“Project Performance Tests”), (“Performance Test Methods”) and (“Performance Guarantees”).

- Net Electrical Output and Net Heat Rate Test – The test during which the Net Electrical Output and Net Heat Rate values will be determined as described in Attachment A-3 (“Project Performance Tests”).
- Net Heat Rate – The net Project heat rate HHV(BTU/kWH) as measured in accordance with Attachment A-3 (“Project Performance Tests”). Refer to Attachment A-3 (“Project Performance Tests”), (“Performance Test Methods”) and (“Performance Guarantees”).
- NO – Nitric oxide
- NO_2 – Nitrogen dioxide
- NOx – Nitrogen Oxides
- NPS – Nominal pipe size
- O_2 – Oxygen
- O&G – Oil and grease
- O&M – Operation and maintenance
- OBS – Organizational Breakdown Structure
- OCR - Optical character recognition
- ODAF – Oil Directed Air Forced
- OEM – Original Equipment Manufacturer
- OFAF – Oil Forced Air Forced
- OFWF – Oil Forced Water Forced
- OL – Over load
- ONAF – Oil Natural Air Forced
- ONAN – Oil Natural Air Natural
- Operating Procedures – Project Site-specific operating procedures described in Section 3.6 above
- OPGW – Optical ground wire
- OWS – Oil/water separator
- P&ID – Piping and Instrumentation Diagram
- PA – Preventive autotransformer
- PCBs – Polychlorinated biphenyls
- PCV – Pressure control valve
- PDC – Power Distribution Center
- PDF – portable document format
- PEECC – Packaged electrical and electronic control compartment
- Performance Guarantee(s) – The Guaranteed Net Electrical Output and Guaranteed Net Heat Rate

- Performance Test Methods – As described in Attachment A-3 (“Project Performance Tests”) (“Performance Test Methods”).
- Performance Testing Contractor – As defined in Attachment A-3 (“Project Performance Tests”) (“Performance Test Methods”).
- PFA – Perfluoroalkoxy
- Plant – Project
- PLC – Programmable Logic Controller
- PM10 – Particulate matter 10 microns diameter and less
- PM2.5 – Particulate matter 2.5 microns diameter and less
- PMB – Performance Measurement Baseline. Reference Attachment A-2 (“Project Execution Plan Requirements”) (“Performance Measurement Baseline”).
- PMI – Positive identification of material
- POI – Point of interconnection
- PPE – Personal Protective Equipment
- ppm – Parts per million
- ppmvd – Parts per million, volumetric dry
- Procurement Plan – As defined in Section 4.2 above.
- Project Demonstration Tests – The tests described in Attachment A-3 (“Project Performance Testing”).
- Project Execution Plan (“PEP”) – The document developed by The Seller in accordance with the requirements of Attachment A-2 (“Project Execution Plan Requirements”). The purpose of PEP is to establish and define the mutually agreed processes, procedures and plans to be utilized during the execution of the Project. The PEP will be the guideline to be followed through the design, procurement, construction, and Commissioning of the Project but will not modify or change any requirements in the Agreement. The PEP will be based on The Seller’s standards that will remain consistent with the warranty and other requirements of the Agreement and Project-specific requirements.
- PRV – Pressure relief valve
- Project Performance Test(s)(ing) – Test(s) used to verify the Project’s capability to meet guarantees for electrical output and heat rate while remaining in compliance with guarantees for emissions and including the tests set forth in Attachment A-3 (“Project Performance Tests”).
- PSD – Prevention of Significant Deterioration
- PSF – Pounds per square feet
- psia – Pounds per square inch absolute
- psig – Pounds per square inch gauge

- PSS - Power system stabilizer
- PVC – Polyvinyl Chloride
- QA/QC – Quality Assurance/Quality Control
- QMS – Quality Management System
- RCP – Reinforced concrete piping
- Reliability Factor ("RF") – The reliability factor calculated in accordance with Attachment A-3 ("Project Performance Testing") ("Reliability Test and Reliability Guarantee") and used to determine the success of the Reliability Test.
- RFI – Request for information
- RFP – Request for proposal
- RGS – Rigid galvanized steel conduit
- RTD – Resistance temperature detector
- RTU - Remote Terminal Unit
- SCF – Standard cubic feet
- SCFM – Standard cubic feet per minute
- SCR – Selective catalytic reduction
- SCS – Supply chain services
- Seller – Solely with respect to Attachment A-18 ("GSU Transformer Specification"), as defined in Attachment A-18 ("GSU Transformer Specification") and ("General Scope of Work").
- SFC – Static Frequency Converter
- SFRA – Special flight rules area
- SL - Seismic Loads
- SNL - Snow Loads
- SO2 – Sulfur dioxide
- SOE – Sequence of events
- SPCC – Spill Prevention, Control, and Countermeasure
- SPL(s) – Sound pressure level(s), as defined in Attachment A-3 ("Project Performance Tests") ("Performance Guarantees").
- SRV – Safety relief valve
- SS – Stainless steel
- Start of Commissioning – date of first turnover by The Seller's construction group to The Seller's commissioning group for Commissioning.
- STG - Steam turbine generator
- SP – Surface Preparation

- SWC – Surge Withstand Capability
- SWPPP – Storm water pollution prevention plan
- System Descriptions – Project Site specific system descriptions as set forth in Section 4.2 below.
- Tagging Procedure – As referenced in Attachment A-4 (“Design Basis”), regarding (“Document, Equipment and Instrument Tagging”) and further described in Attachment A-13 (“Equipment Labeling and Signage Procedure”).
- TCS – Turbine Control System
- TEFC – Totally enclosed, fan cooled
- Test Procedure – As described in Attachment A-3 (“Project Performance Tests”), Section 1 (“Performance Test Methods”).
- TEWAC – Totally enclosed water air cooled
- TL - Thermal Loads
- TOC – Total Organic Carbon
- Type I and Type II – Levels of wastewater
- UAT – Unit Auxiliary Transformer
- UL – Underwriters Laboratories, Inc
- UPS – Uninterruptible power supply
- V - Basic wind speed
- VAR – Value At Risk
- VFD – Variable Frequency Drives
- VOC – Volatile organic compounds
- VT – Voltage transformer
- w.c. – Water column
- Water Effluent Discharge Limits - enforceable parameters that dictate the amount of pollution a facility may discharge on a designated outfall basis as set forth in the National/Louisiana Pollutant Discharge Elimination System (NPDES/LPDES) Permit.
- WL - Wind Loads
- XLPE - Cross-linked polyethylene

Key Personnel Chart

Attachment A-1

Attachment to be inserted by Bidder as part of Proposal

Project Execution Plan Requirements

Attachment A-2

Objective / Introduction

The purpose of this document is to provide an overview of the selected execution method to develop, engineer, and construct the combined cycle facility to generate power in compliance with all federal, state, and local requirements. Following execution of the Agreement, the Seller shall execute the Project in accordance with the requirements of this Attachment A-2.

No modifications to the PEP are permitted without first providing the Owner a reasonable opportunity to review and comment on any proposed modifications, and the Seller shall give due consideration to any Owner's comments received and shall not base its subsequent decision to modify or not modify the PEP solely on cost or convenience to the Seller. The Owner will be reasonable and timely in any modification requests.

This Attachment A-2 is intended to complement and not conflict with any of the various other parts of the Agreement or its Exhibits, Schedules or Attachments; however, to the extent any conflict cannot be reasonably reconciled between the provisions of this Attachment A-2 and those of the Agreement or its Exhibits, Schedules or Attachments besides this Attachment A-2, those provisions and not the conflicting provision(s) of this Attachment A-2 shall control and prevail.

The provisions of this "Objective / Introduction" section shall be construed as having equal force as the provisions in the rest of this document and are not mere recitals.

At a minimum, the following shall be addressed:

1.0	Health, Safety, and Environmental Plan
2.0	Quality Assurance/Quality Control Plan 2.1 Quality Policy 2.2 Quality Program 2.2.1 Process Control 2.2.2 Document and Design Control 2.2.3 Inspection and Testing 2.2.4 Benchmarking 2.2.5 Auditing 2.2.6 Managing Non-conformance 2.2.7 Training
3.0	Project Site Security Plan
4.0	Project Organization Plan 4.1 Overall Project Organization 4.2 Home Office Organization 4.3 Site Organization

5.0	Engineering Plan 5.1 General 5.2 Permits, Laws and Regulations 5.3 Professional Engineers/Architects Seal Requirements 5.4 Definition of Deliverables 5.5 Numbering Systems for Design Documents and Drawings 5.6 Plant Equipment Numbering 5.7 Drawing Title Blocks 5.8 CAE/CAD Approach 5.9 Constructability Approach 5.10 Value Engineering/Cost Reduction Program 5.11 Process Safety Management/Hazard Review 5.12 Unique Design/Execution Considerations 5.13 Requirements for Record Drawings/ Specifications Requirements 5.14 Definition of Spare Parts Requirements 5.15 Drawing Approval Requirements 5.16 Excluded Items
6.0	Contracting Plan
7.0	Procurement Plan 7.1 Procurement Basis 7.2 Procurement Systems 7.3 List of Items Supplied by Client/Others 7.4 Client Purchase Documents and Terms and Conditions 7.5 Receiving/Warehouse Requirements 7.6 Sales Tax Requirements 7.7 Insurance Requirements 7.8 Tax Exempt Status 7.9 Applicable General Conditions 7.10 Invoicing Services and Payment of Invoicing Responsibility 7.11 Expediting Services, Including Supplier Document Review Requirements 7.12 Inspection Services 7.13 Approved Project Supplier List

