

Nuclear Industry in China

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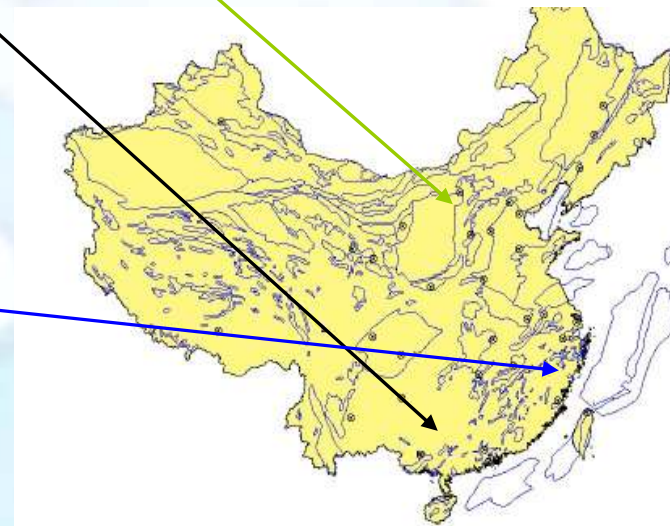
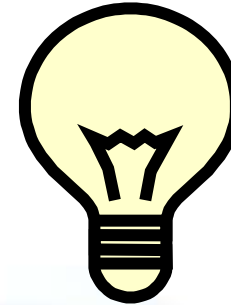


- ◆ **The role of Nuclear energy in China**
- ◆ **Current status of Nuclear power in China**
- ◆ **Developing plan for future**
- ◆ **Uranium industry**

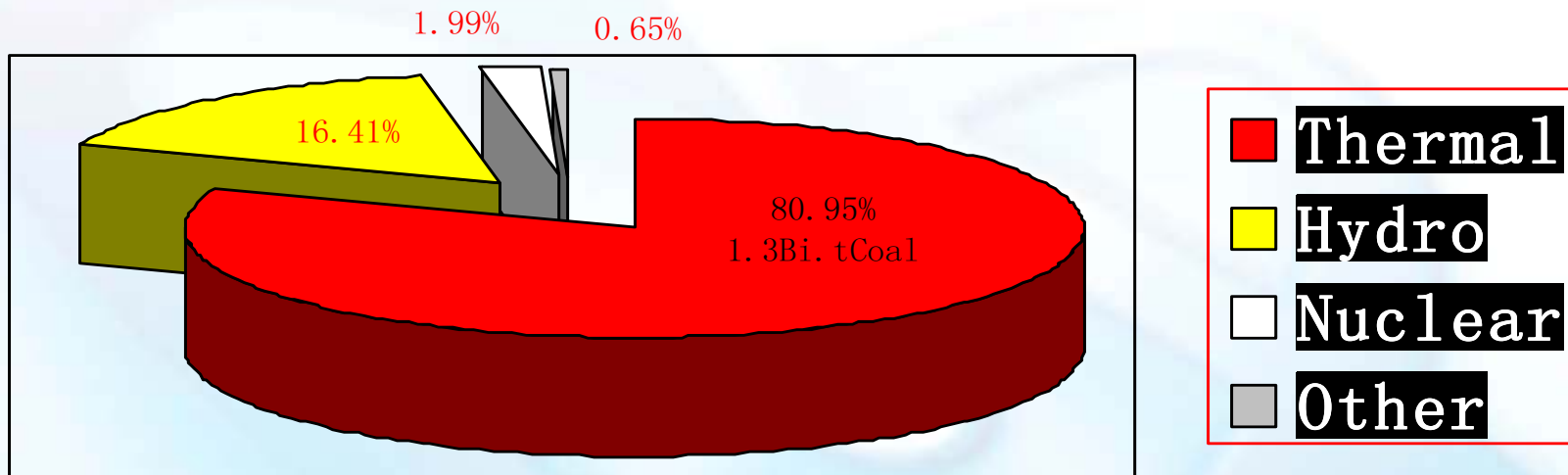


The principle of development of electrical power in China

- To optimized develop the thermal power.
- To actively develop the hydropower.
- “To actively develop the nuclear power”;
To devote major efforts to develop the nuclear power .
- To encourage to develop the wind, solar energy.



Total electricity generated in
China 3469TWh
Total installed capacity for
electricity 793 GWe in 2008

