GUIDE FOR

POWER SERVICE FOR MARINE AND OFFSHORE APPLICATIONS
APRIL 2020

American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862

1701 City Plaza Drive
Spring, TX 77389 USA

Foreword *(1 April 2020)*

Power service vessels are power plants installed on marine or offshore vessels (e.g., barges, ships, offshore installations, mobile offshore units, and converted vessels) that offer a quick and economic method of providing power to remote locations. To meet the increasing global demand, this Guide has been developed to provide requirements on design, construction, and survey for class review and approval of Power service vessels. This Guide is for the use of designers, builders, owners, and operators and specifies ABS requirements for obtaining the classification notation **Power Service**.

This Guide is applicable to Power service barges, Power service ships, Power service offshore installations (OI), Power service mobile offshore units (MOU), which includes self-elevating units (SEU) and column-stabilized units (CSU), and other vessels converted for power service. Power service vessels can be equipped with single or multiple gas turbines, reciprocating diesel or gas engines, or boilers for power generation.

In this Guide, the requirements for the power generation and distribution equipment installed on board are associated with an optional notation. Design and installation requirements for power generation and distribution equipment included in this Guide are based on existing industry practices that are deemed to provide an adequate level of safety. The application of this Guide by ABS promotes the use of state of the art technological approaches that can demonstrate an acceptable level of safety.

Power generation and distribution equipment designed, constructed, and installed in accordance with the requirements of this Guide on an ABS classed vessel, barge, offshore installation, or mobile offshore unit, under ABS review and survey, will be classed and identified in the *Record* by the optional notation ✠ **Power Plant**.

This Guide is to be used in conjunction with other Rules published by ABS, applicable recognized codes/standards and international Regulations.

The effective date of the Guide is the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.

GUIDE FOR

POWER SERVICE FOR MARINE AND OFFSHORE APPLICATIONS

CONTENTS

SECTION 1 Scope and Conditions of Classification

1 Classification *(1 April 2020)*

The requirements for conditions of classification are contained in the separate, generic ABS *Rules for Conditions of Classification (Part 1)* and ABS *Rules for Conditions of Classification – Offshore Units and Structures (Part 1)*. Additional requirements specific to power service vessels including power service barges, power service ships, power service offshore installations, powe service mobile offshore units, and other vessels converted for power service are contained within this Guide.

3 Application *(1 April 2020)*

This Guide covers new construction of power service vessels including power service barges, power service ships, power service offshore installations, and power service mobile offshore units as defined in 1/9.

This Guide has been developed for classification requirements specific to design, construction, and survey of power service vessels. The following base ABS Rule sets, as applicable for the vessel's base Class notation, apply in full for design, construction, and survey of the vessel, except as modified herein:

- The ABS *Rules for Building and Classing Steel Barges (Barge Rules)* are to be complied with for power service barges intended for ocean service, as applicable.
- The ABS *Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways (River Rules)* are to be complied with for power service barges intended for river service, as applicable.
- The ABS *Rules for Building and Classing Marine Vessels (Marine Vessel Rules)* are to be complied with for power service ships, as applicable.
- The ABS *Rules for Building and Classing Offshore Installations (Offshore Installations Rules)* are to be complied with for fixed power service offshore installations, as applicable.
- The ABS *Rules for Building and Classing Floating Production Installations (FPI Rules)* are to be complied with for floating power service offshore installations, as applicable.
- The ABS *Rules for Building and Classing Mobile Offshore Units (MOU Rules)* is to be complied with for power service mobile offshore units including self-elevating units (SEU) and column-stabilized units (CSU), as applicable.
- The ABS *Guide for Floating Offshore Liquefied Gas Terminal (FLGT Guide)* is to be complied with for power service floating offshore terminals utilizing stored liquefied gas, as applicable.

This Guide is also applicable for the conversion of existing vessels. Applicable base ABS *Rules* are to be complied with for vessels converted for power service.

This Guide has also been developed to provide requirements for the design, construction, installation, and survey of power generation and distribution equipment on power service vessels.

5 Class Notations

5.1 New Construction *(1 April 2020)*

Vessels complying with the full requirements in Sections 1 to 4 and 6 of this Guide may be classed and distinguished in the *Record* by adding the classification notation **Power Service**. The vessels will maintain their base rule notations such as barge, floating offshore installation, etc. For example, ✠ **A1 Barge, Power Service** for ocean power service barges; ✠ **A1 Barge, River Service, Power Service** for river power service barges.

If the power service vessel utilizes LNG or LPG as a fuel source and is in compliance with 3/5, an optional notation **(LNG)** or **(LPG)** may be added to the notation.

