



**The Abdus Salam  
International Centre for Theoretical Physics**



**2291-29**

**Joint ICTP-IAEA Course on Science and Technology of Supercritical  
Water Cooled Reactors**

*27 June - 1 July, 2011*

**OPENING REMARK & TEAM DISCUSSION**

Katsumi Yamada  
*Division of Nuclear Power  
Department of Nuclear Energy  
International Atomic Energy Agency  
Vienna  
Austria*



**Joint ICTP-IAEA**  
**Course on Science and Technology of**  
**Supercritical Water-cooled Reactors (SCWRs)**

**Trieste, Italy, 27 June - 1 July 2011**

**Katsumi Yamada**  
**Division of Nuclear Power**  
**Department of Nuclear Energy**  
**International Atomic Energy Agency**

# Objectives

Objectives of this Course are to:

- Provide a comprehensive and up-to-date review of the science and technology of SCWRs; and
- Explore the opportunities and challenges associated with this reactor concept and unveil opportunities for research and development in this area.



# Schedule

■ 5 –day Course from Monday, 27 June to Friday, 01 July

■ Monday, 27 June

- Opening
- 5 Lectures
- Reception

◆ Self-Introduction  
(1 to 2 minutes talk)

■ Tuesday, 28 June

- 7 Lectures

The poster is for a course organized by the Abdus Salam International Centre for Theoretical Physics (ICTP) and the International Atomic Energy Agency (IAEA). The title is "Joint ICTP-IAEA COURSE ON SCIENCE AND TECHNOLOGY OF SUPERCRITICAL WATER COOLED REACTORS". The dates are "27 June - 1 July 2011" and the location is "Miramare - Trieste, Italy". The poster includes a detailed description of the course, its objectives, and the topics to be addressed. It also lists the directors, Katsumi YAMADA and Sama BILBAO Y LEON, and the local organizer, Claudio TUNIZ. The deadline for submitting applications is 25 February 2011. The poster features the ICTP and IAEA logos, a photograph of a reactor, and a stylized atomic symbol.

**ICTP** The Abdus Salam International Centre for Theoretical Physics

**Joint ICTP-IAEA  
COURSE ON SCIENCE AND  
TECHNOLOGY  
OF SUPERCRITICAL WATER COOLED  
REACTORS**

**27 June - 1 July 2011  
Miramare - Trieste, Italy**

The "Abdus Salam" International Centre for Theoretical Physics (ICTP), Trieste, Italy, in co-operation with the International Atomic Energy Agency (IAEA), Vienna, Austria, is organizing a Course on the Science and Technology of Supercritical Water Cooled Reactors (SCWR), to be held at ICTP, Trieste, from 27 June - 1 July 2011.

There is high interest internationally in both developing and industrialized countries in innovative supercritical water-cooled reactors, primarily because such concepts will achieve high thermal efficiencies (44-45%) and promise improved economic competitiveness utilizing and building on recent developments for highly efficient fossil-fueled power plants. The Supercritical Water Cooled Reactor (SCWR) is a Generation IV reactor concept that uses supercritical water as the working fluid. Therefore, SCWR systems are essentially water-cooled reactors operating at high-temperature and high-pressure, above the thermodynamic critical point of water. Since this concept is based on the well-known water-cooled reactors currently in operation all over the world, it provides a good stepping stone for developing countries looking to deploy advanced nuclear power plant designs.

The course will provide a comprehensive and up-to-date review of the science and engineering of supercritical water-cooled reactor concepts, including thermodynamics, thermohydraulics and heat transfer, neutronics and core design, materials requirements, system design and safety aspects, and a detailed description of the various supercritical water-cooled reactor concepts currently under development. The course will also explore the opportunities and challenges associated with this reactor concept, and will unveil opportunities for research and development in this area.

In particular, the following topics will be addressed:

- Thermodynamics of systems at supercritical pressure
- Thermohydraulics and heat transfer in supercritical water-cooled reactors
- Neutronics and core design for supercritical water-cooled reactors
- Selection of materials for use in supercritical water-cooled reactors
- System design and safety aspects for supercritical water-cooled reactors
- Overview of the various SCWR concepts currently under development in the world
- Opportunities and challenges associated with the development and deployment of SCWRs
- Overview of on-going research and development activities in the area of supercritical water-cooled reactors
- Experimental databases for the study of these phenomena
- Overview of advanced computational tools to study and simulate these phenomenologies

**PARTICIPATION**  
Scientists and students from all countries, which are members of the United Nations, UNESCO or IAEA, may attend the Course subject to approval by the Course Directors. The course is intended for nuclear engineering faculty and students (at the university level), graduate engineers/physicists working in the nuclear field, post-graduate students, engineering designers, nuclear researchers and nuclear regulators. A basic knowledge in nuclear physics, thermohydraulics, fluid mechanics and heat transfer is required. Logistics limit the number of participants to 25. As the Course will be conducted in English, participants should have an adequate working knowledge of that language. Although the main purpose of the Centre is to help research workers from developing countries, through a programme of training activities within a framework of international cooperation, a limited number of students and post-doctoral scientists from developed countries are also welcome to attend.

As a rule, travel and subsistence expenses of the participants should be borne by the home institution. Every effort should be made by candidates to secure support for their fare (or at least half-fare). However, limited funds are available for some participants, who are nationals of, and working in, a developing country, and who are not more than 45 years old. Such support is available only for those who attend the entire activity. There is no registration fee.

**REQUESTS FOR PARTICIPATION**  
The application form can be accessed at the activity website:  
<http://agenda.ictp.it/scwr.php?72291>  
Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form. The deadline for submitting applications is 25 February 2011.

