

# **The SUNRISE\* Consortium; Nuclear Science and Engineering Education and Research**

**Presenter: Rich Kochendarfer<sup>3</sup>**

Authors:

Joseph Kelley<sup>1</sup>, Farzad Rahnema<sup>2</sup>, Mel Buckner<sup>1</sup>, and Tom Coleman<sup>3</sup>

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<sup>1</sup>Savannah River National Laboratory

<sup>2</sup>Georgia Institute of Technology

<sup>3</sup>AREVA

**\*The Southeast Universities Nuclear Reactors Institute for Science and Education**

# Outline

- Situation with NS&E Education
- Situation with Nuclear Infrastructure
- The Concept
- DOE Leadership
- What & Who is SUNRISE?
- Support for the SUNRISE Initiative
- What is Next?

# The Situation with Nuclear Science and Engineering (NSE) Education

- Reversal in the downward trend in Nuclear Engineering student enrollment – **requires improved infrastructure in education & research**
- Decline in the number of URRs ... from 60+ down to 26
- Universities have been forced to de-emphasize reactor-related course work
  - students receive degrees without hands-on reactor experience
    - in the graduate programs and
    - at universities without reactors
- Evaporating pool of nuclear workers – Engineers, Radiochemists, Health Physicists, and Rad Techs...
- Questionable ability for universities to field a growing workforce to support nuclear renaissance initiatives

# The Situation with Nuclear Infrastructure

- Limited capabilities to support research & development
  - Generation IV
  - Space nuclear power
  - Naval nuclear propulsion
  - Homeland Security; structural, biological, and agricultural systems
- Issues of actual performance versus predicted performance cannot be resolved without experimentation
  - Reactor physics & Shielding
  - Thermal-hydraulics
  - Materials & structures
    - e.g., new fuels

# Concept to Blend Nuclear Education & Infrastructure Needs

- **Twin reactor approach**  
(e.g. Cabria at CEA Cadarache)
  - **Low power critical facility** for
    - Education
    - Mockup of power test reactor setup for verification
  - **High power research reactor** for conducting experiments. Reactor to include
    - Test loops imbedded within energy spectrum buffer region
    - Integral hot cells & analytic laboratories
- The concept would help demonstrate that nuclear energy as a power source and nuclear engineering as an academic discipline are modern endeavors

# Leadership

- DOE catalysts for university programs
  - INIE, the turning point and a path to follow
  - Other DOE-NE programs complement INIE
  - New programs in place at USC, SCSU & UNLV
  - \$24,000,000 requested for FY 2006
- SUNRISE – A new approach to future leadership
  - Strong, broad regional consortium
  - Consolidated, major next generation education and research facilities
  - Reduces economic, safety, and security risks of such major facilities

# What is "SUNRISE" ?

- A grass roots initiative of 18 colleges and universities across 9 southeastern states... and growing
- Focused on the horizon of next-generation nuclear education and research
- Addressing the needs of the growing workforce and technology of the nuclear renaissance
- Will complement and supplement INIE MUSIC consortium (i.e. our 3 existing URRs)

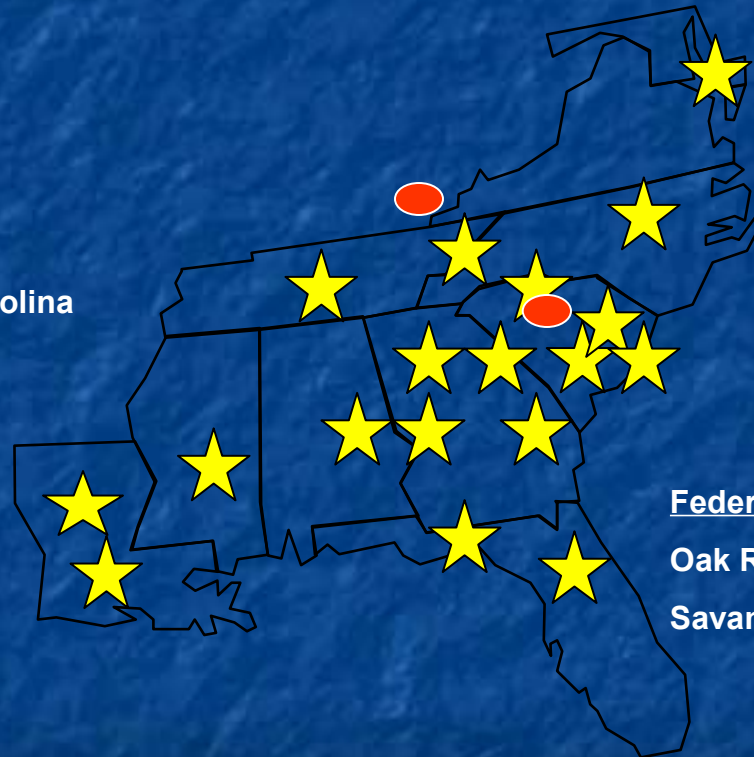
# Who is "SUNRISE" ?

