



Strål
säkerhets
myndigheten

Swedish Radiation Safety Authority

Status of decommissioning in Sweden

Decommissioning, a new challenge for nuclear safety

Nuclear Transparency Watch Exploratory Seminar

European Parliament, Brussels, 6 February 2017

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Nuclear Facilities in Sweden



Boiling Water Reactor
(ASEA Atom)



Pressurized Water Reactor
(Westinghouse)



Other facilities

Ranstad
Ranstad Mineral AB
Uranium Recovery facility

Ringhals NPP
Vattenfall AB

	Capacity	Operation since
Ringhals 1	860 MW	1976
Ringhals 2	917 MW	1975
Ringhals 3	960 MW	1981
Ringhals 4	960 MW	1983

Barsebäck NPP
Sydkraft AB

	Capacity	Operation
Barsebäck 1	615 MW	1975 - 1999
Barsebäck 2	615 MW	1977 - 2005

Clab
Central interim storage facility for spent nuclear fuel Swedish Nuclear Fuel Waste Management Co – SKB

Forsmark NPP
Forsmarks Kraftgrupp AB

	Capacity	Operation since
Forsmark 1	1006 MW	1980
Forsmark 2	1006 MW	1981
Forsmark 3	1200 MW	1985

SFR
Final repository for radioactive waste Swedish Nuclear Fuel Waste Management Co – SKB

Westinghouse Electric Sweden AB
Nuclear fuel factory

Studsvik AB
Scrap treatment, storage

Oskarshamn NPP
OKG AB

	Capacity	Operation since
Oskarshamn 1	487 MW	1972
Oskarshamn 2	630 MW	1975
Oskarshamn 3	1200 MW	1985

Nuclear Facilities in Sweden

- 10 reactors in operation
- Barsebäck NPP (closed)
- Ågesta PHWR (closed)
- Studsvik research reactor (closed)
- Ranstad uranium (closed)
- Clab central interim storage facility for spent fuel
- SFR final repository for short-lived LIL waste
- WSE fuel factory
- Studsvik waste treatment and materials testing facilities

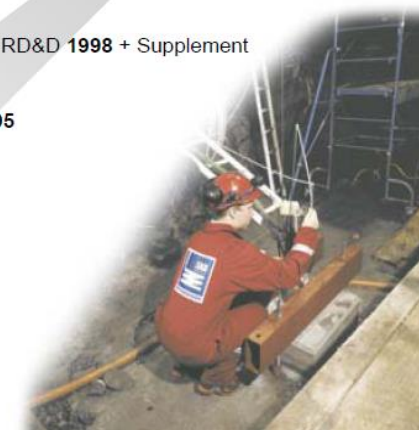
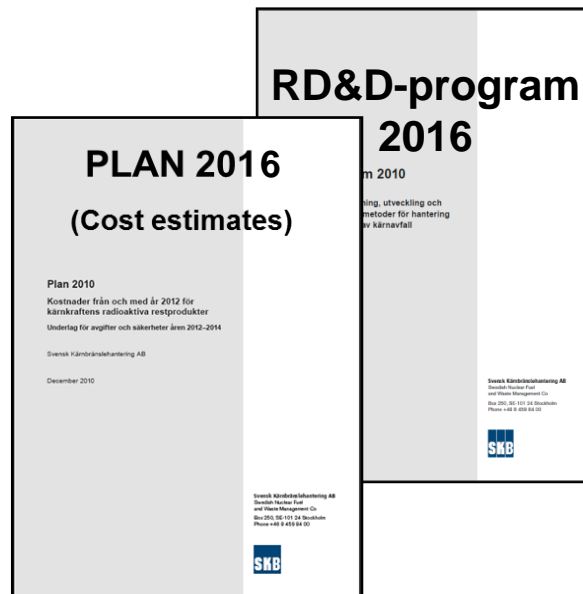


Shared NPP obligations

- In co-operation develop and implement management and disposal solutions for spent fuel and nuclear waste (RD&D programme)
- In co-operation carry out cost estimates as a basis for payments to the Nuclear Waste Fund (Plan Cost estimates)



