Base Load Power Hub (BLPH)

Process Safety Cause & Effect Matrix

Document Number: 123A90-DDL-IN-CE-40000

Document Class: 1

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		00	01	02	03	04	05	06	
1	Cover	X	X	X	X	X	X	X	
2	Table of Contents	X	X	X	X	X	X	X	
3	Revision / Change Log	X	X	X	X	X	X	X	
4	Notes	X	X	X	X	X	X	X	
5	ASD: ABANDON	X	X	X	X	X	X	X	
6	ESD-1D: EMERGENCY SHUT DOWN WITH DEPRESSURIZATION	X	X	X	X	X	X	X	
7	ESD-1: EMERGENCY SHUT DOWN WITHOUT DEPRESSURIZATION	X	X	X	X	X	X	X	
8	PSD: PROCESS SHUT DOWN	X	X	X	X	X	X	X	
9	MOB PUSH BUTTONS		X	X	X	X	X	X	

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Revision / Change Log

Rev.	Description
00	ISSUE FOR ACCEPTANCE (IFA)
01	ACCEPTED FOR CONSTRUCTION (AFC)
02	ACCEPTED FOR CONSTRUCTION (AFC)
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04	ACCEPTED FOR CONSTRUCTION (AFC)
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06	ACCEPTED FOR CONSTRUCTION (AFC)

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NOTES

1. Delay times are:

T1= 1439 min 55 sec
T2= 5 sec.
T3= 30 sec.
T4= 15 sec. (T4<T3)
T5= 24 hours (T1+ T2)

2. Abbreviation

CCR = CENTRAL CONTROL ROOM (ONSHORE)
OER = ONSHORE EQUIPMENT ROOM
ITER=INSTRUMENT & TELECOM EQUIPMENT ROOM
R = RESET
EL = EVENT LOG
F = FLASHING LIGHT INDICATION ON CAP
T = TIME DELAY
ASD=ABANDON
ESD=EMERGENCY SHUTDOWN
MOB= MAN OVERBORD
FGS=FIRE & GAS SYSTEM
HMI=HUMAN MACHINE INTERFACE
SIS=SAFETY INSTRUMENTED SYSTEM
PKG=PACKGE
UPS=Uninterruptible Power Supply
P&ID=Piping and Instrument Diagram
HVAC=Heating, Ventilation and Air Condition.
BLPH=Base Load Power Hub
ITER=Instrument & Telecoms Equipment Room

3. Digital Input/Output on SIS System TAGs legend:

Digital Output from SIS	Digital Input to Fire & Gas System
79-XS-001 (ASD activation)	79-XA-001 (ASD activation)
79-XS-002 (ESD-1D activation)	79-XA-002 (ESD-1D activation)
79-XS-003 (ESD-1 activation)	79-XA-003 (ESD-1 activation)
79-XS-004 (MOB activation)	79-XA-004 (MOB activation)
79-XS-005 (Loss on-shore communication)	

4. Digital Input/Output on SIS System TAGs legend:

Digital Output from FGS	Digital Input to SIS
70-XS-001 (ASD activation)	70-XA-001 (ASD activation)
70-XS-002 (ESD-1D activation)	70-XA-002 (ESD-1D activation)
70-XS-003 (S/D Electrolyzer)	70-XA-003 (S/D Electrolyzer)
70-XS-004 (Inhibit battery Charging B-300)	70-XA-004 (Inhibit battery Charging B-300)
70-XS-005 (H2 Open Area)	70-XA-005 (H2 Open Area)
70-XS-006 (H2/SMOKE B-100)	70-XA-006 (H2/SMOKE B-100)
70-XS-007 (H2/SMOKE B-200)	70-XA-007 (H2/SMOKE B-200)
70-XS-008 (Inhibit battery Charging B-100)	70-XA-008 (Inhibit battery Charging B-100)
70-XS-010 (H2/Smoke in water Treat.)	70-XA-010 (H2/Smoke in water Treat.)
70-XS-015 (H2/Smoke intake B-100)	70-XA-015 (H2/Smoke intake B-100)
70-XS-016 (H2/Smoke intake B-200)	70-XA-016 (H2/Smoke intake B-200)
70-XS-017 (H2/Smoke intake B-300)	70-XA-017 (H2/Smoke intake B-300)
70-XS-018 (H2/Smoke intake B-400)	70-XA-018 (H2/Smoke intake B-400)

