Overview of Human Resources in Nuclear Industry of China

—Country Report of China

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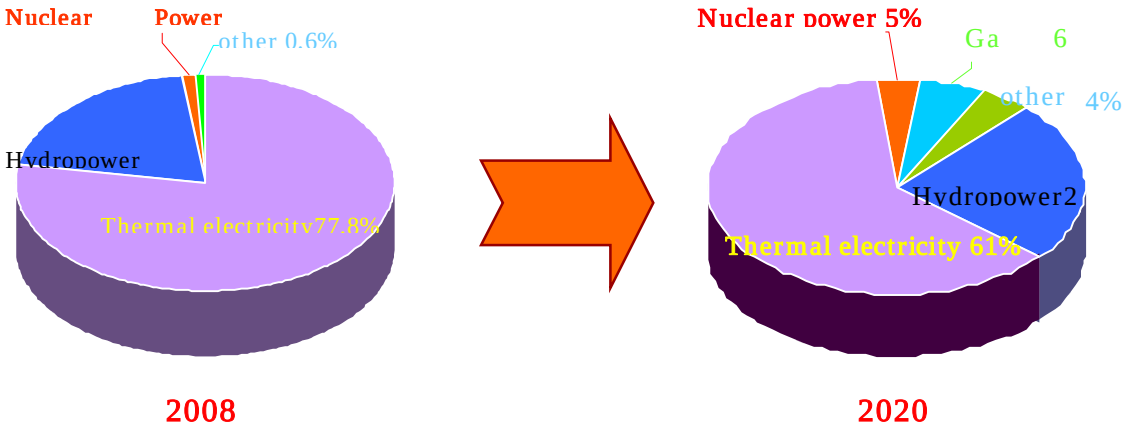
foreword

With the progressive development of modern science and technology and social's continual improvement , the nuclear power technology has been becoming more and more mature.Meanwhile, given the global energy crisis and ecological environment pressure, the construction of nuclear power plants has been attached great importance to ensure sustainable development of human society and environment. Therefore, how to effectively solve the the human resources shortage problem has been emerged as a urgent and challengeable issue in the context of the rapid development of nuclear power. In this paper, the reporter tries to talk about the challenges of human resources shortage in China at the review of nuclear power market and opportunity, with an emphasis on training orgnization and modes with CGNPC's characteristics, which aims at enriching the human resource in the field of nuclear power and providing a useful reference and ideas for the sustainable development of nuclear power .

1 China's Nuclear Power Development Opportunities

1.1 Nuclear Power Market & Opportunity

- As of 2008,China has 11 nuclear power units in operation with installed capacity of about 9.1 million kilowatts and 24 nuclear power generating units under construction with
  installed capacity of about 25.4 million kw.However,the
  proportion of China's nuclear power is just about 1.4%.
- With the expansion of national power capacity, the
  proportion of nuclear power capacity will be most probably up to 5% by 2020.
- In accordance with the principle of "actively promoting nuclear power construction" ,there are 16 qualified provinces in China exploiting the development of nuclear power projects actively.



2 State Medium and Long-term Plan for the Development of Nuclear Power

- In the 80s 20th century, China's industrial policies and guidelines for nuclear power is " properly development".
- In March 2, 2005, the State Council adjusted the policy from "moderate" to "positive."
- In March 22,2006, the State Council Executive Meeting adopted the principle of " Medium and Long-term Development Plan of Nuclear Power" which proposed the national nuclear power capacity would reach 40 million kilowatts in 2020, accounting for about 4% of all power generation capacity. And the capacity under construction would be maintained at the level of 18 million kilowatts at the end of 2020.
- At present, the nuclear energy policy has gradually changed from the "positive" to "rapid development." National Development and Reform Commission will soon complete the new " Medium and Long-term Development Plan of Nuclear Power " in which the installed capacity will increase to 70 million kilowatts in 2020 and 18 million kilowatts under construction by strengthening nuclear power development in coastal areas and scientifically planning for inland nuclear power plants construction. Therefore, the total installed nuclear power capacity will account for more than 5%. It means that there are 6 or 7 newly-commenced units each year from 2009 to 2020 in China. And the investment scale will amount to more than 1 trillion yuan at least. As shown in Figure1.1.