8.0	Construction Plan 8.1 Site Organization 8.2 Mobilization Plan 8.3 Temporary Facilities Requirements 8.4 Evaluations of Special Requirements 8.5 Evaluations of Special Equipment Requirements 8.6 Operations Restriction During Construction 8.7 Pre-Outage Construction Work Permit Requirements 8.8 Summary Analysis of Tie-ins to Existing Facilities 8.9 Support to be Provided by Others 8.10 Definition of Project Completion and Measurement Criteria 8.11 Rigging/Equipment Plans 8.12 Security 8.13 Environmental, Safety and Health 8.14 On Site Material Receiving/Storage
9.0	Document Control Plan
10.0	Project Risk Register
11.0	Schedule Management Plan
12.0	Preliminary Baseline Level I and Level II Project Schedules and WBS
13.0	Performance Measurement Baseline

Project Performance Tests

Attachment A-3

Attachment to be inserted by Bidder as part of Proposal

Design Basis

Attachment A-4

Design Objectives

It is expected that the plant, as designed and constructed, will:

- Meet the expected project requirements of the Owner.
- Meet all of the performance objectives.
- Have minimum life cycle cost.
- Meet or exceed project safety, schedule and budget goals.
- Be able to be commissioned quickly and easily.
- Meet all of the environmental and noise limits.
- Facilitate easy operation and maintenance by the plant operating staff.
- Provide a reliable interconnection to the high voltage grid.
- Be constructed with minimum adverse impact on the local community.
- Employ ergonomic considerations in the design.
- Provide for a thirty (30) year life.

Operability and Maintainability

Where practical, the design configuration of mechanical components should be selected based on simplifying operability and minimizing maintenance requirements, without significantly sacrificing performance or reliability.

The plant will be designed for base load and cycling operation on a combined cycle basis using control room operators. The plant will be designed to be started with use of up to 3 operators.

The plant is planned as an outdoor facility. With the exception of the steam turbine, buildings/enclosures should be provided for various power plant mechanical and electrical equipment only as required for weather protection or noise abatement. Any buildings and enclosures shall be environmentally controlled as suitable for project use.

The steam turbine shall be equipped with an extended outdoor enclosure to facilitate personnel access during maintenance activities. The enclosure shall be designed to remain in place (except for removable roof panels for mobile crane access) during turbine overhaul activities and sized to allow unrestricted personnel access to the equipment. Laydown and storage space for turbine maintenance and overhaul activities shall be provided adjacent to, but outside, the enclosure.

Provisions to facilitate operation shall be provided for routinely accessed/operated valves (including vent and drain valves), switches, instrumentation, and control points through one of the following methods:

- Permanent walkway or access platform with OSHA compliant stairways (preferred for high traffic and high maintenance areas), ladders, landings, grating, toeplates, handrails and swing gates.

- Remote operated (air/motor/solenoid operator).
- Chain or reach rod operator.
- Temporary ladder, only if the item needs to be operated less than three times per year, and the ladder needed is shorter than 8 feet. Temporary ladders will not be used where access is required for emergency operation.

The above requirements will not apply to hydrotest valves or to root valves or branch isolation valves, unless such valves, such as vent and drain valves, are routinely operated during plant startups, shutdowns, or normal operations.

A permanent walkway will be provided on the main pipe rack such that operation personnel can access any of the HRSGs from the Turbine Building without going to grade level.

The Project shall be arranged to facilitate the performance of maintenance activities with the appropriate use of mobile cranes, forklifts, and permanent monorails and hoists (as applicable) and shall allow for maintenance and easy access to all areas of the plant, including consideration of equipment maintenance pull space clearances. Cost-effective measures to enhance ergonomic maintenance shall be incorporated in the design. In areas where maintenance is infrequent, permanent platforms need not be provided. Temporary scaffolding may be used in such areas should maintenance be required.

Rigging beams/monorails/hoists shall be provided (tested, certified and properly marked) as appropriate. At a minimum, maintenance needs of the following equipment shall be considered:

- CT and ST generator bearing and end shield removal.
- CT and ST generator rotor.
- CT and ST turbine maintenance, including rotor removal.
- BFP motor or pump removal
- Condensate pump or motor removal
- Other large pump or motor removal
- Gas compressors (if applicable)
- Air compressors
- Large valves
- Mixed bed removal
- large chemical tote removal

An administrative building shall be an independent permanent structure and shall be provided with a plant control room, 14 offices, a cubicle area that supports 6 cubicles, a kitchen, one conference room per floor (at minimum a large conference room accommodating minimum 20 people, a second smaller room if two-stories, and restroom facilities on each floor. The building shall be equipped with heating,

ventilating and air conditioned (HVAC). The plant control room and any electronic rooms will be provided with separate HVAC system.

At least 10,000 square feet of heated/ventilated warehouse/shop (Mechanical/ICE) space shall be provided, with 20ft. height for mezzanine level parts storage.

Civil / Structural / Architectural Design Criteria

Attachment A-5

ATTACHMENT A-5

1 CIVIL/STRUCTURAL/ARCHITECTURAL DESIGN CRITERIA

This Attachment A-5 ("Civil/Structural/Architectural Design Criteria") describes the civil, structural and architectural design basis for the Project's buildings (if any), structures and general civil work. All civil/structural work shall be designed in accordance with applicable standards, local, state and federal laws and applicable Permits. All required Permits and inspections shall be obtained as part of the work for this project.

1.0 Project Description

1.1 Project Layout and Access
- 1.1.1 Vertical Clearance
- 1.1.2 Pull Space / Maintenance
- 1.1.3 Fire Access
- 1.1.4 Emergency Egress

1.2 Site Preparation
1.3 Geotechnical Investigation
1.4 Topographic Surveying
1.5 Existing Underground Locates
1.6 Earthwork
1.7 Grading and Drainage
1.8 Foundations
1.9 Erosion Control
1.10 Stormwater Management
1.11 Project Site Surfacing
1.12 Fencing

2 ROADS

2.0 Road Classification
2.1 Parking
2.2 Project Area Paving

3 ENVIRONMENTAL

3.0 Spill Containment
3.1 Wetlands Protection
3.2 Landscaping

4 STRUCTURAL DESIGN REQUIREMENTS

4.0 Applicable Standards
4.1 Loads and Load Combinations

Mechanical Design Criteria

Attachment A-6

MECHANICAL DESIGN

1.1. General

1.1.1. Codes and Standards

All mechanical components shall comply with the applicable requirements of the codes and standards delineated in the Scope Book section 3.3.

1.1.2. Materials of Construction

Unless specifically noted otherwise, materials of construction shall be selected by the Seller based on good engineering practice, compatibility with the process fluids and environmental conditions to which the component is exposed, and to support the overall project life and reliability/maintainability expectations.

1.1.3. Equipment Redundancy

Unless specifically noted otherwise, systems shall be designed with N+1 equipment redundancy, such that a single component failure does not require shutdown or curtailment of the facility. Exceptions to this requirement include the following:

- CTGs, HRSGs, STG – only internal auxiliary equipment redundancy associated with these components is required. Beyond that, a single CTG, HRSG, or STG failure is expected to result in facility curtailment, but not a facility shutdown. Balance of plant system shall be designed to accommodate continued operation with a single CTG, HRSG, or STG out of service.
- Heat Rejection System main components (surface condenser, cooling tower, air-cooled condenser) - only internal auxiliary equipment redundancy associated with these components is required. Overall failure of the condenser, cooling tower, or air-cooled condenser structure is expected to result in facility shutdown. Cooling towers and air-cooled condensers should otherwise be designed with sufficient modularity to allow continued operation if individual cells become inoperable; but installed spare cells are not required. Preference will be given for cooling tower and air-cooled condenser designs that include a +10% design margin, unless buyer gives an allowance to deviate based on buyer's design review.
- Tanks and vessels are not required to be redundant unless specifically noted otherwise. However, bypass provisions shall be provided to allow continued operation if a non-redundant tank or vessel is out of service.
- Overall Piping system main headers are generally not required to be redundant. However, piping systems serving redundant equipment should be designed with sufficient isolation capability to allow continued operation on alternate branches.

1.2. Major Equipment and Systems

The facility shall be equipped with all required mechanical equipment and systems necessary to meet the overall project performance and operability criteria, including, but not necessarily limited to the following:

1.2.1. Combustion Turbine Generators (CTGs)

The CTGs shall be equipped with the following minimum systems and components:

a) Outdoor Enclosure, with associated self-contained lighting, heating, ventilation, and fire protection systems.
b) Inlet filtration system with, as applicable, evaporative cooling.
c) Natural gas fuel and combustion system, including fuel gas heating as applicable.
d) Turbine and generator cooling systems.
e) Turbine and generator lubrication and control oil systems.
f) Generator seal oil system, as applicable.
g) Self-contained package electrical and control equipment.
h) CTG starting system.
i) Compressor Blade Washing System (on- and off-line).

