

A high-angle photograph showing two workers in white protective suits and hoods working on a complex piece of machinery. The scene is dimly lit, with some equipment highlighted by a light source.

The Benefit of Practical RP Simulation Training to Improve Safety Performance

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Refuelling Outage 18 Non-Return Valve machining

**WE SAFELY POWER
OUR NATION**

A graphic element for the EDF slogan, featuring a yellow and orange chevron shape pointing to the right.

Sizewell B NPP

- 1200 MW(e) 4-loop Westinghouse SNUPPS PWR
- Commercial generation from 14th February 1995



Radiation Protection Fundamentals (RP.1)

- All personnel who perform **radiological protection*** activities apply the essential **knowledge, skills, behaviours and practices** needed to implement those activities such that worker and public health and safety are protected.
- Personnel **acquire and maintain the knowledge and skills** to perform assigned radiological protection activities. Personnel obtain and maintain qualifications for the functions they perform.
- This presentation focuses on the use of practical techniques including simulations to improve knowledge and behaviours.

***This includes non-RP workers performing activities in radiological areas or on significant radiological tasks, requiring appropriate RP skills to protect themselves and others**

And is it just about acquiring knowledge?

- Theoretical learning and initial practical training only last so long.
- ‘Skills drift’ can occur if workers do not practice skills so refresher training is important.
- Practical training including simulated radiological conditions can also address behavioural drift, where standards have degraded - perhaps due to complacency.
- Particularly effective when combined with coaching and Operational Experience.



Learning Brief

Organisational Learning | NUCLEAR OPERATIONS

Personal Contamination Event during RHR B Return to Service

Event Date: 7th September 2023 A/R no: 1333538 Event location: SZB

During filling and venting operations of Residual Heat Removal (RHR) Pump B, an Operations Technician triggered Whole Body Contamination Monitor alarms at the Radiological Controlled Area (RCA) exit. Follow-up surveys identified loose contamination on the floor and some small components in the RHR Pump B Room, which at the time was not designated as a Contamination Controlled Area C2.

What happened and why?

- Priming and venting of RHR Pump B took place late in the evening shift of 7th September 2023. Work was performed in a room not designated as a C2 area and under Radiological Work Permit (RWP) S, which is not suitable for work intrusive to a radioactive system.
- The technicians used a temporary venting hose without any radiological Personal Protective Equipment or monitoring and were not expecting any contamination issues. However, there was an air block which caused a small unexpected spill of active liquor, which the team tried to mop up with absorbent roll.
- In addition to becoming contaminated from the spill, one technician had handled components in a cable tray, which were subsequently found to be contaminated. These were active valve redundant internals left over from RO18 in early April 2023.

What should YOU do now

- Use a Questioning Attitude when being set to work or when working on plant or equipment that could be contaminated or contain radioactive fluids. Are you working under the correct RWP? Are you wearing the right PPE? Could your procedure contain more “Caution” steps or Operational Experiences? Could you benefit from refresher training on radioactive systems?
- When completing work on a radioactive system and finally decontaminating the area, ensure all contaminated items are suitably “bagged and tagged”, and are labelled and removed if required.





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Types of practical RP Training

- **On plant:**
 - Take the workers to plant areas and practice 'hands on'.
 - Safety risks from interacting with plant plus radiation exposure and risk of contamination events.
- **Virtual Reality:**
 - Portable (bring the training to the worker) and zero safety risk.
- **Mock-ups:**
 - Training and practice/rehearsals with realistic mock-ups.
- **RP simulator:**
 - Mock-ups with simulated radiation and contamination.

Benefits of RP integration with Mock-Ups



Steam Generator nozzle dam jumping rehearsals

- Useful for infrequently performed or First Of A Kind tasks.
- Opportunity to video and critique task and RP performance.
- Photographs and learning can be added to procedures / checklists.
- Practice reduces time spent in high radiation areas \Rightarrow dose.

