Business from technology

RROG country report

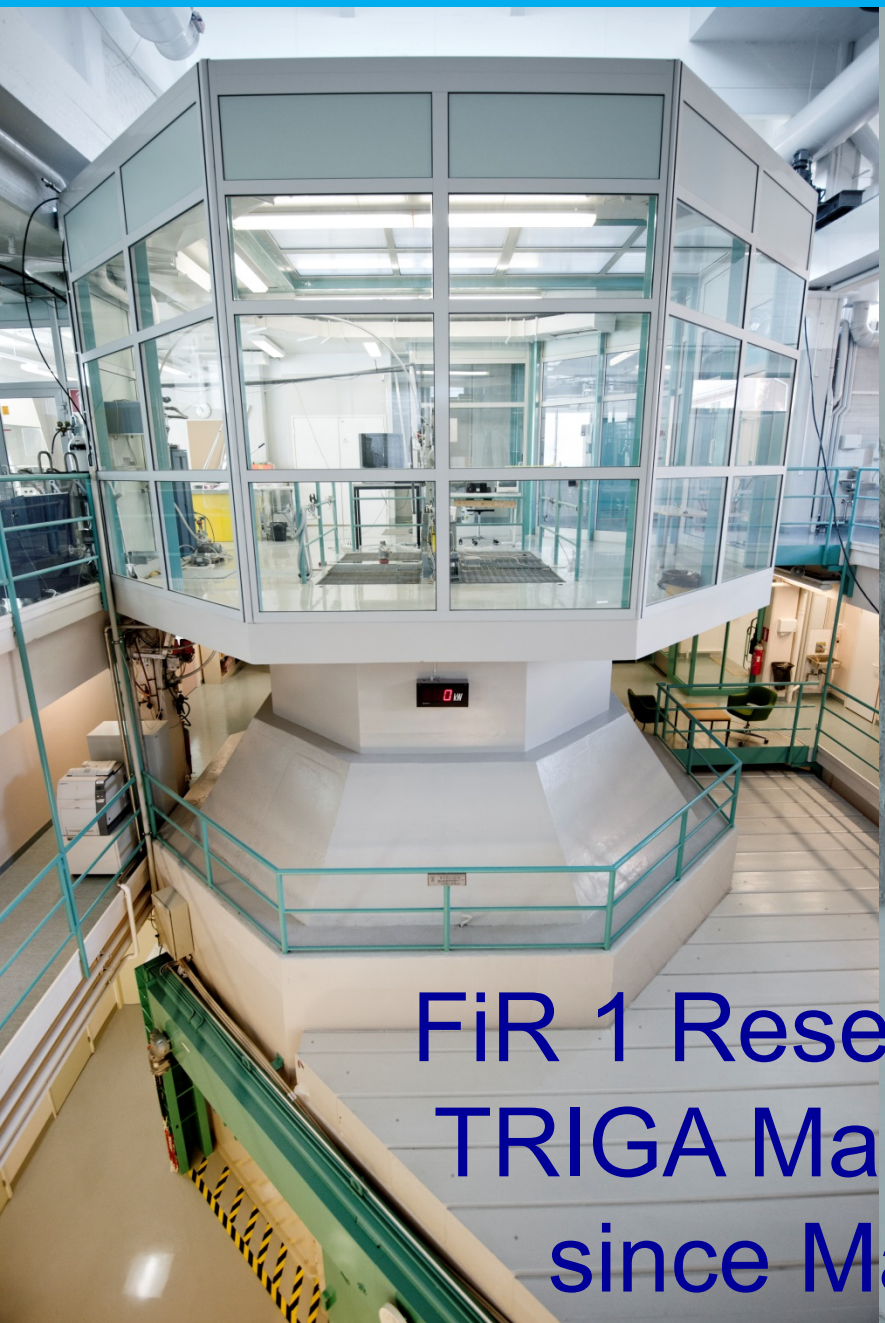
Finland - the FiR 1

IIRO AUTERINEN
FiR 1 reactor manager
VTT Technical Research Centre of Finland

EAES RROG Meeting
Institut für Kernchemie - Forschungsreaktor TRIGA Mainz (FRMZ)
14 - 17.5.2019

FiR 1 Status Report

1. Changing license from operation to decommission
2. Preparation for removal of the spent fuel
3. Lessons learned



FiR 1 Research Reactor
TRIGA Mark II, 250 kW
since March 1962

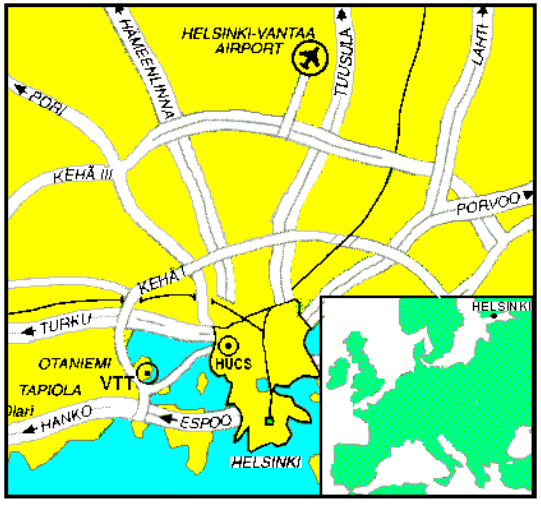
FiR 1

Finnish TRIGA Research Reactor

Until 30.6.2015

International Role in Boron Neutron Capture Therapy (BNCT) and Regional Role in Isotope Production, Education and Training

Baltic Research Reactor Network



FiR 1 Research Reactor (TRIGA Mark II, 250 kW)

- 1962 – early 1990´s:
- intensive neutron beam research, activation analysis
- 1990´s to 2015
- **In-core irradiations** for isotope production (^{82}Br, ^{24}Na, ^{140}La etc.), activation analysis and irradiation testing
- Facility for **Neutron Capture Therapy** constructed
  - BNCT treatments (> 200 patients) in **1999–2012**
- **Training and education**
- **Operating license** valid until **2023**

  Permanent shutdown by VTT 30.6.2015

  → New license to be applied for decommissioning
- **Nuclear waste**:

