



Nuclear Research and Education at KTH

Nuclear Science and Engineering · Applied Physical Chemistry · Solid Mechanics

Status October 2026



Three divisions, one nuclear community



Nuclear Science & Engineering

Dept. of Physics · School SCI

- ≈ 60 staff incl. 26 PhD students
- Reactor physics, safety, materials, nuclear physics
- Hosts the MSc programme



Applied Physical Chemistry

Dept. of Chemistry · School CBH

- Nuclear chemistry group (Prof. M. Jonsson)
- Radiation chemistry, spent fuel, corrosion



Solid Mechanics

Dept. of Engineering Mechanics · SCI

- Fracture & fatigue group (Prof. J. Faleskog)
- Ageing of reactor materials, long-term operation

≈ 75

people in nuclear R&D

NSE research areas



Reactor physics & design

SMR / lead-cooled reactor design, Monte Carlo, machine learning

Wallenius, Dufek, Nallo



Nuclear power safety

Severe accidents, steam explosion, debris coolability, BEPU

Ma, Bechta, Konovalenko



Thermal-hydraulics & LFR technology

Passive safety, heavy liquid metal loops, component tests

Kudinov, Grishchenko



Nuclear materials & fuels

Radiation damage, nitride fuel, corrosion-resistant steels

Olsson, Szakálos, Jolkkonen



Nuclear structure physics

Exotic nuclei, AGATA & FAIR experiments, nuclear theory

Cederwall, Bäck, Qi, Wyss



Applied nuclear physics

Safeguards, waste characterisation, radon sensor networks

Nyberg, Cederwall

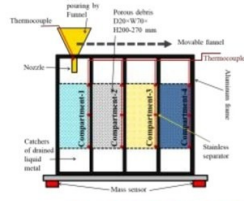
Experimental infrastructure: ~20 facilities



TALL/TALL-3D



PULiMS/SES



REMCOD/MRSPOD



SIMECO-2



DEFOR

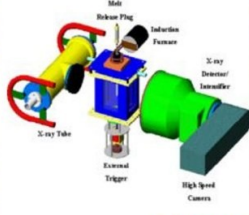


New since 2025

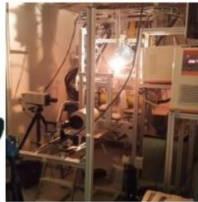
- NUCLEAR lab – powder production and 3D printing of fuel and components (P. Olsson)
- ExPaNS – experimental platform for passive safety and lead-cooled reactors, incl. new lead-corrosion facility (P. Kudinov)
- SOLSTICE prototype, Oskarshamn – electrically heated lead-cooled test reactor, built from Feb 2025
- VR-funded research environments in nuclear chemistry, polymer ageing and non-destructive monitoring



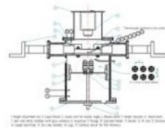
Containment



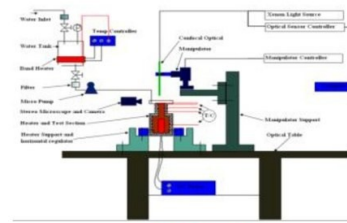
MISTEE



SPAYCOR



MICBO



Severe accidents & safety: SIMECO-2, DEFOR, MISTEE, POMEKO, SPAYCOR, CoSMUS, MICBO, HWAT

