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**Code for emergency exercises of electrochemical energy
storage station**

电化学储能电站应急演练规程

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Code for emergency exercises of electrochemical energy storage station

1 Scope

This document specifies the requirements for emergency exercise plan preparation, work preparation, process implementation, evaluation and summary, as well as continuous improvement for production safety accidents of electrochemical energy storage station.

This document applies to emergency exercises of electrochemical energy storage station with lithium-ion cell, flow cell, lead-acid (carbon) cell, sodium-ion cell, water-electrolysis-produced hydrogen/fuel cell as energy storage carriers.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 42312, Guide for production safety emergency response plan of electrochemical energy storage station

AQ/T 9008, Training syllabus and examination specification for work safety emergency management professionals

AQ/T 9009, Specification for emergency exercises evaluation of production safety accidents

AQ/T 9011, Guidelines for enterprises to assess emergency response plan on work place accidents

DL/T 692, Electric power trade urgently saving technique rule

DL/T 2528, General terminology of electrical energy storage

3 Terms and definitions

Terms and definitions determined by DL/T 2528 and the following are applicable to this document.

4.4 The emergency exercise of electrochemical energy storage station shall be reported to the superior unit of the power station and the competent department of the local government in advance. Also, the relevant surrounding units shall be notified and informed of the relevant information of the emergency exercise.

4.5 Before the emergency exercise of electrochemical energy storage station, the information such as the quantity, quality, and inspection status of the emergency supplies and equipment shall be reviewed; after the exercise, the emergency supplies shall be replenished in time, reviewed, and confirmed again.

5 Plan preparation

5.1 Requirement analysis

The electrochemical energy storage station shall prepare a contingency plan according to the requirements of GB/T 42312 and its own actual situation, which shall clarify the emergency exercise requirements of the electrochemical energy storage station, analyze the risk factors and weak links in the operation and maintenance of the electrochemical energy storage station, and determine plans for emergency exercise, etc.

5.2 Plan preparation

The electrochemical energy storage station shall prepare the emergency exercise plan for the next year at the end of the previous year, which shall determine the accident scenario type, accident area, participating units of the emergency exercise, main tasks of each stage of the emergency exercise, and the planned date for the implementation of the emergency exercise, etc.

5.3 Plan release

The electrochemical energy storage station shall release the emergency exercise plan to the personnel of the unit one week in advance. For emergency exercises that require the cooperation of government departments such as traffic control and fire protection, the relevant units shall be contacted in advance and informed of the main purpose, type, form, time and content of the emergency exercise, as well as the departments and personnel that need to cooperate; the announcement of the emergency exercise plan shall be released in advance in accordance with the requirements of relevant units.

6 Work preparation

6.1 Organization

6.1.1 Commander-in-chief

A commander-in-chief, who is responsible for organizing and leading the preparation and implementation of the exercise, shall be set for the emergency exercise. The

commander-in-chief, held by the person in charge of the exercise unit, shall examine and approve the exercise work plan, exercise safety guarantee plan, exercise work funds, and other important matters that need to be decided, approve the start and end of the exercise activity, and in case of emergency during the exercise, approve the start of the exercise safety guarantee plan, and direct the emergency handling.

6.1.2 Planning and steering team

The planning and steering team of the emergency exercise – composed of the equipment management and dispatching and monitoring personnel of the exercise unit – is responsible for the preparation of the exercise work plan, exercise script, and exercise safety guarantee plan, and responsible for the preparation of the exercise activity, the layout of the accident scenario, the control of the exercise process, the maintenance of the exercise order, and the scheduling of participants and materials, as well as the liaison and coordination with relevant units and working groups.

6.1.3 Logistical support team

The logistical support team of the emergency exercise – composed of the logistics personnel of the exercise unit – is responsible for the funding guarantee, transportation guarantee, energy guarantee, security guarantee, technical guarantee, medical guarantee, record guarantee and other logistics related guarantee measures in the exercise activity.

6.1.4 Exercise rescue team

The exercise rescue team of the emergency exercise – composed of the operation and maintenance personnel of the electrochemical energy storage station and firefighters – shall, according to fire accidents, sudden environmental events, equipment electric shocks, and mechanical scenarios simulated on site during the exercise activity, carry out operation monitoring, equipment operation, emergency evacuation, safety alert, fire extinguishing operations, rush repair operations, etc. according to the division of responsibilities in the emergency plan.

