INMM-USNIC
Spent Fuel Management Seminar

Spent Fuel Management in China

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January 23, 2018
Beijing, December 2017
Sunset over the Forbidden City
China’s Nuclear Program

- 38 reactors (36 GWe) in operation
- 20 reactors (21 GWe) under construction

Under the 13th Five Year Plan (2016-2020)
- By 2020 58 GWe in operation & 30 GWe under Construction
- 15% non-fossil primary energy source by 2020
- 20% non-fossil primary energy source by 2030
- AP1000 - Sanmen & Haiyang online
- Demonstrate commercial reprocessing plant
  (By 2035 over 100 GWe in operation, 200 GWe by 2050)
Nuclear Reactors

• Policy: PWRs – min 1000MW, except 2-CANDU
• Qinshan I- 300 MWe indigenous design (1991)
• M310/CPR1000
• AP1000
• EPR
• VVER
• HTR-PM
• CEFR
• Hualong One
• SMRs
Three authorized nuclear operating companies:
* China National Nuclear Corporation (CNNC)
* China General Nuclear (CGN)
* State Power Investment Corporation (SPIC)

Only CNNC is authorized to engage in fuel cycle activities
Spent Fuel Management

- Closed fuel cycle strategy - 1987
- CNY2.6 cents/kwh fee
- At reactor storage:
  * Except Daya Bay NNP, plants -20 years on site storage capacity
  * Discharge 600 ton in 2016, 1100 tons by 2020
  * Only Daya Bay (on line in 1993 & 1994) reached full capacity-transported twice annually to Central Wet Storage Facility in Gansu
  * Cumulative 14,000 tons SF by 2020
  * Dry storage only at Qinshan III (CANDU) & HTR-PM (future)
Centralized Wet Spent Fuel Facility (CWSF)

- Lanzhou Nuclear Fuel Complex, 25 KM NE of Lanzhou, Gansu
- 1st phase-550 tons (1998)
- 2nd phase-add 550 tons in future
- 3rd phase-add 550 tons with reprocessing
- 3700 km from Daya Bay NNP-by sea & rail
- Transportation Cask: 5 t-Imported and R&D; 20 t under R&D; 50 t & 120 T future
- Options: domestic R&D; Imported; and collaboration with foreign enterprise
Reprocessing

A multipurpose reprocessing pilot plant (RPP) 2015:
  * demonstration of process, equipment & instrumentation and obtain experience
  * Recovery EU from SF of HFETR
  * R&D for MOX or FBR fuel in the future
Next to CWSF with a throughput of 300 Kg
Detailed design & construction underway
Commercial scale-2020 (MOU with AREVA in 2007-800t/yr, $15 billion-French president visit in 12/2017-still under negotiation) at a coastal site
Geological Repository

- Joint guideline by CAEA, MOST & MEP-2006
- Storage of vitrified HLW at 500 m deep
- Three candidate sites in Gansu since 1986
- Beishan area, all in granite
- Study to be done by 2020
- Underground Lab at the site for 20 yrs
- Selection and construction by 2040
- Accept HLW by 2050
Fast Breeder Reactor

• Under the National Development Program for S&T
• FBR:
  * 1\textsuperscript{st} phase - 65 MWe CEFR-imported from Russia
  * 2\textsuperscript{nd} Phase – 600 MWe site work
  * 3\textsuperscript{rd} Phase – 1,000-1,500 MWe planned for future
Thanks!

Q&A