

Removal of Co-60 sources from the gamma irradiation facility at Kjeller: A transition phase activity

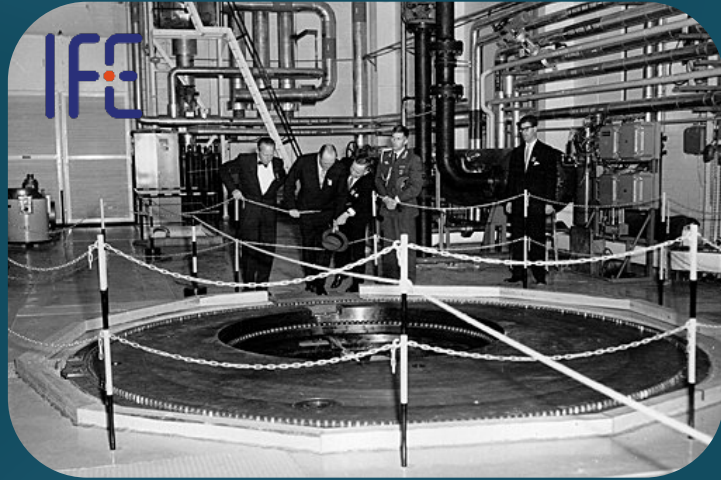
Maria Due-Hansen, MSc, PhD
Technical Lead & Project Manager, Decommissioning Division @ NND

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Institute for Energy Technology (IFE)

Now divided into IFE-NUK and IFE



Founded: 1948 by the Norwegian government as a civilian offshoot of the Defence Research Establishment

Purpose: Developing Norway's nuclear research capabilities

Achievements: Built and operated four research reactors. Contributed significantly to nuclear safety and energy research.

Reactors

- Halden Reactor (HBWR): Operated from 1958 to 2018
- JEEP I Reactor (Kjeller): Operated from 1951 to 1966 (partly decommissioned)
- NORA Reactor (Kjeller): Operated from 1961 to 1968 (partly decommissioned)
- JEEP II Reactor (Kjeller): Operated from 1967 to 2019

In 2016 the government stated its intention to co-finance decommissioning and nuclear waste management leading to the Norwegian Nuclear Decommissioning (NND) agency being formed.

Since April 2025: IFE NUK Halden a part of NND



The Norwegian Nuclear Decommissioning (NND) agency

One organization three main tasks



1. Operating nuclear facilities



2. Decommissioning of nuclear facilities

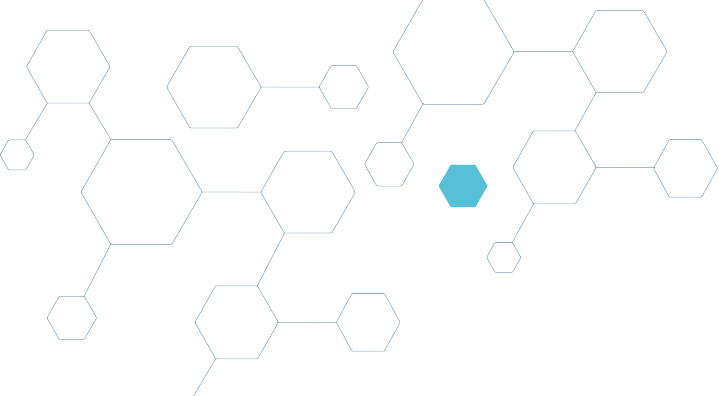


3. Storage of radioactive waste



Build and manage a state agency and facilitate the transfer of IFE-NUK to NND





The Gamma Irradiation Facility at Kjeller

Past, present and future



History of the facility

- Financed by the Royal Norwegian Council for Scientific and Industrial Research (NTNF)
- Operative from 1970 – 2019
- Constructed within the space below JEEP I; previously housed the heavy water tank and heat exchanger room
- 1970: 600 TBq → 1979: 3385 TBq
- R&D and irradiation service
- Important contribution to national food safety in Norway
- Last transfer in 1998



