

High Efficiency 370kW Microturbine with Integral Heat Recovery

DOE AWARD DE-EE0004258

Capstone Turbine Corporation/Oak Ridge National Laboratory/NASA
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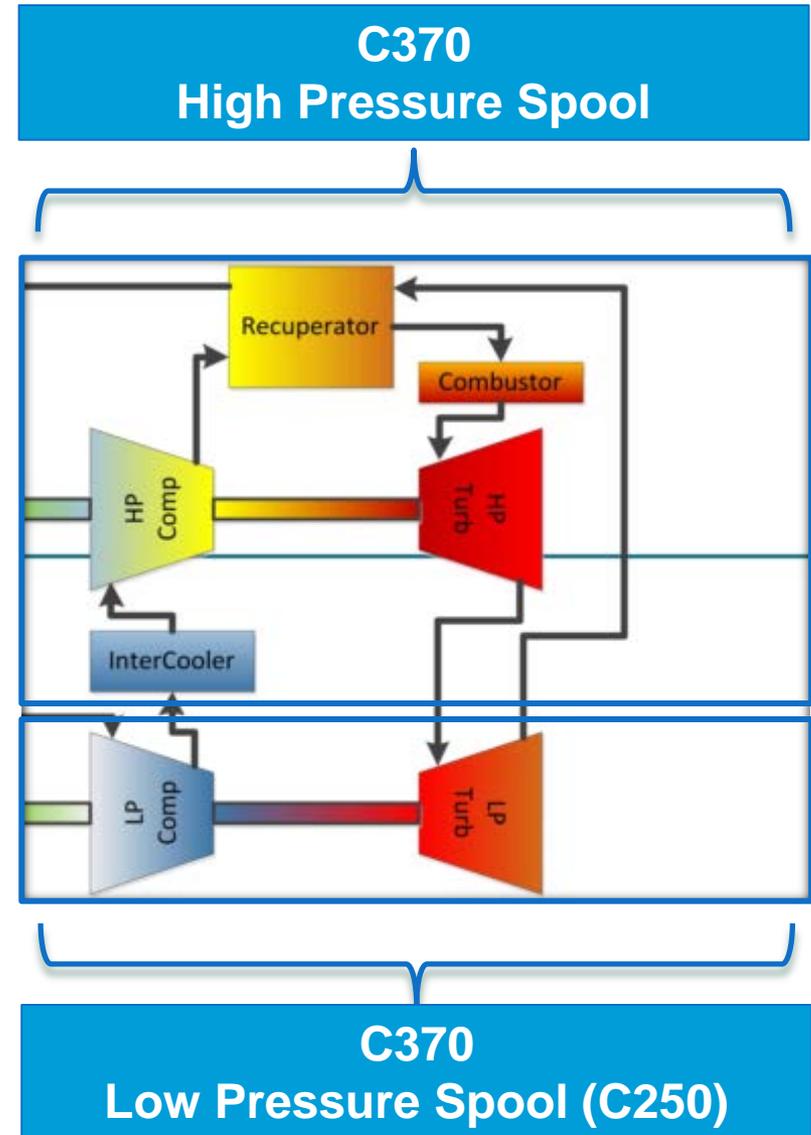
Project Objectives

- Demonstrate a Microturbine-based distributed generation system with the following:
 - 42% Electrical Efficiency
 - 85% Total System Efficiency with CHP
 - CARB-level emissions without combustion after treatment
 - Improved Customer Value: \$600/kW
- Technical Challenges
 - Higher Temperature Combustion System
 - Higher Power Density Power Electronics
 - Dual Spool Control Algorithms

