



the
abdus salam
international centre for theoretical physics

ICTP 40th Anniversary

SMR.1555 - 16

**Workshop on
Nuclear Reaction Data and Nuclear Reactors:
Physics, Design and Safety**

16 February - 12 March 2004

Nuclear Power Plant Simulators for Education

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Division of Nuclear Power
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AUSTRIA**

These are preliminary lecture notes, intended only for distribution to participants

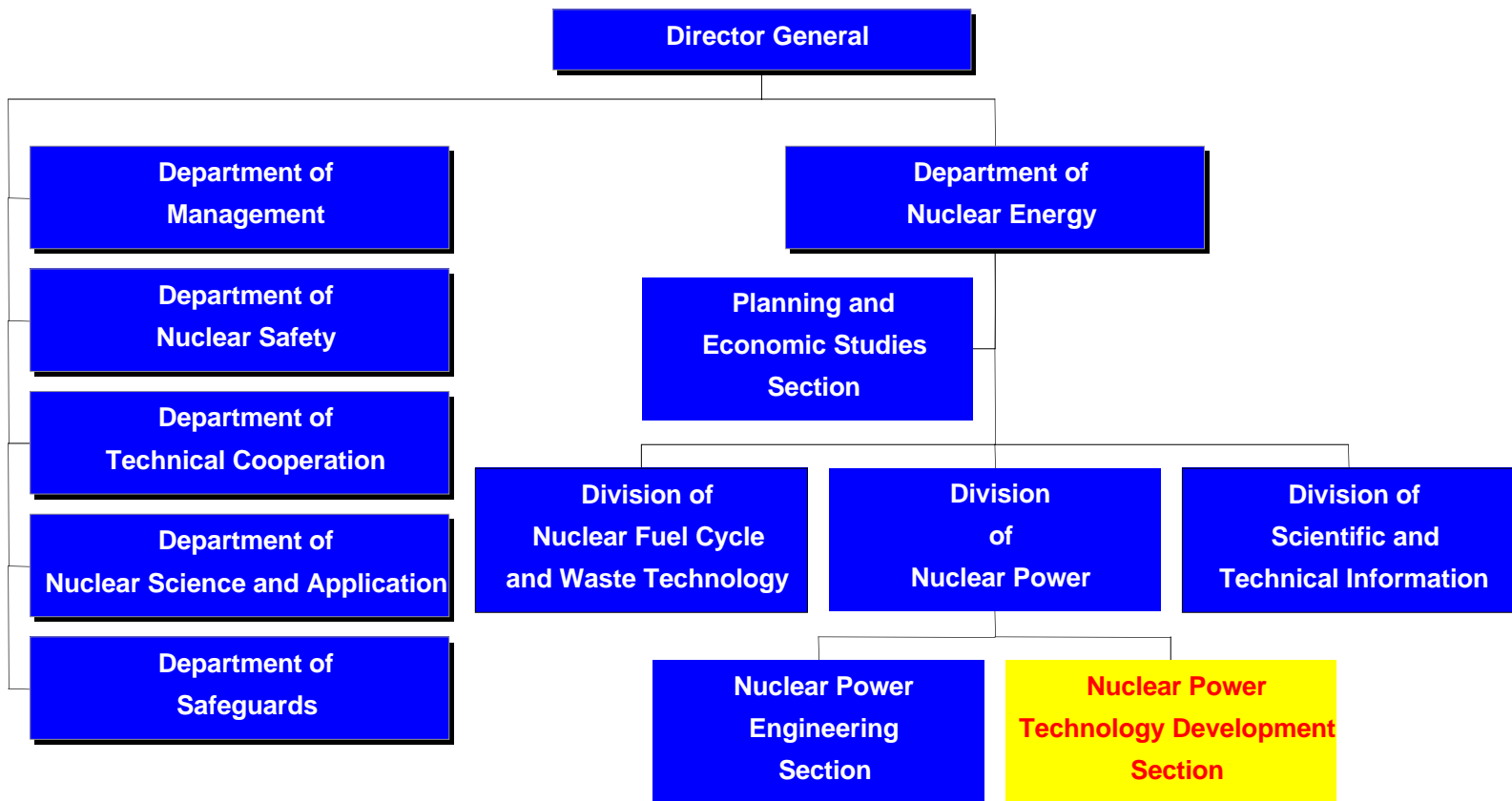


Nuclear Power Plant Simulators for Education

A. Badulescu, IAEA

<http://www.iaea.org/OurWork/ST/NE/NENP/NPTDS/Projects/edu.html>

The simulator activity is conducted within the IAEA's Nuclear Power Technology Development Section



NPTDS Projects

- Requirements and Prospects for Innovative Small and Medium Sized Reactors
- Technology Advances for Water-Cooled Reactors for Improvement of Reliability, Economics and Safety
- Technology Advances in Fast Reactors and Accelerator-driven Systems for Actinide and Long-Lived Fission Product Transmutation
- Support for the Demonstration of Nuclear Seawater Desalination
- International Task Force on Innovative Nuclear Reactors and Fuel Cycles



Nuclear Power Plant Simulators for Education

- **To provide university professors and engineers** involved in teaching topics in nuclear energy with tools (PC-based software) to demonstrate the operational response characteristics of various reactor types. The tools are also **supplied directly to students, junior engineers, and senior engineers and scientists interested in broadening their understanding of the topic**
- The activity is not designed to supply simulators for plant-specific purposes such as design, safety analysis, licensing or operator training, nor to link with control system components
- Since 1997, eleven workshops have been held, in Egypt, Saudi Arabia, the Republic of Korea, Italy and Vienna. Training has been given, and **reactor simulators have been distributed to more than 238 participants from 46 countries.**



