

ISOE Presentation

A Journey To Excellence;

Transforming the EDF Energy (Existing Nuclear UK) Radiological Protection Programme

17 Nov 2010



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Background

EDF Energy – Existing Nuclear

EDF Energy - Existing Nuclear (UK) own and operate eight nuclear power stations in the UK with a combined capacity of around 9000 megawatts. We operate two types of nuclear reactors; **fourteen** advanced gas-cooled reactors (AGR) and **one** pressurised water reactor (PWR).

Our approach to radiological protection is to continually strive to improve standards and emulate best practices.



Key:

● Advanced Gas-Cooled Reactor (AGR)

■ Pressurised Water Reactor (PWR)

● Non operational sites



Background (cont'd): 3 Year WANO Collective Radiation Exposure results

WANO Results 4th Quarter 2009 - 3 Year Collective Radiation Exposure

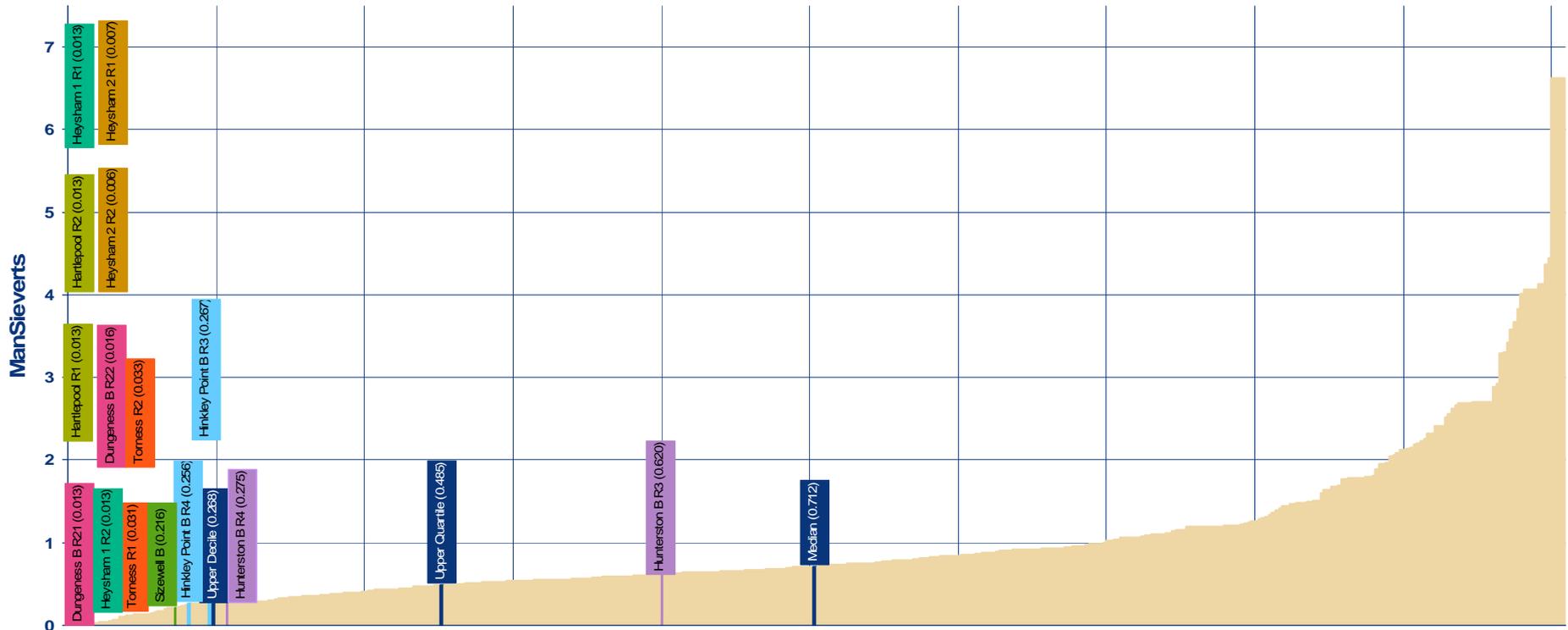


Chart shows position of Existing Nuclear Stations

By comparison with other Nuclear Operators the cumulative radiation dose received by workers at British Energy is relatively low – primarily due to the design of the AGR's and excellent PWR dose performance.

HPB and HNB are the only two sites that undertake high dose boiler repair work.



Background (cont'd): Highest individual dose 2006 – 2010 to date

Year	EDF Energy (Existing Nuclear) Highest individual dose mSv	Number of workers above	
		10 mSv	15 mSv
2010 to date	4.4	0	0
2009	8.7	0	0
2008	9.1	0	0
2007	5.9	0	0
2006	11.7	73	0

Company Dose Restriction level (CDRL) = 10 mSv/a.

Company Dose Investigation level = 15 mSv/a.

