14th Internatinal Conference on
Environmental Remediation and
Radioactive Waste Management
ICEM2011
September 25-29, 2011, Reims, France.

Division of nuclear liabilities between different license holders and owners

Staffan Lindskog
The Swedish Radiation Safety Authority
and
Rolf Sjöblom
Tekedo AB

The structure of this presentation

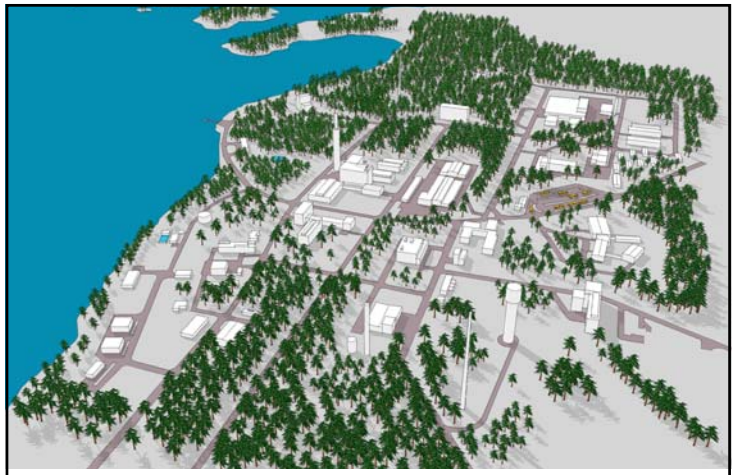
- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

The structure of this presentation

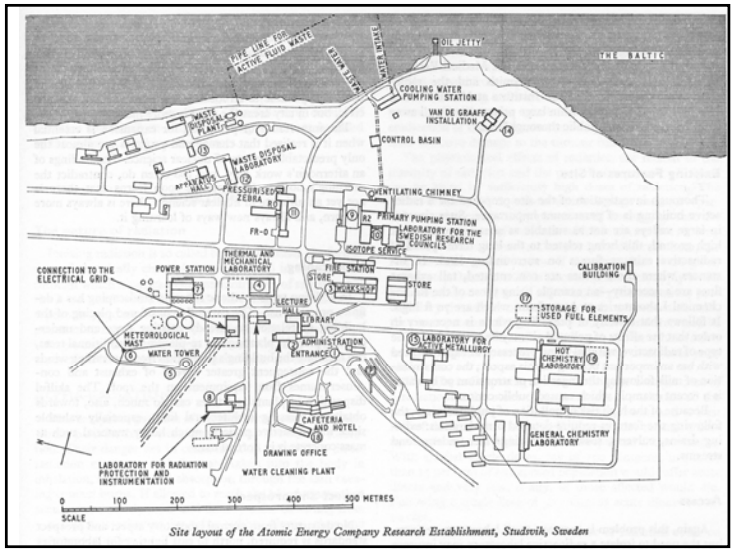
- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

Sweden

- ”Champion” among OECD countries with 6,9 MWh / inhabitant during 2008
- One of 6 countries to first build a NPP
- Initially national strategy with heavy water and tank type reactors
- Initially RD&D for entire fuel cycle
  - Most of the facilities at Studsvik
  - Uranium mining and beneficiation at Ranstad in south-west Sweden
  - Reprocessing on a pilot scale at Kjeller, Norway



The Studsvik facilities at around the year 1965



Modern activities

- 12 light water NPP:s
  - 10 in operation
  - 2 permanently shut down
- Central pool store for spent fuel – CLAB
- Crystalline rock repostiory for short-lived waste - SFR

Decommissioning

- Early planning essential
- Timing may be governed by the needs for financial planning
- Planning and cost estimation treacherous
  - Radiological surveying
  - Methodology selection
  - Financial risk identification
  - Calculation methodology suitable for early estimates

Incubation / initiation times

Discovery of x-ray tube ≈ 1895	**Radiation protection ≥ 1930's**
Nuclear chain reaction = 1942	**Waste management ≥ 1970's**
Nuclear facilities ≥ 1940's	**Decommissioning ≈ ≥ 1990's**

Discovery of greenhouse effect ≤ 1900	General concern ≥ 2000's

Polluter pays principle introduced into Swedish legislation in 1969	Still today – 2011 – struggling with its full implementation

What is the problem1?