Lead / heavy-liquid-metal technology: TALL-3D, CTF, COSTA, SSRT, SEFACE, LOFAT

Fuel & safeguards: Advanced Nuclear Fuel Laboratory, nuclear safeguards lab

Flagship: lead-cooled small modular reactors

2021



SUNRISE centre

SSF, 50 MSEK. KTH, LTU, UU; director P. Olsson

2022



SOLSTICE

Energimyndigheten, 99 MSEK. Electrically heated LFR prototype

2025



Prototype construction

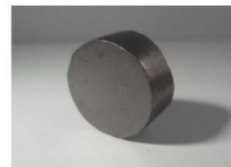
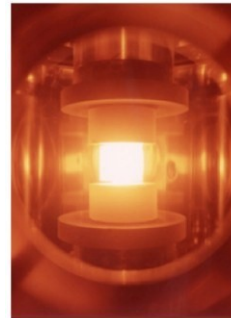
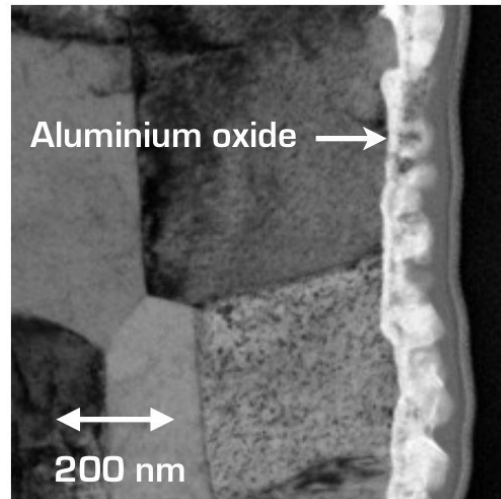
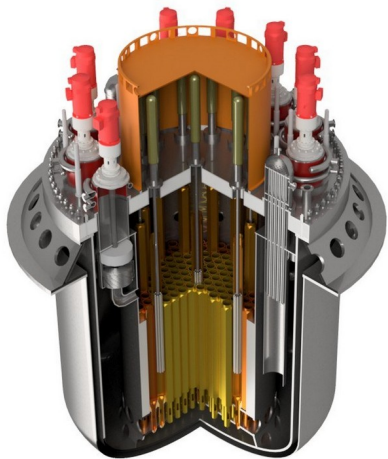
Oskarshamn site with Blykalla; NUCLEAR & ExPaNS labs funded

2028



Testing complete

Lead circulation, accident cooling, maintenance at 350 °C



Science behind the reactor

- Alumina-forming steels and FeCrAl coatings that resist liquid-lead corrosion
- Uranium nitride fuel fabrication
- Reactor design and preliminary safety analysis

