中广核 CGN

核能服务
Nuclear Power Services

中广核工程有限公司
China Nuclear Power Engineering Co.,Ltd.

打造国际一流的核电AE公司

Forge A Leading World Nuclear Power AE Company

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总经理致辞

Address of General Manager

从成功建设大亚湾核电站，到自主建设岭澳核电站一期、岭澳核电站二期，中广核工程有限公司不断发展壮大，目前承担着15台百万千瓦级核电机组的建设任务，总装机容量达到1754万千瓦，在建机组数量和装机容量均位居世界第一。

我们不断提高核电建造水平，已具备成熟的核电工程总承包能力，可为核电站的建设提供从厂址选择、设计招标、采购与设备成套、施工管理（含监理）、调试启动到商业运行的全周期专业化服务。同时通过科技创新和资源掌控，不断提高核电建设的安全性、经济性和竞争力。

我们坚持“安全第一、质量第一、追求卓越”方针，致力为客户铸造精品工程并创造价值，我们秉承“合作共赢”理念，期望与客户构建长期合作的和谐关系，共享核电发展成果。

在核电工程建设领域，我们期望能为您提供全方位的规范化、现代化和专业化的服务，与您携手，共创核电美好明天！

On the strength of GNPS to independently constructed LNPS I and II, China Nuclear Power Engineer Company Ltd. (CNPEC) never stops its pace of growth. It is now undertaking the construction of 15 1000MW NP units, with a total installed power generating capacity of 17540 MW, first in the world rankings for under-construction units and installed capacity.

We devote to enhance the level of nuclear power station construction ceaselessly, and now our company has a mature ability on overall contracting for nuclear power engineering, providing nuclear power station construction with complete-cycle special services, from site selection, design & invitation for bids, procurement & equipment completion, construction management (including supervision), commissioning startup to commercial operation. Moreover, we continuously improve security, economical efficiency & competitiveness of nuclear power construction through the technical innovation and resource control.

We stick to the policy of “Security First, Quality First & Striving for Excellence” and devote to cast high-quality projects and create value for our clients. In addition, we hold the concept of “Win-win Cooperation” and expect to establish harmonious relationship with our clients based on long-term cooperation and enjoy achievements of nuclear power development together.

In the field of nuclear power engineering construction, we hope to provide you with all-around standard, modern & professional services and work with you to create fine tomorrow together!

“安全第一、质量第一、追求卓越”

“Security First
Quality First
Pursing Excellency ”

公司介绍

Company Profile

业务范围

核电、常规电力、热力、燃气、港口、公路、水利、给排水及民用建筑工程的承包、管理、咨询、监理；工程建设技术服务、咨询；经济信息咨询；工程建筑项目招标代理；经营进出口业务；建筑工程施工；电力设备和材料的购销；工程设计。

Business Scope

Contracting, management, consultation and supervision on engineering of nuclear power, conventional electric power, thermal power, gas, harbor, highway, water conservancy, water supply and drainage and civil construction; engineering construction technical service and consultation; economic information consultation; engineering construction project tender invitation agent; import & export business; architectural engineering construction; purchase and sales of electric power equipment and materials; engineering design.

专业团队

在职员工6000多人，是一支具有丰富的核电工程建设专业化管理经验的精英团队。EPCS四大业务板块，分别承担工程设计、采购、施工和调试任务，按专业化、标准化构建管理体系，在各工程项目统筹下，实现无缝衔接和高效运作，能为客户提供核电站建设全周期服务。

Professional Team

Over 6000 staff forms an experienced elite team capable of NP engineering construction and management. Four major business sectors of EPCS are respectively covering engineering design, procurement, construction and commissioning. By virtue of a specialized and standardized management system and centralized coordination of various engineering projects, seamless connection and efficient operation can be achieved to provide customers with full cycle NPP construction services.

企业愿景

打造国际一流核电AE公司

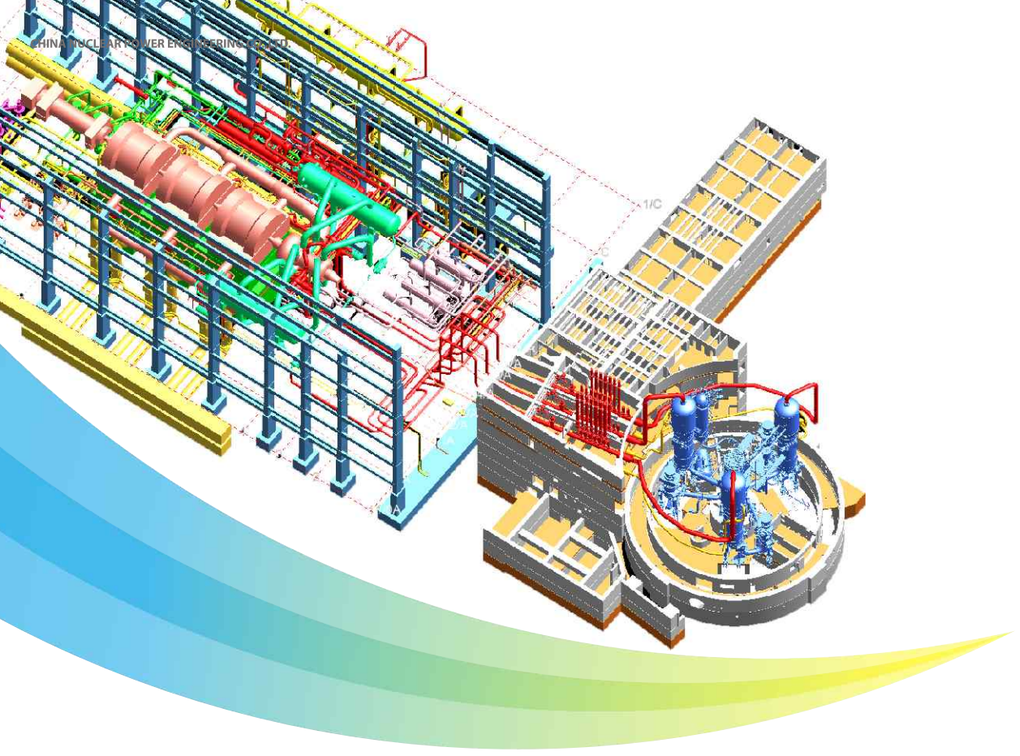
Enterprise Vision

Forge A Leading World Nuclear Power AE Company

核电站建设过程一览

NPP Construction Overview

一座核电站的诞生
Birth of a NPP



核心能力

Core Competence

具备科技创新、市场经营和项目建设三大核心能力，努力向“国际一流的核电AE公司”迈进。

With core competences in three respect of sci-tech innovation, market operation, and project implementation, CNPEC is striving to become a leading world nuclear power AE compamy.

科技创新能力

公司致力于科技创新和投入，追求建设能力不断超越，引领公司可持续发展。公司注重科技创新的体制建设，紧跟世界核电技术发展潮流开展工程技术研发和型号产品研发，重视大量工程实践的经验反馈和积累，加强先进技术和制造工艺的消化、吸收和再创新，为客户提供更优质的服务。

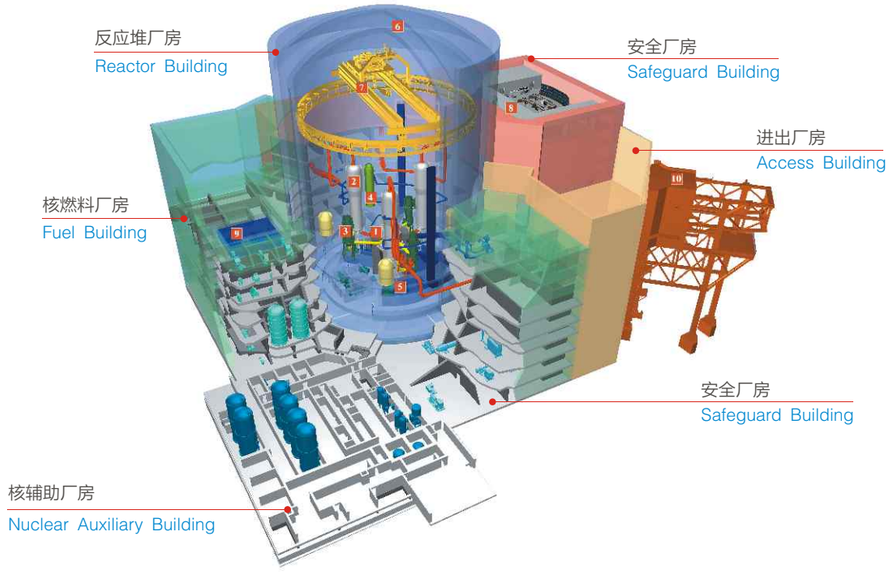
- 可自主完成CPR1000百万千瓦级核电站设计，包括全厂总体设计、初步设计、核岛和常规岛主体设计等。
- 已掌握百万千瓦级二代改进型压水堆核电技术并不断改进，实现了标准化、系列化和规模化建设。
- 引进EPR三代核电技术建设台山核电站，参与AP1000三代核电项目建设及技术的消化、吸收工作。
- 研发、形成具备三代核电技术主要特征的堆型ACPR1000以及具有完全自主知识产权的三代核电技术ACPR1000^{+}，为全面开拓海内外核电市场奠定技术基础。

Sci-tech Innovation

Our company devotes to scientific & technical innovation and investment, pursues continuously transcending construction capacity to lead sustainable development. Our company lays emphasis on the construction for scientific & technical innovation system, keeps up with the world nuclear power development trend, undertakes engineering & technology and product research & development, pays attention to feedback & accumulation of practical experiences from a large amount of projects, strengthens digestion, absorption & re-innovation of advanced technology & manufacturing process to provide our clients with better services.

- Our company can independently complete the design for CPR1000 nuclear power station with a capacity of a million kilowatts, including overall design, preliminary design, main design for nuclear islands & conventional islands.
- Our company has grasped the second generation of advanced pressurized water reactor nuclear power technology and keeps continuous improvement, realizing standardization, systematization & scale construction.
- Has introduced the third generation of EPR nuclear power technology to build Taishan Nuclear Power Plant and taken part in the construction of the third generation of AP1000 nuclear power project as well as the digestion & absorption of its technology.
- CNPEC has developed ACPR1000 with major GENIII technical features and ACPR1000^{+}, a GENIII technology with independent IPR, technically lying foundation for full exploration of NP markets at home and abroad.

