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WG1 - Safe Operating Guidelines for Electrical Energy Storage Systems in Developing Countries

Public Webinar - February 24th 2021

Background

Task Scope:

Provide a simplified common guide for safe operation of energy storage systems for Developing Countries

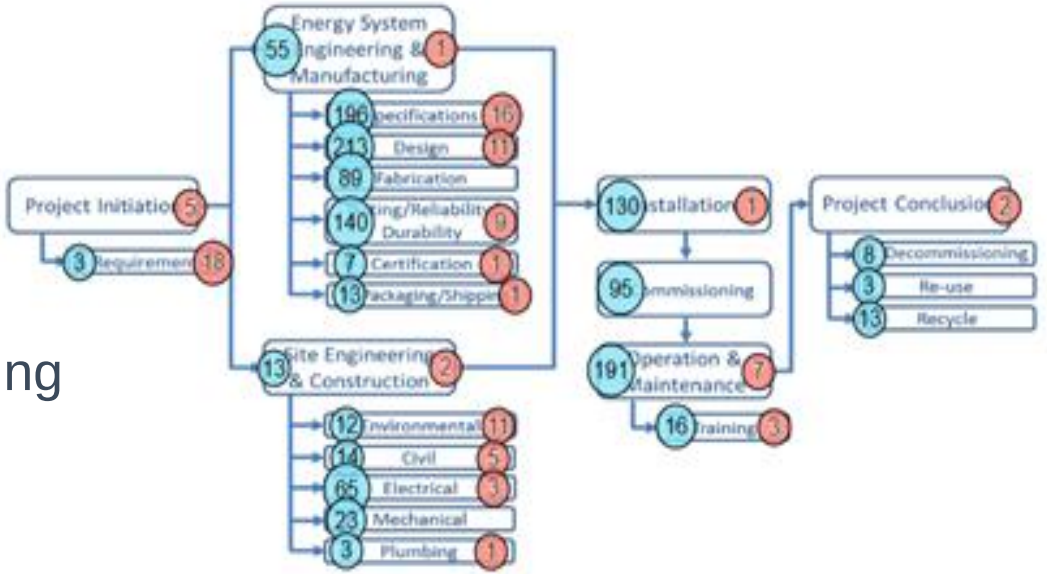
Contains:

- Safety aspects and guidelines to consider throughout the entire project lifecycle including design, deployment, operation, and decommissioning
- References to existing standards and guidelines where possible, including a summary of some existing gaps and updates underway
- A summary of incidents and lessons learned

A whole project approach to safety

As standards and best practice based approach to the entire project lifecycle:

1. Project Development and Planning
2. Deployment and Commissioning
3. Operation, Maintenance and Incident Response
4. Decommissioning and End of Life.



Project Development and Planning

Usually handled in two phases of increasing detail: 1) Feasibility Assessment, 2) Detailed Engineering and Procurement

- Identifying the local authorities and their safety requirements
- Establishing which minimum safety codes and standards to be applied
- Identifies specific:
  - local political, economic, social, and environmental factors
  - current or future requirements when the project is considered critical infrastructure for national security or other reasons
- First responder requirements and training needs for both normal operation and incident response

Deployment and Commissioning

Depending on product and installation maturity, up to three stages of installation and testing: 1) Factory Acceptance Testing, 2) Site Acceptance Testing 3) Commissioning Activities

Includes checks to verify:

- All safety subsystems or devices are installed and functioning, and that stakeholders know how the ESS can and should perform, and how it is controlled
- Assembly quality, completeness of scope, and accuracy of any as-built drawings or other documentation that was specified as a contractual deliverable.
- Safety-related warning and fault threshold values, beginning-of-life performance characteristics, compliance and certification testing including interlock strategies
- First responder action plans, including signage for access routes, assembly points, and emergency lighting

Operation, Maintenance and Incident Response

Normal Operation and Maintenance Phases, follow plans from the design phase from references such as:

- ESIC Energy Storage Commissioning Guide and Implementation Guide
- ESIC Energy Storage Reference Fire Hazard Mitigation Analysis
- NFPA 855

Incident Response and Reporting:

