The information contained in this section, unless otherwise indicated, have been derived from various official government publications and other publications generally believed to be reliable and the market research report prepared by Frost & Sullivan which we commissioned. We believe that the sources of such information are appropriate sources for such information and have taken reasonable care in extracting and reproducing such information. We have no reason to believe that such information is false or misleading in any material respect or that any fact has been omitted that would render such information false or misleading in any material respect. None of our Company, the Sole Sponsor, **[REDACTED]** *any of our or their respective directors, officers or representatives or any other person involved in the* **[REDACTED]***, except for Frost & Sullivan, has independently verified such information nor give any representation as to the accuracy or completeness of such information. As such, you should not unduly rely upon such information in making, or refraining from making, any* **[REDACTED]**.

SOURCE OF INFORMATION

We have commissioned Frost & Sullivan, an independent market research and consulting company, to conduct an analysis of, and to prepare a report on the PRC energy solutions market. The report prepared by Frost & Sullivan for us is referred to in this document as industry report. We agreed to pay Frost & Sullivan a fee of RMB420,000 which we believe reflects market rates for reports of this type.

Founded in 1961, Frost & Sullivan has 40 offices with more than 2,000 industry consultants, market research analysts, technology analysts and economists globally. Frost & Sullivan's services include technology research, independent market research, economic research, corporate best practices advising, training, client research, competitive intelligence and corporate strategy. We have included certain information from the industry report in this document because we believe this information facilitates an understanding of the PRC energy solutions market for the **[REDACTED]**. The industry report includes information of the PRC comprehensive power engineering service market as well as other economic data. Frost & Sullivan's independent research consists of both primary and secondary research obtained from various sources in respect of the power engineering comprehensive service market. Primary research involved in-depth interviews with leading industry participants and industry experts. Secondary research involved reviewing company reports, independent research reports and data based on Frost & Sullivan's own research database. Projected data were obtained from historical data analysis plotted against macroeconomic data with reference to specific industry-related factors. Except as otherwise noted, all of the data and forecasts contained in this section are derived from the industry report, various official government publications and other publications. In compiling and preparing the research, Frost & Sullivan assumed that the social, economic and political environments in the relevant markets are likely to remain stable in the forecast period, which ensures the steady development of the PRC comprehensive power engineering service market.

OVERVIEW OF GLOBAL AND PRC POWER INDUSTRIES

The power industry plays a fundamental role in supporting the operation of the national economy and the energy transition. It encompasses power generation, transmission, distribution, dispatch, trading and related comprehensive energy services. As the global energy transition and the PRC's new power system continue to evolve, the power industry is extending into a broader range of areas, including coordination among source, grid, load and storage segments, comprehensive energy services, and market-oriented operation. These developments impose higher requirements on power engineering design, system integration and comprehensive energy service capabilities.

Traditional Power Generation

Traditional power generation mainly refers to power generation based on non-renewable energy sources such as coal, natural gas, conventional hydropower and nuclear energy. It provides the functions of meeting baseload demand, providing peak and frequency regulation, and supporting the secure and stable operation of power systems.

Renewable Energy Power Generation

Renewable energy power generation mainly refers to power generation based on non-fossil fuel energy sources such as wind, solar and biomass. It features low carbon emissions, broad resource availability and significant potential for large-scale development, and is gradually becoming an important source of newly installed power generation capacity across the global and PRC power markets.

In response to the challenges posed by climate change, the international community has gradually reached a consensus on achieving net-zero emissions. Governments and industry participants worldwide have continued to prioritize the development of renewable energy. Renewable energy power generation such as wind and PV power continues to account for an increasing share of electricity supply, creating additional demand for grid accommodation, energy storage deployment, intelligent dispatch and comprehensive energy management.

New Power System

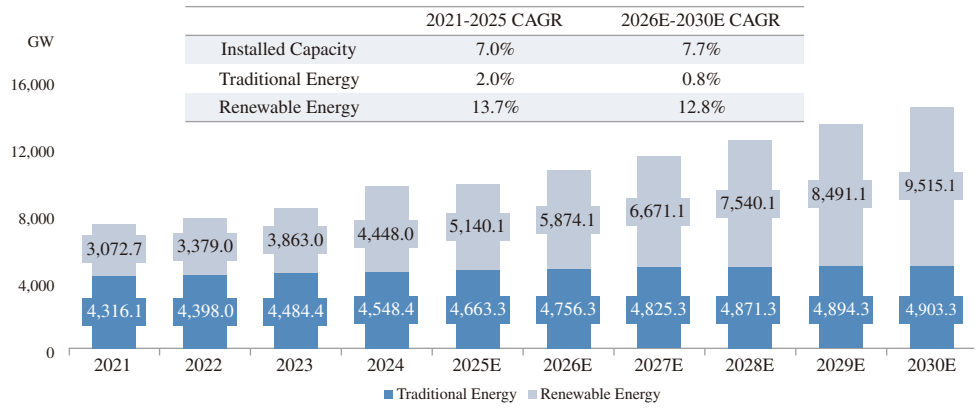
The PRC is accelerating the development of a new power system focusing on renewable energy.