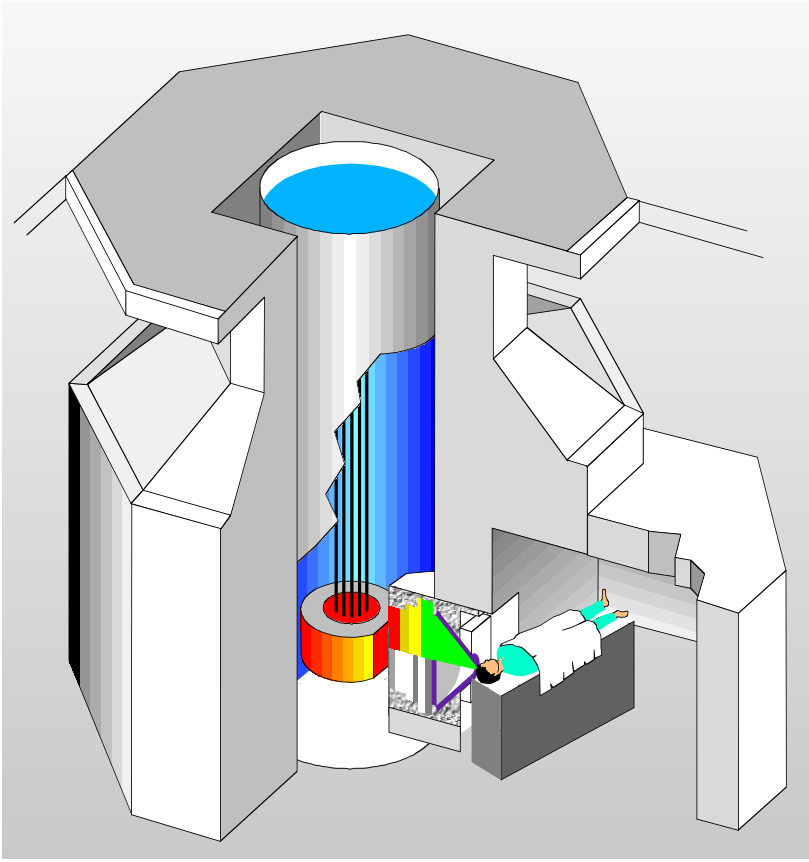
  Spent fuel: 103 fuel elements

  Dismantling waste: Mass 75 tons (mainly concrete)

  Volume 40 m^3

  Activity 3.3 TBq

  (BNCT moderator and steel > 1 TBq)



Status of decommissioning

2012	VTT's decision to shut down FiR 1
2013–15	EIA for decommissioning
2015	End of operations
2016	Dismantling planning
2017	License application for decommissioning
	Public hearing → 31.3.2018
	STUK's safety assessment → 31.3.2019
2021–24	Dismantling begins, subject to SNF solution

VTT submitted application for decommissioning To Finnish Government, 20 June 2017

Nuclear energy Act and Decree define the structure

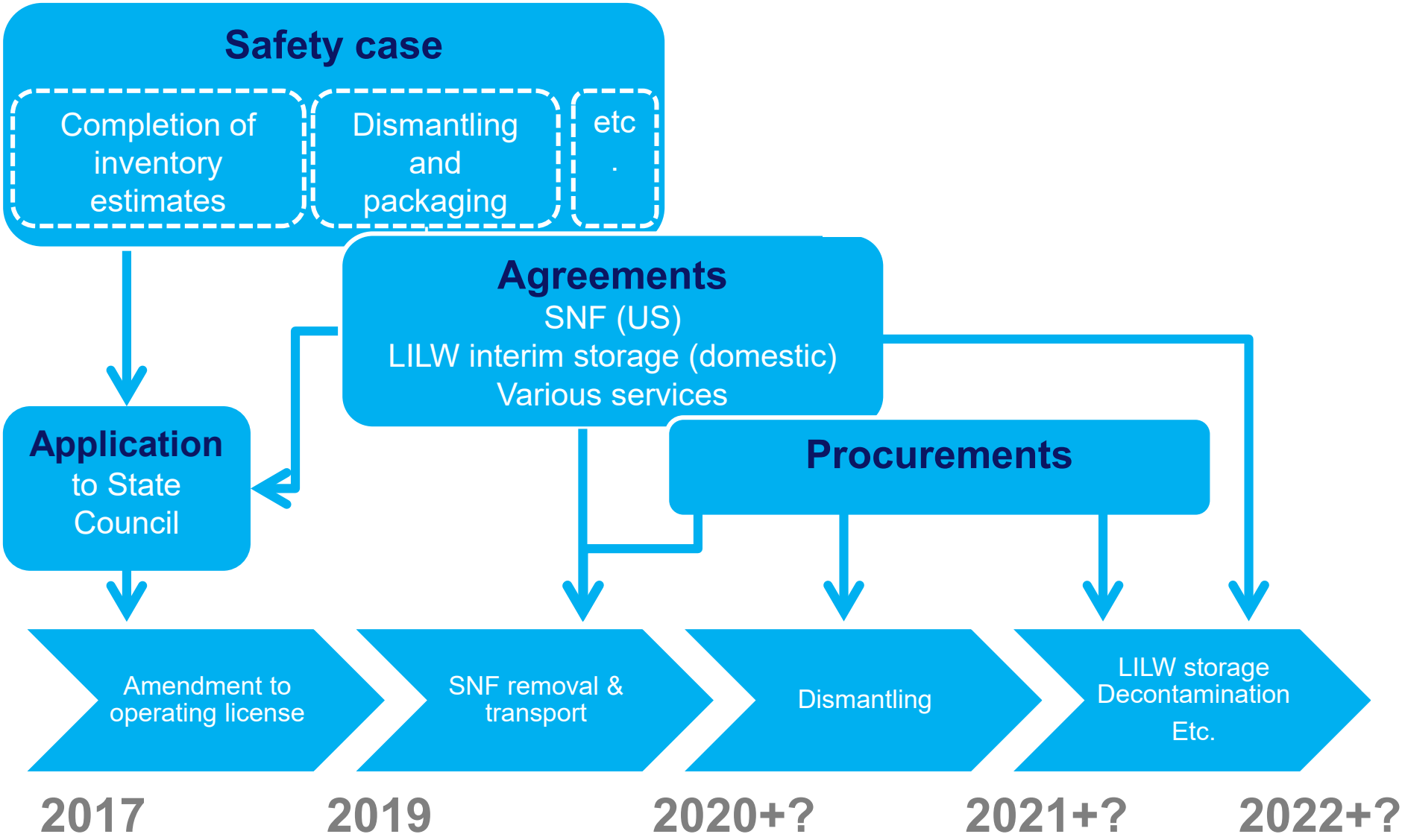
STUK review was due by 10/2018

- was delayed till 4/2019

Other statements (Ministries, municipalities, companies, NGOs,…) by 3/2018

http://tem.fi/en/vtt-technical-research-centre-of-finland-ltd-s-licence-application-for-decommissioning (FI, SE, EN)

