Capstone Turbine Corporation

Shale Gas Utilization:
A Distributed Generation Case Study
September 2014

Safe Harbor Statement

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Reliable power when and where you need it.
Clean and simple.

Agenda

- Company Overview
- Technology Overview
- Product Overview
- Value Proposition
- Projects

COMPANY OVERVIEW

Capstone Turbine Corporation

- Founded 1988 – Commercial launch in 1998
- World Leader in microturbines
- Holds over 120 US and European patents
- Headquarters and manufacturing plants in California
- Sales and/or service centers in:
  - China, Singapore, Mexico, Columbia, Argentina, the United Kingdom, Spain, and the United States
- Over 90 Distribution Partners
- Over 7,000+ units shipped worldwide

Global Market Segments

Energy Efficiency

Renewable Energy

Oil, Gas & Other Natural Resources

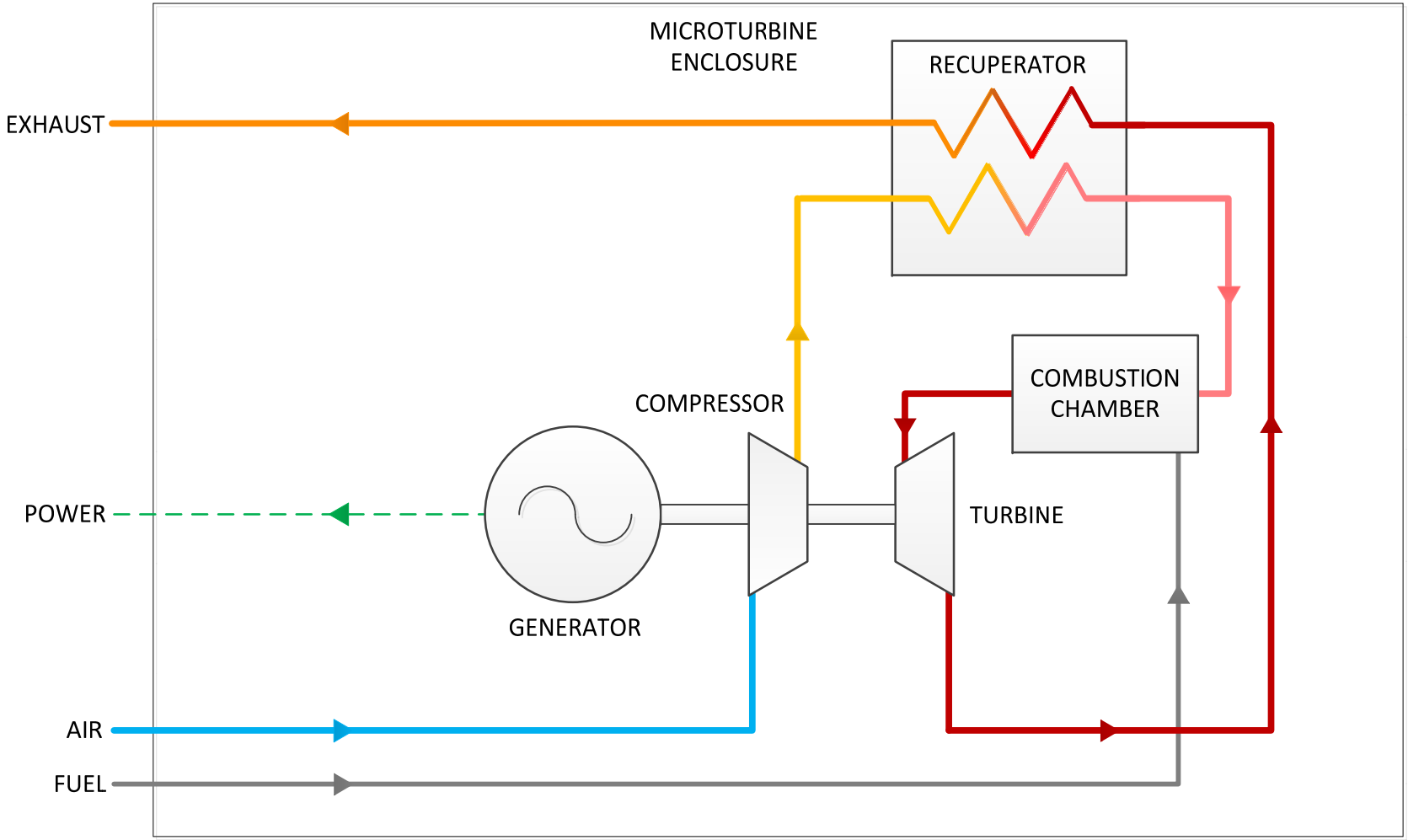
Critical Power Supply

Transportation Products

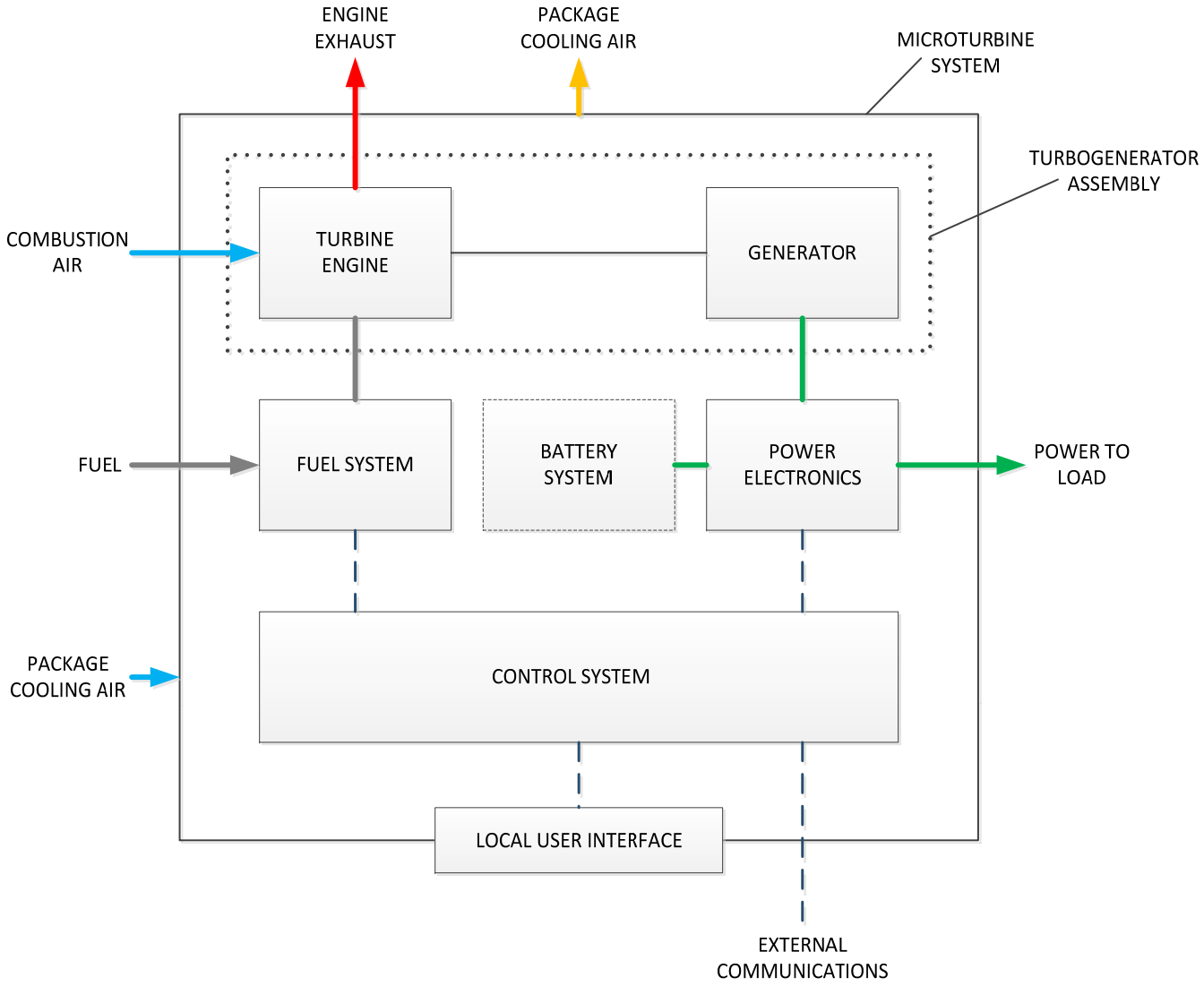
TECHNOLOGY OVERVIEW

What is a Microturbine

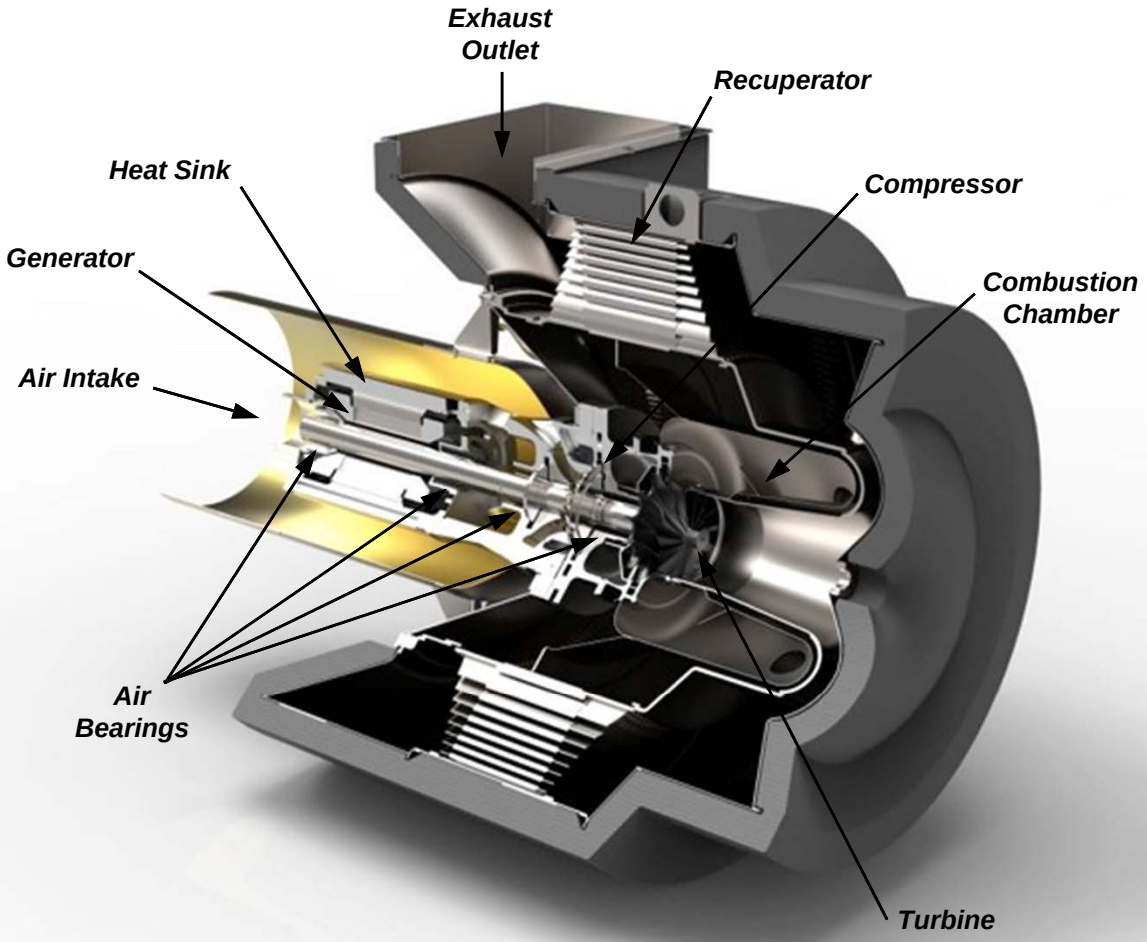
Power generator driven by a combustion turbine



What is a Capstone Microturbine?



