

Overview of Nuclear Safety Oversight Programs in Taiwan

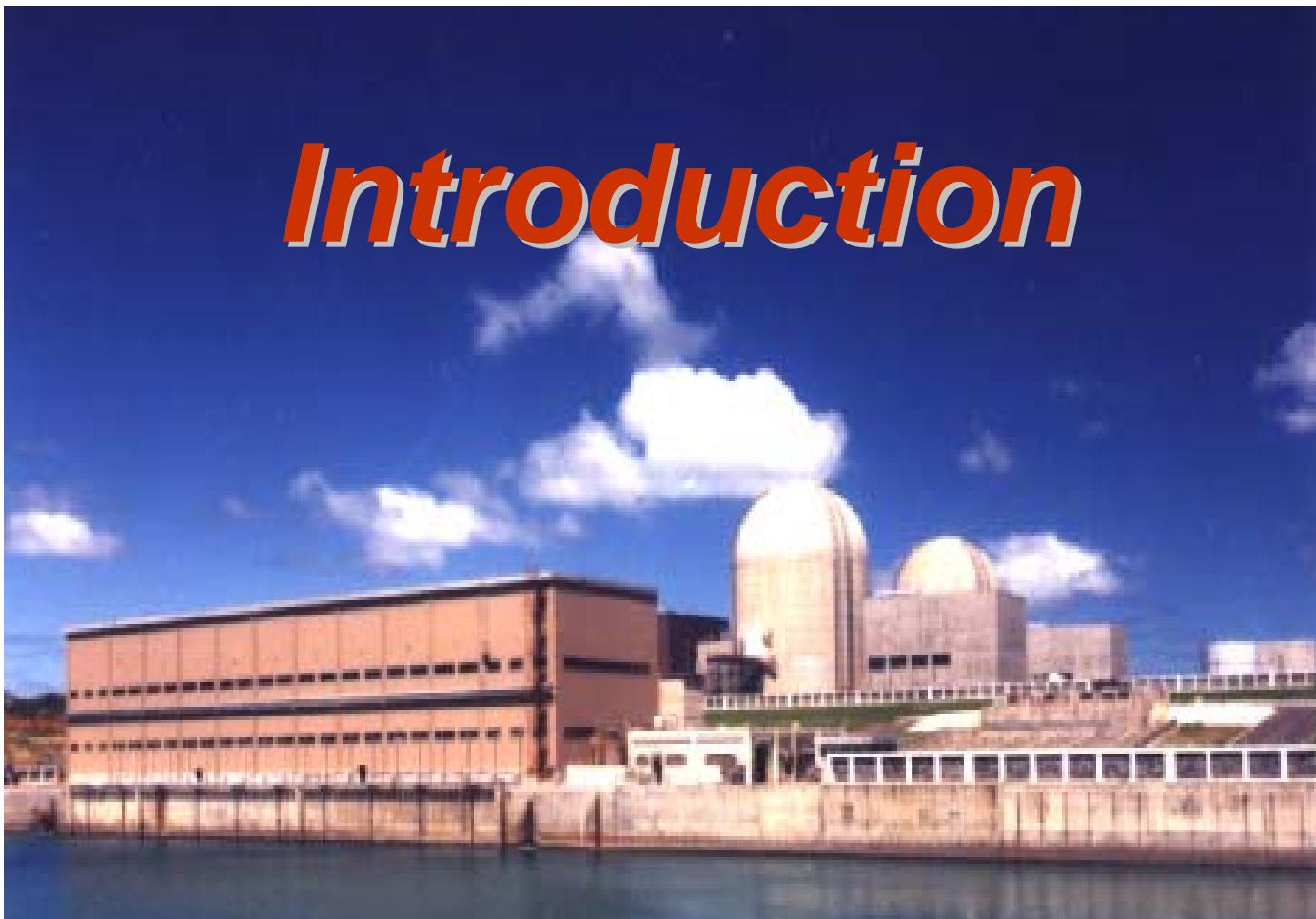
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Department of Nuclear Regulation
Atomic Energy Council, Taiwan

January 29, 2013

Outline

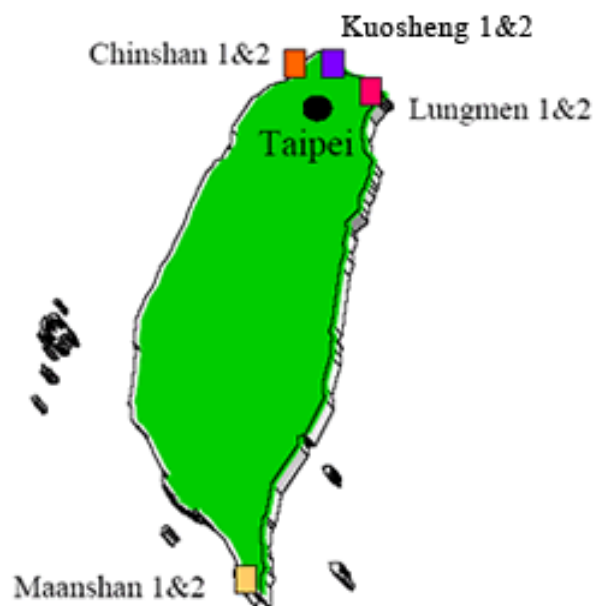
- ❖ **Introduction**
- ❖ **Nuclear Reactor Safety**
- ❖ **Security and Emergency Preparedness**
- ❖ **Radiation Protection & Environmental Monitoring**
- ❖ **Radioactive Waste Management**
- ❖ **Government Reform**

