1st International Forum on the Decommissioning
of the Fukushima Daiichi Nuclear Power Station

Fukushima Daiichi Nuclear Power Station : Current Status and Outreach

April 10, 2016

Naohiro MASUDA @ Spa Resort Hawaiians

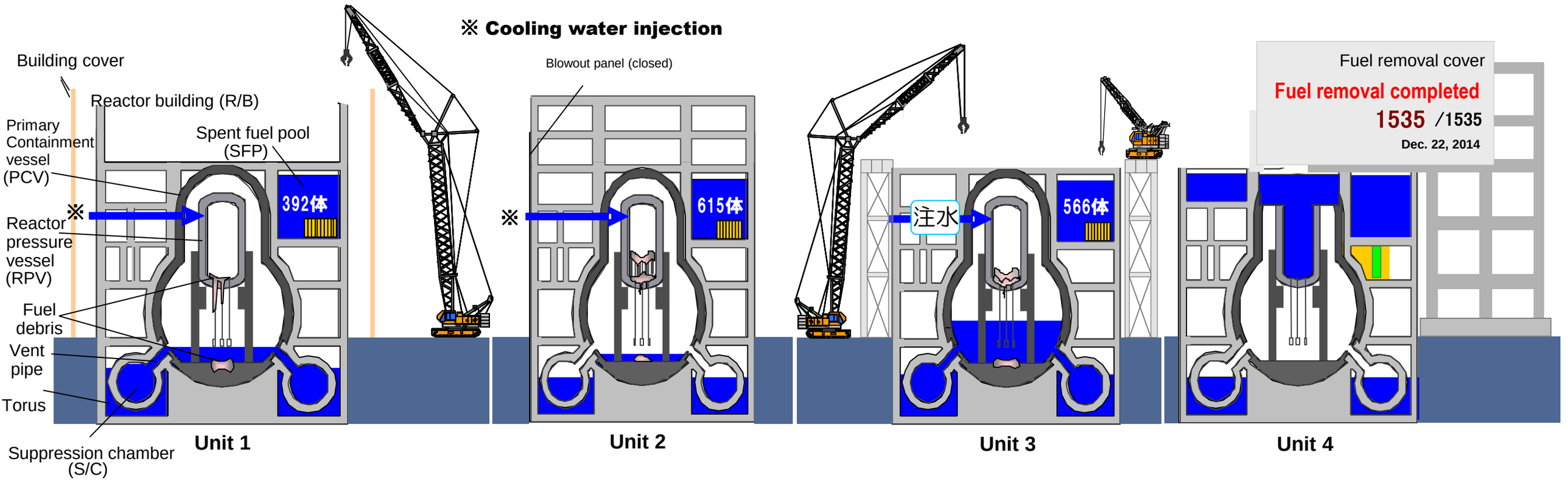
Chief Decommissioning Officer,
President of Fukushima Daiichi Decontamination and
Decommissioning Engineering Company,
Tokyo Electric Power Company Holdings, Inc.

TEPCO

1. Current Status of Fukushima Daiichi NPS

(1) State of Units 1~4

All Units Continue To Be In Cold Shutdown



Values as of 5:00 on 1st March 2016

	RPV bottom temp.	RPV bottom temp.	Fuel pool temp.	Water injection to the reactor
Unit 1	~15℃	~15℃	15. 2℃	4.5㎥ / h
Unit 2	~20℃	~21℃	25. 1℃	4.4㎥ / h
Unit 3	~18℃	~18℃	22. 4℃	4.6㎥ / h
Unit 4	No fuel, so monitoring not required	No fuel, so monitoring not required	11. 3℃	–

Plant parameters including RPV and PCV temperatures are monitored continuously 24 hours/day.

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(2) Current status and tasks of Units 1–4

Unit 1

Current status

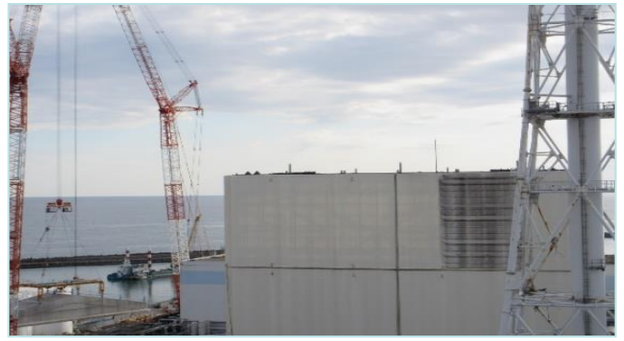
Building cover installed (October 2011)
Removal of building cover toward removal of fuel from spent fuel pool

Tasks

Identification of debris status on operating floor and inside pools. Countermeasures for dispersion of radioactive materials during building cover removal.

Immediately after the earthquake

Now



Unit 2

Current status

Blowout panel closed
Very high radiation level in the building

Tasks

Radiation dose reduction measures

Blowout panel

Unit 3

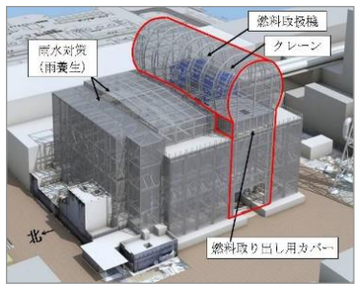
Current status

Debris removal from top of the reactor building completed (October 2013)
Installation of fuel removal cover and fuel handling facility planned

Tasks

Radiation dose reduction measures with remote-controlled heavy machinery

Cover and fuel handling facility for Unit3 pool



Image

Assembling roof parts Undergoing training at Onahama Port

Unit 4

Current status

Fuel removal from SFP completed (commenced November 18, 2013, completed December 22, 2014)

Cantilever structure installed

Removal of SF assemblies

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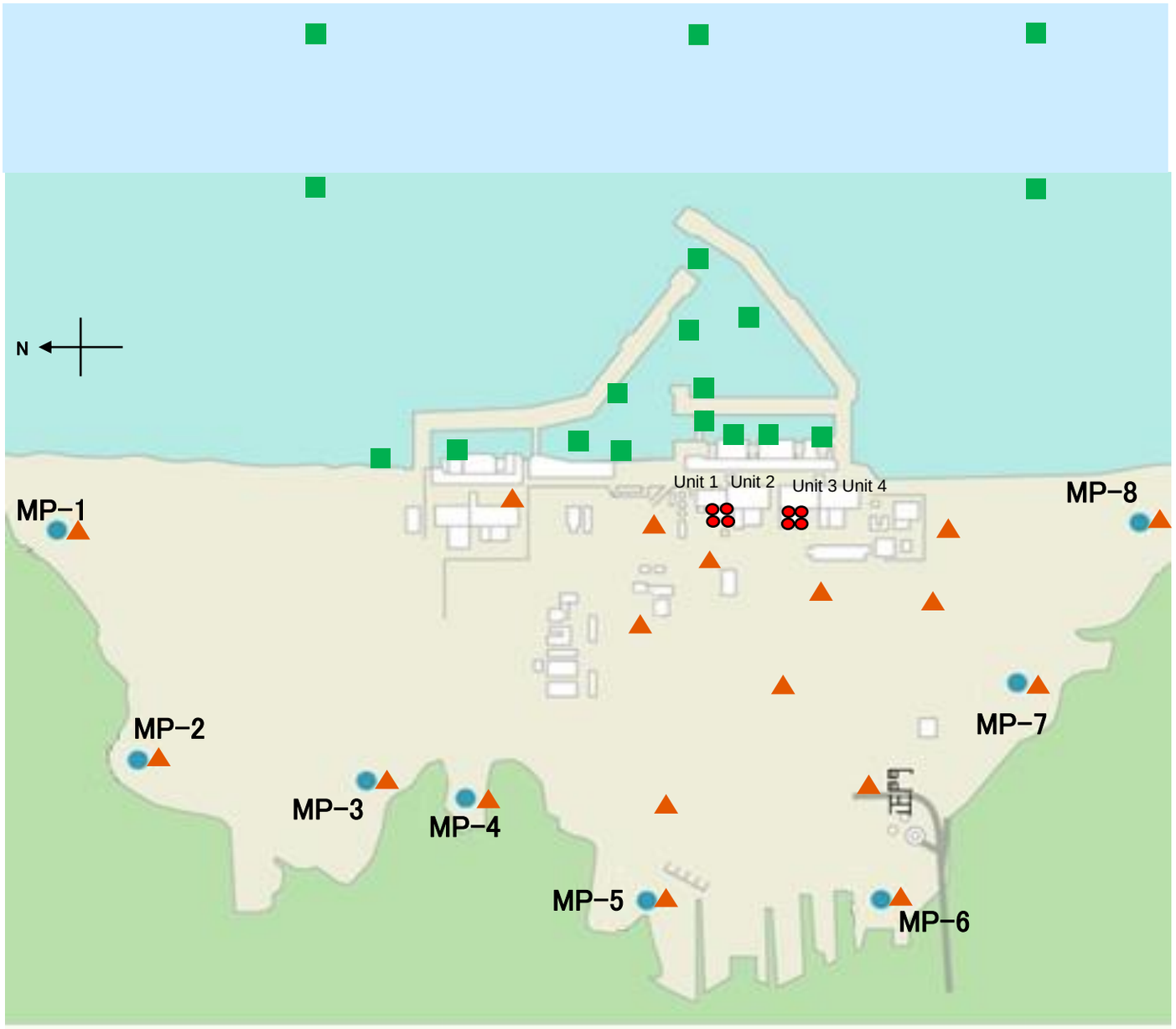
(3) Location of sampling and monitoring points