1.2.2. Heat Recovery Steam Generators (HRSGs)

The HRSGs shall be located outdoors and equipped with the following minimum systems and components:

a) Internally insulated and lined exhaust gas ductwork, including expansion joints and flow distribution equipment as applicable.
b) Tubular heat transfer sections
c) Steam drums and integral deaerator as applicable
d) Air emissions control equipment, as applicable
- Use of anhydrous ammonia for SCR systems will not be acceptable.
- Emissions control catalyst life shall be guaranteed to be no less than 3 years

e) Steam stop valves (motor-operated) and non-return valves
f) Drum water level instrumentation and blowdown valves, as applicable.
g) Safety valves and silencers
h) All required boiler and boiler external piping, pipe hangers and supports, miscellaneous valving, and instrumentation necessary for a fully operable HRSG
i) Access platforms, ladders and stairways, including a permanent walkway between HRSG's at the drum level.
j) Exhaust stack, equipped with access ladder, EPA test and CEMS ports, and 360° test port access platform, along with exhaust silencer and stack damper as applicable.

1.2.3. Steam Turbine Generator (STG)

The STG shall be provided with a manufacturer-provided acoustical weather enclosure to include provisions for ease of maintenance (e.g. removable panels / roofing, sliding / rollup doors) and sufficient footprint to support maintenance activities with engineered lighting and ventilation, and equipped with the following minimum systems and components:

a) Main steam stop and control valves and reheat stop and intercept valves

b) Speed/load control system
c) Steam seal system
d) Exhaust hood spray system
e) Turbine and generator lubrication and control oil systems
f) Generator cooling systems
g) Generator seal oil system, as applicable
h) Generator protective relay and metering panel
i) Insulation and lagging suitable for outdoor installation
j) Any emergency steam venting shall be directed outside of the enclosure

1.2.4. Heat Rejection System

A wet cooling tower based heat rejection system is preferred. However, if deemed advantageous due to water availability and permitting reasons, a dry heat rejection will be considered.

The heat rejection system shall include the following minimum equipment, as applicable for the proposed plant design.

a) Steam surface condenser and hotwell (wet system)
b) Mechanical draft cooling tower (wet system)
c) Circulating water pumps (wet system)
d) Auxiliary circulating water pumps (wet system)
e) Air cooled condenser (ACC) system with condensate storage tank and ACC cleaning package (dry system)
f) Air removal equipment (vacuum pumps)

1.2.5. Main steam systems – multiple pressure as applicable for the proposed plant design

1.2.6. Auxiliary steam system, including a natural-gas fired auxiliary boiler if necessary to meet the proposed plant startup times.

1.2.7. Turbine bypass system, for continued operation without the STG in service

1.2.8. Feedwater system, including HRSG feedwater pumps and pump vibration monitoring system

1.2.9. Condensate system, including condensate pumps and condensate polishing system, as necessary.

1.2.10. Fuel Gas System

The fuel gas system shall include the following minimum equipment, as applicable for the proposed plant design and incoming natural gas conditions:

a) Flow metering and pressure control station(s)

b) Fuel gas scrubbers and filter/separators
c) Fuel gas compression system, utilizing centrifugal or screw type compressors (reciprocating compressors are not acceptable).
d) Heating system (dewpoint, performance)

1.2.11. Closed cooling water system
Use of glycol/water mixtures is not acceptable.

1.2.12. Makeup water supply, storage, and transfer systems as necessary to supply all plant water requirements. Water transfer systems shall be sized to provide a minimum continuous transfer rate equal to the worst case overall plant consumption rate at full capacity.

1.2.13. Permanently installed water treatment systems as applicable for cycle makeup, cooling water makeup, service water, and potable water supply. Temporary lease/rental systems (i.e. trailer systems) are not acceptable. Water treatment systems shall be sized to provide a minimum continuous makeup rate equal to the worst case overall plant consumption rate at full capacity.

1.2.14. Site firewater loop and other fire protection systems as deemed necessary by the applicable codes and the local Authority Having Jurisdiction (AHJ).

1.2.15. Wastewater collection, treatment, storage, and transfer systems, as applicable.

1.2.16. Chemical feed and sampling systems

1.2.17. Compressed air system, including compressors, air dryers, and receiver, to provide instrument and service air

1.2.18. Compressed gas systems (N_2, CO_2, H_2, etc.)

1.2.19. Building heating, ventilation, and air-conditioning (HVAC) systems and plumbing

1.2.20. Cranes and hoists as required to facilitate maintenance

1.3. Mechanical Component General Design Criteria

1.3.1. Pumps
Pumps shall be designed and manufactured in accordance with Hydraulic Institute (HI) standards. Except for open sump pumps handling non-hazardous fluids, all pumps shall be equipped with mechanical seals. Good engineering practice shall be used in establishing pump capacity and head requirements, such that reasonable uncertainties in design parameters and variations in operating conditions can be accommodated without requiring

a complete pump re-design.

Pump lubrication methods and frequency shall be reviewed and no pumps requiring manual lubrication greater than once every 14 days. Where more frequent lubrication is required, pumps shall be equipped with automatic lubrication systems.

1.3.2. Tanks

Atmospheric pressure storage tanks shall be designed per AWWA, API, or ASME requirements, as applicable. Unless otherwise specified below, tank capacity shall be established based on a minimum of 5 days storage volume. The following criteria for developing tank storage capacity shall be used:

- Demin water storage shall be a minimum of twice the total demin water consumption requirement for a facility cold start from shutdown to 100% baseload operation.
- Raw/service water storage shall be no less than the 150% of the demin water storage capacity or the total plant raw/service water consumption for four (4) hours of operation at full plant capacity under worst case ambient conditions, whichever is greater.
- Chemical storage shall provide a minimum on-site inventory of 14 days at full plant capacity.

1.3.3. Pressure Vessels

Pressure vessels shall be designed, fabricated, and tested in accordance with ASME Boiler and Pressure Vessel Code (Vessel Code) and stamped with the appropriate code stamp.

1.3.4. Heat Exchangers

Heat exchangers shall be designed, fabricated, inspected and tested in accordance with the requirements of the Vessel Code and Heat Exchange Institute (HEI). The vessels shall be provided with the ASME code stamp and shall be registered with the NBBI as applicable.

1.5. Piping Systems

1.5.1. Piping Codes and Standards

With the exception of firewater piping and building plumbing, all piping system design and material selection shall be in accordance with ASME Section I and/or ASME B31.1, Power Piping. Firewater piping shall be in accordance with NFPA requirements. Building plumbing (potable water and drains) shall be in accordance with the applicable plumbing codes.

1.5.2. Piping Design Criteria

The design, installation, and testing of all piping and piping support systems shall follow good engineering practice and take into account the following considerations:

1) System design pressure and temperature requirements

2) Reasonable velocity and pressure drop criteria under all anticipated operating conditions.
3) Materials, corrosion allowances, coatings, insulating fittings (for dissimilar metal connections), cathodic protection systems, etc. selected and applied as necessary to be compatible with the fluid and environment, commensurate with the overall project life and reliability criteria.
4) Containment requirements for hazardous fluids
5) Thermal and physical movements and equipment nozzle load limitations. Piping stress analysis shall be performed to ensure movements and load limits are within acceptable level.
6) Accessibility/clearance for operation and maintenance
7) System drainage requirements (normal operation, as well as maintenance requirements).
8) System initial fill requirements. Adequate venting and drainage valves shall be provided to facilitate filling and drainage.
9) Insulation and freeze protection
10) Field pressure testing requirements
11) Process sampling/testing/purging requirements
12) Requirements for future or spare connections

1.5.3. Valve Selection Criteria

The selection and application of valves shall follow good engineering practice, shall account for and be consistent with the above piping system design considerations, and shall take into account the following additional considerations:

1) Manual or automatic operability requirements
2) Process control and safety requirements
3) Ease of operation (e.g. gear operators, stem extensions, operator orientation, etc.)
4) Valve lockability requirements

Electrical Design Criteria

Attachment A-7

ATTACHMENT A-7

Electrical Design Criteria

This Attachment A-7 ("Electrical Design Criteria") describes the electrical design basis for the electrical work. All electrical work shall be designed in accordance with applicable standards, local, state and federal laws and applicable Permits. All required Permits and inspections shall be obtained as part of the work for this project.

1.1 General Description

1.2 Generation System

- 1.2.1 Generator Main Leads
- 1.2.2 Generator Circuit Breaker
- 1.2.3 Main Step-Up (GSU) Transformer
  - 1.2.3.1 The auxiliary load shall be backfed through the GSU transformers for plant start-up. No offsite souce of power is required.
  - 1.2.3.2 Plant design shall accommodate 2 starts per day as recommended by Power Gen.

1.3 Auxiliary System

- 1.3.1 Medium Voltage Power System
  - 1.3.1.1 Medium voltage switchgear shall operate at 6.9kV and be metal-clad type and built according to ANSI/IEEE C37 standards. Breakers shall be vacuum interruptor type. Switchgear shall be designed to maintain the arcflash energy below 25cal/cm sq. Optical or fiber optic arc flash and/or differential protection will be considered if required to achieve 25 cal/cm sq.
  - 1.3.1.2 Remote racking devices shall be provided.
- 1.3.2 Low Voltage Power System
  - 1.3.2.1 Station Service Transformers
  - 1.3.2.2 Low Voltage Switchgear
    - Low voltage switchgear shall be arc resistant with a Type 2B minimum rating
    - Remote racking devices shall be provided.
  - 1.3.2.3 Motor Control Centers
    - Motor Control Centers shall be arc resistant with a Type 2B minimum rating
  - 1.3.2.4 Power Panels

1.4 Power Distribution Center (PDC)

- 1.4.1 All major electrical distribution equipment shall be located in a prefabricated Power Distribution Center(PDC). The PDC's shall have a dedicated climate control, battery room, rodent mitigation methods for conduit penetrations, redundant HVAC system,

fire detection. Interconnecting wiring between internal components (coiled at shipping splits) shall be provided.

