



NORTH CHINA POWER
ENGINEERING CO.,LTD.OF
CHINA POWER ENGINEERING CONSULTING GROUP

中国电力工程顾问集团华北电力设计院有限公司

成就的力量

THE STRENGTH
OF ACCOMPLISHMENT

NCPE completed, in EPC mode, the generating units with the best techno-economic indicators among all the units of 1000MW put into operation in China.

NCPE designed the coal-fired generating units with the largest installed capacity in the world.

NCPE designed the first 600MW direct air-cooling unit, the first 600MW indirect air-cooling unit, and the first 1000MW indirect air-cooling unit in China.

NCPE designed the first series of NZEC projects which are granted the titles of National Energy-Saving and Emission-Reduction Demonstration Power Plant.

NCPE designed the first power plant using seawater desalination (thermal process) technology in China, the first coal-fired power plant with demonstration CO₂ capture system in China, and the first stack-in cooling tower in China

NCPE designed the first 1000kV UHV/AC substation and the first 1000kV UHV series compensation station put into commercial operation in the world.

NCPE designed the cabin support tower of FAST, the biggest and most powerful radio telescope in the world.

NCPE participated in designing the first 1000kV UHV/AC transmission line, the first ±1000kV UHV/DC transmission converter station, and the first ±1100kV UHV/DC transmission line in the world.

NCPE participated in designing the world's first project which integrates wind power, photovoltaic power, energy storage system and intelligent transmission and which was also a national demonstration project in China.

By the end of 2018, NCPE completed the design of a total installed capacity of 119.83 GW, accounting for 10% of the total thermal power installed capacity in China, in which gas turbine power generation units account for 34% of the total installed gas turbine units in the country.

By the end of 2018, NCPE has expanded its international business to more than 40 countries and regions, becoming an active participant in the global energy and infrastructure construction industry.

By the end of 2018, NCPE has undertaken accumulatively more than 170 EPC projects, including power generation, power transmission lines and substations, renewable energy projects and non-electric projects at home and abroad, with a total contract amount of more than 100 Billion RMB.

CORE PHILOSOPHY

MISSION
BRINGING ENERGY TO THE WORLD

VISION
WORLD-CLASS INDUSTRIAL TOP LEADER

CORE VALUES
EVER-IMPROVING PROFESSIONAL COMPETENCE AND OPERATIONAL CAPACITY

CORPORATE SPIRIT
TO ACHIEVE HARMONIOUS COLLABORATION AND SOLID DEVELOPMENT

GOALS
TO ESTABLISH A LEGACY OF REFINEMENT AND QUALITY INNOVATION

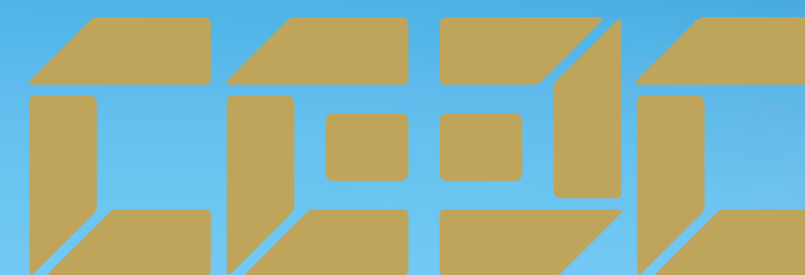
BUSINESS CULTURE
TO CREATE AN INCLUSIVE WORKPLACE OF VIABILITY AND EFFICIENCY

MANAGEMENT IDEOLOGY
TO EXECUTE INTEGRITY OPERATION AND QUALITY PRODUCTIVITY

CODE OF CONDUCT
TO FULFILL INNOVATIVE IDEALS AND EFFICIENT PRODUCTION COOPERATIVELY AND COLLABORATIVELY

COMMUNICATION THEME
THE STRENGTH OF ACCOMPLISHMENT

MANAGEMENT IDEA
CONCISION, HIGH-EFFICIENCY, OPENNING UP AND ORDERLY DEVELOPMENT



ENERGY CHINA



ABOUT US

North China Power Engineering Co., Ltd (hereinafter referred as "NCPE" or "the Company"), restructured by reform from the former North China Electric Power Design Institute founded in 1953, is a high-tech enterprise specializing in engineering survey & design, engineering consultation, and EPC project contracting, with a registered capital of RMB 1 billion (about USD 150 million).

NCPE has been endeavoring to become an international engineering company with high-value creativity and enjoys professional advantages in survey & design, EPC project contracting, project management, technology development, engineering consultation, and project supervision in respect of electric power system, thermal power generation, UHV transmission line and substation, renewable energy power generation, architecture, and communication engineering both in China and overseas. Since its foundation, NCPE has created dozens of "No. 1 Projects in China". It expanded its international business to more than 40 countries and regions including Africa, Middle and East Europe, Middle East, and Southeast Asia and has become an active participant in global energy and infrastructure construction industries.

NCPE has been devoted to building a scientific, effective and modern project management system. It has built an expert team focusing on engineering technology, project management, marketing and sales, and HSE management; set up a corporate information integration system to the demand of development of an international engineering company; and established a management system required of an internationalized engineering company, which integrates design, procurement, construction, and test run, with design as the core competence.

NCPE has been active in developing green low-carbon and sustainable projects including resource saving (water saving, energy saving, and land saving), environment governance (desulfurization, denitrification, and dust removal), renewable energy (wind-PV-storage, and solar CSP). In promotion of sci-tech progress. It organizes workshops for technology break-through in high-parameter and efficient ultra-super-critical unit, combustion gas turbine, circulating fluidized bed, sea water desalination, UHV transmission line & substation, flexible AC and DC transmission, new generation smart substation and smart power station and has gained some technological advantage.

In the past years, NCPE has enabled itself to rank in the Top 100 Survey and Design Enterprises in respect of comprehensive strength and has ranked among the ENR's Top 225 International Contractors, Top 80 Chinese Contractors, and Top 60 Chinese Engineering Design Firms.

Let us join hands to achieve a harmonious and win-win situation.



NCPE office Building (Beijing, China)



NCPE Office building (Kaunas, Lithuania)



NCPE Office building (Abuja, Nigeria)

International Contractor
225
TOP

Chinese Engineering Design Firm
60
TOP

Chinese Engineering Contractor
80
TOP

The Strength Of Accomplishing

Knowledge

Aggregate Excellent Team, Accomplish Strength of Knowledge People-oriented, NCPE strengthens the mechanism of talents cultivation and growth and has aggregated an expert team that is specialized in high-end consultation, survey & design, engineering technology, project management, marketing and commercial management, HSE management, information technology, and project supervision. With this expert team, NCPE accomplishes the strength of knowledge for the booming of electric power industry of China.

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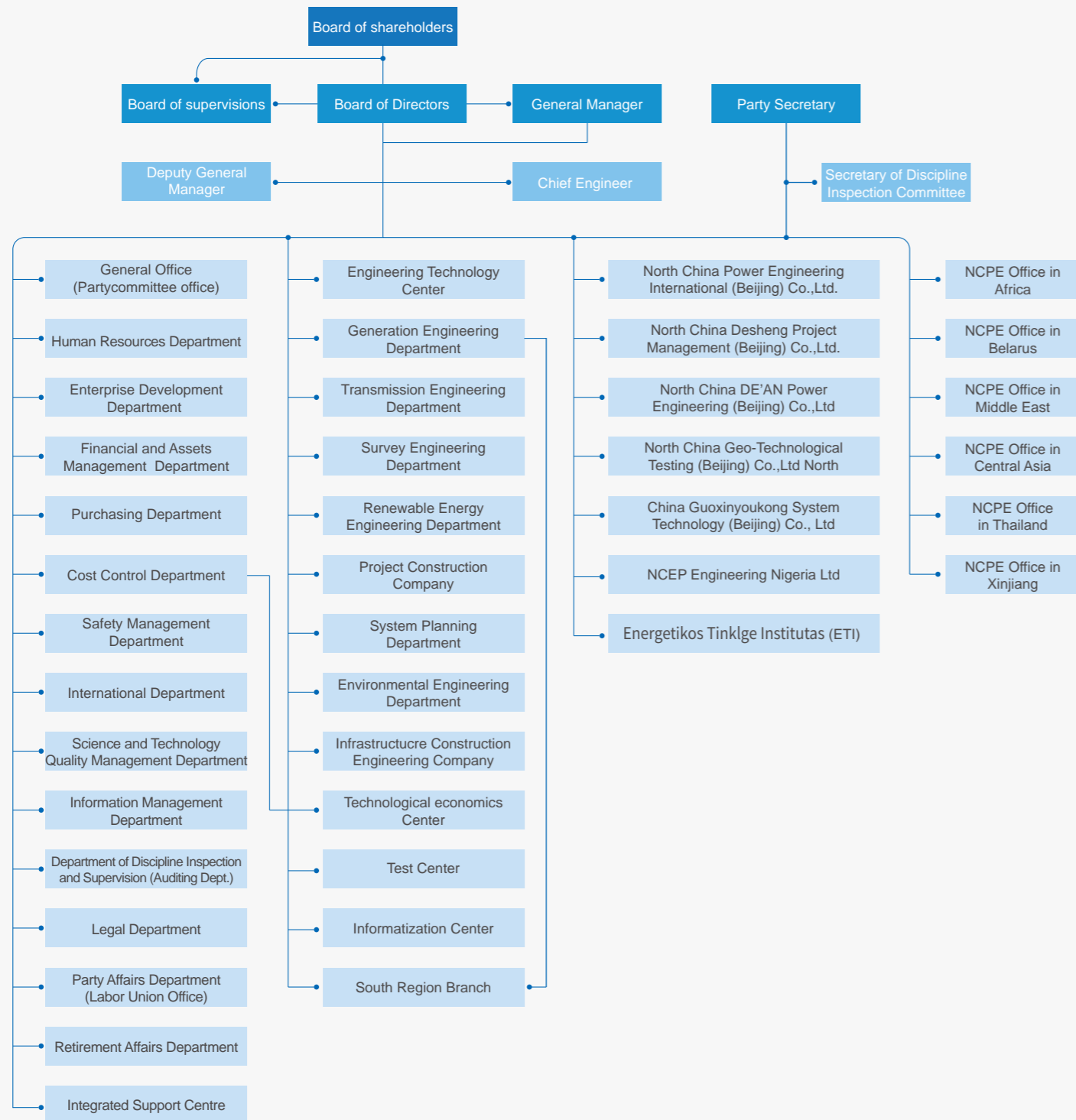
10 / TECHNOLOGICAL CENTER AND WORKSHOP

