

ICS 27.140
CCS F 23

DL

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

DL/T 793.3-2019

**Power plant reliability evaluation procedures - Part 3:
Hydropower units**

发电设备可靠性评价规程 第3部分：水电机组 清晰版
(English Translation)

Issued on: June 4, 2019

Implemented on: October 1, 2019

Issued by: National Energy Administration

Table of Contents

Foreword
1 Scope
2 Terms and definitions
3 Unit status division and statistical time
4 Evaluation Index
5 Statistical Evaluation
6 Filing requirements
Appendix A (informative appendix) Chinese and English comparison of the reliability status of hydropower units
Appendix B (informative appendix) Chinese and English comparison of reliability index of hydropower unit
References

Foreword

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

This standard specifies the corresponding technical requirements and methods for the reliability statistics, analysis and evaluation of conventional hydropower units. DL/T 793 the "Regulations for Reliability Evaluation of Power Generation Equipment" is a series of standards, divided into seven parts, of which the published standards are.

--Part 1: General rules;

--Part 2: Coal-fired units;

--Part 5: Gas turbine generator set.

This standard is part 3 of DL/T 793.

This standard is compiled in accordance with the relevant content of the "Reliability Evaluation Regulations for Power Generation Equipment Part 1: General Rules". Therefore, in this for general terms and evaluation indicators that are not defined or specified in the standard, and indicators that are not in Appendix A and Appendix B, please refer to Read "Reliability Evaluation Regulations for Power Generation Equipment Part 1: General Rules".

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the Power Industry Reliability Management

Standardization Technical Committee.

Drafting organizations of this standard. China Electricity Council, China Yangtze Power Co., Ltd., Huaneng Lancang River Hydropower Company limited by shares

1 Scope

This standard specifies statistical methods and evaluation indicators for the reliability of power generation equipment in hydropower stations.

This standard applies to hydroelectric power generation equipment of hydropower enterprises, except for pumped storage units.

2 Terms and definitions

Reliability for generating equipment Refers to the ability of a device to complete a specified function under specified conditions and within a specified time interval.

Reliable capacity (DC) dependable capacity the maximum capacity that a generator set can reach in a given period due to external environmental constraints such as water head and water volume.

Available capacity (AC) available capacity the maximum capacity that the generator set can reach after considering the various restrictions of the equipment.

In use (ACT) active

The equipment is in a state to be statistically evaluated. The use status is divided into available and unavailable.

2.4.1

Available (A) available the equipment is in a state capable of performing predetermined functions, regardless of whether it is running or not, and regardless of how much power it can provide. Available Status includes running and standby.

a) Run (S) in service for equipment, it means that the generator or tuned camera is electrically connected to the power system for work (including trial operation), which can be full Output operation, planned or unplanned operation with reduced output; for auxiliary equipment, it means working for the unit.

b) Reserve (R) reserve shutdown the device is available, but not running.

c) Unit reduced output operation (IUND) in-service unit derated the unit cannot reach the state of reliable capacity operation (excluding normal output adjustment according to the load curve). Reduced output of the unit can be divided into operation for planned and unplanned reduction operations.

1) In-service planned derated operation (IPD) the unit was operated as planned with a reduced output during the set time period.

2) In-service unplanned derated operation (IUD) Unpredictable unit operation with reduced output.

2.4.2

Unavailable (U) unavailable the equipment is in a state of being unable to operate or unable to stand by for whatever reason. Unavailable status is divided into planned outage and unplanned Out of service.

a) Planned outage (PO) planned outage the unit is out of operation according to the pre-planned state due to inspection, test or overhaul. The planned outage includes Class A planned maintenance outage (POA), Class B planned outage for maintenance (POB), Class C planned outage for maintenance (POC) and Class D planned outage for maintenance (POD).

b) Unplanned outage (UO) 2.5 Inactive (IACT) inactive in accordance with the relevant national policies, the unit shall be stored out of service or out of service after long-term modification approved by the prescribed department.

state. The time when the crew is in the disabled state does not participate in the statistical evaluation.

Gross maximum capacity (GMC) the maximum capacity that the unit can continuously carry in a given period. Generally, the rated capacity of the unit can be used.

Gross actual generation (GAG) gross actual generation the actual amount of electricity generated by the unit in a given period.

Gross maximum generation (GMG) gross maximum generation the amount of electricity generated by the unit continuously operating at the maximum gross capacity during a given period.

Unit derated capacity (UNDC) unit derated capacity the difference between the available capacity (AC) and the reliable capacity (DC) when the unit is in a reduced output state.

2.10

Probability of starting failure (PS) the probability that the unit cannot provide the load during all or part of the demand period.

2.11 Time term definition

2.11.1

Service hours (SH) service hours the number of hours the device has been in operation.

2.11.2

Reserve hours (RH) reserve shutdown hours the number of hours the device has been in standby state.

2.11.3

2.11.4

Unplanned outage hours (UOH) the number of hours the equipment was in a forced outage (UO1-3) or unplanned maintenance outage state (UO4), of which forced outage hours (FOH) Forced outage hours are divided into the following 3 categories.

a) Category 1 unplanned outage hours (UOH1) immediate No1 unplanned outage hours the number of hours that the unit is in Category 1 unplanned outage;

b) Type 2 unplanned outage hours (UOH2) delayed No2 unplanned outage hours the number of hours that the unit is in the category 2 unplanned outage state;

c) Category 3 unplanned outage hours (UOH3) postponed No3 unplanned outage hours the number of hours the unit was in Category 3 unplanned outage the forced outage hours are expressed as.

FOH=UOH1 UOH2 UOH3 (3) Type 4 unplanned outage hours (UOH4) deferred No.4 unplanned outage hours the number of hours that the unit was in Category 4 unplanned outage, including general maintenance outage time (BMOH) and delayed maintenance Repair outage time (EMOH), unplanned outage hours of category 4 (UOH4) are expressed as.

2.11.5

Period hours (PH) period hours the number of calendar hours the device is in use.

2.11.6

Available hours (AH) available hours the number of hours the device is available.

Available hours is equal to the sum of operating hours and standby hours, expressed as

2.11.7 Unavailable hours (UH) the number of hours the device has been unavailable.

Unavailable hours is equal to the sum of planned and unplanned outage hours or the difference between the hours during the statistical period and the available hours,

expressed as 2.11.8 Unit year (UY) the number of hours in the statistical period of one device or the sum of the number of hours in the statistical period of multiple devices divided by the calendar hours of the year, namely for a device 2.11.9 Utilization hours (UTH) the actual gross output of the unit is converted to the number of operating hours when the nameplate capacity (NC) is converted.

2.11.10