- Legal system can sue anyone of the license holders, operators or owners

  BUT
- Many court cases in the area of chemically contaminated soil
- License holders, operators or owners may have appeared
  - In parallel, or
  - Sequentially

What is the problem2?

- Legal system can sue anyone of the license holders, operators or owners

  BUT
- This is a last resort
- Authorities should instigate early financial planning

Scope of present work

- Illuminate implementation of Polluter Pays Principle, PPP

Purpose of present work

- Share examples
- Share lessons learned

In other words

- The mystery of the ½ lost NPP
- The significance of agreements between parties that may not be around any more
- The meaning of the word auxiliary

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

General legislation
Swedish environmental code

"*Persons who pursue or have pursued an activity or taken a measure that causes damage or detriment to the environment shall be responsible, until such time as the damage or detriment ceases, for remedying it to the extent deemed reasonable …*".

There is no limit in time, nor in extent. Thus, the full liability will exist as long as remediation has not been completed.

The Swedish instrument of government

- States that legislation cannot apply retroactively
- Therefore, responsibility is claimed only for such damages that originate from activities that have continued after the 30th of June 1969.
- That is when the environment protection act came into force.

The Swedish instrument of government

- *Lex in casu* not allowed
- =>
- Decisions in individual cases are made only by legal courts
- Many rulings

Rulings depend on the following factors

- the extent of remedial action required
- when the damage was inflicted
- earlier requirements on the operator (e. g. by permits for operation and court decisions)
- compliance with present and previous legislation
- if the damage could reasonably have been foreseen

More on rulings

- The responsibility is a collective one, and can be demanded from any entity involved.
- Responsibility is demanded from operators before owners, and from late operators before early ones.
- It is then up to the parties to come to agreement on how the liabilities are to be distributed among them.

The courts make their decisions in two steps

1. Firstly, they consider and decide on what is the appropriate extent of the remedial actions to be taken, and
2. secondly, on how much of this that can reasonably be demanded from the operators and owners.

For activities carried out before the year 1969

- This may imply that none of the operators and owners can be held liable for at least part of the costs.
- In such cases, remediation cannot come about unless the Government supplies the financing that is missing.
- For such purposes, the Swedish Environment Protection Agency receives on the order of 40 M€ annually.

The timing of the remediation

- depends not only on what may be optimal from health and environment as well as sustainability and technical feasibility points of view,
- but also on the availability of financial resources.

Guarantees for funding

- Are achieved by means of requirements on securities as one of the conditions for licensing
- This includes municipalities

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

Nuclear technology regulation

- Radiation protection act
- Act on nuclear activities
- Nuclear liability act
- The Studsvik act that covers the Swedish nuclear legacy for certain old facilities before 1991

Nuclear liability legislation

- Main purpose to cover nuclear power programme – established in 1981
- Studsvik act to cover historical facilities – 1988
  - Paid by consumers of nuclear electricity ⇔ NPP:s reap benefits of historical research
  - Claimed by industry that purpose was to cover losses at Studsvik – but liability >> loss
  - Liability << total historical RD&D
- Addition to nuclear liability act to cover also small facilities - 2008

Public investigation 2003 - 2004

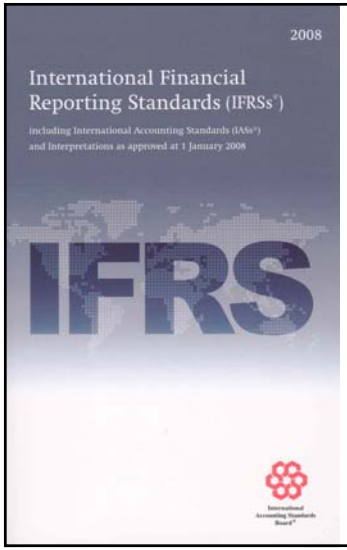
- Proposed that Studsvik act was to be closed
- Reason: *lex in casu* illegal
- No trace has been found in the report on implications for the PPP principle
- Expert Shankar Menon ignored regarding uncertainty
- Same with information from competent authority

