

HIGH INTEREST TOPIC AND QUESTIONNAIRE

PWR ALARA Association Key West, FL January 20-22, 2015

Topic: Do you use robotics? If so, where have you seen the largest dose savings or benefit?			
Contact (Name)	Plant	NSSS	Comments
Kim Helms	Ginna	2LW	FEW years ago - M. Shields, Engineer had vendor do under Head Inspection
	Kewaunee	2LW	
	Point Beach 1,2	2LW	
Doug WARREN	Prairie Island 1,2	2LW	No
	Ringhals 2,3,4	2LW 3LW	
Jeff Fontaine	Beaver Valley 1,2	3LW	No
	Farley 1,2	3LW	No
	Harris	3LW	
R. M. AUST	North Anna 1,2	3LW	NO
J Barber	Robinson	3LW	Yes Radwaste (Place filter in HIC, characterize dose rate survey for shipping)
Jeff Wright	Surry 1,2	3LW	No
	Turkey Point 1,2	3LW	
	VC Summer	3LW	
	Braidwood 1,2	4LW	VERY LIMITED, BUT HAVE BORROWED FOR IMB ENTRIES, ALSO ON HEAD INSPECTIONS & CLEANING CAVITY
Frank Pasloski	Byron 1,2	4LW	YES AT Power Imb LEAK investigation, cavity vacuuming <small>Re head inspection</small>
	Callaway	4LW	
Dana Page	Catawba 1,2	4LW	This is a Catawba question. :)
SHARI MOSTY	Comanche Peak 1,2	4LW	No
David Miller	Cook 1,2	4LW	No
R. Rogers	Diablo Canyon 1,2	4LW	No.
	Indian Point 2,3	4LW	
S. Lisi	McGuire 1,2	4LW	YES, FILTER PACKING
G. TOFT	Salem 1,2	4LW	NO

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Contact (Name)	Plant	NSSS	Comments
Boehl	Seabrook	4LW	Bottom mounted nozzle penetration inspections.
	Sequoyah 1,2	4LW	
	Sizewell B	4LW	
	South Texas 1,2	4LW	
Abby Fields	Vogtle 1,2	4LW	We own one, but rarely use it - used for power entries to look for leaks w/ shield.
G. Thomas	Watts Bar	4LW	WE HAVE ROBOTS & LIMITED USE
	Wolf Creek	4LW	No
	Millstone 3,2	4LW, CE	
Crystal Conroy	Calvert Cliffs	CE	Boric Acid inspections, work inspections leak identification and removal of legacy waste
	Ft. Calhoun	CE	
J. Smith	Palisades	CE	Yes - UNDER HEAD / HEAD LIFT / VACUUM Rx CAULK, LIRA
J. Geyer	Palo Verde 1,2,3	CE	SG ECT / BMI inspection
	San Onofre 2,3	CE	
	St. Lucie 1,2	CE	
	Waterford	CE	
	ANO 2,1	CE, B&W	
	Crystal River	B&W	
Marc Sidor	Davis Besse	B&W	No robots & DB. YET!
Phil Kelley	Oconee 1,2,3	B&W	Power Entries Leak Inspections
Steve Edelman	TMI	B&W	Trach see successes
	Areva		
	EDF		
	Westinghouse		

HIGH INTEREST TOPIC AND QUESTIONNAIRE

PWR ALARA Association

Key West, FL

January 20-22, 2015

Topic: WHEN SETTING RX HEAD IF PERSONNEL ARE IN CAVITY WHO USES RESPIRATORS?			
Contact (Name)	Plant	NSSS	Comments
Kim Holms	Ginna	2LW	IF IN CAVITY PAPR
	Kewaunee	2LW	
	Point Beach 1,2	2LW	
Dooly WARREN	Prairie Island 1,2	2LW	YES - MAXI AIR
	Ringhals 2,3,4	2LW 3LW	
Beaver Valley	Beaver Valley 1,2	3LW	Yes No
	Farley 1,2	3LW	yes, Westinghouse / MSA ultra elite, /PAPR
	Harris	3LW	
EMMET	North Anna 1,2	3LW	Yes, (3) PAPR 1 HP, 2 men
J Barber	Robinson	3LW	Yes - 2 refuel 1 HP PAPR Hoods
Jeff Wagner	Surry 1,2	3LW	YES - (3) - PAPR
	Turkey Point 1,2	3LW	
	VC Summer	3LW	
Henry Miller	Braidwood 1,2	4LW	PAPR
Franke	Byron 1,2	4LW	YES when Rx hd. is 18" off Flange PAPRs
	Callaway	4LW	
Dane Page	Catawba 1,2	4LW	email me - dana.page@duke-energy.com
SHARI MOSTY	Comanche Peak 1,2	4LW	PAPR
David Milla	Cook 1,2	4LW	
R. Rogers	Diablo Canyon 1,2	4LW	Everyone. max air
	Indian Point 2,3	4LW	
S. Lisi	McGuire 1,2	4LW	yes
G. TOFT	Salem 1,2	4LW	PAPR'S FOR ALL IN CAVITY

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PWR ALARA Association Key West, FL January 20-22, 2015

Topic:			
Contact (Name)	Plant	NSSS	Comments
Boehl	Seabrook	4LW	Done Remotely w/ camera. no one in cavity at until 18" from flange for inspection
	Sequoyah 1,2	4LW	
	Sizewell B	4LW	
	South Texas 1,2	4LW	
C. Borne	Vogtle 1,2	4LW	PAPR
	Watts Bar	4LW	
J. Lufke	Wolf Creek	4LW	Yes Max Air
	Millstone 3,2	4LW, CE	
Crystal Cavity	Calvert Cliffs	CE	Only inside the cavity (PAPR)
	Ft. Calhoun	CE	
J. Smith	Palisades	CE	Yes PAPR Opt Air 6
J. Geyer	Palo Verde 1,2,3	CE	No one in cavity when head is set
	San Onofre 2,3	CE	
	St. Lucie 1,2	CE	
	Waterford	CE	
	ANO 2,1	CE, B&W	
	Crystal River	B&W	
Mark Sidoti	Davis Besse	B&W	Yes All PAPR
Phil Kelley	Oconee 1,2,3	B&W	PAPR
Steve Gelman	TMI	B&W	No
	Areva		
	EDF		
	Westinghouse		

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HIGH INTEREST TOPIC AND QUESTIONNAIRE
PWR ALARA Association | Key West, FL | January 20-22, 2015

Topic: Please Update Your Unit Lowest Overage Dose Record. See Attachment
 from Jonathan Fox / D. Miller: DWMiller2@aep.com