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ORGANIZATIONAL STRUCTURE

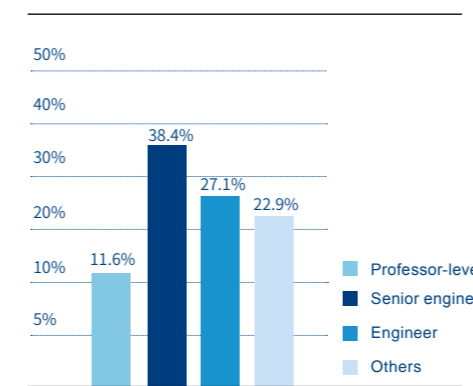


HUMAN RESOURC

NCPE adheres to the people-oriented principle to create and cultivate a number of experts focusing on engineering technology, project management, marketing and commercial management, HSE management etc. By the end of 2018, the Company owns 2,187 employees in total, including 1 national-level master of engineering survey and design, 5 national-level masters of electric power survey and design, 10 experts who receive special allowances from the government. Over the past years, 70 persons in total have won the titles of expert, special expert and young expert of engineering and technology from the group company, 663 person× has obtained various kinds of certified practice qualifications.

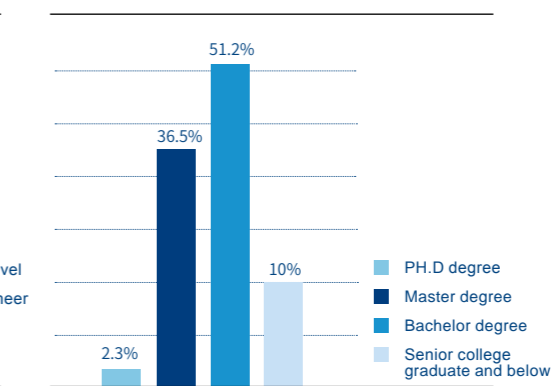
Bar chart of Technical Tiles Composition

NCPE attaches great importance to the building of talent team, among all its staff and personnel, professor-level senior engineers account for 11.6%, senior engineers 38.4%, engineers 27.1%.



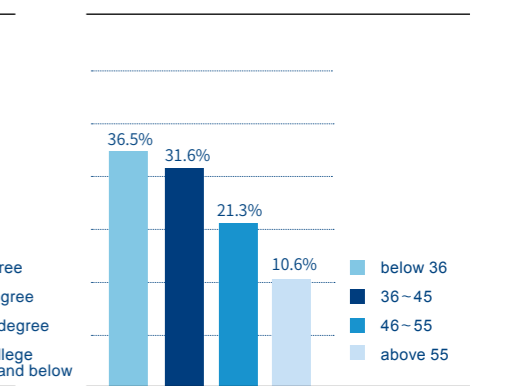
Bar Chart of Educational

The company has a reasonable composition of talents. 90% of its employees hold bachelor or above degrees, among them, 2.3% are PhDs, 36.5% are masters, and 51.2% are bachelors.



Bar Chart of Age Structure

The company aims to build a young and diversified team. 68.1% of its employees are below 45 years. Among them, 36.5% are below 35 years and 31.6% are between 36 and 45 years.



National Professional Qualifications



ENTERPRISE QUALIFICATION

NCPE is a state-owned large and backbone enterprise specializing in engineering survey & design, engineering consultation and EPC project contracting and is authorized to engage in foreign business operation and foreign trade independently. It holds about 20 Class A qualification certificates including national comprehensive engineering design, comprehensive engineering investigation, engineering consultation and engineering surveying & mapping.



Class A Qualification Certificate for Comprehensive Engineering Investigation



Class A Qualification Certificate for Comprehensive Engineering Design



Class A Qualification Certificate for Engineering Cost Consultation



Class A Qualification Certificate for Engineering Consultation



Belarus ISO18001-2009 Labor Protection System Certificate



Belarus Class A Certificate for EPC Contracting

MANAGEMENT SYSTEM

Elaborate planning, scientific management, and pursuing for customer satisfaction; Compliance with laws, cherishing health, and sticking to safety first; Protecting environment, saving resources, continuously improving, and achieving harmonious development.



Quality Management System Certificate



Environmental Management System Certificate



Occupation Health Safety Management System Certificate

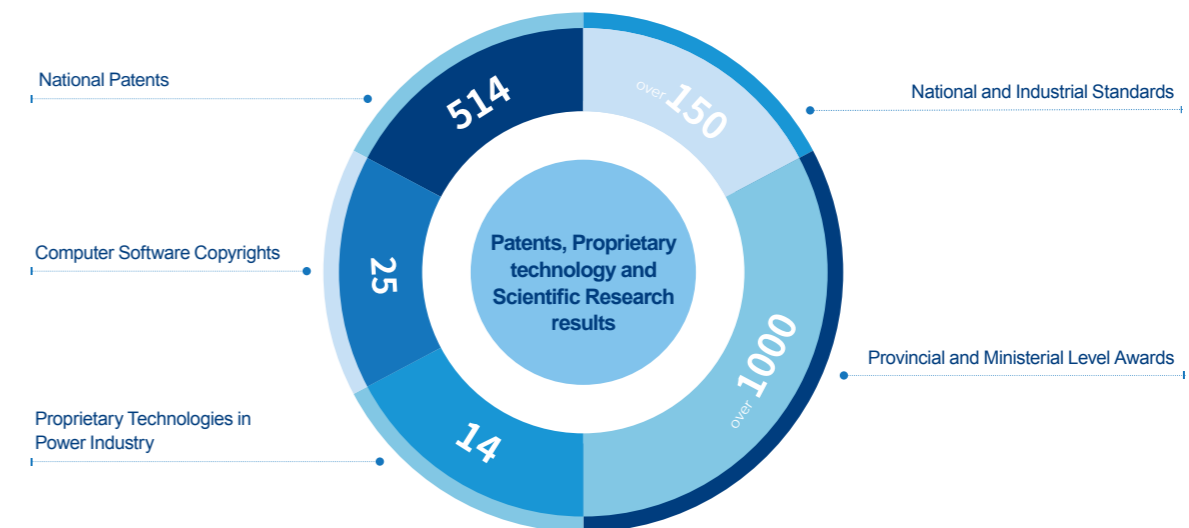
TECHNOLOGICAL CENTER AND WORKSHOP

To adapt to new format of energy industry, NCPE has successively established several technical work groups, such as energy Internet work group and informatization work group etc., to effectively integrate the Company's human resources, improve the ability to tackle key technologies, and give full play to the role of technology in leading the market.



PROPRIETARY TECHNOLOGY AND SCIENTIFIC RESEARCH ACHIEVEMENTS

NCPE always attached great importance to the support and leading role of technological innovation in the development of enterprises. It has compiled or participated in compiling more than 150 national and industrial standards and won more than 1,000 provincial and ministerial level awards. At present, the Company holds a total of 514 national patents, 14 proprietary technologies in the power industry and 25 computer software copyrights.