**SECRETARIAT**  
Telephone: +39-040-2240-9911 Fax: +39-040-2240-7911 E-mail: [scw72291@ictp.it](mailto:scw72291@ictp.it)  
Course web page: <http://agenda.ictp.it/scwr.php?72291> ICTP Home Page: <http://www.ictp.it/>

Trieste, October 2010

**Directors:**  
Katsumi YAMADA  
Sama BILBAO Y LEON  
(IAEA, Vienna, Austria)

**Local Organizer:**  
Claudio TUNIZ  
(ICTP, Trieste, Italy)

**DEADLINE  
for submitting  
applications  
25 February 2011**



# Schedule (continued)

## ■ Wednesday, 29 June

- 7 Lectures and a Special Lecture
- Dinner

## ■ Thursday, 30 June

- 7 Lectures

## ■ Friday, 01 July

- 1 Lecture and a Topic on Fukushima accident
- Course Certificates
- Closing

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**REQUESTS FOR PARTICIPATION**  
The application form can be accessed at the activity website:  
<http://agenda.ictp.it/scwr.php?22291>  
Once in the website, comprehensive instructions will guide you step-by-step, on how to fill out and submit the application form. The deadline for submitting applications is 23 February 2011.

**SECRETARIAT**  
Telephone: +39-040-2240-0911 Fax: +39-040-2240-7911 E-mail: [scwr2291@ictp.it](mailto:scwr2291@ictp.it)  
Course web page: <http://agenda.ictp.it/scwr.php?22291> ICTP Home Page: <http://www.ictp.it/>

Trieste, October 2010

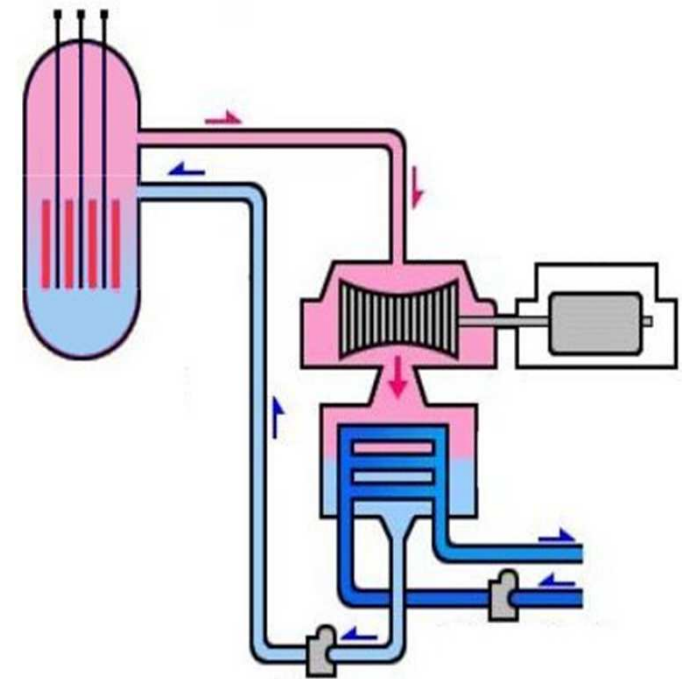
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# Team Discussion and Presentation

- During the Course, each Team creates 'Virtual' R&D Project for an SCWR.
- Each Team consists of 4-5 Participants and discuss a subject.
- All Teams make a presentation (5-7 slides) on their results.
- Some or all of Teams present it on Friday.



# Let's Study and Enjoy SCWR!



# Team A

ABDULLAH Md. Nure Alam

KANAKKASSERY Jayakumar

OJEFUA Osazuwa

WANG Jia





# Team B

AGBODEMEGBE Vincent Yao

FIANTINI Rosalina

LEFTEROV Veselin Marinov

PETROPOULOS Nick

MARKOVIC Nikola



# Team C

ALDAWAHRAH Saadou

HU Zehua

PIOVEZAN Pamela

YOUSIF Eltayeb



# Team D

AMIDU Muritala Alade

HUSAIN Mohamad Annuar Assadat

NGUYEN Thi Thanh Thuy

SLEDKOV Ruslan



# Team E

CHIESA Davide

DUBEY Santosh Kumar

JIANG Jin

NOSTAR Emine

TIKHOMIROV Alexander V.



# Team Discussion Subject: Day-1/2

- ✓ Select or create one SCWR concept your Team will develop.
  - Pressure vessel type / Pressure tube type
  - Thermal / Fast / Mixed spectrum core
- ✓ Name the concept.



# Team Discussion Subject: Day-1/2 (continued)

- ✓ Discuss advantages of the concept over one of conventional reactors.
- ✓ Mention at least two cost reduction features of the primary circuit.



# Team Discussion Subject: Day-3

- ✓ Discuss challenges of your concept in Thermal-hydraulics.
- Mention at least three major R&D items which you think are important for realizing your concept.



# Team Discussion Subject: Day-4

- ✓ Discuss challenges of your concept in Materials and Chemistry.
- Mention at least three major R&D items which you think are important for realizing your concept.





# Team Discussion Subject: Day-5

- ✓ Integrate the Team Discussion results into a 'Virtual' R&D Project to realize your SCWR concept.
  - R&D items and Design issues.
    - Who will do what?
    - By when will it need to be solved?
  - Consider if an experimental reactor and/or a demonstration reactor will be necessary or not.
  - No budget limitation considered.



# Team Discussion Subject: Day-5 (continued)

- ✓ Make the presentation of 5-7 slides to explain your Project.

For example:

- Title Slide: Project name / Members' name
- Objective: Concept name / Advantages etc.
- Development plan:
  - 1) R&D items
  - 2) Design issues
  - 3) Development schedule
- Summary