Capstone Turbine Cutaway

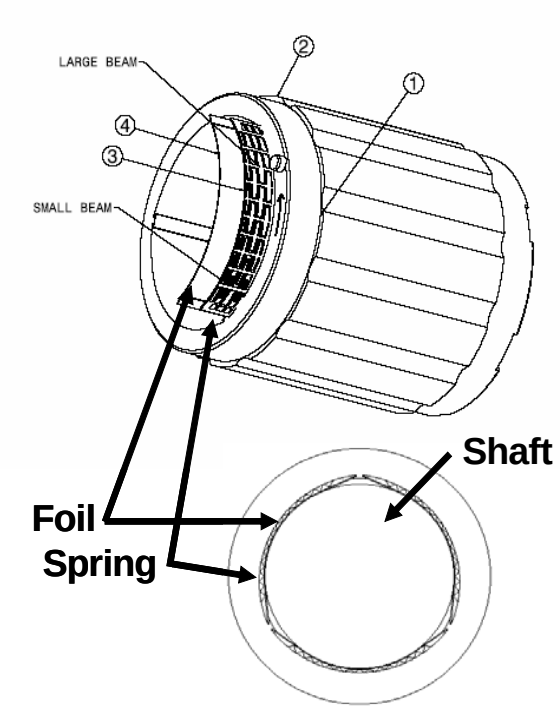


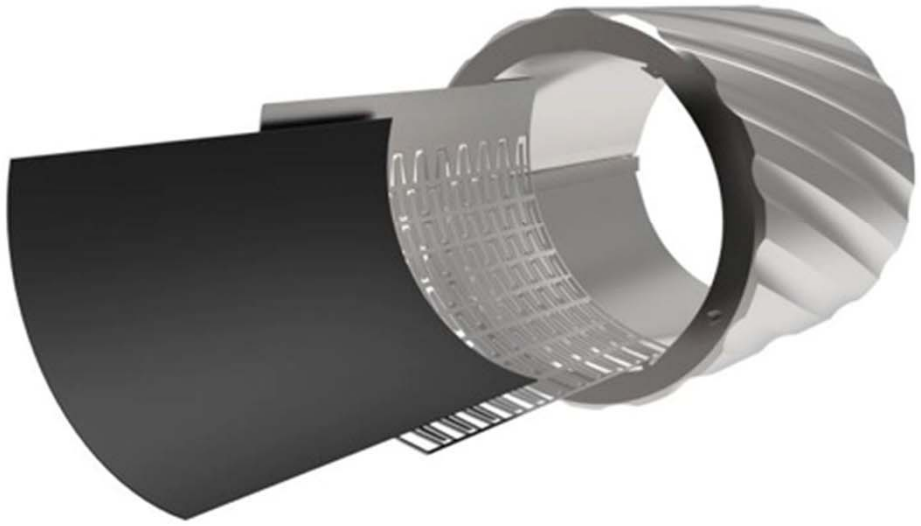
Only One Moving Part

C200 (61K RPM) C65 (96K RPM) C30 (96K RPM)

