What can the first SMRs in The Netherlands learn from the PALLAS-Reactor Project?

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NRG PALLAS

Nuclear. For Life.

PALLAS programme purpose

Medical isotopes

- Secure supply for diagnosis and therapy as the High Flux Reactor has been in operation more than 60 years
- Over 30,000 patients per day worldwide
- New therapy development

Nuclear research

- Strengthen Dutch sector
- New energy technologies development

Energy & Health Campus

- Innovative cluster
- 1,600 direct and 1,600 indirect jobs
- Further development

PALLAS-reactor

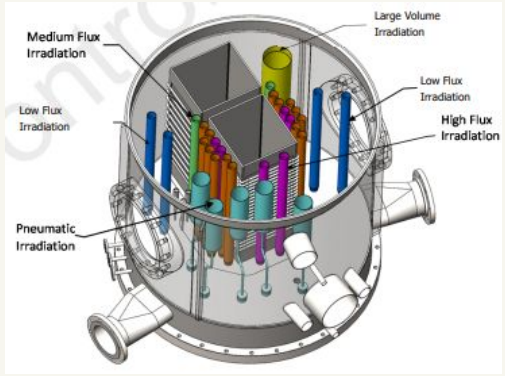
- The PALLAS reactor has a 20 fuel element core (low enriched uranium)
- The core is place in an open pool with light water as moderator and cooling medium
- Around the core there is a reflector vessel filled with heavy water (and partly beryllium) as reflector
- The reactor can be operated with 18 or 19 fuel elements for in-core irradiation positions
- Thermal power is 25 – 30 MW, operating at temperatures 30 – 50 ^{0}C