Contact (Name)	Plant	NSSS	Comments
Kim Holmes	Ginna	2LW	I will confirm & send you the info via email
	Kewaunee	2LW	
	Point Beach 1,2	2LW	
Doug WARDEN	Prairie Island 1,2	2LW	INFO IS CURRENT
	Ringhals 2,3,4	2LW 3LW	
Jeff Fontaine	Beaver Valley 1,2	3LW	BV-1 37.181 Rem BV-2 64. rem
	Farley 1,2	3LW	email me.
	Harris	3LW	
	North Anna 1,2	3LW	
J Barber	Robinson	3LW	I will send update Information is current
	Surry 1,2	3LW	
	Turkey Point 1,2	3LW	
	VC Summer	3LW	
	Braidwood 1,2	4LW	
Frank Paslask	Byron 1,2	4LW	U-1 UPDATED 22.106 P-Rec 2014, 3 PEs U-2 - current.
	Callaway	4LW	
Dana Page	Catawba 1,2	4LW	updated on your attached sheet.
SWARI MOSTY	Comanche Peak 1,2	4LW	I will send update
David Miller	Cook 1,2	4LW	OK
	Diablo Canyon 1,2	4LW	
	Indian Point 2,3	4LW	
	McGuire 1,2	4LW	
C TOFT SALEM	Salem 1,2	4LW	Salem v/1 42 rem Salem v/2 36.5 Rem

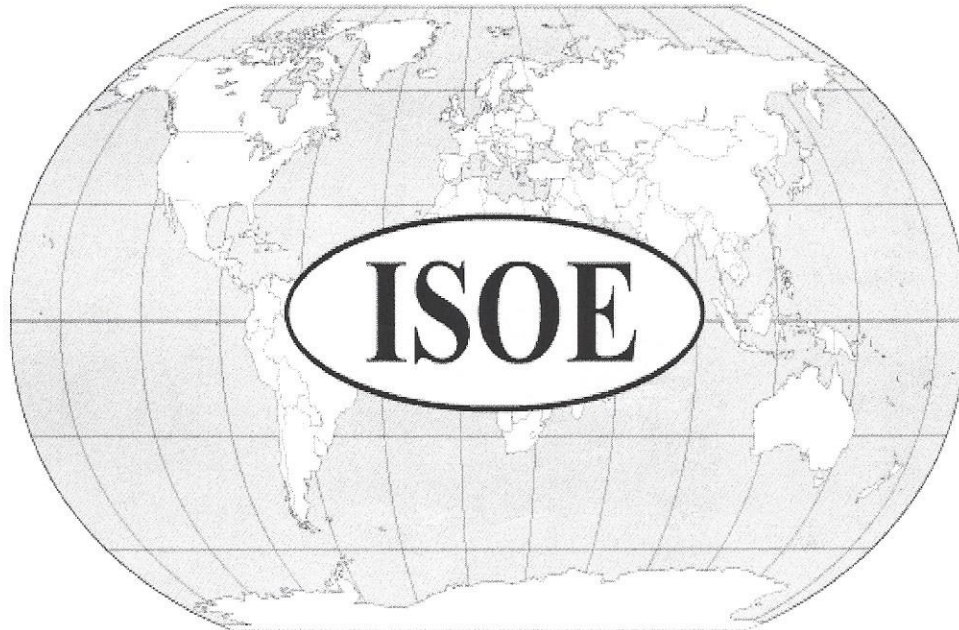
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HIGH INTEREST TOPIC AND QUESTIONNAIRE
PWR ALARA Association Key West, FL January 20-22, 2015

Topic:			
Contact (Name)	Plant	NSSS	Comments
Boehl	Seabrook	4LW	Updated
	Sequoyah 1,2	4LW	
	Sizewell B	4LW	
	South Texas 1,2	4LW	
C. Baune	Vogtle 1,2	4LW	Current
	Watts Bar	4LW	
J. Cuffe	Wolf Creek	4LW	I will update THE INFORMATION
	Millstone 3,2	4LW, CE	
	Calvert Cliffs	CE	
	Ft. Calhoun	CE	
J. Smith	Palisades	CE	186 REM
S. Williams	Palo Verde 1,2,3	CE	updated attachment / I will email most current info
	San Onofre 2,3	CE	
	St. Lucie 1,2	CE	
	Waterford	CE	
	ANO 2,1	CE, B&W	
	Crystal River	B&W	
	Davis Besse	B&W	
Phil Kelley	Oconee 1,2,3	B&W	35 REM UNIT 1 41.5 REM U-3
Steve Wilson	TMI	B&W	No change
	Areva		
	EDF		
	Westing-house		

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OECD Nuclear Energy Agency
International Atomic Energy Agency



INFORMATION SYSTEM ON OCCUPATIONAL EXPOSURE

General Distribution

May 19, 2014

ISOE INFORMATION SHEET

**North American Technical Center
Information System on Occupational Exposure**

US PWR Lowest Outage Dose and Duration Record Book

NATC ISOE Information Sheet No. 2014-12

The NATC ISOE Information Sheet No. 2014-12 provides an annual report on the lowest US PWR Refueling Outage Dose, Year and Fuel Cycle for each operating US PWR Unit. The data is reported and verified by each US Radiation Protection Manager. The Lowest Outage Dose Record Chart serves as an incentive to US PWR plants to be in the continuous ALARA improvement mode during the planning and safe execution of refueling outages. Several US PWRs have achieved site record low refueling outage doses in the past 3 years.

North American Technical Center • College of Engineering • University of Illinois
Published by Dr. David Miller and Derek Hultquist
Copyright 05/20/2014

The table is updated annually. Please send new outage dose records to dwmiller2@aep.com.

TABLE 1: Lowest Reported Refueling Outage Doses for US PWRs						
	PLANT	DOSE	YEAR	CYCLE	TLD/ED	COMMERCIAL OPS DATE
1	PALO VERDE-1	19.157 20.6	2012 2011	17 16	ED	1986
2	FARLEY-2	25.5	2011	21	TLD	1981
3	POINT BEACH-2	28.2	2006	28	TLD	1972
4	GINNA	33.5	2006	30	ED	1970
5	PALO VERDE-3	33.6	2006	12	ED	1988
6	DC COOK-2	34	2009	18	TLD	1978
7	DC COOK-1	36.3	2010	23	ED	1975
8	COMMANCHE PEAK-1	39.5	2011	15	ED	1989
9	HARRIS	41.7	2004	12	TLD	1987
10	PRAIRIE ISLAND-2	42	2006	24	TLD	1974
11	POINT BEACH-1	42.4	96	23	TLD	1970
12	COMMANCHE PEAK-2	43.7	2009	11	ED	1993
13	BYRON-2	44.9	2011	16	TLD	1987
14	VOGTLE-1	47	2011	16	TLD	1987
15	SEABROOK	44.2 47.8	2005	10 16	TLD	1990
16	CALLAWAY	47.9	2008	16	ED	1984
17	OCONEE-1	48	2005	22	TLD	1973
18	FARLEY-1	48.6	2006	20	ED	1977
19	PALO VERDE-2	48.9	2009	15	ED	1986
20	NORTH ANNA-2	50	2008	19	TLD	1980
21	NORTH ANNA-1	51.5	2000	14	ED	1978
22	MCGUIRE-1	52	2002	15	TLD	1981
23	PRAIRIE ISLAND-1	52	2008	25	TLD	1973
24	TURKEY POINT-3	52.7	2005	22	ED	1974
25	SALEM-1	56.29	2011	21	ED	1977
26	VC SUMMER	59	2008	18	ED	1984
27	VOGTLE-2	59.2	2008	13	TLD	1989
28	SALEM-2	59.9	2011	18	ED	1981
29	ROBINSON	60	2008	25	TLD	1971
30	ANO-2	61	99	13	TLD	1980
31	MCGUIRE-2	47.61	2008	18 13	TLD	1984
32	SOUTH TEXAS-1	61	2003	11	ED	1988
33	TMI	61.5	2005	15	TLD	1974

