

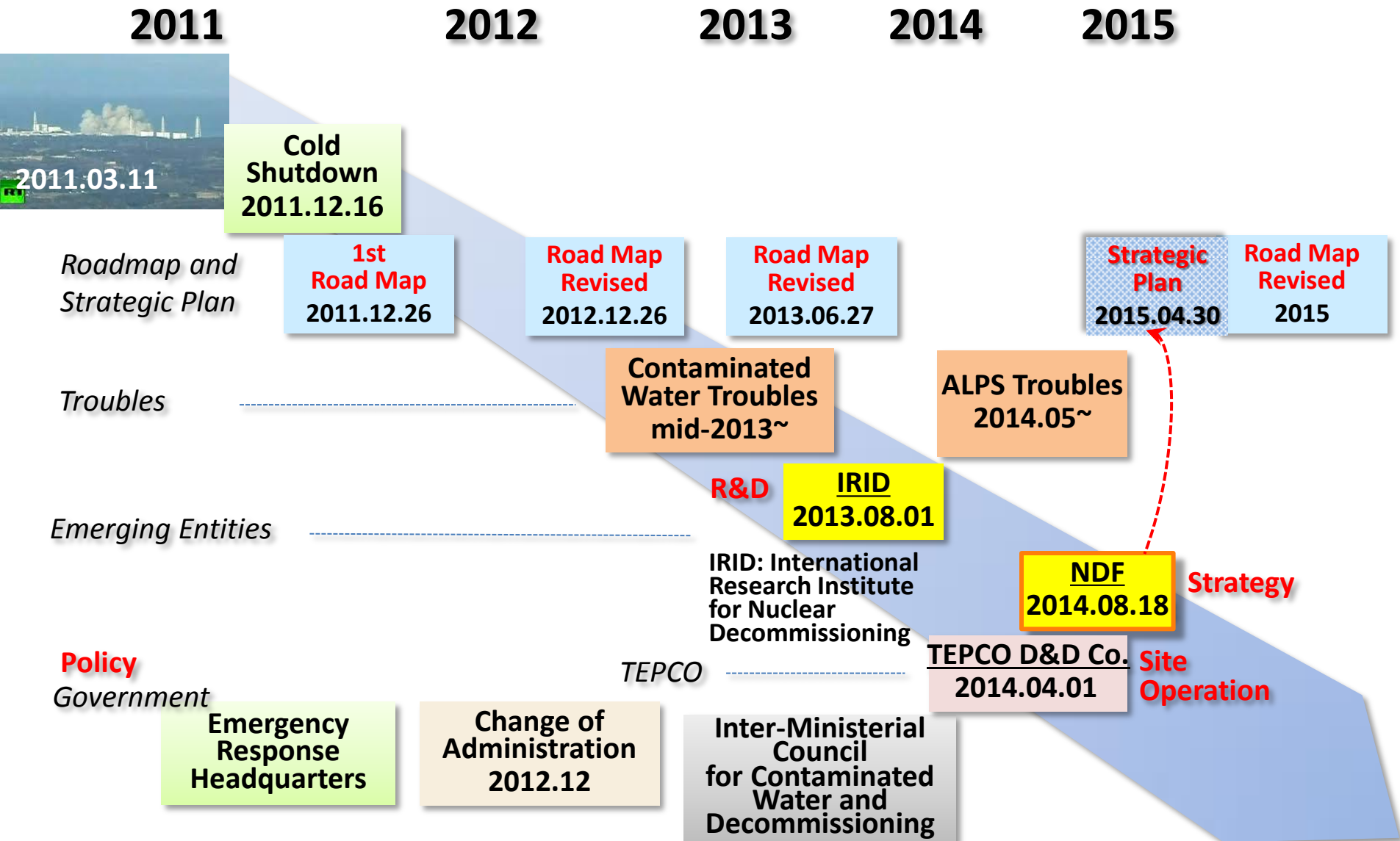
***Activities of
Nuclear Damage Compensation &
Decommissioning Facilitation Corporation (NDF)***

June 3, 2015

Yasuharu Igarashi
Executive Director

Nuclear Damage Compensation &
Decommissioning Facilitation Corporation
(NDF)

Chronology



Roles of Bodies for in Fukushima Daiichi Plant Decommissioning

Government of Japan

Inter-Ministerial Council

Team for Decommissioning and Contaminated water

Secretary=ANRE

Decommissioning Policy (Road Map)

Delivery of Decommissioning

TEPCO

On-site Decommissioning

NDF

✓ "Strategic Plan"
✓ R&D Plan

Technology and Strategic Support

R&D Plan

Tech. Development

IRID

Implementation of R&D

JAEA

Development of “The Strategic Plan” by NDF

As an organization of experts in a variety of technological fields, NDF develops a mid-and-long term technical strategy “The Strategic Plan” through the cooperation with external experts.

