

WM Symposia 2017  
013 Panel Global Support for  
Fukushima D&D and Cleanup Efforts

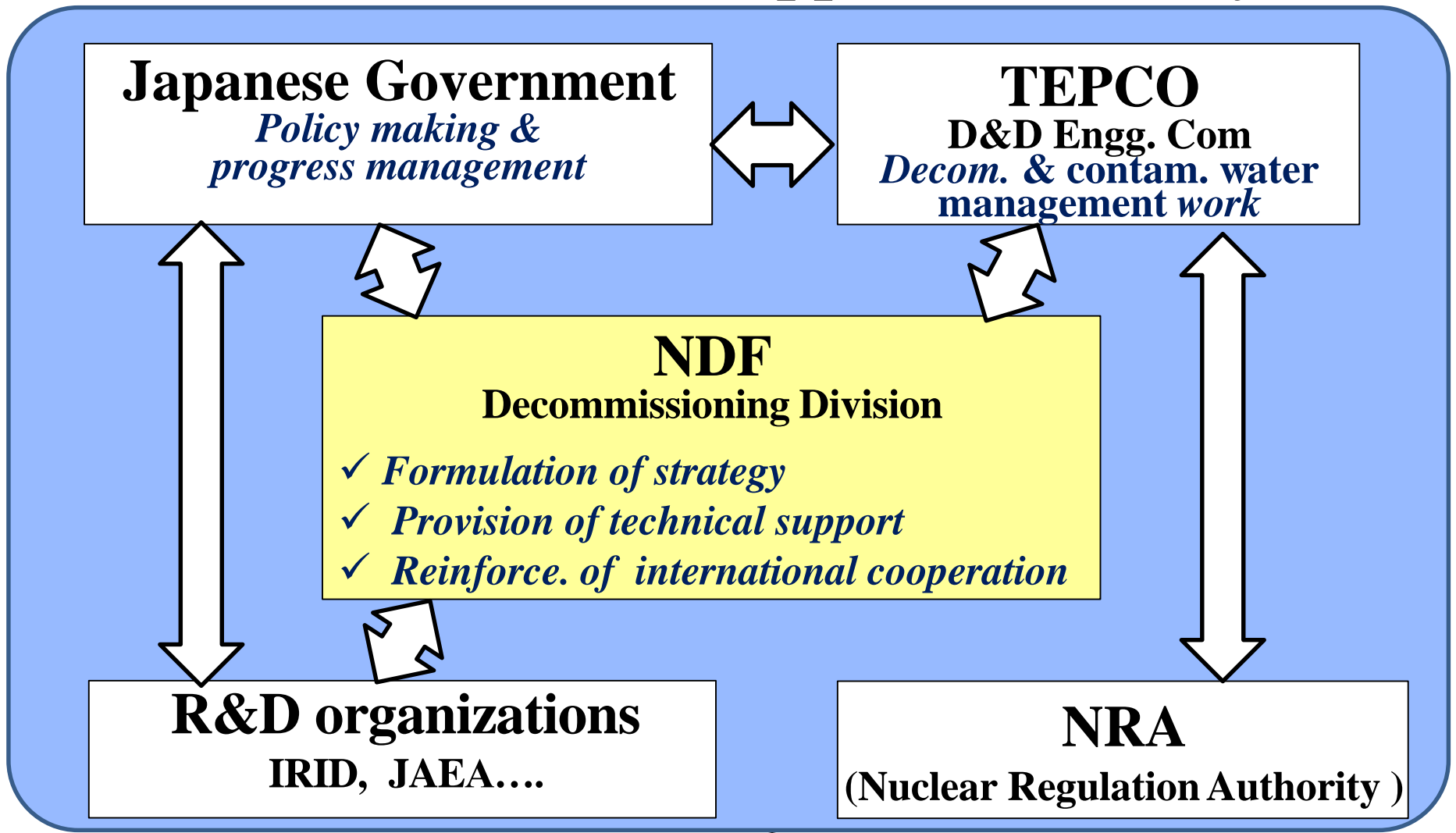
# Japan's Challenges for Fukushima Daiichi D&D

