



# Research on the Benefit Evaluation Method for the Implementation of the New Power System Technical Standards System

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**Abstract.** This article studies the connotation of the new power system technical standard system; Analyzing and comparing the advantages and disadvantages of evaluation methods for the implementation of domestic technical standard systems from two dimensions: the single standard economic effect evaluation method and the standardized systematic economic benefit evaluation method, providing a basis for the selection of evaluation methods for the implementation of new power system technical standard systems.

**Keywords:** new type of electricity · technical standard system · benefit evaluation

## 1 Introduction

Standards are the technical support for economic activities and social development, and are an important aspect of the country's fundamental system [1]. In the new era, promoting high-quality development and comprehensively building a socialist modernized country urgently requires further strengthening standardization work. In order to thoroughly implement the National Standardization Development Outline, actively promote the implementation of the goal of "carbon peaking, carbon neutrality", and promote the construction of a new power system with new energy as the main body, the State Grid Corporation of China organized more than 100 experts inside and outside the system to jointly prepare the National Grid New Power System Technical Standard System.

The evaluation of the implementation benefits of technical standards refers to the process of predicting, analyzing, and calculating the comprehensive benefits generated by the implementation of technical standards [2]. At the same time, the effectiveness of standard implementation is an important indicator of measuring the results of standardization activities and a microcosm of the modern management level of enterprises. The evaluation of the effectiveness of implementing technical standards can be seen as a system and studied using the method of system evaluation [3].

The new power system technology standard system is constructed based on the principles of systematicity, coordination, openness, and scalability. It is decomposed into modules according to the professional technology of the new power system, highlighting key technical directions such as new energy, energy storage, microgrid, and digitization, forming a system framework of “8 branches, 34 fields, and 122 series”. In order to provide a true and objective evaluation of the implementation of the new power system technical standard system, it is crucial to establish an effective method for evaluating the benefits of implementing technical standards.

## **2 Research Process of Evaluating the Effectiveness of Implementing Technical Standards**

The academic research on standardization started relatively early in foreign countries, laying a good theoretical foundation for the practical application of technical standard systematization [4, 5]. In 1997, the Deutsches Institut für Normung (DIN) carried out a two-year study on the “overall economic benefits of standardization” in Germany, Austria and Switzerland, and used regression analysis to calculate the contribution rate of various production factors to the overall economic growth. In his book “Principles of Industrial Standardization” published in 1972, Matsuura Shiro of Japan comprehensively and systematically studied and elaborated on the basic laws of standardization activities, and proposed 19 principles [6]. In 1998, the Japanese Ministry of Economy, Trade and Industry proposed the project “Research on Economic Benefit Evaluation Methods for International Standardization Activities”. The Japan Specification Association has undertaken research work and achieved phased research results. Jones studied the role of technological standardization in product quality assessment, and the results showed that technological standardization not only helps to reduce product quality assessment costs, but also increases consumer welfare [7]. Allen used a case study to investigate the impact of technological standards on enterprise innovation, and the results showed that the promoting effect of technological standards on enterprise innovation is far greater than the hindering effect [8]. Lecraw uses cross industry data and uses multiple linear regression analysis to analyze the impact of technical standards on enterprise product prices, quality, and universality, but has not studied the mechanism by which technical standards affect product prices [9]. Henk De Vires believes in his representative work “Standardization: The Business Approach of National Standardization Organizations” that the standards and standardization definitions provided by the International Organization for Standardization, as well as other standardization organizations, are too restrictive and can only be applied to the standardization organization’s own standardization [10].

## **3 Categories of Evaluation Methods for the Implementation of Technical Standards**

The evaluation methods involving standardization can be divided into two categories: one is the evaluation of the economic effects of a single standard, and the other is the evaluation of the economic benefits of a standardized system, as shown in Table 1.

**Table 1.** Standardized Economic Benefit Evaluation Method

	<b>Evaluation method</b>	<b>Evaluation objectives</b>	<b>Category</b>	<b>Applicable scope</b>	<b>Advantages and disadvantages</b>
Single Standard Economic Effect Evaluation	Economic Benefit Evaluation Method for International Standardization Activities in Japan	Economic benefits of participating in international standardization activities for standards in a certain field	Qualitative and quantitative	Upgrading domestic standards in a certain field to international standards	Simple process, difficult to obtain numerical values
	A Method for Evaluating the Economic Effectiveness of Simple Individual Standards	Simple individual standard economic effect	Ration	Individual national standards, industry standards, local standards, and enterprise standards	Intuitive and simple, unable to reflect and distinguish the common effects of standards and other elements, easy to cross and repeat
Economic Benefit Evaluation of Standardized Systemization	System Comprehensive Evaluation Method	Macroscopic standardization implementation economic benefit evaluation	Ration	Evaluate the standardization contribution rate of a country or region	Intuitive and easy to understand, with less data to collect. Strong subjectivity and insufficient scientific basis
	Production Function Method	Macroscopic standardization implementation economic benefit evaluation	Ration	Evaluate the standardization contribution rate of a country or region	Multiple instances have been verified. Difficulties in data collection
	Value Chain Evaluation Method	Implementation effect of standardization based on industry chain	Qualitative and quantitative	Enterprise or industry	Need to analyze the industry chain of a certain enterprise or industry

