

ICS 27.100
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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

DL/T 1972-2019

**Basic technical conditions for hydropower plant training
simulation system**

水电厂培训仿真系统基本技术条件
(English Translation)

Issued on: January 1, 1970

Implemented on: October 1, 2019

Issued by: National Energy Administration

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Foreword

This standard is drafted in accordance with the rules given in GB/T 1.1-2009 "Guidelines for Standardization Part 1: Standard Structure and Compilation".

Please note that certain contents of this document may involve patents. The issuing agency of this document is not responsible for identifying these patents.

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the Electric Power Industry Hydropower Station Automation Standardization Technical Committee.

Drafting organizations of this standard. China Institute of Water Resources and Hydropower Research, Beijing Zhongshuike Hydropower Technology Development Co., Ltd., China Three Gorges Corporation Co., Ltd., Datang Pengshui Hydropower Development Co., Ltd., Guodian Nanjing Automation Co., Ltd.

1 Scope

This standard specifies the basic requirements, software function requirements, hardware configuration requirements and system performance of the operation and maintenance training simulation system for hydropower plants Claim.

This standard applies to the design, manufacture and maintenance of digital simulation

training systems for hydropower plants.

2 Normative references

The following documents are essential for the application of this document. For dated reference documents, only the dated version applies to this document.

For undated references, the latest version (including all amendments) applies to this document.

DL/T 578 Basic technical conditions of computer monitoring system for hydropower plants

3 Terms and definitions

The following terms and definitions apply to this document.

Operator training simulation system Refers to a system that uses computer simulation technology to simulate real work scenarios and train the trainees' operation and maintenance skills.

Simulation engine

Refers to being responsible for time advancement, scheduling operation, simulation control, data storage in the simulation system, and displaying the situation during the simulation operation.

Show to provide interactive simulation operation control software.

One simulator with multi-models Refers to running multiple sets of simulation object models on a training simulation system at the same time, each model can provide independent training for multiple training objects Simulation scene.

4.1 Operating environment

- a) Altitude. not more than 2000 meters
- b) Temperature. 18-25 degrees Celsius
- c) Humidity. 45%-65%

4.2 It should be able to simulate the production process such as operation, maintenance and testing of the hydropower plant equipment based on the operating principle, structural principle and test principle.

4.3 It should have a multi-mode, group training function.

4.4 It shall have the functions of training file management, online teaching, self-study, assessment and appraisal, and skill competition.

4.5 It should have a monitoring simulation man-machine interface, and it should be

consistent with the simulation power station monitoring system.

4.6 It should have the function of simulation inversion.

4.7 User integration and maintenance tool software should be provided.

4.8 There should be training process and result recording, printing and management functions.

4.9 The man-machine interface should be friendly, easy to operate, simple and flexible.

4.10 The system should be open and expandable.

5 Simulation modeling objects and measuring points

The simulation modeling objects of hydropower plants should include the following.

- a) Water turbine and auxiliary equipment
- b) Governor and hydraulic device
- c) Generator and auxiliary equipment
- d) Excitation system
- e) Main transformer and its auxiliary equipment
- f) Computer monitoring system
- g) Plant electrical equipment system
- h) DC equipment system
- i) Relay protection and safety automatic device
- j) Public equipment system
- k) Switchyard equipment system
- l) Unit technical water supply and roof drainage system
- m) Flood discharge system
- n) Water delivery system
- o) Online monitoring system
- p) Reservoir

Refer to Appendix A for simulation measurement point data.

6.1.1 Skills training

According to the requirements of the level appraisal of the operation and maintenance personnel of the hydropower plant, it shall have the function of grading training. It should include the following.

- a) Theoretical knowledge learning;
- b) Operation monitoring and equipment inspection;
- c) Run operation simulation training - Normal start-up and shutdown, grid-connection and de-training operations of the unit;
 - Unit load adjustment;
 - AGC/AVC switching operation;
 - Normal operation and operation of the unit speed control system;
 - Normal operation and operation of the generator excitation system;
 - Normal operation and operation of the generator and its auxiliary equipment;
 - Normal operation and operation of the turbine and its auxiliary equipment;
 - Normal operation and operation of the main transformer and its auxiliary equipment;
 - Normal operation and switching operation of switch station (GIS);
 - Simultaneous device switching and cutting operations;
 - Switching and cutting operations of the main equipment of the oil, gas and water system;
 - Normal operation and operation of the hydraulic system;
 - Normal operation and operation of the unit braking system;
 - Normal input and withdrawal of protection devices;
 - Normal operation and operation of auxiliary power equipment;
 - Normal operation and operation of the DC system;
 - Normal operation and operation of the gate system;
 - Operation switching of other equipment.
- d) Failure and accident simulation training - Switch station (GIS) accident, fault simulation and handling operations;
 - Hydro-turbine generator set accidents, fault simulation and handling operations;
 - Transformer accidents, fault simulation and handling operations;