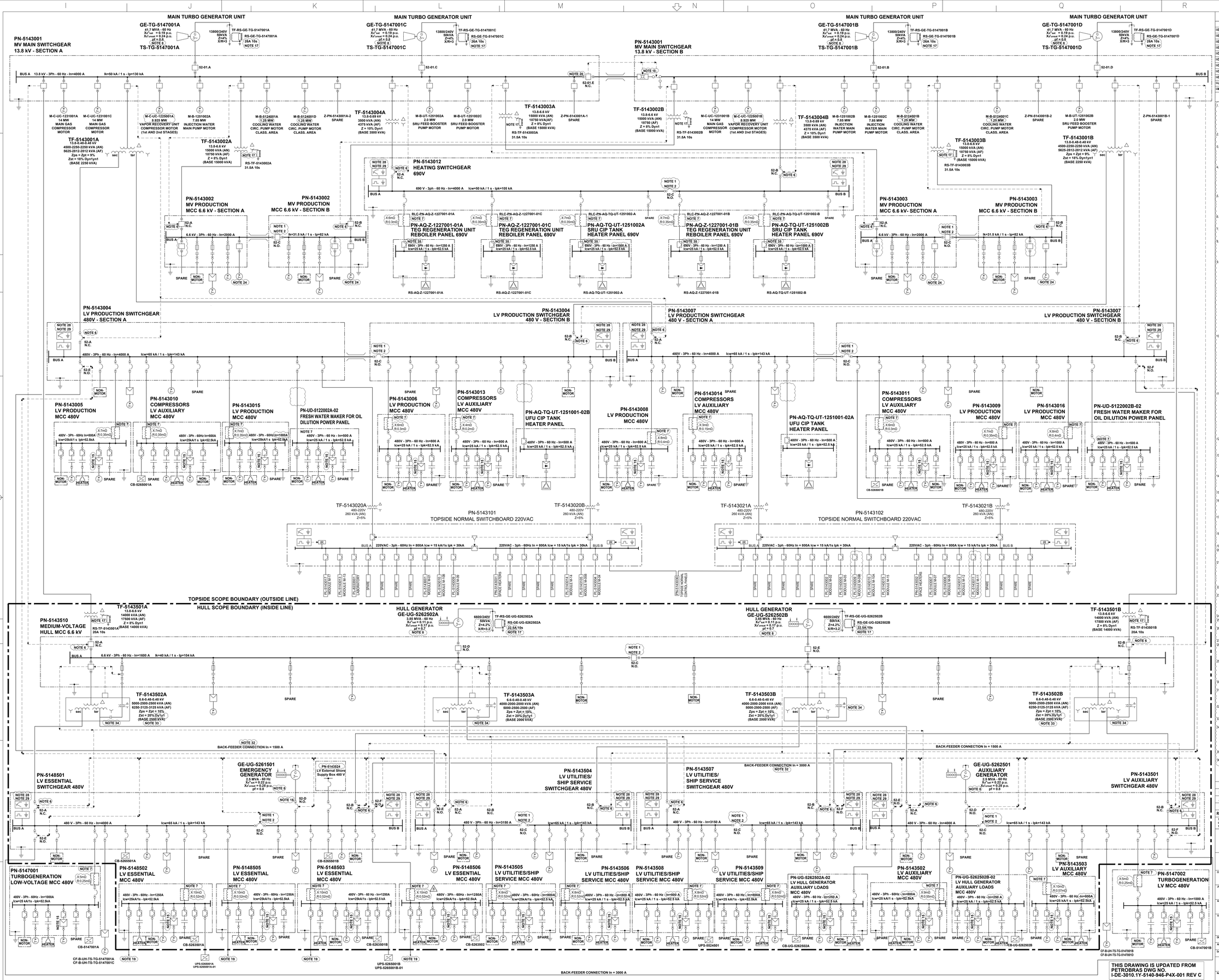

REFERENCE DOCUMENTS

DRAWING NO.	DRAWING TITLE
I-ET-3000.00-0000-940-PAX-002	SYMBOLS FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-5140-700-PAX-001	SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-PAX-002	SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS
I-ET-3010.00-5140-741-PAX-001	POWER PANEL FOR THYRISTORIZED HEATER FOR OFFSHORE UNITS
I-DE-3010.11-5140-946-PAX-002	TOPSIDES 220V SYSTEMS ONE-LINE DIAGRAM
I-DE-3010.11-5140-946-PAX-003	HULL 220V SYSTEMS ONE-LINE DIAGRAM
I-DE-3010.11-5285-946-PAX-001	TOPSIDE UPS AND DC SYSTEMS ONE-LINE DIAGRAM
I-DE-3010.11-5285-946-PAX-002	HULL UPS AND DC SYSTEMS ONE-LINE DIAGRAM
I-ET-3010.00-5143-700-PAX-001	ELECTRICAL SYSTEM PROTECTION CRITERIA
I-LI-3010.2J-5140-797-KES-001	ELECTRICAL SYSTEM AUTOMATION INTERFACE SIGNALS LIST
I-MC-3010.2J-5147-700-KES-001	ELECTRICAL SYSTEM LOAD BALANCE