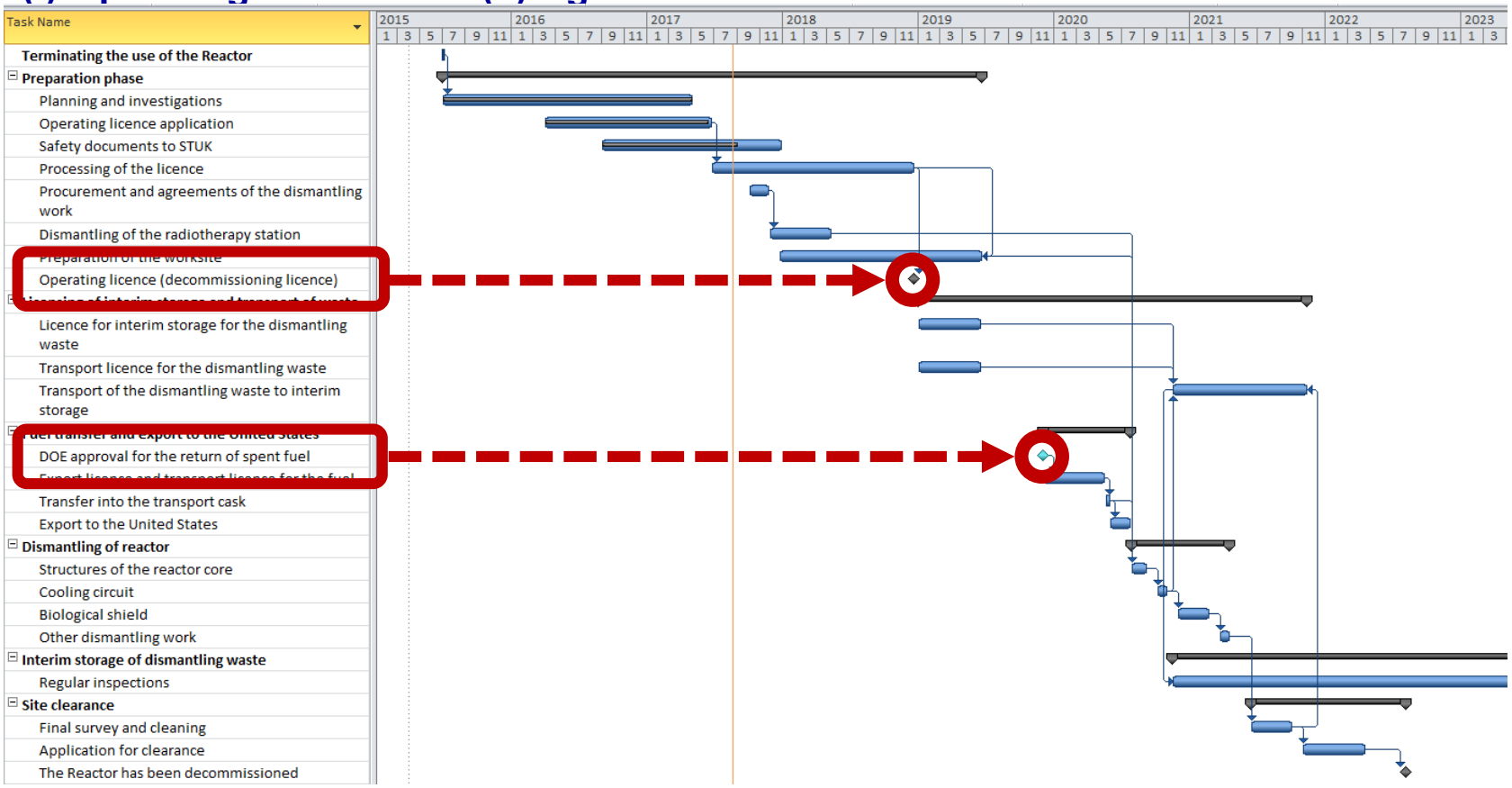
FiR 1 decommissioning: Road map



Indicative time scale: ? ≈ 3 years for licensing of the LILW and SNF interim storage

Decommissioning: critical milestones

(i) Operating license and (ii) Agreement on SNF removal



https://tem.fi/en/vtt-technical-research-centre-of-finland-ltd-s-licence-application-for-decommissioning

Opinions to VTT supplement application 1.2.2019

VTT FiR 1 lupahakemuksen täydennys 2019 PDF

Lausuntopyynnöt 2019

Laaja PDF
Säteilyturvakeskus PDF
Natur och Miljö rf PDF
Strålsäkerhetsmyndigheten PDF
Ålands Landskapsregering PDF

Lausunnot 2019

Museoviraston kansilehti PDF
Museoviraston lausunto PDF
Liikenne- ja viestintäministeriön lausunto PDF
Maa- ja metsätalousministeriön lausunto PDF
Akavan lausunto PDF
Ilmatieteen laitoksen lausunto PDF
Senaattikiinteistön lausunto PDF
TUKESin lausunto PDF
Nakkilan kunnanhallituksen lausunto PDF
Fennovoiman lausunto PDF
Sosiaali- ja terveysministeriön lausunto PDF
STTK:n lausunto PDF
Ympäristöministeriön lausunto PDF
Sisäministeriön lausunto PDF
Fortum Power and Heat Oy:n lausunto PDF
Länsi-Uudenmaan pelastuslaitoksen lausunto PDF
Eurajoen kunnan lausunto PDF
Porvoon kaupungin lausunto PDF
STUKin lausunto PDF
STUKin lausunnon Liite 1 Turvallisuusarvio PDF
STUKin lausunnon Liite 2 YTN lausunto PDF

stuk

Lausunto 1 (9)

2.4.2019

2/F48401/2017

Työ- ja elinkeinoministeriö
PL 32
00023 Valtioneuvosto

TEM/1311/08.05.01/2017, 29.8.2017 ja TEM/1311/08.05.01/2017, 4.2.2019

Säteilyturvakeskuksen lausunto FiR 1 -tutkimusreaktorin käytöstäpoistoa koskevasta lupahakemuksesta

Johdanto

Työ- ja elinkeinoministeriö on viitekirjeissään pyytänyt Säteilyturvakeskukselta (STUK) ydinenergialain (YEL) 23 §:n tarkoittamaa lausuntoa Teknologian Tutkimuskeskus VTT Oy:n (VTT) FiR 1 –tutkimusreaktorin käytöstäpoistoa koskevasta lupahakemuksesta. VTT hakee ydinenergialain 20 §:ssä tarkoitettua lupaa

1) poistaa FiR 1 -tutkimusreaktori käytöstä siten, että laitosalueella jäljellä olevien radioaktiivisten aineiden määrä on ydinenergialain nojalla asetettujen vaatimusten mukainen;

2) pitää hallussa, käsitellä ja varastoida reaktorin käytettyä ydinpolttoainetta sekä muita käytön ja purkamisen yhteydessä syntyneitä ydinjätteitä;

3) pitää hallussa, käyttää, käsitellä ja varastoida VTT:n hallinnoimalla materiaalitasealueella jo olevia muita ydinmateriaaleja, jota Säteilyturvakeskus, Euratom ja IAEA valvovat.

VTT hakee vuoden 2038 loppuun voimassa olevaa käyttölupaa. VTT pyytää samalla reaktorin nykyisen, vuoden 2023 loppuun voimassa olevan käyttöluvan raukeamista.

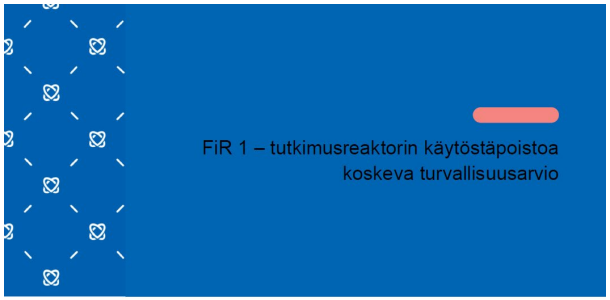
VTT täydensi käyttölupahakemustaan 1.2.2019. Täydennys koski käytetyn ydinpolttoaineen palauttamista Yhdysvaltoihin, ydinjätehuollon sopimusten tilannetta, hankkeen aikataulua sekä hallussa pidettävän ydinmateriaalin määriä.