No Oil – No Coolants – No Friction

Capstone Air Bearings

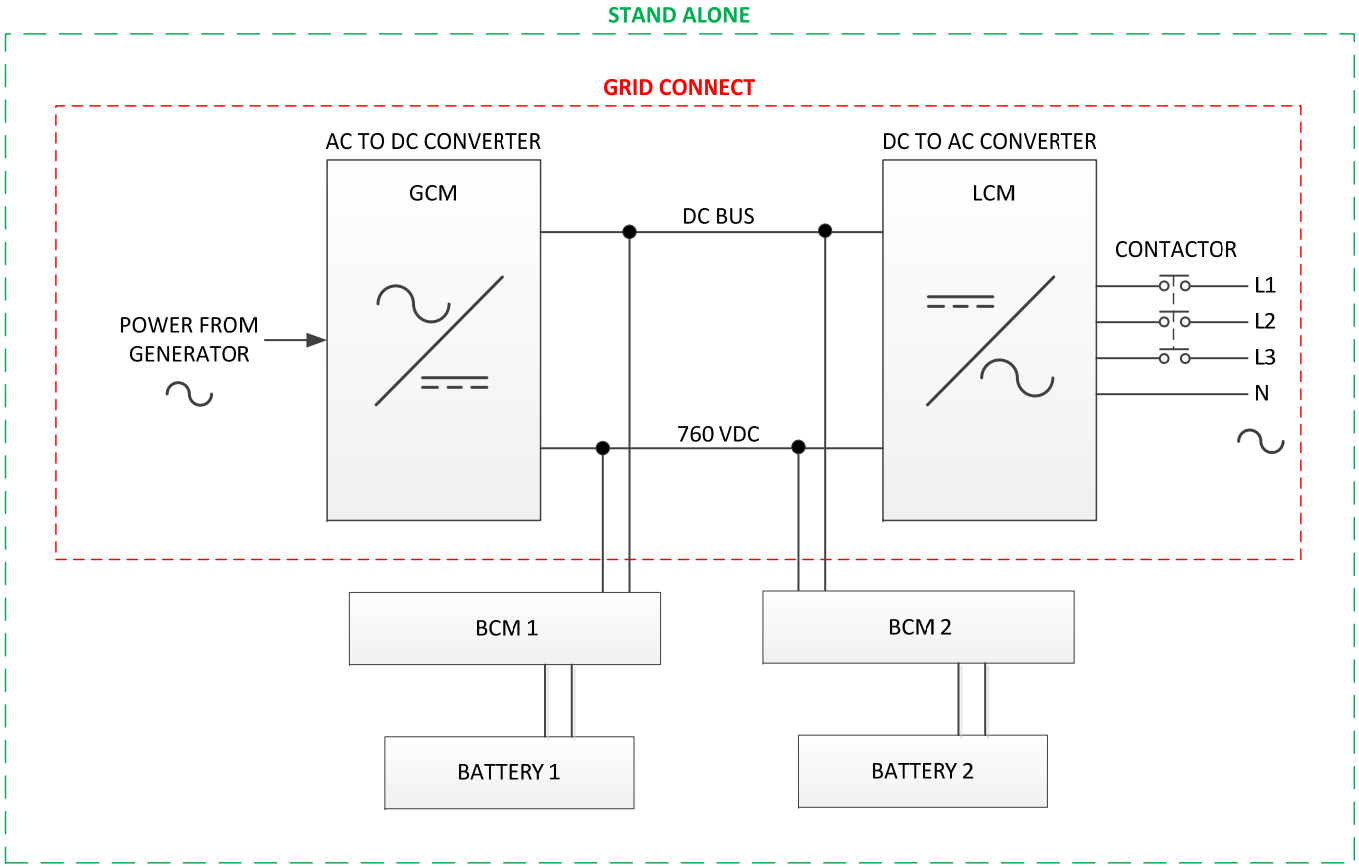




- Benefits:
  - Reduced Maintenance
  - No Oil Consumption or Disposal
  - Clean Exhaust Emissions

Power Electronics

- Inverter-based Technology
- Superior transient handling and turndown
- Variable Voltage 400-480 Volts
- Variable Frequency 50-60 Hz
- Voltage & Current Source Inverter
- Built-in Fault Protection
- UPS Quality Output



PRODUCT OVERVIEW

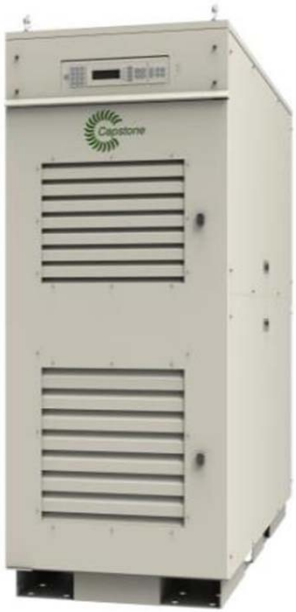
Product Suite

Low-emission, clean-and-green Capstone products are scalable from 30kW to 10MW+

The 200kW turbine is also available in 600kW, 800kW, and 1MW configurations

Capstone Products

- Available for gaseous & liquid fuels



C30 & C65

C65 CHP

C200

Packaged Solutions

- Operates as a single 600-1000kw genset
- (3), (4), or (5) C200 Units
- Enclosure with ISO Footprint
- Stable combustion from 100% to idle

Packaged Solutions (cont.)