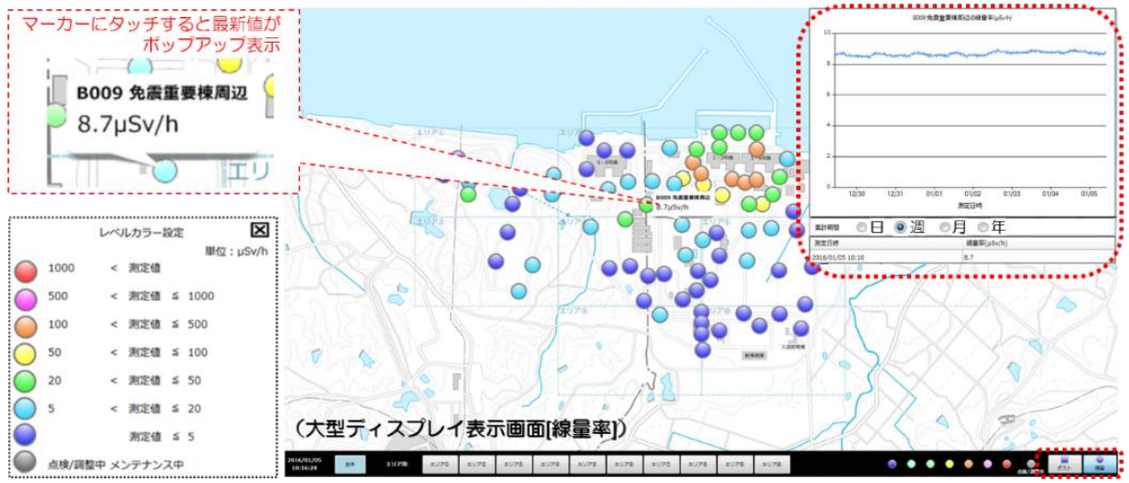
Location of sampling points, dust monitors and monitoring posts

- Dust monitors on the operating floor
- Dust Monitors
- Monitoring Post
- Sampling points in the sea area



Installation of dose-rate monitors

- System visualizing real time dose data in place.
- Data display monitors (86 points) placed where workers can easily access. Continuous dust monitoring data also shown on display.



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(4) Airborne Radiation Level

Release Rate Of Radioactive Materials Significantly Decreased

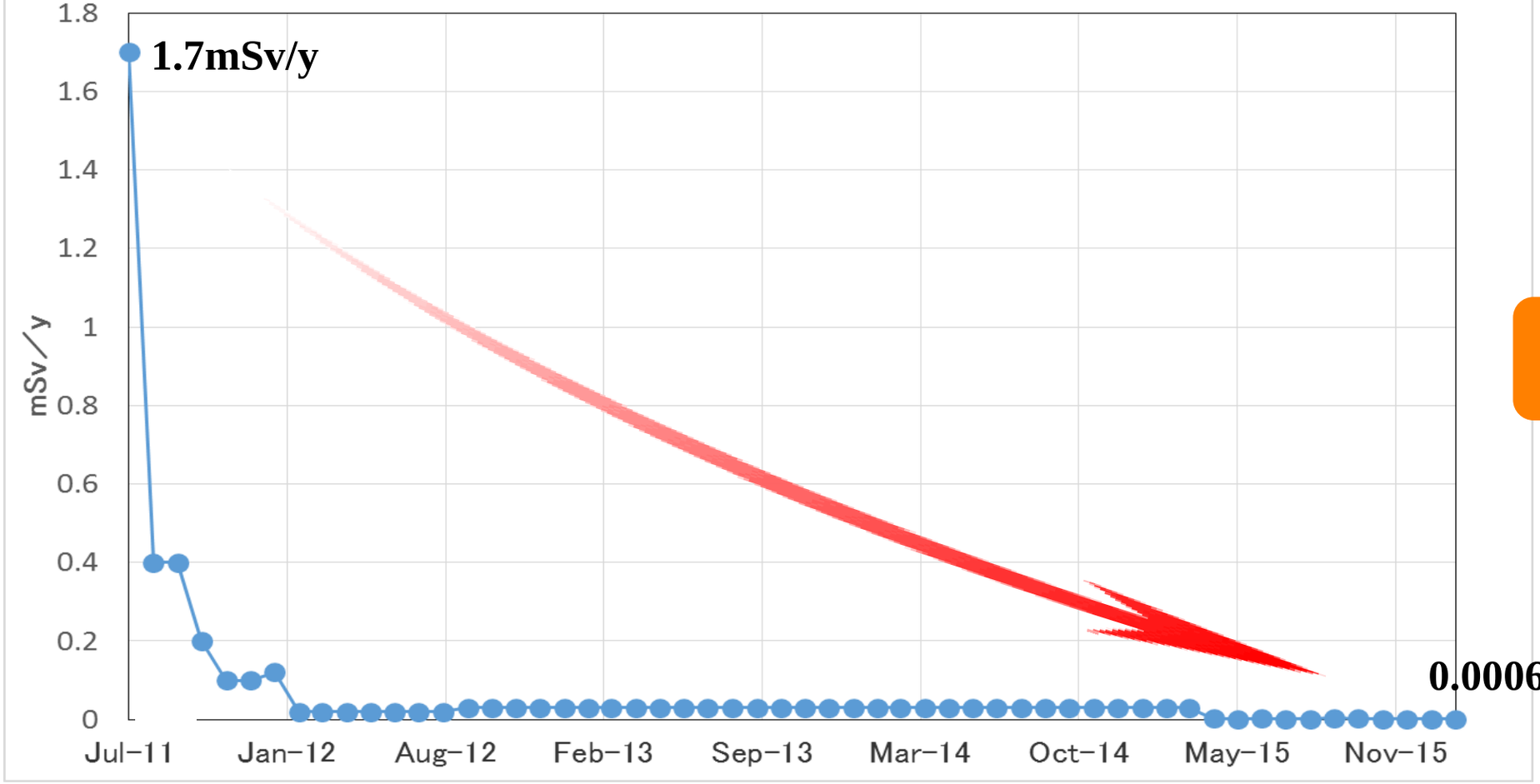
- Amount of radioactive materials (cesium) released from Unit 1-3 PCVs is assessed based on airborne radioactive material concentrations at top of reactor buildings