Sterilization method using ionizing radiation – brochure from IFE



Newspaper article: IFE in the fight against “pepper bacteria”
Image courtesy of Akershus Arbeiderblad, 25.11.1982

History of the facility

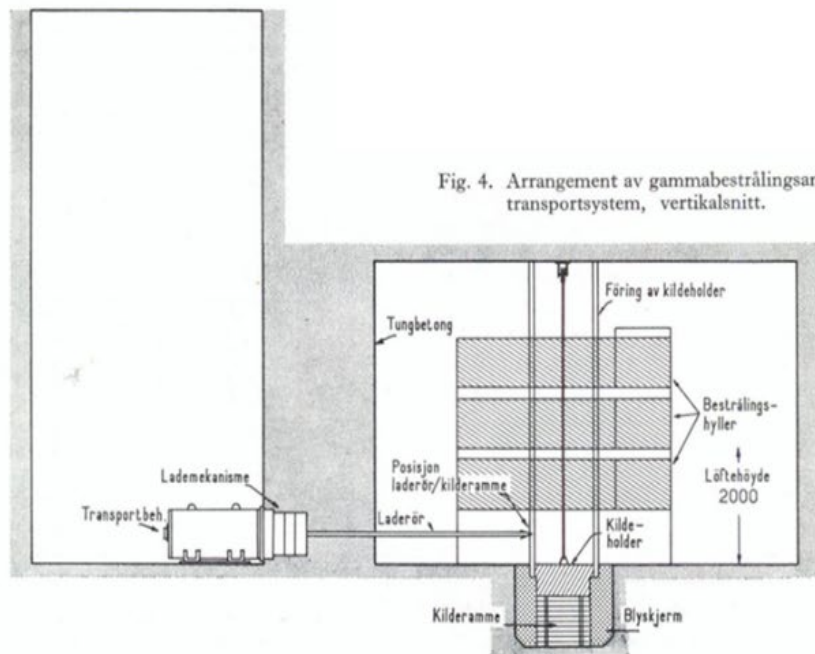


Fig. 4. Arrangement av gammabestrålningsanlegget med transportsystem, vertikalsnitt.

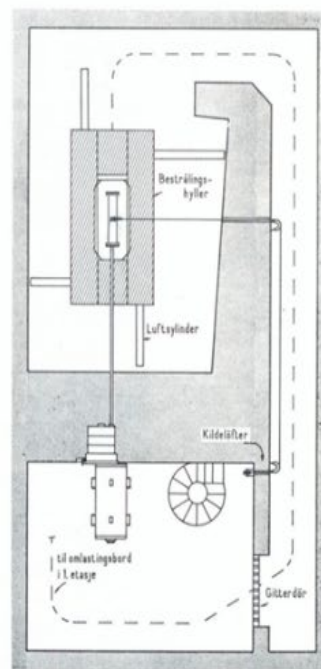
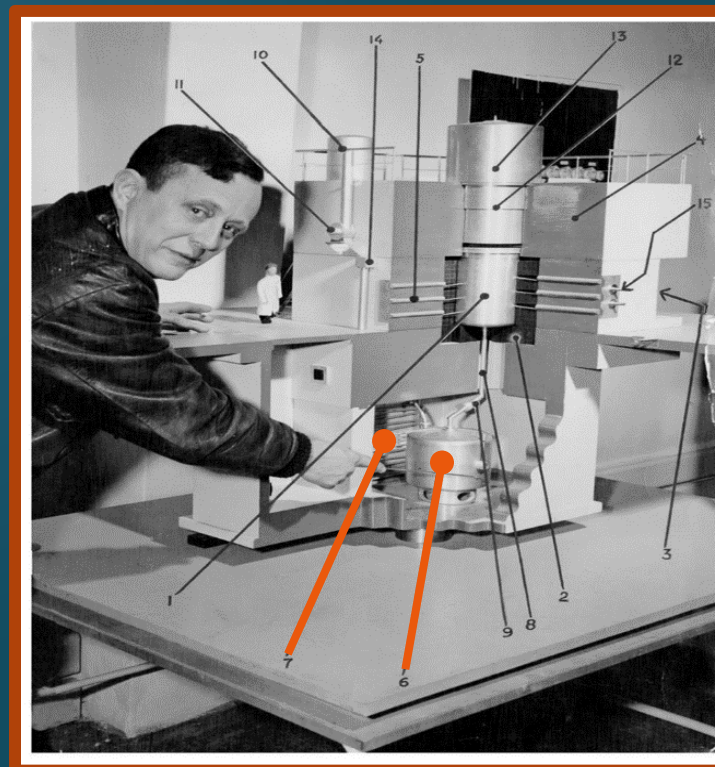


