Profile

Innovative Energy Company Limited

Our experience, Your success!

Your Energy Partner

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

Innovative Energy Corporation
dba// IECSPET®
Introduction

- Energy Services Company
- Private Energy Project Developer & Operator
- Three Decades of Experience
- Develop, Finance, Construct, Operate Power Assets
  (> $800 Million in Aggregate)
- North America, Central America and Caribbean
- Custom Projects To Meet Site / Client Needs
- Expanding Into Renewable Energy Markets
We are Capstone’s Authorized Dealer and Authorized Service Provider for Jamaica
The Capstone Turbines are approved by:

The Bureau of Standards Jamaica

Ministry of Science, Energy & Technology

Jamaica Public Service Company Limited

Underwriters Laboratories Inc.
Mission

- Develop Clean, Reliable Energy Sources For Our Clients
- Form Win-Win Relationships With Our Clients and Partners
- Provide Needed Energy Infrastructure to Promote Economic Growth and Vitality
- Capitalize on changing regulatory framework to lower energy cost for our Clients.
- Distributed Generation to lower peak demand and line losses, benefits that will accrue to the utility.
History of Relationships

Our aggregate experience is derived from strategic relationships with:

- Independent Energy Corporation, Hartford Ct.
- ERI Services - Hartford, Ct.
- Creative Energy - Orangeburgh, NY
- CaribJam Partners - Kingston, Jamaica
- Armorview Holdings Limited - Kingston, Jamaica

- IEC either owned jointly, or was a key member of the teams that developed, financed, constructed, project managed or operated the listed projects.
Our Target Market - CHP & CCHP

Anyone with a consistent need for electricity, hot and/or cold water is a good candidate

- Hotels
- Hospitals
- Large Offices
- Manufacturing
- Wastewater Treatment
- Schools / Universities
- Data Centers
Project Size

Our Historic Track Record

• For power generation, distributed generation, renewable energy facilities: 1 MW to > 120 MW

• For other central plants (chillers / boilers): greater than 100 KPPH steam or 5,000 tons chilling
Our Strategic Partners

**EPPELEY** Private Equity Fund

**CARIB LPG** Fuel Supplier & Financier

**MASSY GAS PRODUCTS** Fuel & Financing Partner

**AES** Battery Storage & Fuel

**Capstone** Technology Partner

**Canadian Solar** PV Solar Partner

**Trimark Associates, Inc.** Integration and SCADA Partner
Our Clients

Innovative Energy Corporation
dba/ IECSEPI®
How are Projects Financed?

IEC and its strategic partners may provide 100% Financing and all Fuel for any project.

- **Private Clients**
  - Convert budgeted energy expense to finance “Capital Asset”
  - Monetize Assets And Use Proceeds For Core Mission
  - Dispose of (or Avoid) Investment In Energy-related Assets
  - Re-deploy (or Preserve) Capital For High-return Core Assets

- **Public Agency or Government Facility**
  - Privatize its Energy Assets
  - Free Up Capital / Budget $ for More Pressing Budgetary Needs
## Our Product Offering

### Features

- **30 kW**
- **65 kW**
- **65 kW + 408 btu/hr hot water**
- **65 kW Hazardous Location**
- **200 kW**

### Benefits

- Only one moving part
- Patented air bearing technology
- Stand alone or grid connect
- Wide fuel range
- High power density
- Advanced Combustion Controls
- Clean waste heat
- Remote monitoring

- Longer service intervals, low operating cost
- No lubricants or coolants needed
- Multiple applications and industries
- Operates on gaseous, renewable, and liquid fuels
- Compact footprint, small modular design
- Low emissions, no exhaust aftertreatment
- Thermal energy for cogeneration/trigeneration
- View performance and diagnostic 24/7

1 MW + 5 MMBtu/hr hot water
Our New Thrust

• CHP and CCHP plants that are **30 kW** & greater with a thermal load.

