

Fed. funding:	\$1.9M
Length	36 mo.

1kW Microturbine System

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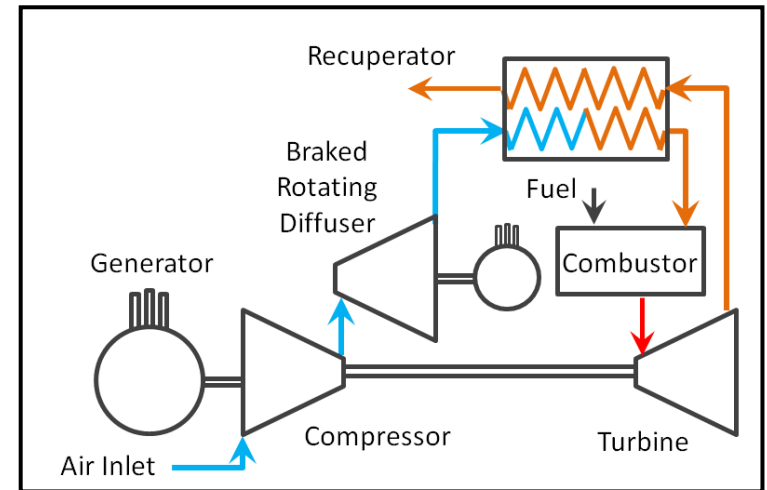
Prof. Daejong Kim, UTA

Project Goal

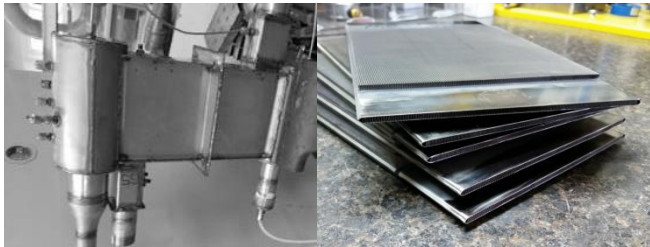
Develop the worlds smallest working microturbine for residential CHP with an electrical efficiency of 30%.

Current Technical Status

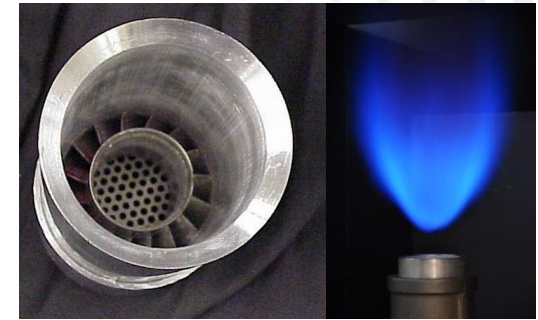
Compressor, turbine, recuperator and combustor sub-components demonstrated. Air bearings in-work with integration and testing to follow.



Technical Details and Data



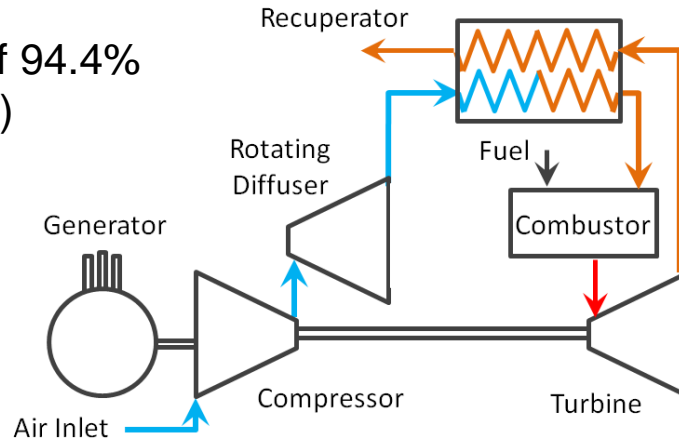
Demonstrated effectiveness of 94.4% (vs. 95% target)



NOx and CO 50% and 80% of target limits



Efficiency 77% (vs. 80%, tested at 50% speed)



1kW Microturbine System



Turbine efficiency 79% (vs. 80% target)



Tech-to-Market Strategy

0-2 Years



Technology Developer

40-250kW turbo-alternator for electric propulsion & aircraft electrification.



System Provider

40-250kW genset for microgrid & CHP applications.

2-4 Years



Product Provider

1-250kW Back-up power & portable systems.

Beyond



Product Manufacturer

1-40kW CHP systems.

Details on Envisioned Product Offering

Metric	Program Target	Current Status	Envisioned Product offering
Device Application	Residential CHP	Residential CHP	Insert application and market size
Power (kWe)	1	1	5
Fuel-to elec. eff. (%)	40	30	30
System cost (\$)	3,000	1,500	7,500
O&M cost (\$/kWh)	≤0.005	NA	NA
Capacity factor (%)	99.9	NA	NA
System Life (years)	≥10	NA	NA
System Noise (dB(A) at 3 feet away)	≤55	59*	65*
System Mass (kg)	≤150	12	60

Current Challenges

- Reaching rotor speed of 480,000 RPM
 - Compressor testing limited to 340,000 RPM
 - Limited by motor sensor-less speed control
 - Dental ball bearings also challenging to work with
 - Small scale and high precision (1 micron / 0.04 mil) is a challenge to work with
- Path forward
 - Using hybrid foil/ball bearing design to overcome challenges with ball bearing
 - Foil bearing located to avoid the need to traverse bending mode
 - Development testing at x1.6 scale (2.5kW) to maximize use of COTS components

Desirable Partnerships

- Casting supplier for small scale high-temperature components
 - Haven't found a casting supplier for Mar M-247 turbine
 - Backup plan is to machining Inconel 718 turbine
- Ceramic component developer / supplier
- Sub-component suppliers
 - NG compressor for 1kW microturbine
 - Ignition system (exciter, sparkplugs)
 - Controller
- Demonstration partners