→ Estimated value of total release amount **(as of Feb 2016)** about 220 thousand Bq/hr

→ Accordingly, assessed the exposure dose at site boundary as maximum 0.00068 mSv/yr
(Excluding effect of already released radioactive materials)

→ **About one-4500th** compared to Jul 2011 (1 billion Bq/hr)

Exposure dose by radioactive materials (cesium) from Units 1 to 4



About one-3500th compared to exposure to natural radiation dose in a year

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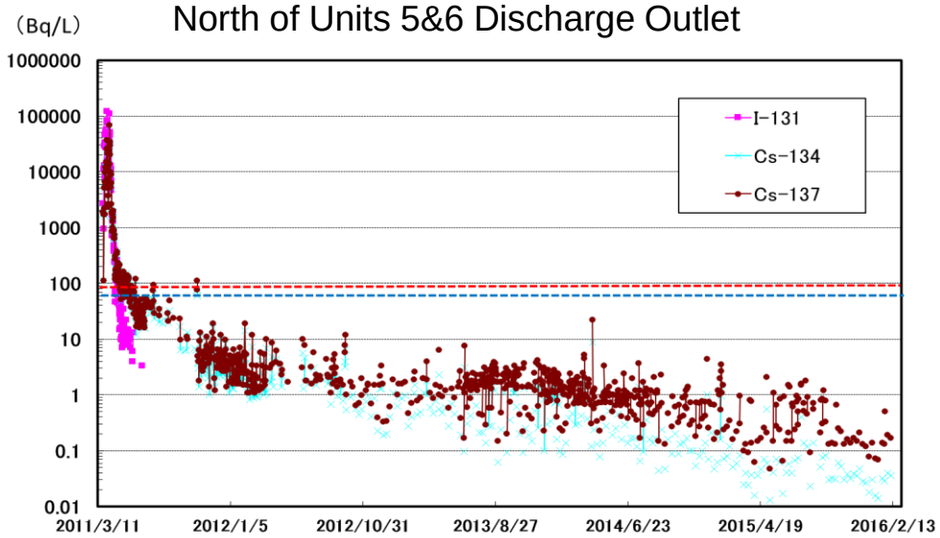
（5）Sea Area Monitoring

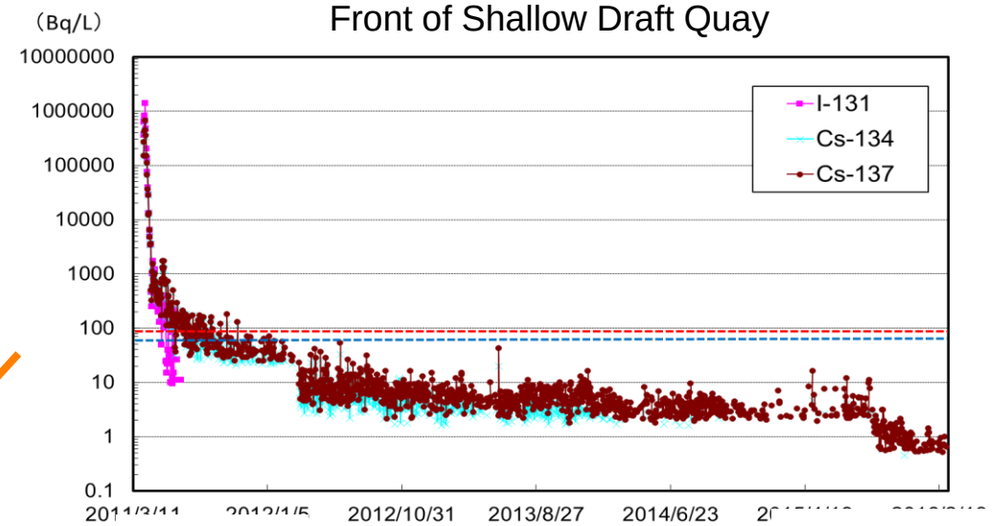
Radioactive Material Concentration In Sea Area Decreased By 1/1,000,000 After The Accident

North of Units 5&6 Discharge Outlet



Mar 2011 Feb 2016

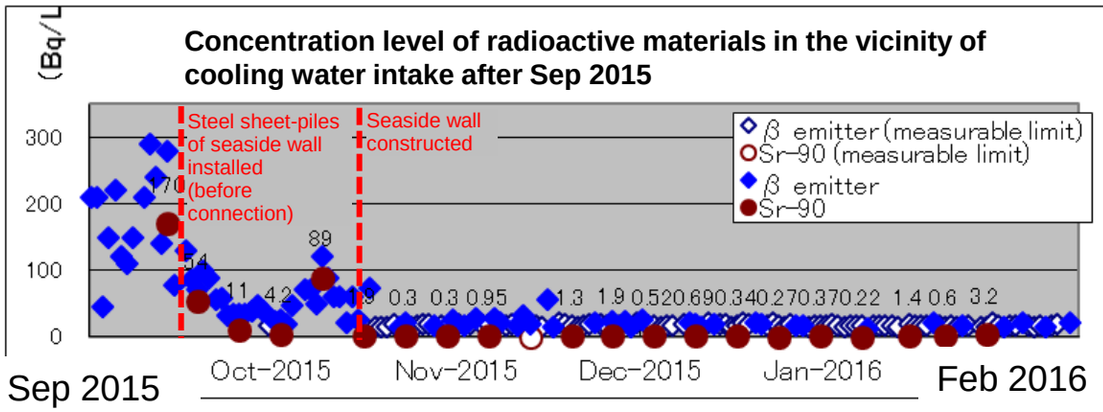
Front of Shallow Draft Quay



Mar 2011 Feb 2016

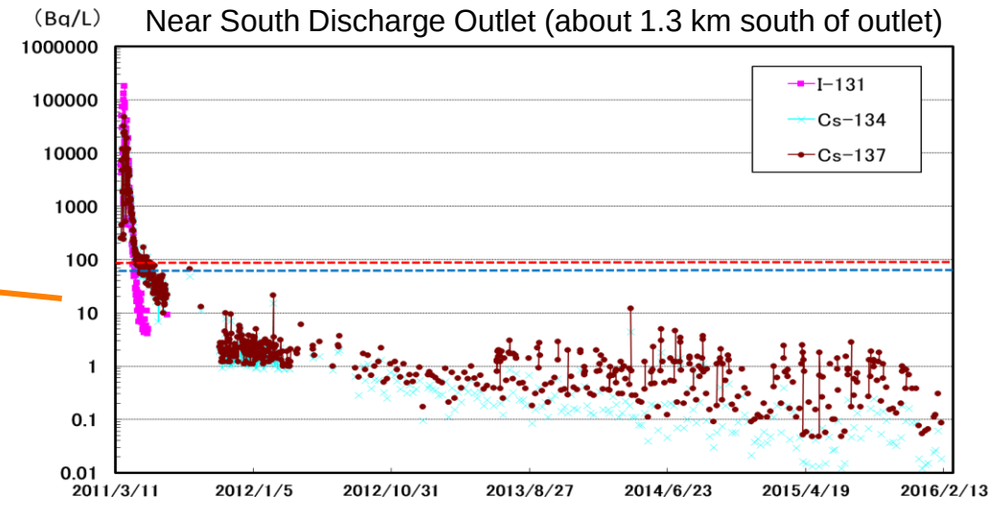
Concentration Limit Specified by the Rule
- Cesium 137: 90Bq/L
- Cesium 134: 60Bq/L

Concentration level of radioactive materials in the vicinity of cooling water intake after Sep 2015



Sep 2015 Feb 2016

Near South Discharge Outlet (about 1.3 km south of outlet)



