

Role of Nuclear Research: the Swedish Example

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Seminar on The Future of Nuclear Power in Europe, June 10, 2014 - Stockholm School of Economics

Outline

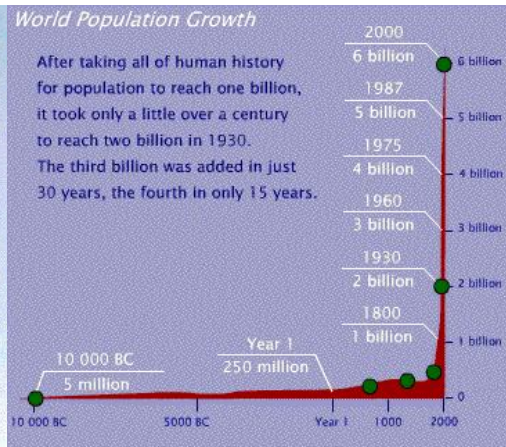
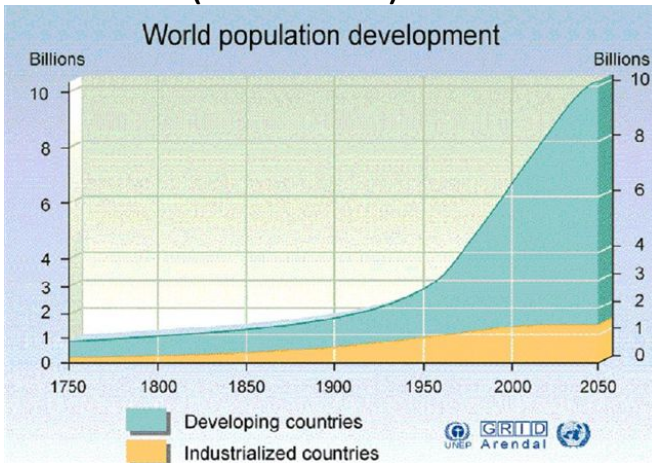
- Why we need research in nuclear engineering?
- SKC - Swedish Centre for Nuclear Technology
- Examples of nuclear engineering research performed at Swedish universities
- Future development directions



Worlds Population (millions):

	2009	2050 (low)	high
World	6829	7959	10461
Developed countr.	1233	1126	1439
Non-dev. countr.	5596	6833	9022
Sweden (thousand)	9249	10571	

Do we need energy research?



Energy consumption:

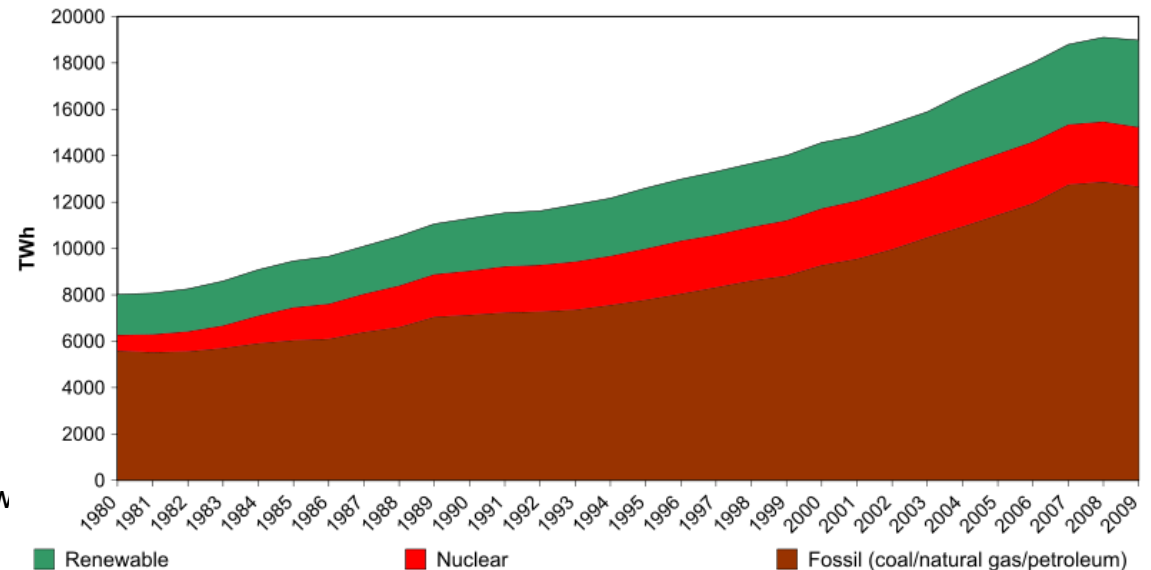
Mean	2000 watts
Western Europe	6000 watts
USA	12000 watts
China	1500 watts

Source: USA Energy Information Agency (EIA)

If no action is taken, by 2030 EU will depend in 70% on external sources of energy.