Major national funding

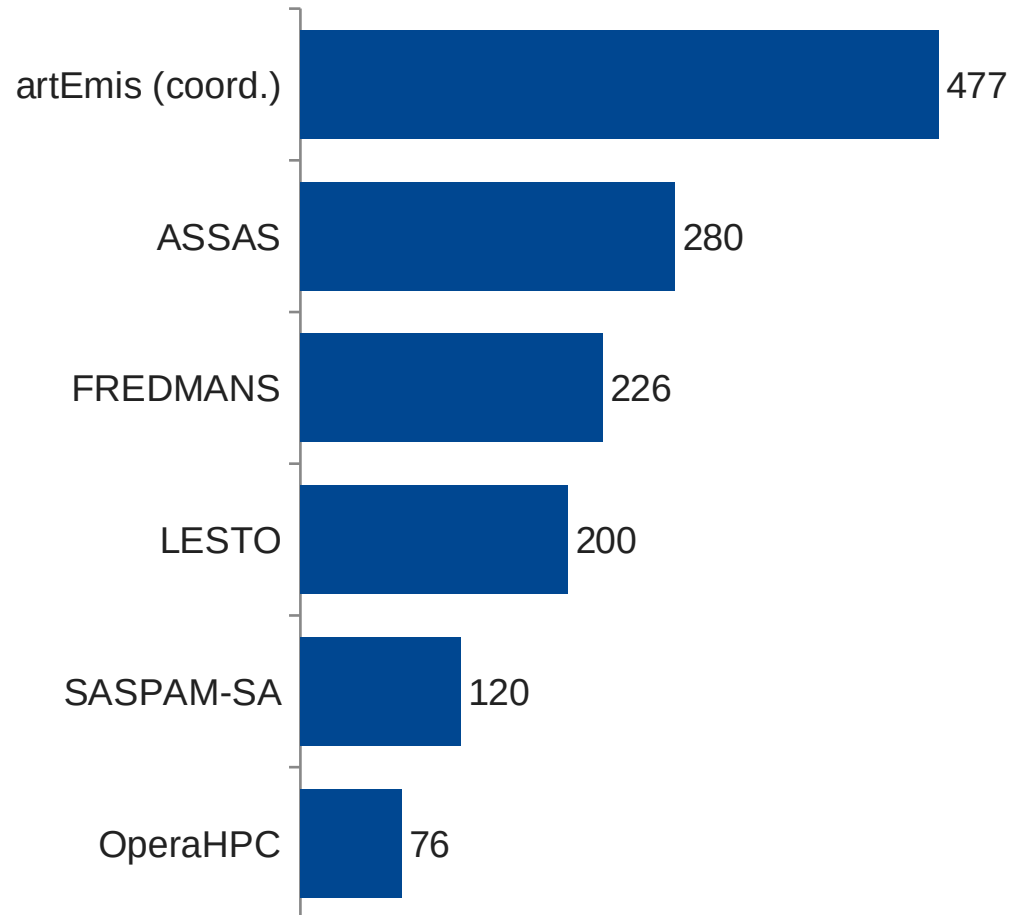


Project	Funder	Period	Budget	KTH lead
SUNRISE – sustainable nuclear energy	SSF	2021–2026	50 MSEK	P. Olsson
SOLSTICE – LFR prototype	Energimyndigheten	2022–2028	99 MSEK	P. Olsson
NuMaP – nuclear materials platform	Energimyndigheten	2024–2027	≈ 40 MSEK	P. Olsson
NUCLEAR lab + ExPaNS platform	Energimyndigheten	2025–2027	> 50 MSEK	Olsson, Kudinov
MÅSTE – Gen-IV research (Chalmers-led)	Energimyndigheten	2024–2027	50 MSEK total	partner
ANItA – SMR competence centre (UU host)	Energimyndigh. + industry	ongoing	–	partner
SKC funded projects	SKC (SSM + nuclear industry)	2024–2027	60 MSEK total	KTH, CTH, UU
VR nuclear research environments	Vetenskapsrådet	2026–2031	81 MSEK (KTH)	APC, SM, +1

Further funders: SSM · SKB · Euratom · Vinnova · Formas · NKS · Ringhals, Forsmark, OKG, Westinghouse, Blykalla

Euratom / Horizon Europe portfolio

KTH share of EU funding (k€), total ≈ 1.4 M€



artEmis 2022–2027

Radon-based earthquake precursor sensor network – coordinated by KTH

ASSAS 2022–2027

AI-based simulation of severe accidents

FREDMANS 2022–2027

Nitride fuel recycling and manufacturing (Chalmers coord.)

LESTO 2024–2028

Lead-cooled fast reactor safety and design tools (ENEA coord.)

SASPAM-SA 2022–2027

Severe accidents in SMRs with passive mitigation

OperaHPC 2022–2027

HPC tools for advanced / accident-tolerant fuels

Applied Physical Chemistry: nuclear chemistry



Team

- Prof. Mats Jonsson
- $\approx$ 4 PhD students
- Associated researchers incl. C. Lousada

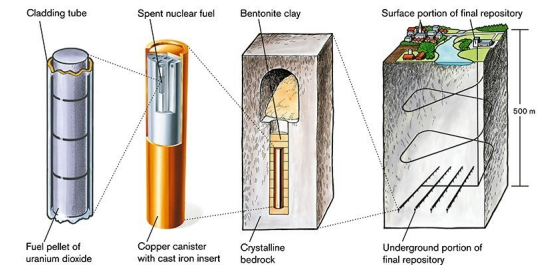


Teaching

- CE2010 Nuclear Chemistry
- KD2370 Photo-, Radiation and Radical Chemistry
- PhD courses in radiation chemistry