ACPR1000^{+}



市场经营能力

• 确立了核电业主市场、工程技术服务市场、大市场三大业务领域。立足核电业主市场，稳步推进核电项目群建设；不断加强外部资源掌控能力，不断丰富核电工程总承包业务内涵，扩展核电工程建设业务外延。

• 推行百万千瓦级核电站报价体系、供应商评价体系和招投标体系。

• 以资本为纽带增强战略资源掌控能力，参股中咨公司、中核华兴等业界龙头企业。

• 通过中国电力行业首批AAA信用等级认证，经国际内审协会质量评估，与多家银行和保险机构建立密切合作关系。

• 获得中国《对外承包工程资质证书》。

• 以“WECAN（中珐国际核能工程有限公司）为载体，初步形成与国际核电同行合作国际业务的业务平台。”

• 积极打造工程公司法国分公司、中咨工程公司、上海科技公司等国内外业务拓展平台，多方位拓展公司业务。法国分公司将成为中广核集团在欧洲拓展核电、风电、太阳能等各项清洁能源业务的大平台。

• 以南非项目部、法国分公司、南非代表处、泰国代表处等为标志，初步建立了国际项目内部组织以及运作方式，结合目标市场研判，初步形成了市场开发区域组织。

Market operation

• Three major business sectors have been established, i.e. NP owners market, engineering technical service market, and major market. A fleet of NPPs is constructed under steady progress based on NP owners market, with the ability to control external resources strengthened, NP EPC business enriched and NP engineering construction business expanded.
• Our company pursues the quotation system, the supplier evaluation system and the bidding system for nuclear power station with a capacity of a million kilowatts.
• Enhances the capacity in strategic resource control with capital as the link, and has shared in such leading enterprises in the industry as China International Engineering Consulting Corporation and China Nuclear Industry Huaxing Construction Co., Ltd.
• Has got the first batch of certification for AAA credit rating in power sector in China, and established close cooperative relationship with several banks and insurance companies on the basis of quality assessment by IIA.
• Has got the Quality Certification of China International Contractor.
• With WECAN (Worldwide Engineering CGNPC AREVA Nuclear Company Ltd.) working as a carrier, an international business platform has been forged for cooperation with world NP peers.
• Efforts are made proactively to build such business platforms at home and abroad as France branch of CNPEC, CIECC Engineering Company Limited, Shanghai Science and Technology Company, so as to expand CNPEC's business in an all- round manner. France branch of CNPEC will become a major platform for CGN to explore clean energy business in Europe, like nuclear power, wind power, solar energy, etc.
• Setup of South Africa Project Dept., France Branch, South Africa Representative office, Thailand Representative office, Vietnam Representative office, etc. are hall marks of internal organization and operation modes that have been preliminarily set up for international projects and also of regional organization basically formed for market development in combination with study and judgment on targeted markets .

项目建设能力

Project Implementation

中广核工程有限公司是中国目前在工程设计、设备采购与成套、施工管理、调试启动四大板块业务最齐全的核电AE公司，是中国核电建设行业的中坚力量，能为客户提供全面的核电工程建设和管理服务。

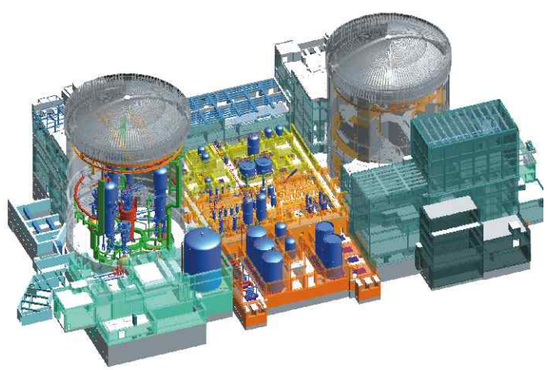
CNPEC is a nuclear power AE company which presently covers the widest range of four business sectors in China, i.e. engineering design, equipment procurement and supply, construction management, commissioning and startup. As the backbone of China's nuclear power construction industry, it can provide customers with complete NP engineering construction and management service.

工程设计

中广核工程有限公司已形成了一套完整有效的核电工程设计与研发体系，在成功建设及运营大亚湾、岭澳核电站一期的基础上，通过全面参与岭澳核电站二期、辽宁红沿河核电站、福建宁德核电站、广西防城港核电站的设计和设计管理工作，完全具备了CPR1000堆型电站的自主设计能力和在役电站技术改造能力。研发、形成具备三代核电技术主要特征的堆型ACPR1000以及具有完全自主知识产权的三代核电技术ACPR1000^{+}。

Engineering Design

CNPEC has already formed a comprehensive and effective NP engineering design and R&D system. Based on successful construction and operation of GNPS and LNPS I, CNPEC, through an all-around involvement in design and design management of LNPS II, Liaoning Hongyanhe NPP, Fujian Ningde NPP and Guangxi Fangchenggang NPP, is capable of independent design of CPR1000 NPPs and of technical improvement of in-service NPPs. CNPEC has researched and produced ACPR1000 with major GENIII technical features and ACPR1000^{+}, a GENIII technology with independent IPR.



设备采购与成套

具备同时开展多个国内、国外核电工程采购工作的能力；能够准确把握国内外核电设备供货市场形势，形成了符合市场形势的成套供货体系；拥有一批掌握核电设备标准及核心技术要求、工程实践经验丰富的设备成套技术专家队伍；形成了覆盖核电设备制造专业领域及分布区域的设备监理组织体系。

Engineering Design

Capable to make procurement for several domestic and foreign NP engineering at the same time, CNPEC can accurately grasp situations of global NP equipment supply markets, and has formed an appropriate supply system. It holds a team of professionals experienced in engineering practice who have mastered NP equipment standard and core technical requirements. An equipment supervision organization system has taken shape, covering all NP equipment manufacturing and distribution area.

施工管理

拥有专业化施工管理队伍；具有较强的施工组织及资源掌控能力，实现了对国内优质建安资源的掌控；具有适合多项目运作的施工管理体系、项目标准化实施体系、资源保障体系；掌握EM2安装、主管道自动焊、DCS安装、半速机安装、自密实混凝土等核电站建造关键技术。

Construction Management

With a professional construction management team, CNPEC has a strong ability in construction organization and resources control and possesses a construction management system, a standardized project implementation system and a resources guarantee system suitable for multi-project operations. It has realized control over good-quality construction and installation resources in China, and mastered key NPP construction technologies for EM2 installation, automatic welding of main pipelines, DCS installation, half-speed turbine generator installation, self-compacting concrete, etc.

调试启动

国内唯一专业化核电调试实体组织，国内同行中首家中国电力建设企业协会电力工程调试专业委员会副秘书长单位。自主承担岭澳核电站二期调试的组织、实施任务，开发了核岛性能试验分析等一系列调试软件平台，具备CPR1000自主化调试总承包能力。

Commissioning And Startup

As the only substantive organization specialized in NP commissioning in China, CNPEC is the first deputy secretary general enterprise in Electrical Engineering Commissioning Specialties Committee of China Electric Power Construction Association. It has independently organized and carried out commissioning on LNPS II, developed a series of software for NI performance test analysis, etc., capable of general contacting of autonomous CPR1000 commissioning.

项目管理

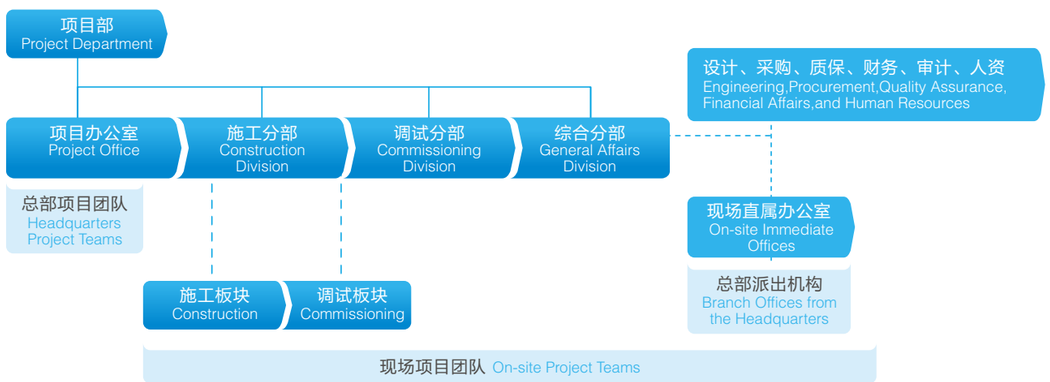
为满足“多项目、多基地”工程建设任务的管理需要，实施“集约化、矩阵式”项目管理，合理调配资源，使稀缺资源在项目间充分共享和有序流动，充分保障多项目建设同步推进。

创造性地推进“理论电站”建设，进一步提升公司项目管理核心能力。

Project Management

In order to manage “multi-project and multi-base” engineering construction, CNPEC implements “intensified management in matrix mode”. By rational allocation of resources, rare resources are fully shared and orderly circulated among different projects, thus guaranteeing smooth simultaneous advancement of multiple projects. A creative promotion of Theory Plant will further elevate CNPEC's core competence in project management.

项目式运作
Project-oriented Operation



主要产品与服务

Key Products & Services

通过长期的核电建设实践，公司培养了一支具有丰富核电工程实践经验、管理经验的专业化人才队伍，建立了完整且专业的施工安全、质量、进度、投资、技术和环境“六大控制”管理体系，形成了成熟的“矩阵型、项目式”管理运作体制，掌握了优质的设备供应、施工建设与工程安装资源，具备独立承担核电工程总承包以及承担工程建设各环节的专项咨询和服务能力。

Through long-term practice in nuclear power construction, our company has cultivated a team of specialized talents with rich practical experiences in nuclear power engineering & management experiences, established a complete & professional management system based on “Six Control” on construction safety, quality, progress, investment, technology and environment, formed mature “Matrix-style & Project-style” management & operation system, grasped high-quality equipment supply, construction & engineering installation resources, and has the ability to independently take responsibility to overall contracting for nuclear power engineering and the ability to undertake special consultation & service for all links of engineering construction.

核电站规划建设系统集成

开展核电规划建设全过程或分阶段的技术咨询服务；为业主提供核电站工程总承包服务（EPC-Turnkey）/（EPC）或项目管理总承包服务（PMC）。

Nuclear Power Station Planning & Construction System Integration

Implements overall or staged technical consulting service for nuclear power planning & construction; provides business owners with service of overall contracting for nuclear power station engineering(EPC-Turnkey) /(EPC) or service of overall contracting for project management(PMC).