Energy research is needed!

Annual electricity net generation in the world



Seminar on The Future of Nuclear Pow



Reynir Bödvarsson, Tobias Nilsson, Martin Tondel, Robert Bergqvist, Christian Ekberg, Martin Hedberg, Henryk Anglart, Lars Barregård.

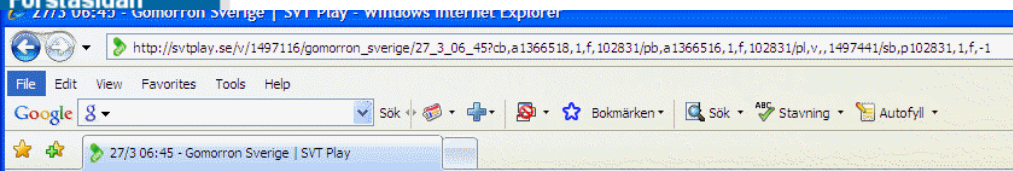
Expert Service to Public

Följ Expressen på facebook
Gilla 9,4k

Experterna svarar på dina frågor!

MENY

Förstasidan



svt play

Start Program A-O Kategorier Sök Sök

Gomorrn Sverige
 Kategori: Nyheter
 27/3 06:45
 Längd: 16 minuter 40 sekunder

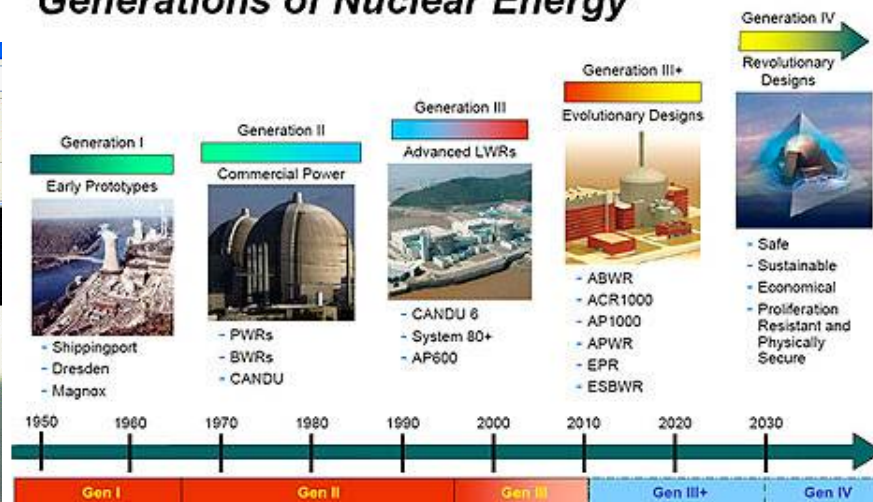
+ Programinformation
 Gomorrn Sverige på svt.se

Denna video finns tillgänglig t.o.m. fre 10 apr

02:17 16:40

Hela program

Generations of Nuclear Energy



Fyra generationer av kärnenergi. Foto: Casl

"Trimmad kärnkraft frestar på säkerheten"

Publicerad 25 januari 2011 08:57

15 kommentarer

DEBATT. Med uppskruvad effekt och trimmade marginaler i våra reaktorer ökar kraven på exakta beräkningar för att inte säkerheten ska äventyras, skriver kärnenergiforskarna Imre Pázsit, Christophe Demazière, Henryk Anglart, Tomasz Kozlowski och Anders Nordlund.

