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FCA	ALARA REVIEW	SUPERSEDES
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1.0 PURPOSE

1.1 To provide guidelines for the Radiation Protection actions that need to be taken in response to incidents / alarms in order to:

- Facilitate a quick response to changing radiological conditions in the plant.
- Prevent the release of radioactive material to the plant and the environment.
- Minimise the exposure of all personnel and public to radiological hazards and maintain the dose of personnel As Low As Reasonably Achievable (ALARA).

2.0 SCOPE

2.1 Applicable to the Radiation Protection actions required in response to alarms as well as trip set point, doserate and other criteria being exceeded for:

- Surveillance
- Filters
- KRTs
- Miscellaneous parameters

2.2 Information and communication protocol for significant radiological events.

2.3 Conventional Areas and Systems with a Radiological Risk Profile.

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

3.1.1 **Airborne Contamination Zone** – Radiological controlled area where the amount of radioactive contamination in the air exceeds the limits prescribed in KWH-S-015.

3.1.2 **ALARA** – Acronym for “As Low As Reasonably Achievable”; refers to the exposure of personnel to ionising radiation and radioactive contamination as well as the radioactive discharges from nuclear plants which must be kept as low as reasonably achievable.

3.1.3 **Assisted Access** – Access control performed by an RP person using the LDM 3000 access control reader.

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3.1.4 **Becquerel** – The SI unit for radioactivity equal to one transformation per second.

3.1.5 **Corrected Counts Per Minute** – The observed counts per minute minus the background counts per minute.

3.1.6 **Gray** – The SI unit of absorbed dose, i.e. one joule of energy absorbed in one kilogram of matter.

3.1.7 **KRT** – Plant radiation monitoring system which monitors the radiation in certain areas and plant operations as well as in some cases the liquid, gaseous and particulate levels of activity in plant systems.

3.1.8 **Radiological Controlled Zones** – Restricted areas containing radiological hazards where the integrated dose to a person may exceed 1mSv per annum. They are enclosed or demarcated areas classified as described in KAA-637. Access to these areas is restricted to authorised personnel only.

3.1.9 **Self-Access** – Computerised access control done by a worker at a LDM 2000 access control reader.

3.1.10 **Surface Contamination** – The deposition of unwanted radioactive material on the surfaces of structures, areas, objects or personnel.

3.1.11 **Surface Contamination Zone** – Radiological controlled area where the loose or smearable surface contamination is in excess of the limits prescribed in KWH-S-001.

3.2 Abbreviations

3.2.1 **µGy/h** – microGray per hour

3.2.2 **µSv/h** – microSievert per hour

3.2.3 **AADQ** – Annual Authorised Discharge Quantity

3.2.4 **ACP** – Access Control Point

3.2.5 **ALARA** – As Low As Reasonably Achievable

3.2.6 **AMS-4** – AMS - 4 Beta Particulate Monitor

3.2.7 **APG** – Steam Generator Blowdown System

3.2.8 **Bq/m^3** – Becquerel per cubic metre

3.2.9 **Bq/t** – Becquerel per ton

3.2.10 **ccpm** – Corrected counts per minute

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3.2.11 **ccps** – Corrected counts per second

3.2.12 **CHEM** – Chemistry

3.2.13 **cm^2** – Square centimetre

3.2.14 **COM** – Communications Group

3.2.15 **CR** – Condition Report

3.2.16 **CVI** – Condenser Vacuum System

3.2.17 **DAC** – Derived Airborne Concentration

3.2.18 **DAY** – Working Day

3.2.19 **DIL** – Derived Investigation Level

3.2.20 **DosiGui** – Dosiserv Global User Interface

3.2.21 **DOSIMASS** – MGP Dosimeter Maintenance and Setup Software

3.2.22 **DVA** – Decontamination Workshop ventilation system

3.2.23 **DVC** – Control Room Air Conditioning System

3.2.24 **DVK** – Fuel Building Ventilation System

3.2.25 **DVN** – NAB Ventilation System

3.2.26 **DWI** – In-service inspection building ventilation System

3.2.27 **DWU** – Chemistry Hot Lab ventilation System

3.2.28 **EBA** – Containment Scavenging Ventilation System

3.2.29 **EC** – Emergency Controller

3.2.30 **EOS** – End Of Shift (On Shift event was declared)

3.2.31 **EPD** – Electronic Personal Dosimeter

3.2.32 **ESK EXM** – Eskom Executive Management

3.2.33 **ESL** – Environmental Surveillance Laboratory

3.2.34 **ETY** – Containment Atmosphere Control Ventilation System

3.2.35 **EVC** – Reactor Pit Ventilation System

3.2.36 **EVF** – Containment Filtration Ventilation System

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3.2.37 **GBq/t** – GigaBecquerel per ton

3.2.38 **H-3** – Tritium

3.2.39 **HPC** – Health Physics Controller

3.2.40 **HR** – Hour

3.2.41 **iCAM** – Intelligent Continuous Air Monitor

3.2.42 **IMS** – Instrumentation Maintenance Services

3.2.43 **KBG SNR M** – Koeberg Senior Management

3.2.44 **KER** – Nuclear Island Liquid Radwaste Monitoring and Discharge System

3.2.45 **KRT** – Plant Radiation Monitoring System

3.2.46 **L-177** – Ludlum-177 Contamination Monitor

3.2.47 **L-300** – Ludlum-300 Alarm Meter

3.2.48 **LDM 2000** – MGPI Access Control Reader

3.2.49 **LDM 3000** – LDM 220 Reader with associated software on pc

3.2.50 **LPDU** – Local Processing and Display Unit

3.2.51 **LUDEP** – Computer Software used for internal uptake

3.2.52 **mSv** – milliSievert

3.2.53 **mSv/h** – milliSievert per hour

3.2.54 **N-16** – Nitrogen-16

3.2.55 **NAB** – Nuclear Auxiliary Building

3.2.56 **NECSA** – South African Nuclear Energy Corporation

3.2.57 **NNR** – National Nuclear Regulator

3.2.58 **Np** – Neptunium

3.2.59 **NSA M** – Nuclear Safety Awareness Manager

3.2.60 **OPS** – Operating Section

3.2.61 **PM** – Plant Manager

3.2.62 **PSY** – Site Appointed Psychologist

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3.2.63 **PTR** – Reactor Cavity and Spent Fuel Pit Cooling System

3.2.64 **PSGM** – Power Station General Manager

3.2.65 **Radpro** – Radiation Protection Computerised System

3.2.66 **RCP** – Reactor Coolant System

3.2.67 **RCV** – Chemical and Volume Control System

3.2.68 **REN** – Nuclear Sampling System

3.2.69 **RIC** – In-core Instrumentation System

3.2.70 **RP** – Radiation Protection

3.2.71 **RPC** – Radiation Protection Certificate

3.2.72 **RPCS** – Radiation Protection Corporate Specialist

3.2.73 **RPM** – Radiation Protection Manager

3.2.74 **RPOO** – Radiation Protection Operations Office

3.2.75 **RRI** – Component Cooling System

3.2.76 **SAMP** – Site Appointed Medical Practitioner

3.2.77 **SAP** – Senior Authorised Person

3.2.78 **SAR** – Safety Analysis Report

3.2.79 **SEK** – Conventional Island Liquid Waste Monitoring and Discharge System

3.2.80 **SEO** – Storm Water Drains Recovery System

3.2.81 **SGTR** – Steam Generator Tube Rupture

3.2.82 **SHIFT M** – Operating Shift Manager (On Duty)

