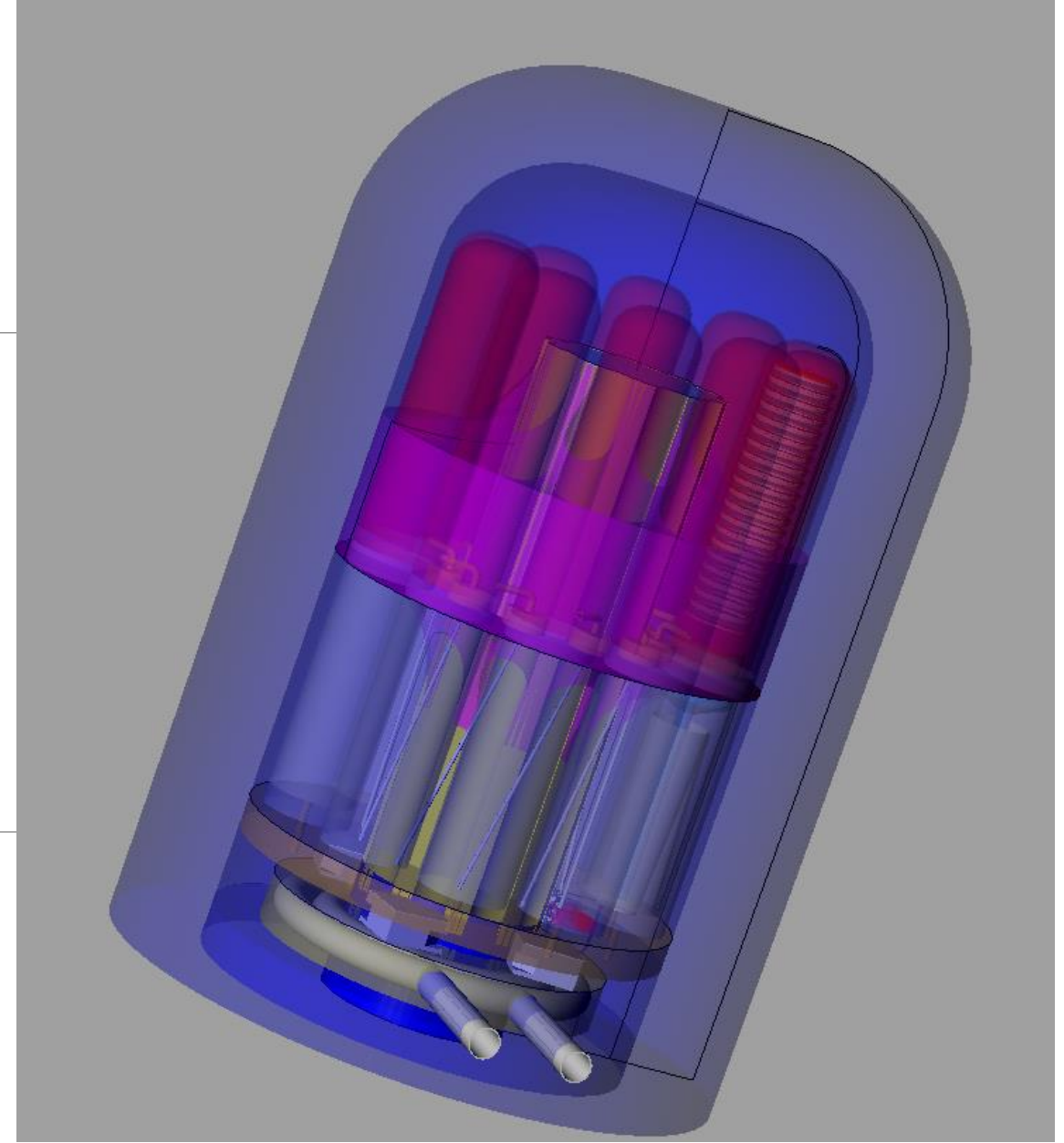




NanoConversion Technologies

Solid-state ionic heat engine for CHP

OCTOBER 21-22, 2015

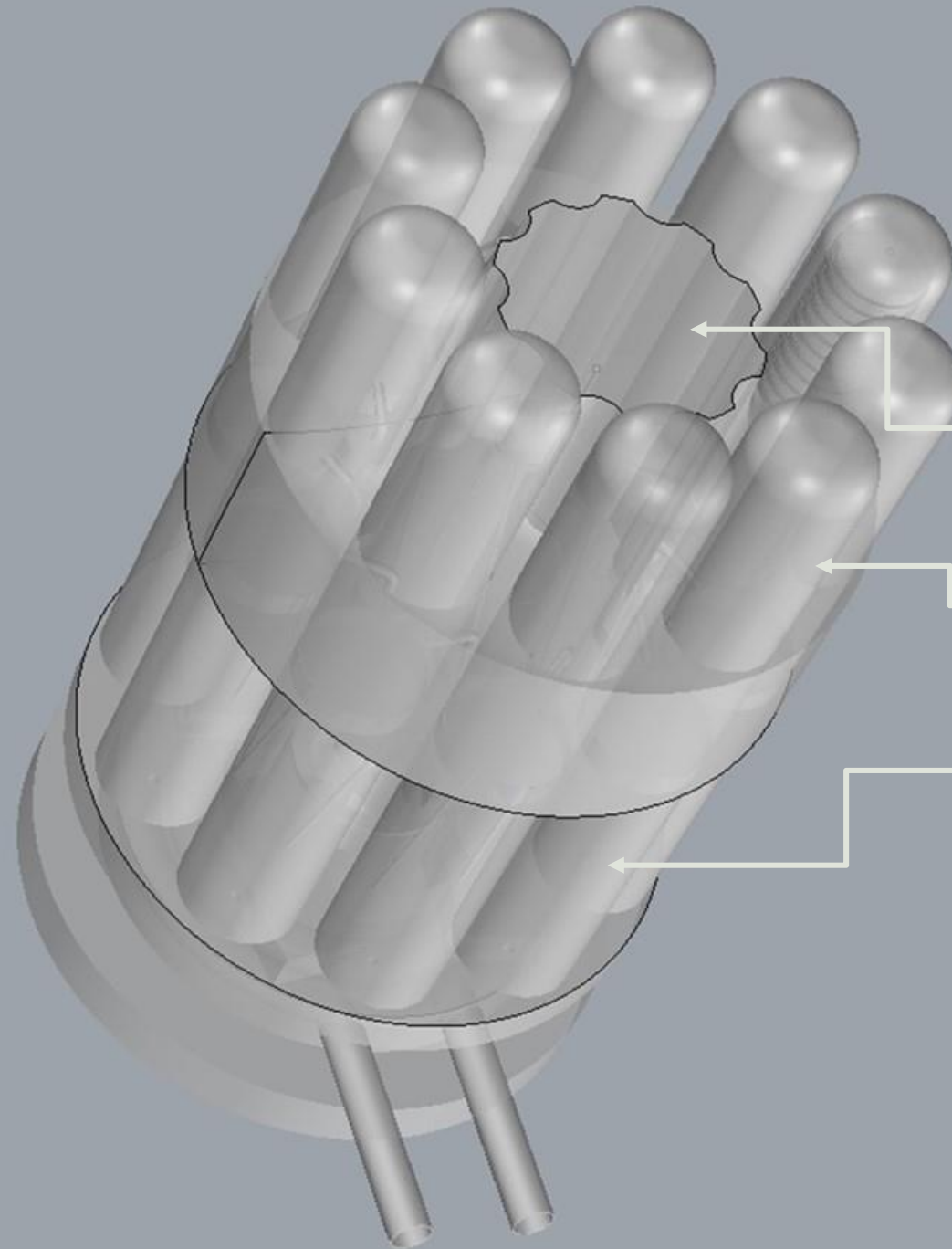


10 C-TEC CHP Generator

2500 W_{LHV} to 1 kW_{DC}

95% LHV-heat combustion efficiency

38% LHV-e(DC) without bottoming cycle or inverter



Superadiabatic Combustor
(1600 K)

C-TEC hot side (1200 K)

C-TEC cold side (550 K)