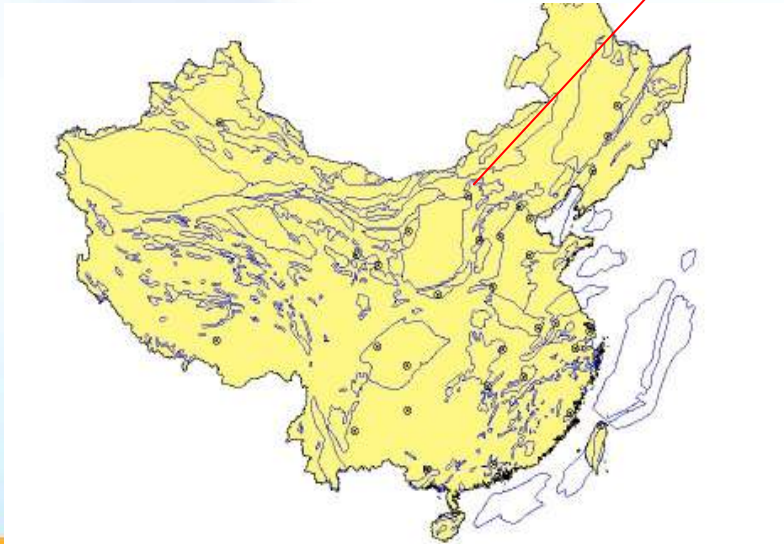


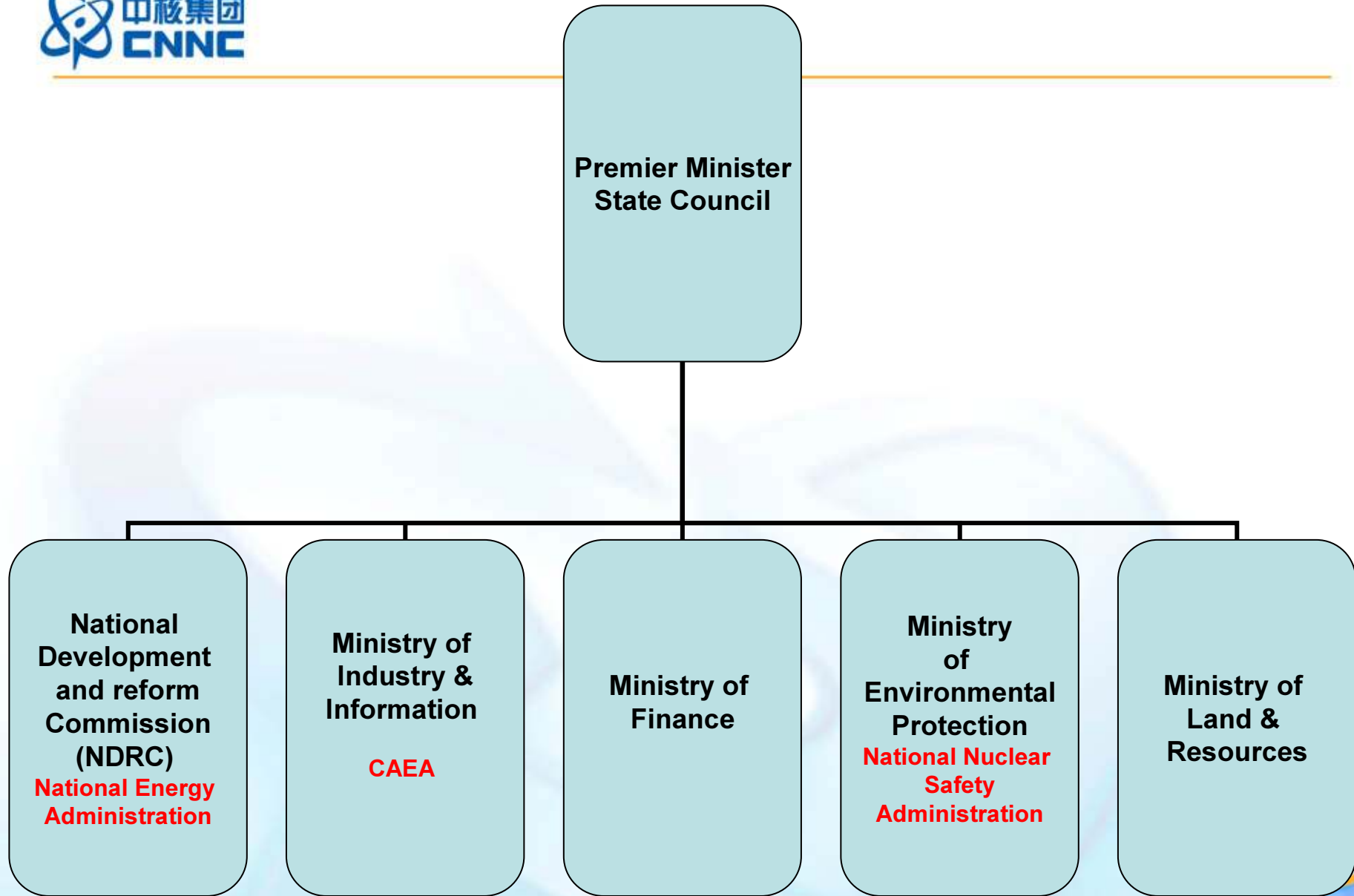
Why Nuclear power in China ?

- Uneven regional distribution of resources
 - Coal located in the northern & northwest of China
 - Hydro-resource in the southwest of China
- Environment clean
 - In 2008, nuclear power generation reached 68.4 TWh which is equivalent to a reduction of over 80 million tons of CO₂ and over 400 thousand tons of SO₂.
- Demand increase,
 - Electricity consumption growth 16% annually during 2004-06, 14.4% in 2007, 5.23% in 2008 respectively, 4-5% for 2009.
- High technology, agriculture, medical, industry...
- Public support-safe and reliable operating of NPPs.

Traffic in highway

Inner Mongolia –
Beijing
Expressway in
winter





Major power entities & companies in China

a. Grid companies

- State Grid Corp. of China, Transport, Transform...

b. Five major power Corp.

- China Huaneng Group, Installed capacity 71600 MWe
- China Datang Corp. 82400 MWe
- China Guodian Corp. 70200 MWe
- China Power Investment Corp. 40100 MWe
- China Huadian Corp. 69000 MWe

c. Provincial power group

- Guangdong Yuedian Group Co. Ltd. 11700 MWe
- Zhejiang Provincial Energy Group Company Ltd. 14500 MWe
- Anhui Province Energy Group Company Ltd. 2200 MWe

d. Other energy groups

- China Three Gorges Project Corp. 25000 MWe 26 units X 700 MWe
- Shenhua Group Corp. Ltd. 8700 MWe
- State Development & Investment Corp.

Major entities & companies for NPPs in China

- China National Nuclear Corp. (CNNC)
- China Guangdong Nuclear Power Holding Co. Ltd. (CGNPC)
CNNC hold 45% share of CGNPC.
- China Power Investment Corp.
China State Nuclear Power Technology Co. Ltd.

Newcomers

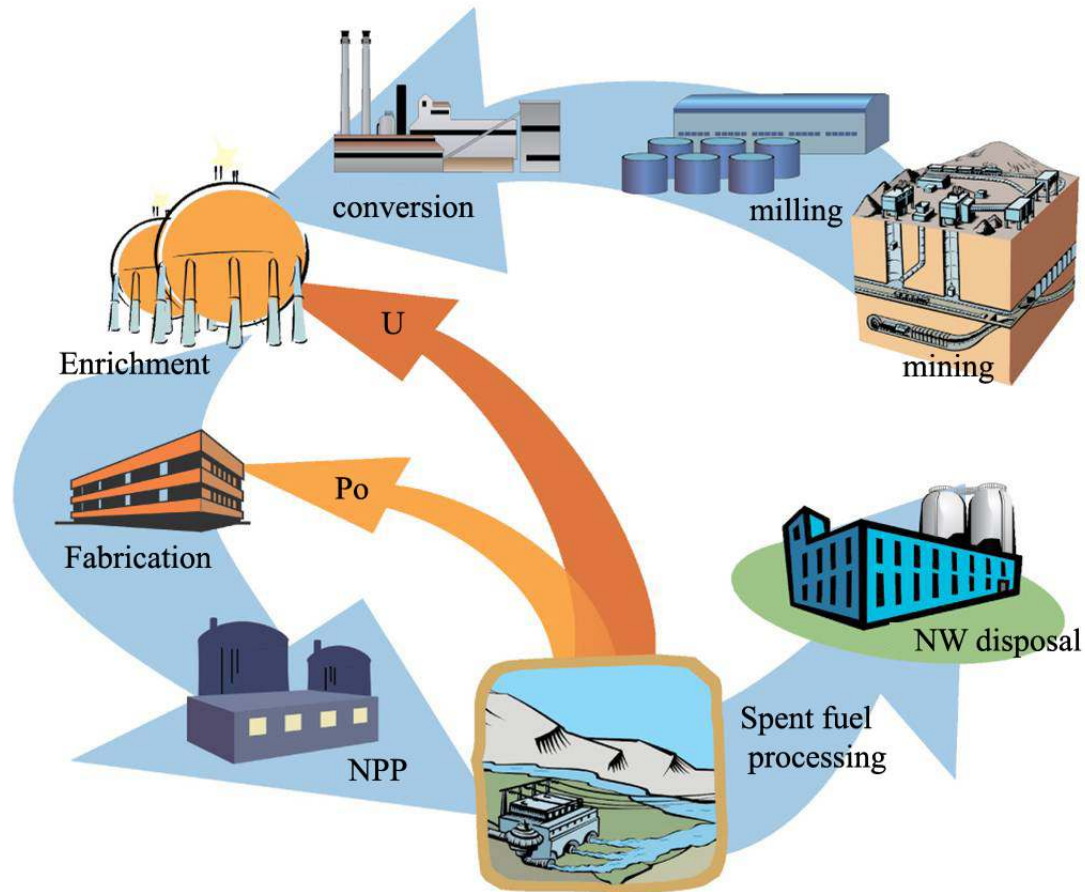
- China Huaneng Group
- China Datang Corp.

