

第1回日米原子力エネルギー運営委員会について

平成19年7月10日
経文 産 業 省
外 部 科 学 省

1. 背景

- 2007年1月9日 甘利経済産業大臣とボドマン・米エネルギー長官が「日米原子力共同行動計画」の策定に合意
- 2007年4月18日 ボドマン・米エネルギー長官と甘利経済産業大臣・伊吹文部科学大臣・麻生外務大臣が日米原子力共同行動計画に署名
- 2007年4月27日 日米首脳会談で日米原子力共同行動計画を歓迎
- 2007年6月22日 第1回日米原子力エネルギー運営委員会を開催

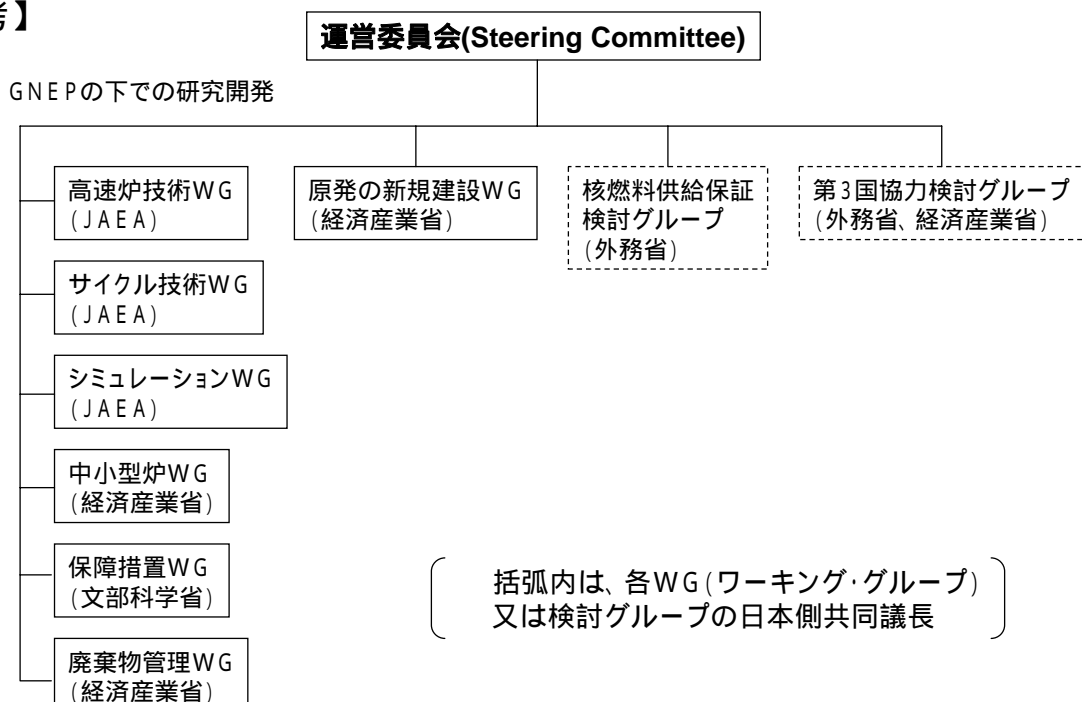
2. 運営委員会の目的

各WG（ワーキング・グループ）や検討グループの進捗状況をレビューすること。

今後の進め方について議論し、各WGや検討グループに対して方向性を示すこと。

各WG及び検討グループが扱えない戦略的課題について議論し、日米で共通のスタンスを形成すること。

【参考】



3．第1回運営委員会の概要

(1) 出席者等

6月22日、ワシントンDCにて開催。

日本側の出席者は、経済産業省、文部科学省、外務省、JAEA、NEXI、JBIC。

米側は、エネルギー省(DOE)、国家核安全保障庁(NNSA)、原子力規制委員会(NRC)、国務省(DOS)等。

(2) GNEPに基づく原子力研究開発の協力

WGの共同議長が、今後各WGの今後の予定及び検討における課題について報告。

各WG間の連携を進めることに合意。必要に応じて法的枠組みの検討を日米で行うことに合意。

(3) 原子力発電所の新規建設を支援するための政策協調

原子力発電所の新規建設を支援するための金融支援について、今後も日米間の調整を推進することに合意。

(4) 核燃料供給保証メカニズムの構築、第3国での原子力の導入・拡大

課題の重要性についての認識を共有。今後も日米で緊密に協議を行っていくことに合意。

4．その他

6月21日に、アラバマ州の原子力発電所において、ブッシュ米大統領が原子力発電の必要性について演説。

Fast Reactor Technology Working Group



Co-Chairs:

