



## IAEA Training Course:

### High Temperature Reactor Post-irradiation Examination

- Duration: 8 – 19 Sep 2008
- Venue: Auditorium, X-Building, Pelindaba
- Presenter: Dr Enrique H Toscano (Retired from JRC-ITU, Karlsruhe)
- Organiser: Mr Wouter Klopper
- Enquiries: 083 308 0173 / 083 486 7072
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#### Background:

South Africa is leading the industrialisation of High Temperature Reactor (HTR) technology through its Pebble Bed Modular Reactor (PBMR) development programme. The qualification and validation of the spherical fuel elements through Post-irradiation Examination (PIE) is an essential function required by the National Nuclear Regulator in order to ensure the safe operation of the reactor.

The PIE work is being jointly planned by Necsa and PBMR (Pty) Ltd and will ultimately be conducted in Necsa facilities. The required infrastructure and expertise base is currently being established at Necsa.

The aim of this course is the enhanced understanding of all technical, safety and management aspects relating to the planned PBMR PIE programmes to be conducted in South Africa with commensurate improvement in technical results and cost savings.

The IAEA is funding the mission of Dr Enrique Toscano under the regional project RAF/0/029 which deals with human resource development. The Necsa Nuclear Fuel Cycle Department is sponsoring the venue and related hosting costs.

Daily attendance will vary between 25 – 40 people.

#### Directions:

Attendees without Necsa access authorisation or cards are requested to report to Reception at Gate 2. Parking is available on approach at left as well as at the right hand side of the circle directly before Gate 2. At the reception desk you will be required to provide identification (ID Book or Passport) and be issued with temporary access permits. Please allow adequate time (~15-30 minutes) for these formalities.

Attendees should then proceed through the gate and drive to X-Building (route indicated in blue on Necsa site map below). The course will take place in the X-Auditorium located at the western end of the ground floor of X-Building.

### Parking:

Parking is available in front of H-building (to your right as you reach X-building along the indicated route) as well as to the east of X-building (see Parking map below). Undercover parking is generally pre-allocated to Necsa personnel, so please use such parking only if indicated for use by course participants.

### Programme

The course programme is provided below. For logistical reasons, site visits are restricted to Dr Toscano and the relevant hosts.

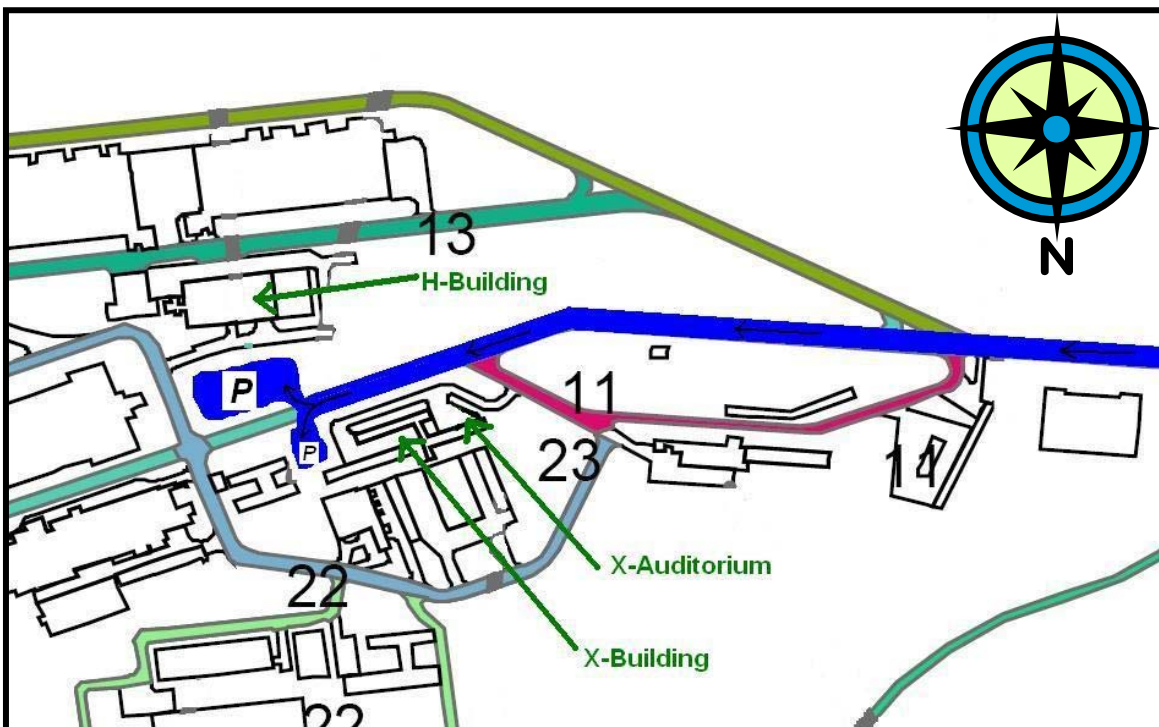
If you are planning to significantly deviate from your previously indicated attendance schedule, please notify the organiser. Please sign the attendance register each day.

