Introducing the:
Integrated Cooling & Heating Module

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Integrated Cooling & Heating Module

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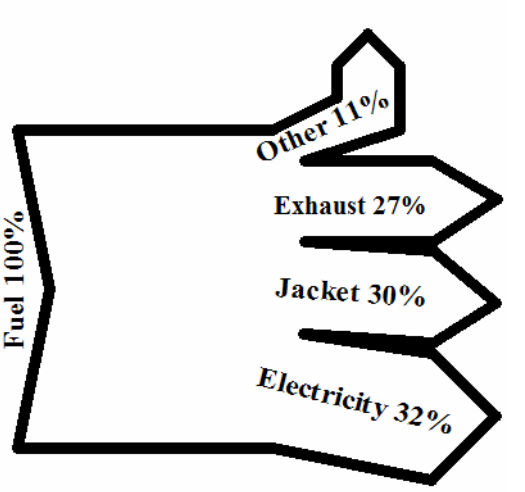
Introduction

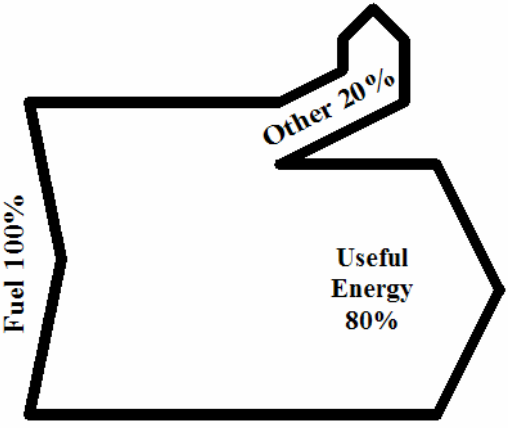
- Integrated CHP Systems Corp. is a systems integrator specializing in the design and provision of prepackaged thermally activated technologies for integration with a variety of on-site electric generating technologies.

- We are working in conjunction with various partners to provide a modular solution for single stage absorption based cogeneration systems – the ICHM.

ICE Sankey Diagram



CHP Sankey Diagram



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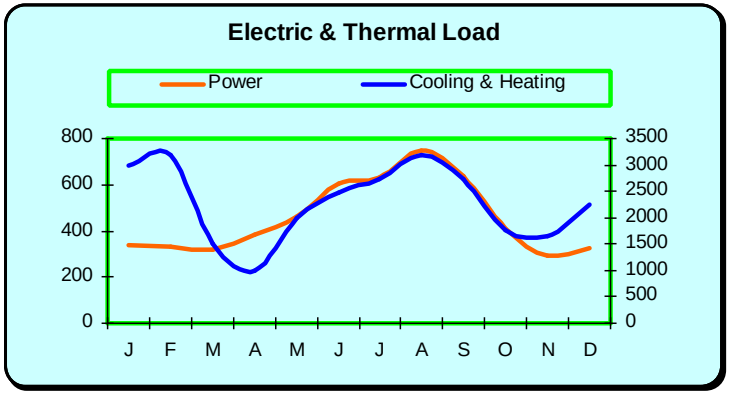
Cogen Design

- Typical Commercial Building Electric & Thermal Load Profile
- Thermal Requirements:
  - Hot Water + Chilled Water
- An Absorption Chiller provides chilling from heat input – it is a thermally activated cooling technology