GENERAL NOTES

1. PARALLEL OPERATION BETWEEN ANY SECONDARY AND/OR ANY TERTIARY WINDINGS OF TRANSFORMERS SHALL BE PERMITTED ONLY FOR MOMENTARY LOAD TRANSFERENCE FOR WINDINGS WITH SAME CONNECTION GROUP WHEN THE SYNCHRONIZATION BETWEEN BUSBARS IS GUARANTEED. THERE SHALL BE INTERLOCKS TO AVOID CONTINUOUS PARALLEL OPERATION BETWEEN SECONDARY / SECONDARY, SECONDARY / TERTIARY AND TERTIARY / TERTIARY WINDINGS OF TRANSFORMERS. THERE SHALL BE INTERLOCKS TO AVOID CONTINUOUS PARALLEL OPERATION IN CONDITIONS WHEN SHORT-CIRCUIT WITHSTAND CURRENTS OF PANELS ARE SURPASSED.
2. IN NORMAL OPERATION, THE INTERLOCK SHALL PERMIT THAT ONLY 2 (TWO) OF 3 (THREE) INCOMING AND TIE CIRCUIT-BREAKERS (52-A, 52-B AND 52-C) BE SIMULTANEOUSLY CLOSED, EXCEPT IN MOMENTARY PARALLEL OPERATION OF TRANSFORMERS OR FEEDERS, DURING LOAD TRANSFERENCE.
3. CONTINUOUS PARALLEL OPERATION BETWEEN AUXILIARY GENERATOR AND MAIN OR HULL GENERATION, THROUGH 1 (ONE) SECONDARY OR 1 (ONE) TERTIARY WINDING OF TRANSFORMERS TF-5143002A/B SHALL BE PERMITTED WHEN SYNCHRONIZATION BETWEEN THEM IS GUARANTEED (RELAY FUNCTION 25). IN THIS SITUATION, IT SHALL NOT BE PERMITTED ANY KIND (CONTINUOUS OR TEMPORARY) PARALLEL OPERATION WITH ANOTHER TRANSFORMER WINDING.
4. CONTINUOUS PARALLEL OPERATION BETWEEN EMERGENCY GENERATOR AND MAIN OR HULL GENERATION, THROUGH 1 (ONE) SECONDARY OR 1 (ONE) TERTIARY WINDING OF TRANSFORMERS TF-5143002A OR TF-5143002B SHALL BE PERMITTED WHEN SYNCHRONIZATION BETWEEN THEM IS GUARANTEED (RELAY FUNCTION 25) AND ACCORDING TO CLASSIFICATION SOCIETY RULES. IN THIS SITUATION, IT SHALL NOT BE PERMITTED ANY KIND (CONTINUOUS OR TEMPORARY) PARALLEL OPERATION WITH ANOTHER TRANSFORMER WINDING. THE DURATION OF THIS PARALLEL OPERATION SHALL BE CONTROLLED AND LIMITED BY OPERATOR.
5. PARALLEL OPERATION BETWEEN AUXILIARY (GE-UG-5262501) AND EMERGENCY (GE-UG-5261501) GENERATORS SHALL BE PERMITTED ONLY FOR MOMENTARY LOAD TRANSFERENCE AND WHEN THE SYNCHRONIZATION BETWEEN THEM IS GUARANTEED (RELAY FUNCTION 25). IN THIS SITUATION, IT SHALL BE NOT PERMITTED SIMULTANEOUS PARALLEL OPERATION WITH MAIN OR HULL GENERATION, THROUGH SECONDARY OR TERTIARY WINDINGS OF TF-5143002A/B.
6. THE SECONDARY AND TERTIARY CIRCUIT-BREAKERS OF THE MAIN TRANSFORMERS SHALL OPEN WHEN PRIMARY CIRCUIT-BREAKERS OPEND. THE SECONDARY AND TERTIARY CIRCUIT-BREAKERS CAN BE CLOSED ONLY AFTER THE PRIMARY CIRCUIT-BREAKER HAS BEEN CLOSED.