核电站设计及咨询专项服务

公司设计院服务范围涵盖核电厂前期工程咨询、核电厂工程设计、核电厂技术支持服务及项目管理等业务。

NPP design and consultation

CNPEC's design institute (CNPDC) handles NPP business in preliminary engineering consultation, engineering design, technical support, project management, etc.

工程采购与成套服务

为电站建设提供专业规范的设备成套服务以及设备招标采购、合同执行和设备监造等专项服务。设备质量管理体系完善，供货渠道成熟，与国内外几千家设备供应商建立了合作关系。

Engineering Procurement & Complete Set of Service

Our company can provide professional & standard equipment completion as well as specialized services, e.g., equipment bidding, contract execution & equipment manufacture supervision etc. The equipment quality management system is perfect while the material supply channel is mature, and our company has established cooperative relationship with thousands of domestic & foreign equipment suppliers.

施工管理服务

承担项目现场总集成商，主要提供核电项目建设过程中的现场建设、监理、咨询和技术服务等业务，并履行现场组织及现场集成的职责。

Construction Management Service

As an overall project field integrator, our company can provide such businesses as on-site construction, supervision, consultation & technical service for the whole course of nuclear power projects and fulfill the duty of on-site organization & integration.

调试启动服务

承担核电厂已安装完毕的部件和系统运转并进行各种试验（包括非核试验和核试验），以验证其性能是否符合设计要求并满足性能准则。

质量保证服务

承担按照中国核安全质量保证法规（HAF003）和国际标准（ISO9001，ISO9004）建立项目保证体系咨询以及公司持续改进的管理体系咨询。

Commissioning startup Service

Can undertake operation of installed parts and system in nuclear power plants and carry out various tests (including non-nuclear test & nuclear test) to verify whether their performances meet design requirements and performance criteria.

Quality Assurance Service

Can undertake consultation about assurance system for projects established according to Chinese quality assurance regulation(HAF003)of nuclear safety & international standards(ISO9001,ISO9004)and consultation of management system for the purpose of continuous improvement for enterprises.

项目管理服务

承担多项目规划、资源调配、项目风险管理、项目经验反馈、项目绩效管理、技术支持平台建设和项目执照申请等多方面管理咨询。

专业培训服务

公司工程培训中心充分利用现有资源，开展对国内外业主、承包商、潜在客户的培训工作。建立了标准的对外培训服务体系，形成了理论与实践相结合，围绕核电工程设计、建造技术，全面覆盖安全、质量、进度、前期开发、设计、施工、调试、项目管理等领域的完整的课程体系。自2007年以来，已经为外部企业和合作伙伴培训了1000多人次。

Project Management Service

Our company can undertake multiple project planning, resource coordination & scheduling, project risk management, project experience feedback, project performance management, technical support platform construction and project license application as well as many-sided management consultation.

Professional Training Service

Making full use of existing resources, CNPEC's training center conducts trainings for owners, contractors and potential clients at home and abroad. An open training system has been standardized, integrating theories with practices. Centering on NP engineering design and construction technologies, a comprehensive curriculum system has been created, covering security, quality, schedule, preliminary development, design, construction, commissioning, project management, etc. Since 2007, the training center has offered trainings for over 1000 people from external enterprises and cooperative partners.

公司业绩

Company Achievements

大亚湾核电站

1994年5月建成至今，保持安全稳定运行，各项经济运行指标达到国际先进水平。

自1999年起，在64台法国同类型机组的安全挑战赛中，荣获21项次第一。

Daya Bay Nuclear Power Station

From its establishment in May, 1994 up to now, it keeps safe and static operation, and its various economic operation indexes all achieve advanced world levels.

Since 1999, it has won the first for 21 items or times in the security challenge competition of 64 units of French generating sets with same type.

岭澳核电站一期

2003年1月建成，国际原子能机构（IAEA）认为：“岭澳核电站一期大部分指标都可以与新的IAEA国际安全标准相媲美，其业绩将成为全球核工业界极有价值的参照。

在全球265台采用压水堆技术的机组中，与2010年WANO指标相比，岭澳核电站一期1号机组有5项指标达到世界先进值，全球同一水平共28台；2号机组有6项指标达到世界先进值，全球同一水平共25台；1号机组也已6年多没有发生非计划停堆事件。这充分说明中广核集团建设、运营核电站的安全性、可靠性和先进性。

Phase I of Ling'ao Nuclear Power Station

It was completed in Jan, 2003, and the International Atomic Energy Agency (IAEA) thinks, "Most indexes of the first stage of Ling'ao Nuclear Power Station can compare favorably with the new international safety standards of IAEA and its achievements will become the quite valuable reference for global nuclear industry."

Among 265 PWR units worldwide, compared with 2010 WANO indicators，Unit 1 of LNPS I has five indicators (only 28 units in total at the same level) and Unit 2 has six indicators at internationally first level (only 25 units in total at the same level). No unscheduled outage events have occurred to Unit 1 for over 6 years. NPPs constructed and operated by CGN have proved to be safe, reliable and advanced.

岭澳核电站二期

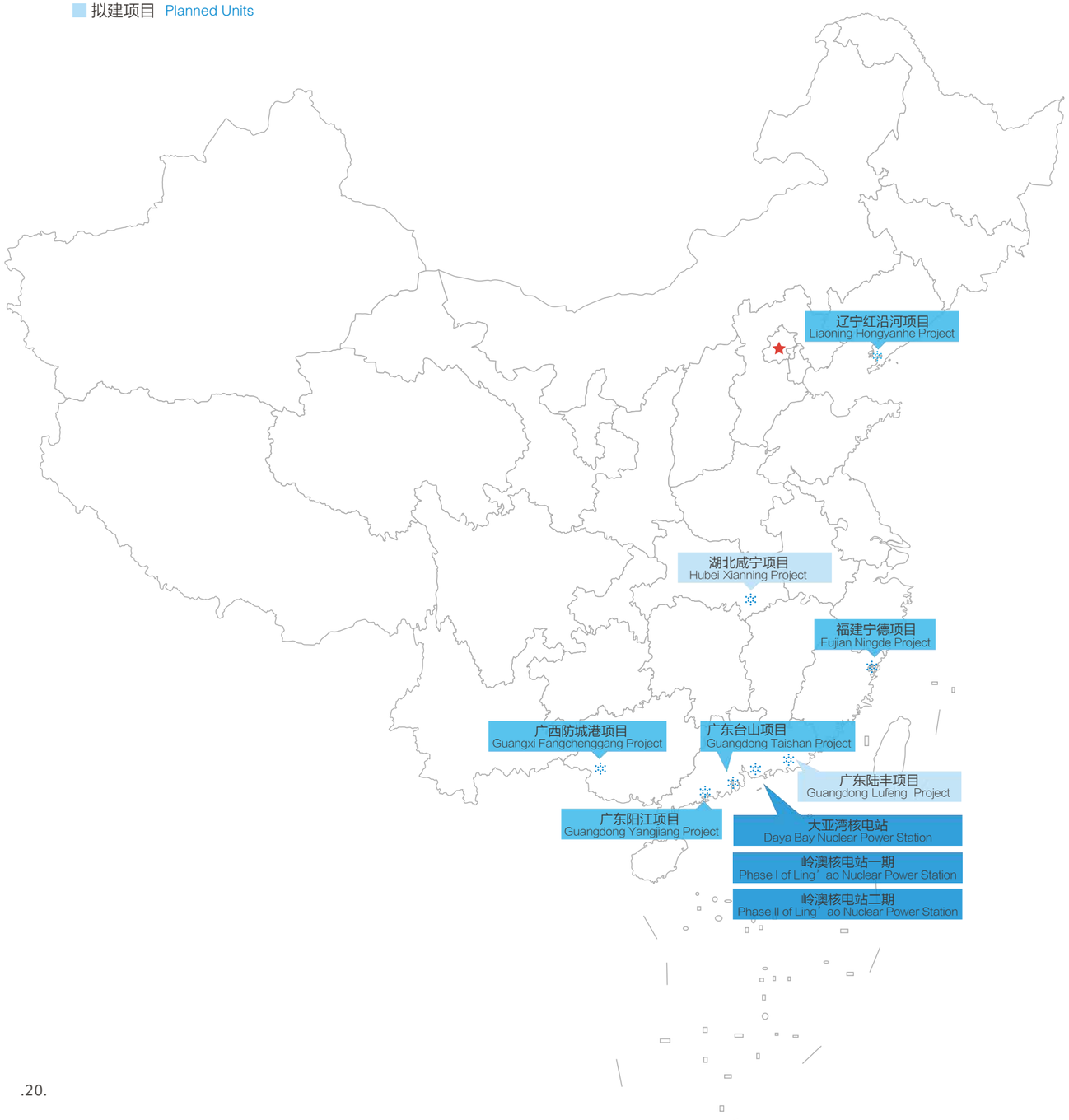
1、2号机组分别于2010年9月、2011年8月实现商运。岭澳核电站二期工程是中国核电自主化依托项目，采用自主品牌核电技术CPR1000建设，项目从选址、设计、采购、施工，到设备安装、调试和竣工移交，均由中广核工程有限公司总体负责。项目采用了全数字化仪控技术、先进堆芯燃料管理、半速汽轮发电机组和非能动氢复合器等多项重大技术改进。综合技术、安全、经济指标均达到目前国际同类核电站的先进水平。

Phase II of Ling'ao Nuclear Power Station

Unit 1 and Unit 2 were put into commercial operation in September, 2010 and August, 2011 respectively. LNPS II, China's supporting project for self-reliance, applies CPR1000 technology with an independent brand, whose site selection, design, procurement, construction, equipment installation, commissioning and as-built handover were all undertaken by CNPEC. Several major technical improvements have been adopted, like digital I&C technology, advanced core fuel management half-speed turbine generator, passive hydrogen recombiner, etc. Its comprehensive technical, safety and economic indicator has reached advanced level among the same type of NPPs internationally.

核电项目信息
NP projects info.

