Federal Energy Regulatory Commission

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Docket No. AD06-4-000

RESOURCE REPORT 13

DRAFT PREFERRED SUBMITTAL FORMAT GUIDANCE

Washington, DC 20426

Resource Report 13

Draft Preferred Submittal Format Guidance

Introduction

This document is intended to assist applicants by identifying the specific information and level of detail required for filing Resource Report 13 for LNG facility applications as required by Title 18 of the Code of Federal Regulations (CFR) Section (§) 380.12. Filings that are complete facilitate staff review and ensure that all areas of the proposed design are operable, reliable and safe.

Resource Report 13 is required for the construction of new LNG facilities, expansion of existing LNG facilities, or the re-commissioning of existing LNG facilities. The submitted information is required to be site specific and developed to the extent that detailed design will not result in changes to the siting considerations, basis of design, operating conditions, major equipment selections, equipment design conditions, or safety system designs.

The guidelines are intended to address all types of LNG facilities and therefore not all of the topics listed in the index will apply to all facilities. Where the topics in the index system do not apply to a proposed facility, the submitter should note in the index that the topic is "**Not applicable**". In the event that the applicant wishes to add to the list of topics in the index, the addition should be made at the end of the list and not as an insert.

The level of detail required to be submitted in the proposed design will require front end engineering of the complete facility. Information should be site specific design information and details produced in the normal course of developing the design of the facility and components. Special drawings and additional details would not normally be required, unless novel designs require additional detail or the Commission staff requests further detail.

The details of the design should include all features necessary for commissioning, start-up, operation and maintenance of the facility, including details of the utility, safety, fire protection and security systems.

The submittal should be prepared as a project manual containing the facility design and safety information in the first volume, Volume 1, followed by the appendix, in accordance with the "Preferred Submittal Format Guidance" attached. The appendix, Volume 2 onward, is intended to contain reference information that supplements the design data which would include equipment information, studies, reports and specifications, written plans and procedures. In the event that more than one binder is required for Volume 1, the binders should be labeled Volume 1A, Volume 1B, etc. Binders containing the appendices should be labeled numerically Volume 2, Volume 3, Volume 4, etc. All filings must be made in compliance with the Commission's regulations or guidance concerning Critical Energy Infrastructure Information (CEII).

All drawings are to be printed using black and white, and not copies of colored drawings. A separate complete set of all the project drawings included in the submittal should be provided, unfolded in a three ring binder, with a master drawing list that includes the revision number of each drawing. Copies of the project drawings should be inserted in the project manual unless noted as "refer to **Project Drawings**".

Information required to be submitted is preceded by the instruction "**PROVIDE**". Where additional information will be added to the document during the project's detailed design and construction phases, the information is preceded by the instruction "**ADDITIONAL**".

Certain information to be included in Volume 1 may be duplicated, or drawn from the appendix for convenience of reference. This would include certain site, marine and tank information, equipment data sheets and manufacturers data sheets, spill containment, vapor dispersion and thermal radiation drawings.

A master index of the entire Resource Report 13 filing should be included in each volume. The spine of each volume should be labeled with a table of contents.

Resource Report 13

Draft Preferred Submittal Format Guidance

Summary Index

Chapter		Page Number
1.	Facility description	1
2.	Project schedule	1
3.	Site plans	2
4.	Basis of design	3
5.	Major process systems	10
6.	LNG storage tanks	14
7.	Utilities	15
8.	Equipment data	15
9.	Instrumentation	16
10.	Safety instrumentation	16
11.	Electrical	16
12.	Fuel gas	17
13.	Spill containment systems	17
14.	Hazard detection systems	18
15.	Fire suppression and response plan	18
16.	Hazard control systems	19
17.	Fire water	19
18.	High expansion foam system	20
19.	Security	20
20.	Piping	21
21.	Foundations and supports	21
22.	Buildings and structures	21
23.	Process drawings	21
24.	Piping and instrument diagrams	22

Appendix

A	Facility description	23
B	Project schedule	23

		Page Number
C	**Basis of design**	**23**
D	**Design codes and standards**	**24**
E	**Permits or approvals**	**24**
F	**Demonstration of code compliance**	**24**
G	**HAZID, HAZOP reviews, safety reviews and recommendations**	**25**
H	**Management of change and reporting**	**25**
I	**Seismic design investigation and design forces**	**25**
J	**Soil characteristics and foundation design**	**25**
K	**Marine systems**	**25**
L	**LNG tank information**	**26**
M	**Equipment information**	**26**
N	**Instrumentation**	**26**
O	**Electrical**	**26**
P	**Fire protection**	**26**
Q	**Thermal radiation and vapor dispersion report**	**27**
R	**Design studies**	**27**
S	**Shut-off valves**	**27**
T	**Project specifications**	**27**
Project Drawings		**28**

ACRONYMS AND ABBREVIATIONS

bbl	barrels
bbl/h	barrels per hour
Btu	British thermal unit
Btu/(ft^{2}hr)	British thermal unit per feet squared per hour
C5 plus	pentane plus
CCTV	closed circuit television
CFR	Code of Federal Regulations
CO	carbon monoxide
DCS	Distributed Control System
ESD	emergency shutdown
F	Fahrenheit
FEED	front end engineering design
FERC	Federal Energy Regulatory Commission
ft	feet
gpm	gallons per minute
h	hour(s)
HAZID	Hazard Identification
HAZOP	Hazard and Operability
HHV	higher heating value
hp	horsepower
inches H_2O	inches of water
inches Hg	inches of mercury
inches Hg/h	inches of mercury per hour
Kts	knots
kV	kilovolt
kVA	kilovolt ampere (one thousand Volt Amperes)
LFL	lower flammability limit
LHV	lower heating value
LNG	liquefied natural gas

ACRONYMS AND ABBREVIATIONS (cont'd)

m^3	cubic meters
m^3/h	cubic meters per hour
mbar	millibar
mbar/h	millibar per hour
MMbtu/h	million British thermal units per hour
MMscfd	million standard cubic feet per day
mph	miles per hour
MWt	megawatt thermal
NAVD	North American Vertical Datum
NFPA	National Fire Protection Association
NOx	nitrogen oxides
No. ins	Number of inches
OBE	Operating Basis Earthquake
P&IDs	Piping and Instrumentation Diagrams
PERC	powered emergency release coupling
PM	particulate matter
ppm	parts per million
psig	pounds per square inch gauge
scfm	standard cubic foot (feet) per minute
SIS	safety instrumented system
SSE	Safe Shutdown Earthquake
UPS	uninterruptible power supply
usg	United States gallons
usgpm	United States gallons per minute
V	voltage
VOC	volatile organic compound
%	percent
"	inches

Resource Report 13

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1. Facility description

PROVIDE a general description of the facility. References to the body of the document and appendices should be kept to a minimum as this description may be used on its own, without access to supporting information.