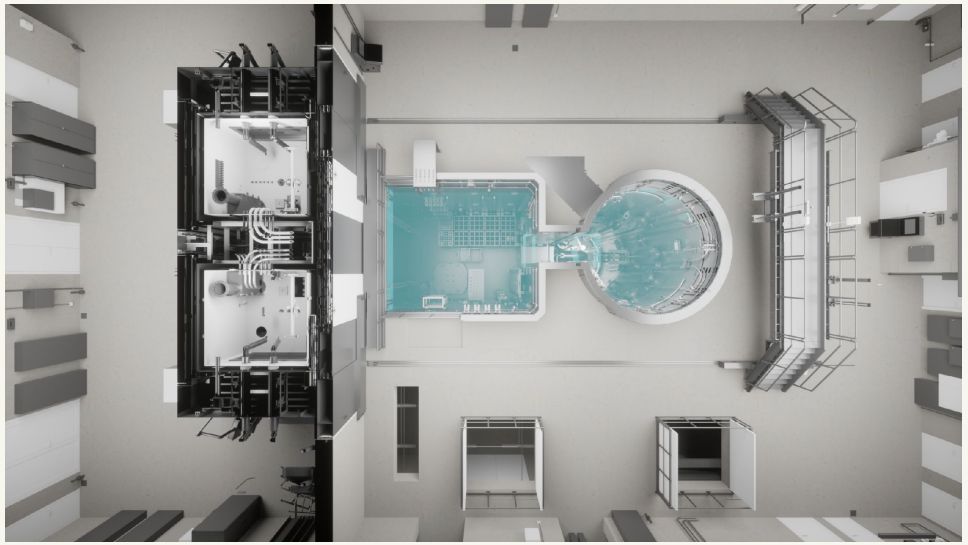
✔ Small

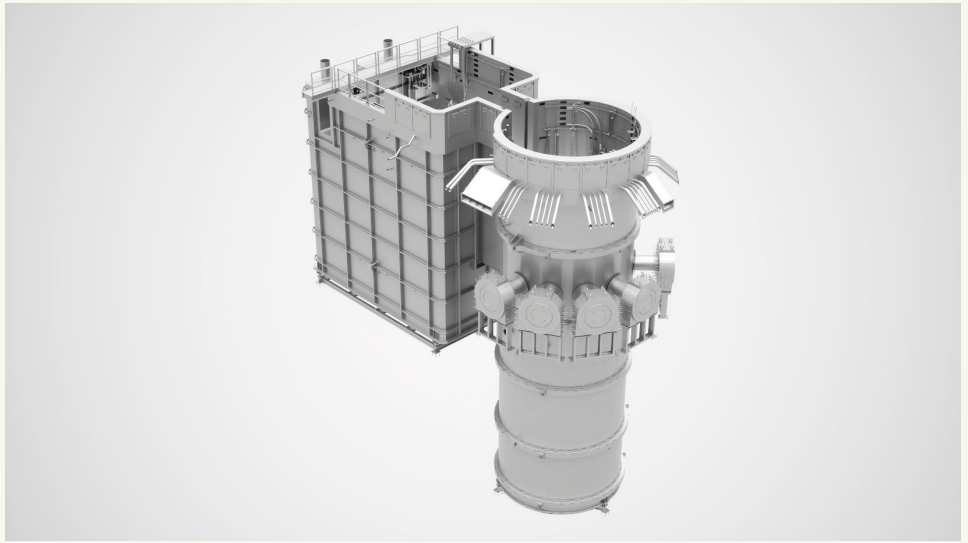
✔ Reactor

≈ Modular

How modular will the first SMRs be?

