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Current Trends and Issues on Contaminated Soil and Waste Treatment Technologies

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What is an Interim Storage Facility (ISF)?

- In Fukushima Prefecture, large quantities of contaminated soil and waste have been generated from decontamination activities.
- Currently, it is difficult to clarify methods of final disposal of such soil and waste.
- Until final disposal becomes available, it is necessary to establish an Interim Storage Facility (ISF) in order to safely manage and store soil and waste.

The following materials generated in Fukushima Prefecture will be stored in the ISF.
1. Soil and waste (such as fallen leaves and branches) generated from decontamination activities, which have been stored at the Temporary Storage Sites.



* In principle, combustible materials will be incinerated, and incinerated ash will be stored.

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Location of Planned Area and Decontamination Areas within Fukushima Prefecture



Estimated Volume of Removed Soil & Wastes



Aspect for 5year Ad-hoc Policy on Interim Storage Facility -1 (Announced Mar. 27, 2016)

- Since progress has been made in land acquisition and construction work, 5 to 12.5 million cubic meters of removed soil is planned to be transported to the interim storage facilities by FY2020, the time when the 2020 Tokyo Olympic games will be held. Thus,
 - 1. An equivalent to the total amount of decontamination soil stored near residences and schools are planned to be transported to the interim storage facilities. (Total to be about 1.8 million m³ as of Dec.31,2015)
 - 2. Further land acquisition will enable the transportation of removed soil equal to the total amount of soil stored near major roads. (Total of soil stored within 500m from highways or 100 m from national roads and prefectural roads are estimated to be about 3 to 5 million m³)
- Municipalities will decide actual order of transportation from temporary storage sites.
- ✓ 5year Ad-hoc Policy will be reviewed according to the progress of ISF construction, as needed.

Aspect for 5year Ad-hoc Policy on Interim Storage Facility -2

FY		Land Acquisition	Volume of Transportation	Volume of soil generated from decontamination <> is the volume before incineration	
2015	March 2015 Transportation started	Approx. 22 ha ※Actual amount as of march 25, 2016	Approx. 50,000 m	Approx. 10.6 mil. m³ > ※Actual amount as of the end of Dec. 2015 ※Total amount of storage and amount already delivered	
2016		Approx. 140 – 370 ha	Approx. 0.2 mil. mໍ	Approx. 16 – 22 mil. m ³ <approx. 18.7="" 28="" m<sup="" mil.="" –="">3></approx.>	
2017		Approx. 270 -830 ha	Approx. 0.5 – 0.7 mil. m	Among following items which are difficult to treat	
2018	Opening between Ryozan & Soma IC (goal) Facilitation of Okuma IC completed (goal)	Approx. 400 – 940 ha	Approx. 1.4 – 2.5 mil. m	other than in ISF will be installed, but it is not include in above volume of soil generated from decontamination (1) Approx. 0.7mil. m ³ of decontamination soil with radioactive concentration of less than 8,000Bq/kg (2) Approx. 0.4 mil. m ³ of waste generated from ISF construction ((1)&(2) will possibly be significantly decreased or increased after the incineration) (3) Volume of waste in the "Area where people have difficulties in returning for a long time" and in future follow-up decontamination which are both difficult t estimate for the moment	
2019	Facilitation of Futaba IC completed (goal)	Approx. 520 – 1,040 ha	Approx. 3 – 6.5 mil. m		
2020	July: Tokyo Olympic and Paralympic will be held	Approx. 640 – 1,150 ha	Approx. 5 – 12.5 mil. m (3.5 – 8 mil. m until June)		

< Concept of estimation >

% This prospect will be reviewed according to the progress of ISF construction, as needed

♦Area for land acquisition will be estimated flexibly according to explanation phase to the landowners

To construct facilities, it will need comprehensive area and 2/3 will be assumed to be used for facilitation. The possible volume for

installation is to be 10,000m³/ha and 140,000m³/5ha for a storage facility, and will be installed from TSS to ISF sequentially

Approximate period from contract with operators to ISF operation: 3months for TSS, 6months for delivery & classification,

12months for storage, 18months for incineration

♦On the premise that infrastructure construction on roads for Okuma and Futaba IC would proceed as planned, the maximum volume of possible transportation is estimated: 2mil. m³/y before the operation of both IC, 4mil. m³/y after Okuma IC & before Futaba IC, 6 mil. m³/y after the both ICs operation Source: MOE