SKC – Swedish Centre for Nuclear Technology



SKC's Partners

- initially SSM, FKA, OKG, Ringhals, Westinghouse, KTH, Chalmers, UU
- In 2014 SSM stepped outside SKC to support research separately

Goals:

- Provide long term support to secure knowledge and competence at academic level
- Contribute to safe, efficient and reliable nuclear energy production
- Provide proper resources to the Swedish nuclear industry

SKC Research Program

Four research programs:

- Nuclear Power plant technology and safety
- Nuclear power plant safety
- Reactor physics and nuclear power plant thermal-hydraulics
- Materials and chemistry

Nine research areas:

- Thermal-hydraulics
- Core physics
- Core and plant dynamics
- Chemistry
- Material physics and engineering
- Safety and severe accidents
- Reactor diagnostics
- Detectors and measurements
- Safeguards



SKC Supported Education

Chalmers:

- International Master Program in nuclear engineering
- Objective to provide both basic and advanced knowledge on physics, chemistry and technology of nuclear power and nuclear fuel cycle

KTH:

- International Master Program in nuclear energy engineering
- The program includes 8 compulsory and 12 elective courses
- Covers thermal-hydraulics, reactor physics, nuclear power safety, reactor technology, reactor dynamics and stability, transmutation, Gen-IV reactors, etc

Uppsala University:

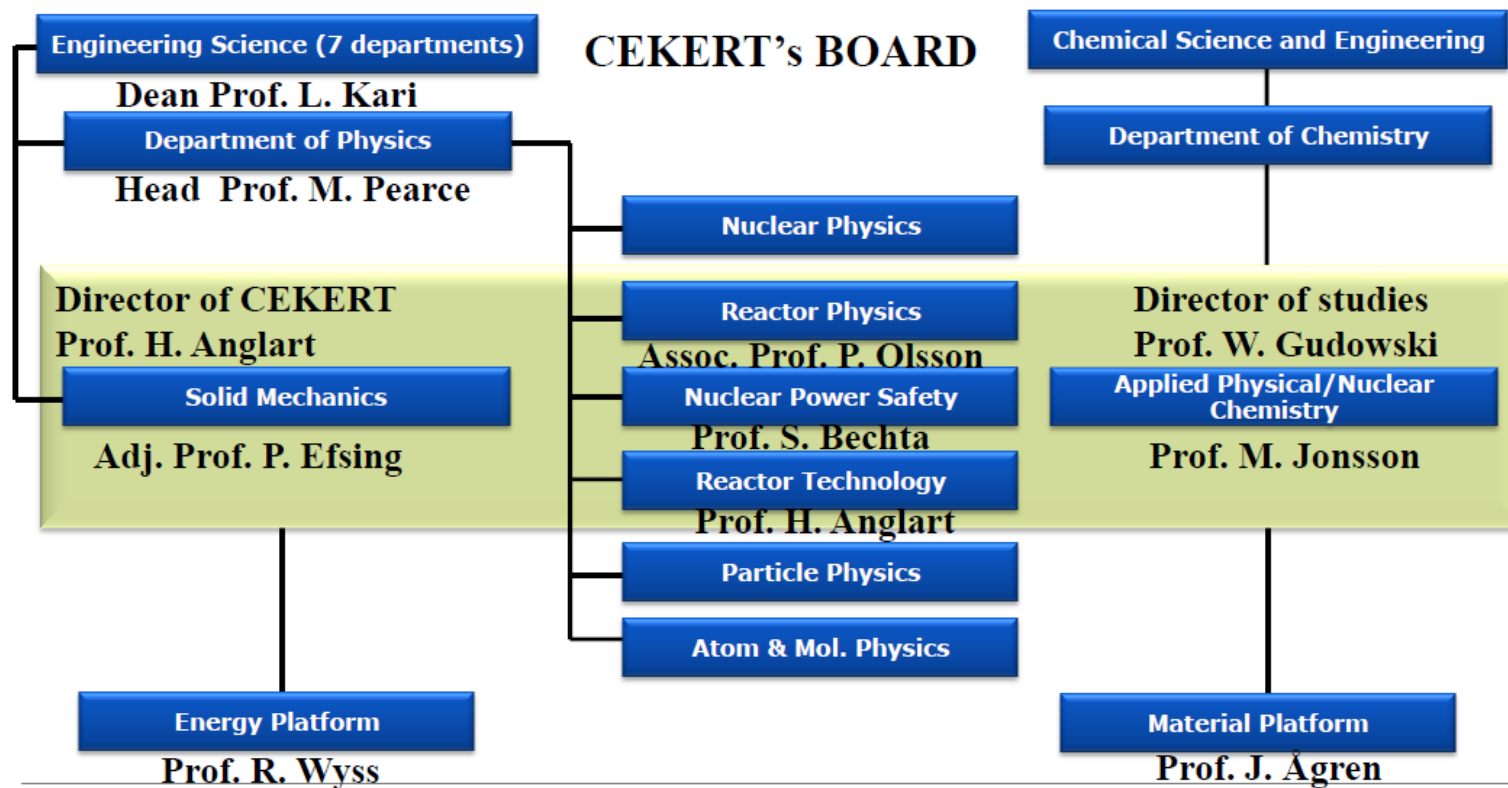
- Bachelor program in nuclear engineering