6.1.5 Medical rescue team

The medical rescue team of the emergency exercise – composed of firefighters and medical personnel with medical rescue qualifications – is responsible for the preparation of first-aid equipment and medicines. During the exercise activities, they are responsible for transferring the injured for first aid, and contacting and assisting the medical institution to carry out the transfer and rescue if necessary.

6.1.6 Exercise evaluation team

The exercise evaluation team of the emergency exercise – composed of experts in emergency response and fire protection – is responsible for the whole-process and all-round follow-up evaluation of the exercise preparation, organization and implementation. After the exercise is over, it shall provide evaluation opinions and

- b) type of accident in the electrochemical energy storage station, time and place of occurrence, and failure point of the accident equipment;
- c) the losses caused, the spread range and the alternative future of the accident in the electrochemical energy storage station.

6.3.3 Script

The script of emergency exercise shall mainly include:

- a) duration of each step and the corresponding scenario content;
- b) disposal actions and operational staff;
- c) instructions and dialogue;
- d) technical equipment selected;
- e) practice transcripts.

6.3.4 Safety guarantee plan

The safety guarantee plan of emergency exercise shall mainly include:

- a) possible accidents and their emergency response measures;
- b) safety facilities, equipment and safety guarantee personnel for the emergency exercise;
- c) conditions and procedures for abnormal termination of the emergency exercise;
- d) other safety precautions.

6.3.5 Evaluation plan

The emergency exercise evaluation plan shall mainly include:

- a) purpose, scenario description, brief introduction of emergency response actions and response measures, etc. of the emergency exercise;
- b) emergency exercise preparation, emergency exercise plan, emergency exercise organization and implementation, emergency exercise effect, etc.;
- c) evaluation indexes for the realization degree of the purpose of the emergency exercise;
- d) format and content of the emergency exercise evaluation report.

7 Process implementation

7.1 Exercise record

Before the emergency exercise, the filing procedures shall be carried out in the relevant government departments, and the relevant units shall be informed of the time, place, purpose, and precautions of the exercise.

7.2 On-site inspection

Before the emergency exercise, the tools, equipment, facilities, and technical data qualification required for the emergency exercise of the electrochemical energy storage station, as well as the availability of participants, shall be confirmed.

7.3 Exercise description

Before the official start of the emergency exercise, an explanation shall be given to the participants so that they can understand the emergency exercise rules, scenarios and main content, job responsibilities, precautions and contact information of the team leaders.

7.4 Start

The commander-in-chief of the emergency exercise shall announce the start of the emergency exercise, and the participating units and personnel shall participate in the emergency response actions according to the set accident scenarios and complete all the exercise work.

7.5 Implementation

7.5.1 Desktop exercise implementation

During the desktop exercise, after the commander-in-chief of the exercise issues information instructions according to the emergency plan or emergency exercise plan, the participating units and personnel shall complete the emergency response activities in the form of answering questions or simulating deduction based on the received information. The desktop exercise can be carried out in a cyclical manner in accordance with the four links of issuing information, asking questions, analyzing and making decisions, and evaluating and summarizing.

- a) Issuing information. Specifically, the exercise planning and steering team shows the participating units and personnel the emergency exercise scenario through various forms such as multimedia files, sand tables, and message sheets, showing the occurrence and development of production safety accidents.
- b) Asking questions. Specifically, in each exercise scenario, the exercise planning and steering team shall ask one or more questions according to the emergency

- e) Dynamic monitoring. Strengthen state monitoring of cells and other equipment; simulate adjusting the warning range, power-off equipment and cooling protection range according to the changes in disaster research and judgment elements such as fire conditions and combustible gas concentrations.
- f) Troubleshooting. The personnel of the exercise rescue team shall wear protective clothing and simulate equipment failure handling.
- g) Pollution control. Simulate the disposal of waste after on-site fire extinguishing.
- h) End and report. After the drillers clean up the exercise site and report the situation to the planning and steering team, the commander-in-chief shall announce the end of the emergency exercise.

7.5.2.1.2 Electrical equipment fire accident exercise

Fire electrical equipment fire accident exercise of electrochemical energy storage station shall be carried out in accordance with the following steps.

