# Research on the Path to Improving Quality and Efficiency of Talent Cultivation in the Electric Power Industry under the New Situation of the 15th Five-Year Plan

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***Abstract:*** *Under the background of the new phase of the 15th Five-Year Plan, the electric power industry, as a fundamental and strategic industry, is at a critical stage of deepening reform and transformation and upgrading, and the demand for high-quality and leapfrog development is urgent. The supply scale and quality of human resources, as the core driving force, have become key bottlenecks for industry development, prominently manifested as insufficient total volume, structural imbalance, and an imperfect cultivation system. Mere quantitative expansion cannot match the development needs. Based on the new situation of industry reform, this paper systematically analyzes the strategic significance of electric power human resources and talent cultivation, examines prominent problems, and, combined with practical cases and quantitative data, proposes an integrated cultivation path of "simultaneous introduction and cultivation, structural optimization, system improvement, and incentive guarantee", providing support for electric power enterprises to consolidate their talent foundation and promote high-quality development. The innovation lies in constructing a closed-loop system for talent cultivation that can be implemented on the ground, achieving precise alignment between talent cultivation and industry development.*

***Keywords:*** *electric power industry reform; human resources; talent training; high-quality development.*

## 1. Introduction

The launch of the 15th Five-Year Plan has pointed out the development direction of "green, low-carbon, safe, efficient, and intelligent upgrading" for China's electric power industry. The Implementation Opinions on Improving the National Unified Electric Power Market System issued by the General Office of the State Council have clarified the strategic goal of basically building a national unified electric power market system by 2030, which pushes the electric power industry into a new stage of systematic deepening reform[1]. The reform and development of the electric power industry involve technological upgrading, market restructuring, and model innovation, and the core of these efforts cannot be separated from the support of human resources. Talents are the key force for solving the "impossible trinity" of energy[2] and promoting the construction of new-type power systems, and they are also the fundamental guarantee for implementing industry reform tasks and achieving high-quality development[3].

At present, China's electric power industry is transforming from traditional electric power to new-type power systems. Large-scale grid connection of new energy sources such as wind power and photovoltaics, deep integration of digital and intelligent technologies with the electric power industry, and continuous improvement of the marketization level of electricity trading have given rise to emerging professions such as electricity traders, which imposes higher requirements on the professional quality and comprehensive ability of talents[4].

## 2. Core Importance of Electric Power Human Resources and Talent Training under the New Situation of the 15th Five-Year Plan

### *2.1 Electric Power Human Resources Are the Core Support for the Implementation of Electric Power Industry Reform*

During the 15th Five-Year Plan period, the reform of the electric power industry focuses on key tasks such as the construction of a national unified electric power market, the establishment of new-type power systems, and the green and low-carbon transition. The implementation of these tasks cannot be separated from a talent team with a reasonable structure, excellent quality, and outstanding capabilities. In the reform of the electric power market, the promotion of joint trading and the coordinated development of multiple product markets require a large number of interdisciplinary talents who are proficient in power system operation, possess knowledge of finance and law, and are familiar with trading rules. By 2025, the shortage of electricity trader positions has reached 38,000 people. In the construction of new-type power systems, the coordination of source, grid, load, and storage as well as digital and intelligent upgrades require high-level talents with interdisciplinary backgrounds and multi-domain skills to solve technical and practical problems.

### *2.2 Electric Power Human Resources Are the Core Competitiveness of High-Quality Development of Electric Power Enterprises*

Under the background of the new phase of the 15th Five-Year Plan, electric power enterprises are facing dual pressures of fierce market competition and transformation and upgrading. As the most dynamic and potential core resource of enterprises, human resources are the key for enterprises to achieve differentiated competition. The high-quality development of electric power enterprises requires not only advanced technology and complete equipment support but also a professional talent team that can adapt to technological changes, market shifts, and management upgrades. Work in various fields such as new energy development and operation, smart grid construction, electricity trading, and integrated energy services all require the support of professional talents[5]. Practice shows that electric power enterprises that attach importance to human resource development and strengthen talent training are more capable of quickly adapting to industry reform and technological upgrading needs, thus taking the initiative in market competition.

