

“Five Targets” management strategy of formulating international standards for energy enterprises

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Abstract. There are many problems in energy enterprises, such as insufficient understanding of internationalization, serious shortage of international talents, unthorough investigation of the rules of international standards organization, and inadequate transformation of existing achievements into standards, which seriously restrict the development of international standardization. The article relies on the research on management strategy of the State Grid Shanghai Electricity Research Institute, and proposes a "Five Targets" international standardized formulation system, which develops the closed-loop value chain of platform operation, professional focus, processed management, refined control, and industrialization development. The chain drives the implementation of the world's leading strategy of energy enterprises, builds an international technology standard ecosystem, enhances the international influence and global competitiveness of energy enterprises, and opens up new areas and new prospects for building a world's leading urban energy internet enterprise with Chinese characteristics.

1 Introduction

At present, a new round of scientific and technological revolution and industrial transformation is emerging, bringing new opportunities and numerous challenges to the energy and electric power industry. China is the world's largest producer and consumer of energy. Guaranteeing national energy security and economic and social development has always been the primary goal of energy development. At the same time, China is also shouldering the important task of promoting technological innovation, improving regional energy transformation, achieving sustainable development and reflecting the responsibility of a major country. A new and further requirement is put forward for China's energy enterprises to build an advanced international standardized formulation system ^[1-4].

Nowadays, there are many problems in energy enterprises, such as insufficient understanding of internationalization, serious shortage of international talents, unthorough investigation of the rules of international standards organization, and inadequate transformation of existing achievements into standards, which seriously restrict the development of international standardization ^[5-9]. Therefore, it is of great significance for energy enterprises to build a set of international standardized management system with strong pertinence, easy operation and standard procedures and integrate talents and technical resources for optimizing their management level, enhancing economic benefits, highlight social value and gathering strength for ecological development ^[10-11].

In response to this situation, the State Grid Shanghai Electricity Research Institute takes advantage of technological innovation and international business to build a strategic positioning of "the window for the world to observe Chinese power" for improving the level and management of international standardized formulation system, and promoting the implementation of the energy internet research and innovation system. At the same time, the State Grid Shanghai Electricity Research Institute proposes the "Five Targets" management strategy of international standardized formulation system, drives the implementation of the world's leading strategy of energy companies, builds an ecosystem of international technology standards, enhances the international influence and global competitiveness of energy companies, and moves from "walking in step" to "running". In order to a build a world's leading urban energy internet enterprise with Chinese characteristics, it is necessary to explore new areas and create new prospects in the future.

2 The "Five Targets" management strategy of formulating international standards

The connotation of "Five Targets" management strategy of formulating international standards is to develop a closed-loop value chain of five targets through platform operation, professional focus, processed management, refined control, and industrialization development. Focusing on five aspects: hub-based platform

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construction, multi-dimensional and multi-channel professional layout cultivation, enterprise-level full-processed management, "Three Wide" refined management and control, and integrated achievement industrial chain construction. Full efforts are made to promote the efficient operation of the international standardized formulation value chain to ensure high-quality cultivation, incubation, formulation and release of international standards to drive innovation and breakthroughs in scientific research systems, professionals, core technologies, brands and values, and accelerate the pace of building a world's leading enterprise with Chinese characteristics.

2.1 Target 1: Build a multi-level collaborative architecture model and promote hub-based platform operation

In order to meet the change of macro environment and the technical talents, and ensure the efficient operation of the international standardized formulation system, the State Grid Shanghai Electricity Research Institute further optimizes organization system and operation mode, integrates organization system, base construction, and university platform resources to form a multi-level platform architecture model, which is horizontal coordinated, vertical connected, internal and external integrated, efficient and collaborated (Fig 1). Its goal is to upgrade the international standardized formulation, promote the common development of all parties, and reshape the energy ecology while achieving win-win results for all parties.



Fig. 1. The platform of international standardized formulation system

2.1.1 Horizontal construction of the collaborative and efficient organizational system

In order to optimize the organizational structure of international standardized formulation and promote the goal of organizational system reform, under the overall leadership of the Standardization Committee of the State Grid Shanghai Power Research Institute, standard centralized management department is responsible for the specific business arrangement and deployment. 6 special working groups and 6 professional work teams are responsible for the technical standards of developing and formulated for key fields. As an entity department, each professional centre supports and guarantees the formulation and revision of various technical standards.