5. Internal wiring isolation between SIS and Network cabinets.

79-XS-010 (ELECT. ISOLATION SOFT. CABLES COMMUNICATION CAT 6A)	CAT 6a Cables isolation

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CAUSE AND EFFECT CHARTS

ASD

EFFECT

Col.	Group	To sheet	P&ID	Description	ESD Level	Action	Tag No.
1	ALARM / INTERFACE			OPERATOR WORKSTATION DISPLAY - EVENT/ALARM			
2	ALARM / INTERFACE						
3	ALARM / INTERFACE			ALARM ON CAP ONSHORE			
4	ALARM / INTERFACE						
5	ALARM / INTERFACE	6		ESD-1D ACTIVATION			
6	ALARM / INTERFACE						
7	ALARM / INTERFACE	NOTE 4		ASD ACTIVATION TO FGS SYSTEM			79-XS-001
8	BATTERIES DISCONNECTED						
9	BATTERIES DISCONNECTED			DISCONNECT AC UPS UP-200F3 BATTERIES A/B (B-300 CONTAINER)		ISOLATE	84-XS-007A/B
10	BATTERIES DISCONNECTED						
11	BATTERIES DISCONNECTED			DISCONNECT AC UPS UP-200F4 BATTERIES A/B (B-300 CONTAINER)		ISOLATE	84-XS-008A/B
12	BATTERIES DISCONNECTED						
13	BATTERIES DISCONNECTED			DISCONNECT DC UPS (B-100 CONTAINER)		ISOLATE	84-XS-006
14	BATTERIES DISCONNECTED						
15	PROCESS/POWER PACKAGES		80011	SHUTDOWN ELECTROLYZER PACKAGE A-20000			20-XS-001
16	PROCESS/POWER PACKAGES						
17	PROCESS/POWER PACKAGES			SHUTDOWN BESS PACKAGE A-85000			85-XS-001
18	PROCESS/POWER PACKAGES						
19	PROCESS/POWER PACKAGES			SHUTDOWN SOLAR FARM PACKAGE (NOTE 1)			83-XS-001
20	PROCESS/POWER PACKAGES						
21	PROCESS/POWER PACKAGES		80012	SHUTDOWN FUEL CELL PACKAGE A-80000			80-XS-001
22	PROCESS/POWER PACKAGES						
23	PROCESS/POWER PACKAGES		80022/23/2	SHUTDOWN WATER TREATMENT PACKAGE A-50000			50-XS-001
24	PROCESS/POWER PACKAGES						
25	PROCESS/POWER PACKAGES		80027	SHUTDOWN INSTRUMENT AIR PACKAGE A-63000			63-XS-001
26	PROCESS/POWER PACKAGES						
27	PROCESS/POWER PACKAGES		80027	SHUTDOWN NITROGEN PACKAGE A-64000			64-XS-001
28	INCOMING CIRCUIT BREAKERS POWER GENERATION						
29	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS			82-XS-002
30	INCOMING CIRCUIT BREAKERS POWER GENERATION						
31	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS			82-XS-003
32	INCOMING CIRCUIT BREAKERS POWER GENERATION						
33	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN SOLAR INCOMING CIRCUIT BREAKERS			82-XS-001
34	INCOMING CIRCUIT BREAKERS POWER GENERATION						
35	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN WIND FARM INCOMING CIRCUIT BREAKERS			81-XS-001
36	HVAC SYSTEM						
37	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-100 (HV CONTAINER)			77-XS-001
38	HVAC SYSTEM						
39	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-200 (LV CONTAINER)			77-XS-002
40	HVAC SYSTEM						
41	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-300 (UPS CONTAINER)			77-XS-003
42	HVAC SYSTEM						
43	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-400 (ITER CONTAINER)			77-XS-004
44	ELECTRICAL ISOLATION UPS POWERS						
45	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (WATER TREAT. A-50000)			84-XS-001
46	ELECTRICAL ISOLATION UPS POWERS						
47	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (INSTRUMENT AIR A-63000)			84-XS-003
48	ELECTRICAL ISOLATION UPS POWERS						
49	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (NITROGEN A-64000)			84-XS-002
50	ELECTRICAL ISOLATION UPS POWERS						
51	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP HVAC B-100			84-XS-004
52	ELECTRICAL ISOLATION UPS POWERS						
53	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP HVAC B-200			84-XS-005
54	ELECTRICAL ISOLATION UPS POWERS						
55	ELECTRICAL ISOLATION UPS POWERS						
56	ELECTRICAL ISOLATION UPS POWERS						
57	ELECTRICAL ISOLATION UPS POWERS						
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CAUSE