CNNC's evolution

- Ministry of the Third Industry in 1955
- Ministry of the Second Industry in 1958
- Ministry of Nuclear Industry in 1982
- China National Nuclear Corp.(CNNC)

In 1988

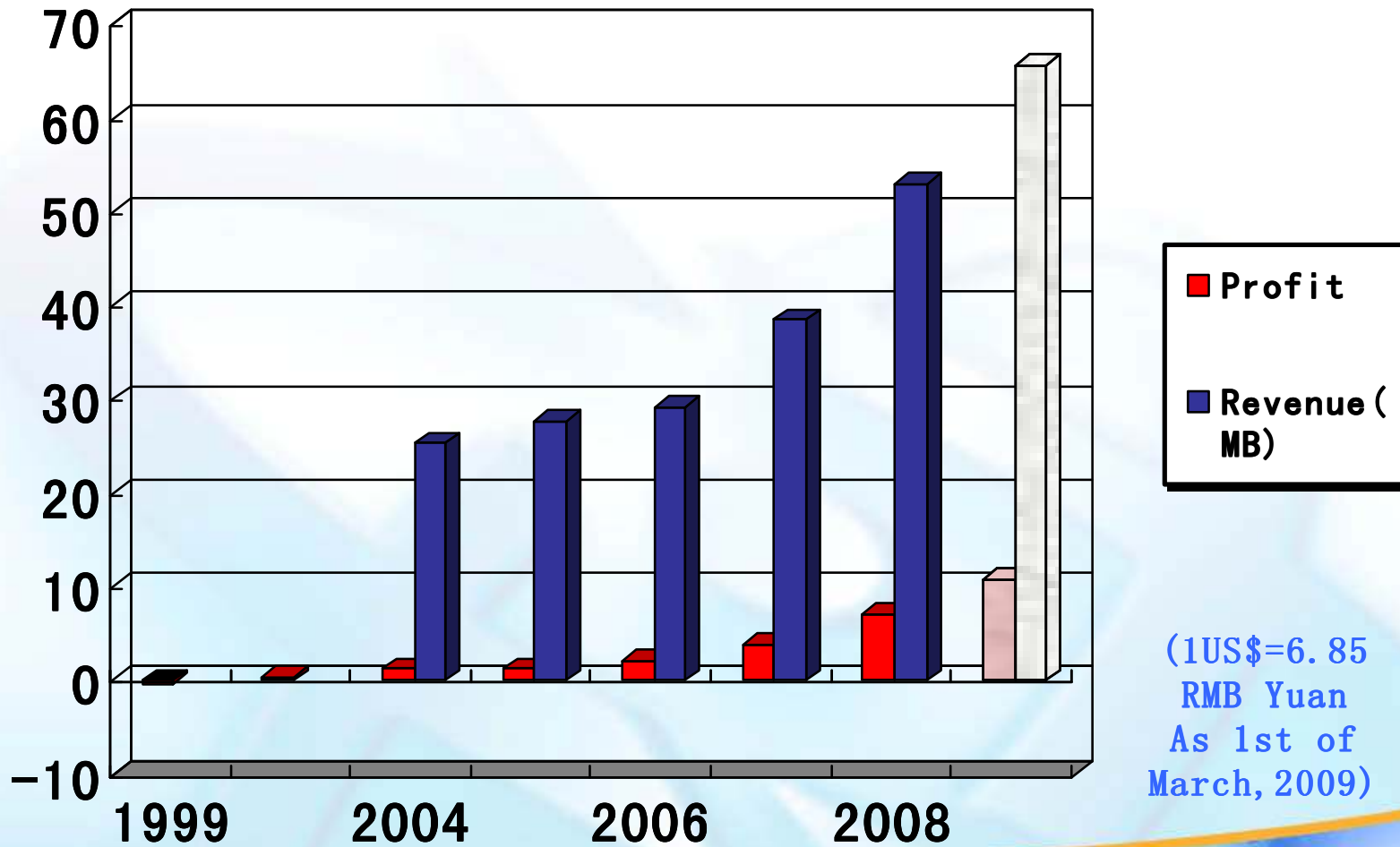
The nuclear fuel cycle in CNNC



核燃料循环示意图
Sketch map of nuclear fuel cycle

The major business (MB) revenue vs profit

100Ma US\$



(1US\$=6.85
RMB Yuan
As 1st of
March, 2009)

Current status of Nuclear power in China

Current operated Nuclear Reactors in China

China's nuclear power started in 1980's;

- By 2009, there are three NPP bases, six NPPs, 11 units in operation.
- The nuclear power reaches 9078 MWe which is accounts for less than 2% of the total electrical capacity generated in China.

Current operating NPPS in China

<u>NPP</u>	<u>Type</u>	<u>Power (MWe)</u>
<u>Qinshan-1</u>	<u>PWR</u>	300
<u>Qinshan-2</u>	<u>PWR</u>	2 × 650
<u>Qinshan-3</u>	<u>PHWR</u>	2 × 720
<u>Daya Bay</u>	<u>PWR</u>	2 × 980
<u>Lingao</u>	<u>PWR</u>	2 × 990
<u>Tianwan</u>	<u>PWR</u>	2 × 1060