• Stand-alone gas-fired Absorption Chiller Plants.

• PV Solar Projects.

• **Distributed Generation for Utility Support**
  
  • Distribution / Voltage Support
  
  • On-Site / Displacement / Peak Shaving

  • Full-Scale Utility Power Generation

• Battery Storage
What is CHP?

Combined heat and power (CHP) is an efficient and clean approach to generating electric power and useful thermal energy from a single fuel source. CHP is used either to replace or supplement conventional, separate heat and power. CHP can be utilized in a variety of applications that have significant electric and thermal loads. (Source: U.S. EPA)
Combined Cooling, Heat and Power (CCHP) incorporates all the same benefits of CHP but adds an absorption chiller to the total system to produce air conditioning and/or cooling for other industrial needs.
CHP Advantages

• CHP does two jobs with one “fire” to increase delivered efficiency from grid average of 33% to 80% or higher
  Electric power and heating produced

• CHP
  • Cuts net fuel per kW-hour in half (vs. electric only)
  • Eliminates transmission losses (vs. grid)
  • Lowers emissions (same emissions for higher energy recovery)
  • Uses 70-80% of fuel’s energy (reduces energy bills)

• Improve project economics
  • Get more out of the fuel you are burning – create both electricity and heat for the same energy cost of producing electricity only
CHP/CCHP vs Traditional Sources

To create the same power output, traditional sources use more fuel and have much higher emissions.

Capstone Microturbine
- Fuel: 230kW of fuel
- Emissions: 45kW waste heat, 0.15 lb/MWh NOx, 1,540 lb/MWh CO₂
- CHP: 80% efficiency
- Output: 120kW hot water output, 65kW electricity output

Traditional Sources
- Fuel: 345kW of fuel
- Emissions: 160kW waste heat, 3.4 lb/MWh NOx, 2,320 lb/MWh CO₂
- Boiler: 80% efficiency national average
- Utility Power Plant: 33% efficiency national average
- Output: 120kW hot water output, 65kW electricity output
CHP/CCHP Resiliency

- What is the value in using a CHP system in the event of a grid loss, lost production, lost business or lost product?

- Incremental project cost can provide standby generation capability at a lower cost than a generator install and with less maintenance

- Capstone microturbines continue to operate seamlessly during and after prolonged utility outages
  - Example: Hurricane Sandy (2012) left 8 million utility customers in the dark (some for over a week). All installed microturbines in the area continued to operate.
CHP Offset Costs

- Does a CHP system avoid or delay other capital projects?
  - Avoid a boiler upgrade
  - Generator upgrade and/or maintenance costs
  - HVAC upgrade
  - Electrical service upgrade

- Many of these costs are significant and can offset a large portion of a CHP installed cost

- A project with a marginal ROI can be drastically improved when the correct avoided costs are included
Utilizing Exhaust Heat

Direct Exhaust

- Exhaust piped directly for use
  - Greenhouse heating
  - Drying processes: furniture, chemicals, agriculture

Indirect Exhaust

- A heat exchanger transfers exhaust heat to a secondary medium
  - Hot water: building heating, boiler feed, pool heating, digester heating
  - Steam: building heating, industrial processes
  - Absorption cycles (cooling): building or process cooling
Capstone Turbines

Simple, Reliable, Efficient & Easy to Maintain
Engine Components

- Simple System: only one moving part
- No liquid, oils or coolants needed due to patented air bearing technology
- No oil consumption or disposal
- Air bearings are maintenance free
- Cleaner exhaust emissions
Microturbine Engine

Recuperated Gas Turbine
- Air cooled and lubricated powerhead
- Continuous combustion system
- Recuperator: exhaust-to-inlet air heat exchanger
- Permanent magnet generator

Variable Speed
- Power is proportional to the speed
- Speed is independent of output voltage and frequency
Capstone C1000 Signature Series

