NRA
Nuclear Regulation Authority

Nuclear Safety
Human and Organizational Factors
Lessons from Fukushima

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Experts Meeting
IAEA
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What happened at Fukushima?

- Earthquake and Tsunami (Beyond Design external events)
- SBO, (small-scale LOCA)
- Cooling failure
- Reactor core damage / Containment failure
- Fuel meltdown
- Hydrogen explosions at reactor buildings
- Large release of radioactive materials
- The worst “complex disaster”

What went wrong?

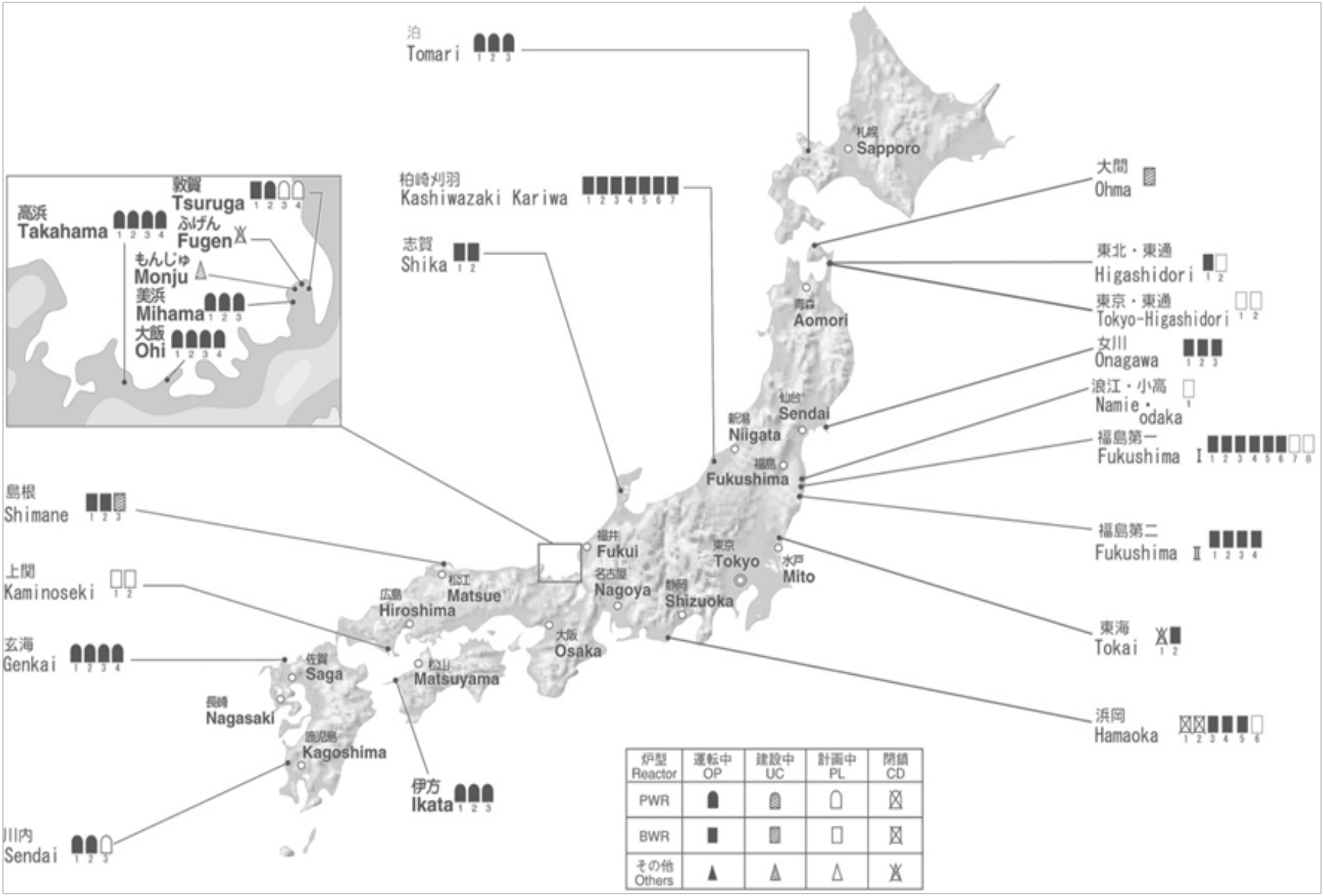
Manmade disaster

- Human error
- Inaction, willful negligence
- Failure in safety-first

  Flawed safety culture (the “myth of 100% nuclear safety”)

Emergency response

- TEPCO
- Command center
- Regulatory bodies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川内
Sendai 1 2 3
炉型 Reactor
運転中 OP
建設中 UC
計画中 PL
閉鎖 CD
PWR
BWR
その他 Others

Was the accident preventable?

Yes, if…

- **"Safety first" policy had been strictly enforced; risks had been squarely faced;**
- **Severe accident measures (defense-in-depth) were in place (esp. natural hazards);**
- **International safety standards and good practices had been followed;**
- **Delays in reinforcements had been avoided…..**

Could have been worse?

Some good luck

- Survival of power lines
  - Fukushima NPP 2
  - Onagawa
  - Tokai NPP
- Emergency operation center

- Spent fuel pool at Unit 4

Organizational／Human factors

- Lack of regulatory independence

- Cozy, collusive relationship
  ("regulatory capture")

- Weak SA response measures
  (in particular against tsunami)

- Inward-looking attitude

(Conti‘d)

Governance problems

- Responsibility gap in crisis management
- Fragmented bureaucratic handling
- Risk communications

Human factors

- Expertise
- Manuals
- Drills/training

Specific Recommendations
(Kurokawa Report)

1 Set up a permanent parliamentary body dedicated to nuclear issues, including for oversight of new regulatory bodies;

2 Review the nation's crisis management system to clarify the role and responsibility of government, local authorities, operators;

3 Urgent government measures needed for the health of the affected population, radiation monitoring, rehabilitation of communities, decontamination, etc.;

4 Governance reform at TEPCO; transparency in relations between regulators and utilities; mutual oversight system among power companies;

5 Requirements for new regulatory bodies;

6 Drastic reform of nuclear-related legislation;

7 Set up independent investigation commissions comprising outside experts to continue work on unresolved or unaddressed issues.

Nuclear Regulation Authority (NRA)
(Established September 2012)

