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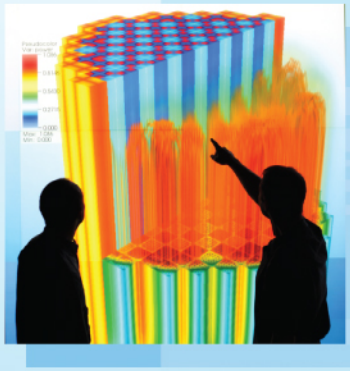
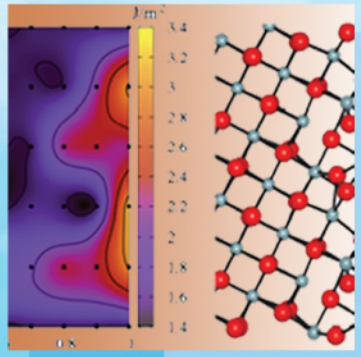
Power uprates
and plant life extension



Engineering design
and analysis

Science-enabling
high performance
computing



Fundamental science

Plant operational data

Consortium for Advanced Simulation of LWRs

Nuclear Energy Institute 2014 R&D Summit "Innovation and Collaboration"

Paolo Ferroni

Westinghouse Electric Company

February 25, 2014

U.S. DEPARTMENT OF ENERGY | Nuclear Energy

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Nuclear Energy Institute 2014 R&D Summit

"Innovation and Collaboration"

Paolo Ferroni, Westinghouse Electric Company

Ronald Reagan Building & International Trade Center
Washington, DC
February 25-26, 2014

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Innovation: easier said than done…in nuclear

- Innovation can be expensive
- Time between incubation and deployment can be long

Hesitancy to start…to make mistakes…to innovate

Difficult "business case" to justify funding

- Strict regulations delay, discourage or make "uncomfortable" replacing a licensed technology
- Technological lock-in: if a class of technologies heavily relies on a learning-by-using principle, there is inertia in leaving the most used one ([1])

[1] R. Cowan, "Nuclear Power Reactors: A Study in Technological Lock-in". The Journal of Economic History, Vol. 50, No. 3 (Sep., 1990), pp. 541-567. Published by: Cambridge University Press on behalf of the Economic History Association

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Role of Collaboration in Innovation

- Collaboration promotes knowledge
- Collaboration enhances creativity
- Collaboration promotes awareness of “real” industry needs
- Collaboration multiplies resources available

Collaboration fosters innovation → Innovation through Collaboration

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Collaboration fosters awareness

Different approach to Innovation by different nuclear communities:

Example: approach to nuclear fuel research ➡

R&D community (academia, labs)	VS	"Design/operation community" (vendors, utilities)
LONG-TERM, SUPER FUEL		SHORT-TERM, COMPETITIVE FUEL

Collaboration fosters awareness of reciprocal needs and limitations

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Innovation-through-collaboration at Westinghouse: three examples

Consortium for Advanced Simulation of LWRs (CASL)

Development of USABLE high-fidelity modeling and simulation capabilities to improve LWR performance

MIT
Univ. of Michigan
North Carolina State Univ.
→ **ORNL**
INL
LANL
SNL
Westinghouse
EPRI
Tennessee Valley Authority

Accident Tolerant Fuel (ATF)

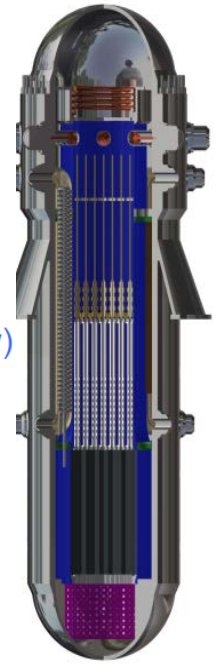
Development of new cladding/fuel materials for enhancing accident tolerance and performance

MIT
Texas A&M Univ.
Univ. of Wisconsin
INL
LANL
→ **Westinghouse**
General Atomics
EWI

Integral Inherently Safe LWR (I^2S-LWR)

Development of a ~1000 MWe, integral PWR concept with enhanced safety

→ **Georgia Tech**
Univ. of Michigan
Univ. Of Tennessee
Virginia Tech
Univ. of Idaho
Morehouse College
Univ. of Cambridge (UK)
Polytechnic of Milan (Italy)
INL
Westinghouse
Southern Nuclear



Government funding opportunities (NEUP, IRP) are often THE initiating events for collaboration/innovation

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CASL Technology

- CASL technology successfully applied at Westinghouse
- Relevant and challenging simulation scenario
- Used to simulate the **AP1000®** PWR advanced first core[1]
- Results documented in a public report

Example of how a mission-driven collaboration can lead to development and early deployment of an advanced technology that is beneficial for real world industrial applications

[1] AP1000 is a trademark or registered trademark of Westinghouse Electric Company LLC, its affiliates and/or its subsidiaries in the United States of America and may be registered in other countries throughout the world. All rights reserved. Unauthorized use is strictly prohibited. Other names may be trademarks of their respective owners

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