Fig. 3. Arrangement av gammabestrålningsanlegget med transportsystem, horisontalsnitt.



Odd Dahl, "The Wizard", with a model of JEEP I. The gamma irradiation facility was installed below JEEP I, in the room which previously housed the heavy water tank and heat exchangers (6+7, respectively)

Schematic drawings of the **original** facility, displaying both control room and irradiation room
Image courtesy of Fysikkens Verden Nr.3, 1969

History of the facility

- Shut-down and a joint project initiative



2019
The facility is taken out of operation

Investigating source return; dialogue with providers initiated. Facility remains on original maintenance schedule

2020

2022

2023

2024...

...2024

2025

Finalised by Q4 2026

NND offers to assist with project management and establishes a project

- Preparation
- Documentation
- Applications
- Training and testing

IFE-NUK submits a suggested disposal plan for the Co-60 sources to the regulators.

DSA responds with agreement and expectations of future actions

- Returning the sources precluded

- Removal of sources primary priority

-Revision and updating the original disposal plan

-Quarterly meetings with the regulators

Removal of sources from the Gamma facility

Removal of the sources

- Key transition period activity
- Removal of final radiation risk from the JEEP I building
- 24 sources safely relocated to temporary storage
- Required detailed planning, safety reviews, and regulatory compliance

Safe and secure storage
until a national disposal
unit is available



Removal of the sources

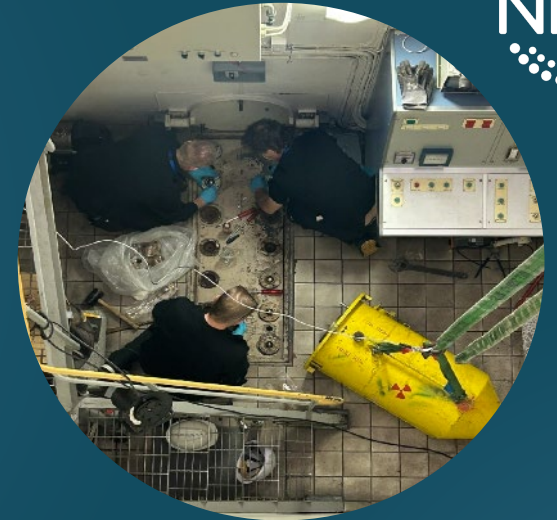
- Equipment



Co-60 source transportation flask
(1850 kg)



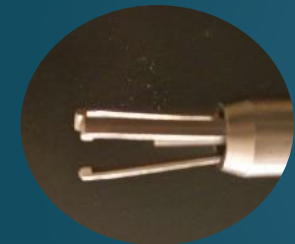
Docking station at the irradiation facility



Top view of the control room



Docking station w/transportation flask at hot cell



Transportation flask gripper claw

Removal of the sources



Preparations before extraction



Transportation between facility and hot cell



Handling and packaging in hot cell



Monitoring radiation



Documentation performed for each source

Removal of the sources



- **New radiation protection procedure**
Implemented with review, training, and third-party evaluation
- **3 dedicated waste containers**
This will facilitate easier relocation at a later stage.
- **Continuous dialogue with regulatory authorities**

Additional measures and documentation:

- Unique documentation has been created for each source,
- A verification test was conducted to confirm complete emptying of the facility
- No deviations were reported.
- Radiation level overview and final reports have been prepared.



Positioning bar for source rack



Thank you for your attention!

maria.due-hansen@nnd.no