Printed copies of Dr Toscano's presentations will be made available.

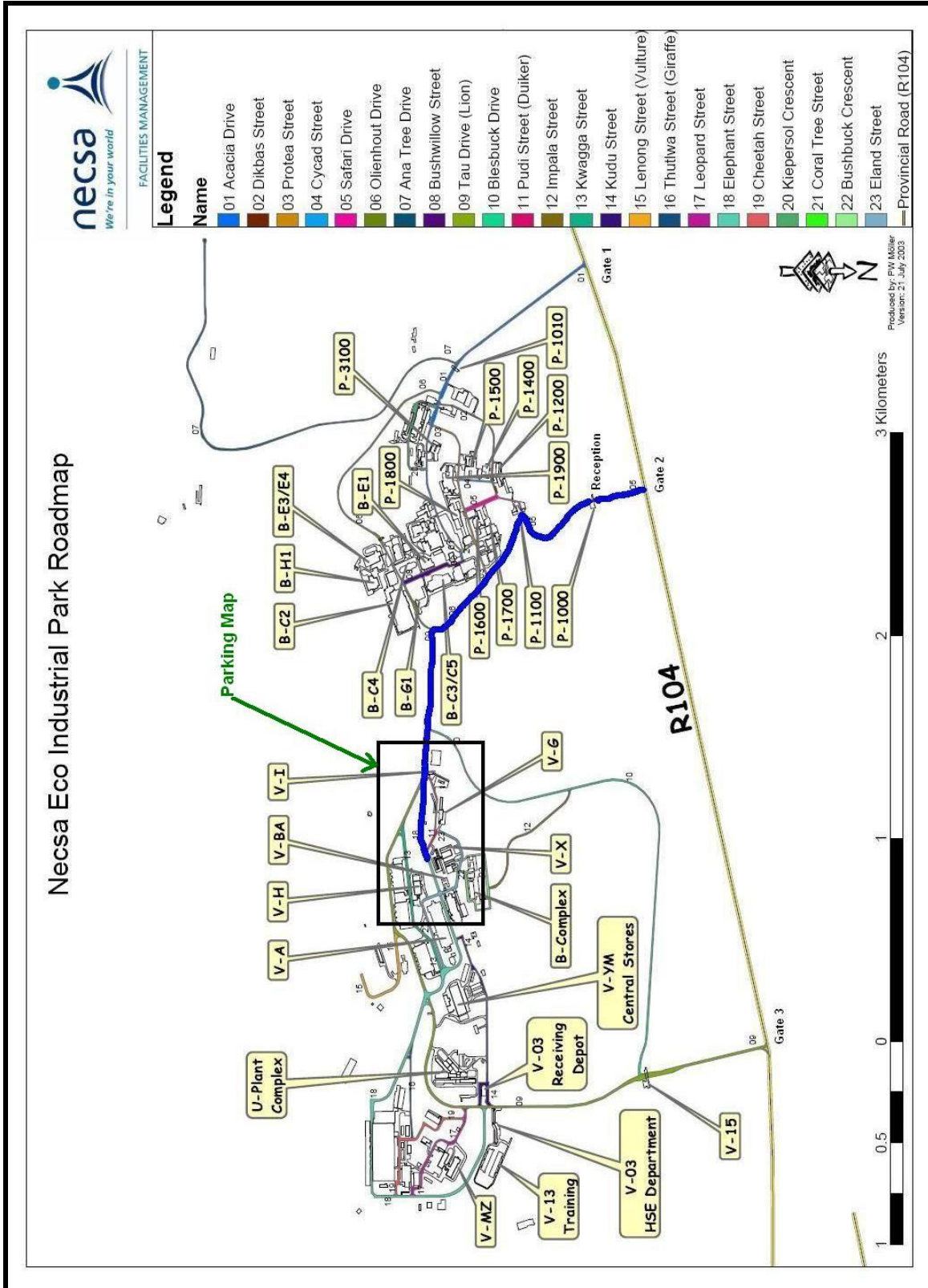
### Please note:

- Obey all traffic rules on site and be on the look out for game crossing the roads
- Security restrictions apply on site - do not wander about
- Necsa's liquor policy prohibits bringing alcohol on site
- Necsa buildings are designated as non-smoking areas – please respect this restriction
- Emergency number on site: 012 305 3333