Independence

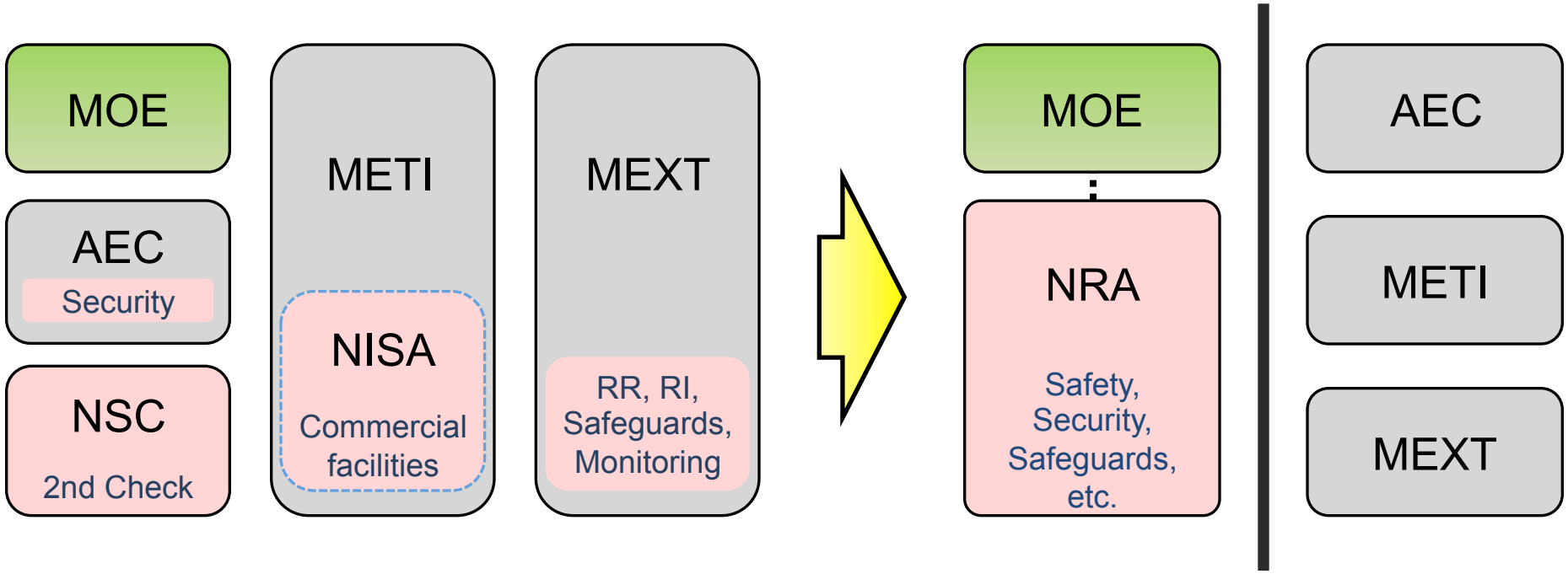
- Clear separation of Regulation from Promotion
- An independent Commission (under the Ministry of the Environment)

Integration

- All nuclear regulatory functions integrated:
  - "3 S" (safety, security, safeguards);
  - Radiation monitoring; RI

Transparency

Integrated and Independent



AEC : Atomic Energy Commission
METI : Ministry of Economy, Trade and Industry
MEXT : Ministry of Education, Culture, Sports, Science and Technology
MOE : Ministry of the Environment
NISA : Nuclear and Industrial Safety Agency (abolished)
NSC : Nuclear Safety Commission (abolished)

NRA's Core Values and Principles (Mission statement)

- Learn and absorb lessons from Fukushima and never allow such accidents again;
- Restore public trust is of utmost importance;
- Foster a genuine safety culture; Highest priority on public safety;
- Independent decision-making based on scientific and technological information, free from any outside pressure or bias;
- Achieve genuinely effective regulations rather than formalities;
- Open and transparent organization: avoid self-isolation, self-righteousness;
- High ethical standards, sense of mission, rightful pride;
- Swift and effective response readiness to all emergencies.