3.2.83 **SI** – International System

3.2.84 **SRPA** – Senior Radiation Protection Assistant

3.2.85 **SVA** – Auxiliary Steam Distribution System

3.2.86 **TEG** – Gaseous Waste Treatment System

3.2.87 **TEP** – Boron Recycle System

3.2.88 **TEU** – Liquid Waste Treatment System

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3.2.89 **TLD** – Thermoluminescent Dosemeter

3.2.90 **VCT** – Volume Control Tank

3.2.91 **WBC** – Whole Body Count

4.0 REFERENCES

4.1 Referenced Documents

4.1.1 335-2, Rev 5: Koeberg Nuclear Power Station Management Manual

4.1.2 KAA-500, Rev 13: The Process for Controlled Documents

4.1.3 KGG-002, Rev 1: Guidelines for the Control of Secondary Contamination Following a Steam Generator Tube Rupture

4.1.4 KGH-013, Rev 2 Guide for the Canberra iCAM Moving Filter Alpha/Beta Continuous Air Monitor

4.1.5 KWH-I-096, Rev 2: Operation, Use and Setting up of the Canberra iCAM Moving Filter Alpha/Beta Continuous Air Monitor

4.1.6 KSA-011, Rev 14 The Requirements for Controlled Documents

4.2 Applicable Documents

4.2.1 238-35: Radiation Protection Dose Limits

4.2.2 238-47: Radiological Environmental Surveillance Requirements

4.2.3 238-49: Liquid and Gaseous Effluent Management Requirements for Koeberg Nuclear Power Station

4.2.4 238-54: Radiological Protection Licensing Requirements for Koeberg Nuclear Power Station

4.2.5 KAA-584: Radiation Instrument Management

4.2.6 KAA-636: Management of the Radioactive Effluents Programme

4.2.7 KAA-637: Access Control to Radiological Controlled Zone

4.2.8 KAA-704: The Process for Containment Access Control

4.2.9 KAH-002: Radiation Surveillance Programme

4.2.10 KFH-HP-026: Manual Data Entry/Exit Form

4.2.11 KFH-HP-063: Weekly Visual Check of Plant System KRT Channels

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4.2.12 KFH-HP-114: Manual Assignment of Equipment when DosiGui Application is Unavailable

4.2.13 KFH-HP-123: SRPA Observation Checklist On Installation of L300, RMS-3, LUDLUM 375 or Tracerco T202 of Thresholds to Appropriate Settings

4.2.14 KFH-HP-141: Alarming or Inoperable Radiation Monitoring System

4.2.15 KFH-HP-150: Conventional Areas and Systems with a Radiological Risk Profile for Operating, Chemistry and Maintenance

4.2.16 KFH-HP-163: Response to Loss of KRT 036 MA Because of Pump Trip

4.2.17 KFH-HP-164: Response to Loss of KRT 036 MA Because Computer Needs Resetting

4.2.18 KLA-005: Koeberg Event Classification and Reporting Criteria Listing

4.2.19 KSH-001: The Administration and Quality Control of Radiation Dosimetry

4.2.20 KSH-008: Radiation Protection Records, Data and Information Management

4.2.21 KWB-1AA-T02: Unit 1 Control Room Panel T02 Alarm Cards

4.2.22 KWB-2AA-T02: Unit 2 Control Room Panel T02 Alarm Cards

4.2.23 KWB-9AA-C2: Common Control Room Panel C2 Alarm Cards

4.2.24 KWB-OP-1-PTR-004: PTR Water Transfer Operations

4.2.25 KWB-OP-2-PTR-004: PTR Water Transfer Operations

4.2.26 KWB-S-0-SEO: Storm Water Drains Recovery System

4.2.27 KWC-RC-KRT: KRT Surveillance and Threshold Setting Control

4.2.28 KWH-B-016: Operation, Calibration and Use of the Koeberg Whole Body Counters and the H-3 in Urine Analysis Programme

4.2.29 KWH-G-005: ETY Containment Purge Release Authorisation Order

4.2.30 KWH-G-007: Radioactive Liquid Effluents KER/SEK/REA/ASG SG Batch Release Authorisation Procedure

4.2.31 KWH-I-063: Radiation Protection KRT Functions

4.2.32 KWH-I-077: Function Test of Portal Monitors

4.2.33 KWH-I-087: Operation and Use of the MED-CP

4.2.34 KWH-I-094: Operation and Use of Radiation Protection Portable Radiation Instruments

4.2.35 KWH-S-001: Radiation and Surface Contamination Surveys

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4.2.36 KWH-S-015: Airborne Contamination Surveys

4.2.37 KWH-S-021: Access Control

4.2.38 KWH-S-026: Decontamination of Personnel and Skin Dose Assessment due to Personal Contamination

4.2.39 KWH-S-044: Radiation Protection Requirements for Normal Maintenance Shutdown

4.2.40 KWH-S-048: Signposting and Barricading in Radiological Controlled Zones

4.2.41 LD-1000: Notification Requirements for Occurrences Associated with Koeberg Nuclear Power Station

4.2.42 RD-0022: Radiation Dose Limitation at Koeberg Nuclear Power Station

4.2.43 RD-0025: Emergency Communication with the National Nuclear Regulator

4.2.44 OTS: Operating Technical Specifications

5.0 DESCRIPTION

5.1 A list of the incidents and the RP actions that need to be taken for each incident, as well as the applicable references, are in Appendix 1.

5.2 The actions in Appendix 1 are in many cases based on procedure requirements.

5.3 Further information about the actions are in the corresponding procedures referenced in Appendix 1.

5.4 The incidents listed in Appendix 1 and the Radiation Protection actions required are in response to alarms as well as trip setpoint, doserate and other criteria being exceeded for:

- Surveillance
  - Radiation levels
  - Surface contamination
  - Airborne contamination
  - Personnel contamination
- Filters
  - Filter change-out criteria during normal operation
  - Change-out criteria of specific filters during normal operation and during oxygenation

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- KRTs
  - KRTs are inoperable
  - Specific KRT alarms
- Miscellaneous parameters
  - Secondary Tritium activity
  - ACP-2 personnel / vehicle gamma alarm / malfunction
  - SG tube rupture
  - 10% DIL exceeded in environment
  - Whole Body Count results
  - Dosimeter alarms
  - Alpha contamination
  - RCP Cs-137 activity
  - RCP H-3 activity
  - Nuclides detected in transfers or releases
  - Opening of inner and outer doors to outside of Controlled Zone
  - Plant Transients

5.5 A list of persons to be notified by various Radiological Incidents, (See Appendix 2).

5.6 The purpose of KFH-HP-150 is to notify the Operating, Operating Procedure Group, Chemistry, Maintenance Manager as well the Head of Operating, Chemistry and Maintenance Training, of the re-classification of a conventional system as a system with a radiological risk, in order to ensure appropriate action is taken. Actions to be taken:

5.6.1 Operating:

- Operating Manager (complete sections 2 and 5); Assess if:
  - Immediate actions are required.
- Operating Procedure Group Manager (complete sections 3 and 5); Assess if:
  - Procedure changes are required.

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- Head of Operating Training (complete sections 4 and 5); Assess if:
  - Training material requires updating.

5.6.2 Chemistry:

- Chemistry Manager (complete sections 2 and 5); Assess if any of the following are required:
  - Immediate actions
  - Procedure changes.
  - Changes to Work instructions.
- Head of Chemistry Training (Complete sections 4 and 5); Assess if:
  - Training material requires updating.