- Corporate Responsibility Initiative Emergency Response Plan
- ESIC Energy Storage Safety Incident Gathering and Reporting List

Decommissioning and End of Life

A plan should be in place for Decommissioning, ESS Component Recycling and Disposal, and recommissioning where necessary. Existing Guidelines include:

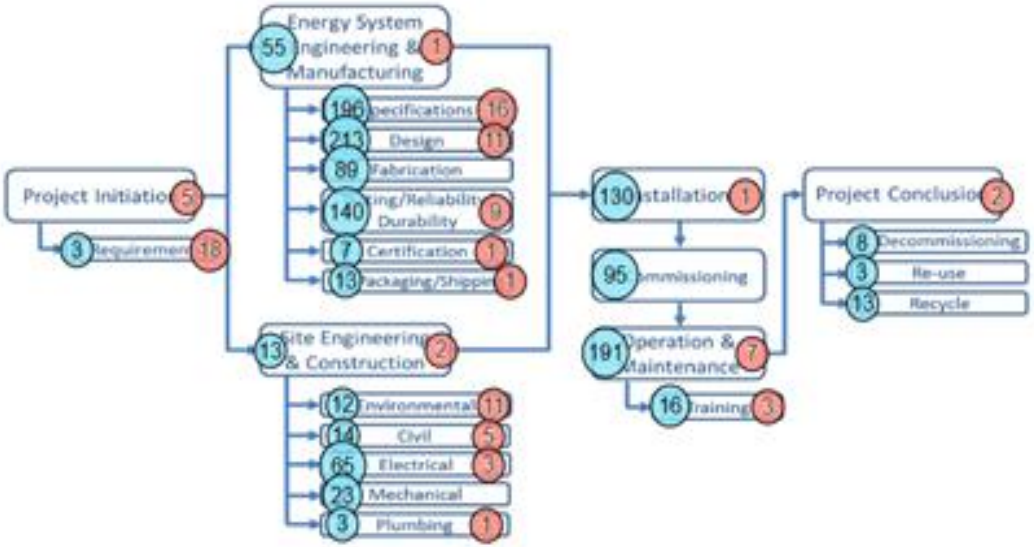
- Recycling and Disposal of Battery-Based Grid Energy Storage Systems
- ESA Corporate Responsibility Initiative: U.S. Energy Storage Operational Safety Guidelines 2019
- ESA End-of-Life Management of Lithium-ion Energy Storage Systems
- UNECE. Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria: Sixth Edition. 2015.
- CFR Title 49 - Transportation.
- U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act.

Lessons Learned

South Korea MOTIE Report	There should be careful investigation of ESS components. For example, examining battery cells for defects will help to avoid cell failures.
	There needs to be careful consideration of the ESS environment with respect to moisture and/or temperature control.
	Proper care during ESS installation is required. For example, batteries should be properly stored prior to installation, and careful installation will avoid incorrect connections and wire shorts.
	Proper care integrating different ESS components that may originate from different manufacturers is crucial.
Myanmar Battery Incident Report	There should be careful investigation of ESS components. For example, examining battery cells for defects will help to avoid cell failures.
	Proper care during installation is required. Careful installation will avoid incorrect connections, loose materials and wire shorts.
McMicken Battery Investigation	Following a thermal event, flammable gases can build up in the ESS, resulting in explosion. Mitigation strategies should be considered.
Japan Transport Safety Board Report (44)	There needs to be careful consideration of temperature control.
	There should be careful investigation of ESS components. For example, examining battery cells for defects will help to avoid cell failures.
	Safety testing should be carefully planned to simulate actual operation conditions, so that effects of potential incidents are not underestimated.
PCTEST Battery Incident Root Cause Analysis	There should be careful investigation of ESS components. For example, examining battery cells for defects will help to avoid cell failures.

Updates to Codes, Standards and Regulation

- Many global organizations have created ESS standards to help ensure safe operation (UL, IEEE, ESA, ESIC etc.)
- NRC has a web based tool to search for the appropriate ESS standards by Canadian jurisdiction/ESS element
- Gaps still exist within the CSR Landscape, and codes are constantly under revision



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THANK YOU

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