7. THE SIZING CRITERION FOR LIMITING REACTORS SHALL BE 25KA SYMMETRICAL / 52.5KA PEAK IN ORDER TO LIMIT THE THERMAL EQUIVALENT SHORT-CIRCUIT CURRENT OF LOWER THAN 18KA DURING 1S IN THE DOWNSTREAM PANELS/MCCS (REFER TO ITEM 8 OF TOP-PI60-KES-BE-TOP-ELE-0006).
8. TOLERANCES FOR MAIN GENERATORS ARE AS FOR BELOW:
   Xd'= -15 to +7.9% Xd''= 14.4 to +15%
9. NO NEGATIVE TOLERANCE FOR SATURATED SUB-TRANSIENT REACTANCE SHALL BE CONSIDERED FOR HULL AUXILIARY AND EMERGENCY GENERATORS. NO POSITIVE TOLERANCE FOR UNSATURATED TRANSIENT REACTANCE SHALL BE CONSIDERED FOR HULL AUXILIARY AND EMERGENCY GENERATORS.
9. OPERATION OF PN-5148501 IN "I" CONFIGURATION WITH TIE CIRCUIT-BREAKER 52-C OPENED (SEE NOTE 1) SHALL BE ACCORDINGLY:
   CONDITION 1: CIRCUIT-BREAKERS 52-A AND 52-B CLOSED (52-D OPENED): 52-E AND 52-F OPENED OR CLOSED OR
   CONDITION 2: CIRCUIT-BREAKERS 52-A AND 52-F CLOSED (52-B AND 52-D OPENED): 52-E OPENED OR CLOSED) OR
   CONDITION 3: CIRCUIT-BREAKERS 52-B AND 52-E CLOSED (52-A AND 52-D OPENED): 52-F OPENED OR CLOSED) OR
   CONDITION 4: CIRCUIT-BREAKERS 52-E AND 52-F CLOSED (52-A, 52-B AND 52-D OPENED)
   - IF AN UNDERVOLTAGE OCCURS ONLY IN BUSBAR B, PN-5148501 SHALL SEND A SIGNAL TO START GE-UG-5261501, TO TRIP CIRCUIT-BREAKER 52-B AND 52-F AND, IF NO SHORT-CIRCUIT IS DETECTED IN THIS BUSBAR BY ARC FAULT MONITORING DEVICE, ECCP SHALL CLOSE CIRCUIT-BREAKER 52-D AFTER GENERATOR STARTING.
10. OPERATION OF PN-5148501 IN "L" CONFIGURATION WITH TIE 52-C CLOSED (SEE NOTE 1) SHALL BE ACCORDINGLY:
   CONDITION 1: FED FROM TF-5143502A BY 52-A CLOSED (52-B AND 52-D OPENED): 52-E AND 52-F OPENED OR CLOSED) OR
   CONDITION 2: FED FROM BUSBAR B OF PN-5143501 BY CIRCUIT-BREAKER 52-E CLOSED (52-A, 52-B AND 52-D OPENED): 52-F OPENED OR CLOSED)
   - IF AN UNDERVOLTAGE OCCURS IN BUSBAR B, PN-5148501 SHALL SEND A SIGNAL TO START GE-UG-5261501 AND TO TRIP CIRCUIT-BREAKERS 52-B, 52-C AND 52-F. IF NO SHORT-CIRCUIT IS DETECTED IN THIS BUSBAR BY ARC FAULT MONITORING DEVICE, THE EMERGENCY GENERATOR POWER AND CONTROL PANEL (EGCP) SHALL CLOSE CIRCUIT-BREAKER 52-D AFTER GENERATOR STARTING.
   - IF AN UNDERVOLTAGE OCCURS IN BUSBARS A AND B, PN-5148501 SHALL SEND SIGNALS TO START GE-UG-5261501 AND TO TRIP CIRCUIT-BREAKERS 52-A, 52-B, 52-E AND 52-F. CIRCUIT-BREAKER 52-C SHALL BE KEPT CLOSED. IF NO SHORT-CIRCUIT IS DETECTED IN THESE BUSBARS BY ARC FAULT MONITORING DEVICE, EGCP SHALL CLOSE CIRCUIT-BREAKER 52-D AFTER GENERATOR STARTING, RESTORING VOLTAGE.