- 2 to 8 C65 Units on pre-engineered skid
- Can operate as a single 120KW to 520KW genset
- Stable combustion from 100% to idle

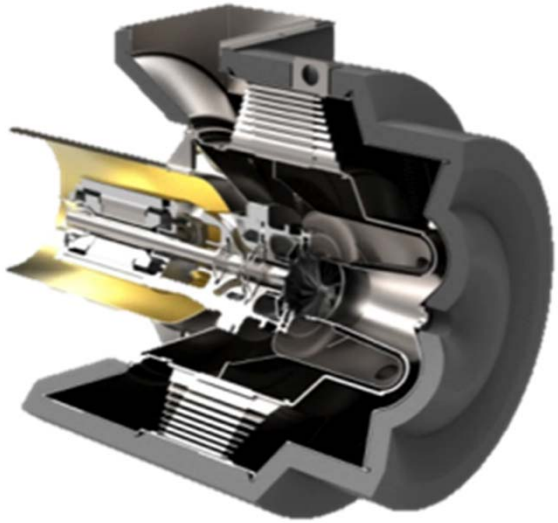
Packaged Solution (cont)

- One electrical connection; one fuel connection
- Perform maintenance on 1 while all other units continue to operate

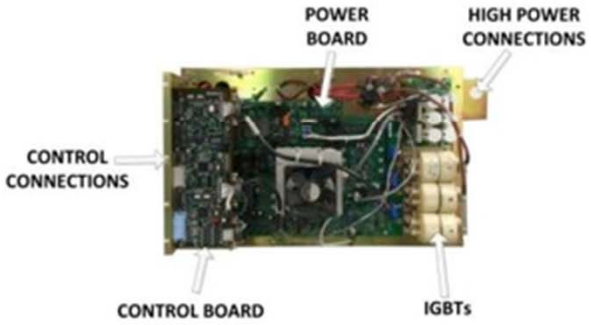
How do Models Differ?

C30

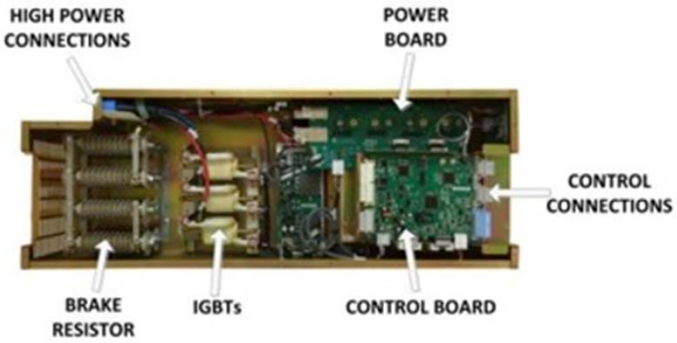
C65



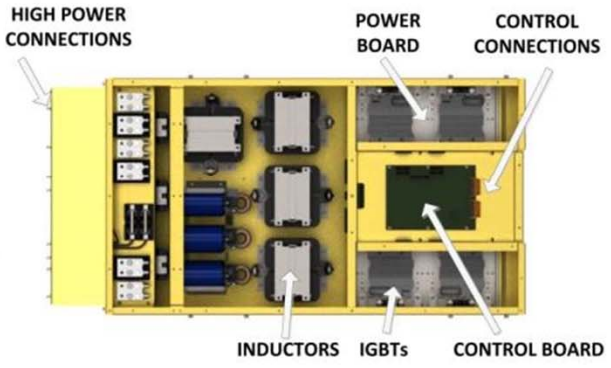
C200



C30 CONTROL MODULE



C65 CONTROL MODULE



C200 CONTROL MODULE

Hazardous Location Products

- Available for C30, C65 and C200
- UL Certified Class I Div 2 or ATEX Zone 2
- Enclosure fabricated from 316 SS and pressurized with explosion proof blowers
- Gas detection and heat detection
- Remote PLC controller for safety functions

