IMPACT OF THE FULL SYSTEM CHEMICAL DECONTAMINATION ON THE JOSÉ CABRERA NPP DECOMMISSIONING

BRUSSELS_ JUNE 2016

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Began commercial operation: 1968

Permanently shut down: 2006

Full system decon:2007

Spent fuel in ISFSI: 2009

Began decommissioning: 2010

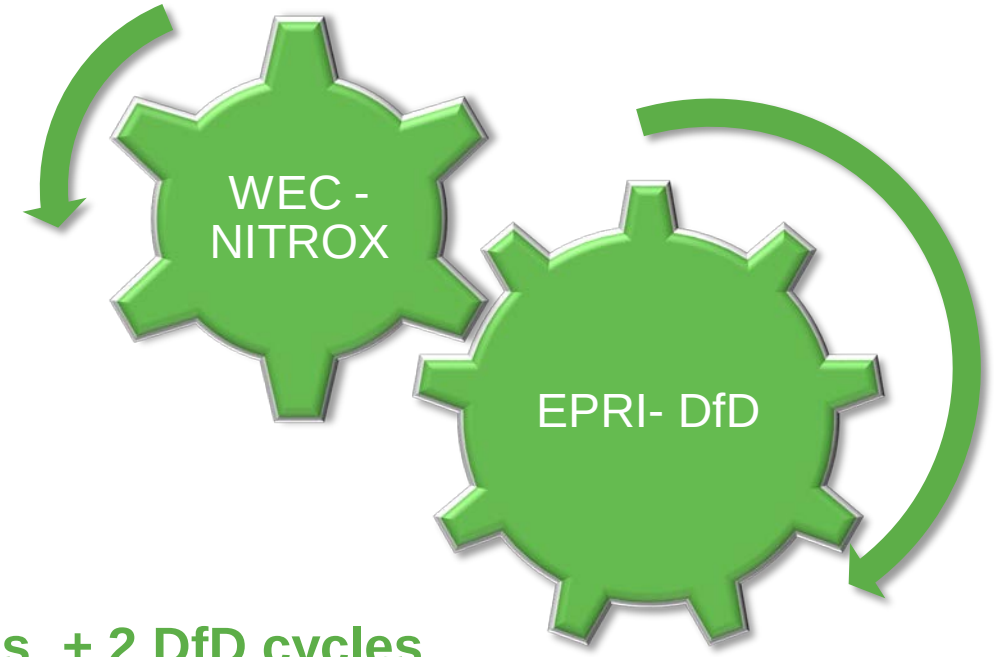
RCS

- Reactor Vessel & Internals
- Steam Generator
- Reactor Coolant Pump
- Pressurizer
- System piping

Auxiliary systems

- Residual Heat Removal System (RHR)
- Chemical & Volume Control System (CVC)

Combination of Two Processes



Phase 1: 3 Nitrox cycles + 2 DfD cycles
Phase 2: 1 DfD cycle
Phase 3: 4 DfD cycle (only CVC and RHR systems)

MAIN GOALS

- To reduce the levels of radiation and contamination
- To facilitate the dismantling of the plant's large components
- To reduce individual and collective doses

Quantity / DF	Final Results
Total Activity (Ci)	802
Co60 Activity (Ci)	714
Metal Removed (kg)	234
Decon Factor (DF)	
SG Tube Bundle	12
Auxiliary Systems	33
Primary System	8
Pressurizer	50
Resins (m^3)	13