Legal limit = 20 mSv/a

No worker (including Outage contract partners) has exceeded the Company CDRL post 2006. This is attributed to excellent dose and work management controls across all sites.



The Challenge facing the RP function

- Complacency resulting from excellent dose performance.
- Profile of radiological protection.
- Eight stations with different ways of doing things – reluctant to change.
- Robust with regard to legal compliance but lagging Industry best practices.
- Obsolete instrumentation, radworker practices and contam control.
- Radiological protection performance not objectively assessed and reported at executive level.
- About to embark on extremely high dose maintenance work.
- Transitioning the Corporate function from policy making to support and continuous improvement.
- What to aim for and where to start?



Way Forward – as determined by the RP Peer Group

- Provide infrastructure and terms of reference - debate issues, but support decisions once agreed.
- Develop a the process model.
- Improve reporting at Stations and Corporate level.
- Implement an Improvement Plan to deploy and embed best practices across the Company.
- Align to a Company standard.
- Revise Metrics, Performance Indicators and Reports – more objective.
- Obtain Executive support.



Infrastructure: Radiological Protection Peer Group and Task Teams

Training Steering Committee

Heads of Radiological Protection Peer Group (HoRP)

Task Team 1
PPE & Contam Control

Task Team 2
RP Instrumentation

Task Team 3
Dosimetry

Task Team 4
RAM Transport

Task Team 5
RWPs, Safety Documents & Permits

Task Team 6
Radiography

- HoRP Peer Group:
 - review performance and determine priorities
 - approve Improvement Plan initiatives
 - agree the Corporate RP Business Plan and Risks
 - approve Task Team recommendations
- Monthly Peer Group call downs and quarterly face to face meetings
- Task Team meetings to resolve problems and standardise processes
- Process to deal with emergent work
- RP risks managed via the Company Risk Register
- Monthly progress review and update

Radiological Protection Process Model

RESULTS

STANDARDS

- Management and leadership
- Personnel Knowledge and skills
- Radiation dose control
- Contamination control
- Control of radioactive material
- Radiological protection measurements
- Radiation worker practices

Prevention

Detection

Correction

- Effective dose to a group of workers exceeds specified level
- Failure to meet IRR requirements
- Staffing level against station structure
- Time in the field
- RP personnel qualification compliance
- Contractor training completion
- Training qualifications as causal factor
- Collective radiation exposure
- Genuine EPD dose alarms
- Highest individual dose
- Radiation hot spots
- Events potentially leading to an unplanned radiation exposure
- Contamination controlled area (m2)
- Level 1 personal contam events
- Level 2 personal contam events
- Spread of contam outside CCA
- Spread of contam outside RCA
- Temporary contam control areas
- Release or spillage of radioactive material
- Breakdown of radiological control
- TRA Offsite control breakdown
- TRA Onsite control breakdown
- Equipment found out of calibration
- EPD spurious events
- Progress to replace RP Instrumentation
- Number of worker lockouts
- Worker practices

• RP Business & Improvement Plans
• Company Risk Log

Health Report

After reviewing our coaching observations, CAP trends, cause investigation results and analysis of our performance metrics, including comparison against target and best practice values determine what actions are required.

Self-Assessments
Benchmarking
Coaching cards
Time in the field
OPEX, MEVAL, REVAL