### **Parking Map:**



# Necsa Site Map:



## Final Programme:

Day	Time	Topic	Presenter
<b>Monday</b>	09:00	<i>Welcoming address</i>	Dr Charles Piani
<b>2008/09/08</b>	09:15	<i>Introductions, presentation of audience and arrangements</i>	Mr Wouter Klopper
	09:30	<i>Overview of ITU activities</i>	Dr Enrique Toscano
	10:00	<b>Coffee break</b>	
	10:15	<i>Description of a Hot Cell Installation</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Description of a Hot Cell Installation</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Introduction to PBMR</i>	Dr Johan Slabber
	15:00	<i>Site visit 1</i>	Mr Wouter Klopper
	16:00	<b>Adjourn</b>	
<b>Tuesday</b>	09:00	<i>Description of Hot Cell Installation &amp; ALARA</i>	Dr Enrique Toscano
<b>2008/09/09</b>	10:00	<b>Coffee break</b>	
	10:15	<i>In-Pile Phenomena, Basis for PIE</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Visual Inspection, FE-Identification, QC, Safeguards</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	13:30	<i>Introduction to Necsa</i>	Dr Van Zyl de Villiers
	14:30	<i>Site visit 2</i>	Mr Wouter Klopper
		16:00	<b>Adjourn</b>
<b>Wednesday</b>	09:00	<i>Density measurement. Macroscopic dimensional changes</i>	Dr Enrique Toscano
<b>2008/09/10</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Gamma spectrometry</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Gamma spectrometry &amp; Burnup determination</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>PBMR Fuel QA/QC (incl. dimensions, density)</i>	Mrs Leoni Strauss & Mr Ken Labuschagne
	15:00	<i>Site visit 3</i>	Mr Wouter Klopper
		16:00	<b>Adjourn</b>

<b>Thursday</b>	09:00	<i>Sample cutting &amp; identification, QA, Fissile material accountability</i>	Dr Enrique Toscano
<b>2008/09/11</b>	10:00	<b>Coffee break</b>	
	10:15	<i>De-consolidation &amp; IMGA</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>De-consolidation &amp; IMGA</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Panel Discussion: Development of De-consolidation &amp; IMGA</i>	Dr Enrique Toscano
	15:00	<i>Site visit 4</i>	Mr Wouter Klopper
	16:00	<b>Adjourn</b>	
<b>Friday</b>	09:00	<i>Simulation D-LOFC (KUEFA)</i>	Dr Enrique Toscano
<b>2008/09/12</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Simulation D-LOFC (KUEFA)</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Simulation D-LOFC (KUEFA)</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Panel Discussion: Development of KUEFA</i>	Light Project Management
	16:00	<b>Adjourn</b>	
<b>Weekend</b>			
<b>Monday</b>	09:00	<i>PyC-Anisotropy</i>	Dr Enrique Toscano
<b>2008/09/15</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Burnup determination, IC-ICP-MS, Wet Chemistry</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Ceramography &amp; Micro-Hardness</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Introduction to NNR (National Nuclear Regulator)</i>	Mr Peter Bester
	15:00	<i>Site visit 5</i>	Mr Wouter Klopper
	16:00	<b>Adjourn</b>	
<b>Tuesday</b>	09:00	<i>Ceramography &amp; Micro-Hardness</i>	Dr Enrique Toscano
<b>2008/09/16</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Mechanical properties &amp; Weibull distribution</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>Fission gas release, Air Ingress Accident (KORA)</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Panel discussion: PBMR irradiation &amp; testing programmes</i>	Mr Dieter Geduld
	15:00	<i>Panel discussion: International HTR Programmes</i>	Dr Enrique Toscano
	16:00	<b>Adjourn</b>	

<b>Wednesday</b>	09:00	<i>Air Ingress Accident (KORA)</i>	Dr Enrique Toscano
<b>2008/09/17</b>	10:00	<b>Coffee break</b>	
	10:15	<i>GD-MS, SEM, TEM</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>SIMS, EPMA</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Overview of PIE programme status at Necsa</i>	Mr Wouter Klopper
	15:00	<i>Discussion on test implementation and cell allocation at Necsa</i>	Dr Johan H Venter
	16:00	<b>Adjourn</b>	
<b>Thursday</b>	09:00	<i>Knudsen Cell, Laser Ablation, X-Ray</i>	Dr Enrique Toscano
<b>2008/09/18</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Thermal properties</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	<i>GEN-IV, PIE requirements, Future Hot Laboratories Activities</i>	Dr Enrique Toscano
	12:15	Wrap-up	Dr Enrique Toscano
	12:30	<b>Lunch</b>	
	14:00	<i>Panel discussion: University activities &amp; Research programmes</i>	Dr Deon Joubert
	16:00	<b>Adjourn</b>	
<b>Friday</b>	09:00	<i>Waste handling: Quality control &amp; Quality assurance</i>	Dr Enrique Toscano
<b>2008/09/19</b>	10:00	<b>Coffee break</b>	
	10:15	<i>Overview of minor actinides lab at ITU</i>	Dr Enrique Toscano
	11:15	<b>Coffee break</b>	
	11:30	General wrap-up	Dr Enrique Toscano
	12:15	Closing: Vote of Thanks	Mr Wouter Klopper
	12:30	<b>Lunch</b>	
	14:00	<i>Panel discussion: Future training and courses</i>	Mr Wouter Klopper
	15:00	<b>Braai</b>	
	Later	<b>End of the Course</b>	