Allows for efficient operation and very high turn-down
Operational Modes

Grid Connect

- Automatically synchronizes to a live utility grid
  - 400 VAC @ 50 Hz or 480 VAC @ 60 Hz
- Can be configured for Time of Use and Load Following

Stand Alone

- Equipped with on-board battery system
- Provides user-configured voltage and frequency to grid-isolated loads
- Soft Start Function available for Large Dedicated Motor

Dual Mode

- Functions in Grid Connect mode when the grid is available, switches to Stand Alone mode when the grid goes offline
- Requires a Dual Mode System Controller
Aftermarket Service

- Industry-leading Factory Protection Plan (FPP)
- Factory quality spare parts
- Unscheduled maintenance

Factory Certified Service Technicians

Spare Part Inventory Maintained by Local Distributor

Access to Capstone Turbine Technical Resources

24/7 Call Center Access
Capstone Turbines are widely used all over the Globe

>10,000 units deployed with over 120 million operating hours and capacity of >1 GW
Turbines Deployed Globally

**FY16 Units Shipped**
- Total: 281 Units
- FY16: 172
- Cumulative: 51
- Others: 18

**FY16 MW Shipped**
- Total: 60 Megawatts
- FY16: 44.0
- Cumulative: 11.2
- Others: 3.6

**Cumulative MW Shipped**
- FY12: 430 MW
- FY13: 533 MW
- FY14: 643 MW
- FY15: 734 MW
- FY16: 794 MW
Units in Latin America and Caribbean (771+)

- Mexico: 448 units
- Brazil: 78 units
- Bolivia: 70 units
- Colombia: 20 units
- Chile: 12 units
- Peru: 10 units
- Puerto Rico: 9 units
- U.S. Virgin Islands: 8 units
- Argentina: 5 units
- Haiti: 5 units
- Dominican Republic: 3 units
- Barbados: 2 units
- Panama: 1 unit
- Total: 771 units
Powered by Capstone
14 of Fortune’s Top 25 Global Companies Use Capstone Products
The Difference between Capstone Microturbines and Piston Engines
# Capstone Microturbines vs Recip. Engines

<table>
<thead>
<tr>
<th>Capstone Microturbine</th>
<th>Reciprocating Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard units are NEMA 3R rated. Requires no buildings and may be installed outdoor.</td>
<td>Standard unit requires a building, but may be containerized.</td>
</tr>
<tr>
<td>All controls and synchronizing equipment are integral to the package. Requires no elaborate switchgear.</td>
<td>Need synchronizing switchgear and associated equipment to integrate with client's electrical system or with the utility grid.</td>
</tr>
<tr>
<td>Requires very little real estate. 40 foot container = 1 MW</td>
<td>Requires more area per equivalent power.</td>
</tr>
<tr>
<td>Less costly to operate and maintain.</td>
<td>More costly to operate and maintain</td>
</tr>
<tr>
<td>Has only one moving part.</td>
<td>Has many moving parts</td>
</tr>
<tr>
<td>Uses patented air bearing technology and uses no oil, grease or coolant.</td>
<td>Uses lubricating oil, grease and coolant.</td>
</tr>
<tr>
<td>Electric efficiency ranges between 29% and 33%. Overall efficiency can approach up to 92%.</td>
<td>Electric efficiency ranges between 38% and 45%. Overall efficiency can approach up to 90%.</td>
</tr>
</tbody>
</table>
## Capstone Microturbines vs Recip. Engines

### Capstone Microturbine

- Ultra-low NOx emissions – <10 ppm
- No oil required
- No coolant required
- Programmed maintenance – each 8,000 hours
- Power electronics integrated in the package
- Grid protection and ability to sync with grid
- Lightweight and small footprint/power density

### Reciprocating Engine

- NOx emission between 250 and 500 ppm
- Oil required
- Coolant required
- Typical maintenance – from 500 to 1,500 hours
- External control panel without power electronics
- External protection required
- Usually double weight and space of a microturbine
# Capstone Microturbines vs Recip. Engines

