NATIONAL NUCLEAR REGULATOR

For the protection of persons, property and the environment against nuclear damage.

Using RASCAL at NNR

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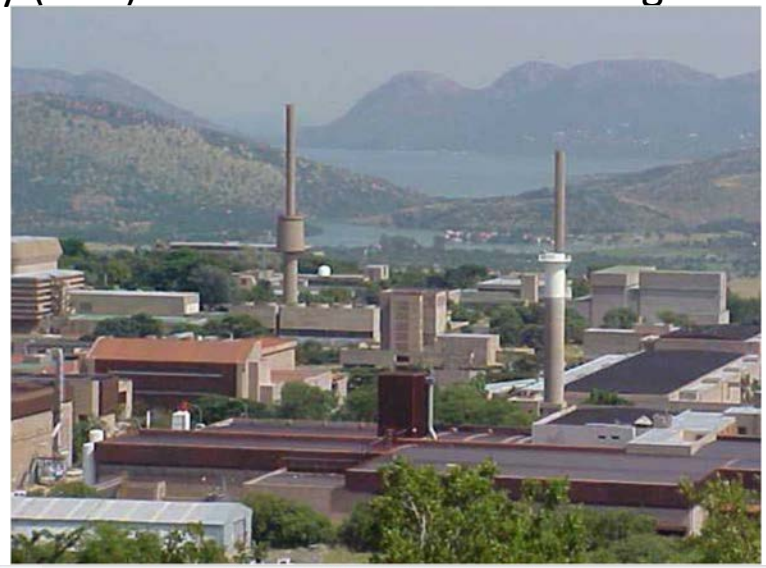
NNR's Regulatory Emergency Response Centre (RERC)

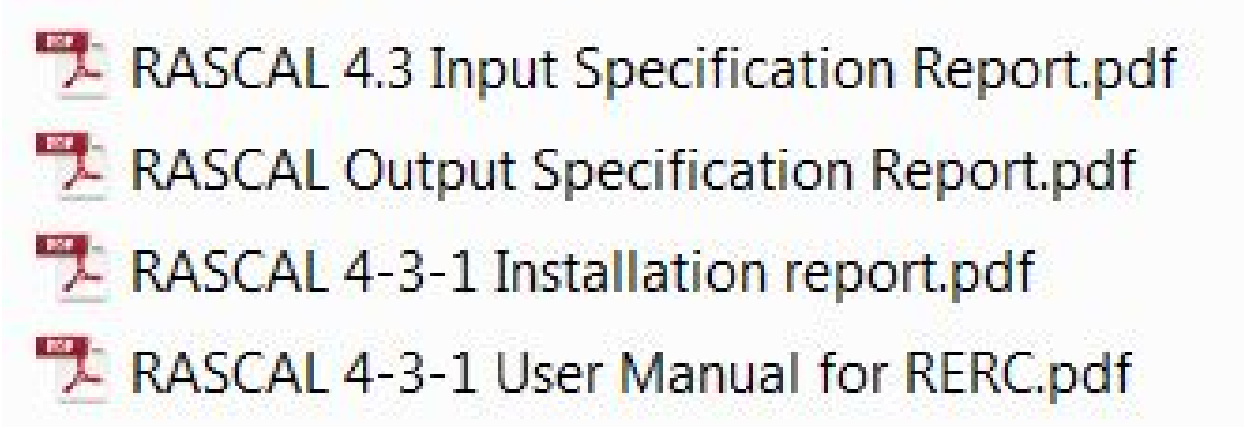
RASCAL 4.3.1 is used in the NNR's Regulatory Emergency Response Centre (RERC) for independent dose and consequence analysis during radiological emergencies and drills:

- Koeberg NPP Units 1 and 2 (Western Cape)
- South African Nuclear Energy Corporation (Necsa) SAFARI-1 Research reactor, Isotope production facility (NTP) and various other radiological facilities (North West Province)



PROJECT MANAGEMENT

As part of the RERC project deliverables, the following internal documents were developed:

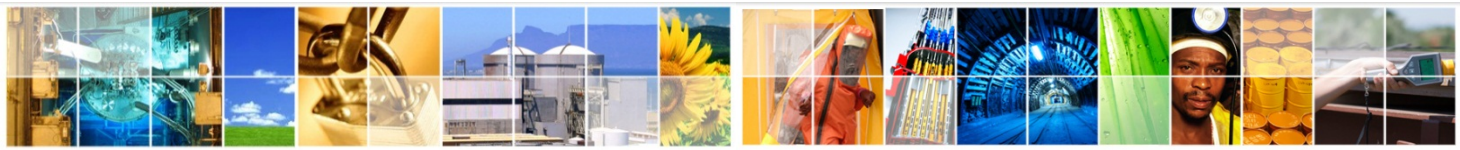


INPUT SPECIFICATION REPORT

- Input Specification Report:
  - Data requirements to enter at input interface:
    - Facility coordi
    - Source term
    - Meteorologica data

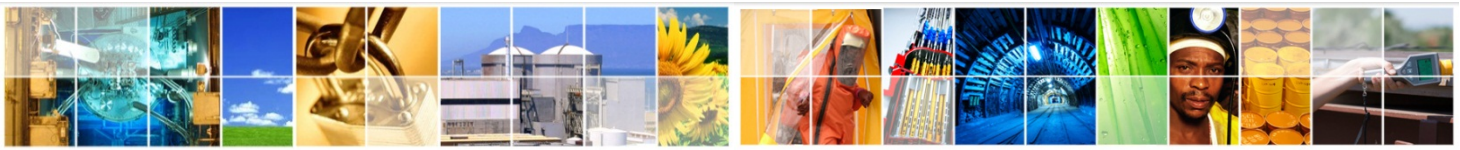
Table 1: Input Specification for STDOSE Module

Input Data	Specific input data	Koeberg NPP	Necsa Facilities
Event Type		Nuclear Power Plant	Other Radioactive Material Releases
Event Location		Define a "generic" Nuclear Power Plant Site	Describe a Material Site not in the Database
	Location and Plant Parameters		
	Type	Generic PWR with large dry containment	
	Name	Koeberg NPP	
	Time Zone - World Offset from GMT/UTC	2 hours	2 hours
	Latitude	-33.67645 degrees (South)	-25.8016 degrees (South)
	Longitude	18.432 degrees (East)	27.9481 degrees (East)
	Elevation	25 meters	1300 meters
	All other input is optional and only used for description purposes		
Source Term	Select one of the following:		
	- Coolant sample	For each nuclide - Bq/g or Bq/kg or Bq/l or Bq/ml (please pay attention to the prefix of the units, i.e. none, kilo, micro, etc.)	N/A
	- Containment air sample	For each nuclide - Bq/m^3 or Bq/cm^3	N/A
	- Effluent release - by mixtures		
		Noble gases - Bq/s or Bq/min or Bq/h (RASCAL can also calculate the release rate from the gross concentration (Bq/m^3 or Bq/cm^3) and the flow rate (cm^3/s or cm^3/min or cm^3/h or m^3/s or m^3/min or m^3/h))	N/A
		Total iodine or I-131 equivalent - Bq/s or Bq/min or Bq/h (RASCAL can also calculate the release rate from the gross concentration (Bq/m^3 or Bq/cm^3) and the flow rate (cm^3/s or cm^3/min or cm^3/h or m^3/s or m^3/min or	N/A



OUTPUT SPECIFICATION REPORT (i)

- Output Specification Report:
  - Provides guidance on different output options
  - Provides a procedure to create static background display maps which can be used to show projections in RASCAL for local sites



OUTPUT SPECIFICATION REPORT (ii)