Power generation and distribution equipment, systems, subsystems, and components that have been built, installed, and commissioned to the satisfaction of the Surveyors to the full requirements in Sections 5 and 6 of this Guide, may be classed and distinguished in the ABS *Record* by the optional notation ✠ **Power Plant**.

Note:

The symbol ✠ {Maltese Cross} signifies that the vessel or system in compliance with ABS Rules and verified by ABS survey during construction of the vessel. This includes survey of the machinery at the manufacturer's plant (where required), during installation on board the vessel, and during trials.

Where an existing vessel, not previously classed by ABS, is accepted for class, these class notations are assigned without the ✠ symbol.

5.3 Conversion of Existing Vessels *(1 April 2020)*

When an existing vessel is converted to a power service vessel and it complies with the full requirements in Sections 1 to 4 and 6 of this Guide, it may be distinguished in the *Record* by adding the classification notation **Power Service**. The primary class notation should reflect the base rule set notation for the conversion.

For example, if an existing drillship is converted into a power service vessel, the base rule set, the *MOU Rules*, is to be applied for this conversion and it would be assigned with the notation ✠ **Floating Offshore Installation (Ship-Type) (CI), Power Service**.

7 Submission of Plans *(1 April 2020)*

For the **Power Service** class notation, plans and documents specified in Sections 1 to 4 of this Guide, together with supporting calculations, as appropriate, are to be submitted before proceeding with the work.

For the optional class notation **Power Plant**, the submission of design plans and data is specified in Section 5 of this Guide.

Plans are generally to be submitted electronically to ABS. However, hard copies will also be accepted.

7.1 Materials *(1 April 2020)*

This Guide is intended for power service vessels designed and constructed of steel materials having properties as specified in the ABS *Rules for Materials and Welding (Part 2)*.

The use of steel or other materials that have properties different from those specified in the ABS *Rules for Materials and Welding (Part 2)* and the corresponding scantlings are subject to special consideration.

Where the power plant is fueled by natural gas the materials used in the construction of the liquefied natural gas (LNG) tanks, gas piping, process pressure vessels, and other components in contact with

cryogenic liquids or gases are to be suitable for the intended purpose and in compliance with Section 5C-13-7 of the *Marine Vessel Rules*.

7.3 Stability, Loading and Operating Information *(1 April 2020)*

Details are to be submitted of the ballast, fuel, supplies and hold arrangement and capacities; summary and distribution of fixed and variable weights for each reviewed condition; and information on all loaded and ballasted conditions in which the power service barge, ship, floating offshore installation, or mobile offshore unit may be operated.

In accordance with the requirements contained in 2/3, stability calculations demonstrating that the power service barge, ship, floating offshore installation, or mobile offshore unit meets the stability criteria in all loading and ballast conditions are to be submitted for review.

Information is to be submitted for intended operating location and any specific requirements based on applicable local/national codes and standards for review.

9 Definitions *(1 April 2020)*

Power service Vessel. Power service vessel includes power barge, power ship, power offshore installation, and power mobile offshore unit.

- *Power service Barge.* A non-self-propelled vessel primarily intended to mount the power plant whose generated power is transferred or distributed externally.
- *Power service Ship.* A self-propelled vessel primarily intended to mount the power plant whose generated power is transferred or distributed externally.
- *Power service Offshore Unit.* Power offshore unit includes power offshore installation and power mobile offshore unit.
- *Power service Offshore Installation.* An offshore installation (OI) including floating offshore installation moored or dynamically positioned on location or fixed offshore installation composed of a buoyant or non-buoyant structure supported by or attached to the sea floor, primarily intended to mount the power plant whose generated power is transferred or distributed externally.
- *Power service Mobile Offshore Unit.* A mobile offshore unit, self-elevating unit (SEU) or column-stabilized unit (CSU), primarily intended to mount the power plant whose generated power is transferred or distributed externally.
- *Converted Vessel for Power Service* . An existing vessel converted by installation of a power plant whose generated power is transferred or distributed externally.
- *Power Plant Systems.* Industrial equipment provided onboard for generation and distribution of external power to shore or other vessels.
- *Hazardous Area.* An area where flammable or explosive gases, vapors, or dust are normally present or likely to be present.

