Liquid Salt Combined-Cycle Pilot Plant Design

Energy Storage for Fossil Power Generation (DE-FE0032016)

Scott Hume
Principal Technical Leader

Advanced Energy Storage Initiative Program
Project Review Meeting
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- **DE-FE0032016**

**electric_power_research_institute**

- **PI: Scott Hume**

- Sub-Recipients: Pintail Power, Southern Company and Nexant ECA (sub-contract)

- Location: Charlotte, NC
  Site: Plant Rowan, NC

**Objectives**

- Conduct feasibility study for slipstream LSCC demonstration to advance the technology to TRL 6, essential for real world adoption by utility customers

- Technoeconomic study of full scale LSCC system (estimate costs of system installed on typical SCGT)

- Phase II bid (project plan and cost)

**Relevance and Outcomes/Impact**

- Concept design and project plan for development of a pilot LSCC system to demonstrate efficiency and responsiveness of hybrid energy storage

- LSCC system absorbs excess renewable energy and provides low CO\textsubscript{2} intensity peaking power (i.e. heat rate <5000 Btu/kWh)

- Cost assessment of full scale (single gas turbine) plant to deliver expanded peaking power capacity (i.e. >80% more power delivery)

**Funding**

- **DOE:** $199,731
- **Non-DOE:** $49,932
- **Total:** $249,663
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  - Uses renewable energy to charge molten salt thermal energy storage
  - Coupled to exhaust of simple cycle gas turbine
  - Using stored energy and exhaust gas heat, generates >3 times steam flow than conventional combined cycle
  - Flexible storage duration possible, focused on diurnal applications, 5+ hours

Potential Retrofit to Existing Simple Cycle Fleet to Boost Flexible Capacity using Renewable Power
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**Project Team:**

- Scott Hume
- Jose Marasigan
- Dr. William Conlon
- Josh Barron
- Babul Patel
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Host Site – Plant Rowan (North Carolina)
- 985 MWe total capacity
- 2 combined cycle units
- 3 simple cycle units
- LSCC pilot can be installed at back end of existing simple cycle unit
- Water/steam interface with combined cycle unit for convenience

Potential Pilot Plant Location
Potential Full Scale Location

Ideal location with both simple cycle units and steam systems
Discussion:

1) How should electricity markets be structured to ensure reliability is achieved for all weather combinations as we introduce more variable renewable energy?

2) Will electricity in-electricity out energy storage (i.e. AC-AC) systems be favored over thermal plant connected strategies by investors? Should they be?

3) How can be best utilize the existing generation fleet over the next 20 years while reducing CO₂ emissions?

4) How important is energy storage density and footprint?
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Thank you for your attention.

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