Project Team

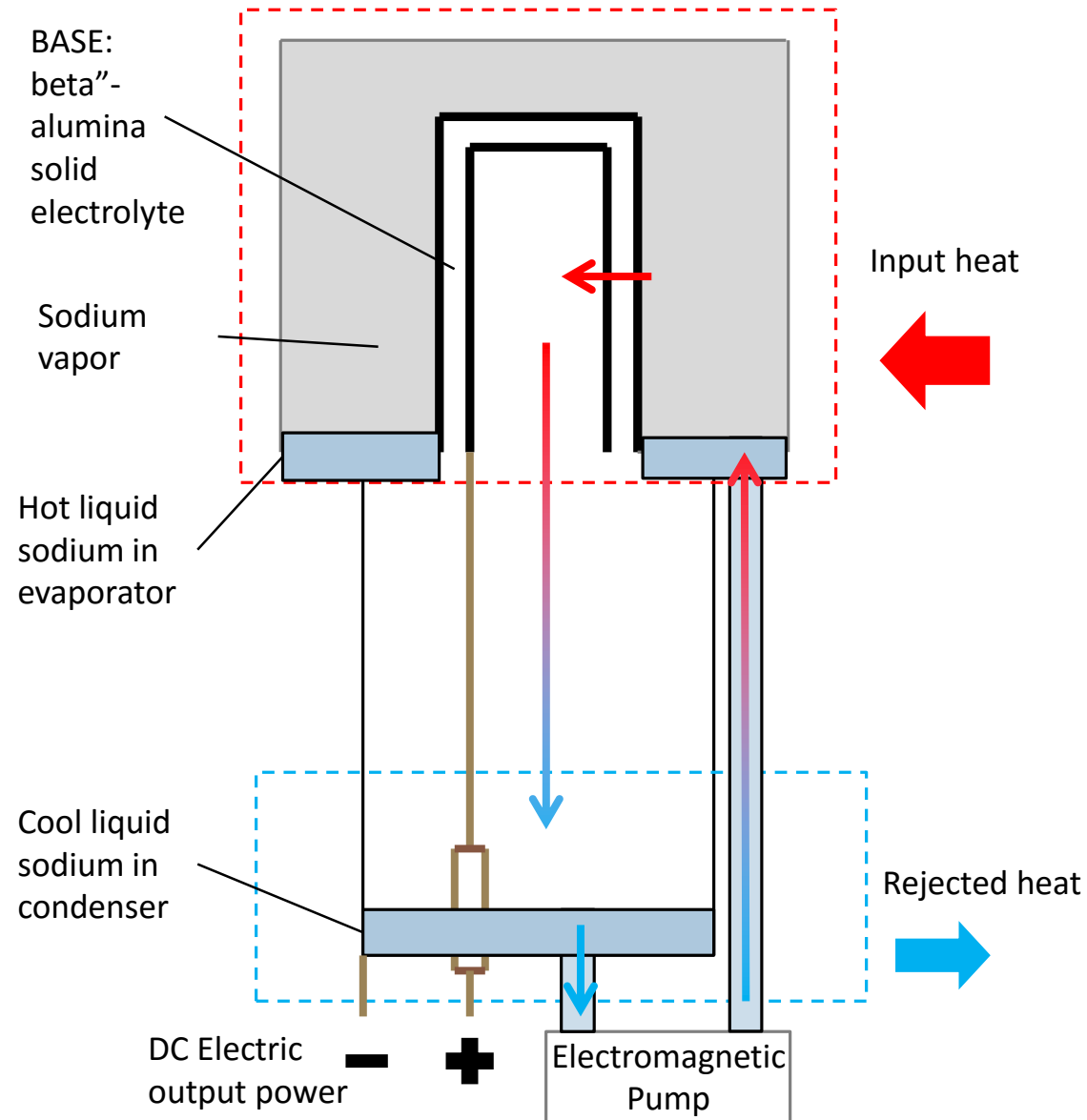
- NanoConversion Technologies, Inc.
 - Developing C-TEC based on Sodium Cycle for commercial application in 2016
 - 7 years, \$5MM in investment to date
 - PI: Evan Green, PhD (Vice President, Product Engineering)
 - T2M Lead: Mike Staskus (Chief Executive Officer)
- Gas Technology Institute
 - 40 years history in industrial combustion and natural gas research
 - David Rue (Institute Engineer) - advanced industrial combustion and waste heat recovery
- North Carolina State University
 - Alexei Saveliev, PhD – superadiabatic and recuperated combustion
- General Electric Appliances

100 W_{DC} C-TEC power block

Sodium cycle's inherent limit
is near Carnot efficiency

42%_{h-e} efficiency (925/275 C)

NCT's patented stacked-cell
architecture reduces thermal
parasitic losses and limits
device Ohmic losses