The new power system is centred on coordination among four key elements, "source, grid, load and storage": on the power generation side, the share of installed new-type power system continues to increase; on the grid side, upgrades to power grids are enhancing their flexibility, digitalization and intelligence, while continuously improving their capacity to accommodate renewable energy; on the load side, electrification is expanding from automobiles to rail transit, vessels, construction machinery and aircraft, while the electrification of industrial energy consumption continues to deepen; on the energy storage side, the construction of energy storage facilities has entered a period of rapid development to address the intermittency of renewable energy power generation and support reliable power supply for new electricity consumption scenarios such as AI computing centers. These trends are driving power engineering design enterprises to evolve into full-lifecycle solution providers covering consultancy, design, EPC, O&M, and energy management.

Market Size of the Global and PRC Power Industries

Globally, cumulative installed power capacity is expected to increase steadily from 7,790.6 GW in 2021 to 14,844.1 GW by 2030E, representing a CAGR of 7.0% from 2021 to 2025 and 7.7% from 2026E to 2030E. Renewable energy is expected to be the main growth driver, rising from 3,072.7 GW in 2021 to 9,515.1 GW by 2030E, with CAGRs of 13.7% and 12.8% over the two respective periods. By contrast, traditional energy capacity is expected to grow only moderately, from 4,316.1 GW in 2021 to 4,903.3 GW by 2030E, reflecting the continued shift in the global power generation mix toward renewable energy.

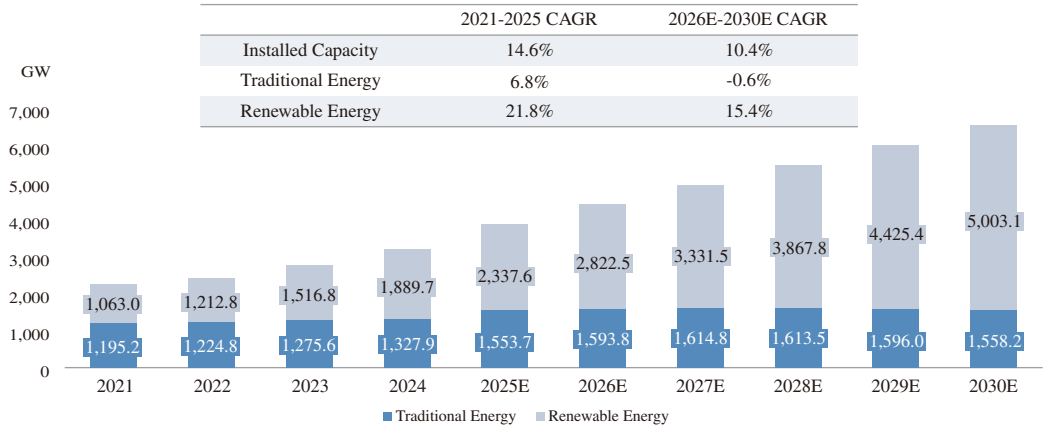
Global Cumulative Installed Power Capacity, 2021-2030E



Source: Frost & Sullivan

In the PRC, cumulative installed power capacity is expected to grow from 2,258.2 GW in 2021 to 6,561.3 GW by 2030E, at a CAGR of 14.6% from 2021 to 2025 and 10.4% from 2026E to 2030E. Renewable energy capacity is projected to expand rapidly from 1,063.0 GW in 2021 to 5,003.1 GW by 2030E, significantly outpacing traditional energy, which is expected to remain broadly stable and decline slightly from 2026E onward. This indicates that renewable energy will become the dominant source of capacity growth in PRC's power system over the forecast period.

