: R&D

Red letters, red boxes: revisions

				A	As of July 30, 2012				
Issues			Step2		Phase 1		Phase 2 (Early)		
			Completed				✓ SFP Fuel Removal Start		
				FY2011	FY2012	FY2013	FY2014		
Action p	ction plan for mid-term issues Plan			Response b <mark>as</mark>	ed on the plant operation	\rightarrow	\rightarrow		
			8 m	Ongoing Monitoring of Reactor Cold	Shutdown States (Maintain water injection	and monitoring using temperatu	re and pressure parameters etc.) \rangle		
ല്≦	Plan for Reactor Cooling		Condition uivalent t d Shutdov		Partial Internal PCV Inspection		· · · · · · · · · · · · · · · · · · ·		
n C				Improving the Paliability of Circulatio	ng Water Cooling (water withdrawal from tu	urbing building)	/ <mark> </mark>		
ong Pl			s ∘ ∾						
lan for ning P going S State			in P		ment with current treatment system		Processing via Reliability Improved		
e g P for			int o		bility of Existing Facilities etc.	> Water Processing Fac			
Plan for Maintaining Plant in an Ongoing Stable State	Plan for Aco		tion of Ac Wat		inking circulation line	Conduct work based			
ole in	Water Pro	ocessing	of t or n	Cleanu <mark>p,</mark>	restore sub-drain pit		n system when ready→Reduce		
_			otal Iulat		Groundwater bypass installation wo	ork/ operate when ready	e groundwater inflow amount (reduce accumulated water		
			ed	Install multi-nuclide removal system		urification of on-site stored water	Σ		
ν Ο τ	Plans to Mit	tirata Saa	Mitig Cont		Water Shielding Walls Installation	n			
רומח Dosa as a			ate O. Jamina	Covering Sea	bed Soil in front of the Intake Canal, Circu	llating Seawater Purification (ong	ding) etc.		
			cean Ition		Underground Water and Seawater	Monitoring (ongoing)			
ג כסי	Pla Was Dose	Rubble etc.	Miti _i Stora		stable storage and improve reliability				
	Plans for Radioactive Waste Management and ose Reduction at the Si Boundaries	Rubble etc.	itig	Reduce Radiation Dos <mark>e f</mark>	from Stored Rubble etc. via Shielding	Conti	nue Reduction Efforts		
and to Mitigate	s for Mar Bou	Secondary Waste	ate]e∕N		Continue Storage				
t o x	Rad Nage tion	from Water Treatment	Sca	Stored Water Treatment via Shielding etc. Redu			rue Reduction Efforts		
ce Kadio Power Ind to M	ioact ment at th	neathent	from Water Treatment Iseous/Liquid		condary Waste from Water Treatment and	Storage Container Lifespan	Facility Replacement Plan Development		
Sta Nitig	tive t and ne Sit	Gaseous/Liquid Waste	ring	PCV Gas Control System Installation					
Nitigate	te		- T		Land/Sea Area Monitorin		<u>└───</u>		
ΨΞΦ	Onsite Decontamination Decontamination Systematic Onsite Decontamination				ntamination				
		SFPs of Units 1-4	7	Circ <mark>ula</mark>	ation Cooling of the Pools (Improve Reliability v	ia maintenance and replacement etc			
			Nore	Removal of Rubb	ole/Cover for Fuel Removal /Cask Procuremen	t/Install or Repair of Fuel Handling			
							Fuel Removal		
	Fuel Removal ent Fuel Pool Common Pool		Stable	Port restoration (crane restoration		g area restoration)	Storage of Fuel Assemblies Removed from SFP		
from Spe			Ö	Cask Manufacturing (s Common Pool Rest		<u>sk Manufacturing/ Delivery (sequent</u> mmon Pool Fuel Removal and Facilit			
		R&D		Long-term Integrity Assessment of Fuel			y mounications		
						Consider Handling	Method of Damaged Fuels from the SFPs		
		Decontamination of		Decontamination Technology Investigation /	Remote Decontaminating Equipment Developm	nent			
		the Inside of the Reactor Building	0		<u> </u>		ntamination and Shielding etc. (Ongoing)		
	Inspection		Inspectio		ond	Design, Manufacture and Test, etc. of P	CV Leakage Point Survey Equipment		on of Leakage Points (including field test of R&D
		Leakages inside Fuel Debris	Condition	Design, Manufacture and Test, etc. of In					
		Removal Safe Storage,	()	Design, Manufacture and Test, etc. of In	Iternal POV Inspection Device		tigate Outside of PCV (including field test of R&D		
Fuel Debris	s Removal Plar	Processing and	Equivalent Shutdown			Development of Fuel Debris Container (investigation of existing technology, selection of st	orage system as well as development of safety assessment techno		
		Disposal of Removed Fuel	aler own	Investigation and Development of Processin Establish Measuring Method to Weigh Fuel D					
		Reactor Building	nt to	Establish Measuring Method to Weigh Fuel	Jebris				
		Container	0						
		RPV/PCV	old	Development of Integrity Assessment Tec <mark>h</mark>	nology for RPV/PCV Corrosion		X		
		Integrity Maintenance		Corrosion Prevention Measures (reducing oxygen dissolved in the reactor coolant via nitrogen burbling)					
Reactor Disma		Dismantling Plan		Investigate and Develop a Database Establis	shment Plan	Establish a Basic Database	(contamination status etc) for Reactor Facility		
Radioactive \ Processing/D		active Waste				Understanding Wast	e Characteristics, Assessment of		
Processing/D	lopooul	g∕Disposal Plan		Development of R&D Plan for Processing	Disposal		Optimal Waste Disposal		
Organiz	Organization & Staff Planning		Enhancement o Environment	Systemat	ic Staff (including from partner companies) Trai	ining/Allocation, Improving Motivatio	n. etc.		
_									
Worker Safety Plan			Radiation Dose Control	Continue to Promote Sa	fety, Maintain and Improve Radiation Protection	n weasures, Continuously Maintain N	iedical Gare System		