VTT on toimittanut työ- ja elinkeinoministeriölle ydinenergia-asetuksen (YEA) 33 §:n tarkoittaman käyttölupahakemuksen ja ydinenergia-asetuksen 34 §:n edellyttämät käyttölupahakemukseen liitettävät asiakirjat. VTT on toimittanut STUK:lle ydinenergia-asetuksen 36 §:n mukaiset asiakirjat.

STUK on laatinut tämän lausunnon liitteenä 1 olevan turvallisuusarvion VTT:n toimittamien asiakirjojen sekä FiR 1 -tutkimusreaktorin

STUK
SÄTEILYTURVAKESKUS
STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY

Osoite / Address | Laippatie 4, 00880 Helsinki
Postiosoite / Postal address | PL / P.O.Box 14, FI-00811 Helsinki, FINLAND
Puh. / Tel. (09) 759 881, +358 9 759 881 | Fax (09) 759 88 500, +358 9 759 88 500 | www.stuk.fi



YDINTURVALLISUUS-NEUVOTTELUKUNTA LAUSUNTO 7.3.2019 1(4)

SÄTEILYTURVAKESKUS
Kirjaamo
Laippatie 4, 00880 Helsinki
PL 14
00881 Helsinki

Viite: STUKin lausuntopyyntö; 2/F48401/2017, ratkaistu 12.2.2019

Ydinturvallisuusneuvottelukunnan lausunto FiR 1 -reaktorin käytöstäpoistoa koskevasta VTT:n hakemuksesta Säteilyturvakeskuksen lausunnon ja turvallisuusarvion perusteella

Espoon Otaniemessä sijaitseva FiR 1 –tutkimusreaktori, Triga-tyyppinen teholtaan 250 kW:n allasreaktori, on otettu käyttöön vuonna 1962. FiR 1:llä on voimassa normaalin käytön kattava käyttölupa vuoteen 2023. Luvanhaltija, Teknologian Tutkimuskeskus VTT Oy (VTT), on vuonna 2012 päättänyt lopettaa reaktorin käytön, sulkenut reaktorin lopullisesti vuonna 2015 ja hakenut vuonna 2017 uutta käyttölupaa, jossa käyttölupa rajattaisiin koskemaan reaktorin käytöstäpoistoon ja jätehuoltoon liittyviä VTT:n toimenpiteitä. VTT hakee uutta käyttölupaa vuoteen 2038 asti, ja pyytää samalla nykyisen käyttöluvan raukeamista.

Säteilyturvakeskus on pyytänyt ydinturvallisuusneuvottelukunnalta lausuntoa VTT:n hakemuksesta lausuntopyynnön liitteenä olleen lausuntoluonnoksen ja turvallisuusarvion (luonnos 6.2.2019) perusteella.

Ydinturvallisuusneuvottelukunta (YTN) on käsitellyt STUKin lausuntoa FiR 1 –tutkimusreaktorin käyttölupahakemuksesta ja STUKin laatimaa, hakemusta koskevaa turvallisuusarvion luonnosta. Arviointinsa perusteella YTN kiinnittää huomiota seuraaviin seikkoihin:

1. STUK toteaa, että FiR 1 –tutkimusreaktori täyttää pysyvässä sammutustilassa sille asetetut ydin- ja säteilyturvallisuutta koskevat vaatimukset. YTN yhtyy tähän käsitykseen ja toteaa, että turvallista tilaa on mahdollista ylläpitää niin kauan kuin VTT ylläpitää tarvittavaa organisaatiota, turva- ja valmiusjärjestelyjä sekä reaktoria ympäröivää infrastruktuuria.
2. Turva- ja valmiusjärjestelyjä ja ydinmateriaalivalvontaa on STUKin lausunnossa ja turvallisuusarviossa arvioitu riittävän kattavasti ja riittävää asiantuntemusta käyttäen.
3. Ydin- ja säteilyturvallisuutta on STUKin lausunnossa ja turvallisuusarviossa arvioitu kattavasti ja huolellisesti sovelluvan säämöstön vaatimuksia vasten. Turvallisuusarvion perusteiden ymmärtämiseksi olisi kuitenkin ollut hyvä kuvata teknisin termein reaktoria ja sen polttoainetta. Erityisen hyödyllistä olisi suhteuttaa käytetyn ja tuoreen polttoaineen määrät, kemiallinen koostumus, isotooppivärkevöinti, ja palama voimalaitosreaktoreiden vastaaviin suureisiin. Samoin reaktorin aktivoituneiden rakenteiden keskeisten isotooppien laadut (mm. tritium ja hiili-14) ja määrät tulisi ilmoittaa ja suhteuttaa voimalaitosreaktoreiden tritium- ja hiili-14 –tuotantoon. YTN:n käsityksen mukaan em. vaaraa aihe-

Finnish regulation for decommissioning of nuclear installations

IAEA Safety Standards
for protecting people and the environment

Decommissioning of Facilities

General Safety Requirements Part 6
No. GSR Part 6

IAEA
International Atomic Energy Agency

STUK

GUIDE **YVL D.4** / 15 NOVEMBER 2013

PREDISPOSAL MANAGEMENT OF LOW AND INTERMEDIATE LEVEL NUCLEAR WASTE AND DECOMMISSIONING OF A NUCLEAR FACILITY

continues

With regard to new nuclear facilities, this Guide shall apply as of 1 December 2013 until further notice. With regard to operating nuclear facilities and those under construction, this Guide shall be enforced through a separate decision to be taken by STUK. This Guide replaces Guides YVL 8.2 and YVL 8.3.

First edition
Helsinki 2014

ISBN 978-952-309-124-5 (print) Kopijyvä Oy 2014
ISBN 978-952-309-125-2 (pdf)
ISBN 978-952-309-126-9 (html)

STUK • SÄTEILYTURVAKESKUS
STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY

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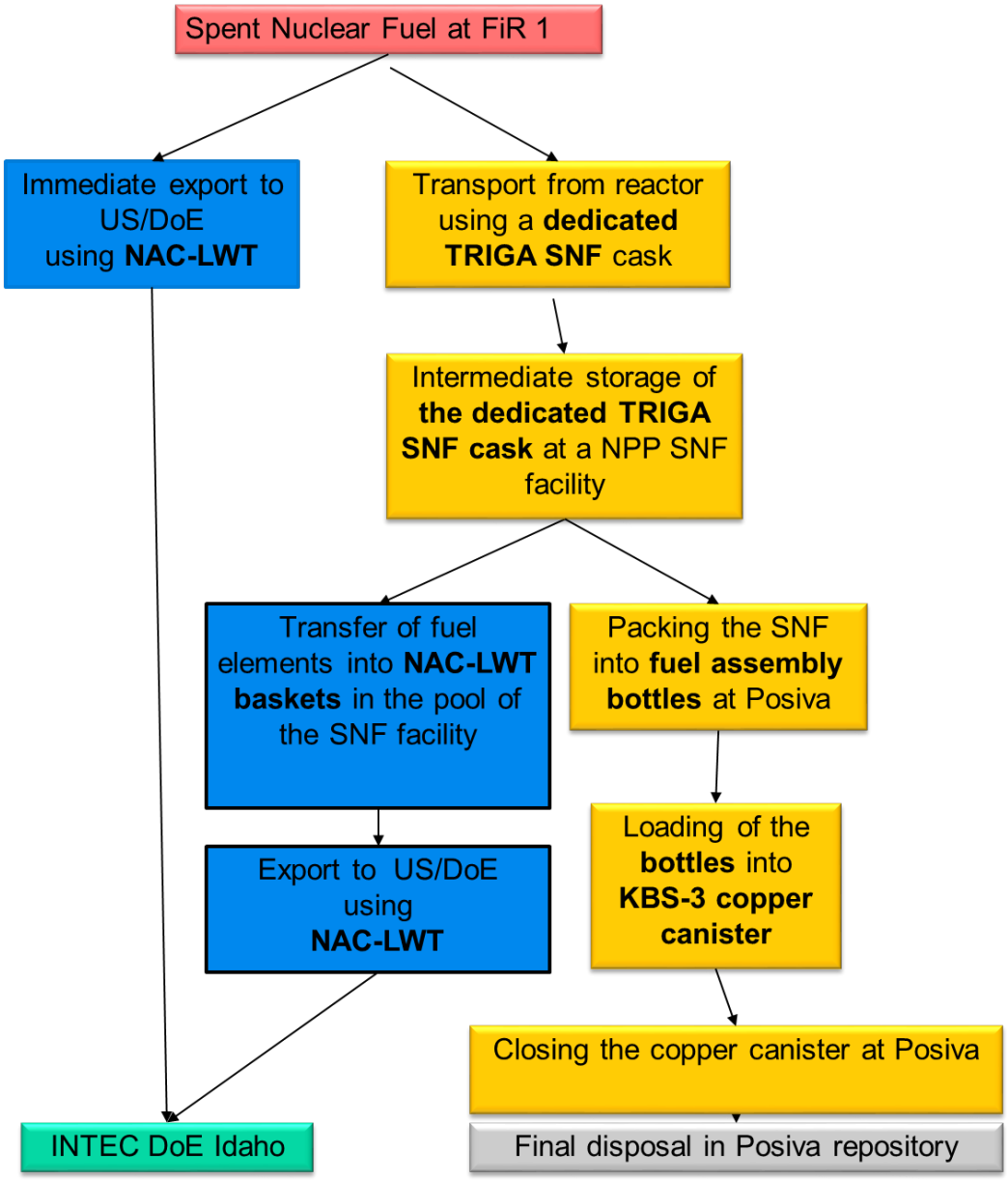
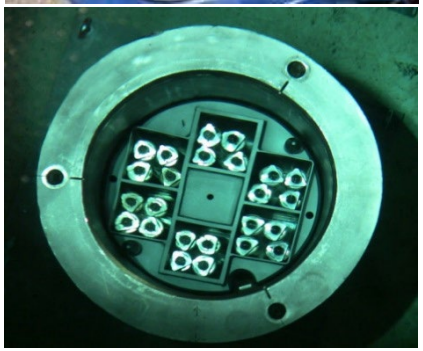
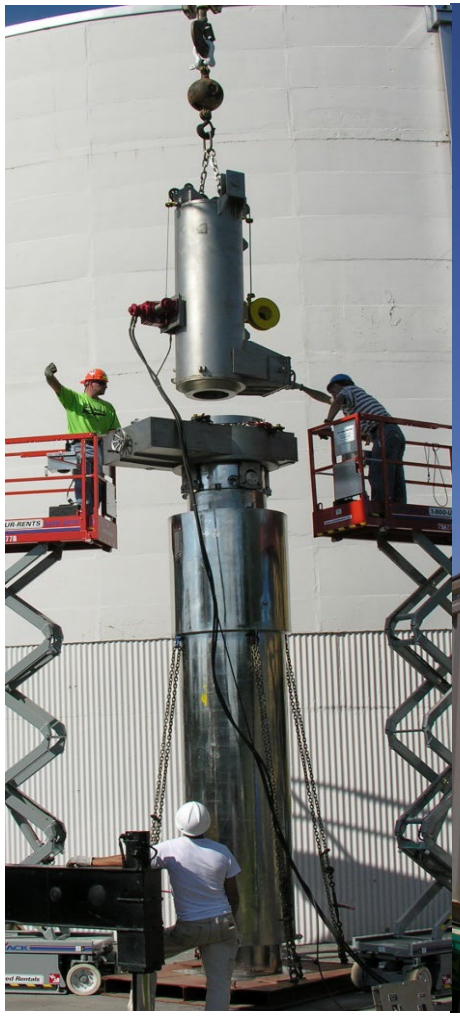
The Nuclear Energy Act and the STUK's regulations and YVL Guides (Guide YVL D.4) cover the decommissioning requirements of the IAEA standard as well as WENRA's decommissioning reference levels.


Spent Nuclear Fuel at FiR 1
Immediate export to US/DoE using **NAC-LWT**
Transport from reactor using a **dedicated TRIGA SNF** cask
Intermediate storage of **the dedicated TRIGA SNF cask** at a NPP SNF facility
Transfer of fuel elements into **NAC-LWT baskets** in the pool of the SNF facility
Packing the SNF into **fuel assembly bottles** at Posiva
Export to US/DoE using **NAC-LWT**
Loading of the **bottles** into **KBS-3 copper canister**
Closing the copper canister at Posiva
INTEC DoE Idaho
Final disposal in Posiva repository

NAC-LWT cask system for transport of irradiated TRIGA fuel to INTEC facility for storage

- NAC-LWT SNF baskets





- Transfering the basket from the NAC-LWT into a fuel storage canister at INTEC

Preparation of the DOE/INTEC documents

434.28
02/25/16
Rev. 05
Use with MCP-2861

FUEL AND PACKAGING REQUIRED SHIPPER'S DATA FORM

Page 1 of 15

Revision Number:

Description	Shipper Summary Instruction: If items do not apply, mark as N/A.	References (list reference number from Form 434.28B)
I. SHIPPER AND SHIPMENT IDENTIFICATION INFORMATION		
1. Shipper Information [1]		
a. Shipper Reporting Identification Symbol (RIS): [2]	WRRF / Euratom	
b. Shipping Facility Name:		
c. Shipping Facility Address:	, Espoo, F	
d. Shipping Facility Point of Contact (name of authorized person for shipper):	uterinen	
e. Shipping Facility Point of Contact Number:		
2. U.S. port of entry (foreign shipments only		
3. Shipping Agent Information (entity ensuri INL)		
a.		
b.		
c.		