The expert advisory committee provides guidance and suggestions, and the Shanghai Institute of standardization provides maintenance support. To achieve the breakthroughs of formulating international standards in key sectors, some special international standardization expert teams have been established in areas such as energy storage applications, superconducting cables, smart power distribution networks, and big data in Shanghai Power Grid. With the goal of transforming advanced technological achievements into international standards, the teams take the initiative to formulate special plans for standardization and promote the formulation of international standards, so as to continuously make new breakthroughs in the formulation of international standards in key and characteristic areas of Shanghai.

2.1.2 Vertical construction of the international first-class standard innovation base

Relying on the technical standard innovation base and the international standard innovation base, the State Grid Shanghai Electricity Research Institute continues to strengthen the planning and guidance of the formulation of technical standards to build a world-class standard innovation base. By focusing on the deployment of six directions including DC magnetic bias, dynamic capacity increase, big data, power storage, cable and PMU, and six majors including planning and design, engineering construction, operation and control, the professional advantages are brought into play. At the same time, the standard layout is optimized, the standardization work is coordinated and unified, and the development of fine products is promoted. Focusing on the development of Shanghai power grid and key areas for tackling key scientific and technological problems, it is important to implement the integrated management mode of national standards, bank standards, enterprise standards, group standards and international standards, and strengthen the coordinated management of making and revising technical standards.

2.1.3 Build an integrated innovation ecosystem of industry-university-research institute and domestic and foreign academic platforms

By combining the industry-university-research technology alliance with domestic and foreign academic platforms, an integrated innovative open ecosystem will be formulated. Based on the cooperation of industry-university-research integration technology alliance and relying on comprehensive strategic cooperation projects with Shanghai Jiao Tong University and Shanghai University of Electric Power, it accelerates the formation of the preliminary research results or draft standards of international standards. As the secretariat affiliated units of Chinese Society for Electrical Engineering, China Electrotechnical Society, Shanghai Metrology Association and other special committees, relying on the achievements of industry-university-research efforts to improve academic leadership, strategic support,

international influence and basic support capacity. The State Grid Shanghai Electricity Research Institute makes full use of international exchange platforms such as the Conference International Repartition et Distribution Chinese National Committee (CIRED CNC), the International Utility Working Group (IUWG), IEEE PES and Offshore Wind Power Sub-Committee to carry out international standard exchanges and speeches. At the same time, it provides international business supports for the Global Sustainable Electricity Partnership (G-SEP), World Future Energy Summit and other international conferences, and actively implements the international promotion of standards.

2.2 Target 2: Establish multi-dimensional and multi-channel layout cultivation, focus on oriented specialization

In order to realize the professional development requirements of leading energy enterprises of "being more refined, deeper and stronger", the State Grid Shanghai Electricity Research Institute establishes the multi-dimensional supply-demand matching law to determine the preferred direction, and implements the multi-channel precision incubation strategies to focus on cultivating fields of advantage.

2.2.1 Establish multi-dimensional supply and demand matching rules to determine the preferred direction

Starting from the six aspects of international standardization gaps, key technological market demand, key international discourse power, high-end technological achievement transformation, engineering and product internationalization, and state-owned enterprise brand building, it is necessary to sort out the international standardized formulation pedigree in the energy field systematically, and identify and exert force point and determine the "main attack direction" of standardized formulation.

The foundation of international talents, professional technology and engineering application is strengthened, and the "ammunition" for standard internationalization work is enriched. The first is to strengthen the cultivation and reserve of internationalized standard talents, the second is to strengthen the summary and refining of professional and technical fields, and the third is to strengthen the concise improvement of engineering application results. The three mechanisms of standard cultivation and transformation, performance incentive and internal and external liaison provide the necessary "catalyst" for the internationalization of standards. It is implemented to establish "dynamic" standard reserve pool and implement "quantitative" performance incentives and smooth internal and external "integrated" communication.

2.2.2 Develop multi-channel accurate incubation strategies for key cultivation

Based on the special support of standardized funds, supporting multi-level scientific research projects and experimental verification abilities, the resources and platform guarantee of standardized formulation work will be strengthened. With international standardized training, interdisciplinary international talent cultivation and standardization of engineering experience as the starting point, we will strengthen the technical and ability guarantee of standardized formulation.