11 Operating Manual *(1 April 2020)*

An operating manual, consistent with the information and criteria upon which classification is based, is to be placed on board the power service vessel for the guidance of the operating personnel. Insofar as classification is concerned, the operating manual is to include, as appropriate, the following information:

i) A general description of the vessel, including major dimensions and lightship characteristics

ii) Summaries of approved operation conditions for offshore power service vessels including:

- Limiting environmental conditions (e.g., wave height and period, wind velocity, current velocity, service temperature of the vessel)

- Design deck loadings, mooring loads, icing loads, variable load, cranes, and types of helicopters for which the helideck is designed
- Disposition (open or closed) of watertight and weathertight closures
- Identification of "Restricted Service" or "Limited Service" conditions

iii) Vessel Information:

- General arrangement drawings
- Watertight and weathertight boundaries, location of unprotected openings, and watertight and weathertight closures
- Type, location, and quantities of permanent ballast
- Allowable deck loadings
- Capacity, centers of gravity, and free surface correction for each tank
- Hydrostatic curves or equivalent

iv) Guidance for the maintenance of adequate stability and the use of the stability data

v) Guidance for the routine recording of lightweight alterations

vi) Guidance for the recommended sequence of emergency shut-downs, where applicable

vii) Examples of loading conditions for each mode of operation and instructions for developing other acceptable loading conditions, including the vertical components of the forces in the anchor cables

viii) Power Plant:

- Details on power plant electrical connections to shore and to marine systems, as applicable
- Guidance on power plant monitoring and associated safety systems
- Guidance on startup, normal, and emergency operating procedures
- Guidance on maintenance requirements
- Guidance on periodic testing and maintenance requirements

The Operating Manual is to be in the language or languages required by the Flag State. If the language is not English, a translation into English is to be included and submitted to ABS.

The Operating Manual is to be submitted for review by ABS solely to verify the presence of the above information, which is to be consistent with the design information and limitations considered in the classification of the power vessel. ABS is not responsible for the operation of the vessel.

The Operating Manual required by this Subsection does not need to be in addition to that required by flag and coastal Administrations. The administration may require that additional information be included in the Operating Manual.

13 Alternative Arrangements and Novel Designs *(1 April 2020)*

13.1 Alternative Arrangements

ABS will consider alternative arrangements and designs that can be demonstrated, through either satisfactory service experience or a systematic analysis based on sound engineering principles, to meet the overall safety, serviceability, and design standards of this Guide.

13.3 Administration Requirements and National Standards *(1 April 2020)*

Requirements additional to those given in this Guide may be imposed by the flag Administration with whom the vessel is registered or by the Administration within whose territorial jurisdiction the vessel is intended to operate.

Approval of structural fire protection, fire extinguishing equipment, and/or stability of the vessel by the vessel's flag Administration, in accordance with requirements equivalent to those by class, may be considered as complying with the class requirements provided such approval can be satisfactorily documented.

Additionally, for power generation and distribution systems and equipment:

i) ABS will consider special arrangements or designs of equipment, components, systems, or subsystems that can be shown to comply with codes/standards recognized in the country, provided the proposed codes/standards are no less effective.

ii) When alternate standards are proposed, comparative analyses are to be provided to demonstrate an equivalent level of safety to this Guide.

13.5 Novel Designs *(1 April 2020)*

Power service service vessels with power generation & distribution systems and equipment that contain novel designs to which the provisions of this Guide are not directly applicable may be classed, when approved by ABS, on the basis that the requirements in this Guide, insofar as applicable, have been complied with and that special consideration has been given to the novel design, based on the best information available at that time. Refer to the ABS *Guidance Notes on Review and Approval of Novel Concepts*.

15 References *(1 April 2020)*

Additional requirements from the following Rules, Guides, and Guidance Notes are referenced in this Guide:

- ABS *Rules for Building and Classing Marine Vessels (Marine Vessel Rules)*
- ABS *Rules for Building and Classing Steel Barges (Barge Rules)*
- ABS *Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways (River Rules)*
- ABS *Rules for Building and Classing Mobile Offshore Units (MOU Rules)*
- ABS *Rules for Facilities on Offshore Installations (Facilities Rules)*
- ABS *Rules for Building and Classing Floating Production Installation (FPI Rules)*
- ABS *Rules for Building and Classing Offshore Installations (Offshore Installations Rules)*
- ABS *Rules for Survey After Construction (Part 7)*
- ABS *Guide for Building and Classing Accommodation Barges (Accommodation Barge Guide)*
- ABS *Guide for Floating Offshore Liquefied Gas Terminal (FLGT Guide)*
- ABS *Guide for High Voltage Shore Connections*
- ABS *Guidance Notes on Review and Approval of Novel Concepts*

The additional requirements of the following codes and standards are referenced in this Guide:

- MODU Code: IMO *Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code)*
- FSS Code: International Code for Fire Safety Systems (FSS Code)

- SOLAS: International Convention for the Safety of Life at Sea, 1974, as amended
- NFPA Codes/Standards: National Fire Protection Association Codes/Standards

SECTION 2 Hull Construction and Equipment

1 General *(1 April 2020)*

The ABS Rule set, as applicable for the vessel's base Class notation, applies in full for hull construction and equipment except as modified herein.