- Technology experts in NDF’s decommissioning department (about 30 experts)
 - Plant engineering
 - Robotics
 - Civil engineering and architecture
 - Materials, analysis, monitoring
 - Fuel and nuclear reactor engineering
- Experts from external organizations (universities, JAEA and other research institutions)



<Decommissioning Strategy Board>

1 st Aug. 21, Thu	6 th Jan. 28, Wed
2 nd Sep. 30, Tue	7 th Feb. 23, Mon*
3 rd Oct. 28, Tue*	8 th Mar. 26, Thu
4 th Dec. 4, Thu	9 th Apr. 16, Thu
5 th Jan. 6, Tue	

* With the participation of four international special advisors.

<Expert Committee>

- Fuel Debris Retrieval Expert Committee

1 st Oct. 20, Mon	4 th Jan. 19, Mon
2 nd Nov. 26, Wed	5 th Feb. 13, Fri
3 rd Dec. 22, Mon	6 th Mar. 18, Wed
- Waste Management Expert Committee

1 st Nov. 26, Wed	4 th Feb. 25, Wed
2 nd Dec. 25, Thu	5 th Mar. 30, Mon
3 rd Jan. 26, Mon	

Intensive Workshop type Meetings have held repeatedly among ANRE, TEPCO and IRID under the Lead of NDF on specific Issues.

International Relationship

- (i) Appoint overseas experts International Special Advisors and invite them to the Decommissioning Strategy Board Meeting.
- (ii) Participate in international frameworks such as IAEA and OECD/NEA.
- (iii) Develop a cooperative relationship with overseas organizations.

International Special Advisors



Dr. Rosa Yang

Dr. Mike Weightman

Mr. Paul Dickman

Mr. Christophe Behar

EPRI Fellow, Nuclear Power, U.S. Electric Power Research Institute (EPRI)

Former Chief Executive, the Office for Nuclear Regulation (ONR)

Senior Policy Fellow, U.S. Argonne National Laboratory

Director of Nuclear Energy Division, Commissariat a l'energie atomique et aux energies alternatives (France) (CEA)

Cooperative Agreement



NDA (UK)



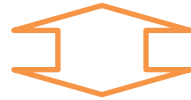
CEA (France)

Strategic Plan for the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station

Strategic Plan and Mid-and-Long Term Roadmap

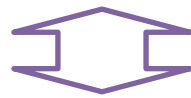
- Goals and policies presented by the Government
- Key elements of strategies, policies and plans determined by the Government

Mid-and-Long
Term Roadmap



- Strategic Plan identifies the issues, ways how to address them and action plans for the most important challenges in terms of the technical judgment for 1) Fuel debris retrieval and 2) Waste management, embracing the organizations involved.

Strategic Plan



- Delivery of Decommissioning by TEPCO and research institutions (field work, engineering, R&D)

Implementation
Plans

Guiding Principles for the Strategic Plan

● Principle

- The decommissioning of the Fukushima Daiichi Nuclear Power Plant is a **continuous risk reduction** activity to protect people and the environment from the risk of radioactive materials, resulting from severe accident.
- A risk reduction strategy along a mid- to-long-term timeline will be designed in the Strategic Plan.

● 5 Guiding Principles for Risk Reduction

- ✓ Principle 1: **Safe** Reduction of risks caused by radioactive materials* and work safety
(*Environment impact and exposure to workers)
- ✓ Principle 2: **Proven** Reliable and flexible technology
- ✓ Principle 3: **Efficient** Effective utilization of resource
(human, capital, money, and space etc.)
- ✓ Principle 4: **Timely** Awareness of time axis
- ✓ Principle 5: **Field Oriented** Emphasize actual place, actual parts and actual situation