11. OPERATION OF PN-5148501 IN "J" CONFIGURATION WITH THE CIRCUIT-BREAKER 52-C CLOSED (SEE NOTE 1) AND BEING FED THROUGH A BUSBAR B SHALL BE ACCORDINGLY:
   CONDITION 1: CIRCUIT-BREAKER D-E CLOSED (52-A AND 52-D OPENED): 52-E AND 52-F OPENED OR CLOSED) OR
   CONDITION 2: CIRCUIT-BREAKER 52-F CLOSED (52-A, 52-B AND 52-D OPENED): 52-E OPENED OR CLOSED)
   - IF AN UNDERVOLTAGE OCCURS ONLY IN BUSBAR A AND NO SHORT-CIRCUIT IS DETECTED IN THIS BUSBAR BY ARC FAULT MONITORING DEVICE, THE EMERGENCY GENERATOR POWER AND CONTROL PANEL (EGCP) SHALL CLOSE CIRCUIT-BREAKER 52-D AFTER GENERATOR STARTING.
   - IF AN UNDERVOLTAGE OCCURS IN BUSBARS A AND B, PN-5148501 SHALL SEND SIGNALS TO START GE-UG-5261501, TO TRIP CIRCUIT-BREAKERS 52-A, 52-B, 52-E AND 52-F. CIRCUIT-BREAKER 52-C SHALL BE KEPT CLOSED. IF NO SHORT-CIRCUIT IS DETECTED IN THESE BUSBARS BY ARC FAULT MONITORING DEVICE, EGCP SHALL CLOSE CIRCUIT-BREAKER 52-D AFTER GENERATOR STARTING, RESTORING VOLTAGE.
12. INTERLOCKING FUNCTIONS EQUAL TO THOSE DESCRIBED FOR EMERGENCY GENERATOR (GE-UG-5261501) AND PN-5148501 SHALL BE IMPLEMENTED FOR AUXILIARY GENERATOR (GE-UG-5262501) AND PN-5143501. ALTHOUGH IN THIS CASE, THE CIRCUIT BREAKER D (GE-UG-5262501) MUST ALWAYS BE CLOSED MANUALLY BY OPERATOR.
13. N.C. MEANS "NORMALLY CLOSED" AND N.O. MEANS "NORMALLY OPEN".
   THE INDICATION OF N.C. AND N.O. FOR CIRCUIT-BREAKERS IS THE PREFERENTIAL NORMAL OPERATIONAL CONDITION CONSIDERING AVAILABILITY OF ELECTRICAL SYSTEM. OPERATOR MAY CHOOSE OTHER DISTRIBUTION CONFIGURATION ACCORDING TO SPECIFIC OR CONTINGENCY CONDITIONS.
14. MV SWITCHGEARS, MV MCC AND LV SWITCHGEARS SHALL HAVE ARC MONITORING DEVICES INSTALLED IN BUSBARS COMPARTMENTS, IN OUTGOING CABLES COMPARTMENTS AND IN COMPARTMENTS WITH COUPLING PARTS OF SWITCHING DEVICES. THE ACTUATION OF ARC MONITORING DEVICES SHALL BE CONFIRMED BY CURRENT SENSORS.
15. FOR LOW VOLTAGE MCCs, SOFT-STARTERS OR VSDs MAY BE INSTALLED INSIDE OR OUTSIDE THE LOW-VOLTAGE PANELS.
16. EMERGENCY GENERATOR CIRCUIT-BREAKER SHALL NOT HAVE INSTANTANEOUS OVERCURRENT TRIP DEVICE. WHEN THE GENERATOR DEMAND REACHES 85% OF GENERATOR RATED CAPACITY, ONE ALARM SIGNAL SHALL BE SENT TO AAC. WHEN THE GENERATOR DEMAND REACHES 90% OF GENERATOR RATED CAPACITY, TRIP SIGNAL SHALL BE SENT TO BACK-FEEDERS CIRCUIT-BREAKERS OF PN-5143501.