- 1.1. **Owner, operator and principal contractors**
- 1.2. **Location and site information**
- 1.3. **LNG receiving terminal; source and market for product**
- 1.4. **LNG receiving terminal; storage, import and sendout capacities and conditions**
- 1.5. **Base load liquefaction; source of feed gas and market for product**
- 1.6. **Base load liquefaction; capacities of feed gas, pretreatment, liquefaction, fractionation products**
- 1.7. **Base load liquefaction; storage, product shipping and sendout capacities and conditions**
- 1.8. **Peak shaving; source of feed gas and market for product**
- 1.9. **Peak shaving; capacities of feed gas pretreatment and liquefaction**
- 1.10. **Peak shaving; storage, vaporization, sendout capacities and conditions**
- 1.11. **Satellite; source of LNG and market for sendout**
- 1.12. **Satellite; storage, vaporization, sendout capacities and conditions**
- 1.13. **LNG trucking facilities**
- 1.14. **List of major systems and components**
- 1.15. **Design features**
- 1.16. **Utilities and services**
- 1.17. **Safety features for containment**
- 1.18. **Safety features for fire protection**
- 1.19. **Emergency response**
- 1.20. **Operating modes**
- 1.21. **Commissioning and cooldown**
- 1.22. **Operation and maintenance**
- 1.23. **Staffing structure**
- 1.24. **Future plans**
- 1.25. **Drawings**
  - 1.25.1. **Area location map**
  - 1.25.2. **Site plan**
  - 1.25.3. **Organizational plan**

2. Project schedule

PROVIDE a Gannt chart of the project schedule. The project schedule should provide sufficient detail to show the feasibility of the engineering, procurement, construction and startup of the facility. Milestones should be provided which can be used for filing requirements, Commission approvals and key inspection points.

- 2.1. **Gannt chart project overview**
  - 2.1.1. **Front end engineering design and reviews**

2.1.2. **FERC submittal process**
2.1.3. **LNG tank schedule**
2.1.4. **Detailed engineering**
2.1.5. **FERC review/approval of final design**
2.1.6. **Procurement**
2.1.7. **Construction**
2.1.8. **Commissioning**
2.1.9. **Staged start up/commencement of service**
2.1.10. **Operation**

2.2. **Milestones**
2.2.1. **Complete HAZID, operability and maintenance review**
2.2.2. **Complete front end engineering**
2.2.3. **Application submittal**
2.2.4. **FERC authorization**
2.2.5. **File implementation plan**
2.2.6. **Start initial site preparation**
2.2.7. **Start LNG tank foundations**
2.2.8. **Start underground piping and systems**
2.2.9. **Start equipment foundations**
2.2.10. **Complete fire protection design**
2.2.11. **Complete HAZOP review or equivalent review process**
2.2.12. **Complete final design review by FERC staff for design changes**
2.2.13. **P&IDs issued for construction**
2.2.14. **Mechanical completion**
2.2.15. **Complete plant personnel startup training**
2.2.16. **Start pre-commissioning**
2.2.17. **Construction completion**
2.2.18. **Start commissioning**
2.2.19. **Complete cooldown**
2.2.20. **Start up**
2.2.21. **Complete testing**
2.2.22. **In service**

3. Site plans

PROVIDE a description summarizing the site development and any changes required to improve soil conditions, the type of foundations required, the road system for access and egress, equipment layout, berms and walls. The proposed layout plans with coordinates and dimensions should be provided, clearly showing the proposed location of all equipment, pipe racks and services.

3.1. **Site description**
3.1.1. **Location**
3.1.2. **Site development**
3.1.3. **Soil and site preparation**
3.1.4. **Foundations**
3.1.5. **Roads**
3.1.6. **Equipment layout considerations**
3.1.7. **Berms and walls**

3.2. **Drawings**

3.2.1. **Site plans**

3.2.1.1. **Area plan**

Surrounding area, plant and property lines

3.2.1.1. **Site plan**

Overall layout of the facilities showing property lines, roads, gates, access control and emergency routing

3.2.1.1. **Overall plot plan**

The plot plan should show the location of all major equipment, pipe racks and spill containments, with sufficient detail to verify the safe spacing of all equipment and buildings as required by NFPA 59A – 2001 edition.

3.2.2. **Plot plans**

PROVIDE unit plot plans for each process area or system showing the locations of all equipment. Each area and piece of equipment should be clearly labeled. The unit plot plans should be detailed enough to allow for measurement of distances between various components with a reasonable degree of accuracy. Specifically, the smallest scale used should be 1-inch to 100-feet (1:1200).

3.2.2.1. **Marine berth and mooring**
3.2.2.2. **Unloading platform and jetty**
3.2.2.3. **Unloading piping**
3.2.2.4. **LNG tank piping**
3.2.2.5. **Pipeline tie in and meter station**
3.2.2.6. **Feed gas pretreatment**
3.2.2.7. **Liquefaction**
3.2.2.8. **Steam generation**
3.2.2.9. **Fractionation**
3.2.2.10. **Refrigerant manufacture and storage**
3.2.2.11. **LNG pumps**
3.2.2.12. **LNG vaporizers**
3.2.2.13. **Btu stabilization**
3.2.2.14. **Boiloff compressors and blowers**
3.2.2.15. **Boiloff recondensation**
3.2.2.16. **Vents and flares**
3.2.2.17. **Sendout metering**
3.2.2.18. **Major utility systems**

4. Basis of design

PROVIDE a detailed basis of design specifying the conditions and features that are required to be incorporated in the design and construction of the facility.

4.1. **Guarantee conditions**

4.1.1. Total net storage capacity **bbl (m^3)**
4.1.2. Net storage capacity per tank **bbl (m^3)**
4.1.3. Gross capacity per tank **bbl (m^3)**
4.1.4. Liquefaction capacity **MMscfd**
4.1.5. LNG export rate **MMscfd**

4.1.6. Fractionation products rate **bbl/h (m^3/h)**
4.1.7. Maximum vaporization sendout rate **MMscfd**
4.1.8. Minimum vaporization sendout rate **MMscfd**
4.1.9. Pipeline pressure at maximum sendout rate **psig**
4.1.10. Sparing philosophy for equipment and utilities, **list of operating, standby and backup**.

4.2. **Site conditions**

4.2.1. Site elevations **ft**
4.2.1.1. Platform
4.2.1.2. Inner tank bottom
4.2.1.3. Process areas
4.2.1.4. Impoundment floor
4.2.1.5. Roads
4.2.2. Elevation reference **NAVD**
4.2.3. Channel depth **ft**
4.2.4. Channel width **ft**
4.2.5. Berth depth **ft**
4.2.6. Tidal range, elevations **ft**
4.2.7. Normal channel current **Kts**
4.2.8. Maximum channel current **Kts**
4.2.9. Frost line depth **ft**

4.3. **Emissions**
4.3.1. **NO_X ppm**
4.3.2. **CO ppm**
4.3.3. **VOC ppm**
4.3.4. **PM ppm**
4.3.5. Water discharge restrictions

4.4. **Seismic**
4.4.1. Maximum considered earthquake design philosophy
4.4.2. Systems designed to operating basis earthquake, **OBE**
4.4.3. Systems designed to safe shutdown earthquake, **SSE**
4.4.4. Ground motion detection: identify systems that alarm and shutdown

4.5. **Climatic conditions**
4.5.1. Minimum design temperature **F**
4.5.2. Maximum design temperature **F**
4.5.3. Barometric pressure **inches Hg (mbar)**
4.5.4. Barometric pressure rate of change **inches Hg/h (mbar/h)**
4.5.5. Wind direction **from**
4.5.6. Design wind speed **mph**
4.5.7. Hurricane design force **mph or storm category**
4.5.8. Storm surge height **ft**
4.5.9. Rain fall 100 year storm **inches per hour**
4.5.10. Snow load **ft**

4.6. **Shipping**
4.6.1. LNG vessel capacity range **m^3**
4.6.2. LNG vessel unloading frequency **per year**
4.6.3. LNG vessel port time, pilot on to pilot off **h**

4.7. **Mooring**
- 4.7.1. Number of berths
- 4.7.2. Turning basin **yes/no**
- 4.7.3. Jetty **yes/no**
- 4.7.4. Trestle **yes/no**
- 4.7.5. Tug services **Owned/Leased**
- 4.7.6. Tug services **Full time/As required**