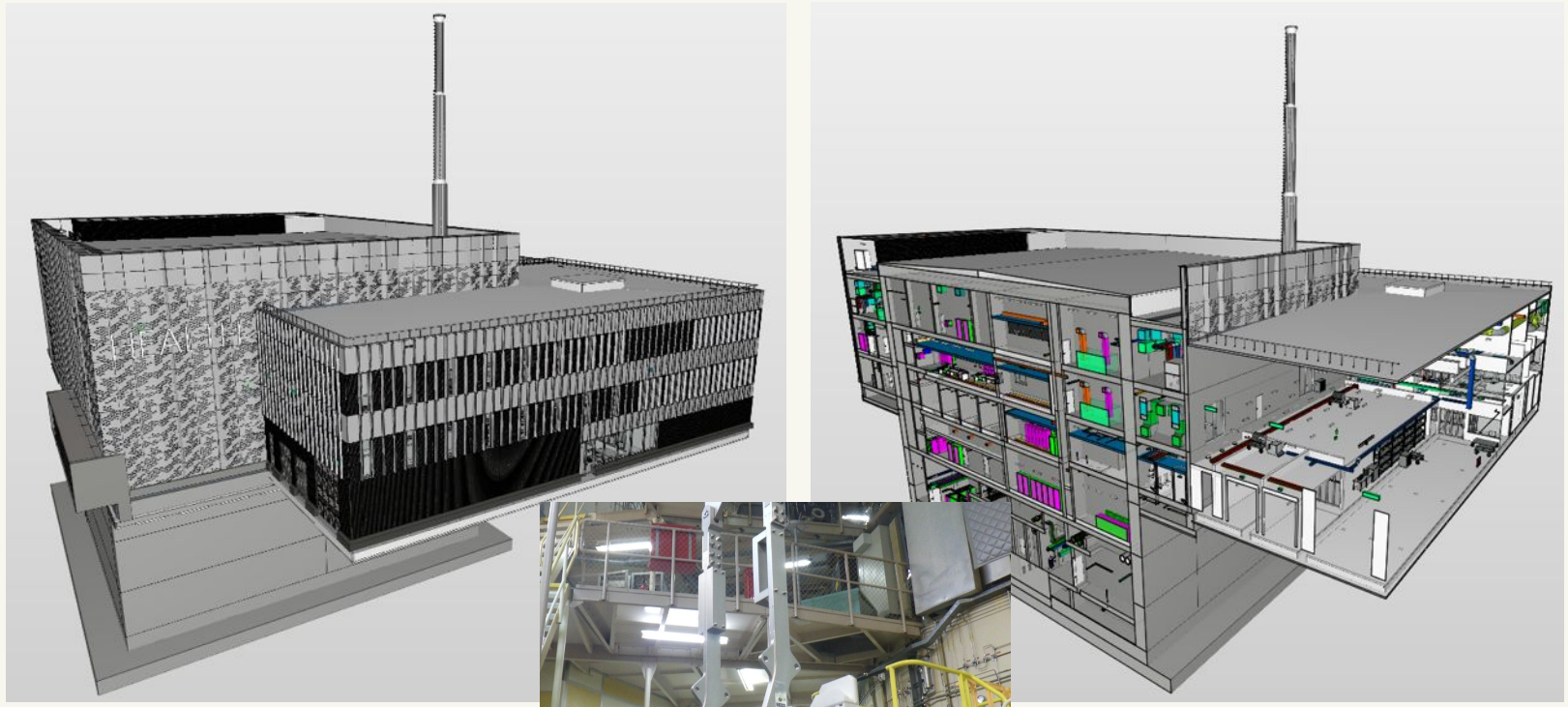






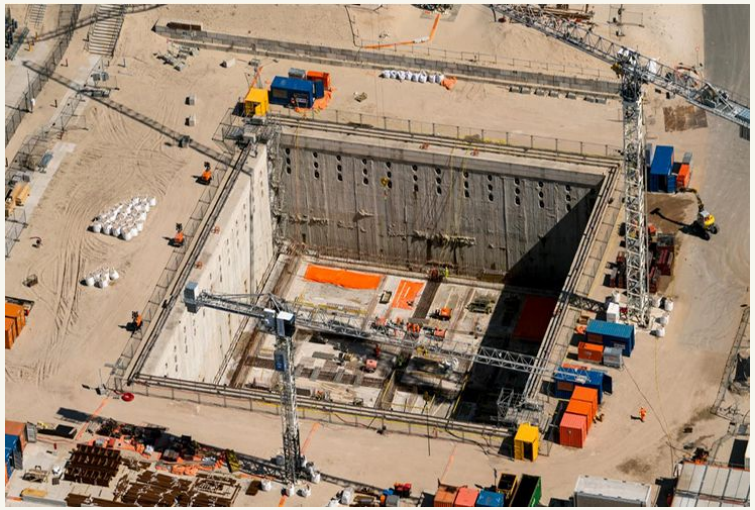
PALLAS-reactor

The Nuclear Island & Logistics Building

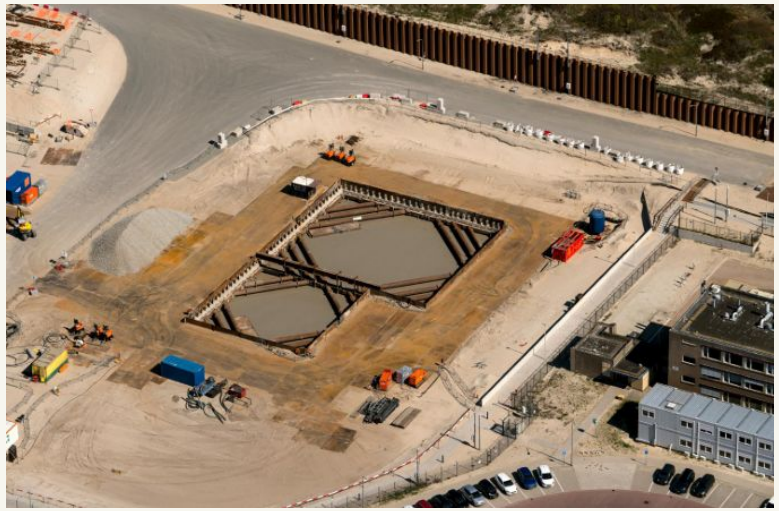


- **Safe & secure design**
  External hazards, flooding, airplane protection