5.6.3 Maintenance:

- Maintenance Manager (Complete sections 2 and 5); Assess if any of the following are required:
  - Immediate actions
  - Procedure changes.
  - Changes to Work instructions or Work packages.
- Head of Maintenance Training (complete sections 4 and 5); Assess if:
  - Training material requires updating.

NOTE: *KFH-HP-150 to be completed and returned to the RP Manager. Additional information is on the form under actions to be taken. RP Plant must initiate KFH-HP-150.*

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6.0 RECORDS

6.1 KFH-HP-150 is a permanent record and will be handled in accordance with KSH-008.

7.0 ATTACHMENTS

Appendix 1 – Radiation Protection Incident Response

Appendix 2 – External Communications Protocol for Radiological Incidents

Appendix 3 – Justification

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APPENDIX 1

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
SURVEILLANCE		
1. AMS 4 or iCAM Alarm	(a) In the event that an AMS 4 or iCAM alarms, the relevant Shift SRPA will evacuate the immediate area and investigate the cause of the alarm. (b) The Operating Shift Manager must be notified. (c) The RP Manager must be notified within one hour of the alarm being initiated. (d) In the event that more than one AMS 4 or iCAM alarms within the reactor building, the entire (all staff) reactor building will be evacuated. The relevant Shift SRPA must notify the Operating Shift Manager to initiate the evacuation process. Inform the OCC. (e) The RP Manager must be notified immediately. (f) <u>Evacuation via the 8m airlock:</u> The Step Off Pad area at the 8m airlock must be extended to facilitate the volume of radworkers exiting the reactor building. Radworkers are to move to N411/N421. Once all the radworkers have been guided in N411/N421, the floor area outside the 8m airlock must be decontaminated to ensure that the floor area is free of contamination. A step off pad must be placed at the entrance to N411 / N421 and radworkers must be frisked as they exit via the GEM-5 portal at the relevant 8m airlock. Once all radworkers have been exited N411/N421 the floor area must be decontaminated. Ensure at least one airlock door is closed after all personnel have been accounted for. ***NOTE:*** *When simultaneous alarms of AMS-4 or iCam occurs, while the biological door, 0.00m and 8.00m airlocks are open, the 0.00m airlock and the biological door must be closed and the 8.00m airlock must be closed once all staff have been evacuated.* (g) <u>Evacuation via the 0m airlock</u>: All radworkers exiting the 0m airlock are to be guided to the RP dress-out ski cabin. Additional white coveralls are to be provided to the exiting radworkers. The radworkers are to be frisked on exiting the area after they have removed their yellow coveralls. The radworkers must then proceed to exit via the NAB Argos portal monitors. The RP dress-out ski cabin is to be decontaminated once all radworkers have exited. Ensure at least one airlock door is closed when all personnel have been accounted for.	KWH-S-015 KAA-704 KAA-704

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
SURVEILLANCE		
EBA Out of Service	(h) The decision to re-enter the affected areas / the reactor building, to resume work will be made post an evaluation conducted by the RP Manager. (i) Radworkers exiting the GEM5 or Argos units and initiate an alarm due to contamination in close proximity of the mouth or nose will immediately be sent for a whole body count. Inform Dosimetry of time of evacuation and names of people involved. (j) The RP Manager must be notified immediately of any positive internal contamination incidents or positive whole body counts. (k) As a minimum, one inlet and one outlet line of EBA must be in service during maintenance periods (e.g. nozzle lower level work, LLRT's and electrical board outages), while personnel are inside the containment. In the event that this configuration cannot be met, the maximum amount of primary valves are to be closed, S/G opening/closing or S/G eddy current to be stopped and any work on other high contaminated components or in high contaminated areas e.g. cavity to be stopped until one inlet and one outlet line of EBA is in service again.	
2. > 0,1 DAC air sample result in area not posted as an airborne contamination area.	(a) Evacuate area. (For reactor building see 14). (b) Rezone as an airborne contam zone. (c) Take appropriate air sample. (d) If < 0,1 DAC allow work to recommence & declassify area. (e) If > or = 0,1 DAC, (excluding Tritium and Noble Gas) use engineering controls such as tenting / filtered ventilation, closing doors or respiratory protection, and re-write the RPC for an airborne zone. (f) Send affected workers for a WBC. Inform Dosimetry of time of evacuation and names of people involved. (g) If > = 0,1 DAC for Tritium, staff associated with activities in this area, to be sent to Dosimetry for urine sample analysis. (h) If > = 0,1 DAC for Noble Gas, skin dose calculations must be performed for all relevant staff. Stay times to be implemented for staff prior to working in the Noble Gas field. ***NOTE:*** *To speed up the counting of an Air Sample, arrange with Chemistry to count the sample immediately for 10 minutes. The Gamma ID Worksheet must be made priority 1 and the counting time for 10 minutes stated in the comments. If available, the Canberra Gamma Spec Monitor may be used to count the Air Samples.*	KWH-S-015

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
SURVEILLANCE		
3. Portal Monitor Alarm Personnel contamination detected.	(a) Record incident and decontaminate in accordance with KWH-S-026. (b) Perform skin dose calculation, when required. (c) Decontaminate in accordance with KWH-S-026. (d) When contamination found in close proximity of mouth or nose send affected worker for a WBC. Inform Dosimetry of time of incident. (e) The RP Manager must be notified immediately of any positive internal contamination incidents or contamination of face, nose and mouth.	KWH-S-026
4. Surface contamination detected outside contamination zone (all plant areas, excluding Reactor Building).	(a) Rezone area as contamination zone, barricade and place step-off pad at entrances. (b) If practical, decontaminate area and reclassify. (c) Determine source of contamination and raise defects to repair leaks if required. (d) Inform RP Manager (Appendix 2) and raise a CR.	KWH-S-001
4.1 Surface contamination detected outside the Controlled Zone.	a) Barricade area as a contamination zone to prevent spread and investigate source of contamination. (b) If practical, decontaminate area and reclassify. (c) Raise a defect to remove contamination if (b) was not successful. (d) Inform RP Manager (Appendix 2) and raise a CR.	KWH-S-001
5. Surface contamination levels in Reactor Building > 37 Bq/cm^2.	(a) Barricade the area. (b) Sign-post as contamination area. (c) Place step-off pad at entrances.	KWH-S-001 KWH-S-048

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
SURVEILLANCE		
6. General area dose rates > zone classification.	(a) Rezone the area. Consider occupancy times for areas outside the controlled zone. (b) Determine cause of doserate increase. (c) If it was unexpected, determine if any action can be taken to reduce doserate such as: (i) Shielding (ii) Removal of source by decon, pipe flushing or equipment removal (iii) Demineralising / filtering (d) For unexpected orange or red zones, in addition inform RP Manager (Appendix 2) and raise a CR.	KWH-S-001
6a. Reclassification of a conventional system as a system with a radiological risk in order to ensure appropriate action is taken.	a) Complete form KFH-HP-150 as per section 5.6 of this procedure.	KFH-HP-150
6b When informed by OPS for draining of the Fuel Building Transfer compartment or any active water movement including draining of the SG secondary system for RCP and RRI of RRA/RCV during Outages.	a) Duty SRPA to request from OPS assistance with identification of transfer route and affected plant areas and components which may be affected b) Duty SRPA to arrange for radiological surveillance of identified areas which shall be document in the RP Log and RadPro Survey programme. c) When spills / leaks identified the SRPA should consider the checking of all levels / rooms above and below to determine the affected areas. d) Areas to be barricaded and signposted as necessary. e) OPS to be informed, a CR to be raised. f) SRPA to arrange for any “spillblocks” or any other means to prevent the spillage to migrate to other areas and or decontamination of affected areas including shielding for dose rates as required necessary.	KWB-OP-1PTR 004 KWB-OP-2PTR 004 KWH-S-001
7. Measured or possible loose contamination > 400 Bq/cm².	Ensure any work performed in such areas has an additional layer of clothing as required in the RPC.	KWH-S-001