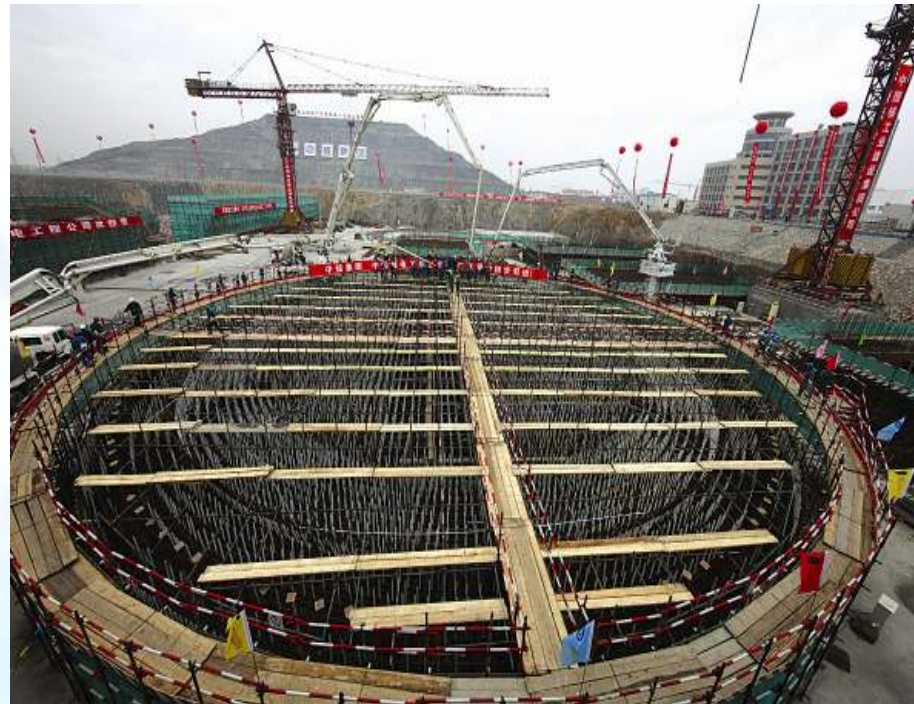


Qinshan Phase I

Tianwan NPP

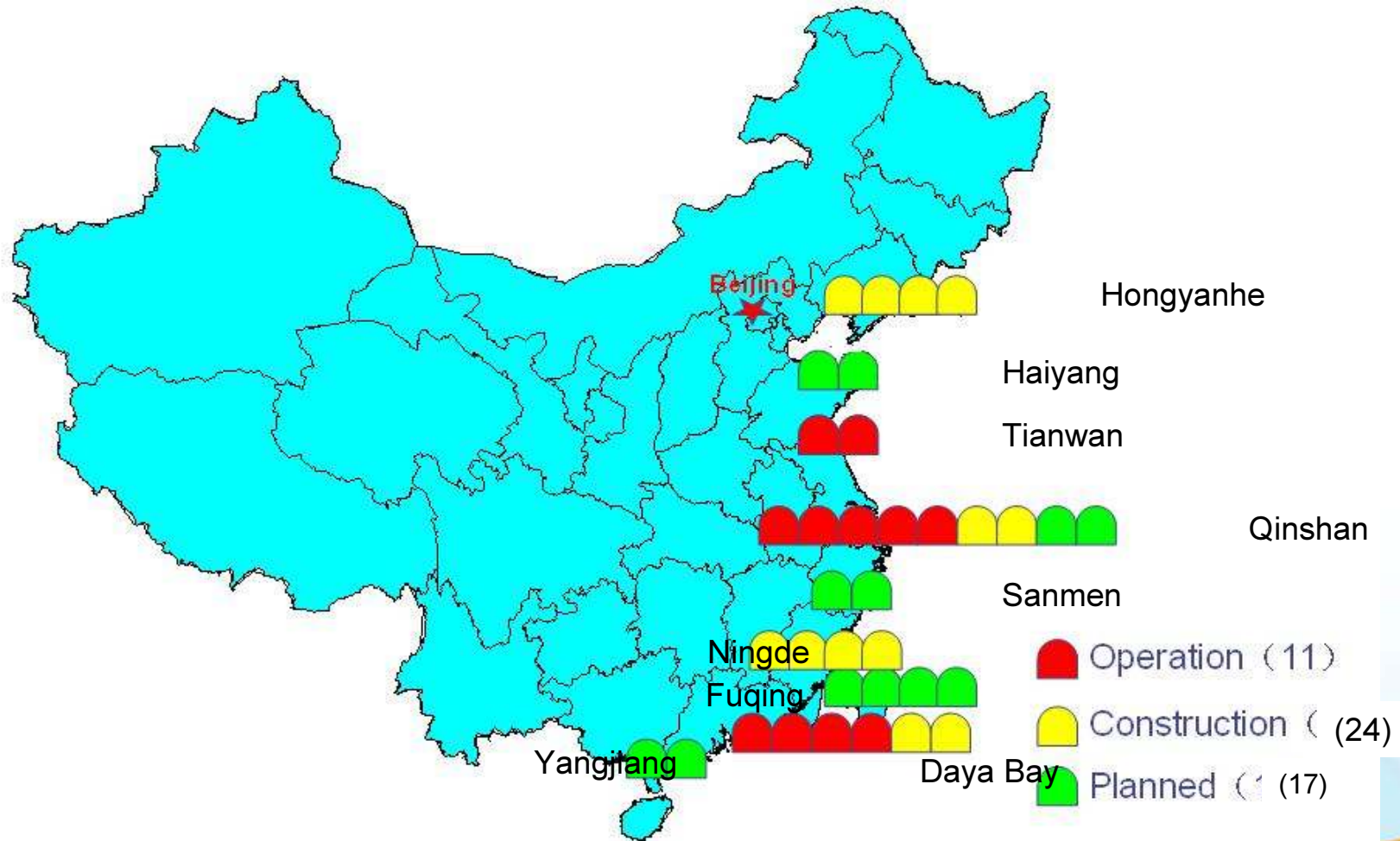


- 13 NP units under the construction with the total capacity of **13350 MWe**. 30% Of the total in the world up to date;
- 24 units with a total capacity of 24 GWe were approved to commence construction.
- 17 units with a total capacity of 17 GWe were given green light to carry out siting and other preliminary preparation work.



Fangjiashan project

Status of Nuclear Power Development in China





Sanmen project in construction
Zhejiang Province, the first project
for indigenization with third
generation AP1000 technology, was
officially started on April 19, 2009

CEFR--- China Experimental
Fast Reactor



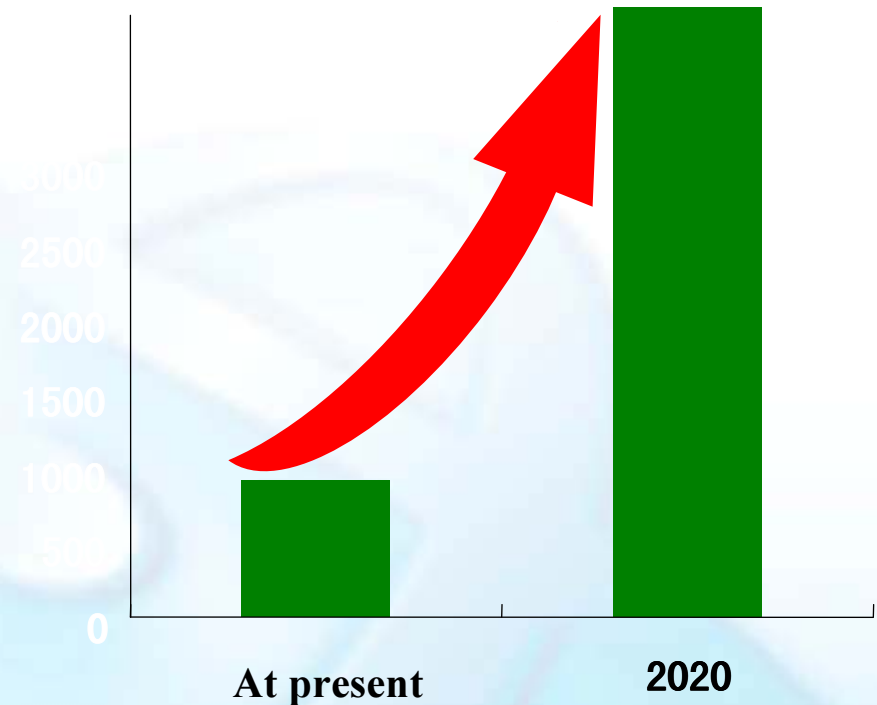
CHASNUPP in Pakistan

- According to the 《China's middle-long term economic development plan(2005-2020) 》 issued by the State Council in 2007;
- 40 GWe NPP will be built, and 18 GWe will be under the construction by 2020, reduction of 296 million tons CO₂, and 1 million tons SO₂/year;
- >60 Billion USD needed for the construction;
- At least 3-5 reactors annual shall be constructed in next 10 years.