Dose year cycle

34	TURKEY POINT-4	62	2002	20	TLD	1973
35	MILLSTONE-3	63	2005	10	ED	1986
36	CALVERT CLIFFS-1	63	2005 2008	17	TLD	1975
37	BYRON-1	63.39	2008	15	TLD	1985
38	BEAVER VALLEY-2	64	2002	9	TLD	1987
39	INDIAN POINT 3	66	2005	13	TLD	1976
40	KEWAUNEE	66	94	19	TLD	1974
41	WATTS BAR	31.4 67	2008 2014	8	TLD ED	1996
42	ANO-1	68	77	1	ED	1974
43	CATAWBA-1	22.769	2002	2012 2013	TLD	1985
44	BRAIDWOOD-2	35.70	2005 2011	11	TLD	1988
45	SURRY-1	64.5 70	2000	2013 16	ED	1972
46	OCONEE-3	72	2003	20	TLD	1974
47	DIABLO CANYON-2	22.274	2006	2013 1713	ED	1986
48	SEQUOYAH-1	76	2004	13	TLD	1981
49	SEQUOYAH-2	76	2008	15	TLD	1982
50	SURRY-2	53.5 78	2005	2014 19	ED	1973
51	BRAIDWOOD-1	25.70	2004	11	TLD	1988
52	DAVIS BESSE	40 80	2012 80	19 8	ED	1978
53	OCONEE-2	80	2005	20	TLD	1974
54	SAN ONOFRE-2	81	2008	15	ED	1983
55	CATAWBA-2	62.82	2000	2012 1810	TLD	1986
56	WOLF CREEK	82	2003	13	ED	1985
57	SOUTH TEXAS-2	82	2006	12	ED	1989
58	MILLSTONE-2	85	2002	14	ED	1975
59	BEAVER VALLEY-1	37.14 85	2007 2013	18	TLD	1976
60	ST LUCIE-2	86	2000	12	TLD	1983
61	FORT CALHOUN	89	2008	24	TLD	1974
62	WATERFORD	92	2003	12	TLD	1985
63	SAN ONOFRE-3	94	2008	15	PD	1984
64	ST LUCIE-1	98	2008	22	ED	1976
65	DIABLO CANYON-1	30 108	2007 2014	1814	TLD	1985
66	CRYSTAL RIVER	119	2003	13	ED	1977
67	INDIAN POINT-2	143	2008	18	ED	1974
68	CALVERT CLIFFS-2	149	2001	13	ED	1977
69	PALISADES	174	2001	15	TLD	1971
	Not Active					
1	MAINE YANKEE	221	77	2	TLD	1972
2	ZION-2	206	95	13	ED	1974
3	HADDAM NECK	392	93	17	ED	1968
4	ZION-1	484	89	11		1973

HIGH INTEREST TOPIC AND QUESTIONNAIRE

PWR ALARA Association

Key West, FL

January 20-22, 2015

Firewall, please provide gmail or other email address.

Topic: PWR ALARA Take Aways; Ringhal u-4 PZR Replacement.
 Ringhal ALARA Paper (Attached) were provide to you on MY Box, were you able to

Contact (Name)	Plant	NSSS	Download: Y?, Comments IE Blocked by Company
	GINNA	2LW	
	Kewaunee	2LW	
	Point Beach 1,2	2LW	
	Prairie Island 1,2	2LW	
	Ringhals 2,3,4	2LW 3LW	
	Beaver Valley 1,2	3LW	
	Farley 1,2	3LW	
	Harris	3LW	
<i>PR</i>	North Anna 1,2	3LW	<i>Have not tried yet</i>
	Robinson	3LW	
	Surry 1,2	3LW	
	Turkey Point 1,2	3LW	
	VC Summer	3LW	
	Braidwood 1,2	4LW	
	Byron 1,2	4LW	
	Callaway	4LW	
Darcy Campbell Dana Page	Catawba 1,2	4LW	Yes - forwarded to Email.
	Comanche Peak 1,2	4LW	
<i>David Miller</i>	Cook 1,2	4LW	<i>Yes - Download OK</i>
	Diablo Canyon 1,2	4LW	
	Indian Point 2,3	4LW	
<i>S. Lisi</i>	McGuire 1,2	4LW	<i>Have not tried yet</i>
<i>C. TOFT</i>	Salem 1,2	4LW	<i>HAVE NOT TRIED YET</i>

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Boehl	Seabrook	4LW	have not tried yet.
	Sequoyah 1,2	4LW	
	Sizewell B	4LW	
	South Texas 1,2	4LW	
Abby Fields	Vogtle 1,2	4LW	Have not tried yet.
	Watts Bar	4LW	
	Wolf Creek	4LW	
	Millstone 3,2	4LW, CE	
Roy Lopez	Calvert Cliffs	CE	Have not tried yet.
	Ft. Calhoun	CE	
	Palisades	CE	
J. Byger	Palo Verde 1,2,3	CE	Please forward to Jeffery, byger@APS.com
	San Onofre 2,3	CE	
	St. Lucie 1,2	CE	
	Waterford	CE	
	ANO 2,1	CE, B&W	
	Crystal River	B&W	
	Davis Besse	B&W	
	Oconee 1,2,3	B&W	
Steve Edelman	TMI	B&W	Not yet
	Areva		
	EDF		
	Westing-house		