WANO reviews
RP/SRD surveillances
Audit findings
Performance trends

Corrective actions
Cause investigation

Target Performance Actual Performance Best Performance

Performance GAPS and risks

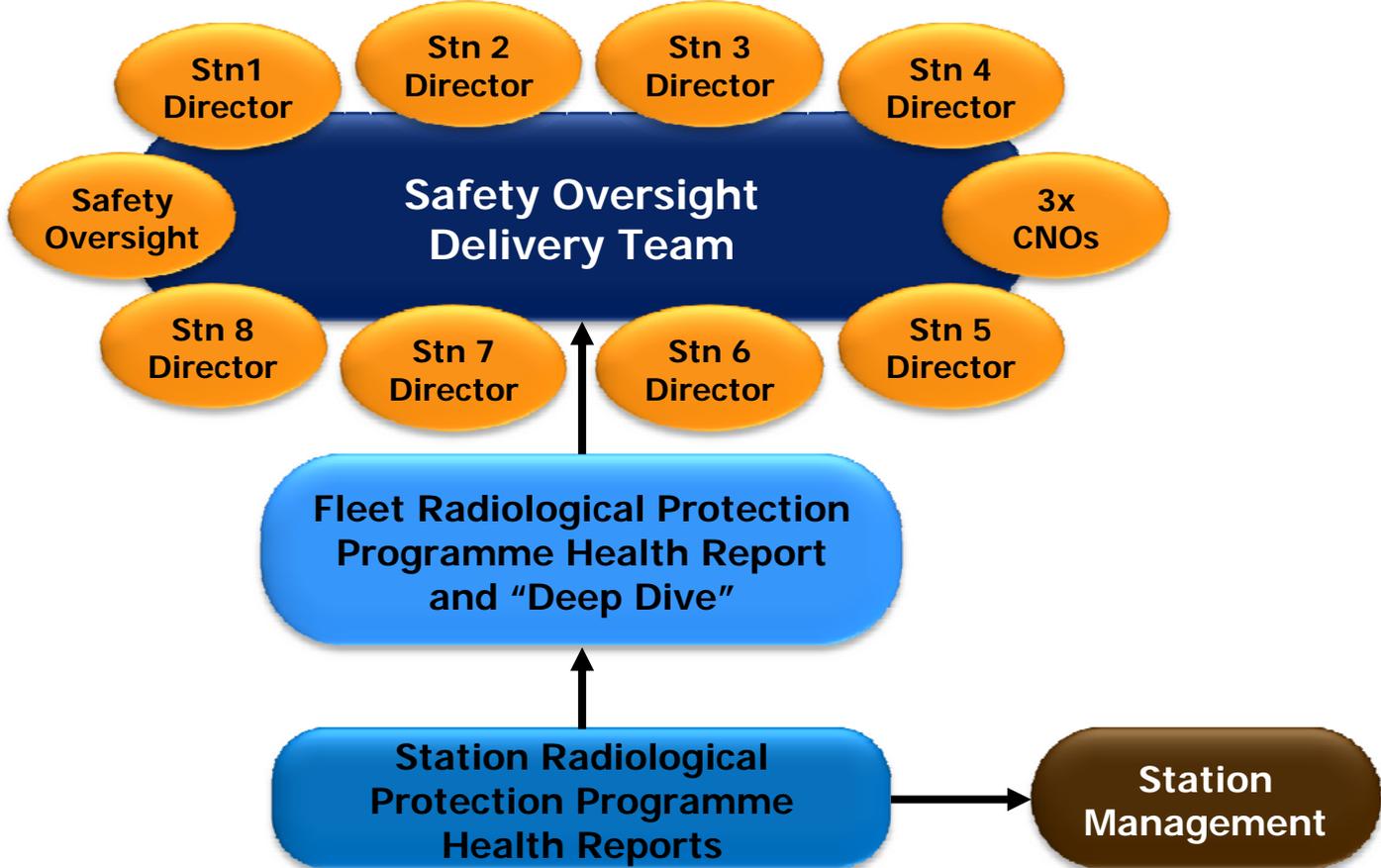
- What have we learned from analysis of leadership coaching observations?
- What self-assessments have we completed and what are these telling us?
- What OPEX has been reviewed, what actions do we need to take?

- What have we learned from trends of near-misses and event precursors? Learning clock resets?
- Have we received any WANO AFIs? What are the causes?
- What have our oversight organisations identified?
- Has the regulator identified any findings?

- What have we learned from event investigations?
- What are the underlying causes of events?

- What is the analysis of our performance metrics telling us?
- If there is a delta between our actual and target performance, what is the reason?
- Is the trend improving or deteriorating? Why?
- How does our performance compare with international best practice? What is the reason?