P-mSv / FINAL DECONTAMINATION PROCESS

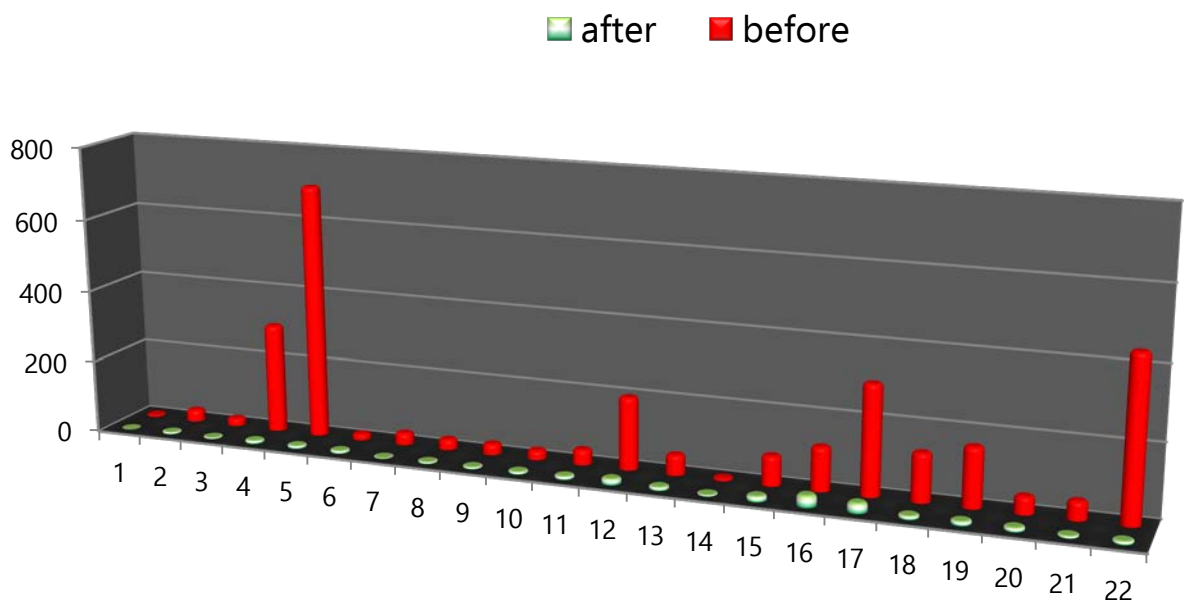
Task	P-mSv
Plant Modifications	23
Maintenance & Inspections	11
Decontamination process	25 (21%)
Spent resins conditioning	60 (50%)
TOTAL	119

- Decommissioning estimated dose

6416

119 (1,9%)

- Final decontamination collective dose



22 reference points

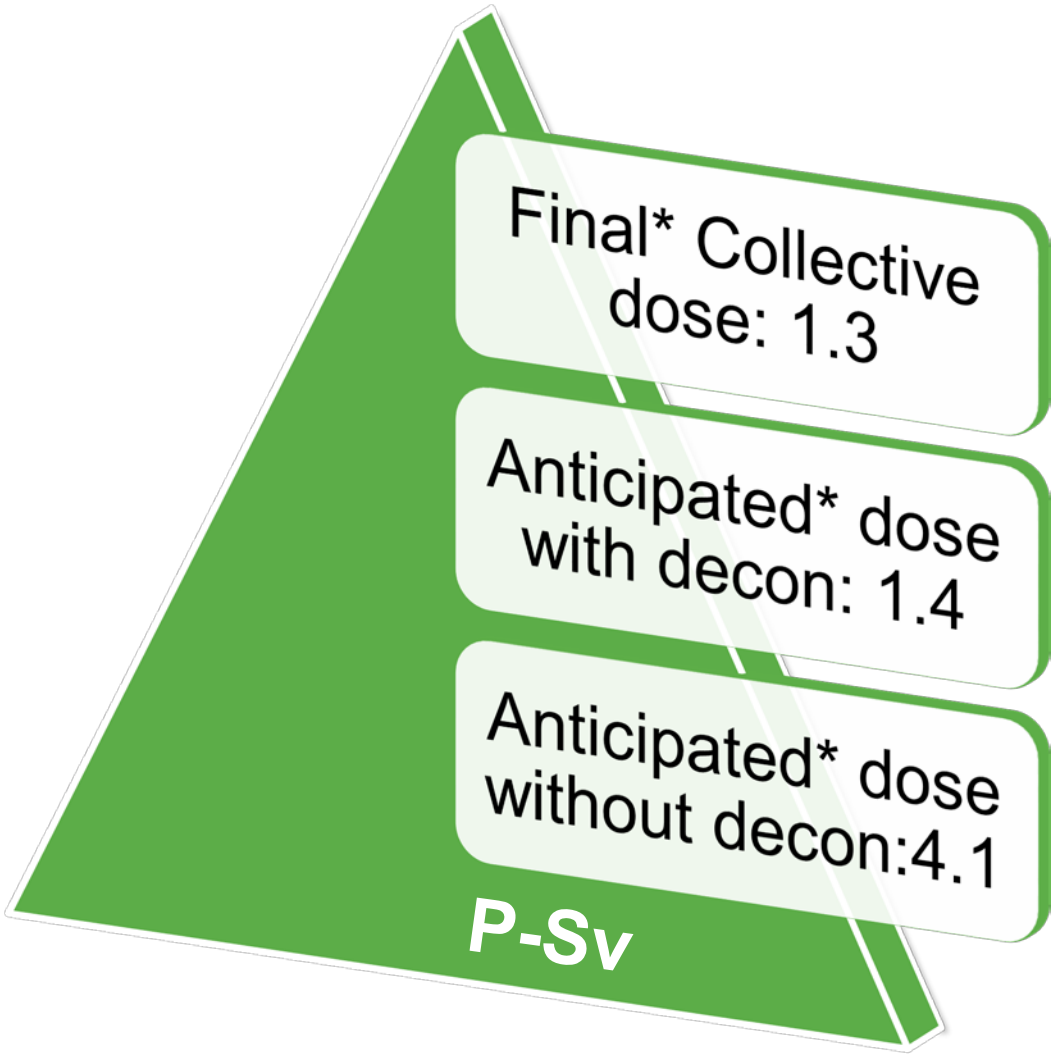
Average Dose Rate (µSv/h)