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
SURVEILLANCE		
8. Specific Filters change-out criteria: RCV 003 or 004 FI > 135 mSv/h on housing or KRT 050 MA for RCV 003 FI and KRT 051 MA for RCV 004 FI > Th2 PTR 005 or 006 FI > 55 mSv/h on housing or KRT 053 MA for PTR 005 FI >Th2 REA 011 FI > 40 mSv/h on housing TEU 002 FI > 25 mSv/h on housing or KRT 554 MA > Th2	Inform Operating to change filter. Can be done by hand.	KWH-I-063 and form KFH-HP-063
9. KRT 10/15 MA and 052 MA > Th2 setting for normal operation.	Consult KWH-I-063 for maximum threshold 2 setting and filter change out criteria. Filter change must be done by Chateaux.	KWH-I-063
10. KRT 10 MA and 052 MA > Th2 setting for oxygenation.	Consult KWH-I-063 for maximum threshold 2 setting and filter change out criteria. Filter change must be done by Chateaux.	KWH-I-063
11. Other filters in filter floor > 1 Sv/h on housing during normal operation Or when operable 9 KRT 550 MA for PTR 003 FI 9 KRT 551 MA for PTR 004 FI 9 KRT 552 MA for TEP 005 FI 9 KRT 553 MA for TEU 001 FI 9 KRT 554 MA for TEU 002 FI 9 KRT 555 MA for TEU 006 FI	Inform Operating to change filter. Must be done by Chateaux.	KWH-I-063 and form KFH-HP-063

NOTE: *The doserate measured through the inspection hole for filters on the filter floor, can be multiplied by 5 to obtain an estimated contact dose rate on the housing and if the doserate is measured on the filter housing, t can be multiplied by 3 to obtain an estimated contact dose rate.*

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APPENDIX 1 (continued)
RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
KRT		
12. Any area KRT not operational.	(a) Place portable alarming area doserate meter in vicinity with probe near KRT detector. (b) Lock off areas not monitored, but if not possible, barricade the area with appropriate sign-posting.	KWH-I-063 KFH-HP-141 KFH-HP-123
13. KRT alarm: Area monitor 040, 041, 042, 043, 530, 531, 532, 533, 534, 535, 536 and 537 MA.	(a) Evacuate area. (b) Survey the area. (c) If doserates have increased beyond zone classification take actions given in parameter 6.	KWH-I-063 KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KFH-HP-141
14. KRT alarm: 008 / 009 / 024 MA unexpectedly during access to containment for both power operation and shutdown.	(a) Evacuate containment, depending on airborne sample results. Ensure at least one airlock door is closed following the evacuation and all personnel are accounted for. (b) Ensure operating have terminated any ETY releases and /or close EBA dampers. (During a fuel handling incident it may be necessary to run ETY while containment is being evacuated with airlock doors open). (c) Request Chemistry to take air samples for H-3, radioiodines, particulates and noble gas. (d) Investigate possibility of primary pump seal failure (KRT 040 MA and KRT 050/051 MA). (e) If results are < 0.1 DAC allow re-entry. (f) If results are > or = 0,1 DAC initiate the following: (i) If iodine/particulate levels require such, request Operating to start EVF. (ii) If H-3/Noble gas levels are above levels as per KWH-S-015, request Operating to re-start ETY and / or open EBA dampers. Ensure AADQ limits will not be compromised by performing release package calculation in accordance with KWH-G-005. (iii) H-3 levels will reduce if temperature in containment can be reduced. Liaise with operating as to whether EVC or other methods can be used to reduce temperature. (iv) The decision to re-enter the affected areas / the reactor building, to resume work will be made post an evaluation conducted by the RP Manager. (v) Determine if there is any potential source for the activity that can be isolated / repaired or removed. (vi) Send any affected workers for a WBC. Inform Dosimetry of time of evacuation and names of people involved. (vii) The RP Manager must be notified immediately of any positive internal contamination incidents. ***NOTE:*** *To speed up the counting of an Air Sample, arrange with Chemistry to count the sample immediately for 10 minutes. The Gamma ID Worksheet must be made priority 1 and the counting time for 10 minutes stated in the comments. If available, the Canberra Gamma Spec Monitor may be used to count the Air Samples.) may be used to count the Air Samples.*	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KWH-S-015 KWC-RC-KRT OTS KFH-HP-141

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
KRT		
15. KRT alarm: Gaseous effluent KRTs. 016/017/025/021 MA	(a) Verify that Operating has terminated any releases through the affected path. (b) Verify that Chemistry has taken samples of the affected path. Assess impact on AADQs. ***NOTE:*** *Advise Chemistry not to sample in the REN room if DVN is out of service.* (c) Advise Operating on ways of reducing a gas release: (i) Running EVF when an ETY release had been taking place or EBA was running on a shutdown unit. (ii) Routing DVK through iodine filters if freshly unloaded fuel from the core is in the fuel building. (iii) Routing DVN through iodine filters. (iv) Terminating TEG, EBA or ETY releases. (v) Terminating any chemistry sampling. (vi) Terminating any work activities that may be generating airborne activity. (vii) Do not initiate RCP oxygenation. (viii) If RCP is already oxygenated and RCV – VCT is connected directly to DVN, request Operating to reduce RCV letdown flowrate.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 OTS KFH-HP-141
16. KRT alarm: liquid effluent KRTs. 901/902/903/904 MA	(a) Ensure Operating have terminated any releases through the affected path. (b) Verify that OPS have raised threshold on KRT 901 MA in accordance with effluent release package. (c) Ensure Chemistry has taken samples of the affected path. Assess impact on AADQs. (d) Advise Operating on ways of reducing a liquid release: (i) Terminating KER or SEK tank releases as appropriate. (ii) Ensuring SEK bypass has been routed to the SEK tanks as appropriate.	KWH-G-007 KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 OTS KFH-HP-141 238-49
17. KRT alarm: 001 MA (RCV letdown)	(a) Perform radiation survey of affected areas. This includes peripheral areas including seal filters, RCV pump rooms, RCV heat exchanger rooms, +5 m and +7 m catacomb affected rooms and RCV VCT room. If containment is accessible, a reactor building survey may also be required. (b) If oxygenation is in progress and the Reactor Building is accessible, perform survey of oxygenation points. (c) Chemistry to perform additional sampling of RCV. Operating to decide on plant operability based on results.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KWC-RC-KRT KWH-S-044

