

ALARA Program and RP Activities for the Reactor Vessel Head Replacement in Vandellòs II NPP

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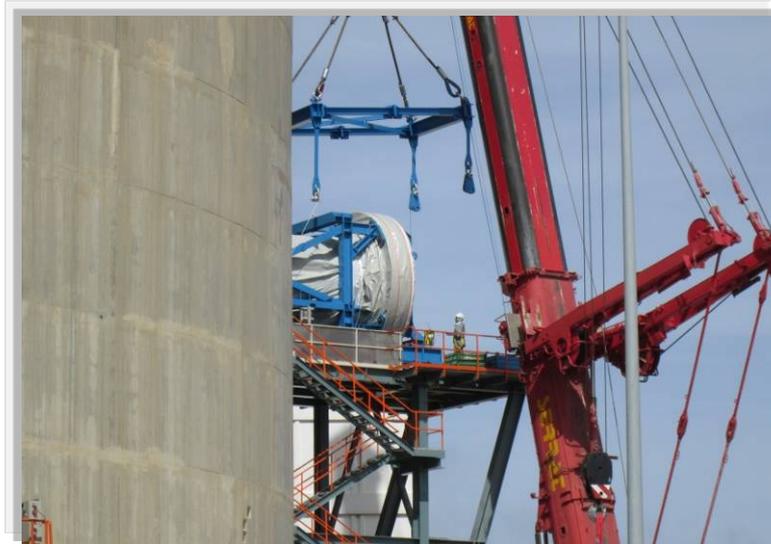
2015 ISOE International ALARA Symposium, Brussels



Asociación Nuclear Ascó-Vandellòs II, A.I.E.

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2. Reactor vessel head dose rate evolution
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1. Vandellòs II NPP: why RHVR?



Owners

ANAV ( endesa + )

Technology

Westinghouse 3 loop Pressurised Water Reactor (PWR)

Cooling

Mediterranean sea and aircoolers. Forced draught cooling towers and safeguards pool recently implemented (2009)