1.4.2 Buildings shall include in addition to the Switchgear and MCC's, the Distributed Control System (DCS) cabinets, relay cabinets, AC/DC panels and UPS system.

1.4.3 Platform/stairways and maintenance doors for access shall be provided.

1.5 Motor Design Criteria

1.6 Protective Relay and Metering

1.7 DC and Vital AC systems

1.7.1 125V DC System

1.7.1.1 Battery backup should be sized to safely shut down the plant to include 8 hours or more of battery operation.

1.7.2 Vital AC System

1.7.2.1 Diesel generator shall be sized to support local plant loads only. Black start capabilty is not required.

1.8 Plant Communication

1.9 Lighting and Convenience Receptacles

1.10 Cables and Raceway Systems

1.10.1 Cables

1.10.2 Raceways

1.10.3 Cable Trays-

1.10.3.1 Voltage separation shall be provided

1.10.3.2 Cable trays shall be provided with covers

1.10.4 Conduit

1.10.5 Ductbanks

1.10.6 Manhole and Handholes

1.11 Grounding System

1.12 Lightning Protection System

1.13 Cathodic Protection

1.14 Freeze Protection

Controls Design Criteria

Attachment A-8

Attachment A-8

CONTROLS DESIGN CRITERIA

This Attachment A-8 ("Controls Design Criteria") describes the instrumentation and control system work. All instrumentation and control system work shall be designed in accordance with applicable standards, local, state and federal laws and applicable Permits. All required Permits and inspections shall be obtained as part of the work for this project.

1.1. General
1.2. Supervisory Control and Data Acquisition (SCADA)/Automatic Generation Control (AGC)
1.3. Distributed Control System (DCS)
1.3.1. Spares

Seller's DCS shall have a minimum of twenty percent spare I/O points (by I/O type) upon turnover of the system to Buyer

1.3.2. Redundancy

Seller's DCS shall meet the following redundancy requirements:

- As a minimum, the DCS power supplies shall have N+1 redundancy.
- Control processors, network communication cards and I/O bus communication cards shall apply 100% redundancy.

1.3.3. Graphics
1.3.4. Digital I/O
1.3.5. Analog I/O
1.3.6. Foreign Device Interface (FDI)
1.3.7. Factory Acceptance Test
1.4. Analytical Equipment
1.4.1. Continuous Emissions Monitoring System
1.5. Instrumentation Design Criteria/General Requirements
1.5.1. General
1.5.2. General Requirements for Flow Measurement
1.5.3. Flow Nozzles
1.5.4. Orifice Plates
1.5.5. Venturi Tubes and Low Loss Flow Tubes
1.5.6. Averaging Pitot Tubes
1.5.7. Flow Indicators
1.5.8. Magnetic / Vortex / Ultrasonic Flowmeters
1.5.9. Thermocouples and RTDs
1.5.10. Thermowells
1.5.11. Protecting Tubes
1.5.12. Test Wells
1.6. Local Indicators
1.6.1. Local Temperature Indicators (Thermometers)

1.6.2. Local Pressure Indicators (Pressure Gauges)
1.6.3. Local Level Indicators

1.7. Transmitters

1.7.1. General

1.7.2. Redundancy

Process transmitters shall be applied in sufficient redundancy such that no single component failure shall result in plant shutdown or load reduction. Single transmitter inputs can be used for process monitoring and non-critical controls. Dual transmitter inputs allowing Operator selection of high, low, A, B or average input value shall be provided for controls required to maintain plant output. Triple redundant transmitter inputs allowing Operator selection of high, low, A, B, C or median input value shall be provided for controls and interlocks required to prevent a plant shutdown.

A similar approach shall be applied to process switches, if applied, for control interlocks. However, Buyer's preference is for process transmitters to be applied in lieu of process switches, wherever possible.

1.7.3. Pressure and Differential Pressure Transmitters
1.7.4. Temperature Transmitters
1.7.5. Position Transmitter

1.8. Switches

1.8.1. General
1.8.2. Differential Pressure and Material Level Switches
1.8.3. Temperature Switches
1.8.4. Special Switches
1.8.5. Control Valves
1.9.1.1. General
1.9.1.2. Valve Sizing
1.9.1.3. Valve Trim
1.9.1.4. End Connections
1.9.1.5. Valve Actuators
1.9.1.6. Control Valve Accessories
1.9.1.7. Positioners
1.9.1.8. Solenoid Valves
1.9.1.9. Materials & Welding
1.8.6. Instrument Tubing and Installation
1.8.7. Instrument Air System

1.9. Instrumentation and Controls Interface

1.10. Vibration Monitoring System

1.10.1. Vibration monitoring system shall be manufactured by Alta Solutions unless otherwise approved by the Owner

1.11. Calibration

1.12. Pressure Testing

1.13. Instrumentation and Control Documentation

- 1.13.1. Instrument List
- 1.13.2. Instrument Datasheets
- 1.13.3. Instrument Installation Details
- 1.13.4. Instrument Layout Drawings
- 1.13.5. Instrument Installation Specification
- 1.13.6. Instrument Wiring Diagrams
- 1.13.7. I/O List
- 1.13.8. Network Architecture Drawing

High Voltage Interconnect Facility

Attachment A-9

ATTACHMENT A-9

High Voltage Interconnect Facility Criteria

1.1 Remote Switchyard (Tie in Point)
- 1.1.1 General Description
- 1.1.2 Location
- 1.1.3 Required Switchyard Modifications
- 1.1.4 Transmission Line To Plant Switchyard

1.2 Plant Switchyard (Air Insulated)
- 1.2.1 General Description
- 1.2.2 Switchyard Equipment
- 1.2.3 Transmission Line to Interconnect Facility
- 1.2.4 Grounding/Lightning Protection
- 1.2.5 Lighting
- 1.2.6 Switchyard AC/DC Power
- 1.2.7 Protective Relaying
- 1.2.8 Revenue Metering

Construction / Erection and Installation

Attachment A-10

ATTACHMENT A-10

CONSTRUCTION / ERECTION AND INSTALLATION

1.0 Introduction

1.1 General
- 1.1.1 Mobilization
- 1.1.2 Project Controls Program
- 1.1.3 Site Conditions
- 1.1.4 Lifting, Rigging, and Transporting
- 1.1.5 General Cleaning
- 1.1.6 Final Terminations
- 1.1.7 Demobilization

1.2 Security / Safety / Environment

1.3 Quality Assurance / Quality Control

1.4 Civil / Structural / Architecture

1.5 Mechanical

1.6 Piping and Supports

1.7 Electrical

1.8 Instrumentation and Control

Terminal Points

Attachment A-11

Attachment to be inserted by Bidder as part of Proposal

Division of Responsibility

Attachment A-12

Attachment to be inserted by Bidder as part of Proposal

Equipment Labeling and Signage Procedure

Attachment A-13

Attachment to be inserted by Bidder as part of Proposal

Training Procedure

Attachment A-14

Attachment to be inserted by Bidder as part of Proposal

Drawing Specification

Attachment A-15

Attachment to be inserted by Bidder as part of Proposal

Approved Manufacturers List

Attachment A-16

Approved list of manufacturers is current at time of RFP issuance and is subject to change prior to execution of a final Definitive Agreement.