Introduction



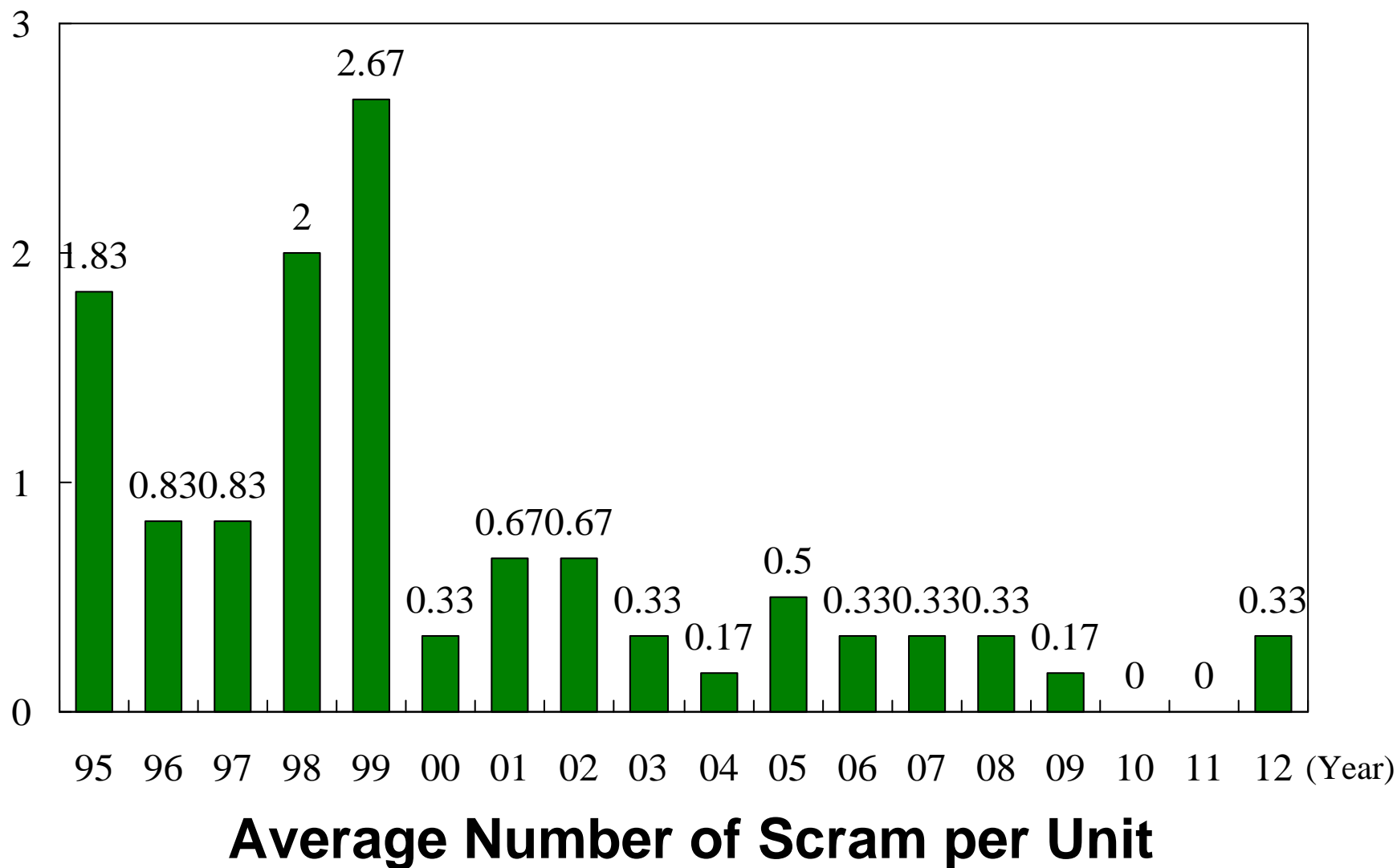
Nuclear Power Plants in Taiwan

Total nuclear
generation in 2012 :
38.9 TWh



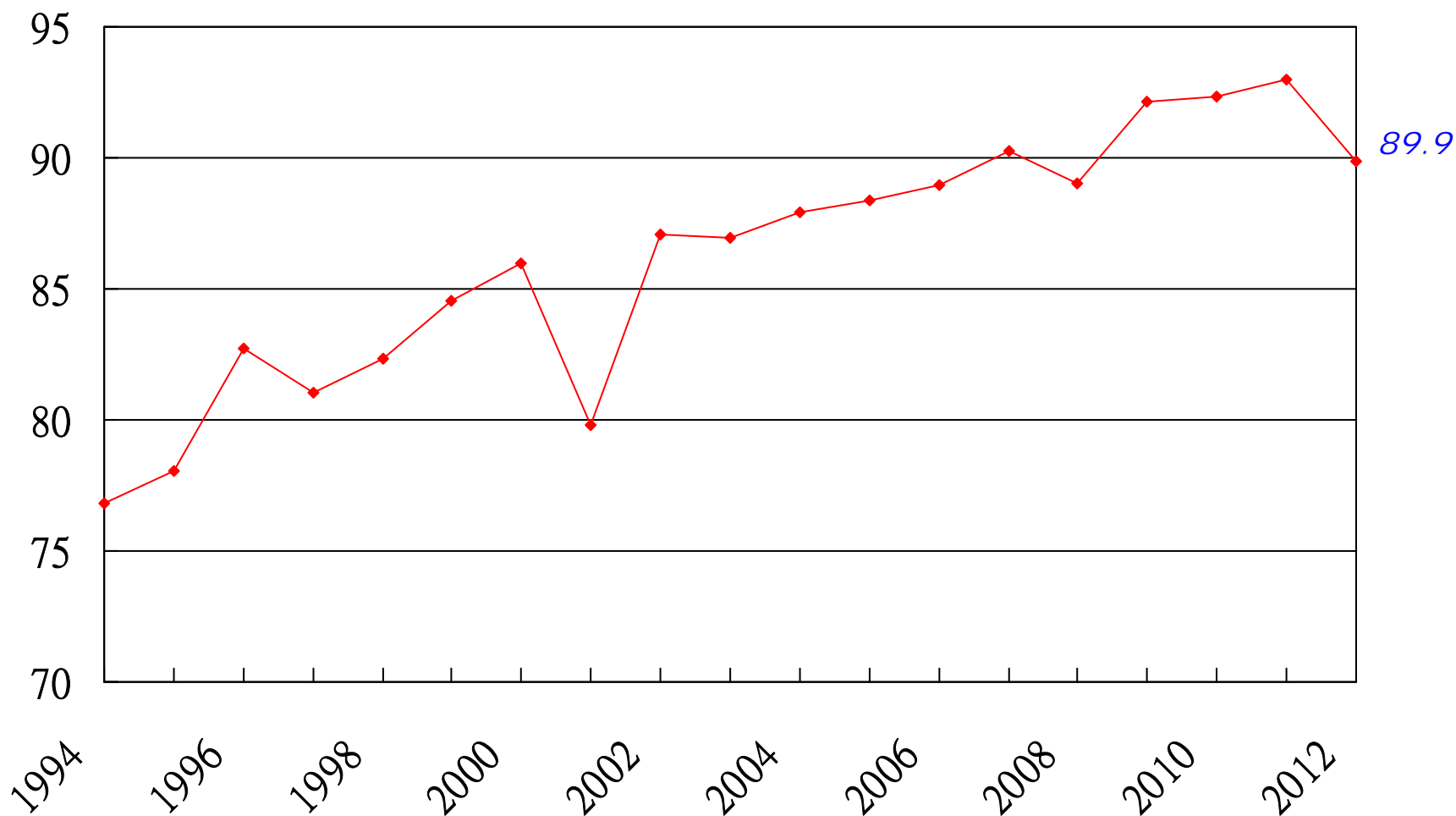
Plant	Capacity/Type	Operating License
Chinshan	636 MWe/unit GE BWR4 X 2	Unit 1:1978.12.06 Unit 2:1979.07.16
Kuosheng	985 MWe/unit GE BWR6 X2	Unit 1:1981.12.28 Unit 2:1983.03.15
Maanshan	951 MWe/unit WH PWR X2	Unit 1:1984.07.27 Unit 2:1985.05.18
Lungmen	1350 MWe/unit GE ABWR X2	Under Construction