  Cooling and containment
  Security barriers
- **Operations & production**
  6 hot cells
  Logistics of casks
  Intermediate storage
- **Maybe not so small anymore**

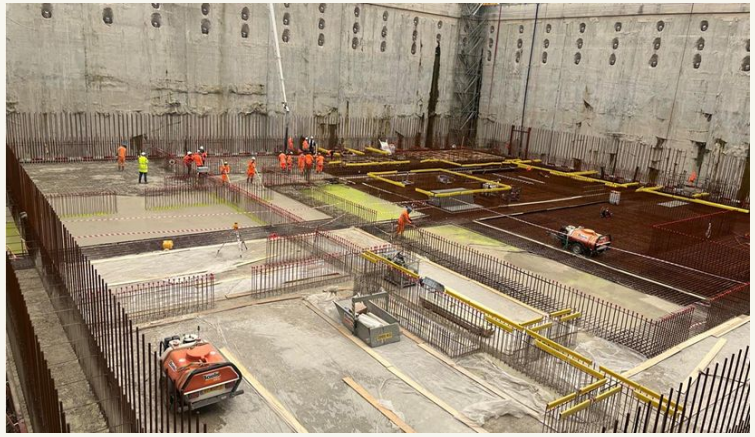
PALLAS Programme: *not so small anymore!*