In general, for power service barges designed for ocean or river services with power generation operation at a specific site, structural design requirements are to comply with the applicable requirements in Part 3 of the *Barge Rules* or Part 3 of the *River Rules*. For special design requirements to take account of the site specific environmental conditions, detailed structural analyses are to be submitted for ABS review and approval.

For power service offshore installations, hull design requirements are subjected to special review and approval. The applicable requirements in Part 3 of the *Offshore Installations Rules* are to be complied with for fixed service power offshore installations. The applicable requirements in Part 5A or 5B of the *FPI Rules* are to be complied with for floating power service offshore installations.

For power service mobile offshore units, including self-elevating units (SEU) and column-stabilized units (CSU), hull design requirements are subject to special review and approval. The requirements in Part 3, Chapter 2 of the *MOU Rules* are to be complied with, as applicable.

Hull interface structures are to comply with the applicable requirements of the appropriate base rule set. Where heavy power plant equipment is installed on the deck, details of hull interface scantlings are to be submitted for review and calculations are to be submitted to demonstrate the adequacy of the interface structure. Reference may be made to Section 5A-1-4 of the *FPI Rules*, as applicable.

3 Stability *(1 April 2020)*

For all applications, stability is to meet the base Rule set and be acceptable by the flag Administration of the vessel/coastal state or local regulatory body. In the case of a pier/jetty or bottom founded unit, the stability should be considered in accordance with 1/13, "Alternative Arrangements and Novel Designs".

The stability analysis demonstrating that the power service barge / power service unit meets the stability criteria is to be submitted for ABS review and approval.

5 Mooring Systems *(1 April 2020)*

The purpose of the position mooring system in this Guide is to keep the power service vessel on station at a specific site.

The system includes mooring lines, anchors, mooring accessories, mooring equipment, and thrusters, where applicable.

For floating power service vessels, the mooring system design is to comply with the applicable requirements associated with the power service vessel's primary class notation (e.g., Barge, Floating Offshore Installation, Column-Stabilized Unit). For a ✠ **A1 Barge, Power Service**, the mooring system is outside the scope of class. The designer is to submit a statement that the mooring system is adequate for the intended installation site. For those that are moored to a jetty, or similar bottom supported structure, the jetty structure is the responsibility of the Owner, including compliance with coastal state requirements.

For floating power service under short-term operations at one site, the requirements of the mooring system in Part 3, Chapter 4 of the *MOU Rules* are to be complied with, as applicable.

7 Bottom Founded Power Service Vessels *(1 April 2020)*

For a power service vessel intended to rest on the seabed, the effect of the foundation is to be considered in the structural analysis including uneven loading, sliding, etc. The effect of scouring and possible loss of bottom support is also to be considered as follows: for a broad mat type support, 20% of the bottom bearing area is to be considered unsupported.

SECTION 3 Machinery, Piping and Electrical Systems

1 General *(1 April 2020)*

This Section is applicable to machinery, piping, and electrical systems utilized to support power service vessel operations, excluding the power plant systems which is covered in Section 5 of this Guide. The ABS Rule set, as applicable for the vessel's base Class notation, applies in full for machinery, piping, and electrical systems, except as modified herein.

For ship type power service installations, the applicable requirements in the *Marine Vessel Rules* are to be complied with. For power service offshore installations other than ship type, the applicable requirements in the *MOU Rules* are to be complied with.

Plans showing the general arrangement of all machinery spaces are to be submitted for review and approval.

3 Hazardous Areas *(1 April 2020)*

Power service vessels may have hazardous areas due to permanent or temporary equipment onboard required for marine operations which utilizing gas or other low flash point fuels. The area where such equipment will be installed is to be considered as a hazardous area, and electrical equipment, ventilation, and access to adjacent spaces in this area are to comply with the applicable requirements in Part 5C, Chapter 13 of the *Marine Vessel Rules*.

Where power vessels are using gas or other low flash point fuels for power generation, the hazardous areas due to permanent or temporary equipment onboard for such operation are to be determined based on acceptable recognized codes / standards or as per applicable requirements in Part 5C, Chapter 13 of the *Marine Vessel Rules*.

For power service offshore installations, 4-8-4/27 of the *Marine Vessel Rules* is to be complied with.

5 LNG or LPG as Fuel *(1 April 2020)*

Where natural gas or petroleum gas is used as a fuel source for power vessels and the optional **Power Plant** notation is requested, the classification of the arrangements, machinery, equipment, and containment systems, etc. are to meet the requirements and safety principles of Part 5C, Chapter 13 of the *Marine Vessel Rules*, as applicable.