Performance Records of Operating NPPs





Capacity Factor of NPPs in Taiwan

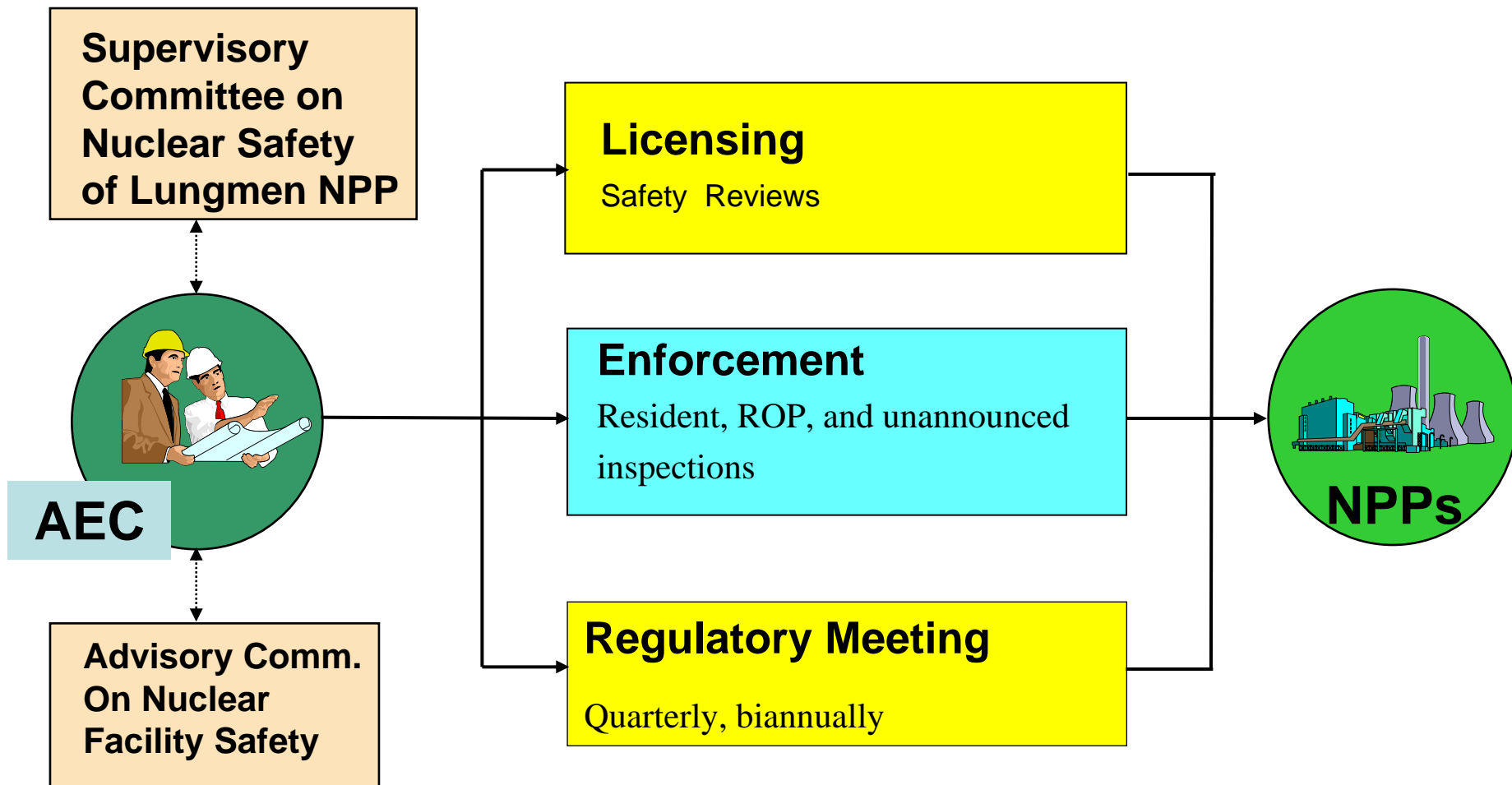


Nuclear Reactor Safety





Regulatory Oversight of NPPs





Recent Regulatory Activities

- ❖ Review of Chinshan's Stretch Power Uprate (SPU) Application
- ❖ Safety Re-evaluation and Enhancement Plan for Seismic Resistance
- ❖ Groundwater and Buried Pipe Monitoring
- ❖ Risk-Informed Application Review
- ❖ BWR ECCS Suction Strainer Inspection
- ❖ Domestic Fire Protection Standards for NPPs
- ❖ Lungmen ABWR Construction & Initial Test Program Inspection