Swedish Nuclear Fuel and Waste Company, SKB



R&D 1984

R&D 1986

R&D 1989

RD&D 1992 +
Supplement

RD&D 1995

RD&D 1998 + Supplement

RD&D 2001

RD&D 2004

RD&D 2007

RD&D 2010

RD&D 2013

RD&D 2016



National waste management system

EXISTING FACILITIES

Near-surface repositories (land burials) for VLLW

On site interim storages for long-lived LILW

④ Repository for short-lived LILW (SFR)

① Central interim storage for SF (Clab)

Barsebäck interim storage for decommissioning waste

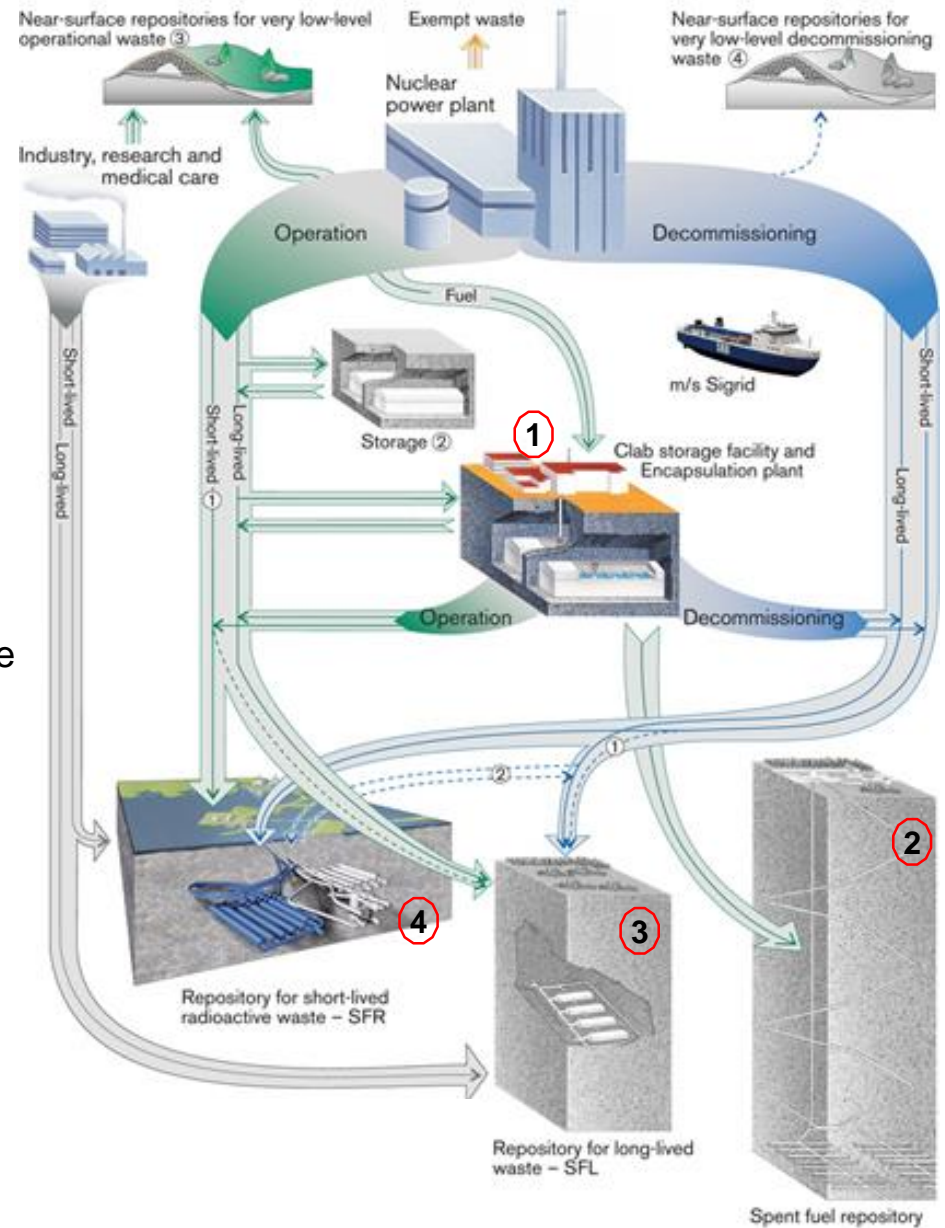
PLANNED FACILITIES

① Encapsulation plant for spent fuel (2030)

