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India SMART UTILITY Week 2025

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Session : 2: Future Trends and Challenges

20MW/40MWH BESS – Implementation Challenges & Way Forward

Presented By

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- BRPL in the final stage of commissioning 20MW Battery Energy Store System at Kilokri 33/11kV Grids

Project Details	Key Milestone
Developer: Kilokari BESS Pvt Limited (KBPL- The Consortium of IndiGrid 2 Limited and Amperehour Solar Technology Private Limited)	BESPA Signing date : 22 nd Dec 2023
Concessional Funding: 70% concessional debt from agency – GEAPP (Global Energy Alliance for People & Planet)	DERC Approval : 01 st May 2024
Off taker : BSES Rajdhani Power Limited(BRPL)	Land Handover : 01 st June 2024
Model : Build Own Operate Transfer(BOOT) basis	Effective Date : Based on Land Handover (1 st June 2024)
Concession Period : 12 Years (8760 Cycle)	Commissioning Timeline : March'2025 (10 months)
Capacity : 20MW/ 40MWh - 2 cycle Per day Operation.	



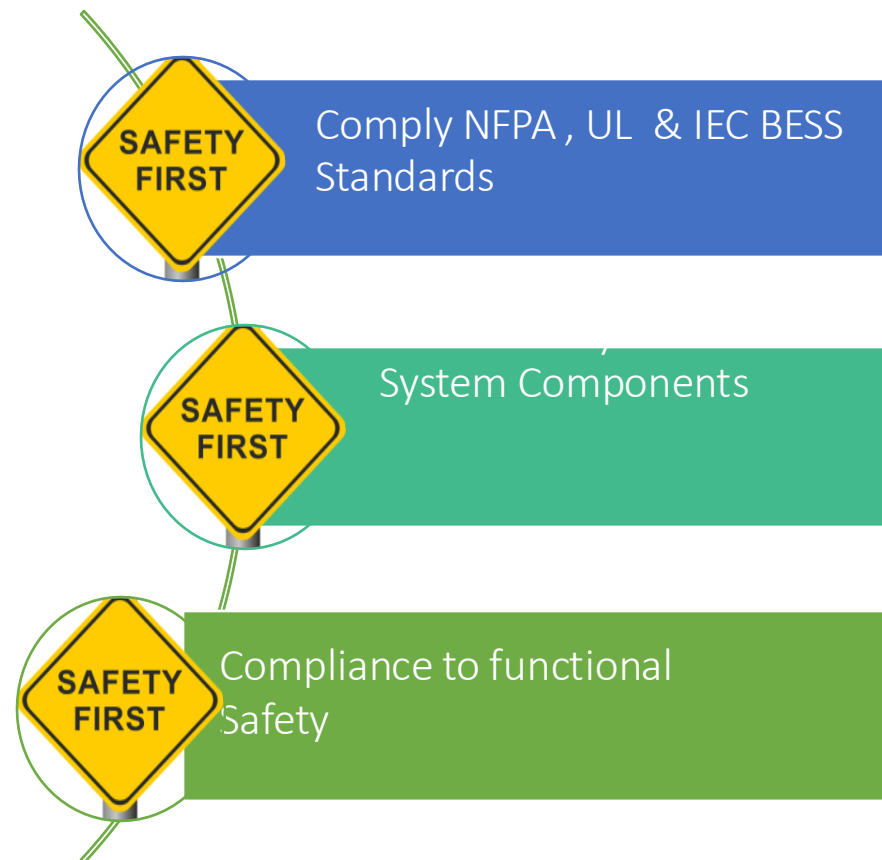
INTRODUCTION

Particulars	Battery/ Battery Container	Power conditioning System (PCS)
Make	Lischen	Fimer
Number of container /PCS	12	12
Rated Energy of container	4.179MWh	
Rated discharge Power of container / PCS	2.08 MW	2.5MVA
Operating Voltage Range	1123.2 – 1497.6 V	978 – 1600V
Cell Chemistry	Lithium Ion Phosphate	
Cell Capacity	314 Ah	
Cooling Mode	Liquid	
Fire Protection	Condensed Aerosol Fire extinguishing system and water Fire protection System	