4.8. **LNG cargos**
- 4.8.1. Source
- 4.8.2. LNG specifications, range of conditions **Composition, molecular weight, HHV, LHV, specific gravity at cargo equilibrium pressure/temperature**
- 4.8.3. LNG vessel cargo design condition for unloading and vapor recovery: **Composition, molecular weight, HHV, LHV, specific gravity, equilibrium temperature (F) and cargo pressure (psig)**
- 4.8.4. Maximum cargo equilibrium pressure **psig**
- 4.8.5. Design cargo equilibrium pressure **psig**

4.9. **Unloading**
- 4.9.1. Unloading arms and size per dock liquid **No. ins**
- 4.9.2. Unloading arms and size per dock vapor **No. ins**
- 4.9.3. Unloading maximum rate **gpm (m^3/h)**
- 4.9.4. Unloading minimum pressure at ship manifold **psig**
- 4.9.5. Unloading maximum pressure at ship manifold **psig**
- 4.9.6. Design pressure, arms and piping **psig**
- 4.9.7. Maximum vapor return pressure at ship manifold **psig**
- 4.9.8. Maximum vapor return temperature at ship manifold **F**

4.10. **Feed gas**
- 4.10.1. Source
- 4.10.2. Natural gas specifications, range of conditions **Composition, molecular weight, HHV, LHV**
- 4.10.3. Maximum battery limit pressure **psig**
- 4.10.4. Minimum battery limit pressure **psig**

4.11. **Pretreatment**
- 4.11.1. Maximum flow rate to pretreatment **MMscfd**
- 4.11.2. Minimum flow rate to pretreatment **MMscfd**
- 4.11.3. Design pressure to pretreatment **psig**
- 4.11.4. Design temperature to pretreatment **F**
- 4.11.5. Treated gas specifications, range of conditions **Composition, molecular weight, HHV, LHV**
- 4.11.6. Maximum pressure to liquefaction **psig**
- 4.11.7. Minimum pressure to liquefaction **psig**
- 4.11.8. Design temperature to liquefaction **F**
- 4.11.9. Maximum flow rate to liquefaction **MMscfd**

4.12. **Regeneration gas**
- 4.12.1. Disposal of tail gas
- 4.12.2. Regeneration gas specifications, range of conditions

Composition, molecular weight, HHV, LHV

4.12.3. Maximum delivery pressure **psig**

4.12.4. Minimum delivery pressure **psig**

4.13. **Liquefaction**

4.13.1. LNG to storage; specifications, range of conditions
Composition, molecular weight, HHV, LHV

4.13.2. Net LNG to storage; specifications, range of conditions
Composition, molecular weight, HHV, LHV

4.13.3. Condenser outlet temperature **F**

4.13.4. Cooling water temperature **F**

4.13.5. Air temperature **F**

4.13.6. Liquefaction outlet temperature **F**

4.13.7. Liquefaction outlet pressure **psig**

4.13.8. Net LNG to storage **MMscfd**

4.14. **Fractionation products**

4.14.1. Fractionation products; specifications, range of conditions
Composition, molecular weight, HHV, LHV

4.14.2. Product flow rate **bbl/h (m^3/h)**

4.14.3. Product outlet temperature **F**

4.14.4. Product outlet pressure **psig**

4.14.5. Product storage pressure **psig**

4.15. **Storage**

4.15.1. Type of tank

4.15.2. Foundation

4.15.3. Secondary containment

4.15.4. Number of tanks

4.15.5. Gross capacity per tank **bbl (m^3)**

4.15.6. Working capacity per tank **bbl (m^3)**

4.15.7. Design pressure **psig**

4.15.8. Design vacuum **inches H_2O**

4.15.9. Working pressure **psig**

4.15.10. Specific gravity

4.15.11. Boiloff rate **percent (%) per day**

4.16. **Tank pumps**

4.16.1. Type of pump. Intank, or pot mounted

4.16.2. Number of pumps operating and spare

4.16.3. Design flow rate **gpm (m^3/h)**

4.16.4. Head at rated flow **ft**

4.16.5. Head at shutoff **ft**

4.16.6. Maximum LNG specific gravity

4.16.7. Shutoff pressure **psig**
(at design LNG specific gravity and suction pressure)

4.16.8. Rated and design specific gravity

4.17. **Sendout pumps**

4.17.1. Type of pump(s)

4.17.2. Number of pumps operating and spare

4.17.3. Design flow rate **gpm (m^3/h)**
4.17.4. Head at rated flow **ft**
4.17.5. Head at shutoff **ft**
4.17.6. Maximum LNG specific gravity
4.17.7. Shutoff pressure **psig**
(at design LNG specific gravity and suction pressure)
4.17.8. Rated and design specific gravity

4.18. **Vaporizers**
4.18.1. Vaporizer type
4.18.2. Vaporizers operating and spare
4.18.3. Emission control
4.18.4. Design flow rate each **MMscfd**
4.18.5. Design heat rate each **MMbtu/h**
4.18.6. Design pressure **psig**
4.18.7. Design discharge pressure **psig**
4.18.8. Design discharge temperature **F**

4.19. **Gas liquid removal**
4.19.1. Process
4.19.2. Throughput capacity **MMscfd**
4.19.3. Column operating pressure **psig**
4.19.4. Column design pressure **psig**

4.20. **Btu adjustment**
4.20.1. Process
4.20.2. Throughput capacity **MMscfd**
4.20.3. Pipeline Btu and composition specification

4.21. **Battery limit**
4.21.1. Design flow rate **MMscfd**
4.21.2. Maximum pressure vaporizer outlet **psig**
4.21.3. Pipeline maximum allowable operating pressure **psig**
4.21.4. Maximum allowable pipeline temperature **F**
4.21.5. Minimum allowable pipeline temperature **F**

4.22. **Vapor handling**
4.22.1. Vapor return blower type
4.22.2. Vapor return blower operating and spare
4.22.3. Vapor return blower each **MMscfd**
4.22.4. Vapor return blower discharge pressure **psig**
4.22.5. Low pressure compressor type
4.22.6. Low pressure compressors operating and spare
4.22.7. Low pressure compressors each **MMscfd**
4.22.8. Low pressure compressor discharge pressure **psig**
4.22.9. Vapor recondensation process
4.22.10. Maximum vapor flow rate **MMscfd**
4.22.11. Design vapor recondensation flow rate **MMscfd**
4.22.12. Required LNG send out rate **MMscfd**
4.22.13. High pressure compressor type
4.22.14. High pressure compressors operating and spare

4.22.15. High pressure compressors each **MMscfd**
4.22.16. High pressure compressor discharge pressure **psig**

4.23. **Vent stacks**
4.23.1. Vent type
4.23.2. Vent sources and rates
4.23.3. Maximum flow to vent **MMscfd**, **MWt, F, psig.**

4.24. **Flares**
4.24.1. Flare type
4.24.2. Flare sources and rates
4.24.3. Maximum flow to flare **MMscfd**, **MWt, F, psig.**

4.25. **Fuel gas**
4.25.1. Source
4.25.2. Flow rate **MMscfd, MWt, F, psig.**
4.25.3. Pressure levels **psig.**
4.25.4. Minimum temperature at pressure levels **F @ psig**
4.25.5. Design temperature at pressure levels **F @ psig**
4.25.6. Odorized **yes/no**

4.26. **LNG Trucking**
4.26.1. Number of trucks per year
4.26.2. Number of trucks per day loading
4.26.3. Number of trucks per day unloading
4.26.4. LNG unloading rate **usgpm**
4.26.5. LNG truck fill rate **usgpm**