### *2.3 Talent Training Is a Key Measure to Address Talent Shortages and Activate Talent Vitality*

During the 15th Five-Year Plan period, the technological iteration of the electric power industry continues to accelerate. The construction of new-type power systems, digital transformation, and market-oriented reforms put forward new requirements for the professional ability and comprehensive competence of talents. Traditional talent cultivation models can no longer meet the development needs of the industry. As a core means to improve talent quality, optimize talent structure, and activate talent vitality, talent training can precisely match talent capabilities with industry development needs and effectively solve the problem of the asynchronous growth between talent quantity and quality improvement[6]. Systematic and targeted talent training can help existing employees update their knowledge systems, enhance professional skills, and adapt to technological changes and job requirements. It can cultivate interdisciplinary talents with innovative thinking and cross-domain abilities to fill the talent gap in emerging fields. It can also improve talent career development channels, stimulate employees' learning and work motivation, and build a virtuous cycle of "cultivation-utilization-advancement." At the same time, deepening the integration of industry and education and building collaborative education platforms can promote the organic connection of the education chain, talent chain, industrial chain, and innovation chain, continuously supplying high-quality talents for the electric power industry.

## 3. Prominent Problems in Talent Cultivation in the Electric Power Industry under the New Situation of the 15th Five-Year Plan

### *3.1 The Growth of Total Talent Volume Lags Behind, and the Contradiction between Supply and Demand Becomes Increasingly Prominent*

As the reform of the electric power industry continues to deepen during the 15th Five-Year Plan

period, the demand for talents in areas such as new-type power system construction, new energy development, and market-oriented electricity trading has shown explosive growth. The growth of total talent volume lags far behind the pace of industry development, and the contradiction between supply and demand is relatively prominent. According to the 2025 China Electric Power Industry Talent Annual Development Report[7,8], the total talent demand in the electric power industry in 2025 increased by 31.2% compared with three years ago, and the demand for digital talents reached 4.5 times that of two years ago. In the same year, the shortage of electricity trader positions reached 38,000 people, and the shortage of interdisciplinary talents was particularly serious.

Although some electric power enterprises have increased their efforts in talent introduction and increased the total number of talents, most of the newly added talents are concentrated in basic positions. The supply of high-quality, high-skilled, and interdisciplinary talents is insufficient, making it difficult to meet the needs of high-quality and rapid industry development. Particularly in emerging fields such as new energy (NES), smart grid (SG), electricity trading (ET), and digital operation and maintenance (DOM), the talent gap is even more significant. According to the 2025 White Paper on Talent Development in China's Electric Power Industry, the core talent gap in China's electric power industry in 2025 reached 198,000 people, including 72,000 in the new energy field, 51,000 in the digital operation and maintenance field, 38,000 in the electricity trading field, and 37,000 in the smart grid field. This gap has become an important bottleneck restricting the transformation and upgrading of the industry.

### *3.2 The Talent Structure Is Imbalanced and Does Not Match the Development Needs of the Industry*

The current talent structure in the electric power industry has obvious imbalances, which are mainly reflected in three aspects. First, there is a structural imbalance in specialties. The supply of talents in traditional electric power specialties such as power system automation and electrical engineering is relatively sufficient, while the supply of talents in emerging fields such as new energy, digitalization, electricity trading, and financial risk control is seriously insufficient, making it difficult to meet the needs of new-type power system construction and electric power market reform. Second, there is a structural imbalance in hierarchy. The stock of grassroots operational talents is large, while the supply of mid-level management, high-level decision-making, and interdisciplinary talents is insufficient, and the talent echelon construction is not perfect. Third, there is a structural imbalance in age. Some electric power enterprises have an aging talent population, insufficient reserve of young talents, and prominent talent gap issues, which cannot support the sustainable development of the industry. The imbalance in talent structure restricts technological innovation, market expansion, and management upgrading of the electric power industry, making it difficult to meet the high-quality development needs of the industry during the 15th Five-Year Plan period. From the perspective of age structure, the proportion of young talents under the age of 35 in China's electric power industry in 2025 reached 35.6%, while the proportion of talents over the age of 45 dropped to 44.8%. Although the talent gap phenomenon has been alleviated, it is still prominent. From the perspective of specialty structure, the proportion of talents in traditional electric power specialties dropped to 64.2% in 2025, while the proportion of talents in emerging fields such as new energy and digitalization increased to 35.8%. The adaptability to industry transformation needs has continued to improve, but a certain gap still exists.