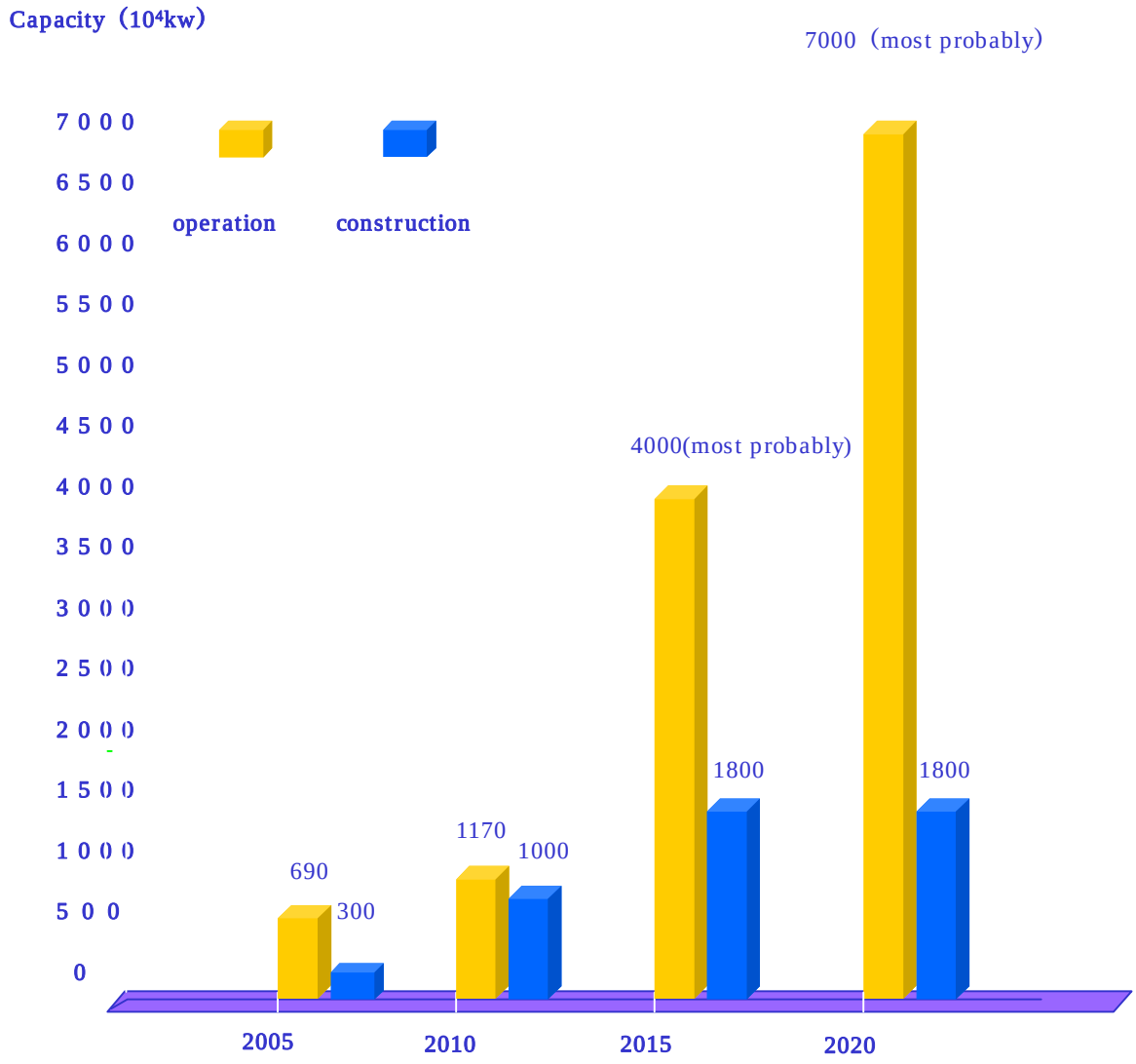
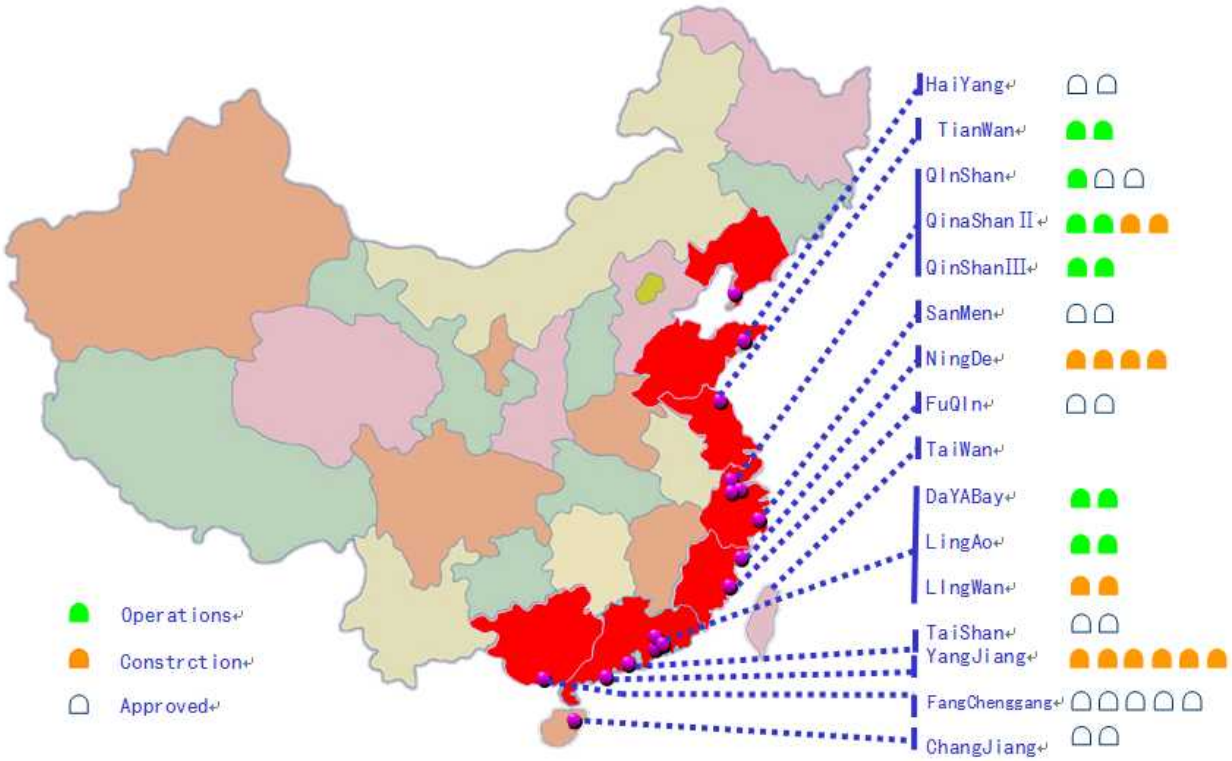


