Base Load Power Hub (BLPH)

Process Safety Cause & Effect Matrix

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Document Class: 1

Rev.	Date	Description	Prepared	Reviewed	Approved
07	11/11/2025	AS-BUILT (ASB)	SPS	MGA	CGI
06	30/09/2025	Accepted For Construction (AFC)	SPS	MGA	CGI
05	21/07/2025	Accepted For Construction (AFC)	CDA	MGA	CGI
04	11/02/2025	Accepted For Construction (AFC)	LCA	MGA	DLO
03	08/10/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
01	08/03/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
00	24/11/2023	Issue for Acceptance (IFA)	LCA	MGA	DLO

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1	Cover	X	X	X	X	X	X	X	X
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4	Notes	X	X	X	X	X	X	X	X
5	ASD: ABANDON	X	X	X	X	X	X	X	X
6	ESD-1D: EMERGENCY SHUT DOWN WITH DEPRESSURIZATION	X	X	X	X	X	X	X	X
7	ESD-1: EMERGENCY SHUT DOWN WITHOUT DEPRESSURIZATION	X	X	X	X	X	X	X	X
8	PSD: PROCESS SHUT DOWN	X	X	X	X	X	X	X	X
9	MOB PUSH BUTTONS		X	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)
03	ACCEPTED FOR CONSTRUCTION (AFC)
04	ACCEPTED FOR CONSTRUCTION (AFC)
05	ACCEPTED FOR CONSTRUCTION (AFC)
06	ACCEPTED FOR CONSTRUCTION (AFC)
07	AS-BUILT (ASB)

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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 = OFFSHORE CONTROL 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
54–70							

CAUSE

ESD Level	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO.	NOTE	Row
							1
ASD	ASD ACTIVATION FROM FGS SYSTEM	70-XA-001				4	2
							3
ASD	FZ-01 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-01101		X		3	4
							5
ASD	FZ-03 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-03101		X		3	6
							7
ASD	FZ-04 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-04101		X		3	8
							9
ASD	FZ-06 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-06101		X		3	10
							11
ASD	FZ-07 ABANDON SHUTDOWN ACTIVATION PUSH BUTTON	950-ASD-07101		X		3	12
							13–55

Matrix (effect columns with entries)

Row	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
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
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
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
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
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
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

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

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

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	OFFSHORE CONTROL 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
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
07	11/11/2025	AS BUILT (ASB)	SPS	MGA	CGI

