

Global Nuclear Energy Partnership (GNEP)

Licensing Considerations and Issues for Global Small-Medium Reactor (SMR) Deployment

Presented to

American Nuclear Society 2006 Winter Meeting

Panel Session on Small-Scale Reactors for GNEP

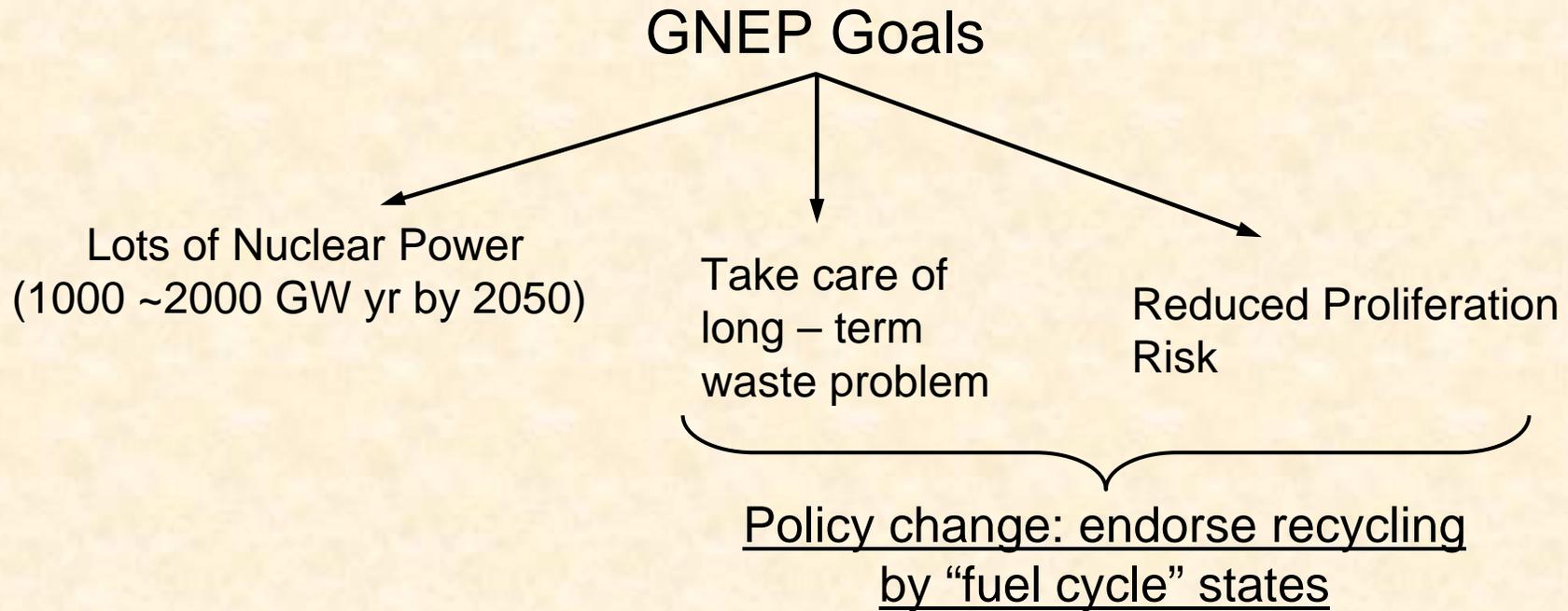
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GNEP Has Three Simultaneous Goals



GNEP Principles:

- Global issues require global solutions
- Spent fuel is an **asset** to be managed – not a waste