Figure1.1 State New Plan Being Adjusted for Medium and Long-term Development of Nuclear Power（2005-2020）

2.1Distribution of Nuclear Power Projects Under Construction in China



2.2 Nuclear Power Plants in Commercial Operation

Group	Plants name	Power (10^4kw)	Total (10^4kw)	Reactor
CGNPC	DaYaBay	2×100	400	PWR
	LingAo	2×100		PWR
CNNC	QinShan	1×30	502	PWR
	QinShan	2×60		PWR
	QinShan	2×70		HWR
	TianWan	2×106		PWR
Total (10^4kw)	902			

2.3 Nuclear Power Projects Under Construction and Agreed to Carry Out Preparatory work

Group		Plants Name	Power (10^4kw)	Total (10^4kw)	Reactor	Operation Time
CGNPC	1	GuangDong , LingAo	2×108	2534	CPR1000	2010-2020
	2	GuangDong , YangJiang	6×108		CPR1000	
	3	GuangDong, TaiShan	2×170		EPR1700	
	4	GuangXi, Fang Chenggang	2×108		CPR1000	
	5	HuBei, DaFan	2×125		AP1000	
	6	Liao Ning, Hong Yanhe (CGNPC&CPIC—45%：45%)	4×108		CPR1000	
	7	Fu Jian, Ning De (CGNPC&DTPC—51%：49%)	4×108		CPR1000	
CNNC	1	QinShan (extension)	2×65	1192	PWR	
	2	QinShan,FangJiashan(extension)	2×108		PWR	
	3	ZheJiang, SanMen	2×125		AP1000	
	4	FuJian, FuQin	2×108		PWR	
	5	HuNan, Tao Huajiang	2×125		AP1000	
	6	HanNan, ChangJiang	2×65		PWR	
CPIC	1	ShanDong, HanYang	2×125	500	AP1000	
	2	JiangXi, PengZe	2×125		AP1000	
CHG	1	ShanDong, RongCheng	19×20	380	HTGR	
Total(10^4kw)		4606				

3. Strategy of Human Resource Training in CNGPC

3.1 Strategic Perspective

Orienting to the the actual demands and long-term target of national development, CGNPC has drafted series of human resource trainning strategy and plans according to analyze and forecast the demands for human resource in the next ten years,as well as the State Plans for Medume and Long-term Development of Nuclear Power.