- a) The commander-in-chief shall release the scenario information of the emergency exercise, and carry out the emergency exercise on the designated equipment in the exercise area of the electrochemical energy storage station.
- b) After receiving the emergency notification, the operation and maintenance personnel of the exercise rescue team shall immediately organize to go to the scene, simulate cutting off the power supply of the faulty equipment, report the fire to the planning and steering team, and notify the surrounding units and people.
- c) The operation and maintenance personnel of the exercise rescue team shall notify and guide the personnel in the station to evacuate urgently and quickly, pull up the warning line, make a preliminary judgment on the impact of the fire on the spot, and choose whether to send a rescue application to the professional fire brigade and call the police; the reporter shall explain to the fire brigade the nature of the burning material, the fire conditions and other relevant information.
- d) According to the fire situation and on-site conditions, the personnel in the emergency rescue team shall wear gas masks or positive pressure respirators to simulate fire extinguishing. They shall simulate – when the fire is out of control – stopping firefighting immediately, controlling the spread of the fire, and evacuating to a safe area.
- e) With the close cooperation of professionals, the firefighters in the exercise rescue team shall wear protective clothing, protective glasses and other protective equipment, as well as positive pressure oxygen respirators, and use fire extinguishing equipment with good insulation performance to carry out simulated fire extinguishing.

- f) When the fire is initially under control, the personnel in the exercise rescue team shall wear protective clothing and simulate the handling of faulty equipment.
- g) After the fire is reliably controlled and the drillers clean up the exercise site and report the situation to the planning and steering team, the commander-in-chief shall announce the end of the emergency exercise.

7.5.2.2 Emergent environmental accident exercise

7.5.2.2.1 Liquid leakage accident exercise

Liquid leakage accident exercise of electrochemical energy storage station shall be carried out in accordance with the following steps.

- a) The commander-in-chief shall release the scenario information of the emergency exercise, and carry out the emergency exercise on the designated equipment in the exercise area of the electrochemical energy storage station.
- b) After receiving the emergency notification, the personnel of the exercise rescue team shall immediately organize to go to the scene, report the leakage situation to the planning and steering team, simulate cutting off the power supply at the fault location, and notify the surrounding units and people. For flow cell, first simulate the closing of the relevant valves and circulation pumps of the faulty equipment.
- c) The operation and maintenance personnel of the exercise rescue team shall quickly pull up the warning line and keep the roads on site unobstructed.
- d) After the maintenance personnel of the exercise rescue team arrive at the scene, they shall review the outage of the energy storage system in the station.
- e) Under the guidance of professionals, the firefighters in the exercise rescue team shall wear protective equipment and go to the leakage site to investigate the leakage situation at the site, and after confirming that there are no potential safety hazards, they shall simulate leak plugging, collection, and cleaning.
- f) Simulate the recycling of leaked waste and surrounding polluted soil, and simulate the leakage treatment of damaged equipment and buildings (structures).
- g) The maintenance and repair personnel of the exercise rescue team shall wear protective clothing and simulate the handling of faulty equipment.
- h) After the drillers clean up the exercise site and report the situation to the planning and steering team, the commander-in-chief shall announce the end of the emergency exercise.

7.5.2.2.2 Hazardous gas accident exercise

- a) The commander-in-chief shall release the emergency exercise scenario information, and carry out the emergency exercise in the designated area for the exercise of the electrochemical energy storage station.
- b) After receiving the emergency notification, the operation and maintenance personnel of the exercise rescue team shall immediately organize to go to the scene, simulate cutting off the power supply of the equipment that is electrocuted and the power supply of equipment that is at risk of electric shock during the rescue process, and simulate using insulating tools to disconnect the electric shocker from the power supply.
- c) When the electric shocker is disconnected from the power supply, according to the specific situation of the electric shocker, quickly simulate taking rescue suiting the case. At the same time, immediately report to the emergency exercise medical rescue team and make an emergency call.
- d) The medical rescue team shall simulate the electric shock rescue activities; the rescue measures shall meet the requirements of DL/T 692.
- e) After the drillers clean up the exercise site and report the situation to the planning and steering team, the commander-in-chief shall announce the end of the emergency exercise.

7.5.2.4 Mechanical injury accident exercise

Mechanical injury accident exercise shall be carried out in accordance with the following steps.

