Emergency Preparedness and Response in China

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1 General Information
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After Fukushima accident, Chinese policy on nuclear development and safety:

- To put nuclear safety as part of integrated national security
- To learn Lessons from Fukushima and conduct safety improvement
- To make Nuclear Safety Plan and maintain high level safety
- To develop continuously nuclear energy in China
General information

- **NPP**
  - 13 sites
  - 20 units in operation
  - 28 units under construction

- TianWan
  - 2x1060 MWe

- Qinshan Nuclear Power Plant
  - 310 MWe

- Qinshan 2nd Nuclear Power Plant
  - 4x650 MWe

- Qinshan 3rd Nuclear Power Plant
  - 2x700 MWe

- Daya Bay
  - 2x984 MWe

- Ling Ao
  - 2x990.3 MWe
  - 2x1080 MWe
General information

- NPP in 2020: 58GWe in Operation, 30GWe under constructing
- Research reactors: 19 reactors
- Radioactive sources: 110,000 in use, 140,000 spent sources in storage
- Nuclear fuel cycle: 20 facilities
- Rad-Waste: 2 LLW disposal facilities in operation, 1 under construction. One storage facility in each province
Advisory Committee on Nuclear Safety → NNSA/MEP → Provincial agencies for radiation safety and environment (31)

Adm. Office → Dept. Nuclear Reg. 1 → Dept. Nuclear Reg. 2 → Dept. Nuclear Reg. 3 → Intel. Coop. Office → Others (HR, laws etc.) → NROs (6) → TSOs: NSC, RMTC
Regulatory Body and its TSOs

- NNSA/MEP is regulatory body for safety of nuclear installations, nuclear activities, nuclear material and radioactive material, and responsible for radiological environment management.

- NNSA reports to the Premier of Chinese Government by Minister of MEP. MEP vice ministers is NNSA’s Administrator.

- TSOs:
  - NSC: full time, in areas related nuclear & radiation safety
  - RMTC: in radiological environmental monitoring
Human resources and budget of NNSA

- Headquarter: three technical departments, and international cooperation office, staff 85
- Six Regional offices, 331
- TSOs:
  - NSC, staff 600
  - RMTC, 100
- Regular Budget:
  - 2011: RMB 200 million
  - 2012: RMB 350 million
  - 2014: RMB 390 million
Nuclear Safety legal system

- 1 Law (Law on Prevention and Control of Radioactive Pollution)
- 7 Administrative Regulations on safety
- 27 Departmental Rules
- 89 Guides
2 Activities after Fukushima accident

• NNSA/MEP and its TSOs finished:
  ➢ Environmental radiological monitoring national wide
  ➢ Accident analysis, consequence assessment and lessons
  ➢ Information to the public
  ➢ Nuclear safety plan
  ➢ Safety examination, safety margin assessment and safety improvement actions
  ➢ Nuclear safety culture, to be published soon
Information to Public

- gamma dose rate continuous monitoring
- gamma spectrometry analysis of artificial radioactive of aerosol, iodine in air, soil samples, water samples, dry/wet deposition, and biological samples
- monitoring data and related information was published and updated on web-site of NNSA/MEP
Auto-monitoring for environment quality
NNSA/MEP activities in emergency

Fukushima Accident Response in 2011
**Fukushima Accident Response in 2011**

### NNSA/MEP activities in emergency

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<th>模拟范围</th>
<th>设定源项参数</th>
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<tr>
<td>释放点坐标：</td>
<td>所有释放核素的释放量：</td>
</tr>
<tr>
<td>纬度</td>
<td>经度</td>
</tr>
<tr>
<td>141.0325</td>
<td>37.4213</td>
</tr>
</tbody>
</table>

### 参考参数
- 释放起始时间：2011年03月12日15时00分
- 释放结束时间：2011年03月12日16时00分
- 算例简单描述：
  - Xe-133m: 8.78E+16
  - Xe-135: 7.25E+17
  - Kr-85: 1.42E+16
  - Xe-135m: 5.87E+17

### 设定源项
- 体源释放参数：
  - 左下角坐标：141.0325，37.4213
  - 右上角坐标：141.0325，37.4213

### 释放模式
- 随地高度
- 释放高度：
  - 底部: 0
  - 顶部: 0

### 关注点
- 模拟区中心点（140.5，33.5）
NNSA/MEP will publish Statement on Nuclear Safety Culture soon

- Common position on Safety Culture in regulator, other governmental agencies and nuclear industry
- Keep in line with the international practice and summarize Chinese practice
- Continuous promotion of safety culture by
  - Individuals
  - Organizations in nuclear industry
8 Elements of Safety Culture

- Policy levels’ safety commitment
- Management levels’ attitudes and demonstration
- Responsibilities and participation of the individuals
- Organizational learning
- Complemented Management system
- Proper working climate
- Questioning attitude and experience feedback
- Harmonious public relations
3 Emergency management system
Emergency law and regulations

- **Law** on Emergency Response
- **Law** on Prevention & Control of Radioactive Pollution
- **Regulations** on Emergency Management for Nuclear Accidents at Nuclear Power Plant
- **Regulations** on the Safety and Protection of Radioisotopes and Radiation Devices
- Basic Safety Standard for Ion-Radiation and Safety of Radiation Source
- related NNSA Safety Guides on emergency preparedness and response
Nuclear accident management

- according to law and regulations, 3 levels emergency plans
  - National Nuclear Emergency Plan
  - Provincial Nuclear Emergency Plan
  - Plant Nuclear Emergency Plan