3.1.1 Strategic Goal

CGNPG has already taken significant steps towards implementing new nuclear projects in Guangdong, Liaoning, Fujian, Anhui, Hunan, and Hubei Provinces in China. Due to the rapid development mentioned above, CGNPC needs talents in many areas, such as operation, maintenance, technological support, design, engineering construction, debugging, etc. The development of various training systems for management, operation and maintenance, engineering, and education has been placed on the calendar.

In the next 3-5 years, CGNPC plans to cultivate senior management talents in NPP design, engineering, operation, R&D, technological supply and new business areas. Through innovation in management system, CGNPC plans to cultivate technology talents with reasonable structure, professional division, and high quality.

By the year 2010, CGNPC will attain the following targets in building talents pool.

- 20 senior managers in management and operation
- 20 senior project managers
- 30 chief technological experts
- 30 senior marketing managers
- 600 technological experts in operation
- 300 technological experts in engineering
- 200 technological experts in design

- 50 senior managers in contract and business

By 2020,the number of talent team will expand in accordance with country's higher goal to 20,000.And CGNPC is able to provide all project bases of CNGPC for the plentiful profesional nuclear talented people.

3.1.2 Strategic organization structure

CGNPC has set up Nuclear Power Institute which has four departments,namly Management Training Center of Group, Su zhou Branch of Institute, Nuclear Power Operator training base,Nuclear Power engineering training base and training centers in subsidiary companies,which have establishment all-round and multi-level professional training system.

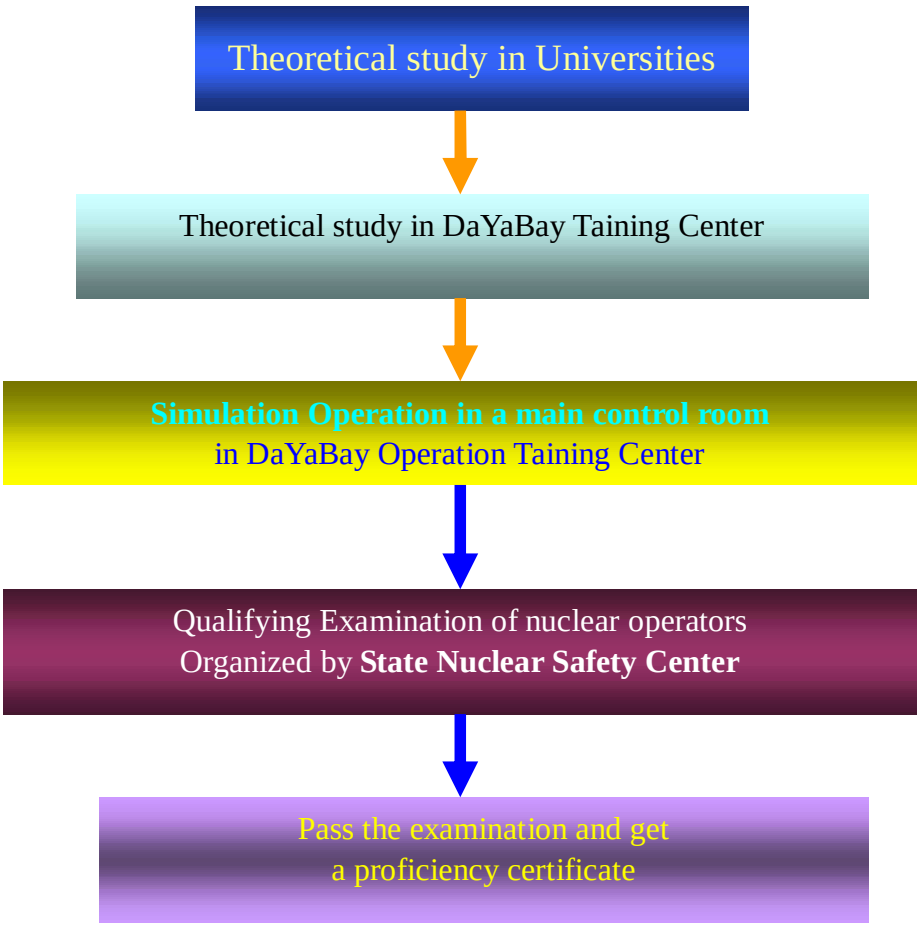
3.2 Strategic Implementation

3.2.1 Management Training

Management training system is divided into the training of leading cadres, general management training and new staff induction training, which aims at developing nuclear power at all levels of management for cadres and new employees. According to the special training program in accordance with for much-needed administrative talents and technical talents with digital operation, the group selected each year a group of excellent technical backbones of the youth to train abroad ,of which ten young staffs have been sent to the United States ,the United Kingdom and France in two phases.