Important Upcoming Activities

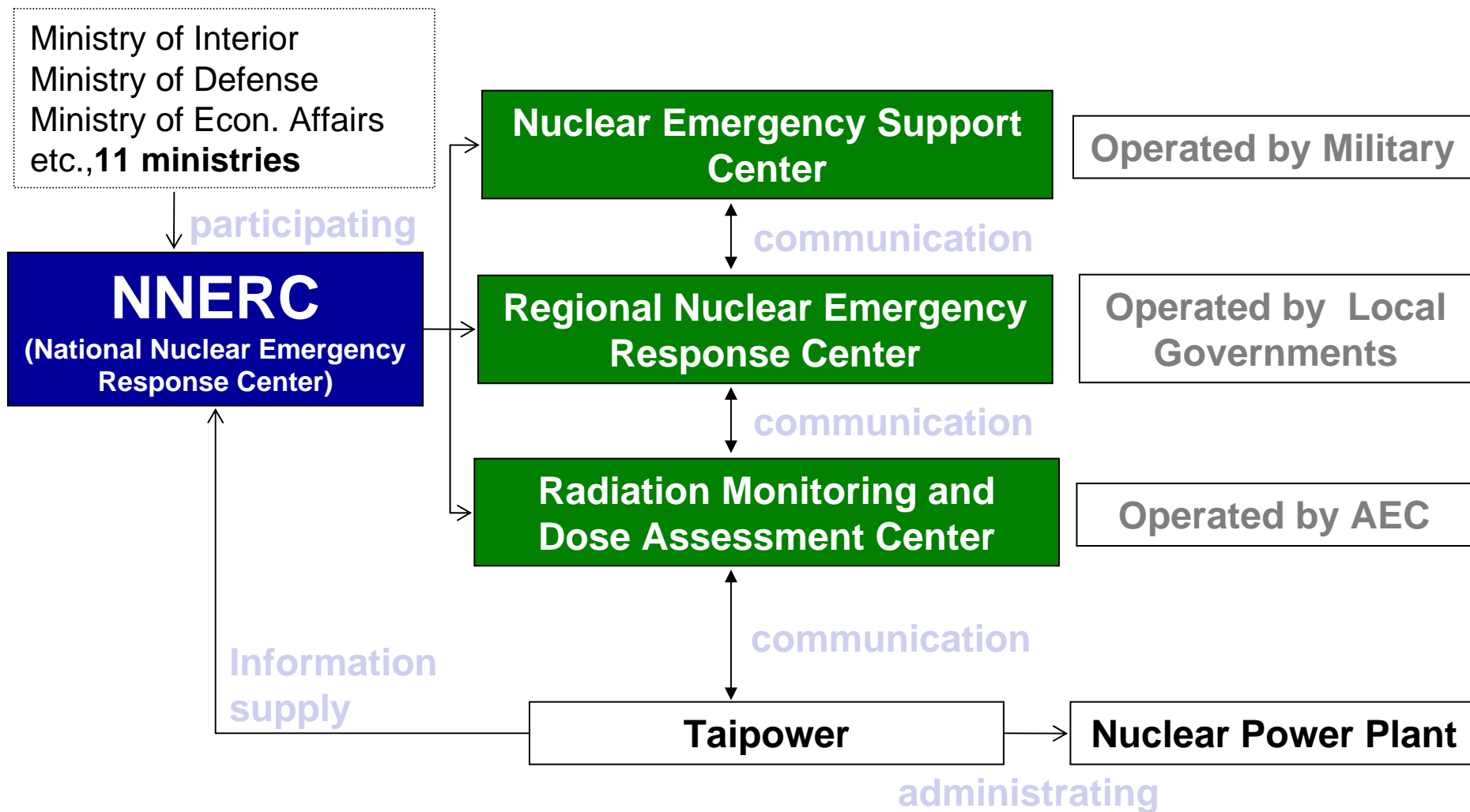
- ❖ Safety Review of Maanshan Containment Sump
- ❖ Continue FSAR review and conduct taskforce inspections related to pre-operational test and operational readiness before fuel loading for Lungmen ABWR plant
- ❖ Safety Review of Taipower countermeasures to Fukushima Daiichi accident for both operating NPPs and Lungmen plant

Nuclear Security and Emergency Preparedness





Nuclear Emergency Response System



Emergency Preparedness

On-Line Monitoring and Emergency Exercise



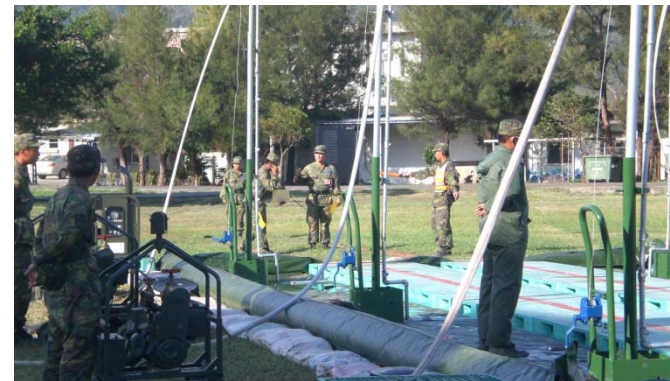
Nuclear Safety Duty Center



Table-top exercise in NNERC



Medical Aid



Decontamination

Nuclear Security

Dirty Bombs Drill and Anti-terrorism Drill



Personnel Detecting



Terrorist intrusion



Decontamination



Terrorist arresting

Radiation Protection & Environmental Monitoring



Oversight of Radiation Sources

- ❖ As of January 2013:
 - 28,893 registrations/permits issued for equipment and materials
 - 9,476 certificates issued to radiation officers and operators
- ❖ Computerized Customs Approval and Registration System established to verify and monitor the status of all sources.
- ❖ Online monthly reporting system established to effectively track radioactive materials.
- ❖ Annual special inspection on Class I & II sources for safety and security.
- ❖ Training seminars to enhance radiation safety culture.