Process Safety Cause & Effect Matrix

ASD: ABANDON

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

Rev: 07 Status: **ASB**

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

CAUSE AND EFFECT CHARTS

ESD-1D

EFFECT

Col.	Group	To sheet	P&ID	Description	ESD Level	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	7		ESD-1 ACTIVATION			
6	ALARM / INTERFACE						
7	ALARM / INTERFACE	NOTE 3		ESD-1D ACTIVATION TO FGS SYSTEM			79-XS-002
8	ALARM / INTERFACE						
9	DEPRESSURIZATION		80015	OPEN 25-BDV-005 ON H2 STORAGE TANKS V-25001A	ESD-1D		25-BDY-005
10	DEPRESSURIZATION						
11	DEPRESSURIZATION		80016	OPEN 25-BDV-007 ON H2 STORAGE TANKS V-25001B	ESD-1D		25-BDY-007
12	DEPRESSURIZATION						
13	DEPRESSURIZATION		80017	OPEN 25-BDV-010 ON H2 STORAGE TANKS V-25001C	ESD-1D		25-BDY-010
14	DEPRESSURIZATION						
15	DEPRESSURIZATION		80018	OPEN 25-BDV-013 ON H2 STORAGE TANKS V-25001D	ESD-1D		25-BDY-013
16	DEPRESSURIZATION						
17	DEPRESSURIZATION		80019	OPEN 25-BDV-016 ON H2 STORAGE TANKS V-25001E	ESD-1D		25-BDY-016
18	DEPRESSURIZATION						
19	DEPRESSURIZATION		80020	OPEN 25-BDV-019 ON H2 STORAGE TANKS V-25001F	ESD-1D		25-BDY-019
20	DEPRESSURIZATION						
21	DEPRESSURIZATION		80014	OPEN 25-BDV-022 ON OUTLET H2 HEADER TO FUEL CELL PGK	ESD-1D		25-BDY-022
22	DEPRESSURIZATION						
23	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-100 (HV CONTAINER)	ESD-1D		77-XS-001
24	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-300 (UPS CONTAINER)			77-XS-003
25	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-200 (LV CONTAINER)	ESD-1D		77-XS-002
26	HVAC SYSTEM			SHUTDOWN HVAC SYSTEM OF B-400 (ITER CONTAINER)			77-XS-004
27	BATTERY INHIBITION (B-100 AND B-300)						
28	BATTERY INHIBITION (B-100 AND B-300)			INHIBIT. BATTERY CHARGING B-100			84-XS-009
29	BATTERY INHIBITION (B-100 AND B-300)						
30	BATTERY INHIBITION (B-100 AND B-300)			INHIBIT. BATTERY CHARGING B-300 AC UPS UP-200F3 BATTERIES			84-XS-010
31	BATTERY INHIBITION (B-100 AND B-300)						
32	BATTERY INHIBITION (B-100 AND B-300)			INHIBIT. BATTERY CHARGING B-300 AC UPS UP-200F4 BATTERIES			84-XS-011
33	ELECTRICAL ISOLATION UPS POWERS	4		ELECT. ISOLATION SOFT. CABLES COMMUNICATION CAT 6			79-XS-010
34	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP HVAC B-100			84-XS-004
35	ELECTRICAL ISOLATION UPS POWERS						
36	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP HVAC B-200			84-XS-005
37	ELECTRICAL ISOLATION UPS POWERS						
38	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (INSTRUMENT AIR A-63000)			84-XS-003
39	ELECTRICAL ISOLATION UPS POWERS						
40	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (NITROGEN A-64000)			84-XS-002
41	ELECTRICAL ISOLATION UPS POWERS						
42	ELECTRICAL ISOLATION UPS POWERS			ELECT. ISOLATION UPS POWER UCP (WATER TREAT. A-50000)			84-XS-001
43	ELECTRICAL ISOLATION UPS POWERS						
44	ELECTRICAL ISOLATION UPS POWERS			DISCONNECT DC UPS (B-100 CONTAINER)		ISOLATE	84-XS-006
45	ELECTRICAL ISOLATION UPS POWERS						
46	PROCESS/POWER PACKAGES		80011	SHUTDOWN ELECTROLYZER PACKAGE A-20000			20-XS-001
47	PROCESS/POWER PACKAGES						
48	PROCESS/POWER PACKAGES			SHUTDOWN BESS PACKAGE A-85000	1		85-XS-001
49	PROCESS/POWER PACKAGES						
50	PROCESS/POWER PACKAGES			SHUTDOWN SOLAR FARM PACKAGE	1		83-XS-001
51	PROCESS/POWER PACKAGES						
52	PROCESS/POWER PACKAGES		80012	SHUTDOWN FUEL CELL PACKAGE A-80000	1		80-XS-001
53	PROCESS/POWER PACKAGES						
54	PROCESS/POWER PACKAGES		80022/23/2	SHUTDOWN WATER TREATMENT PACKAGE A-50000	1		50-XS-001
55	PROCESS/POWER PACKAGES						
56	PROCESS/POWER PACKAGES		80027	SHUTDOWN INSTRUMENT AIR PACKAGE A-63000	1		63-XS-001
57	PROCESS/POWER PACKAGES						
58	PROCESS/POWER PACKAGES		80027	SHUTDOWN NITROGEN PACKAGE A-64000	1		64-XS-001
59	INCOMING CIRCUIT BREAKERS POWER GENERATION						
60	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS			82-XS-002
61	INCOMING CIRCUIT BREAKERS POWER GENERATION						
62	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS			82-XS-003
63	INCOMING CIRCUIT BREAKERS POWER GENERATION						
64	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN SOLAR INCOMING CIRCUIT BREAKERS			82-XS-001
65	INCOMING CIRCUIT BREAKERS POWER GENERATION						
66	INCOMING CIRCUIT BREAKERS POWER GENERATION			OPEN WIND FARM INCOMING CIRCUIT BREAKERS			81-XS-001
67	INCOMING CIRCUIT BREAKERS POWER GENERATION						
68							
69							
70							

CAUSE

ESD Level	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO.	NOTE	Row
							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 WESSEL V-25001A	25-PT-004	HI_HI	X	80015		6
							7
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE WESSEL V-25001B	25-PT-006	HI_HI	X	80016		8
							9
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE WESSEL V-25001C	25-PT-008	HI_HI	X	80017		10
							11
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE WESSEL V-25001D	25-PT-009	HI_HI	X	80018		12
							13
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE WESSEL V-25001E	25-PT-011	HI_HI	X	80019		14
							15
ESD-1D	HIGH HIGH PRESSURE ON H2 STORAGE WESSEL 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	

