

Liquid Salt Combined-Cycle Pilot Plant Design

Energy Storage for Fossil Power Generation (DE-FE0032016)

Scott Hume
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Advanced Energy Storage Initiative Program
Project Review Meeting
April 6, 2021



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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**

DOE: \$199,731

Non-DOE: \$49,932

Total: \$249,663

Objectives

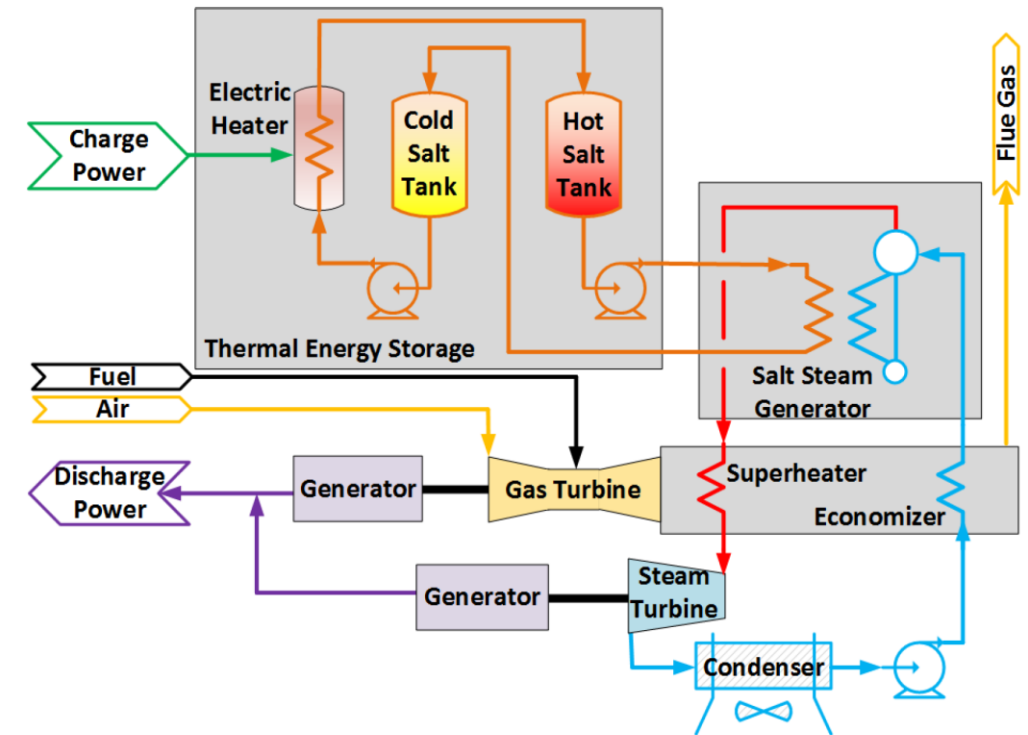
- Conduct feasibility study for slipstream LSCC demonstration to advance the technology to TRL 6, essential for real world adoption by utility customers
- Technoeconomic study of full scale LSCC system (estimate costs of system installed on typical SCGT)
- Phase II bid (project plan and cost)

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 CO₂ 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)

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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:

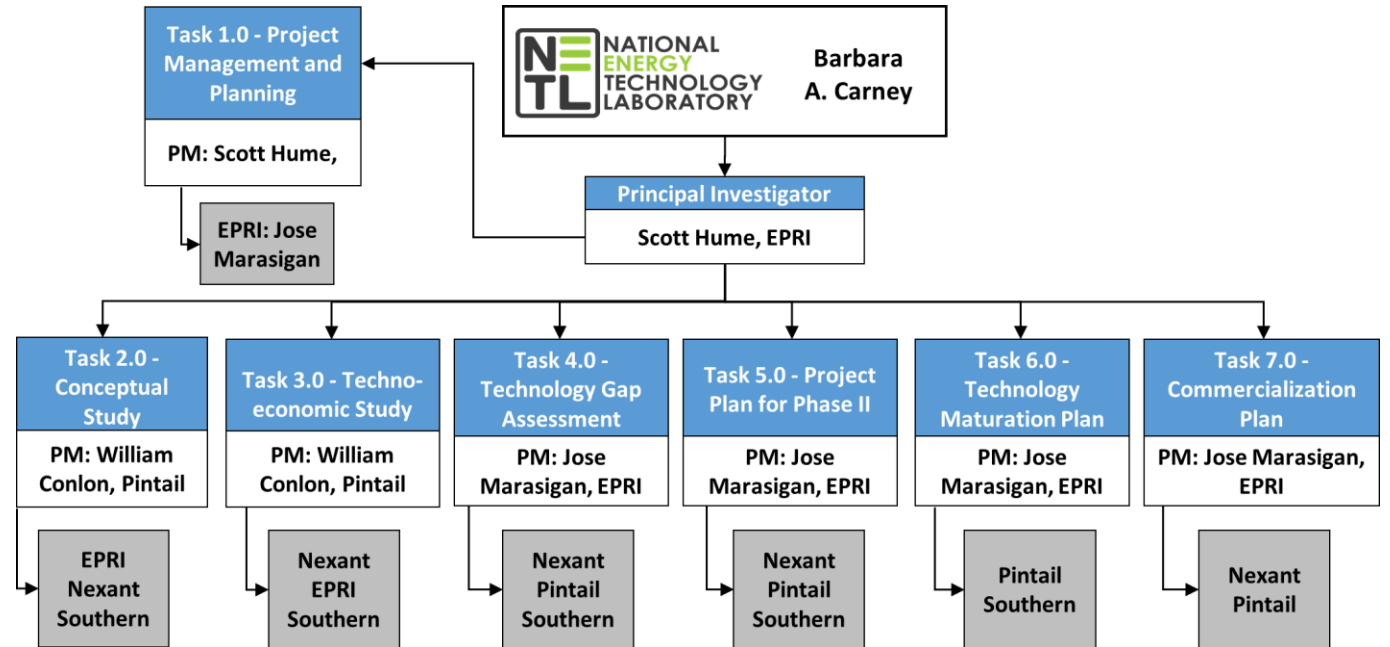
Scott Hume

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

Ideal location with both simple cycle units and steam systems



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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 we best utilize the existing generation fleet over the next 20 years while reducing CO₂ emissions?
- 4) How important is energy storage density and footprint?

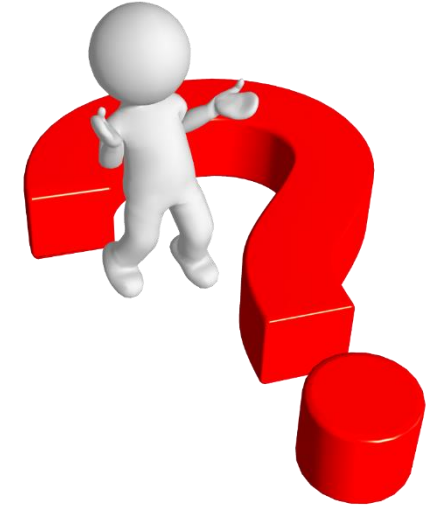
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Thank you for your attention.

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Questions?