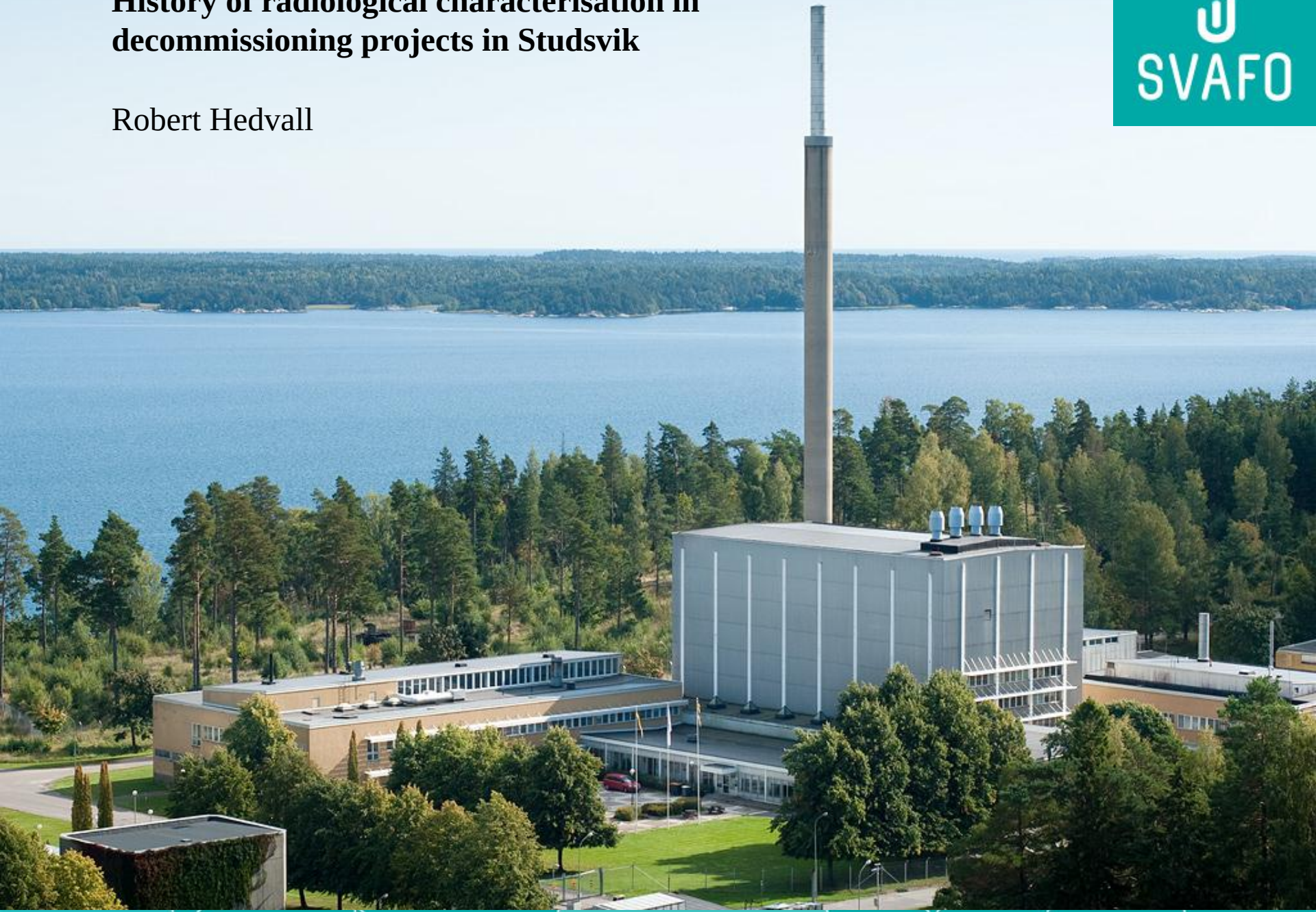
History of radiological characterisation in decommissioning projects in Studsvik