PRC Cumulative Installed Power Capacity, 2021-2030E



Source: Frost & Sullivan

Analysis of the Global and PRC Energy Storage Market Size, by Installed Capacity, 2021-2030E

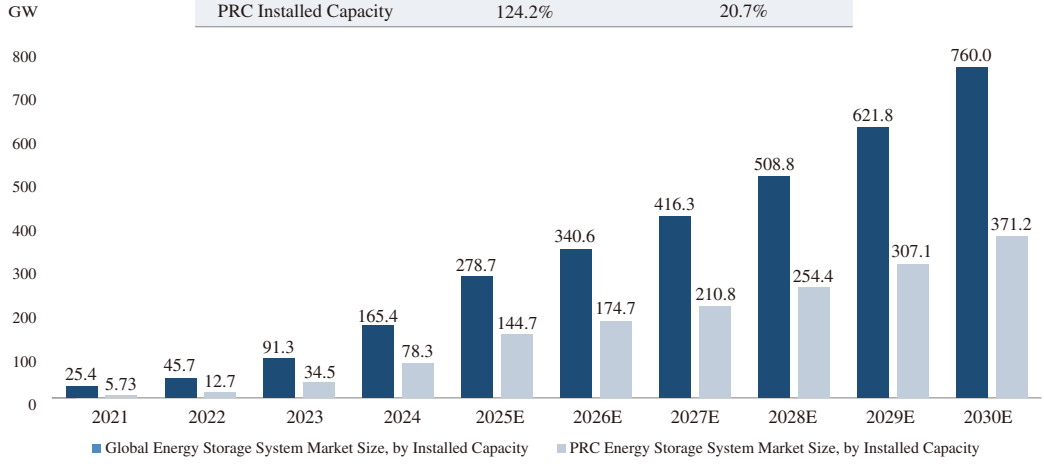
The expansion of the global and PRC power markets is characterized by steady growth in overall installed capacity and a continued increase in the share of renewable energy capacity. As wind power, PV power and other energy sources accelerate their development, renewable energy is expected to contribute an increasing share of newly installed capacity and further drive demand for supporting facilities and services such as energy storage, grid accommodation, grid connection and system dispatch.

The global energy storage system market is poised for substantial expansion, propelled by the rapid growth of renewables, heightened requirements for grid flexibility, and a steady decline in storage costs. Installed capacity is projected to surge from 25.4 GW in 2021 to 760 GW by 2030E, representing a CAGR of 82.0% during 2021-2025E and 22.2% during 2026E-2030E growth that underscores the increasingly critical role of energy storage in enabling renewable integration and maintaining power system stability.

In the PRC, the energy storage system market is expected to expand at an even faster pace, supported by the country's renewable energy build-out, ongoing power system reform, and growing demand for both grid-side and user-side storage solutions. Installed capacity is projected to climb from approximately 5.7 GW in 2021 to 371 GW by 2030E, at a CAGR of 124.2% during 2021-2025E and 20.7% during 2026E-2030E, cementing the PRC's position as one of the world's fastest-growing energy storage markets.

Global and PRC Energy Storage System Market Size, by Installed Capacity, 2021-2030E

	2021-2025 CAGR	2026E-2030E CAGR
Global Installed Capacity	82.0%	22.2%
PRC Installed Capacity	124.2%	20.7%



Source: Frost & Sullivan

Market Drivers and Development Trends of the Power Industry

Green and Low-carbon Transition

The power industry is expected to continue shifting towards renewable and low-carbon power generation. Renewable energy, including wind and PV power, is expected to account for an increasing share of both installed capacity and power generation. As renewable energy penetration rate increases, power systems are expected to feature a higher proportion of renewable energy and greater integration of power electronic equipment. This will set higher standards on grid connection and accommodation, energy storage deployment, system security and operational control.

Growth in Electricity Demand

Global electricity demand continues to demonstrate resilient growth. Industrial upgrading, the expansion of advanced manufacturing, and the construction of data centers, 5G infrastructure and AI computing centers are creating additional electricity load, requiring more reliable power supply, stronger distribution grid capacity and enhanced cross-regional power allocation capabilities. In particular, the electrification of end-use energy consumption is an important source of growth in electricity demand, such

as renewable energy vehicles, rail transit and EVTOL. The growth in electricity demand, together with the electrification transition, is driving upgrades of power transmission and distribution, grid dispatch, energy storage and demand-side response, thereby providing a stable market driver for power engineering design and comprehensive energy services.