Cause & effect matrix (effect columns 1–35)

Row	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
2					X				T2		T2		T2		T2		T2		T2		T2												X		
4	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
6	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
8	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
10	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
12	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
14	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
16	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
18					X				T2		T2		T2		T2		T2		T2		T2												X		
20					X				T2		T2		T2		T2		T2		T2		T2												X		
22																												X							
24																														X		X			
26	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
28	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
30	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
32	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
34	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
36	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
39					X				T2		T2		T2		T2		T2		T2		T2		X										X	X	
41					X				T2		T2		T2		T2		T2		T2		T2				X								X		
43					X				T2		T2		T2		T2		T2		T2		T2												X		
45	X				T1		T1		T5		T5		T5		T5		T5		T5		T5														
47	X		F		X		X		T2		T2		T2		T2		T2		T2		T2														
70-XA-015																							X												
70-XA-016																									X										
70-XA-017																								X											
70-XA-018																										X									

Cause & effect matrix (effect columns 36–70)

Row	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
4											X		X		X		X		X		X		X		X		X		X		X				
6											X		X		X		X		X		X		X		X		X		X		X				
8											X		X		X		X		X		X		X		X		X		X		X				
10											X		X		X		X		X		X		X		X		X		X		X				
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20			X		X						X		X		X		X		X		X		X		X		X		X		X				
26											X		X		X		X		X		X		X		X		X		X		X				
28											X		X		X		X		X		X		X		X		X		X		X				
30											X		X		X		X		X		X		X		X		X		X		X				
32											X		X		X		X		X		X		X		X		X		X		X				
34											X		X		X		X		X		X		X		X		X		X		X				
36											X		X		X		X		X		X		X		X		X		X		X				
39									T4		X		X		X		X		X		X		X		X		X		X		X				
41	X										X		X		X		X		X		X		X		X		X		X		X				
43							X				X		X		X		X		X		X		X		X		X		X		X				
45											T1		T1		T1		T1		T1		T1		T1		T1		T1		T1		T1				
47											X		X		X		X		X		X		X		X		X		X		X				

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

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

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	OFFSHORE CONTROL 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
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
07	11/11/2025	AS-BUILT (ASB)	SPS	MGA	CGI

Process Safety Cause & Effect Matrix

ESD-1D: EMERGENCY SHUT DOWN WITH DEPRESSURIZATION

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

Rev: 07 Status: **ASB**

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

CAUSE AND EFFECT CHARTS

ESD-1

EFFECT

Effect column	Group	To sheet	P&ID	DESCRIPTION	ESD LEVEL	ACTION	TAG. NO.
1	ALARM / INTERFACE			WORKSTATION HMIs - EVENT/ALARM	1		
	ALARM / INTERFACE						
	ALARM / INTERFACE			ALARM ON CAP ONSHORE			
2	ALARM / INTERFACE						
3	ALARM / INTERFACE	8		PSD ACTIVATION	PSD		
4	ALARM / INTERFACE						
5	ALARM / INTERFACE	NOTE 2		ESD-1 ACTIVATION TO FGS SYSTEM	1		79-XS-003
6	ALARM / INTERFACE						
7	PROCESS/POWER PACKAGES		80011	SHUTDOWN ELECTROLYZER PACKAGE A-20000			20-XS-001
8	PROCESS/POWER PACKAGES						
9	PROCESS/POWER PACKAGES						
10	PROCESS/POWER PACKAGES						
11	PROCESS/POWER PACKAGES						
12	PROCESS/POWER PACKAGES						
13	PROCESS/POWER PACKAGES		80012	SHUTDOWN FUEL CELL PACKAGE A-80000	1		80-XS-001
14	PROCESS/POWER PACKAGES						
15	PROCESS/POWER PACKAGES		80022/23/2	SHUTDOWN WATER TREATMENT PACKAGE A-50000	1		50-XS-001
16	PROCESS/POWER PACKAGES						
17	PROCESS/POWER PACKAGES						
18	PROCESS/POWER PACKAGES						
19	PROCESS/POWER PACKAGES						
20	SHUT-DOWN VALVES						
21	SHUT-DOWN VALVES		80027	CLOSE 64-SDV-001 NITROGEN TO H2 STORAGE TANKS	1		64-SDY-001
22	SHUT-DOWN VALVES						
23	SHUT-DOWN VALVES		80014	CLOSE 25-SDV-023 ON OUTLET H2 HEADER TO FUEL CELL PKG			25-SDY-023
24	SHUT-DOWN VALVES						
25	SHUT-DOWN VALVES		80013	CLOSE 25-SDV-001 ON H2 HEADER TO STORAGE TANKS			25-SDY-001
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CAUSE