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CONTENTS¶
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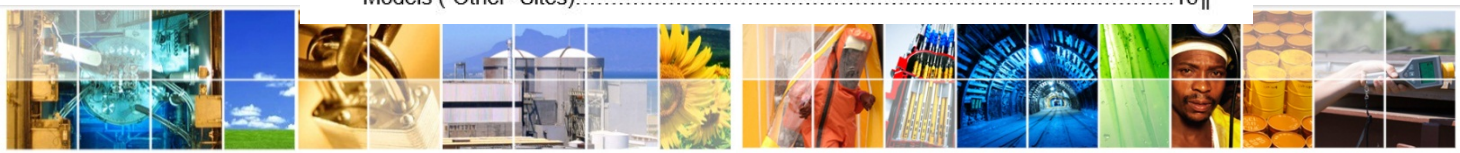


OUTPUT SPECIFICATION REPORT (iii)

An example of an exported GIS Text File displayed on a GIS map with dose contours is given in Figure 9.

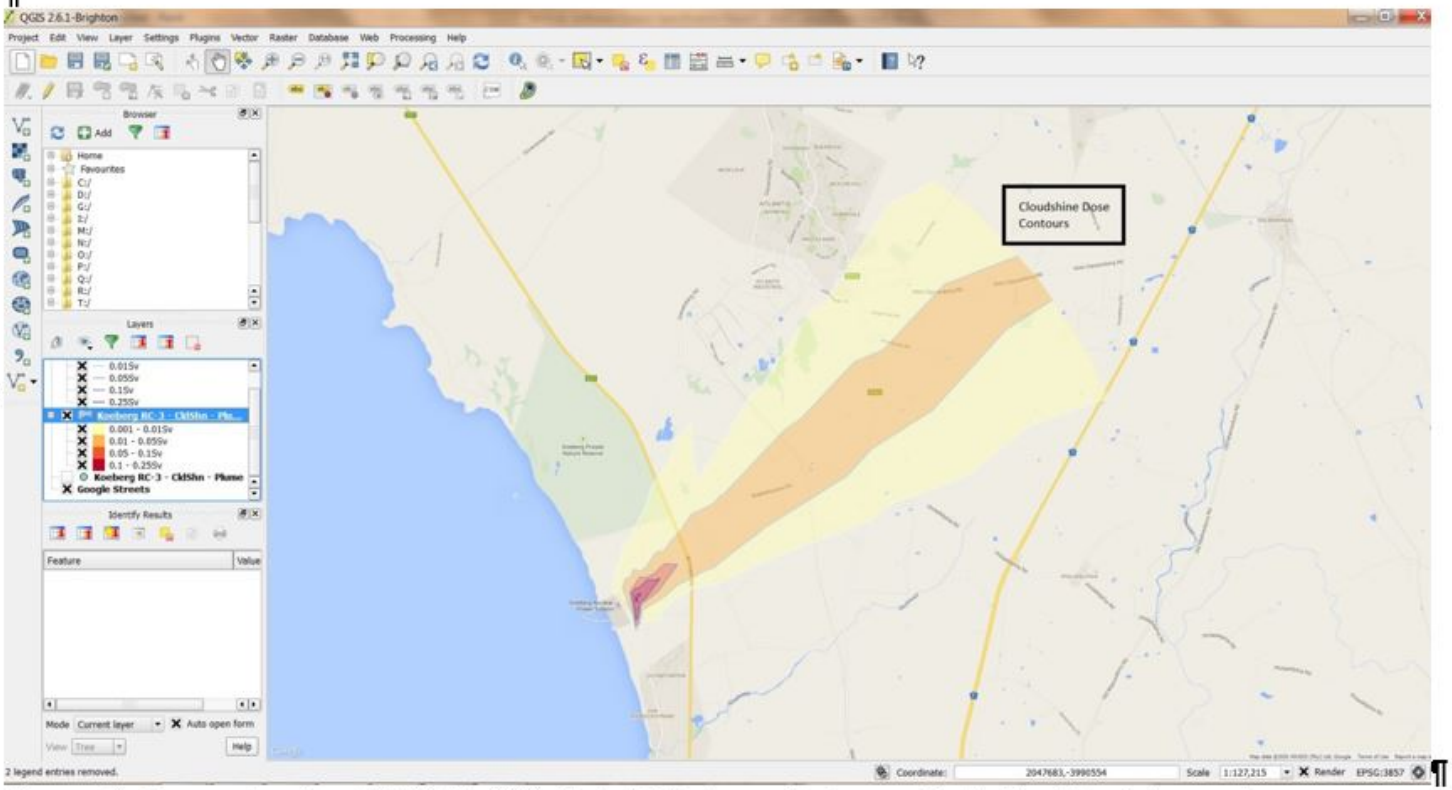
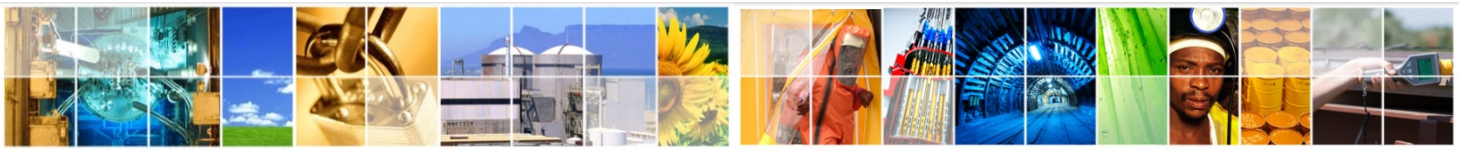


