Research on Optimization of Science and Technology Innovation System Mechanism of Power Grid Enterprises

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Abstract. The deepening of reforms to the science and technology system represents a crucial avenue for China to bolster its capacity for independent innovation and establish itself as a formidable force in the global science and technology landscape. Grid enterprises play a pivotal role in ensuring national energy security and constitute a vital component of the national economy. They serve as the backbone of state-owned enterprises and are entrusted with a crucial responsibility within the national technological innovation system. The current situation facing the science and technology management system and mechanism of power grid enterprises is undergoing profound changes, and there is an urgent need to deepen the reform of the science and technology system of power grid enterprises, optimize the environment of science and technology innovation, and improve the capacity of science and technology on a systematic basis. Innovation is essential for the rapid realization of high-level scientific and technological self-reliance, which in turn provides robust scientific and technological support for the construction of a new type of electric power system, the promotion of energy transformation, and the provision of services to achieve the 'dual-carbon' goal.

Keywords: Science and technology innovation, technological innovation, institutional reform.

1 Introduction

The contemporary era is witnessing a rapid acceleration of global changes, accompanied by the advent of a new scientific and technological revolution and an energy revolution that is advancing at a profound depth. Countries across the globe are engaged in a race to advance their scientific and technological capabilities, striving to secure a dominant position in the global scientific and technological landscape. The competition in science and technology is not solely concerned with technological innovation and market share; it also has implications for national economic development and international status. National strategic scientific and technological power represents a significant instrument for our country to achieve scientific and technological self-reliance and

M. Huang et al. (eds.), *Proceedings of the 2024 6th Management Science Informatization and Economic Innovation Development Conference (MSIEID 2024)*, Advances in Economics, Business and Management Research 323,
https://doi.org/10.2991/978-94-6463-676-5_10

autonomy. The leading scientific and technological enterprises constitute a crucial foundation for the advancement of national strategic scientific and technological power[1].

As a mega state-owned key backbone enterprise related to the lifeblood of the national economy and national energy security, power grid enterprises should continue to optimize the system and mechanism of science and technology management, explore a more synergistic system of science and technology innovation, a more flexible project management system, and a more efficient mechanism. In order to facilitate the transformation of achievements, it is necessary to implement a more sophisticated incentive and constraints mechanism, and a more rigorous system of talent training. This will enable the entity in question to fulfil its role as a leader in science and technology innovation, and to unleash a steady stream of scientific and technological innovation vitality, and to continuously take advantage of the market's demand. The leading role of science and technology innovation will be fully exploited, a constant stream of scientific and technological innovation vitality will be released, and market demand, integrated innovation, and organisational platforms will be utilised to completely open up the channel from strong science and technology to strong enterprises, strong industries, and a strong economy.

2 Analysis of Scientific and Technological Innovation Institutional Mechanism Problems of Power Grid Enterprises

Firstly, it is necessary to implement further improvements to the science and technology innovation system. The positioning of each innovation body within the power grid enterprise sector is not clearly defined. The configuration of disciplines requires optimization. The leading role of science and technology innovation, coupled with a systematic approach to pursuing ambitious projects, is insufficient. Scientific research activities are relatively dispersed and independent. The integration of diverse aspects of scientific and technological innovation is not highly effective. It is imperative to reinforce interdepartmental and interdisciplinary collaborative innovation. Currently, there is a dearth of substantial interaction and communication between the relevant parties, and the sharing of construction is inadequate. Furthermore, the various types of innovation factors are not fully complementary and aligned, which impedes the formation of a cohesive and integrated innovation system.

Secondly, the process of transforming scientific and technological achievements must be further reinforced. The understanding of researchers in grid enterprises with regard to the transformation of results is biased. The majority of their activities are oriented towards the end of the process, such as the acceptance, title evaluation, and so forth. Consequently, the proportion of scientific and technological achievements that are transferred and licensed is relatively low. The commercial value of the development of the greater difficulty is a further challenge. There is a need to improve the evaluation system of scientific and technological achievements and to build a suitable evaluation system for the characteristics of scientific and technological innovation. This would facilitate the promotion of high-quality output and application of results. At the same

time, there is a lack of incentives for technical managers in the process of transforming achievements. The system of remuneration, wage evaluation and job promotion is unclear, so the relevant system and distribution mechanism require further development[2-3].