Efficient and Clean Coal-fired Generation Technology

NCPE actively studies advanced and efficient coal-fired generation technologies such as ultra-supercritical coal-fired power generation, 620°C high parameter coal-fired power generation, boiler deep coupling, ultra-low back pressure, collecting water from a high altitude, wide load efficient power generation, etc., which have been applied in many projects such as the Phase II of Anqing Power Plant and Phase I of ZEPC Penglai Power Plant, aiming to practically implement the construction of efficient and clean coal-fired power generation projects, to ensure pollutants such as carbon dioxide, carbon dioxide and mercury etc may meet the national ultra-low emission standards.

ZEPC Penglai Phase I 2×1000MW high-efficiency ultraclean coal-fired power plant project

Large-capacity Gas Turbine Power Generation Technology

As the first designing firm entering the gas-turbine power generation market in China, NCPE is in the leading position in China in respect of engineering design of large capacity gas-steam combined cycle cogeneration units. In view of the characteristics of gas turbine supplied by the major manufacturers such as GE, Siemens, Mitsubishi etc, and consider the needs of heating for cities in Northern part of China at the same time, NCPE actively researches on 3S clutch, the utilization of flue gas waste heat, and cascade condensate pump technology. So far the Company has completed the designing work for many turbine power generation projects including the four thermal power centers and Taiyanggong Power Plant Project in Beijing, and Tianjin Chentangzhuang Power Plant Project etc..



Beijing Taiyanggong 2×350 MW gas-fired CCHP Power Plant (Auxiliary Project of the 2008 Beijing Olympic Games)

Integrated Gasification Combined Cycle Power Generation and Carbon Capture Technology

NCPE runs the IGCC&CCS Research Center under CEEC Engineering Research Institute. It actively researches on the integrated gasification combined cycle power generation technology, and the US-China 2×400MW IGCC power generation system. The company also works on technologies such as adjusting the unit design of the synthesis gas for domestic gas turbine and the post-combustion decarbonization, oxycombustion, pre-combustion decarbonization works. NCPE is also the first company to put the technology into engineering practice.

Energy Conservation and Emission Reduction Technology

Energy Conservation and Emission Reduction Technology NCPE maximizes the synergistic functions of the existing pollutants removal equipment for the dust, sulfur, nitrogen and mercury in coal-fired flue gas to research on the synergistic emission reduction technology for flue gas pollutants. The company has realized the synergistic and integrated treatment of atmospheric pollutants in coal-fired power stations which economically optimized the operation of gas pollutant treatment system. The company designed the first "near-zero emission" thermal power plant of North China, the Tianjing Beitang Thermal Power Plant, as well the first "near-zero emission" thermal power plant of Beijing-Tianjin-Hebei Region, the renovation project of Sanhe Power Plant.



Guodian Ningxia Fangjiazhuang 2×1000MW Coal-Fired Ultra-supercritical Indirectly Air Cooling Unit

Water-saving Technology for Coal-Fired Thermal Power Units

NCPE vigorously advocates the concept of water-saving. Through the research and application of direct air cooling, indirect air cooling, DC cooling, flue gas water lifting, rainwater collection and utilization, cascade water use and intelligent water resource management and control technology, the watersaving concept is put into practice. At present, it is possible to control the water consumption indicators of large-scale million-level units at 0.05m³/s.gw. The company has obtained many invention and utility model patents, such as "A SCAL indirect air-cooling system for construction of 600MW air cooling unit." In 2018, the Company participated in the research project, "Theory, Technology and Practice of China's Water-saving Society Construction" which won the second prize of National Science and Technology Progress Award.

Design technology of large cooling tower

NCPE actively studies the thermal and structural design technology of large cooling towers, and fully masters the design technology of large indirect air-cooling tower, high water intake cooling tower, desulfurization-flue gas emission-cooling 3 in 1 tower, mechanical ventilation cooling tower, and sea water cooling tower, etc. Its technologies has been applied to many power plant projects such as Guoding Ningxia Fangjiazhuang Power Plant and Shenhua Shengli Power Plant. The company holds the copyrights of several independently developed software, namely the "Cooling Tower Structure Design Software", "Cooling Tower Thermal Design Software". "The technology research on large-capacity air-cooling system selection and design" completed by the Company in 2013 was awarded the third prize of China Electric Science and Technology Award.



Huainan 1000KV Substation - Huainan to Shanghai UHV AC Transmission Line and Substation Project of "Anhui to East China Power Transmission Program"

UHV/AC and UHV/DC Technology

NCPE participated in the completion of the world's first 1000kV UHVAC, 800kV, 1100kV UHV/DC transmission project and innovatively proposed a series of key UHV/AC technologies such as the "1100kV GIS - linear layout method", "optimized layout method for 'four components' of highresistance circuit", and "terminal circuit breaker folding layout method". By the research on frontier issues carried out during project execution, the Company has obtained more than 200 patents of invention and utility model, among which the "Key Technology, Complete Plant, and Engineering Application of UHV AC Transmission" is awarded Special Prize of National Science and Technology Progress Award and "Study on Electromagnetic Environment of Multi-circuit UHV AC/DC Transmission Corridor" has won the Second Prize of Electric Power Science and Technology Progress Award.

Flexible AC/DC Transmission Technology

NCPE has carried out research on key technologies of 500kV flexible DC, and created new research on the co-tower arrangement of pole conductor and metal return wire on HVDC double circuit transmission line and its electromagnetic environment, etc., which has been applied to many projects such as Zhangbei renewable energy flexible DC power grid test demonstration project. To carry out the key technology on 1000 kV series compensation and determine series compensation device control protection equipment and related technical specification, the minimum air gap in 1000kV series compensated distribution equipment and ground field intensity control standards, to determine the series compensation device layout scheme, and for the first time the 1000kV series compensation technology applied to Changzhi - Nanyang - Jingmen UHVAC Transmission Expansion Demonstration Project. The Key Technology Research and Development and Application of 1000kV Series Compensation Design won the first prize of Electric Power Engineering Science and Technology Progress Award, which filled the blank of related research fields at home and abroad.



The World's First 1000kV Compensating Device put into operation in Jindongnan Substation

UHV DC Test Base

NCPE has participated in the design of the UHV DC test base in Changping and the design of test line in the Tibet High Altitude UHV DC Test Base.

Changping UHV DC test base has the world's longest double-circuit DC test line with the highest voltage level (can be boosted upto 1200kV), and the biggest DC corona cage of the world. Its "Automatic Control Mobile Beam Design for UHV DC Test Tower" won the Proprietary Technology of electric power in China. Its application of big-diameter suspension tubular busbar was firstly adopted in China, winning many patents.

Within the Tibet's high-altitude test base, the towers are characterized in many circuits, many cross arms, many hanging points, and complicated load conditions and structure. The test tower of $\pm 800/\pm 1100$ kV is capable to test the high-altitude UHV DC, providing technical support for construction of high altitude UHV DC power transmission projects and for transmission of UHV electric power to Tibet in the future.



Tibet's High-altitude UHV DC Test Base Project



Tibet Gongga Trough-type Solar Thermal Power Generation Demonstration Project

Offshore Wind Power Technology

NCPE actively develops and researches on offshore wind power technologies such as offshore wind turbine foundation design, offshore wind farm substation, submarine cabling and others. NCPE participated in compiling "Offshore Wind Farm Design Standard" which is a national standard. Meanwhile, NCPE has commanded the core technology of offshore wind power and obtained a few related utility model patents such as "Offshore Wind Turbine Reinforced Monopile Foundation" and "Offshore Wind Turbine Rock-embedded Composite Pile Foundation", etc. NCPE participated the design of several projects such as CNOOC Suizhong Offshore Wind Farm in Bohai Sea, Jiangsu Dafeng Offshore Wind Farm, etc.

Solar Thermal Power Generation Technology

NCPE is active in research on optical resource analysis and various forms of solar thermal power generation design technology and development of complex terrain photo-voltaic design software on its own. NCPE carried out a series of R&D on solar thermal power generation technologies including the trough-type, tower-type, butterfly-type and the Fresnel-type. It also researches on multiple heat conduction and storage material such as heat conduction oil, molten salt, silicone oil and quartz sand etc. Besides, NCPE works on the research of co-generation combining solar thermal power generation and coal-fired power generation, gas power generation and the supercritical CO₂ working medium. NCPE is involved in the compiling of "Trough-type CSP Power Plant Design Code" which is a national standard. NCPE is also in charge of compiling 6 CSP generation standards including "Regulations on Content of Feasibility Study Report of Solar Thermal Power Plants" etc.

Biomass Coupling Power Generation Technology

Because the coal-biomass coupled power generation technology has the characteristics of zero carbon emissions, NCPE developed a series of targeted researches on the utilization of biomass such as direct mix, indirect mix (biomass gasification coupling) and parallel mix (steam side coupling). Its research results have been adopted in many domestic projects.