3.2.2 Operation training

The training includes Daya Bay Nuclear Power operator training, the advanced pressured nuclear reactor in Taishan and operational training in all bases. According to the program, operator training base of the Daya Bay Nuclear Power is able to bring up 900 qualified management personnel running the nuclear power plant a year. By 2010, the number of professional and technical personnel in operation will reach around 7000.



3.2.3 Nuclear Power Engineering Training

The training includes engineering design, project management and debugging training.According to the project management training programs by the year 2010, engineering and project management personnel in CGNPC will exceed 4,000 people, which can bear several nuclear power projects and meet the demands for CGNPC in "Eleventh Five-Year" period and follow-up nuclear power projects.

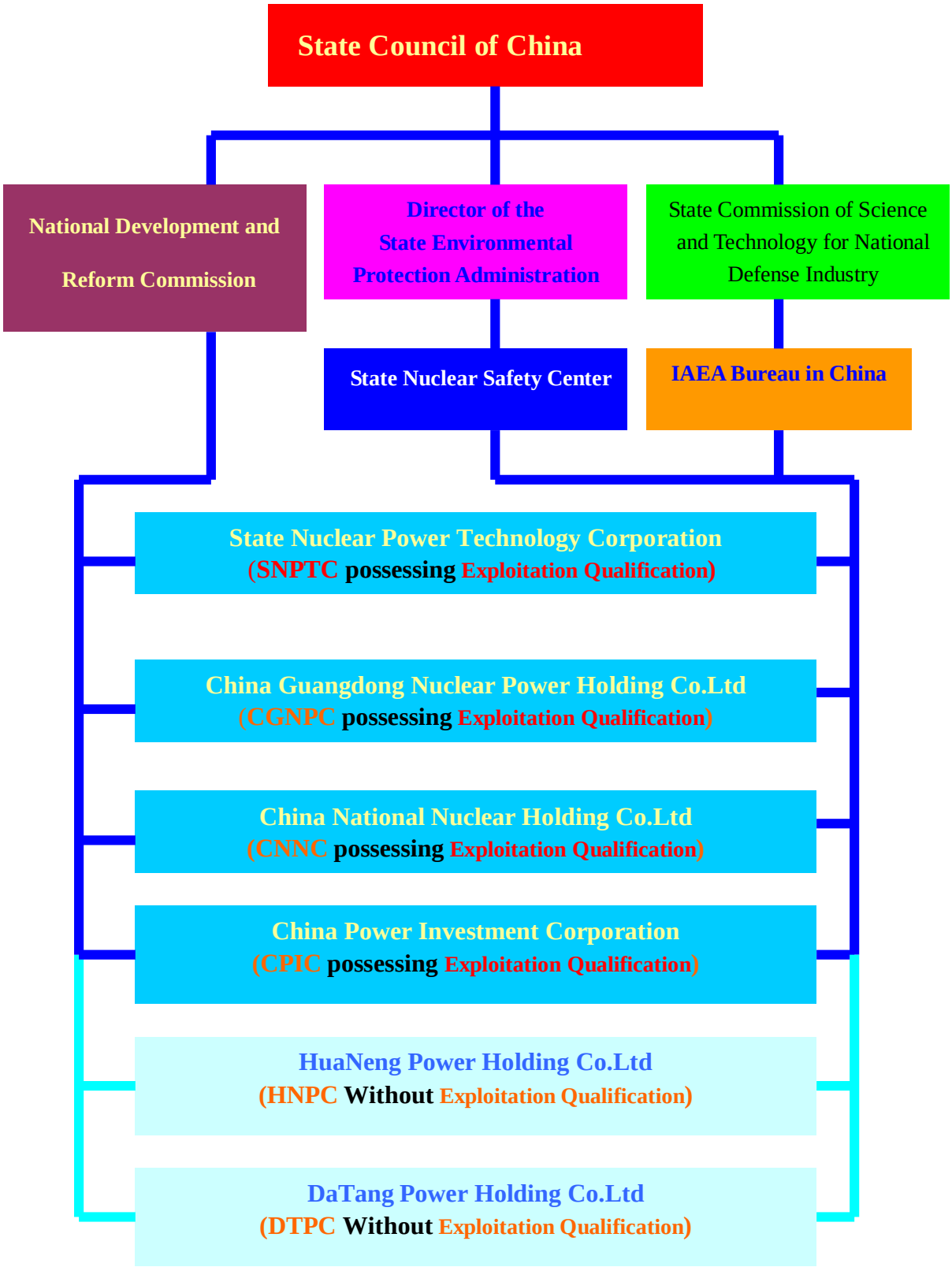
3.2.4 Jointly running schools with universties