Robert Hedvall



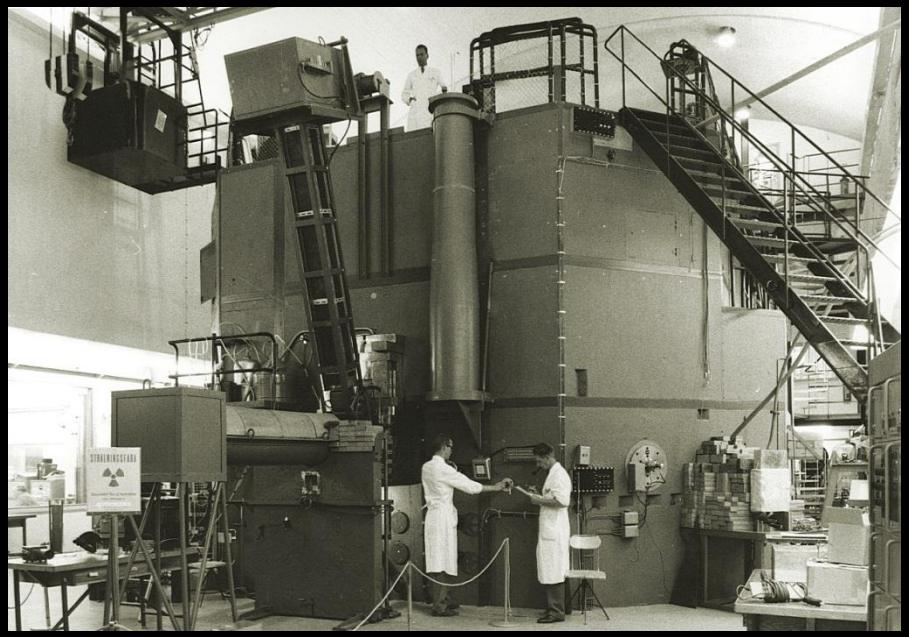
Decommissioning projects 1979-2006

Underground research reactor (R1) Sweden's first nuclear reactor was closed down in 1970 and decommissioned between 1979 and 1983. The limit for release to unrestricted use was set by the authorities to 8 kBq/m^2

Van de Graaff (VdG) The pre-decommissioning with cleaning up of the accelerator and characterisation was done between 1990 and 1997 with a small group of workers. For the characterisation in 1990, 100 samples were taken. One smear sample for tritium and one smear sample for alpha/beta was taken for every 9 m^2.

Purification plant (Ågesta) The nuclear plant was closed down in 1974. Characterisation was performed in 1995. The limit for free release was set to 5 kBq/m^2 (gamma, beta) and 0.5 kBq/m^2 (alpha). For tritium and C-14, the limit was set to 500 kBq/m^2 in 1997. Tritium was measured with approximately 1000 samples.

Nuclear lab (ACL). 41,000 smear tests were taken, 39,000 m^2 was monitored by hand and 37,000 m^2 was covered with gamma spectrometry.