Developing plan for future

Objective of Nuclear Power Development Program

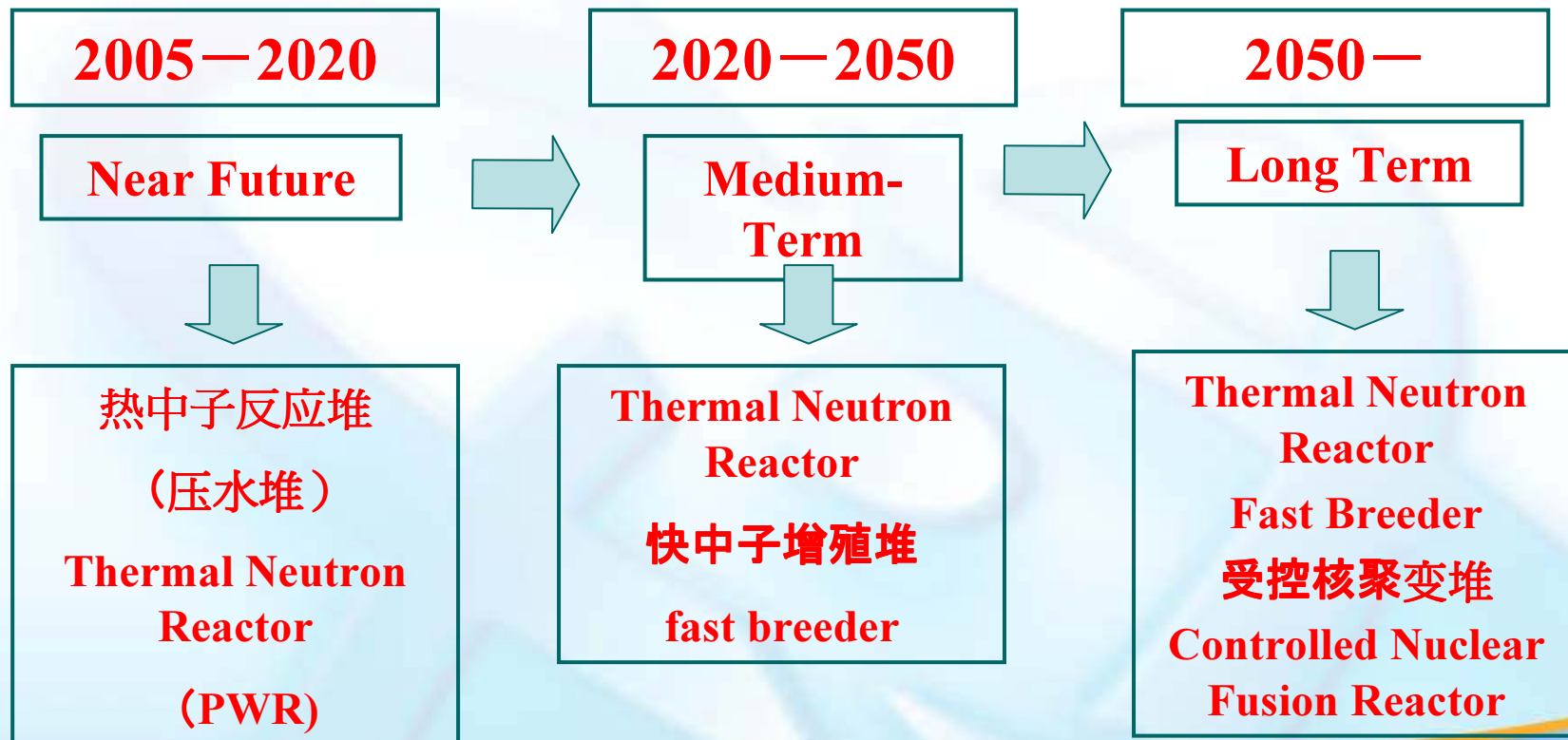
We will strive to have the installed nuclear power capacity reach 40 GWe by 2020, accounting for 4% of the total installed electric power capacity.