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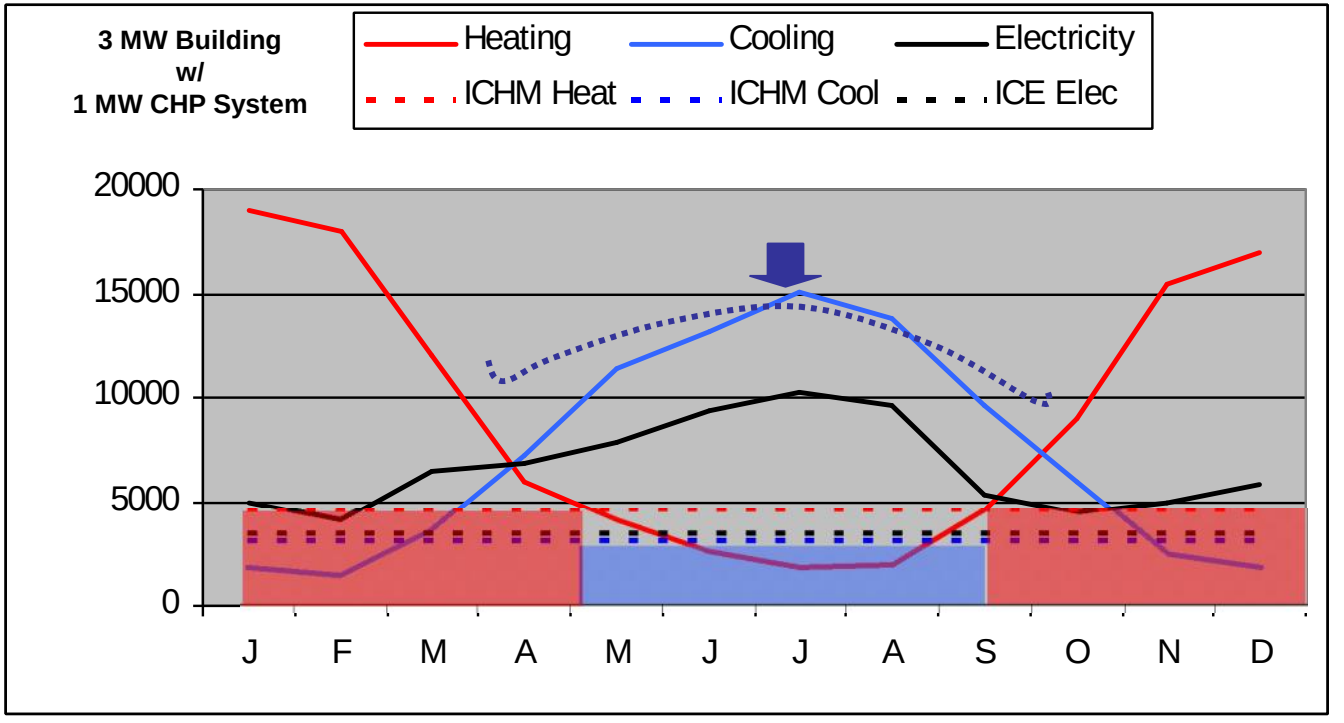
Annual Load Factor



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Product Development Partners

- CEC PIER Award
  - Integrated CHP Systems Corp.
  - DE Solutions, Inc.
  - BluePoint Energy, Inc.
- SoCalGas Funding Support
- York International

Cost Effective

Goals of the Agreement:

"*The goal of this Agreement is to significantly reduce the installed cost of CHP integrated HVAC systems for Commercial and Light Industrial applications. The goals will be accomplished through 1) the development of standardized factory assembled heating/cooling modules and 2) absorption chiller and engine heat management system that are cost optimized for CHP performance.*"

Modular

Integrated with Engine & Building

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ICHM

- The ICHM is a pre-fabricated Integrated Cooling & Heating Module designed for cogen applications with IC engines.
- The ICHM includes an absorber, load heat exchanger, cooling tower, condenser pump, system controls, pipe, valves and fittings in an outdoor enclosure.
- The ICHM provides simultaneous heating and cooling for maximum load factor.

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The ICHM

Design
Cooling & Heating Equipment
Engineering
Fabrication
Commissioning
@
30% Less Cost
w/
National Service Network

hot water heat exchanger
diverting valve
control system
lighting
data acquisition
motor control center
starters
Single Source of Responsibility
pipe support
temp sensor
power panel
coolant diverting valve
skid
communications
enclosure
cooling tower
absorber
exhaust fan
pressure indicators
actuator