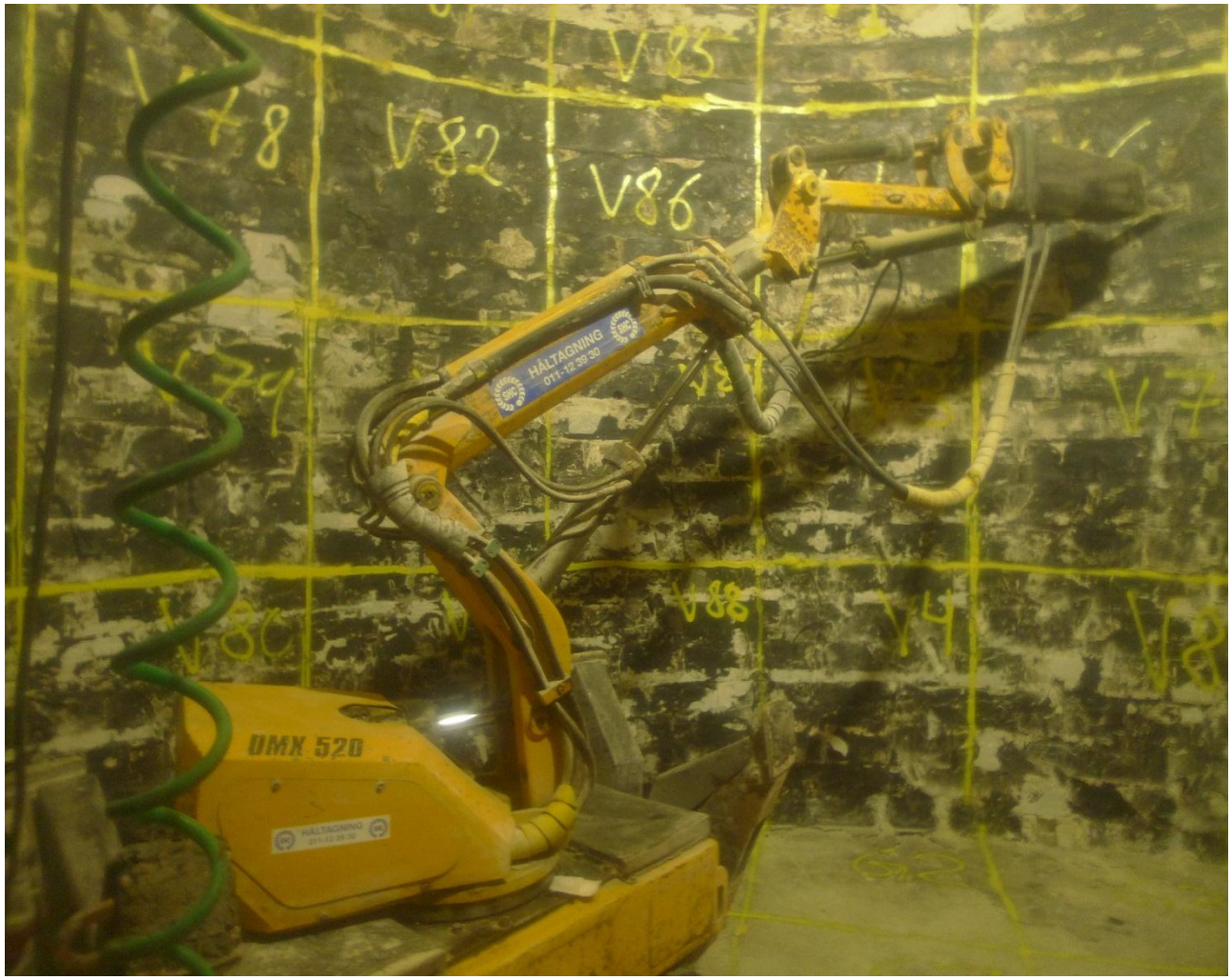
R1 1980 to waste storage 2012

For the R1-reactor in 1982 the limit for release to unrestricted use was set by the authorities to 8 kBq/m^2. Accepted limits were 5 kBq/kg for concrete for shallow land deposit at the Studsvik site and 1 MBq/m^3 for release to a municipal dump.

Release limits have changed from a single value of 8 kBq/m^2 in 1980 to different nuclide-specific limits in 2012, and much more extensive efforts for characterisation are now done on all surfaces. Gamma spectrometry now covers all surfaces.

From a few hundred smear tests in smaller projects, hundreds of thousands of measurements are now performed and complemented with sophisticated gamma spectrometry methods and mathematical statistic decisions.

Normally: every square metre of flooring and walls up to a height of 2 m



SVAFO 2012

Already decommissioned or on going:

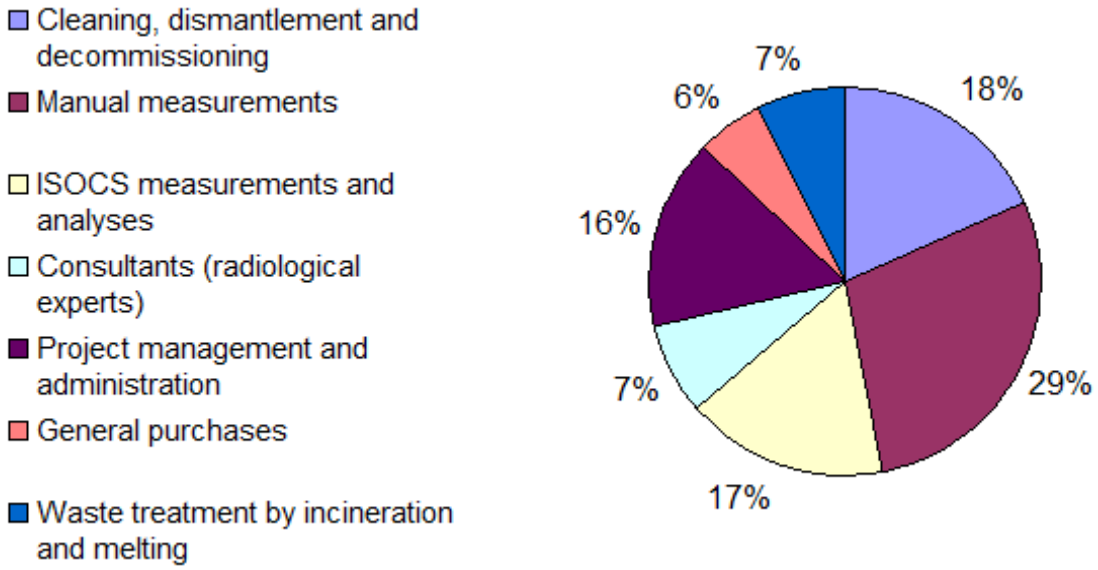
- ACL (lab), 1998-2005, demolition 2006
- ACF (ventilation for ACL), demolition 2006
- VdG (Van de Graaff), 1997-1999, demolition 1999
- ID (evaporation plant), 2004-2009, demolition 2012
- AS (waste storage), 2006-2008, demolition 2008
- UA (waste storage), 1997-2006, reused 2012
- (R2)
- Silo (waste storage), 2000-2012

ACL 2005

Table. Specific decommissioning clearance levels for ACL-lab

Nuclide	Activity (kBq/m^2)
Co-60	10
Cs-134, 137	100
Sr -90	1,000
H-3	100,000
Pu-238, 239, 240, 242	10
Am-241	10
Pu-241	1,000

Costs for measurements (ACL-lab) = 29 + 17 = 46%



Project Evaluation of the Decommissioning of a Laboratory Plant in Studsvik
R. Hedvall, H. Stridsman, R. Berg, B. Johnsson. WM 2006