Reactor Instituut Delft LTO

IAEA: The 19 infrastructure issues to revamp new nuclear plant

~~Electrical grid~~
Nuclear fuel cycle ✓
Safeguards ✓

Nuclear safety
Radiation protection
Nuclear security
Environmental protection
Radioactive waste management
Emergency planning
Legal framework
Regulatory framework

Funding and financing
National position
Stakeholder involvement

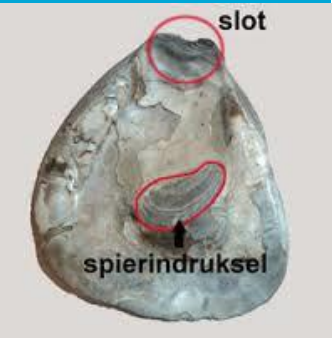
Management
Human resource development

Site and supporting facilities
Industrial involvement
Procurement

RID 2005 start of OYSTER

- 42 years of operation experience with 2 MW pool type RR (HOR)
- excellent Reactor and Institute safety and security record
- scientific excellence in:
  - neutron beam instruments – Larmor precession
  - positron continuous beam
  - gamma detectors
  - reactor physics (Gen IV)
  - radioisotopes for health
  - Instrumental Neutron Activation Analyses (INAA)
- full support of the Board of Directors of the Delft University of Technology
- ambitious plan:
  - business plan ready, including budget estimate
  - upgrade plan ready, including budget estimate (OYSTER)