4.27. **Electrical**
4.27.1. Main power utility supplier
4.27.2. Utility supply voltage **kV**
4.27.3. Utility supply capacity **kVA**
4.27.4. Main power generated onsite **yes/no**
4.27.5. Main power generators **number, type, kV, kVA**
4.27.6. Emergency power supply **Utility/Generated**
4.27.7. Emergency power generators **number, type, kV, kVA**
4.27.8. Emergency power voltage **kV**
4.27.9. Emergency power capacity **kVA**
4.27.10. UPS services, voltage, size and capacity **V, kVA, h**

4.28. **Control Instrumentation**
4.28.1. Design of Distributed Control System (DCS) **manufacturer**
4.28.2. Control system software **supplier**
4.28.3. Safety instrumentation system **type**

4.29. **Instrument air**
4.29.1. Compressors **type**
4.29.2. Drying system **type**
4.29.3. Flow rate **scfm**
4.29.4. Pressure **psig**

4.30. **Plant air**
- 4.30.1. Compressors **type**
- 4.30.2. Flow rate **scfm**
- 4.30.3. Pressure **psig**

4.31. **Inert gas**
- 4.31.1. Source
- 4.31.2. Flow rate **scfm**
- 4.31.3. Pressure **psig**

4.32. **Nitrogen**
- 4.32.1. Source
- 4.32.2. Liquid nitrogen storage capacity **usg**
- 4.32.3. Flow rate **scfm**
- 4.32.4. Pressure **psig**

4.33. **Fire water**
- 4.33.1. Source **mains/storage/other**
- 4.33.2. Pump and driver type
- 4.33.3. Pump rated capacity **usgpm, hp, psig**
- 4.33.4. Pumps operating and standby
- 4.33.5. Make up water source
- 4.33.6. Make up water available flow rate **usgpm**
- 4.33.7. Make up water available pressure **psig**
- 4.33.8. Fire water storage type and capacity **usg**
- 4.33.9. Fire water design flow rate **usgpm**
- 4.33.10. Fire water supply pressure **psig**
- 4.33.11. Fire water nozzle pressure **psig**

4.34. **Cooling water**
- 4.34.1. Source
- 4.34.2. Available flow rate **usgpm**
- 4.34.3. Delivery pressure **psig**
- 4.34.4. Return pressure **psig**
- 4.34.5. Maximum temperature **F**
- 4.34.6. Minimum temperature **F**
- 4.34.7. Design temperature **F**

4.35. **Hydrotest water**
- 4.35.1. Source
- 4.35.2. Available flow rate **usgpm**
- 4.35.3. Pressure **psig**

4.36. **Utility water**
- 4.36.1. Source
- 4.36.2. Flow rate **usgpm**
- 4.36.3. Pressure **psig**

4.37. **Fire protection**
- 4.37.1. Fire protection service

4.38. **Site security**
- 4.38.1. Site security service

5. Major process systems

PROVIDE technical descriptions of each process system, which should include a general description of the process, the design conditions and technical features of the process, special features and provisions for cooldown, startup and operation, special operating modes, emergency shutdown, isolation and maintenance of the system. The descriptions should reference P&IDs, drawings, specifications and other documents contained in the Project Manual.

5.1. Marine

PROVIDE a technical description of the marine facilities, which should include the turning basin, slip, dock mooring arrangement, jetty/trestle, dock, unloading platform, arm design, arm arrangement and PERC system, cargo transfer, spill containment, vapor return.

- 5.1.1. **Dock mooring arrangement and turning basin, jetty/trestle, dock**
- 5.1.2. **Marine facility spacing**
- 5.1.3. **LNG vessel size, transfer design rates and pressure**
- 5.1.4. **Unloading platform**
- 5.1.5. **Unloading arm and piping design conditions**
- 5.1.6. **Piping design**
- 5.1.7. **Vent and blow down design**
- 5.1.8. **Platform details**
- 5.1.9. **Platform, dock and jetty fire protection**
- 5.1.10. **Security provisions**
- 5.1.11. **Operating and safety systems**
- 5.1.12. **Drawings**
  - 5.1.12.1. **Overall layout**
  - 5.1.12.2. **Berthing layout**
  - 5.1.12.3. **Jetty to platform layout**
  - 5.1.12.4. **Jetty to platform elevations**
  - 5.1.12.5. **Platform piling plan and section**
  - 5.1.12.6. **Trestle piping plan**
  - 5.1.12.7. **Pipe trestle sections and details**
  - 5.1.12.8. **Platform elevation showing high and low water levels**

5.2. Unloading

PROVIDE a technical description of the unloading system, including LNG vessel unloading rates and conditions, unloading line system, circulating system, isolation valves, drain and vent systems, and spill control.

- 5.2.1. **LNG vessel capacities, unloading rates and conditions**
- 5.2.2. **Vapor return desuperheating**
- 5.2.3. **Liquid removal**
- 5.2.4. **LNG relief valve discharge containment**
- 5.2.5. **LNG vents and drains**
- 5.2.6. **Isolation valves**

5.3. Feed gas pretreatment

PROVIDE a technical description of the feed gas pretreatment, including pipeline battery limit conditions, feed gas flow rates and conditions, pretreatment system, heating and cooling systems and disposal of regeneration gas and liquids.

5.3.1. **Pipeline conditions and battery limit metering and regulation**
5.3.2. **Feed gas flow rates and composition variations**
5.3.3. **Carbon dioxide removal system**
5.3.4. **Water removal system**
5.3.5. **Removal of other impurities**
5.3.6. **Regeneration heating and cooling**
5.3.7. **Disposal of regeneration gas and liquids**

5.4. **Liquefaction**

PROVIDE a technical description of the liquefaction system, including the liquefaction process, refrigerant exchangers, refrigeration compressors and drivers, cooling system, refrigerant production, refrigerant storage and refrigerant loading.

5.4.1. **Liquefaction process**
5.4.2. **Liquefaction equipment and operating conditions**
5.4.3. **Refrigerant exchangers and mid point heavy hydrocarbon removal**
5.4.4. **Refrigerant compressors and drivers**
5.4.5. **Cooling system**
5.4.6. **Refrigerant production and specifications**
5.4.7. **Refrigerant storage**
5.4.8. **Refrigerant loading**

5.5. **Fractionation, base load liquefaction**

PROVIDE a technical description of the fractionation system, including the demethanizer system design, demethanizer start up and operating conditions, Deethanizer, depropanizer, debutanizer and refrigerant production. Fractionation product storage and export.

5.5.1. **Demethanizer**
5.5.2. **Deethanizer**
5.5.3. **Depropanizer**
5.5.4. **Debutanizer**
5.5.5. **Refrigerant manufacture**
5.5.6. **Ethane product specification, storage and export**
5.5.7. **Propane product specification, storage and export**
5.5.8. **Butane product specification, storage and export**
5.5.9. **C5 plus product specification, storage and export**

5.6. **Vapor handling**

PROVIDE a technical description of boiloff gas handling systems, vapor return blowers, boiloff gas low pressure compression, boiloff gas condensation, boiloff gas high pressure compression.

5.6.1. **Vapor return to the LNG vessel**
5.6.2. **Boiloff gas low pressure compression**
5.6.3. **Boiloff gas recondensation**
5.6.4. **Boiloff gas high pressure compression**

5.7. **LNG Sendout system**

PROVIDE a technical description of the sendout process from storage to the meter station, which should include equipment utilization, operating conditions and capacities for sendout pumps, vaporizers and boiloff gas condensation systems. The utilization of the pump system for LNG transfer between tanks, unloading line cooling, recirculating systems for pump minimum flow pump suction headers and LNG surge vessels.