March 6, 2017

**Shigeo NOMURA**  
Executive Director

**Nuclear Damage Compensation &  
Decommissioning Facilitation Corporation (NDF)**

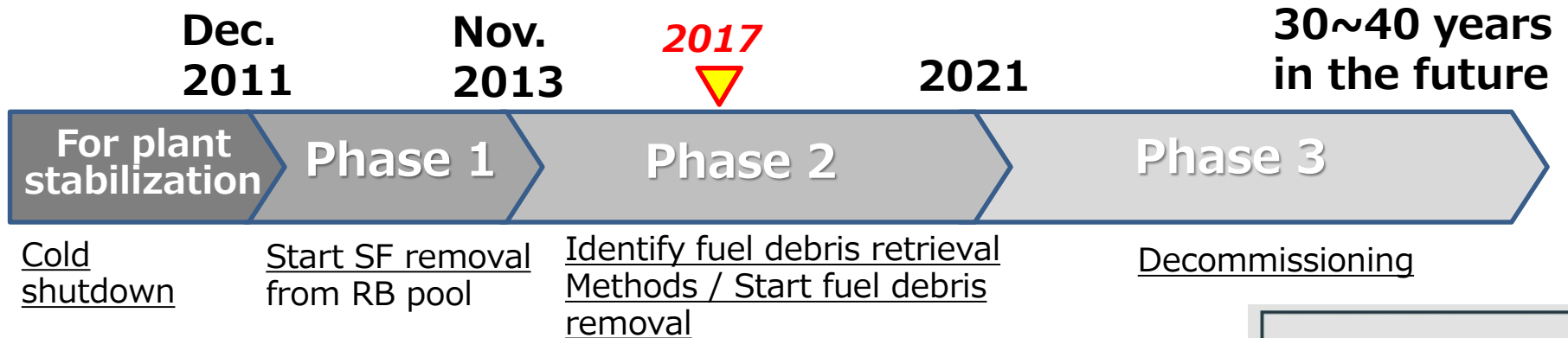
# Fukushima D&D Supported Globally



*USA/DOE/NRC, UK/NDA/ONR, France/CEA, Spain/ENRESA, Russia/Ukraine  
IAEA, OECD/NEA, Private Companies .....*

# Concept of Strategic Plan

## Government Roadmap 2015



## NDF's Technical Strategic Plan

Risk reduction for mid & long-term decommissioning

- ✓ 'Fuel debris retrieval policies for each unit' in 2017
- ✓ 'Basic concept of processing & disposal for solid waste' in 2017
- ✓ 'Technology & safety prospects of waste processing & disposal' around 2021.



