Insights of Design, Construction & commissioning for Advanced NPP

Zheng Mingguang

Chief Designer of Chinese National Key Project  CAPs
President of SNERDI
Senior Vice President of SNPTC
8 June 2017
知识产权声明

本文件的知识产权上海核工程研究设计院及其相关产权人所有，并含有其保密信息。对本文件的使用及处置应严格遵循获取本文件的合同及约定的条件和要求。未经上海核工程研究设计院事先书面同意，不得对外披露、复制。

*Intellectual Property Rights Statement*

*This document is the property of and contains proprietary information owned by SNERDI and/or its related proprietor. You agree to treat this document in strict accordance with the terms and conditions of the agreement under which it was provided to you. No disclosure or copy of this document is permitted without the prior written permission of SNERDI.*
Content

1. Situations & Challenges

2. Is Nuclear Power Indispensable?

3. Lessons Learned and Engineering Solutions

4. Example of CAP1400 & its Techno-economy
1. Situations & Challenges

- High Safety Demand from Public & social development
- Renewable Energy Quick Development
- Environment required Risk & quantities minimized on Rad-waste & spent Fuel
- Globally Physical Economy Slow Down
- Give up winds & solar energy
1. Internal Challenge & Root Causes Analysis

- **New Standards & Requirements**
  - 60 years, SSE >0.3g, higher safety and reliability, smaller CDF, LRF
  - ALARA, very low discharge <100Bq
  - HFE & convenience, maintainability

- **New Technology**
  - Passive Safety, modular construction

- **New Process**
  - ADS 4 with squib valve

- **New Equipment**
  - Canned pump/Squib valve
  - Digitalized I&C

- **New Material**
  - CA31、MN20 with boron silicone

- **New Cooperation Mode & People**

Additional notes:
- AP and EPR Delayed
- Resulting into Poor Economy
- Invest. Increase
2. Is Nuclear Power Indispensable?

1. Green & High Density Power

2. Nuclear Power for Base Load important to social safety & National Strategy. Such as banking, medical, steelmaking etc.

3. East China is lack of natural resource but high electricity demand.

4. Nuclear power is promising in ocean & deep sea, deep space.

2. Severs for steady, reliable, affordable industrial base load, Renewable energy severs favorably residential and commercial.
Design needs **carefully & comprehensively coordinated, simulated & reconciliated** among thermal, hydraulic, mechanics, electric, magnetic and etc for better safety & economy.
3. Lessons Learned and Engineering Solutions

All plans & schedules of Project shall be correlated & integrated each other to know clearly the risk and significance.

Dry Running also important

- Design Schedule
- Test, verification & Validation Plan
- Equipment Contract plan
- Equipment Make & delivery Plan
- Construction & erection plan
- Safety Review plan

Project Risk Identification & Management
4. Example of CAP1400 & its Techno-economy

How to realize the better techno-economy:

- Continuously & uninterruptedly 40 years experiences in PWR technology R&D, engineering, construction and 25+ years experiences in safe operation of NPPs in China.
- Establishment of educational, Industrial infrastructures, experimental facilities, analysis tools, safety review system, standard system, talent team
- Based on rightly simplified and good philosophy of AP1000 and supportive project construction experience and feedbacks.
4. Example of CAP1400 & its Techno-economy

- Model based & driven to keep design and its equipment to be developed at same time. Equipment shall support the design.
- Complete supply chain with multiple suppliers & benign competition established.
  - Reduce supply risk;
  - Promote market competition thus to reduce the cost.
  - Promote the sustainable technology development.
- Proven Design with fully scaling and scenario testing, V&V &
- Accurate Engineering with Proven & Qualified equipment,
- Decisively safety review & less marginal effects.
- Balance between localization and international procurement
- New mechanism of cooperation with 100+ international and domestic organizations participated.
谢谢！
THANK YOU！