Present situation

- Studsvik act has become reopened twice
- Will now apply through the year 2017
- Estimated costs are still escalating
- (Fee for Studsvik should cover only actual costs; no securities for uncertainty)

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks



How to calculate costs

- No national detailed instructions on how to assess nuclear liability
- There are ASTM standards on assessments and disclosure
- IFRS/IAS standards on financial reporting include environmental liabilities

How to calculate costs, continued

According to IAS 16: costs for

”asset dismantlement, removal and restoration”

should be included in the

”costs for an item of property, plant and equipment”

How to calculate costs, continued

According to IFRC 1 which ” *applies to changes in the measurement of any existing decommissioning, restoration or similar liability* ...“

Such "*changes in the liability shall be added to, or deducted from, the cost of the related asset in the current period*". "

How to calculate costs, continued

"*The amount deducted from the cost of the asset shall not exceed its carrying amount*" and "*the excess shall be recognised immediately*".

"*If the adjustment results in an addition to the cost of an asset, the entity shall consider whether this is an indication that the new carrying amount of the asset may not be fully recoverable*".

How to calculate costs, continued

IAS 36 states that "*if the recovered amount of an asset is less than its carrying amount, the carrying amount shall be reduced to its recoverable amount. That reduction is an impairment loss*" ... "*and shall be recognised immediately*".

How to calculate costs, continued

Please note that this is collection of quotes, and that one should read the full text

In practice, sudden recognition of decommissioning cost might in some cases be balanced against surplus values

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

The Ågesta nuclear power plant in operation 1963-1973

Sweden one of six countries to build first nuclear power reactors

The Ågesta NPP

- Tank type heavy water moderated
- Natural or slighetly enriched uranium oxide fuel
- Thermal output 65 MW of which
  - 10 MW electricity
  - 55 MW district heating
- In operation 1963 – 1974
- Severe fuel damages but primary system decontaminated in the early 1990's

The Ågesta NPP

- Located in Stockholm on a real property owned by the City of Stockholm
- Reactor previously owned 50/50 Vattenfall AB / Studsvik AB
- Now 50/50 Vattenfall AB / AB SVAFO (SVAFO is owned by the Swedish utilities and carries out the tasks under the Studsvik Act)
- License to operate presently held by Vattenfall AB
- It is intended that SVAFO takes over license & Vattenfall shares

50 % of a NPP lost

- Original version of Studsvik act explicitly excluded the 50 % owned by Vattenfall
- This reference was dropped in the 2006 revision of the Studsvik Act
- ⇔ Vattenfall liability no longer excluded from the Act
- Appears to be unintentional
- Vattenfall has made payments in the same way as before

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

Swedish uranium mining in the 60'ies – the artificial lake Tranebergssjön

The Ranstad uranium mine

- In full operation 1965 – 1969
- 215 tonnes of uranium produced
- One million cubic meters of tailings generated
- 27 hectares lake – Tranebergssjön
- Alum shale with 0.03 % uranium
- Uranium beneficiated by leaching with sulphuric acid and subsequent ion exchange

The Ranstad uranium mine

- Plant originally owned and operated by *AB Atomenergi* (now Studsvik AB)
- 1977, *Svensk Alunskifferutveckling (ASA)* formed by LKAB and Boliden AB, 50 % each
- 1978, *Ranstad Skifferaktiebolag (RSA)* formed as subsidiary of ASA (with 60 %) but LKAB and Studsvik held 20 % each
- RSA took over facilities and personnel from Studsvik

Agreement between Ranstad Skifferaktiebolag and Studsvik

- Clause that Studsvik maintained responsibility for restoration related to earlier production
- => Studsvik managed drainage & waste water treatment
- => Studsvik prepared for final restoration
- => All Ranstad related Studsvik liabilities fall under the Studsvik Act

Further developments

- 1984 – Swedish Government decided to stop all plans for uranium production
- => RSA/ASA stopped all activities when their license expired
- 1987 – Ranstad Industricentrum AB (RI) acquired RSA
  (from ASA, LKAB and Studsvik)
- The timing of these events proves that RI could neither have had the intent nor the possibility to carry out previous activities