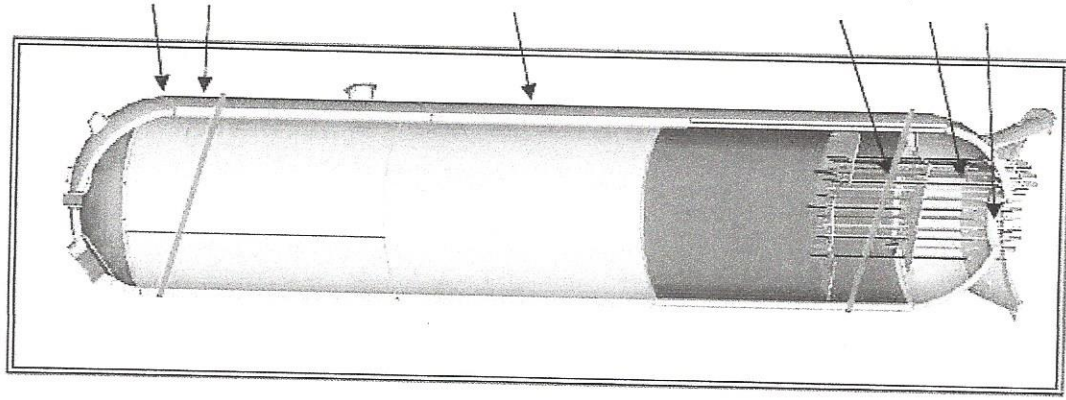
ALARA Management Measures and Experience in Post Handling of Replaced Pressurizer (PRZ), Ringhals unit 4

ISOE NATC ALARA Symposium, Fort Lauderdale 2015

E Hernvall Ringhals AB



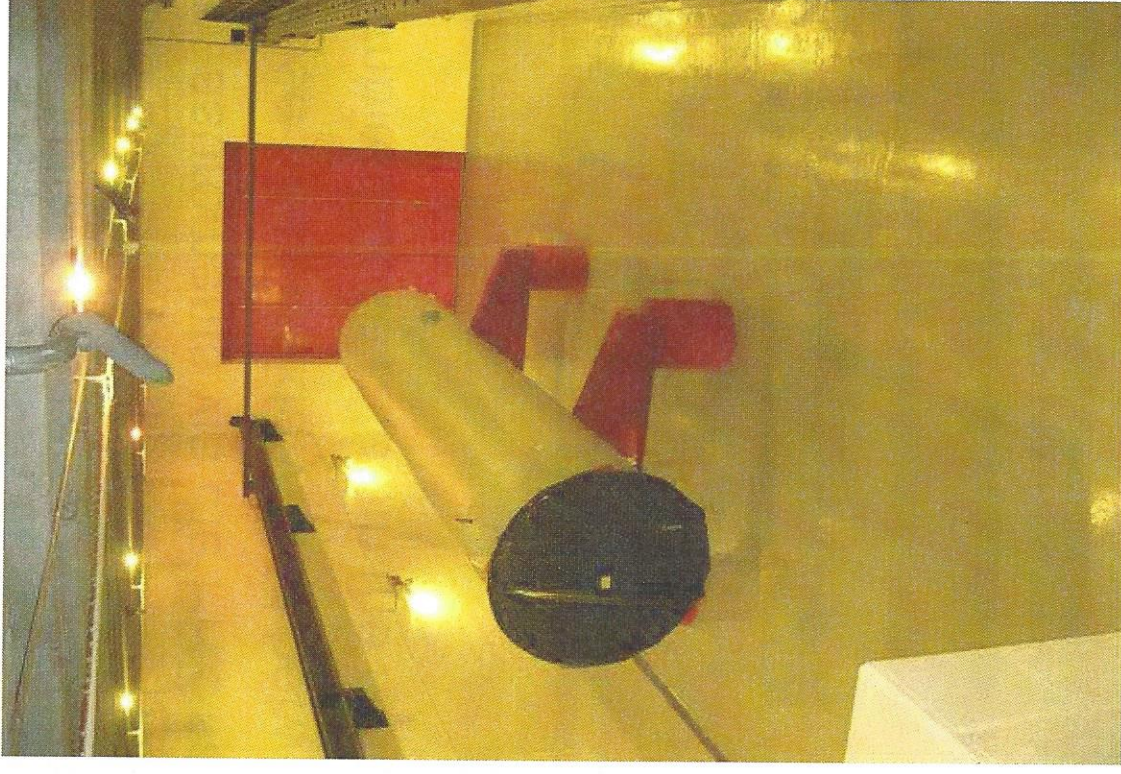
Parts to be removed for Investigation



- Instrument nozzle by electro sparking (ESM)
- Top dome by sawing
- Spray nozzle and lining
- Opening for ventilation by ESM
- Surge nozzle and lining by sawing
- 67 Heaters by turning
- Lower dome by sawing

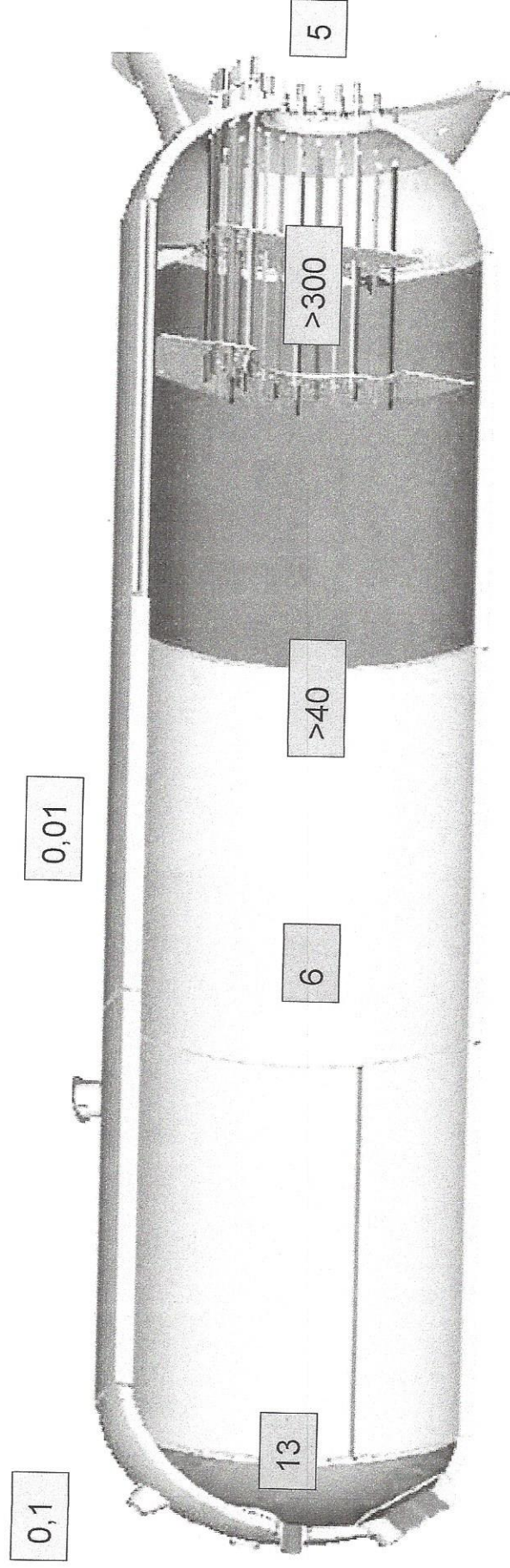
Where shall we work with the PRZ?