Power

1,087.14 Mwe

Start-Up

March 1988

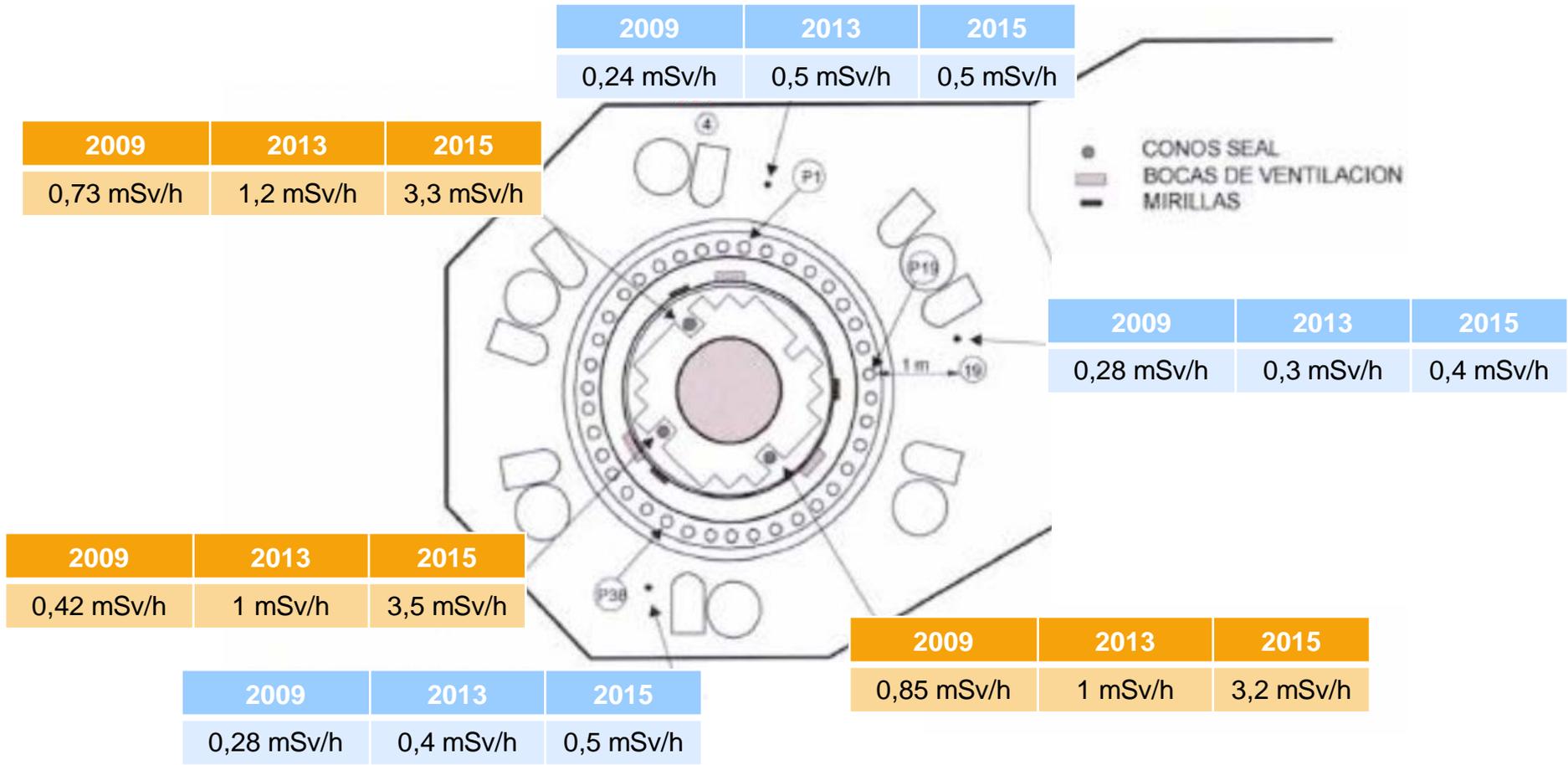
Date of Current Operating Permit

2010

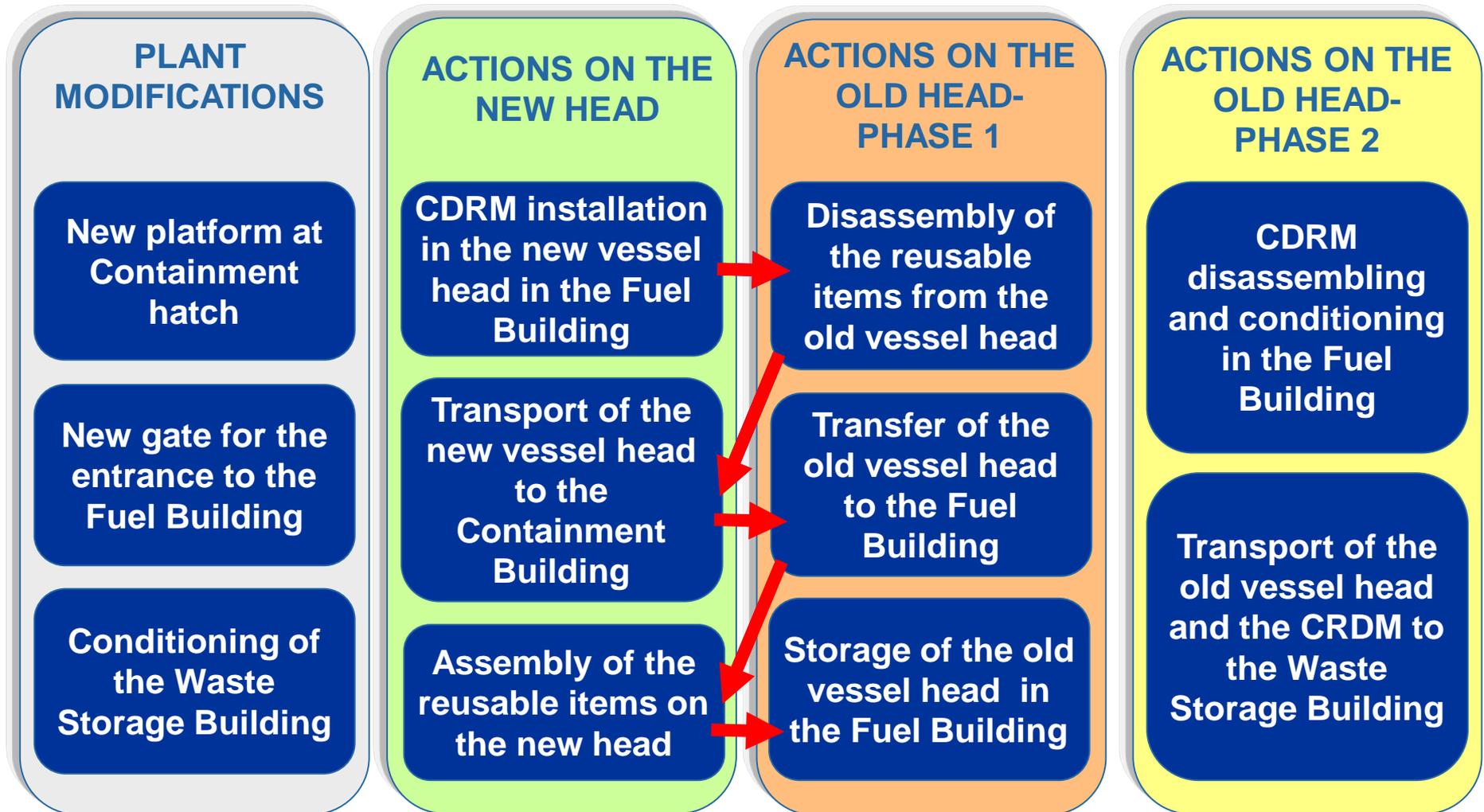
Spent Fuel Pools Saturation

2020

2. Reactor vessel head dose rate evolution



3. Project description and dose planning



3. Project description and dose planning

- ACTIONS ON THE NEW HEAD**
- CDRM installation in the new vessel head in the Fuel Building**
- Transport of the new vessel head to the Containment Building**
- Assembly of the reusable items on the new head**

Activity	Man-hours		Man-mSv	
	Inverted	Estimated	Re-estimated	Received
Assembly of the reusable items	1091	3	1	1,271



No significant radiological concerns

3. Project description and dose planning

ACTIONS ON THE OLD HEAD-PHASE 1

Disassembly of the reusable items from the old vessel head

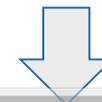
Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building

Activity	Man-hours	Man·mSv		
	Inverted	Estimated	Re-estimated	Received
Partial disassembly of insulation	35	10	10	9,293
Disassembly of the reusable items	594	34	22	21,439
Scaffolding	621	8	8	8,105
Shielding	54	1	5	4,715



The shroud is the last reusable part to be removed. Opportunity to install additional shielding.