These were the pearls to start with

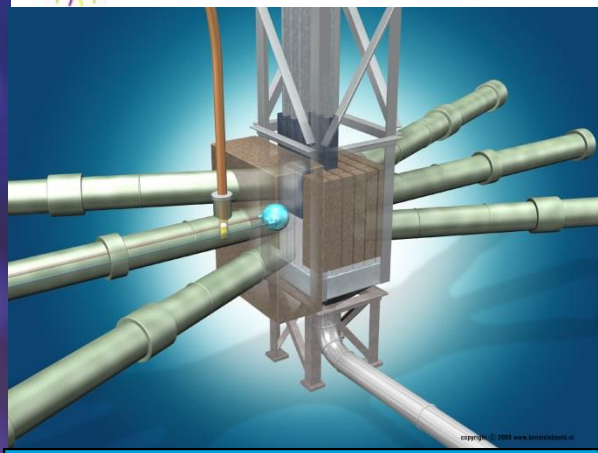


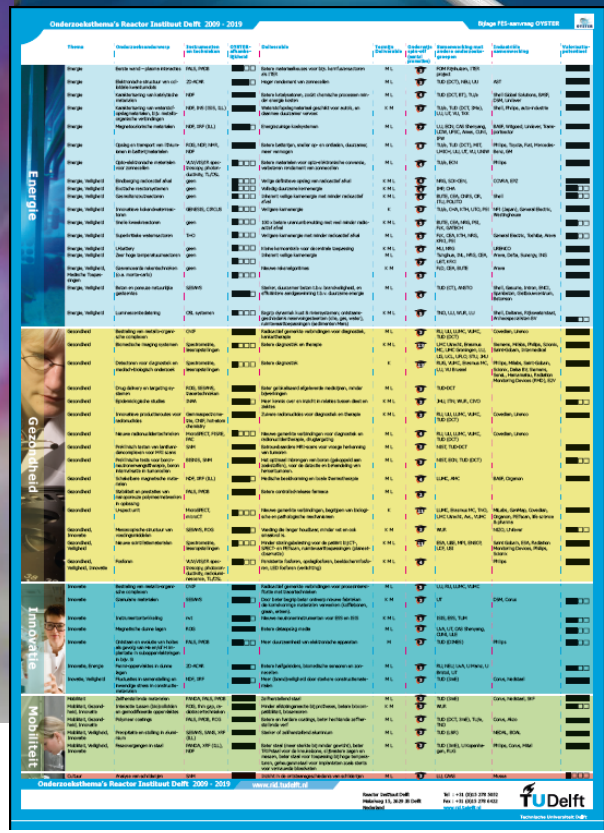
Delft University of Technology

OYSTER

Big ideas from small particles

REACTOR INSTITUTE DELFT

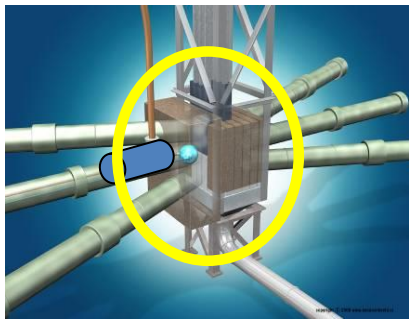




TUDelft

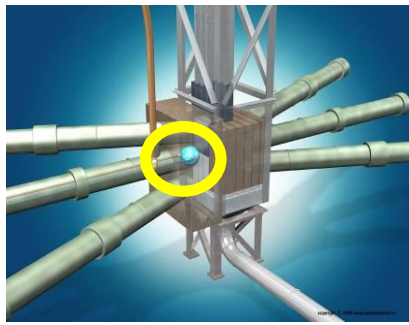
What is

Oyster



Core

Reflectors around beam tubes → more neutrons to instruments

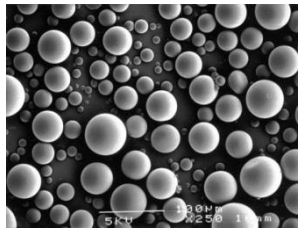


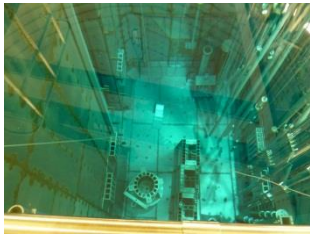
Cold Neutron Source

Slower neutrons → More easy to focus into beams
Better properties to use in instruments

Irradiation facilities

New facilities
Improved irradiation conditions





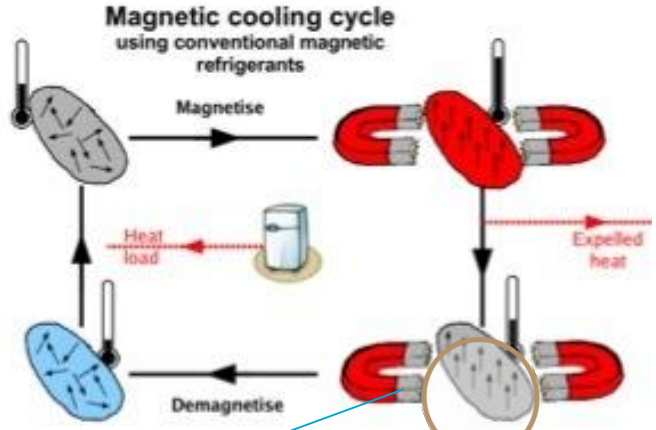
Instruments

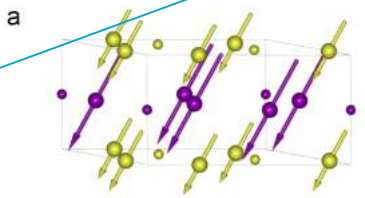
New neutron and positron instruments

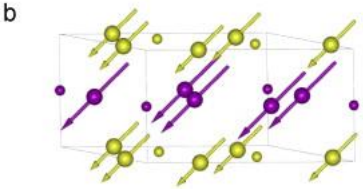
TU Delft

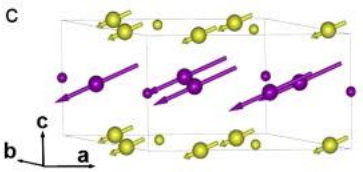
societal relevance: energy development of functional materials

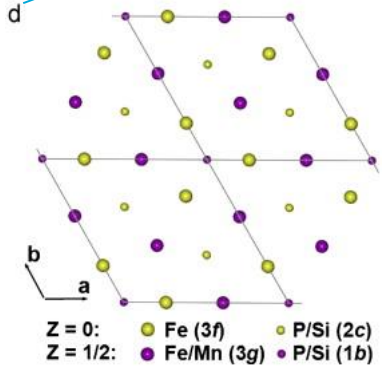
magneto-caloric











alloys with e.g. iron, manganese, phosphorus, silicon i.s.o. gadolinium, terbium

societal relevance: energy
development of functional materials
solar luminescence

30m^2 PowerWindows for new building Rabobank in Eindhoven
a demo project by RID spin-off Physee