Typical workshop content

- **Refresher lectures on nuclear technology – thermalhydraulics, reactor physics, control, safety....**
- **Simulator demonstrations**
- **Hands-on practice, with exercises**
- **Building a simulator**
- **Participants take simulators home, including the one they built**
- **Feedback session and forms**



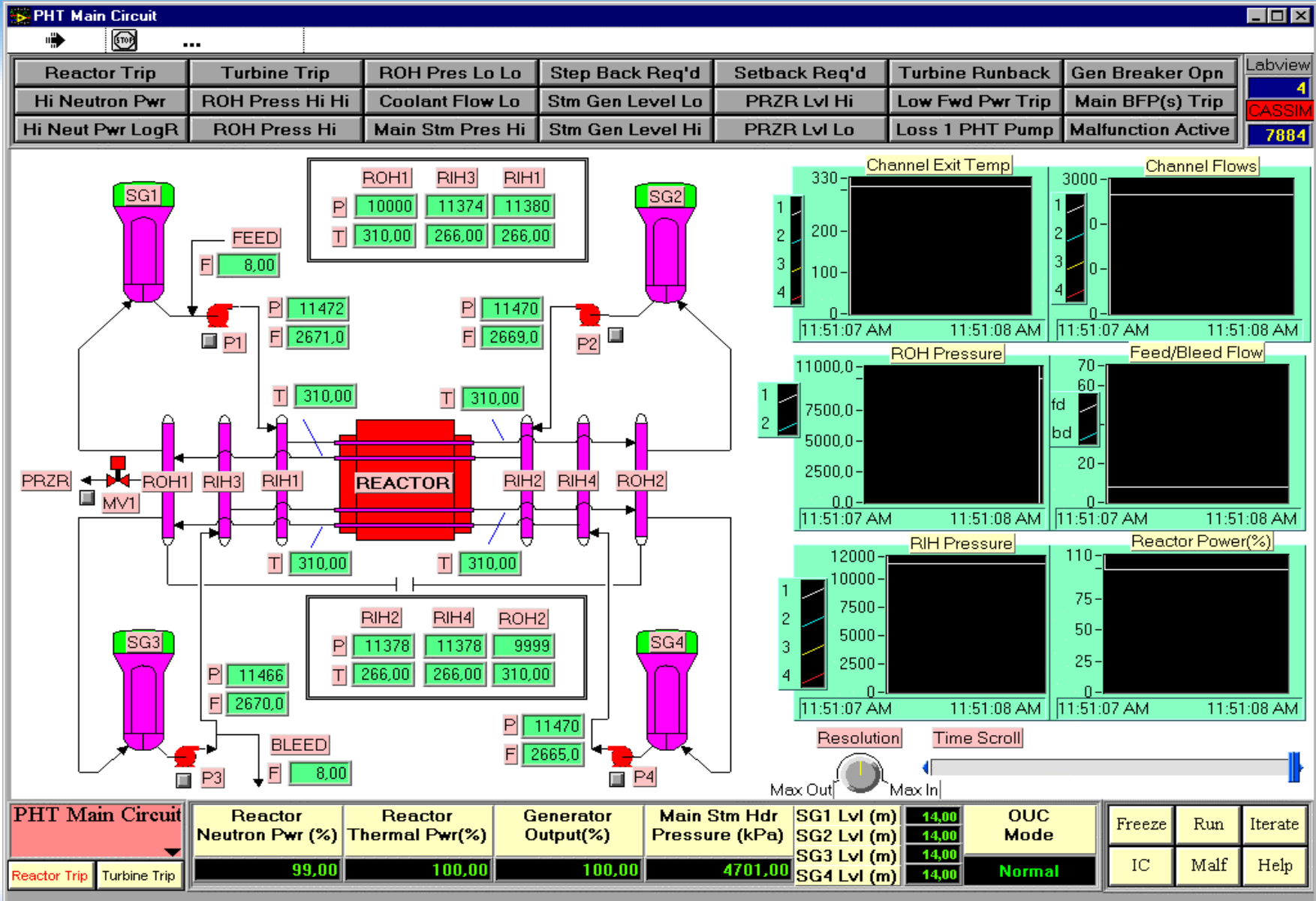
Simulators

- **WWER-1000**
- PCTRAN PWR Simulator
- CASSIM Simulators:
 - CANDU
 - BWR
 - PWR
- CASSIM Simulator Development System



Examples





Office

Microsoft

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FA parameters

Selection 01 - 24

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Δ _T	22.3	T _{del}	37.9
Kq	1.00	Kv	0.78

Deviation Influence Prohibition

More Less More Less More Less

N° 99.8 P2 ****

H T ACP

IMS failure

ΔT N P A O

99.8 EIC 1 *****

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EIC 2 99.8

EIC 3 99.8

Teff 169.75 40 42

24 hours

Teff h.m.s. 6104:26:48

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Lim 100

00:14:59

Thermohydraulic 1C model

Core model

STATIC Mode

Boron Shim

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Auto Rem

Boron exchange 1C model

CPS TAB

1C TK

TQ TF

GRP 2C

TB10S26 TK70S14

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2 GCP 1 2 3 4 5 6 7 8 9 10

Start

Exploring - Wep

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09:40



WORKSHOP in 2004

- **Workshop on "Nuclear Power Plant Simulators for Education", to be held in 8-19 November 2004, ICTP, Trieste, ITALY**
- <http://agenda.ictp.trieste.it/agenda/current/fullAgenda.php?email=0&ida=a0370>