Figure 9: Example of a RASCAL GIS Point File Imported as a Delimited Text Layer in QGIS

INSTALLATION REPORT (i)

- Installation Report:
  - Provides a step-by-step guide for installing RASCAL
  - The applicability and identified limitations of using RASCAL in a non-USA environment are also given
  - Provides a record of installations performed at the NNR for quality assurance purposes



INSTALLATION REPORT (ii)

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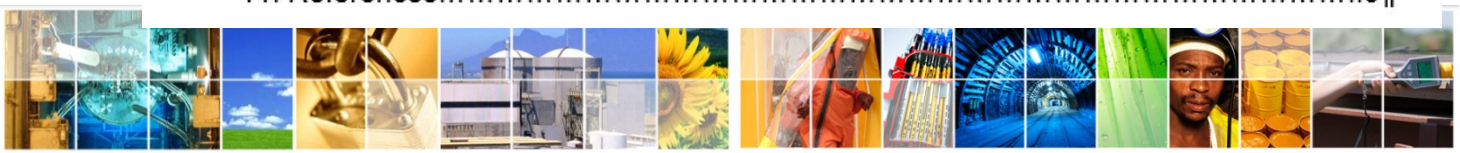
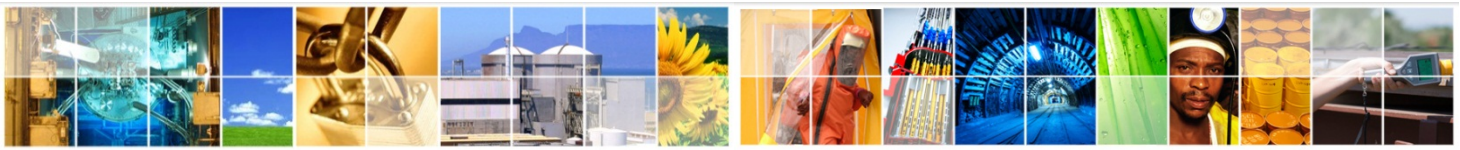


INSTALLATION REPORT (iii)