- Historical use of sealed sources meaning absence of:
 - Painted surfaces
 - Negative pressure
 - Air sampling
 - Active drain
- Adapted filtrated ventilation

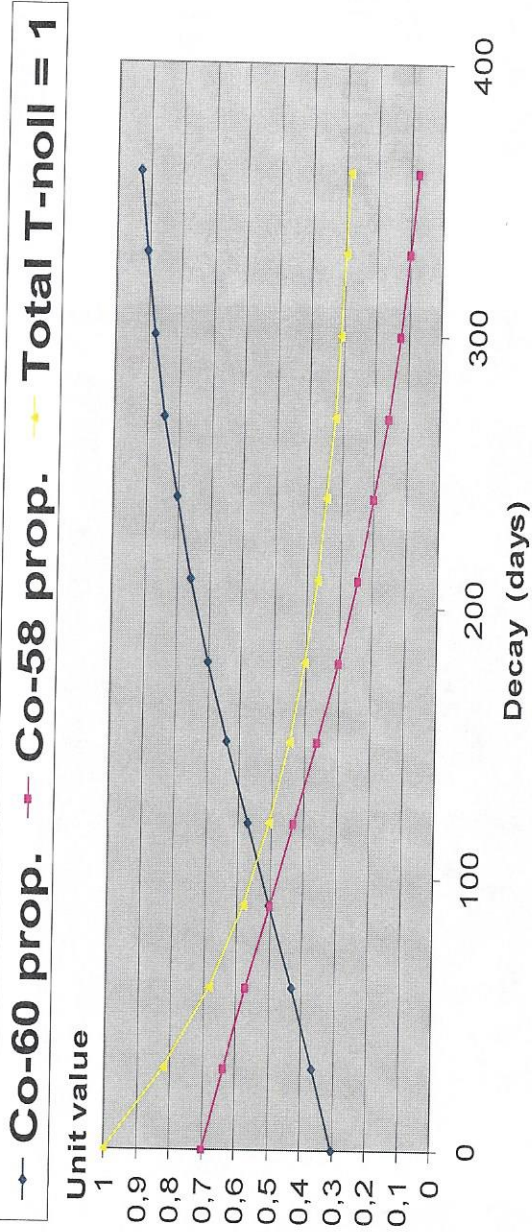


PRZ – dose rate survey

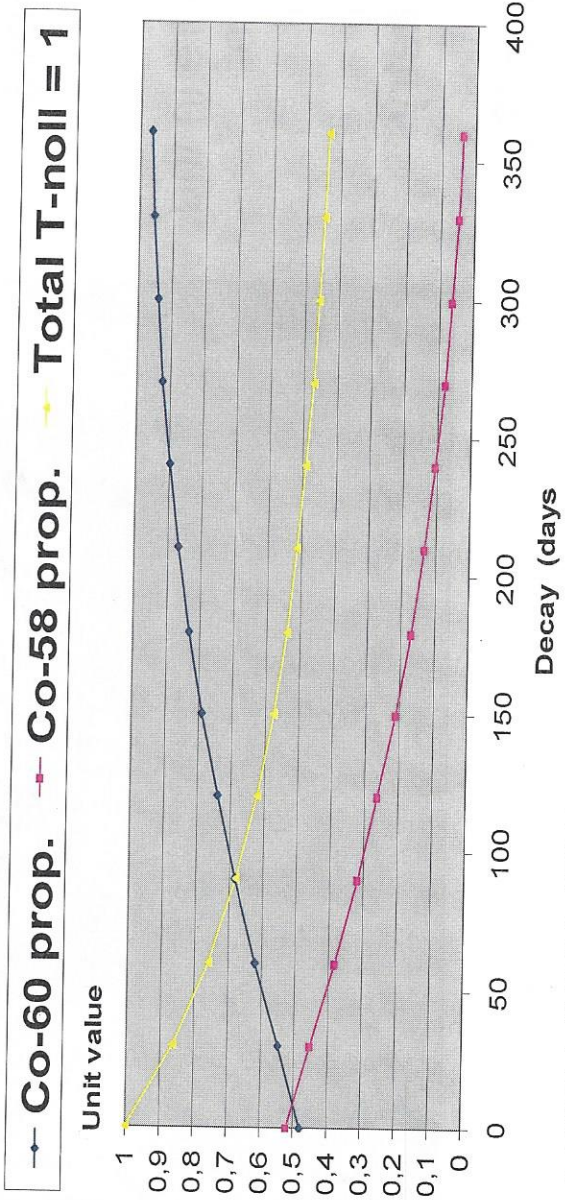
- The initial dose rates were determined by manual measurements and by nuclide specific surface activity measurements. TLD measurements via the PRZ safety valves and a PT 100 nozzle.
- Dose rates inside varied between 5 to 300 mSv/h
- Ambient dose rates in the range of a few $\mu\text{Sv/h}$ to 5 mSv/h