SEE Nanshan Waste Power Plant Phase II

Waste Power Generation Technology

Making full use of its own technology advantages, NCPE carried out research on topics such as waste power plant site selection, waste incineration, flue gas treatment etc. Through reducing the moisture content of waste when entering the boiler, optimizing the thermal system, gasifying the waste for power generation, the Company successfully improves the economic efficiency of waste power generation. By researching on ventilating, deodorization, seepage treatment, green architect and noise treatment, the Company successfully make the waste power plant become environment friendly. The above technologies are adopted in projects such as SEE Nanshan Waste Power Plant and Municipal Waste Incineration Power Plant in Wuhe county, etc.

Seawater Desalination Technology

NCPE is one of the design firms with the most comprehensive technology of seawater desalination in China. NCPE was the first company that introduced the multi-stage flash heat method of desalination technology, and the first domestic company that introduced the lowtemperature multi-effect heat water desalination technology. NCPE designed the largest domestic lowtemperature multi-effect thermal desalination project, the seawater desalination project of Tianjin BeiJiang Power Plant and the first large-scale reverse osmosis desalination system, the seawater desalination system of Hebei Wangtan Power Plant. NCPE presided over compiling the national standard "Design Standard of Seawater Desalination of Thermal Power Plant" and "Seawater Desalination Design Code" of the Group company.



Seawater Desalination System of Hebei Wangtan Power Plant



National Wind-PV-Storage-Transmission Demonstration Project-Awarded with excellent project prize by FIDIC in 2018

Comprehensive Energy New Format

To adapt to the energy development trend which is changing from meeting the demand of supply-demand balance to green development featured by energy structure adjustment, NCPE actively participates in the research and exploration of "Internet +" smart energy, multi-energy complementarity, energy storage (hydrogen production and storage) and other comprehensive new energy formats. NCPE works on the analysis of overall structure of energy Internet, load forecasting, energy configuration optimization, data information system, communication transmission networks. Hence, the Company generates a technical framework and solution that integrate planning & consultation and survey and design of energy system infrastructure + telecommunication infrastructures and comprehensive energy system coordination control + energy market transaction and energy comprehensive services.

Clean Heating Technology

NCPE continues to carry out researches on clean heating technologies, such as deep recovery and utilization of flue gas waste heat, heating pump, long distance heating, inter-season heat storage, intelligent heating network technology and so on. The company is committed to promoting cleaning of heat source, renewable energy heating, eliminating use of bulk coal for heating, and alleviating environment pollution of heating.

Sub-synchronous Resonance Risk Assessment & Control Technology

NCPE has made consistent research and study on the application of series-capacitor compensation in power transmission system and relevant sub-synchronous resonance issues. It has commanded the key technology of series compensation configuration and design package, risk assessment of sub-synchronous resonance and vibration, testing of shaft system torsional vibration parameter, package design of blocking filter, and accurate parameter measurement and identification system of large synchronous motors, and obtained the patent for invention of New Blocking Filter. Besides, NCPE also presided over the preparation of industry standards "Design Code for Torsional Vibration Protection of Steam Turbine Generator Shafts" and "Design Code for Risk Assessment Of Subsynchronous Resonance".



Panorama of Blocking Filters at Datang Tuoketuo Power Station



The Strength Of Accomplishing

Value

Establishing Model of Industry, Accomplishing Strength of Value with its corporate vision of 'Becoming an international engineering company with high value creativity', NCPE has fully understood and satisfied the needs of clients and has established long-term and diversified relationship with them. Over the years, with the client-centered service concept in mind, NCPE has delivered many quality projects and gained respect and trust from the clients and each client has also obtained value increase from NCPE's services.

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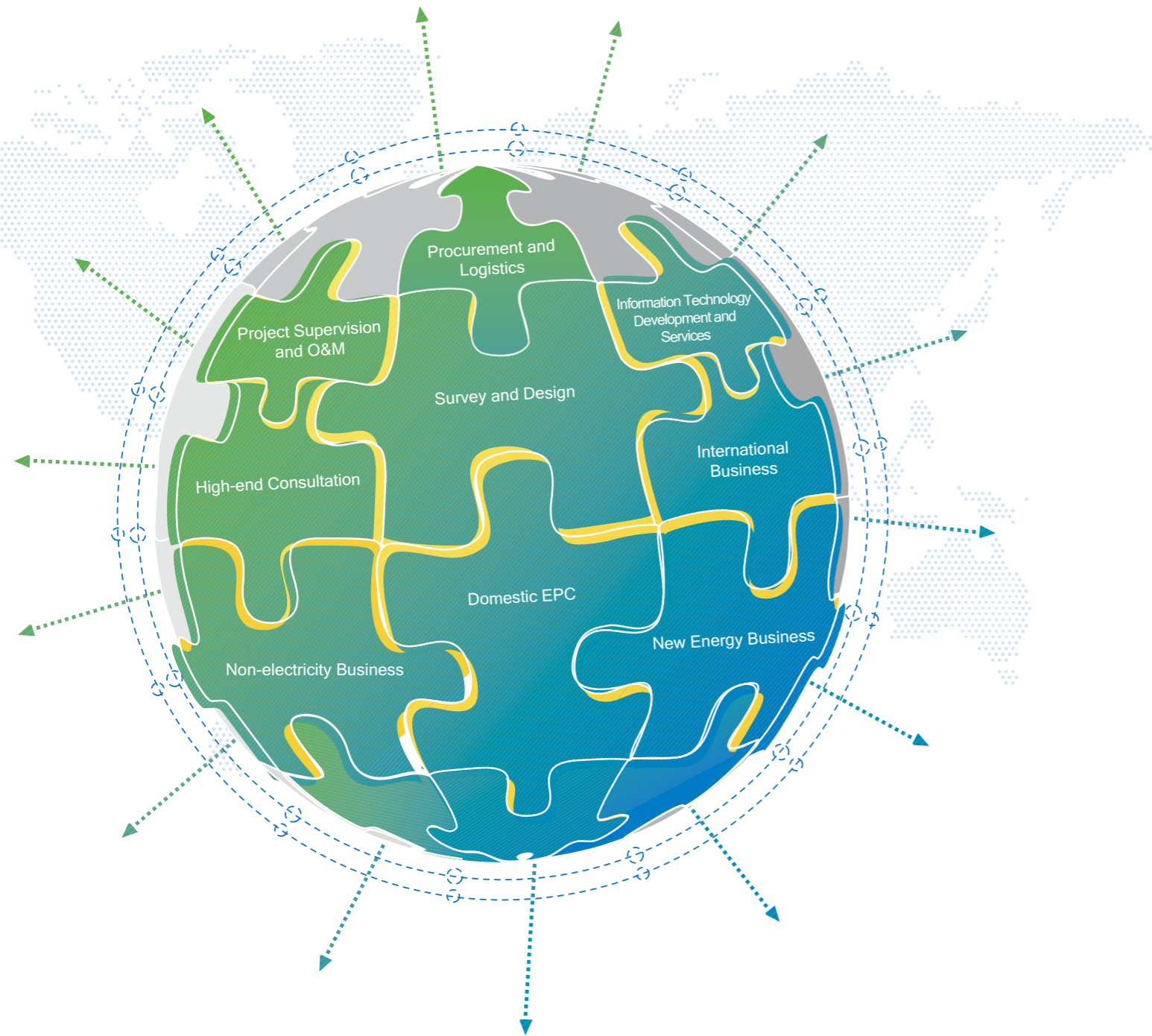
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SUPERVISION, OPERATION AND
MAINTENANCE

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DEVELOPMENT AND SERVICES

BUSINESS SCOPE



HIGH-END CONSULTATION

With Class A Qualification Certificate for national engineering consultation, NCPE is qualified to provide professional planning and assessment consultation services in the fields of thermal power, renewable energy, nuclear power, ecological construction and environmental engineering and geo-technical engineering. NCPE has completed a number of planning researches and consulting services in recent years and made contributions to the development of electric power industry of China.

Research and Consultation on Power Development Planning

NCPE provides services of investment consultation, engineering consultation, project evaluation, and enterprise development planning to government authorities, financial institutions, big group companies, and power developers, which raised the investment benefit in power sector and power developers' viability and competitiveness.

Research and Consultation on Planning of Power Supply and Power Grids Development

In North China region, NCPE undertakes the medium and long-term power development planning, power supply and power grid planning, power market analysis, power supply and transmission planning and system connection design, and special researches of power system. It is also involved in the researches on UHV AC & DC power transmission, flexible DC power grid and trans-national power transmission and preparation of trade standards. In recent years, it participated in preparing the 13th five-year national power plan and the medium-long term national power plan and completed the research on the 13th five-year plan of North China Power Grid.