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Image of "Aspect for 5year Ad-hoc Policy on Interim Storage Facility"



Interim storage project policy for FY 2017

Transportation

Total volume of transportation in FY2017 to be about 500,000m3

- Priority given to transportation of soil stored at schools
- Priority given to transportation of soil already moved from schools to temporary storage sites
- Share of volume of soil (including incineration ash) to be transported from each municipality is decided through the following conditions:
- 1. Base volume for each municipal
- 2. Priority given to Okuma and Futaba Villages, where interim storage facilities are located
- 3. Amount of soil generated from decontamination practices at each municipal

Since it is assumed that transportation volume and number of vehicles will increase, road traffic countermeasures are to be taken.

- ✓ Pavement improvements were made in FY2016 to cope with transportation volume of FY2017.
- Construction roads are to be built sequentially to deal with future peaks of transportation.

Interim storage project policy for FY 2017

Land Acquisition

• Full efforts will be made to acquire land of ISF site, in line with the "5year Adhoc Policy of ISF "(total of FY2017:270 to 830ha).

Construction

- To complete construction work for reception / classification facilities and soil storage facilities already in progress and to start actual storage of soil in autumn 2017.
- To begin construction work for reception /classification facilities and soil storage facilities to accept 0.9 to 1.8 million cubic meters of soil to be transported in FY2018.
- To begin construction work for volume reduction facilities at Okuma Village aimed to start operations in winter 2017, as well as for volume reduction facilities at Futaba Village, aimed to start operations in FY2019.
- To secure stockyard for incineration ash of which transportation is to start, and to begin preparing waste storage facilities aimed to start operations in FY2019.
- To establish stockyard necessary for the total volume to be transported in FY2017, for seamless transportation of decontamination soil.

Facilities and Disposal Process at the Interim Storage Facility

The Interim Storage Facility will consist of several facilities with various functions.



Image of Facility (Reception / Classification Facility)



Source: MOE(7th meeting on Committee for environmental safety of interim storage facilities)(Tentative translation)





Indoor facilities

Image of Facility (Soil Storage Facility)



Source: MOE(7th meeting on Committee for environmental safety of interim storage facilities)(Tentative translation)



Progress of construction work



Source: MOE(1st meeting of Conference for volume reduction facilities for combustible decontamination waste at interim storage facilities) (Tentative translation)

Image of Facility (Waste storage facility)



Source: MOE(1st meeting of Advisory committee for volume reduction facilities for combustible decontamination waste at interim storage facilities)(Tentative translation)

Facilities to be developed over the next few years

Items to be accepted:

Soil (soil, pebbles and gravels) stored at temporary storage sites and stockyards **Facilities to be installed:**

Reception / Classification Facility

Main facilities: Unloading equipment, Measuring equipment, Container bag breaker, Sieving machines for primary & secondary classification, Classification device for radioactive level

*Equipment for classification of radioactive level to be installed primarily to check soil status Soil Storage Facility

Main facilities: Storage facility, Seepage control lining, Leachate treatment facility <u>Associated Facilities (screening facilities, carwash machines etc.)</u> <u>Major specifications of facilities</u>

	Specifications	Futaba construction area	Okuma construction area	
Reception /	Treatment capacity	140t/h	140t/h	
Classification	Height of building	Approx. 10 meters	Approx. 10 meters	
Facility	Type of building	Steel frame supported membrane structure	Steel frame supported membrane structure	
	Type of facility	Type II	Type II	
	Water sealing method	Туре А	Туре А	
Soil Storage Facility	Volume of storage	Approx. 60,000m ³ (38,000m ³ primarily)	Approx. 60,000m ³	
	Height of storage	Approx. 10 meters	Approx. 10 meters	

Schedule:

	FY2016	FY2017		FY2018
Order notice End of Mar. 2016 Survey, design, construction (Approx. 1 year		tion, test operation 4 months)	Operation	n and Storage

*Schedules may change due to land acquisition conditions , weather , etc.