NRA: Current and future activities

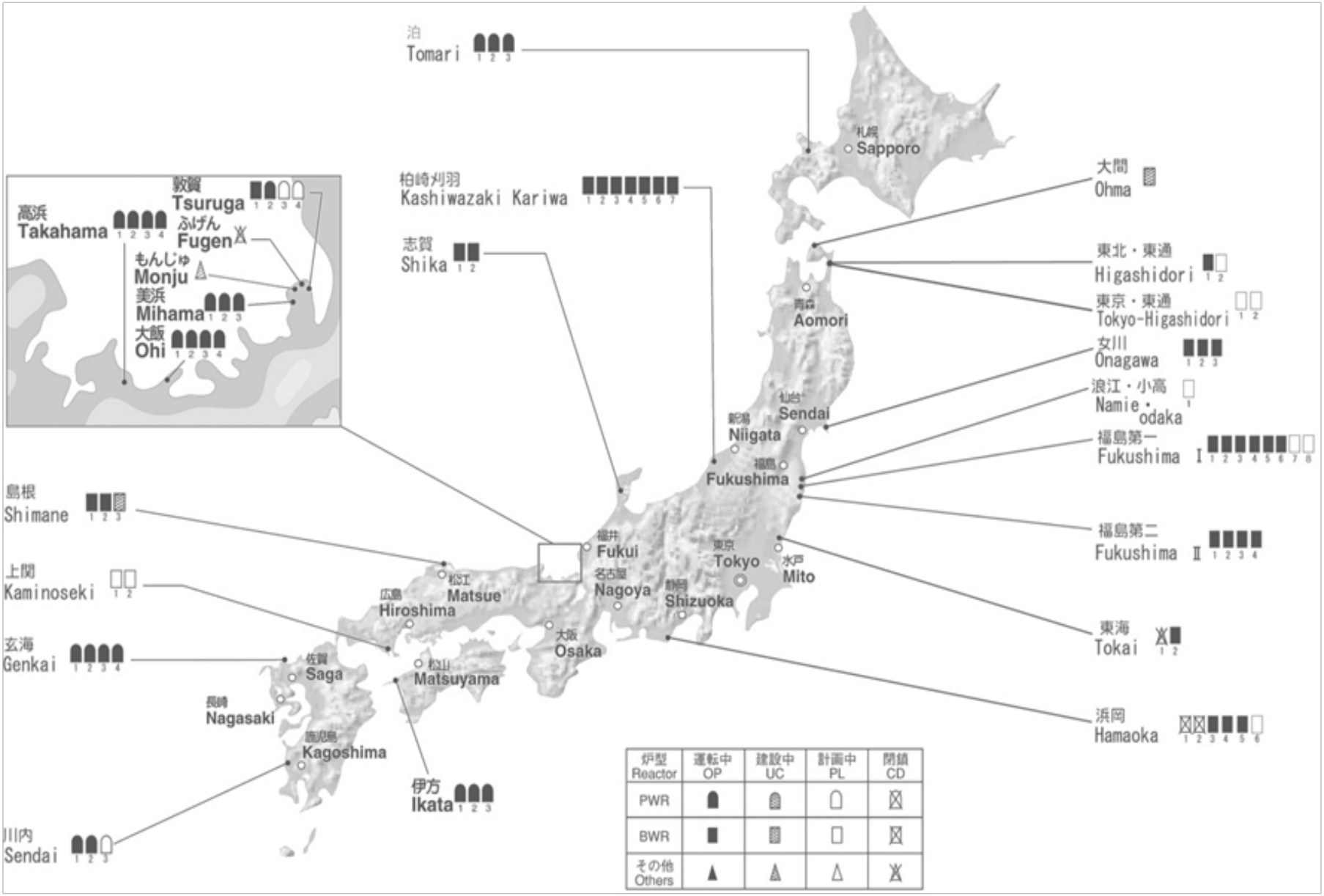
- TEPCO Fukushima Daiichi NPP

- Designing new regulatory requirements

- Fracture zones surveys

- Preparedness and evacuation guidelines

- Safety assessment regarding shutdown reactors (50)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Policy on New Safety Regulations

1. **Amendments to the Nuclear Regulation Act (promulgated in June 2012)**

- **Mandatory severe accidents measures;**
- **Mandatory back-fitting;**
- **40-year operational limit for NPPs (with possibility of up to 20-year extension)**

Policy on New Safety Requiements (conti'd)