### *3.3 The Talent Cultivation System Is Imperfect, and the Effectiveness of Training Is Insufficient*

Although most electric power enterprises attach importance to talent training, the existing talent cultivation system still has many deficiencies, and the effectiveness of training is insufficient, making it difficult to achieve precise matching between talent capabilities and job requirements. The specific manifestations are as follows: First, the training objectives are not clear. Some enterprises lack systematic planning and fail to align with the reform direction of the industry during the 15th Five-Year Plan period and the enterprises' development strategies. The training content is disconnected from job requirements, making it difficult to meet the actual needs of talent growth and enterprise development. Second, the training mode is too simplistic, mainly relying on traditional offline lectures and centralized training. It lacks diversified methods such as case teaching, practical exercises, and online-offline integration, which makes it difficult to mobilize employees' learning enthusiasm, and the training effect is poor. Third, the integration of industry and education is insufficient in depth, mostly concentrated at the level of vocational education and oriented toward frontline operations. It lacks systematic and macro-theoretical guidance, making it difficult to meet the needs of high-level talents in scientific research and management for the integration of theory and practice. Moreover, the content of

training bases lags behind the speed of technological iteration. Fourth, the training evaluation mechanism is not sound. There is a lack of comprehensive assessment and feedback mechanisms, which makes it difficult to accurately measure the training effect or optimize the training content and mode accordingly, resulting in training work becoming a mere formality.

### *3.4 The Talent Incentive Mechanism Is Unsound, and the Phenomenon of Talent Loss Is Prominent*

The talent incentive mechanism is the key to activating talent vitality and retaining talents. At present, the talent incentive mechanism in some electric power enterprises still has many deficiencies, making it difficult to meet the needs of talent growth and value demands. First, the incentive methods are too simplistic, mainly focusing on material incentives and lacking diverse forms such as spiritual incentives, career development incentives, and emotional incentives, which makes it difficult to fully mobilize employees' work enthusiasm and creativity. Second, the distribution of incentives is unreasonable, with a tendency toward "egalitarianism." The incentive gap between outstanding talents and ordinary employees is small, which fails to reflect the value of talents and makes it difficult to stimulate a sense of competition among talents. Third, the career development channels are imperfect. In some enterprises, the promotion paths are narrow, and there is a lack of smooth transition mechanisms between management positions, technical positions, and skill-based positions, which limits the space for talent growth. Fourth, the talent evaluation mechanism is unscientific. The evaluation criteria place excessive emphasis on educational background and seniority while neglecting the actual abilities and work performance of talents, making it difficult to objectively and comprehensively assess the value of talents. As a result, outstanding talents fail to receive recognition, and the phenomenon of talent loss is prominent, further exacerbating the contradiction between talent supply and demand.

## 4. Targeted Strategies for Talent Cultivation in the Electric Power Industry under the New Situation of the 15th Five-Year Plan

### *4.1 Optimizing the Layout of Talent Introduction and Cultivation to Alleviate the Contradiction between Talent Supply and Demand*

In response to the problems of insufficient total talent volume and prominent contradiction between supply and demand, electric power enterprises should adhere to the principle of "simultaneous introduction and cultivation, with efforts from both sides," optimize the layout of talent introduction and cultivation, and expand the talent supply. On the one hand, enterprises should increase efforts in talent introduction, precisely align with the development needs of the industry, and focus on introducing high-quality interdisciplinary talents in emerging fields such as new energy, digitalization, electricity trading, and financial risk control, as well as scarce talents in senior management and core technologies. Enterprises should also strengthen cooperation with universities and research institutes, carry out "order-based" talent introduction, reserve young talents in advance, and alleviate the talent gap problem. On the other hand, enterprises should strengthen internal talent cultivation, tap into the potential of existing employees, and carry out systematic and targeted training based on the needs of different positions and levels, so as to promote the simultaneous improvement of talent quantity and quality.