Risk Reduction in Strategic Plan

(i) Risk of radioactive materials

- Risk = level of effect x likelihood of loss of containment function

(ii) Level of effect

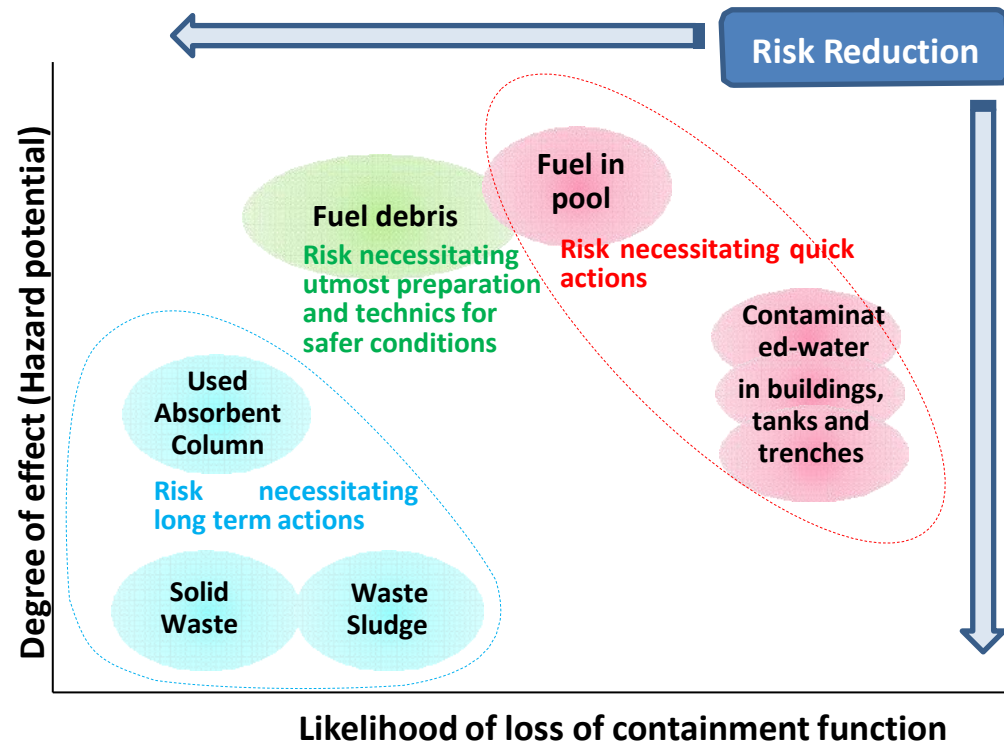
- Level of effect = level of activity x physical state (solid, liquid or gas)

(iii) Likelihood of loss of containment function

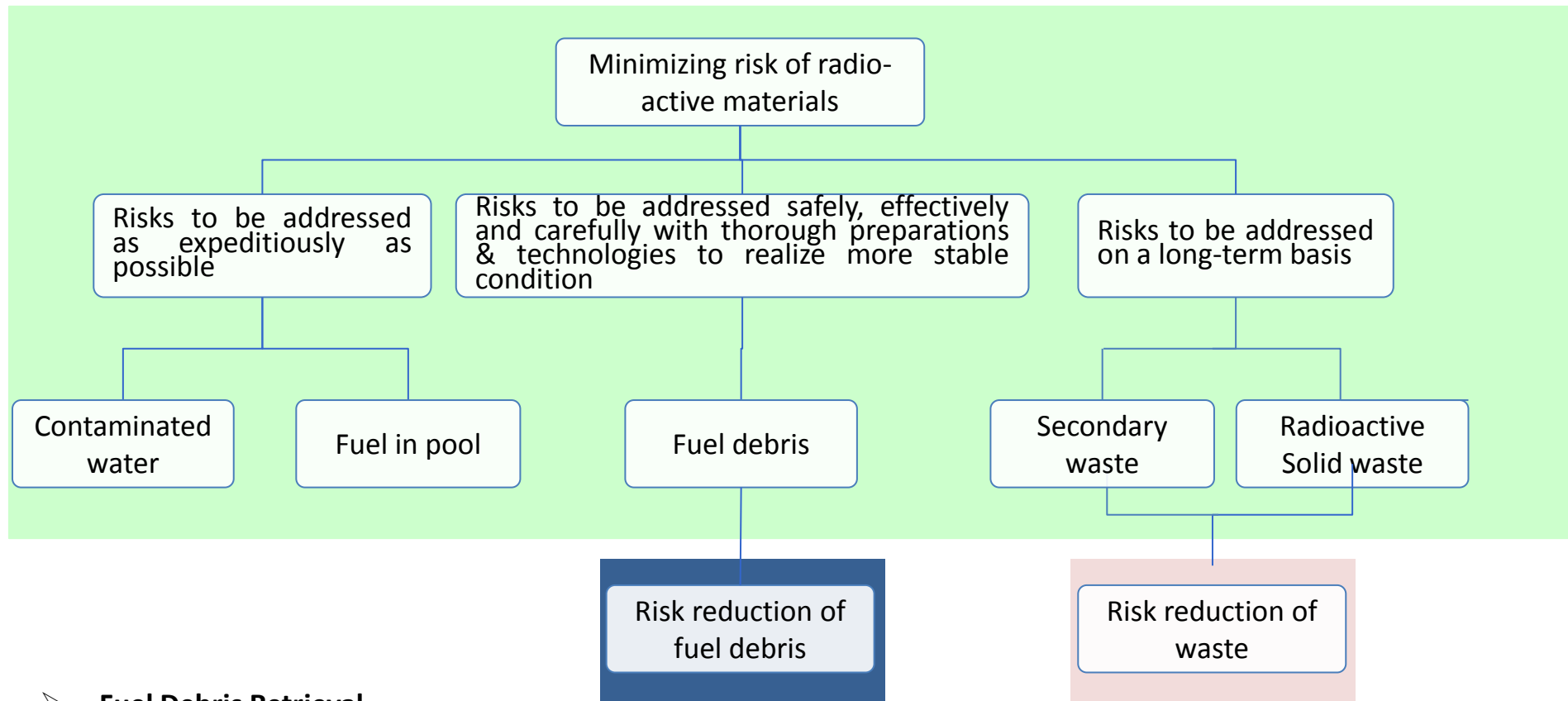
- Likelihood of loss of containment function = possibility of occurrence of the factor x vulnerability of the facility