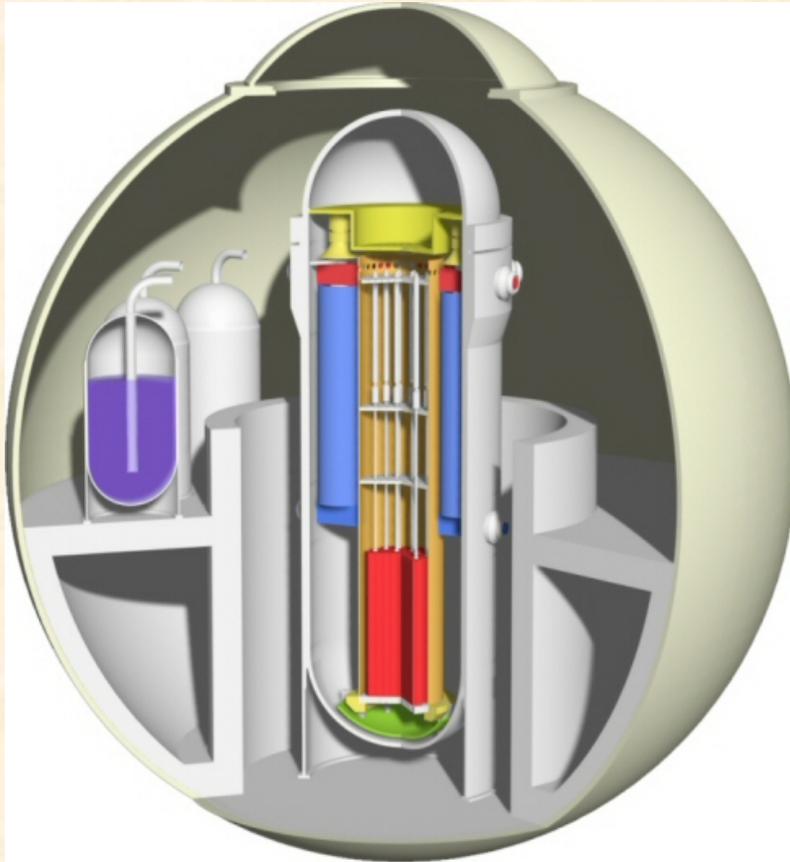


U.S. GNEP Strategy Has Seven Objectives



1. Expand LWR → NP-2010 / Energy Policy Act
 2. Export (L)WR → **Small reactors**
 3. Demonstrate recycle technology for spent fuel management
 - 3a. UREX + (spent LWR fuels) → U Cs Sr
 - ↓
 - 3b. Actinide fuel fabrication
 - ↓
 4. Demonstrate Fast Burner Reactors
 - ↓
 - 3c. Pyroprocessing for ABR fuels
- } **Recycle - No separated Plutonium**
- } **Little Transuranic Waste**
5. Minimize waste disposition to repository
 - Disposition = Spent fuel w/o (U Cs Sr + Actinides)
 - 1 x Yucca Mountain sufficient for long term
 6. Establish reliable fuel services [to “reactor states”]
 7. Enhanced nuclear safeguards technologies [NNSA and IAEA roles]