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
KRT		
18. KRT alarm: – 002/003/004 (APG) – 007 MA (CVI) – N-16 KRTs 055/056/057 MA	(a) Initiate secondary system survey (possible primary to secondary leak) Major secondary systems with significant changes in radiation dose rates to be considered, inter alia, are VVP- Main steam lines, CVI systems, CEX, ARE, APG, ATE, ASG. (b) Ensure chemistry obtain grab samples. (c) Inform both the SRPA on duty and RP Manager. (d) If 007 MA alarms: (i) Assess DVN noble gas released activity for effluent purposes. (e) Assess SEK bypass released activity. If the activity is ≥ 4.3 E+05 Bq/m^3, advise operating to route waste to SEK tanks. (f) Based on chemistry results of APG and determined primary to secondary leakrate, operating will determine plant operability. A Senior Authorised Person should advise operating with respect to AADQ and secondary system doserate consequences. SAP should also review assessed primary to secondary leakrate.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 OTS KWC-RC-KRT KFH-HP-141 KWH-I-063 KAH-002 KWH-S-001 KAA-636 and 238-49
19. KRT alarm: 005 / 006 MA	(a) Ensure Chemistry is taking samples of affected RRI train. (b) Consider effects of any release of RRI water on AADQs. (c) Assess need to perform surveys of RRI non-controlled zones, based on alarm level and Chemistry results.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KWC-RC-KRT KFH-HP-141
20. KRT alarm: 011, 012, 013 and 014 MA or portable area radiation monitor installed in their place.	(a) Evacuate affected area. (b) Determine whether the alarm could be due to head lifting, upper / lower internals removed, or object removed from cavity or transfer compartments or spent fuel pool. (c) Operating will ensure routing of DVK to the iodine trains for 013 / 014 MA alarm. Verify this has been done. (d) Operating will ensure EBA isolation if 011 / 012 MA alarms. Verify this has been done. (e) If portable area radiation monitor is installed in place of KRT, inform Operating and verify actions (c) and (d).	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KWH-I-063 OTS KFH-HP-141
21. KRT alarm: 018 / 019 MA	(a) Initiate radiological surveillance of the control room (radiation and airborne). (b) Ensure start-up of DVC iodine filter.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 Emergency Plan KFH-HP-141

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
KRT		
22. KRT alarm: 022 / 023 MA	(a) Inform RP Manager.	Emergency Plan
23. KRT alarm: 505 MA	(a) Assess consequences of SVA steam contamination with respect to AADQs. (b) Request Chemistry to sample secondary water. (c) Perform surveys of affected areas.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KFH-HP-141
23.1 KRT alarm: 508 / 509 / 510 / 511 MA	(a) Evacuate affected areas. (b) Liaise with Operating Radwaste as to the cause and necessary actions with respect to drumming of waste. (c) Perform surveys of affected areas.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2 KFH-HP-141
23.2 KRT inoperable: 508 / 509 / 510 / 511 MA	(a) Refer to KFH-HP-141 for survey and drumming requirements.	KAA-584
24. KRT alarm: 512 MA	(a) Evacuate drumming corridor. (b) Investigate reason for high dose rates. (c) Perform radiation survey of the area.	KWB-1AA-T02 KWB-2AA-T02 KWB-9AA-C2
25. Effluent KRTs inoperable	(a) Refer to OTS, KFH-HP-141 and 238-49 for release condition.	KAA-584

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
KRT		
26. KRT 036 MA		KWB-1AA-T02
26.1 Alarm Thresholds 1 and 2	The air is drawn directly from the ducting, upstream from any filters of the ventilation system concerned. **Channel 1/Line 1**: Suction of DVW fans. (Both units respectively). **Channel 2/Line 2:** DVN exhaust from filters and demineralisers for RCV, PTR, APG, TEP, TEU, RRI galleries, NAB electrical room, TEU tanks and pumps. (Both units respectively). **Channel 3/Line 3:** DVN normal exhaust from TEP tanks, demineralisers and pumps; (Unit 1 only). **Channel 4/Line 4:** (Unit 1) DVN iodine exhaust from TEG 001 BA, RCV 002 BA, RCV heat exchangers, REN sample room and REA pump rooms; (Unit 2: channel 3/Line 3). **Channel 5/Line 5:** (Unit 1) DVN iodine exhaust from TEP degassers and TEP pump rooms; (Unit 2: channel 4/Line 4). **Channel 6/Line 6** (Unit 1) DVK exhaust; (Unit 2: channel 5/Line 5). **Channel 7/Line 7** (Unit 1) DVN exhaust from TEU tanks, RIS 011, 021 and 022 PO, RIS 004 BA, RCV pumps and RRI 155 VN; (Unit 2: channel 6/Line 6). (a) (i) Operating notifies RP of increasing activity in affected area. (ii) RP, with assistance from Operating, to determine cause of increased activity and measures to terminate the cause. (b) Co-ordinate evacuation of affected area. (c) Take appropriate air samples (particulate, noble gas, tritium, iodine). (d) If $< 0,1$ DAC allow work to recommence and declassify area. (e) If $\geq 0,1$ DAC: (i) send affected workers for a WBC (ii) Zone affected area as airborne contamination area.	KRT 051 AA KRT 052 AA KWH-S-015
26.2 Channel defect	Refer to KFH-HP-163 and KFH-HP-164 for Pump trip and Computer needs restart ***NOTE:*** *For any other faults that cannot be acknowledged using the computer, contact IMS.*	KRT 053 AA OTS

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
27. Secondary H-3 activity level exceeds 7.4 E8 Bq/m^3.	(a) Assess consequences on AADQs in consultation with SAP. (b) Make a log entry of the event.	
28. ACP-2 personnel / vehicle gamma alarm	(a) For personnel alarms, an RP representative must go to ACP-2 and supervise passage of personnel past the gamma detectors until detection of the contaminated individual. (b) Perform a survey of the individual in the security booth. Escort contaminated persons to the appropriate decon facility. (c) For vehicle alarms: (i) with a uniform load of material not related to the controlled zone, analyse a representative sample by gamma spectroscopy. Apply KWH-S-047. (ii) with miscellaneous equipment, perform survey of vehicle and equipment or analyse the whole vehicle by means of ISOCS. (ii) Bricks: Chemistry analysis using 1 litre poly-bottle geometry must have < 260 Bq total activity per nuclide, or if a brick geometry is used then activity must be below that for radioactive material 200 Bq/kg. (iii) Sandblasting grit: Take a sample > 1kg for analysis to ESL. Acceptance criterion for individual nuclides is < 200 Bq/kg. (iv) Depending upon what type of vehicle and whether it has entered any radiological controlled zone loading bay, the wheels, loading area or container, cab should be surveyed for radioactive contamination (v) The driver must exit ACP2 via the GEM 5 before collecting the vehicle on exit from ACP2.	KWH-S-026
29. ACP-2 personnel gamma monitor malfunction.	(a) Barricade applicable personnel monitor (s). (b) If all personnel monitors are out of service: • Allow personnel to bypass monitors when leaving site; • Increase contamination survey frequency of controlled zone exit points to twice per shift and off site roads and walkways to weekly.	