At the same time, relying on resources such as new-type power system demonstration projects and major science and technology special projects, enterprises should build industry-education integration training bases, promote collaborative education among universities, enterprises, and research institutes, expand the scale of talent cultivation, and improve the quality of cultivation. Data show that by the end of 2025, China's electric power industry had built 142 industry-education integration training bases, cultivating a total of 523,000 person-times of various types of electric power talents, including 207,000 person-times of high-skilled talents, which effectively alleviated the talent shortage pressure in some fields. However, compared with the annual talent demand of 258,000 person-times in 2025, a large gap still exists.

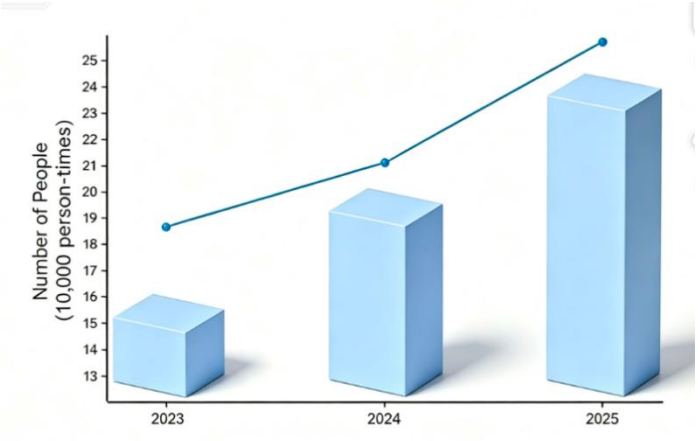


*Figure 1. Comparison between the Talent Cultivation Volume and Demand of Industry-Education Integration in the Electric Power Industry from 2023 to 2025 (Unit: 10,000 persons).*

### *4.2 Optimizing the Talent Structure to Achieve Precise Matching with the Development Needs of the Industry*

Based on the needs of the electric power industry reform and high-quality development during the 15th Five-Year Plan period, efforts should be made to optimize the talent structure and solve the problem of structural imbalance. First, the specialty structure should be optimized by increasing the efforts to introduce and cultivate talents in emerging fields such as new energy, digitalization, electricity trading, and smart grid, while reducing the supply of talents in traditional oversupplied specialties, so as to achieve precise matching between professional talents and industry needs. Second, the talent echelon should be improved by building a three-level system of "young talents, core talents, and leading talents," clarifying the cultivation objectives and growth paths for each level, and strengthening the cultivation and support for young talents to alleviate the talent gap. Third, the age structure should be optimized by increasing the efforts to introduce and cultivate young talents, improving the growth mechanism and development platform, and building a younger, more professional, and interdisciplinary talent team.

### *4.3 Improving the Talent Cultivation System to Enhance the Effectiveness of Training*

Based on the development needs of the industry during the 15th Five-Year Plan period, a systematic, diversified, efficient, and practical talent cultivation system should be built to promote the deep integration of talent cultivation with job requirements, enterprise development, and industry reform. The specific paths are as follows: First, clarify the training objectives. Focusing on the reform direction of the electric power industry and the development strategies of enterprises, a medium- and long-term talent cultivation plan should be formulated, and the training objectives and content for each position and level should be detailed to improve the relevance and systematicness of training. Second, innovate the training mode. Break through traditional models and adopt diversified methods such as "online + offline," "theory + practice," and "case study + exercise." Technologies such as digital twins and virtual reality should be applied to upgrade training bases and create a platform combining virtual and real training. Third, deepen the integration of industry and education. Improve the collaborative education mechanism, promote the joint construction of talent cultivation and training bases by electric power enterprises, universities, and research institutes, and facilitate the deep connection among the education chain, talent chain, industrial chain, and innovation chain. Fourth, establish a sound evaluation mechanism. Build a closed-loop management system of "training-assessment-feedback-optimization," link the assessment results with employee promotion, salary, and merit evaluation, accurately measure the training effect, and continuously optimize the training content and mode. Through the closed-loop operation of "goal setting, plan implementation, assessment feedback, and optimization and improvement," precise matching between training and job requirements as well as talent growth can be achieved, effectively enhancing the effectiveness of training. According to industry statistics in 2025, electric power enterprises adopting closed-loop training management saw the employee training pass rate increase by more than 38% and the training outcome conversion rate increase by 45%, which is significantly better than traditional training models.