ESD Level	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO.	NOTE		1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53
							1																											
ASD	ASD ACTIVATION FROM FGS SYSTEM	70-XA-001				4	2			X		T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
							3																											
ASD	FZ-01 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-01101		X		3	4	X	F	X	X	T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
							5																											
ASD	FZ-03 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-03101		X		3	6	X	F	X	X	T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
							7																											
ASD	FZ-04 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-04101		X		3	8	X	F	X	X	T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
							9																											
ASD	FZ-06 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-06101		X		3	10	X	F	X	X	T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
							11																											
ASD	FZ-07 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-07101		X		3	12	X	F	X	X	T3	T3	T4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Rows 13–55: empty.

NOTES

1. SERIAL SIGNALS THROUGH FIBER OPTIC CABLE.
2. T4= 15 sec. (PROPOSED delay time).
3. THE FLASHING ALARM ON CAP ONSHORE IS A CUMULATIVE OF ALL ASD PUSH BUTTONS ACTIVATION.
4. FGS AND SIS SYSTEM EXCHANGE DATA BETWEEN THEM BY USING THE Vnet/IP NETWORK. THIS IS IMPLEMENTED AS REDUNDANT SAFETY COMMUNICATION, APPROVED FOR SIL 3 LOOP.

HOLDS

Reference

Document Title	Document Number
Fire & Gas Cause & Effect Matrix	123A90-DDL-IN-CE-40002
Process Safety Cause and Effect Block Diagram	123A90-DDL-PR-DG-80000

LEGEND

CCR	CENTRAL CONTROL ROOM (ONSHORE)
OER	ONSHORE EQUIPMENT ROOM
ITER	INSTRUMENT & TELECOM EQUIPMENT ROOM
R	RESET
EL	EVENT LOG
F	FLASHING LIGHT INDICATION ON CAP
T	TIME DELAY

Rev.	Date	Description	Issued by	Checked by	Approved by
00	24/11/2023	Issue for Acceptance (IFA)	LCA	MGA	DLO
01	08/03/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
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Process Safety Cause & Effect Matrix

ASD: ABANDON

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Contract No. CW-I-WP4-2023-05