5.7.1. **Low pressure LNG pumps, minimum flow, low pressure LNG recycle systems from high pressure pump suction**
5.7.2. **Inter tank LNG transfer systems**
5.7.3. **Unloading line cooling**
5.7.4. **High pressure LNG pumps, pump vessel vent system, minimum flow recycle**
5.7.5. **LNG vaporization**
5.7.6. **LNG vaporizer heating system**
5.7.7. **Emissions control requirements and sytem**
5.7.8. **Generated water handling/disposal system**

5.8. **Gas liquid removal LNG receiving terminals**

PROVIDE a technical description of the process, which should include basis of design, operating conditions, startup and shutdown conditions, product handling, vent and drain requirements. The description should include the basis of design for providing containment within the maximum allowable operating pressure of the system. A description of the equipment should include type of equipment and any special features of design, or operation.

5.8.1. **Fractionation system**
5.8.2. **Equipment design features**
5.8.3. **Operating considerations**
5.8.4. **Startup and shutdown conditions**
5.8.5. **On site product storage**
5.8.6. **Product sendout**

5.9. **Btu adjustment**

PROVIDE a technical description of the process, which should include the basis for the design including pipeline composition limits, the equipment capacities, operating conditions and systems designed to prevent the operation of the system outside the limits of the specified conditions.

5.9.1. **Btu adjustment requirements**
5.9.2. **Btu adjustment system**
5.9.3. **Equipment design features**
5.9.4. **Operating considerations**
5.9.5. **Startup and shutdown conditions**

5.10. **Vent and flare systems**

PROVIDE the basis of design for vents and flares and the anticipated operating conditions for vent or flare operation, the design features of the equipment including operating conditions and special design conditions. The information

should include dimensions of the flare or vent and maximum capacity, with radiation conditions for flares and ignited vent stacks, and vapor dispersion considerations for cold vents.

5.10.1. **Vent system**
5.10.2. **Flare system**

5.11. **Pressure relief**

PROVIDE the design philosophy for containment and handling of relief valve discharge for LNG, other liquid hydrocarbons, cryogenic flammable vapors, non-cryogenic flammable vapors and non-flammable fluids.

5.11.1. **LNG relief valve discharge**
5.11.2. **Hydrocarbon liquid relief valve discharge**
5.11.3. **Cryogenic flammable vapor relief valve discharge**
5.11.4. **Non-cryogenic flammable vapor relief valve discharge**
5.11.5. **Non-flammable relief valve discharge**

5.12. **Sendout metering**

PROVIDE a technical description of the sendout metering system, which should include the design conditions of the meter station, design pressure and temperatures, overpressure safety system, isolation system, metering instrumentation and analysis of sendout. The description of the pipeline system should include the size, maximum allowable operating pressure, maximum and minimum allowable operating temperatures and the minimum operating pressure of the pipeline.

5.12.1. **Meter station**
5.12.2. **Metering system**
5.12.3. **Pipeline**

5.13. **LNG product loading marine**

PROVIDE a technical description of the LNG loading and custody transfer system, which should include analysis of product, measurement of LNG product delivered to the LNG vessel, LNG loading pumps, loading arms, vapor return handling, control and shutdown systems.

5.13.1. **LNG product analysis**
5.13.2. **LNG product measurement**
5.13.3. **LNG loading pumps**
5.13.4. **Loading arms**
5.13.5. **Vapor return handling**
5.13.6. **Control and shutdown**
5.13.7. **Safety features**

5.14. **LNG product loading and unloading trucking**

PROVIDE a technical description of the LNG truck loading and unloading system, which should include a description of the system, vapor handling, method of operation and safety features

5.14.1. **LNG truck stations**
5.14.2. **LNG truck weighing**

5.14.3. **LNG truck loading system**
5.14.4. **LNG truck unloading system**
5.14.5. **Vapor handling**
5.14.6. **Method of operation**
5.14.7. **Safety features**

5.15. **Commissioning plan**

PROVIDE a description of the commissioning plan, which should include a summary of the transition between mechanical completion, pre-commissioning and commissioning, electrical and control system checks, the method for tightness testing, inerting and cooldown of the systems, the certification of readiness to operate.

5.15.1. **Commissioning plan summary**
5.15.2. **Mechanical completion verification and sign off**
5.15.3. **Pre-commissioning activities**
5.15.4. **Commissioning**

6. LNG storage tanks

Provide manuals and preliminary drawings for LNG storage tank(s).

PROVIDE a technical description of the proposed LNG storage tank, which should include essential features of the tank design and foundation system, piping support systems on the tank and support between the tank and horizontal ground piping, tank spill protection and instrumentation.

6.1. **LNG tank**
6.2. **Tank foundation**
6.3. **Insulation systems**
6.4. **Piping support system**
6.5. **Spill containment and protection**
6.6. **Tank level gauging and overfill protection**
6.7. **Tank pressure measurement and control**
6.8. **Cooldown sensors**
6.9. **Leak detection instrumentation**
6.10. **Assessment for rollover and site specific guidelines for prevention of rollover**
6.11. **Basis of design**
6.12. **LNG tank siting diagram**

PROVIDE schematic elevation section of tank dike and the tank, at the minimum distance between the outer tank wall and dike, showing the maximum liquid height, height of top of dike and distance from inside top of dike to inner tank wall.

6.13. **Design considerations, basis and calculations for sizing pressure and vacuum relief valves**
6.14. **Instrument list**
6.15. **LNG tank drawings with dimensions**
6.15.1. **Overall tank drawing with dimensions and design data**
6.15.2. **Foundations**
6.15.3. **Elevation section**
6.15.4. **Insulation systems**

6.15.5. **Corner thermal protection**
6.15.6. **Piping penetrations and schedule of openings**
6.15.7. **Piping support structure**
6.15.8. **Roof spill containment and protection**
6.15.9. **Tank base spill protection**
6.15.10. **Top and bottom fill piping**
6.15.11. **In-tank pump column and support arrangement**
6.15.12. **Relief valve and discharge orientation**
6.15.13. **Temperature sensor locations**
6.15.14. **Undertank heating**
6.15.15. **Cathodic portection**
6.15.16. **LNG level and density instruments**
6.15.17. **Temperature sensors**

7. Utilities

PROVIDE technical descriptions of each utility system that address the design and operation of the system. Electricity and fuel gas are included in sections 11 and 12 respectively. The descriptions should reference P&IDs, drawings, specifications and other documents contained in the Project Manual.

7.1. **Instrument air**
7.2. **Plant air**
7.3. **Nitrogen**
7.4. **Service water**
7.5. **Chemical treatment**
7.6. **Other utilities**

8. Equipment data

PROVIDE equipment data for the major process components. The information should include a complete list of process and utility equipment, design data sheets and manufacturers' information.

8.1. Equipment list with design conditions

PROVIDE the equipment list with design conditions. Design conditions should be appropriate for the type of equipment and should include as applicable; design pressure and temperature conditions, equipment dimensions, rated and normal flow capacity, rated and normal heating capacity, heat transfer area, motor horse power and voltage, as applicable.

8.2. Equipment data

PROVIDE equipment process data sheets for summary reference. The front page of the equipment item should list the appendix where the design specification and manufacturers data are contained. Each equipment item should include the process and manufacturers data sheets and reference the relevant section in the appendix for the design specification and manufacturers data.

8.2.1. **Equipment item**
FEED process data sheets and manufacturer's data sheets.