If the optional ✠ **Power Plant** notation is not requested, the entire power generation system need not comply with the requirements of Part 5C, Chapter 13 of the *Marine Vessel Rules*. However, the arrangements, systems and equipment are to meet the safety requirements of recognized codes or standards, or are to meet the safety principles of the following Sections of the *Marine Vessel Rules*:

- Goal and Functional Requirements: 5C-13-3/2
- Risk Assessment: 5C-13-4/2
- Limitation of Explosion Consequences: 5C-13-4/3
- Machinery Space Concepts: 5C-13-5/4, 5 or 6
- Fuel Containment System: 5C-13-6, or equivalent
- Fuel Supply to Consumers: 5C-13-9/4, 6 or 7, 8

- Fire Safety: 5C-13-11
- Explosion Prevention: 5C-13-12
- Ventilation: 5C-13-13
- Electrical Installations: 5C-13-14
- Control, Monitoring and Safety Systems: 5C-13-15

For non-propelled vessels such as barges, redundancy requirements need not be considered. In addition, for vessels that do not store or handle LNG or LPG onboard, 5C-13-4/2 and 5C-13-6 of *Marine Vessel Rules* need not be considered.

For unmanned barges, only the minimum fire safety requirements in Section 4 of this Guide are to be applied in lieu of 5C-13-11 of *Marine Vessel Rules*.

7 Marine Systems Powered by the Power Plant *(1 April 2020)*

When marine systems are powered via a power plant, the following additional conditions are to be met:

i) The electrical distribution arrangements for the marine systems are to be clearly indicated.

ii) Where the main source of electrical power is necessary for the support systems of power generation plant, the system is to be so arranged that, in the event of the loss of any one of the generators or transformers in service, the electrical supply to equipment necessary for support systems are maintained or restored.

iii) A self-contained emergency source of electrical power is to be provided, as required by the base Rule set (e.g., *Marine Vessel Rules*, *MOU Rules*, *Barge Rules*, etc.), so that in the event of a failure of the main source of electrical power, the emergency source of power will become available to supply power to services that are essential for safety in an emergency. Shore power supply may be considered as an emergency source of power if the loss of the power plant will not disrupt the shore power supply and supply is automatically connected within 45 seconds upon failure of power plant.

iv) Instrumentation is to be provided at the marine system switchboard showing energized status of the connected power plant switchboard. Means are to be provided for checking the polarity (for DC) or the phase sequence (for three-phase AC) of the power plant supply in relation to the marine system.

9 Marine System Powered by Shore Power Supply *(1 April 2020)*

When the marine systems of a power service vessel are powered via shore power supply and the vessel is not fitted with an auxiliary power generation machinery, the following additional conditions are to be met:

i) The vessel is to be provided a standby source of power in case of loss of shore power.

ii) The standby source is to be capable to take the load automatically within 45 seconds upon loss of shore power.

iii) The standby source is to be capable to run services that are essential for safety and provide necessary lighting, ventilation and other services to allow movement of service personnel from and to the barge for a period of at least 6 hours.

SECTION 4 Safety Systems

1 General *(1 April 2020)*

Power service vessels are to meet the requirements of the applicable base ABS Rule set, except as modified by this Section, with regard to fire and safety measures and features as well as lifesaving appliances and equipment.

3 Manned and Unmanned Barges *(1 April 2020)*

Manning is established by the flag Administration. For manned power service barges without accommodation, the flag Administration requirements with respect to safety (e.g., fire protection and protection of personnel onboard) are to be complied with.

For unmanned power service barges, safety systems are to be evaluated based on the operational profile of the barge. Where a review of all or part of the requirements covered in this Section has been conducted by the flag Administration found acceptable, the same will be acceptable to ABS. The designer or builder is to submit evidence that the flag Administration has reviewed the arrangements and that the details are acceptable to that flag Administration.

5 Safety Requirements for Power Service Barges Permanently Moored Alongside Jetty/Pier *(1 April 2020)*

In addition to the requirements of the base Rule set, each power service barge is to comply with the following:

5.1 Structural Fire protection *(1 April 2020)*

For all applications, structural fire protection is to meet the base ABS Rule set.

5.2 Firefighting Systems *(1 April 2020)*

i) Power generation machinery spaces housing the generators, turbines or boilers are to be appropriately protected by fixed firefighting systems per international standards (e.g. FSS Code, applicable NFPA Codes/Standards etc.).This is to be to the satisfaction of the flag Administration. The designer or builder is to submit evidence that the flag Administration has reviewed the arrangements and that the details are acceptable to that flag Administration. Alternatively, ABS certification of the system to the standard is required.

ii) In addition to the above fixed firefighting systems, power service barges are to be provided with hand portable fire extinguishers and semiportable fire extinguishing systems in accordance with the requirements of the 3-5-2/Table 2 of the *Rules for Building and Classing Steel Barges*.