JAPAN: Yutaka Sagayama

US: Robert Hill and Kemal Pasamehmetoglu

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

Washington, DC



Fast Reactor Technology: Mission & Objectives



- **The mission is to jointly pursue key fast reactor research and technology improvements**
 - Capital cost reduction
 - Improved reliability
 - Improved safety
 - Development and demonstration of recycle fuels
- **This work is being conducted in the context of an international concept for an advanced recycle reactor**
- **The objective in Phase I is to identify and initiate promising joint activities**
 - Joint research and technology development in Phase II



Fast Reactor Technology: Topics for Future Collaboration



- **Phase I (through June 2008)**

- Agree on basic specifications of Advanced Recycling Reactor (ARR)
 - Share design targets, requirements, and criteria
 - Comparison study of loop and pool reactor types
 - Identification of R&D items for the selected basic specifications of ARR
- Specify joint candidate fuels and materials
 - Identify research and development issues
 - Evaluate ARR fuel supply issues
- Identify test facility options for joint collaboration
 - Capability and cost estimates for planned test facilities

- **Phase II (through June 2011)**

- Research on cost reduction technologies (e.g., advanced materials)
- Safety technology development and design application
- Recycle fuels performance and safety testing



Fast Reactor Technology Working Group

Fuel Cycle Technology Working Group



Co-Chairs:

US: J.Laidler; JAPAN: T.Sugiyama

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

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Fuel Cycle Technology : Topics for Future Collaboration



- **Aqueous separations**
 - NEXT process, UREX+ process
 - Product conversion
 - Waste products recovery and immobilization
 - Plant design considerations
- **Pyrochemical separations**
 - Head-end processing
 - Metal and oxide fuel processing
 - Waste products recovery and immobilization
- **Fuel fabrication**
 - Advanced oxide fuel fabrication methods
 - Metal fuel fabrication methods
 - Target fabrication methods



Fuel Cycle Technology Working Group

Fuel Cycle Technology : Issues for Steering Committee Consideration



- **There is a need for very close liaison among the related Working Groups**
 - Fast Reactor, Fuel Cycle, Waste Management, and Safeguards
 - Need for regular interaction among Working Group co-chairs
- **Revisions to the U.S. – Japan Joint Nuclear Energy Action Plan**
 - Joint design review of AFCF should be redesignated as a “detailed technical description of the AFCF and comments thereon by Japanese experts”
 - Joint technical evaluation of the proposed U.S. Consolidated Fuel Treatment Center is not possible due to legal issues concerning contractual actions; the U.S. proposes instead to engage in a description and discussion of ongoing engineering and design studies for a large LWR spent fuel reprocessing plant



Simulation and Modeling

(Summary for Steering Committee)



Co-Chairs:

US: Dr. David McCallen; JAPAN: Dr. Norihiro Nakajima

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

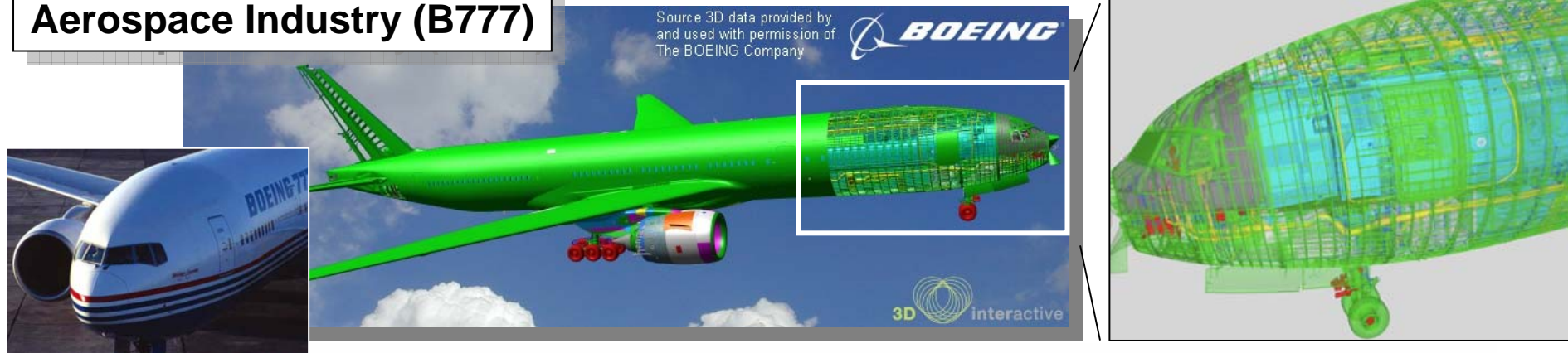
Washington, DC



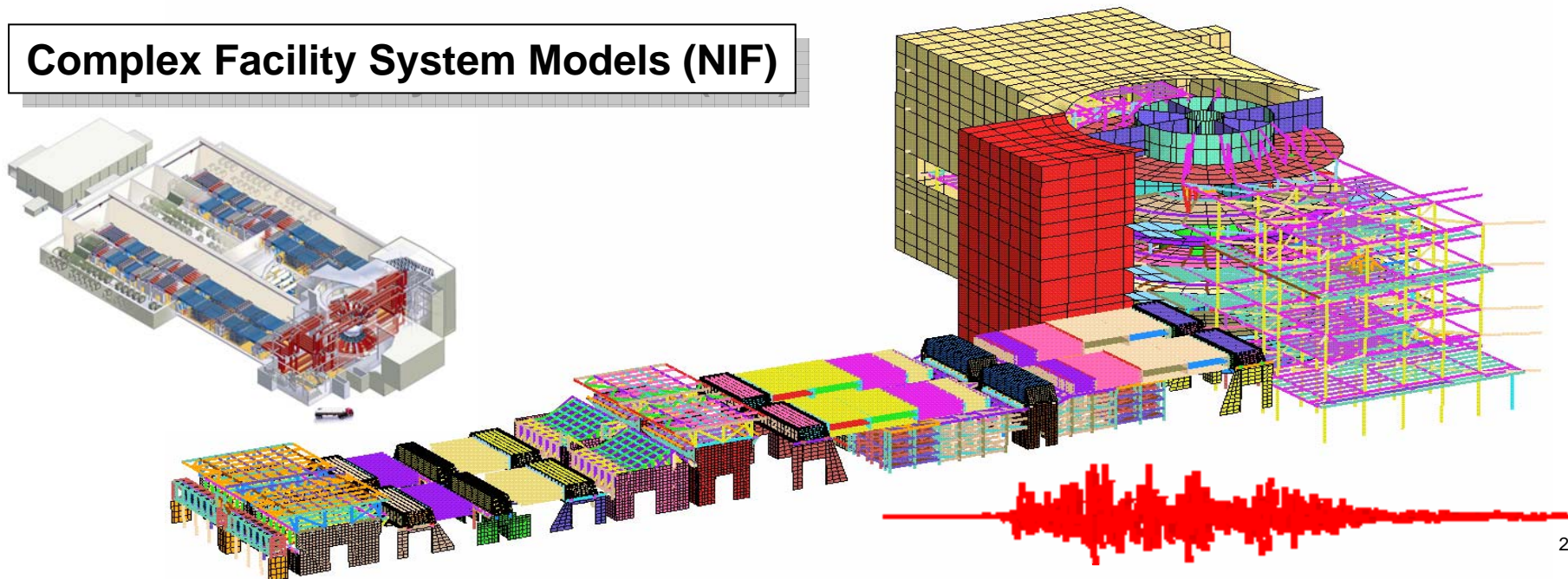
High Performance Computing has transformed the engineering design process in many fields



Aerospace Industry (B777)



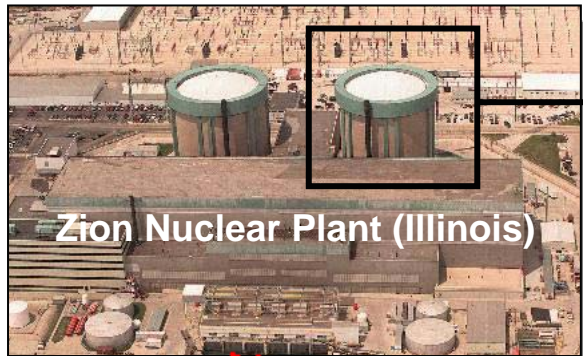
Complex Facility System Models (NIF)