Nuclear Engineering Research Groups at KTH



CEKERT – A Forum for Nuclear Engineering Research and Education at KTH

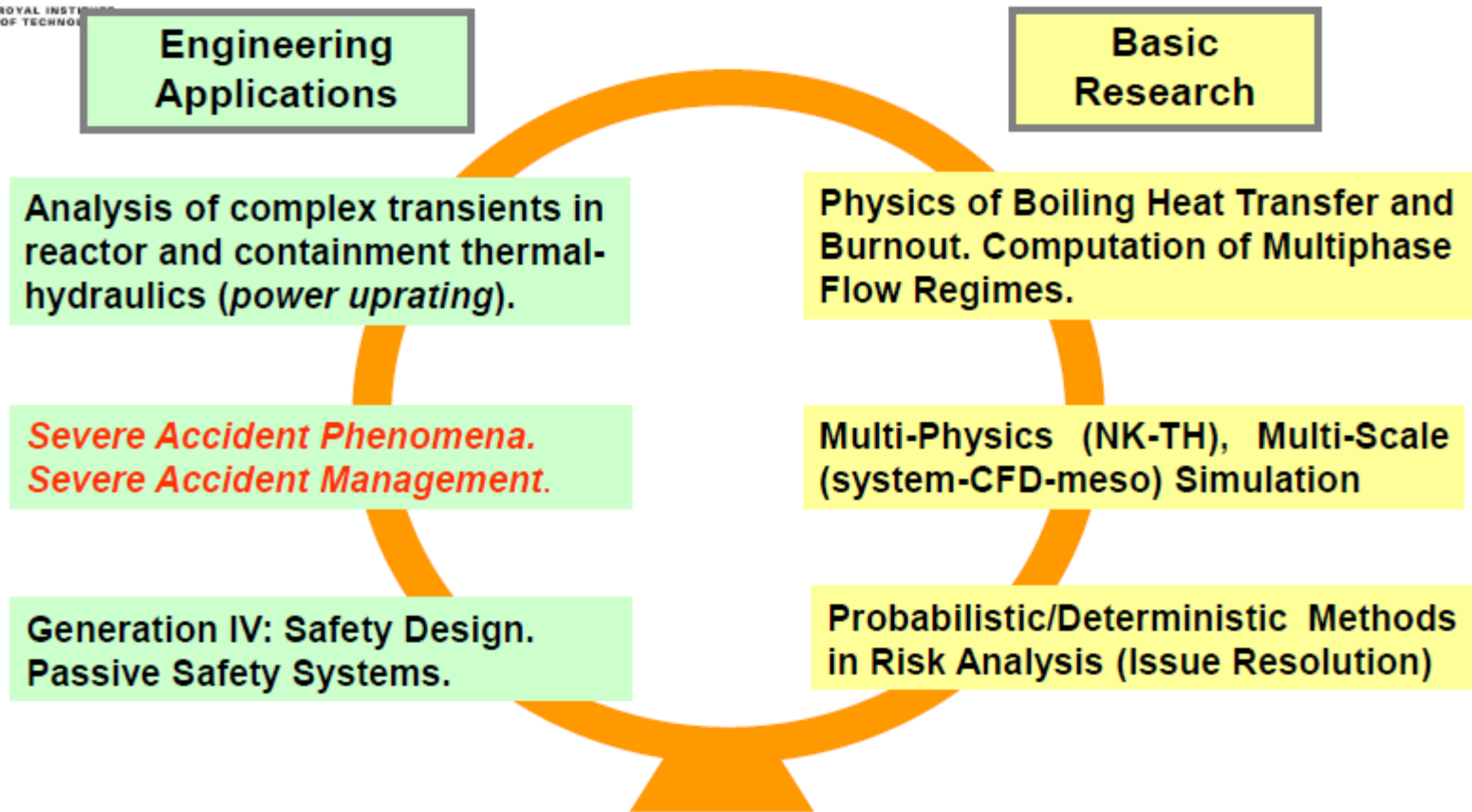


Nuclear Power Safety Group

Head: Prof. S. Bechta



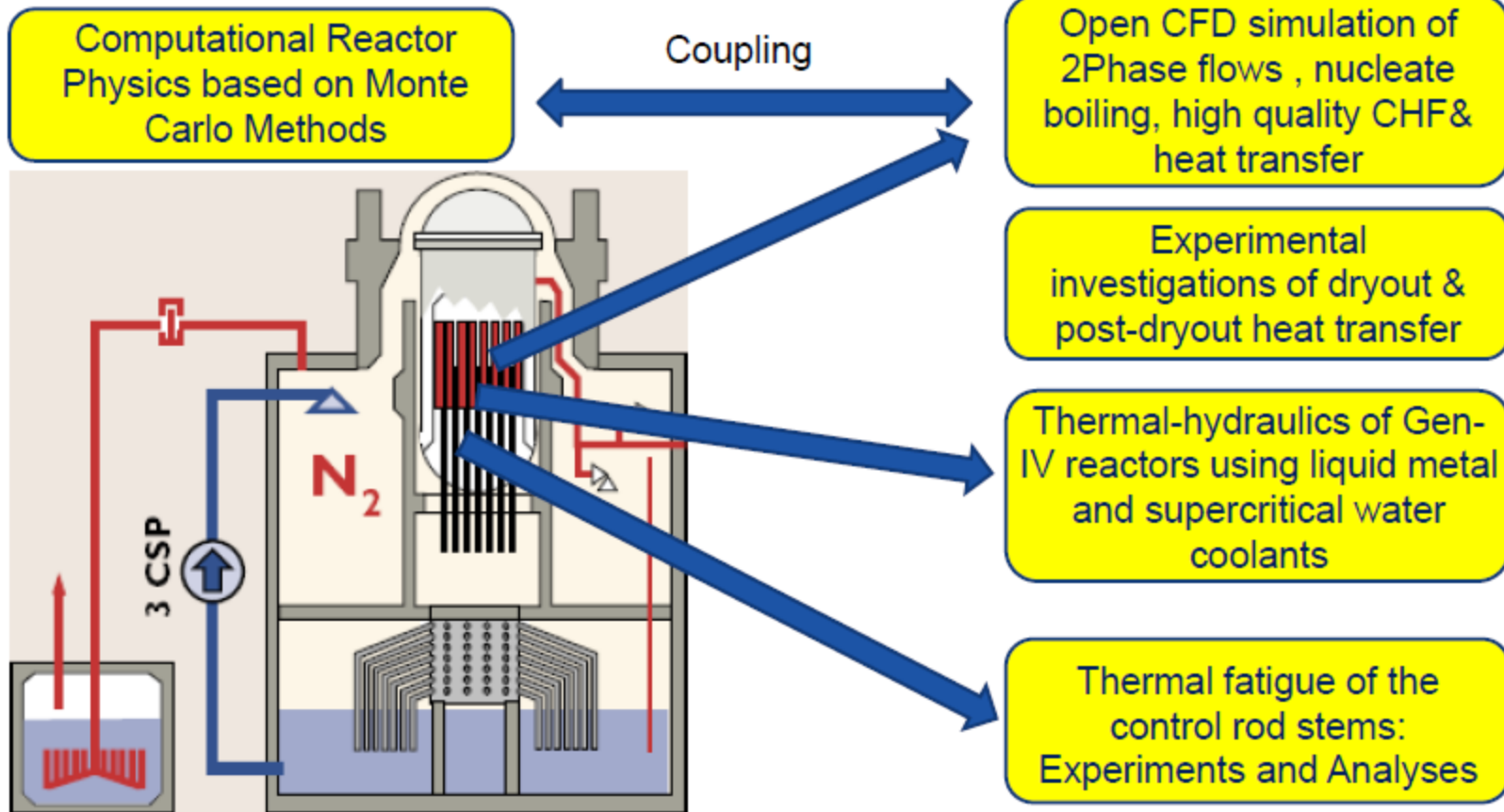
Current Research Areas



Nuclear Reactor Technology Group

NRT – Main Research Interests

Head: Prof. H. Anglart



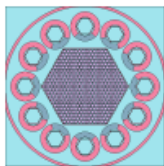
Reactor Physics Group

Head: Prof. J. Wallenius



Major research areas

- System and safety analysis of Accelerator Driven Systems for transmutation of nuclear waste
- System and safety analysis of Generation IV reactors for transmutation of nuclear waste
- Nuclear fuel development for LWRs & transmutation
- Radiation damage physics