Technological Advancement

Technological advancement in the power industry continues to improve project efficiency. Ultra-high voltage transmission improves the efficiency of long-distance transmission of large-scale renewable energy, while flexible direct current (DC) transmission technologies enhance the grid connection and accommodation of renewable energy. At the same time, advances in PV, wind power, energy storage and intelligent dispatch technologies, combined with economies of scale and continued improvements in the industry chain, are driving down the levelized cost of electricity (LCOE) for renewable energy power generation. Tools such as BIM, digital twins, unmanned aerial vehicle surveying, LiDAR and AI-assisted verification are increasingly being adopted in engineering design processes to improve survey, verification and delivery efficiency.

Market Opportunities in the PRC Power Industry

Favorable Policies and Sustained Investment in Power Infrastructure

Domestic policies and investment are creating dual growth drivers. During the 15th Five-Year Plan period, the Chinese government has been actively encouraged the development of and sustained capital investment in the new power system. Over the next few years, huge amount of capital investment is projected to be introduced across the industry value chain. Specifically, on the power generation side, investments will structurally pivot from fragmented project deployment toward the integrated capacity expansion of utility-scale renewable energy hubs. Another investment focus would be upgrade of digital energy solutions including smart operation. On the power grid side, cumulative grid investment during the 15th Five-Year Plan period is expected to exceed RMB5 trillion, focusing primarily on construction of smart distribution networks and inter-provincial transmission networks. On the energy storage side, massive investments will be directed toward long-duration energy storage to enable critical source-grid-load-storage coordination. Collectively, these investments will collectively drive the market demand for power engineering comprehensive services.

Market Opportunities in Overseas Power Industry

Opportunities in overseas power markets are primarily driven by the need to address power infrastructure shortfalls and the pursuit of energy transition in emerging markets. In Southeast Asia, industrialization, urbanization and manufacturing relocation are driving relatively rapid growth in electricity demand, creating opportunities in distributed PV power, wind power, energy storage and cross-border power interconnection. In Africa, relatively underdeveloped power infrastructure has created substantial demand for power generation facilities, grid expansion and renewable energy projects. Latin America has favorable renewable energy resources and great potential for grid upgrades, renewable energy development and cross-regional interconnection. New power generation facilities, grid expansion and integrated energy projects in these regions provide overseas business opportunities for PRC power engineering comprehensive service enterprises with technological expertise, cost advantages and strong project delivery capabilities.

Overview of the PRC Comprehensive Power Engineering Services Industry

Definition of Comprehensive Power Engineering Services

Comprehensive power engineering services refer to a portfolio of full-lifecycle services provided for power infrastructure, including planning, consultancy, survey, engineering design, project management, EPC contracting, and O&M services, with the goal of supporting the development and optimization of power infrastructure. The services are provided across power generation, transmission, distribution, substations, energy storage and integrated energy. As the energy transition progresses, comprehensive power engineering services have extended from traditional power generation and power grid projects to emerging areas such as renewable energy, energy storage, microgrids, virtual power plants, integrated energy and energy trading.

Classification by Service Type

(i) Engineering planning and consultancy: front-end services that support strategic planning and decision-making, including energy planning studies, project feasibility analyses, investment assessments, energy conservation assessments, environmental impact assessments, policy consultancy and carbon asset management. Which helps ensuring alignment with national energy strategies and green development requirements.

(ii) Engineering survey and design: core technical services encompassing geological, hydrological and geotechnical surveys, as well as engineering design. Deliverables include survey reports, consultancy reports, design proposals and digital drawings.

(iii) Engineering supervision and project management services: focus on full-process control over construction quality, schedule, investment and safety.

(iv) EPC: Engineering, procurement and construction (EPC) model, under which service providers are responsible for the entire process from equipment procurement and construction management to system integration and commissioning. The services focus on power transmission and substation projects, renewable energy power stations, integrated smart energy systems and related infrastructure.

In the comprehensive power engineering services industry, survey and design services and EPC services are generally classified as separate business segments to reflect differences in their business scope, risk profiles and project stages. Survey and design services are characterized by an asset-light model, high technical intensity and stringent professional compliance requirements. The related risks are mainly associated with technical solutions, design quality, and regulatory approval and compliance matters. EPC services, by contrast, involve integrated project delivery at the mid-to-late stages, under which the contractor is engaged by the project owner to assume overall responsibility for the entire process. Compared with standalone design services, EPC services generally require greater capital commitment and longer project cycles, and service providers are exposed to execution risks relating to schedule, cost, quality, safety and performance assurance.