Source term dominating the RP measures



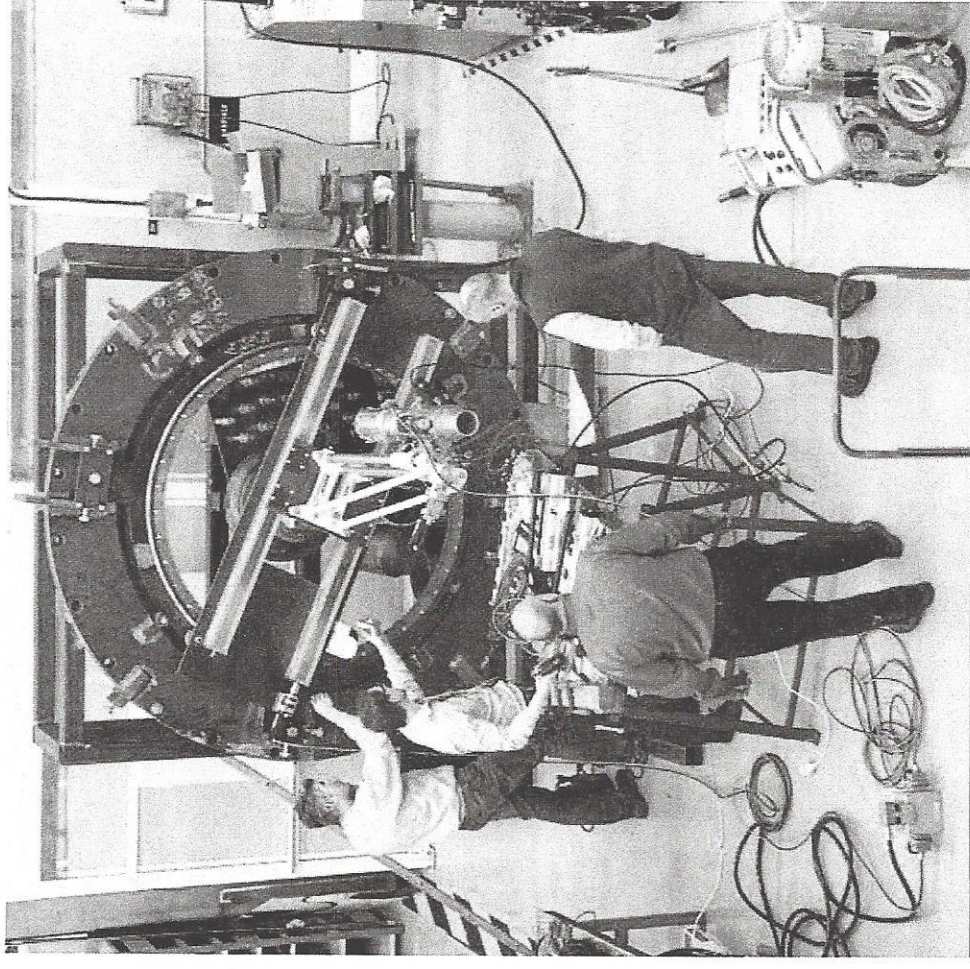
- Open source



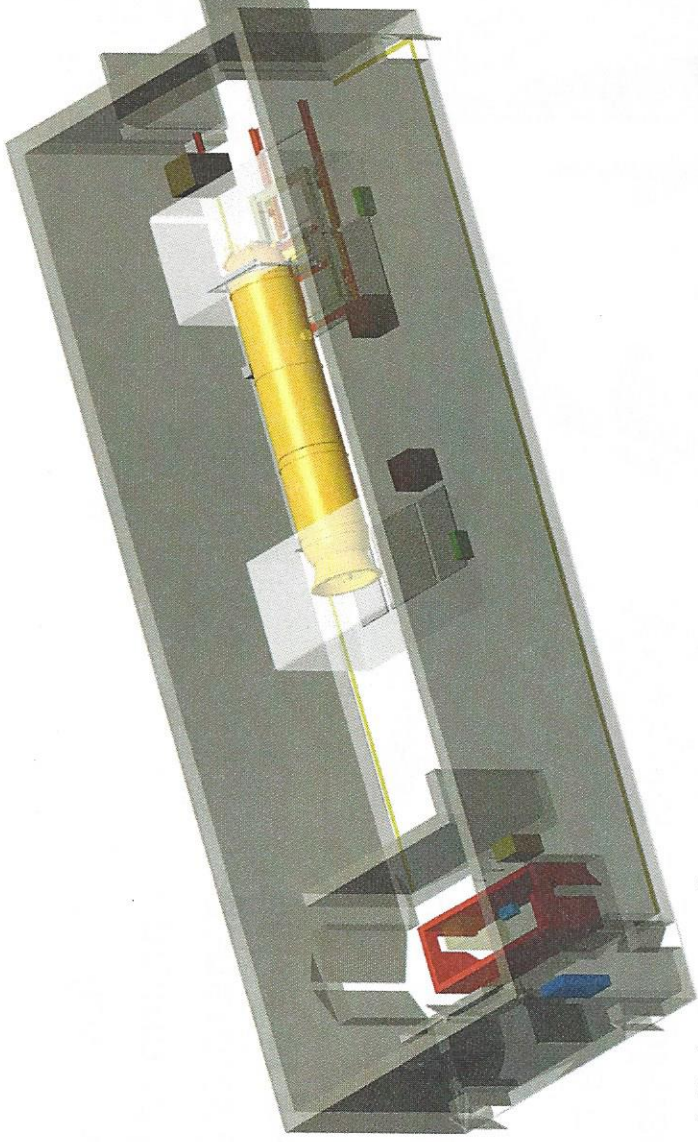
- Sealed source
- 8 cm Fe

ALARA-plan – main goals

- Very close cooperation between maintenance and RP
- Mock-up training before operations
- Remote controlled equipment. Handled from low dose area
- "Tailor made" shielding in all occasions near radioactive source
- Create negative pressure in the PRZ to prevent spread of contamination
- Use of telemetric dosimetry
- Dose estimation 75 mmanSv

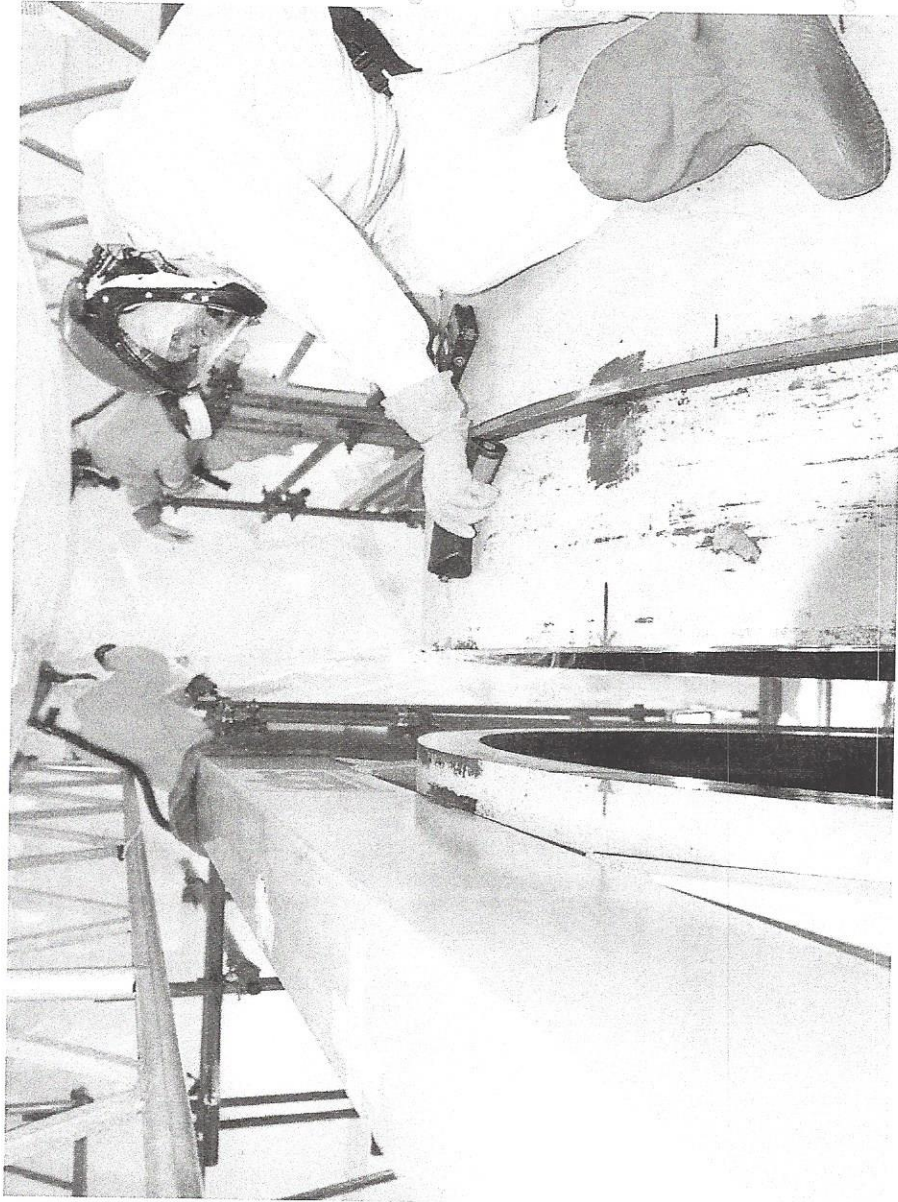


ALARA preparations before handling the PRZ as an open source



- Import of 40 tons of concrete blocks to create "low-dose" areas
- Connecting ventilation to the inside of PRZ
- Manufacture of a 5 ton concrete shielded box to store the removed 67 heaters
- Tents with negative pressure