Dose re-estimation

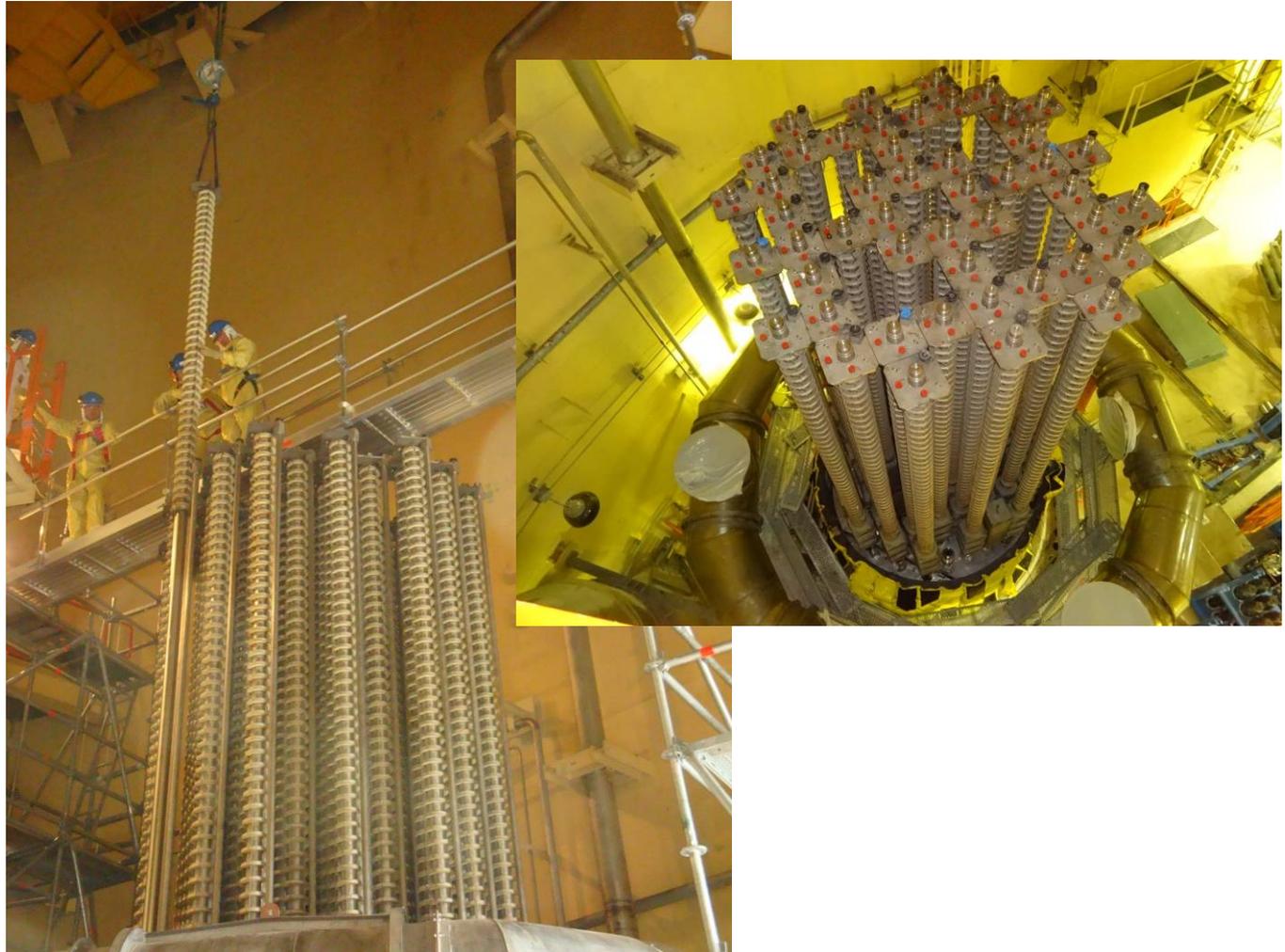
3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of
the reusable
items from the
old vessel head

Transfer of the
old vessel head to the Fuel
Building

Storage of the old
vessel head in
the Fuel Building



3. Project description and dose planning

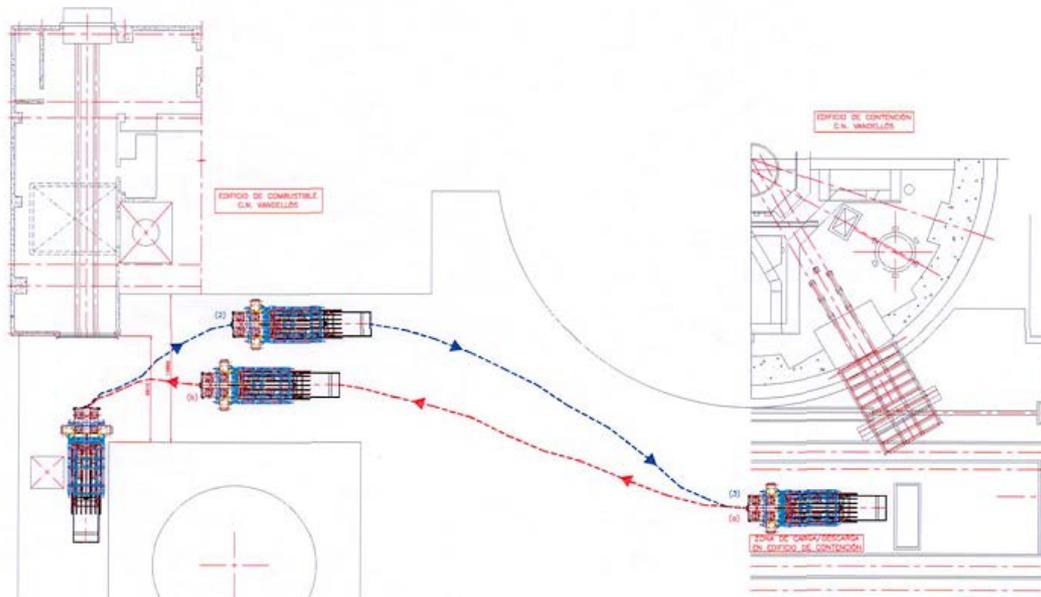
ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building

Activity	Man-hours		Man-mSv	
	Inverted	Estimated	Re-estimated	Received
Preparation and Decontam.	119	8	7	6,772
Transfer to the Fuel Building	1180	41	22	22,125