Problems with Mock-Ups and RP usage



SG drain line machining



Fuel cask trunnion removal

- Costs of physical mock-ups (especially single use).
- Worker frustration and buy-in (“why do I need to wear a power hood too?”)
- Making it realistic: difficult to simulate plant areas including lighting, space, access.
- Programme constraints: allowing time to involve RP in design and practice.

The Sizewell B Flow Loop simulator



Based at the Training 'Excellence Centre', the simulator has real fluid-flow pumps, tanks, pipes and valves designed for Operations and Maintenance training.

RP has provided training PPE/RPE, equipment and instruments.



Contamination and radiation simulators



Contamination instruments use aerosol sprays or UV fluorescent powder/dye.

Teleprobe FH40 and GL10 instruments and EPDs use radio transmitters.

Sources can be used for hotspots, inverse square law training, stay-time calculations, shielding/plant attenuation, etc.

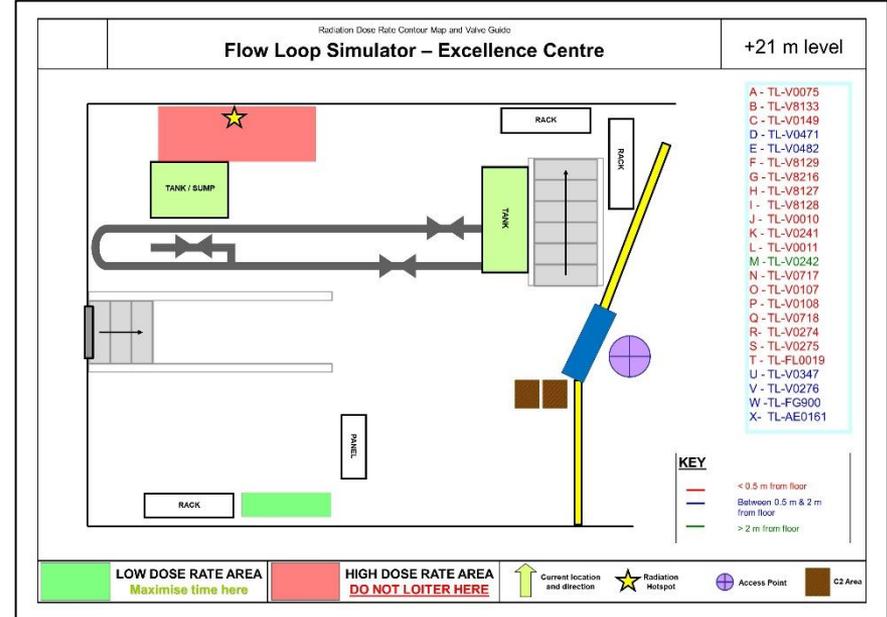


Uses of the RP Simulator

1. 'Dressout' contamination area clothing practical undressing
2. Radiation Protection Technician and 'Radworker' practical skills
 - Hands-on use of contamination and radiation instruments
 - Contamination control and decontamination techniques
 - Radiography skills training
3. Workgroup RP skills and behavioural improvements
 - Setting to work against Radiological Work Permits
 - Plant operations e.g. active venting and draining
 - Maintenance e.g. active valve lapping/machining
 - Emergency teams e.g. 'pathfinder' surveys and dose control

Example of RP Simulator facility in use

The following video was made at great expense by a professional camera crew in the Flow Loop Simulator and features a simulated hot spot and a spread of contamination.



Example improvements observed in RP performance from the training

- Systematic training of all Operations plant staff on active venting and draining before the RO15 outage, supported by RP. Very well received by the Operations crews. During the outage there was an observable improvement in the quality of Operations venting and draining activities with the need for less intervention by RP to correct poor practices.
- Maintenance active valve machining practice with RP and decon support prior to RO18. Zero active valve EPRI Level 2 or 3 PCEs (one EPRI Level 1) during the following significant RO18 mid-loop outage, including NRV machining.



Thank

You