Consultation on Power Development Planning

Entrusted by power generation or transmission companies, NCPE has completed over one thousand feasibility study reports, Hument preliminary designs, preparation of bid documents and post-bid evaluations. Entrusted by government authorities and power enterprises, NCPE has completed the review of proposals and preliminary designs of Funeng Shimen'ao co-generation power plant, 220kV out-going transmission line for 100MW wind farm of Huolinhe circular economy demonstration project phase IV, wind farm & PV projects of Huaneng Group, and investment assessment and consultation on the 2nd & 3rd wind farm projects of China Three Gorges Corporation in Pakistan. phase IV, wind farm & PV projects from Huaneng Group, and the view of investment on 2nd & 3rd wind farm projects in Pakistan from China Three Gorges Corporation.



The National Main Power Flow Diagram

SURVEY AND DESIGN

As an influential and branded international engineering company in power industry of China, NCPE has created dozens of "China No.1" projects that reflect the highest level of power development of the country. It has completed about 1,000 large power generation and transmission projects both in China and abroad.

POWER GENERATION

By the end of 2018, NCPE has completed the design of power generation projects with the installed capacity of 119,830MW, accounting for one tenth of the total thermal power installation capacity in China.



1. Datang Tektor Power Plant Project in Inner Mongolia

Tektor power plant is a key project of the national "Western Development" strategy and "West-to-East Power Transmission" energy strategy. Since the first phase of the project completed in 2000 till the project fully put into operation in 2017, the total installed capacity reached 6720 MW. It is a coal-fired thermal power plant with the largest generating capacity in the world.

3. Shishi Hongshan Cogeneration Power Plant in Fujian

Shishi Hongshan co-generation power plant project is located in Fujian Western Strait Economic Zone. Its planned installed capacity is 5,200MW. The 2×600MW units in phase I is the first 600MW supercritical extracting & condensing co-generation unit in China. It was put into operation in 2001 and won the silver medal of China Quality Power Project Award. Its Phase II has 2×1000MW USC units whose main pollution emission indicators are lower than gas turbine emission limits, realizing "near zero emission". The 2 units of project phase II were put into operation in March and April 2015 and won 2016 China Quality Power Project Award.

2.4×1000MW Ultra-Super Critical (USC) Units of Tianjin Beijiang Power Plant

It is the first large thermal power plant in the world that integrates power generation, seawater desalination, salt production from condensed seawater, land saving consolidation and reutilization of waste resources. It is one of the first circular economy demonstration projects in China. The first phase of the project is the first 1000MW level USC Power Unit in northern part of China. The project won the first prize of 2009 Excellent Engineering Design in Power Industry and the prize of 2011 China Quality Power Project. Phase II of the project was the biggest airbleed unit of China and realized the zero emission of the desulfurization waste water.

4. Desulfurization and Dust Removal Upgrading Project of Sanhe Power Plant Co., Ltd

The Phase I of the Sanhe Project was installed with 2×350MW sub-critical once-through reheat coal-fired condensing units, which was put into operation in 2000. Phase II of the extension project, with a planned installed capacity of 2×300MW of sub-critical co-generation units, was put into operation in 2007. In 2013, NCPE took the design work of reconstruction of de-NOx, desulfurization, dust removal and emission reduction of #1 and #2 units. The project was completed in 2014 and won the title of demonstration project of coal-fired power plant for energysaving and emission-reduction.



1



2



3



4



5



6

Gas-fired Co-generation Power Plants of "Four Heat and Power Centers" in Beijing

As one of the first design companies entering into gas turbine project market, NCPE has completed and undertaken 79 large-capacity gas turbine projects with a total capacity of 20,650 MW, accounting for 34% of the gas turbine market in China. All of the 4 major gas turbine co-generation power plants of the "12th 5-Year Plan" were designed by NCPE in Beijing, which are located respectively in southeast, southwest, northeast, and northwest of Beijing. The 4 major co-generation power plants were constructed from 2010 to 2015 and won the first prize of Excellent Power Project Design Award, China Quality Power Engineering Award and China Quality Design Gold Medal.

1. Beijing Southeast Heat and Power Center - Huaneng Beijing Power Plant Gas Turbine CHP Extension Project

2. Beijing Southwest Heat and Power Center - Beijing Caoqiao Gas Turbine Combined Cycle Cogeneration Power Plant Phase II

3. Beijing Northwest Heat and Power Center - Jingxi Gas Turbine Cogeneration Power Plant Project

4. Beijing Northwest Heat and Power Center - Datang Gaojing Gas Turbine Cogeneration Power Plant Project

5. Beijing Northeast Heat and Power Center - Shenhua Guohua Beijing Gas Turbine Cogeneration Power Plant Project

6. Beijing Northeast Heat and Power Center - Jingneng Gaoantun Gas Turbine Cogeneration Power Plant Project

TRANSMISSION LINE & SUBSTATION

NCPE has completed 346 transmission lines with a total length of 23,434 km and 336 substations with a total design capacity of 188,600 MVA.



1.1000kV UHV Transmission Line & Substation Projects

The Jindongnan-Nanyang-Jinmen transmission line is the world's first UHV AC demonstration project put into commercial operation. 46 newly designed tower types are used for the line. This project won the first Gold Medal of the National Excellent Transmission Line & Substation Project Award and the prize of Top 100 Excellent Projects Award for 60-Year Anniversary of New China.

2.1000kV Substation Project in Central Zhejiang

The 1000kV substation project in central Zhejiang province is an important part of the UHV AC main grid in east China. The project won the first prize of 2015 Excellent Power Project Design Award and the first prize of 2016 Superior Design Award by China Association of Construction Enterprise Management.



3.Xinjiang Santanghu-Hami 750 kV Power Transmission and Substation Project

The construction of Xinjiang SantangHu-Hami project solves the power supply deficiency of two channels of Ha-Zheng DC and Xinjiang and northwest AC, which provides strong grid support for the development of large-scale power and the outgoing of wind farm power & coal-fired power in bundle in Hami district. It won the second prize of 2016 National Superior Engineering Consulting Award and the second prize of 2017 State Grid Superior Engineering Design Award.

1. $\pm 800\text{kV}$ UHV DC Transmission Line Demonstration Project

The project from Yunnan to Guangdong is the first $\pm 800\text{kV}$ UHV DC transmission line project in the world with a total length of 1,373.34 km, a transmission capacity of 5,000MW and bipole lines on the same tower. The project won the Prize of the Best Transmission Line & Substation Project Award in Asia.

2. Shanghai Miao-Shandong $\pm 800\text{kV}$ UHV DC Transmission Project (converter station project)

Shanghai Miao-Shandong project is the largest UHV DC transmission project with the same voltage level in the world.

3. Changji-Guquan $\pm 1100\text{kV}$ UHV DC Transmission Project (converter station and line project)

Changji Yiguquan project has the highest voltage grade, the largest transmission capacity, the longest power transmission distance and the most advanced technology in the world.

4. Design of Cabin Support Tower of FAST for National Astronomical Observatory

The FAST project, which was honored as “the Sky Eye of China”, is a radio Astronomy-Telescope with the largest single caliber and the most sensitive characteristics in the world, and with independent intellectual property rights of China. NCPE has participated in the construction of the FAST project since 2009, and with independent intellectual property rights of China. NCPE has participated in the construction of the FAST project since 2009, NCPE had successfully completed a lot of contractual works including the concept design and optimization, detailed design, and engineering consultation on manufacture and installation in relation to the cabin support tower of FAST, and was awarded “Outstanding Contribution Organization in FAST Project Construction”



ENGINEERING SURVEY

NCPE has an industry-leading survey team. The team is equipped with hundreds of advanced survey equipment and digital processing apparatus. The Company holds Class A qualification certificates for comprehensive engineering survey, engineering mapping, geological disaster control design, and hydrological resources investigation and appraisal; Class B qualification certificates for geological survey (investigation of hydrogeology, engineering geology, environmental geology) and marine engineering survey; and qualification for outsource drilling services. The company has undertaken over a thousand large survey and technical consultation projects in respect of thermal power generation, power transmission lines and substations, hydro-power generation, nuclear power, renewable energy, civil architecture, and municipal facilities both in China and abroad. NCPE has won many gold medals and bronze awards in "National Excellent Engineering Award", over a hundred "Excellent Engineering Award" of provincial or ministerial levels. NCPE owns 8 patents, 6 registered copyright certificates in computer software, 4 proprietary technologies. It compiled or participated in compiling over a hundred codes and standards of national, industrial, or Group Company levels.



