PALLAS
HFR Successor for the Future!

IAEA Safe Management and Effective Utilization

Fred Wijtsma NRG PALLAS
NRG: Nuclear Research & consultancy Group

- The Netherlands’ leading expert;
- First-rate R&D Infrastructure with High Flux Reactor (HFR) and Hot Cell Laboratories;
- 420 nuclear market orientated professionals, providing irradiation services and nuclear consultancy;
- One of the world major supplier for medical and industrial isotopes;
- Turnover € 65 million of which 45% outside the Netherlands;
- Located in Petten and Arnhem, but activities are world-wide!
‘Petten’ Marks Fifty Years of Forward Thinking

A series of unique events in November 2011 found at: www.petten50years.eu

Three Milestones:

- The signing of the so called ‘site license agreement’ 25th of July 1961 between the Dutch Government and The European Commission;
- The High Flux Reactor (HFR) first criticality achieved on Friday 9 November 1961;
- 2011: daily 24,000 treatments worldwide with HFR products.
The High Flux Reactor in Petten

Key Aspects

- 1961: Start full operation;
- 1984: Reactor vessel replacement;
- 2006: HEU – LEU conversion;
- Increase of maintenance costs;
- Risk of reduced availability;
- Change in use over lifetime;
- Identified need for replacement reactor: PALLAS!

Fifty years of experience in running the HFR is the basis for defining PALLAS
Design and Safety Requirements

- Renewal of site evaluation and characterization;
- Redundancy and diversity for safety systems;
- Common cause/mode failure proof;
- Defence in depth applying all 5 levels of DiD;
- Full scale PSA (level 1 to 3);
- Independent of existing HFR infrastructure and utilities;
- Largely based on NPP requirements but using graded approach;
- Second shut-down system and secondary control room;
- Influence of Fukushima accident evaluation.

Main feature: Fully compliant with IAEA safety guides and international good practice!
Technical Requirements for PALLAS

- Tank-in-pool reactor type;
- Flexible power level from 30 to 80 MW;
- Isotope production requirements with nuclear research capabilities in the reflector zone and reactor core;
- Fuel and targets fully LEU: Uranium-silicide but suitable for UMo;
- Additional requirements expected from Dutch licensing authorities:
  - Withstand high internal pressure;
  - Aircraft crash (both military and commercial type);
  - Long “grace period” in case of accidents (including BDBA);
  - Core Damage Frequency < 10^-6;
  - Post-Fukushima requirements.

Main feature: Flexible design for NRG’s business of tomorrow!
Business Case PALLAS

- The BC PALLAS shows that cost of capital (equity & loans), operations and decommissioning can be paid for.

- The business focus is on the production of (medical) isotopes and on irradiation services to the nuclear industry.

- The business case PALLAS meets the requirements for support as stated by the Dutch government in their letter to parliament.

- This business case enables the project to finance the design, licensing and construction.
PALLAS Project History 2002 - 2011

- **2002 – 2006:**
  - Necessity for HFR replacement investigated;
  - PALLAS project gained broad society support.

- **2007:**
  - Preliminary requirements for PALLAS drafted;
  - Licensing procedure discussed with licensing authorities.

- **2008:**
  - Employer Requirements Specification finalised;
  - Tendering procedure started on the basis of an EPC-contract.

- **2009 - 2011:**
  - Contractual negotiations discontinued;
  - Participation of stakeholders in architectural aspects;
  - Environmental Impact procedure started;
  - PALLAS organization erected.
PALLAS Line Organization

PALLAS Project Board

Management Team

Project Director

Executive Secretary

Contract Manager

SHEQS Manager

Public Relations Manager

Senior User

Project Manager

Senior Supplier

Project Office Manager

Design Control Manager

Construction Control Manager

Commissioning Manager

Licensing Manager
PALLAS Nuclear Island

One EPC-agreement based on functional specification (URS):

- EU tender procedure for competitive dialogue and consultation between employer and qualified suppliers
- System responsibility lays with main Contractor
- Deliverables:
  - Nuclear Reactor and associated infrastructures;
  - Commissioning isotope production rigs;
  - Commissioning experimental devices and loops;
  - Auxiliary and EI&C systems;
  - Building and building related systems.
- Facility and rig design to be based on HFR experience.
PALLAS Off Plot Scope (OPS)

Contracts to be placed via Engineer & Contractor:

- OPS comprises the following systems:
  - Off-site power supply (25 km supply line);
  - Secondary cooling water supply;
  - Renewal of site utilities (e.g. gas, potable water, sewage system);
  - Independent fire fighting systems;
  - Renewal of security infrastructure (“security by design”);
  - (Temporarily) site infrastructure (e.g. roads, offices, etc.).

- All other SSCs necessary for realization and operation of PALLAS;

- Nuclear Island dictates the content of the OPS.
Decision Making “Progress”

- Decision making progress strongly influenced by:
  - Economical situation in the EU member states;
  - Fukushima accidents and subsequent EU stress test;
  - Predicted worldwide financial crisis.

- Four (4) Dutch ministries involved in decision making process:
  - Ministry of Economic Affairs, Agriculture and Innovation;
  - Ministry of Health, Welfare and Sport;
  - Ministry of Education, Culture and Science;
  - Ministry of Finances.

- Political support of all major parties is in place;
- Political decision has been positive, however financing still pending!
PALLAS: Status of Today

- Sound Business Case based a.o. on OECD findings and recommendations;
- Users Requirements Specification, Project plan and Licensing Plan available;
- Major project risks with respect to planning and costs due to the Dutch requirements exceeding the IAEA requirements for R&D reactors;
- Project Management Manual compliant with ISO-9001 & 14001 and the IAEA Safety requirements available;
- Stakeholder management is operational (example Landscaping);
- Financing of the project execution urgently needed and expected soon!
PALLAS 2012 - 2022

- 2012: Tendering
- 2012 – 2015: Licensing, contracting & designing
- 2015 – 2017: Detailed design phase
- 2017 – 2021: Construction and commissioning
- 2022: Acceptance & production
SHOKRAN!

Wadih mafih soal???