Mar 2011 Feb 2016

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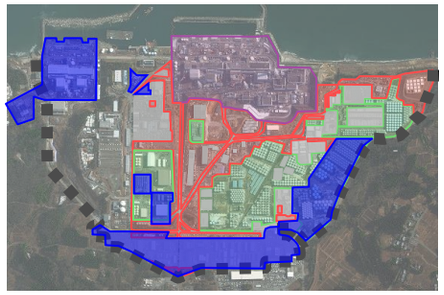
（6）Decreasing Site Radiation Dose

Decreasing radiation dose at Fukushima Daiichi

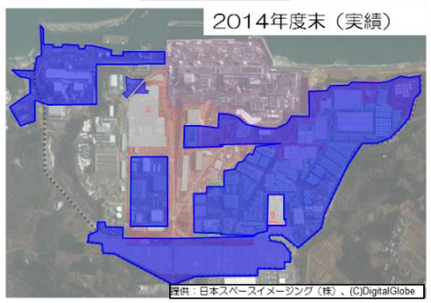
Performance
（Area comparison with FY2015 target）

: Area confirmed below targeted radiation dose（5μSv/h）
（confirmed on chest or at ground surface）

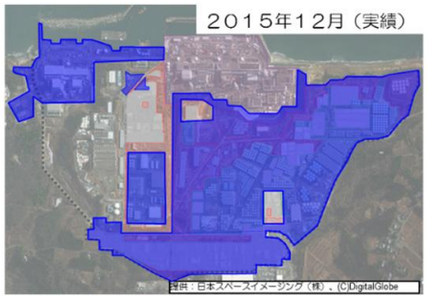
FY2013 40 %



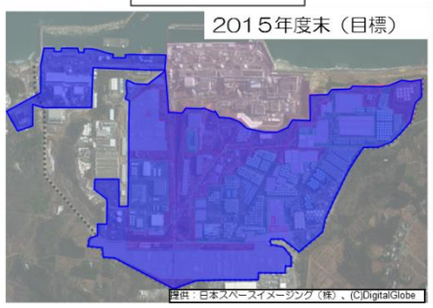
FY2014 77 %



As of Dec 2015 89 %

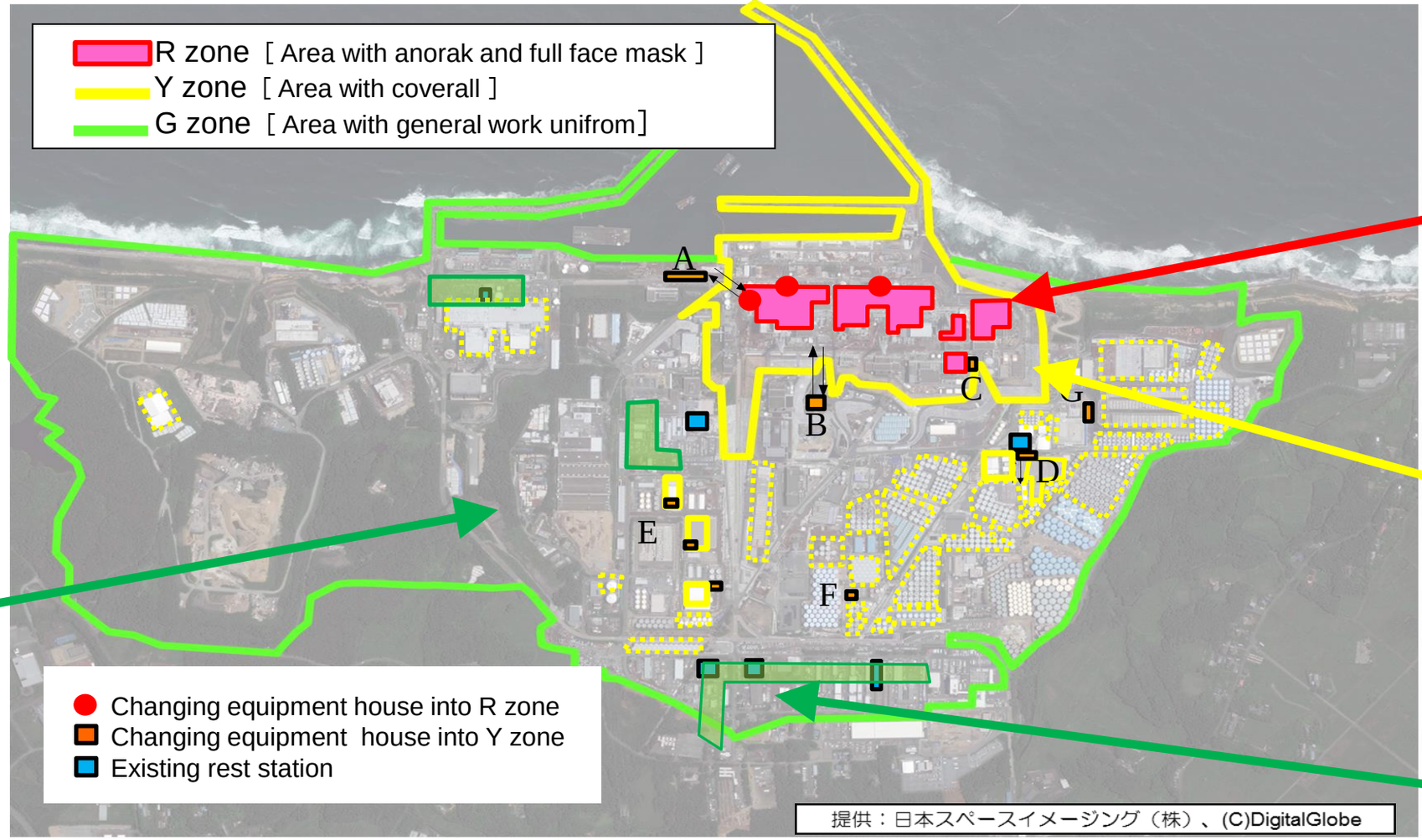


FY2015 target 100 %



Personal protective equipment in each zone

Green zone equipment



Full-face respirator

Half-face Respirator

DS2 Mask

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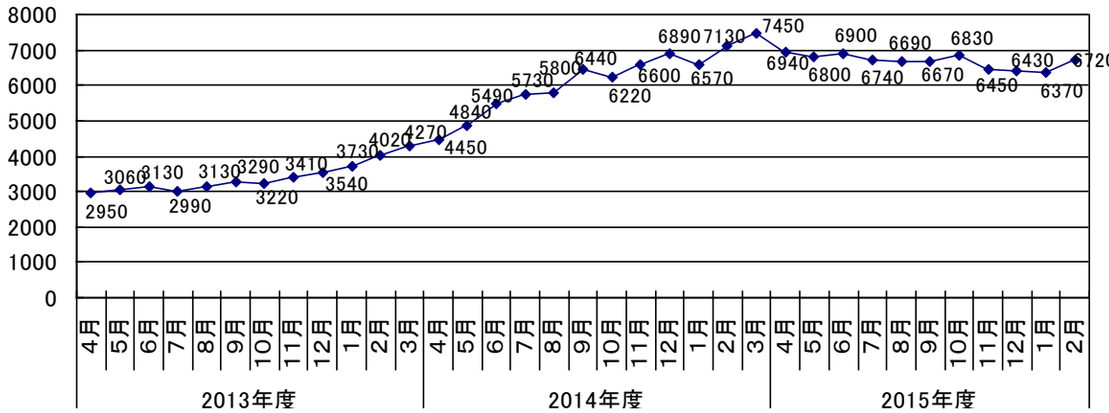
（7）Worker Security and Improved Work Environment

- Efforts being made to secure personnel over long term while managing amount of worker radiation exposure.
- Further efforts made for continuous improvement of work environment while understanding worker needs.

Changes in number of workers

- Number of workers per weekday (TEPCO employees and contractors) engaged in work during March assumed as approximately 6,390 people.
- Percentage of locally born workers approximately 50% in Jan.