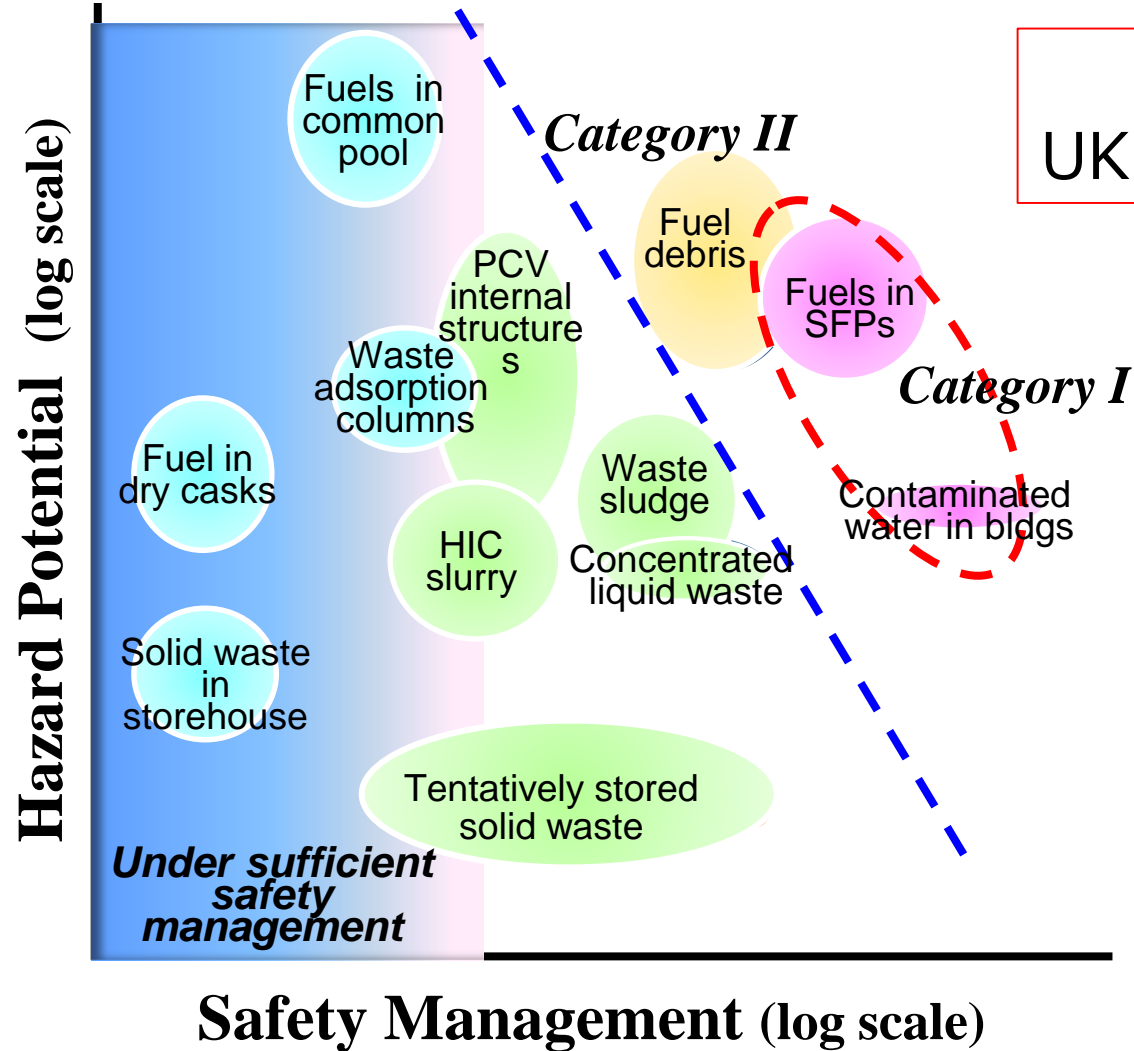
Published every year  
(in Japanese/English)

- ① **Time dependent risk management for mid & long-term D&D.**
- ② **Investigation and retrieval of debris scattered in RPV & PCV by remote system under high dose radiation exposure.**
- ③ **Characterization & pre-disposal management for 1F waste.**
- ④ **Sustainable D&D of multi damaged reactors.**