CAUSE AND EFFECT CHARTS

ESD-1D

CAUSE / EFFECT

ESD Level	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO.	NOTE	
							1
ASD	ESD-1D ACTIVATION IN CASCADE FROM ASD						2
							3
ESD-1D	LOW LOW PRESSURE ON NITROGEN MANIFOLD	64-PT-002	LO_LO	X	80027		4
							5
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001A	25-PT-004	HI_HI	X	80015		6
							7
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001B	25-PT-006	HI_HI	X	80016		8
							9
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001C	25-PT-008	HI_HI	X	80017		10
							11
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001D	25-PT-009	HI_HI	X	80018		12
							13
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001E	25-PT-011	HI_HI	X	80019		14
							15
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE VESSEL V-25001F	25-PT-012	HI_HI	X	80020		16
							17
ESD-1D	ESD-1D ACTIVATION FROM FGS SYSTEM	70-XA-002				3	18
							19
ESD-1D	HYDROGEN CONFIRMED IN OPEN AREA FROM F&G SYSTEM (ISOLATE EQUIP. NOT SUITABLE FOR ZONE 1)	70-XA-005				3	20
							21
ESD-1D	INHIBIT BATTERY CHARGING B-100	70-XA-008				3	22
							23
ESD-1D	INHIBIT BATTERY CHARGING B-300	70-XA-004				3	24
							25
ESD-1D	FZ-01 ESD-1D PUSH BUTTON ACTIVATION	950-ESDD-01101		X		2	26
							27
ESD-1D	FZ-03 ESD-1D PUSH BUTTON ACTIVATION	950-ESDD-03101		X		2	28
							29
ESD-1D	FZ-04 ESD-1D PUSH BUTTON ACTIVATION	950-ESDD-04101		X		2	30
							31
ESD-1D	FZ-06 ESD-1D PUSH BUTTON ACTIVATION	950-ESDD-06101		X		2	32
							33
ESD-1D	FZ-07 ESD-1D PUSH BUTTON ACTIVATION	950-ESDD-07101		X		2	34
							35
ESD-1D	ESD-1D PUSH BUTTONS ONSHORE	950-ESDD-00001				2	36
							37
							38
ESD-1D	H2/SMOKE INSIDE B-100 (ELECT. ISOLATION) FROM FGS SYSTEM	70-XA-006				3	39
							40
ESD-1D	H2/SMOKE INSIDE B-200 (ELECT. ISOLATION) FROM FGS SYSTEM	70-XA-007				3	41
							42
ESD-1D	H2/SMOKE IN WATER TREATM. PKG (ELECT. ISOLATION) FROM FGS SYSTEM	70-XA-010				3	43
							44
ESD-1D	LOSS OF ON-SHORE COMMUNICATION	79-XS-005					45
							46
ESD-1	LOW LOW PRESSURE ON INSTRUMENT AIR MANIFOLD	63-PT-004	LO_LO	X	80027		47
							48
	H2/SMOKE INTAKE B-100 FROM FGS SYTEM	70-XA-015				3	
	H2/SMOKE INTAKE B-200 FROM FGS SYSTEM	70-XA-016				3	
	H2/SMOKE INTAKE B-300 FROM FGS SYSTEM	70-XA-017				3	
	H2/SMOKE INTAKE B-400 FROM FGS SYSTEM	70-XA-018				3	