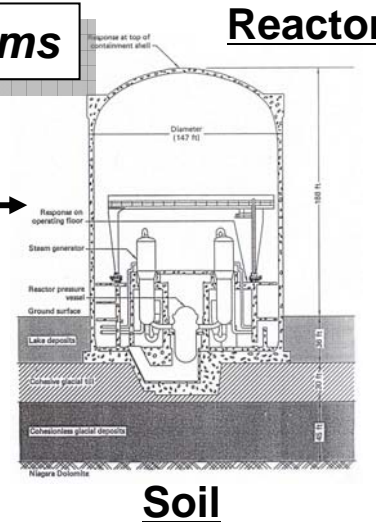
In contrast, the nuclear energy industry has yet to fully exploit **High Performance Computing**



Seismic analysis of reactor systems

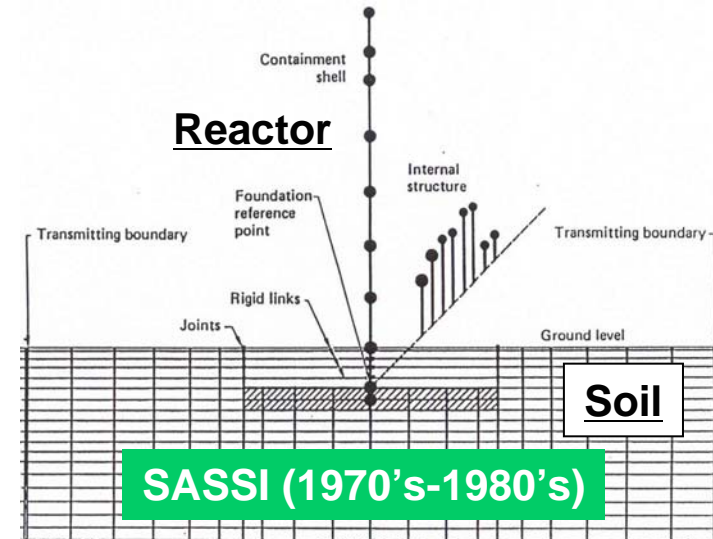


Zion Nuclear Plant (Illinois)

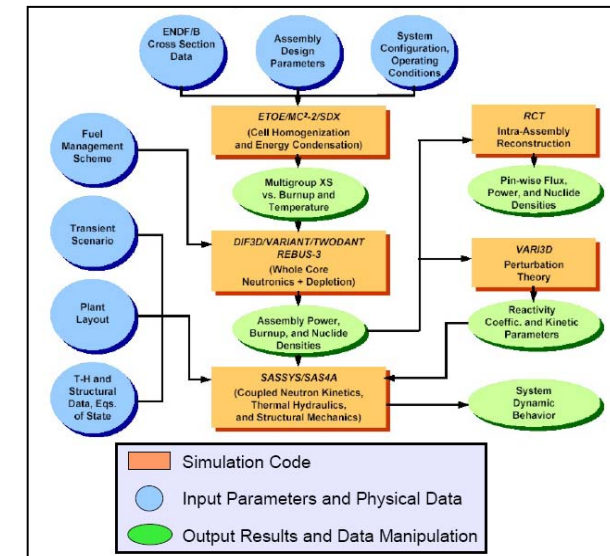
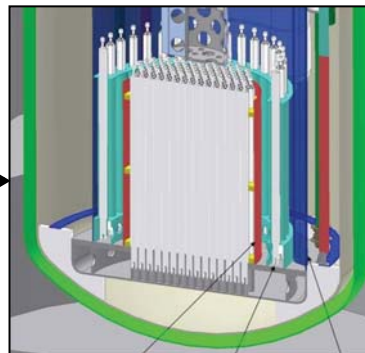
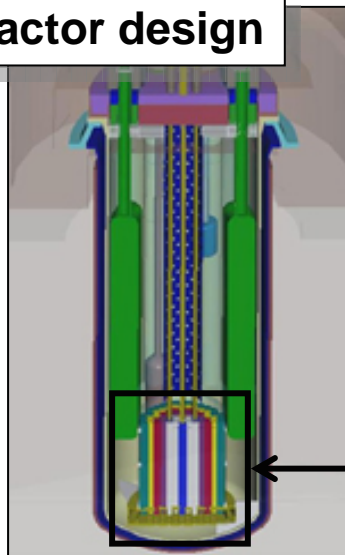