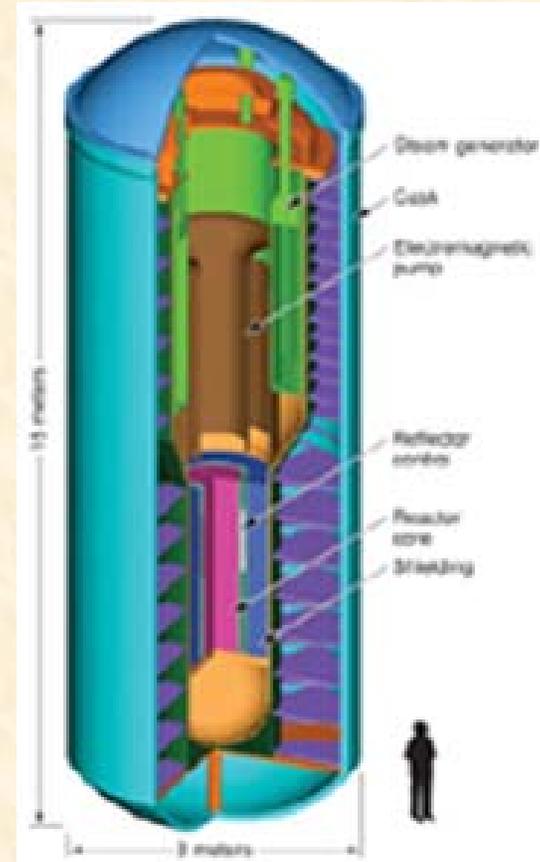
SMR Deployment Considerations



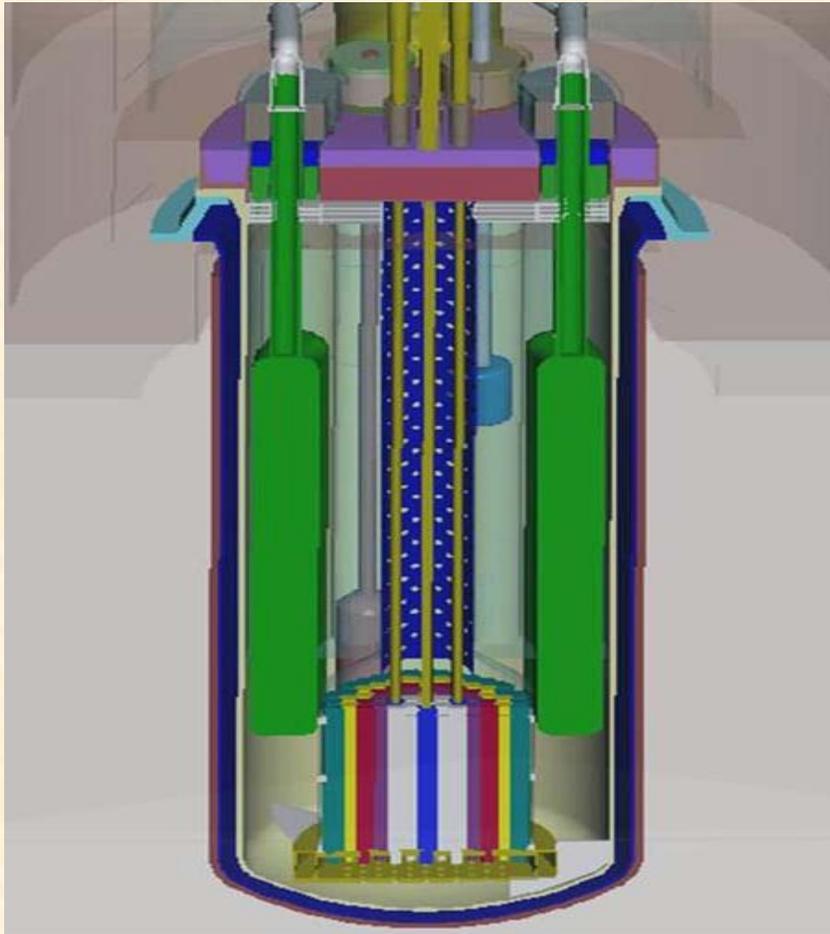
- ***Licensing***
- **Institutional Framework**
- **Technology Considerations**
- **Economics**

SMR Licensing Considerations

- **Multinational Design Approval (Evaluation) Process (MDAP/MDEP)**
- **General Safety Design Characteristics**
- **Specific Safety Design Characteristics**
- **SMR Modularity**



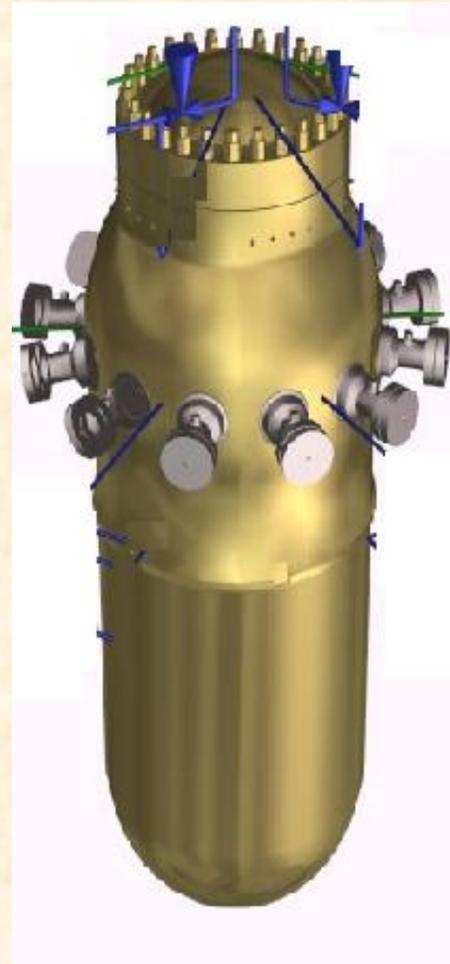
SMR Licensing Considerations – MDAP/MDEP



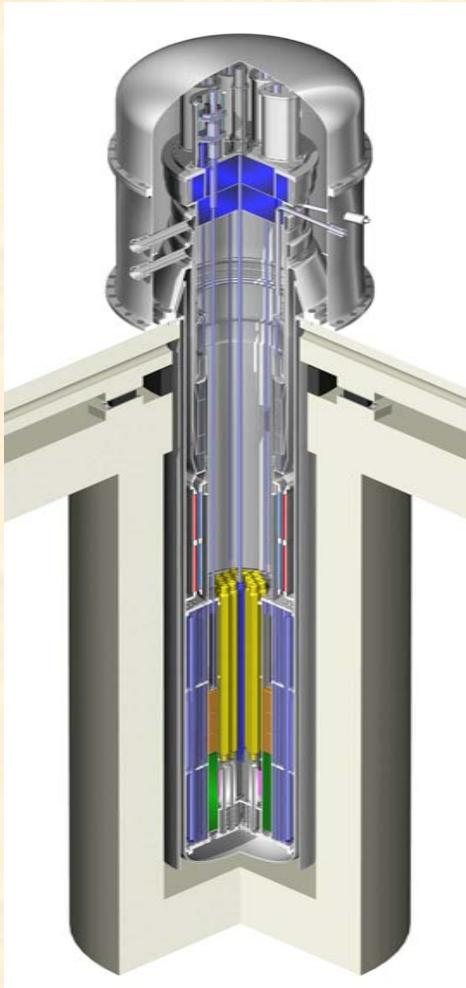
- **Multinational approval process for new nuclear power plant designs**
- **Practical forum for cooperation and convergence of safety issues**
- **Phase 1 – EPR review (Finland / France / U.S.)**
 - Phases 2 & 3: Expanded scope
- **Multinational acceptance beneficial to SMRs**