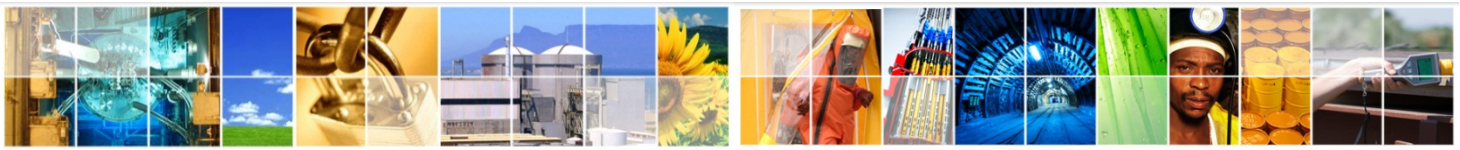
5. → APPLICABILITY·AND·LIMITATIONS·OF·RASCAL¶

RASCAL·was·primarily·developed·for·the·U.S.·NRC·and·therefore·it·is·much·more·customized·around·nuclear·sites·in·the·U.S.A.·and·local·U.S.A.·conditions.·It·is·however·not·limited·to·U.S.A.·nuclear·sites·and·with·a·little·effort·'other'·sites·can·be·created.·Some·of·the·features·of·the·code·such·as·downloadable·observed·and·predicted·meteorological·data·and·nuclear·plant·specific·source·terms·are·not·available·for·'other'·sites·but·in·such·a·case·the·data·and·source·term·can·be·input·directly·from·the·user·interface.¶



USER MANUAL IN RERC (i)

- User Manual:
  - Covers the installation and use of RASCAL 4.3.1 in the NNR RERC
  - Provides guidance on running RASCAL from pre-planned accident templates for Koeberg NPP and the SAFARI-1 Research Reactor (identified from SAR, PRA)
  - Provides guidance on trouble-shooting of the most common errors we encountered using RASCAL at the NNR



USER MANUAL IN RERC (ii)

TABLE·OF·CONTENTS¶

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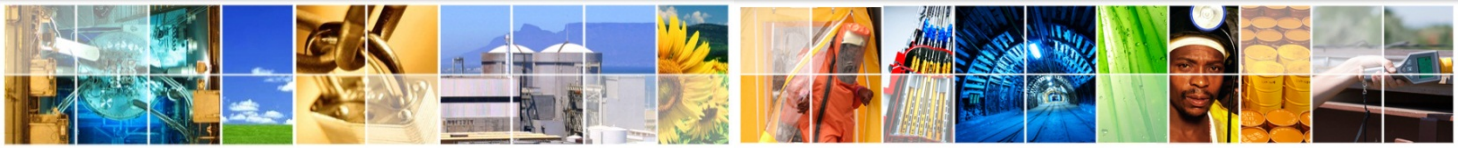


USER MANUAL IN RERC (iii)

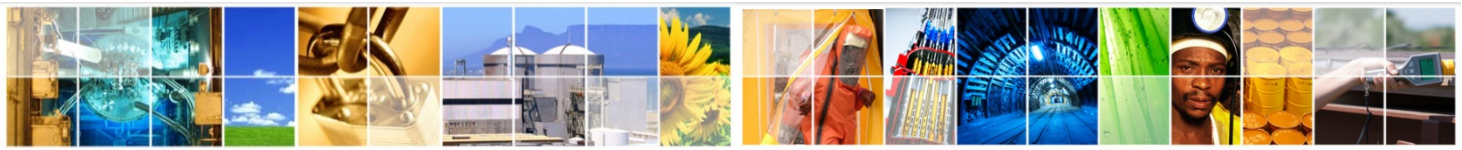
11. TROUBLE SHOOTING

a. Diagnostic run time errors are given as the RASCAL model is set-up and executed.

b. In case where the user cannot solve the errors, support can be obtained by e-mailing to *RASCAL_Help@nrc.gov* or through the discussion online forum at *http://www.usnrc-ramp.com/rascal/forums/rascal-forums* (note login is required to enter the RAMP RASCAL internet site).

c. Some of the most common errors made are the following:

- Time of accident mismatches the observed/forecast meteorological data.
- Error messages due to a mismatch in the date and time format often occur due to the Date and Time Format of Windows. It is advised that the Time and Date format be set to (Control Panel\Clock, Language and Region) English (United States). This will prevent conflicts with RASCAL using the Windows time and date format for output and calculations.
- The Export function linked to MapWinGIS (as per Section 6.2 (e)) does not export GIS Shape Files after calculation of doses (Detailed Results>Display Results>Export>To GIS Shape File). This is an indication that MapWinGIS did not install correctly or integrate (as a plugin to RASCAL) correctly. Uninstall MapWinGIS and reinstall the program for correct integration with RASCAL.



