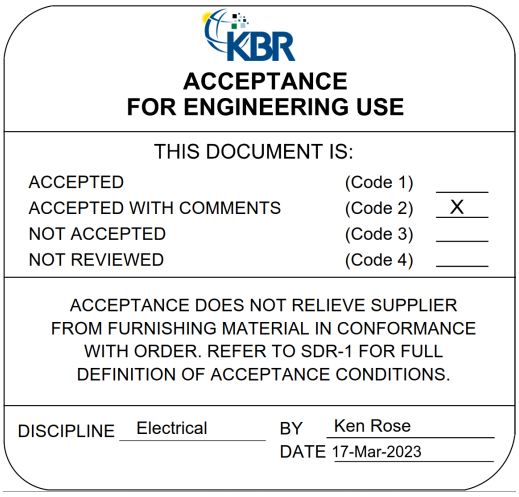
Battery Energy Storage System (BESS)
BASE LOAD POWER HUB

Statron ref. 331497

Project Code: K559-2254
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SDRL Code: C06
Sequence Number: 001
Document number: K559-2254-CWIWP4202201-C06-001
Document description: Electrical Single Line Diagrams



Revision	Date	Name	Description
001	20.02.2023	CPA / ADI	First Version

Electrical Single Line Diagrams
C06

for Base Load Power Hub (BLPH) Project

Classification: confidential

Document no.	C06
Document name	Electrical Single Line Diagrams
Component / System	BESS
Project code	K559-2254

Version	Date	Name	Description
1.0	2023-20-02	C. Palenzuela	First version

Table 1: Version overview

	Date	Name
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Checked by	2023-28-02	D. Grochotzky
Approved by	2023-28-02	A. Fritz

Table 2: Approval overview

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Identification

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Original document

This document is an original document of FREQCON GmbH.

1 Introduction

1.1 About this Document

This document is part of project phase “Detailed Design Engineering” for the Base Load Power Hub (BLPH) Project (K559-2254). In case of any contradiction resulting by the information or specification given in this document, phase 2 or later documents supersede the information provided in this document.

1.2 Display Elements

Symbol	Meaning
➜	Action with one or several steps for which the sequence is irrelevant.
Step 1 : **Step 2 :**	Action with several steps for which the sequence is relevant.
•	First level of list.
-	Second level of list.

Table 1: Display Elements

1.3 Other Applicable Documents

The following documents are applicable:

Document type	Document Name
Single Line Diagram – FREQCON BESS and PCS	10354_23A2007_CAE_Statron_Shell Crosswind BESS FQ 1MW 5MWh Offshore_20230302_V0.01_eng

Table 2: Other applicable documents

1.4 Generic Terms and Abbreviations Used

This following list should help you understand some of the abbreviations used in this document.

Generic Term and Abbreviation	Description
BESS	Battery Energy Storage System
BLPH	Base Load Power Hub
PCS	Power Conversion System

Table 3: Generic terms and abbreviations used

2 General

The electrical single line diagram of the proposed BESS and PCS system is attached to this document (*see section 1.3 "Other Applicable Documents"*).

3 Appendix

1. FREQCON Single Line Diagram:
   10354_23A2007_CAE_Statron_Shell Crosswind BESS FQ 1MW 5MWh Offshore_20230302_V0.01_eng.pdf

KBR comments

1. Please provide Legend of Symbols

2. Please add all ratings of switchboards e.g. What are the Isc fault levels (kA) on the BUS on each switchboard

3. For control, Statron to send request to CCS (open,close, trip) 6.6kV system - CCS will provide these functions Please refer to BLPH "Electrical Protection Philosophy" (K559-2254-EL-PHI-001) and ensure that all inter-trips, interlocks and inhibits are fully understood and included in Ballard design Also refer BLPH "Typical Electrical Protection & Metering SLD" (K559-2254-EL-DTL-001-003).

4. Also refer BLPH "Typical Electrical Protection & Metering SLD" (K559-2254-EL-DTL-001-001).

5. Can personnel safely enter the room whilst system is in operation

6. Bottom of SLD says "next page 2a" - is there a second page?

7. The Aux. Power is not shown along with the other associated loads of the BESS system - eg Control system, ventilation system, HVAC, cooling, pumps, heaters etc.