▼As of July 30, 2012

Progress Status of Each Plan (1)

: On-site Work
:R&D
: Considerations d boxes: revisions

▼As of July 30, 2012 Red letters, red boxes: revisions									
Issues		Phase 1	Phase 2 (Early)						
	Step2 Completed	EV2012		FY2014					
Action plan for mid-term issues	FY2011 Response Based on the P	FY2012 ant Operation Plan	FY2013						
Plan for Reactor Cooling	Install alternate thermome Partial Internal PCV Insp Diffected Unit Using Microson Unit Using Microson 3 Measurment a Improving the Reliabil	Narrow down system to insert alternate thermometer for UNArrow down system to insert a	Jnit 1 RPV Jnit 3 RPV F PCV Situations, and r Remote Monitoring of PCV S I PCV Temperature/PCV Water PCV Situations, and Direct V Water Level ☆ vithdrawal from turbine bu source: 3u CST	ituations, and Direct ar Level ☆ also explore the possibility of PCV Inspectior					
	Accumulated water treatment with current treatment system								
	Improve reliability of current system (ir PE pipes for major pipes in larger circu	prove reliability of transfer, treatment, storage facility)	Accumulated water with improved reliab	treatment with water treatment system ility					
Plan for Accumulated	Study PE pipes for branch pipe pressu Tank leak spread prevention measu soil dykes, covered drainage chann Study shu	mpes (RC curbs)	duct work based on study res						
Water Processing	Clean−up∕ restore workable	sub-drain pits	Study restoration methods for sub-d	rains that would interfere					
	with work in area→Restore □□□□ Groundwater bypass installation work Reduce groundwater inflow amount (reduce accumulated water) Operate as ready, reduce groundwater Reduce groundwater inflow amount (reduce accumulated water)								
	Install multi-nuclide removal system (c Install multi-nuclide removal system (S		Purify on-site	stored water					

Progress Status of Each Plan (2)