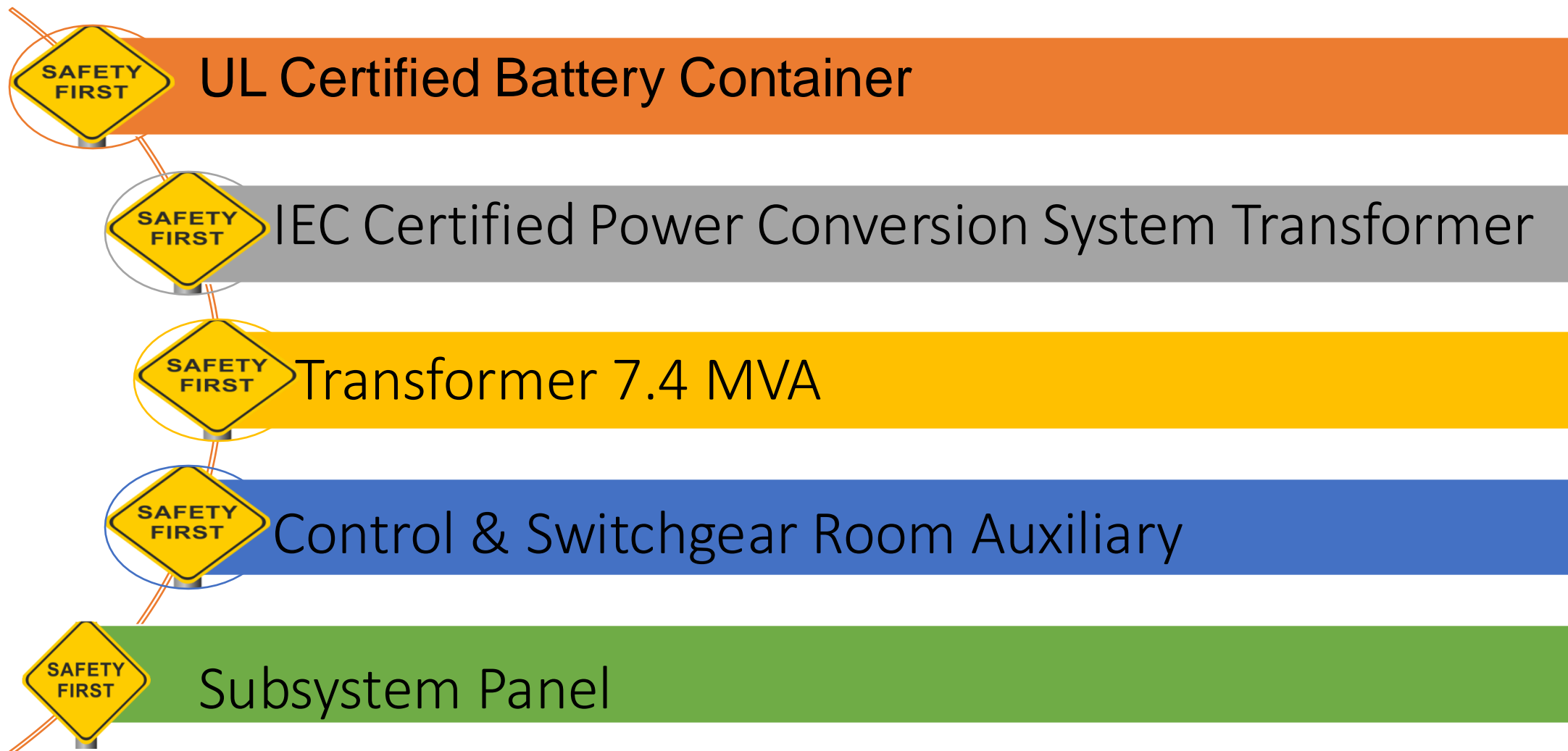
- Sharing unique challenges in such project standard requirement, regulations and fire safety related matters.
 - Located in residential area
 - Must to follow best practice and compliance to local norms.
 - Clear certification and NoC from local authority essential.