Reporting structure

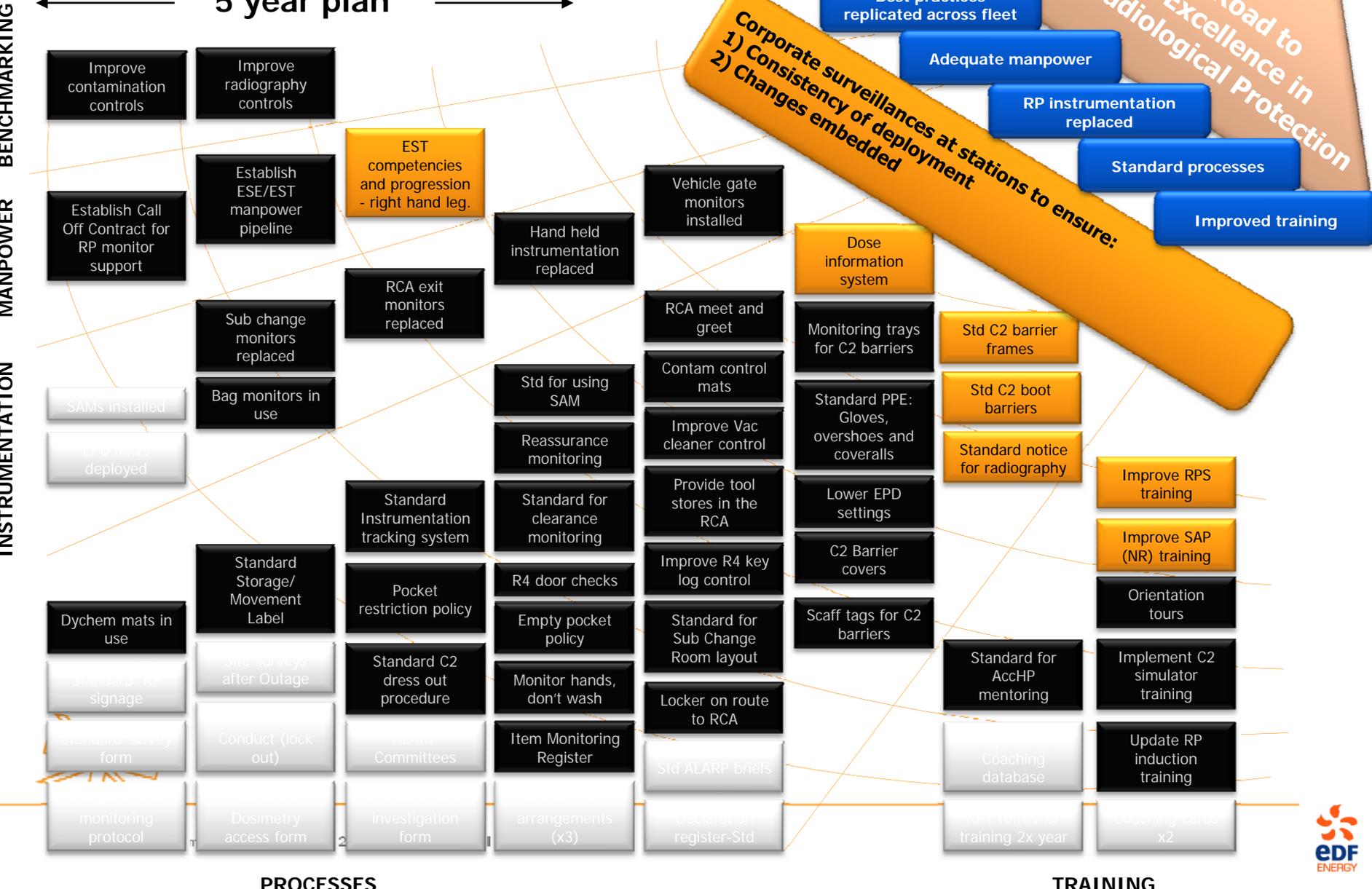


Stations compile a quarterly Station Health Report to analyse performance and identify gaps, trends and corrective actions. The Station Health Reports are rolled up into a Fleet Health Report that is reported as a "Deep Dive" reflecting fleet programme health and progress to deploy improvement initiatives. A comprehensive annual report is presented to the Company Safety Oversight Delivery Team together with monthly updates.

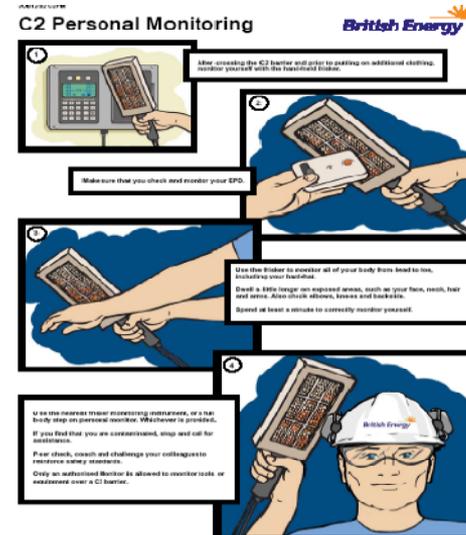
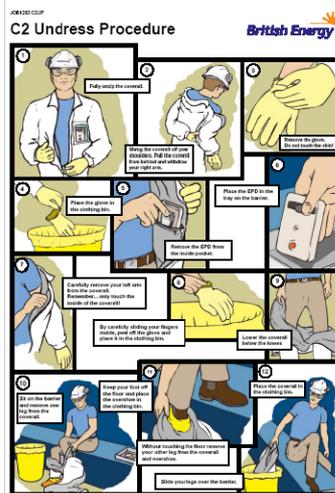
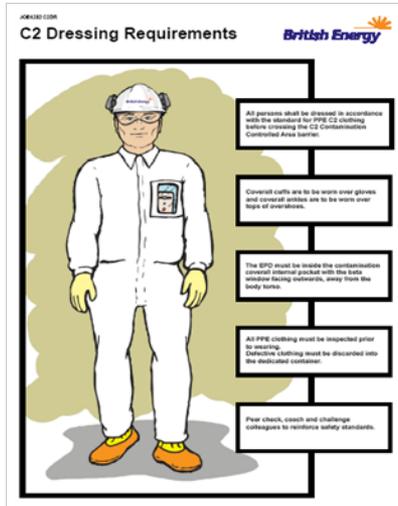
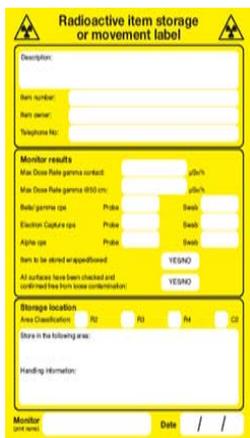
Drive to excellence: Radiological Protection Improvement Plan