No.	ESD Level	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
1																																		
2	ESD-1D	ESD-1 ACTIVATION IN CASCADE FROM ESD-1D										X																		X		X		X
3																																		
4																																		
5																																		
6																																		
7																																		
8																																		
9																																		
10	ESD-1	FZ-01 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-01101		X		1	X		F		X		X		X						X		X								X		X
11																																		
12	ESD-1	FZ-03 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-03101		X		1	X		F		X		X		X						X		X								X		X
13																																		
14	ESD-1	FZ-04 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-04101		X		1	X		F		X		X		X						X		X								X		X
15																																		
16	ESD-1	FZ-06 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-06101		X		1	X		F		X		X		X						X		X								X		X
17																																		
18	ESD-1	FZ-07 ESD-1 PUSH BUTTON ACTIVATION	950-ESD-07101		X		1	X		F		X		X		X						X		X								X		X
19																																		
20	ESD-1	ESD-1 PUSH BUTTONS ONSHORE	950-ESD-00001				1	X		F		X		X		X						X		X								X		X
21																																		
22	ESD-1	BESS ALARM THERMAL RUN AWAY	85-XA-004					X		F		X		X		X						X		X								X		X
23																																		
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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

1.T1= 1439 min 55 sec

2. T2= 5 sec.

3. T3= 30 sec.

4. T4= 15 sec. (T4<T3)

5. T5= 24 hours (T1+ T2)

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	OFFSHORE CONTROL 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
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
07	11/11/2025	AS-BUILT (ASB)	SPS	MGA	CGI

Process Safety Cause & Effect Matrix

ESD-1: EMERGENCY SHUT DOWN WITHOUT DEPRESSURIZATION

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

Rev: 07 Status: **ASB**

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

CAUSE AND EFFECT CHARTS

PSD

EFFECT

CAUSE

PSD	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO 123A90-DDL-PR-PID-.	NOTE	
							1
ESD-1	PSD ACTIVATION IN CASCADE FROM ESD-1					Sh.7	2
							3
PSD	LOW PRESSURE ON NITROGEN MANIFOLD	64-PT-002	LO	X	80027		4
							5
PSD	LOW LOW PRESSURE ON OUTLET H2 HEADER TO FUEL CELL PACKAGE	80-PT-002	LO_LO	X	80012		6
							7
PSD	HIGH HIGH PRESSURE ON INLET H2 HEADER TO STORAGE TANKS	25-PT-002	HI_HI	X	80013		8
							9
PSD	HIGH HIGH PRESSURE ON OUTLET H2 HEADER TO FUEL CELL PACKAGE	80-PT-002	HI_HI	X	80012		10
							11
PSD	S/D ELECTROLYZER PKG FROM FGS SYSTEM FOR O2 CONFIRMED	70-XA-003				2	12
							13
PSD	HIGH LEVEL H2 VENT KO DRUM	43-LT-001	HI	X	80029		14
							15
	F&G UCP PANEL FAULT WATER TREATMENT PKG	50-XA-003					16
							17
	ELECTROLYZER PACKAGE CUMULATIVE CRITICAL FAULT	20-XA-003					18
							19
	FUEL CELL PACKAGE CUMULATIVE CRITICAL FAULT	80-XA-003					20
							21
	BESS PACKAGE CUMULATIVE CRITICAL FAULT	85-XA-003					22
							23
	INSTRUMENT PACKAGE CUMULATIVE CRITICAL FAULT	63-XA-003					24
							25
	NITROGEN PACKAGE CUMULATIVE CRITICAL FAULT	64-XA-003					26
							27
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-100 (HV CONTAINER)	77-XA-001					28
							29
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-200 (LV CONTAINER)	77-XA-002					30
							31
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-300 (UPS CONTAINER)	77-XA-003					32
							33
	HVAC PACKAGE CUMULATIVE CRITICAL FAULT B-400 (ITER CONTAINER)	77-XA-004					34
							35
	NAVAIDS PACKAGE CUMULATIVE CRITICAL FAULT	72-XA-001					36
							37
	SOLAR PACKAGE CUMULATIVE CRITICAL FAULT					Note 1	38
							39
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	TAG. NO.	ACTION	PSD	DESCRIPTION	P&ID	To sheet
				ALARM / INTERFACE		
1				WORKSTATION HMIs - EVENT/ALARM		
2						
3				ALARM ON CAP ONSHORE		
4						
5						
6						
7						
				SHUT-DOWN VALVES		
8	25-SDY-001		PSD	CLOSE 25-SDV-001 ON H2 HEADER TO STORAGE WESSELS	80013	
9						
10	64-SDY-001		PSD	CLOSE 64-SDV-001 NITROGEN TO H2 STORAGE TANKS	80027	
11						
12	25-SDY-023		PSD	CLOSE 25-SDV-023 ON OUTLET H2 HEADER TO FUEL CELL PGK	80014	
13				**PROCESS/POWER PACKAGES**		
14	50-XS-001		PSD	SHUTDOWN WATER TREATMENT PACKAGE A-50000	80022/2324	
15						
16	20-XS-001		PSD	SHUTDOWN ELECTROLYZER PACKAGE A-20000	80011	
17						
18	80-XS-001		PSD	SHUTDOWN FUEL CELL PACKAGE A-80000	80012	
19						
20	85-XS-001		PSD	SHUTDOWN BESS PACKAGE A-85000		
21						
22	63-XS-001		PSD	SHUTDOWN INSTRUMENT AIR PACKAGE A-63000	80027	
23						
24	64-XS-001		PSD	SHUTDOWN NITROGEN PACKAGE A-64000	80027	
25						
26	83-XS-001			SHUTDOWN SOLAR (Note 1)		
27						
28	83-XS-001A			SHUTDOWN SEAWATER LIFT PUMP P-50001A		
29						
30	83-XS-001B			SHUTDOWN SEAWATER LIFT PUMP P-50001B		
31				**HVAC SYSTEM**		
32	77-XS-001			SHUTDOWN HVAC SYSTEM OF B-100 (HV CONTAINER)		
33						
34	77-XS-002			SHUTDOWN HVAC SYSTEM OF B-200 (LV CONTAINER)		
35						
36	77-XS-003			SHUTDOWN HVAC SYSTEM OF B-300 (UPS CONTAINER)		
37						
38	77-XS-004			SHUTDOWN HVAC SYSTEM OF B-400 (ITER CONTAINER)		
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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