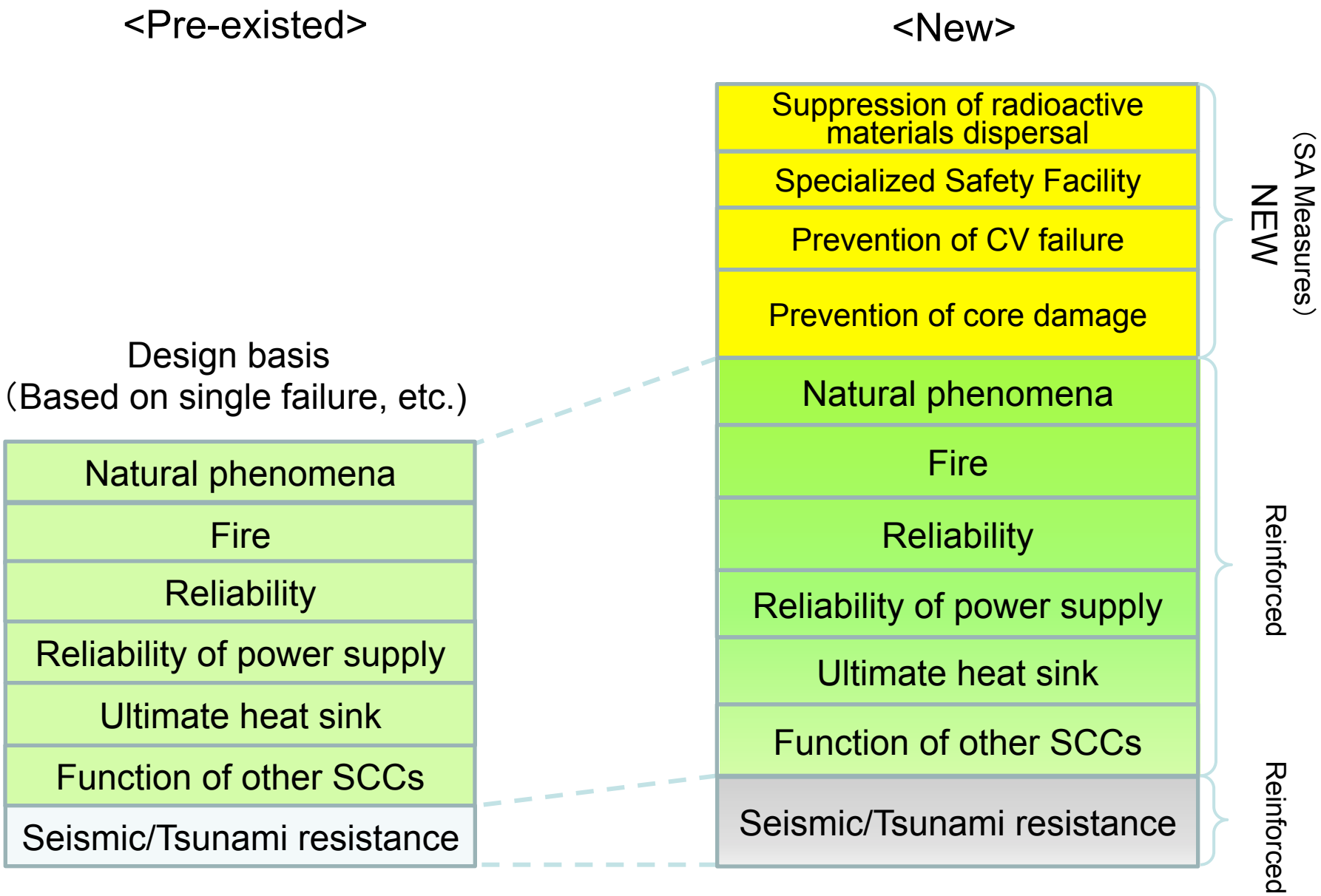
2. Strengthening Design Basis

- Enhanced measures against extreme natural hazards
- Stringent criteria for active faults
- Fire protection, tsunami inundation, etc.

3. Severe accident measures

- Defense-in-Depth
- Robust measures for preventing core damage, containment failure…
  - e.g. Filtered venting system (BWR)
- Preventing hydrogen explosion
- Measures against terrorism, unintentional plane crash
- Specialized safety facility

Structure of proposed requirements



International Dimension

-IAEA:

Inviting IRRS, IPPAS as soon as ready

- Bilateral cooperation:

US, France, UK, Russia, Canada, Ukraine, Belarus and others

-Regional trilateral cooperation:

Japan, Korea, China

- International organizations

Thank you for your attention！