AREAS OF IMPROVEMENT

- Identified areas of possible improvements for customizing RASCAL for SA use:
  - Import option for meteorological data from a csv text file or EXCEL spreadsheet
  - Import option for source term from a csv text file or EXCEL spreadsheet
  - Model option for ‘rough’ terrain when ‘Other’ sites are modelled (at this stage surface roughness is by default for ‘smooth’ terrain, resulting in very conservative results with the Necsa model)
  - Ground shine dose integration period not be limited to 4 days but extended to 7 in order to be compatible with our local requirements
  - Option to select Metric/SI units globally and not on every input/output screen
  - Option for sheltered/unsheltered doses with different shielding factors as input (assist in decision-making as the accident progresses)

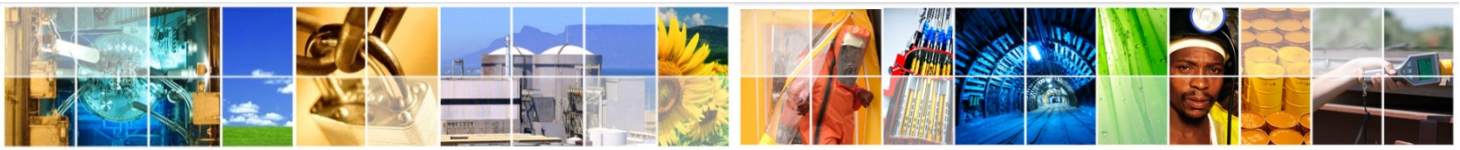
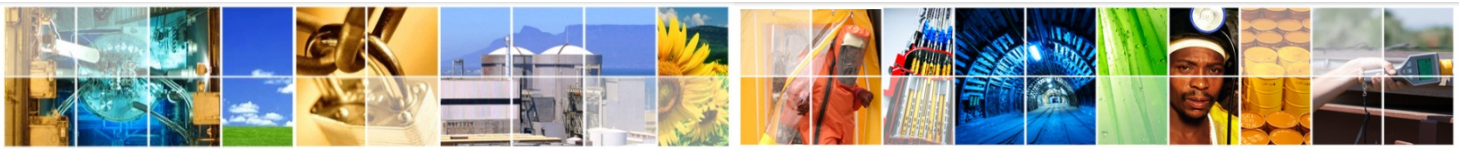


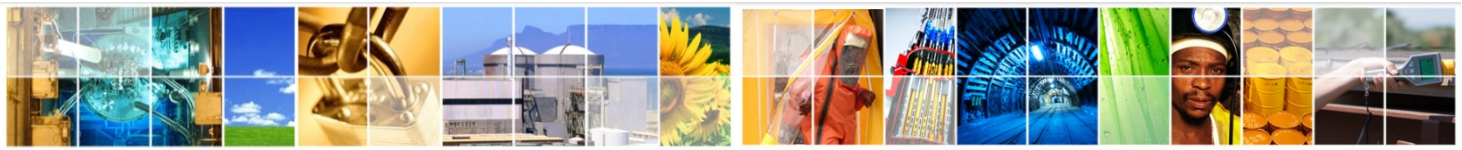
TABLE A-1. GENERIC CRITERIA FOR PROTECTIVE ACTIONS AND OTHER RESPONSE ACTIONS IN EMERGENCY EXPOSURE SITUATIONS TO REDUCE THE RISK OF STOCHASTIC EFFECTS

