

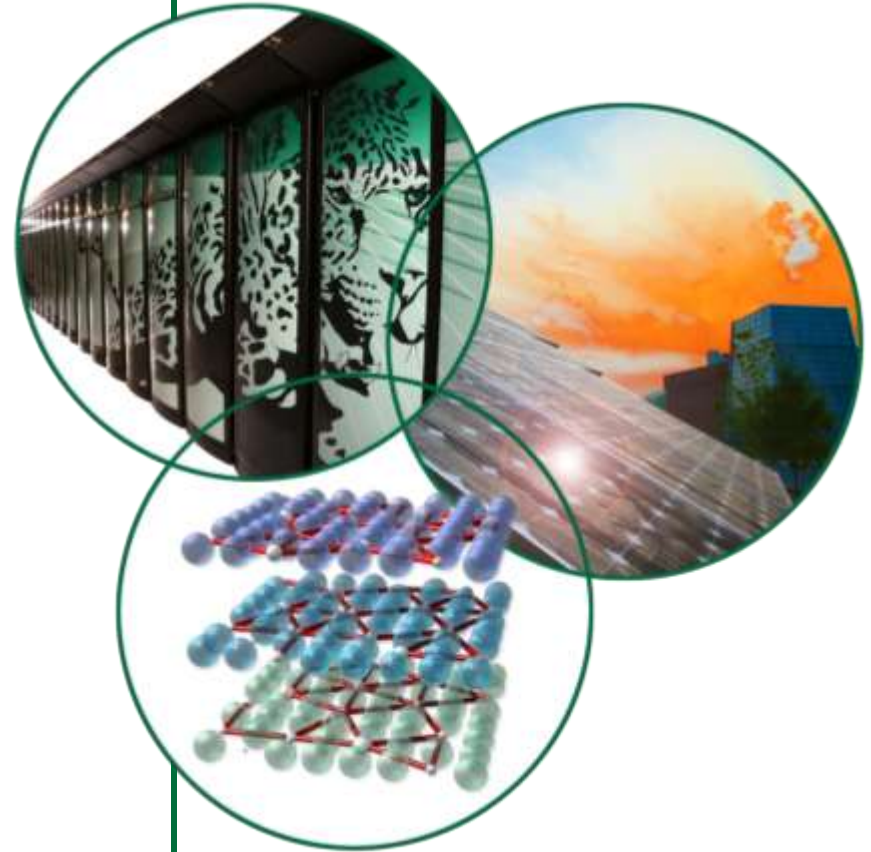


# Biomass Gasification at Oak Ridge National Laboratory

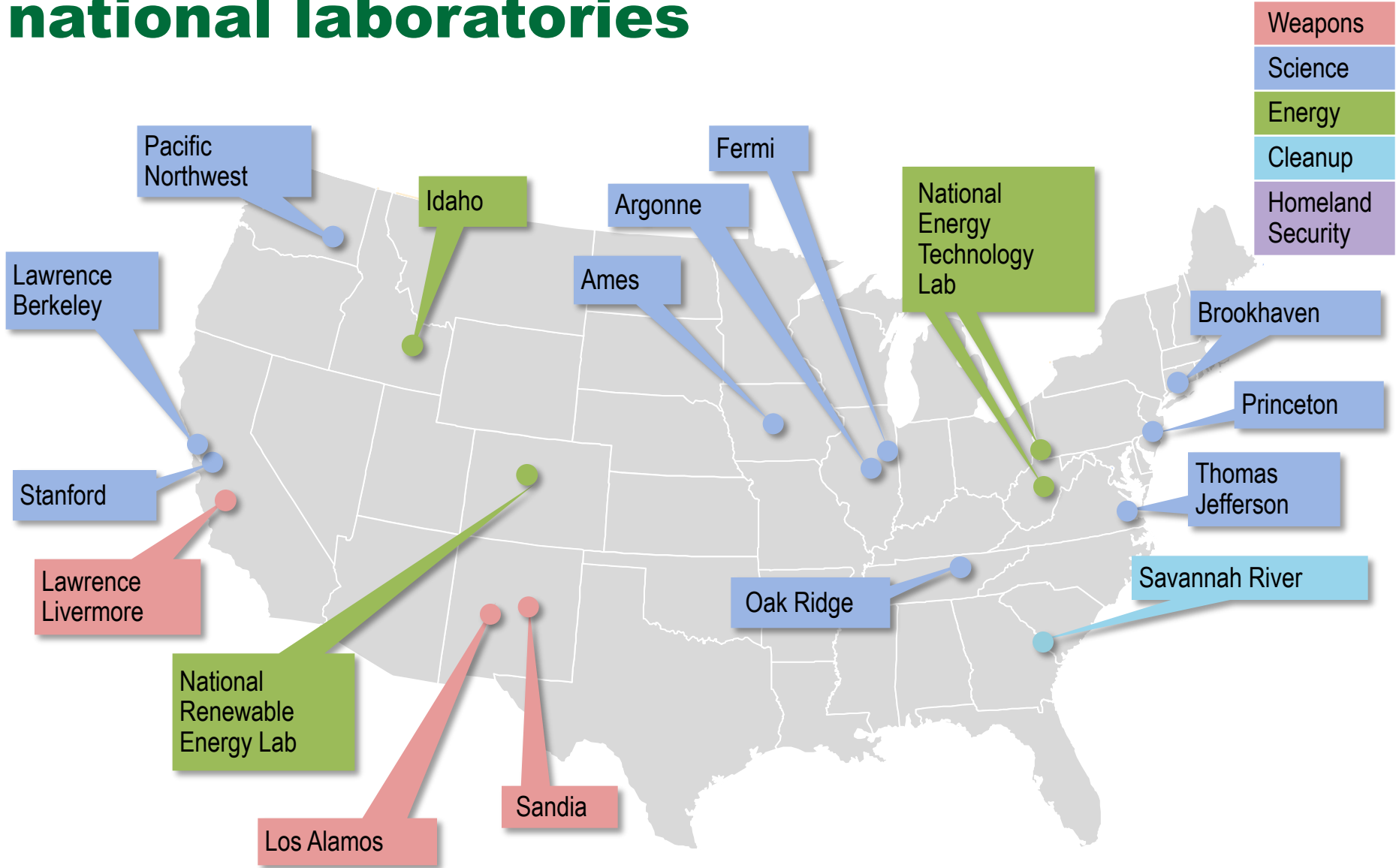
## IDEA Conference

Jimmy Stone  
Deputy Director,  
Facilities and Operations

Arlington, Virginia  
June 30, 2009



# Department of Energy national laboratories



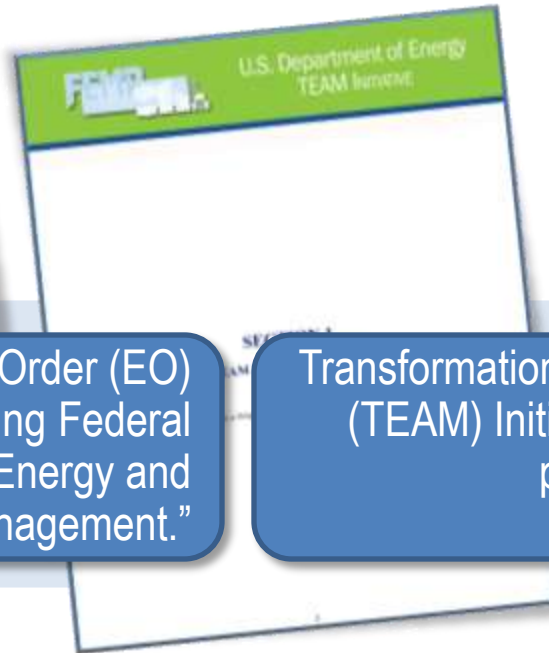
# ORNL is DOE's largest science and energy laboratory

- Staff exceeds 4,200 with ~3,000 guest researchers
- Host site of the Office of Science BioEnergy Science Center
- Large old central heating plant, large fossil fuel consumer, large greenhouse gas generator

# ORNL project drivers



President issued Executive Order (EO) 13423, “Strengthening Federal Environmental, Energy and Transportation Management.”



Transformational Energy Action Management (TEAM) Initiative announced as the DOE’s plan of action to meet the goals of Executive Order 13423.



# TEAM Initiative requirements

- TEAM Initiative requires all of DOE's national facilities to:
  - Reduce their energy intensity by 30% and water intensity by 16% by the end of fiscal year 2015
  - Maximize the installation of on-site renewable energy generation and acquire at least 7.5% of all energy from renewable sources by the end of fiscal year 2010
  - Develop best practice models for the use of third party financing for energy saving projects