运营项目 Units In Service
在建项目 Units Under Construction
拟建项目 Planned Units



项目 Project	规模 Scale	技术路线 Technical Route	建设进展（截至 2012 年 5 月） Schedule (by May, 2012)
辽宁红沿河项目 Liaoning Hongyanhe Project	4×1000MW 压水堆核电机组 4×1000MW PWR units	CPR1000	4台机组全部开工建设，目前项目整体进度可控；其中1号机组按期完成冷试，处于机组联调阶段，即将开展热试，预计2012年年底具备商运条件。 4 units are all under construction with overall project progress controllable. Unit 1 has finished cold test on schedule and is now at integrated test stage, with a hot test to be taken, expecting commercial operation at the end of 2012.
福建宁德项目 Fujian Ningde Project	4×1000MW 压水堆核电机组 4×1000MW PWR units	CPR1000	4台机组全部开工建设，建设进度良好，其中1号机组处于热试阶段，预计2012年年底具备商运条件。 4 units are all under construction at good construction schedule. Unit 1 is at hot test stage, planned to possess operating conditions at the end of 2012.
广东阳江项目 Guangdong Yangjiang Project	6×1000MW 压水堆核电机组 6×1000MW PWR units	CPR1000	阳江项目1、2、3号机组已开工建设，4号机组第一罐混凝土浇筑工作受国家政策影响未完成。目前阳江项目1—4号机组工程建设一级里程碑按期完成31个，按期完成率96.9%。 Unit 1, Unit 2, and Unit 3 are under construction. FCD work of Unit 4 has not been finished as influenced by national policies. So far, for Units 1-4, 31 Level 1 engineering construction milestones have been finished, with a timely completion ratio of 96.9%.
广东台山项目 Guangdong Taishan Project	2×1750MW 压水堆核电机组 2×1750MW PWR units	EPR	广东台山项目1、2号机组已开工建设，目前1号机组反应堆压力容器已完成吊装，整体建设工作有序推进。 Unit 1 & 2 of Taishan Project are under construction. Up to now, the RPV (Reactor Pressurized Vessel) of Unit 1 has been mounted and the project overall is at good construction schedule.
广西防城港项目 Guangxi Fangchenggang Project	2×1000MW 压水堆核电机组 2×1000MW PWR units	CPR1000	两台机组全部开工建设，整体进展良好，1号机组已完成穹顶吊装，正在开展常规岛安装；2号机组正在推进厂房土建工作。 Both units are under construction at a smooth schedule. For Unit 1, dome lifting was finished and CI erection is under way. For Unit 2, CW construction is under way .

产品 / 服务清单
Product / Service List

核电站规划建设系统集成服务

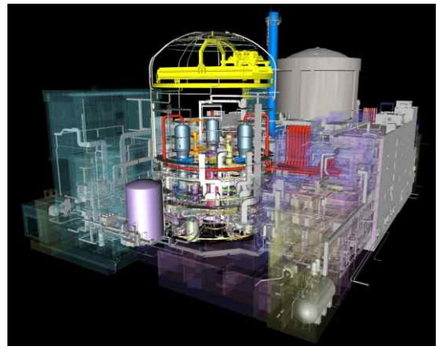
Integration Service of Planning & Construction System for Nuclear Power Station

核电AE服务

作为业主聘用的代表，负责整个核电项目从项目前期阶段至项目商运阶段的全过程项目策划及管理、咨询，实现建设项目的所有权和建设权相分离；为业主协调EPC模式中各承包商；为业主提供包括六大控制在内的技术与管理服务和其他咨询服务。

Nuclear power AE service

As a representative appointed by the Owner, we are responsible for the planning, management and consultation of the whole nuclear power project in the whole process from preliminary stage to commercial operation stage and realize the separation of construction project ownership from construction right; coordinate all constructors in EPC mode for the owner; and provide the owner with technical and management service including the six major controls and other consultation service.



核电站工程EPC-Turnkey总承包服务

对核电建设项目进行总承包，负责全部工程建设及管理工作，按照合同约定，组织实施所有前期准备、勘察、咨询、设计、采购、施工、调试（含竣工试验）和移交全过程，使机组达到商业运行的条件。

核电站工程EPC

对核电项目建设过程中的一个或多个阶段的项目建设进行总承包，负责该阶段全部工程建设及管理工作，按照合同约定组织该阶段所有建设及项目管理工作。

核电站项目管理总承包服务（PMC）

负责项目的设计、采购、施工和调试全过程管理和组织，帮助业主对项目前期策划、项目定义、项目计划、项目融资，以及设计、采购、施工和调试等阶段的工作进行集约化管理。

Nuclear power station project EPC-Turnkey general contracting service

Carry out general contracting for nuclear power construction projects and undertake all engineering construction and management work; organize and carry out all preliminary preparation, investigation, consultation, design, procurement, construction, commissioning (including completion test) and handover as agreed in the contract to make the unit reach the conditions for commercial operation.

Nuclear power station project EPC

Carry out general contacting for the project construction in one or several stages in the nuclear power project construction process, undertake all engineering construction and management work in the stage and organize all construction and project management work in the stage as agreed in the contract.

General contracting service nuclear power station project management (PMC)

Undertake whole process management and organization including project design, procurement, construction and commissioning and help the owner carry out intensive management for the work in stages like preliminary planning, project definition, project planning, project financing as well as design, procurement, construction and commissioning.

核电站设计咨询专项服务

Design and Construction Special Service of Nuclear Power Station

核电工程前期咨询

项目可行性研究、初步可行性研究以及厂址普选等核电项目前期咨询所有工作。

核电工程设计与技术服务

CPR1000、CPR1000+和CPR1700核电技术的核岛、常规岛、BOP等全范围、全过程设计。

核电工程设计管理

对核电工程项目进行设计策划、进度管理、设计审查，承担项目设计的六大控制，通过进度、接口管理工具实现与分包商和供应商之间的设计信息交换和进度、接口的实时跟踪管理。

核电站运行文件编制

策划及编制CPR1000电厂的总体性运行文件包括机组及事故运行基准文件和最终安全分析报告。

核电工程设计概率安全分析

- 核电厂初步设计阶段功率和停堆工况内部事件一级概率安全评价。
- 施工图设计阶段的功率和停堆工况内部事件一级概率安全评价。
- 核电厂设计改进项的概率安全分析与可靠性评价。

核电工程项目技术经济分析

- 施工图预算编制。
- 工程量清单编制。
- 工程决算、结算审查服务。
- 核电项目估算和概算编制。

Preliminary consultation of nuclear power project All preliminary consultation

works for nuclear power projects including project feasibility study, preliminary feasibility study and plant sitting.

Nuclear power engineering design and technical service

Whole range and whole process design of nuclear island, conventional island and BOP with CPR1000, CPR1000+ and CPR1700 nuclear power technologies.

Nuclear power engineering design management

Carry out design planning, schedule management and design review for nuclear power engineering projects, undertake six major controls for project design and use schedule and interface management tools to realize design information exchange between subcontractor and supplier as well as real time follow up management for schedule and interface.

Nuclear power station operation documentation Plan and compile general

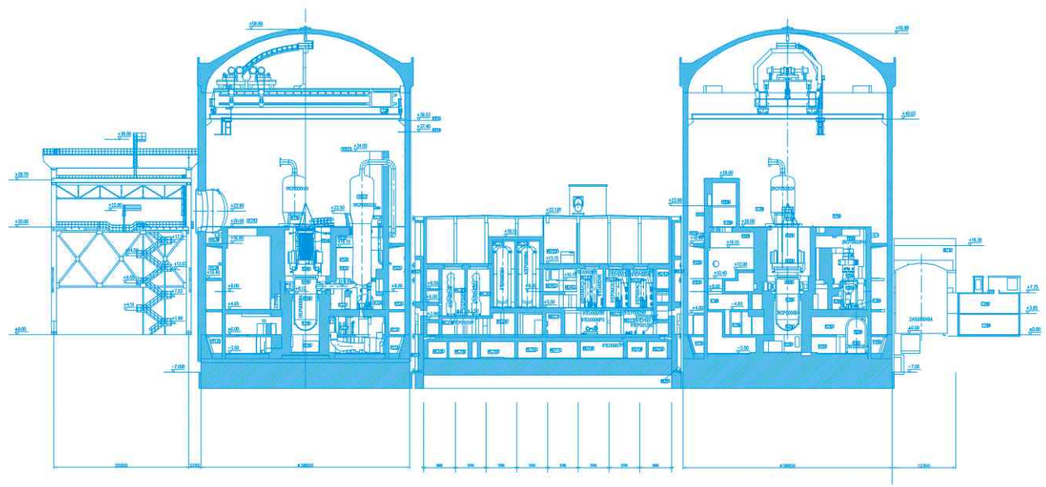
Operation documents for CPR1000 power plants including unit and emergency operation reference document and final safety analysis report.

Nuclear power engineering design probabilistic safety analysis

- Level 1 probabilistic safety assessment for power and shutdown condition in preliminary design stage of nuclear power plant.
- Level 1 probabilistic safety assessment for power and shutdown condition in construction drawing design stage.
- Probabilistic safety analysis and reliability evaluation for improved modification in design of nuclear power plant.

Technical and economic analysis of nuclear power engineering project

- Construction drawing budget making.
- Bill of quantities preparation.
- Final account and estimate examination service.
- Nuclear power project preliminary estimate and budgetary estimate preparation.



堆芯设计
Reactor core design

堆芯核设计
Nuclear reactor core design

热工水力设计
Thermal hydraulic design

燃料组件设计
Fuel assembly design

辐射屏蔽设计
Radiation shield design

设计瞬态分析
Design transient analysis

严重事故分析等
Severe accident analysis etc

核蒸汽供应系统设计

承担CPR1000核蒸汽供应系统（含专设安全系统）设计和咨询，包括初步可行性研究设计、可行性研究设计、初步设计、施工图设计，以及一回路技术改造。

Nuclear steam supply system design

Undertake design and consultation of CPR1000 nuclear steam supply system (including engineered safety system), including preliminary feasibility study design, feasibility study design, preliminary design, construction drawing design and primary system technical innovation.

核电站设备设计

- 不同堆型核电站核岛设备选型分析、论证和咨询工作。
- 核电站设备的初步设计和施工设计工作。
- 核电站设备潜在供应商技术能力评估技术咨询和澄清。
- 设备监造、现场技术问题处理。
- 施工、调试阶段各类设备相关现场技术问题处理。

Nuclear power station equipment design

- Nuclear island equipment sizing analysis, demonstration and consultation work of different core nuclear power station.
- Preliminary design and construction design work of nuclear power station equipment.
- Technical capacity evaluation, technical consultation and clarification of potential equipment suppliers of nuclear power station.
- Equipment manufacture supervision and site technical problem handling.
- Handling of various equipment-related site technical problems in construction and commissioning stages.

核电站核岛三维布置设计

- 电站CPR1000品牌核岛厂房可研阶段设计、初步设计和施工图阶段设计。
- 核电站核岛厂房的三维模型建立，含厂房、设备、管道、支架、电缆桥架和通风管道等。

3D arrangement design of nuclear power station nuclear island

- Design of feasibility study stage, preliminary design and construction drawing stage for nuclear power station CPR1000 nuclear island buildings.
- 3D modeling of nuclear power station nuclear island buildings, including building, equipment, support, cable tray and ventilating duct etc.