Change in the average number of workers (actual value) per weekday in the months following 2013.

Improving work environment

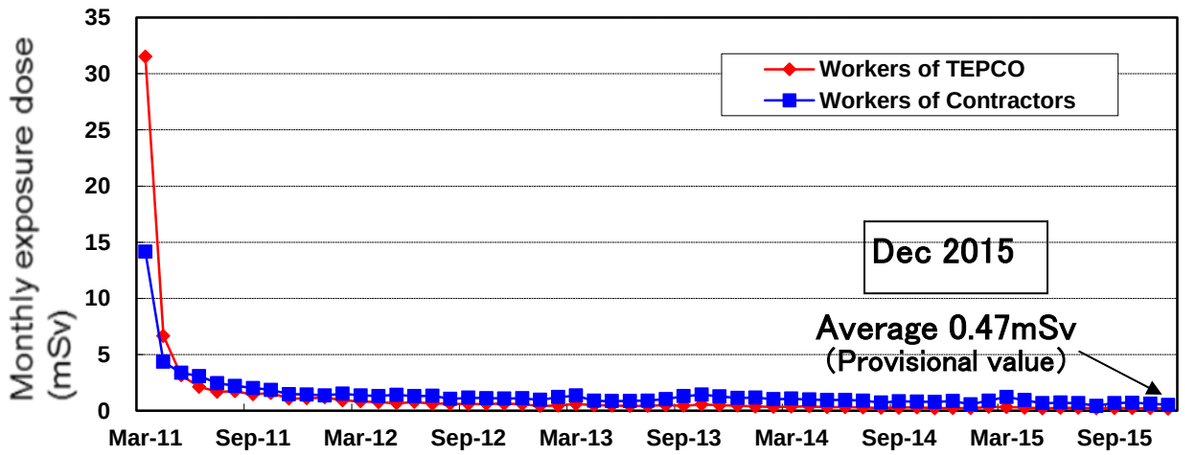
- New buildings at Fukushima Daiichi
  - Large rest house with a capacity of approx. 1,200 workers (from May 2015)
    →Convenience store “Lawson” opened on March 1, 2016
  - New office building close to the field (from 2014)
- Fukushima Revitalization Meal Service Center (from March 2015)
- Providing warm meals to Fukushima Daiichi
- Creation of employment opportunities
- Dispelling harmful rumors about Fukushima food

Large rest house

Ensuring stable long-term employment

- Importance of arranging a long-term work environment for contractors confirmed to steadily move forward with 4 decades of decommissioning work.
- Currently, approximately 90% of orders fulfilled by negotiated contracts.
- By securing long term workers, more deliberate personnel assignment and human resource development is possible.

Trend of monthly exposure dose rate



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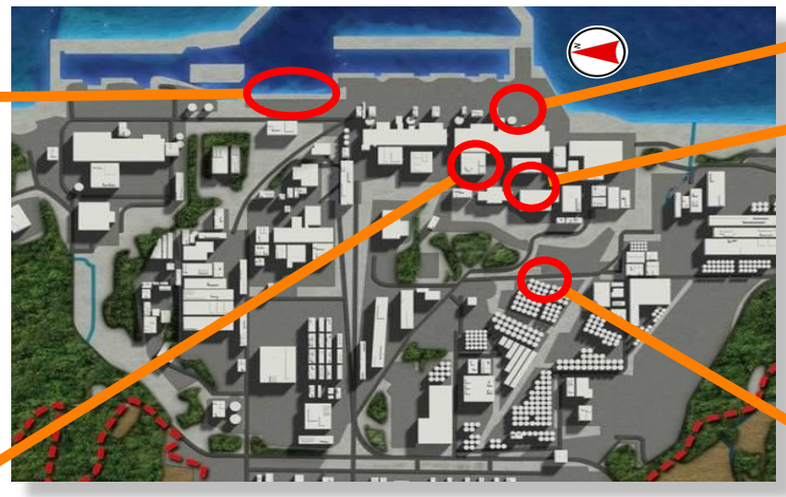
（8）Comparing “Before And After” Clean Up Work

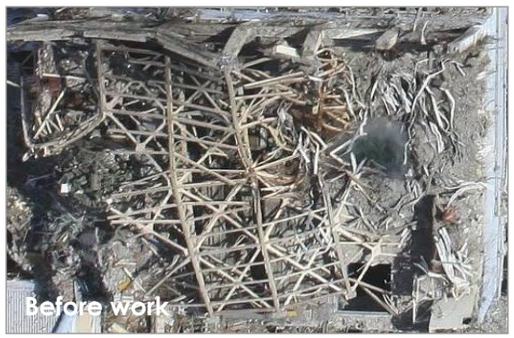
Restoration of revetment at shallow draft quay

Removal of tsunami debris



Installation of land-side (frozen soil) impermeable wall

Removal of scattered debris on top of Unit 3



Draining the ditches to preventing from rainwater inflow

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(9) Illustration of Roadmap Toward Decommissioning

Roadmap Target (formulated Dec 2011, revised Jun 2013 and Jun 2015)

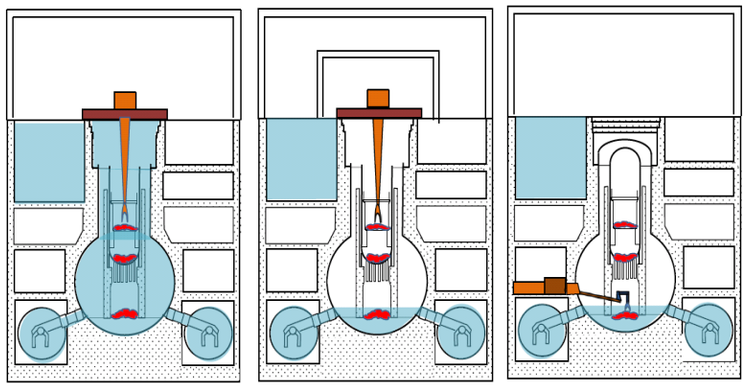
Stabilization efforts	Dec. 2011	Dec. 2013	30～40 years later
＜Cold shutdown achieved＞ ・Cold shutdown ・Significantly reduce radiation release	**Phase 1** Period to commencement of fuel removal from the spent fuel pool (within 2 years)	**Phase 2** Period to commencement of fuel debris removal (within 10 years)	**Phase 3** Period to completion of Decommissioning measures (30 to 40 years in the future)

Started at #4 unit on Nov18, 2013.

※Fuel debris (Fuel, cladding and other material that melted and hardened again)

Fuel debris removal (Units 1, 2, and 3)

In terms of reducing radiation exposure during the work process, the most reliable method of fuel debris removal is to remove the fuel debris while submerged. But depending on the results of future investigations, we may adopt a substitute method such as taking fuel debris without filling the primary containment vessel with water.

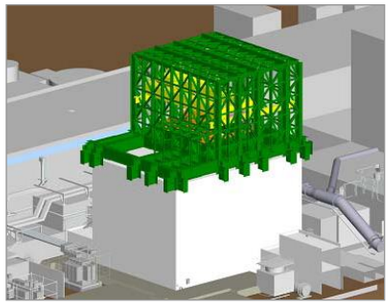


Fuel Debris	submerged	open air
Removal Channel	Upside	Side
Challenge	Waterproof and Earthquake proof	Shielding radiation and radioactive dust

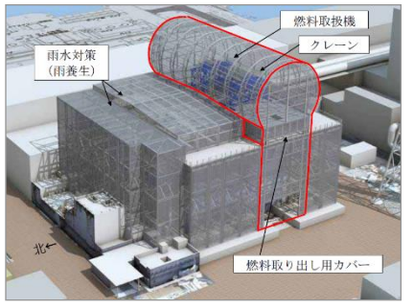
Construction method for fuel debris removal (image)

Spent fuel removal plan (Units 1, 2, and 3)

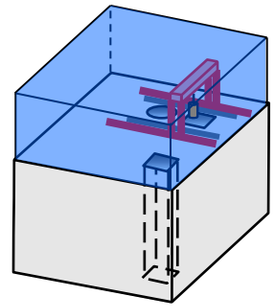
FY	2015	2016	2017	2018	2019	2020	2021	2022
Unit 1	Building cover demolition		Rubble removal		Cover installation		Spent fuel removal	
Unit 2	Upper building demolition Preparation Rubble removal			Plan① Container installation Plan② Cover installation			Spent fuel removal	
Unit 3	Building cover installation			Spent fuel removal				



Frame for Unit 1 pool



Cover for Unit 3 pool



Equipment for Unit 2

To facilitate the removal of fuel assemblies and debris in the Unit 2 spent fuel pool, we decided to dismantle the whole rooftop above the highest floor of the Reactor Building.