NAC-LWT Basket - Loading Verifications Data Sheet - TRIGA Fuel

NAC-LWT Basket - Loading Verific

NAC-LWT Basket - Loading Verific

NAC-LWT Basket - Loading Verifi

434.28A
10/19/2006
Rev. 01
Use with MCP-2861

FUEL UNIT REQUIRED SHIPPER'S DATA FORM

Revision Number:

Fuel Unit[3]		Pre-Irradiation[3]			Post-Irradiation[3]							
Unique ID Number	Drawing Reference Number from Form 434.28B	Total U (grams)	U-235 (grams)	U-238 (grams)	Total U (grams)	U-235 (grams)	U-236 (grams)	U-238 (grams)	Total Pu (grams)	Pu-239 (grams)	Pu-240 (grams)	Pu-24 (gram
2070		176,03	34,87	141,16	176,15	30,56		145,57	0,500	0,47	0,030634	0,0009
2210		177,33	35,13	142,20	179,80	33,86		145,92	0,223	0,22	0,006332	0,0000
2344		178,19	35,30	142,89	176,25	32,47		145,78	0,339	0,32	0,014303	0,0002
2345		179,03	35,47	143,56	176,26	30,66		145,60	0,477	0,45	0,029471	0,0012
2492		180,32	35,72	144,60	176,88	31,19		145,69	0,413	0,39	0,021520	0,0009
2493		181,46	35,95	145,51	176,01	30,44		145,57	0,502	0,47	0,031064	0,0016
2494		181,44	35,94	145,50	176,15	30,53		145,62	0,463	0,43	0,026263	0,0013
2495		181,43	35,94	145,49	176,13	30,54		145,60	0,476	0,45	0,029620	0,0014

https://www.energy.gov/nepa/listings/eis-0218-documents-available-download

DOE/EIS-0218-SA-8

SUPPLEMENT ANALYSIS FOR THE FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL ACCEPTANCE PROGRAM

APRIL 2019

National Nuclear Security Administration

U.S. Department of Energy
National Nuclear Security Administration
Washington, DC

MAY 6, 2019

EIS-0218-SA-08: Supplement Analysis

NNSA proposes to extend the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program through May 12, 2029 and implement the Policy on Exemptions

Foreign Research Reactor Spent Nuclear Fuel Acceptance Program
This Supplement Analysis (SA) evaluates extension of the Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Acceptance Program through May 12, 2029 and implemention of the Policy on Exemptions to the FRR SNF Acceptance Program.

Based on the analysis in the SA, DOE/NNSA finds that the impacts of the proposed action would be within the range of impacts analyzed in the FRR SNF EIS.

Extending the Acceptance Program end date consistent with the Policy on Exemptions would not constitute a substantial change in the proposed action evaluated in the FRR SNF EIS. DOE/NNSA determined that neither a supplement to the FRR SNF EIS nor a new EIS is required.

For more information, see
Foreign Research Reactor Spent Nuclear Fuel Acceptance Program.

supplement-analysis-eis-0218-sa-08-foreign-research-reactor-snf-2019-05.pdf

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

May 7, 2019

Mr. Riku Huttunen
Director General
Energy Department
Ministry of Employment and the Economy
P.O. Box 32
FI-00023 Helsinki, Finland

Dear Mr. Huttunen:

The Department of Energy's National Nuclear Security Administration (DOE/NNSA) implements the Foreign Research Reactor Spent Nuclear Fuel Acceptance Program (Acceptance Program), which permits other countries to send U.S.-origin spent fuel to the United States for storage and disposition. This program is set to expire on May 12, 2019.

DOE/NNSA completed a review of the Acceptance Program and concluded there may be circumstances that warrant an exemption to the May 2019 program expiration. A Policy on Exemptions was established to allow DOE/NNSA to provide an exemption to the Acceptance Program end date on a case-by-case basis if there is a national security or non-proliferation reason to do so. For example, a limited exemption may be granted if an HEU research reactor is shutdown or converted; if a significant amount of HEU and/or separated plutonium will be removed from a nuclear facility; or if the facility meets the criteria of the program prior to the deadline in 2019 but is unable to complete the shipping campaign for reasons outside of its control.

After careful analysis, we have determined that the FIR-1 research reactor operated by VTT Technical Research Centre (VTT) has met the criteria established in the Policy on Exemptions. Therefore, VTT is granted permission to return the LEU spent fuel until May 12, 2029.

If you have any questions regarding this matter, please contact Peter Hanlon, Assistant Deputy Administrator for Material Management and Minimization, at peter.hanlon@nnsa.doe.gov.

Sincerely,

Brent K. Park
Deputy Administrator for
Defense Nuclear Nonproliferation

After careful analysis, we have determined that the FIR-1 research reactor operated by VTT Technical Research Centre (VTT) has met the criteria established in the Policy on Exemptions. Therefore, VTT is granted permission to return the LEU spent fuel until May 12, 2029.

Contracts under preparation

CONTRACT NO. _____

BETWEEN THE

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

AND

VTT TECHNICAL RESEARCH CENTRE OF FINLAND
HELSINKI, FINLAND

TERMS AND CONDITIONS FOR
THE ACCEPTANCE OF
FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL
AT UNITED STATES DEPARTMENT OF ENERGY SITE

Note: This contract contains clauses that are common to many contracts that have been entered into by the Department of Energy and foreign research reactor operators in countries with high income economies. However, the terms and conditions of any contract between the Department and individual operators will be negotiated on a case-by-case basis.

EDLOW INTERNATIONAL COMPANY

AGREEMENT

for

Finnish Reactor 1 (FiR1) TRIGA Spent Nuclear Fuel Shipment and all Transportation Services from Espoo (Finland) to Idaho National Laboratory (INL - U.S.A.)

Between

VTT Technical Research Centre of Finland, Ltd.

Kemistintie 3
FI-02150 Espoo
Finland

and

Edlow International Company

1666 Connecticut Avenue, NW, Suite 201
Washington, DC 20009
U.S.A.

15.5.2019 Services - 203965-2019 - TED Tenders Electronic Daily

Services - 203965-2019

02/05/2019 S85 – – Services – Contract notice – Competitive procedure with negotiation
I. II. III. IV. VI.

Finland–Espoo: Radioactive–, toxic–, medical– and hazardous waste services

2019/S 085–203965

Contract notice

Services

Legal Basis:

Directive 2014/24/EU

Section I: Contracting authority

I.1) Name and addresses
Teknologian tutkimuskeskus VTT Oy
2647375-4
PL 1000, VTT
Espoo
02044
Finland
Contact person: Markus Airila
E-mail: kilpailutus@vtt.fi
NUTS code: FI1B1
Internet address(es):
Main address: http://www.vtt.fi

I.2) Information about joint procurement

I.3) Communication
The procurement documents are available for unrestricted and full direct access, free of charge, at: https://tarjouspalvelu.fi/hanki
Additional information can be obtained from the abovementioned address
Tenders or requests to participate must be submitted electronically via: https://tarjouspalvelu.fi/hanki?id=235873&tpk=501aaefa-71d9-41b3-93ca-a47dd78a88ac

I.4) Type of the contracting authority
Body governed by public law

I.5) Main activity
Other activity: tutkimus ja kehitys

Section II: Object

II.1) Scope of the procurement

II.1.1) Title:
FIR 1 -tutkimusreaktorin ja Otakaari 3:n materiaalitutkimuslaboratorion käytöstäpoiston palvelut, mukaan lukien ydinjätteiden ja muiden radioaktiivisten jätteiden vastaanotto
Reference number: Ref. nro. 261/206/2019

II.1.2) Main CPV code
90520000

II.1.3) Type of contract
Services

II.1.4) Short description:
Teknologian Tutkimuskeskus VTT Oy (jäljempänä VTT, tilaaja tai hankintayksikkö) pyytää ehdokkaita lähettämään osallistumishakemuksen neuvottelumenettelyyn Hilma-ilmoituskanavassa julkaistun osallistumisilmoituksen sekä sen liitteiden O1-O6 ja näiden alaliitteiden mukaisesti.