核电站系统与设备计算分析
Nuclear power station system and equipment calculation and analysis

1. 可进行电站系统、设备、结构力学计算与分析。 Conduct power station system, equipment, structure mechanical calculation and analysis.
2. 承担民用核级和非核级压力容器的应力分析，验证压力容器设计方案，寻找设计缺陷，提出优化方案。 Undertake stress analysis of civil nuclear and non-nuclear pressure vessel, verify pressure vessel design scheme, search design defect and put forward optimization scheme.

核电站常规岛专项设计工作

编写核电站常规岛运行瞬态分析，辅助系统的运行文件、调试文件、定期试验文件，满足系统调试、运行的要求。根据系统设置、管道布置、运行工况，对管道系统（包括容器、泵、阀门等）参数进行稳态、瞬态分析，以校核和优化设计方案。

Special design work of nuclear power station conventional island

Prepare operation transient analysis of nuclear power station conventional island, auxiliary system operation document, commissioning document and periodic test document to meet system commissioning and operation requirements. Conduct steady state and transient analysis on pipe system (including vessel, pump, valve etc.) to check and optimize design scheme in accordance with system setup, pipe arrangement, operation conditions.

核电站冷端优化设计

根据不同的厂址条件，对微增出力、凝汽器面积、冷却塔面积、循环水量、循环水泵容量以及厂房容积变化、土建工程量等因素进行分析，从而确定较为合理的冷端配置。

Nuclear power station cold end optimum design

Based on different plant site conditions, analyze incremental output, condenser area, cooling tower, circulating water flow, circulating water pump capacity as well as building volume change and civil amount of works to determine reasonable cold end configuration.

核电站数字化仪控系统设计

- 核电站数字仪控系统总体设计，安全分级、保护系统结构、安全级平台与非安全级平台通讯、进入DCS原则、接地及供电方案等设计。
- 核电站核岛仪控系统设计、核电站专用仪控系统设计、核电站常规岛仪控系统设计、核电站BOP仪控系统设计。
- 核电站数字化仪控系统技术规范及采购合同技术附件的准备和谈判支持。

Nuclear power station digital instrumentation and control system design

- Overall design of nuclear power station digital instrumentation and control system, safety classification, protection system structure, safety-related platform and non-safety-related platform communication, principle of going into DCS, grounding and power supply scheme etc.
- Nuclear power station nuclear island instrumentation and control system design, nuclear power station special instrumentation and control system design, nuclear power station conventional island instrumentation and control system design and nuclear power station BOP instrumentation and control system design.
- Preparation and negotiation support for procurement contract technical appendix and technical specifications of nuclear power station digital instrumentation and control system

核电站先进控制室设计

主控室、远程停堆站（备用控制室）设计、主控室环境设计、智能报警系统、规程数字化、后备盘、应急停堆装置等设计。

Advanced control room design for nuclear power station

Main control room, remote shutdown station (back-up control room) design, main control environmental design, intelligent alarm system, procedure digitalization, backup panel, emergency shutdown device etc.

核电站数字化仪控系统设计验证

核电站控制系统及人机接口的模拟、仿真，人机接口功能验证与优化，仪控系统LD/AD功能验证，组态验证，核电站实时信息管理系统的验证。

Design verification of nuclear power station digital instrumentation and control system

Nuclear power station control system and human interface simulation and emulation, human interface function verification and optimization, instrumentation and control system LD/AD function verification, configuration verification, nuclear power station real time information management system verification.

核电站辅助系统设计及技术改进

承担CPR1000 BNI系统（包含一回路化学容积控制、硼和水补给、核岛热阱、乏燃料贮存水池冷却和净化、核岛系统取样分析等）设计和技术咨询，包括初步可行性研究设计、可行性研究设计、初步设计、施工图设计，以及BNI系统技术改造。

Nuclear power station auxiliary system design and technical improvement

Undertake CPR1000 BIN system (including primary chemical and volume control, boron and water makeup, nuclear island heat sink, spent fuel pool cooling and purification, nuclear island system sampling analysis etc.) design and technical consultation, including preliminary feasibility study design, feasibility study design, preliminary design, construction drawing design and technical innovation of BNI system.

核电技术应用

- 城市放射性废物库、辐照站等工艺设计、设计咨询或工程总承包。
- 辐射计量实验室、放射源库设计或工程总承包。
- 核设施辐射防护专项工程设计或工程总承包。
- 其他核技术应用相关的辐射防护咨询及工程设计。

Nuclear power technology application

- Technological design, design consultation or general contracting of urban radioactive waste repository and irradiation station etc.
- Design or general contracting of radiation metering laboratory and radioactive source storehouse.
- Special engineering design or general contracting of nuclear facility radiation protection.
- Other radiation protection consultation and engineering design related to nuclear technology application.

核电实时信息管理系统
Nuclear power real time information management system

a	核电厂生产实时数据平台	Nuclear power plant production real time data platform
b	零点数据收集	Zero point data collection
c	生产过程信息采集和监视	Production process information acquisition and monitoring
d	生产过程事件和事故回放功能	Production process event and accident playback function
e	数据查询比较功能	Data query and comparison function
f	手工输入	Manual output
g	系统安全	System safety
h	主控室辅助监视支持功能	Main control room auxiliary monitoring support function
i	集团数据传输功能	Group data transmission function
j	应急数据传输功能	Emergency data transmission function

核电设计管理信息系统定制开发

- 基于Documentum、K2、P6等平台上的设计管理信息系统的定制开发，建立符合核电设计流程的信息系统。
- 核电设计过程管理、进度管理、接口管理、提资管理、文件编校审流程电子化、设计文档管理等领域信息系统的咨询。

Custom development of nuclear power design management information system

- Custom development of design management information system based on Documentum, K2 and P6 platforms and establishment of the information system conforming to nuclear power design flow.
- Consultation of information systems in nuclear design process management, schedule management, interface management, information provision management, document compilation, check and examination flow electronization and design document management.

核设施放射性废物处理
Nuclear facility radwaste handling

1. 核设施放射性废物处理系统的设计、供货及退役设计。 Design, supply and decommissioning design of nuclear facility radwaste handling system.
2. 城市放射性废物库工艺设计和设计咨询，包括初步可行性研究设计、可行性研究设计、初步设计、施工图设计。 Technological design and design consultation of urban radioactive waste repository, including preliminary study design, feasibility study design, preliminary design and construction drawing design.
3. 辐射监测仪表校准实验室工程设计，放射源库房工程设计，核设施放射性卫生出入口专项工程设计。 Radiation monitoring instrument calibration laboratory engineering design, radioactive source storehouse engineering design and special engineering design for nuclear facility radioactive hygienic access.

核电厂通信系统和火灾自动报警系统设计

各种类型核电厂的通信系统和火灾自动报警系统的设计和咨询工程，包括可行性研究设计、初步设计、施工图设计。

Nuclear power plant communication system and automatic fire alarm system design

Design and consultation work of communication system and automatic fire alarm system for various nuclear power plants, including feasibility study design, preliminary design and construction drawing design.

在运核电站技术支持与服务

- 在运核电站换料设计。
- 在运核电站核岛、常规岛技术改造。
- 在运核电站核辅助系统、放射性废物处理系统技术改造及辐射防护优化技术服务。

Technical support and service for nuclear power station in operation

- Reloading design of nuclear power station in operation.
- Technical innovation of nuclear island and conventional island of nuclear power station in operation.
- Technical innovation of nuclear auxiliary system and radwaste handling system of nuclear power plant in operation as well as optimal technical service for radiation protection.

海水淡化设计和设计咨询

可以承担海水淡化的设计和设计咨询，包括系统设计、设备选型、施工图设计。

Sea water desalination design and design consultation

Undertake sea water desalination design and design consultation, including system design, equipment sizing and construction drawing design.

核岛主设备设计和技术服务

根据设计输入，进行相关初步设计、施工图设计。同时提供制造过程中的技术服务。

Nuclear island major equipment design and technical service

Based on design input, carry out related preliminary design and construction drawing design, and provide technical service in manufacturing process.

核岛设备材料、无损、焊接设计及技术咨询

可承接各种堆型（ CPR1000, EPR,AP1000等 ）核岛设备（反应堆压力容器、控制棒驱动机构、反应堆堆内构件、蒸汽发生器、稳压器、主泵、主管道、安注箱、硼注箱等 ）的材料、无损、焊接等设计。同时提供相应的技术咨询。

Material, nondestructive and welding design and technical consultation for nuclear island equipment

Undertake material, nondestructive and welding design of the equipment (reactor pressure vessel, control rod drive mechanism, reactor internals, steam generator, pressurizer, reactor coolant pump, main pipe, accumulator and boron injection tank etc.) for nuclear island of various core types (CPR1000, EPR, AP1000 etc.).

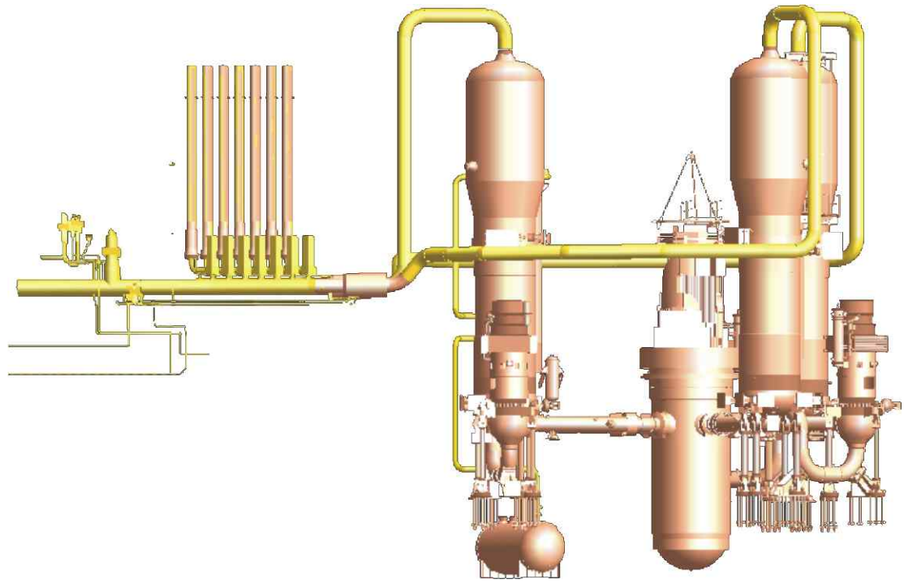
设备采购与成套服务

Equipment Procurement and Integration Service

招标代理服务（中国）
Tendering agent service (China)

为委托人提供编制招标文件(包括编制资格预审文件)，审查投标人资格，组织投标人踏勘现场，答疑，组织开标、评标、定标服务，以及提供招标前期咨询、协调合同的签订等服务。

Provide clients with the services of preparing tendering document (including prequalification document); reviewing tender qualification; organizing tender site survey, question answering, bid opening, evaluation and determination, as well as bidding consultation in preliminary stage and contract sign coordination.