	Progress Status of Each Plan (2)									
▼As of July 30, 2012 Red letters, red boxes: red										
	Issues			Phase 1				Phase 2	(Early)	
		Step2 Completed								
		FY2011	FY2			FY20			Y2014	$\dashv \dashv$
				uction of the Risk of Expa		a Water Contamination	on when Contami	nated Water Leaks	,▼	
		Water Shielding Walls		Install steel-pipe-sh	ieet-pile		>			
Diamate		Backfill non-port arla/ install wave-dissipating blocks				Bac	kfill port area			
	Plans to igate Sea	Additional Silt Fence In		✓Target: Reduction of Radius of			crations in Sea Wa	ater in the Port		
	Water	Covering Seabed Soil in f	front of the Intake (Canal (below announce	d density	1)				
Cont	tamination	Circulating Seawater	Purification (on	going)						
	ſ					C	overing Dredge	d Sand at Seawa	y/Anchor Ground	T
				Underground Water	and Se					-
<u>ſ</u>		∇Assess	⊽Ass <mark>ess ⊽</mark>			Target: Attainment of Dosage		ite Boundaries due Sources	s such as New Emissions of	
믿	Reduce site boundary	V A33533	Assess impact	of dose reduction m				a Whole		
Plans	dose			rovement measures assessmer	\ \			ew as appropriat	te	— ,
for					/					<u> </u>
		D. I. D. Patien F				storage and impro				
lioa	Rubble			Rubble etc. via Shieldir			Continue Re	duction Efforts		λ
ctiv	ole e			bble into soil covered temp		age facility methods)
e V	etc.			Soil covering work for						
Radioactive Waste Si	1		Develop lor	ng-term storage plan						
	Sec			Contir	ued sta	able storage				
Management and te Boundaries	Secondary Waste from Water Treatment	Stored Wa	ater Treatment via		1-		Questinue De	La Line Efforte		\
em€ nda	dary n W ∌atn		diation Dose from	Secondary Waste			Continue Re	duction Efforts		;/
ent : ries	condary Wa from Water Treatment			Shielding	\rightarrow					
and	3ste r	Assess Characteris	tics of Secondary	Waste from Water Tre	atment a	and Storage Contai	ner Lifespan	Facility Replacen	ment Plan Development	t
Dose	Ga	PCV Gas Control Sys	stem Installation							
e Re	Gaseo	Unit 2: In Operation								$> \setminus$
3 duc)peratio <mark>n</mark>							$\geq / $
stio	Liq		operatio <mark>n</mark> Dit 2 Cover blow-ou	ut panel opening, install	~					
n at	/ bir					neasures for	for the of "pontaining it	" La the second release moni	the fact the long term magn	
duction at the	ıs∕Liquid Waste	Building opening	dust concentration i	measurement/ field investig		ime being)	g function of containing in	1" buildings and release more	toring (mid=to=long term measu	Jre)
	te			Land/Sea	Area M	lonitoring (ongoing	g)			
Γ,	0					7Target: Reduce Radiation	Dose at Corporate E	Buildings (implement per p	partner companies needs)	
	Onsite Intaminatio	Systematic Onsite		n area in conjunction with effort	- to roduor					
0	n	(sequentially implement from	Bus stop area		s to reduce	radiation dose outside of	the site)			
				in gate residing area						/