- All plans are revised based on lessons learned from Fukushima accident, and emergency capacity are enhanced
National Nuclear Emergency Plan

This Plan approved by State Council, National Nuclear Emergency Coordination Committee (NNECC) established:

- CAEA is leading organization, NNSA/MEP deputy, 24 ministries involved. NNECC Office is in CAEA.
- organize and coordinate national level emergency
- approve provincial emergency plans
- guide and support provincial emergency activities
- emergency training and exercise
- contact with IAEA emergency center
Provincial Nuclear Emergency Plan

This Plan approved by NNECC

- provincial governor leads provincial NECC, related agencies involved.
- organize and coordinate provincial level emergency
- implement provincial emergency plans, including information, monitoring, assessment, traffic control and other protection actions, etc
- emergency training and exercise
Operating organization’s Nuclear Emergency Plan

This Plan reviewed and approved by NNSA. In the plan:

- Emergency organization is established and Plant Manager take full responsibility during emergency
- Emergency preparedness and response are described, and related procedures are established.
- To maintain emergency capability
- Emergency training and exercise
- In addition, Fast Emergency Assistant Team of nuclear industry can provide outside support.
NNSA & NEA jointly request CNNC and CGNPC to establish separately one FEAT.

FEAT is national level emergency support to operating NPP. It located in Qianshan NPP and Daya Bay NPP separately, with emergency equipment, 200 engineers, operators and maintenance workers from different NPPs, three-year rotation.

By the end of 2014, FEAT will possess practical abilities of emergency response assistance.

Five companies signed mutual assistant agreement on May 2014.
Signing agreement for mutual assistant
Radiological accident management

- according to law and regulations 3 levels emergency plans for radiological accidents
  - NNSA/MEP Radiological Emergency Plan
  - Provincial Radiological Emergency Plan
  - Facility Radiological Emergency Plan

- All plans are revised after safety examination, and emergency capacity are enhanced.
Radiological emergency management

- **NNSA/MEP Radiological Emergency Plan**
  - NNSA/MEP is leading organization, MOPS and MOH involved.
  - Organize and coordinate Level 1 radiological accident
  - Provide guide and support to provincial EPA when accident
  - Report to the State Council and information release to public
  - Emergency training and exercise
  - Accident investigation and enforcement based on grade regulation by NNSA/MEP or provincial EPA.

- **Digital emergency response network** has been established among NNSA/MEP, TSO and provincial EPA.
Provincial Radiological Emergency Plan

- This plan is approved by provincial government
- Provincial EPA is leading organization, police and provincial health department involved.
- Provincial EPA organize, command and action for Level 2-4 radiological accidents
- Report to the NNSA/MEP and information release to public
- Emergency training and exercise
- Radiological monitoring
Radiological emergency management

◆ Facility’s Radiological Emergency Plan

➢ This plan is graded approval during licensing by NNSA/MEP or provincial EPA.

➢ Emergency organization is established and Manager of the licensee take full responsibility during emergency.

➢ Emergency preparedness and response are described, and related procedures are established.

➢ To maintain emergency capability

➢ Emergency training and exercise
4 Environmental Radiological Monitoring System
National Environmental Radiological Monitoring System (NERMS)

- NERMS is established by NNSA/MEP
- RMTC provides technical support
- Monitoring data from provincial EPAs and licensees
  - Environmental quality monitoring: 831 monitoring points, among them 157 auto monitoring equipment
  - Source monitoring:
    - Gas & liquid effluent
    - Auto monitoring around 18 nuclear sites
- Mobile emergency monitoring team: RMTC, NSC and provincial EPA
NPP Monitoring Point (source monitoring)

Auto-monitoring for environment quality
Some 20 vehicles/labs in-service in some important region, equipped with large-sized NaI survey spectrometry, HPIC, aerosol sampler, meteorological instrument, GPS, high purity Ge spectrometry, alpha spectrometry and other portable sampling & measurement instruments.
5 Enhance emergency capability
5 Enhance emergency capability

• After Fukushima accident, NNSA/MEP conduct a Comprehensive Safety Examination on nuclear installations and radioactive sources. Weakness have been identified, some related to emergency capability.

• Nuclear Safety Plan is approved by State Council. One of the task of the plan is to enhance emergency capability.
Activities to enhance emergency capability:

- Improving emergency plans in different levels
- Responding to external disasters and ensure water and electricity supply during accident
- Real time data collection and assessment ability
- Improving emergency management center
- Improving SAMG and keep an on-site engineering maintenance team
- Off-site assistant team, FEAT
- Emergency radiological monitoring by licensees and environmental agencies
◆ NNSA and its TSO in Nuclear Emergency

- Revising emergency plan
- Enhancing communication and real-time data collection: safety parameters, meteorological data, radiological monitoring data
- Enhancing accidents analysis, consequence evaluation and assessment
- Improving NNSA/MEP Emergency Decision Support System
- Conducting inspection & enforcement for licensee’ response activities
- Implementing emergency trainings, drills and exercises
NNSA/MEP activities in emergency

Emergency Exercises on Radiological Accident in 2012
NNSA/MEP activities in emergency

- Emergency training
• Chinese emergency system for nuclear and radiation accidents has been well established, and lots of improvements have been made after Fukushima accident.

• TSOs have provided and will provide fully technical support to regulator.

• Further enhance TSO technical capacity.
Thank You!

Questions & Comments?