Reactor

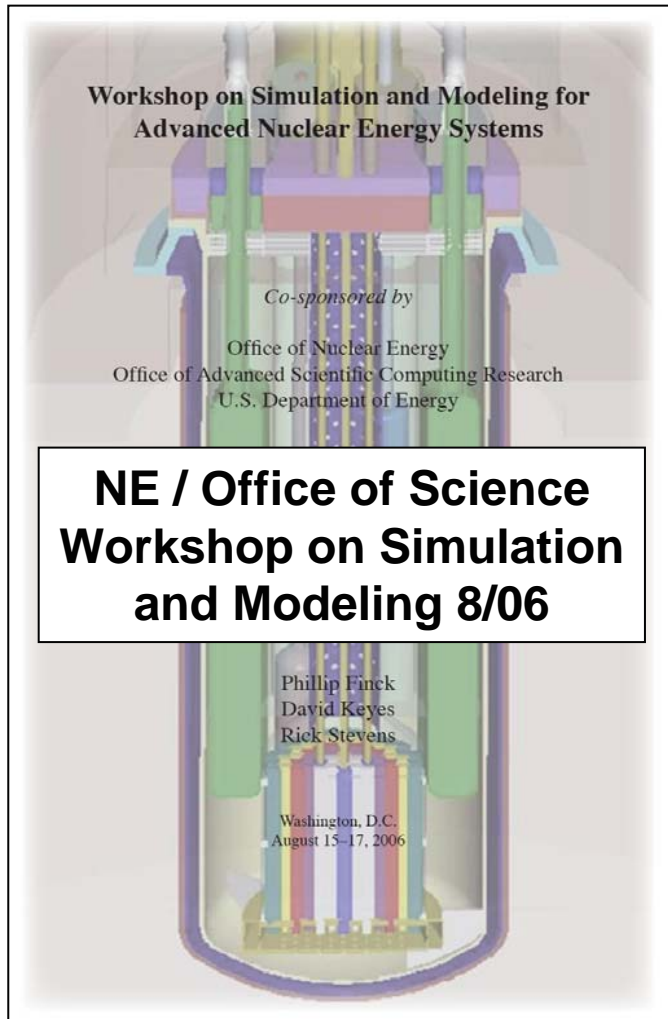
Soil



Fast reactor design



We can draw upon the consensus opinions from the DOE Office of NE / Office of Science workshop



• **Multi-Organization Sponsorship**

- DOE Office of Nuclear Engineering
- DOE Office of Science

• **Broad Participation**

- 170 attendees (2/3 from nuclear community)
- 20 Universities
- 10 DOE National Labs
- International collaborators (**Japan** and France)

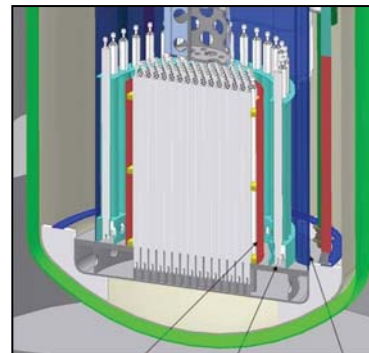
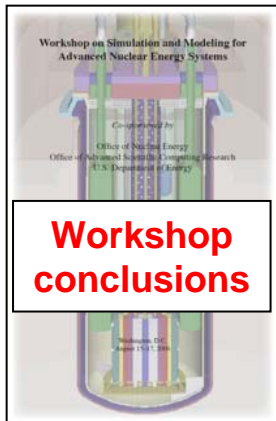
• **Identified Benefits of Advanced Simulations**

- **Improve designs of future reactors**
- **Improve safety**
- **Reduce uncertainty**
- **Reduce the development time of new fuels**

Areas identified for high leverage/ high benefit from applications of high performance computing