(Source MOE: 5th meeting of Advisory committee for R&D strategy for volume reduction and recycling technology)(Tentative translation)

Overview of JESCO

JESCO was established by the Law to assist MOE for implementation of the Interim Storage project and to conduct PCB waste treatment

1. Title of the Law: Japan Environmental Storage & Safety Corporation Law (entry into force on Dec. 24, 2014)

- PCB Wastes Treatment
- Interim Storage Project in Fukushima
- 2. Minister in charge: Minister of the Environment
- 3. Establishment : Apr. 1, 2004
- **4. Capital** : JPY 12.6 Billion (All from the Government) (as of Oct. 21, 2016)
- 5. Employee : Board Member: 9, Employee : 457(as of Mar. 31, 2017)

History of JESCO

1965	"Environmental Pollution Control Service Corporation Law" enacted. "Environmental Pollution Control Service Corporation" (predecessor of JEC) established.
1992	"Environmental Pollution Control Service Corporation Law" is reenacted. (Reorganized to "Japan Environment Corporation (JEC)")
2001	 "Law concerning Special Measures for Promotion of Proper Treatment of PCB Wastes" is enacted, "Japan Environment Corporation Law" is reenacted. (JEC is assigned to conduct PCB waste treatment) "Reorganization and Rationalization Plan for Special Public Institutions" is adopted by the Cabinet. (Abolition of "Japan Environment Corporation (JEC)" is decided)
2003	"Japan Environmental Safety Corporation Law" is promulgated and enforced.
2004	"Japan Environmental Safety Corporation (JESCO)" is established. "Japan Environment Corporation (JEC)" is abolished. JEC's former projects are succeed to JESCO and ERCA.
2014	"Japan Environmental Storage & Safety Corporation (JESCO)" established (reorganized). "Law for Partial Amendment of Japan Environmental Safety Corporation Law" is promulgated and enforced (Law renamed to "Japan Environmental Storage & Safety Corporation Law". "Japan Environmental Storage & Safety Corporation (JESCO)" established(reorganized). JESCO is assigned to conduct interim storage)

Law amendment for the interim storage project (Outline of the amendment of the JESCO Law)

- **Government is responsible** for installing and managing interim storage facilities, which are essential for the recovery of Fukushima.
- Laws to be amended to utilize JESCO, a <u>100% government-owned company which the government has</u> regulatory powers over, a company that has <u>accumulated know-hows on handling harmful substances.</u>

Name of company and law

(*JESCO will continue treatment of PCB wastes)

Company name is changed to the "Japan Environmental Storage & Safety Corporation." Law is renamed to "Japan Environmental Storage & Safety Corporation Law".

Government's responsibility

- 1. To construct the facilities and secure the safety.
- 2. To take appropriate actions to obtain recognition and cooperation from the residents near the facilities
- 3. To take appropriate actions to accomplish final disposal outside Fukushima Prefecture within 30 years

Mandate of JESCO

from start of project

Commissioned by the government, JESCO conducts interim storage-related work such as the transportation and storage of removed soil within Fukushima Pref., information gathering, technological knowledge provision and R & D for the project.

Government shares, investments and tax exemptions

- 1. Law change redefines government ownership rates of shares of JESCO from a "majority" to 100%.
- 2. Government makes additional investment to JESCO.
- 3. Exemption of registration license tax for the increased capital stock due to the additional investment
 - ※ In addition, change in regulations will be made to adopt separate accounting
 - ☆ The Law entered into force on Dec. 24, 2014 (except part of the law).

Trends in number of JESCO employees involved in the interim storage project



JESCO's role in FY2017

Since the law was amended in Dec.24, 2014, JESCO is commissioned by the MOE to take charge of activities such as supervision of construction work at stockyards, management of transportation, supporting MOE on tendering construction work and conducting technical surveys.

For FY2017, JESCO has been assigned by the MOE to carry out the following :

- (1) Support for tendering construction work
- (2) Deputy supervisor of construction work
- (3) Management of interim storage facilities
- (4) Transport management utilizing the "Total Management System (TMS)"
- (5) Monitoring activities
- (6) Management and disclosure of data and information
- (7) Training and education for workers
- (8) Technological Survey
- (9) Conducting demonstration projects of technologies such as volume reduction

(1)Support for tendering of construction work

JESCO assists the MOE prepare the documents required to tender construction work of the interim storage facilities. In addition, JESCO conducts surveys within the ISF planned area to find suitable sites for each facility.

(2) Deputy supervisor of construction work

JESCO serves as deputy supervisor of construction work. JESCO supports the MOE in matters such as construction control, process control, quality control, safety control, work progress control, design changes and expense settlements.

(2)Supporting construction work supervision at stockyard.