Generic criteria		Examples of protective actions and other response actions
Projected dose that exceeds the following generic criteria: Take urgent protective actions and other response actions		
$H_{Thyroid}$	50 mSv in the first 7 days	Iodine thyroid blocking
E H_{Fetus}	100 mSv in the first 7 days 100 mSv in the first 7 days	Sheltering; evacuation; decontamination; restriction of consumption of food, milk and water; contamination control; public reassurance
Projected dose that exceeds the following generic criteria: Take protective actions and other response actions early in the response		
E H_{Fetus}	100 mSv per annum 100 mSv for the full period of in utero development	Temporary relocation; decontamination; replacement of food, milk and water; public reassurance
Dose that has been received and that exceeds the following generic criteria: Take longer term medical actions to detect and to effectively treat radiation induced health effects		
E	100 mSv in a month	Screening based on equivalent doses to specific radiosensitive organs (as a basis for medical follow-up), counselling
H_{Fetus}	100 mSv for the full period of in utero development	Counselling to allow informed decisions to be made in individual circumstances



Other Codes in RAMP and Status at NNR

- **NNR is also interested in using the following :**
  - **GALE (downloaded, future use)**
  - **HABIT (downloaded, not installed yet)**
  - **Any other dispersion codes (GENII, PAVAN, ARCON96)**
  - **RADTOOLBOX (downloaded and using it currently)**
  - **DAND (future use)**
  - **VARSKIN (future use)**
  - **SNAP/RADTRAD (future use)**



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IRPA 14 CONFERENCE

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Conference Theme

“Practicing Radiation Protection – Sharing the experience and new challenges”


Cape Town International Conven

IMPORTANT DATES TO REMEMBER

IRPA14 Important Diary Dates

Deadline for Abstract Submission	20 September 2015
Deadline for Standard Rate Exhibition Space	30 September 2015
Notification of Acceptance of Papers	31 December 2015
Early Registration	Until 31 January 2016
Standard Registration	Between 1 February and 31 March 2016
Deadline for Submission of Full Papers	31 March 2016
Late Registration (Thereafter on-site only)	Between 1 April and 1 May 2016
IRPA Associates Society Forum	9 May 2016
Congress Opening Ceremony	9 May 2016
IRPA14 Congress	9 - 13 May 2016

REGISTRATION FEES

Registration Category	Early Pay before 31 Jan 2016	Standard Pay between 1 Feb - 31 Mar '16	Late Pay between 1 Apr - 1 May '16	Onsite Pay after 1 May '16	What is Included
Delegate	ZAR 12 000.00	ZAR 13 000.00	ZAR 14 000.00	ZAR 15 000.00	Delegate Pack Access to all Congress sessions Access to exhibition and poster area Congress kit Coffee breaks Dialy Lunch Welcome Cocktail Gala Dinner
One Day Registration	ZAR 4 000.00	ZAR 4 000.00	ZAR 4 000.00	ZAR 4 000.00	For the nominated day only: Delegate Pack Access to Congress sessions Access to exhibition and poster area Congress kit Coffee breaks Lunch
Student Full Registration	ZAR 7 000.00	ZAR 8000.00	ZAR 9 000.00	ZAR 10 000.00	Delegate Pack Access to all Congress sessions Access to exhibition and poster area Congress kit Coffee breaks Daily Lunch Welcome Cocktail Gala Dinner
Students Day Registration	ZAR 2 600.00	ZAR 2 600.00	ZAR 2 600.00	ZAR 2 600.00	For the nominated day only: Delegate Pack Access to all Congress sessions Access to exhibition and poster area Congress kit Coffee breaks Lunch
Accompanying Persons	ZAR 2 280.00	ZAR 2 280.00	ZAR 2 280.00	ZAR 2 280.00	Congress Pack Coffee breaks Daily Lunch Welcome Cocktail Gala Dinner
Social Events					
Gala Dinner Guest Ticket			ZAR 1 200.00		Wednesday, 11 May '16 at 19h00

THANK YOU

We look forward to hosting IRPA14 in Cape Town, South Africa

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