<table>
<thead>
<tr>
<th>Capstone Microturbine</th>
<th>Reciprocating Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microturbines can tolerate 5,000 ppm (C30 70,000 ppm) of H₂S without changing service intervals</td>
<td>Reciprocating engines typically tolerate 350 ppm and service intervals are shortened to 1,000 hours approx.</td>
</tr>
<tr>
<td>Microturbines can run on as low as 35% of methane while maintaining its rated output</td>
<td>Reciprocating engines can run on as low as 45% of methane while maintaining its rated output</td>
</tr>
<tr>
<td>CO₂ emissions &lt; 64 ppm – C200 (For NG)</td>
<td>CO₂ emissions &lt; 643 ppm – C200</td>
</tr>
<tr>
<td>NOx &lt; 10 ppm (as NO₂) – C200 (For NG)</td>
<td>NOx &lt; 239 ppm (as NO₂) – C200</td>
</tr>
<tr>
<td>300°C exhaust temperature allow extended range of applications</td>
<td>Lower exhaust temperature</td>
</tr>
<tr>
<td>Clean exhaust gases allow for use in drying applications</td>
<td>Exhaust gases are more difficult to use due to oil combustion system</td>
</tr>
<tr>
<td>Clean exhaust gases are O₂ rich, allowing for post combustion applications</td>
<td>Exhaust gases allow for some post combustion applications</td>
</tr>
<tr>
<td>Minimal methane loss</td>
<td>Reciprocating gas engine typical methane loss can achieve up to 3.5%</td>
</tr>
<tr>
<td>Efficiency guarantee is not based on ISO3046/1 – (i.e. no tolerance must be taken into consideration)</td>
<td>Efficiency guarantee is typically based on ISO3046/1 – (i.e. there is a 5% tolerance permitted)</td>
</tr>
</tbody>
</table>
## Aftermarket Service Comparison

**Capstone Microturbine**

6 hrs Planned Maintenance/Year  
Average uptime **99%**

<table>
<thead>
<tr>
<th>Operating Hours</th>
<th>Item</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 – 2,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1,500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8,000</td>
<td>Air/Fuel Filters, Igniter</td>
<td>Inspect, Replace</td>
</tr>
<tr>
<td>20,000</td>
<td>Injectors, Batteries</td>
<td>Replace</td>
</tr>
<tr>
<td>40,000</td>
<td>Engine/Generator, Injectors, Batteries</td>
<td>Overhaul</td>
</tr>
</tbody>
</table>

**Reciprocating Engine**

120 hrs Planned Maintenance/Year  
Average uptime **82%**

<table>
<thead>
<tr>
<th>Operating Hours</th>
<th>Item</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air &amp; Oil Filters, Oil, Spark Plugs</td>
<td>Inspect, Replace</td>
</tr>
<tr>
<td></td>
<td>Top End</td>
<td>Inspect</td>
</tr>
<tr>
<td>8,000</td>
<td>Top End</td>
<td>Inspect</td>
</tr>
<tr>
<td>20,000</td>
<td>Top End</td>
<td>Overhaul</td>
</tr>
<tr>
<td>40,000</td>
<td>Bottom End</td>
<td>Overhaul</td>
</tr>
</tbody>
</table>
Case Studies
Associated Manufacturers Limited

- **Location**: Walkerswood, Jamaica
- **CAPEX**: US$310K
- **Project**: 65 kW iCHP
- **Our Role**: Developer & EPC Contractor
- **Owner**: Associated Manufacturers Limited
- **Client**: Walkerswood Jerk Sauce
West Kingston Power Partners

- **Location:** Kingston, Jamaica
- **CAPEX:** US$128 Million
- **Project:** 66 MW HFO Power plant
- **Our Role:** Project Management, Electrical & Mechanical Construction Services
- **Owner:** West Kingston Power Partners
- **Client:** Wärtsilä
Jamaica Broilers Ethanol Plant