Sawing off the upper part of PRZ



Air-flow into PRZ confirmed by smoke generator (from both sides of the opening)

4 mSv/h inside PRZ

Purpose built 20 mm steel plates mounted at openings

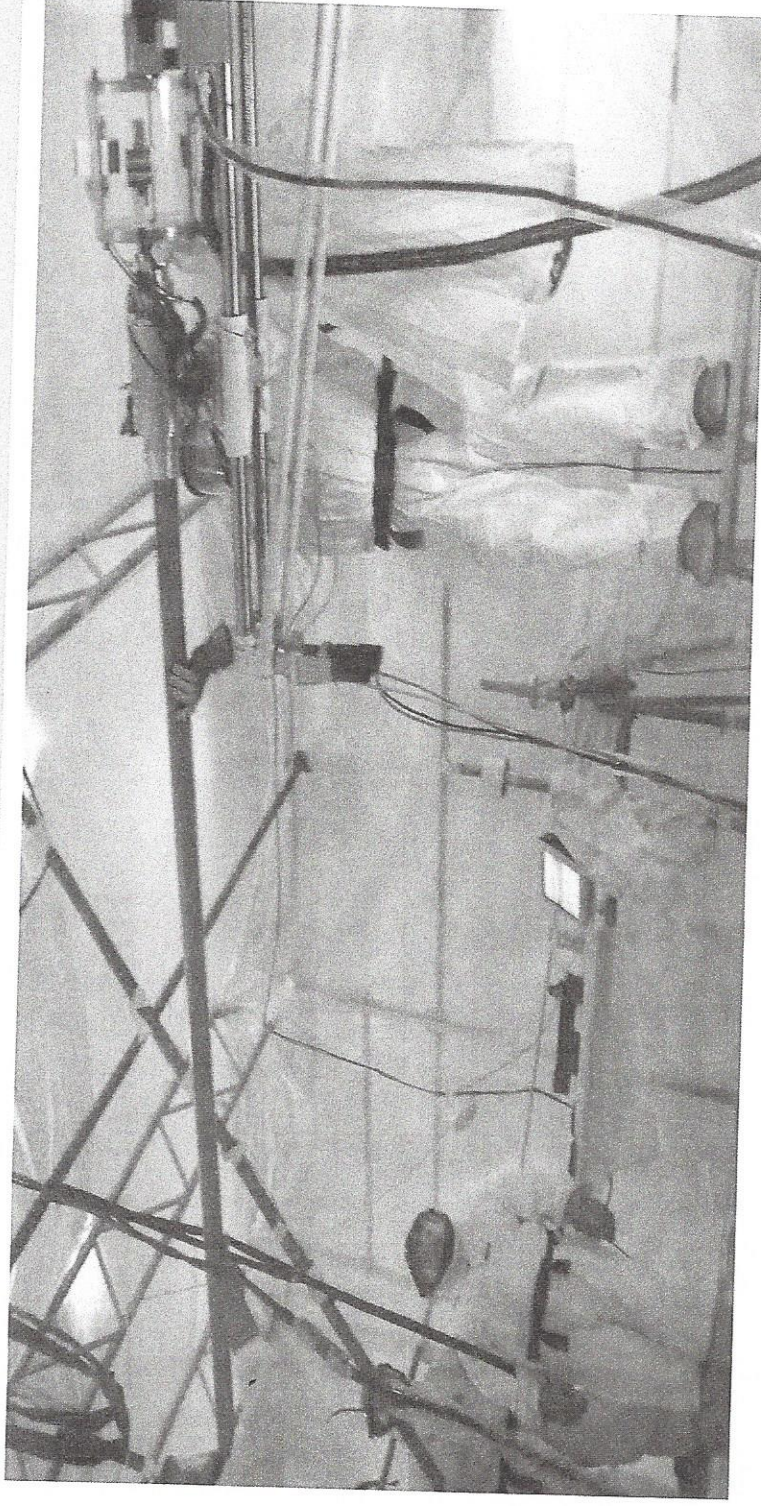
Top dome moved to decontamination workshop before re-use as mock-up

Sawing surge nozzle and turning heaters

- Rotating shielding
- Air-flow into PRZ
- Machines controlled from "low-dose" area