The joint system takes full advantage of resources of enterprise and university students.Selecting from the talents, combining with the actual enterprise and carrying out targeted training system provide a wide range of channels to ensure the rapid growth of nuclear power talented people themselves.

And the group has signed personnel training cooperation agreement with 13 famous universities, for example Tsing hua University, Technology University of China ,Shanghai Jiaotong University, Xi'an Jiaotong University,Sichuan University,
North China Electric Power University, Harbin Engineering University and so on.

According to the training model of "Ordered training + joint school",CGNPC selects a third-year university students to implement the targeted training. During 2006-2008, CGNPC recruited beyond 1000 university students a year .

4 Nuclear Power Administrative Institutions & Corporations



4.1 Four Nuclear Power Groups possessing Exploitation Qualification

- **State Nuclear Power Technology Corporation (SNPTC)**

SNPTC is a state-owned key enterprises managed by the State Government which was set up and funded jointly by the State Council, China National Nuclear Corporation, China Power Investment Corporation, China Guangdong Nuclear Power Group Co., Ltd. and four other large state-owned enterprise.It administrates the nuclear power technology Ap1000 applied in the nuclear power projects of ZheJiang,SanMen (CNNC)and ShanDong,HaiYang (CPIC).

- **China Guangdong Nuclear Power Holding Co.,Ltd (CGNPC)**

It is the only clean energy corporation in China which concentrates its business on nuclear power.CGNPG has owned nearly 4000 MWe of installed capacity and 25,340 MWe of installed currently under construction.It has established its own nuclear power brand--- the improved Chinese PWR--- CPR1000.

- **China National Nuclear Power Holding Co.,Ltd (CNNC)**

It is mainly responsible for research , construction and operation relating to the military nuclear industry, nuclear power, nuclear fuel, the application of nuclear technology and so on. CNNC has owned nearly 5020 MWe of installed capacity and over 11,920 MWe of installed currently under construction.

- **China Power Investment Holding Co.,Ltd (CPIC)**

It has owned Shandong Haiyang nuclear power project and cooperated with CGNPC in LiaoNing Hong Yanhe nuclear power project at the shareholding proportion of 45%:45%. CPIC has owned 5000 MWe of installed capacity under construction.

4.2 Two Power Groups Without Exploitation Qualification

- **HuaNeng Power Holding Co.Ltd(HNPC)**

HNPC concentrates on the conventional power,such as:

Thermal electricity,wind power andhydropower.Recently years,it has paid efforts to compete in the exploitation of nuclear power projects. It has owned 3800 MWe of installed capacity under construction in ShanDong,RongCheng nuclear power project with the application of High Temprature Gas Cooled Reactor.

- **DaTang Power Holding Co.Ltd(DTPC)**

Just like HNPC, **DTPC** also concentrates on the conventional Power and cooperated with CGNPC in FuJian NingDe nuclear Power project at the shareholding proportion of 49%:51% (DTPC:CGNPC).

Training System	Training Organization			
	Nuclear Power Institute			
	Management Training Center of Group	Su Zhou Branch Of Institute	Nuclear Power operation training base	Nuclear Power Engineering training Bases
Management Training	Divided into the training of leading cadres, general management training and new staff induction training, which aims at developing nuclear power at all levels of management for cadres and new employees.			
Operation training	The training includes DaYaBay Nuclear Power operator training, the advanced pressured nuclear reactor in Taishan and operational training in all bases. By 2010, the number will reach around 7000.			
Engineering Training	The training includes engineering d by the year 2010, engineering and project management personnel in CGNPC will exceed 4,000 people esign, project management and debugging training.			
Jointly running schools	The group has signed nuclear power plant personnel training cooperation agreement with 11 famous universities, During 2006-2008, CGNPC recruited beyond 1000 university students a year .			