- **Location:** Port Esquivel, Jamaica
- **CAPEX:** US$55.0 Million
- **Project:** 120 Million Gallons per Year, Fuel Grade Ethanol Production
- **Our Role:** Development, Project Management & Construction
- **Owner & Client:** Jamaica Broilers Group
Jamaica Broilers Cogeneration Plant

- **Location:** Spring Village, Jamaica
- **CAPEX:** US$25.0 Million
- **Project:** 18 MW Cogen Power Plant
- **Our Role:** Develop, Finance, Construct & Operate.
- **Owner & Client:** Jamaica Broilers Group
Duquesne University

- **Location:** Pittsburgh, PA
- **CAPEX:** $12.6 Million
- **Project:** 5 MW; 80 kPPH; 2400T, “Tri-generation”; GT / HRSG / Chillers
- **Our Role:** Develop & Operate
- **Owner:** Duquesne University
- **Client:** ERI Services
Petroelectrica de Panama

- **Location:** Colon, Panama
- **CAPEX:** US$40.0 Million
- **Project:** 52 MW Independent Power Producer
- **Our Role:** Develop, Finance, Project Management, Operate
- **Client:** ERI Services
Innoquality – San Luis Potosi, Mexico

Application
• Base Load
• Tetrapack Juice bottler

Technologies
• One Capstone C800 microturbines (CHP)
• Hot water generators

Project Highlights
• The C800 provides 635kW of electricity as well as hot water for the pasteurization process
• Estimated cost savings of 55% with less than 4-year expected payback
Nutriplus – Queretaro, Mexico

**Application**
- Base Load
- Preservatives for the food industry

**Technologies**
- Three Capstone C65 microturbines (CHP)
- Direct exhaust for drying process

**Project Highlights**
- The three C65 input power offsetting the demand from the grid
- The exhaust heat from the turbines is used directly to dry the product
- Estimated cost savings of 60% with less than 3-year expected payback
Tonno Castiglione – Casa Santa Erice, Italy

**Application**
- Prime Power
- Tuna packaging facility

**Technologies**
- Capstone C600 microturbines (CHP)
- Hot water heat exchanger
- Saturated steam generator

**Project Highlights**
- Energy savings of 210 TOE (tonnes of oil equivalent) per year, or approximately 593 tons of CO₂ avoided per year
- **Financial savings of about €170,000 per year**
Recla – Silandro Bozen, Italy

**Application**
- Prime Power
- Sausages manufacturer

**Technologies**
- Capstone C1000 microturbine (CHP)
- Hot water heat exchanger
- Saturated steam generator

**Project Highlights**
- Energy savings of 270 TOE (tonnes of oil equivalent) per year, or approximately 760 tons of CO$_2$ avoided per year
Felsineo La Mortadella – Bologna, Italy

Application
• Prime Power
• Mortadella manufacturer

Technologies
• Capstone C1000 microturbine (CHP)
• Natural gas compressor
• 3-ton saturated steam generator

Project Highlights
• Total system efficiency improved by 30%
• Facility avoids 478 tons of CO₂ per year
• Installation saves the food manufacturer €300,000 annually in energy costs
Surgital – Conselice, Italy

**Application**
- Prime Power
- Pasta manufacturer

**Technologies**
- Capstone C600 microturbine (CHP)
- Saturated steam generator
- Ammonia chiller

**Project Highlights**
- Energy savings of about 200 TOE (tonnes of oil equivalent) per year, or approximately 563 tons of CO₂ avoided per year
- Financial savings of about €180,000 per year
Abafoods – Badia Polesine, Italy

Application
- Prime Power
- Juice producer

Technologies
- One Capstone C600 microturbines (CHP)
- Hot water heat exchangers
- Gas compression system

Project Highlights
- Energy savings of 216 TOE (tonnes of oil equivalent) per year, or approximately 610 tons of CO₂ avoided per year
- Financial savings of about €200,000 per year