2.3 Target 3: Develop a closed-loop mechanism for the whole life cycle and strengthen enterprise-level processed management

The international standardized formulation covers the whole life cycle of standards. In order to strengthen the collaborative management of the formulation from the front-end layout to the back-end application, the State Grid Shanghai Electricity Research Institute establishes a three-stage processed management mechanism of planning, formulation and promotion (Fig 2).

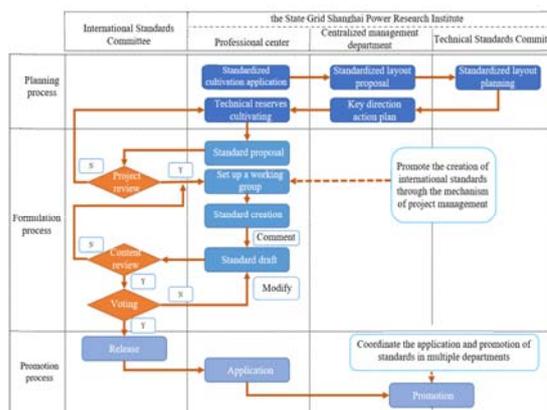


Fig. 2. Main flow chart of international standardized formulation management

Planning process: including standardized cultivation application, standardized layout proposal, standardized layout planning, the key direction of action plan, technical reserves cultivating. As a whole lead guidance, the technology standard committee design the top layout and comprehensive plan strengthen the cooperative interaction among the manage department and the professional centre. The technical standard cultivation and implementation normalization working mechanism are formed. It consists of a top-down "gradual planning guidance, step-by-step decomposition and implementation", bottom-up "gradual feedback and reporting, step-by-step improvement and promotion", which advancing the advantage and emerging areas in the field of standard breeding work.

Formulation process: including the initiation of standard proposal, project review, establishment of working groups, standard formulation, draft submission, content review of standard text, international voting, internal and external opinions soliciting and other links in each stage. Standard proposal is launched by professional centre, and the necessity and feasibility of formulation standard will be introduced to International

Standards Committee. A joint working group covering major member states of the Standard Committee and relevant industry, university, research and application units shall be set up to undertake the specific compilation work of the standard text and conduct a rolling solicitation of opinions. The draft standard shall be revised step by step until the submitted version is formed and entered into the international voting process of the committee.

Promotion process: including standard release, application and promotion. Led by technical standards committee, the centralized management department is responsible for organizing the industry-university-research technology alliance with domestic and abroad to establish a multi-dimensional cooperation, strategic cooperation and technical alliance. Extensive fund collection, research and special discussions are carried out in response to standards involving tests, parameters and related system performance requirements to enhance the accuracy and applicability of the standard content and ensure the smooth release of the standard. Centralized management departments and specialized centres shall cooperate to carry out publicity and application of technical standards, strengthen the construction of scientific and technological information resource sharing platform, and speed up the update and storage of standards in related fields, especially the collection of IEC, IEEE and GIGRE standards (reports). In combination with the enterprise technology innovation forum, international standard science education activities will be held 2 -3 times every year, as well as the occasional IEC, IEEE, GIGRE related standards (reports) interpretation and learning seminars.

2.4 Target 4: Strict standards of progress , quality and risk, to achieve the "Three Wide" refined control

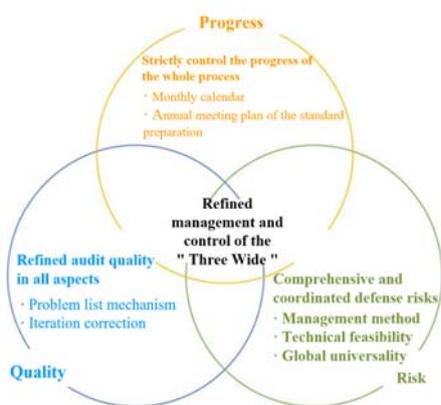


Fig. 3. Refined management and control of the " Three Wide "

In order to further strengthen the progress, quality, and risk management and control of standardized formulation at all levels, the State Grid Shanghai Electricity Research Institute has established and implemented the “Three Wide” refined control (Fig 3), that is, refined control of the entire process, quality

review of the entire process, and comprehensive coordination docking.