(continued)

**Table 1.** (continued)

	<b>Evaluation method</b>	<b>Evaluation objectives</b>	<b>Category</b>	<b>Applicable scope</b>	<b>Advantages and disadvantages</b>
	Fuzzy Comprehensive Evaluation Method	Evaluation of standardized economic benefits at the industry and national levels	Ration	Evaluation of standardized economic benefits at the industry and national levels	The clear and systematic results can effectively solve fuzzy and difficult to quantify problems, making it suitable for solving various non deterministic problems
	121 Evaluation Method	Implementation effect of standardization based on enterprises	Qualitative and quantitative	Enterprise	It is necessary to collect evaluation indicators and data of enterprises, and ensure their relevance and objectivity

The evaluation of the economic effectiveness of a single standard has been shown by research in Japan that if a domestic new technology product standard is formed into an international standard, it can generally bring economic benefits of 30 billion yen. Taking the international standard for flat pallets for transportation as an example, Japan invested 56 million yen and generated an economic benefit of up to 230.4 billion yen. In terms of mobile phone standards, due to the lack of adoption of Japan's PDC standard by international standards, Japan has incurred an increase in purchasing technical standards, paying for technology transfer fees, and increasing production costs and prices by 5–10%, resulting in an annual loss of over 30 billion yen.

The production function method is widely used in the evaluation of standard systematic economic benefits. German DIN adopts the macro data from 1960 to 1996, the Cobb Douglas production function, and the conventional production factors: capital, labor force, and technological progress, of which technological progress uses three output indicators: the number of patents, export license fees, and standard numbers. Through research, it has been found that a significant portion of the growth in the output value of German operating industries is related to standards. During the period from 1960 to 1990, the standard contribution rate accounted for 0.9% of the overall annual

output growth rate of 3.3%, second only to capital investment, and more important than other sources of technological progress such as domestic innovation and direct purchase of technology from abroad. BSI in the UK used statistical data from 1948 to 2002 to analyze the following three conclusions: firstly, for every 1% increase in effective standard quantity, labor productivity increases by 0.05%; The second is that the standard is related to 0.28% of the annual growth rate of labor productivity, which is 13% of the productivity growth rate in the UK from 1948 to 2002; Thirdly, the impact rate of technological progress on the annual economic growth of the UK is 1.0%, while the GDP output growth rate based on this is 2.5%. Therefore, the contribution rate of the standard to technological progress exceeds 25%.

#### **4 Inspiration from the Study of Evaluation Methods for the Implementation Benefits of Technical Standards**

Most research on implementation benefits focuses on economic benefits, while there is less research on the evaluation of comprehensive benefits such as social benefits and environmental protection benefits. Most of the existing studies focus on the economic functional analysis of standards, such as how to stimulate technological innovation and technological progress through standards to promote economic growth, or how to reduce product costs by promoting economies of scale [11]. However, for power companies, the implementation benefits of technical standards not only focus on economic benefits, but also on the social benefits generated by the standards, such as energy conservation, emission reduction, and sustainable development.

The existing theoretical research methods mostly focus on the evaluation of the benefits of implementing individual standards, and the research on the evaluation of the benefits of implementing standardized systems is currently in a blank stage. The research on existing literature has limitations in scope, with most of it focusing on the evaluation of the implementation benefits of individual standards. The research on the evaluation of the implementation benefits of standardized systems is still in a blank stage. For enterprises or industries with complex business division, numerous process processes, and a large technical standard system, existing research results are difficult to provide sufficient theoretical guidance.

In terms of evaluating the effectiveness of enterprise technical standards, the content is relatively mature. Starting from the various characteristics of standard indicators and guided by the full lifecycle management of technical standards, targeted improvements are made to different links to ensure the effectiveness of technical standards; In terms of the effectiveness evaluation methods of the enterprise technology standard system, they include the “process + process + module” method, Analytic Hierarchy Process, system comprehensive evaluation research method, fuzzy set identification standard, and fuzzy comprehensive evaluation method. The most commonly used effective evaluation methods are concentrated in the Analytic Hierarchy Process.

## 5 Conclusion

This article studies the connotation of the new power system technical standard system; Analyzing and comparing the advantages and disadvantages of evaluation methods for the implementation of domestic technical standard systems from two dimensions: the single standard economic effect evaluation method and the standardized systematic economic benefit evaluation method, providing a basis for the selection of evaluation methods for the implementation of new power system technical standard systems.

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