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2. Intensifying efforts for dialogue with local residents

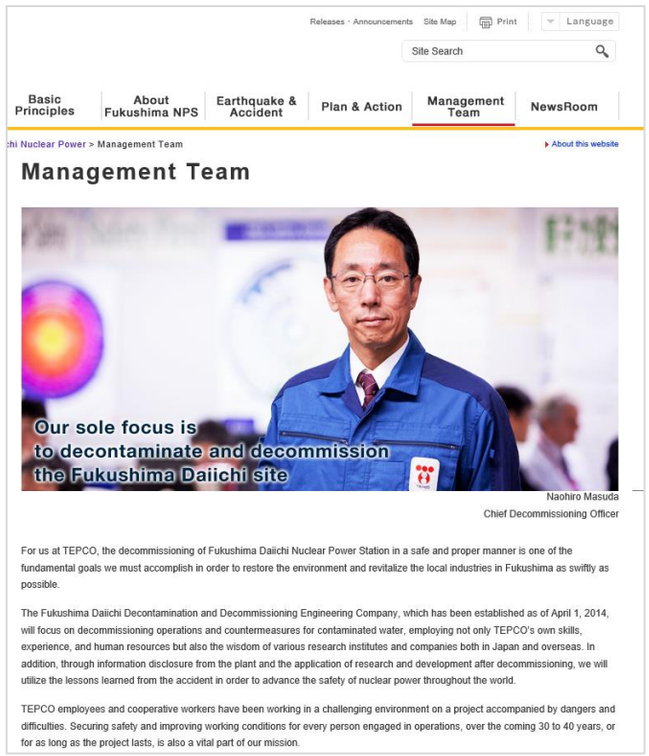
（1）Information Sharing and Communication

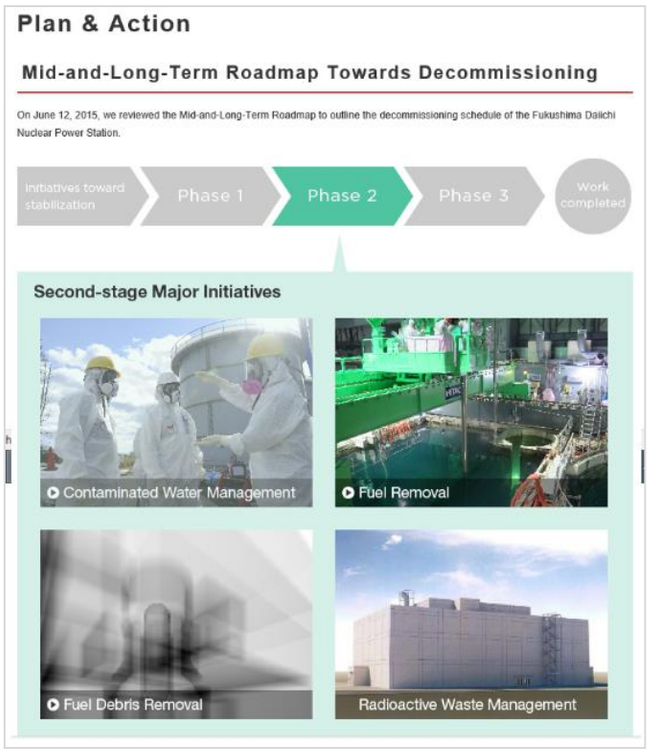
In accordance with agreements, TEPCO reports to local governments about the progress of decommissioning. TEPCO also informs them of any accidents or problems at the site.

TEPCO reviewed data analysis result reporting results to ensure easy access of the latest data of radioactive dose.

More visualized information and videos available to enhance understanding of decommissioning work.

Website layout (http://www.tepco.co.jp/nu/fukushima-np/index-j.html）reviewed to facilitate specific topic search.





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Feb. 25, 2015 Fukushima Minpo

福島民報

15.2.25

第一原発 汚染雨水 港湾外に流出

東電、昨年4月に把握

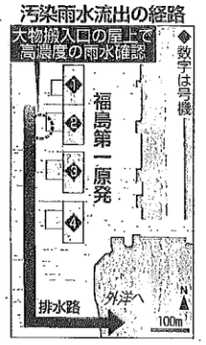
東京電力は二十四日、福島第一原発で、2号機原子炉建屋屋上の一部にたまる高濃度の放射性物質を含む雨水が構内の排水路を通じて港湾外の海に流れ出ていたと明らかにした。東電は汚染水の海洋流出を昨年四月までに把握し原因を調査していたが、公表はしていなかった。

この排水路は1～4号機原子炉建屋付近の山側を通り、4号機南側で外洋につながっている。2号機原子炉建屋の入り口のうち、大型トラックなどが出入りする「大物搬入口」の屋上にたまった雨水からは、放射性セシウムが一㍑当たり二万九四〇〇㌔、ストロンチウム90などベータ線を出す放射性物質が同じく五万二〇〇〇㌔検出された。

放射性物質の海洋流出を防ぐ対策が取られていない港湾外の排水口では、一㍑当たり最大で放射性セシウムは一〇五〇㌔、ベータ線は一五〇〇㌔検出されていた。東電は「これまでの測定結果、港湾外の海水の放射性物質濃度に目立った変動はない」としている。

東電は今後、屋上の雨水の排水溝周囲や建屋西側の排水路に、セシウムを吸着するゼオライトを入れた土のうを置くなどして汚染拡大を防ぐ。

汚染雨水流出の経路



二十二日には港湾内に雨水を排水する別の排水路で放射性物質濃度が急上昇した。

対策の安全性 疑問

漁協関係者

東京電力福島第一原発で、高濃度の放射性物質を含む雨水が港湾外の海に流出していたことについて、相馬双葉漁協の遠藤和則総務部長（57）は「放射性物質が」海に漏れ出すことを最も避けてほしいのが漁業者の強い気持ち。トラブルが相次ぐ状況が続くようでは、あらゆる対策の安全性に疑問を抱かざるを得なくなる」と懸念した。

Feb. 25, 2015 Fukushima Minyu

福島民友

汚染雨水が港湾外流出

第1原発2号機屋上 東電、昨年5月に把握

東京電力は24日、福島第1原発2号機の原子炉建屋屋上の一部に、高濃度の放射性物質を含む雨水がたまっているのを確認したと発表。この雨水が排水路を通じて外洋（港湾外）に直接流出していた可能性が高いことを明らかにした。

東電は昨年5月、2号機西側から港湾外につながる排水路の放射性物質濃度が他の排水路に比べて高いことを把握し、原因はいたが、海洋流出を防ぐ措置は講じていなかった。

問題の排水路は4号機南側で外洋につながっている。東電は「港湾外でのモニタリングで海水の放射性物質濃度に目立った変動はない」としている。

東電によると、雨水が見つかったのは2号機原子炉建屋に大型機器などを運び込む「大物搬入口」の屋上。放射性セシウムが1㍑当たり2万9400㌔、ベータ線を出す放射性物質が5万2千㌔含まれていた。