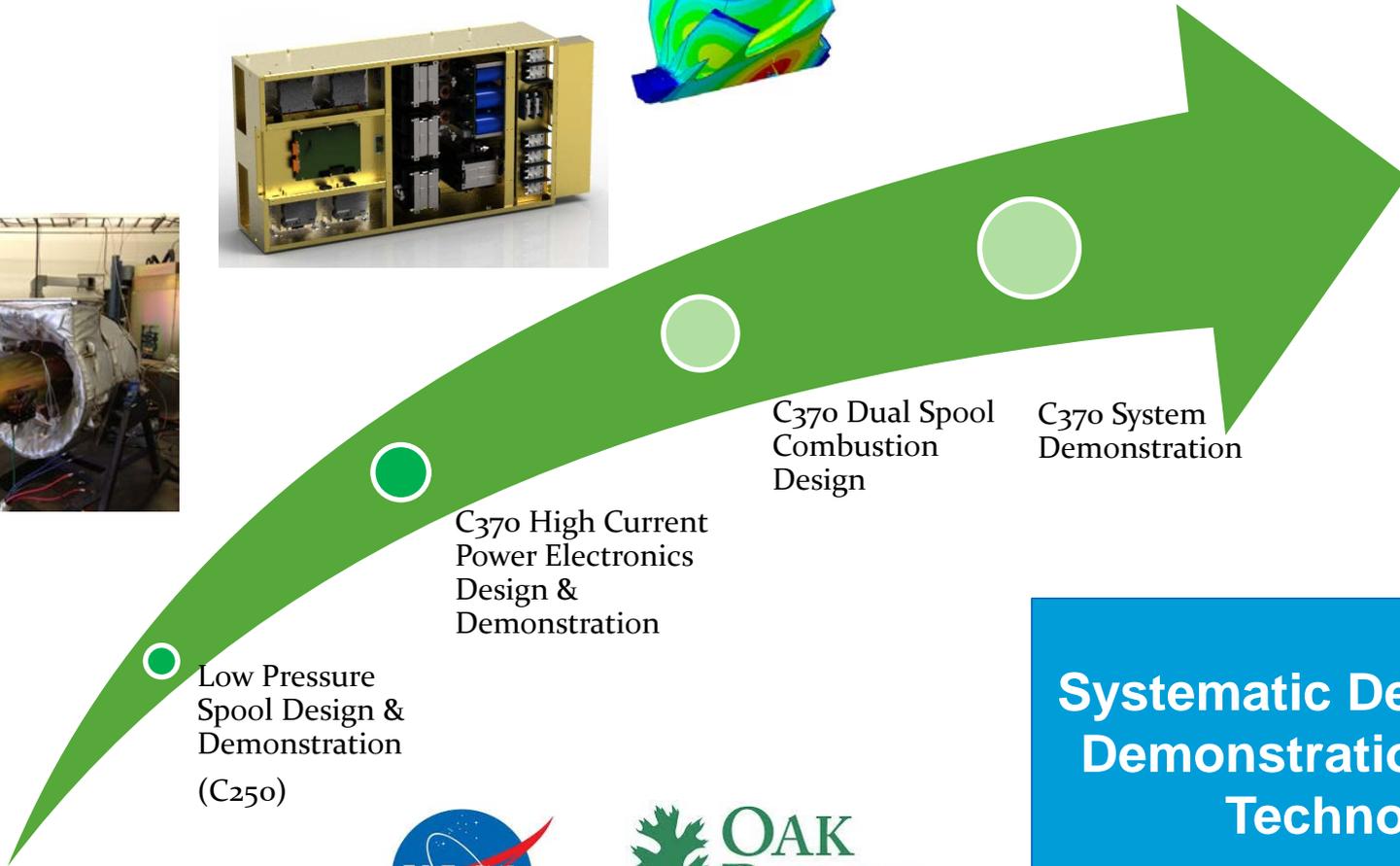
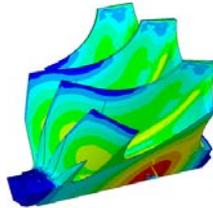
Higher Efficiency & Emissions at Commercially Competitive Prices

Technical Approach

- Capstone's Current Microturbine Technology
 - C30, C65 , C200
 - Air Bearing Technology
 - Lean Combustion
 - Low Emissions
 - High Reliability
- Dual Spool Approach
 - Aerodynamic Interconnect
 - Single Combustion Stage
 - Critical Technology Risk Burndown



Technical Approach



Low Pressure
Spool Design &
Demonstration
(C250)

C370 High Current
Power Electronics
Design &
Demonstration

C370 Dual Spool
Combustion
Design

C370 System
Demonstration

TRL 6

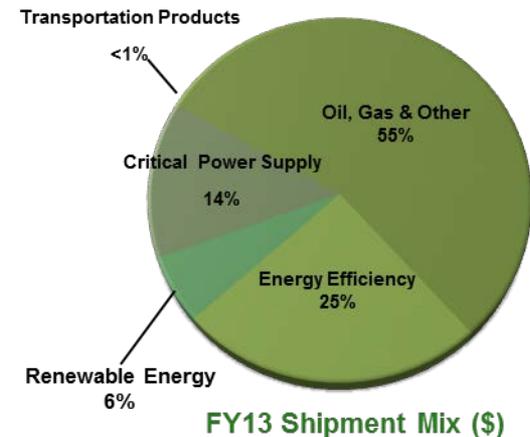
Prototype
Demonstration
in a Relevant
Environment

