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Standard for technical renovation of small hydropower station

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1 General

1.0.1 This standard is formulated in order to standardize the technical transformation of small hydropower stations, promote the technological progress of power stations, scientifically utilize hydropower resources, eliminate potential safety hazards, ensure safe operation, improve production technology and energy efficiency, and improve the ecological environment.

1.0.2 This standard applies to the technical transformation of small hydropower stations with a single station installed capacity of 500kW~50000kW.

1.0.3 The technological transformation of small hydropower stations should follow the principles of safety, reliability, environmental protection, reasonable technology, and economical applicability, make full use of existing facilities or equipment of hydropower stations, and actively adopt mature new technologies, new processes, new equipment, and new materials.

1.0.4 Before the technical transformation of small hydropower stations, relevant design reports should be compiled. When the electromechanical equipment conforms to the current national standard "Small Hydropower Station Electromechanical Equipment Scrap

Conditions" GB/T 30951, it should be scrapped and updated in time.

1.0.5 The technical transformation of small hydropower stations shall not only comply with this standard, but also comply with the relevant current national standards and meet the needs of river channel ecological flow discharge.

2.0.1 Technical renovation

Taking technical measures to rebuild, update, increase or reduce the capacity of small hydropower station facilities or equipment, and improve its reliability, economy, rationality and advanced nature.

2.0.2 Renovation by renewal of equipment

Activities to update small hydropower plant facilities or equipment in order to improve facility or equipment performance, increase efficiency and reliability.

2.0.3 Renovation for increasing installed capacity

It is an activity to carry out technological transformation of electromechanical equipment, increase the installed capacity of the power station, improve performance, and increase efficiency and reliability.

2.0.4 Renovation for decreasing installed capacity

Carry out technological transformation of electromechanical equipment, reasonably reduce the installed capacity of power stations, improve performance, optimize operating areas, and improve efficiency and reliability.

3.0.1 The following data should be collected for technical transformation of small hydropower stations.

1 Engineering design, completion and operation data;

2 hydrological and sediment data;

3 Safety testing and performance testing or evaluation data;

4.Other relevant information.

3.0.2 Before the technical transformation of small hydropower stations, safety analysis should be carried out on hydraulic structures, hydraulic machinery, electrical, metal structures and other facilities or equipment based on safety inspection or evaluation results, operation and maintenance data, and the necessity of technical transformation should be determined. evaluate.

3.0.3 Before the technical transformation of small hydropower stations, the water resource

utilization conditions shall be analyzed and evaluated according to the river planning and the latest hydrological data, and the following contents shall be included.

1 Review runoff and flood when necessary;

2 Possibility of increase and decrease of working water head and flow;

3 Amount of discarded water available;

4 Conditions for reducing head loss and flow loss;

5 Ecological flow and discharge facilities.

3.0.4 The performance evaluation of facilities or equipment shall be made based on the preventive test report or the current performance test results.

3.0.5 Analyze the operation data and maintenance data of the power station, and combine the hydrological data to study the change law of the water level, water head, flow, ecological flow, sediment content, etc. in the upstream and downstream of the power station, and demonstrate the necessity and feasibility of the power station transformation.

4 performance test

4.0.1 For hydro-generator units with a unit capacity of 10,000kW and above, performance comparison tests shall be carried out before and after technical transformation.

4.0.2 Turbine performance test should be carried out in accordance with the specific circumstances, according to the relevant provisions of the current national standard "Site Acceptance Test Regulations for Small Water Turbines" GB/T 22140 or "Hydraulic Turbines, Storage Pumps and Pump Turbines Hydraulic Performance Field Acceptance Test Regulations" GB/T 20043.

4.0.3 For the power station where the main mechanical and electrical equipment exceeds the design service life or affects the safe operation, and abnormal conditions occur, the inspection and evaluation shall be carried out according to the current national standard "Small Hydropower Station Safety Inspection and Evaluation Specification" GB/T 50876.

4.0.4 The detection of steel gates and hoists can be carried out in accordance with the relevant provisions of the current industry standard "Technical Regulations for Safety Inspection of Hydraulic Steel Gates and Hoists" SL101.The inspection of penstocks can be carried out in accordance with the relevant provisions of the current industry standard "Technical Regulations for Safety Inspection of Penstocks" NB/T10349.

4.0.5 For the performance test of the main electrical equipment of small hydropower stations, the preventive test report or the current performance test results can be used before the transformation. After the transformation, the test and acceptance should be carried out according to the current national standard "Electrical Equipment Handover Test

Standard for Electrical Installation Engineering" GB 50150.

4.0.6 The detection and evaluation results shall be used as the basis for determining the necessity of technological transformation of small hydropower stations, the transformation plan and the assessment of the effectiveness of technological transformation.

5.1.1 When one of the following situations occurs, technical transformation shall be carried out.

1 There are potential safety hazards;

2 Large changes in the upstream and downstream hydrological characteristic parameters;

3 Unreasonable utilization of water energy resources;

4 The quality of civil construction, equipment manufacturing or installation is poor, the performance of equipment is backward, and the technical condition is poor;

5 Changes in geological conditions;

6 No ecological flow discharge facilities;

7 Electromechanical equipment meets the scrapping conditions;

8 Other situations that require modification.

5.1.2 The usable part of the existing facilities and equipment shall be reviewed and calculated as necessary, and corresponding technical processing shall be carried out if necessary.

5.1.3 Small hydropower stations with a lot of discarded water can be expanded and transformed. During the transformation, the impact of the discharge of ecological flow on the installed capacity should be considered, the installed capacity should be reasonably determined, the reference flow, head loss, structural strength, hydraulic transition process, etc. of the water diversion system should be reviewed and calculated, and other equipment and facilities should be reviewed.

5.1.4 Power plants with low annual utilization hours, reduced water head or flow can be converted to capacity reduction. "Technical Transformation Standards for Small Hydropower Stations" GB/T 50700-2022

5.2.1 The technical transformation of hydraulic structures shall meet the following requirements.

1 Eliminate potential safety hazards;

2 The submergence loss is small;

3 It is convenient for construction.