9. Instrumentation

PROVIDE technical information on the design of the control system

9.1. **Description of control system**
9.2. **Distributed Control System (DCS) components and software**
9.3. **Field control instruments**
9.4. **Control communication and control power**
9.5. **Backup power supply**
9.6. **Sample conditioning, analyzers and custody transfer**
9.7. **Drawings**
  9.7.1. **Control system block diagram**

10. Safety instrumentation

PROVIDE information relevant to the safety instrumented system (SIS), which should include:

10.1. **Description of the SIS**
10.2. **SIS components**
10.3. **Communication and control power**
10.4. **Backup power supply**
10.5. **ESD system**
10.6. **Drawings and tables**
  10.6.1. **SIS block diagram**
  10.6.2. **Cause and effect diagrams for alarm, shutdown and hazard control activation, with set points**.

11. Electrical

PROVIDE engineering information on the plant's electrical power generation system, distribution system, emergency power system, uninterruptible power system, and battery backup system.

PROVIDE technical descriptions and information on the electricity supply, power requirements, electrical distribution system, backup and standby power supply, emergency power supply, control power and other electrical systems. Provide tables listing connected power, anticipated power requirements and primary transformers. Provide drawings of area classification, oneline diagrams, lighting and pass through seal arrangements.

11.1. **Description of electrical system**
  11.1.1. **Electrical system**
    Electrical supply, distribution and voltage levels, back-up supply, uninterruptible power supply systems, cathodic protection
  11.1.2. **Hazardous area classification basis**

11.2. **Electrical tables and lists**
  11.2.1. **Anticipated power requirements for operating modes**
  11.2.2. **Transformer list, with tag number, size and location**

11.3. **Electrical drawings**
  11.3.1. **Hazardous area classification, overall plans and area plans**
  11.3.2. **Single line drawings power distribution**
  11.3.3. **Single line drawings of emergency load supply and distribution**
  11.3.4. **Emergency lighting plan**

11.3.5. **Electrical pass through seals for services such as LNG pumps and instrumentation.**

12. Fuel gas

PROVIDE a detailed layout of the fuel gas system showing all taps with process components.

PROVIDE a technical description of the fuel gas system which should include sources, pressure levels, heating requirements, odorant system, overpressure protection and low temperature protection considerations. Reference the specific P&IDs depicting the fuel gas system.

12.1. **Description of fuel gas system**
12.2. **Drawings**
12.2.1. **Plans showing piping and equipment layout**

13. Spill containment systems

PROVIDE a detailed layout of the spill containment system showing the location of impoundments, sumps, sub-dikes, channels, and water removal systems.

PROVIDE a description of each containment component which should contain the location, design configuration, dimensions, capacity and materials of construction. The description should also include details of the water removal system, basis of design and flow rate required to be removed. Each spill containment system, trough, trench, sump and impoundment should be clearly referenced to the drawings. See appendix Q for vapor dispersion and thermal radiation exclusion zone references.

13.1. **Description of spill containment systems**
13.1.1. **LNG storage (main area and sub impoundments0**
13.1.2. **Fractionation product storage**
13.1.3. **Refrigerant storage**
13.1.4. **LNG unloading**
13.1.5. **LNG trucking facilities**
13.1.6. **Process areas**
13.1.7. **Storm water drainage**
13.1.8. **Storm water removal**
13.1.9. **LNG transfer lines**

13.2. **Drawings**

PROVIDE plot plans for each process area or system showing the location of all equipment served by each containment system. Troughs, dikes and sumps should be clearly shown. For clarity, it may be necessary to provide separate drawings for each process area. Details should include dimensions and cross-sections of each system and arrows showing direction of spill flow into sumps or impoundments.

13.2.1. **Plot plans** showing spill containment systems, and the equipment served by each system, including drainage
13.2.2. **Spill containment sections and details**.
13.2.3. **Vapor dispersion limits.**

Plot plans showing the limits of vapor dispersion at 5% and 2.5% LFL and the property line. See appendix Q for vapor dispersion calculations.

13.2.4. **Thermal radiation isopleths.**

Plot plans showing radiation isopleths for 1600, 3000, and 10,000 Btu/(ft^2hr), and the property line. See appendix Q for thermal radiation calculations**.**

14. Hazard detection systems

PROVIDE a layout of the hazard detection system showing the location of combustible-gas detectors, fire detectors, heat detectors, smoke or combustion product detectors, and low temperature detectors. Show all combustion/ventilation air intake equipment, the detectors covering the air intake and the distances to any possible hydrocarbon release (LNG, flammable refrigerants, flammable liquids and flammable gases).
Identify those detectors that activate automatic shutdowns and the equipment that would shut down. Include all safety provisions incorporated in the plant design, including automatic and manually activated emergency shutdown systems.

14.1. **Description of hazard detection systems**

14.2. **Description of hazard warning systems including offsite, plant wide and local area**

14.3. **List with tag number, location, type/model of detection equipment.**

14.4. **Matrix of all detection equipment with area location, number and detector type**

- 14.4.1. **Flammable gas, including set points**
- 14.4.2. **Low temperature, including set points**
- 14.4.3. **Heat**
- 14.4.4. **Smoke**
- 14.4.5. **Products of combustion**
- 14.4.6. **Fire**

14.5. **Drawings**

- 14.5.1. **Hazard detector layout plans**
- 14.5.2. **Combustion/ventilation air intake locations**

PROVIDE drawings clearly showing the location of each detector and coverage areas of all hazard detection equipment. Drawings should also be provided showing all combustion/ventilation air intake equipment and the distances to any possible hydrocarbon release. Separate plot plans should be created where necessary to provide clarity.

15. Fire suppression and response plan

PROVIDE a description of the utilization and responsibilities of onsite personnel and offsite personnel and equipment in response to fires.

15.1. **Description of response to fire and deployment of resources**

15.2. **Organizational chart for emergency response and fire fighting**

16. Hazard control systems

PROVIDE a description explaining the function of the various types of fire suppressant, the location, capacity and discharge rate required. The basis of design should include criteria for sizing the flow and capacity of the suppressant.
Hazard control systems include dry chemicals, carbon dioxide, nitrogen snuffing and other fire extinguishing systems.

PROVIDE a list or matrix of the hazard control equipment and detailed layout, of each system

16.1. **Description of hazard control equipment and systems**
16.2. **Dry chemical basis of design**
16.3. **List or matrix of hazard control equipment**

PROVIDE tag number, location and area covered, type, size, discharge conditions, activation, or remote control capabilities and manufacturer/model for all dry chemical equipment, and provide similar information for other types of hazard control systems used at the site.

16.4. **Dry chemical system drawings**

PROVIDE a detailed layout of the hazard control system showing the type of unit and the area of coverage. The legend should indicate the type of each unit and the quantity of suppressant.

16.4.1. **Dry chemical equipment and other systems location plans**
16.4.2. **Dry chemical and other systems coverage plans**

17. Fire water

PROVIDE a detailed layout of the fire water system showing the location of fire water pumps, piping, hydrants, hose reels, and auxiliary or appurtenant service facilities.

PROVIDE the source (firewater tank, pond, ocean, wells, city, etc.) and the estimated maximum flows for all water supplies, the required pressure and the maximum total water flow for the design fire scenario.

PROVIDE specifications and operating conditions for the pumps, or fire water supply system, secondary pumps, backup pumps and jockey pumps.
The drawings should clearly show the location of all fire water equipment on separate fire water coverage plans.

17.1. **Description of fire water system**
17.1.1. **Fire water system design**
17.1.2. **Fire water system demands and basis of sizing**
17.1.3. **Fire water supply and back up supply**
17.1.4. **Fire water system components**
17.1.5. **Fire water piping**
17.1.6. **Fire water hydrants**
17.1.7. **Fire water monitors**
17.1.8. **Hose reels**
17.1.9. **Water screens and deluge systems**
17.1.10. **Water supply for high expansion foam**

17.2. **List or matrix of all fire water delivery equipment**

PROVIDE tag number, location and area covered, type, size, discharge conditions, activation, or remote control capabilities and manufacturer/model for all fire water equipment including deluge systems, sprinklers, monitors, hydrants and hose stations.