**Systematic Development &
Demonstration of Critical
Technologies**



Transition and Deployment

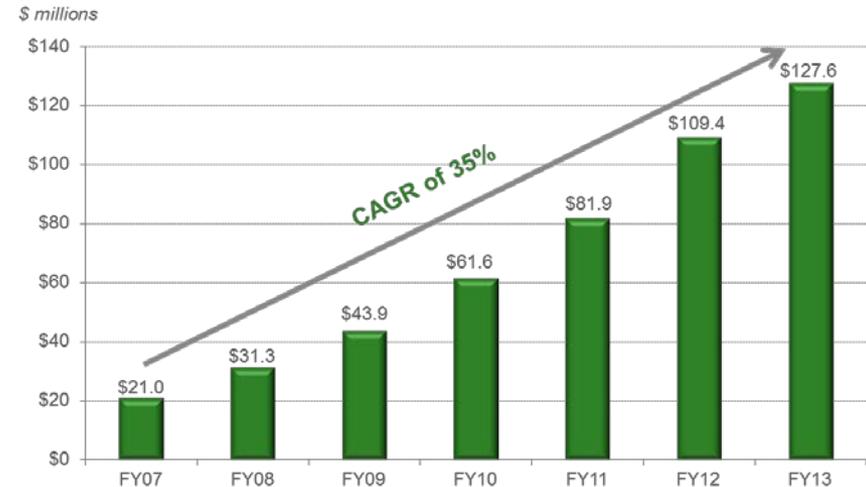
- Market cares about:
 - Increased system efficiency, reducing energy waste
 - Reduced energy costs
 - Reduced emissions
- Technology developed improves all market segments
 - Higher Power Density Electronics
 - Higher Electrical Efficiency
 - CARB-level Emissions
 - 1st Example: C250 Commercialization



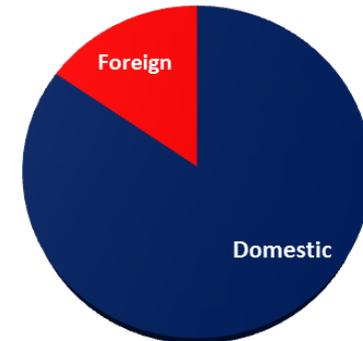
C370 Technology will transition to all market segments

Measure of Success

- If we are successful, Capstone and our US-based supply chain will grow:
 - Similar to successful DOE AMTS program
- Driven by benefits from:
 - CARB-level Emissions
 - Higher Efficiency
- Cost attractive green energy solution for the marketplace
 - Low Cost (<\$600/kW)



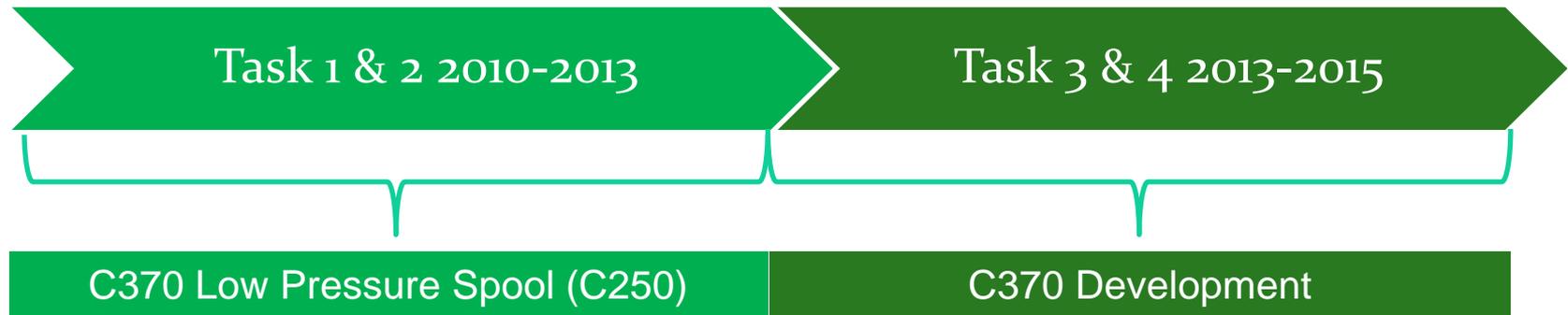
AMTS (C200) enabled 7 Years of Growth



Capstone Turbine's Supply Chain Breakdown

Highly Efficient Low Cost Distributed Power Solution

Project Management & Budget



Total Project Budget	
DOE Investment	\$5,000,000
Capstone Cost Share	\$10,025,310
Project Total	\$15,025,310

On Budget & Schedule

Results and Accomplishments

- Low Pressure Spool (C250)
 - Power: 278 kW @ 70°F
 - Electrical Efficiency: 35% @ 70°F
 - Achieved CARB Emissions Standards
- Task 1 and Task 2 Complete
 - Stage Gate 2 Decision Point
 - C250 Demonstration (TRL 5)