核电站工程及运营成套备件/工具供应

提供核电站工程建设阶段和运行阶段所需备件/工具的供应服务。

核电设备工程技术服务

可提供电站设备技术服务，包括设备制造过程技术支持、设备功能/性能验收、不符合项处理等技术工作；可提供二代改进型、三代核电等不同堆型设备工程技术服务。

Supply of complete spare parts/tools for nuclear power station construction and operation

Provide supply service of spare parts/tools necessary for construction stage and operation stage of nuclear power plant project.

Nuclear power equipment engineering technical service

Provide technical service for power station equipment, including technical support in equipment manufacturing process, equipment function/performance acceptance, nonconforming item treatment; provide engineering technical service for the equipment with different core types such as the second generation improved type and third generation nuclear power.

设备成套供应服务

利用众多长期合作设备供应渠道和自身设计管理能力，尤其是中国核电设备制造资源，为核电站工程建设提供设备或集成系统供货服务，包括NI/CI/BOP设备。

供应商管理能力咨询

通过授课、流程梳理、审查作业文件等方式，帮助供应商质量管理、生产组织管理等方面得到提升。

设备监造及技术咨询

对工程项目的设备监造进行策划并组织监造活动实施，提供设备监理人力和技术支持服务。

核电设备制造质量培训

• 提供设备制造质量管理体系、质量文化、核安全文化、业务知识和专业技能等方面的培训。

• 对设备监造人员及制造厂质量检验人员进行产品制造质量和工艺方面的培训。

在役电厂专项服务

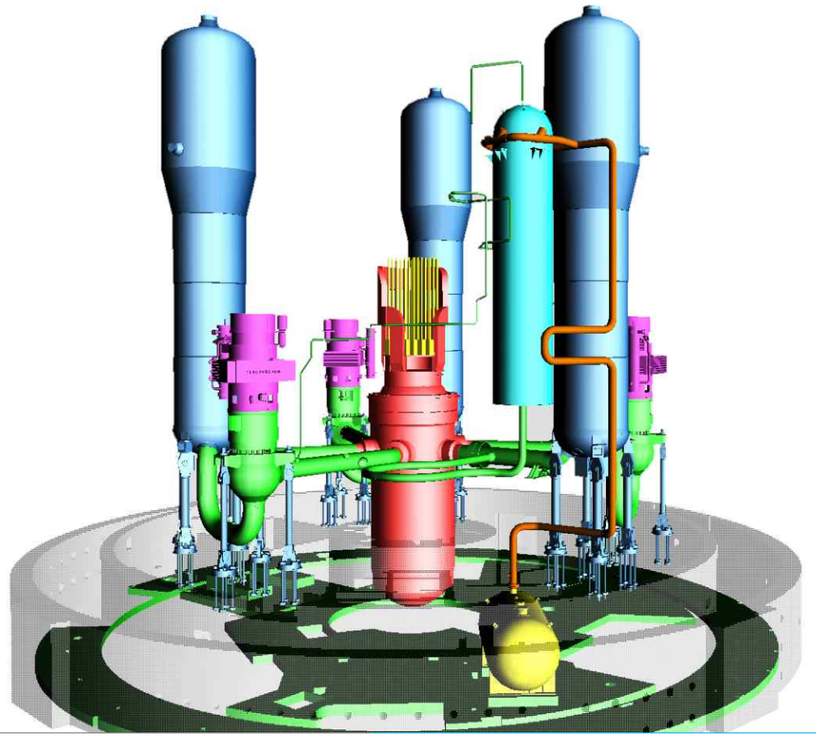
• 提供RPV的寿命管理服务，包括提供延寿服务。

• 核岛主设备更换和升级服务。如：控制棒驱动机构的新增和更换 、反应堆压力容器顶盖更换、蒸汽发生器的更换、保温层更换等。

• 核岛主设备检修维护所用的专用工具和服务设备研发。

• 在役核岛主设备的技术支持与功能评价。

如：在役设备的无损检测、材料老化(含腐蚀、磨损、断裂、疲劳)、辐照脆化、失效、延寿等分析评价。



Complete equipment supply service

Provide equipment or integrated system supply service, including NI/CI/BOP equipment, for project construction of nuclear power station by means of numerous long term cooperation equipment supply channels and our own design management ability and especially nuclear power equipment manufacturing resources in China.

Supplier’s management ability consultation

Help improve the supplier’s quality management and production organization management by giving courses, smoothing flow and examining operation document.

Equipment manufacture supervision and technical consultation

Plan, organize and carry out supervision activities for the equipment manufacture supervision of the engineering project and provide equipment supervision human and technical support service.

Nuclear equipment manufacturing equality training

• Provide training in equipment manufacturing quality management system, quality culture, nuclear safety culture, professional knowledge and special skills etc.
• Provide training in product manufacturing quality and process to equipment manufacture supervisors and manufacturer’s quality inspectors.

Special service for power plant in service

• Provide RPV life management service including lifetime extension service.
• Replacement and update service of major equipment in nuclear island, e.g. addition and replacement of control rod drive mechanism, replacement of reactor vessel head, replacement of steam generator and replacement of insulation layer etc.
• Development of special tools and service equipment used for repair and maintenance of major equipment in nuclear island.
• Technical support and function evaluation for main equipment in nuclear island in service, e.g. nondestructive inspection of equipment in service, analysis and evaluation of material ageing (including corrosion, abrasion, rupture and fatigue), irradiation embrittlement, failure and lifetime extension.

施工管理服务

Construction Management Service

项目管理及代建服务

核电站核岛、常规岛及BOP以及配套的民用项目总体或分块的施工管理服务。核电项目中海工、进场路桥（隧洞）、厂平、负挖、临建总体布置等子项施工管理服务。

Project management and agent construction service

General and partial construction management service for nuclear power station nuclear island, conventional island, BOP and supporting civil construction project. Construction management service for sub-projects such as maritime work, access road and bridge (tunnel), plant site leveling, excavation and temporary construction overall arrangement in nuclear power projects.

施工总承包管理

CPR1000、EPR、AP1000堆型核电站项目前期、核岛、常规岛、BOP及配套的民用项目的施工总承包。

General construction contracting management

General construction contracting of preliminary work, nuclear island, conventional island, BOP and supporting civil projects for CPR1000, EPR and AP1000 core nuclear power station projects.

电力工程监理

核电工程、火力发电站工程、输变电工程监理。

Electric power engineering supervision

Nuclear power project, thermal power plant project and power transmission and transformation project supervision.

专项技术支持

Special technical support

提供核电站工程建造整体的技术支持或关键施工技术支持服务。

Provide overall technical support or key construction technical support service for nuclear power station project construction.

核岛、常规岛主设备安装	Installation of major equipment for nuclear island and conventional island
核岛筏基大体积混凝土浇筑	Nuclear island raft foundation mass concreting
反应堆安全壳预应力工程	Reactor containment prestressing work
反应堆主管道自动焊技术	Reactor major pipe automatic welding technology
大件、重件现场运输及吊装技术	Site transportation and lifting technology for large and heavy equipment
电气贯穿件安装工程专项施工	Special construction of installation works for electric penetration
DCS安装工程专项施工	Special construction of DCS installation work
GIS/GIC安装专项施工	Special construction of GIS/GIC installation
主变压器/辅助变压器安装专项施工	Special construction of main transformer/auxiliary transformer installation
测量基准网建立技术	Measuring basis network establishment technology
专项施工测量技术	Special construction measuring technology
海工、进场路桥（隧洞）、厂平、负挖等前期项目工作策划。	Preliminary project work planning for maritime work, access road and bridge (tunnel), plant site leveling and excavation
施工总平面布置专项技术支持	Special technology support for general plan arrangement of construction
核岛施工给排水、供电、通信方案策划	Water supply and drainage, power supply and communication scheme planning for nuclear island construction
核电站防雷接地工程施工及接地电阻测试技术	Nuclear power station lightning grounding work construction and ground resistance test technology
核岛施工消防技术方案	Nuclear island construction fire fighting technical scheme
前期项目工作策划技术支持	Technical support for preliminary stage project work planning

役前检查管理服务

在核电站运行开始前，对核岛核级设备进行检验、试验和评价，以提供核岛核级设备初始状态下的基准数据，作为以后在役检查结果的比较依据。

Pre-service inspection management service

Before the nuclear power station starts to operation, inspect, test and evaluate nuclear equipment in the nuclear island and provide basis for nuclear equipment in the nuclear island in initial condition as the comparison basis for subsequent in-service inspection result.