5.3 Lifesaving Appliances *(1 April 2020)*

i) For power service operations, the requirements of flag Administration are to be complied with. These power service barges are to maintain at least two access/exit gangways during operations to facilitate personnel escape in the event of an emergency situation on the barge.

7 Emergency Shutdowns *(1 April 2020)*

For power generation machinery/equipment, means are to be provided with an emergency shutdown system. Means of control system to be situated outside the space in which the machinery/equipment are located so that they may be stopped in the event of fire or emergency.

SECTION 5 Power Generation and Distribution Systems and Equipment

1 General *(1 April 2020)*

This Section applies to installations seeking the optional classification for the design, construction, installation, and survey of power generation and distribution equipment for exporting power to external loads. Vessels whose systems and components meet the full requirements of this Section may receive the optional notation **Power Plant**.

The scope of this Section includes power generation and distribution systems and equipment installed on board power service vessels. Power plant systems may be used to provide power to vessel marine services and the arrangement is to be in accordance with 3/7.

3 Submissions of Design Plans and Data

The following Subsections describe the minimum design plans and data submission requirements for associated power generation and distribution systems, subsystems, equipment and/or components. Additional details may be required for submittal.

i) The submitted design plans and data are to be in accordance with the requirements of this Guide.

ii) The design plans and data as specified in this Guide are to be generally submitted electronically to ABS. However, hard copies will also be accepted.

iii) All plan submissions originating from designers or manufacturers are understood to be made with the knowledge of the primary contracting party.

iv) All plan submissions originating from manufacturers are understood to be made with the cognizance of the primary contracting party. A fee may be charged for the review of plans that are not covered by the contract for Classification.

3.1 Electrical Systems and Components

The following plans and data are to be submitted for review:

i) *One Line Diagram* - One line diagram of main and emergency power distribution systems to show:

- *Generators:* kW rating, voltage, rated current, frequency, number of phases and power factor
- *Motors:* kW or hp rating, voltage and current rating
- *Motor controllers:* type (direct-on-line, star-delta, etc.), disconnect devices, overload and undervoltage protections and remote stops, as applicable
- *Transformers:* kVA rating, rated voltage and current, winding connection
- *Circuits:* designations, type and size of cables, trip setting and rating of circuit protective devices, rated load of each branch circuit, emergency tripping and preferential tripping features
- *Batteries:* type, voltage, rated capacity, conductor protection and charging and discharging boards

ii) *Schematic Diagrams* – Schematic diagrams for the following systems are to be submitted. Each circuit in the diagrams is to indicate type and size of cable, trip setting and rating of circuit protective device, and rated capacity of the connected load.

- Interior communications
- General emergency alarm
- Intrinsically safe systems
- Fire detection and alarm system (if independent from vessel marine systems)

iii) Short Circuit Data submittals as documented in 4-8-1/5.1.3 of the *Marine Vessel Rules*

iv) Protective Device Coordination Study submittals as documented in 4-8-1/5.1.4 of the *Marine Vessel Rules*

v) High Voltage Systems submittals as documented in 4-8-1/5.1.7 of the *Marine Vessel Rules*. High voltage in this Guide refers to voltages above 1000 V. For voltages exceeding 15 kV, special consideration will be given.

vi) Installation plans submitted as documented in 4-8-1/5.3 of the *Marine Vessel Rules*

vii) Electrical Equipment submittals as documented in 4-8-1/5.5 of the *Marine Vessel Rules*

3.3 Piping Systems

The following plans are to be submitted for review as referenced in 4-6-1/9 of the *Marine Vessel Rules*, as applicable:

- Power plant machinery space arrangement, including locations of fuel oil tanks
- Booklet of standard details (see 4-6-1/9.5 of the *Marine Vessel Rules*)
- Compressed air system
- Cooling water systems
- Exhaust piping (for boilers, incinerators, and engines)
- Fuel oil systems, including storage tanks, drip trays, and drains
- Hydraulic and pneumatic systems
- Lubricating oil systems
- Sea water systems
- Vent, overflow, and sounding arrangements
- Steam systems
- Steam piping analyses, as applicable
- Tank venting and overflow systems

3.5 Internal-Combustion Engines and Turbines *(1 April 2020)*

Technical submissions for internal-combustion engines are to include, but are not limited to, the requirements of 4-2-1/1.9 of the *Marine Vessel Rules*.