Value Chain of the PRC Comprehensive Power Engineering Services Industry

Upstream

For survey and design services, upstream participants primarily include providers of industrial software, specialized calculation tools, survey data services, geological and hydrological data, surveying and mapping equipment, and standardized office hardware. Power engineering design requires a high degree of data accuracy, system simulation and professional verification. Design enterprises typically rely on tools such as CAD, BIM, GIS, power flow calculation, short-circuit current calculation, protection setting and structural calculation to develop design solutions. Technologies such as drone aerial surveying, LiDAR point clouds, geographic information systems and meteorological resource assessment also play an important role in renewable energy and power transmission line projects.

For EPC services, comprehensive power engineering service providers generally do not directly own upstream raw material or component manufacturing assets. Instead, they monitor and influence raw material procurement and the manufacturing of core components, such as polysilicon, PV cells and modules, wind turbine blades, rare-earth magnetic materials and battery materials, through strategic partnerships, qualified supplier management systems and procurement management. This process is intended to ensure supply security, cost competitiveness, quality compliance and adherence to sustainability standards.

Midstream:

Mainstream services cover all segments of the source-grid-load-storage value chain: on the power generation side, they provide engineering design for traditional energy and renewable energy power generation; on the grid side, they provide power transmission and transformation, distribution grid and grid-connection solutions; on the load side, they serve industrial and commercial user projects, industrial park microgrids and demand-side response; and on the energy storage side, they provide system integration design for electrochemical energy storage, pumped storage and compressed-air energy storage. By service type, midstream services can be divided into planning and consultancy, survey and design, EPC contracting, operation and maintenance, and technical support.

Downstream:

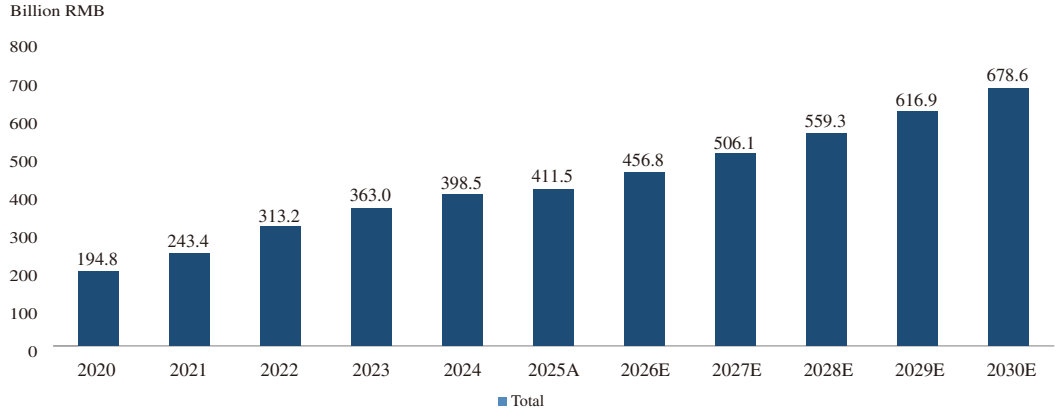
Downstream customers include power grid enterprises, power generation groups, renewable energy developers, local state-owned enterprises, private energy investment enterprises, industrial and commercial users, and government investment platform companies. Power grid enterprises place emphasis on power supply reliability, distribution grid capacity and renewable energy accommodation. Power generation groups and renewable energy developers focus on project resources, grid connection conditions, investment returns and construction periods. Industrial and commercial users focus more on power supply stability, energy costs, green electricity consumption and carbon compliance requirements. These different customer needs drive comprehensive power engineering service providers to offer full life-cycle services include preliminary consultancy, construction delivery and operational optimization.

Market Size of the PRC Comprehensive Power Engineering Services Industry

From a PRC market perspective, demand for power engineering design services is closely tied to investment in power infrastructure, renewable energy construction and the ongoing transformation toward a new-type power system. Demand for power generation design services is expanding from conventional power sources and standalone renewable energy projects to utility-scale renewable energy bases, source-grid-load-storage integration, and related energy storage and grid connection solutions, reflecting the increasing scale and complexity of renewable energy deployment. Meanwhile, the demand for grid design services continues to be driven by ultra-high-voltage and cross-regional transmission projects, distribution grid upgrades, intelligent dispatching systems and the need to accommodate renewable energy.

Sustained investment in power infrastructure, renewable energy and grid construction is expected to continue to support the growth of the PRC comprehensive power engineering services industry. Market size expanded from RMB194.8 billion in 2020 to RMB398.5 billion in 2024, and is forecast to reach RMB678.6 billion by 2030E, representing a CAGR of 16.1% during 2021-2025E and 10.5% during 2026E-2030E, with EPC remaining the largest service segment.