1. Geo-technical engineering survey of 2×300MW Shenzhen west power plan which was granted the Gold Medal of National Excellent Engineering Survey & Design Award

2. Hydro-geological Survey of Yanhe Spring Water Source Project for Shanxi Yangcheng Power Plant which was granted the Gold Medal of National Excellent Engineering Survey Award

3. Geotechnical survey for the transmission line of Jindongnan – Nanyang - Jingmen 1000kV UHV AC Experiment and Demonstration Project which was awarded the Gold Medal of National Excellent Engineering Exploration Award and Silver Medal of National Excellent Engineering Survey Award



DOMESTIC EPC EXPERIENCE

2018

Signing of the EPC contracts: Coal bunker reconstruction project of Sanhe power plant
500MW Inner Mongolia Guohong Xingfu wind farm project
100MW Inner Mongolia Mengneng wind power heating project

2017

Signing of the EPC contracts: Shenhua 2 x660MW wind farm project
Anhui Wuhe domestic waste power generation project
Tianjin Gegu Rongcheng Zone B 20 MW/p distributed photovoltaic power generation project
Shanxi Shuozhou Huairen 65 MW distributed power generation package I Project

2016

Signing of the EPC contracts: 220kV transmission project for Yanyuan Liangfeng'ao wind farm unit 3&4 thermal supply reconstruction project for Shenhua Guoneng Tianjin Dagang Power Generation Co., Ltd

2015

2X660MW Zhundong Wucaiwan project Phase II with Shenhua Shengdong Power Company
2X660MW Shenwan Hefei Lujiang generatoin project
110kV construction power supply project for Sushanglong and other hydropower station in the upper reaches of the Jinsha River

2014

Signing of the EPC contracts: Zhongtian Hechuang thermal power plant for Erdos coal intensive processing project
2x660MW low calorific Value coal power generation project with Shanxi Chinacoal Pingshuo Group project
power supply line for the Yalong River Upstream Hydropower project Phase I

2013

Signing of the EPC contracts: PV power station of Inner Mongolia Datang International Hongmu Phase I air cooling system of Xinjiang TumuShuke 2X350MW cogeneration project.

2012

Signing of the EPC contracts: Ningxia Yanchi Hanas Gaoshawo trough-type SGCC power plant; 2x1000MW Anqing power plant (ext.); Shenhua Shengdong Wuzhongqi thermal plant.

2006

Signing of the EPC contracts: 1x200MW comprehensive utilization power plant with Qian'an Thermal Power Center; 2 x135MW power plant phase III with Tangshan Kailuan Group; 670t/h flue gas desulfurization of #8 and #9 furnace with Hebei Xingtai Power Generation Co., Ltd

2005

Signing of the EPC contracts: 3x440t/h+ 2x100MW Shenhua Shengdong coal-to-liquid captive power plant project management contract of 2x135MW with Shanxi Lu'an Group Tunliu Power Plant

DOMESTIC EPC

As one of the first enterprises to take EPC power projects in China, NCPE set foot in the field in the late 1980s. Over 20 years' efforts and development, NCPE has undertaken a dozen of medium and large EPC projects. Its business scope covers electricity, petro-chemical, coal, metallurgy, etc, and business area includes coal power, gas power, solar PV, wind power and waste power generation. It has forged a complete management organization structure required of an engineering company, a mature management system, and an excellent project management team. The Company has a strong comprehensive technical competence, a good capability of resources integration, a complete modernized management system, and rich experiences in project management. The EPC projects completed by NCPE have won many Golden Key and Silver Key Awards.

2010

Signing of two EPC contracts of Ningxia East Thermal Power Plant project and Ningxia West Cogeneration Power Plant project with Hanas Group and Master Group, as well as two wind farm contracts (each 49.5MW); Signing of the EPC contract of Xinjiang Wucaiwan 2X350MW Power Plant project.

2009

Signing two EPC contracts of two 49.5MW wind farm projects with Hanas Group and Master Group respectively.

2008

Signing of the EPC contract of Shanxi Gujiao 2x600MW Power Plant phase II Extension.

2002

Signing of the EPC contract of 2x60MW gas turbine power plant with Dongguan Tianming and Fengming Power Co., Ltd. It is the first whole-process EPC power plant project in NCPE's history that includes design, procurement, construction, installation, commissioning, and after-sale service. From then on, NCPE has hadits domestic EPC business expanded more and more.

2011

Signing six EPC contracts of wind farm projects with Hanas Group and Master Group respectively (each 49.5MW)

2007

Signing of the EPC contract of Shenhua Shengdong 3 x42 MW (3x 6 B class (Gas turbine SimpleCycle Power Plant project, and the EPC contract of Coal- based Alkene project of Shenhua Ningxia Coal Group (including six 460 t/h HP pulverized coal-fired boilers, four double extraction steam turbines and four generators), and the EPC contract of 2x300MW Power Plant project of Shougang Jingtang Iron and Steel Co., Ltd.

2004

Signing of the EPC contract of Datong 4x50MW Cogeneration Power Plant project of Shanxi Datong Coal Mine Group.



1. Shenwan Anqing Power Plant (Phase II) 2×1000MW Extension EPC project the units reach the best techno-econo the mic indicators among all the 1000MW units put into operation nationwide. The project won the Golden Key Award of the 8th National Excellent EPC Project

2. Caofeidian 2X300MW Captive Cogeneration Power Plant project of Jingtang Iron and Steel Co., Ltd. It won the Golden Key Award of the 6th National Excellent EPC Project.

3. Shanxi Gujiao power plant 2×600MW extension EPC project (Phase II) It won the Silver Key Award of the 6th National Excellent Engineering EPC Project.

4. Shenhua Zhundong Wucaiwan 2×350MW EPC Cogeneration Power Plant It won the 7th Golden Key Award of the 7th National Excellent EPC Power Project.

5. Sinopec Zhongtianhechuang Erdos Coal Intensive Processing Demonstration Project Cogeneration Power Devices EPC Project It won the first prize of the 3rd Excellent Project of Urban Power Survey and Design Industry.



INTERNATIONAL BUSINESS

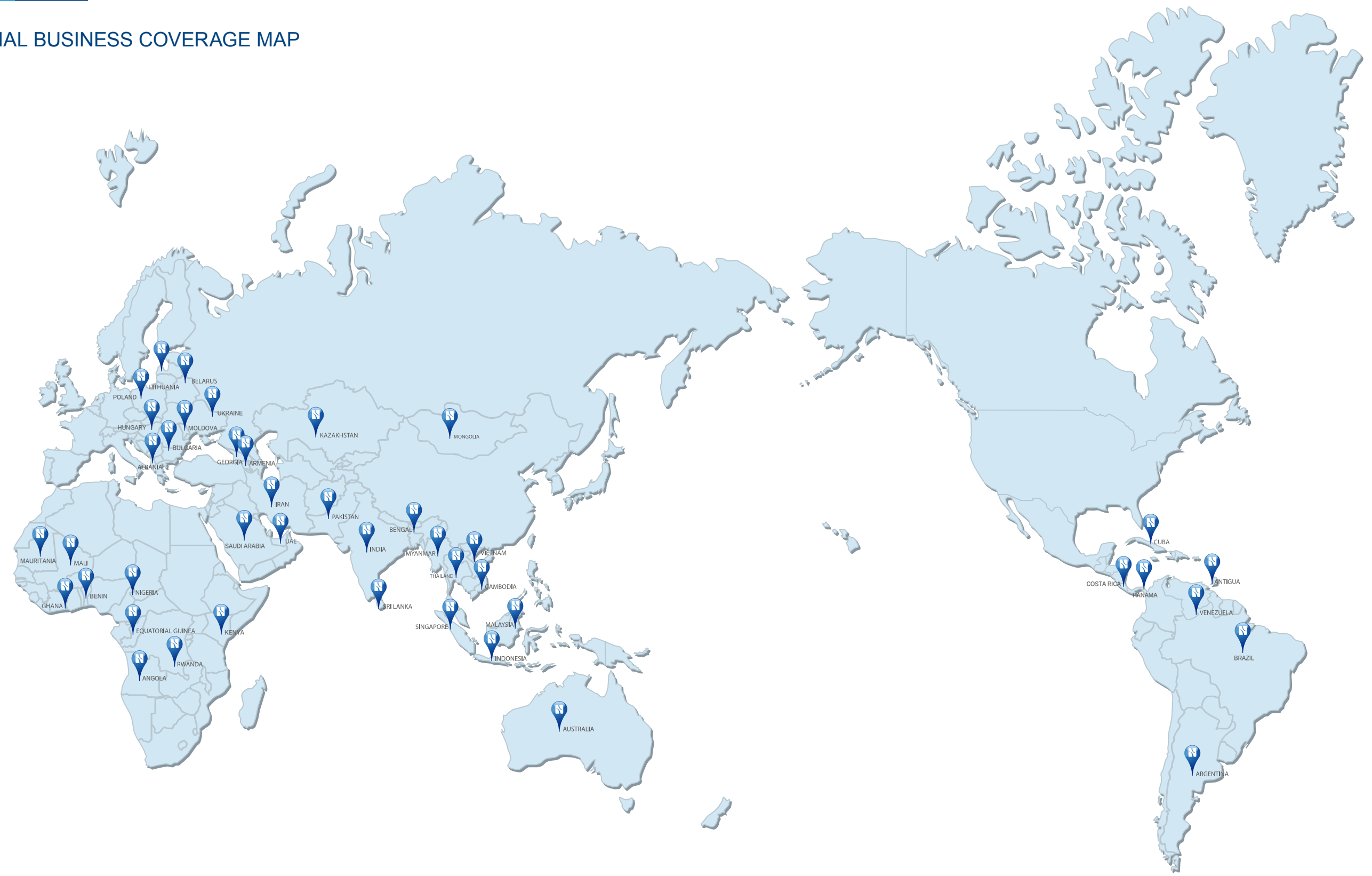
Guided by the strategy of "International Business Priority" and the idea of "know international market, be aware of international rules, be familiar with other cultures, and be good at transnational operation", NCPE has constantly lifted its capabilities in resource integration, commercial operation, and project management and has expanded its international business scope step by step. The projects undertaken by NCPE can be found in more than 40 countries and regions including Nigeria, Kenya, Belarus, Australia, and Angola and good business and cooperation relations have been established with companies and organizations in more than 20 countries and regions including the United States, Germany, and Indonesia. The Company also sets up its branches in Africa, Belarus, the Middle East, Central Asia, and Thailand. In the meanwhile, NCPE's wholly-owned subsidiary company, NCEP Engineering Nigeria Limited., is set up in Nigeria, which operates in a localized way. NCPE acquired the Energetikos Tinklų Institutas (ETI) in Lithuania and established a marketing and project performance platform in Central and Eastern Europe.