1.T1= 1439 min 55 sec

2. T2= 5 sec.

3. T3= 30 sec.

4. T4= 15 sec. (T4<T3)

5. T5= 24 hours (T1+ T2)

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	OFFSHORE CONTROL 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
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
07	11/11/2025	AS-BUILT (ASB)	SPS	MGA	CGI

Process Safety Cause & Effect Matrix

PSD: PROCESS SHUT DOWN

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

Rev. 07 | Status: **ASB**

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

Sheet 8 of 9

CAUSE AND EFFECT CHARTS

MOB PUSH BUTTONS

EFFECT

Effect No.	Group	To sheet	P&ID	DESCRIPTION	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	NOTE 2		MOB PUSH BUTTONS ALARM ACTIVATION TO FGS SYSTEM	ALARM	79-XS-004
6						

Effect columns 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

CAUSE

PSD	DESCRIPTION	TAG NO.	FUNC.	By-Pass / Reset	P&ID NO 123A90-DDL-PR-PID-.	NOTE		1	2	3	4	5	6
							1						
	FZ-01 MAN OVER BOARD ACTIVATION	950-MOB-01101		X		1	2	X		F		X	
							3						
	FZ-03 MAN OVER BOARD ACTIVATION	950-MOB-03101		X		1	4	X		F		X	
							5						
	FZ-04 MAN OVER BOARD ACTIVATION	950-MOB-04101		X		1	6	X		F		X	
							7						
	FZ-06 MAN OVER BOARD ACTIVATION	950-MOB-06101		X		1	8	X		F		X	
							9						
	FZ-07 MAN OVER BOARD ACTIVATION	950-MOB-07101		X		1	10	X		F		X	
							11						
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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.

HOLDS

1.T1= 1439 min 55 sec

2. T2= 5 sec.

3. T3= 30 sec.

4. T4= 15 sec. (T4<T3)

5. T5= 24 hours (T1+ T2)

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	OFFSHORE CONTROL 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
02	12/06/2024	Accepted For Construction (AFC)	LCA	MGA	DLO
07	11/11/2025	AS- BUILT (ASB)	SPS	MGA	CGI

Process Safety Cause & Effect Matrix

MOB PUSH BUTTONS

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

Rev: 07 Status: **ASB**

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