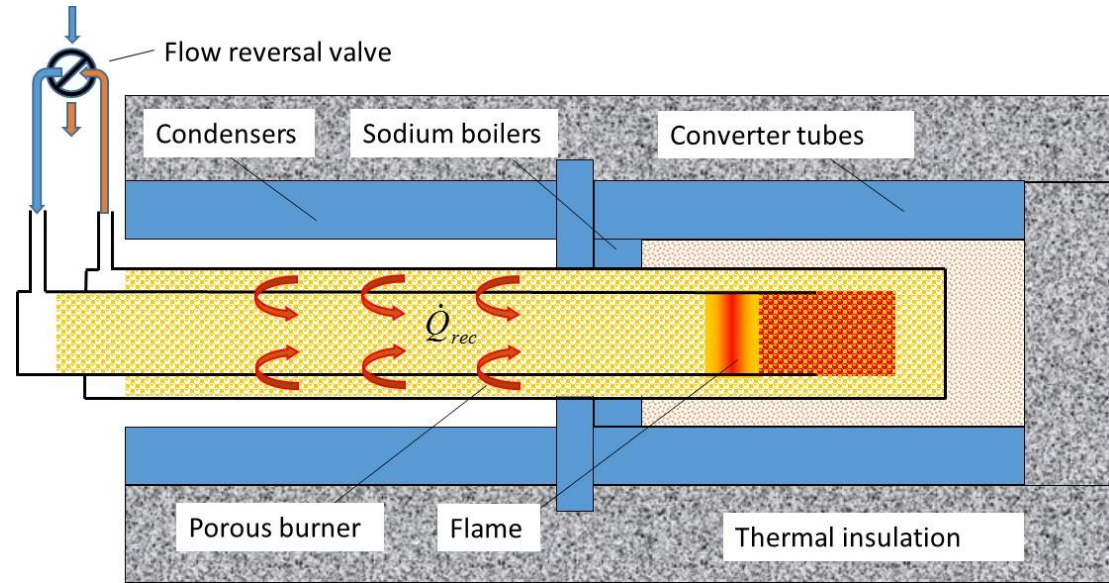


2.5 kW_{th} Superadiabatic Burner

Porous media combustion
and flow recovers nearly
100% of exhaust heat

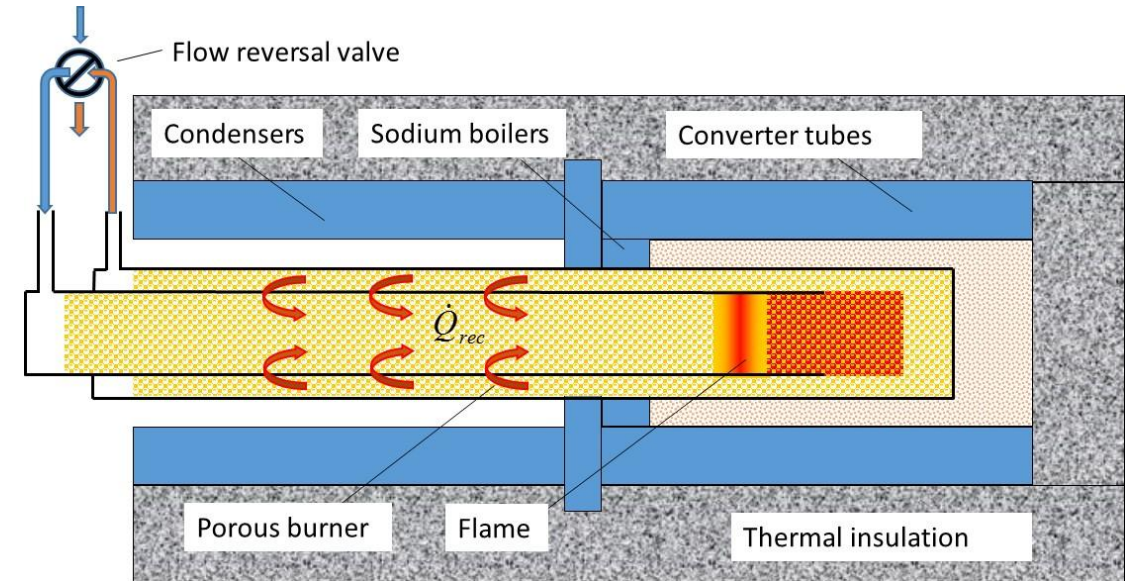
90-95%_{LHV-th} efficiency

NOx below 5 ppm



Combustion System

- SAC attains ultra-low NO_x by firing with higher than normal excess air
- An SAC burner recoups nearly all heat from the exhaust gas by counter-flow through porous medium
- With low wall losses and near zero exhaust gas losses, all combustion heat is transferred to the load



2 year program deliverables

- Key technical milestones for 100W @ 42% C-TEC device
- 2.5 kW_{th} SA burner at 90%_{lhv-th}
 - Demonstrated NO_x, CO, VOC, particulate, noise requirements
 - Efficient heat exchange from 1600 K burner to 1200 K C-TEC hot side
- Integrated system for 3rd party testing

Kickoff meeting goals

- Introductions and access to:
 - Affordable thermal and FEA analysis
 - Electrochemical and mechanical design expertise
 - System manufacturers and other technology adopters
 - Utilities and users for field trials