Safety and Security Protection of High-Risk Sources



**Locked container
holding the source**



**Access control
(Entrance of
the Storage room)**



**CCTV
surveillance and
intrusion alarm**



**Area
monitor**

QA Program for Radiotherapy, Mammography & CT

- ❖ Medical exposure QA program started since 2003.
- ❖ Radiotherapy (6 equipment) effective in July 2005.
- ❖ Mammography
 - Implementation effective in July 1, 2008
 - 251 units
- ❖ Computed tomography (CT)
 - National diagnostic dose survey started in Jan. 2009
 - Implementation of QA program beginning in July 2011
 - 454 units





Detection of Abnormal Radioactive Materials

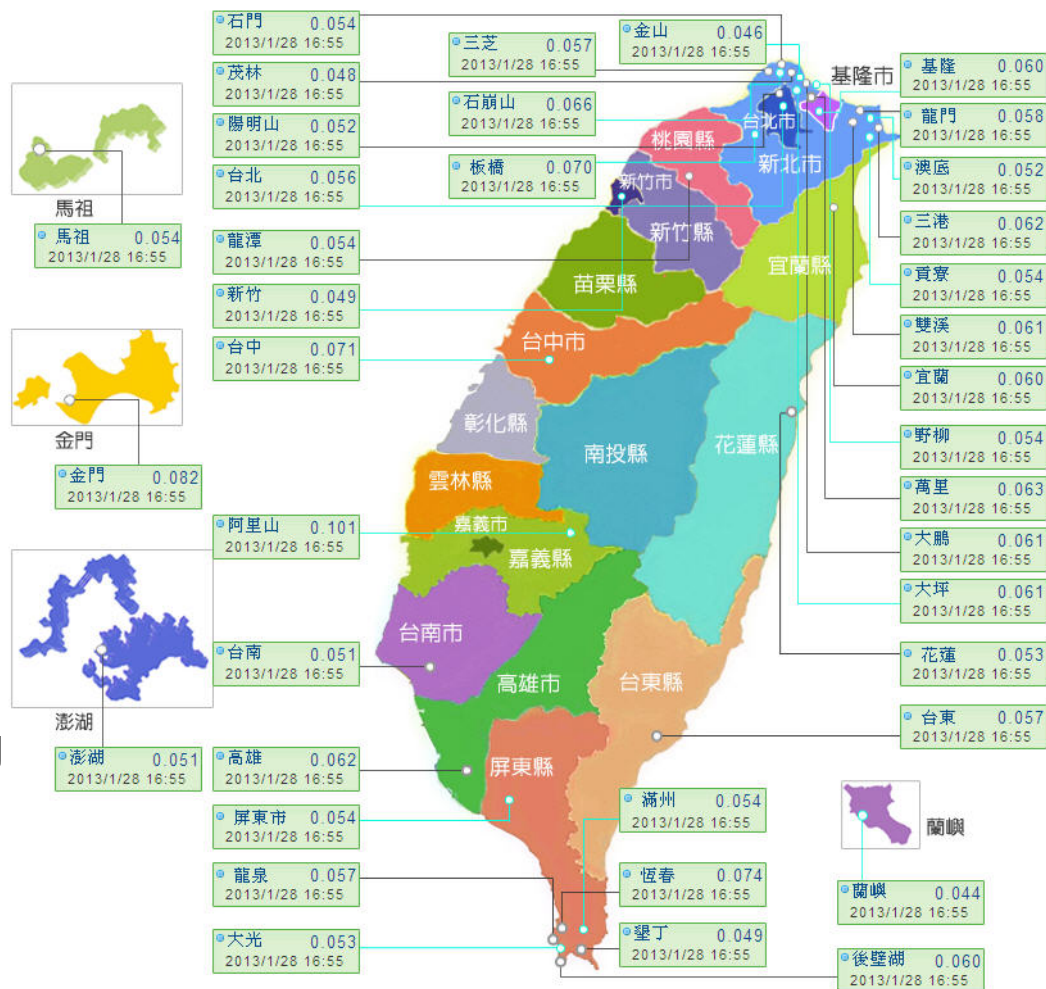
- ❖ Iron and steel makers who own smelting furnace(s) are required to install portal type radiation detector(s) since 1995.
- ❖ Up to end of December 2012, there have been 741 cases of abnormal radioactive materials (including 53 orphan sources) have been detected from metal scrap at steel mills.





Environmental Monitoring

- 38 fixed gamma monitoring stations
- Real-time data updated every minute
- Color coding:
 - ◆ $< 0.2 \mu\text{Sv.h}^{-1}$
Background
 - ◆ $0.2\text{--}20 \mu\text{Sv.h}^{-1}$
verif./intens.monitoring
 - ◆ $> 20 \mu\text{Sv.h}^{-1}$
Immed. investigation