C200

C30 & C65

Microturbine Controllers

- Capstone designed
- PLC based system
- Customizable user interface

Single microturbine

Multiple microturbines

VALUE PROPOSITION

Market View

- Shale gas is a valuable product, often associated with the recovery of hydrocarbon liquids.
- Flaring/venting is viewed as wasteful as it produces no economic benefit.
- Methods to monetize
  - Conditioning and compressing into pipeline
  - Gas by wire (exporting to grid)
  - **Onsite power generation**

Value Proposition

- Microturbines allow customers to utilize Shale gas as a local fuel source to generate power
  - Economic solution
    - Produce site power using local fuel source
    - Save money by eliminating diesel usage
  - Environmental benefit
    - Microturbines have very low emissions
    - Increased efficiency with the use of exhaust heat recovery
  - Onsite/Remote power generation
    - Requires no power or pipeline infrastructure
    - Gas treatment minimal to use gas in Microturbine

Value Proposition (cont.)

- Can relocate microturbines as gas flows change
- 100% turndown capability
  - Modular design maintains performance through turndown
- High H2S tolerance
  - C30 = 70,000 ppm
  - C65, C200-C1000 = 5,000 ppm
  - Higher H2S value possible with factory approval
- Fuel Constituents
  - Heating value (550- 2550 BTU/scf)
  - CO_2 (Up to 41%)
  - N_2 (Up to 22%)
- Microturbines require minimal fuel pre-treatment and no exhaust after treatment

PROJECTS

Shale Gas - Anadarko Petroleum

Application

Prime Power / Stand Alone

Technologies

15+MW in Eagle Ford and Marcellus using Capstone C65 and Capstone C200

Project Highlights

- Provides power for:
  - Compressor stations
  - LACT units
  - Artificial lift equipment

Shale Gas – Pioneer – Eagle Ford Shale, USA

Application

Prime Power / Stand Alone

Technologies

Capstone C1000

Project Highlights

- Prime power for multiple facilities
- Lease Automatic Custody Transfer (LACT)
- Customer has 15MW+ of Capstone microturbines
- http://www.capstoneturbine.com/news/video/view.asp?video=pioneer

Flare Gas – Talingas Gas Field, Australia

Application

Prime Power / Stand Alone / CHP

Technologies

3MW using Capstone C1000s
with Heat Recovery Modules

Project Highlights

- Power used for water treatment equipment and site needs
- Operate on CBM gas
- Waste heat used for RO water preheating
- Remote location, Australian Outback
- Operation in harsh climate

Shale Gas – XTO Energy

Application

Prime Power / Stand Alone

Technologies

6.3 MW across 4 projects using
2x Capstone C65
2x Capstone C600 and 5x C1000

Project Highlights

- Williams is a major transmission company
- Provides power for shale gas compressor station

Shale gas – Crestwood

Application

Prime Power / Stand Alone

Technologies

2.4MW across 3 projects using
3x Capstone C800

Project Highlights

- Midstream company contracted to Antero in WV

Shale Gas – Kansas

Application

Prime Power / Stand Alone

Technologies

Pre-engineered C195 Package

Project Highlights

- Powering electric submersible pumps (ESP)

Marcellus Shale – Chevron

Application

Prime Power / Stand Alone

Technologies

215kW across 6 projects
5x Capstone C30
1x Capstone C65

Project Highlights

- Powering electric submersible pumps (ESP)

Microturbine Installations in CNPC and Sinopec Project Sites

Sinopec Pipeline in Brazil

Sinopec Project In Brazil

CASCAV 10 stations

20x C30

CNPC Kazakhstan Pipeline Project

CNPC CPPLB as EPC contractor
26x C30 + 2x C65

CNPC Alwaha Oil Project in Iraq

Installed location - Ai Hardy Bbu Oil field.

Microturbine with associated gas as prime power to drive ESP (@ 170kw).

2x C200

Q & A