	Approved Manufacturers List										
Equipment											
Combustion Turbine Generators											
Lube Oil Conditioners (BOP only)	Alfa laval	Kaydon									
Air Compressors (Oil-Free)	Atlas Copco	Ingersoll-Rand									
Air Dryer (Desiccant)	Hankinson	Pneumatech	Zeks	Zurn	Atlas-Copco	Ingersoll-Rand					
Oil Water Separator	Highland Tank	PS International									
CEMS	ESC										
Gas Chromatograph	ABB	Daniel									
Composite Sampler	Omega										
Cathodic Protection	CTS	Corrpro	Norton Corrosion Limited	MESA	Farwest Corrosion	ARK Engin.					
Pumps											
Boiler Feed	Flowserve	Sulzer	KSB								
Centrifugal Horizontal	Flowserve	ITT Goulds	Grundfos								
Submersible	Flygt										
Vertical Sump	Flowserve	ITT Goulds	Sulzer/ Johnston								
Heaters and Tanks (BOP only)											
Fuel Gas Heater	Manning & Lewis Engineering Company	Hebeler	Fabsco								
Tank Immersion Heaters	Watlow										
Shop Fabricated Tanks (Steel)	Arrow	Highland Tank									
Field Erected Tanks (AWWA)	Matrix Service	RECO	CB&I	Peabody							
Field Erected Tanks (API)	Matrix Service	RECO	CB&I	Peabody							
Electrical (BOP only)											
Power Distribution Center	Powell	Zachry	PACS								
HV Circuit Breakers	ABB	GE-Hitachi	Mitsubishi	Siemens	Alstom						
HV Disconnect Switch	Pascor	Southern-States	GE	S&C Electric							
Generator Circuit Breakers	ABB	GE/Hitachi	Alstom	Mitsubishi							
Generator Step-Up Transformers	ABB	Waukesha	Siemens	Alstom	Hyundai	Mitsubishi	JST	EFACEC			
Station Service Transformers	ABB	Waukesha	Virginia Transformer	Cooper	Niagra Transformers	Pennsylvania Transformers	Siemens	Alstom	Hyundai - suggest removing	Mitsubishi	
Auxiliary Transformers	ABB	Waukesha	Virginia Transformer	Cooper	Niagra Transformers	Pennsylvania Transformers	Siemens	Alstom	Hyundai	Mitsubishi	EFACEC
Switchgear	ABB	Cutler-Hammer	GE	Powell	PACS						
Isophase Bus Duct	ABB	Delta-Unibus	GE	Calvert	Technibus	Crown Electric					
Cable Trays	MP Husky	PW Industries	T&B	Eaton (Cutler Hammer)	ABB	Schneider Electric					
Motor Control Center - 480V	Allen-Bradley	Cutler-Hammer	GE	Square D Co.	Siemens	Rockwell Automation	Powell				
Motors	GE	Reliance	Siemens	TECO-Westinghouse *See Note 1	U.S. Electrical Motors						
Relays (New line item)	ABB	Beckwith	Schweitzer	GE	Basler						
Instrumentation (BOP only)											
Motor Monitoring	Schweitzer	GE (MulitLin)									
MOV Actuators	Limitorque (See Note 2)										
Transformer On Line Monitoring (New Line Item)	Dynamic Ratings	Doble									
PLC	Rockwell Automation - ControlLogix	Emerson Delta V									
Pressure Transmitter	Rosemount 3051 Smart										
Flow Transmitter	Rosemount 3051 Smart										
Level Transmitter	Rosemount 3051 Smart										
Temperature Transmitter	Rosemount 3051 Smart										
Level Guided Wave Transmitter	Magnetrol	Rosemount									
Liquid Level Gauges	Magtech	Yarway (Division of Pentair)	Clark-Reliance	Penberthy							
Analyzers (Conductivity, pH, ORP, and I	Emerson	Siemens	Yokogawa								
Instrument Enclosures	OBrien	Intertec									
Instrument Tube Fittings	Swagelok	Parker									
Limit Switch	Stonel	Namco									
Pressure Switch	SOR, Inc	ITT Barton	Ashcroft								
Flow Switch	Clark-Reliance Jacoby-Tarbox										
Level Displacement Switch	Magnetrol										
Liquid Ball Float Level	Magnetrol										
Temperature Switch	Ashcroft										
Temperature Guage Indicators	Ashcroft	Wika									
Pressure Guage Indicators	Ashcroft	Wika									
Flow Indicator	Clark-Reliance Jacoby-Tarbox	Dwyer Midwest									
Flow Rotometer	Brooks Instrument										
Flow Meter Tube	Daniel	Fluidic									
Orifice Plate	Rosemount (Daniel)	Fluidic									
Solenoids	Asco	Parker-Hannifin									
Remote Mounted Level Instrument	Clark-Reliance										

Notes:					
1. Horizontal World Series Class Only					
2. B320 gearboxes are not permitted for valves with a design temperature above 700 deg. F					

Gas Turbine Technical Specification

Attachment A-17

Attachment to be inserted by Bidder as part of Proposal

Turbine Driven Generator
Technical Specification

Attachment A-18

Attachment to be inserted by Bidder as part of Proposal

Steam Turbine Technical Specification

Attachment A-19

Attachment to be inserted by Bidder as part of Proposal

HRSG Technical Specification

Attachment A-20

Attachment to be inserted by Bidder as part of Proposal

GSU Transformer Specification

Attachment A-21

Attachment to be inserted by Bidder as part of Proposal

Continuous Emission Monitoring System

Attachment A-22

Attachment to be inserted by Bidder as part of Proposal

Fire Protection System

Attachment A-23

Attachment A-23

Summary

Entergy Risk Engineering endorses the design process as described in NFPA 850 (2020 edition) Chapter 4. The design process should be initiated as early in the process as possible under the direction of a qualified Fire Protection Engineer having extensive experience in power plant operation.

Initial Stakeholders (Risk Engineering, Owner's Engineers' design team, Constructors, Operating Plant representatives, and others with an interest in the property protection risks) determine the goals and objectives and evaluate whether the recommendations of NFPA 850 are adequate to meet those goals.

The site-specific Design Basis Document (DBD) provides a record of the thought processes and decisions made in the application of the recommendations delineated in Chapters 5 through 20 of NFPA 850. The format for the site-specific Design Basis Document is a statement on the general philosophies (protection, separation, evaluated risk) followed by a comparison of the fire protection design features to the specific chapters in NFPA 850 applicable to the plant. Finally, the administrative controls to be put in place during construction activities are evaluated against this standard. The DBD is a living document prepared by the organization responsible for the fire protection design. It may begin with general information and will continue to evolve as the project progresses until it is turned over to the plant at project completion to be maintained by plant staff after plant commissioning.

What follows is documentation of the Property Protection Goals established by Entergy Risk Engineering, specific design concerns to be addressed in the development of the detailed plant design and finally a template that meets the intent of NFPA 850 and should be used in developing the DBD as a required Deliverable.

It is an expectation that all applicable NFPA codes and standards will be followed whether or not specifically called out in this document. It is further expected that all recommendations in NFPA 850 be followed unless specifically addressed in this document.

Applicability

NFPA 850 shall be the standard of comparison to all new facilities and major revisions to existing facilities in the Entergy Power Generation Fleet. Despite language in NFPA 850 that suggests compliance is “advised, but not required”, for the purposes of Entergy Risk Engineering, compliance with the recommendations in NFPA 850 is expected unless documented by an Engineering justification prepared by a qualified individual and acceptable to the Authority Having Jurisdiction. Throughout this document references will be made to “qualified individuals” and the “Authority having Jurisdiction”. A “qualified individual” or “Fire Protection Engineer” shall meet the education and experience requirements of “Member” grade in the Society of Fire Protection Engineers. Membership in the Society is not required however the qualified individual shall have met the education and experience required to be considered. “Authority Having Jurisdiction” (AHJ) is a term defined by NFPA as “An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure.” For the purposes of this document, the AHJ may be the Office of the State Fire Marshal, an insurance company, or Entergy’s Risk Engineering Staff.

NFPA Codes and Standards

NFPA documents (codes, standards, recommended practices and guides) are developed through a consensus standards development process. This process brings together volunteers representing different viewpoints and interests to achieve consensus on fire and other safety issues. Engineers in the Entergy Risk Engineering Staff participate in many of the technical committees and have been personally responsible for much of the revised content in these documents over the past 20 years. The NFPA administers this process, and issues the documents, but does not have any power to enforce compliance with the contents of any NFPA document.

Enforcement of compliance is through legislative action to adopt certain NFPA documents into State and local Laws, recommendations made by insurance companies to maintain insurability, and through actions of corporate risk management groups, such as Entergy Risk Engineering. NFPA 850 is the standard by which we and our insurers measure the protection of Entergy property assets and actions used to mitigate the risks from fires exposing these assets.

NFPA 850 is a Recommended Practice and typically not adopted into legal statutes by any Building Official. NFPA therefore recommends that all Stakeholders (e.g. EPC Contractor, Owner’s Engineers, Insurance Underwriters, and various Owner groups) collaborate to establish common goals and objectives. Inclusion into the detailed design takes into consideration the goals of the various Stakeholders.

Applicable NFPA codes, Standards, and Recommended Practices shall include, but are not limited to the following:

NFPA 10, Standard for Portable Fire Extinguishers

NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam

NFPA 12, Standard on Carbon Dioxide Extinguishing Systems

NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems

NFPA 13, Standard for the Installation of Sprinkler Systems

NFPA 14, Standard for the Installation of Standpipe and Hose Systems

NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection

NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems

NFPA 17, Standard for Dry Chemical Extinguishing Systems

NFPA 17A, Standard for Wet Chemical Extinguishing Systems

NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection

NFPA 22, Standard for Water Tanks for Private Fire Protection

NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

NFPA 30, Flammable and Combustible Liquids Code

NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 54/ANSI Z223.1, National Fuel Gas Code

NFPA 55, Compressed Gases and Cryogenic Fluids Code

NFPA 56, Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems

NFPA 58, Liquefied Petroleum Gas Code

NFPA 70®, National Electrical Code®

NFPA 72®, National Fire Alarm and Signaling Code

NFPA 75, Standard for the Protection of Information Technology Equipment

NFPA 76, Standard for the Fire Protection of Telecommunications Facilities

NFPA 80, Standard for Fire Doors and Other Opening Protectives

NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures

NFPA 85, Boiler and Combustion Systems Hazards Code

NFPA 101®, Life Safety Code®

NFPA 214, Standard on Water-Cooling Towers

NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

NFPA 750, Standard on Water Mist Fire Protection Systems

NFPA 780, Standard for the Installation of Lightning Protection Systems

NFPA 850, Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems

NFPA 2010, Standard for Fixed Aerosol Fire Extinguishing Systems

Entergy Risk Engineering Generic Goals and Objectives

- The Fire Protection Design shall meet all Specific EPC Contractual requirements.
- The Fire Protection Design shall meet all applicable State and Local Building Codes and Standards incorporated into them by reference.
- Specific plant features shall be protected as recommended by NFPA 850 where specifically recommended, except as documented in the Design Basis Document.
- All fire protection features, where indicated in this document as required, shall be designed and installed in accordance with the applicable NFPA standard.
- With regard to potential options presented by NFPA 850 to protect against fire and explosion hazards (e.g. Outside Oil Filled Transformers), protection should be considered in the following order of importance
    - Spatial separation and/or fire rated construction, or
    - If separation is not practical, provide fixed fire suppression systems.
- Each hazard identified in this document should be evaluated and the appropriate mitigation strategy identified along with the decision-making process.
- Each hazard discussion should identify any assumptions and or source documents used in the decision-making process.
- Selection of fixed fire protection systems should consider a balance between effectiveness, drainage, containment, manual fire fighting access, and lifetime maintenance costs.
- In situations where UL or FM approved fire retardant oils are specified (Including Steam Turbine and CT Lube oils, Seal oils, EHC units, and transformers), Fire Suppression may be omitted after Entergy Risk Engineering’s review and prior concurrence.