### *4.4 Improving the Talent Incentive Mechanism to Retain Outstanding Talents*

The talent incentive mechanism should be improved to activate talent vitality and retain outstanding talents, thereby providing stable support for the high-quality development of the electric power industry. First, enrich the incentive methods by building a diversified system of "material incentives, spiritual incentives, and career development incentives." While increasing the compensation of outstanding talents, enterprises should also strengthen spiritual incentives such as commendations and awards to enhance talents' sense of belonging and honor. Second, optimize the distribution of incentives by breaking down egalitarianism and establishing a distribution mechanism centered on ability and performance. Enterprises should increase the incentive intensity for core talents to stimulate competition and innovation vitality. Third, improve career development channels by building multiple channels for management, technology, and skills, opening up job transition paths, and expanding the space for talent growth. Fourth, establish a sound talent evaluation system by breaking the limitations of educational background and seniority, focusing on actual ability, work performance, and innovation achievements, ensuring fair and reasonable evaluation, and reducing talent loss.

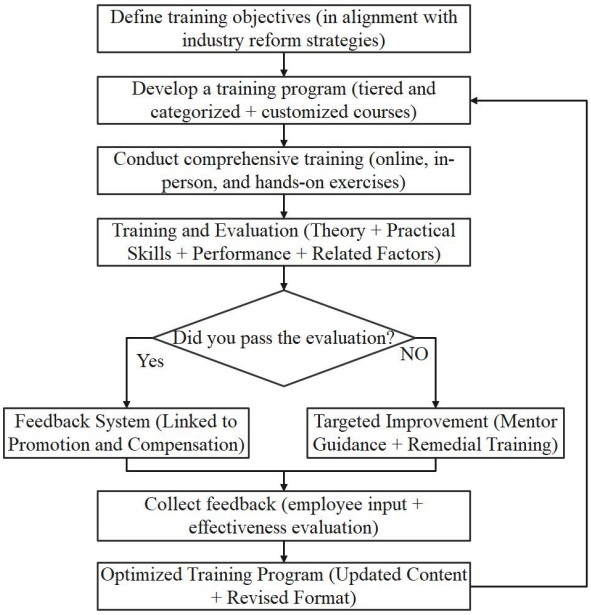


*Figure 2. Flowchart of the Closed-Loop Management for Talent Training in the Electric Power Industry.*

## 5. Conclusion

Under the background of the new phase of the 15th Five-Year Plan, the reform of the electric power industry continues to deepen, the construction of new-type power systems accelerates, and high-quality development becomes the core theme of the industry. As the core driving force of industry development, the importance of human resources is becoming increasingly prominent. At present, talent cultivation in the electric power industry faces prominent problems such as insufficient total volume, structural imbalance, an imperfect cultivation system, and an unsound incentive mechanism. Simply expanding the quantity can no longer meet the needs of high-quality development, so strengthening talent cultivation and addressing the shortcomings have become inevitable choices. Electric power enterprises should base themselves on the development needs of the 15th Five-Year Plan, adhere to the principles of "simultaneous introduction and cultivation, structural optimization, system improvement, and incentive strengthening," and retain outstanding talents by optimizing the layout of introduction and cultivation, adjusting the talent structure, improving the cultivation system, and strengthening the incentive mechanism, so as to build a high-quality, interdisciplinary, and innovative talent team.

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