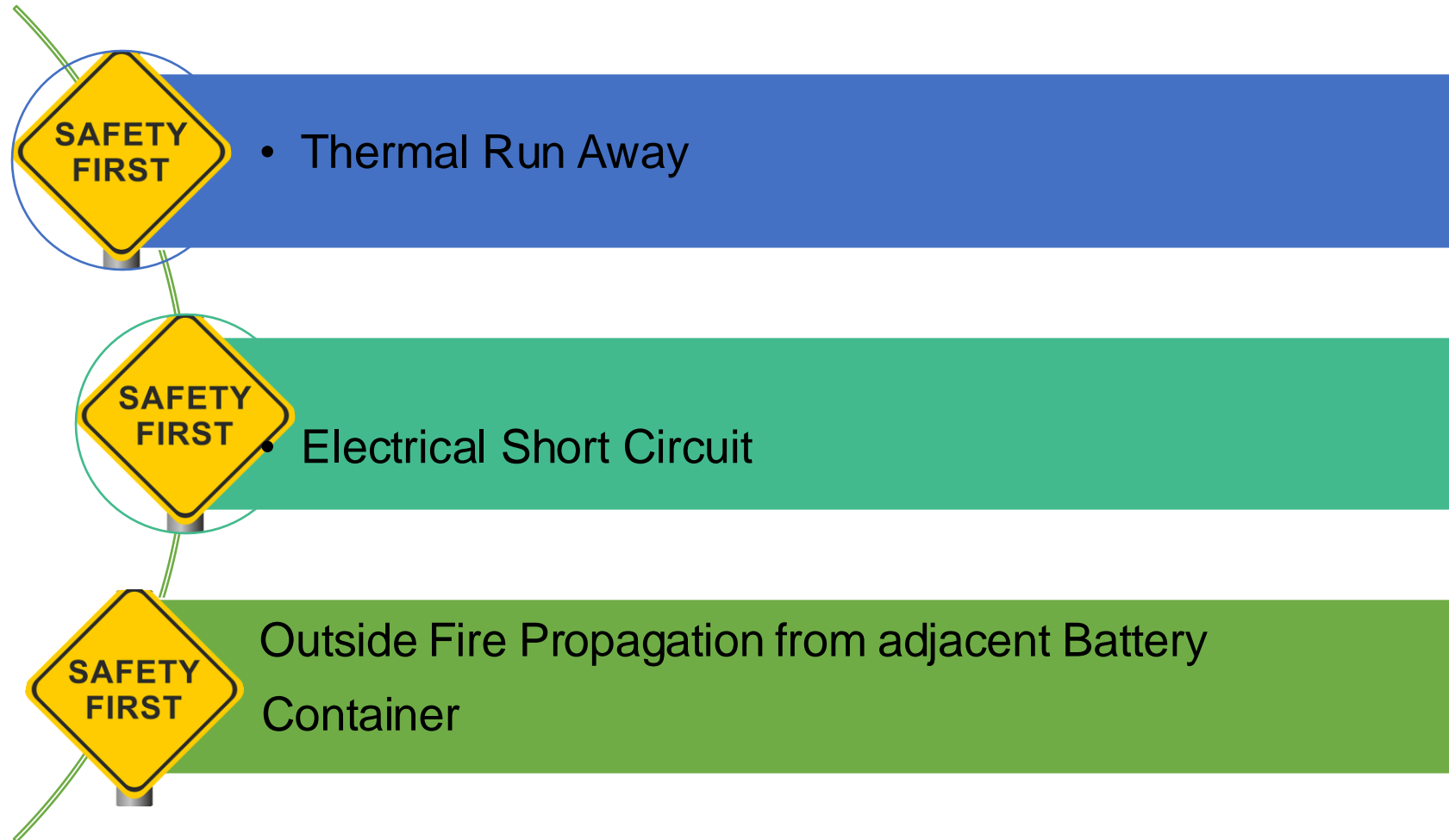


Safety approach

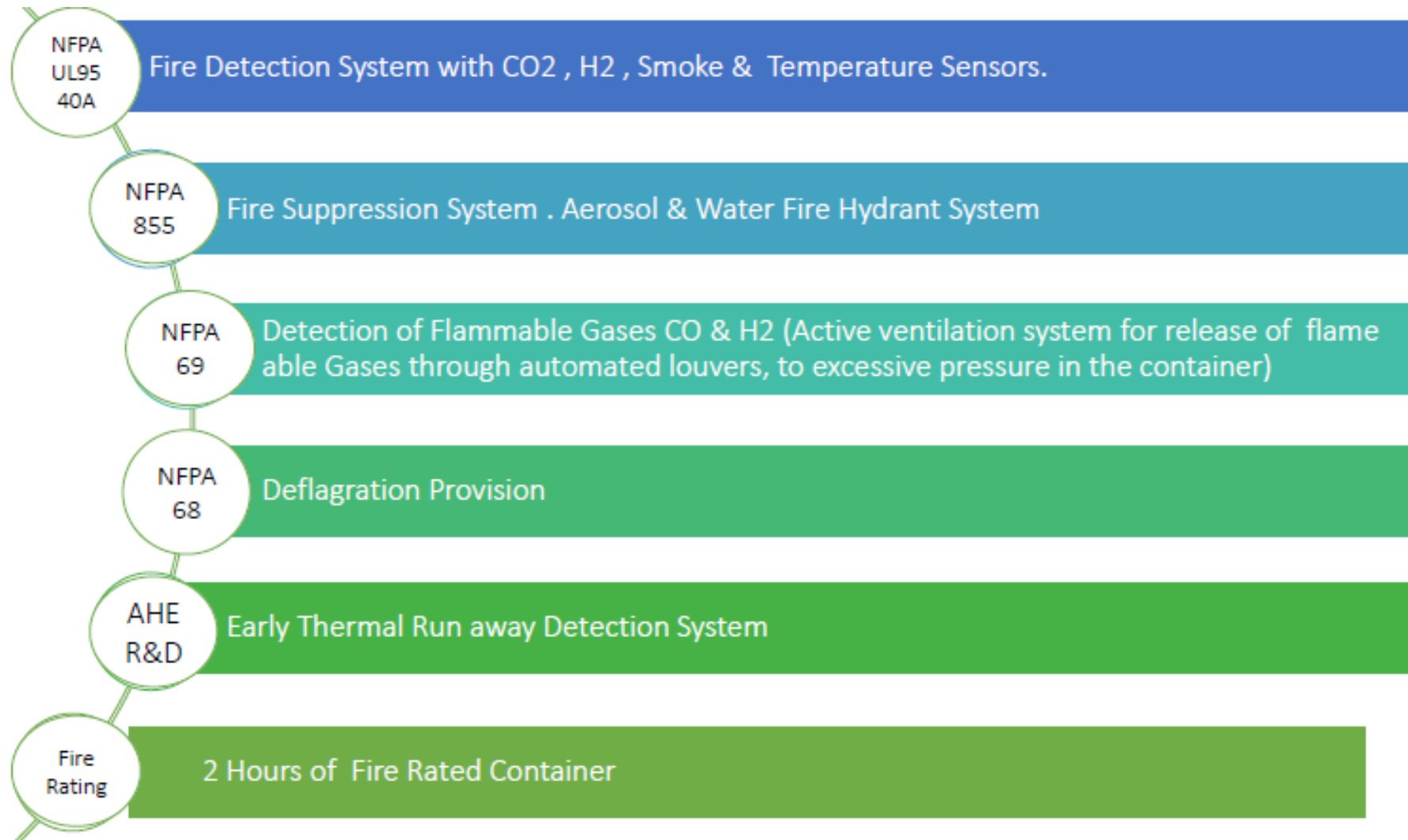


FIRE PROTECTION	Efforts designed to stop a fire and decrease fire-related damage.
FIRE PREVENTION	Proactive steps to prevent a fire from happening while also decreasing hazards and potential fire impact.
FIRE SUPPRESSION	Efforts to put out a fire once it ignites.





1. NFPA 855--2023 Installation Standards for Stationary Energy Storage Systems
2. NFPA 68--2018 Explosion Ventilation and Explosion-proof Standard
3. NFPA 69--2019 Standard for Explosion-proof Systems
4. NPPA 720—2015 Installation Standard for Carbon Monoxide (CO) Detection and Alarm Equipment
5. NFPA 2010--2020 Standard for Fixed Aerosol Fire Extinguishing Systems
6. UL 864--2020 Safety Standards for Control Units and Accessories of Fire Alarm Systems
7. UL 268--2016 Safety Standard for Smoke Detectors in Fire Alarm Systems
8. UL 521--2019 Safety Standard for Temperature Detectors of Fire Signal Systems
9. UL 464--2023 Safety Standard for Audio Signalling Devices (Including Accessories) of Fire Alarm Signalling Systems
10. UL 1638--2023 Safety Standard for Visual Signalling Devices Used in Fire Alarm and Signalling Systems (Including Accessories)
11. UL 1203--2020 Safety Standard for Explosion-and Dust-proof Electrical Equipment Used in Hazardous (Classified) Places
12. UL 507--2020 Safety Standard for Electric Fans
13. UL 9540 (Which included UL 9540A)
14. IEC 62933-5-2 - Function Safety & Operational Safety (IS 17067 – 5/4/2/1)
15. IS 17387 - General Safety and Performance Requirements of Battery Management Systems



1. Restrict Supply of Oxygen

-> By activating Aerosol & At latter stage HVWS spray System

2. Restrict Heat Propagation from other Modules , Racks & adjacent battery containers

-> a. UL9540A certification at Cell , Module , Rack & Container.