II.1.5) Estimated total value

II.1.6) Information about lots
This contract is divided into lots: no

II.2) Description

II.2.1) Title:

II.2.2) Additional CPV code(s)

II.2.3) Place of performance
NUTS code: FI1B1

https://ted.europa.eu/udl?uri=TED:NOTICE:203965-2019:TEXT:EN:HTML&tabId=0

Finnish licensing for the FiR 1 SNF transfer to US

- **Export license by STUK**
  - EU Directive 2006/117/Euratom
  - NSG guidelines (INFCIRC 254 / Part1)
- **Transport license & responsible manager**
  - Transport Plan
  - Transport security plan
- **Nuclear liability insurance**
- **Safeguards notification and reporting**
- **Approval of the VTT-DOE contract by the Euratom Supply Agency (ESA)**

Lessons learned about decommissioning planning and reality

Evolution of detail in planning

2007: Consultation on potential decommissioning strategies (Platom)

Various options to execute the project

Review of VT

Suggestions f

Experiences f

2013: Preliminary dismantling plan (Platom)

Available dismantlin

Experiences and da
foreign research rea

One of the backgrou

2016: Detailed dismantling planning (BNG)

All specific background information from FiR 1

Documentation suitable for the procurement of the dismantling wo

Technical repo
p.)

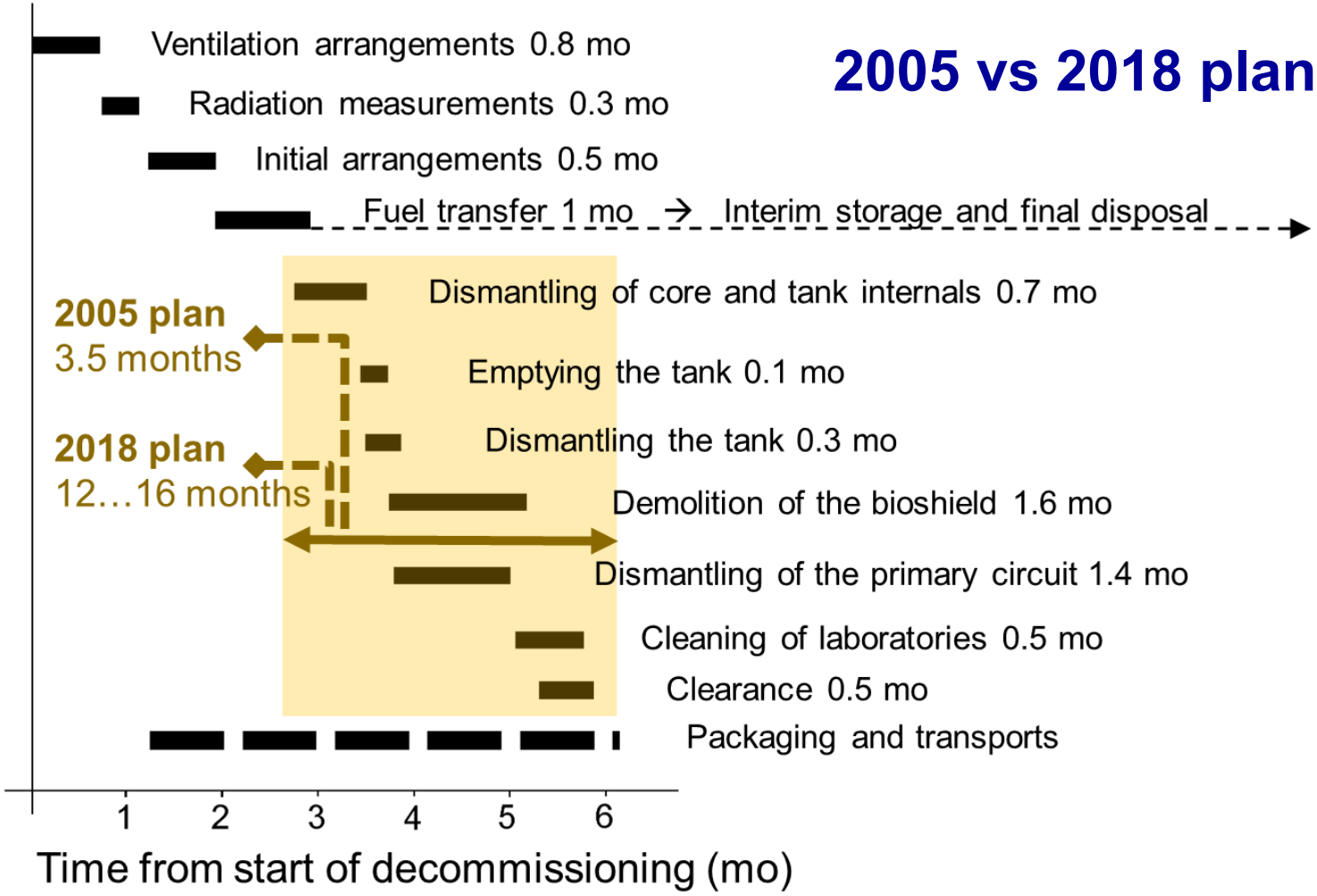
VTT prepared
decommission

2017 → Refine the detailed dismantling plan (Fortum)