## University Members ★

Clark Atlanta University  
Clemson University  
Florida State University  
Georgia Institute of Technology  
Louisiana Tech University  
Medical College of Georgia  
Medical University of South Carolina  
Mississippi State University  
North Carolina State University  
South Carolina State University  
Tuskegee University  
Tulane University  
University of Florida  
University of Georgia  
University of Maryland  
University of South Carolina  
University of Tennessee  
Vanderbilt University

## Industry Members

Citizens for Nuclear  
Technology Awareness  
Economic Development  
Partnership of Aiken  
and Edgefield Counties  
Framatome-ANP  
Incorporated  
General Atomics  
MWH America's  
Incorporated



## Federal Laboratories ●

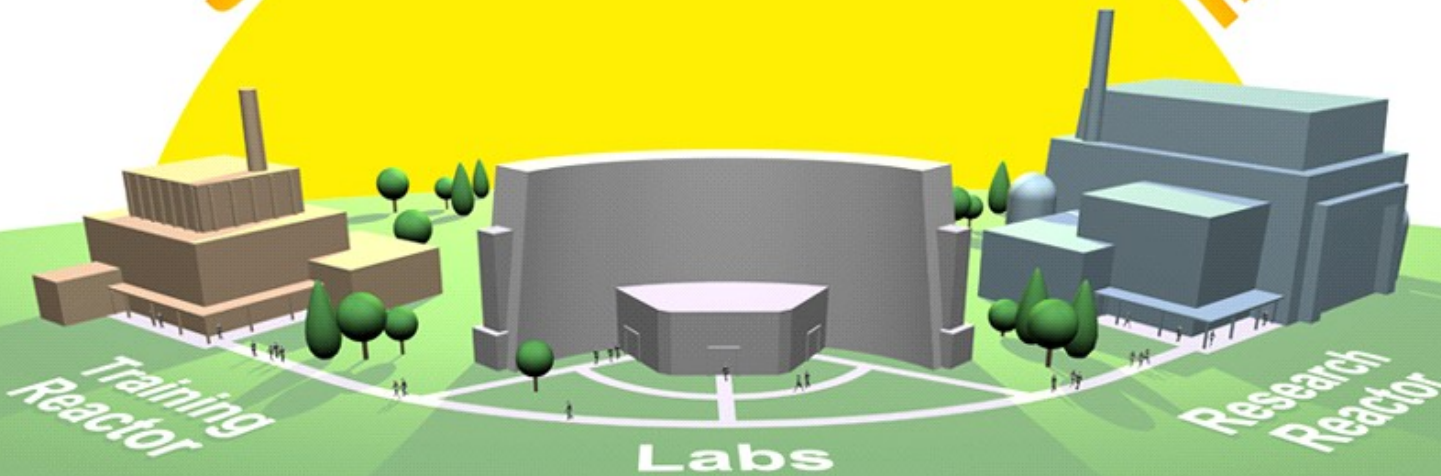
Oak Ridge National Laboratory  
Savannah River National Laboratory



# Broad Based Support for the SUNRISE Initiative

- NERAC – regional reactor user facilities
- House Subcommittee on Energy – general concern at topical hearings:
  - loss of expertise in reactor systems
  - inadequate research funding
  - lack of interest in developing new programs at universities
- House Subcommittee on Energy and Water Development Appropriations
  - recommended next generation research reactor to be hosted at a DOE site
- General concern of ANS, NEI, NEDHO, NRC, DOE, TRTR, and many others for the erosion of nuclear education infrastructure
- Unmet research infrastructure needs
  - e.g., shortage of test reactors to test fuel components

S·U·N·R·I·S·E



SOUTHEAST UNIVERSITIES NUCLEAR REACTORS INSTITUTE  
FOR SCIENCE AND EDUCATION

**Education, Industry, and Government  
Cooperating Today... To Prepare The Nation  
for Tomorrow**

# Functional Requirements

## Training Reactor

Low power, ~ 250kw

Training and education

Hands-on facility

Core mockups

Some research

## Laboratories

Serve both reactors

Neutronic studies

Operational studies

High temperature analysis

Materials and component testing

Nondestructive testing

Medical application/dosimetry

## Research Reactor

State-of-the-art

10 - 20 MW power level

Flux level

~  $10^{14}$  n/cm<sup>2</sup>·sec

High temperature tests

Neutron activation

Isotope production

Gen IV test support

Space Nuclear studies

Defense applications



# Status of SUNRISE

- Preliminary pre-conceptual design of the research reactor (2 concepts evaluated)
- Business Plan Developed
- EOI response to DOE request for nuclear education infrastructure upgrades including new facilities
- NERI proposal for research gap analysis and concept downselect

# Next Steps

- Workshop to develop input on research needs and functional requirements
  - member universities and others outside the region
  - nuclear industry and National Labs.
- Proposal for conceptual design study

Questions?