Research on design and safety of lead-cooled reactors



Main Research Infrastructure



High-pressure Water Test (HWAT) Loop
at Division of Reactor Technology, KTH

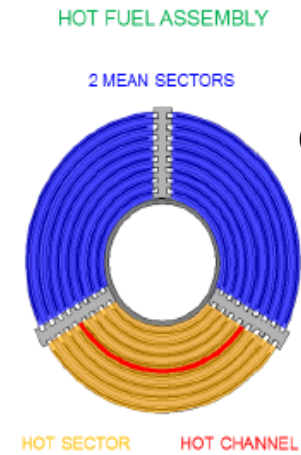
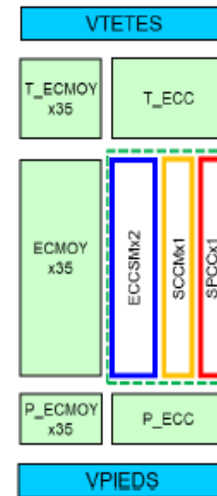
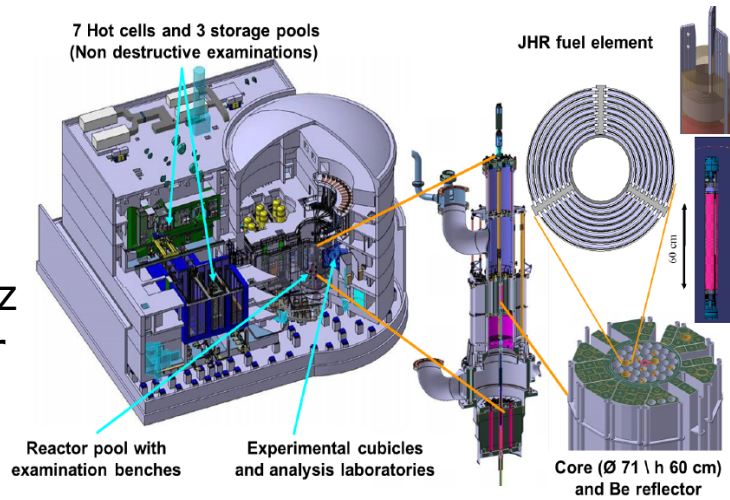


TALL loop at Division of
Nuclear Power Safety, KTH



Examples of International Cooperation

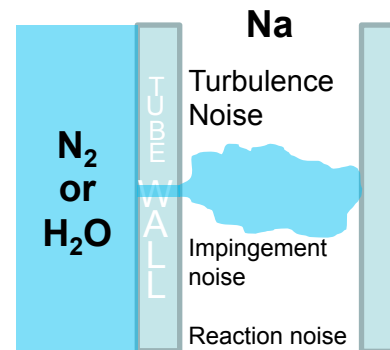
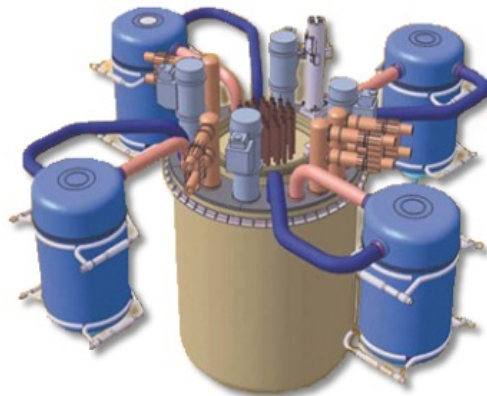
JHR
Jules
Horowitz
Reactor



Computational model of a fuel assembly in JHR

Research performed in Cooperation by KTH, Chalmers, UU and CEA

ASTRID
Generation IV
sodium-cooled
reactor to be
build in 2020



ALDESA project:
Accoustic Leak
Detection in Sodium
Cooled Systems



Future Development Directions

- Industry-tailored research teaching
 - problem-solving oriented
 - current and future (Generation III+) systems
 - current tools (computer codes) applied at industry
 - focused on computer aided research teaching
 - extensive availability of industrial training for students
- Distance teaching and research
 - distance teaching available for industry
 - computer codes and research resources available through internet
- Affiliated faculty positions at universities for industrial experts