Entergy Risk Engineering Compliance Assumptions

1. NFPA 850 recommends specific protection for some hazards, protection for other hazards may be listed with several options, and for some equipment, protection is optional based on a Hazard Evaluation.
    a. Where specifically addressed, compliance is expected as recommended (unless documented as an approved exception in the Fire Protection Design Basis Document).
    b. NFPA 850 Protection goals related to options for specific hazards to be addressed in the project design documents are listed below.
    c. Where protection is omitted based on a hazard evaluation, the hazard evaluation shall be submitted for review and concurrence of the Authority Having Jurisdiction prior to the design being issued for construction.
2. All components used for fire protection services shall be UL listed or FM approved for the intended service.
3. This document is specifically applicable to construction of power plants intended for continuous personnel occupation. Plants that are partially occupied or intended for remote operation will require a separate design basis risk evaluation approved by Risk Engineering prior to commencement of construction.
4. All fire protection equipment shall be supplied in accordance with applicable Code/Standard. The applicable edition of the standard shall be the current Code/Standard as of the Contract execution date.

Non-Fire Protection Design Specifications

1. All cable (regardless of voltage level and use) shall be constructed utilizing a fire retardant jacket and shall have successfully passed the appropriate (IEEE, ASTM, or UL) flame spread and smoke generated test for the class, voltage rating and size of the specific cable.
2. Generation Step Up (GSU) transformers shall be equipped with a minimum of 8 gas (plus moisture) online monitoring and bushing monitors.
3. Motor overloads for DC lube oil pumps shall cause an alarm but shall not cause a pump trip.
4. Vented Lead Acid (VLA) batteries shall be installed in a room(s) dedicated to the batteries and associated equipment with approved ventilation.
5. Battery Rooms containing Vented Lead Acid batteries shall be provided with ventilation (Natural or forced) to limit the concentration of hydrogen to 1 percent by volume. Loss of forced ventilation shall be monitored and alarmed at a constantly attended location.
6. Properly designed normal battery room ventilation will keep Hydrogen below dangerous levels and eliminate the need for Hazardous Electrical Classification and explosion proof components.
7. Valve Regulated Lead Acid (VRLA) batteries do not require dedicated rooms or special ventilation.
8. Installations of large NiCd, NiMH, or Lithium ion batteries (any quantity greater than that contained in portable electronics equipment) are not addressed in this standard and shall have a separate Fire Hazard analysis approved by Entergy Risk Engineering.
9. All buildings and equipment structures shall be protected against damage due to lightning strikes in accordance with NFPA 780.

Fire Barriers and Sealed Penetrations

1. Rated Fire Barriers shall be provided to separate the following specific hazards
2. Fire Rated walls may be used in conjunction with physical separation between transformers and other equipment in lieu of providing automatic suppression as follows:
    a. For outdoor transformers with oil capacity less than 500 Gallons, maintain separation of 5 ft. from other structures.
    b. For outdoor transformers with an oil capacity between 500 and 5000 gallons, maintain clear separation of 25 feet or provide a 2 hour fire rated barrier
    c. For outdoor transformers with an oil capacity of greater than 5000 gallons, maintain clear separation of 50 feet or provide a 2 hour fire rated barrier.
    d. For Indoor transformers with an oil capacity greater than 100 gallons, provide a 3 hour rated fire barrier.
    e. For transformers using a Listed Less Flammable Oil, a specific detailed hazard evaluation is required prior to altering separation or omitting barriers.
3. Separate Fire Pumps with a combination of a two hour fire rated barrier and automatic suppression covering both pumps.
4. Provide fire rated barriers to separate adjacent fire areas as described in the Design Basis Document where physical separation is not sufficient.
5. Provide fire rated seals in all openings and penetrations in all rated barriers commensurate with the fire rating of the barrier.
6. Provide Non combustible or fire rated sealing materials for all cable penetrations entering from below a raised electrical structure (Power Distribution Center, MCC Enclosure, etc.).

Fire Protection Water Supply

1. The water supply should be capable of supplying the larger of the following plus 500 gpm manual hose streams:
    a. The largest single calculated system demand for a minimum of 2 hours.
    b. All fixed fire suppression demands that could reasonably be required to operate simultaneously for a 2 hour period.
2. A water supply sufficient to meet the above system demand flow rate is required to be supplied from a reliable source (tank, pond, river, lake, or cooling tower basin). The standard for a reliable source includes a single supply of sufficient volume, two redundant Listed Fire pumps with diverse power supplies (i.e. Diesel Engine and Electric Motor), and a suitable underground distribution network.
3. If a tank is used, it shall meet the requirements of NFPA 22
4. Combination tanks for Fire Protection and other water (e.g. Service Water) is permitted, however the tank must maintain an adequate dedicated volume accessible only for Fire Protection service.
5. If a tank is used, the refill rate should be calculated/demonstrated to provide a complete refill of the minimum water supply volume within 8 hours.

6. Each Fire Pump shall be chosen in accordance with NFPA 20 such that the maximum system demand is between 90-140% of the pump rating.
    a. Oversized pumps are not conservative and shall be avoided.
7. The Fire Pump House should be located a minimum of 50 ft. from any structure representing an exposure fire hazard.
8. Redundant fire pumps shall not be subject to a single electrical or mechanical failure (piping or valves) that would prevent the operation of both pumps.
9. Diesel and Electric fire pumps shall be separated by a minimum 2 hour rated fire wall and the entire building protected by a wet pipe sprinkler system.
10. The diesel engine air intake/filter shall be protected from direct water impingement from the building sprinklers.
11. Discharge from the Circulation relief valve (Electric Motor Driven Pump), the Diesel Relief Valve (If needed) and the Cooling Water discharge from the Diesel engine shall be routed to open drain hubs with their respective flows visible from the pump room.
12. The Fire Pumps shall be capable of full flow testing by the following means
    a. Flow through a calibrated flow meter routed back to the tank (above the water level), and
    b. Flow through a test header to the ground with a sufficient number of test valves for the rated flow.
    c. The test meter shall be located so that it is easily accessible for annual use.
    d. The test header shall be located outside the pump house so that all test valves are located not more than 5 feet above finished grade (or made accessible via a permanent platform).

Underground Fire Main

1. Underground Fire Main shall be designed in accordance with NFPA 24.
2. The Fire Main shall be arranged in a complete loop. Sectionalizing valves (Post Indicator Valves -PIV) shall be arranged such that the maximum number of Fire Protection Connections between two valves does not exceed five.
3. The supply mains shall be looped around the main power block and sized such that the hydraulic demand of all individual sprinkler systems can be met with the hydraulically shortest part of the loop out of service.
4. Piping Materials shall be limited to those permitted in NFPA 24. HDPE is preferred, Ductile Iron is acceptable, Steel is not permitted.
5. Heat fusion welded HDPE if used is considered a self-restrained joint. No additional restraints are required; however, this applies to restraint of joints only. The need for thrust blocks shall be evaluated at locations where the direction of water flow changes.
6. Hydrants shall be placed strategically around the site such that hydrant spacing does not exceed 250 feet.
7. Hydrants shall be located not less than 40 ft. from the plant building, structure, or major equipment to be protected. Where this clearance cannot reasonably be provided, an adjacent accessible hydrant within 250 ft. is considered acceptable.

8. The total number of hydrants shall be sufficient that all major equipment is accessible between 40 and 250 ft from at least one hydrant.
9. Mechanical joint fittings that utilize set screws to clamp the fitting to the HDPE pipe shall not be used. Transition pieces that use fusion welding and a standard flange shall be used to transition between HDPE pipe and non-HDPE components.
10. All hydrants shall be dry barrel type and shall have two 2 ½" outlets and a 4 ½" pumper outlet for Fire Department use. All Hydrants and Fire Hose connections shall be NST National Standard Fire Hose Thread (sometimes indicated as NH).
11. All hydrants shall be installed such that the 4 ½" pumper connection faces the access road or most logical access point for the Fire Department.
12. Each hydrant and sectionalizing Post Indicating Valve shall be equipped with an operating device attached to the Hydrant/PIV.
13. There shall be a minimum of one Hydrant hose house located near the closest Hydrant to the plant entrance equipped with the following tools:
    a. Two Hydrant Wrenches
    b. Four Universal Spanners
    c. Two Curb Box valve operator extension handles.
    d. One Adapter to connect the 4 ½ inch hydrant pumper connection to the local responding fire departments. If the responding departments require different adapters, then provide one of each type.