Single line diagram

=UNIT_01++CONV

+AC_DC | +CIR | +IND | +CON | +IND | +CIR | +AC_DC

medium voltage transformer
-18T1
1MVA
6,6kV/0,62 kV AC

Gehäuse Erdung

-78W1 - 78W3
GRID L1 -L3

3WL1112-2BB36-1B22-Z
A08+K07+M06+M21+R10

-80Q1
max.
1250 A

-83U1
Filter Caps 3*600µF
Overvoltage protect

PT100
201L1 - 203L1
Inductor
1*1000A
0,2mH

PIII 1_1
-
PIII_1_3
201Q1 - 203Q1
1000A Stack x 3

PIII 1_4
-
PIII_1_6
-204Q1
3X250A Stack

PT100
-204L1
0,6mH
3*250A

-224U1

PIII 2_1
-
PIII_2_3
-211Q1
3X250A Stack

PT100
-211L1
0,6mH
3*250A

-231U1

PIII 2_4
-
PIII_2_6
-214Q1
3X250A Stack

PT100
-214L1
0,6mH
3*250A

-234U1

=UNIT_02++
BAT 1-3
BAT 4+5
BAT 6-8
BAT 9-11
LFP Battery Modul

=UNIT_03++
BAT 1-3
LFP Battery Modul

78W4:N
78W5:PE

UDC_LINK_+
UDC_LINK_N
UDC_LINK_-

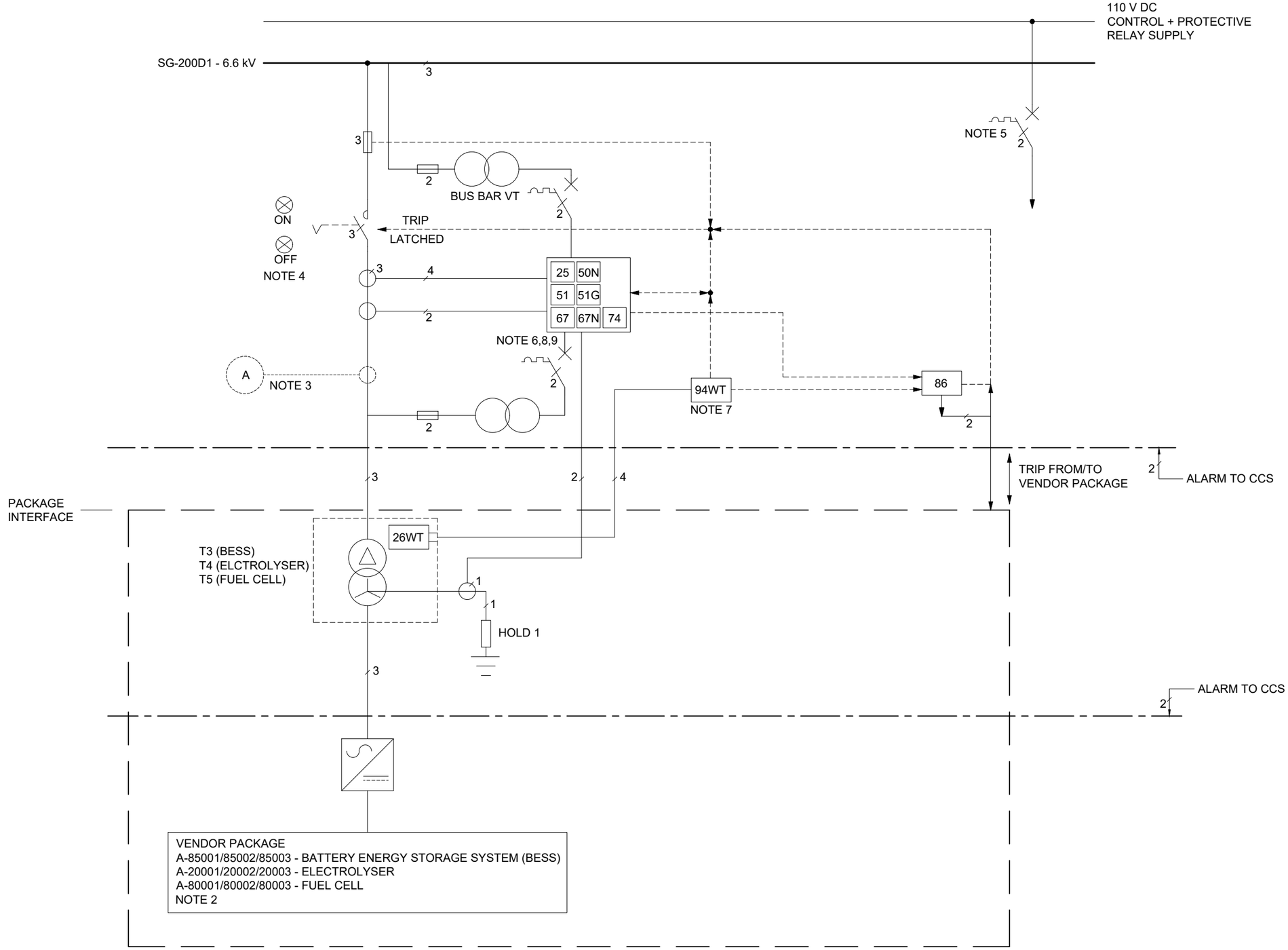
KBR comments

1. Please provide Legend of Symbols
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7. The Aux. Power is not shown along with the other associated loads of the BESS system - eg Control system, ventilation system, HVAC, cooling, pumps, heaters etc.