Technical submissions for gas turbines are to include, but are not limited to, the requirements of 4-2-3/1.5 of the *Marine Vessel Rules*.

Technical submissions for steam turbines are to include, but are not limited to, the requirements of 4-2-4/1.5 of the *Marine Vessel Rules*.

Alternatively, technical submissions based on the requirements of applicable industry standards may be acceptable after ABS review and approval.

3.7 General Equipment Details

Plans and data for equipment and components are to provide the following, as applicable:

i) Model and size

ii) Design specifications, including design codes, standards, and references

iii) Design parameters: loads, temperature, environmental conditions, etc.

iv) Design analysis and/or calculations, as applicable

v) Dimensional details and drawings

vi) Fabrication details and welding configurations

vii) Material specifications and material properties

5 Design Requirements

5.1 General Arrangement and Equipment Layout Drawings

General arrangement and layout drawings are to denote:

i) The layout of the power generation machinery with essential auxiliaries, specifications of main equipment with information on manufacturer's name, type, rating, and number of the equipment

ii) General arrangement of the switchboards and distribution boards

5.3 Certification and Classification Requirements

In general, power generation and distribution machinery and electrical systems are to be in built and constructed in accordance with ABS Rules or recognized industry standards. ABS design review verifies that the design of systems, subsystems, equipment, and/or components meets the requirements of this Guide.

5.5 Loss of Export Load *(1 April 2020)*

Power generating installations are to be arranged and provided with necessary equipment so that in the event of a disconnection of all transmission lines and total loss of external load the system can be removed from service without damage. Additionally, the entire plant is to be arranged to be able to be returned to service without external assistance to the power service vessel.

5.7 High Voltage Shore Power Connection

Vessels equipped with a high voltage shore connection designed to power the vessel with the shore power alone, enabling the shipboard generators to be shut down while in port, are to comply with the requirements given in the ABS *Guide for High Voltage Shore Connection*.

5.9 Protection from Shore Distribution Faults *(1 April 2020)*

If the power service vessel provides power to shore, which may also augment other shore power generation sources as a parallel power source, the connection from the power service vessel to the shore distribution system is to be protected from shore power faults, frequency, and voltage variations in accordance with the applicable recognized codes/standards in the country where it is providing power.

5.11 Environmental Suitability

Design of system and components for power plant applications are to be suitable for the inclination and vibration requirements of the host vessel or unit.

SECTION 6 Surveys

1 General *(1 April 2020)*

The requirements of 6/3 and 6/5 are provided for surveys during and after construction for power service vessel classification of **Power Service**. The requirements of 6/7 are provided for surveys during and after construction for the optional ✠ **Power Plant** notation.

3 Testing, Trials and Surveys during Construction

The ABS Rule set, as applicable for the vessel's base Class notation, applies in full for testing, trials, and surveys during construction, except as modified herein.

3.1 Hull Trials and Testing *(1 April 2020)*

For power service offshore installations, the requirements in Sections 5-5-2 and 5-2-3 of the *Offshore Installations Rules* are to be complied with for fixed power offshore installations. The requirements in 7-2-1/7, 7-2-2/3, 7-2-2/7, 7-2-2/13, 7-2-4/3, 7-2-4/5, 7-2-4/7 and 7-2-4/9 as applicable of the *FPI Rules* are to be complied with for floating power offshore installations.

3.3 Machinery Trials and Testing *(1 April 2020)*

For power service vessels, the machinery systems are to be tested in accordance with the appropriate sections of the applicable Rules and Guides specified in 3/1 of this Guide.

5 Surveys after Construction *(1 April 2020)*

The ABS Rule set, as applicable for the vessels' base Class notation, applies in full for surveys after construction, except as modified herein.

The requirements in 7-2-1/7, 7-2-2/3, 7-2-2//7, 7-2-2/13, 7-2-4/3, 7-2-4/5, 7-2-4/7 and 7-2-4/9 as applicable of the *FPI Rules* are to be complied with for Survey after Construction for floating power offshore installations and offshore installations.

The requirements in 7-2-1/7, 7-2-2/3, 7-2-2//7, 7-2-2/13, 7-2-4/3, 7-2-4/5, 7-2-4/7 and 7-2-4/9 as applicable of the *FPI Rules* are to be complied with for Drydocking Surveys or Equivalent, for a floating power service vessel intended to be stationary at a specific site for long-term operations (i.e., five years or longer) including UWILD, cathodic protection, mooring system, etc.