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
30. ACP-2 vehicle gamma monitor malfunction	a) Install alternative gamma sensitive low range instrument at ACP-2 with alarm just above normal background. b) The Radeye G10 may also be used as an alternative instrument. c) Identify vehicles and material / equipment posing a risk to transport contamination off-site and survey when leaving site. d) Depending upon what type of vehicle and whether it has entered any radiological controlled zone loading bay, the wheels, loading area or container cab should be surveyed for radioactive contamination. e) The driver must exit ACP2 via the GEM 5 before collecting the vehicle on exit from ACP2.	KWH-I-094
31. Steam Generator Tube Rupture	***NOTE:*** *Due to the large number of systems that may become contaminated on the secondary side, and the uncertainty of the activity levels, the entire turbine hall must be viewed as contaminated.* (a) After it has been declared by Chemistry/Ops that an SGTR has occurred (12L/hr leak rate has been specified), the turbine hall must be declared a controlled zone. It must then be subject to the rules and procedures applicable to a controlled zone. (b) All turbine hall doors leading to the exterior must be closed and barricaded. (c) Entrance and exit into the turbine hall must be through the 0,00m electrical building entrance. (i) This entry and exit point must be manned by RP. (ii) An authorised RPC shall be required for access into the controlled zone. (iii) Personnel exiting the turbine hall must be frisked at the 0,0m electrical building entrance, and then proceed past the RPOO to the Argos 6 for contamination monitoring. (d) Before personnel are allowed to enter the affected turbine hall, RP must perform radiation, contamination and airborne surveys. (i) Areas exhibiting the potential for rapid, significant changes in radiation dose rates, such as the condenser hot well and CVI system, must be provided with portable general area alarm units. (ii) Demarcate areas and establish a survey routine, as applicable. (e) Declare the SEK pumphouse a controlled zone.	KWH-S-001

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
32. 10% of derived investigation level exceeded in environment	(a) RP Manager to be informed. (b) A physicist must assess the reasons for exceeding 10% of a DIL. Possible reasons are: (i) A high short term release of activity. (ii) An outside source such as leaking source, medical use.	
33. WBC result > DIL	(a) RP Manager to be informed immediately. (b) Follow up WBCs to be performed in first ten days. (c) Retention to be compared with ICRP-78 data. (d) Most appropriate clearance rate to be used to assess dose. (e) If DIL still exceeded, use software to determine dose.	KWH-B-016
34. Alarming dosimeter exceeds dose limit.	(a) If assessed dose plus dose to date exceeds 15 mSv in a quarter or 20 mSv in a year, restrict access and process TLD. (b) If assessed dose is > 2 mSv restrict access and process TLD. (c) Restrict the individual and follow the Restriction/Unrestricting Process. (d) Inform ALARA co-ordinator, RP Dosimetry Supervisor. (e) Record alarm in accordance with KWH-S-021.	KSH-001 KWH-S-021

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
35. Alpha contamination due to fuel failure detected by: (a) Detection of Np-239 in RCP or other samples. (b) Other positive alpha analysis results.	(a) Effluent releases to be reviewed by senior authorised person for consequences. (b) Utilise method in KWH-S-015 to determine if alpha contamination is airborne. Send a selection of samples to NECSA for analysis. (c) Perform alpha surveys for the following activities: (i) When any item is removed from the spent fuel pool or cavity or transfer compartment. (ii) Work is performed on RCV, TEP and PTR filters. (iii) Work is performed on RIC system. (iv) Alpha contamination is suspected. (v) Weekly airborne samples. (d) Inform RP Manager. He / she will decide upon further action dependent on the extent of the problem.	KWH-S-015 KWH-S-001 KWH-S-048
36. RCP Cs-137 Activity >1,5 E+6 Bq/m³	(a) Perform weekly alpha analysis of air-samples.	KWH-S-015
37. RCP H-3 Activity >3,7 E+8 Bq/m³	(a) Perform H-3 routine air-sampling in reactor building for entry purposes.	KWH-S-015
38. H-3 activity in RCP exceeds 1E11 Bq/m³	(a) Operating should initiate a bleed and feed on RCP. (b) Verify AADQ limits for H-3 will not be exceeded.	
39. Nuclide detected in transfers or releases not having an AADQ in accordance with 238-49. (Use of “another” nuclide in accordance with 238-49).	(a) Inform the RP Manager. (b) Verify nuclide modelled by SAR Activity Migration Model, else: (c) Perform reassessment of SAR Activity Migration Model.	238-49 SAR

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
40. Plant Transient e.g. Power Excursion, Reactor SCRAM, Turbine Trip.	(a) Monitor area KRTs (b) Monitor system KRTs (c) Monitor 1 / 2 KRT 036 MA (d) Monitor dose rates in areas affected by primary coolant [letdown line and charging line].	
41. NAB access Radpro Turnstile and /or EPD reader malfunction/ power failure.	(a) Unlock turnstile. (b) Post a RP person at the unlocked turnstile to check that EPD is switched on.	Refer to instructions posted at turnstile to disable or enable turnstile.
41.1 Access when Radpro Network or Server is down (DosiGui and Access validations unavailable).	(a) Self-Access readers (LDM 2000) will not be available, so entry must be performed on the assisted access LDM3000 reader. (b) Duty SRPA approval required for entries. (c) Ascertain from the current exposure listing printout whether the individual meets the requirements to permit entry i.e. all certifications valid, worker in possession of correct TLD and access code, worker dose available, worker linked to RPC (view RPC to determine any special requirements) and briefed if applicable. ***NOTE:*** *During a network interruption, default values of the dose and dose rate alarms will be assigned to the EPD, not those of the RPC. The default values are programmed as follows:* Dose Alarm: 200 µSv Dose Rate Alarm: 1000µSv/h (d) Issue additional dosimetry and / or respiratory protection by using the manual form, KFH-HP-114, and assigned to the worker once the system becomes available again.	KWH-S-021
41.2 All systems down (network, server and assisted access (LDM3000) unavailable.	(a) EPDs must be switched on at alternative locations where either an Assisted Access PC or a PC with DOSIMASS is available. (b) Record any access control entries or issue of equipment on manual forms KFH-HP-026 and KFH-HP-114 respectively.	KWH-S-021

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
42. Unplanned loss or low flow (defined by OPS) of DVN ventilation system	(a) Evacuate non-essential staff from NAB. All personnel to be accounted for before any new entries. (b) Inform OPS (c) Inform SAP (d) A special RPC for essential workers to be issued which states the areas permitted into and special precautions to be taken in terms of airborne contamination. A Pre Job Briefing shall be performed before access into the NAB. (e) - Friskers will be placed at strategic locations for emergent work and essential OPS/Chem rounds (Alarm level just above background radiation for that area to be selected). - AMS-4 units must be placed in conjunction with the friskers to indicate the presence of particulates. - Noble gas samples to be taken in N234 once per shift. - Noble gas samples to be taken in REN sampling room and N281 during personnel entry. - Noble gas samples to be taken in a room or area where essential staff needs to work or enter, if practical. ***NOTE:*** *Essential workers could consist of the following personnel:* *- Maintenance workers for emergency repairs on DVN system.* *- OPS for essential rounds and manning of the NAB control room.* *- RP for job cover and air sampling.* *- CHEM. for essential sampling e.g. DVN KRT`s (no HOT lab sampling allowed)* (f) Be aware of increased possibility of airborne contamination in certain areas of the NAB. (g) A possibility exists that the DVN KRT`s will alarm due to decreased dilution of airborne activity. ***NOTE:*** *Refer to Parameter 15 (DVN KRT`s) and Parameter 27 (KRT36MA) of this procedure for further actions on alarms.* (h) Ensure: - No REN sampling allowed. - No ETY/TEG releases (all to be isolated). - No work over SOP's, only essential staff. - No breach of any active system allowed. - No Fuel handling allowed (both units). - TEU, TEP degassers and evaporators should not be in production. - Notify Effluent management about DVN release packages and to consider the different flow rates and activity levels for different time periods for the week.	OTS/SRSM