Before Decon

129

11

After Decon



Reduction:

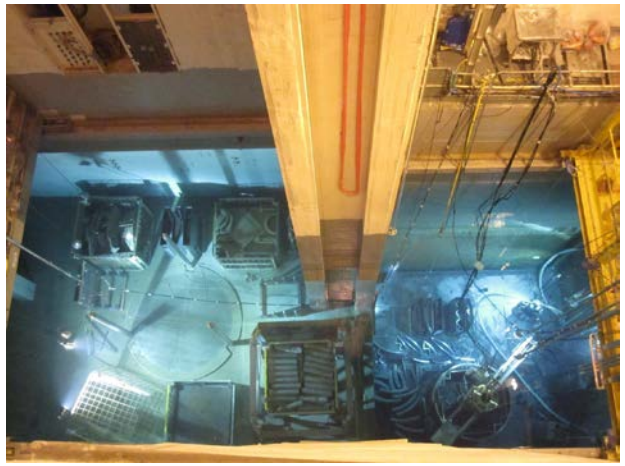
2.8 Sv-p

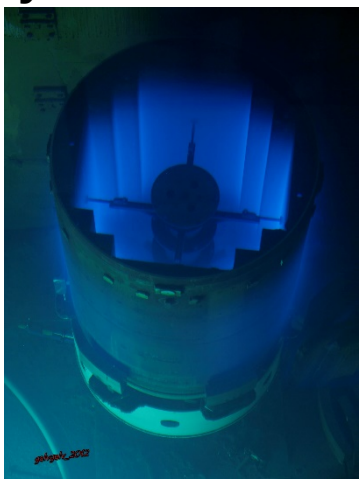
68 %

* In tasks affected by decontamination

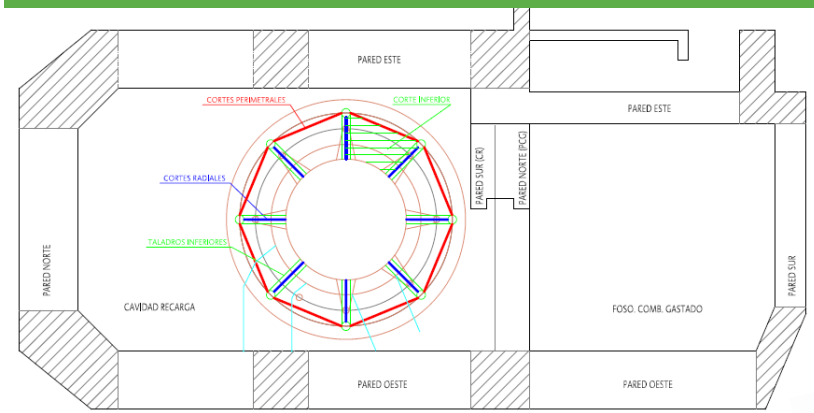
Conclusions

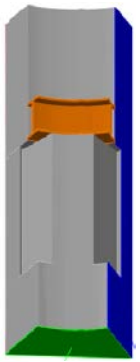
- ✓ **The DF attained exceded those expected for the Pressurizer and the Auxiliary Systems**
- ✓ **DF's were lower than expected for the SG due to the presence of plugged tubes (8%)**
- ✓ **The overall DF's were on the order of other similar decontamination projects**