Thirdly, it is necessary to implement further improvements to the incentive and constraint mechanism. It is imperative to reinforce the grid enterprise's performance-oriented talent incentive guide and to enhance the scientific research personnel assessment and evaluation mechanism. Furthermore, it is essential to establish and refine the evaluation standards for significant projects and research tasks undertaken by scientific and technological talent.

Fourthly, the cultivation of scientific and technological talent must be further strengthened. The cultivation of high-end talent capacity and the acceleration of the construction of new power systems require the support of major scientific and technological projects and demonstration projects. However, the ability of grid enterprises to take on major scientific research tasks is insufficient. Therefore, it is necessary to further optimize the mechanism for cultivating scientific and technological talent.

3 Optimization Initiatives of Scientific and Technological Innovation System Mechanism of Power Grid Enterprises

3.1 Clarify the Positioning of the Main Body of Scientific Research in Each Unit, and Strengthen the Layout of Forward-Looking Technology

Focusing on the requirements for the construction of a new type of national system for scientific and technological innovation, clearly defining the functional position of the main body of scientific research of each unit, focusing on the basic research of the new type of electric power system and the demand for original innovation, strengthening the layout of forward-looking technologies, strengthening the research of subversive technologies, promoting the improvement of the mechanism of breakthroughs of the new type of electric power system technology of the grid enterprises, and gathering innovative resources to become a source of original technology.

3.2 Strengthen Forward-Looking Technology Layout

The company's strategic focus is on the future shape of the energy Internet. To this end, it will undertake technology layout in three aspects: the energy grid system, the information technology system and the value creation system. In addition, it will strengthen research on disruptive technologies and respond actively to changes and developments in the energy and power industry.

In the context of the energy grid system, the key breakthroughs anticipated in the future of new energy power system grid form and planning technology, 'double high' power system operation and control basic theory, and the whole electromagnetic transient simulation technology of the power grid include the mastery of a high proportion of renewable energy AC and DC hybrid grouping and transmission technology, new

energy active support and accurate prediction technology, and the promotion of AC and DC flexible power transmission technology and equipment. The technology and equipment employed in flexible power transmission.

In terms of the information support system, the key breakthroughs will be in the new generation of dispatch control system that supports integrated grid scheduling, friendly interaction between sources, networks, loads and storage, and the optimal operation of multiple types of energy; the development of independent, safe and controllable secondary automation equipment; the study of network and information security technologies, and the construction of a full-scenario intelligent security protection system[4].

With regard to the value creation system, the objective is to achieve breakthroughs in load sensing and cluster optimization and control technologies, to further develop user interaction technologies such as Telematics, to master multi-energy complementary and integrated energy synergistic control technologies, and to efficiently apply electric refrigeration (heat) and hydrogen generation technologies to support the efficient conversion of major energy varieties.

3.3 Strengthening the Supportive Force of Talents

Firstly, the introduction of overseas high-end talents with greater vigour is to be encouraged. To further reinforce the selection of overseas 'highly sophisticated' talents, a number of 'one-hit wonder' individuals with international influence, in the field of expertise, are to be introduced through the national recruitment platform, headhunters or international companies. These individuals are to make outstanding contributions to the world's 'masters'. The objective is to attract the highest caliber of global talent. The 'one-person-one-negotiation' approach will be adopted in order to gain insight into the working methods, expectations and contract terms of overseas experts. Contracts will be signed which include details of job duties, remuneration packages and confidentiality agreements. The entry and work of overseas experts will be properly arranged, and they will be provided with work and life support.

Secondly, the autonomy of scientific research institutions and their personnel must be increased, and the latter must be authorised. The optimal control of the headquarters should be achieved through the delegation of greater autonomy to scientific research institutions. The authority of scientific research units should be increased, and the intervention or non-intervention of the headquarters should be minimized. The autonomy of scientific research units should be extended to encompass the selection and employment of personnel, scientific research projects, the disposal of results, financial management, salary distribution, and other relevant matters. This will enable scientific research units to operate with greater autonomy and flexibility, and will facilitate a gradual transition in the way enterprises manage scientific research, aligning it more closely with their management of production. This will also help to alleviate the constraints currently faced by scientific researchers.