(iv) How to reduce risk

- Move radioactive materials to a safer and more stable facility.
 - Reduce the degree of effect.
- Decay of radioactivity and change in the physical state.
 - Reduce the likelihood of loss of containment function.



Logic Tree Diagram Regarding Risk Reduction



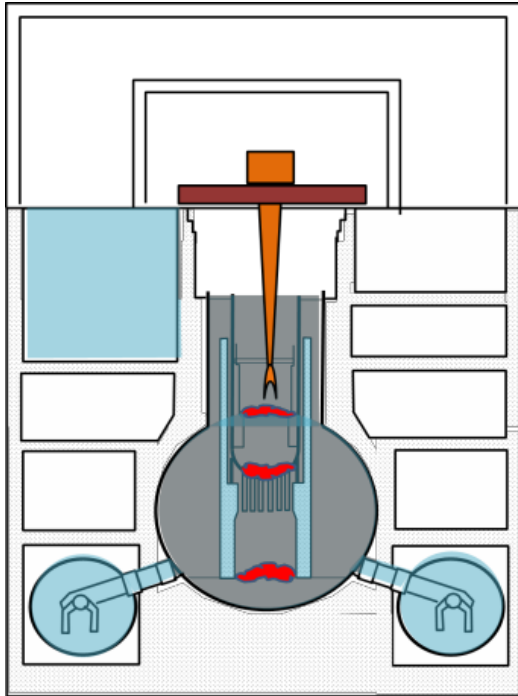
➤ **Fuel Debris Retrieval**

- Develop a workable scenario for fuel debris retrieval assuming several methods (submersion, dry) and a combination of the methods, taking into account the status of each Unit.

➤ **Waste Management**

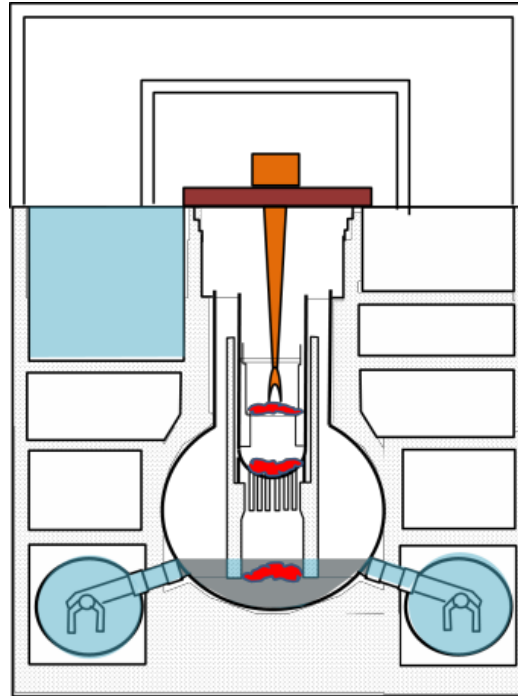
- Develop a policy for storage management, processing and disposal from a mid-to- long-term perspective, based on the principles for safe waste disposal and appropriate waste processing.