# Identify, Quantify and Prioritize all Risks for 1F D&D

## NDF Strategic Plan 2016

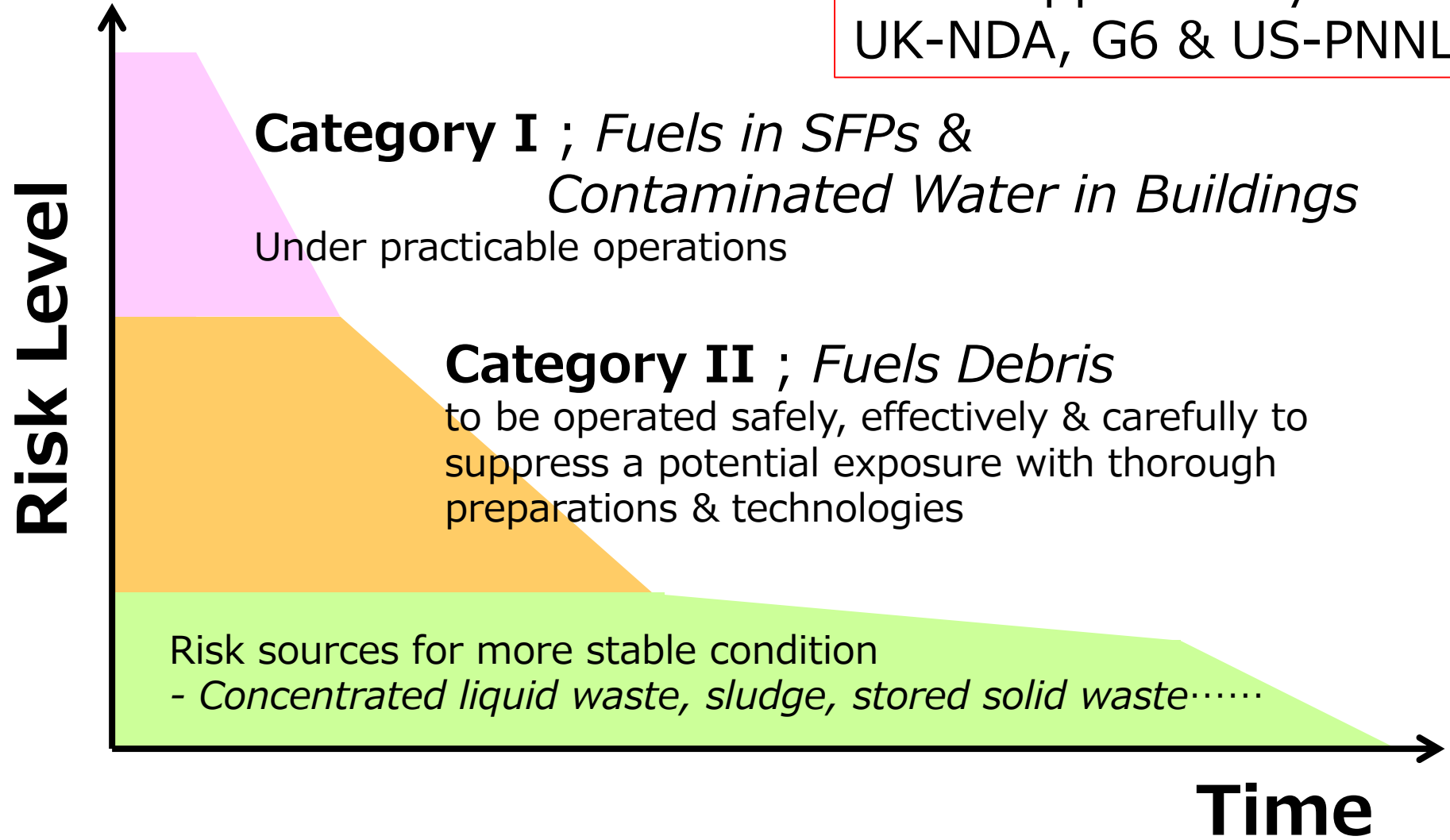
*Risks in category I & II are reduced preferentially to the engineered safe conditions*