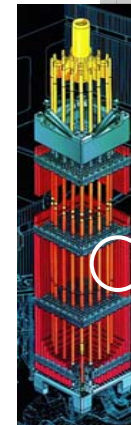


1) Reactor Core Simulation

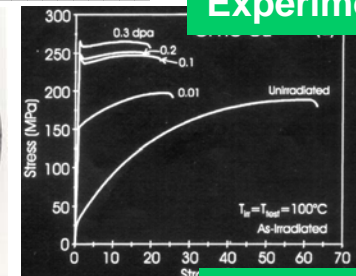
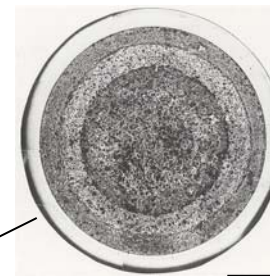


*Reactor core design
(coupled physics)*

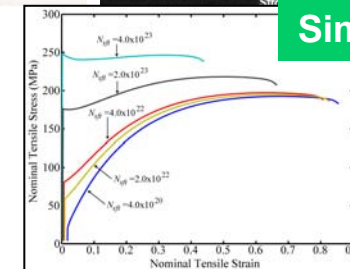
2) Materials and Fuels



*Nonlinear behavior
of fuels and materials*

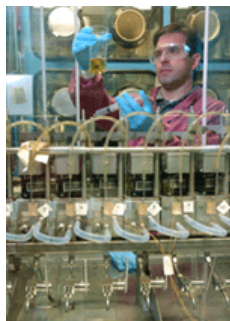


Experiment

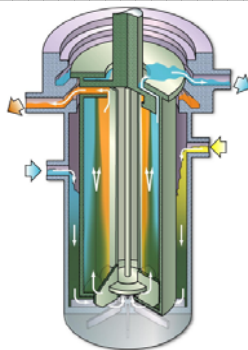


Simulation

3) Separation Chemistry

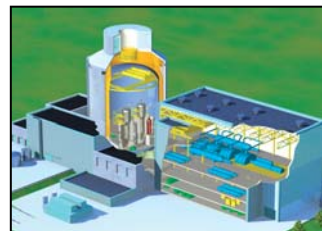


*Laboratory
scale*

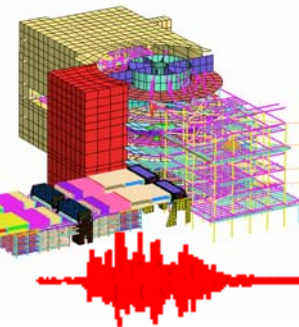


*Industrial
scale*

4) Plant design



Performance-based design



5) Repository modeling

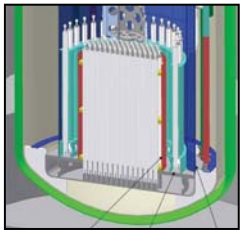


*Repository impacts of
alternate waste streams*

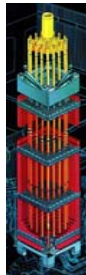
Simulation & Modeling: Topics for Future Japan – U.S. Collaborations



- **Level 1**: Collaborative, comparative discussions on a broad suite of simulation methodologies and needs



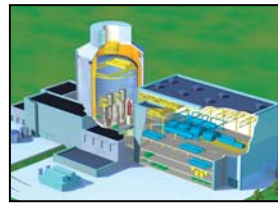
Reactors



Fuels/materials



Separations



Structural/seismic



Repository

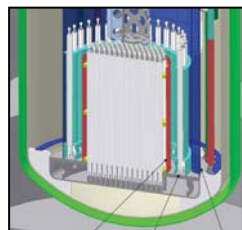


System Analysis,
safeguards
and physical
protection

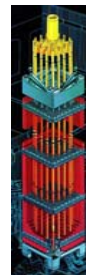
← Simulation is cross cutting →

- **Level 2**: Collaboration on focused code development and code validation activities

Three
leading
candidates:



Reactors



Fuels/materials



Structural/seismic, plant system

Simulation and Modeling: Issues for Steering Committee Consideration



- **Validation**

- Steering Committee should validate final Level 2 areas identified for code development focus

- **Communication**

- Steering Committee should ensure priority of timely communications across working groups (especially important for simulation working group)

- **Security**

- Computer security for collaboration on software development will be essential, Steering Committee can facilitate this at high levels

US-Japan Working Group on Small and Medium Reactors



Co-Chairs:

US: Rob Price; JAPAN: Koichi Noda

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

Washington, DC



Small & Medium Reactors: Mission & Objectives



- **Mission**

- To support a large-scale increase in the worldwide use of clean, safe nuclear energy without increasing the risk of nuclear proliferation through the development of Small and Medium Reactors (SMR) that are appropriately sized and designed for developing countries

- **Near-Term Objectives**

- Develop common set of high-level system requirements for SMRs suitable for developing countries
- Identify and conduct joint R&D in the field of innovative SMR concepts that meet proliferation resistance, safety, and other established requirements
- Assessment of U.S. and Japan reactor concepts relative to agreed requirements



SMR Working Group

Small & Medium Reactors: Topics for Future Collaboration



- Phase I (2007 - June 2008)
 - Development of common set of high-level requirements for SMR designs
 - Development of follow-on Work Plan for SMR-WG including possible R&D activities and assessment of U.S. and Japan SMR concepts
- Phase II (2008 -)
 - Mutual technology R&D relevant to SMRs (fuels, materials, instrumentation, etc.)
 - Assessment of U.S. and Japan reactor concepts relative to agreed high-level requirements



SMR Working Group

Small & Medium Reactors: Issues for Steering Committee Consideration



- **Initial meeting of SMR-WG was very successful**
 - We agreed on a common vision and objectives for the WG
 - We identified possible near-term collaboration interests
 - U.S. introduced the concept of “GNEP Certification” to address need for high-level SMR requirements
- **SMR-WG will interface with other groups, such as:**
 - Fast Reactor Technology
 - Safeguards and Physical Protection
 - Expansion of Nuclear Energy Group



SMR Working Group

Safeguards and Physical Protection



Co-Chairs:

US: John McClelland-Kerr; JAPAN: Nobuhiro Muroya

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

Washington, DC



Safeguards and Physical Protection : Topics for Future Collaboration



- **Mission** - collaborate in development of safeguards, physical protection and proliferation resistance for future nuclear fuel cycle facilities.
- **Objectives** - examine, identify and engage in R&D activities of common interest
 - Next-Generation Safeguards (Beyond Advanced)
 - Safeguards by Design (e.g., Simulation & Modeling)
 - Physical Protection Systems
 - Proliferation Resistance Evaluation Methodologies
- **Cross-cutting Topics**
 - Simulation and Modeling (3D parametric Studies for SG Analysis)
 - Fuel Cycle Technology (Flow Sheet Options, SRD, Transportation Security)
 - Small and Medium Reactors (Fuel Forms, Operating Characteristics)
 - Fast Reactor Technology (Fuel Forms, Operating Characteristics)



Safeguards and Physical Protection Working Group

Safeguards and Physical Protection : Issue for Steering Committee Consideration



- **Close liaison among the related Working Groups especially in the areas of “proliferation resistance” and “safeguards by design”**
- **Section 2.5 of the Action Plan refers to Proliferation Resistance in the SGPPWG, but Appendix 3, Section 5 does not refer to Proliferation Resistance for the SGPPWG, instead places the topic under the Fuel Cycle Technology WG.**
- **Where should Proliferation Resistance reside?**



Waste Management Working Group



Co-Chairs:

US: James Bresee; JAPAN: Kyoji Yoshino

Steering Committee Meeting

US-Japan Joint Nuclear Energy Action Plan

June 22, 2007

Washington, DC



Waste Management: Topics for Future Collaboration



- **Develop a general approach and methodology for optimization of waste management systems, with applications to a range of future advanced fuel cycles and broad geologic settings and geochemical environments through two interrelated tasks:**
 - Task 1: Analysis of credible nuclear scenarios and resulting waste inventories
 - 1-1 Future scenarios for nuclear energy use
 - 1-2 Waste inventory development
 - Task 2: Waste management system optimization
 - 2-1 Development of repository system concepts
 - 2-2 Advanced waste forms development
 - 2-3 Definition of optimization problems
 - 2-4 Systems analysis



Waste Management Working Group

Waste Management: Issues for Steering Committee Consideration



- **There is a need for very close liaison among the related Working Groups**
 - Fast Reactor Technology, Fuel Cycle Technology, Simulation and Modeling, Small and Medium Reactors
 - Guidance is needed for coordination of systems analysis activities
 - Need for regular interaction among Working Group co-chairs



Waste Management Working Group