Head vessel transfer much faster than expected (36 h estimated / 8 h inverted)

3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building



- 134 smear samples before the vessel head exits out of the Containment Building (all $< 0,4 \text{ Bq/cm}^2$)



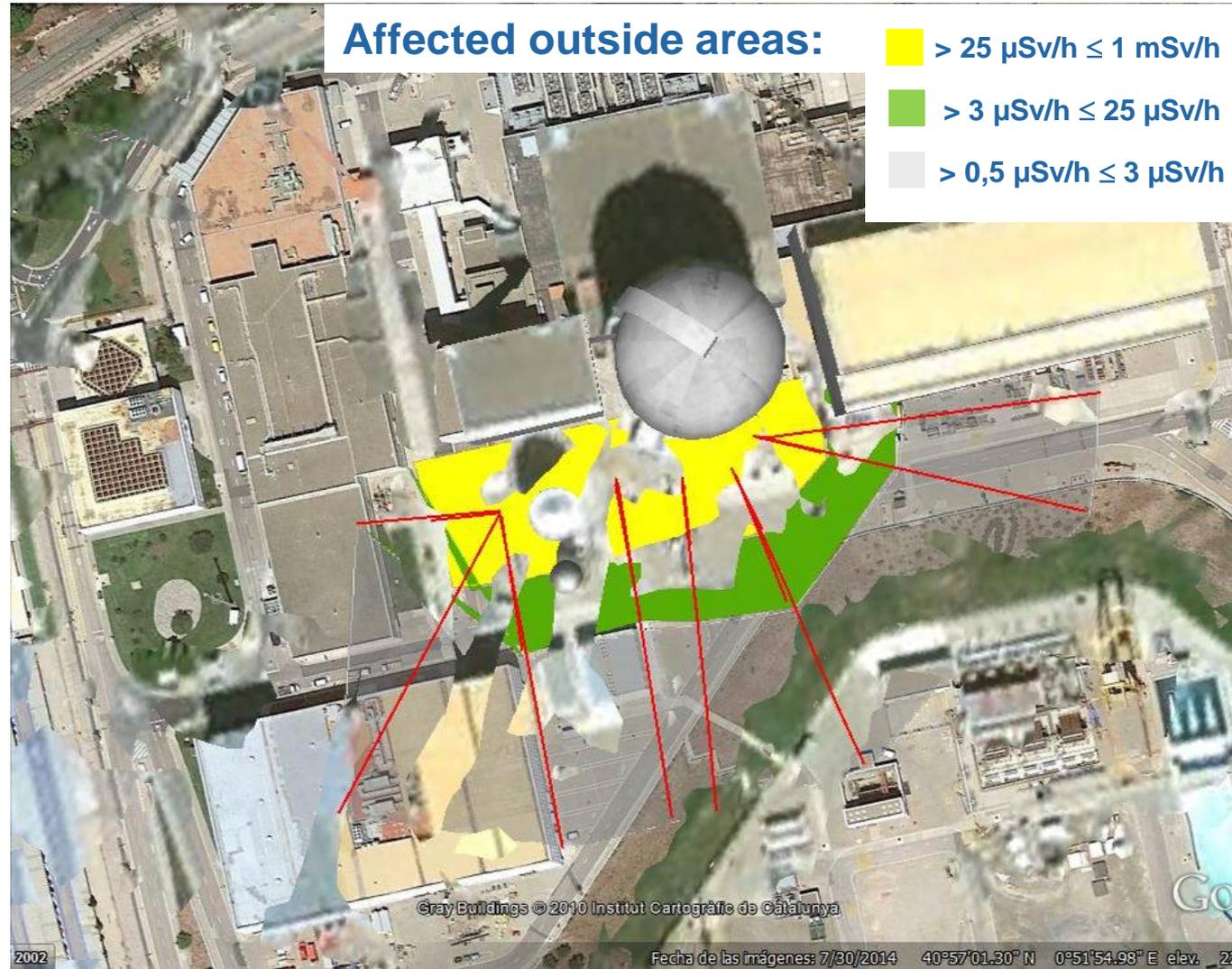
3. Project description and dose planning