Aerial overview of concrete pouring -3 floor Nuclear Island



Aerial overview of the SCS building pit



Concrete pouring of -3 floor Nuclear Island

Delivery of inlet pipes of SCS building

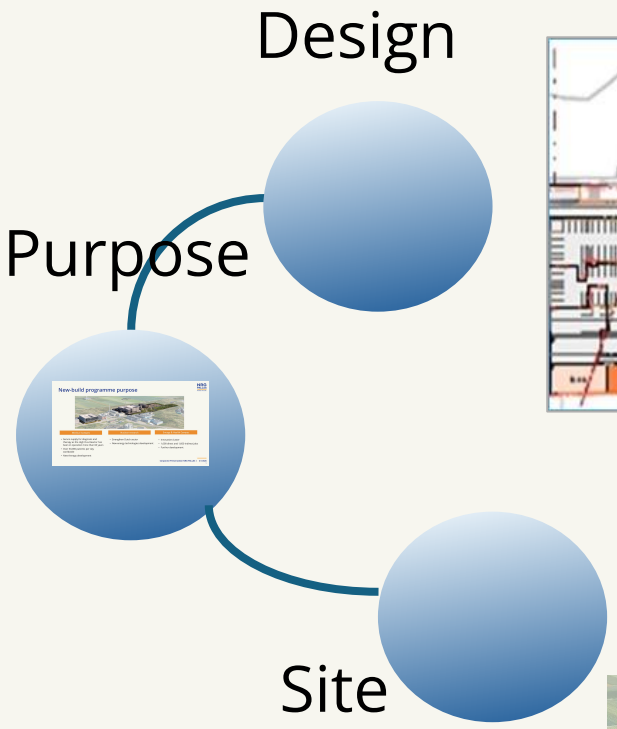
Realization of PALLAS Reactor

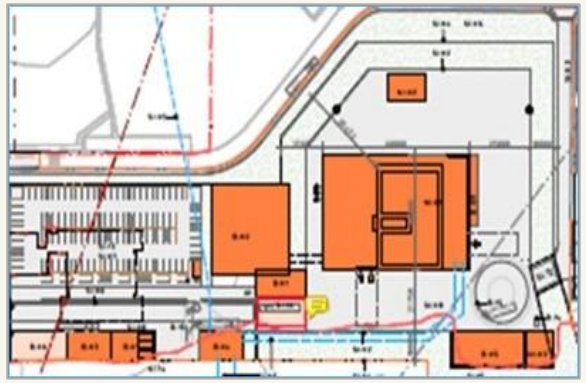
Purpose

New-build programme purpose

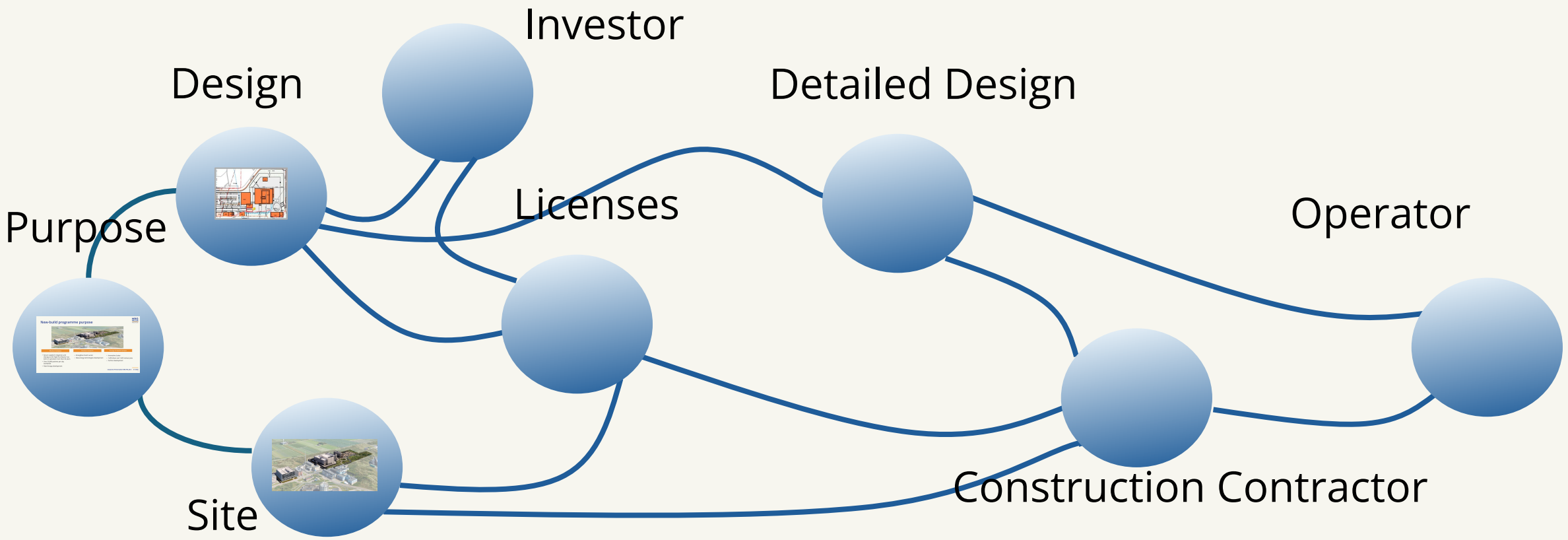
Medical isotopes	Nuclear research	Energy & Health Campus
• Secure supply for diagnosis and therapy as the High Flux Reactor has been in operation more than 60 years • Over 30,000 patients per day worldwide • New therapy development	• Strengthen Dutch sector • New energy technologies development	• Innovative cluster • 1,600 direct and 1,600 indirect jobs • Further development