			Progress Status o	f Each Plan (3)		: On-site Work : R&D : Considerations
			As of July 30, 2012			Red letters, red boxes: revisions
Issues			Phase 1		Phase	2 (Early)
	\sum	Step2 Completed				
		FY2011	FY2012	FY2013		FY2014
Mai	n Schedule		Rubble at Unit 4	Rubble at Unit 3	<mark>☆Start Fuel Removal at</mark> Start Fuel Remova	
Unit 4 Unit 3		Preparation and Removal of Ru Design and Manufacture Cover for Design and Manufacture Crane/ Consideration of Onsite Cask	5F equipment removal Install Fuel Handling Equipments and Cover f Fuel Removal uel Handling Equipments		Rubble in the pools/Fuel	Survey
		Preparation and Removal or Install Lower Gantry Design and Manufacture Co Design and Manufacture Co Design and Manufacture On	Dose reduction m over for Fuel Removal	easures/ fuel cover developme	nt, install fuel hardling syst	em in the pools/Fue Fuel Remova
	Unit 1	Consideration of	- Fuel Removal Measures/ Investigati	on of Units 3&4		
	Unit 1				Surbey o	of Rubble etc./Planning
	Unit 2	Considaration/Pre	eparation of Decontamination/Shiel	ding Inside the Buildings		
			20 Ocales for Storens or			ation/Shielding, Facility Survey
	Cask for	Mar factoria Ocala	22 Casks for Storage an		ks for Storage and ransport asks 15Cas	
	Storage and	Manufacturing Casks Procured Materials	5 Casks		10040	
Fuel	Transport ation		itional procurement after the earthquake) ●6 Cas	ks 🍽 6 Casks		
	Dry Cask	Manufacturing Casks	• 7 Casks • 4 Casks			
Removal from (Site Harbor	Crane and Road Retoration	Loading area restoration v Transfer empty ca	ask (as ready)		
Common Pool	Common Pool	Common Pool Restoration Inspect Exist Design and Manufacture (b	ing Dry Cask (9 casks) Common	Pool Fuel Removal	rging of 4 Months	
ol			Design and Manufacture (I		Ir semblies Removed from Co	nstall ommon Pool (store/manage)
	Cask Temporary Storage Facility	Design and Manufacture	n			
	Storage Facility	Insta		/Temporary Storage		
	R&D	Long-term Integrity Assess	ment of Fuel Assemblies Removed			
nab				Consider Handling Metho	d of Damaged Fuels from	n the SFPs

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	Progress Status of Each Plan (4)							
Issues Step2 Completed								
		FY2011 FY2012	FY2013	FY2014				
	Decontamination of the Inside of the Reactor Building	Decontamination Technology Investigation / Remote Decontamin Establish Decontaminating Robot Technology① Remote Decontaminating Equipment Development① Investigation, Field Test	nating Equipment Development	▼Target: Establish Decontamination Robot Technology Target: Ensure Access Route via Decontamination▼				
			[Unit 2] In R/B 1F	ork environment improvement ①) n R/B upper floor n R/B upper floor n R/B upper floor				
-	Ins	R&D for PCV Leakage Point Survey/ Repairs (including stopping ir	nter-building water leakage)					
uel	Inspections inside	Design, Manufacture and Test, etc. of PCV Leakage Point Survey Equipn	ment ②	>				
De	ctions	Design, Manufacture and Test, etc. of PCV Repair Equipment ③⑥						
Fuel Debris Removal Plan	of Leakages PCVs	[Unit 1] R/B basement floor investigation [Unit 2] R/B basement floor investigation [Unit 3] R/B basement floor investiga		[Unit 1] Leak location investigation * cation investigation * [Unit 3] Leak location *: including field verification of				
P	R	R&D for Fuel Debris Removal (Continuously address long term issues	such as the internal inspection method and	equipment development)				
lan	Fuel Debris Removal	Design, Manufacture and Test, etc. of PCV Survey Equipment(5)						
			Investigate Outside	of PCV (including field test of R&D result)				
	Safe Storage, Processing and Disposal of Removed Fuel Debris	Development of Fuel Debri Investigation and Development of Processing/ Disposal Technology	ris Container (Investigation of Existing Technology, Selection of Stor	age System as well as Development of Safety Assessment Technology				
		Establish Measuring Method to Weigh Fuel Debris						
	Reactor Building Contain er Installat ions etc.							
	RPV/PC V Maintena Other	Development of Integrity Assessment Technology for RPV/PCV (
		Corrosion Prevention Measures (reducing oxygen dissolved in the	reactor coolant via nitrogen burbling)					
		Assess Criticality, Develop Detection	n Technology					
Reactor Investigate and Develop a Database Establishment Plan Establish a Basic Database (contamination status etc) for Reactor				tatus etc) for Reactor Facility Dismantlement				
Dismantling Plan Radioactive Waste		Understanding Waste Characteristics, Assessment of Volume et Development of R&D Plan for Processing/Disposal R&D of Optimal Waste Disposal						
Processing/		Misc, solid waste incinerator design/ production						
	oosal Plan zation & Staff	Install						
-	Planning	Systematic Starr (including from partner companies) Training/ Allocation, Improving Motivation, etc.						
Worker Safety Plan		Continue to Promote Safety, Maintain and Improve Radiation Protection Measures, Continuously Maintain Medical Care System						