Three Priority Methods of Fuel Debris Retrieval



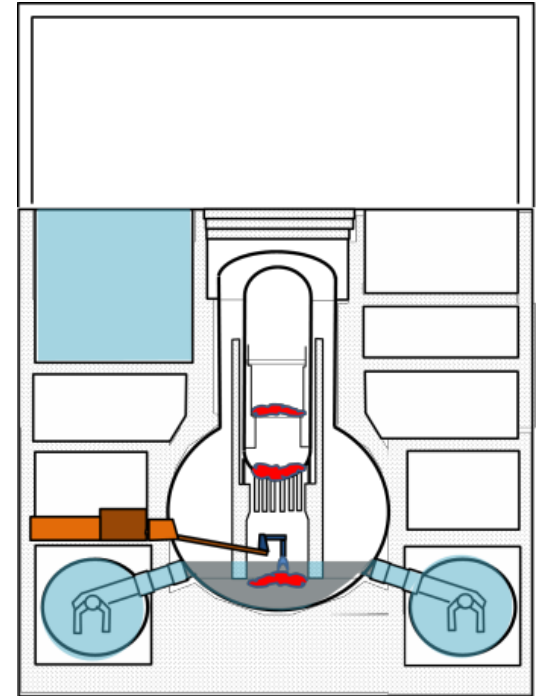
Submersion

Image on condition that the removal of core internals above fuel debris has finished.



Partial submersion
top access

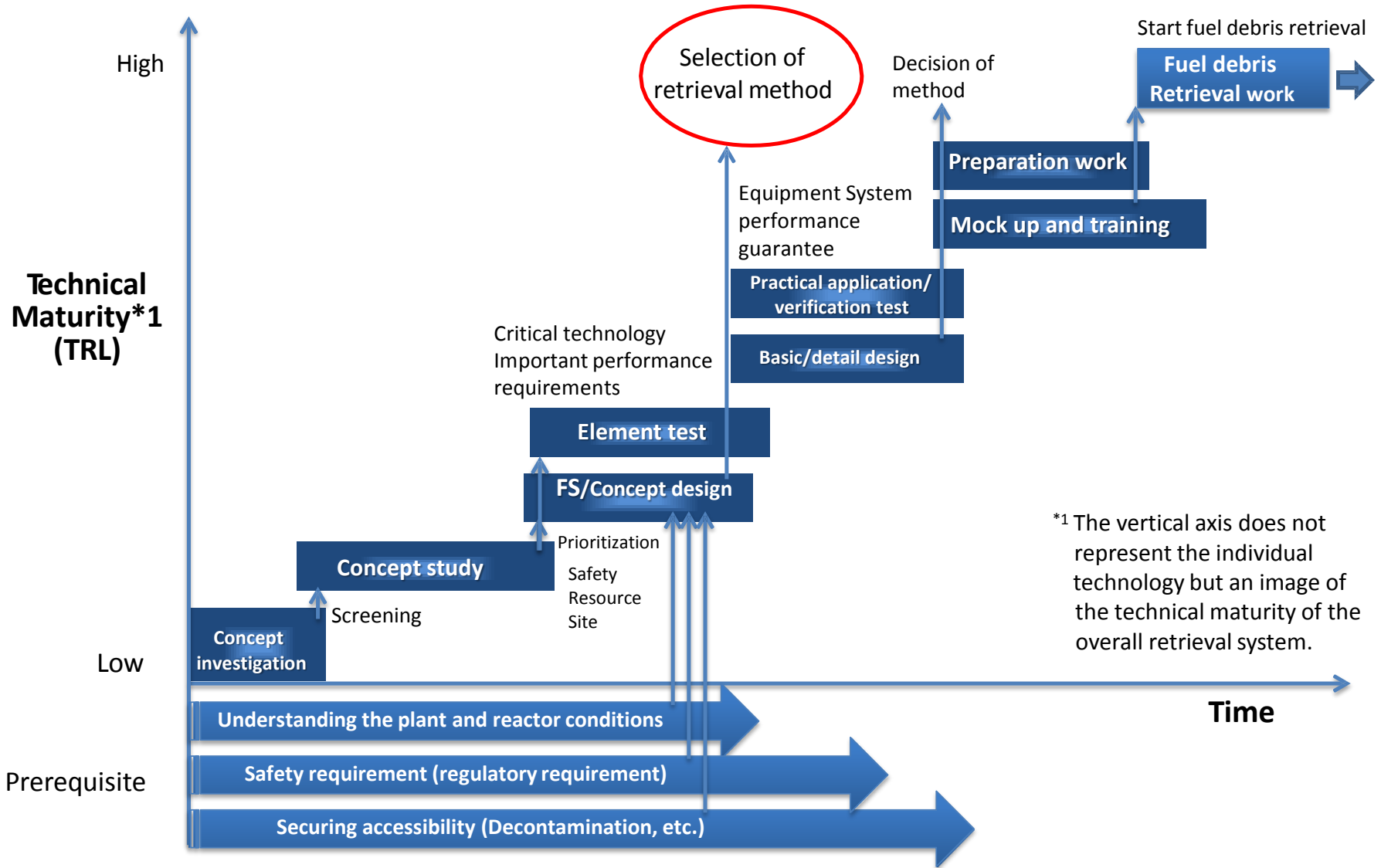
Image on condition that the removal of core internals above fuel debris has finished.