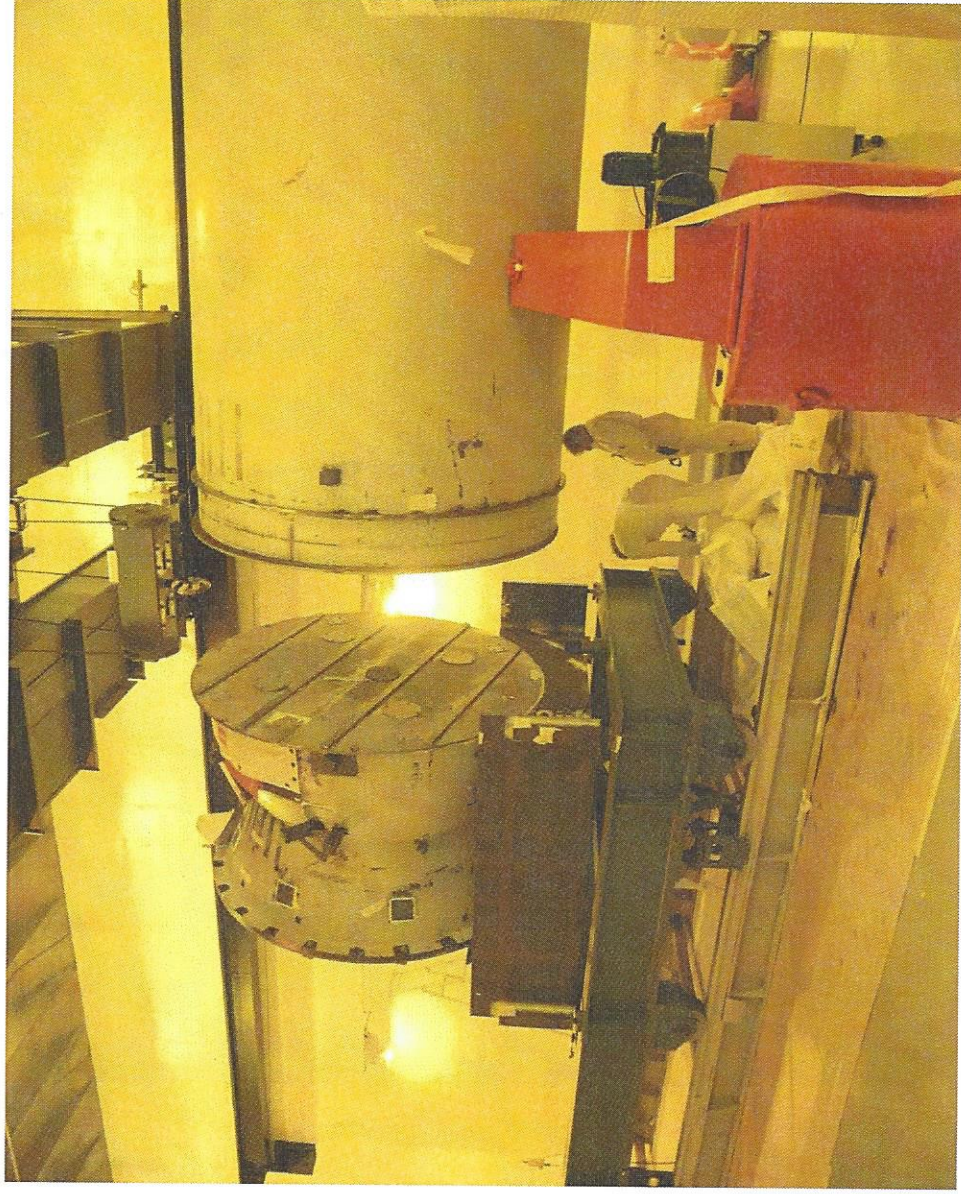


Pulling the heaters out of PRZ



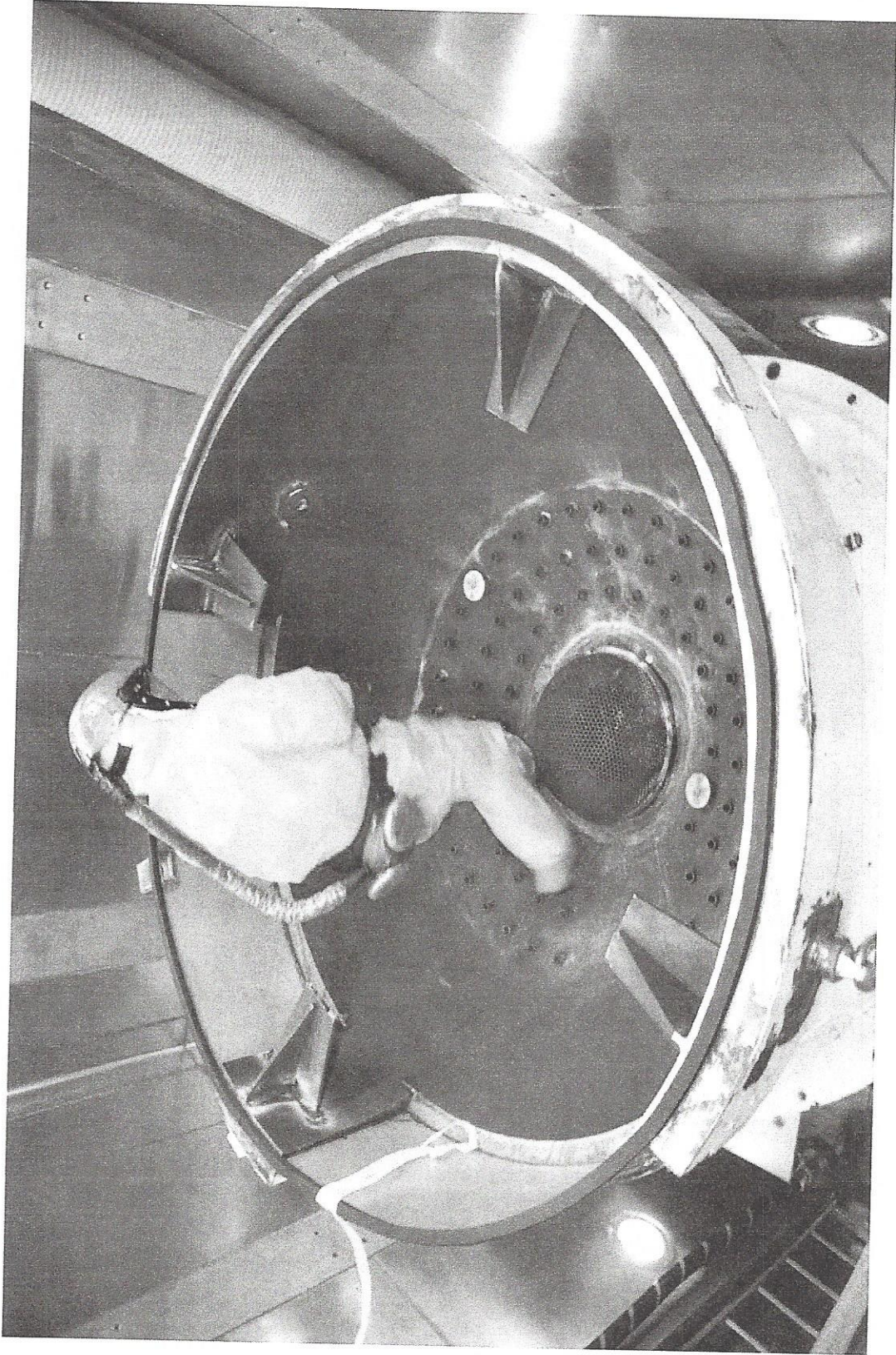
- Always as a sealed source
- Negative pressure inside PRZ
- 1-6 mSv/h in contact
- Placed in 5 ton concrete box, attenuation factor 10

Sawing off the lower part of PRZ



- Air-flow into PRZ from both sides of the opening, confirmed with smoke
- 6 mSv/h inside PRZ
- Purpose built 20 mm steel plates mounted at openings
- Bottom dome moved to decontamination workshop before re-use as mock-up

Decontamination of the lower part



12 | Ringhals ALARA for PRZ handling | E Hernvall/ T Svedberg | 2014-03-17
© Ringhals AB

Result

- Planned dose: ~75 mmanSv
- Received dose: ~28 mmanSv
- Max individual dose: 4,2 mSv
- No personal contamination
- No injuries
- Technical information received
- Full functional "Mock-up"