ACTIONS ON THE OLD HEAD-PHASE 1

Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building



3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building



Teledosimetry

16 remote monitoring DLD +
6 additional transmitters
1 personal computer
6 TLD

3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

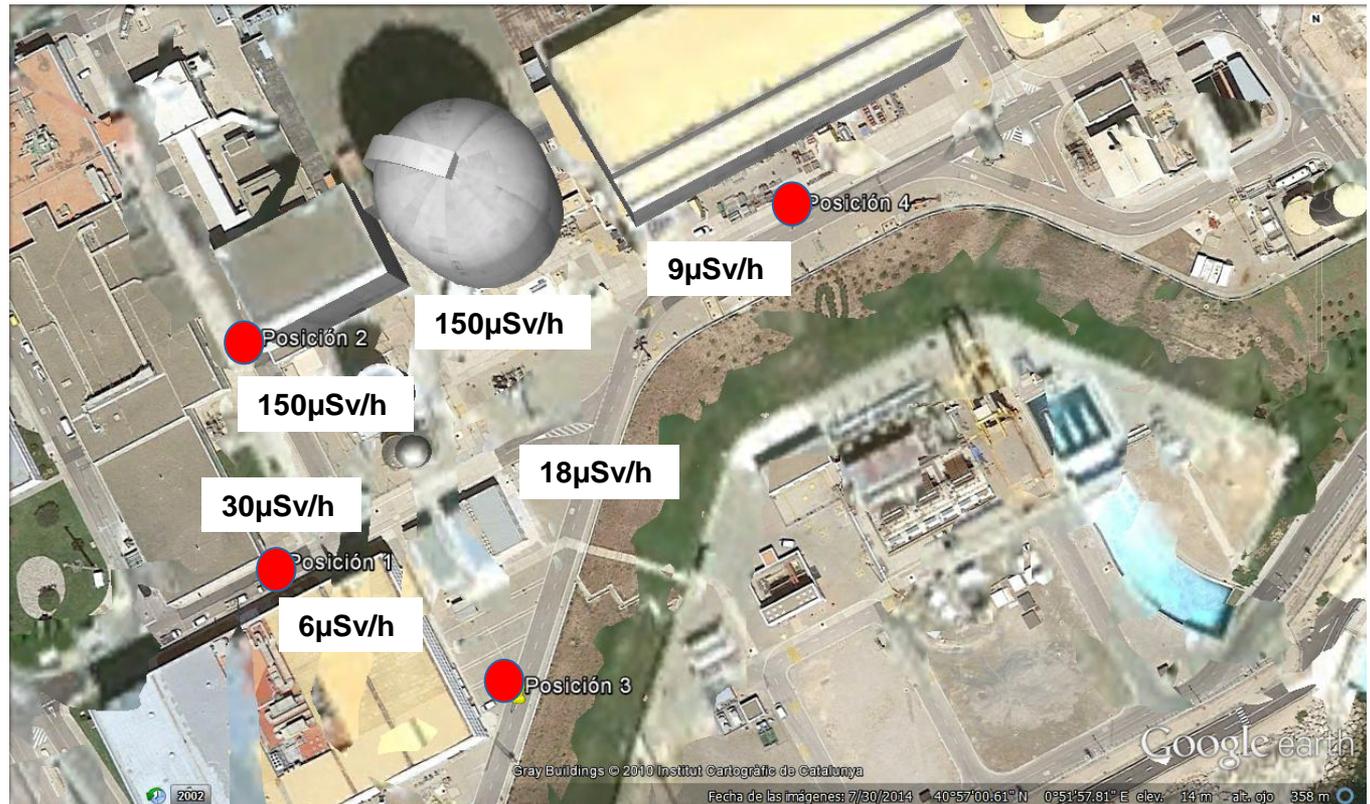
Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building

● RP checkpoints (entrance to the restricted area)

Maximum dose-rate measured with the remote monitoring system



RP team

8 ALARA Technicians + 2 RP coordinators (inside/outside containment) + 4 RP for teledosimetry control + RP managers

3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of the reusable items from the old vessel head

Transfer of the old vessel head to the Fuel Building

Storage of the old vessel head in the Fuel Building



	Remote monitoring system:	
	Accumulated dose (μSv)	Maximum dose rate ($\mu\text{Sv/h}$)
Crane 1	32	159
Crane 2	239	231



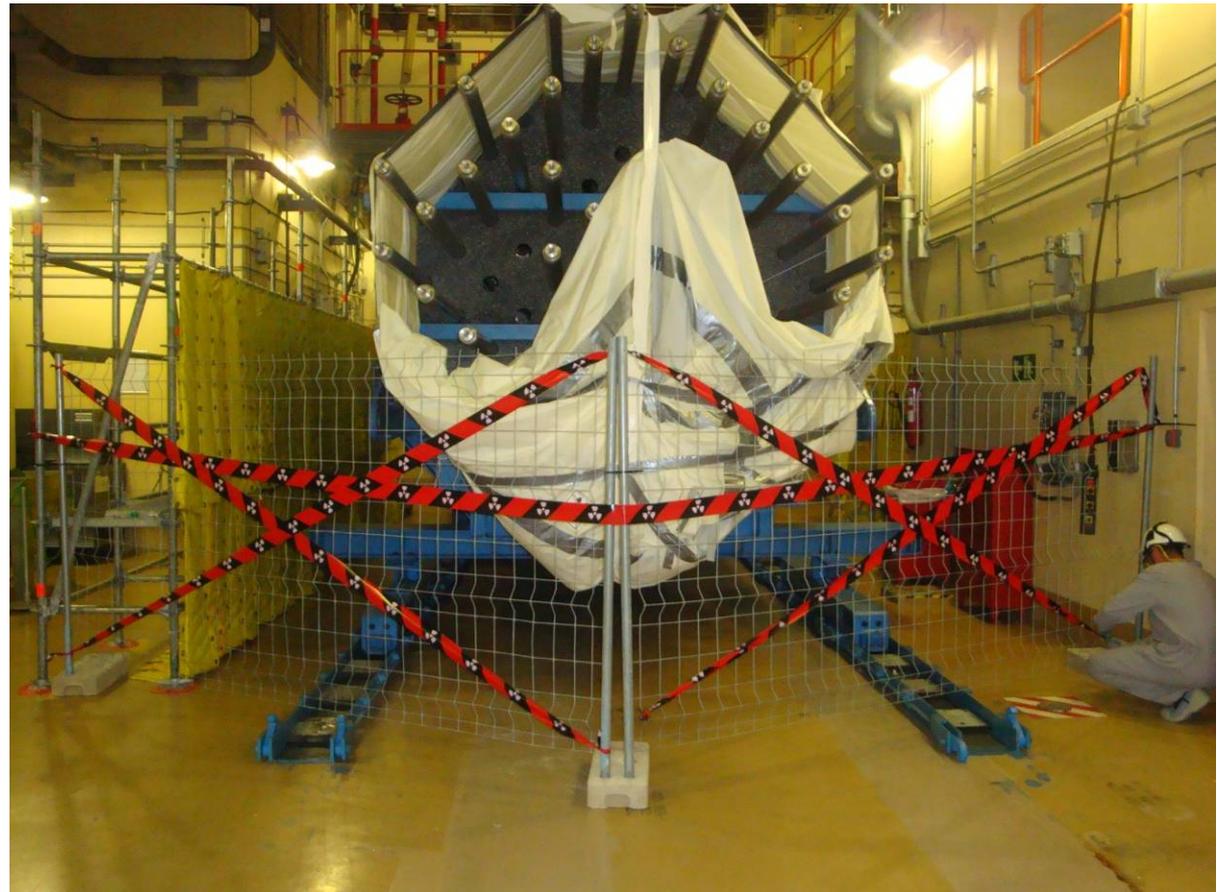
3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of
the reusable
items from the
old vessel head