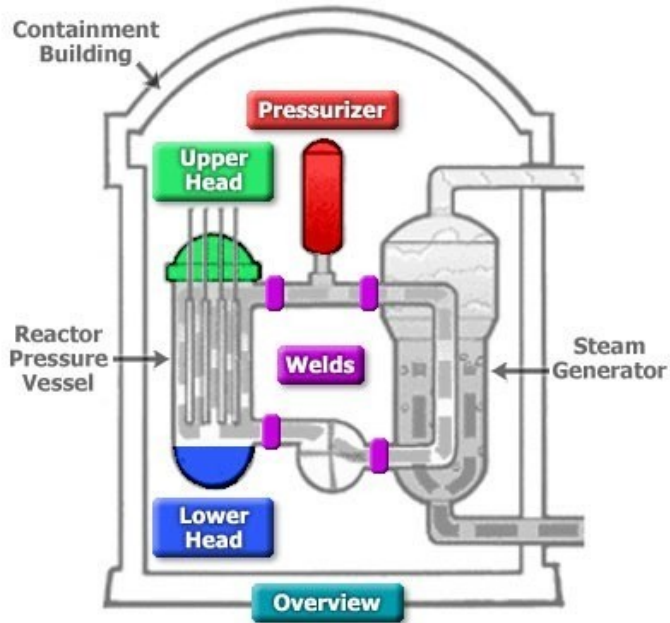
Current research

- Radiation-induced processes at oxide–water interfaces – VR environment 2026–2031
- Radiation chemistry on surfaces in LWRs; corium dissolution – SKC
- Boric acid in light-water SMRs; iodide on zirconia – SSM, Energimyndigheten
- Spent fuel dissolution in a geological repository – SKB
- Cu–water interface under γ -radiation – with KAIST (Korea)



***KTH hosts the Miller Conference
on Radiation Chemistry in 2027***

Solid Mechanics: integrity of reactor materials

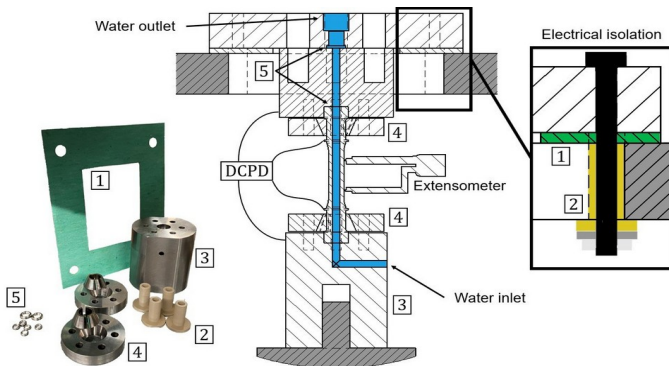


Team

- Prof. Jonas Faleskog
- Adj. Prof. Pål Efsing (Vattenfall / Ringhals)
- Researchers C. Dahlberg, R. Mansour
- Postdocs M. Subasic, G. Hultgren

Research

- Ductile fracture of aged and irradiated RPV steels and welds
- Corrosion fatigue of stainless steel in LWR water
- Fatigue and fracture of additively manufactured metals



3

PhD theses defended in 2025
(Wang, Klein, Subasic)

2026–31

New VR research environment on
AM metals for long-term operation

Funding: VR · SKC · SSM ·
Ringhals LTO programme · NKS

MSc programme in Nuclear Energy Engineering

2 years · 120 ECTS · taught in English · Sweden's only nuclear master's programme

Year 1 – compulsory courses

- Nuclear Reactor Physics
- Radiation Protection, Dosimetry and Detectors
- Thermal-Hydraulics
- Nuclear Power Safety
- Nuclear Reactor Technology

Electives (11 courses)

- Generation IV Reactors
- Small Reactors
- Nuclear Fuel Cycle
- Chemistry & Physics of Nuclear Fuels
- Radiation Damage in Materials
- Monte Carlo Methods
- Numerical Methods
- Compact Reactor Simulator
- Leadership for Safe Nuclear Power
- Sustainable Energy Transformation Technologies
- Nuclear Physics

Year 2 – research

- Theory & methodology of science
- Research methodology in physics
- Degree project, 30 ECTS – at KTH or in industry



MSc students: growing demand

