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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 6451-2023

Technical parameters and requirements for oil-immersed power transformers

油浸式电力变压器技术参数和要求

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents" Drafting. This document replaces GB/T 6451-2015 "Technical Parameters and Requirements for Oil-immersed Power Transformers" and GB/T 25289-2010 "20kV Technical parameters and requirements for oil-immersed distribution transformers. This document is based on GB/T 6451-2015 and integrates GB/T 25289-2010 Content. Compared with GB/T 6451-2015, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

---The no-load loss of 6kV level and 10kV level non-excitation voltage regulating distribution transformers dropped by about 28% on average, and the no-load current dropped by about 20%. The no-load losses of 6kV and 10kV non-excitation voltage regulating power transformers and on-load voltage regulating distribution transformers have decreased on average About 20%, the no-load current drops by about 20% on average (see Table 1~Table 3, Table 1~Table 3 of GB/T 6451-2015).

---Added relevant technical content of 6kV and 10kV single-phase non-excitation voltage regulating distribution transformers (see Chapter 4).

---Added relevant technical content of 20kV transformers (see Chapter 5 and Appendix B).

---The no-load loss of 35kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops by about 20% (see Table 7~Table 9, Table 4~Table 6 of GB/T 6451-2015).

---The no-load loss of 66kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops by about 20% (see Table 11

and Table 12, Table 8 and Table 9 of GB/T 6451-2015).

---The no-load loss of 110kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops on average About 20% (see Table 14~Table 18, Table 11~Table 15 of GB/T 6451-2015).

---The no-load loss of 220kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops on average About 20% (see Table 19~Table 25, Table 16~Table 22 of GB/T 6451-2015).

---The no-load loss of 330kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops on average About 20% (see Table 26~Table 32, Table 23~Table 29 of GB/T 6451-2015).

---The no-load loss of 500kV transformers drops by about 20% on average, the load loss drops by about 5% on average, and the no-load current drops on average About 20% (see Table 33~Table 36, Table 30~Table 33 of GB/T 6451-2015).

---Added relevant technical content of 750kV and 1000kV transformers (see Chapter 12, Chapter 13, Appendix A and Appendix D). Please note that some content in this document may be subject to patents. The publisher of this document assumes no responsibility for identifying patents. This document is proposed by the China Electrical Equipment Industry Association. This document is under the jurisdiction of the National Transformer Standardization Technical Committee (SAC/TC44). This document was drafted by: Shenyang Transformer Research Institute Co., Ltd., Baoding Tianwei Baobian Electric Co., Ltd., Mingzhu Electric Co., Ltd. Co., Ltd., TBEA Shenyang Transformer Group Co., Ltd., Wujiang Transformer Co., Ltd., Chint Electric Co., Ltd., China Electric Power Technology Research Institute Co., Ltd., TBEA Hengyang Transformer Co., Ltd., Haihong Electric Co., Ltd., Xi'an Xidian Transformer Co., Ltd., Xi'an High Voltage Electrical Apparatus Research Institute Co., Ltd., Shandong Electric Power Equipment Co., Ltd., Changzhou Xidian Transformer Co., Ltd., Guangdong Power Grid Co., Ltd. Electric Power Research Institute, Hainan Weite Electric Group Co., Ltd., TBEA Xinjiang Transformer Factory, Jiangsu Su Huapeng Transformer Co., Ltd., Guangdong Kangdewei Electric Co., Ltd., Baoding Tianwei Group Tebian Electric Co., Ltd., Jiangsu Yawei Transformer Transformer Co., Ltd., China Southern Power Grid Co., Ltd. Ultra-High Voltage Transmission Company Maintenance and Test Center, Xiangtan Huaxia Special Transformer Co., Ltd. Division, Chenglai Electric Technology Co., Ltd., Zhejiang Detong Transformer Co., Ltd., Tianjin Tebian Electrical Transformer Co., Ltd., Wolong Electric Yinchuan Transformer Co., Ltd., Zhejiang Jiangshan Transformer Co., Ltd., Wuhu Jinniu Electric Co., Ltd., Hefei Yuanzhen Electric Power Technology Co., Ltd. Co., Ltd., Tiansheng Electric Co., Ltd., Chongqing Wangbian Electric (Group) Co., Ltd., Hebei Gaojing Electrical Equipment Co., Ltd., Shenda Electric Gas Group Co., Ltd., Shandong Dachi Electric Co., Ltd., Jiangsu Tianhua Transformer Co., Ltd., Jichang Electric Group Co., Ltd., Daqing Huayi Electric Gas Engineering Automation Co., Ltd., TBEA Beijing-Tianjin-Hebei Intelligent Technology Co., Ltd., and State Grid Shaanxi