② Repository for spent fuel (2030)

③ Repository for long-lived waste (2045)

④ Repository for decommissioning waste (2027)





Nuclear energy

50 years of commissioning and decommissioning decisions in Sweden	
1972 - 1985	12 commercial PWR/BWR reactors commissioned at 4 sites
1980's	No more than 12 reactors allowed Nuclear phase out by 2010 Requirements on waste disposal program and financing
1999 / 2005	Barsebäck NPP 1 & 2 close down following political decisions
2005	NPP operation beyond 2010 is allowed
2010	New-build may replace a reactor at an existing NPP site
2012	Vattenfall submit application for new-build of 1-2 reactors
2014	Vattenfall application on hold
2015	Utility decisions to close down 4 oldest reactors pre 2020
2016	New political energy agreement
2017 -	Decommissioning of 6 commercial reactors + Ågesta Long-term operation (60 years?) of 6 commercial reactors



New agreement on Swedish Energy Policy

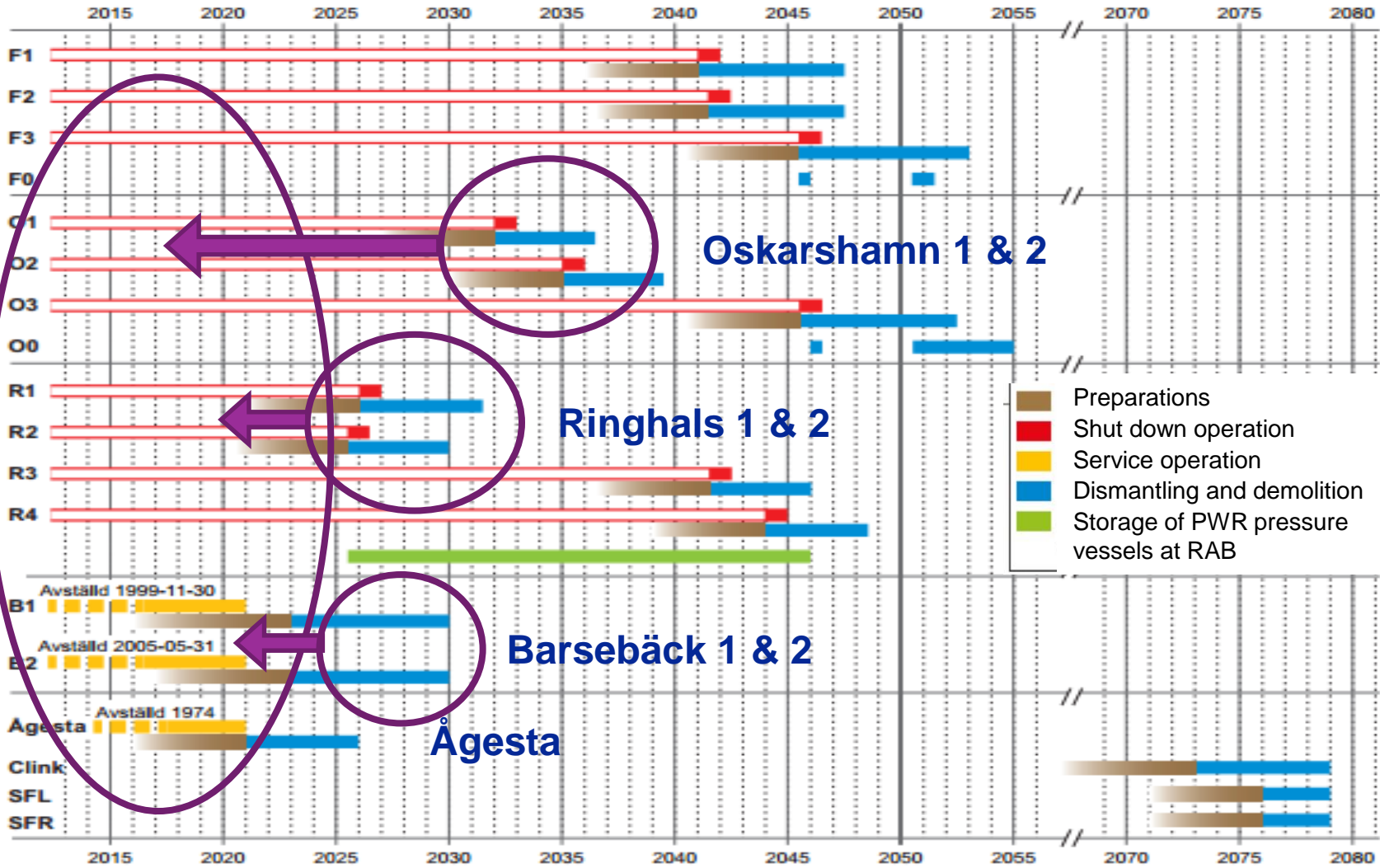
June 2016

- Long-term energy policy agreement between the Government and opposition parties the Moderate Party, the Centre Party and the Christian Democrats
- A common road map for a controlled transition to an entirely renewable electricity system, with a target of 100 per cent renewable electricity production by 2040