SMR Licensing Considerations – General Safety Design Characteristics

- **SMRs will be simpler plants → rethink the regulatory framework and approach to licensing**
- **Emerging technology-neutral regulations in the U.S. (10 CFR Part 53)**
- **Role of PRA in SMR design/regulation**



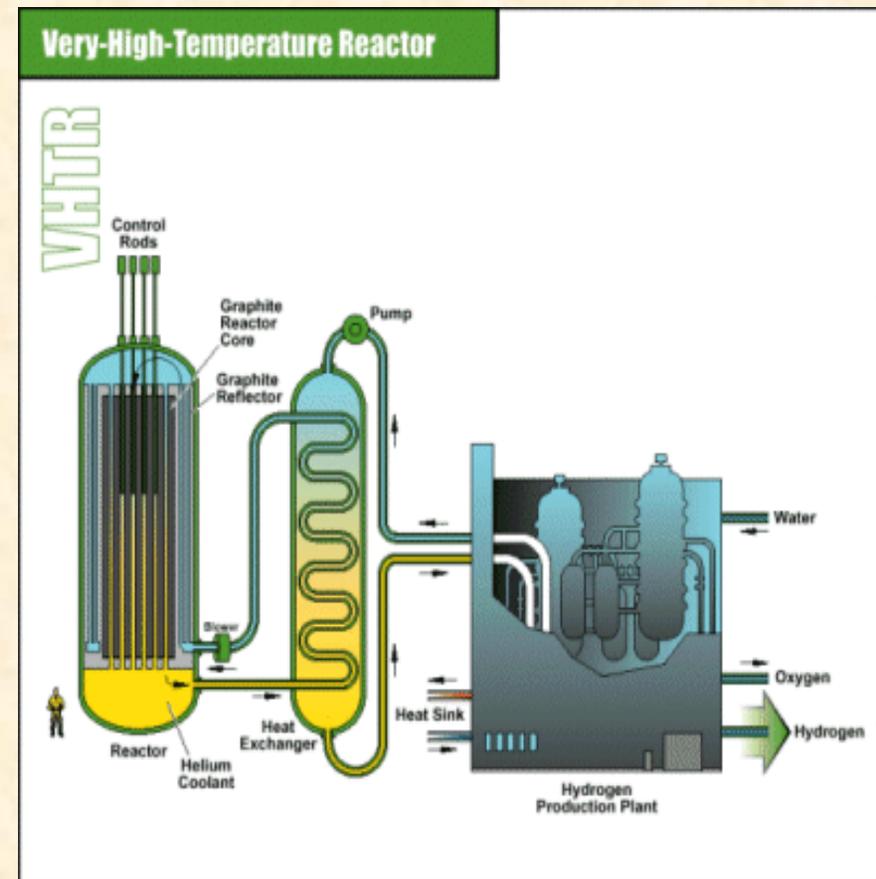
SMR Licensing Considerations – Specific Safety Design Characteristics



- **Non-LWR and non-traditional SMR designs → regulatory acceptance of passive and inherent safety features**
 - Fuel integrity → No need for containment
 - Early operator intervention during an accident not required
 - Source term + safety features → reduced emergency planning zone

SMR Licensing Considerations – SMR Modularity

- **Modular construction considered to be less complicated**
- **Staged completion of multiple units at a single site**
- **Level of tolerable risk needs to be assessed**



Other Licensing Considerations (1)

- **Fuels – Qualification/acceptance of non-traditional or innovative designs**
- **Materials – Interaction with SMR coolants, radiation impacts, high temperature effects**
- **I&C – Use of digital technology, sensor design, automated vs. autonomous controls**
- **Safeguards, security & manufacturing – regulatory assurance for methods employed**

Other Licensing Considerations (2)

- **R&D, testing and analyses**
- **Technology-specific guidance**
- **License-by-test**
- **PRA levels**
- **Role of containment**
- **Workforce for SMR construction/operation**
- **SMR operator training/certification/safety function**
- **Inspectors for remote SMRs**

Summary

- **SMRs are an important component of the GNEP strategy**
- **SMR designs are assumed to be licensable**
- **Licensing issues should be addressed early in the SMR design process**