2.4.1 Strictly control the progress of the whole process

Based on the monthly calendar and annual meeting plan of the standard preparation, it is important to control the standard preparation progress strictly. According to the requirements of time nodes in the whole process of project approval of international standards, the goal of standard preparation is decomposed in two dimensions of time schedule and the person in charge of the preparation. The key work and node goal of each month is established, and the monthly calendar of standard plan promotion is formed, which serves as the main basis for the implementation and supervision of standard work. According to the participants and importance, which are subdivided into IEC conference, IEC working group meeting, domestic counterpart standard committee promotion meeting, domestic establishment group discussion and etc, it should be done to make annual meeting plan and adopt online and offline meetings as the main support for standard implementation and supervision flexibly. In the implementation phase, the above two plans will be revised on a rolling basis according to the actual situation.

2.4.2 Refined quality review in all aspects

In the whole process of standard preparation, the problem list of technical standards is sorted out and established, and the quality is improved through careful review. During the process of the preparation, proposal, inquiry, approval, publication and other aspects of formulating international standards, it should be done to solicit opinions from domestic and foreign experts extensively, comprehensively analyse various problems in the draft standard, by taking the list of questions as the starting point for work. Through the two main dimensions of standard text norms and standard content depth, as well as the two supplementary of dimension research funding and special research, it should be given about targeted improvement measures and suggestions, iterative feedback and corrections, for improving the quality of standard texts continuously.

2.4.3 Comprehensive and coordinated risk prevention

It is the goal to establish an all-directional, coordinated risk prevention mechanism that runs through the China horizontally and connects the world vertically, so as to comprehensively reduce all kinds of risks encountered in the preparation of standards and ensure the smooth and high-quality completion of standards. At the domestic level, firstly, we should conduct extensive research, fully absorb the valuable experience and practices of international standard advanced units inside and outside the industry, and avoid unnecessary management detours. Secondly, at the technical level, valuable opinions and

suggestions will be extensively solicited from the industry peers to ensure the feasibility and advancement of the standards relying on the National Standardization Committee, which is the counterpart of the international standards. In the international vertical, relying on the international standard platform, the expert recommendation and peer review function of relevant technical committees and working groups should be given full play to eliminate the risks and challenges of global universality of standards brought by international differences.

2.5 Target 5: Connect one-stop achievement transformation chain and promote the development of profitable industrialization ^[12-15]

The State Grid Shanghai Electricity Research Institute takes advantage of international standards to synchronize scientific research and development and transform scientific and technological achievements rapidly. It regards technical standards as the first stop for achievement transformation, and international standards as a gas station for technology research and development brand building and achievement upgrades. An innovative achievement transformation chain has formed the development of profitable international standardized formulation and industrialization of intellectual property distribution, industrial docking, product research and development, application demonstration, and market promotion, which has enhanced international influence.

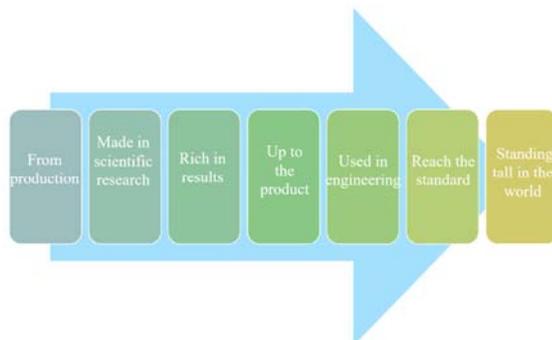


Fig. 4. The complete transformation chain of production and scientific research results

Based on the successful experience of the industrialization of achievements in the field of DC bias, a "seven-step method" type of complete production and scientific research results transformation chain is summarized (Fig 4). (1) From production. Starting from the technical problems encountered in production, analysing and sorting out the key difficulties. (2) Made in scientific research. Setting up scientific research projects, scientific research on theoretical methods to solve key difficulties. (3) Rich in results. Focusing on core technologies, we will produce high-quality patents and papers. (4) Up to the product. Scientific research results from scientific research products and verify core technologies. (5) Used in engineering. Scientific research products are used in engineering practice, demonstration and promotion, and perfect core technical standards. (6)

Reaching the standard. Condensing core technology and formulating professional standards. (7) Standing tall in the world. The technical reserves in advantageous areas have contributed to the establishment, formulation and release of international standards.

3 Conclusion

First-class enterprises shall make first-class standards, and first-class international enterprises shall make first-class international standards. The "Five Targets" international standardized management system proposed in this paper strengthens enterprise-level processed management by establishing a closed-loop mechanism for the full life cycle of technical standards, promotes standard layout work in advantageous and emerging fields, improves the management level of the enterprise's international business systematically, and accelerates the implementation of the world's leading strategy of energy enterprises.

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