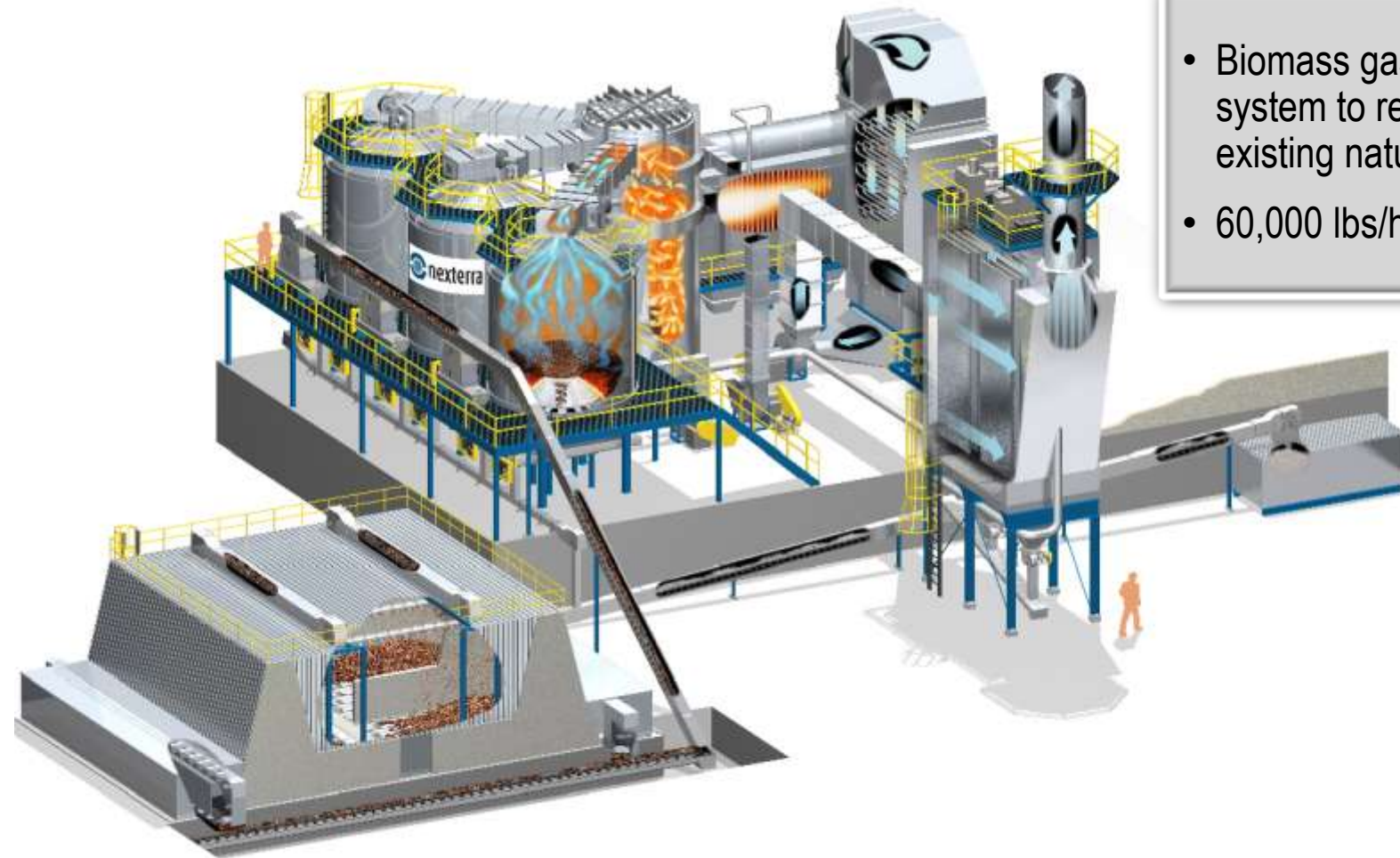
# Site solution

- In August, JCI and DOE signed an agreement to provide \$89M of Energy Conservation Measures (ECMs) to ORNL
- Measures range from the anchor Biomass Gasification System to an educational program advising staff to turndown the thermostat and wear sweaters
- Biomass gasification system was chosen by ORNL because of:
  - JCI and Nexterra experience with the technology, viewed as a low risk project
  - Technology well understood by the research group at ORNL, who recognized the opportunity to use a full-scale plant for research
  - Ultra low emissions



# Nexterra biomass gasification solution

- Biomass gasification system to replace existing natural gas plant
- 60,000 lbs/hr steam