TAG. NO.	ACTION	ESD LEVEL	DESCRIPTION	P&ID	To sheet
			ALARM / INTERFACE		
			WORKSTATION HMIs - EVENT/ALARM		
			ALARM ON CAP ONSHORE		
			ESD-1 ACTIVATION		7
79-XS-002			ESD-1D ACTIVATION TO FGS SYSTEM		NOTE 3
			DEPRESSURIZATION		
25-BDY-005		ESD-1D	OPEN 25-BDV-005 ON H2 STORAGE VESSEL V-25001A	80015	
25-BDY-007		ESD-1D	OPEN 25-BDV-007 ON H2 STORAGE VESSEL V-25001B	80016	
25-BDY-010		ESD-1D	OPEN 25-BDV-010 ON H2 STORAGE VESSEL V-25001C	80017	
25-BDY-013		ESD-1D	OPEN 25-BDV-013 ON H2 STORAGE VESSEL V-25001D	80018	
25-BDY-016		ESD-1D	OPEN 25-BDV-016 ON H2 STORAGE VESSEL V-25001E	80019	
25-BDY-019		ESD-1D	OPEN 25-BDV-019 ON H2 STORAGE VESSEL V-25001F	80020	
25-BDY-022		ESD-1D	OPEN 25-BDV-022 ON OUTLET H2 HEADER TO FUEL CELL PGK	80014	
			HVAC SYSTEM		
77-XS-001		ESD-1D	SHUTDOWN HVAC SYSTEM OF B-100 (HV CONTAINER)		
77-XS-003			SHUTDOWN HVAC SYSTEM OF B-300 (UPS CONTAINER)		
77-XS-002		ESD-1D	SHUTDOWN HVAC SYSTEM OF B-200 (LV CONTAINER)		
77-XS-004			SHUTDOWN HVAC SYSTEM OF B-400 (ITER CONTAINER)		
			BATTERY INHIBITION (B-100 AND B-300)		
84-XS-009			INHIBIT. BATTERY CHARGING B-100		
84-XS-010			INHIBIT. BATTERY CHARGING B-300 AC UPS UP-200F3 BATTERIES		
84-XS-011			INHIBIT. BATTERY CHARGING B-300 AC UPS UP-200F4 BATTERIES		
			ELECTRICAL ISOLATION UPS POWERS		
79-XS-010			ELECT. ISOLATION SOFT. CABLES COMMUNICATION CAT 6A		4
84-XS-004			ELECT. ISOLATION UPS POWER UCP HVAC B-100		
84-XS-005			ELECT. ISOLATION UPS POWER UCP HVAC B-200		
84-XS-003			ELECT. ISOLATION UPS POWER UCP (INSTRUMENT AIR A-63000)		
84-XS-002			ELECT. ISOLATION UPS POWER UCP (NITROGEN A-64000)		
84-XS-001			ELECT. ISOLATION UPS POWER UCP (WATER TREAT. A-50000)		
84-XS-006		ISOLATE	DISCONNECT DC UPS (B-100 CONTAINER)		
			PROCESS/POWER PACKAGES		
20-XS-001			SHUTDOWN ELECTROLYZER PACKAGE A-20000	80011	
85-XS-001		1	SHUTDOWN BESS PACKAGE A-85000		
83-XS-001		1	SHUTDOWN SOLAR FARM PACKAGE		
80-XS-001		1	SHUTDOWN FUEL CELL PACKAGE A-80000	80012	
50-XS-001		1	SHUTDOWN WATER TREATMENT PACKAGE A-50000	80022/23/24	
63-XS-001		1	SHUTDOWN INSTRUMENT AIR PACKAGE A-63000	80027	
64-XS-001		1	SHUTDOWN NITROGEN PACKAGE A-64000	80027	
			INCOMING CIRCUIT BREAKERS POWER GENERATION		
82-XS-002			OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS		
82-XS-003			OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS		
82-XS-001			OPEN SOLAR INCOMING CIRCUIT BREAKERS		
81-XS-001			OPEN WIND FARM INCOMING CIRCUIT BREAKERS		

NOTES

1. SERIAL SIGNALS THROUGH FIBER OPTIC CABLE.
2. THE FLASHING ALARM ON CAP ONSHORE IS A CUMULATIVE OF ALL ESD-1D PUSH BUTTONS ACTIVATION.
3. FGS AND SIS SYSTEM EXCHANGE DATA BETWEEN THEM BY USING THE Vnet/IP NETWORK. THIS IS IMPLEMENTED AS REDUNDANT SAFETY COMMUNICATION, APPROVED FOR SIL 3 LOOP.
4. INTERNAL WIRING ISOLATION BETWEEN SIS AND NETWORK CABINETS.

HOLDS

Reference

Document Title	Document Number
Fire & Gas Cause & Effect Matrix	123A90-DDL-IN-CE-40002

LEGEND

CCR	CENTRAL CONTROL ROOM (ONSHORE)
OER	ONSHORE EQUIPMENT ROOM
ITER	INSTRUMENT & TELECOM EQUIPMENT ROOM
R	RESET
EL	EVENT LOG
F	FLASHING LIGHT INDICATION ON CAP
T	TIME DELAY

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Process Safety Cause & Effect Matrix

ESD-1D: EMERGENCY SHUT DOWN WITH DEPRESSURIZATION

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Contract No. **CW-I-WP4-2023-05**