Transfer of the
old vessel head
to the Fuel
Building

Storage of the old
vessel head in
the Fuel Building



3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 1

Disassembly of
the reusable
items from the
old vessel head

Transfer of the
old vessel head
to the Fuel
Building

Storage of the old
vessel head in
the Fuel Building

May 2015- October 2015

- Forbidden access to the old vessel head
- Shielding to reduce the radiological impact in outer areas
Work-management: minimization of jobs in the influenced area of the Fuel Building
- Temporal change of the affected area monitors threshold



3. Project description and dose planning

ACTIONS ON THE OLD HEAD-PHASE 2

CRDM disassembling and conditioning in the Fuel Building

Transport of the old vessel head and the CRDM to the Waste Storage Building

Activity	Man-hours	Man-mSv	
	Inverted	Estimated	Received
Scaffolding	178	12	7,988
CRDM cutting	1465	26	11,161
Decontam.	290	1,7	2,787
Shielding	47	1,5	2,283



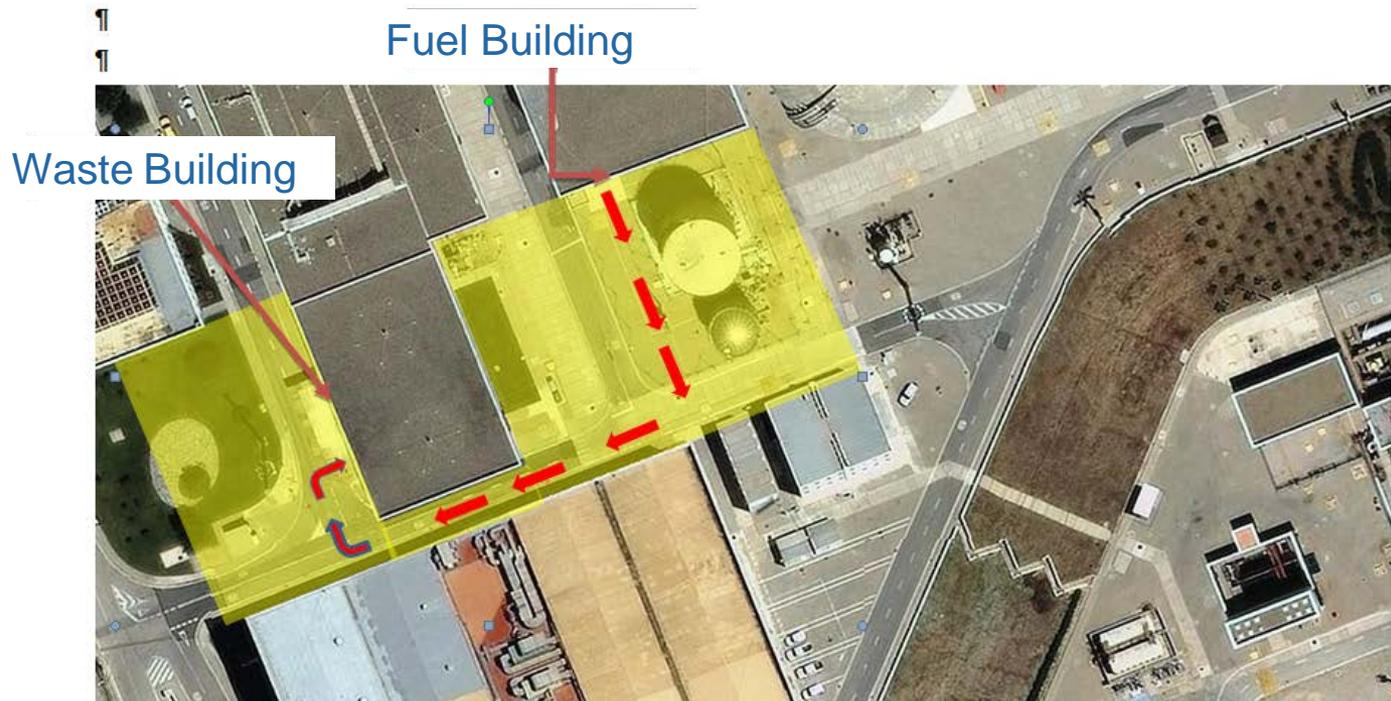
3. Project description and dose planning

ACTIONS ON THE OLD HEAD-PHASE 2

CDRM disassembly and conditioning in the Fuel Building

Transport of the old vessel head and the CRDM to the Waste Storage Building

Activity	Man-hours	Man-mSv		
	Inverted	Estimated	Re-estimated	Received
Transfer to the Waste Storage Building	1983	37,9	22	15,388