调试启动服务

Commissioning and Startup Service

1000MW 核电机组成套启动
Complete startup of 1000MW nuclear power unit

核电机组成套调试启动以核燃料装载为界分两个阶段进行，装料之前的调试试验属于运行前试验阶段，主要模拟（无燃料）换料停堆到热停堆的核蒸汽供应回路所有运行工况，证明系统和部件能够按设计要求在整个设计的运行范围内的各种工况下运行，对试验中发现的部件和系统的缺陷采取必要的纠正措施；装料开始到机组商运之前的试验归入运行试验阶段，其目的为验证核电厂已按设计要求建造完工，能够对安全分析报告中所描述的预期瞬态和假想事故做出正确的响应，表明该核电厂能够按设计在合同规定范围内生产电力。具体为：

Nuclear power unit complete commissioning startup is divided into two stages with fuel loading as time boundary. The commissioning test before fueling, as the test stage before operation, mainly simulates all NSSS operational conditions (without fuel) from refueling shutdown to hot shutdown, so as to adopt necessary corrective actions for the found defects of components and systems in test. The test between fueling and commercial operation, as the operation test stage, aims to verify that NPP has been completed as design required, and is able to correctly respond to the expected transient and postulated accidents in the safety analysis report, which demonstrates that NPP is capable of generating electricity as per design under contract. The details are as follows:

单体试验	Individual test
单系统试验	Single system test
核回路冲洗试验	Nuclear loop flush test
热态功能试验	Hot functional testing
冷态功能试验	Cold functional testing
预临界试验	Pre-clinical test
首次装料	Initial fuel load
各功率水平试验	Test at all power levels
首次临界和低功率试验	Initial critical and low power test
性能试验	Performance test
机组试运行	Unit trial operation
调试移交接产	Commissioning handover and operation takeover

核电机组调试相关专项试验
Related special tests for nuclear power unit commissioning

具备百万千瓦级核电厂安全壳打压试验、堆芯物理试验、电源切换试验、控制电源失电试验等专项试验能力，并具备核主设备再鉴定、设备故障处理等在役电站技术服务能力。具体为：

Own special test ability, such as 1000MW NPP containment pressurizing test, core physics test, power supply switching test, test of control power loss, as well as in-service NPP technical service ability of nuclear main equipment reassessment and failure handling; the details is as follows:

安全壳打压试验	Containment pressurizing test
反应堆控制系统瞬态性能试验	Reactor control system transient performance test
核级泵性能试验	Nuclear pump performance test
反应堆LOCA监控系统安全试验	Reactor LOCA monitoring system safety test
反应堆中子通量泄漏电流试验	Reactor neutron flux leakage current test
反应堆控制系统性能参数优化	Reactor control system performance parameter optimization
棒控系统性能再鉴定试验	Rod cluster control system performance reassessment testing
机组负荷扰动试验	Unit load disturbance test
系统断电试验	System power failure test
高效过滤器、碘吸附器效率试验	High efficiency filter and iodine absorber efficiency test
发电机整组启动试验	Generator complete set startup test
机组负荷扰动试验	Unit load disturbance test
数据采集系统（DCS）性能试验	Data acquisition system (DCS) performance test
电源切换试验	Power supply changeover test

设备维护保养和故障处理
Equipment service and maintenance and fault handling

具备核电设备维护保养、事故诊断和分析及故障处理能力，提供设备到货后的日常性维护保养、故障处理方案及应急预案等，确保核电厂安全可靠经济运行。具体为：

Own ability of nuclear equipment maintenance, accident diagnosis and analysis, and failure handling; provide equipment daily maintenance after its arrival, failure handling scheme and emergency scheme and etc, so as to ensure NPP operation in a safety and reliable mode; the details are as follows:

工艺设备维护保养	Process equipment service and maintenance
电仪设备维护保养	Electric instrument equipment service and maintenance
一回路主泵故障诊断及分析	Primary reactor coolant pump fault diagnosis and analysis
反应堆厂房贯穿件泄露率检测与分析	Reactor building penetration leakage rate detection and analysis
核回路设备故障诊断与分析	Nuclear loop equipment fault diagnosis and analysis
核级蒸发器、除气器效率检测与分析	Nuclear evaporator, deaerator efficiency test and analysis
碘吸附器效率检测与故障分析	Iodine absorber efficiency test and fault analysis
控制棒失步原因分析	Control rod misalignment cause analysis
发电机变压器组保护故障诊断及分析	Generator transformer set protection fault diagnosis and analysis
蒸汽发生器二次侧泄漏检测与分析	Steam generator secondary side leakage detection and analysis
励磁调节系统故障诊断及分析	Excitation regulation system fault diagnosis and analysis
不间断电源系统故障诊断及分析	Uninterruptible power system fault diagnosis and analysis
汽机意外跳闸	Steam turbine inadvertent trip
化学水质分析	Chemical water quality analysis

调试管理和技术咨询
Commissioning management and technical consultation

核电厂调试管理涉及调试安全、质量和进度控制，调试管理体系建立，调试业务管理信息系统建设等多个方面；同时安全壳打压试验、机械贯穿件试验、机组总体启动试验、控制电源失电试验、电源切换试验等重大专项试验项目上，有着较强的技术能力和丰富的经验，可以提供核电厂调试管理和相关技术咨询服务。具体为：

NPP commissioning management covers safety, quality & schedule control, construction of commissioning management system and management information system and etc; provide NPP commissioning management and related technical consultation service due to our strong ability in technology and rich experience in some significantly special tests, such as containment pressurizing test, mechanical penetration test, unit overall startup test, test of control power loss, power supply switch test. The details are as follows:

管理咨询	Management consultation
调试安全与风险管理	Commissioning safety and risk management
调试重大试验专项安全控制管理	Special safety and control management for significant test in commissioning
工作许可证、试验许可证管理	Work permit and test permit management
调试物资管理	Commissioning material management
调试移交接产管理	Commissioning handover and production takeover management
调试支持服务	Commissioning support service
工作平台建设与维护	Work platform construction and maintenance
调试程序管理	Commissioning procedure management
经验反馈与风险分析管理	Experience feedback and risk analysis management
技术咨询	Technical consultation
单体调试技术	solo test technology
单系统调试技术	Single system commissioning technology
机组联调技术	Unit joint commissioning technology
专项试验技术	Special test technology
事故鉴定技术	Emergency survey technology
放射性废物管理技术	Radwaste management technology
系统隔离技术	System isolation technology
核级设备维护保养技术	Nuclear equipment service and maintenance technology
调试试验结果分析与评价技术	Commissioning test result analysis and evaluation technology

调试程序编制
Commissioning procedure preparation

调试程序是用于指导现场各类调试活动的试验导则、系统调试大纲以及试验程序等调试文件。调试程序编制必须基于研究分析机组的设计差异性、逻辑关联性和内在规律性。完整且具有可操作性的调试程序，有利于规范调试行为、保证试验设备和试验人员的安全，并确保机组调试活动高质量、高标准的有序进行。具体为：

The commissioning procedure covers commissioning documents, such as test guideline, system commissioning program and test procedure, to guide various commissioning activities on site. The preparation of commissioning procedure must base on the study and analysis on the unit design difference, logic association and inherent regularity. A complete and operational commissioning procedure is beneficial to standardizing commissioning, ensuring the safety of test equipment and personnel and the implementation of unit commissioning in high quality and standard. The details are as follows:

机组调试大纲	Unit commissioning outline
试验程序(TP)	Test procedure(TP)
系统调试大纲(CP)	System commissioning outline(CP)
试验导则(SG)	Test guideline(SG)
定期试验程序	Periodic test procedure

调试培训服务
Commissioning training service

已具备核电调试管理、核级设备调试方法、核电站专项试验和核安全等多个维度的培训课程体系，具备雄厚的师资和教学力量，具体为：

Own a multi-dimension training system and sufficient teachers and teaching resources in nuclear power commissioning management, nuclear equipment commissioning test, NPP special test and nuclear safety; the details are as follows:

核级设备调试方法培训	Nuclear equipment commissioning method training
安全壳打压、堆芯物理等专项试验培训	Special test training such as containment pressurizing and core physics
调试安全培训	Commissioning safety training
调试移交接产管理培训	Commissioning handover and production takeover management training
调试质量管理培训	Commissioning quality management training
调试风险控制管理培训	Commissioning risk control management training
调试进度控制管理培训	Commissioning schedule control management training
调试文件管理培训	Commissioning document management training
调试支持服务培训	Commissioning support service training
核电水化学知识培训	Nuclear power water chemistry knowledge training
放射性废物管理培训	Radwaste management training
其他核电机组调试相关培训	Related training for other nuclear power unit commissioning

调试监理服务
Commissioning supervision service

具备调试安全及风险管控、调试试验结果分析与评价、故障诊断与处理、调试质量过程监控等调试监理能力，可确保安质环得到有效控制，为核电机组调试活动的顺利进行保驾护航。

Own commissioning supervision abilities of commissioning safety and risk control, commissioning test result analysis and evaluation, failure diagnosis and handling, commissioning quality control, so as to ensure an efficient control in safety, quality and environment protection and successful unit commissioning activities.

核岛调试监理	Nuclear island commissioning supervision
常规岛调试监理	Conventional island commissioning supervision
核电配套项目调试监理	Nuclear power supporting project commissioning supervision

调试特需物资的采购与管理
Procurement and management of equipment and material specially needed for commissioning

可提供调试用仪表、工器具等调试特需物资的采购服务，提供核电工程调试特需物资流转全过程管理，包括：现场物资到货计划管理、供货一致性核查、到货检验、仓储维护及发放控制等，可有效降低调试成本，并为核电机组调试活动的顺利开展提供便利的条件。具体为：

Provide with the procurement service of equipment and material specially needed for commissioning, such as commissioning instrument and tooling; provide with the management on commissioning material and equipment transfer process, including management on the plan of equipment and material arrival at site, supply consistency inspection, arrival inspection, warehouse maintenance and issue control, so as to efficiently reduce cost and to provide convenient conditions for unit commissioning activities. The details are as follows:

核电调试特需物资标准清单	A standard list of commissioning equipment and material
核电调试特需物资市场信息采集管理	Management on the marketing data acquisition of commissioning equipment and material
核电调试用仪表、工器具标准采购包清单	A list of standards lots for commissioning instrument and tooling
核电调试特需物资流转全过程管理	Management on commissioning material and equipment transfer process

调试专用试验工装租赁
Leasing tool equipment specially for commissioning test

针对CPR1000核电调试特点，已自主研发安全壳打压试验专用工装、核主回路带压试验差压保护工装、核主回路化学品添加工装等特殊试验装置，可提供此类特殊试验装置的租赁服务，具体为：

On the basis of CPR1000 commissioning specialty, independently develop some special test equipment, such as containment pressurizing test tool, differential pressure protection tool for the primary circuit pressure test, primary circuit chemical addition tool; provide tool equipment leasing service. The details are as follows:

调试专用试验工装租赁	Commissioning special-purposed test tool equipment leasing
调试高端工器具租赁	Commissioning high level tool equipment leasing
调试专用试验工装现场指导和支持	Guide and support of commissioning special-purposed test tool equipment on site

调试计量支持
Commissioning metering support

可提供调试计量支持和现场数据采集，并建立可靠的调试数据库，将大幅提高核电机组调试质量，为核电机组长期安全稳定运行提供有力保障，主要包括：

Provide commissioning metering support and site data acquisition and the construction of reliable commissioning database, so as to improve unit commissioning quality and to ensure unit long-term operation in safe and stable manner, including:

计量服务	Metering service
现场数据采集	Site data acquisition
仪器仪表检定	Instrumentation check
工艺参数评价	Process parameter evaluation

信息系统建设
Information system construction

S板块信息化平台基本覆盖了调试准备、调试实施、调试移交三大阶段的业务工作，从调试成本管理、进度管理、调试工作流程管理、调试科研工作等不同的维度，实现了较高的业务信息化覆盖。

S block information platform basically covers three stages' business of commissioning preparation, implementation and handover, so relatively high business information coverage is realized in commissioning management on cost, schedule, process and science & study.