東電は今後、屋上にある雨水の排水溝の周囲や建屋西側の排水路に、セシウムを吸着するゼオライトの土のうを置くなどして汚染の拡大防止に努めるとしている。

22日に放射性物質濃度が急上昇した排水路は汚染水を保管するタンク群の近くを通るもので、今回の排水路とは別。

Feb. 26, 2015 Fukushima Minpo

15.2.26 福島民報

第一原発 汚染雨水流出

知事「極めて遺憾」

東電対応批判 早急な対策要求

東京電力福島第一原発の2号機原子炉建屋大物搬入口屋上から汚染雨水が排水路を通じて外洋に流出していた問題で、内堀雅雄知事は二十五日、情報を公表してこなかった東電の対応を「極めて遺憾」と批判した。その上で、東電に対し、汚染源の除去など早急な対策を求めた。

（2・31面に関連記事）

内堀知事は県庁で開いた緊急の原子力関係部長会議で「県民に大きな不安を与える問題であり、速やかな情報の公表がなされず極めて遺憾」と述べた。①放射性物質の流出防止策の徹底②海水の放射性物質濃度と空間放射線量の測定強化③県民への分かりやすい情報提供などを東電に対し求めるよう県担当者に指示した。

さらに、県廃炉安全監視協議会の専門委員らを二十七日、福島第一原発に派遣し、立ち入り調査することを決めた。

会議で県原子力専門員は「問題の排水路のほかに海への流出がないか再点検すべき」と指摘。ほかの専門員は「屋上の排水溝から排水路に入る前の雨水を浄化するなどの対策を検討すべき」とした。

「海水の放射性物質濃度が上昇しなくても、流出したこと自体が問題」と厳評などを懸念する意見も出た。

外洋に汚染された雨水が流出していた排水口では、一㍑当たり最大で セシウム134が二八〇㌔、セシウム137が七七〇㌔、ストロンチウム90などベータ線を出す放射性物質が一五〇〇㌔検出された。汚染水対策として昨年五月から実施している地下水バイパスの排出基準は、セシウム134、137ともに一㍑当たり一㌔未満、ベータ線を出す放射性物質は同じく五㌔未満としている。

会議では二十二日にタンク群から港湾内につながる別の排水路で放射性物質濃度が急上昇した問題についても、早期の原因究明と再発防止策の徹底などを求めた。

県漁連が同日開いた組合長会議でも出席者から反発の声が上がった。

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（2）K Drainage Information Disclosure（Cause and Measure）

- In February 2015, Tepco’s report on the outcome of radiation analysis to the NRA including detection of large concentration, Tepco was highly criticized for inappropriate disclosure.

- After 3rd party examination and verification, the following two points were indicated as the main cause of inappropriate disclosure

  ① Cultural issue : Spirit of information disclosure was not widely spread internally

  ② Systematic problem : Past information disclosure policy not actually implemented

Taking these seriously, Fukushima D&D Engineering company intensified the following:

- Management level of engineers sit in press conference to understand the public relations activities. Risk Communicators sit in important meetings to heighten sensitivity toward information disclosure.
- Establishing mechanism of managing what the company promises and reflecting into daily operation
- All radiation data should be publicly available with creation of appropriate reporting system and responsibility identified.

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(2) K drainage information disclosure (new policy and intensification of dialogue)

March 30, 2015 announcement “New efforts and company’s management for information disclosure” introduced the following measures.

1. New mechanism on information disclosure

Plan	Achievement
① Disclosure of all data on radiation at Fukushima Daiichi ② Data available on the web ③ Periodic monitoring and evaluation by third party	Data disclosure started from April 2015 • 70,000 radiation data samples on the web • Introducing the mechanism of reviewing disclosure process • Topics on data variation explained at press conference

2. Structural change

Plan	Achievement
• Strengthen capacity of Risk Communicators (RCs)	• Increased number of RCs at Fukushima Daiichi • Strengthen capacity of RC proposals to D&D Engineering company

3. Intensifying dialogue with local stakeholders

Plan	Achievement
① Establishing new platform to exchange views with local residents ② Intensifying efforts to visit local residents	• Preparing to establish new platform • Fivefold increase of local resident visits (communities) compared to previously • Continue to strengthen efforts to have direct dialogue with residents in 12 towns or villages where evacuation directive is applicable.

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（3）Intensifying Communication Before Unit 1 Building Cover Removal

- In removing the Unit 1 building cover, local government expressed concerns over possible contaminated dust dispersion as rice exceeding legal radiation level was found in Minami-Souma.

▼

- In order to respond seriously, Tepco, which originally planned to begin building cover removal in summer 2014, repeatedly explained countermeasures against dust dispersion and exchanged ideas with local governments including Fukushima Prefecture.

▼

Additional measures taken as a result

- Strengthen countermeasures against dust dispersion
- Strengthen dust monitoring including additional dust monitors
- Strengthen notification system to local governments
- Evaluate effectiveness of proposed measures by temporarily removing two roof panels from Oct to Dec 2014
- Provide information on daily work, values at monitoring posts, and live camera data on website.

Roof panel removal began afterward in July 2015

Sep 11, 2012

Nov 10, 20114

Live camera data

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（4）New information tools (Visualizing decommissioning tasks)

Video footage or 3D/CG used to enhance public understanding of decommissioning work, especially topics of high social interest. Materials are provided through various channels including website and press conferences.

Example of 3D Graphic

Example of Video (Tank replacement)

Example of Video (Reconstruction)

New information channels

- Website
- Twitter
- Facebook
- YouTube
- Meetings
- Press conferences, etc.

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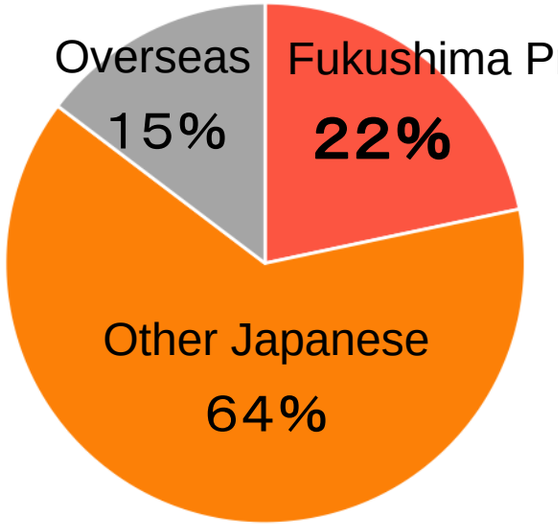
（5）Information to Residents（1/2：Opportunities for Site Visit）

Information by Site Visit

- Offering opportunities to local governments and communities, the number of visitors from Fukushima Prefecture is increasing, increasing from 20% to 30% in FY 2014.
- Tepco strives to offer more opportunities to meet local community requests.

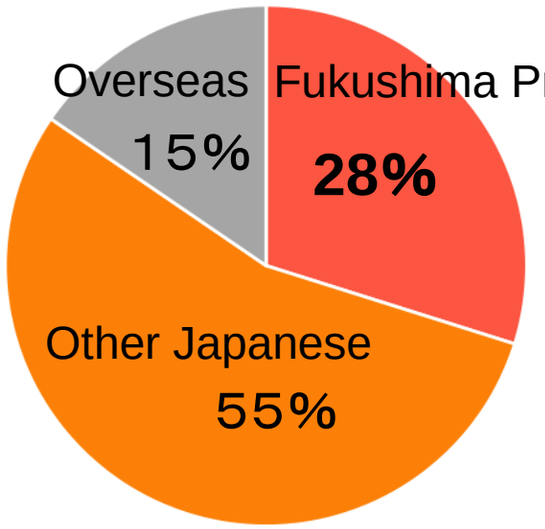
Visitor Trend

【FY 2014】



Total：4,727

【FY 2015】※



Total：6,723

The number of total visitors after the accident exceeds 17,000.