Partial submersion
side access

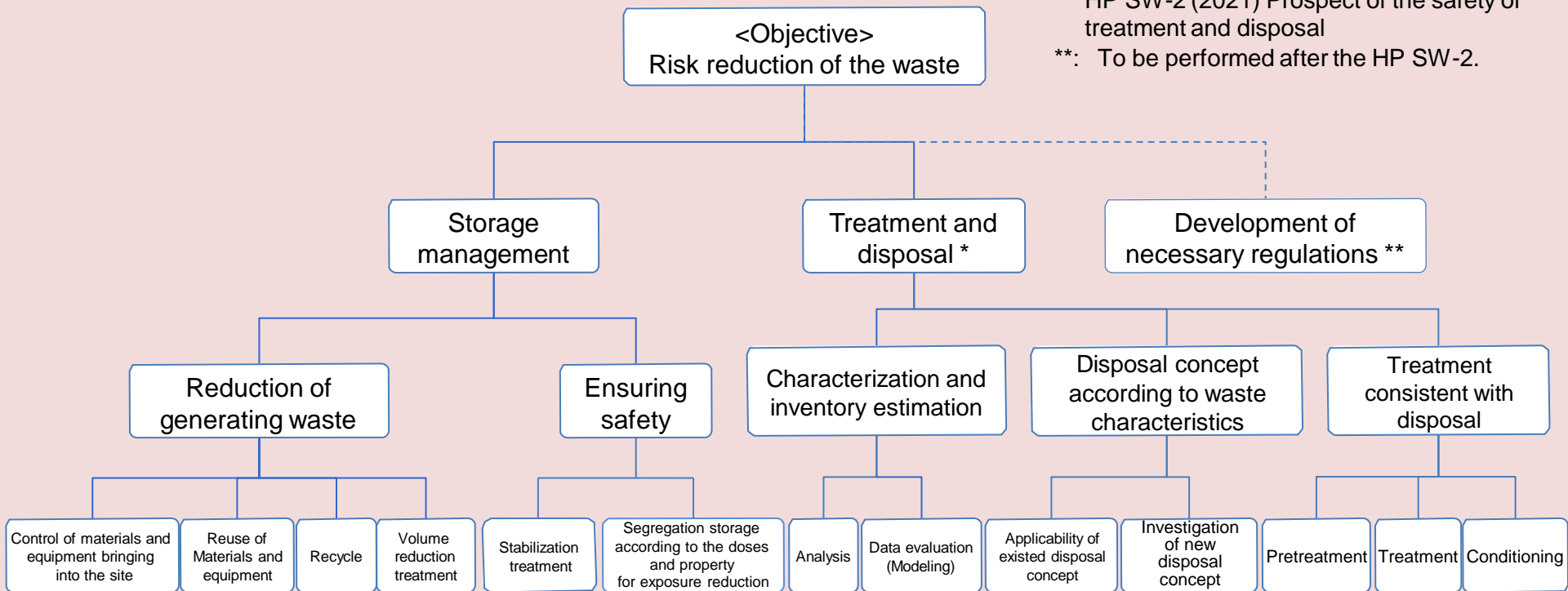
Image on condition that RPV pedestal exterior component inside PCV and the interference have been removed.

Road towards Fuel Debris Retrieval (Reference)



Structure of Strategic Plan for Waste Management

* : HP SW-1 (2017) Fundamental policies of treatment and disposal
 HP SW-2 (2021) Prospect of the safety of treatment and disposal
 **: To be performed after the HP SW-2.



Basic Concept for Ensuring Safety for Radioactive Waste Disposal

NDF has reviewed relevant world's standards for waste management. GSR-part5 and SSR-5 of IAEA are important references.

- ◆ To contain the waste
- ◆ To isolate the waste from the accessible biosphere and to reduce substantially the likelihood of, and all possible consequences of, inadvertent human intrusion into the waste
- ◆ To inhibit, reduce and delay the migration of radionuclides at any time from the waste to the accessible biosphere
- ◆ To ensure that the amounts of radionuclides reaching the accessible biosphere due to any migration from the disposal facility are such that possible radiological consequences are acceptably low at all times
- ◆ To control the release of radioactive materials to ensure that their concentrations without having do not have significant health effects

Approaches to the radioactive waste treatment are also developed.