(3) Management of interim storage facilities -1

 Managing gateways: JESCO manages the gateways of ISF planned-area premises, and checks the IDs and admission of passing vehicles. At the gateways where air dose rate is high, JESCO takes measures to reduce worker exposure.

 Operating screening facilities: JESCO conducts screening tests, when vehicles leave ISF planned-area premises. JESCO also conducts studies to streamline operations at the gateways and screening facilities.



(3)1. Managing a gateway





(3) 2. A screening facility

(3)2. Screening of a truck

(3) Management of interim storage facilities -2

3. Maintaining Stockyard: JESCO maintains stockyards to accommodate soil collected from other sites

4. Maintaining acquired land: JESCO patrols and maintains the land acquired by the MOE for the ISF.



(3)3. Maintaining a stockyard



(3)4. Maintaining acquired land for ISF

(3) Management of interim storage facilities -3

- 5. Studying management of facilities: JESCO is studying better management of the facilities from a long-term perspective.
 - JESCO will prepare facility maintenance plans.
 - Also, JESCO will prepare a prototype operating system at reception / classification facilities to control data of the soil, and will add functions to manage storage data at soil storage facilities.
- 6. Preparation for analysis facilities & research buildings: JESCO will study the specifications (functions, contents, scale, location, and numbers) needed for analysis facilities and research buildings. JESCO will also establish operation & maintenance plans from a long-term perspective.
- 7. Preparation for Information Disclosure Center: JESCO study the requirements for the establishment of a "Information Disclosure Center" aimed to transmit information and communicate mutually with local residents and other stakeholders.

(4) Transport management utilizing Total Management System

- Operation and enhancement of the TMS: JESCO utilizes the "Total Management System" (TMS) to constantly monitor the status of all transport vehicles and delivered items. JESCO operates and maintains this system, which is also enhanced as required.
- 2. Integrated management of transportation: JESCO monitors the location of transport vehicles and checks whether they are taking the desired route from temporary storage sites to the ISF. In the event of an emergency, JESCO will respond appropriately in line with the authorities concerned and under transportation execution plans.



(4)2. Checking the status of transportation using TMS

- 3. Measures for "out of signal" spots: JESCO will take measures for communication in "out of signal" spots at temporary storage sites, transport routes, and interim storage planned areas.
- 4. Management of vehicle rest stations: JESCO maintains parking lots reserved for transport vehicles at rest stations on designated highways. JESCO guides such vehicles and checks their packaging at the rest stations.

(5) Monitoring activities

- 1. Radiation monitoring of the ISF planned-area and transport routes: To check whether interim storage project-related work is affecting the areas surrounding the ISF planned-area or the transport route roadsides, JESCO monitors the radiation level of stockyards, etc.
- Environmental monitoring of transport routes: To check whether vehicles are affecting the roadside environment of transport routes, JESCO monitors the noise, vibrations and air quality of the routes.
- Traffic monitoring of transport routes: To check the impact of the transport vehicles on traffic, JESCO monitors the traffic volume of crossroads, traffic length and duration of the transport routes.





(5)1. Inspection of real-time monitoring post



(6) Management and disclosure of data and information

- JESCO manages and publishes the following data and information on its website after receiving confirmation from the MOE.
 - Transport plans, transported soil volume.
 - Monitoring data collected by the TMS.
- 2. JESCO checks workers exposure level collected by the TMS, makes sure proper measures are taken, analyzes trends, and gives feedbacks for radiation control.

JESCO Japan Environmental Storage & Safety Corporatio	on			Google 力スタム検索 検知
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事業の仕組み	■ 輸送路における	5放射線量率の	<u>測定結果(平成28年4)</u>	<u>]~平成29年3月)</u> 型
事業の内容	[<u>平成27年度</u>]	<u>以前の輸送路に</u>	おける放射線量率の測	[定結果]
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□ 輸送に関する安全管理				
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よくあるご質問	 輸送路における 「平成27年度」 	5 <u>騒音、振動、大</u> 以前の輸送路に	<u>(気質の測定結果(平成</u> おける騒音、振動、大気	<u>\$28年度</u>)四 気質の測定結果]

(6)1. Monitoring data published on JESCO's website

JESCO trains drivers of vehicles involved in MOE construction work and safety managers. Training programs follow the basic transport plan and transport execution plans.









(7)Training program for the transportation of contaminated soil to interim storage facilities

Trends in number of trainees



1. Technical Surveys (FY2016)

In FY2016, JESCO conducted 9 surveys based on areas A-F as listed

below.