Visitor Feedback

- ✓ Understand the progress of decommission work
- ✓ Decommissioning is cutting edge & large scale project
- ✓ Field site with the latest R&D including robot technology etc.

Site visit by Kazurao-mura community leaders

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（5）Information to residents（2/2：Direct dialogue with residents and meetings）

- Direct communication with local residents by visiting provisional housing and public relations magazines.
- Information through various channels such as local governments, community leaders, and businesses.

- Meeting local residents to explain decommissioning work especially topics of social interest.
- Building mutual confidence by answering community questions in person.

Examples

- Tepco employees visit provisional housing to explain progress.
- Communication activities including patrol of communities in Naraha Town, Kawamata Town, Katsurao Village and Minamisoma City.
- Leaflet on decommissioning work provided with public relations paper by local governments.
- Strengthen efforts to provide site visit opportunities.

Example : Meeting with Hirono residents on Dec 2 2015

① Participants：29
② Topics
- Removing Unit 1 building cover
- Training facilities for removing the building cover in Hirono town

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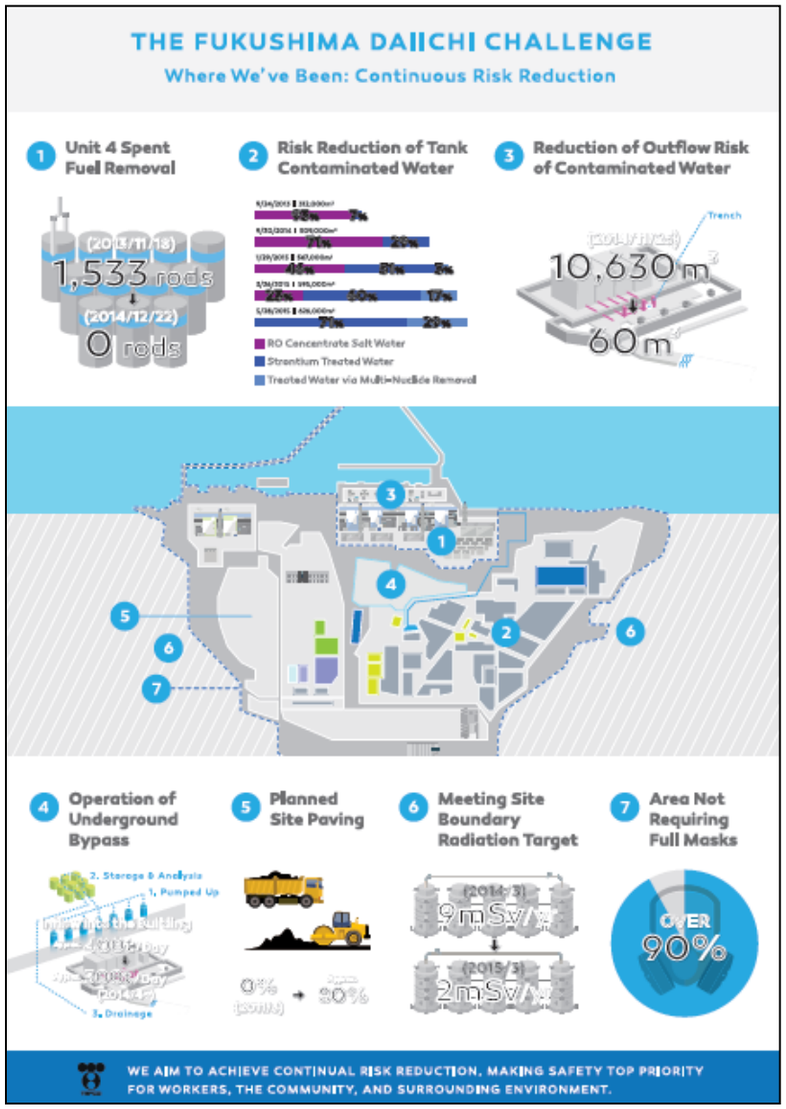
（6）International Communication Activities

- At IAEA General Conference in Sep 2015, Japanese government and companies prepared panels in co-operation. Tepco also used panels and leaflets to explain the status of decommission work.
- Intensifying efforts targeting Asian countries, particularly Korea and Taiwan, to mitigate reputational damage and actively proposing site visit/interviews.



Infographic flyer

Media Coverage in Asia

YONHAP News Korea： September 14

Objectively covered start of subdrain

China Television Company（CTV）： Aired on Nov 7　2015「60 min」

Reported current status of Fukushima Daiichi as normal construction site though previously like a war zone

- **China Business News（Shanghai）：On Nov 5 2015**

  Reported current status of Fukushima Daiichi and various measures learned from the Fukushima accident implemented at Kashiwazaki-Kariwa NPS

- **Singapore Press Holdings（Singapore）：On Nov 25 2015**

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（7）Communication with on-site workers（website launch）

- October 2015: “1 FOR ALL JAPAN,” launch of website specifically designed for on-site workers and their families
- Monthly paper “Ichiefu (1F)” simultaneously issued and delivered at Fukushima Daiichi NPS and J-village.

http://1f-all.jp/

Simple layout, large font size and accessible from smart phones

MENU　BUS SERVICE TABLE　DATA　REPORT


福島第一原子力発電所で働くみなさんへのお知らせ

月刊 いちえふ。 創刊号

1F FOR ALL JAPAN 事務局

とびっくす

インフルエンザの予防接種 ただ今、受け付け中！

インフルエンザの発症の予防と感染拡大防止に向けて、予防接種がスタートしました。予防接種が受けられる場所と日時については、各企業の担当の方にご確認ください。

11月の重点基本行動 運行前の車両点検 ヨシッ！

11月9日から15日まで、「秋の全国火災予防運動」が実施されます。車両からの油漏れは火災のおそれがありますので、火災予防の意識を高め、油漏れゼロを目指しましょう。

天神岬温泉の「しおかぜ荘」が営業再開しました

9月16日から、天神岬スポーツ公園内の天神岬温泉「しおかぜ荘」が営業再開しました。営業時間や利用料については、「しおかぜ荘」にご確認ください。電話：0240-25-5726

1Fを守る仲間たち 01

「廃炉をやり遂げよう」とする みなさんの心意気を感じます

浅村 忠文さん
鹿島建設株式会社　東京土木支店
福島第一凍土遮水壁工事事務所　所長

廃炉における汚染水処理は、重要で緊急性の高い仕事です。「凍土遮水壁」は汚染水処理の対策のひとつで、2013年度にスタート。「原子炉建屋のまわりに“氷の壁”をつくり、汚染源に地下水を近づけないことで建屋内の汚染水の発生を減らす対策です」と語る、凍土遮水壁の工事責任者、鹿島建設・所長の浅村忠文さんにお話を伺いました。

――工事のあらましと、このあとの予定を教えてください。

浅村さん：現在、1日約300トンの地下水が建屋内に流れ込んでいます。この地下水が原子炉を冷やしたあとの水と混ざり、汚染水を増やしています。そこで、1～4号機の建屋群を囲む地下に凍結管を1メートル間隔で埋めて、その中にマイナス30度の液体の冷却剤を循環させて地盤を凍らせます。総延長1500メートル、深さ30メートル、厚さ2メートルもの巨大な氷の壁が完成すると、地下水の流入を1日100トン未満に減らすことができます。山側（北・西・南側）は今年7月に凍結管の設置を完了、海側（東側）も11月完了の予定です。凍結を始

1981年入社。14年福島原子力室に所属。95年から鉄道建設に携わり、つくばエクスプレス「つくば駅」など、主に開業後の鉄道関連で所長を務める。震災後は1Fのほかに、岩手県宮古市田老地区の防潮堤事業にも参加

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Thank you for your kind attention!!

TEPCO