Supported by  
UK-NDA, G6 & US-PNNL

# Strategy for Time Dependent Risk Reduction

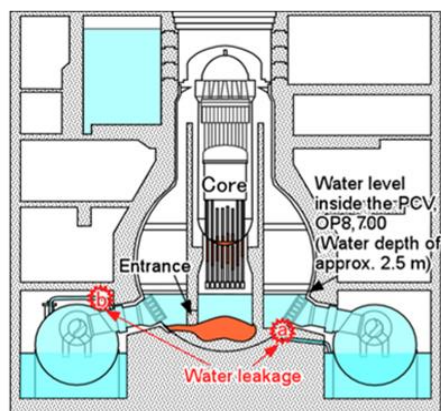
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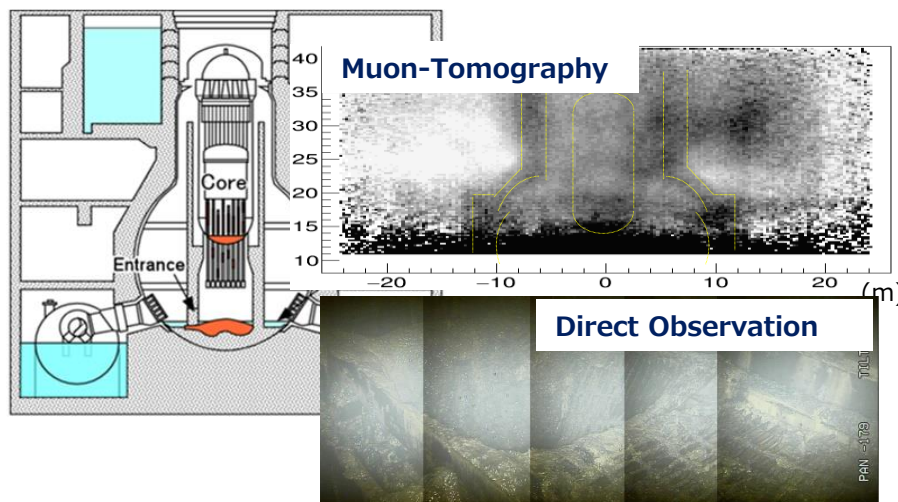
# Analysis of Relocation & Top/Side Access

## NDF strategic plan 2016

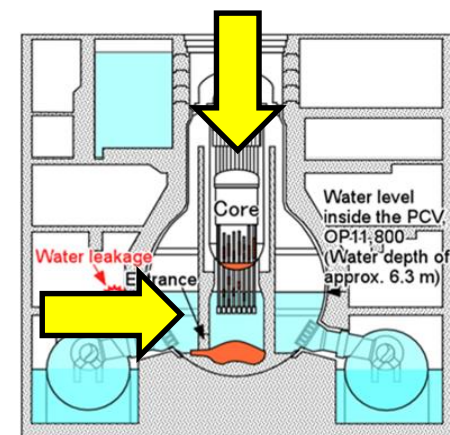
### Unit 1



### Unit 2



### Unit 3



✓ Total amount of fuel debris is estimated about 880 t by code analysis, 6 times compared with TMI debris of 133 t.

- Benchmark & modification of SA code supported by OECD, EPRI etc.
- Focus quick looks for debris retrieval
- Plan side and/or top access by a full remote system.

# Lessons learnt from TMI, Chernobyl, Windscale & Severe Accident Programs

*Melted core is unique depending on reactor type & accident progression.*

TMI 133t (UO<sub>2</sub> 94t)