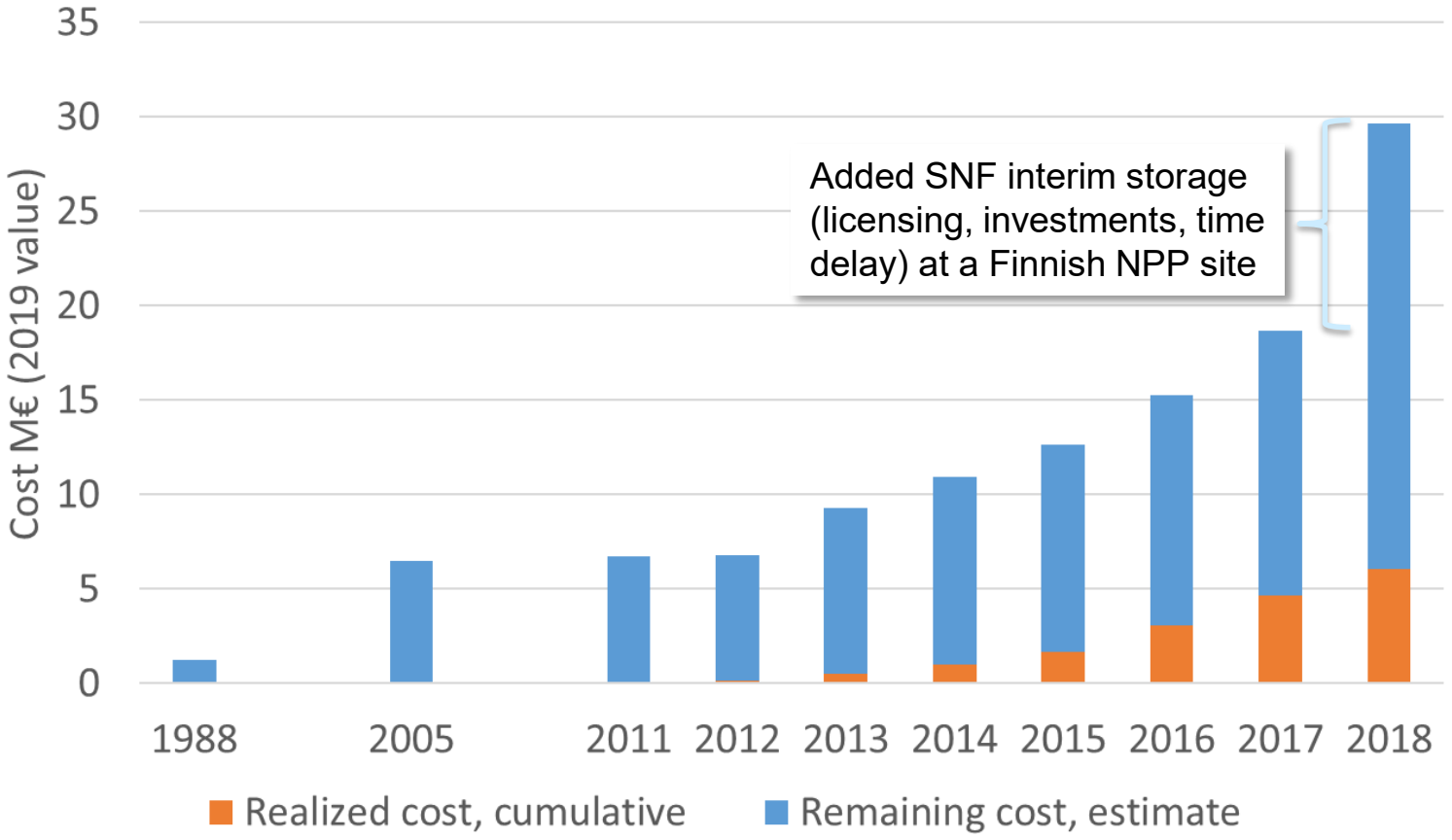
Include all practical considerations:

- Site logistics
- Waste acceptance criteria
- Integrate dismantling, waste management, radiation protection and security operations

2005 vs 2018 plan



Cost estimate evolution 1988–2018



Summary of lessons learned
First nuclear facility to be decommissioned in Finland

Impact on national regulation and practices
→ Interpretations of specific requirements (safety goals and practice)
→ MEAE and STUK used FiR 1 experiences in development of legislation
→ **NPPs will have license to receive nuclear waste from other facilities**

Experience gained in the project organization
→ Active owner in dismantling planning projects
→ In-house experience in inventory modelling and measurements

Adapting the organization to decommissioning
→ Retained all operating personnel + key recruitments
→ Safety culture assessment 2018 – recommendations being implemented

Main challenge: uncertainty over waste solutions at shutdown
→ Licensing: long preparation and review times
→ Planning: slow convergence of plans (lack of fixed boundary conditions)

See also

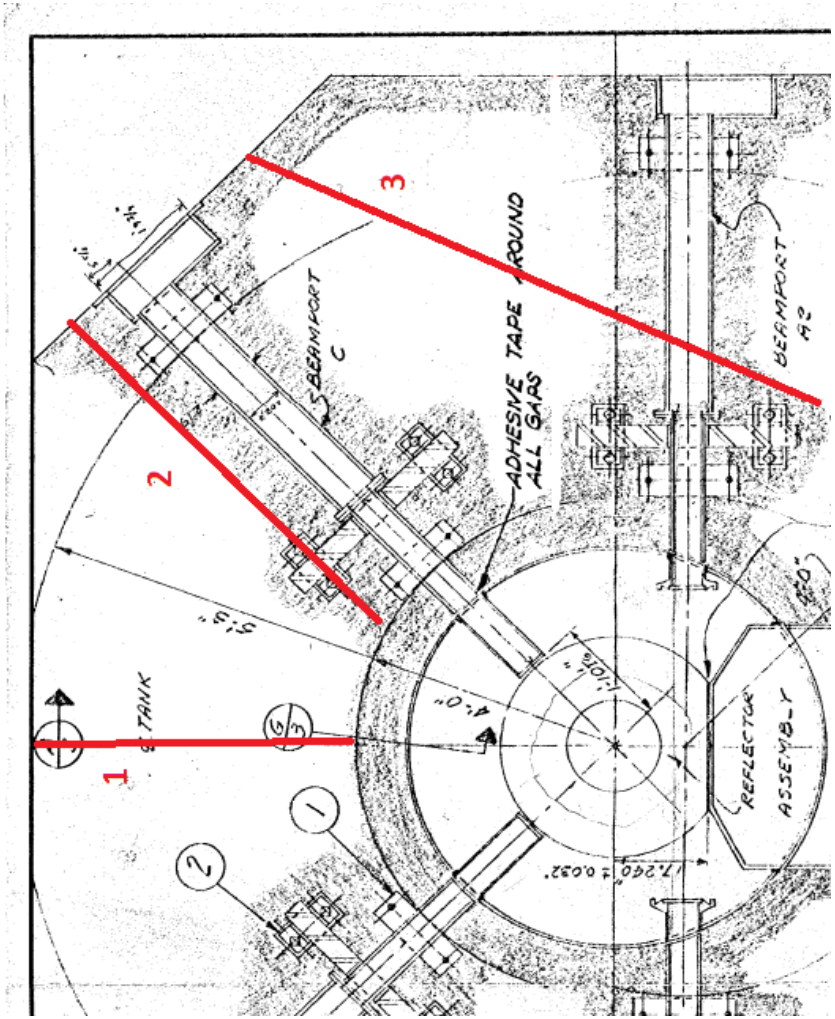
VTT's info pages on the decommissioning project

http://www.vttresearch.com/services/low-carbon-energy/nuclear-energy/decommissioning-of-finlands-first-nuclear-reactor

Decommissioning license application (Website of the Ministry)

http://tem.fi/en/vtt-technical-research-centre-of-finland-ltd-s-licence-application-for-decommissioning

Drilling samples from the biological shield

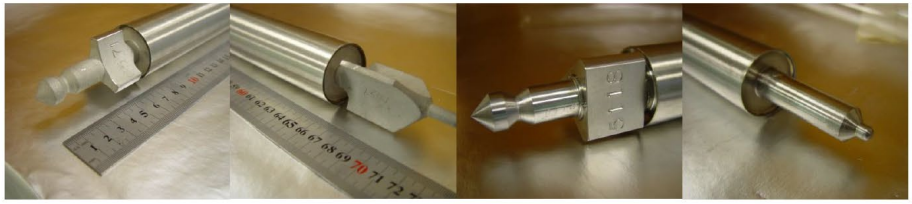



PUSH

BROCHURE

TRIGA FUEL 19.11.2015

Unused TRIGA fuel at FiR 1



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