Automatic Suppression

Automatic suppression systems shall be provided for the following areas at a minimum and other areas as determined by the Hazard Evaluation (application rates as defined in applicable NFPA documents):

1. Fire Pump House - Wet Pipe
2. Warehouse – Wet Pipe
3. Combustion Turbine – Per OEM Requirements
4. Reciprocating Engine halls – Dry or Wet Pipe
5. Steam Turbine Bearings – Single Interlock Preaction
6. Steam Turbine Under deck Lube oil hazards – Dry Pipe or Deluge
7. Steam Turbine Lube Oil Tank – Dry Pipe or Deluge
8. Hydrogen Seal oil Skids – Dry Pipe or Deluge
9. EHC system skids unless using Listed Fire Retardant fluids (e.g. Fyrquel EHC, Quinto Lube, EcoSafe).
10. Transformers – Deluge, Only IF adequate separation cannot be achieved.
11. Burner Fronts of any liquid fueled boiler (including oil ignitors and Aux Boiler main fuel) – Dry Pipe or wet pipe.
12. Steam Driven Boiler Feed Pumps – Deluge, Preaction, or Dry Pipe
13. Motor Driven Feed Pumps – Greater than 100 Gallons Mineral oil requires separate documented hazard evaluation approved by Entergy Risk Engineering. None if Listed Fire-Retardant oil is used in Coupling.
14. Emergency Diesel Generators located inside a building – Preaction.
15. Areas with large concentrations of cable critical to plant operations (e.g. Inside Cable Spreading Rooms) – Clean Agent Gaseous systems (NOVEC 1230 preferred. Other agents with Risk Engineering Permission)
16. Other areas with grouped electrical cables (e.g. External Stacked Cable Trays, Internal Cable tunnels) should be provided with automatic suppression unless cables with fire retardant jackets are used.

Manual Fire Fighting Features

1. Fire Hose additional demand over and above the automatic suppression system demand shall be as follows
    a. 500 GPM for all lube oil and liquid fuel hazards regardless of quantity.
    b. 500 GPM for all outdoor transformers containing > 1000 gallons mineral oil
    c. 250 GPM for all outdoor transformers containing < 1000 gallons mineral oil
2. Containment of all firefighting water used (particularly Turbine ground floor and transformers) shall be sized at a minimum to accommodate the following without uncontrolled flooding or off-site discharge:
    a. The spill of the largest single container of any flammable or combustible liquid in the area, and
    b. The maximum expected manual hose streams (above) for ten minutes, and
    c. The maximum design discharge of any fixed fire suppression systems operating for a minimum of ten minutes.
3. Where open pits are used for transformer containment, a 12 inch layer of rock between steel gratings should be provided at the top of the pit.
4. Portable Fire Extinguishers should be provided at strategic locations in accordance with NFPA 10. Extinguisher types shall be as follows
    a. Sensitive Electronic Equipment areas (Control Room/DCS servers/Computer Room, etc.) shall have an ABC Rated Clean agent, Halotron, water mist, or other effective agent that does not leave a residue. Dry Chemical Extinguishers shall not be used in these areas.
    b. General Electrical Hazard Areas shall utilize CO2 or a clean agent extinguisher sized appropriately for the hazard. Dry Chemical shall not be used for general electrical hazards
    c. General areas and oil hazard areas may use any suitable ABC rated extinguisher including Dry Chemical.
    d. Large Oil Hazards (Turbine Deck, Lube oil System, Emergency Diesel Generator, etc.) shall have one 250 lb. wheeled unit, or two 125 lb. wheeled unit in addition to any general extinguisher, located between 10 and 50 ft. from the hazard.
    e. Extinguishers shall be located as follows:
        i. Near entrances and/or exits to an area
        ii. Extinguishers in occupied buildings (Warehouse, Control Room, DCS/Computer Rooms, Electrical Distribution, etc.) shall be located at a minimum, one at each exit door with additional extinguishers in the interior if required to meet NFPA 10 travel distances.
        iii. Extinguishers in unoccupied enclosures (e.g. Emergency DG) should be mounted outside near the access doors.

Fire Detection and Alarm

1. All fire alarms shall be arranged to annunciate at a constantly attended location on a main fire alarm control panel. Local panels may be installed in addition to the main panel as required.
2. If local panels and the Main Fire Alarm Panel are installed by multiple organizations, one organization shall be designated as responsible for the integration of all remote alarms to the Main Fire Alarm Panel.
3. All devices shall be individually addressable
4. All communications (network) wiring shall be Class A. Individual detection circuits may be Class B.
5. The Main Fire Alarm Control Panel shall have the capability to store an electronically retrievable historical record of a minimum of 500 alarms.
6. Smoke and /or heat detection (as appropriate) shall be provided in accordance with NFPA 72 and where recommended by NFPA 850, (specifically, but not limited to the following areas):
    a. Air Aspirating Early Warning Smoke Detection (e.g. VESDA) shall be provided in areas with critical electronic equipment (e.g. Computer Rooms/DCS Servers).
    b. Control Rooms shall have smoke detection installed throughout the Control Room in the operating spaces, below raised floor systems, and above suspended ceilings.
    c. In Control Rooms that are occupied 24/7, the detection in the operating spaces may be omitted.
    d. Control Room Break Areas.
    e. In-duct detectors should be used for ventilation systems in occupied buildings.
    f. Cable Spreading rooms, cable tunnels, and other areas with high concentrations of electrical cables.
    g. Switchgear rooms and relay rooms. (Including Turbine OEM Structures)
    h. Battery Rooms
    i. Warehouses
    j. CEMS enclosures
    k. Maintenance Shops

Combustion Turbine/Generators

1. The design shall include automatic protection for all areas as recommended by the OEM manufacturer. Water Mist is the preferred choice of extinguishing agent. If CO2 is required by the CT vendor, a low pressure system shall be used. Full scope of suppression to be provided shall be discussed and approved by Entergy Risk Engineering prior to design finalization.
2. Fixed suppression systems should be sized to provide the required protection for the full time of turbine coastdown, exposure to hot metal, or where uncontrolled combustible liquid flow may exist, whichever is longest.
3. Early Warning Alarm-only Fire Detection shall be provided for any areas not covered by an automatic suppression system (e.g. Generator and Exciter areas) In addition, Combustible Gas detection shall be provided for the Turbine Compartment.

4. Any area capable of being occupied (i.e. electrical compartment with computer terminal) shall use a Clean Agent gaseous suppression system if automatic suppression is required. Total Flooding CO2 shall not be specified in spaces that could reasonably be occupied.
5. Hydrogen cooled generators shall be equipped with excess flow devices at the hydrogen source to eliminate uncontrolled hydrogen leaks.

Steam Turbine Lube Oil

1. Cabling for redundant Lube Oil Pumps (AC/DC Motors) shall be separated such that a single event will not render both inoperable. Adequate separation shall be accomplished by one of the following means
    a. Physical separation throughout the cable run (minimum 10 ft. horizontal separation), OR
    b. Separate cables for DC Driven Pump by routing in dedicated conduit.
2. Pressurized bearing lube oil for both Turbine and Generator (lube and seal oil) shall be run in concentric guarded piping where possible. Any turbine or generator bearing lube or seal oil piping pressurized to greater than 50 psi with flanges outside of the guard pipe shall utilize noncombustible flange guards. If a listed fire retardant fluid is used, neither guard pipe, flange guards, nor automatic suppression is required.
3. Piping containing steam or other fluids in excess of flash points of nearby lube oil (within 25 ft.) shall be fully insulated.
4. Lube oil lines shall be separated by a minimum of 10 ft. horizontal separation or run below steam lines (or other piping that could exceed lube oil flash points) to minimize the potential for ignition.

Cooling Tower (If provided)

1. Cooling towers shall be constructed in accordance with NFPA 214.
2. Cooling towers constructed fully out of non-combustible materials do not require automatic suppression systems
3. Cooling towers constructed in accordance with an FM Approved design out of FM approved materials do not require Automatic Suppression Systems. Documentation of FM Approval is required.
4. Cooling towers constructed out of FM Approved, Fire Retardant materials with a documented flame spread less than 25 shall be evaluated prior to construction without an automatic suppression system. The evaluation shall be reviewed and concurrence obtained from the AHJ (Entergy Risk Engineering) prior to issue for construction.
5. Cooling towers constructed out of combustible materials shall require an automatic suppression system.

Emergency Generators

1. Emergency Generators located within plant structures shall be protected by an automatic suppression system. A weather protected enclosure is not considered "within a plant structure".
2. Weather protected enclosures that are large enough to walk into shall have automatic (heat actuated) fire detectors.
3. Standalone emergency generators should be installed and protected in accordance with NFPA 37 "*Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*". NFPA 37 requires a Fire Risk evaluation considering at least:
    a. Location of the Engine, including separation from other structures
    b. Fuel type and location
    c. Criticality of the Generator to operations
    d. Anticipated replacement time if damaged.

Warehouses

1. Warehouses that house combustible materials or high value (combustible or noncombustible) equipment (>$1 Million) shall have a fixed automatic suppression system (Dry or Wet Pipe Sprinklers) designed for the expected materials to be stored.
2. The sprinkler systems for warehouse and storage areas are to be designed and installed in accordance with requirements of NFPA 13, for the commodity type, rack and storage arrangement and maximum available storage height to be present in the area. The minimum design shall be for Class III commodities on wooden pallets, in single or double row rack or piled storage, utilizing 8 foot aisles and maximum storage height suitable for the building height.
3. The sprinkler systems should be hydraulically designed. Pipe schedule systems are not permitted.
4. The systems should be designed for full protection from sprinklers installed at the ceiling. The installation of in-rack sprinklers should be avoided.
5. Classification of the storage as "miscellaneous or incidental storage" less than 12 feet in height, in order to permit the use of an ordinary hazard sprinkler systems shall not be permitted unless approved in writing by Entergy Risk Engineering.