17. GROUNDING SYSTEM OF 13.8 kV SYSTEM SHALL BE BY HIGH RESISTANCE AT MAIN GENERATORS' NEUTRALS. GROUNDING SYSTEM OF 6.6 kV SYSTEMS SHALL BE BY HIGH RESISTANCE AT SECONDARY TRANSFORMERS' NEUTRALS AND HULL GENERATORS' NEUTRALS. FOR GENERATORS THE GROUNDING RESISTOR SHALL BE CONNECTED AT THE SECONDARY OF A GROUNDING TRANSFORMER.
18. IS LIMITER SHALL ACTUATE FOR THE OPERATIONAL CONDITIONS WITH THREE OR FOUR MAIN GENERATORS IN PARALLEL AND SHALL BE BLOCKED WHEN THE TIE BREAKER OF THE 13.8KV SWITCHGEAR IS OPENED OR WHEN THE SYSTEM IS OPERATING WITH ONLY ONE OR TWO MAIN GENERATORS.
19. ONE FEEDER FOR EACH LOAD. THE KIND OF FUNCTIONAL UNIT DEPENDS ON THE KIND OF LOAD.
20. WHEN THE SWITCH IS AT BUSBAR POSITION AND STARTS TO MOVE TO THE GROUNDED POSITION, THE TIE CIRCUIT-BREAKER (52-D1 E) SHALL OPEN BEFORE THE OPENING OF THE CONTACTS OF THE SWITCH. IT SHALL NOT BE POSSIBLE TO CLOSE THE TIE CIRCUIT-BREAKER (52-D1 E) WITH THE SWITCH AT GROUNDED POSITION.
21. INCOMING, TIE AND BACK-FEEDERS CIRCUIT-BREAKERS IN PN-5148501 AND PN-5143501 SHALL HAVE SYNCHRONIZATION CHECK RELAYS (FUNCTION 25) IN ORDER TO AVOID CLOSING OUT OF SYNCHRONISM. INCOMING AND TIE CIRCUIT-BREAKERS IN PN-5143510 SHALL HAVE SYNCHRONIZATION CHECK RELAY (FUNCTION 25) IN ORDER TO ALLOW PARALLELISM BETWEEN MAIN AND HULL GENERATORS. OTHER CIRCUIT BREAKERS WILL HAVE THE RELAY FUNCTION 25, FOR MORE DETAILS SEE I-ET-3010.00-5143-700-PAX-001 - ELECTRICAL SYSTEM PROTECTION CRITERIA.
22. THE CLASSIFICATION OF ELECTRICAL LOADS ACCORDING TO THE KIND OF POWER SUPPLY (NORMAL OR ESSENTIAL) IS DEFINED IN I-MC-3010.2J-5147-700-KES-001 - ELECTRICAL SYSTEM LOAD BALANCE.
23. THE DISTRIBUTION OF 220 VAC AND THE DC SYSTEMS WHICH ARE NOT CONNECTED DIRECTLY FROM CDC ARE NOT INCLUDED IN THIS DOCUMENT. REFER TO I-DE-3010.11-5140-946-PAX-002 - TOPSIDE 220V SYSTEMS ONE-LINE DIAGRAM, I-DE-3010.11-5285-946-PAX-001 - TOPSIDE UPS AND DC SYSTEMS ONE-LINE DIAGRAM, I-DE-3010.11-5140-946-PAX-003 - HULL 220V SYSTEMS ONE-LINE DIAGRAM, I-DE-3010.11-5285-946-PAX-003 - HULL UPS AND DC SYSTEMS ONE-LINE DIAGRAM AND I-DE-3010.11-5140-946-PAX-003 - HULL 220V SYSTEMS ONE-LINE DIAGRAM.
24. OUTGOINGS TO SEA WATER LIFT PUMP MOTORS SHALL BE OUTFITTED WITH CIRCUIT BREAKERS.
25. WHEN AUXILIARY GENERATOR DEMAND REACHES 85% OF GENERATOR RATED CAPACITY, AN ALARM SIGNAL SHALL BE SENT TO AAC.
26. HULL GENERATORS CAN ALSO BE USED TO OPERATE WITH LOW POWER DEMAND AND DURING COMMISSIONING. IT IS ALSO ALLOWED TO OPERATE THEM IN CONTINUOUS PARALLELISM WITH THE MAIN GENERATION THROUGH TRANSFORMERS TF-5143501A/B.