Sheet 6 of 9

CAUSE AND EFFECT CHARTS

ESD-1

CAUSE / EFFECT

ESD Level	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO 123A90-DDL-PR-PID-.	NOTE		TAG. NO.	ACTION	ESD LEVEL	DESCRIPTION	P&ID	To sheet
											ALARM / INTERFACE		
							1			1	WORKSTATION HMIs - EVENT/ALARM		
							2				ALARM ON CAP ONSHORE		
							3			PSD	PSD ACTIVATION		8
							4						
							5	79-XS-003		1	ESD-1 ACTIVATION TO FGS SYSTEM		NOTE 2
							6						
							7	20-XS-001			**PROCESS/POWER PACKAGES**		
							8				SHUTDOWN ELECTROLYZER PACKAGE A-20000	80011	
							9						
							10						
							11						
							12						
							13	80-XS-001		1	SHUTDOWN FUEL CELL PACKAGE A-80000	80012	
							14						
							15	50-XS-001		1	SHUTDOWN WATER TREATMENT PACKAGE A-50000	80022/2324	
							16						
							17						
							18						
							19						
							20				**SHUT-DOWN VALVES**		
							21	64-SDY-001		1	CLOSE 64-SDV-001 NITROGEN TO H2 STORAGE VESSEL	80027	
							22						
							23	25-SDY-023			CLOSE 25-SDV-023 ON OUTLET H2 HEADER TO FUEL CELL PKG	80014	
							24						
							25	25-SDY-001			CLOSE 25-SDV-001 ON H2 HEADER TO STORAGE VESSEL	80013	
							26						
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ESD-1D	ESD-1 ACTIVATION IN CASCADE FROM ESD-1D							64-SDY-001		1	CLOSE 64-SDV-001 NITROGEN TO H2 STORAGE VESSEL	80027	
								25-SDY-023			CLOSE 25-SDV-023 ON OUTLET H2 HEADER TO FUEL CELL PKG	80014	
								25-SDY-001			CLOSE 25-SDV-001 ON H2 HEADER TO STORAGE VESSEL	80013	
ESD-1	FZ-01 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-01101		X		1							
ESD-1	FZ-03 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-03101		X		1							
ESD-1	FZ-04 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-04101		X		1							
ESD-1	FZ-06 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-06101		X		1							
ESD-1	FZ-07 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-07101		X		1							
ESD-1	ESD-1 PUSH BUTTONS ONSHORE	950-ESD-00001				1							
ESD-1	BESS ALARM THERMAL RUN AWAY	85-XA-004											

NOTES

1. THE FLASHING ALARM ON CAP ONSHORE IS A CUMULATIVE OF ALL ESD-1 PUSH BUTTONS ACTIVATION.

2. FGS AND SIS SYSTEM EXCHANGE DATA BETWEEN THEM BY USING THE Vnet/IP NETWORK. THIS IS IMPLEMENTED AS REDUNDANT SAFETY COMMUNICATION, APPROVED FOR SIL 3 LOOP.

HOLDS

Reference

Document Title	Document Number
Fire & Gas Cause & Effect Matrix	123A90-DDL-IN-CE-40002
Process Safety Cause and Effect Block Diagram	123A90-DDL-PR-DG-80000

LEGEND

CCR	CENTRAL CONTROL ROOM (ONSHORE)
OER	ONSHORE EQUIPMENT ROOM
ITER	INSTRUMENT & TELECOM EQUIPMENT ROOM
R	RESET
EL	EVENT LOG
F	FLASHING LIGHT INDICATION ON CAP
T	TIME DELAY

Rev.	Date	Description	Issued by	Checked by	Approved by
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04	11/02/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
05	21/07/2025	Accepted For Review (IFR)	CD		
06	30/09/2025	Accepted For Review (IFR)	CD		