Miscellaneous Site Structures

6. Miscellaneous site support structures such as oil storage buildings, vehicle maintenance facilities, water treatment facilities, supplemental offices, storage facilities, bulk compressed gas storage, or other facilities not specifically mentioned here shall be evaluated for provisions of automatic detection and suppression systems in accordance with applicable codes and standards.
7. Miscellaneous site structures shall be separated from other important plant structures and equipment in accordance with NFPA 80A.

Construction Site Considerations

8. A written Site Fire Prevention and Response Plan in accordance with NFPA 241 and Chapter 8 of NFPA 850 shall be documented and used during the construction of the facility.
9. Permanent plant fire protection systems should be in service and ready to support manual fire fighting prior to site “backfeed” and shall be in service and available prior to “first fire”.
10. Construction facilities (Offices, workshops, and warehouses) that are intended or are likely to be retained after construction shall have permanent fire protection in accordance with this document.
11. In the event “temporary” warehouses or offices are kept after completion of construction, they shall have protection in accordance with this criteria installed prior to occupancy of permanent plant staff or placement of permanent plant materials.

Deliverables

The Site Specific Fire Protection Design Basis Document as described in Chapter 4 of NFPA 850 is intended to address the above items and is prepared as a deliverable by the Fire Protection Engineer responsible for the design and supplied to the owners. It is intended to be prepared early in the design process and continue as a living document to be updated as the project progresses. The DBD should contain the following information (details can be obtained from NFPA 850 Chapter 4):

1. Plant name/ location information
2. Plant location
3. Responsible Fire Protection Engineer
4. Table of Contents
5. Stakeholders
6. General Fire Protection Philosophies
7. Assumptions
8. Site Specific Information
9. Source Documents
10. Plant Layout (description of fire areas)
11. Water Supply (Fire protection water storage, fire pumps, mains, hydrants, etc.)
12. Hazards
13. Administrative Controls

An example template for a Design Basis Document follows.

NOTE:

The purpose of this Compliance Guide is to illustrate the recommended information to be included and the structure of the Design Basis Document as required by NFPA 850, Chapter 4. Throughout this guide document, notes are inserted with bold, italicized text (this is an example). These notes are intended to be explanatory notes and not necessarily included as document text. Plain text is intended as standard text to be included in every Design Basis Document. The format is flexible, but preferred format elements are shown.

Cover Page

(Format and Title Block style are flexible)

(Project Name) Fire Protection Design Basis Document

Project Specific Information

Revision History

Approval Signatures

Table of Contents

1.0 Introduction (insert data as applicable)

1.1 Plant Description

1.1.1 Plant Name:

1.1.2 Plant Location:

1.1.3 Owner:

1.1.4 EPC Contractor:

1.1.5 Summary of Plant features:

1.2 Document Purpose

The purpose of this document is to identify the applicable building codes, Contract documents, and NFPA codes and standards used by the EPC Contractor in the development of the Fire Protection Design features. This document will also serve as the Fire Protection Design Basis Document as defined in Chapter 4 of the 2020 edition of NFPA 850, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations.* It is intended to remain as a living document that will evolve as the plant design is finalized. It is intended to provide a record of the decision-making process including concurrence of all applicable stakeholders. At the completion of the project, the document will be turned over as a Deliverable to the Owner who will then be responsible for the maintenance of the document.

2.0 References

NOTE:

Generally, the Codes and Standards will be the edition that is in effect at the time of Contract execution. Any exceptions should be identified and explained in this section. For example, if a Building Code has just been revised, it may not be the same as edition being enforced by the Local Building Authority. Any differences between the latest edition and the edition being enforced that affect the system design shall be explained in the Design Basis Text

2.1 Codes and Standards

2.1.1 Building Codes List all applicable Codes

2.1.2 NFPA (List All Applicable)

2.2 Project Documents (insert as applicable)

2.2.1 Contract Documents

2.2.2 Specifications

2.2.3 Drawings

2.2.4 Calculations

2.3 Fire Protection Design Basis Process

2.3.1 Building Code Applicability

Early in the Design Process, the EPC Contractor should discuss the project with applicable code officials (state and Local Fire Marshals or other building code Officials). This section should contain the scope of review and any agreements with regard to the design. If the Fire Marshal's review is limited in scope (e.g. Life Safety Concerns in occupied structures only, no reviews required for asset protection only, etc), those agreements should be documented here

2.3.2 NFPA Codes and Standards

2.3.3 NFPA 850 is a Recommended Practice and typically not enforced by any Building Official. NFPA therefore recommends that all Stakeholders (e.g. EPC Contractor, Owner's Engineers, Insurance Underwriters, and various Owner groups) collaborate to establish common goals and objectives. Inclusion into the detailed design takes into consideration the goals of the various Stakeholders.

2.3.4 The Owner Goals are as follows:

- The Fire Protection Design shall meet all Specific EPC Contractual requirements.
- The Fire Protection Design shall meet all applicable Building Codes and Standards incorporated into them by reference.
- Specific plant features shall be protected as recommended by NFPA 850 where specifically recommended, except as documented in this document.
- Where indicated in this document as provided, all fire protection features shall be designed and installed in accordance with the applicable NFPA standard.
- With regard to potential options presented by NFPA 850 to protect against fire and explosion hazards, protection should be considered in the follow order of importance
    - Spatial separation and/or fire rated construction, or
    - If separation is not practical, provide fixed fire suppression systems.
- Each hazard identified should be evaluated and the appropriate mitigation strategy identified along with the decision-making process.
- Each hazard discussion should identify any assumptions and or source documents used in the decision-making process.
- Selection of fixed fire protection systems should consider a balance between effectiveness, drainage, containment, manual fire fighting access, and lifetime maintenance costs.
- In situations where UL or FM approved fire retardant oils are specified (Including Steam Turbine and CT Lube oils, Seal oils, EHC units, and transformers), Fire Suppression may be omitted with Entergy Risk Engineering concurrence.

3.0 Definitions

3.1 Include any terms or acronyms used in this document and the following specific terms

3.2 AHJ - Authority Having Jurisdiction – AHJ is a term defined by NFPA as “An Organization, Office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation or a procedure.” For the purposes of this document, the AHJ may be the Office of the State Fire Marshal, and insurance company, or Entergy’s Risk Engineering Staff.

4.0 Occupancy Classifications

This information is preferred to be presented in a tabular format such as illustrated below (including, but not limited to the following). Include each building/floor or other defined area.

Occupancy Classifications				
Building Name	Approximate Dimensions	Floor Area/Number of Stories	IBC Occupancy Group	NFPA Occupancy/Construction Type
Warehouse	100 x 200 ft.	20,000 sq ft. Single Story	S-1	Storage Type II-B
Control Room/Offices	50 x 75 Ft	3750 sq. ft. Single Story	B	Business Type II-B

5.0 Facility Description and Hazard Evaluation

5.1 General Facility Design

This section should include description of natural hazards design basis (Wind, flood, seismic, etc).

5.2 Fire Protection Water Supply

This section should contain a description of the water source and fire pumps. Applicable specific design requirements should be included from the Risk Engineering Implementation Guide.

5.3 Hazard Evaluation

Each hazard in each plant area is reviewed against the goals and objectives in Section 2.3 above. Hazards may be mitigated by separation, protection, administrative controls, or a combination of all.

Tabular format as shown below is preferred.

Building/Area	
Description	Include physical description of the area and intended use.
Hazards	List the hazards/ignition sources/ etc. in the area
Separation from external hazards	Include description of spatial separation, fire rating of walls, containment of hazards, etc.
Passive Fire Protection	List/describe fire rated barriers
Active Fire Protection	List/describe automatic and manual suppression systems, detection systems, and early warning alarms.

6.0 Fire Detection and Alarm (***May be tabular combined with all manual and automatic suppression summaries below***)

7.0 Manual Fire Fighting Features

8.0 Fire Protection System Summary

9.0 Construction Fire Protection/Prevention Plan ***Add additional description as appropriate***

9.1 Prior to the delivery of high value equipment or where loss or damage could cause significant construction delays, either temporary or permanent fire protection demonstrated adequate for the hazard shall be in service.

9.2 All warehouses shall be equipped with an operating automatic sprinkler system prior to the introduction of high value equipment or significant quantities of combustibles.

9.3 Prior to the introduction of fuel or lube oils into permanent plant equipment, the permanent fire suppression (if included in the design) for the component shall be fully operable.

9.4 The Fire Protection Implementation Plan for the Construction Period shall be reviewed and concurrence obtained from the appropriate Authority Having Jurisdiction.

9.5 Any portable heating units shall be UL listed and used in accordance with their manufacturer's instructions.

9.6 All coffee pots shall be of the type that have either thermal carafe, or automatic timers to turn off the warming plate automatically

9.7 Cooking devices with open heating elements shall be prohibited.

10.0 Commissioning/Startup testing ***Describe processes***

11.0 Deliverables

11.1 This Design Basis document is intended as a living document. Initially it may have "Laters" and "To Be Determined". As the project progresses and design decisions are made and agreed between all stakeholders, they should be documented as revisions to this document.

11.2 Upon completion of Construction, a final review shall be made by the Responsible Design Organization, compiling all the “As-Built” data.

11.3 Upon final turnover, revision control of this Design Basis Drawing shall transfer to the Owners.