Market Size of the PRC Comprehensive Power Engineering Services Industry



		2020	2021	2022	2023	2024	2025A	2026E	2027E	2028E	2029E	2030E	2021-2025 CAGR	2026-2030 CAGR
EPC	Billion RMB	147.2	182.8	252.7	291.1	323.4	334.1	375.1	418.0	464.0	514.0	567.5	17.8%	11.2%
Survey and Design	Billion RMB	35.2	39.6	46.9	57.0	54.6	59.5	62.7	67.6	73.1	78.9	85.2	11.1%	7.4%
Consultancy	Billion RMB	3.7	3.9	5.6	5.7	10.3	9.9	10.6	11.6	12.7	13.8	15.1	22.0%	8.8%
Supervision	Billion RMB	1.9	2.1	2.5	2.1	2.8	2.5	2.6	2.9	3.1	3.3	3.6	5.4%	7.5%
Other	Billion RMB	6.9	15.0	5.5	7.0	7.4	5.5	5.8	6.1	6.5	6.8	7.2	-4.5%	5.7%
Total	Billion RMB	194.8	243.4	313.2	363.0	398.5	411.5	456.8	506.1	559.3	616.9	678.6	16.1%	10.5%

Source: Frost & Sullivan

Market Drivers of the PRC Comprehensive Power Engineering Services Industry

Continued Growth in Power Infrastructure and Renewable Energy Development

Electricity consumption in the PRC continues to grow, while the energy structure is shifting at a faster pace towards renewable and low-carbon energy, driving sustained investment and construction of large-scale power infrastructure, including large-scale renewable energy bases, power grid upgrades and distributed projects. Demand for renewable energy bases, power grid connection, transmission and distribution works, substations, supporting dispatch and communications facilities, and regional energy infrastructure continues to grow, further driving demand growth for engineering survey and design, EPC contracting and full-process engineering consultancy services.

Comprehensive Energy Services and Multi-energy Complementary Design

Demand for integrated energy solutions from industrial parks, commercial complexes, data centers and large public facilities continues to grow. Design scope is expanding from standalone power supply and distribution systems to multi-energy coordination across cooling, heating, electricity, gas, storage, charging and hydrogen, with emphasis on energy efficiency, operational resilience, green electricity consumption and cost optimization. Projects generally require integrated design based on load curves, energy prices, distributed power sources, energy storage and energy efficiency management systems. Service providers with consultancy, design, EPC, operation and maintenance, and energy management capabilities are better positioned to meet customers' demand for one-stop services and single-point accountability.

Flexibility Upgrades of Traditional Power Generation

As the share of renewable energy increases, traditional thermal power is shifting from a basic power source to a regulating and grid-supporting power source, giving rise to demand for energy-saving and carbon-reducing retrofits, flexibility retrofits, heating retrofits and environmental protection upgrades. Engineering design enterprises are required to develop technical solutions in areas such as unit efficiency improvement, deep peak shaving, combined heat and power, flue gas treatment, carbon reduction, and secure and stable operation. Low-carbon upgrades to traditional energy, together with renewable energy development, power grid upgrades and energy storage deployment, will constitute important sources of demand in the power engineering comprehensive service industry.

Development Trends of the PRC Comprehensive Power Engineering Service Industry

Increase in Full-lifecycle Comprehensive Services

As wind power, PV power, energy storage and integrated energy projects continue to expand, the share of renewable energy-related engineering demand within power engineering services is expected to increase. Compared with traditional power engineering projects, renewable energy engineering projects involve a broader and more integrated scope of work, including resource assessment, site planning, step-up substations and power evacuation works, grid connection, energy storage deployment, accommodation assessment and full-lifecycle O&M coordination. These projects impose higher requirements on engineering service providers in respect of design and planning capabilities, multidisciplinary coordination, system integration and EPC organization. In addition, clients seek single-point accountability to reduce project risks, accelerate timelines and optimize long-term performance. Enterprises with comprehensive full-lifecycle service capabilities will capture market demand better.