- ✓ **The personnel dose for the dismantling was significantly reduced**
- ✓ **Radiologicals risks, including the risk of airborne radioactivity, were reduced**
- ✓ **Very good visibility for the vessel and internals segmentation works, increasing productivity**

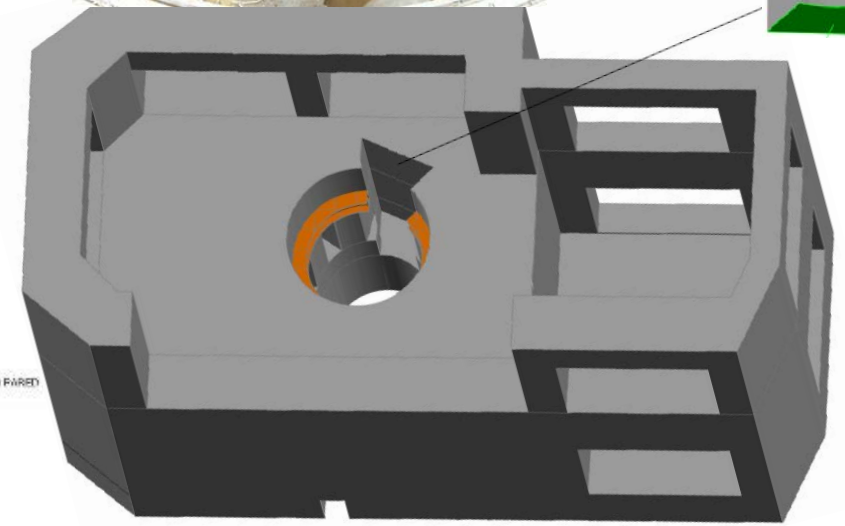


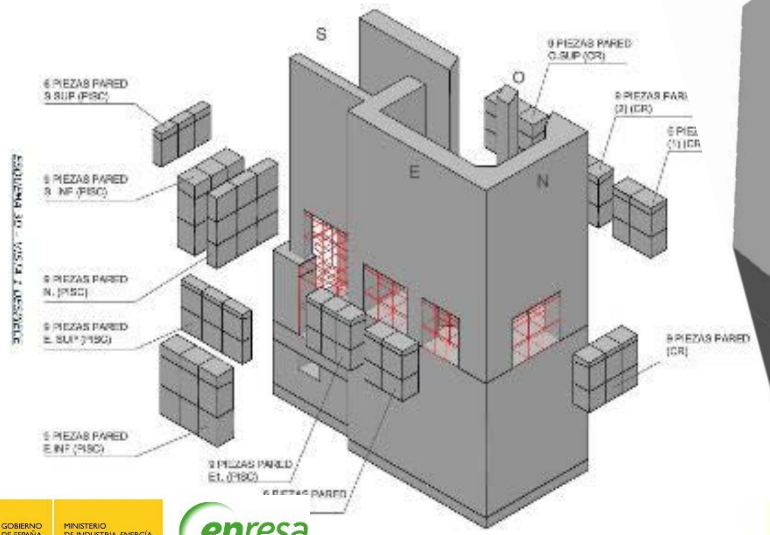


- **75% Project progress**
- **Full RCS and auxiliary systems segmented**
- **Removing Biological Shielding**
- **Removing Cavity and Spent Fuel Pool contaminated walls**
- **Expected Completion Date: 31st December 2018**