Process Safety Cause & Effect Matrix

ESD-1: EMERGENCY SHUT DOWN WITHOUT DEPRESSURIZATION

Document Reference: **123A90-DDL-IN-CE-40000**

Rev: 06 Status: **AFC**

Contract No. **CW-I-WP4-2023-05**

CAUSE AND EFFECT CHARTS

PSD

EFFECT

Column	Group	To sheet	P&ID	DESCRIPTION	PSD	ACTION	TAG. NO.
1	ALARM / INTERFACE			WORKSTATION HMIs - EVENT/ALARM			
2	ALARM / INTERFACE						
3	ALARM / INTERFACE			ALARM ON CAP ONSHORE			
4	ALARM / INTERFACE						
5	ALARM / INTERFACE						
6	ALARM / INTERFACE						
7	ALARM / INTERFACE						
8	SHUT-DOWN VALVES		80013	CLOSE 25-SDV-001 ON H2 HEADER TO STORAGE VESSEL	PSD		25-SDY-001
9	SHUT-DOWN VALVES						
10	SHUT-DOWN VALVES		80027	CLOSE 64-SDV-001 NITROGEN TO H2 STORAGE VESSEL	PSD		64-SDY-001
11	SHUT-DOWN VALVES						
12	SHUT-DOWN VALVES		80014	CLOSE 25-SDV-023 ON OUTLET H2 HEADER TO FUEL CELL PGK	PSD		25-SDY-023
13	PROCESS/POWER PACKAGES						
14	PROCESS/POWER PACKAGES		80022/23/24	SHUTDOWN WATER TREATMENT PACKAGE A-50000	PSD		50-XS-001
15	PROCESS/POWER PACKAGES						
16	PROCESS/POWER PACKAGES		80011	SHUTDOWN ELECTROLYZER PACKAGE A-20000	PSD		20-XS-001
17	PROCESS/POWER PACKAGES						
18	PROCESS/POWER PACKAGES		80012	SHUTDOWN FUEL CELL PACKAGE A-80000	PSD		80-XS-001
19	PROCESS/POWER PACKAGES						
20	PROCESS/POWER PACKAGES			SHUTDOWN BESS PACKAGE A-85000	PSD		85-XS-001
21	PROCESS/POWER PACKAGES						
22	PROCESS/POWER PACKAGES		80027	SHUTDOWN INSTRUMENT AIR PACKAGE A-63000	PSD		63-XS-001
23	PROCESS/POWER PACKAGES						
24	PROCESS/POWER PACKAGES		80027	SHUTDOWN NITROGEN PACKAGE A-64000	PSD		64-XS-001
25	PROCESS/POWER PACKAGES						
26	PROCESS/POWER PACKAGES			SHUTDOWN SOLAR (Note 1)			83-XS-001
27	PROCESS/POWER PACKAGES						
28	PROCESS/POWER PACKAGES			SHUTDOWN SEAWATER LIFT PUMP P-50001A			83-XS-001A
29	PROCESS/POWER PACKAGES						
30	PROCESS/POWER PACKAGES			SHUTDOWN SEAWATER LIFT PUMP P-50001B			83-XS-001B
31	HVAC SYSTEM						
32	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-100 (HV CONTAINER)			77-XS-001
33	HVAC SYSTEM						
34	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-200 (LV CONTAINER)			77-XS-002
35	HVAC SYSTEM						
36	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-300 (UPS CONTAINER)			77-XS-003
37	HVAC SYSTEM						
38	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-400 (ITER CONTAINER)			77-XS-004
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CAUSE

PSD	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO 123A90-DDL-PR-PID-.	NOTE		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
							1																																						
ESD-1	PSD ACTIVATION IN CASCADE FROM ESD-1					Sh.7	2																												X		X								
							3																																						
PSD	LOW PRESSURE ON NITROGEN MANIFOLD	64-PT-002	LO	X	80027		4	X									X																												
							5																																						
PSD	LOW LOW PRESSURE ON OUTLET H2 HEADER TO FUEL CELL PACKAGE	80-PT-002	LO_LO	X	80012		6	X		F					X				X		X		X		X										X		X								
							7																																						
PSD	HIGH HIGH PRESSURE ON INLET H2 HEADER TO STORAGE VESSELS	25-PT-002	HI_HI	X	80013		8	X		F					X						X		X												X		X								
							9																																						
PSD	HIGH HIGH PRESSURE ON OUTLET H2 HEADER TO FUEL CELL PACKAGE	80-PT-002	HI_HI	X	80012		10	X		F					X				X		X		X		X										X		X								
							11																																						
PSD	S/D ELECTROLYZER PKG FROM FGS SYSTEM FOR O2 CONFIRMED	70-XA-003				2	12														X		X												X		X								
							13																																						
PSD	HIGH LEVEL H2 VENT KO DRUM	43-LT-001	HI	X	80029		14	X													X		X												X		X								
							15																																						
	F&G UCP PANEL FAULT WATER TREATMENT PKG	50-XA-003					16	X													X		X												X		X								
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	ELECTROLYZER PACKAGE CUMULATIVE CRITICAL FAULT	20-XA-003					18	X													X		X												X		X								
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	FUEL CELL PACKAGE CUMULATIVE CRITICAL FAULT	80-XA-003					20	X											X						X																				
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	BESS PACKAGE CUMULATIVE CRITICAL FAULT	85-XA-003					22	X																			X																		
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	INSTRUMENT PACKAGE CUMULATIVE CRITICAL FAULT	63-XA-003					24	X																					X																
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	NITROGEN PACKAGE CUMULATIVE CRITICAL FAULT	64-XA-003					26	X																							X														
							27																																						
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-100 (HV CONTAINER)	77-XA-001					28	X																															X						
							29																																						
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-200 (LV CONTAINER)	77-XA-002					30	X																																	X				
							31																																						
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-300 (UPS CONTAINER)	77-XA-003					32	X																																			X		
							33																																						
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-400 (ITER CONTAINER)	77-XA-004					34	X																																					X
							35																																						
	NAVAIDS PACKAGE CUMULATIVE CRITICAL FAULT	72-XA-001					36	X																																					
							37																																						
	SOLAR PACKAGE CUMULATIVE CRITICAL FAULT					Note 1	38	X																									X												
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NOTES