previous page: &EAC/6a

next page: 2a

Editor	Freqcon_DG			Statron	FREQCON	SYSTEMS OVERVIEW	ANL1_20230302_V0.01	= UNIT_01 Converter Container 1
Date	03.03.2023	Norm						& EFA Single line diagram
Proved by				Shell Crosswind BESS FQ 1MW 5MWh Offshore			10354_23A2007	++ page: 1a
Date								+ total: 257



LEGEND:

►	=	DIRECTION OF SIGNAL
------	=	CONTROL CABLE (INSIDE THE PANEL)
25	=	CHECK SYNCHRONISATION
26WT	=	WINDING TEMPERATURE INDICATOR
50N	=	INSTANTANEOUS EARTH FAULT RELAY (CORE BALANCE)
51	=	TIME DEPENDENT (IDMT) OVERCURRENT RELAY
51G	=	TIME DEPENDENT STANDBY EARTH FAULT RELAY
74	=	TRIP CIRCUIT SUPERVISION
86	=	INTER TRIP/ LOCKOUT RELAY
94WT	=	WINDING TEMPERATURE ALARM AND TRIP RELAY

NOTES:

1. THIS ELECTRICAL PROTECTION AND METERING SINGLE LINE DIAGRAM SHALL BE READ IN CONJUNCTION WITH ELECTRICAL PROTECTION PHILOSOPHY K559-2254-EL-PHI-001.
2. ELECTRICAL PROTECTION REQUIREMENTS ARE TYPICAL FOR THE FEEDER CIRCUIT TO THE BATTERY ENERGY STORAGE SYSTEM (BESS), THE FUEL CELL AND ELECTROLYSER. VENDOR PACKAGE ELECTRICAL PROTECTION REQUIREMENTS TO BE DETERMINED BY THE EQUIPMENT SUPPLIER.
3. IF NUMERICAL RELAYS ARE USED, AMMETER MAY BE OMITTED UNLESS REQUIRED FOR OPERATIONAL REASONS.
4. POSITION INDICATION REQUIRED. USUALLY AS PER MANUFACTURER'S STANDARD.
5. MCBS SHALL HAVE FACILITY TO LOCK IN OPEN POSITION.
6. FOR CCS SYSTEM, RELAY NEEDS TO INTERFACE WITH AN ETHERNET SWITCH (IEC 61850).
7. '94WT' REPRESENTS AXILLARY ALARM AND TRIP RELAY.
8. CHECK SYNCHRONISATION TO BE INCLUDED FOR BESS AND FUEL CELL FEEDERS (NOT REQUIRED FOR ELECTROLYSER) TO VERIFY THE VOLTAGE, PHASE ANGLE AND FREQUENCY ARE WITHIN ACCEPTABLE LIMITS PRIOR TO CLOSING THE SWITCHING DEVICE. THE CHECK SYNCHRONISATION SHALL INCLUDE THE FACILITY FOR DEAD BUS CLOSING.
9. DIRECTIONAL OVERCURRENT (67) AND EARTH FAULT (67N) PROTECTION APPLICABLE TO TRANSFORMER FEEDERS T3 TO THE BESS AND T5 TO THE FUEL CELL.

HOLDS:

1. NEUTRAL EARTHING RESISTOR REQUIRED WHERE OPERATING VOLTAGE IS>1KV. (DC PACKAGE BUS VOLTAGE TBC BY VENDORS).

REV.	DATE	DESCRIPTION	ORG	CHK	APP
0	10/02/2023	ISSUED FOR CLIENT REVIEW (ICR)	RM/GD	SA	KCE

DocuSigned by: Steve Aylesworth DS CE9EDB42F83E463...

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TYPICAL ELECTRICAL PROTECTION AND METERING SINGLE LINE DIAGRAM

6.6 kV LATCHED CONTACTOR FEEDER TO BATTERY ENERGY STORAGE SYSTEM

(BESS), ELECTROLYSER AND FUEL CELL

SCALE		DWG NO.:	SHEET	REV.
FORMAT	A3	K559-2254-EL-DTL-001-001	1 OF 5	0