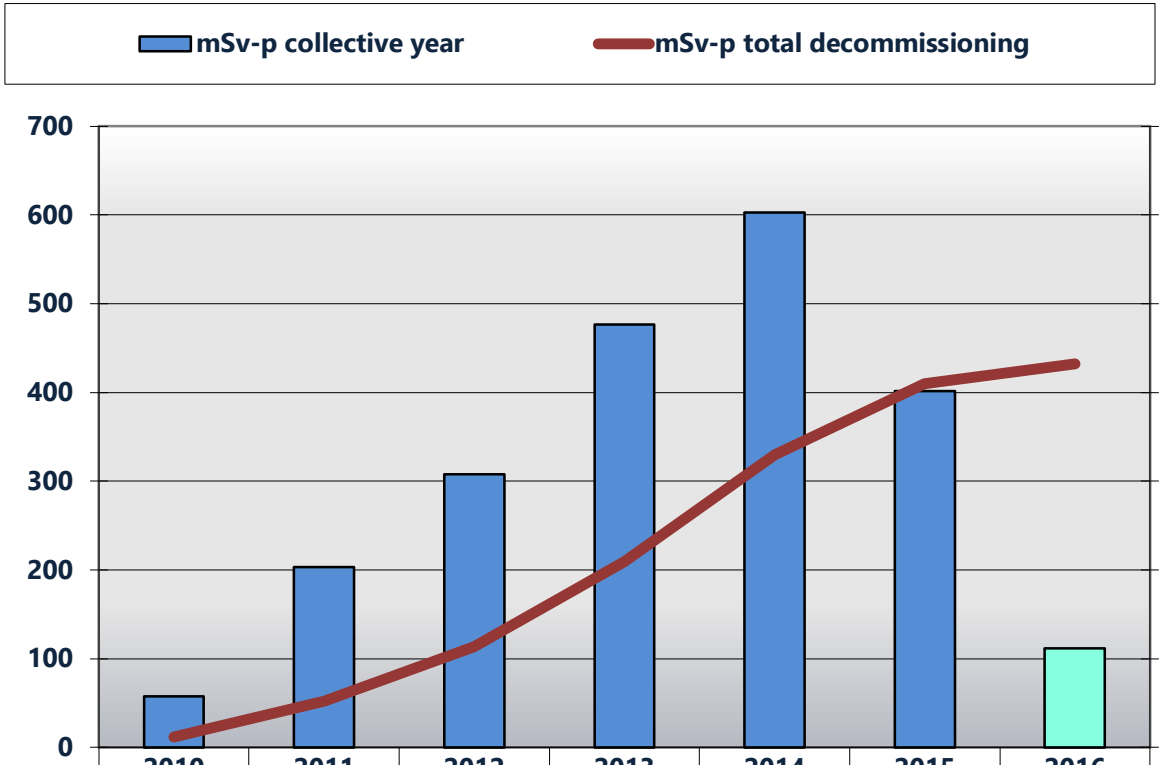








Collective dose



	2010	2011	2012	2013	2014	2015	2016
mSv-p collective year	57.71	203.64	307.96	476.64	602.98	401.41	111.74
mSv-p total decommissioning	57.71	261.35	569.30	1045.95	1648.93	2050.33	2162.07