Realization of PALLAS Reactor

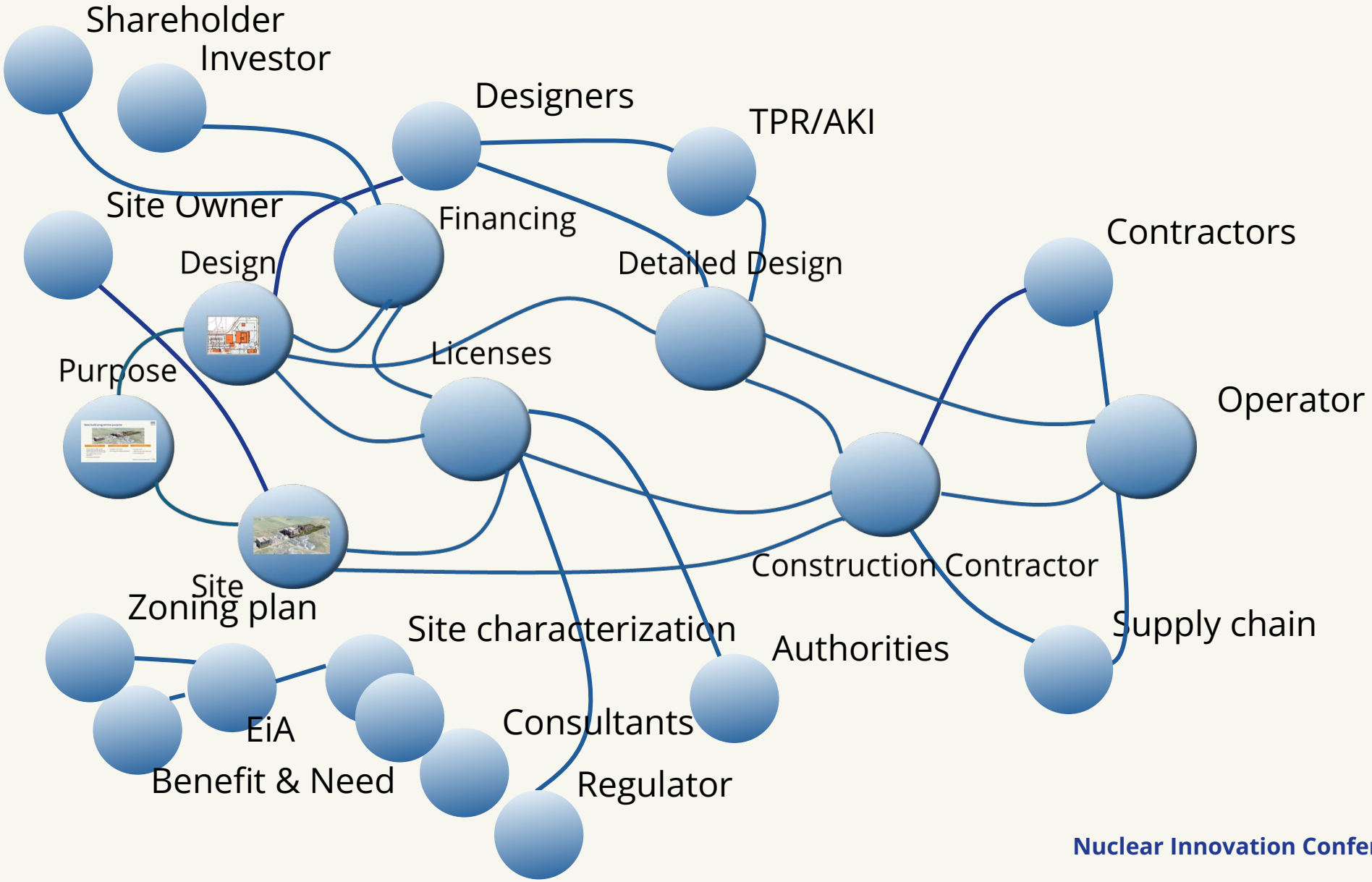




Realization of PALLAS Reactor



Eco-System of connections

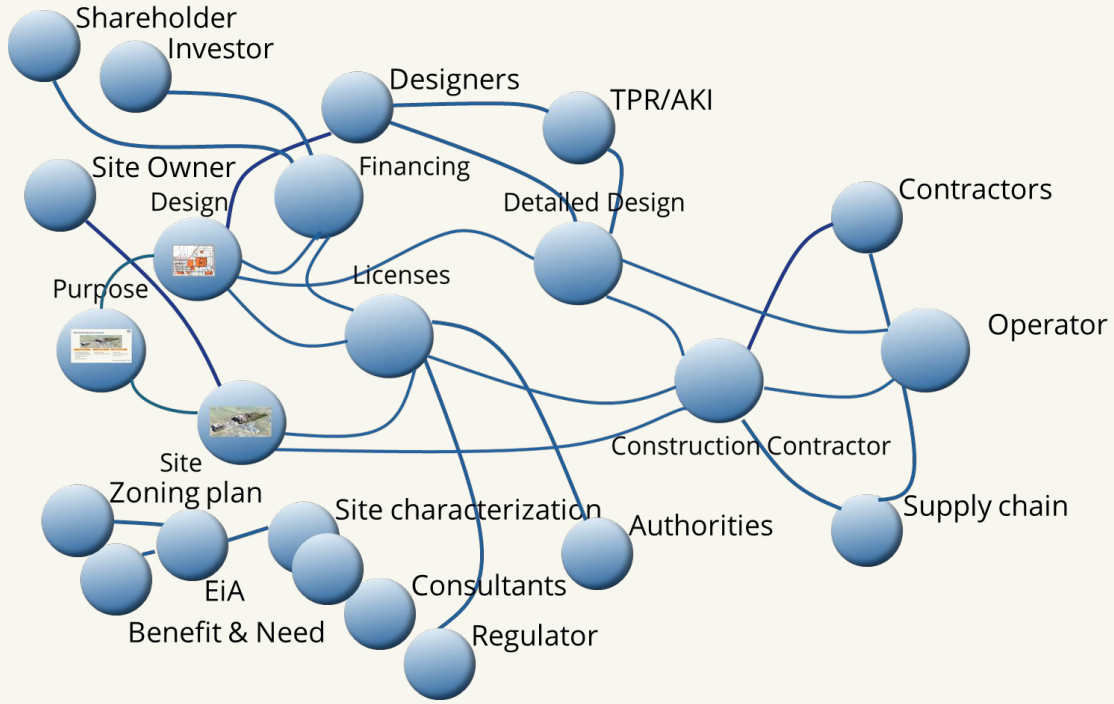


Eco-System of connections

Connecting Concepts to Markets

PALLAS vs SMR

- Build this Eco-System in Nuclear context
- Build Nuclear organization
  - Licensee
  - Intelligent customer
  - Design Authority
  - Operational Readiness
  - Public acceptance and Stakeholder management