17.3. **Fire water delivery matrix**

17.4. **Fire water drawings**

PROVIDE drawings of the fire water system which should include P&IDs, system and equipment layouts and fire water coverage plans.

17.4.1. **Fire water P&IDs**

17.4.2. **Fire water piping plans**

The plan drawings should show the fire water supply, the sizing of the firewater mains, and how they are arranged in either a loop or grid system throughout the site. Isolation valves to allow water flow in case a portion of the system is damaged should be shown. They should also show monitors, hydrants, hose stations and post indicator valves.

17.4.3. **Fire water coverage plans**

Coverage areas for each system should be clearly depicted showing the coverage circle. Where buildings, or equipment block the line of sight of the monitor the non-covered area should be indicated.

18. High expansion foam system

PROVIDE a detailed layout of the high expansion foam systems, water supply and auxiliary or appurtenant service facilities.

PROVIDE a description of the foam system coverage and basis of design for sizing the systems, including capacity and discharge rates. Provide an assessment of the impact of adverse weather conditions on the effectiveness of the systems.

18.1. **Description of foam system and equipment**
18.2. **Foam system basis of design**
18.3. **List or matrix with tag number, location, type/model of foam equipment.**
18.4. **Drawings**
18.4.1. **Foam system component location plans**
18.4.2. **Foam system coverage plans**

19. Security

PROVIDE a general description of the proposed security that addresses the principal concerns for facility security, plans of the security fencing and CCTV locations. Identify the third parties who would be instrumental in the development of the security plan during the design phase of the project. Sufficient information should be provided to demonstrate that the facility would be designed, installed and operated to provide the level of security and safety, consistent with the requirements of the design and location of the facility.

19.1. **Security description**
19.2. **Security plan development**
19.3. **Site access control**
19.4. **Onsite access control**

19.5. **Cameras**
19.6. **Intrusion detection**
19.7. **Drawings**
19.7.1. **Security fencing and access control plan**
19.7.2. **Camera layout plan**

20. Piping

PROVIDE a description of the piping system, which should include the type and design of the piping systems, method of expansion and contraction control, and insulation systems.

20.1. **Piping systems**
20.2. **Piping insulation**
20.3. **Pipe racks**
20.4. **Piping specification tabular summary**
Service, class, design pressure, design temperatures and insulation system
20.5. **Piping drawings**

PROVIDE layouts and elevations of major process equipment, pipe rack layouts and typical piping support systems.

20.5.1. **Layout and sections of major pipe racks**
20.5.2. **Layout and elevations of major equipment**
20.5.3. **Layout and elevations of typical piping support system**

21. Foundations and supports

PROVIDE a description of equipment and piping foundations and supports, which should include a brief description of the type of foundations required for different areas, the design of the support systems and any passive protection that will be applied to the structures to protect against fire or cryogenic temperatures.

21.1. **Description of foundations and supports**
21.2. **Drawings**
21.2.1. **Foundations, typical**
21.2.2. **Equipment supports**

22. Buildings and structures

PROVIDE brief descriptions and preliminary plans for the proposed buildings and structures, which should include the type of structure size and any special features, such as pressurization or fireproofing.

22.1. **Description of buildings**
22.2. **List of buildings with dimensions**
22.3. **Drawings**
22.3.1. **Preliminary building plan and elevation**

23. Process drawings

PROVIDE process flow diagrams showing the process systems and include simulations of the process conditions used as the basis for equipment design.
The process flow diagrams should be provided in 11”x17” format and should be clearly legible at that scale. The diagrams should include stream designations keyed to the material

and energy balance. All process drawings and flow diagrams should be printed in black and white.

23.1. **Process flow diagrams and material and energy balances**

24. Piping and instrument diagrams

PROVIDE up-to-date piping and instrumentation diagrams (P&ID's). Include a description of the instrumentation and control philosophy, type of instrumentation (pneumatic, electronic), use of computer technology, and control room display and operation.

PROVIDE P&IDs, symbols and legend drawings.

Drawings and all information should be clearly legible on 11" x 17" paper and the piping legend and symbology should be in accordance with accepted practice. All drawings should be filed in black and white. Copies of color drawings are not acceptable. Drawings should include all process and utility systems.

24.1. **Drawing list with revision number and issue date**
24.2. **Piping and instrumentation legend and symbols**
24.3. **Piping and instrumentation details**
24.4. **P&IDs**

PROVIDE the following information on the P&IDs:

- Equipment tag number, name, size, duty, capacity and design conditions
- Piping with line number, piping class spec, size and insulation
- LNG tank pipe penetration size or nozzle schedule
- Piping spec breaks and insulation limits
- Vent, drain, cooldown and recycle piping
- Isolation flanges, blinds and insulating flanges
- Valve type, in accordance with the piping legend symbol
- All control valves numbered
- All valve operator types and valve fail position
- Instrumentation numbered
- Control loops including software connections
- Alarm and shutdown set points
- Shutdown interlocks
- Relief valves numbered, with set point
- Relief valve inlet and outlet piping size
- Car sealed valves and blinds
- Equipment insulation
- Drawing revision number and date

ADDITIONAL information to be included on the P&IDs issued for construction should include:

- All manual valves numbered including check, vent, drain and car sealed valves
- Alarm and shutdown set points

Note: It is preferable, but not essential that manual valves are numbered on the P&IDs submitted with the application.

Resource Report 13

Draft Preferred Submittal Format Guidance

APPENDIX

A Facility description

ADDITIONAL area maps, plans and information relevant to the siting and development of the facility.

B Project schedule

PROVIDE general description of the execution of the project as it applies to the Gannt chart.

B.1 Project execution, general description

B.2 Project schedules, progress and information (during detailed design and construction phases)

C Basis of design

PROVIDE basis of design clarification where necessary as a summary of the features influencing the design basis, with comments to justify, explain, or clarify the design requirement. Items to be considered should include, but not be limited to: guarantee conditions, sparing philosophy, venting and flaring, outside services, emissions, fire water, hydrotest water and equipment.

The format should be tabular as:

Item | Design Basis | Comment

C.1 Basis of design clarification

PROVIDE Wind and flooding information confirming that LNG storage tanks and critical equipment (cryogenic transfer piping; marine/cargo unloading platforms; primary and emergency electrical power; boil-off gas compression; and control systems) would adequately withstand conditions from potential wind, storm surge, flooding, and similar hurricane events. Provide the historical or scientific basis for wind, storm surge, and flooding conditions used as design criteria.

C.2 Wind and Flooding

Provide details on the facilities design that are being proposed to handle potential regional hurricane activity or other storm effects (e.g., site elevation, shoreline stabilization, jetty design and operation, stormwater management and spill retention). Include information to confirm why and how the overall facility would adequately withstand conditions from potential wind, storm surge, flooding, and similar cyclone (hurricane, blizzard, and tornado) effects. This information should specifically address the basis (Federal Emergency Management Agency, Sea Lake, and Overland Surges from Hurricanes, etc.) for determining the design flood and storm surge elevations for the proposed project.

Provide all facility elevations for dikes, storm surge walls, and other elevated features of the facility, their design basis, and demonstrate how they will conform to industry and Federal standards and protect critical equipment or ensure minimal consequences.

Provide information confirming that the LNG storage tanks and critical equipment (cryogenic transfer piping, marine/cargo unloading platforms, primary and emergency electrical power, boil-off gas compression, and control systems) would adequately withstand conditions from potential wind, storm surge, flooding, and similar cyclone effects. Provide a copy of the design assessment used to support these determinations along with who prepared it.