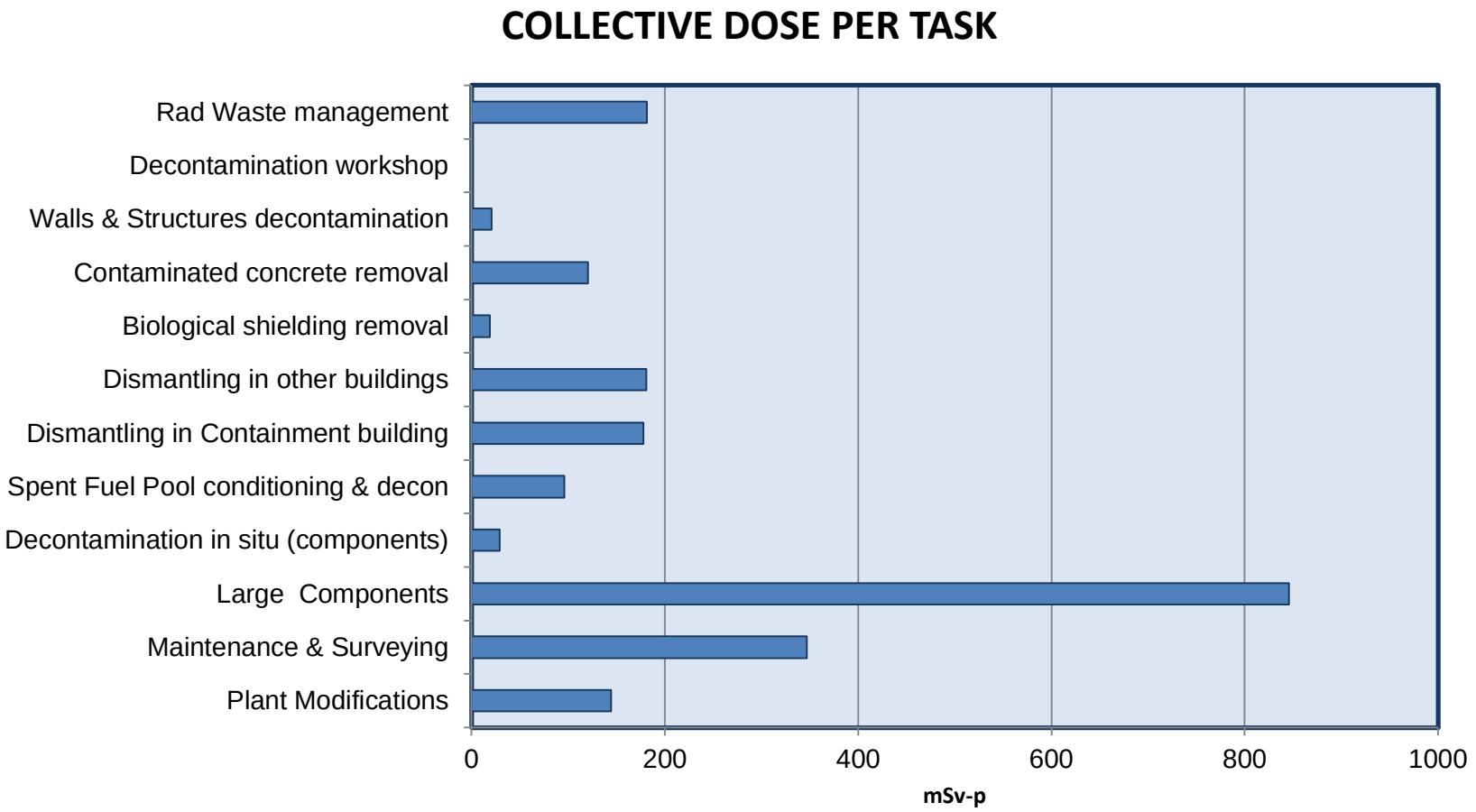
updated at 31st March 2016

Collective dose per task, updated at 31st March 2016

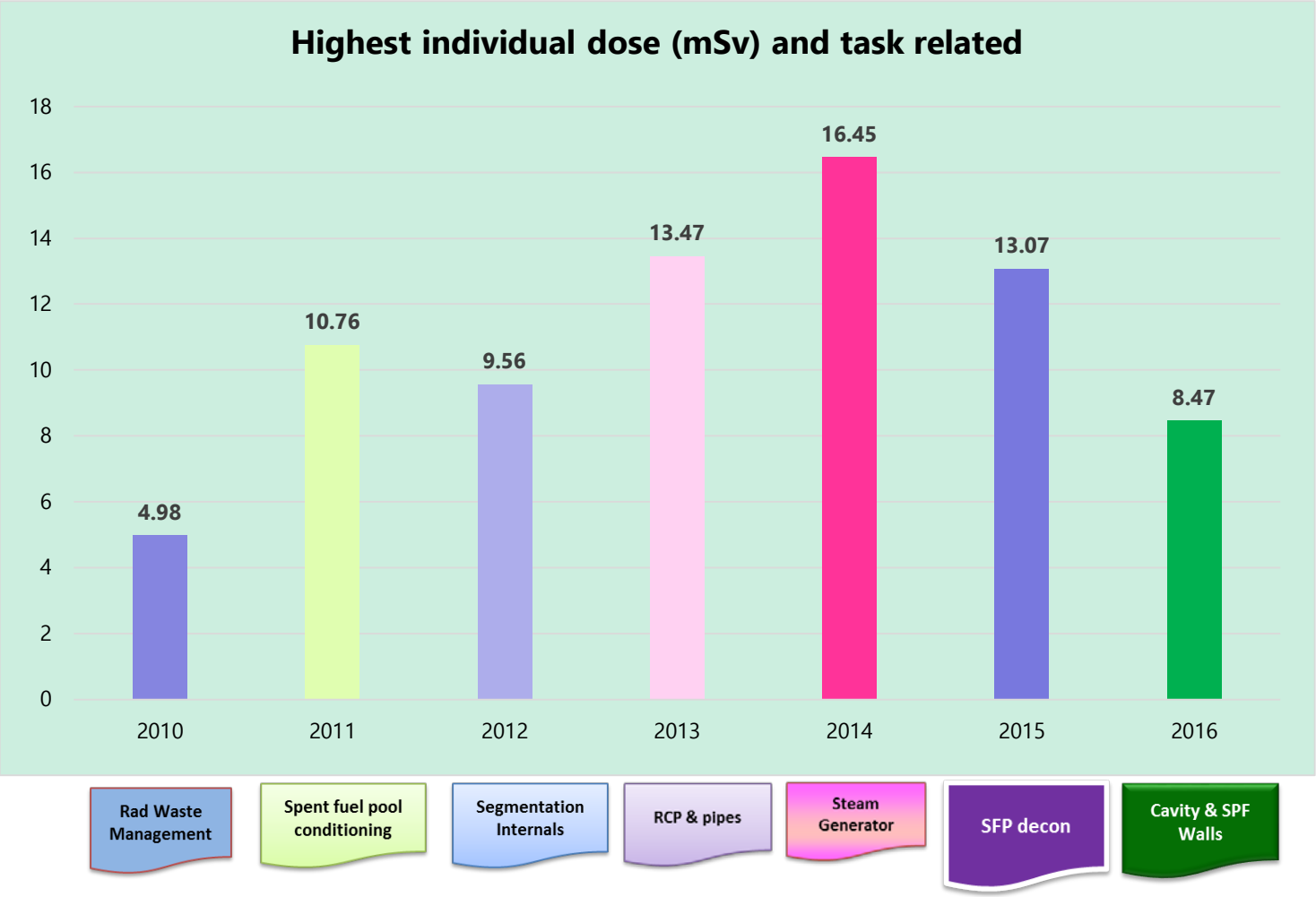
Cum.		WORK GROUPS	Acumulado	
142,77	RV internals	Plant Modifications	144,11	6,7%
234,35	Reactor vessel	Maintenance & surveying	347,03	16,1%
329,71	Steam generator	Large components	846,00	39,1%
16,64	Pressurizer	Decontamination in situ (components)	29,03	1,3%
122,54	Pump & loop pipes	Spent fuel pool conditioning & decon	95,79	4,4%
846,00	total	Dismantling in Containment building	177,67	8,2%
		Dismantling in other buildings	180,73	8,4%
		Biological shielding removal	18,71	0,9%
		Contaminated concrete removal	120,34	5,6%
		Surfaces decontamination	20,81	1,0%
		Decontamination workshop	0,25	0,0%
		Rad Waste managing	181,61	8,4%
		total	2162,07	

Figures in mSv-p

Collective dose per task, updated at 31st March 2016



Highest individual dose, updated at 31st March 2016



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