Nuclear Power Development Program

● China Nuclear Energy Development Strategy

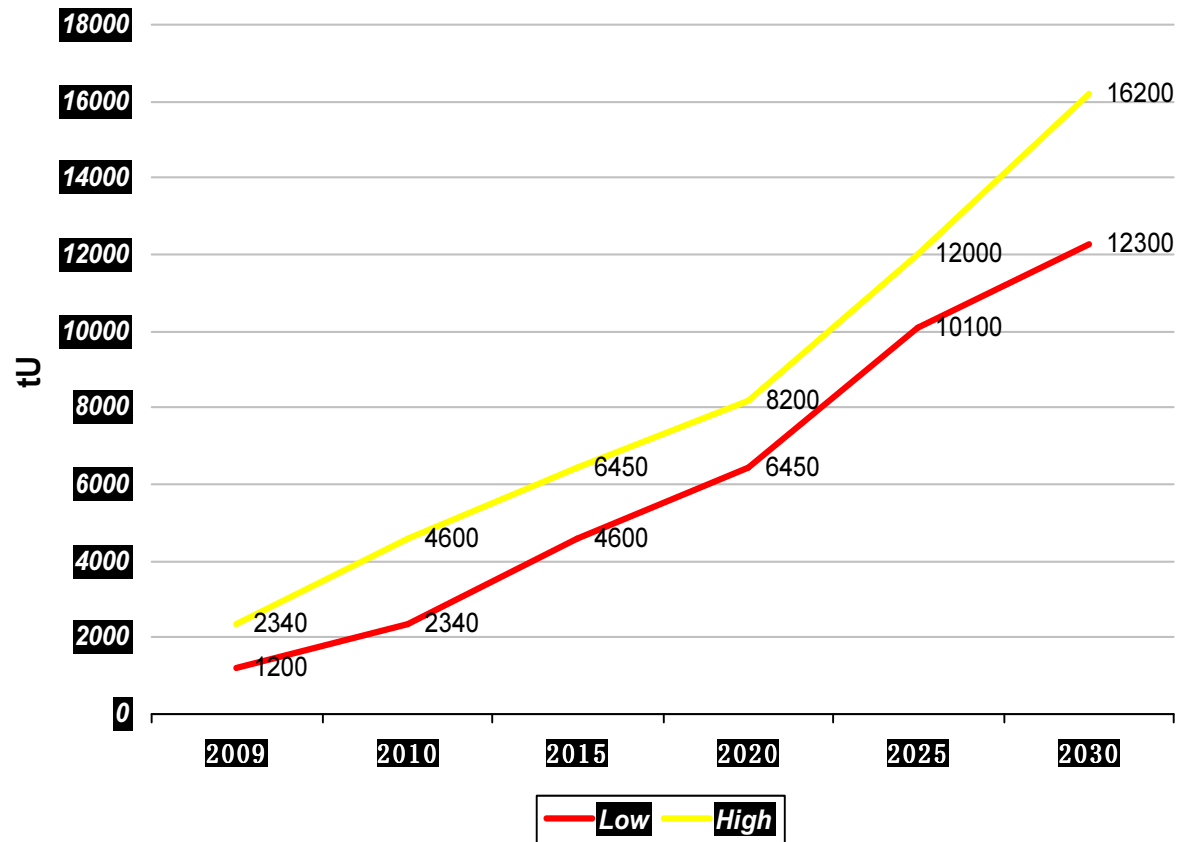
“Three-Step” Development Strategy



Uranium requirements & production

Uranium Demand

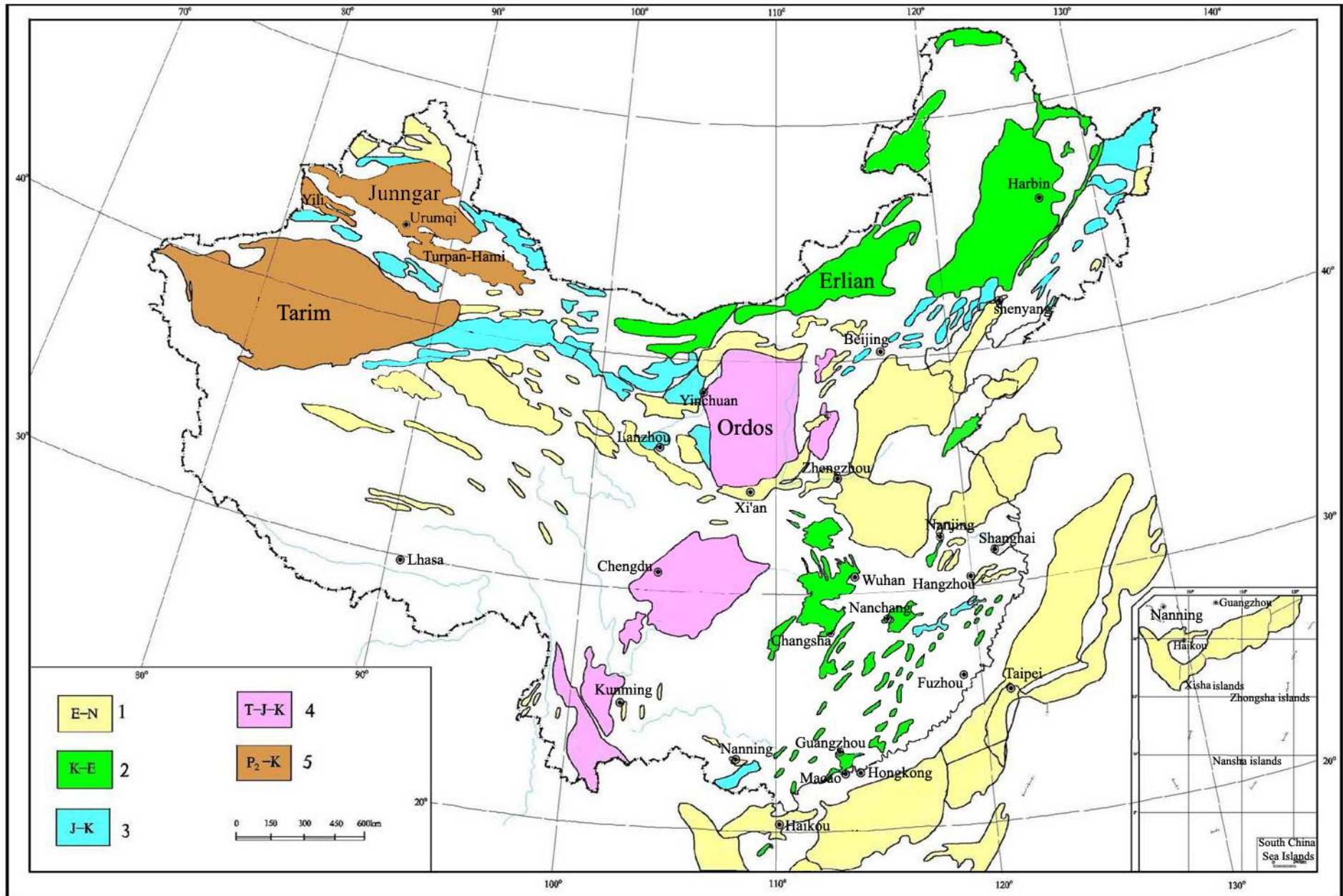
From 2009 to 2020, the estimated demand of uranium will be increased from 1200-1500 tU/y to a range of 6450 t – 8200 tU/y.