D **Design codes and standards**

PROVIDE all codes and standards under which the plant (and marine terminal, if applicable) will be designed, and any special considerations or safety provisions that were applied to the design of plant components.

PROVIDE a list of applicable codes from the National Fire Protection Association, American Petroleum Institute, American Society Of Mechanical Engineers, American Society of Civil Engineers, National Electrical Code, The Instrumentation, Systems, and Automation Society, Center for Chemical Process Safety, etc. that would be applied in the design, construction and operation of the facility.

E **Permits or approvals**

PROVIDE a list of all permits or approvals from local, state, Federal, or Native American groups or Indian agencies required prior to and during construction of the plant, and the status of each, including the date filed, the date issued, and any known obstacles to approval. Include a description of data records required for submission to such agencies and transcripts of any public hearings by such agencies. Also provide copies of any correspondence relating to the actions by all, or any, of these agencies regarding all required approvals.

PROVIDE a list of all permits as specified above. This section may reference Resource Report 1.

E.1 **List of permits and approvals**

F **Demonstration of code compliance**

PROVIDE a code compliance demonstration showing how each applicable requirement will comply with 49 CFR Part 193 and the National Fire Protection Association (NFPA) 59A LNG Standards – 2001 version. For new facilities, the siting requirements of 49 CFR Part 193, subpart B, must be given special attention. If applicable, vapor dispersion calculations from LNG spills over water should also be presented to ensure compliance with the U.S. Coast Guard's LNG regulations in 33 CFR Part 127.

PROVIDE tabulated lists of 49 CFR Part 193 and NFPA 59A requirements indicating how each has been satisfied. The specific location of relevant supporting information/calculations contained in the application should also be provided.

F.1 **Code compliance demonstration**

G **HAZID, HAZOP reviews, safety reviews and recommendations**

PROVIDE copies of HAZID and HAZOP design reviews, with lists of the recommendations and status of implementation. The design reviews should include the requirements for commissioning, startup, operation and maintenance. Note that recommendations resulting from the HAZID, HAZOP reviews performed during the FEED phase of the project should be included in the design submitted with the application.

G.1 **Hazard design reviews and HAZOP or equivalent reviews: pre authorization**

ADDITIONAL Hazard design reviews, the final HAZOP review prior to finalizing the design as "Issued For Construction" and the pre-operational safety review should be filed as appendix G and added to the appendix as completed.

G.2 **Hazard design reviews and HAZOP or equivalent reviews: post authorization**

H **Management of change and reporting**

PROVIDE a description of the management of change system to be used during the project and sample documents.

H.1 **Management of change description**
H.2 **Sample documents**

I **Seismic design investigation and design forces**

PROVIDE the information and supporting data for the seismic hazard evaluation of the site and seismic design of the proposed facility as specified in NFPA 59A, 2001 edition, Chapter 4 and Appendix B. Additional guidance will be prepared and made available later in 2006 by- the staff.

I.1 **Seismic hazard study and basis of design for seismic conditions, including regional seismicity and on-site faulting**
I.2 **Development of design earthquakes**
I.3 **Design criteria**
I.4 **Sloshing freeboard**

J **Soil characteristics and foundation design**

PROVIDE a summary of the geotechnical study, including subsurface conditions, flooding potential and foundation designs.

J.1 **Summary of geotechnical study**
J.2 **Seismic soil liquefaction potential and mitigation, if necessary**

K **Marine systems**

PROVIDE complete specifications, vendor information and drawings of the marine facilities to be installed.

K.1 **Marine facilities technical specifications**
K.2 **Vendor information**
K.3 **Drawings**

L **LNG tank information**

PROVIDE a complete specification of the proposed LNG tank and foundation system. In the event that the LNG tank supplier has not been selected, the LNG tank specifications should include all details of the design that would be required to be incorporated by the selected tank supplier.

L.1 **LNG tank specifications**
L.2 **Assessment for rollover and site specific guidelines for prevention of rollover**
L.4 **Construction sequence**
L.5 **Hydrotesting**
L.6 **Drawings**

M **Equipment information**

PROVIDE the equipment list with design conditions. Design conditions should be appropriate for the type of equipment and should include as applicable; design pressure and temperature conditions, equipment dimensions, rated and normal flow capacity, rated and normal heating capacity, heat transfer area, motor horsepower and voltage, as applicable. (See Section 8)

M.1 **Equipment list with design conditions**

PROVIDE project specific design and manufacturers information for each equipment item. Each equipment item should have the FEED design specifications and manufacturer's information. Where more than one manufacturer is under consideration and meets specifications, the equipment specifications and design data need not be repeated.

M.2 **Equipment item**

M.2.1 **Equipment specifications and design data**
FEED design data, engineering specifications and construction specifications where applicable.

M.2.2 **Manufacturer's data and specifications**
Manufacturer's data should meet the requirements of the equipment specifications and design conditions.

N **Instrumentation**

ADDITIONAL information to be provided during detailed design and construction would include instrument lists, manufacturers' data and other site specific information.

O **Electrical**

ADDITIONAL information to be provided during detailed design and construction would include cable and wiring, manufacturers' data and other site specific information.

P **Fire protection**

PROVIDE the preliminary fire protection evaluation according to NFPA 59A (2001), Section 9.1.2. This evaluation should support the types of hazard control systems chosen, general locations, and sizing.

P.1 **Fire protection evaluation**

ADDITIONAL information prepared during the design and construction of the facility would include emergency response plans and procedures related to fire protection.

P.2 **Fire protection emergency response plans**

Q **Thermal radiation and vapor dispersion report**

Provide the information listed in Section 11.2 of the Guidance for Filing Resource Reports 11 & 13 for LNG Facility Applications.

R **Design studies**

PROVIDE copies of company, engineering firm, or consultant studies of a conceptual nature that show the engineering planning or design approach to the construction of new facilities or plants.

PROVIDE studies that support a design decision such as selecting a specific type of equipment where other alternatives were available. For example, studies supporting the choice of ambient vaporizers versus submerged combustion; twin 30-inch-diameter transfer lines versus one 42-inch-diameter; full containment versus single containment LNG storage tanks, and so on.

PROVIDE studies that were used to develop unique design features that differ from currently operating facilities.

S **Shut-off valves**

PROVIDE manufacturer's specifications, drawings, and literature on the fail-safe shut-off valve for each loading area at a marine terminal (if applicable).

PROVIDE a description of the type of valve used for each service together with a reference list by tag number and location. Provide manufacturer's specifications and information on shut off valves and actuators.

S.1 **Description of shut-off valves and method of operation for each service**

S.2 **List of shutoff valves**
Tag number, line number, P&ID reference and location

S.3 **Manufacturers data**
Provide information for each type of valve, including fire safe features and closing time specifications**.**

T **Project specifications**

PROVIDE a list of the project specifications that would be used to design, construct and test the facilities prior to initial operation. Specifications should be provided to clarify the proposed design where necessary and should include, but not necessary be limited to those listed below.

T.1 **Civil**
T.2 **Piping material**
T.3 **Valves**
T.4 **Insulation**
T.5 **Electrical**
T.6 **Control system**
T.7 **Safety instrument system**
T.8 **Buildings**

Resource Report 13

Draft Preferred Submittal Format Guidance

PROJECT DRAWINGS

PROVIDE a complete set of the drawings in a separate 11”x17” three ring binder. The drawings must be legible and should be printed in black and white on 11”x17” paper and not folded. The drawings should be preceded by a master index on 8 ½” x 11” paper that lists drawing number, drawing name, revision date and revision number. The drawings should include, but not necessarily be limited to the drawings listed in the guidelines for the preparation of the project manual.