Radiation safety research and knowledge development in Sweden

Per Seltborg

Research manager, SSM

Sweden’s research program in radiation safety

Three main missions:

- Funding of research
  - Research budget of ~95 MSEK per year
- National competence and knowledge development
  - Development of a national strategy for national competence in Sweden
  - Cooperation with universities, industry and authorities etc
- International research activities
  - Euratom, OECD/NEA, NKS, bilateral (e.g. Finland)

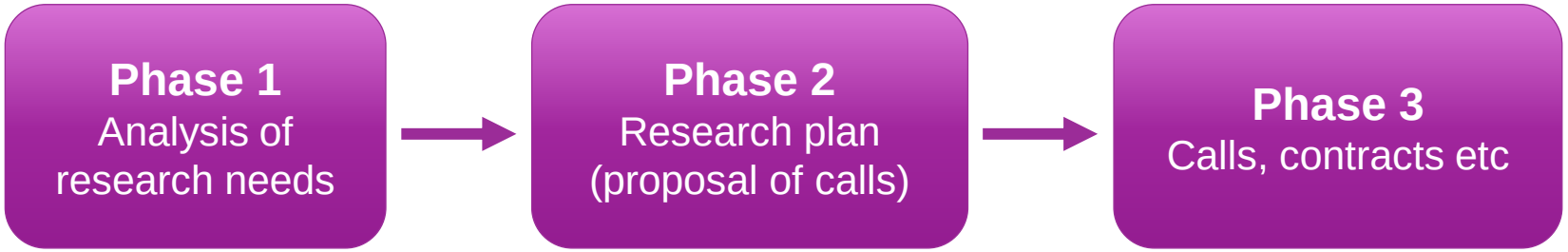
Funding of radiation safety research

Funding of radiation safety research

- Research budget
  - About 95 MSEK/year
  - About 100 research projects running in parallel, duration 1-5 years
- Three main research areas
  - Reactor safety (~70 MSEK)
  - Nuclear waste management (~10 MSEK)
  - Radiation protection (~15 MSEK)
- Funding provided for both basic and applied research
  - Basic research: Main objective to support national competence
  - Applied research: Main objective to support SSM’s missions

SSM:s new research funding process

- Objectives and phases of the new process
  - Enhanced strategy with clearer connection to SSM:s mission and goals
  - Objective, transparent and equal assessment
  - Well-defined routines and criteria for the distribution of funding and assessment of applications
  - Six calls planned for 2023



Research areas

Reactor Safety

- Safeguards and Nuclear non-proliferation
- Human Technology Organization (MTO)
- Radiation protection for workers, the public and the environment
- Instrumentation and control systems (I&C)
- Power supply
- Risk analysis (PSA)
- Internal events
- External events
- Nuclear security
- Reactor physics, thermo-hydraulics and nuclear data
- Nuclear fuel design
- Severe accidents and accident chemistry
- Constructions and materials

Nuclear waste management

- Waste management
- Decommissioning
- Technical barriers in final repository
- Geosphere in connection with final repository
- Biosphere and impact analysis for final repository
- Social science issues concerning final repository

Radiation protection

- Radiation biology
- Radiation protection dosimetry
- Radiation protection in medical exposure
- Non-ionizing radiation
- *Radiation protection in emergency preparedness*
- *Radioecology*

National strategy for national competence in Sweden

(SSM2022-484-1)

Background and objectives

- Initiative from SSM to present a proposal to the Government
  - Recommendations from the IRRS* review 2012 and follow-up 2016
  - Conclusions from SSM's previous Government assignments within national competence (SSM2017-134-23 and SSM2020-407-1)
  - Development of a broadly based proposal, in consultation with the "Cooperation Platform" (stakeholders and interested parties)
- A proposal that can be adopted and implemented by the Government
- Coordination, involvement and commitments of several actors other than SSM

*IRRS: "Integrated Regulatory Review Service" (IAEA)

Vision and strategic focus areas

Vision: *”Secured national supply of competence in the field of radiation safety enables socially beneficial use of radiation and contributes to the protection of people and the environment from unwanted effects now and in the future.”*

The vision is divided into five strategic focus areas:

1. National coordination
2. Research policy for viable research environments
3. International research cooperation
4. Education and training for the competence needs in society
5. The attractiveness of the radiation safety area