Electric Power Company Electric Power Research Institute. The main drafters of this document. Zhang Zhongguo, Zhang Dong, Cai Dingguo, Gao Minhua, Che Li, Lin Canhua, Li Jinbiao, Fu Chao, Sun Jicheng, Liu Jinbo, Liang Qingning, Nie Sanyuan, Hao Yuliang, Guo Penghong, Li Zixing, Lin Chunyao, Zhu Yanchun, Dong Honglin, Cai Shengwei, Meng Jie, Chen Qi, Wang Wenguang, Zhang Yajie, Tian Zhengwen, Deng Jun, Zhang Ximing, Zheng Guopei, Qian Guofeng, Zhao Wenzhong, Lu Wei, Jiang Zhenjun, Liu Chaofeng, Xiong Shifeng, Wu Tianyou, Zou Hong, Cao Jianfei, Zheng Jun, Kong Feifan, Zhou Hui, Guo Yanliang, Fu Jingxin, Li Qiangde, Qi Yingya, Liu Xiaowei. The previous versions of this document and the documents it replaces are as follows:

---First published as GB/T 6451-1986 in 1986, revised for the first time in.1995, revised for the second time in.1999, and third revised in.2008 The first revision, the fourth revision in.2015;

---This is the fifth revision and incorporates GB/T 25289-2010 "Technical Parameters and Requirements for 20kV Oil-immersed Distribution Transformer". Technical parameters and requirements of oil-immersed power transformers

1 Scope

GB/T 6451-2023 sets the technical parameters and requirements for oil-immersed power transformers across the whole Chinese voltage range. It is one of the most consequential product standards in the country's electricity system: it fixes the rated capacities, the impedance voltages, the no-load and load losses and the sound levels that every transformer purchased by the grid companies must meet, and because the loss figures are binding they determine a large part of the energy dissipated in the network as a whole. The standard works up the voltage classes in turn - 6 kV and 10 kV, 20 kV, 35 kV, 66 kV, 110 kV, 220 kV, 330 kV, 500 kV, 750 kV and 1000 kV - giving for each the parameter tables and the requirements that go with them, with normative annexes on the testing of 20 kV dual-voltage transformers and on the tests to be negotiated between user and manufacturer. It replaces GB/T 6451-2015 and GB/T 25289-2010 and took effect on 1 April 2024.

This document specifies the performance parameters, technical requirements, inspection rules and methods, marking, lifting, packaging, transportation and Storage. This document is applicable to applications with rated frequency of 50Hz, rated capacity of 30kVA and above, and voltage levels of 6kV, 10kV, 20kV, Three-phase oil-immersed power transformers of 35kV, 66kV, 110kV, 220kV, 330kV, 500kV, 750kV and rated capacity of 5kVA and above, single-phase oil-immersed power transformers with voltage levels of 10kV, 20kV, 500kV, 750kV and 1000kV.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 1094.1 Power transformers Part

3 Terms and definitions

The following terms and definitions as defined in GB/T 1094.1 and GB/T 2900.95 apply to this document.

3.1 When the 1000kV single-phase oil-immersed auto-coupling power transformer adopts the transformer body part and the voltage regulation compensation part to be arranged in separate boxes, the transformer body part.

Note. See Appendix A for wiring principles.

3.2 The voltage regulation compensation part of the transformer is arranged separately from the main transformer.

Note. The function of the voltage regulation compensation transformer is to reduce the voltage fluctuation of the low-voltage winding of the transformer during the neutral point voltage regulation process. Please refer to Appendix A for the wiring principle.

5 Ability to withstand short circuit

GB/T 1094.7 Power Transformers Part

7 Loading Guidelines for Oil-immersed Power Transformers

GB/T 1094.10 Power transformer Part

10 Sound level determination

GB/T 1094.18 Power transformer Part

18 Frequency response measurement

GB/T 2900.95 Electrical terminology transformers, voltage regulators and reactors

GB/T 4109 Insulating bushings with AC voltage higher than 1000V

GB/T 11604 Radio interference test method for high-voltage electrical equipment

JB/T 501 Power Transformer Test Guidelines