# ORNL: Biomass gasification benefits

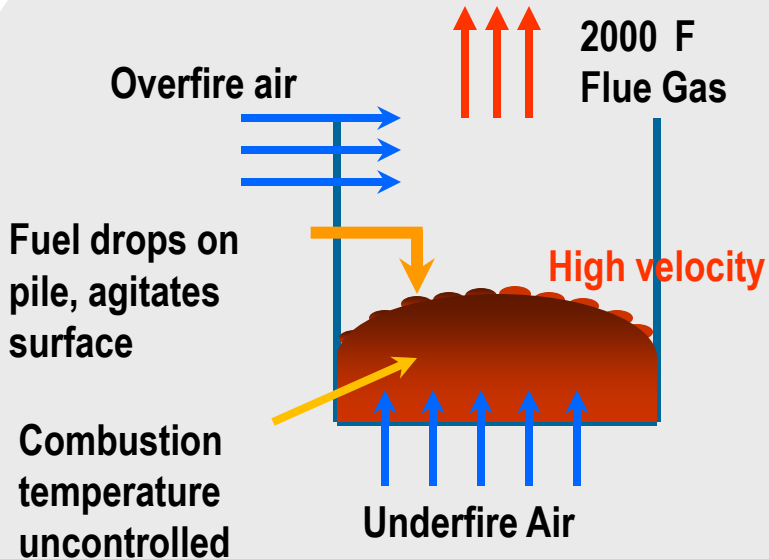
- Shut down 4 fossil fuel fired boilers (WWII vintage marine steam boilers)
- Stabilize fuel costs and reduce by \$3–4M/year
- Lowers GHG emissions by 23,000 tons per year
- Reduces reliance on fossil fuel by 85% and will use locally procured biomass
- Adding a valuable research tool for ORNL BioEnergy Science Center



# Why Gasification

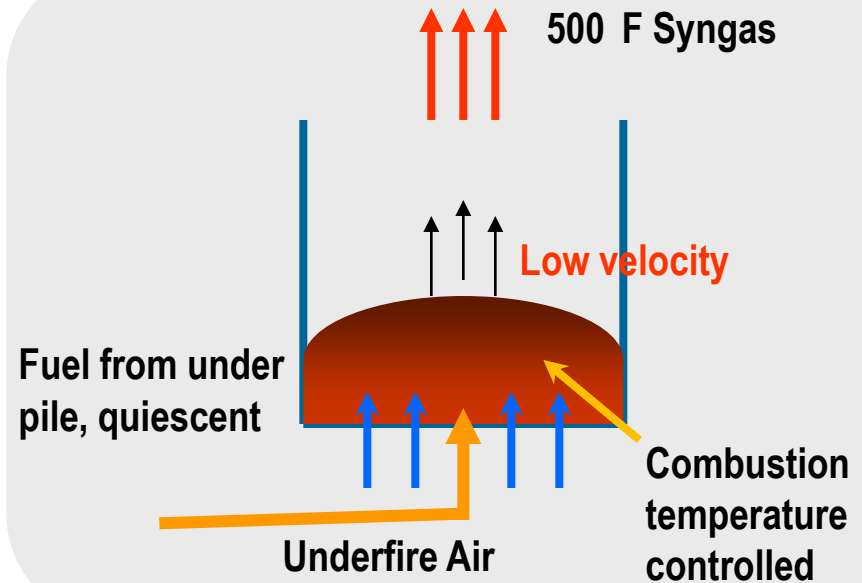
# Comparing Gasification to Combustion

## Combustion



- 2000 F Flue Gas
- 2.5 lbs/mmBtu particulate
- Complete combustion produces dirty hot flue gas

## Gasification



- 500 F Syngas
- 0.1 lbs/mmBtu particulate
- Partial combustion produces syngas for remote combustion

# Nexterra gasification technology

- Rugged, simple technology
- Clean burning syngas yields low emissions
- Consumes wide range of locally available fuels without pretreatment (like drying, pulverizing or pelletization)
- Versatile applications for the syngas



# Thermal Projects

- On-site gasification systems that use low cost, locally-sourced, renewable, carbon neutral, biomass to deliver heat and/or power



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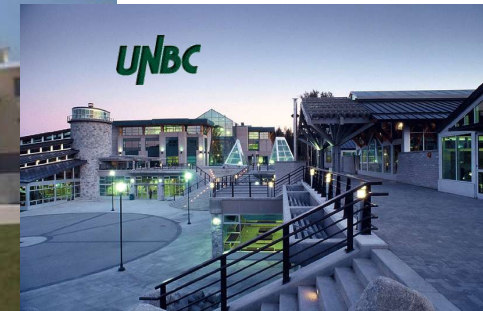
- On-site gasification systems that use low cost, locally-sourced, renewable, carbon neutral, biomass to deliver heat and/or power



Johnson Controls



UNIVERSITY OF SOUTH CAROLINA



# What's next?...

- Direct-firing existing solid fuel (coal) boilers



# High Efficiency, Small Scale (<10MW) Co-Generation



# Thank you

## For more information see our website