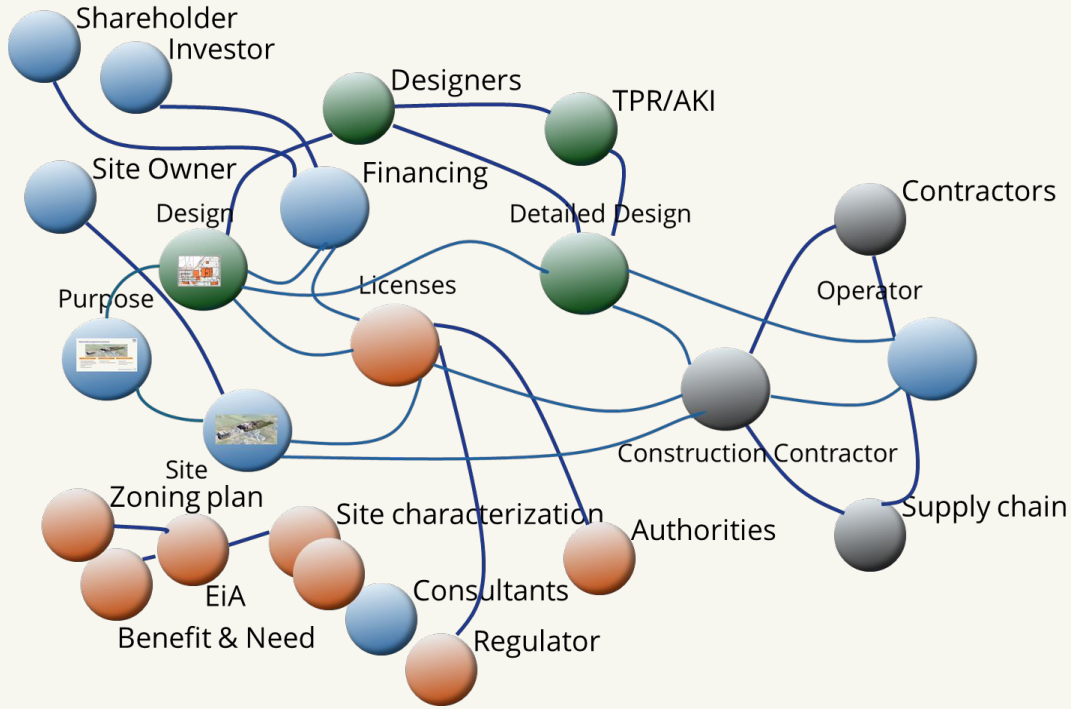


Eco-System of sub-systems of connections

Connecting Concepts to Markets

PALLAS vs SMR

- Build this Eco-System of sub-systems
- Design and get approval
  - Design Maturity
  - Design Authority
  - Independent reviews
  - Regulator approvals
- Nuclear construction
  - Demonstrate compliance
  - QA/QC
- Involve supply chain
  - Nuclear equipment (codes)
  - COTS equipment (conventional codes) made Nuclear



Conclusion

Connecting concepts to markets

- We started with the PALLAS-**concept** more than 10 years ago.
- Now we have a **connection** with the **market** and together we are realizing the PALLAS reactor
- Building and managing this eco-system of sub-systems is the main task of the PALLAS organization
- The total eco-system is as strong as the sub-systems, as strong as the connections within the subsystems
- The eco-systems required to realize an SMR in The Netherlands is **very similar** to the eco-system that PALLAS has built
- The organization required manage the eco-system to realize an SMR in The Netherlands is **very similar** to the organization that PALLAS has built

Questions?

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