A Sorting out facts to seek a common basis for wind-range R&D activities

(Title of survey) 1. Research on composition of removed soil in flexible containers

B Systemization of elemental technology for interim storage

(Title of survey) 2. Research on specifications for volume reduction facilities (temporary incinerators) for interim storage

- 3. Research on technical information of water treatment facilities for interim storage
- 4. Studies for operating and maintaining interim storage facilities (*New theme)
- 5. Studies for measures to reduce traffic at transport routes despite increases in vehicles (*New theme)

C Management of field studies

(Title of survey) 6. Research on making GIS database of the interim storage planned area
 7. Measures for "out of zone" cell-phone spots at transport routes to interim storage area (*New theme)

D Setting target levels of volume reduction & recycling and measuring technologies

(Title of survey) (2. Research on specifications for volume reduction facilities (temporary incinerators) for interim storage)

E Verification of volume reduction technologies

(Title of survey) 8. Demonstration project of volume reduction technologies for removed soil (*New theme)

F R&D with NIES (*New area)

(Title of survey) 9. Research on volume reduction facilities and soil storage facilities for interim storage (*New theme)

2. Technical Surveys (FY2017)

Considering recent progress on interim storage related business activities, JESCO has reconsidered the FY2016 priority areas A to F, and will conduct technical surveys based on the following 4 priority areas for FY2017.

FY2017 priority areas for research & development

- A Promotion of recycling and volume reduction technologies
- B Steady progress in interim storage
- C Measures to deal with rapid increase in transportation
- D Comprehensible and accessible transmission of technical information

3. Collaboration with external research institutes

JESCO has concluded Memorandums of Understanding (MOU) between NIES and SRRCE in FY2015 to promote information exchanges and technical support.

JESCO concludes MOU for R&D with NIES and SRRCE



The Society for Remediation of Radioactive Contamination in Environment (SRRCE), Sep. 29, 2015

National Institute for Environmental Studies (NIES), May 11, 2015



Verification project (Verification of technologies such as volume reduction)

JESCO evaluates the effectiveness, efficiency and safety of technologies potentially applicable to the interim storage project, such as reducing the volume of removed soil. JESCO widely calls for proposals of technologies for technical themes and has them fairly reviewed by outside specialists. Selected themes are tested, evaluated and published.

[Reference] FY2016 results



Themes selected for Verification of Technologies Project FY2016

No.	Field of techno- logy	Subject	Name of theme	Organization
1		Volume reduction	Development of soil character discrimination system for removed soil	Obayashi Corporation
2		Volume reduction	Dissolving clay mineral using alkaline cleaning and volume reduction of removed soil by cleaning-classification	Taisei Corporation
3	ycling	Volume reduction	Development of technology for removing foreign substances from removed soil	JFE Engineering Corporation
4	and rec	Volume reduction	Plant demonstration test on high-volume reduction of sifted fine-grained soil using melting technique	Kubota Environmental Service Co. Ltd.
5	eduction	Volume reduction	High-speed ion exchange cesium recovery and high-volume reduction immobilization of Cs in glass by metal ion-containing subcritical water	Tokyo Institute of Technology
6	Volume r	Volume reduction	Demonstration of soil sorting with "continuous concentration measuring and sorting machine" and soil conditioning for easier soil sorting	Hazama Ando Corporation
7		Recycling	Volume reduction of mud soil having high water content generated from cleaning-classification and reusing dehydrated sludge cake as artificial gravel stone	Rinkai Nissan Construction Co., Ltd.
8	ortation storage rea work	Transportation of removed soil	Demonstration of measures for transporting removed soil on routes with "out of signal" spots	NTT Communications Corporation
9	Transpo interim related a	Interim storage, removed, waste treatment	Plant demonstration test on high-volume reduction of sifted fine-grained soil using melting technique	Hitachi Zosen Corporation

[Reference] FY2017 plans



Operation of "Decontamination and Volume reduction technology options exploration" website

It is necessary to promote the matching and cooperation between companies which possess new promising technologies and companies which carry out decontamination work.

Thus, JESCO will collect and register technologies, evaluate the effectiveness, efficiency and safety of the technologies, compile the information and publish them on the "Decontamination and Volume reduction technology options exploration" website (tentative name).

[Decontamination and Volume reduction technology options exploration website (tentative name)URL] https://www2.env.go.jp/dtox/info/proof



Thank you for your Attentions