3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 2

CDRM
disassembly and
conditioning in
the Fuel Building

Transport of the
old vessel head
and the CRDM to
the Waste
Storage Building



Teledosimetry

16 remote monitoring DLD +
3 additional transmitters
1 personal computer
6 TLD

RP team

4 ALARA Technicians +
1 RP coordinator
+ 2 RP for teledosimetry
control + RP manager



3. Project description and dose planning

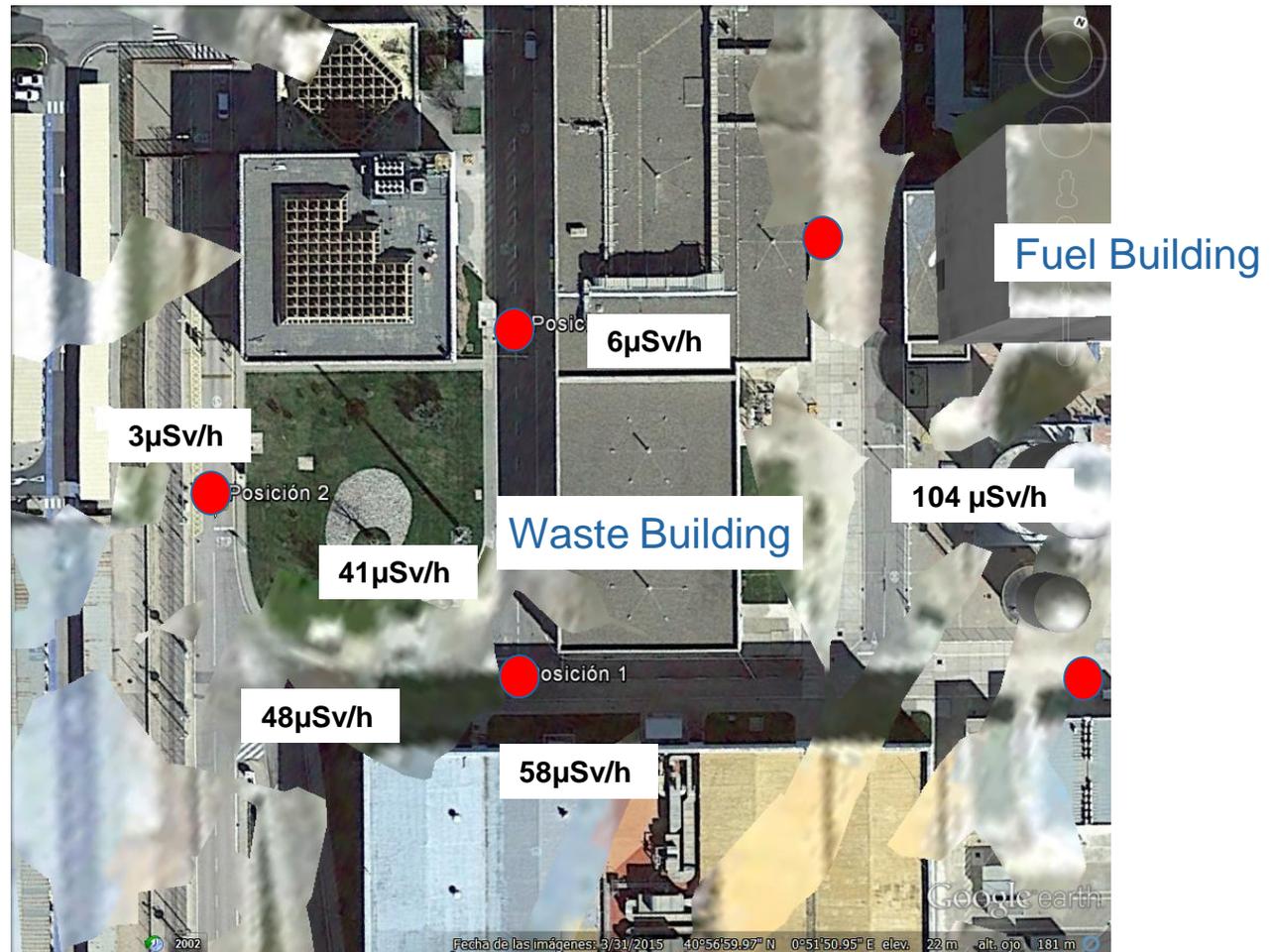
ACTIONS ON THE OLD HEAD-PHASE 2

CDRM disassembly and conditioning in the Fuel Building

Transport of the old vessel head and the CRDM to the Waste Storage Building

● RP checkpoints (entrance to the restricted area)

Maximum dose-rate measured with the remote monitoring system



3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 2

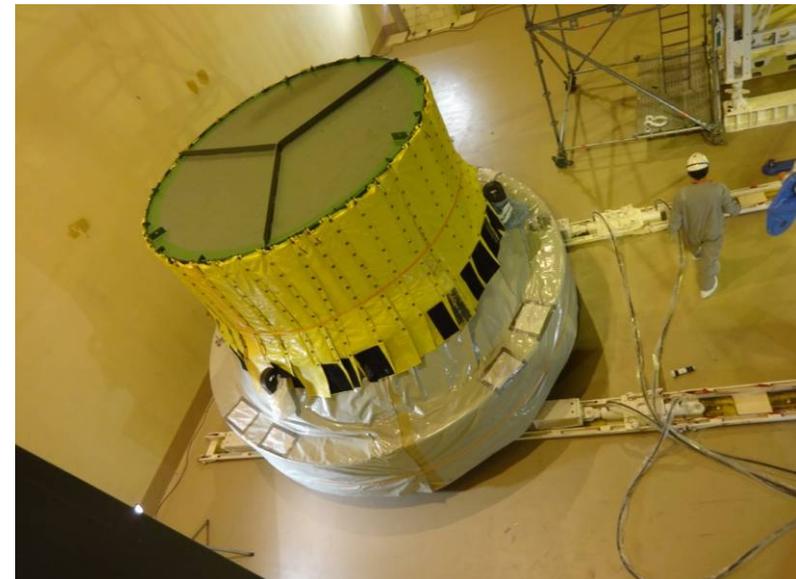
CDRM disassembly and conditioning in the Fuel Building

Transport of the old vessel head and the CRDM to the Waste Storage Building



12 hours for the head vessel movement - saturday

	Remote monitoring system:	
	Accumulated dose (μSv)	Maximum dose rate ($\mu\text{Sv/h}$)
Driver 1	9	34
Driver 2	18	51