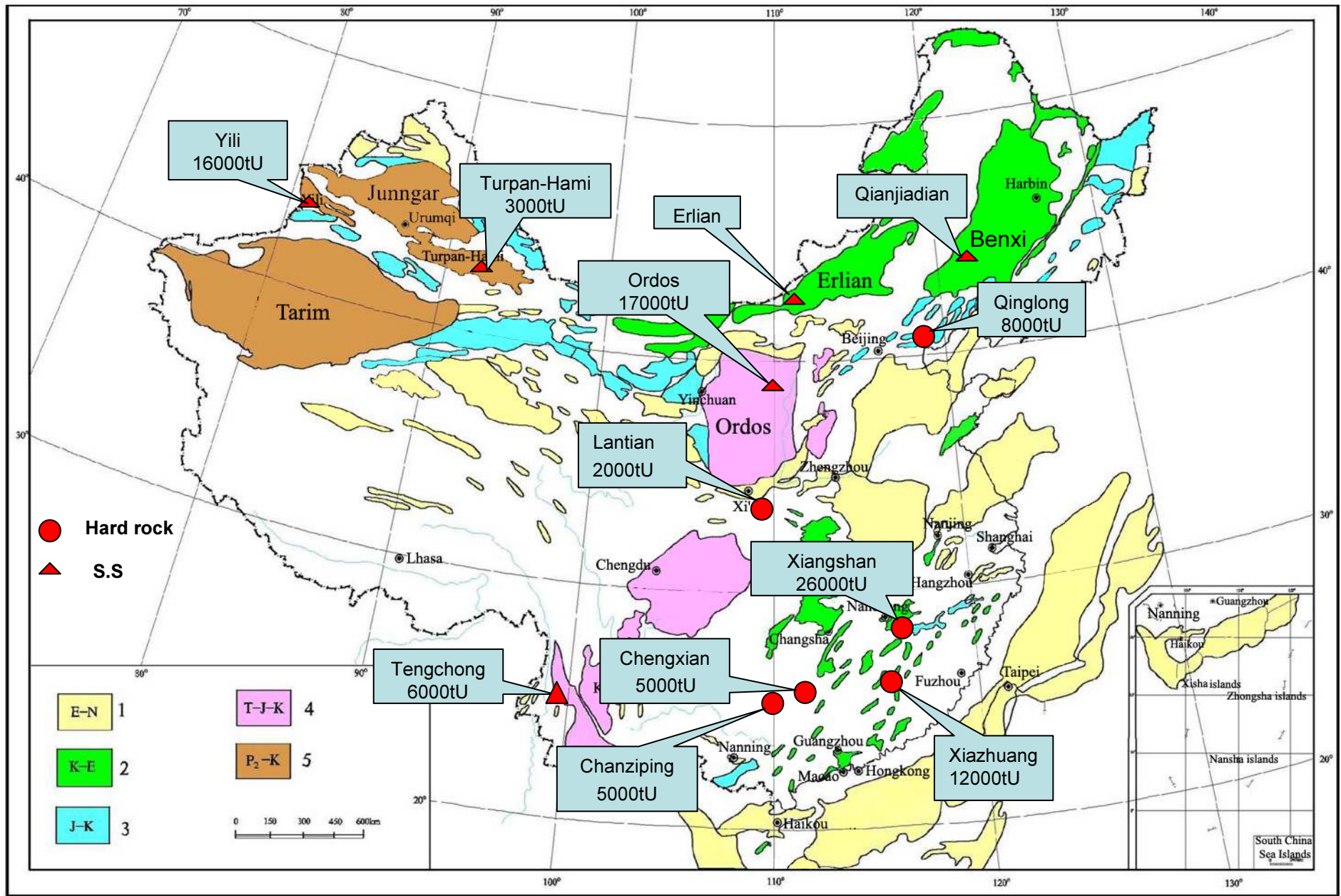
Uranium exploration, mining, milling

Uranium Exploration

- The major target is sandstone type uranium deposits in Mesozoic – Cenozoic basins in northern China.
- Other types including granite-related, volcanic-related and black shale are supplementary.



Major uranium deposits in China



The characteristics of uranium deposits in China

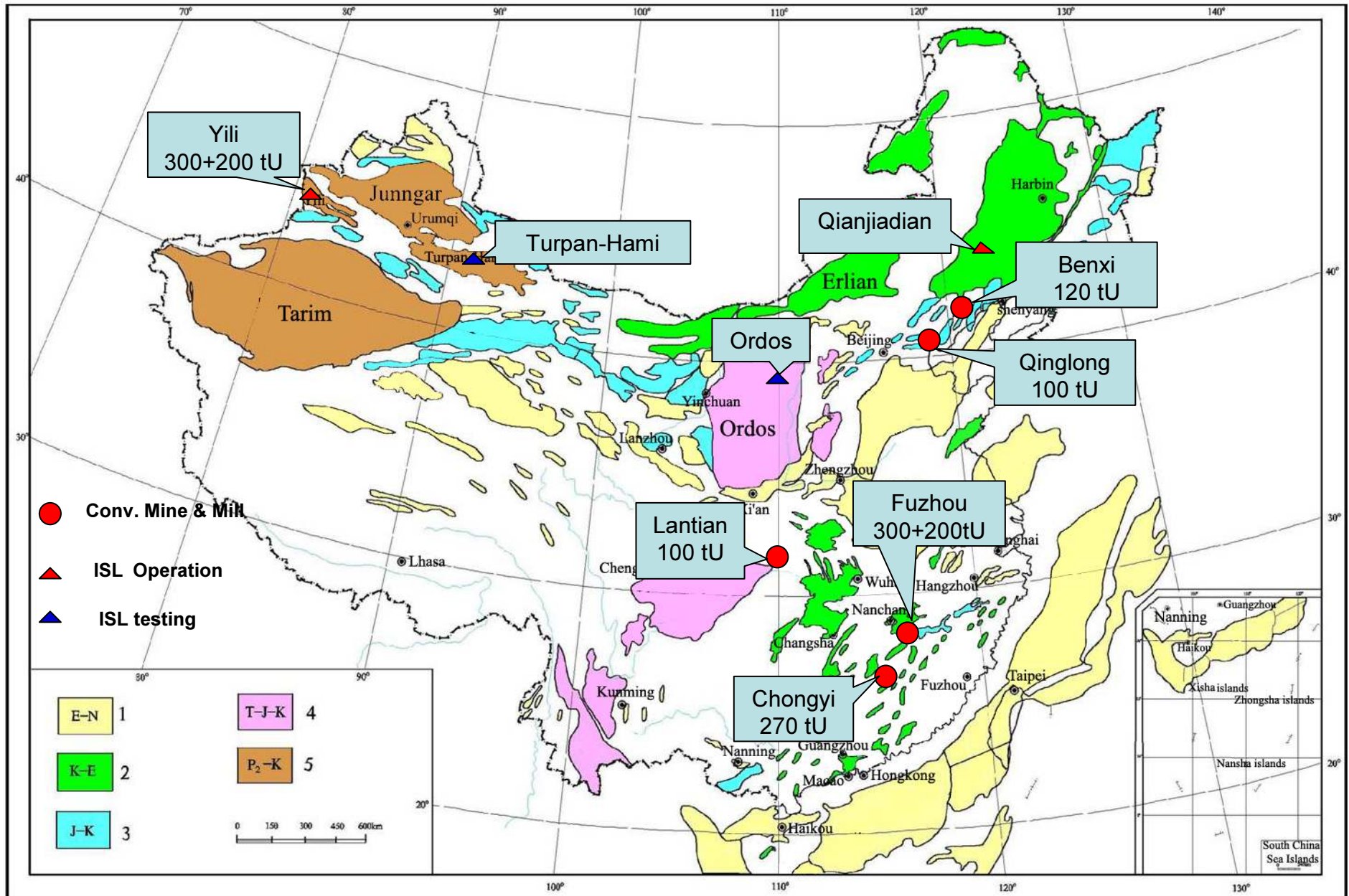
- ◆ Rich in different types;
- ◆ Many different metallogenic ages;
- ◆ Abundant in numbers of deposits;
- ◆ Relative easy to be treated;
- ◆ Occurred in relative dense areas;

China is relative rich in uranium resources !

Uranium Mining and milling

- Yili -- Only Insitu leaching mine located Yili, Xinjiang, northwest China
- Insitu leaching test under the way in Shihongtan Deposit, Turf-Hami Basin, Erlian Basin and Donsheng Deposit of Erdos Basin.
- Dongsheng Deposits located in Erdos basin will be developed into an new production center by both conventional and ISL methods.