Yellow - Core action not completed **Green** - Stations implementing **Blue** - Implemented across the fleet

← **5 year plan** →

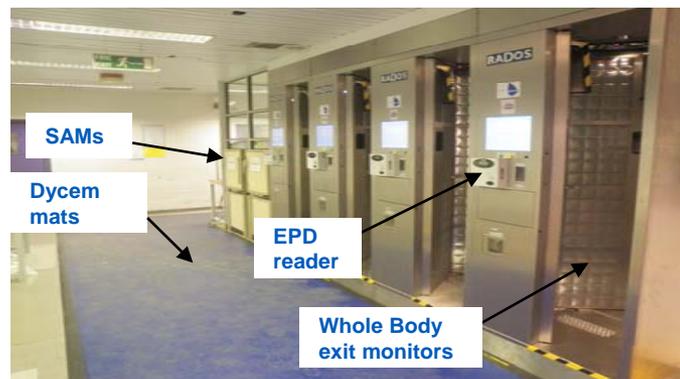


Improvements: The fleet is working towards implementing 53 initiatives aimed at standardisation and improvement



Standard labels and signs

Standard coveralls, standard for dressing/undressing and personal monitoring requirements.

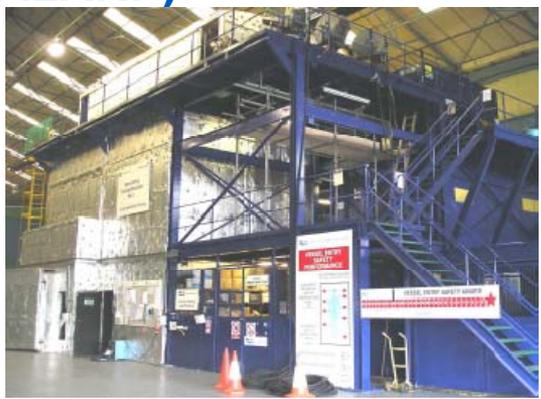


Standard for temporary contamination controlled area (C2) barrier set up

Standard for Radiation Controlled Area exit layout.

Bagging and tagging standard..

Improvements (cont'd): Initiatives to keep doses as low as reasonably practicable (ALARP)



Gateshead training facility for in vessel work



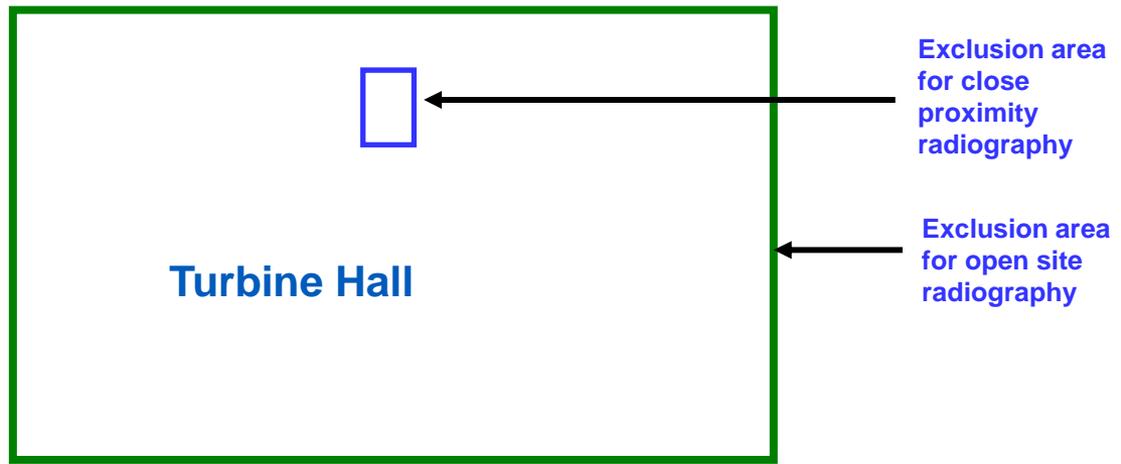
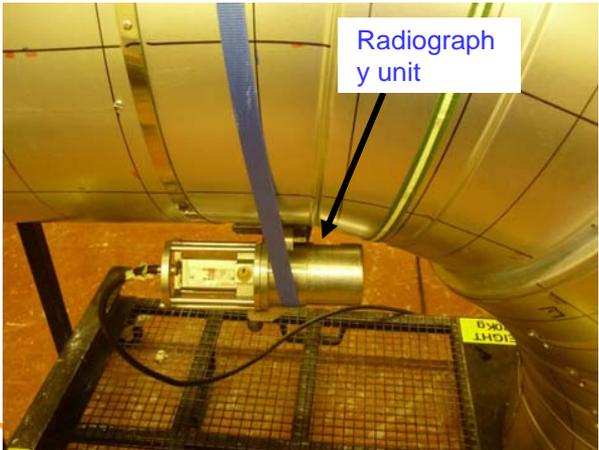
SZB Pressuriser mock up training



Remote welding

Use of mock up training for all high dose work have made a significant contribution to keeping doses ALARP.