Start-up PHYSEE wins €500,000

News

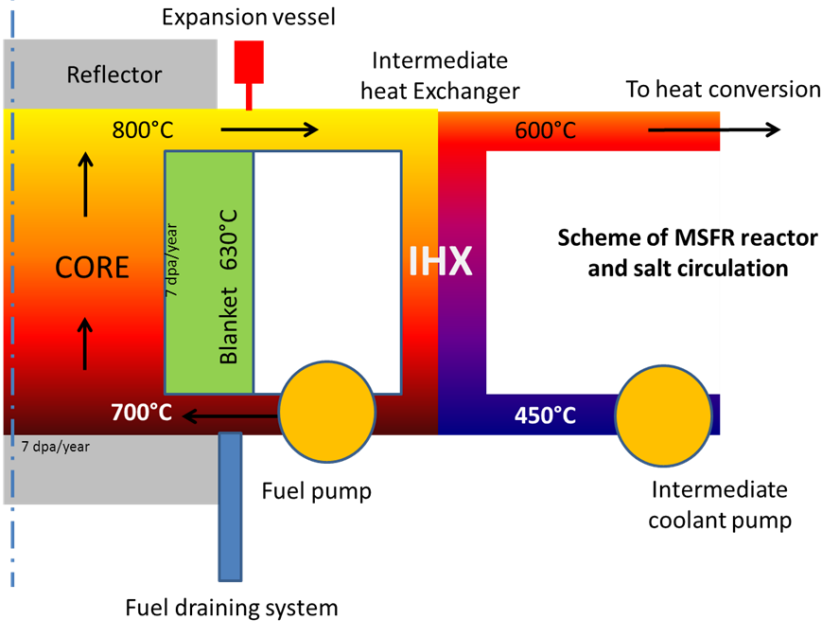
14 September 2016

The Dutch green start-up PHYSEE is the winner of the tenth edition of the Postcode Lottery Green Challenge. Co-founder Willem Kesteloo impressed the international jury during the finals in Amsterdam with his PowerWindow….

societal relevance: energy

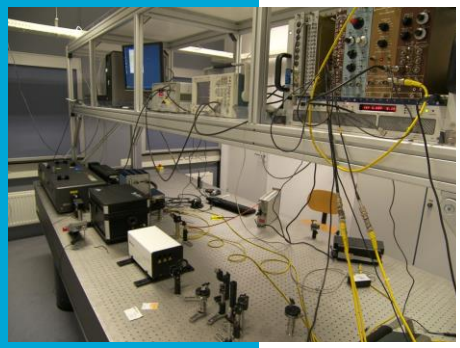
Molten Salt Fast Reactor

Thorium

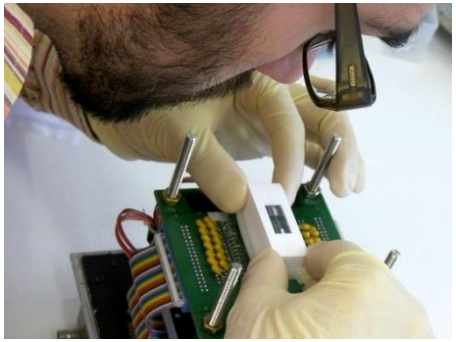


- no long-term nuclear waste
- virtually unlimited resources
- burns old, long-term nuclear waste
- no high pressures