- a) The commander-in-chief shall release the emergency exercise scenario information, and carry out emergency exercise in the exercise area of the power station.
- b) After receiving the notification, the operation and maintenance personnel of the exercise rescue team shall immediately go to the accident site, simulate cutting off the power supply of the equipment that is electrocuted and the equipment power supply that may have the risk of electric shock during the rescue process, and simulate the medical injury rescue activities.
- c) After confirming that there is no secondary injury, according to the specific situation of the electric shocker, quickly simulate taking rescue suiting the case. At the same time, immediately report to the emergency exercise medical rescue team and make an emergency call.
- d) The medical rescue team shall simulate the electric shock rescue activities; the rescue measures shall meet the requirements of DL/T 692.

- e) After the drillers clean up the exercise site and report the situation to the planning and steering team, the commander-in-chief shall announce the end of the emergency exercise.

7.6 On-site management and control

On-site management and control shall be implemented during the emergency exercise of the electrochemical energy storage station; the control content mainly includes:

- a) Delineate the warning area according to the severity of the accident, evacuate the surrounding people, and coordinate the traffic police department to divert the road traffic;
- b) Strictly control the entry and exit of people and vehicles within the warning area, and arrange special personnel to guide and locate rescue vehicles;
- c) During the exercise, the participants shall use equipment such as thermal imagers, thermometers, gas detectors, etc. to continuously monitor the temperature and gas content of the scene, strengthen real-time monitoring of the unburned and unexploded battery module area, and timely adjust the warning range;
- d) During the exercise, personnel and vehicle equipment shall keep a sufficient safe distance from the energy storage battery and lines;
- e) Do not blindly shoot water at unburned batteries during the exercise.

7.7 Exercise record

During the exercise of the electrochemical energy storage station, the logistics support team shall record the exercise process by means of text, photos, audio and video.

7.8 Interrupts

During the implementation of the emergency exercise of the electrochemical energy storage station, the commander-in-chief of the emergency exercise can interrupt the emergency exercise according to the pre-specified procedures and instructions. The main scenarios include:

- a) A real emergency occurs, which requires the participants to return to their posts quickly to perform emergency duties;
- b) The evaluation team finds serious safety risks that may cause casualties and equipment damage, which cannot be eliminated in time;
- c) The supervision team finds serious deviations in the exercise or dangerous situations that may cause casualties;

Appendix A

(Informative)

Implementation steps of different types of cell fire emergency exercises

A.1 Lithium-ion cell, lead-acid (carbon) cell, sodium ion cell

The implementation steps of fire emergency exercises for lithium-ion cell, lead-acid (carbon) cell, sodium ion cell mainly include the following.

- a) The commander-in-chief shall release the scenario information of the emergency exercise, and carry out the emergency exercise on the designated equipment in the exercise area of the electrochemical energy storage station.
- b) After receiving the emergency notification, the operation and maintenance personnel of the exercise rescue team shall immediately organize to go to the scene, report the situation to the planning and steering team, choose to call the police according to the size of the fire, pull up the warning line, notify the surrounding units and crowds, and guide the emergency evacuation of people in the station.
- c) The personnel of the emergency rescue team shall master the disaster research and judgment elements such as the accident location, burning state, spreading situation, battery-related types, quantity and arrangement, and the scope of battery fire. The operation and maintenance personnel shall immediately simulate cutting off the power supply equipment related to the faulty battery, and cut off power to nearby electrical equipment.
- d) The operation and maintenance personnel of the exercise rescue team shall remotely confirm whether the fire extinguishing device is activated normally. If it is not activated normally, it shall simulate the remote activation of the fire extinguishing device. Operation and maintenance personnel shall use fire extinguishing equipment with good insulation performance to simulate fire extinguishing. Simulate the further expansion of the fire, control the spread of the fire and evacuate the people outside the safe range, and wait for the firefighters to arrive at the scene. When the firefighters arrive at the scene, the operation and maintenance personnel of the exercise rescue team shall inform the firefighters of the exercise rescue team of the fire information and safety precautions in a timely manner, and simulate assisting the firefighters to continue to fight the fire from a safe distance. Simulate continuous cooling after fire extinguishing.
- e) Use gas detectors, infrared thermometers and other instruments to conduct real-time monitoring of on-site gas concentration and accident site temperature.

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