**Stub-shaped fuel**



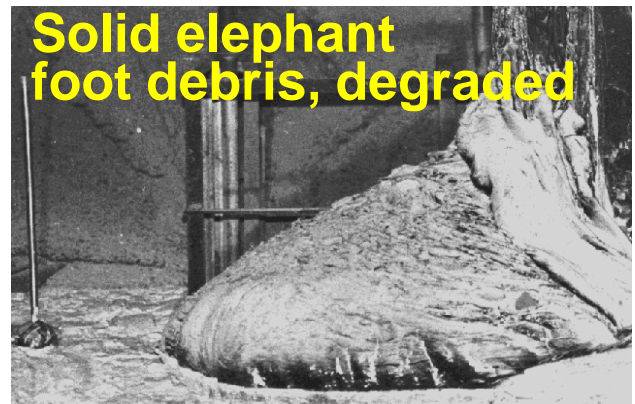
**Granular solidified debris**



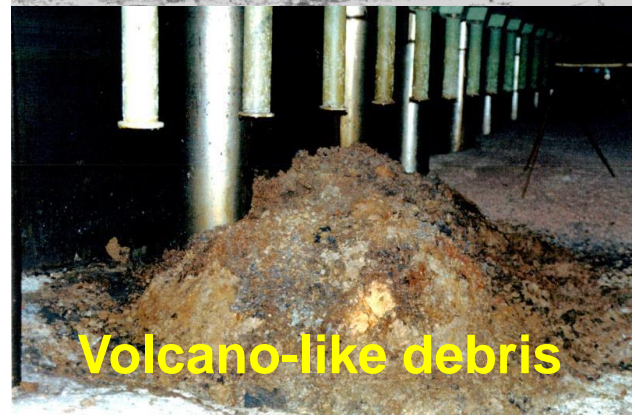
Doug Akers:TMI Knowledge Management System, NRC 2016

Chernobyl 500m<sup>3</sup>  
(UO<sub>2</sub> 200t)

**Solid elephant foot debris, degraded**



**Volcano-like debris**



S.Bozhko:NDF side event, IAEA GC 2016

Windscale 16.3 t

**Agglomerated debris**



MT.Cross:UKAEA/NUKEM WS 2007

ANL MCCI test

**Debris from MCCI**



C.Journeau & P.Piluso ; Compre. Nucl. Material 2012



# Management Scheme for 1F Wastes & Debris

## 1F Wastes

Characterization

Establish  
Classification

Processing

FS for  
Processing & Disposal Concept

Reduce & Stabilize Waste for Storage

Standardization & Capability of Radiological & Chemical Analysis

## Debris

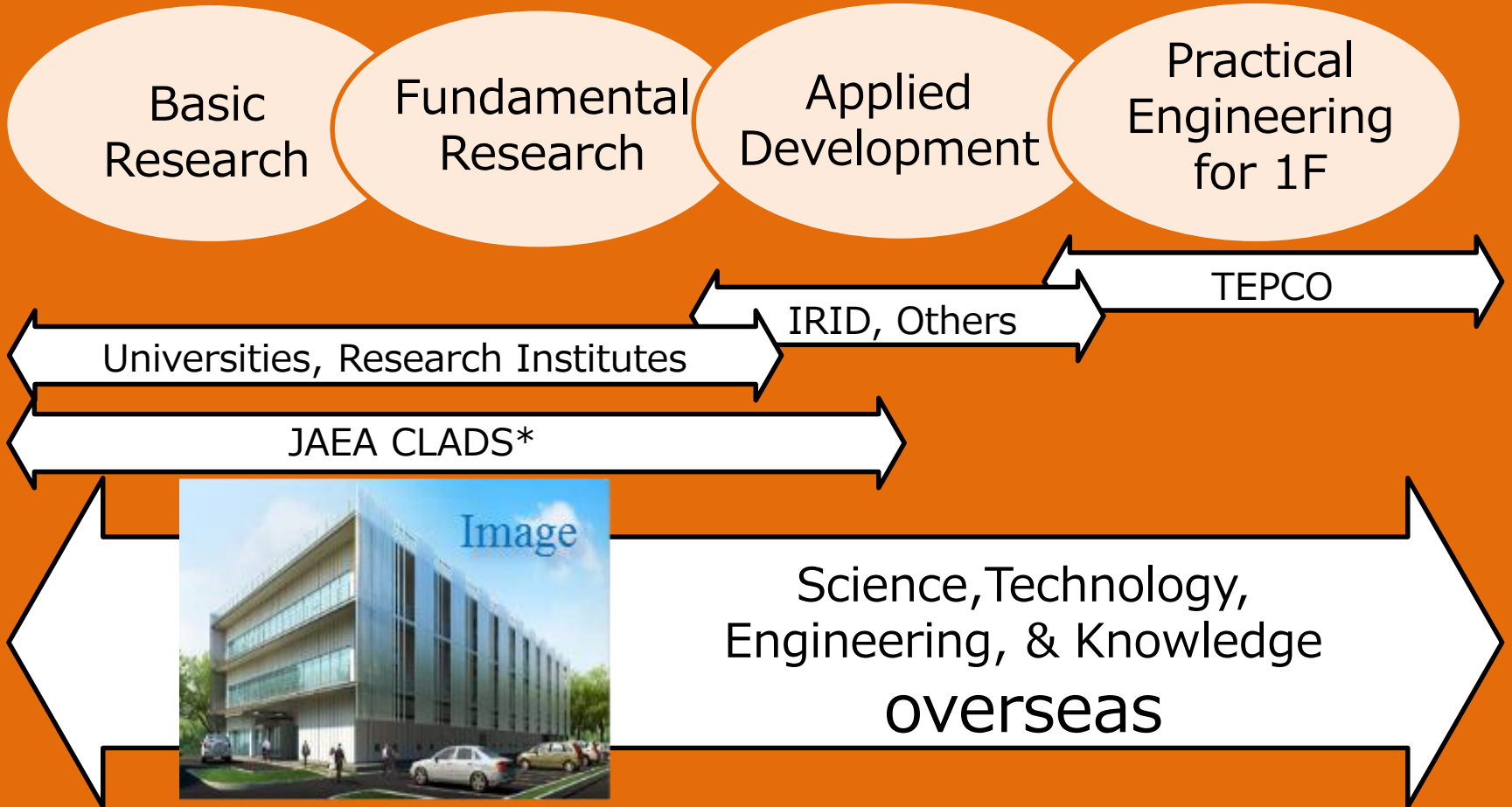
Estimate Volume & Properties,  
Design for Safe Storage