27. THE TOLERANCES USED FOR TRANSFORMERS IMPEDANCES SHALL BE IN ACCORDANCE WITH IEC 60076-1.
28. ALL LOADS FED FROM LV SWITCHGEARS SHALL HAVE EARTH FAULT INDICATOR (EFI) CONNECTED TO AN INSULATION MONITORING DEVICE. THE EFI SHALL TRIP CIRCUIT BREAKERS OF LOADS LOCATED IN OR WHICH FEEDERS CROSS ZONE 1 HAZARDOUS AREA. INSULATION MONITORING DEVICES SHALL BE SUITABLY INSTALLED TO MONITOR WITH THE BUSBARS CONNECTED IN ALL POSSIBLE CONFIGURATIONS.
29. FOR PANELS WITH POSSIBILITY TO OPERATE IN "L" CONFIGURATION WITH THE INTERCONNECTION CIRCUIT-BREAKERS CLOSED, AND FOR SWITCHGEARS WITH POSSIBILITY TO OPERATION CONNECTED THROUGH BACK-FEEDERERS, IT SHALL BE PROVIDED A LOGIC TO DISABLE ONE OF THE INSULATION MONITORING DEVICES IN THIS CONDITION. IT SHALL BE ALSO PROVIDED A LOGIC TO ENABLE BOTH INSULATION MONITORING DEVICES DURING THE RETURN OF "I" CONFIGURATION.
30. NOT ALL LOADS ARE INDICATED IN THIS DRAWING. ALL LOADS OF EACH PANEL ARE DEFINED IN I-MC-3010.2J-5147-700-KES-001 - ELECTRICAL SYSTEM LOAD BALANCE.
31. EARTH FAULT INDICATORS (EFI) IN ALL LOW-VOLTAGE MCCs SHALL BE COMPATIBLE WITH INSULATION MONITORING DEVICES (IMD) OF RESPECTIVE UPSTREAM SWITCHGEARS. IT INCLUDES MCCs SUPPLIED IN PACKAGES AND MCCs SUPPLIED IN SEPARATE CONTRACTS. IF ANY (E.G. TOPSIDES MCCs CONNECTED TO HULL SWITCHGEARS, IN CASE OF SEPARATE CONTRACTS FOR HULL AND TOPSIDE).
32. BACK-FEEDERS ARE EXCLUSIVE TO SUPPLY POWER FROM HULL GENERATORS TO TOPSIDE PANELS WHEN MAIN GENERATION IS OUT. POWER FLOW FROM TOPSIDE TO HULL (SIGNAL) THESE BACK-FEEDERS ARE NOT ALLOWED.
33. NO NEGATIVE TOLERANCE FOR SHORT-CIRCUIT IMPEDANCES SHALL BE CONSIDERED FOR TRANSFORMERS TF-5143502A/B.
34. PRE-MAGNETIZATION SYSTEM SHALL BE FORESEEN IN ORDER TO REDUCE THE POWER TRANSFORMER INRUSH CURRENT DURING ENERGIZATION AND SHALL BE SCOPE OF THE POWER TRANSFORMER MANUFACTURER. THE PRE-MAGNETIZATION DEVICE SHALL BE DESIGNED BY MEANS OF AN AUXILIARY TRANSFORMER, INSTALLED, PREFERABLY, INTERNALLY TO THE MAIN POWER TRANSFORMER ENCLOSURE. THE PRE-MAGNETIZATION CONTROL PANEL AND THE LOW-VOLTAGE CONTACTORS (SWITCHING DEVICES) SHALL BE EXTERNALLY INSTALLED AS PART OF THE POWER TRANSFORMER ENCLOSURE.
35. MOULDED CASE CIRCUIT-BREAKERS MAY BE EXCLUDED, IF THE THYRISTORIZED POWER PANEL IS FED FROM PANEL INSTALLED IN THE SAME ROOM.
36. VENTILATION PANELS ARE REQUIRED FOR FORCED AIR COOL OF TRANSFORMERS (AF).