Improvement in Operational Efficiency

Renewable energy projects are generally characterized by short construction cycles, clearly defined grid connection milestones and a high degree of equipment standardization. This is encouraging design enterprises to establish standardized design libraries, typical cost benchmark databases and general equipment selection modules. Standardized design and modular construction can reduce repetitive design work, lower uncertainties in on-site construction and improve delivery efficiency. Pre-assembled solutions can also help shorten construction cycles and reduce on-site construction risks. Standardization does not mean simplified solutions; rather, it involves project-specific optimization based on replaceable modules, taking into account project resources, grid connection conditions and client needs.

Digitization and Intelligent Technologies

Digital tools are improving the efficiency and quality of power engineering design. BIM, digital twins, GIS, UAV surveying, LiDAR and AI-assisted verification can improve survey accuracy, shorten design cycles and reduce error rates. They can also support renewable energy site selection, resource analysis, energy storage capacity planning and O&M fault identification. In the future, the competitiveness of design enterprises will be reflected in their knowledge bases and delivery capabilities developed through the integration of engineering experience, standardization capabilities and digital technologies.

Overview of the Competitive Landscape of the PRC Comprehensive Power Engineering Service Industry

Classification of Key Market Players

State-owned Enterprises

The PRC comprehensive power engineering service market is generally characterized by a competitive landscape dominated by state-owned enterprises. Power Construction Corporation of PRC, PRC Energy Engineering Corporation, together with their regional, provincial and specialized design institutes, have significant advantages in large-scale hydropower, thermal power, ultra-high voltage, nuclear power, renewable energy base and cross-regional power transmission projects. These enterprises have access to government and central state-owned enterprise customers, strong financial resources, comprehensive qualifications, extensive project experience and nationwide resource integration capabilities, and therefore account for a substantial share of the market.

Non-state-owned Enterprises and Specialized Service Providers

Private design enterprises and specialized energy service providers usually operate on a smaller scale than large state-owned enterprises, but they benefit from greater operational flexibility and faster customer response. As a result, they are able to establish differentiated positions in market segments such as renewable energy, distributed PV, industrial and commercial power distribution, energy storage, user-side integrated energy and specialized design services. Certain private enterprises are also competitive in regional markets and specific sectors because of their technical service capabilities, customer response efficiency and one-stop solution capabilities.

Ranking of non-state-owned Comprehensive Power Engineering Service Enterprises in PRC, 2025

Rank	Company Name	Qualification	Revenue from [for FY2025] power engineering (RMB billion)
1	Company A	Grade A qualification for Engineering Design in the Power Industry	0.94
2	Company B	Grade A Professional Qualification in Power for Transmission Engineering	0.72
3	The Company	Grade A qualification for Engineering Design in the Power Industry	0.63
4	Company C	Grade A Professional Qualification in Power for Transmission Engineering, Substation Engineering	0.40
5	Company D	Grade A Professional Qualification in Power for Transmission Engineering, Substation Engineering	0.36

Source: Frost & Sullivan

1 Company A is a PRC-based power engineering and design company established in 1994 and listed on the Shenzhen Stock Exchange's ChiNext Board. Focused on new energy, clean energy, energy storage, smart grids and digital energy solutions, it provides full-lifecycle power engineering services covering planning and consulting, survey, design, construction and intelligent operations. It has grid-solution capabilities covering 220 V to ±1,100 kV transmission lines and substations. It is a domestically listed company.

2 Company B is a PRC-based power engineering and energy-service company established in 2007 and listed on the Shenzhen Stock Exchange's ChiNext Board. It provides one-stop EPCOS services for power supply and electricity-use projects, covering power design and consulting, equipment supply, construction and installation, operations and maintenance, energy management, electricity sales, photovoltaics, energy storage and microgrid services. It is a domestically listed company.

3 Company C is a PRC-based comprehensive energy solutions provider established in 2003 and headquartered in Zhuhai, Guangdong Province. Focused on new-type power energy, it provides power-project consulting, survey and engineering design, EPC delivery, and operations and maintenance services across the project lifecycle. It is a Hong Kong listing applicant.

4 Company D is a PRC-based comprehensive energy services and digital-intelligence platform company established in 2003 and listed on the Shenzhen Stock Exchange's ChiNext Board. Through its wholly owned power-design subsidiary, it provides power and new-energy planning consulting, design, engineering construction, operations and maintenance, and integrated energy services, supported by proprietary 3DGIS and digital-twin platform capabilities. It is a domestically listed company.