1. SERIAL SIGNALS THROUGH FIBER OPTIC CABLE.

2. FGS AND SIS SYSTEM EXCHANGE DATA BETWEEN THEM BY USING THE Vnet/IP NETWORK. THIS IS IMPLEMENTED AS REDUNDANT SAFETY COMMUNICATION, APPROVED FOR SIL 3 LOOP.

HOLDS

Reference

Document Title	Document Number
Fire & Gas Cause & Effect Matrix	123A90-DDL-IN-CE-40002
Process Safety Cause and Effect Block Diagram	123A90-DDL-PR-DG-80000

LEGEND

CCR	CENTRAL CONTROL ROOM (ONSHORE)
OER	ONSHORE EQUIPMENT ROOM
ITER	INSTRUMENT & TELECOM EQUIPMENT ROOM
R	RESET
EL	EVENT LOG
F	FLASHING LIGHT INDICATION ON CAP
T	TIME DELAY

Rev.	Date	Description	Issued by	Checked by	Approved by
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06	30/09/2025	Accepted For Review (IFR)	CD		

Process Safety Cause & Effect Matrix

PSD: PROCESS SHUT DOWN

Document Reference: **123A90-DDL-IN-CE-40000**

Rev: 06 Status: **AFC**

Contract No. CW-I-WP4-2023-05

CAUSE AND EFFECT CHARTS

MOB PUSH BUTTONS

CAUSE / EFFECT

PSD	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO 123A90-DDL-PR-PID-.	NOTE
	FZ-01 MAN OVER BOARD ACTIVATION	950-MOB-01101		X		1
	FZ-03 MAN OVER BOARD ACTIVATION	950-MOB-03101		X		1
	FZ-04 MAN OVER BOARD ACTIVATION	950-MOB-04101		X		1
	FZ-06 MAN OVER BOARD ACTIVATION	950-MOB-06101		X		1
	FZ-07 MAN OVER BOARD ACTIVATION	950-MOB-07101		X		1

TAG. NO.	ACTION		DESCRIPTION	P&ID	To sheet
			ALARM / INTERFACE		
			WORKSTATION HMIs - EVENT/ALARM		
			ALARM ON CAP ONSHORE		
79-XS-004	ALARM		MOB PUSH BUTTONS ALARM ACTIVATION TO FGS SYSTEM		NOTE 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
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NOTES

1. THE FLASHING ALARMS ON CAP ONSHORE IS CUMULATIVE FOR ALL MAN OVERBOARD (MOB) PUSH BUTTON ACTIVATION.

2. FGS AND SIS SYSTEM EXCHANGE DATA BETWEEN THEM BY USING THE Vnet/IP NETWORK. THIS IS IMPLEMENTED AS REDUNDANT SAFETY COMMUNICATION, APPROVED FOR SIL 3 LOOP.

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Process Safety Cause & Effect Matrix

MOB PUSH BUTTONS

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Rev: 06 Status: **AFC**

Contract No. **CW-I-WP4-2023-05**

Sheet 9 of 9