Nuclear Energy after Fukushima

Prospects in China

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Fukushima has left a severe burn on people’s mind. One year later, it is time that the world should consider in retrospect what lessons can be learned from the accident to benefit the entire industry.
Contents

1 Post-Fukushima Nuclear Industry in China
2 Prospects of Nuclear Industry in China
The Chernobyl Accident stimulated a world-wide anti-nuclear movement. However, after calculations and arguments, China persisted in its nuclear power development plan. The Qinshan and Daya Bay projects continued. A new era started after 2000. The government policy went increasingly pro-nuclear from "moderate development" to "proactively development" and to "rapid development on the basis of safety". The State Council summoned conferences to discuss nuclear safety right after Fukushima.
Strict regulatory process and comprehensive audit to guard nuclear safety

1. Comprehensive safety audit of all nuclear facilities to ensure safety

2. Adhering to strict safety control on all operating nuclear facilities. Extreme supervision measures imposed.

3. A temporary halt to approval of new nuclear projects.


The halt to new project approval and imposing of safety audit showed the government’s sense of responsibility and rationality in decision making.
Developing nuclear power rapidly on the basis of ensuring safety

After Fukushima

State Oceanic Administration

NNSA

NEA

Ministry of Environmental Protection

Suspended approval of waters utilization appealed by new nuclear projects.

1. Instructed all facilities to perform a comprehensive self-review
   Established the National Civil Nuclear Facilities Inspection Group, and reviewed all operating and being-built nuclear units

2. All nuclear units in progress and to be built must pass self-review and national inspection. New project approval halted.

3. Real time monitoring and exposure of radioactive indices
   - Medium & Long-term Development Plan
   - Nuclear Safety Plan
   - Nuclear Power Safety Plan

China will take lessons from Fukushima, but development of nuclear power will remain a national policy.

Safety First, Quality Foremost, and Pursuing Excellence
Developing nuclear power rapidly on the basis of ensuring safety

After Fukushima

Two additional bureaus; head count expanded by 1000.

NNSA

Nuclear Power Bureau newly opened for nuclear power safety surveillance.

NEA

One additional bureau (Nuclear Crisis Bureau) and one additional center.

COSTIND

Additional administrative bodies and man force on government level.

Safety First, Quality Foremost, and Pursuing Excellence
Developing nuclear power rapidly on the basis of ensuring safety

After Fukushima

NEA

Initiated the Nuclear Safety Technology R&D Plan

The plan covers passive UPS (high-capacity battery system), high level coolant source, NPP severe accident prevention and mitigation, GEN II+ seismic endurance upgrade, severe external flooding and spent fuel meltdown prevention and mitigation, multiple catastrophe analysis and countermeasure (for Qinshan & Daya Bay), severe accident simulation platform, hydrogen removal, emergency robot, passive containment heat removal, passive secondary side heat removal, radioactive pollution detection, etc.

Aiming at increasing the security of China’s GEN II+ nuclear power technology, decreasing CDF to 10-5/unit-year and LERF to 10-6/unit-year.

Safety First, Quality Foremost, and Pursuing Excellence
Drawing lessons from Fukushima, China Guangdong Nuclear has set the following mottos and action plans to ensure safety of operating and being-built units:

- Safety is the Life of a Nuclear Power Plant.
- Follow instructions from administrative bodies and learn from international peers.
- Technical improvements for better safety and maturity.
- 0 emission and 0 loophole on operating and being-built units.
China Guangdong Nuclear – Endeavors to Ensure Safety

The entire CGN
  - Self-review
  - The Fukushima Lessons Studies Committee
  - Info sharing with WANO and other international associations
  - Academic studies on Fukushima Accident

Operating & being-built units
  - Operating: introduced over 20 technical improvements as recommended by national administrative bodies and WANO;
  - Being-built: 25 technical improvements for CPR1000 units and 17 for CEPR units;
  - Rigid schedule and clear responsibility on the above improvements.
Co-work with partners

- Expert interviews to clear doubt of the public
- Popular exhibitions for local communities
- Smoothing communication channels with the public
- Non-emergency incidents above Level 0 are publicized within 2 work days

Collaboration with domestic peers to share information
- Conversations with main suppliers to protect the supply chain
- Building confidence in the industry

China Guangdong Nuclear – Endeavors to Ensure Safety

Safety First, Quality Foremost, and Pursuing Excellence
Contents

1. Post-Fukushima Nuclear Industry in China
2. Prospects of Nuclear Industry in China
China consumed 20% energy of the world’s total in 2010, ranking the 1st place.

The population, resources and environment will not sustain energy inefficiency.

Reforming the energy supply and consumption mechanism. Building a safe, sustainable, economical and clean one.

Clean energy accounting for 15% by 2020.

Nuclear is the inevitable choice of safe, sustainable, economical and clean energy.

Safety First, Quality Foremost, and Pursuing Excellence
Nuclear Power Is Irreplaceable

Nuclear is below 2% in China at present. The future is enormous.

Lower tariff than coal-fired plants

Technical advancement and environmental friendliness

High availability through the year

Safety First, Quality Foremost, and Pursuing Excellence
Safety is the irreplaceable choice of green massive energy. Fukushima reveals our weaknesses in the technology itself as well as emergency handling, and safety culture. The industry will not advance unless lessons are learned.

Safety is the precondition of the existence of the nuclear industry. Safety is the responsibility of nuclear operators.

Fukushima is a significant event in nuclear history. In retrospection, the industry needs to learn the lessons and make sure the same will never happen again.

Safety First, Quality Foremost, and Pursuing Excellence
# Nuclear Power Units Being Built in Mainland China

<table>
<thead>
<tr>
<th>No</th>
<th>Owner</th>
<th>Approved units</th>
<th>Being Built</th>
<th>Province</th>
<th>Unit capacity</th>
<th>Unit type</th>
<th>FCD</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>CGN/CPI</td>
<td>Hongyanhe 1/2/3/4/5/6</td>
<td>Hongyanhe 1/2/3/4</td>
<td>Liaoning</td>
<td>1080</td>
<td>CPR1000</td>
<td>2007-08-18, 2008-03-28, 2009-03-07, 2009-08-15</td>
<td>15 units 17540MW</td>
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<td>Fujian</td>
<td>1080</td>
<td>CPR1000</td>
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<tr>
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<td>CGN</td>
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<td>1080</td>
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<td>CGN</td>
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<td>1750</td>
<td>EPR</td>
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<td>CNNC</td>
<td>Fuqing 1/2/3/4</td>
<td>Fuqing 1/2/3</td>
<td>Fujian</td>
<td>1080</td>
<td>M310+</td>
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<td>CNNC</td>
<td>Sanmen 1/2</td>
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<td>1250</td>
<td>AP1000</td>
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## Total

- **26 units**
- **29240MW**

## Approved for FCD

- **6 units**
- **6820MW + HTGR**
15 operating units on the mainland
Thank you