Policy of Waste Management

● Storage management

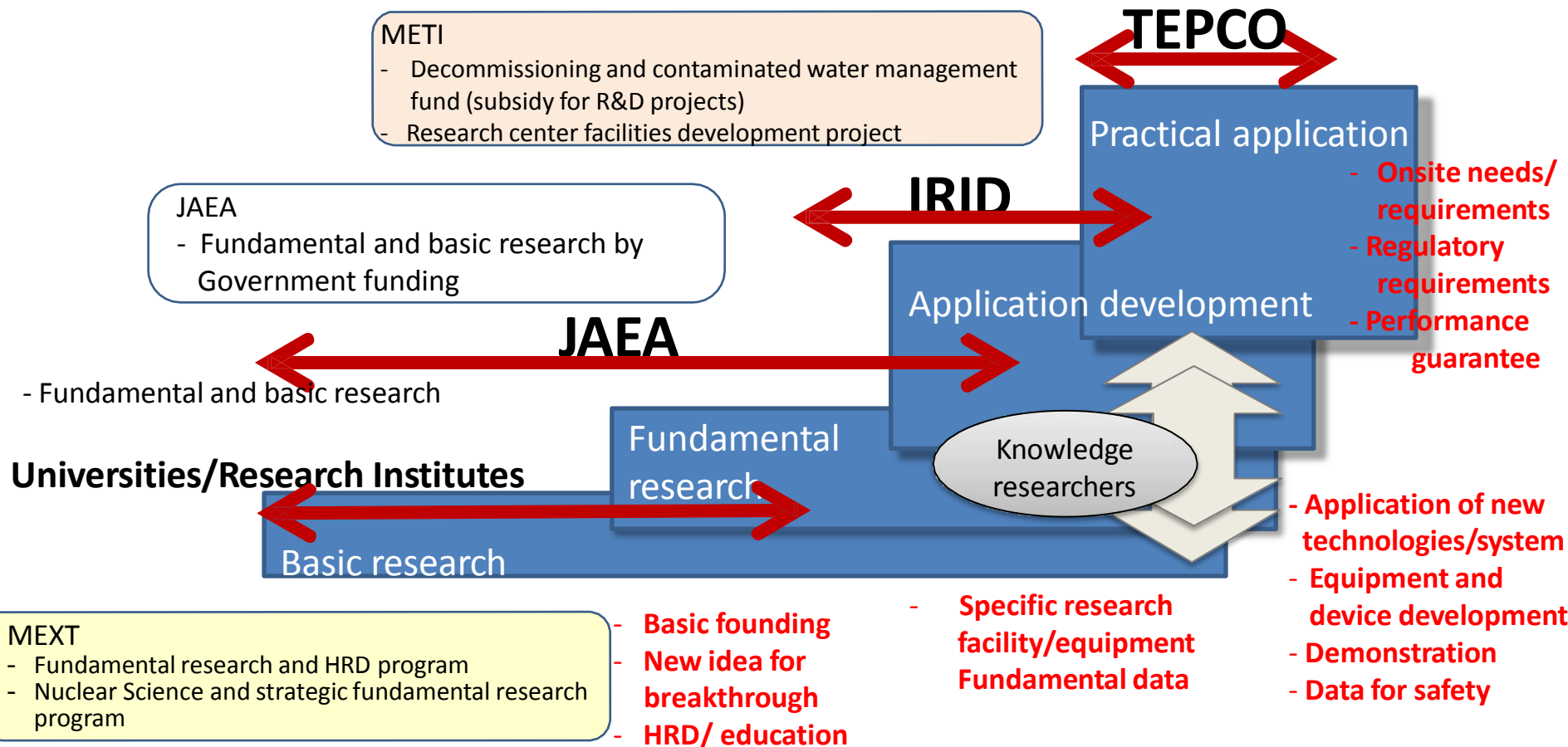
- ◆ Reduction of volume generated
 - ✓ Reduction of carry-in materials
 - ✓ Considerations on the secondary waste
- ◆ Storage management
 - ✓ Plan for storage management
 - ✓ Storage management plan for the waste generated from fuel debris retrieval

● Waste Treatment & Disposal

- ◆ Understanding of waste properties
 - ✓ Waste sampling plan
 - ✓ Analysis ability for understanding of waste properties
- ◆ Treatment and disposal methods according to the characteristics of the waste at the Fukushima Daiichi NPS
 - ✓ Study on treatment and disposal methods
 - ✓ Classification management and history information management
 - ✓ Regulatory system

Overall Diagram of R&D Activities

- It is important to facilitate interaction and communication among researchers and engineers involved in a series of R&D initiatives.