After the introduction of the Studsvik Act in 1988

- Cover on 27 hectares of tailings
- Demolition of some buildings
- More recently, cleaning up of some chemicals

Ranstad Mineral AB (RM) and Ranstad Industricentrum AB (RI)

- RM rents facilities from RI (who had acquired them from RSA, cf above)
- Recycling of enriched uranium
  - Studsvik incinerates residues containing U
  - RM reprocesses the ash using historical facilities
  - On a small scale in 1984, 150 tonnes per year around the year 2000

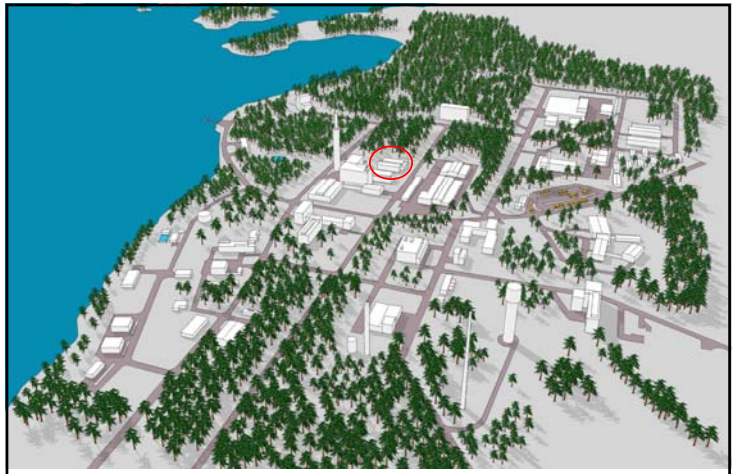
How to share environmental responsibility between Studsvik Act and RM/RI?

Arguments against same and ongoing activity:

- the purpose is entirely different,
- the latter annual turnover has been around 150 tonnes as compared with on the order of 500 thousand tonnes, and
- there was more or less a discontinuity in time of 15 years (between 1969 and 1984)

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks



The Neutron Research Laboratory –
- an auxiliary facility?

The R2 research reactor

- In operation between 1960 and 2005
- Light water moderated, but enrichment of fuel much higher than for NPP:s
- Core about one meter cube
- Maximum thermal output 50 MW
- Used for
  - Fuel testing
  - Materials testing
  - Research – operation synergetic with NRL
  - Other

Neutron Research Laboratory, NRL

- Separate (auxiliary?) building + equipment in the R2 reactor hall
- Operation synergetic with R2 – had to close down at the same time
- License of operation held by University of Uppsala
- Building owned by Akademiska Hus AB
- Real estate owned by Studsvik AB
- Remediation fulfilled as tenant

Neutron Research Laboratory, NRL

- Neutron Scattering Activities form materials research
- Neutron and X-ray Scattering
- Studies of Materials
- Neutron Diffraction Research
- Neutron Scattering Projects for Reactor Physics
- Experimental Subatomic Physics, in particular Neutron Physics
- Physical Biology

Key question

- Laboratory has largely been financed by what is now the National Research Council – a non-profit organisation with no assets of its own
- Little contamination has been added since the Studsvik Act was passed
- Is the NRL building such an auxiliary building as is mentioned in the Studsvik Act?

Key question, continued

- Obvious that separate building was used together with equipment in reactor hall
- One could not be used without the other
- => Conclusion in this report that the building is auxiliary
- And should be included in under the Studsvik Act
- This is also what SSM recommended, and the Government decided in June 2011

The structure of this presentation

- Introduction
- Decommissioning & general legislation
- Decommissioning & nuclear legislation
- The fund system and financial reporting
- Examples
  - The Ågesta NPP
  - The Ranstad uranium mining and benefitiation facility
  - The Neutron Research Laboratory at Studsvik
- Final remarks

Between erection of a facility and end of responsibility

- Changes can be expected with regard to
  - Owners
  - Operators
  - License holders
  - Authorities
  - Financiers
- => May well lead to complex situations
- => Important to sort out responsibilities at the time of any change

Solutions should stand the tests of time

- Sharing of experience
- Lessons learned
- Public values
- State of scientific knowledge

- => Responsible action
- => Public recognition and acceptance