ALL CLOUDED AREA WILL BE THE PART OF REVISION B CHANGES

REV.	DESCRIPTION	DATE	EXEC.	CHECK	APPROV.
B	APPROVED FOR CONSTRUCTION	11/JUN/2024	SY/DK	HY/AA	RJK
A	ISSUED FOR CONSTRUCTION	21/JUL/2023	SY/DK	HY/AA	RJK
0	ISSUED FOR DESIGN	21/NOV/2022	SY/YWH	HY/AA	SAK

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KEPPEL SHIPYARD

KELLOGG BROWN & ROOT ASIA PACIFIC PTE LTD

PETROBRAS SCP-80

CLIENT: E & P

JOB: BUZIOS FIELD AREA DEVELOPMENT

AREA: PETROBRAS 80 (P-80)

TITLE: KEY ONE-LINE DIAGRAM

DESIGN	KES	EXEC.	SY/YWH	CHECK	HY/AA
APPROV.	SAK	DOC TYPE	DRAWING		-
DATE	21/NOV/2022	SCALE	NOT TO SCALE	SHEET	1 OF 1

(1) SRGE

No. I-DE-3010.2J-5140-946-KES-001

THIS DRAWING IS UPDATED FROM PETROBRAS DWG NO. I-DE-3010.1Y-5140-946-P4X-001 REV C

A0 1189mm X 841mm