R & D Activities

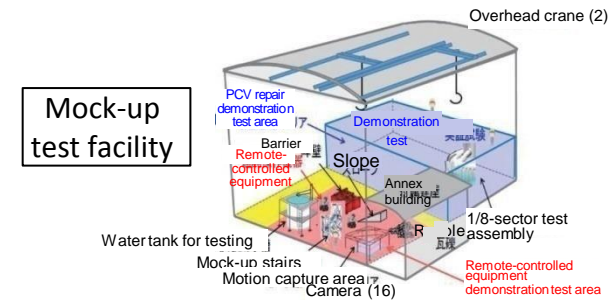
- **R&D facilities (JAEA)**

- ◆ Mock-up test facility
- ◆ Radioactive materials analysis and research facility
- ◆ International joint research center for decommissioning

- **Fundamental Research Activities**

- ◆ JAEA & other research organizations
- ◆ Universities

- **Development and securing of human resource**



Mock-up test facility

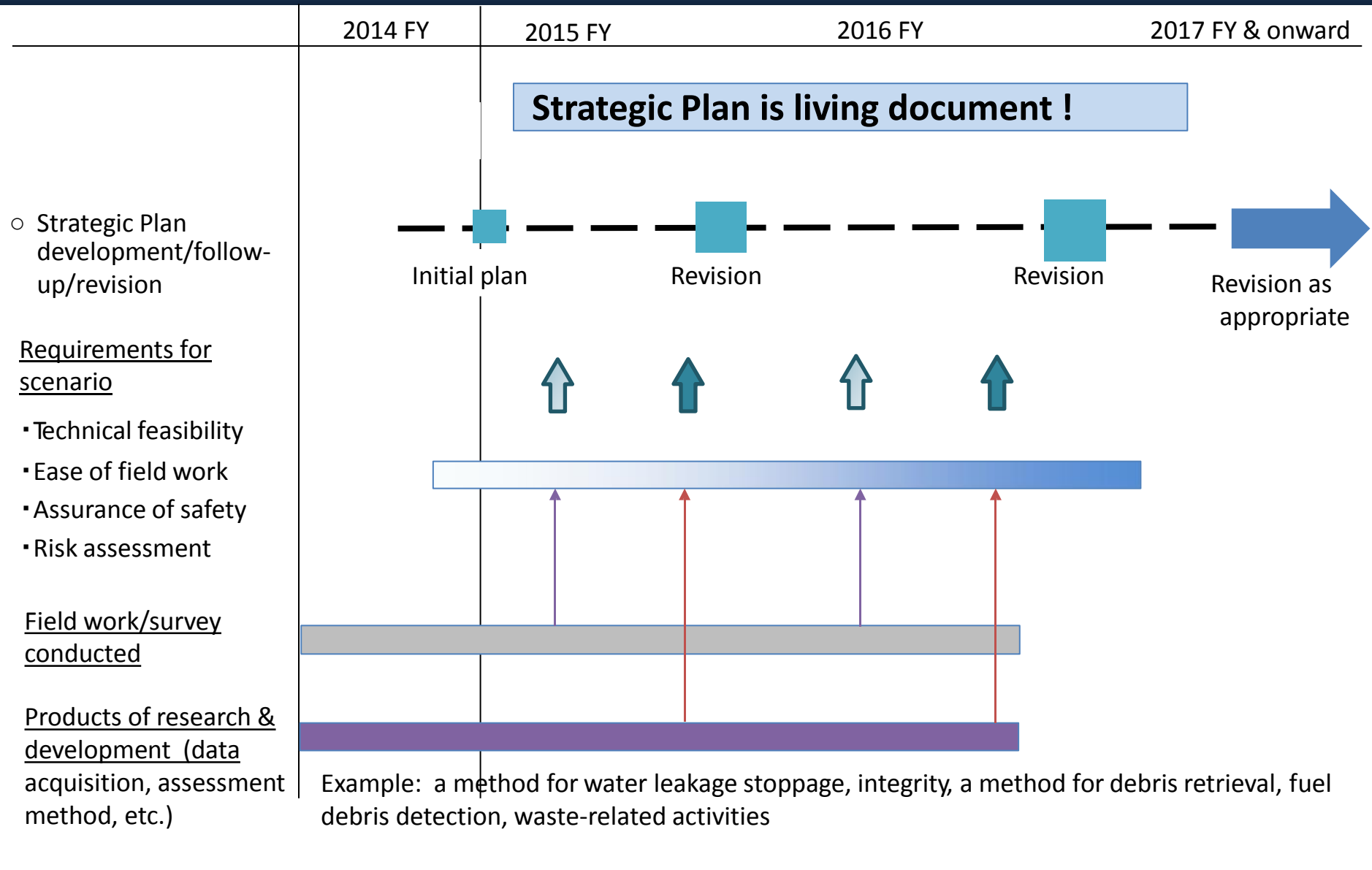
Analysis & R&D facility



International joint research center for decommissioning



Future Development of the Strategic Plan



Thank you for your attention