 - *“This is a target, not a deadline for banning nuclear power, nor does it mean closing nuclear power plants through political decisions”*





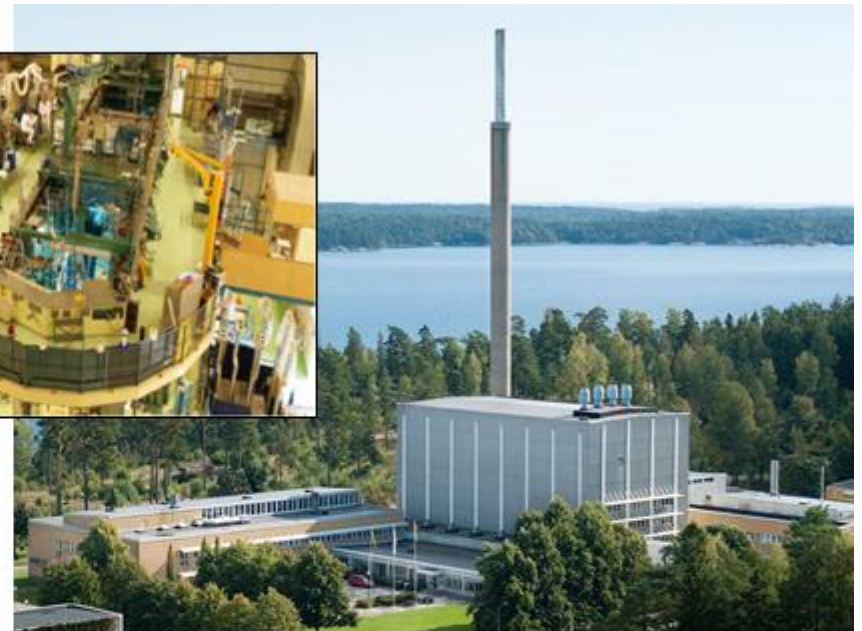
7 reactors in decommissioning pre 2020



SSM is revising its regulations



On-going dismantling – valuable experience



- Studsvik research reactor
 - since 2015
- Ranstad uranium mining and milling facility
 - since 2010



Regulatory challenges in decommissioning

- Maintained NPP operational safety culture pre shut down
- NPP organisation – dedicated to decommissioning?
- Short transition time from shut down to dismantling
- Decommissioning costs and financing under pressure
- Logistics of waste handling, storage, transport and disposal

- *SSM resources and competence*
- *SSM regulations*
- *SSM authorizations*
- *SSM supervisory oversight*



Transparency and public participation

Nuclear activities legislation

- ➔ 30 years of RD&D and Cost reviews and public consultations
- ➔ Local safety boards in NPP communities
- ➔ Euratom Art.37 notification procedure
- ➔ Nordic countries agreement on the sharing of information

Environmental Code

- ➔ Licensing process with requirements on Environmental Impact Assessment and formal public consultation
- ➔ Espoo Convention – information to neighboring countries and general public

Also

- ➔ Right of access to public information
- ➔ SSM outreach activities