

## Technical Strategic Plan for Decommissioning of Fukushima Daiichi Nuclear Power Station

June 30, 2016

Yasuharu Igarashi

## Nuclear Damage Compensation & Decommissioning Facilitation Corporation

### Roadmap / Strategic Plan





## NDF Organizational Relationship





# Functions of Decommissioning Division of NDF

## (1) Develop mid- and long- term strategy

- Fuel Debris Retrieval
- Waste Management

#### (3) R&D planning and progress management

- Effective planning of R&D
- Progress management and Evaluation of results

#### (2) Provide technical support for progress management of key issues

- For Japanese government and TEPCO

## (4) Reinforcement of international cooperation

- Knowledge and experience gathering from around the world
- Proper dissemination of information



### Strategic Plan 2015 (SP2015)

Technical Strategic Plan 2015 for Decommissioning of the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Company

~Towards Amendment of the Mid-and-Long-Term Roadmap in 2015~



2015.04.30 Released

In SP2015, we identified issues and organized the "Unit Teams" in NDF to solve those issues.

Since then, 16 Unit Teams have worked with TEPCO,IRID, and JAEA.

http://www.dd.ndf.go.jp/en/strategic-

plan/book/20150624\_Technology\_strategy\_plan\_e.pdf

You can get pdf version of the Strategic Plan at NDF web site.

above!



### **Purpose of the Strategic Plan 2016**

To contribute to the technical basis necessary in order to implement smoothly, steadily the mid- and long-term roadmap





## **NDF's Guiding Principles**

### ♦ Principle 1: Safe

Reduction of risks caused by radioactive materials and work safety

### Principle 2: Proven

Highly reliable and flexible technologies

### Principle 3: Efficient

Effective utilization of resources (human, physical, financial, space, etc.)

### Principle 4: Timely

Awareness of time axis

### Principle 5: Field-oriented

Thorough application of "three actuals" (actual place, actual parts and actual situation)



## **Risk Reduction**



### Likelihood of loss of containment function



## **Risk Reduction**









## **Difficulty of Field** ①

#### Implementation of Internal survey in Unit1



First survey: we could confirm the grating open.

Next survey plan : Robot goes down to the pedestal floor from the grating open.



Source:METI

## **Difficulty of Field** ①

Next investigation method has to be changed

because sediment is stirred up in the PCV water.



> The way to hang down the measuring machine or the censer **by wire**  $\Rightarrow$ By **uncertainty of Field Conditions**, the plan delayed about 1 year.



## **Difficulty of Field** 2

Internal survey in Unit 2

Plan: Robot into the PCV from penetration

 $\rightarrow$  Shielding blocks in front of the penetration couldn't be moved



Radiation level is more than 10 Sv/h by leakage from the PCV penetration  $\Rightarrow$  Delayed about 1 year

Those uncertainties will occur many times in Fukushima Daiichi decommissioning.



Source: METI 13

### **Comprehensive Evaluation (Inside PCV)**



Based on the new findings, continuously improve the comprehensive analysis/evaluation



## **Estimation of Fuel Debris Location**

#### Current **estimation** of Unit 1 to Unit 3 in the Fukushima NPS ⇒We will challenge more brush-up

	Unit 1		Unit 2		Unit 3	
Location	Range of Estimation (t)	Typical Value*	Range of Estimation (t)	Typical Value*	Range of Estimation(t)	Typical Value*
Core	0-3	0%	0-51	0%	0-31	0%
RPV Lower Head	7-20	5%	28-85	18%	21-79	6%
Near RPV Pedestal	225-334	95%	164-224	72%	167-284	94%

\*: The most reliable value of estimation



Estimated Distribution

©Nuclear Damage Compensation and Decommissioning Facilitation Corporation

### **Method of Fuel Debris Retrieval**







Submersion method

Partial submersion -Top entry method Partial submersion -Side entry method

16

We will finish the R&D program within FY2016 and select the method in SP2017.



### Waste Management



We will finish the R&D program within FY2016 and consider the outline of basic concept of processing/disposal for solid radioactive wastes in SP2017.



Source:IRID 17

 $\textcircled{\sc CNuclear}$  Damage Compensation and Decommissioning Facilitation Corporation

## **R&D** Activities

- It is important to facilitate interaction among researchers and engineers involved in R&D initiatives.
- The Decommissioning R&D Partnership Council integrates management from fundamental research to practical application.



## **R&D** Facilities



- **Remote Technology Development Center RTDC:**
- **Analysis and Research Center** ARC:
- **CLADS:** Collaborative Laboratories for Advanced Decommissioning Science



Analysis & R&D facility



International joint research center for decommissioning



Source: JAEA 19 ©Nuclear Damage Compensation and Decommissioning Facilitation Corporation

## Naraha RTDC

### Mock-up Test

Facilities for the development and validation of remotely-operated

#### devices and equipment

Method to repair the PCV lower part Full-scale test for repair and water leakage stoppage technology for inside the PCV

#### 1/1(1/8) Sector Suppression Chamber Mock up



#### Interior of the torus room





JAEA, Naraha Remote Technology Development Center Test building



Interior of the S/C



Source : Development of Fuel Debris Retrieval Technology at IRID The 1st International Forum on the Decommissioning of the Fukushima Daiichi Nuclear Power Station at April 11, 2016 Kenro Takamori, International Research Institute for Nuclear Decommissioning (IRID)

©Nuclear Damage Compensation and Decommissioning Facilitation Corporation

### **Remote Technology R&D Collaboration**

#### "The University of Tokyo Yamashita Lab"





Source : Development of Fuel Debris Retrieval Technology at IRID The 1st International Forum on the Decommissioning of the Fukushima Daiichi Nuclear Power Station at April 11, 2016 Kenro Takamori, 21

©Nuclear Damage Compensation and Decommissioning Facilitation Corporation

## The 1<sup>st</sup> International Forum

#### We held [The 1st International Forum on the Decommissioning of the Fukushima Daiichi NPS].

Place: Iwaki-City, Fukushima, Japan

NDF



平成28年4月10日(日)·11日(月)

スパリゾートハワイアンズ ラピータ

〒972-8326 福島県いわき市常磐藤原町蕨平50

S

S

## Thank you for your attention !