The PRC comprehensive power engineering services industry is relatively fragmented, with competition mainly driven by service qualifications, project experience, technical capabilities, delivery capacity, and cost control. Large state-owned enterprises and established engineering groups generally hold advantages in major power infrastructure, grid, and large-scale clean energy projects due to their strong track records, financing capabilities, and full-chain service coverage. At the same time, regional and specialized service providers compete in specific segments such as survey and design, consultancy, supervision, and supporting engineering services. As PRC accelerates the construction of a new power system, market demand is increasingly shifting toward comprehensive service providers with expertise in clean energy, grid connection, energy storage, and digitized project management.

Key Entry Barriers

Qualification and Licensing Barriers

To undertake projects, enterprises must obtain qualifications at the relevant grades for engineering design, survey, consultancy, construction or ERC. Enterprises must also have relevant professional personnel holding qualifications such as registered electrical engineer, registered structural engineer and registered constructor. Only a very limited number of non-state-owned engineering service providers hold Grade A qualification for Engineering Design in the Power Industry across PRC. A comprehensive qualification portfolio is difficult to be established within a short period of time, creating significant qualification barriers for new entrants. At present, only three non-state-owned enterprises have been granted the Grade A qualification for Engineering Design in the Power Industry. A Grade A qualification generally covers all design types under the relevant industry, while a Grade A professional qualification is limited to the corresponding professional design type under such industry. In terms of qualification requirements, an applicant for a Grade A qualification is required to have registered capital of not less than RMB6.0 million, compared with not less than RMB3.0 million for a Grade A professional qualification.

In terms of project track record, an applicant for a Grade A qualification must have, within the past ten years, completed the engineering design for at least one large-scale project or at least three medium-scale projects in the relevant industry, and such projects must have been completed and put into operation. By contrast, an applicant for a Grade A professional qualification is required to have completed at least one large-scale engineering design project or at least two medium-scale engineering design projects within the corresponding professional design type under the relevant industry.

Technical Expertise and Industry Experiences

Provision of comprehensive power engineering services requires coordination across multiple disciplines, including electrical, structural, civil, thermal power, control and protection, communications, geology, hydrology and environmental protection. Projects are also subject to stringent safety and reliability requirements. Emerging areas such as renewable energy grid connection, energy storage system integration, source-grid-load-storage coordination, microgrids, virtual power plants and flexible direct current further increase technical complexity. Design enterprises need to develop technical solutions, standardized drawing sets, equipment selection experience and problem-solving capabilities through extensive project delivery. This creates significant experience-based barriers for new entrants.

Customer Resources and Brand Recognition

Power engineering clients typically evaluate service providers based on their experience in comparable projects include delivery quality, safety records and responsiveness. Given the long construction cycles, complex technical interfaces and frequent design changes involved in power projects, clients often prefer to maintain long-term cooperation with design enterprises that are familiar with their workflows, technical standards and management requirements. Stable client relationships, market reputation and project track record form an important foundation for design enterprises to secure projects on a continuing basis.

Key Success Factors

Technological Innovation and Multidisciplinary Talent Pool

Power engineering design enterprises need to continue investing in R&D in areas such as renewable energy, energy storage, source-grid-load-storage integration, digital design, AI-assisted design, virtual power plants and carbon asset management. The industry has strong demand for registered electrical engineers, registered structural engineers, project managers and multidisciplinary professionals. A talent pool combining technical expertise, project management experience and digital capabilities forms an important foundation for competitive advantage.

Full-value-chain Services and EPC Contracting Capabilities

Clients increasingly value integrated services covering front-end consultancy, survey and design, procurement, construction and O&M management. Enterprises with full-lifecycle service capabilities can participate in project decision-making at an earlier stage, optimize technical solutions and investment plans, and provide continuous support during construction and operation. The design-led EPC model enables cost and schedule control through technical optimization, which represents an important path for power engineering design enterprises to extend its business scope to cover full-lifecycle engineering service.

Digital Delivery and Intelligent Design Capabilities

Digital tools such as BIM, digital twins, AI-assisted verification, UAV surveying and O&M data platforms are improving industry efficiency. Enterprises that can develop standardized design modules, project databases and digital delivery capabilities will be able to shorten project cycles, strengthen quality control, improve cost estimation and support O&M. Digital capabilities can also help enterprises expand beyond one-off design services into long-term technical services and operational optimization.

Quick Response Mechanisms and Localized Service Capabilities

Power engineering projects often involve local policies, site conditions, client procedures and grid connection approvals. Localized service capabilities have a direct impact on project efficiency. Enterprises with flexible operating mechanisms, short decision-making chains, effective client communication and the ability to quickly deploy professional teams are more likely to gain competitive advantage in regional markets and specific scenarios.