Major uranium mines & mills

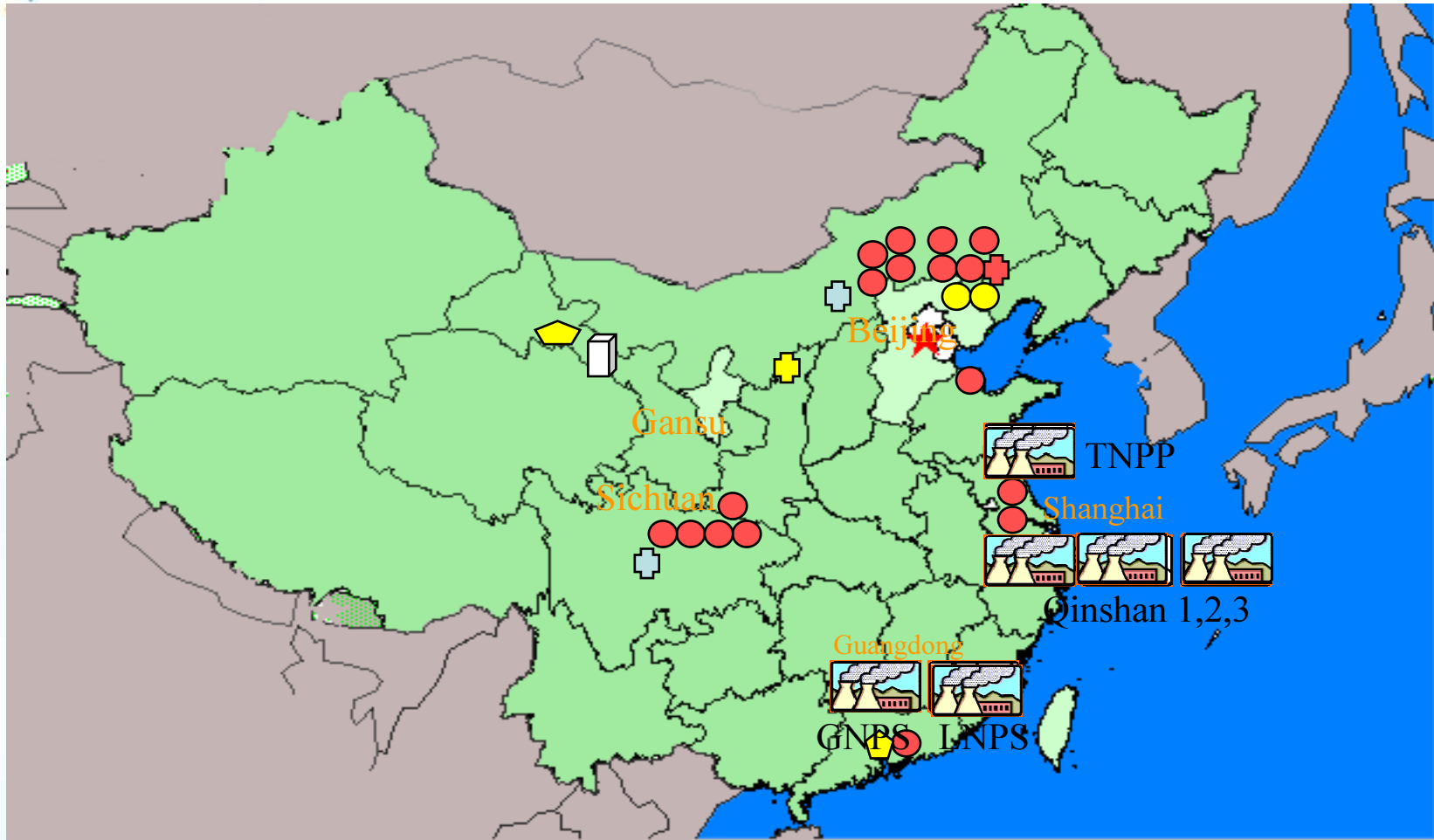


Fuzhou Mine & Mill



- a. Intensified exploration within in China
Drilling footage reached 0.5 Million m in 2008
Resource has been dramatically added due to the endeavor and input since last three years.
- b. Exploration and mining oversea
 - CNNC in Niger, Africa
 - CGNPC & CNNC in Kazakhstan
 - CGNPC in Irkol mine
 - Sinosteel in Australia
- c. Direct purchase from international market
Central Asia, Africa, Russia, Australia
- d. JV – CGNPC with Areva, UraMin.

Chinese nuclear facilities



Reprocessing plant



Disposal facility



NPP in Operation



Fuel fabrication plant



Research reactor



NPP under Construction



The keys of the faster and health development of nuclear power

- Invention ability, R&D;
- Manufacture ability, localize equipment;
- Guarantee of nuclear fuel supply;
- Human resources capacity;
- Importance of safety culture.



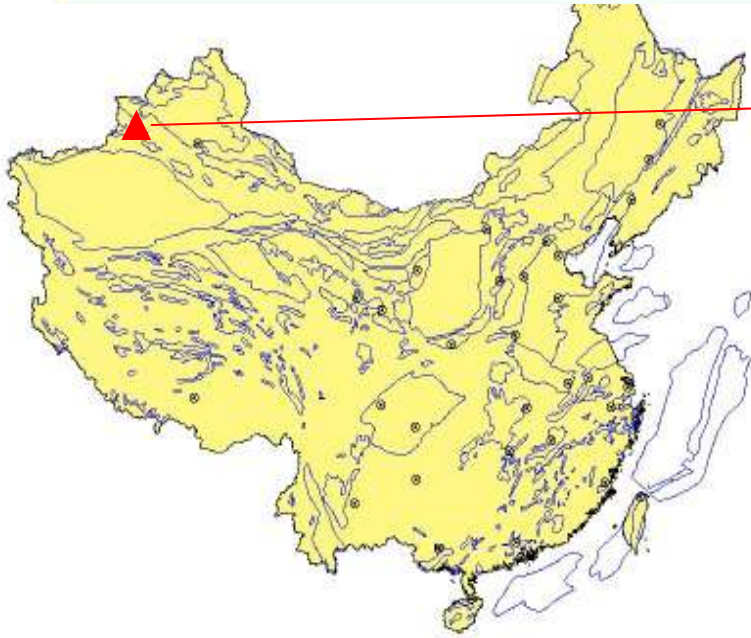
- More mines and mills will be constructed along with the new discovery of new deposits;
- The conversion plant is finished with the new capacity;
- The new enrichment plant has started the construction.

● Upgrade of manufacture level and capacity of NPP Three major nuclear power manufacture groups

Harbin, Shanghai and Orient

Three heavy machine manufacture groups, **the first, second and third** over US\$440 ma. investment for R & D, raise the capacity for those companies to produce NPP equipment

Uranium deposit and ISL operation at Yili Basin



- ◆ The site for URL and repository for HLW is under the R & D.
- ◆ More than 40 universities have subjects with nuclear-related.

Beilong disposal site located in Guangdong province is one of the five planned national regional LILW disposal facilities.



Plan for 70 GWe nuclear power plants will be built and 30 GWe will be under the construction by 2020 which will be 5% of the total electricity generated.....

THANK YOU