Retrieval  
Storage Facility

2017

# Partnership for 1F D&D

## Integrated Management by NDF



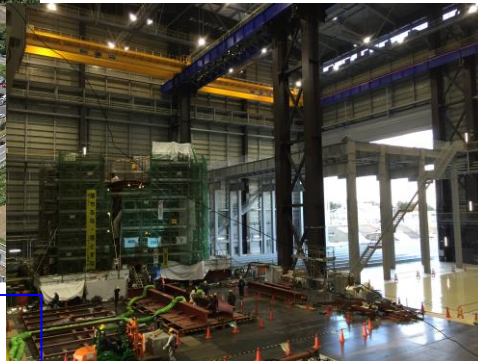
\* Collaboration Laboratories for Advanced Decom. Science

# Global Collaborations for 1F Decommissioning with IRID, JAEA, Domestic & International organizations & companies

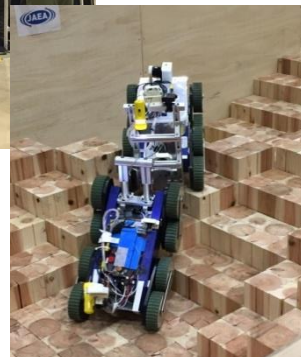
- ✓ R&D Fundamentals & Applications including Capacity Buildings by JAEA
- ✓ Creation of Innovative Technologies with Next Generations



JAEA Naraha Remote  
Technology Development Center



JAEA Radioactive Material  
Analysis & Research Facility



Robotic Contest by National  
Institute of Technology

- ✓ **Effective global collaborations are strongly requested to tackle challenges of Fukushima D&D.**
- ✓ **D&D with innovative technologies are essential in order to lift up a motivation for multi generations.**
- ✓ **Management of radioactive waste should be sustained as a long-term activity, synchronized with revitalization of Fukushima municipalities.**

# NDF 2<sup>nd</sup> International Forum on the Decommissioning of Fukushima Daiichi NPS

12

**July 2<sup>nd</sup> and 3<sup>rd</sup>, 2017 at Fukushima, JAPAN**

## ➤ Program

- ✓ Day 1 (July 2<sup>nd</sup>) For mainly the local community
  - Introduction on the decommissioning of Fukushima Daiichi (1F)
  - Exchange of opinions with the local, regarding present state and future
- ✓ Day 2 (July 3<sup>rd</sup>) For mainly technical experts
  - The latest technical situation of 1F
  - Discussion on related technology globally
  - Technical poster session

## ➤ Web site

[http://ndf-forum.com/index\\_en.html](http://ndf-forum.com/index_en.html)