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
43. Unplanned loss or low flow (defined by OPS) of DVK ventilation system	(a) Evacuate non-essential staff from FB. All personnel to be accounted for before any new entries. (b) Inform OPS (c) Inform SAP (d) A special RPC for essential workers to be issued which states the areas permitted into and special precautions to be taken in terms of airborne contamination. A Pre Job Briefing shall be performed before access into the FB. (e) - Friskers will be placed at strategic locations for emergent work and essential OPS/Chem rounds (Alarm level just above background radiation for that area to be selected). - AMS-4 units must be placed in conjunction with the friskers to indicate the presence of particulates. - H-3 samples to be taken at a frequency determined by the RP manager. - Noble gas samples to be taken in FB once per shift. - Noble gas samples to be taken in a room or area where essential staff needs to work or enter, if practical. ***NOTE:*** *Essential workers could consist of the following personnel:* - Maintenance workers for emergency repairs on DVK system. - OPS for essential rounds - RP for job cover and air sampling. - CHEM. for essential sampling in the FB. (f) Be aware of increased possibility of airborne contamination in certain areas of the FB. (g) A possibility exists that the DVK KRT`s will alarm due to decreased dilution of airborne activity. ***NOTE:*** *Refer to Parameter 26 (KRT36MA) of this procedure for further actions on alarms.* (h) Ensure: - No work over SOP's, only essential staff. - No breach of any active system allowed. - Fuel handling to be stopped in the fuel building within 1 hour. - Fuel handling in the fuel building may be restarted if one DVK iodine extraction train is operable and in service.	OTS/SRSM

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
44. Unplanned loss or low flow (defined by OPS) of DVW ventilation system	(a) Refer to Parameter 26 (KRT36MA) of this procedure. Monitor KRT 036 MA. (b) Inform OPS (c) Inform SAP (d) Take PINGT samples once per shift.	KGH-010 parameter 26.1
45. Unplanned loss or inoperability of DWU ventilation system ***Note:*** *Inoperability is declared by I&T after failure of filter efficiency test*	(a) Ensure no loose contamination in chemistry building. Any loose contamination found should be decontaminated or covered. (b) Inform OPS (c) Inform SAP (d) All non-essential staff to be evacuated from the Chemistry Hot Lab (controlled zone). (e) A special RPC for handling/preparing/counting licence requirement samples to be issued which states special precautions to be taken in terms of airborne contamination. A Pre Job Briefing shall be performed before counting or handling of radioactive samples can take place. (f) An AMS-4 or iCam to be set up in the Hot Lab during handling of licence required samples. (g) All entries into Hot lab to be approved by the Day shift SRPA normal hours, and Duty SRPA after hours.	
46. Unplanned loss or inoperability of DVA ventilation system ***Note:*** *Inoperability is declared by I&T after failure of filter efficiency test*	(a) Ensure no loose contamination on floor in main hall and loading bay. (b) Inform OPS (c) Inform SAP (d) All non-essential staff to be evacuated from the DWS building. (e) Equipment with high contamination to be wrapped or covered. (f) No work on components with loose contamination allowed. (g) An AMS-4 or iCam to be set up in the DWS during work on the ventilation system. (h) Any emergent work including repair of ventilation need to be approved by the Dayshift SRPA during normal hours and Duty SRPA after hours.	

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APPENDIX 1 (continued)

RADIATION PROTECTION INCIDENT RESPONSE

PARAMETER	ACTION	PROCEDURE
MISCELLANEOUS		
47. Unplanned loss or inoperability of DWI ventilation system ***Note:*** *Inoperability is declared by I&T after failure of filter efficiency test*	(a) Ensure no loose contamination on floor in main hall and loading bay. (b) Inform OPS (c) Inform SAP (d) All non-essential staff to be evacuated from the ISI controlled zone. (e) Equipment with high contamination to be wrapped or covered. (f) No work on components with loose contamination allowed. (g) An AMS-4 or iCam to be set up in the ISI during work on the ventilation system. (h) Any emergent work including repair of ventilation need to be approved by the Dayshift SRPA during normal hours and Duty SRPA after hours.	
48 MED- CP alarm	(a) Refer to Work-stop criteria and Communication. (b) Refer to Alarm and Work-stop Flowchart. (c) Refer to Fault finding summary.	KWH-I-087 Appendix 2 Appendix 4
49. Routine air samplers not available.	(a) Evaluate the priority of the work to be performed. (b) Take a GRAB sample. (c) Restrict/limit staff entry to the area.	KWH-S-015
50 Portal monitors (ARGOS) out of service at a specific CZ, i.e. Chemistry, NAB, ISI, DWS	(a) If all NAB portal monitors are out of service: • Barricade portal monitors. • Inform RP Technicians (immediately). • Consult with RP Manager to call out a technician (after hours). • RPM to oversee frisking and escort workers to closest satellite CZ portal monitor. • Increase contamination survey frequency of applicable controlled zone exit points. • Record in Logbook. • Raise a CR. (b) If the portal monitors at Chemistry CZ, ISI, CZ or both at DWS are out of service: • Inform RP Technicians (immediately). • Consult with RP Manager to call out a technician (after hours) if necessary. • RPM to oversee frisking and escort worker to closest satellite CZ or NAB portal monitors. • Increase contamination survey frequency of applicable controlled zone exit points. • Record in Logbook. • Raise a CR.	Refer to KWH-I-077 when Argos is placed in conditional service.

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APPENDIX 2

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

1. Notification items marked with # are as a result of an airborne contamination event, PN 57187, and cannot be changed without analysing the impact on the risks associated with a possible uptake.

2. If the Emergency Plan is activated, the Shift Manager carries out the notification to the NNR person on standby.

3. The RP Manager will take control of further communication protocol once informed in order to ensure that all relevant parties are informed in accordance with this protocol.

4. Numbers indicated in brackets under notification requirements refer to NNR document LD 1000 references. All notifications to the NNR must be performed in accordance with document RD-0025.

5. For events described as per KLA-005, the Shift Manager must report in accordance with the required notification time after he has given the initial grading.

6. For events not described as per KLA-005, the SRPA will report in accordance with the required notification time.

7. For notification time equal to 1 hour, all attempts must be made for **immediate** notification, and no later than 1 hour from event declaration.

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
An event that results in a fatality, or serious injury involving over-exposure to radiation at Koeberg, or from nuclear-hazardous material for which ESKOM is responsible.	1 HR EC	1 HR	8 HR	1 HR	1 HR	24 HR	24 HR (1.2)	1 HR EC	1 HR	1 HR	12 HR	24 HR
An event that results in a member of the public receiving an effective dose in excess of 0.1mSv (See 238-54, Appendix A)	1 HR EC	12 HR	24 HR	1 HR	12 HR	24 HR	12 HR (1.3)	1 HR EC		4 HR	24 HR	24 HR
An event that results in a Radworker or Non-Radiation Worker or Visitor receiving a dose above the limits in RD-0022	1 HR HPC	1 HR	24 HR	1 HR	1 HR	24 HR	24 HR (2.21)	1 HR HPC	1 HR	1 HR	24 HR	12 HR
Transport incident or accident involving radioactive material for which Eskom is responsible in terms of Sections 37 (1) and (5) of the National Nuclear Regulator Act (Act No. 47 of 1999) as amended. (This includes the dry spent fuel storage casks.)	12 HR EC and HPC	1 HR	24 HR	EOS	1 HR	12 HR	12 HR (1.13)	12 HR EC and HPC	24 HR	24 HR	24 HR	24 HR