1 The Largest Power Transmission Project in Angola so far – Angola SK 400kV Transmission Line

2 Kenya Loiyangalani-Suswa 400kV Transmission Line Project

INTERNATIONAL BUSINESS COVERAGE MAP





Belarus Minsk No.2 Thermal Power Plant



Belarus Transmission and Interconnection Project



1. Nigerian Makurdi-Jos 330kV DC Transmission Line project

2. Indonesia Indramayu 3X330MW coal-fired power plant project

3. Belarusian nuclear power outgoing transmission and grid connection project Postawi 330kV substation

4 Ghana 100MW Gas-fired Combined Cycle Power Plant Project

NEW ENERGY BUSINESS

NCPE has committed itself in the design, R&D, and application of power generation technology of renewable energies, including mainly PV, Solar Thermal Power Generation, wind, biomass, energy Internet, distributed energy, energy storage technology applications and other fields.

PV Power Generation

Photovoltaic Power Generation

NCPE stepped in PV power generation field in 2002. After ten years' experiences and researches, NCPE is competent to design all kinds of PV power stations and its completed projects can be found in every corner of the country. With the design data accumulated from hundreds of PV power stations, NCPE can provide accurate and elaborate solar energy resource analysis. It also participated in construction of management systems of many smart PV power stations and has accumulated rich engineering experiences.

Photothermal Power Generation

Since NCPE entered the field of solar thermal power generation in 2007, it has completed dozens of projects with a total capacity more than 2GW.

1.PV Power Station of Jingzhang Olympic PV Corridor Project in Zhangjiakou

The Beijing-Zhangjiang Olympic Welcome Corridor Project is a green and environmentally-friendly eco-power project that will be built in conjunction with the 2022 Winter Olympics. The total capacity of the project is 500MW. In November 2017, it was successfully connected to the grid for power generation. The project has established a model of interactive development and win-win development between the Olympics and the city.

2.Yumen Longteng 50MW trough-type solar thermal power generation project

The Yumen Longteng Project has an installed capacity of 50MW and chooses the most mature trough-type solar thermal power generation technology in the world. The heat collecting field is composed of 200 standard 600-meter trough-type circuits; the molten salt heat storage system is configured, and the maximum heat storage capacity can meet the full-load operation of the unit for 10 hours.



Jiangsu Dafeng 200MW Wind Power Generation Project

Jiangsu Dafeng 200MW Wind Power Generation Project belongs to the third batch of the NDRC concession project. Its total capacity is 200 MW with 174 units wind power generator. The project started construction in 2007 and has the largest capacity among the contemporaneous wind farms in the region, constituting a typical example of the wind power projects in the Jiangsu coastal area.



Wind Power

Since its entry into wind power generation field in 1995, NCPE has undertaken wind power generation projects covering different project stages, including wind resource survey, planning, site selection, anemometry, wind resource assessment, prefeasibility study, feasibility study, project application, primary design, and construction drawing design, and has completed the design of hundreds of wind farms of different types in offshore, mountainous, intertidal, and flat areas. The Company has won over 30 national and industrial awards.

Biomass Power Generation

NCPE began undertaking biomass power project since 2000 and up to now the biomass power generation projects that have been completed or under construction are including direct combustion of agricultural and forestry wastes, power generation of agricultural and forestry wastes, landfill gas power generation, biogas power generation, and harmless treatment and power generation of waste from chemical plant .



1. Guodian Qianjin Biomass Power Generation Project

Guodian Qianjin Biomass Power Generation Project is in Qianjin Farm, where the forward farm site of Jiansanjiang Agricultural Reclamation Branch of Heilongjiang Province is located. This project has made great contributions to the local economic development by burning straw to generate electricity and taking into account heat supply.

2. Wuhe Household Waste Incineration Power Generation Project EPC Contract in Anhui Province

The Wuhe County Household Waste Incineration Power Generation Project is constructed in EPC mode. The project is located in the northeastern part of Anhui Province. The construction scale 1X500 tons/day mechanical grate domestic waste incinerator +1X10MW steam turbine generator set, synchronously constructing furnace denitration (SNCR) and furnace External flue gas purification device.

New business of Comprehensive energy

The company actively explores the sustainable development of energy economy, and actively explored technical practice and business model research in the fields of energy Internet, distributed energy, and energy storage technology applications. The engineering design of commercial energy storage projects was first carried out in China.

Tongliao Huolinhe Circular Economy Demonstration Project

The project is the first project in the world that has realized the isolated grid of wind-fire-aluminum combined operation. It relies on 8 units of circular economy, 300MW wind power, 8 substations, 21 lines and synchronous construction monitoring command center to solve the stability problem of the isolated grid. Technical problems such as operation control, high permeability wind power consumption, electrolytic aluminum DC load frequency response, and application to the dispatching system of the isolated network.



NON-ELECTRICITY BUSINESS

With years of accumulated state-of-the-art technologies in power sector and a broad range of EPC project experiences, aiming at specialized and characterized technological superiority and value creation ability, by means of optimizing top-level design, satisfying the market demands, and paying attention to the customer experiences, NCPE has rapidly developed its nonelectric power business such as green building, municipal transportation, urban utility tunnels, smart city, water supply and drainage system, and other public services. The Company has made good achievements in non-electric business fields including municipal works, waterworks engineering, civil works, environmental engineering, reconstruction of shanty areas, and new-style urbanization, etc.



1. The largest water intake and drainage project in the world to date - Saudi Jizan JIGCC water drainage project.
2. Zhangzhou Nanhu Bridge Project
3. Taizhou Base Commercial Supporting Project--Apartment Hotel
4. Langfang Xinyi HuaQi ZuoAn Residential Project

PROCUREMENT AND LOGISTICS

NCPE's project bidding agency, material and equipment procurement, equipment manufacturing supervision, logistics, and storage, etc. With its smarttype working facilities and advanced production management methods, it has set up a technical support system of corporate information of which the core part are integrated procurement management system and qualified suppliers management system.