21 proposed activities

Some of the planned activities in 2023

- Maintain and strengthen the national coordination, for instance through the established collaboration platform
  - Authorities, research funders, industry, universities, regions
- Regularly follow up the status of the national competence and the identified critical research areas
- Strengthen the education programs in nuclear technology and radiation sciences
- EURATOM
  - Strengthen Sweden's position in Euratom's research funding system
  - Investigate and evaluate the organisational research structure in Sweden and EU
- Investigate the current status and needs for infrastructure
- Strengthen the dialogue and collaboration with other research funders in the radiation safety and the nuclear technology area

The Swedish ”Cooperation Platform”

Uppsala universitet
Stockholms universitet
Linköpings universitet
Chalmers
KTH
Umeå universitet
Sveriges Lantbruksuniversitetet
Lunds tekniska högskola
Karolinska institutet
Skåne universitetssjukhus
Karolinska universitetssjukhuset
Norrlands universitetssjukhus
Region Halland
Region Dalarna
Region Kronoberg
Region Östergötland
Region Gotland
Region Västra Götaland

Kärnkraftskommunernas samarbetsorgan
Jordbruksverkets Beredskapsenhet
Kärnavfallsrådet
Formas
Energiforsk
Energiföretagen
FOI
Kärnteknik
OKG Aktiebolag
Ringhals AB
Forsmarks Kraftgrupp AB
Westinghouse Electric Sweden
Svensk Kärnbränslehantering Aktiebolag
Slutförvaret SFR
Mellanlagret Clab
European Spallation Source

AB SVAFO
Cyclife
Studsvik Nuclear AB
Myndigheten för samhällsskydd och beredskap (MSB)
Länsstyrelsen Kalmar
Länsstyrelsen Halland
Länsstyrelsen Uppsala
Socialstyrelsen
Vattenfall AB
Uniper Sverige
Oxford research AB
Vetenskapsrådet
Energimyndigheten
SFOR (Svensk Förening för Odontologisk radiologi)
Vysusgroup
Swedenergy

International research activities

Main international research activities

- Euratom Work Programme 2023-2025 (~160 M€ in total)
  - Three research areas, 11 open calls
  - Three co-funded partnerships
    - PIANOFORTE (radiation protection)
    - EURAD (nuclear waste management)
    - “ORIENT-NM” (nuclear materials)
  - **SSM:s objective to enhance the possibilities for Swedish researchers to participate and receive funding!**
- OECD/NEA joint projects
  - Sweden/SSM part of many OECD/NEA projects
  - Sweden operating agent for two projects (SCIP and SMILE, lead by Studsvik Nuclear)
- Nordic cooperation
  - NKS (Nordic nuclear safety research)
  - Bilateral with Finland

Additional

Current development of nuclear in Sweden

- Increased governmental funding for nuclear technology
  - SSM (25/50 MSEK/y): To develop regulation, licensing processes and national competence
  - The Energy Agency: (50/100 MSEK/y): Nuclear technology research
- Strong interest in new nuclear from the industry
  - Pre-study of 2 new SMR:s by Vattenfall (BWRX-300 and Rolls Royce)
  - Increased focus from Svenskt Näringsliv and many other actors and potential investors
- The 2022 IRRS
  - One of the recommendations: *Establishment of a national strategy addressing competence needs, taking into account the possible expansion of nuclear power*
- International SMR activities that SSM are involved in
  - IAEA: NHSI, (SMR Regulators Forum)
  - EU: SMR pre-partnership
  - OECD/NEA: EGSMR (Expert group for SMR)
  - Bilateral with Finland/STUK etc

Government assignment to SSM

- To review the legal framework and other measures needed for existing and new nuclear power (e.g. SMR)
- SSM shall evaluate
  - Licencing of SMR:s and licencing of multiple reactors of the same type
  - The need for changes in laws and ordinances
  - How international collaboration and harmonization can support developing the licensing process
- Preliminary responses
  - Swedish legislation for existing NPPs allows operation as long as the requirements are fulfilled
  - There are existing processes for licensing and a general legal framework to handle applications of new reactors
  - Basic principles regarding security (incl. physical protection and radiation safety) as well as safeguards still apply
  - The government has proposed to change the current legislation regarding allowed sites and the number of NPPs
  - Challenges in predicting future needs for licensing, e.g. type approval of SMR designs

Research collaboration between Sweden and Finland

- Respective national research programs
  - SSM part of SAFIR2022 and SAFER2028
  - STUK part of SSM:s research council
- International projects - cooperation and common interest
  - Euratom (e.g. the partnerships)
  - OECD/NEA
- NKS (Nordic Nuclear Safety Research)
  - Collaboration between authorities, industry and universities
- Knowledge development