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
Any event that renders access to CSR equipment inaccessible as a result of a release of radioactive material**.**	4 HR EC	4 HR	24 HR	12 HR	1 HR	24 HR	24 HR (1.17)	4 HR EC			24 HR	24 HR
Any instance where levels of radioactivity in environmental samples are detected in excess of the public dose limits in 238-47.	EOS HPC	EOS	24 HR	EOS	12 HR	24 HR	24 HR (2.3)	EOS HPC			2 DAYS	24 HR
Any other event in which the integrity of safety control features has degenerated to the extent that life threatening exposure to radiation or loss of the property in the public domain, attributable to the event, has occurred or is about to occur.	2 HR EC and HPC	2 HR	24 HR	2 HR	12 HR	24 HR	24 HR (1.17)	2 HR EC and HPC			24 HR	24 HR
Any instance when the Radiation Protection Manager is overruled on a matter pertaining to nuclear safety.	1 HR EC	1 HR	24 HR	1 HR	N/A	24 HR	2 DAYS (1.12)	1 HR EC				

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
Release of radioactive material which exceeds safety standards stated in section 36 of the NNR Act 47 of 1999 and is capable of causing nuclear damage with regards to persons, property or the environment	1 HR EC	1 HR	24 HR	1 HR	1 HR	24 HR	24 HR (1.16)	1 HR EC			24 HR	24 HR
An event that results in the individual or collective dose equivalent higher than site administrative limits, but below 238-35 limits.	24 HR HPC	1 HR	24 HR	1 HR	1 HR		24 HR (2.23)	24 HR HPC	24 HR	24 HR		
Exceeding half of any AADQ (in accordance with OPS 7030) in a 3 month period.	12 HR HPC	12 HR	24 HR	24 HR	12 HR		24 HR (2.2)	12 HR HPC				
Any instance where levels of radioactivity in environmental samples are detected in excess of the reporting levels specified in 238-47.	24 HR HPC	12 HR	24 HR	24 HR	12 HR		24 HR (2.23)	24 HR HPC				
Release of radioactive effluent that is unquantified, or bypasses the KER, SEK, DVN or GCT systems, or is unauthorised / incorrectly authorised.	24 HR HPC	12 HR	24 HR	24 HR	12 HR		24 HR (2.4/5/7)	24 HR HPC				

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
Any other event which could have led to a degradation of the integrity of safety control features to the extent that life-threatening exposure to radiation, or loss of use of property in the public domain could occur, but where the possible consequences of the event were prevented by appropriate control.	24 HR EC	24 HR	24 HR	24 HR	24 HR		24 HR (2.22/ 23)	24 HR EC				
Any event that causes the spread of radioactive contamination on Site	12 HR EC	1 HR	24 HR	12 HR	1 HR		24 HR (2.19)	12 HR EC	24 HR	24 HR		
Any event that causes off-site public exposure of the order of at least one tenth but not exceeding, the prescribed dose limits in RD-0022	24 HR HPC	12 HR	24 HR	12 HR	12 HR		24 HR (2.19)	24 HR HPC	24 HR	24 HR		
Total gamma activity in sewage sludge at Melkbosstrand sewage works > 100 Bq/kg or single nuclide > 50 Bq/kg (excluding natural radioactivity).	KORC	5 DAYS	5 DAYS	5 DAYS	5 DAYS		5 DAYS (3.7)	KORC				

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
Any other event which could not give rise in the short term to life-threatening exposure to radiation, or loss of use of property in the public domain, but which would indicate a degraded level of assurance in the adequacy of safety control features, or could be a precursor to an event falling into the S (Significant) or P (Plant) categories.	KORC	24 HR	5 DAYS	24 HR	24 HR		5 DAYS (3.10)	KORC				
Off-site warning siren inoperable for more than 7 days.	KORC	24 HR	5 DAYS	24 HR	24 HR		5 DAYS (3.8)	KORC				
* Loss of a radioactive source	4 HR	1 HR	24 HR	4 HR	1 HR		24 HR	4 HR				
* Serious damage/leakage of a radioactive source	24 HR	1 HR	24 HR	12 HR	1 HR		24 HR	24 HR				
* Unplanned exposure or overexposure of personnel due to radioactive source	24 HR	1 HR	24 HR	1 HR	1 HR		24 HR	24 HR	1 HR	1 HR		
* Fire, explosion or flooding, involving radioactive sources	12 HR	EOS	24 HR	12 HR	EOS		24 HR	12 HR	12 HR	12 HR		

* Also requires notification of Directorate Radiation Control

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**KBG PSM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
* Loss of control over a radioactive source	24 HR	1 HR	2 DAYS	24 HR	1 HR		2 DAYS	24 HR				1 HR
* Unauthorized access to, or unauthorized use of, a source	24 HR	2 HR	2 DAYS	24 HR	24 HR		2 DAYS	24 HR				
* Malicious acts threatening authorized radioactive source activities	24 HR	24 HR	2 DAYS	24 HR	24 HR		2 DAYS	24 HR				
* Failures of equipment containing sources which may have security implications	24 HR	2 HR	5 DAYS	24 HR	24 HR		5 DAYS	24 HR				
* Discovery of any unaccounted source	24 HR	12 HR	24 HR	12 HR	12 HR		24 HR	24 HR				
Any multiple KRT alarms (more than one KRT alarm)	24 HR	EOS		12 HR	EOS			24 HR				
Any job stopped due to radiological concerns		EOS		12 HR	EOS							
Declaration of an unexpected airborne zone		EOS		12 HR	EOS						24 HR	24 HR
Any individual “possible or confirmed” internal uptake event	12 HR	1 HR		12 HR	1 HR			12 HR	EOS	EOS	12 HR	24 HR
Any multiple “possible or confirmed” internal uptake events	12 HR	1 HR	24 HR	EOS	1 HR	12 HR	24 HR	12 HR	EOS	EOS	EOS	12 HR
Contamination of eyes or mouth (KWH-S-026)		24 HR		24 HR	EOS				EOS			

* Also requires notification of Directorate Radiation Control

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APPENDIX 2 (continued)

EXTERNAL COMMUNICATION PROTOCOL FOR RADIOLOGICAL INCIDENTS

NOTIFICATION												
Person Notified	**Com**	**SHIFT M**	**ESK EXM**	**PM**	**RP M**	**NSA M**	**NNR**	**KBG PSGM**	**SAMP**	**PSY**	**KBG SNR M**	**RPCS**
Notified by	**PSGM**	**SRPA**	**PSGM**	**RP M**	**SRPA**	**RP M**	**SHIFT M**	**PM**	**RP M**	**RP M**	**PM**	**RP M**
# Contamination of inner ear (KWH-S-026)		24 HR		24 HR	EOS				EOS			
# Contamination of the nose (KWH-S-026)		24 HR		24 HR	EOS				EOS			
Contamination of open wound		24 HR		24 HR	EOS				EOS			
A worker, or any part of his body is contaminated in excess of the appropriate authorized limits specified (KWH-S-026), and such contamination has persisted for more than three consecutive days.					12 HR				12 HR	12 HR		
EPRI level 2 contamination event (5000 - 50 000 ccpm)					12 HR							
EPRI level 3 contamination event (> 50 000 ccpm)				12 HR	12 HR							
Unexpected orange or red zones		24 HR		24 HR	12 HR							
Detection of alpha contamination					12 HR							24HR
Unexpected EPD dose or dose rate alarm in orange or red zones.				24 HR	12 HR			24 HR				24 HR

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APPENDIX 3

JUSTIFICATION

Revision 15

1. To address LI 39092-009; Update Appendix 2, point number 4, on page 35 to reflect the correct references.

2. Update the new NNR reference for LD 1020 to RD-0022 & LD 1008 to RD-0025

3. Update abbreviations to include PSGM.

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