计算机辅助隔离系统在票证管理、系统隔离与移交等阶段发挥着至关重要的作用，是核电站调试和生产准备活动中不可缺少的重要应用软件系统。具体为：

Computerized blocking assistance (CBA) plays a key role at the stages of certificate management, system isolation and handover, as an indispensable software application system in NPP commissioning and production preparation. The details are as follows:

移交申请文件及票证准备	Handover application document and certificate preparation
调试业务流程梳理	Commissioning business process sort-out
系统开发应用	System development and application
系统设计和逻辑优化	System design and logic optimization

调试现有自主研发系统
Independently developed systems for commissioning

调试管理信息系统（IMS-SU），调试主要业务电子流程集成平台，包括现场调试文件的编制及管理，调试设备、系统移交管理，调试程序、导则、大纲、变更文件的便审批管理、调试物资管理、调试设备维护保养管理等。

Commissioning management information system (IMS-SU): it is used to test the main business electronic process integrated platform, including commissioning document preparation and management, commissioning equipment and system handover management, management on the review and approval of commissioning procedure, guideline, program and modification document, commissioning equipment and material management and equipment maintenance.

调试工作票管理系统（WPM），调试现场工作票管理及隔离边界设备在线管理及应用	Commissioning certificate management system (WPM): it is used for commissioning site certificate management and isolation boundary equipment on-line management and application.
调试智库：调试成果共享、知识管理应用及查询平台	Commissioning database: commissioning result share, knowledge management application and search platform

项目管理专项服务

Special Service for Project Management

核电工程项目管理组织策划与咨询

根据核电项目的不同承包模式，量身定制适应性的组织架构，包括项目管理规章制度的建立、多级项目办公室的组建，项目团队的建设、接口管理、流程优化、授权体系的建立等。

Nuclear power engineering project management organization planning and consultation

Depending on different contracting modes of nuclear power projects, tailor adaptive organizational framework, including establishment of project management rules and regulations, organization of multi-level project office, project team construction, interface management, flow optimization and establishment of authorization system etc.

核电工程项目绩效考核指标体系建立与咨询

通过对核电工程项目关键环节建立关键绩效指标体系，以便促进工程项目的总体目标得以实现，并激励业主、承包商、供应商等项目参与方采取积极措施,促进绩效的持续改进。

Establishment and consultation of nuclear power engineering project performance evaluation indicator system

By establishing key performance indicator system for key links of nuclear power engineering projects, promote the accomplishment of overall objective for engineering projects, encourage project participants including owner, contractor and supplier to take positive measures and promote continuous performance improvement.

项目管理信息系统建设咨询服务

针对核电工程总承包项目管理，提供全过程的信息系统解决方案及信息基础设施建设方案，信息系统涵盖工程建设的设计、采购、施工、调试移交全过程及项目进度管理、质量管理、安全管理、成本管理、文档管理等领域。

Project management information system construction consultation service

For general contracting project management of nuclear power projects, provide whole process information system solutions and information infrastructural construction schemes. Information system covers the whole process ranging from engineering construction design, procurement, construction, commissioning to handover as well as project schedule management, quality management, safety management, cost management and document management etc.

核电工程项目进度管理咨询服务

构建进度管理体系，编制及审核各级进度计划，建立进度测量与监控系统，工程总体及各专业工程的进展评估，进度风险分析，总体工期和专项进度计划的优化分析，进度管理工具软件应用，进度控制技术培训。

Nuclear power engineering project schedule management consultation service

Build schedule management system, compile and audit schedule plans at all level, establish schedule measurement and monitoring system, evaluate overall progress of the project and respective professional works and carry out schedule risk analysis, optimum analysis of overall construction period and special schedule, schedule management tool software application and schedule control technical training.

质量保证服务

Quality Assurance Service

核电工程质量保证体系建设咨询

- 指导委托方按照国际原子能机构（IAEA）和所在国的核安全法规，建立相应的项目质量保证组织机构，确定其组织运作原则。
- 指导委托方编写项目质量保证大纲及大纲程序，协助评审。

Nuclear power engineering quality assurance system construction consultation

- Instruct the client to establish corresponding project quality assurance organization framework pursuant to nuclear safety laws of the International Atomic Energy Agency (IAEA) and host country and determine its organization operation principle.
- Guide the client to compile project quality assurance program and program procedure and assist in review.

质量保证监督监查

- 接受业主方或工程承包方委托，对项目的供应商、承包商进行独立的质量保证监督监查。监督检查的范围包括委托方内部，以及各物项和服务的供方。
- 通过监督检查活动，为委托方提供被监督方的质量管理状况分析，通过纠正行动要求不断改进质量保证体系运作。
- 受委托方委托，提供质量事件调查专家，从质量管理体系的角度运用质量事件调查方法对质量事件产生的根本原因进行分析和鉴别，为委托方揭示质量事件责任单位的管理缺陷，以为其后续活动提供真实可靠的信息基础（如索赔、事故处理）。

Quality assurance supervision and inspection

- Accept the entrustment of the owner or contractor and carry out independent quality assurance supervision and inspection for project supplier and contractor. Supervision and inspection range includes client's internals as well as suppliers of all items and services.
- Provide the client with the supervised party's quality management condition analysis through supervision and inspection activities and continuously improve quality assurance system operation through corrective actions. 3. Entrusted by the client, provide quality event investigation experts to use quality event investigation method to analyze and identify the root cause of quality event from the angle of quality management system and reveal the management defects of the quality event responsible organizations for the client so as to provide true and reliable information basis for their subsequent activities (e.g. claim, accident handling).

核电工程程序体系建设咨询

- 为委托方提供核电工程项目程序体系建设的管理咨询和应用指导，协助委托方建立基于流程管理的核电项目程序体系和程序管理系统平台。
- 为委托方提供管理咨询专家，对委托方运行的核电工程项目程序体系进行完整性、适宜性和有效性的诊断与评估，并就程序体系运行中的重大或瓶颈问题提供解决方案。

Nuclear power engineering procedure system construction consultation

- Provide the client with management consultation and application guidance for the construction of nuclear power engineering project procedure system and assist the client to establish the flow management-based nuclear power project procedure system and procedure management system platform.
- Provide the client with management expert consultants, diagnose and evaluate the completeness, adaptability and validity of the nuclear power engineering project procedure system operated by the client and provide solutions to major or bottleneck problems in the procedure system operation.

专业培训服务

Specialized Training Service

核电工程培训和人才培养的体系诊断与咨询服务

提供端到端的核电工程培训和人才培养的体系诊断与咨询服务，通过分析企业培训与人才培养体系现状，提供针对性的人才队伍建设、能力提升解决方案，推动完善培训与人才培养机制。具体包括：培训和人才培养的组织机构与运作机制建设；专业技术与管理人才培训与培养制度、方法与流程的设计；系统科学的培训课程体系、教员体系以及培训交付体系的搭建等。

专项培训和人才培养方案的策划与全流程专业服务

紧贴客户需求，提供专项培训和人才培养方案的策划与全流程专业服务。通过项目经理、班主任、专业顾问以及资深讲师的投入，为客户提供从需求分析、整体方案策划、培训课程设计与开发、培训教员培养、培训实施与交付、培训评估与反馈直至最终的知识传递与分享等环节的全流程项目管理服务。

核电工程建设与全过程项目管理课程的开发及培训服务

根据客户委托，可为其提供从核电站前期咨询、工程设计、设备采购与成套、施工管理、调试启动以及全过程项目管理涉及到的专业知识与技能课程开发与菜单式培训服务。

Diagnosis and consultation services on nuclear power engineering training and talent cultivation system

Provide diagnosis and consultation services on the end-to-end nuclear power engineering training and talent cultivation system, i.e. providing solutions pertinent to talent team construction and capability improvement on the basis of analyzing the existing training and talent cultivation system, so as to improve training and talent cultivation system, including construction of training and talent cultivation organization and operation mechanism; design of technical and management talent training and cultivation system, method and process; construction of systematic and scientific training system, trainer system and training handover system.

Design of special training and talent cultivation scheme scheme and providing full flow flow professional services

Provide Develop planning of special training and talent cultivation scheme and provide full flow professionalflow services as per customer' s demand. Provide clients with project management services from demand analysis, scheme planning, design and development of training courses, trainer cultivation, training and handover, training evaluation and feedback to knowledge transfer and share, through the participation of project manager, head teacher, consultant and experienced instructor.

Development of nnuclear engineering construction and full-process project management courses and related training services

Provide the development ofDevelop professional knowledge and skill courses and menu training services as required by clients, covering project management from NPP pre-project consultation, engineering, equipment procurement and completion, construction management to commissioning & startup.

核电专业基础知识课程开发与培训服务

根据客户委托，为其提供专业化的核电专业基础知识课程开发服务以及涵盖核电站核岛主要系统与设备、常规岛主要系统与设备及其相关各专业基础理论知识的培训课程。通过培训，学员可以掌握核电站基本运作原理与主要系统的流程与设备结构，为从事核电工程项目建设与管理工作奠定基础。

核电工程仿真系列课程开发与培训服务

根据客户委托，为其提供专业化的工程仿真培训课程开发服务以及一系列的仿真培训课程。工程仿真培训可逼真地模拟核电站各类工况、工艺流程、以及设备的结构与制造安装流程等，可突破传统的教学模式，实现人机互动，增加学员的参与度，从而提高核电从业人员的专业知识/技能。

具体服务包括：协助客户建立仿真培训课程开发的方法、标准及流程；提供系统仿真培训、虚拟仿真培训以及工程设计验证培训课程等。

Development of nuclear professional knowledge courses and training services

Provide the development services of nuclear professional knowledge courses as required by clients and training courses covering NI main systems and equipment, CI main systems and equipment and basic theoretical knowledge in the related fields. Trainees can master NPP basic operation principles and main system process and equipment structure through these courses, so as to lay a foundation for nuclear engineering construction and

Development of nuclear engineering simulation courses and training services

Provide the development services of professional engineering simulation training courses and a series of simulation training courses as required by clients. Simulation training can realistically simulate NPP various conditions, process, equipment structure and the process of manufacturing & erection, as a breakthrough compared with traditional teaching mode due to the realization of human and machine interaction and increase of trainees' participation, so as to improve their knowledge and skill.

Services include assistance in providing method, standards and process in simulation training course development and providing training courses of system simulation, virtual simulation and engineering verification.