3. Project description and dose planning

ACTIONS ON THE OLD HEAD- PHASE 2

CDRM disassembly and conditioning in the Fuel Building

Transport of the old vessel head and the CDRM to the Waste Storage Building



2 days /12 hours per day for the CDRM containers movement

Final disposal



3. Project description and dose planning

Contamination control surveillance after each movement

**ACTIONS ON THE
OLD HEAD-
PHASE 1 and 2**

**Transfer of the
old vessel head
to the Fuel
Building**

**Transport of the
old vessel head
and the CRDM to
the Waste
Storage Building**



Zero personal skin contamination events

4. Dose Results Summary

Activity	Man-hours	Man·mSv		
	Inverted	Estimated	Re-estimated	Received
Assembly of the reusable items	1091	3	1	1,271
Disassembly of the old vessel head and auxiliary activities	1304	53	45	43,552
Preparation and transference of the old vessel head to the Fuel Building	1299	49	29	28,897
Assembly of the reusable items on the new head	1091	3	1	1,271
CDRM disassembling and conditioning in the Fuel Building	1980	41,2	-	24,219
Transfer to the Waste Storage Building	1983	37,9	-	15,388
Plant modifications	2440	1,65	9,95	6,515
TOTAL	10097	185,75	164,05	119,842

5. Information and procedures

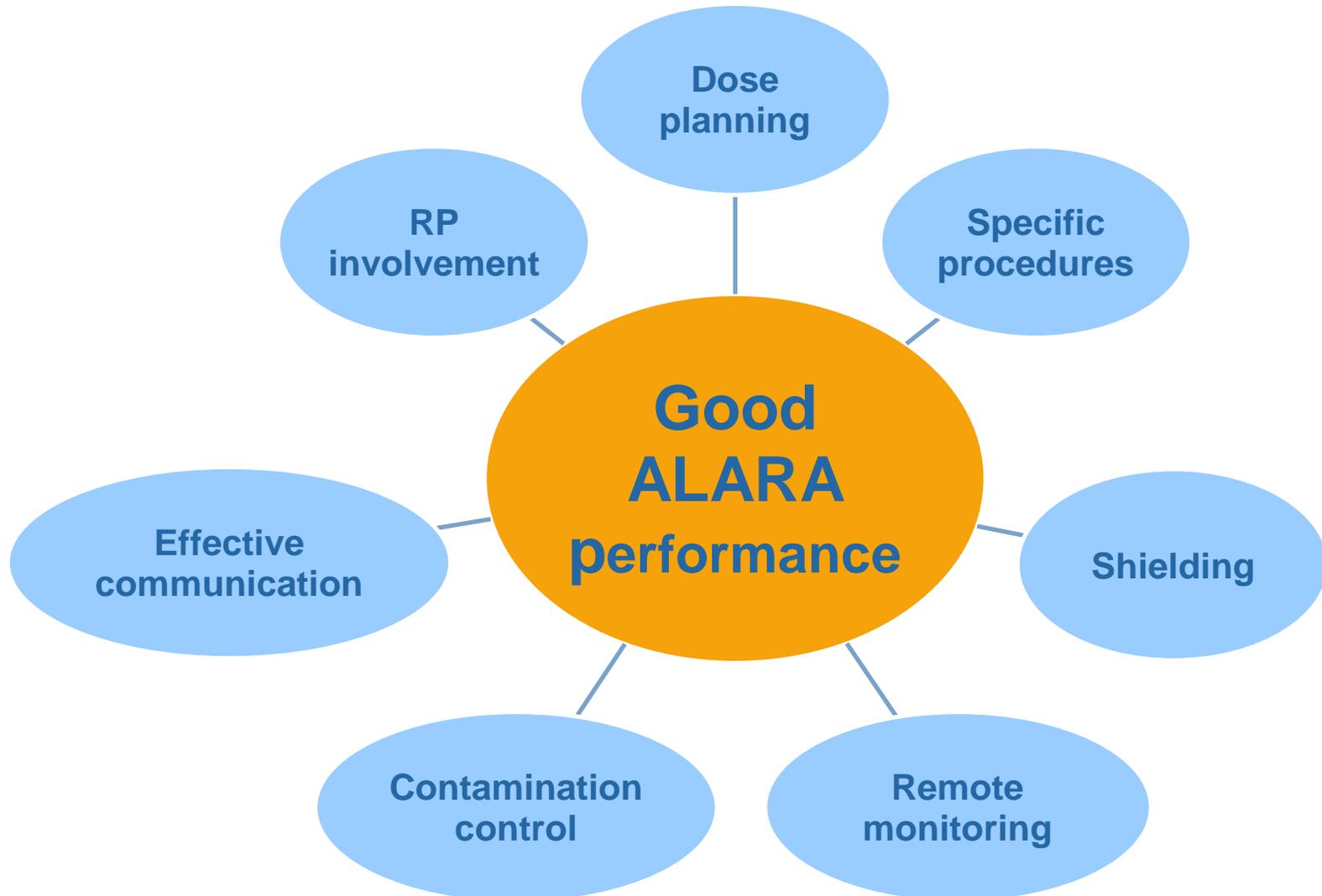
Before

- **2 reports describing specific RP activities: to the regulatory body**
- **Emission of specific RP procedure describing the preparation and radiological control of the vessel head cover during transport**
- **Presentation to the ALARA Committee (dose estimation and main RP activities)**
- **Information to the entire organization (areas with forbidden access)**

After

- **2 reports summarizing the obtained results: to the regulatory body**
- **2 reports with the remote monitoring system results**
- **Presentation to the ALARA Committee (dose results and main RP activities)**
- **Information to the entire organization**

6. Learned lessons





THANKS