societal relevance: health



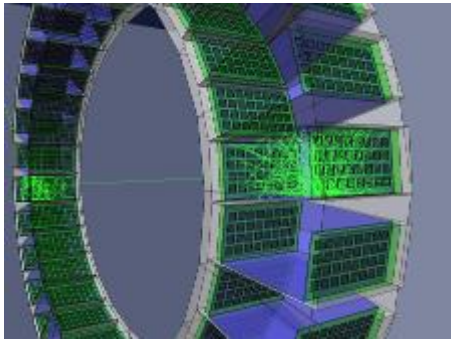
materials research



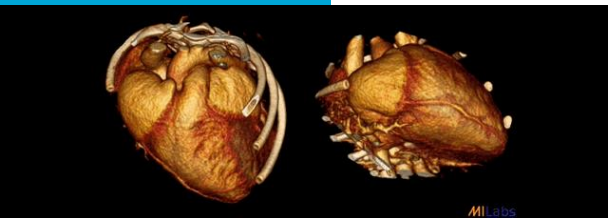
detector research

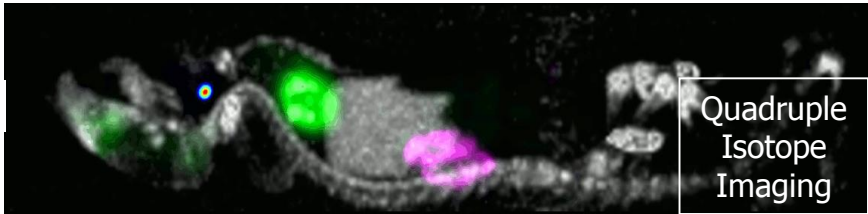
better imaging systems

better scintillators



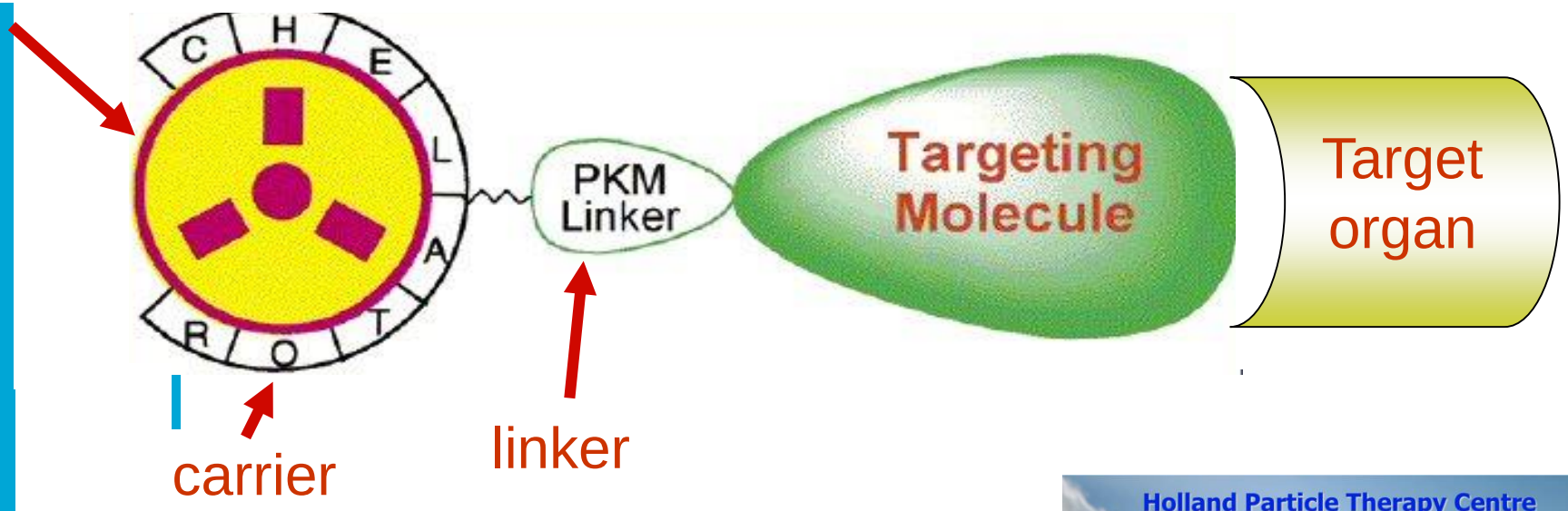
modeling & reconstruction





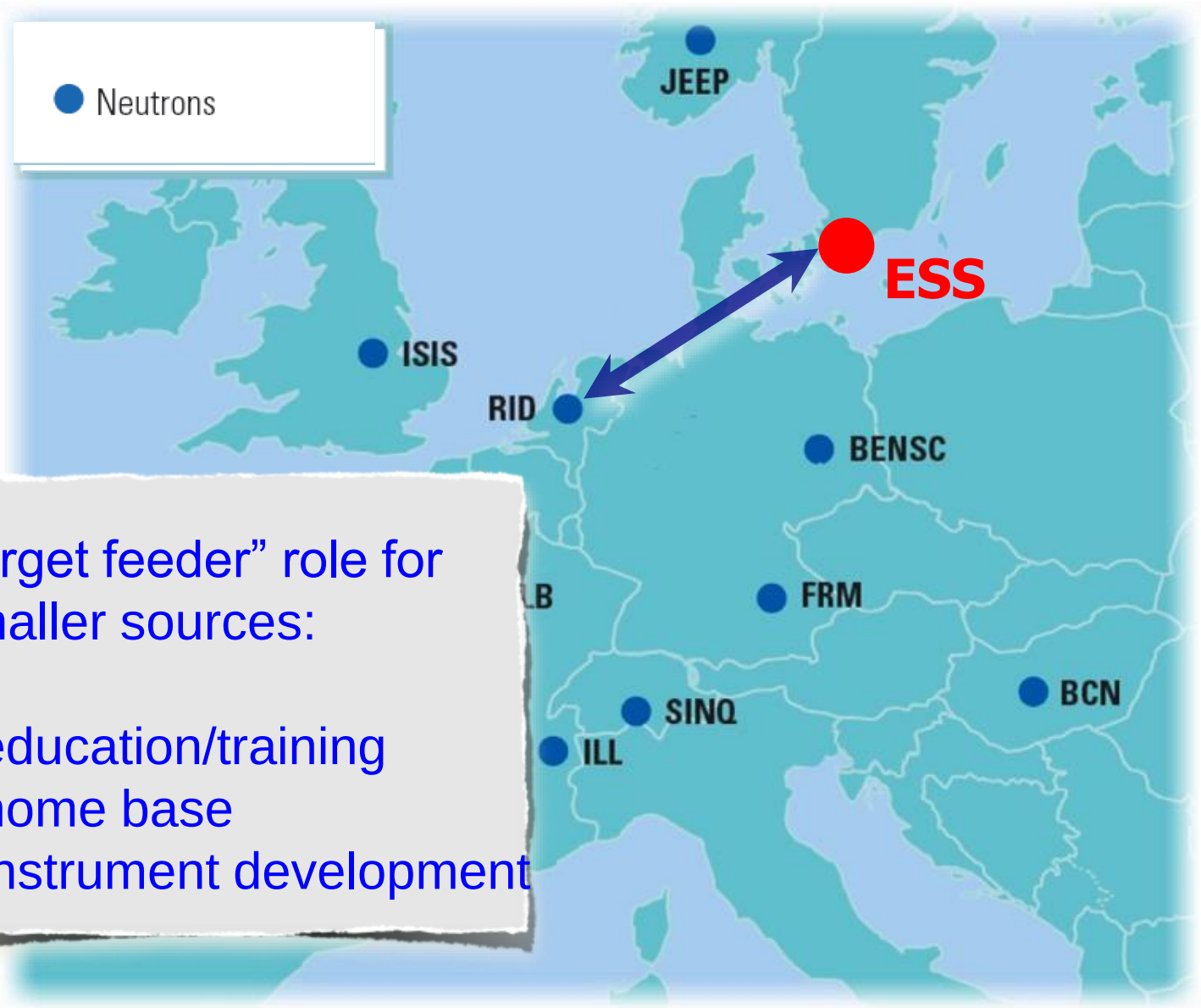
societal relevance: health

new techniques new materials



TUDelft

Unique *knowledge centre* in Northwest Europe



"target feeder" role for smaller sources:

- education/training
- home base
- instrument development

source: GENNESYS White Paper 2009
(Grand European initiative on Nanoscience and nanotechnology using NEutron- and SYnchrotron radiation Sources)

OYSTER neutron instrumentation

PEARL

FISH

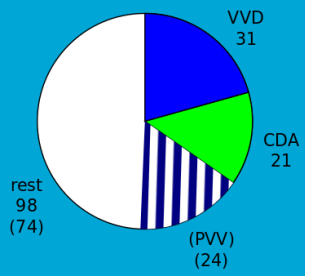
ROG

SANS

SESANS

NDP

OYSTER granted



Nieuwsbericht | 20-01-2012

Het kabinet geeft met 38 miljoen euro een extra impuls aan de Hoger Onderwijs Reactor van de TU Delft. Dat heeft staatssecretaris Zijlstra vrijdag 20 januari bekend gemaakt.

Met deze impuls kan de TU Delft haar investeringsprogramma OYSTER uitvoeren. De huidige reactor wordt naar de laatste stand van wetenschap ingericht en ingezet voor onderzoek, onderwijs en innovatie. Daarmee verzekert Nederland zich van een internationale rol van betekenis op het terrein van nucleaire kennis en expertise en van continuering van zijn vooraanstaande plaats in de mondiale nucleaire gemeenschap.

De totale investering bedraagt over een periode van 10 jaar 117 miljoen, waarvan zo'n 74 miljoen via de TU Delft zelf.

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Developments

- 10EVA → aging management
- 9/11 security upgrade
- decommissioning → 2050
- Fukushima → stresstest

- IAEA Collaborating Centre

aging management

Why we can operate till 2050:

- 2MW reactor = low fluency compared to e.g. the HFR (45MW)
- safe shutdown without emergency systems→ choice for run-to-fail strategy only for fail-safe systems
- less redundant systems, which are more complicated to guarantee the availability
- lower temperatures (<40 ^{o}C) and pressures(< 3 bar in the cooling systeem) than power reactors
- open pool type with easy access
- low power means less activation

Of course with good aging management

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- renewal of our license including OYSTER implementing DSR (VOBK)
- renewal of contract with COVRA
- renewal of regulator ANVS

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Reactor Instituut Delft

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development of functional materials

Li-ion batteries