PROJECT MANAGEMENT, ENGINEERING SUPERVISION, OPERATION AND MAINTENANCE

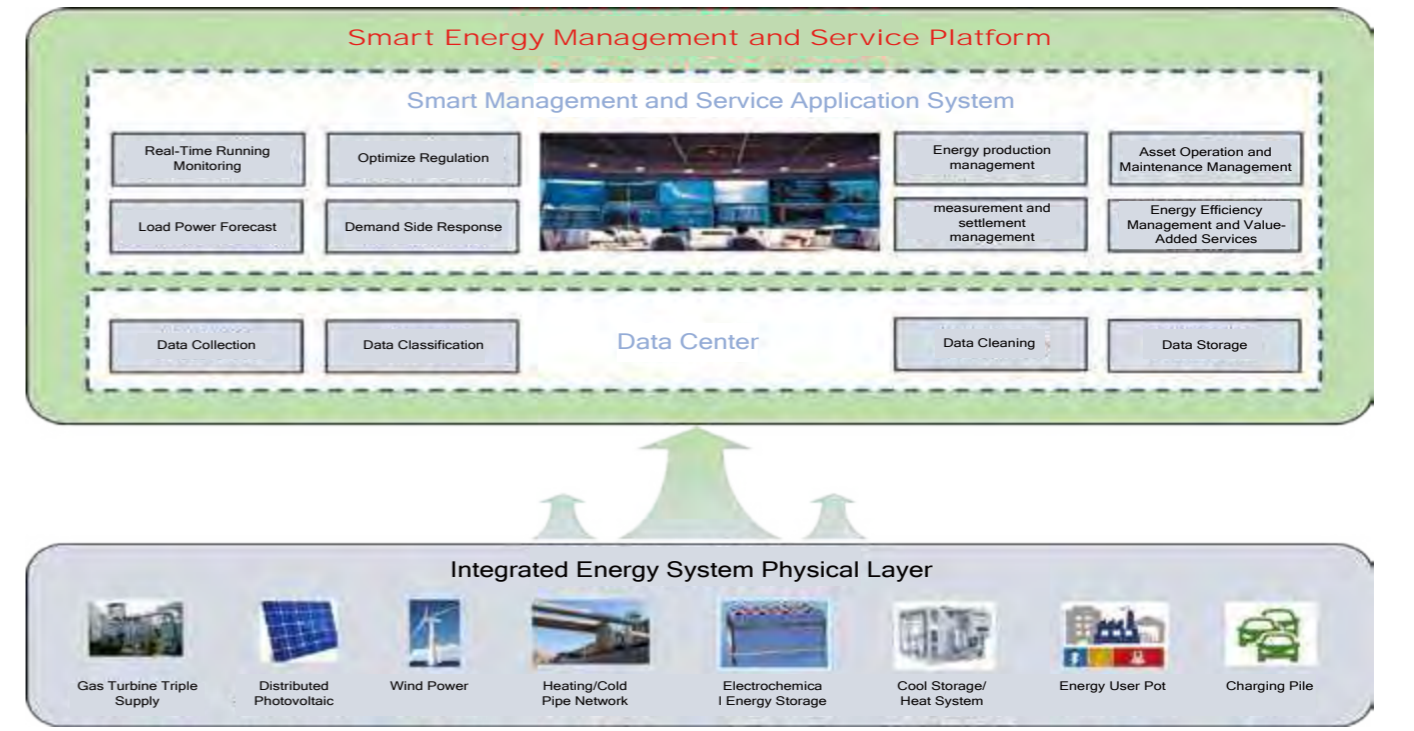
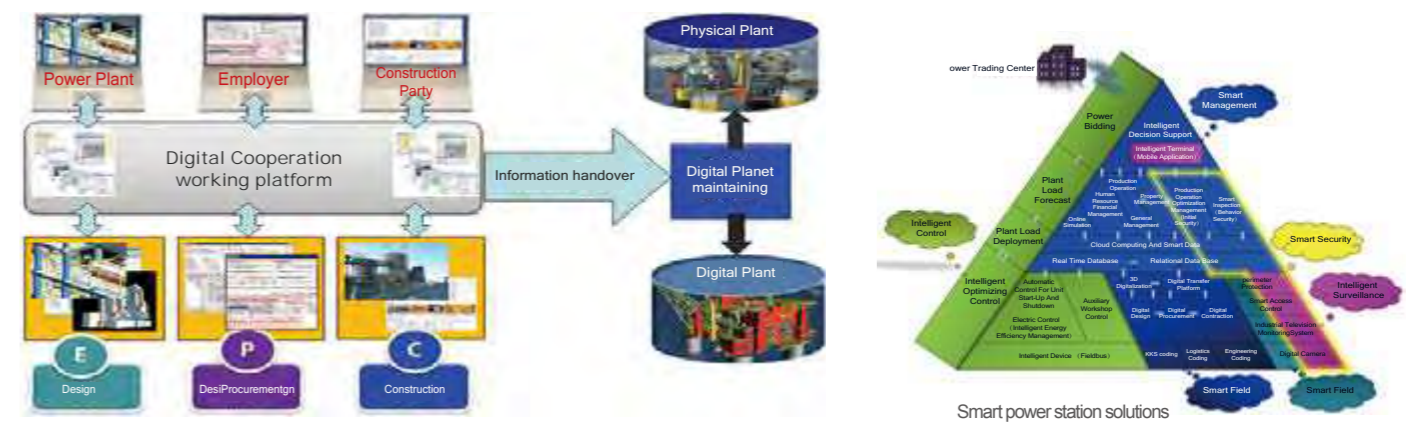
NCPE has a professional project management team, which is competent to perform a wholeprocess supervision, consultation, and project management on design, construction, and commissioning works. NCPE is one of the first batch of organizations that are granted by the Ministry of Housing and Urban-Rural Development of China with Class A Certificate for Project Supervision and is recognized by China Electric Power Construction Association as Qualified Organization for Quality Evaluation on Thermal Power, Wind Power, and Transmission Lines and Substations Projects. The company has successively undertaken over 200 projects of design supervision, construction supervision, quality evaluation, and post-project evaluation on both power projects and civil engineering projects, awarded with 3 Luban Prizes, 1 National Quality Project Golden Prize, and 13 National Quality Project Silver Prizes, 22 China Electric Power Quality Engineering Awards. In recent years, the Company vigorously pushed forward its project management business and undertook a dozen of project management businesses including Sri Lank Coal-Fired Power Plant Project and Shenhua Sichuan Jiangyou Power Plant Project.



1. Bao' an Lao hukeng Waste Incineration Power Plant Phase II Project in Shenzhen – Golden Award of National Quality Project
2. Sri Lanka Puttalam Phase II 2×300MW Coal-Fired Power Plant Project - National “Lu Ban Award”

INFORMATION TECHNOLOGY DEVELOPMENT AND SERVICES

NCPE has a team of professional talents with engineering background and information technology knowledge, and is committed to providing customers with life-cycle IT technology solutions to enhance their work efficiency. The introduction of 3D engine technology and cloud deployment plan by Huabei Institute has completed the digital handover of power plants such as Anqing and Gao'an, providing smart power plant overall solutions, project smart security solutions and implementation, power plant data model construction and modular product customization development, software business. Services such as conversion. Based on advanced big data storage and analysis technology, the traditional digital handover, SIS and MIS systems are integrated, and a power plant integrated intelligent management platform and smart energy management and service platform suitable for plant-level and collection company-level are developed. Video is also developed. New technology products such as intelligent identification and trough solar collector controllers provide customers with modern information technology applications and help enterprises innovate.



The Strength Of Accomplishing

Harmony

The Strength of Accomplishing Harmony

Creating a harmonious situation and establishing a winwin partnership. Energy is lifeline of global economy. In energy and infrastructure realm, NCPE has been providing its clients with high-tech, environment - friendly and innovative projects and has played an important role in promoting social civilization and improving people's living standard. NCPE will combine its self-value with the interest of the client to attain mutual accomplishment and harmonious win-win situation.

53 / DEVELOPMENT OF CORPORATE CULTURE

54 / CORPORATE SOCIAL RESPONSIBILITY



DEVELOPMENT OF CORPORATE CULTURE

Importance is always attached to the building of enterprise culture and team cohesion and maintaining sustainable development of NCPE. What is condensed here is the persistence of the team, the strength of harmonious cooperation, and the responsibility for the social development. NCPE is building a culture of harmony to develop further domestically and expand extensively to outside world.



1. Performance with the theme of "Well - cultured, Harmonious, Happy, and Accomplishing"
2. "Suburb Healthy Trip" in Beijing Yanqi Lake Cycling Activities
3. "Growing with NCPE" monthly Birthday celebration
4. Youth Knowledge Competition of "Follow the Party Staying True to Our Original Mission"

CORPORATE SOCIAL RESPONSIBILITY

Keeping the corporate culture in mind, NCPE takes its corporate social responsibility as a corporate act responsible for the society. The Company adheres to a scientific outlook on corporate social responsibility, and is devoted in the mutual promotion between the duty performance and business operation of an enterprise, and endeavors to turn corporate social responsibility into the critical thrust corporate business operation. The Company has been honored "National Civilization Position" and "Tax-class Credit A-level Enterprise" for years; takes an active part in public welfare activities; takes multiple ways to reward the society; and tries to achieve a harmonious co-development of the Company and the society.



1. Performance with the theme of "Well-cultured, Harmonious, Happy, and Accomplishing"
2. NCPE donated a school bus for SOS village in Belarus.
3. NCPE donated learning materials to Xiaotaitai Town Central Primary School in Zhangbei County
4. NCPE's employees worked as volunteers introducing energy saving in a primary school.



FUTURE DEVELOPMENT

With the base in China and the world in view and sticking to the core values of "Trust-Responsibility", NCPE has been strengthening its exchange and cooperation with domestic and foreign organizations and institutions in an effort to become a key participant in global energy and infrastructure construction. It spares no effort to cultivate and develop a whole-service value chain and takes its due social responsibilities to attain a mutual accomplishment and all-win situation.

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