Improvements: Use of close proximity radiography



Use of Close Proximity Radiography (SCAR and Saferad) drastically reduces the radiological risk and only requires a very small exclusion area compared to conventional open site radiography – also improving productivity. Can be performed 24/7.

Improvements (cont'd): Initiatives to improve contamination control and worker practices



Contamination Controlled Area (C2) simulator training - training to a Company standard.



Lockers on route to the Radiation Controlled Area (RCA) to support the Pocket Restriction Policy ie only take the items you require for the job into a RCA.



Empty pocket policy. All personal items, including those in pockets to be monitored in a Small Article Monitor when exiting a RCA.



Laundry barrier covers introduced to prevent the spread of contamination



Radiation Controlled Area tool stores: Not having to remove tools from the RCA reduces the risk of inadvertently spreading contamination beyond the RCA boundary and improves all-round productivity.



Laundryable contamination control mats: To provide a clean working surface in a Contamination Controlled (C2) Area.

Improvements (cont'd): Standardisation and replacing obsolete instrumentation



Replace RCA whole body exit monitors.



Two Step monitors for sub change areas. Major improvement over the old hand and foot monitors.



Standard portable instrument for personnel to monitor themselves at temporary Contamination Controlled Area (C2) barriers.



All stations now using Small Article Monitors.



Bulk monitoring instrument.



Stations only permitted to purchase RP instruments on Company approved list



All stations now using Siemens Mk2 Dosemeters as Legal Electronic Personal Dosemeter.



Gate drive through monitors.



There has been significant investment and progress to replace the most critical radiological protection instrumentation.

Deploying best practises across the fleet – control sheet.

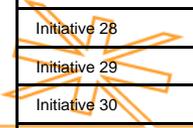
Implementation	Core	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8
Initiative 1	Completed	1	1	1	1	1	1	0	0
Initiative 2	Completed	0	0	1	0	0	0	0	0
Initiative 3	Completed	0	1	0	0	0	0	0	1
Initiative 4	Completed	1	1	1	1	1	1	1	1
Initiative 5	Completed	1	1	1	0	0	0	0	1
Initiative 6	Completed	1	1	1	1	1	0	0	1
Initiative 7	Completed	1	1	0	1	0	1	1	1
Initiative 8	Completed	1	1	1	1	0	1	1	1
Initiative 9	Completed	1	1	1	0	0	0	1	0
Initiative 10	Completed	1	0	0	0	0	0	0	0
Initiative 11	Completed	1	1	1	1	1	1	1	1
Initiative 12	Completed	1	1	1	1	1	1	1	1
Initiative 13	Completed	1	1	1	1	1	1	1	1
Initiative 14	Completed	1	1	1	1	1	1	1	NA
Initiative 15	Completed	1	1	1	1	1	1	1	1
Initiative 16	Completed	1	1	1	0	0	0	1	1
Initiative 17	Completed	1	0	0	1	0	1	1	1
Initiative 18	Completed	1	1	1	1	1	1	1	1
Initiative 19	Completed	1	1	1	1	1	1	1	1
Initiative 20	Completed	1	1	1	1	1	1	1	1
Initiative 21	Completed	1	1	1	1	1	1	1	1
Initiative 22	Completed	1	1	1	1	1	1	1	1
Initiative 23	Completed	0	1	1	0	1	1	1	0
Initiative 24	Completed	0	1	0	0	1	1	1	0
Initiative 25	Completed	0	0	0	0	0	0	0	1
Initiative 26	Completed	0	1	1	1	1	1	1	1
Initiative 27	Completed	0	1	0	1	0	0	0	1
Initiative 28	Completed	1	1	0	1	1	0	NA	1
Initiative 29	Completed	0	1	0	1	NA	1	0	1
Initiative 30	Completed	1	1	0	1	0	0	1	0
Initiative 31	Completed	0	1	0	0	0	0	0	0
Initiative 32	Completed	1	1	0	1	0	0	1	0
Initiative 33	Completed	1	1	1	1	1	1	1	1

Station implementation status
 0 = Not implemented at station
 1 = Station claim full implementation

Full description of improvement initiative – with references embedded

Corporate surveillance at station
 Green: Adequately implemented
 Yellow: Some refinement required
 Red: Not adequately implemented

Corporate standard issued



Assessing progress (out of 53) – Overall performance.