b. 2 Hour of Fire Rating

c. Safety Clearances as per NFPA 855:2023

3. Cut Supply of Fuel / Electricity

-> a. Very Fast Operating Electrical Fuses Provided at Module , Rack & Container Level. (1.5 Milli second in case of fault)

b. Remotely Operatable Circuit Breaker Provided at Container Level

2 – Hours Fire Rating of Container

SGS

Test Report No. SDFS2405003393FR Date: Jun.06, 2024 Page 7 of 22

The actual average temperatures within the furnace recorded in below table:

Time (min)	standard furnace temperature (°C)	Actual furnace average temperature (°C)	Time (min)	standard furnace temperature (°C)	Actual furnace average temperature (°C)
61	948	952.9	91	1008	1006.8
62	950	955.1	92	1009	1008.8
63	953	957.4	93	1011	1009.0
64	955	958.5	94	1012	1011.5
65	957	958.2	95	1014	1012.3
66	960	963.8	96	1016	1013.2
67	962	963.8	97	1017	1014.6
68	964	966.3	98	1019	1019.6
69	966	968.8	99	1020	1020.7
70	968	969.4	100	1022	1022.8
71	971	970.2	101	1023	1022.7
72	973	974.4	102	1025	1025.2
73	975	975.5	103	1026	1025.4
74	977	975.8	104	1028	1027.8
75	979	977.5	105	1029	1029.3
76	981	977.9	106	1030	1030.6
77	983	977.3	107	1032	1032.5
78	985	981.7	108	1033	1033.2
79	986	982.5	109	1035	1033.3
80	988	985.1	110	1036	1034.2
81	990	989.5	111	1037	1035.7
82	992	995.8	112	1039	1036.2
83	994	998.1	113	1040	1037.0
84	996	1001.3	114	1041	1040.0
85	997	1002.0	115	1043	1040.4
86	999	1002.5	116	1044	1041.6
87	1001	1002.6	117	1045	1042.4
88	1003	1004.0	118	1047	1043.7
89	1004	1003.4	119	1048	1048.2
90	1006	1005.2	120	1049	1051.3

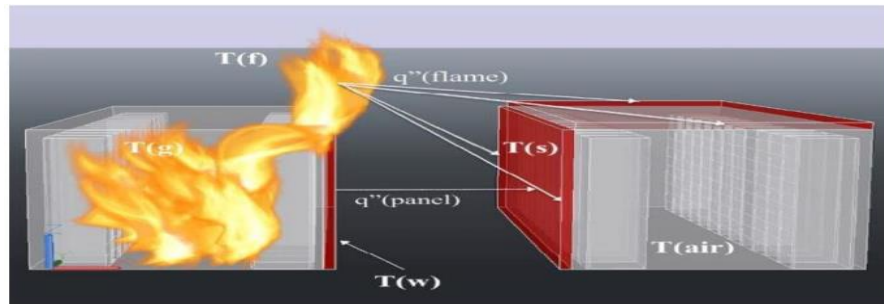


Figure 11 The fire triangle and its relationship to thermal runaway



The results of this study indicated the rise of inside air temperature within the exposed BESS container and identified the time at which a thermal threshold: 80°C is reached.

In addition to the mentioned study, large BESS facilities are often composed of multiple containers placed adjacent to each other. Their separation distance should be considered with maximum heat generation from the battery. Adequate space separation should be provided between BESS containers to mitigate overall fire risk. If the space separation between BESS enclosures is limited, a thermal barrier, rated for a minimum of 1 hour, may be provided on the inside or outside of the enclosures.



Radiation Heat Transfer Exchange

BESS Container is
rated for 2 Hrs of Fire
Rating .
Best in BESS Industry

9.5.2.6.1.5

Clearances to buildings and exposures shall be permitted to be reduced to 3 ft (0.9 m) where the enclosure of the ESS has a 2-hour fire resistance rating established in accordance with ASTM E119 or UL 263.



Compliance :

1. International Benchmarking practice – NFPA/UL/IEC
2. National Standards – CEA codes/ IS 17387/IS 17067



Challenges:

Clearance from Fire department – Fire NOC

Safety Clearance – Electrical Safety Officer Certificate – EIC



Recommendation & Take Away

- Standard needs legal acceptance – CEA in process of forming norms / regulation for BESS. This will help in Electrical Safety Clearance.
- Local Testing and certification facilities to enable Fire NOC

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THANK YOU

For discussions/suggestions/queries email: isuw@isuw.in

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Links/References (If any)