Radioactive Waste Management

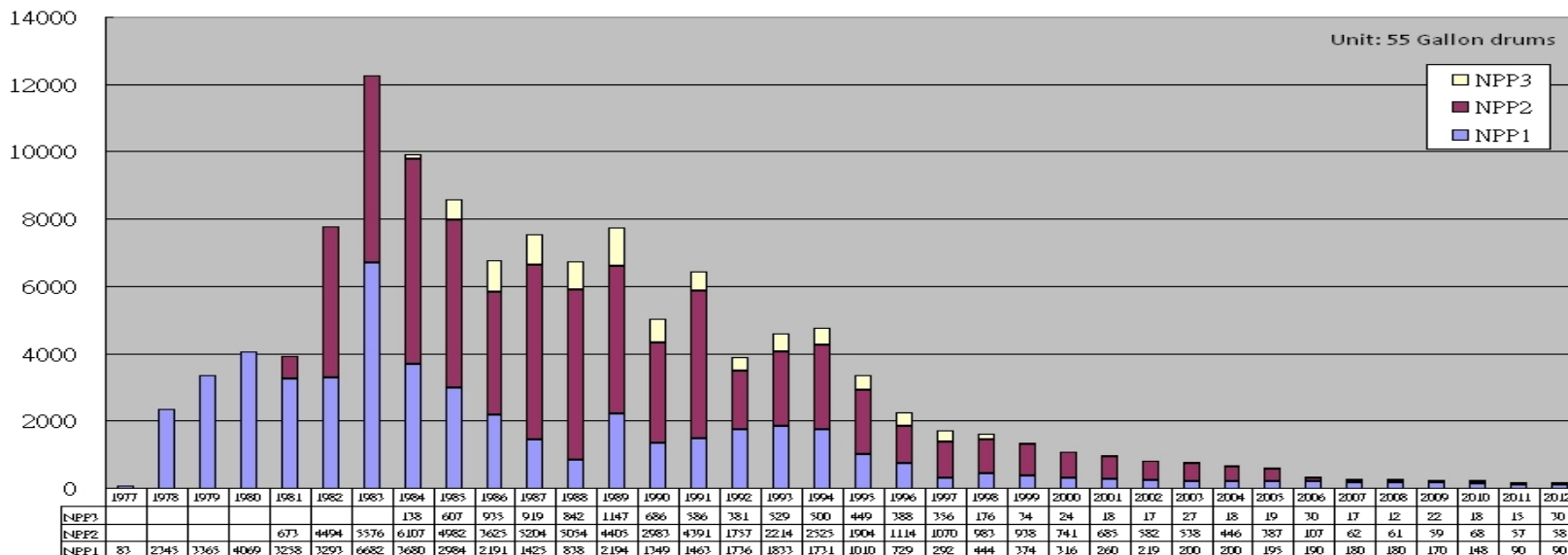




LLW Treatment

❖ Radwaste Reduction

- The volume of solidified LLW has been reduced to the minimum practicable.
 - ◆ The maximum volume was 12,258 drums by 2 BWR NPP in 1983
 - ◆ 3 NPPs generated only 178 drums in 2012



LLW Storage and Disposal

❖ Interim Storage

- Lanyu Storage Facility

❖ On-site Storage

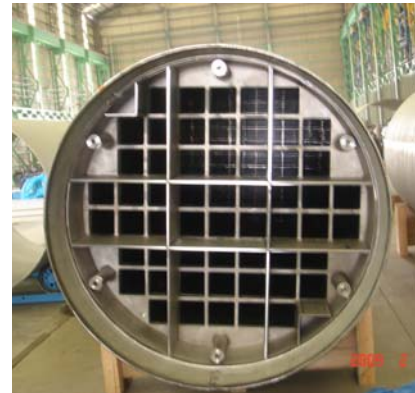
- modern air-conditioned, automated and well shielded storage facilities at each NPP

❖ Final Disposal

- The 2006 “siting” law: voluntary/proposed site, local referendum, incentive package
- 2011-3-29: MOEA announced two candidate sites
- Difficulties in implementation
- Amendments to the law being drafted

Spent Fuel Management

- ❖ Dry Storage -- Chinshan Project
 - Construction commenced in Oct. 2010
 - TPC to test run Oct. 2012
 - TPC to apply for OL in Jan. 2014
- ❖ Final Repository
 - Reprocessing
 - Direct disposal
 - Regional/International Cooperation



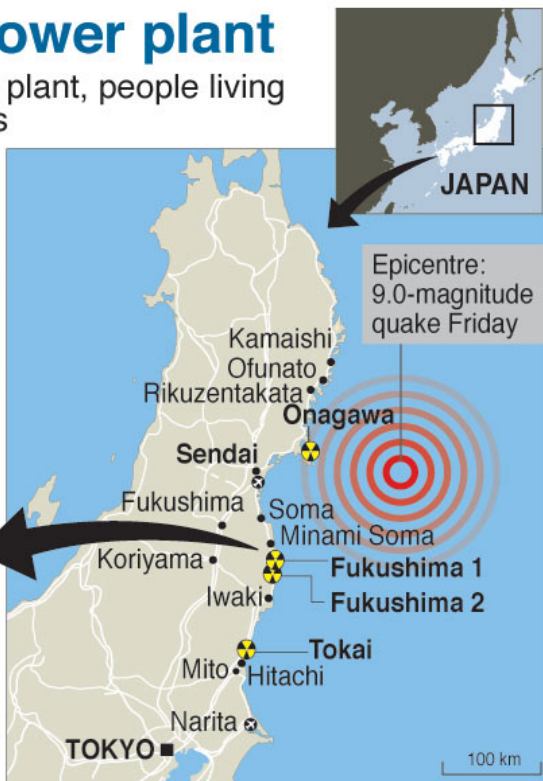
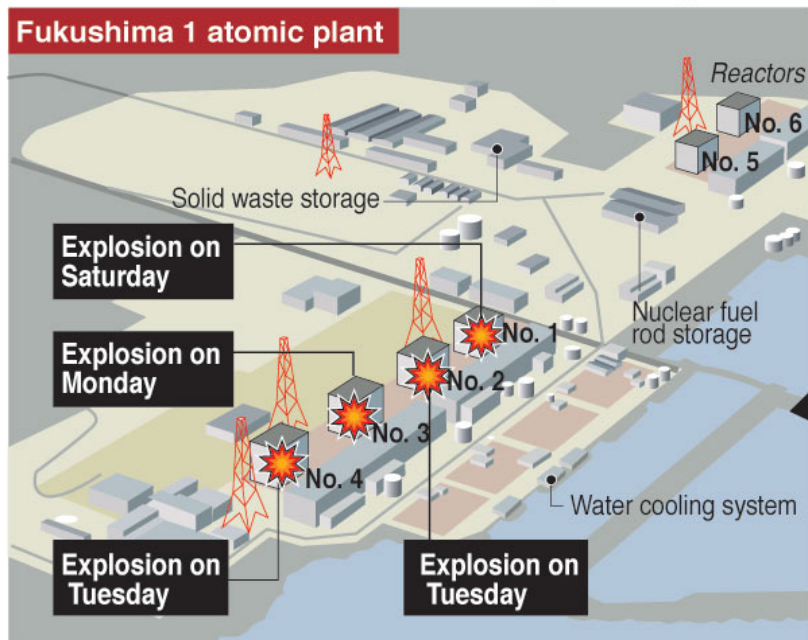


Government Reform

Crisis at Fukushima nuclear power plant

Tens of thousands evacuated from 20km radius of the plant, people living within a further 10km of the zone urged to stay indoors

Fukushima 1 atomic plant



Government Reform (1/2)