Thirdly, it is recommended that support for scientific and technological talent be increased, and that the aforementioned talent be actively unbound. In response to the current surge in workflow, work traces and other workloads resulting from standardized

management, inspection and audit procedures, we have reinforced information technology infrastructure, optimized IT services and enhanced the efficacy of scientific and technological research personnel. To illustrate, the mobile phone and computer online reimbursement system has been implemented with the objective of enhancing the standardization and facilitation of reimbursement procedures, thereby optimizing the efficiency of the approval process[5].

3.4 Strengthening Incentive Binding

Firstly, consideration should be given to the strategic layout in order to enhance the value of the distribution of action leadership. The strategic layout of the grid enterprise business serves as a crucial reference point for optimizing assessment and evaluation processes, with the objective of emphasising the strengthening of the 'baton' 'monitor' role as the foundation for the incentive mechanism. This mechanism is designed to facilitate the promotion of strategic layout initiatives pertaining to technology sources, equipment research and development, results output, talent training and other pivotal mechanisms that reinforce the strategic layout of the Institute.

Secondly, the construction of major platforms and the strengthening of the incentive drive represent key areas of focus. The concept of incentives and guarantees of stratification and classification should be adhered to, with the construction and operation of important enterprise platforms combined with the performance objectives of the relying entity and the innovation mechanism. This will result in differentiated incentive combinations, which will drive the strengthening and expansion of incremental contributions. Furthermore, key technology and equipment should be matched to the action, with the implementation of a more flexible performance management system, a more long-lasting incentive structure and a more lenient environment to protect. This will enhance the harvest for experts, talents and front-line scientific researchers, strengthening the incentive mechanism. The aforementioned experts, talents and front-line researchers will, in fact, experience an enhancement in their sense of gain and happiness.

Thirdly, the objective of strengthening strategic support is to enhance incentive effectiveness. It is essential to adhere to the concept of strengthening comprehensive incentive effectiveness based on a combination of initiatives. This should focus on integrating the pursuit of personal value into enterprise development goals, improving remuneration distribution and incentive and constraint mechanisms as the core, and continuously tapping the incentive potential of cultural atmosphere, burden reduction and empowerment, safety and security, and Party building leadership for scientific researchers. In addition, it is vital to promote the overcoming of the limitations of limited scale and slow growth of economic incentives.

4 Conclusion

The advancement of power grid enterprises is inextricably linked to the robust impetus and backing of scientific and technological innovation. It is imperative that grid enterprises persist in the deepening of the reform of the science and technology innovation

system. This must be accompanied by the acceleration of the construction of a more conducive institutional mechanism and innovation ecology. The formation of a favourable situation, in which the competent, the excellent, the mediocre and the bad are distinguished, is a key objective. It is essential to minimize administrative interference in the innovation and creation process. Furthermore, favourable conditions must be created for scientific and technological talents to engage in innovation. The corporate culture must be shaped in a way that encourages innovation and tolerates failures. The potential for innovation must be released, the vitality of innovation stimulated, and the high-quality and sustainable development of the company and the grid promoted. The objective is to facilitate the high-quality development of the company and the power grid.

Acknowledgments

This work was supported by State Grid technology service project- Research on the Company's Scientific and Technological Innovation System and the Management of National Major Scientific Research and Development Tasks.

References

1. Chun Jiang, Shihan Li, Qi Shen. Science and technology evaluation reform and universities' innovation performance[J]. Technology in Society, 2024, 78(1): 102-108.
2. Ashish Arora etal. First-mover advantage and the private value of public science[J]. Research Policy, 2023, 52(9): 244-257.
3. Nan Chen, Chen Han, Lu Wei. The impact of subjective and objective inconsistencies in scientific and technological innovation attributes on the listing of enterprises on the Science and Technology Innovation Board[J]. Procedia Computer Science, 2023, 221: 493-500.
4. Chika Ishii, Kimitaka Asatani, Ichiro Sakata. Obtaining interactions among science, technology, and research policy for developing an innovation strategy: A case study of supercapacitors[J]. Heliyon, 2022, 8(9): 107-120.
5. Lei Zhou, Wen Xiao, Na Yan. International comparative research on the relevance of science and technology and the innovation ability of the rare earth industry-from the perspective of technology-industry mapping based on patent information[J]. Resources Policy, 2023, 80: 224-235.