Initiatives Implemented	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8
Improvement Plan	23	29	21	23	19	22	24	25
Support Work	11	18	8	12	12	13	13	12
Total Implemented	34	47	29	35	31	35	37	37

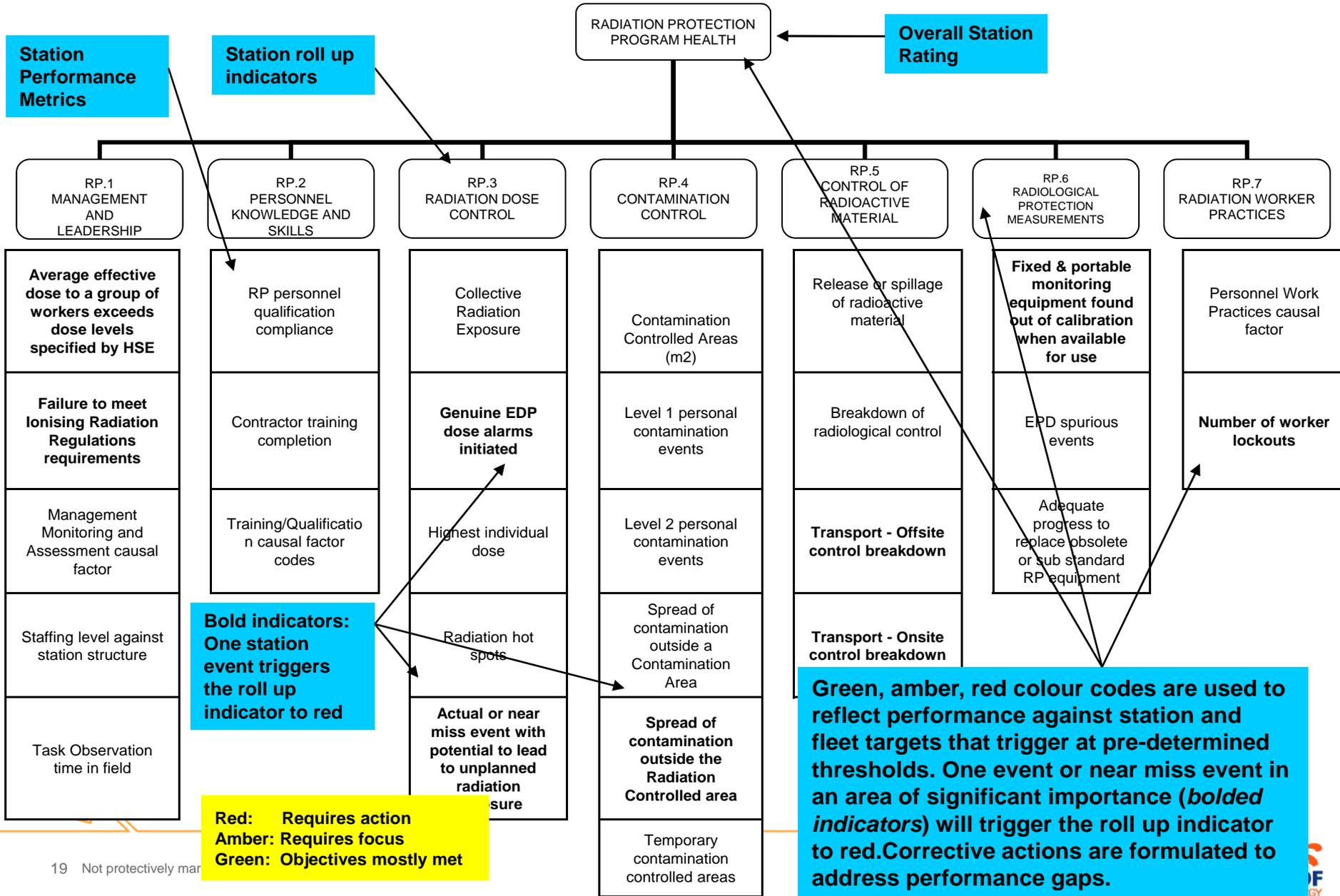
Overall good progress being made to implement fleet improvement initiatives. Excellent progress by Stn 2.

Corporate verification	Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8
Adequately Implemented	30	31	16	3	3	7	30	11
Some refinement required	2	7	7	1	0	0	5	2
Not adequately implemented	1	0	1	2	1	0	0	0
Total Assessed	33	38	24	6	4	7	35	13

Corporate implementation plan surveillances indicate that the majority of initiatives are being implemented to the Company standard.



Indicators: Station Radiological Protection Program Health Indicators - aligned to WANO PO&Cs and measured against 28 parameters – set to drive excellence.