7 Surveys for Optional Power Plant Notation *(1 April 2020)*

Where a power service vessel is assigned the optional notation ✠ **Power Plant**, the survey requirements in 6/7.1 and 6/7.3 of this Guide are to be complied with. Annual Surveys Machinery are to be carried out in accordance with 7-6-2/1 of the ABS *Rules for Survey after Construction (Part 7)* as applicable. Special Surveys Machinery are to be carried out in accordance with 7-6-2/3 of the ABS *Rules for Survey after Construction (Part 7*) as applicable.

7.1 Surveys during Construction and Commissioning *(1 April 2020)*

This Subsection provides requirements for initial surveys during manufacturing, installation, and start-up (commissioning) of power generation and distribution systems installed on barges, or offshore installations, or mobile offshore units.

During construction, ABS Surveyors are to be provided access to manufacturers' or fabricators' facilities to witness construction and/or testing as required by Part 4 *of the Marine Vessel Rules* , and the applicable design codes and/or standards.

The manufacturer/fabricator is to contact the ABS Surveyor to make necessary arrangements to examine systems, subsystem, equipment, and/or components.

The purpose of the initial onboard survey of equipment is to verify that the installation is in compliance with the ABS approved plans, with particular emphasis on examination of the following, as applicable:

i) Location of equipment in relation to any hazardous areas

ii) Equipment orientation on the vessel or unit, equipment structural arrangements, supporting foundations, securing details, and protective coating

iii) Visual and/or NDT examination of assembled and installed equipment, attachment on board, including underdeck support

iv) Hook-up and integrity of equipment piping, electrical, machinery, and ventilation system, including watertight penetrations and integration with associated ship systems

v) Piping system visual examination, NDT, and pressure test per applicable Rules or codes

vi) Testing of pressure relief and safety valves for hydraulic/pneumatic systems on board

vii) Visual examination of electrical equipment, wiring connections, cable routing, earthing, cable penetrations, and distribution panels to include testing of electrical systems and insulation tests

viii) Lighting systems examination and test

ix) Ventilation systems examination, ducting arrangements, and penetrations, damper arrangements, operational tests

x) Control systems, safety devices, and shutdowns to be tested to the satisfaction of the attending Surveyor

xi) Fire/Safety measures such as fire control plan, EEBDs, lifesaving appliances, as applicable, crew protection, general alarm/pa, fire detection, portable extinguishers, escape arrangements, main and emergency lighting, and any required emergency shutdowns

xii) Compliance with any special requirements from the flag Administration, local codes, or regulations

xiii) Commissioning of communication equipment related to power plant operation

xiv) All power plant systems and equipment to be checked for proper operation

7.3 Surveys after Construction *(1 April 2020)*

Surveys after construction of power generation and distribution systems installed on power service vessels are mandatory for maintenance of the **Power Plant** notation.

Surveys after construction are to be in accordance with the applicable requirements based on the notation assigned to the vessel and Section 7-6-2 of the ABS *Rules for Survey after Construction (Part 7)*.

7.3.1 Annual Surveys *(1 April 2020)*

In addition to the surveys referenced in the ABS *Rules for Survey after Construction (Part 7)*, the following are to be carried out in the presence of an ABS Surveyor on an annual basis, as applicable:

i) Examination of structure and hull connection weld points

ii) Satisfactory operational test of all emergency stops, controls, and remote controls

iii) Review of calibration record, operations manual and logbooks, and insulation resistance log

iv) Examination and testing of fire/safety alarms, detectors, and ventilator dampers

v) Testing of all means of communication

vi) Examination of all piping systems

vii) Functional tests of equipment integrated or associated with vessel's systems

viii) Examination and testing of electrical systems and related equipment

ix) Satisfactory operational test of all vessel equipment alarms

x) Compliance with any special requirements from the flag Administration, local codes, or regulations

If the ABS Surveyor recommends repairs or additional surveys based on his/her observations/findings, notice will be given to the Owner or their representative so that appropriate action may be taken.

7.3.2 Special Survey (Every 5 Years) *(1 April 2020)*

In addition to the applicable requirements noted in 6/7.3.1 above and 7-6-2/3 of the ABS *Rules for Survey after Construction (Part 7)* as applicable for Annual Surveys, the following is to be carried out in the presence of an ABS Surveyor :

i) Examination of structure and hull connection weld points, supplemented by NDT of the connection welds

ii) Examination of power plant equipment wiring, wireways, junction boxes, and electrical panels for damage, corrosion, or loose connections

iii) Examination and testing of insulation resistance of motors and cables related to power systems and equipment

iv) Calibration of essential safety alarms, detectors, and equipment

v) Satisfactory operational test of all emergency stops, controls, and remote controls

vi) Satisfactory operational test of all equipment alarms