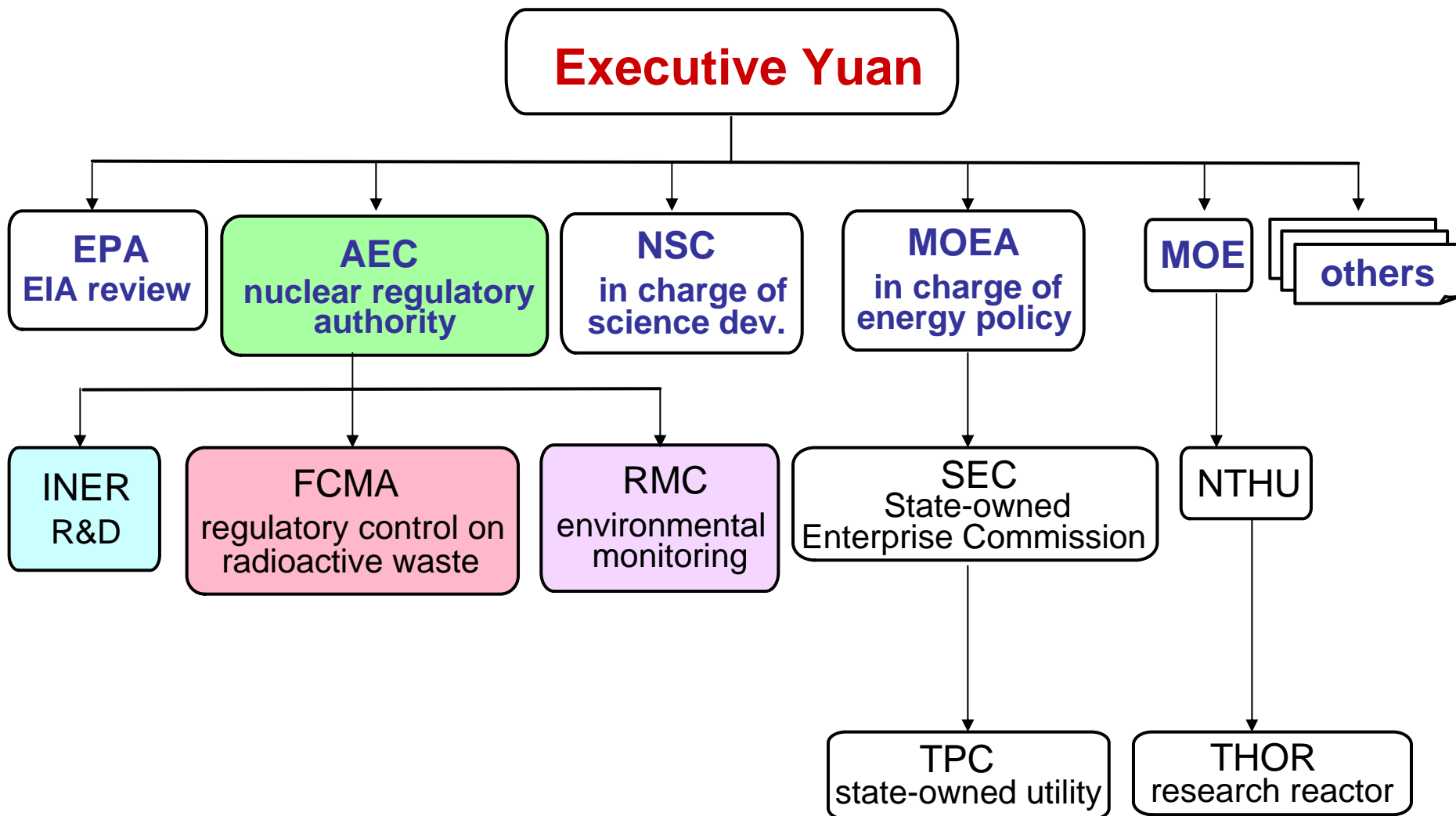
- ❖ “Amendments to the Law Governing Organization of the Executive Yuan” passed in January 2010:
 - 37 2nd-tier ministries → 29 2nd-tier ministries
 - National Science Council + Atomic Energy Council
→ Ministry of Science and Technology (MOST)
 - Ministry of Economic Affairs → Ministry of Economic and Energy Affairs
- **The Executive Yuan further confirmed in mid 2010:**
 - Functions and resources of **AEC** HQs, FCMA, RMC and part of INER (supporting nuclear safety regulation) will be **under MOST**
 - All functions and resources of **INER** except those supporting nuclear safety regulation will be **under MOEEA**
- **Reform started from January 2012**

Government Reform (2/2)

- The Executive Yuan modified the nuclear regulatory body in late 2012:
 - Functions and resources of **AEC** HQs, FCMA, RMC and part of INER (supporting nuclear safety regulation) will be a 3rd-tier independent **Nuclear Safety Commission**
 - All functions and resources of **INER** except those supporting nuclear safety regulation will still be **under MOEEA**
 - No permanent 3rd-tier organization directly under Executive Yuan existed before