Indicators: Fleet Radiological Protection Program Health measured against excellence/best practice

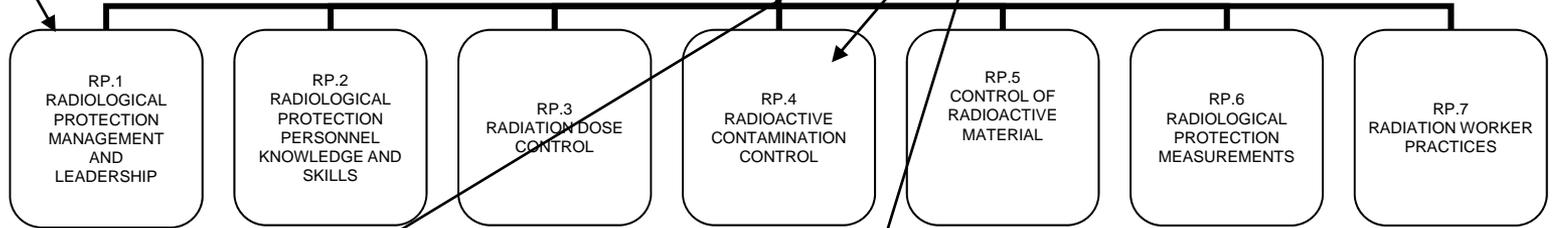
Fleet roll up indicator

Overall Station Rating (from previous slide)

Overall Fleet Rating

RADIATION PROTECTION PROGRAM HEALTH

Green, amber, red colour codes used to reflect fleet performance. Fleet actions formulated to address fleet performance gaps.



Stn	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 1	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 2	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 3	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 4	RP1	Station roll up indicators (from previous slide)		RP4	RP5	RP6	RP7
Stn 5	RP1	Station roll up indicators (from previous slide)		RP4	RP5	RP6	RP7
Stn 6	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 7	RP1	RP2	RP3	RP4	RP5	RP6	RP7
Stn 8	RP1	RP2	RP3	RP4	RP5	RP6	RP7

Station roll up indicators (from previous slide)

Red: Requires action
 Amber: Requires focus
 Green: Objectives mostly met



Indicators (cont'd): Other parameters

Health reports

		Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8
Peer group meeting attendance	Submitted by due date	G	G	G	G	G	G	G	G
	Quality of Health Report	G	G	G	G	G	G	G	G

Red = No attendance
 Amber = Stand-in
 Green = HoRP attended

		Stn 1	Stn 2	Stn 3	Stn 4	Stn 5	Stn 6	Stn 7	Stn 8
Peer Group Face to Face Meetings	Jun-09	G	R	G	G	G	G	A	G
	Nov-09	G	G	G	G	G	G	G	G
	Feb-10	G	G	G	G	G	G	G	G
	Jun-10	G	G	G	G	G	G	G	G
Peer Group teleconferences	Sep-09	G	G	A	G	G	A	G	R
	Oct-09	G	R	G	A	G	G	G	G
	Nov-09	G	G	G	G	G	G	A	G
	Dec-09	G	G	G	G	G	G	G	G
	Jan-10	G	G	G	G	A	G	G	G
	Feb-10	G	G	G	G	G	G	G	G
	Mar-10	G	G	G	G	G	G	R	G
	Apr-10	G	G	A	G	A	G	G	G
	May-10	G	G	G	G	G	G	G	G
	Jun-10	G	G	G	A	G	A	A	G
	Jul-10	G	G	A	G	G	G	G	A
	Aug-10	G	G	G	G	G	G	A	G



Key Lessons Learnt

Management

- ❑ The Company Executive must have an understanding of what underpins a RP programme and understand the RP vision. They also need to be aware of performance (health of the programme), problem areas, corrective actions, what support is required and why.
- ❑ Deploying instrumentation with an improved detection capability and introducing an empty pocket policy will inevitably result in an increase in contamination events, requiring stakeholder management.

Fleet approach

- ❑ A fleet approach based on consensus ultimately delivers the desired results, but is time consuming and “painful”.
- ❑ Working to a common Company standard has proven to have many advantages.
- ❑ Involving workers at the rock face in Task Teams is a recipe for success.
- ❑ Success breeds success – the 20/80 rule is not always appropriate.
- ❑  What gets measured gets done. Recognise and publicise successes.

Metrics

- ❑ The health of the RP programme must be based on objective metrics. It is important that significant events or near misses are high-lighted and brought to management's attention (averaging is not always appropriate).
- ❑ Balanced reporting = Improved focus and credibility.

Training/Worker practices

- ❑ The use of simulators to train workers undertaking high dose work has resulted in significant dose savings.
- ❑ Initial observations have indicated that training workers to a common standard in a contamination area simulator is fundamental to improving worker behaviours in the field – do workers know what is required of them?

Radiography

- ❑ Use of close proximity radiography reduces the overall radiological risk and improves productivity.

Dose control

- ❑ Individual doses can be maintained below 10 mSv/annum.



Closing Comments

- **Steady progress has been made to deploy Radiological Protection Improvement Plan initiatives across all EDF Energy Existing Nuclear (UK) Sites.**
- **This has contributed to overall improvement in Radiological Protection standards across the Company.**
- **The challenge for the Company is to maintain this level of improvement.**
- **The achievements to date, would not have been possible without ongoing management involvement and support.**
- **Our journey to excellence has just begun.**



Road to excellence