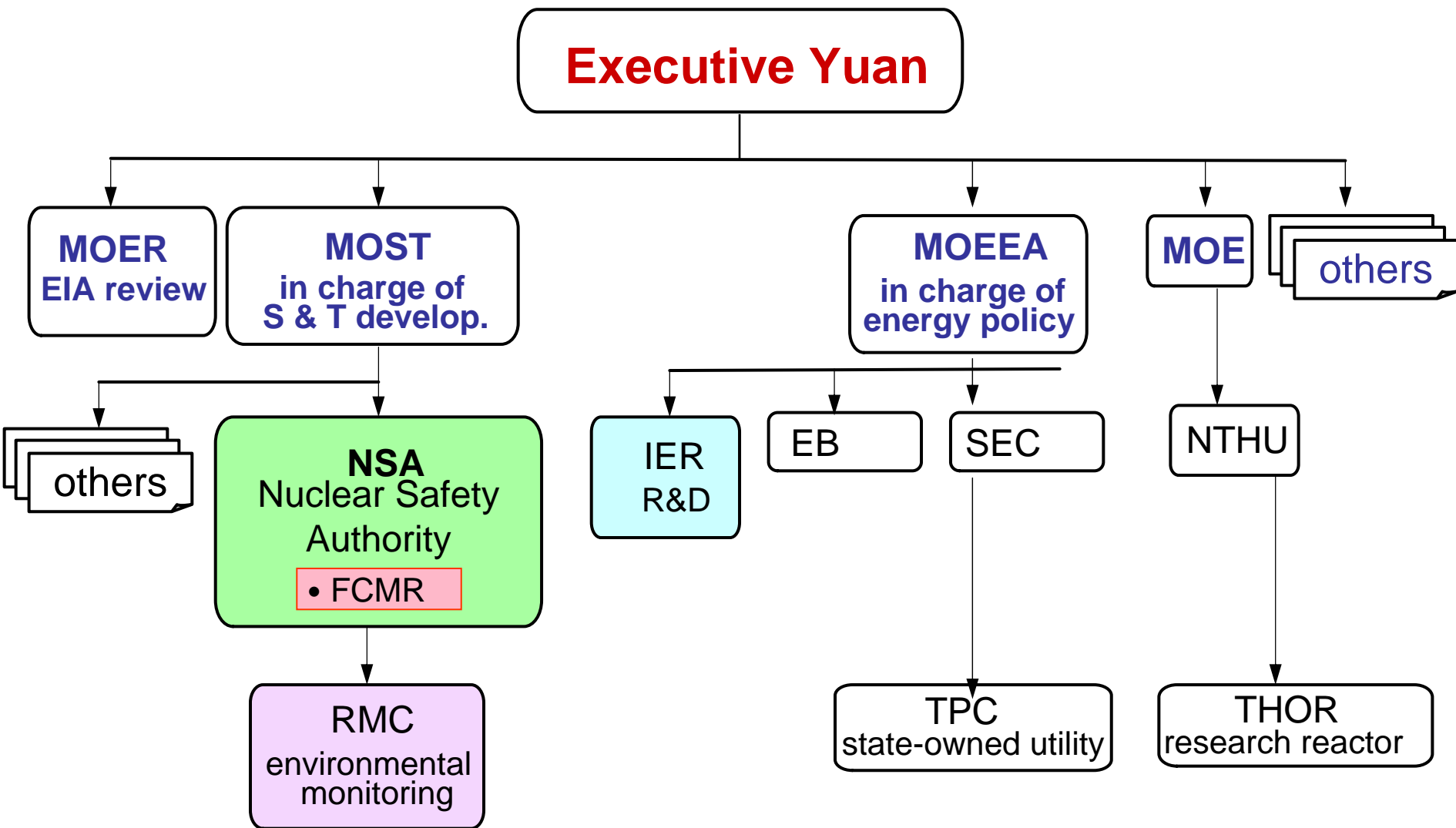


Old Government Organizations



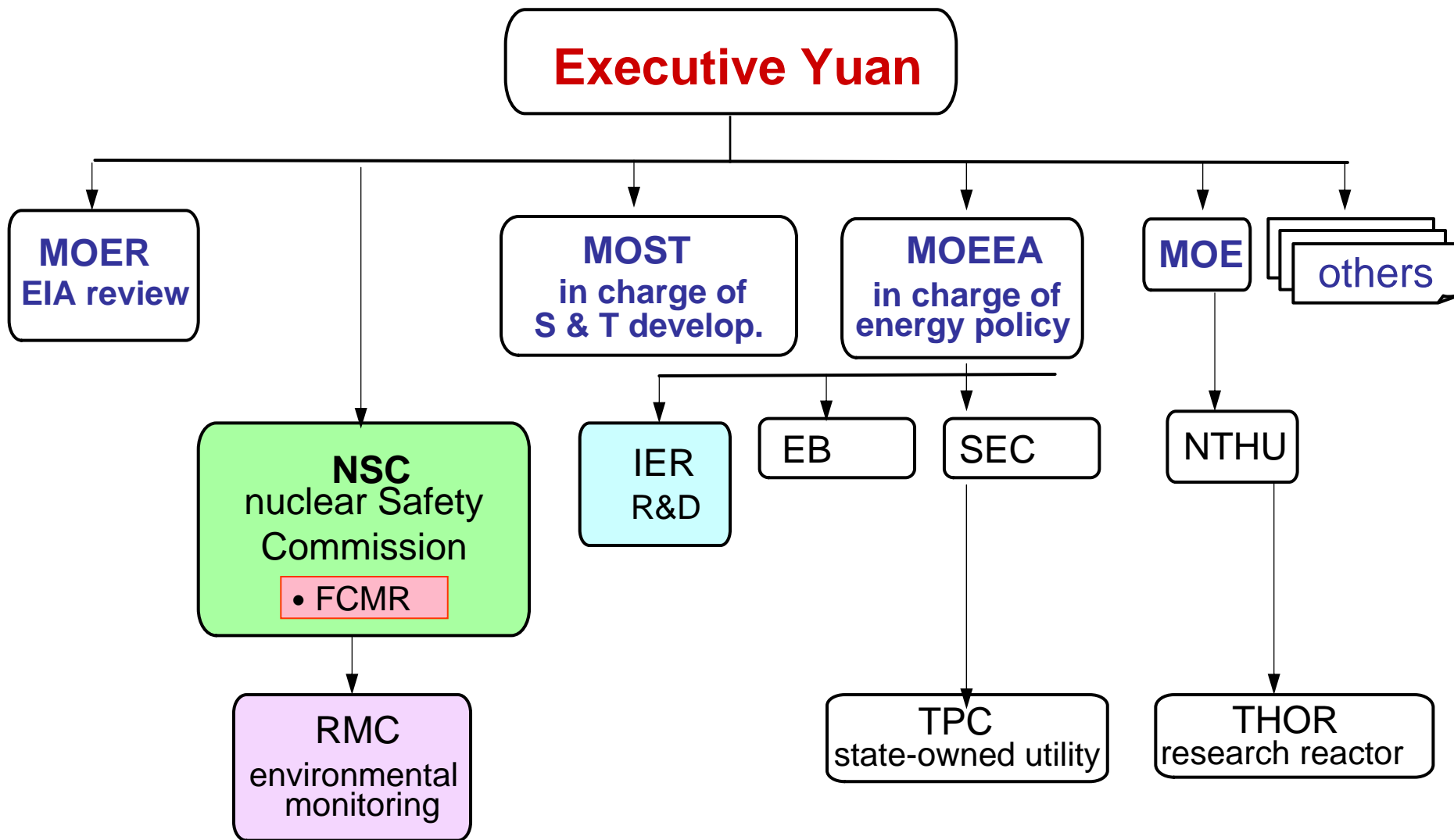


Proposed Government Organizations





New Government Organizations (2013)





New Nuclear Safety Commission