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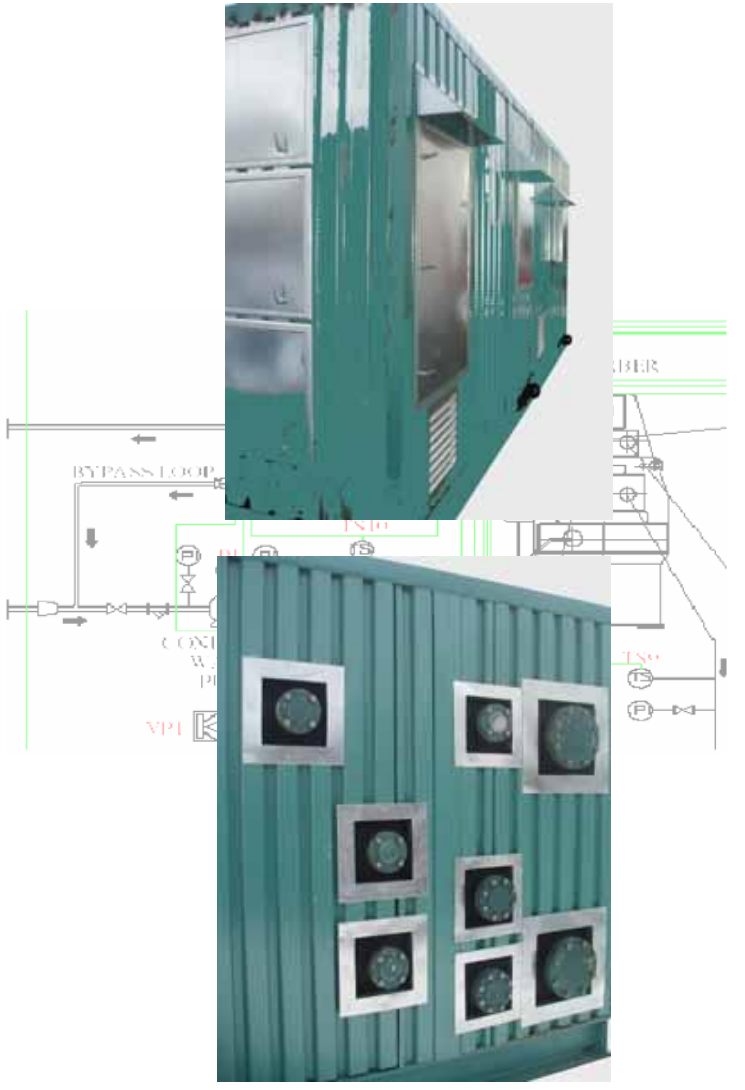
Design

- Compatible with multiple generator platforms and control systems.
- Packages for engines from 250 kW to 2 MW. Larger systems also available.
- Standardized design reduces costs.
- Pre-Engineering provides reliable performance and reduced commissioning costs.
- National Service Network.



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Components

Major U.S. Suppliers:

- Absorber – York
- HEX – Flat Plate Inc.
- CT – Baltimore Air Coil
- Controls – Allen Bradley
- Cd Pump & By-Pass
- Heat Load Control
- Sensors, PV&F
- Skid & Enclosure

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Control System

- PLC Based Controller
- Interface between Engine, Building, Absorber, Load HEX and Data Acquisition System.
- A single 2-Wire MODBUS connection is provided for communications and data acquisition.
- Indicator Lights and a display screen provide local interaction.

Description	Type
Cooling	On/Off
Heating	On/Off
System Shut Down	On/Off
Mode Status	Message 1 – 20
Chilled Water Pump	On/Off
Chiller Fault	On/Off
Inlet Coolant Temp	Temp Reading (F)
Outlet Coolant Temp	Temp Reading (F)
V1 Coolant Valve Position	1 – 100%
Stage 1 Outlet Temp	Temp Reading (F)
Chilled Water Outlet Temp TS9	Temp Reading (F)
Chilled Water Inlet Temp TS8	Temp Reading (F)
Heating Water Inlet Temp	Temp Reading (F)
Heating Water Outlet Temp	Temp Reading (F)
Condenser Water Inlet Temp	Temp Reading (F)
Chilled Water Flow	On/Off
Condenser Water Flow	On/Off

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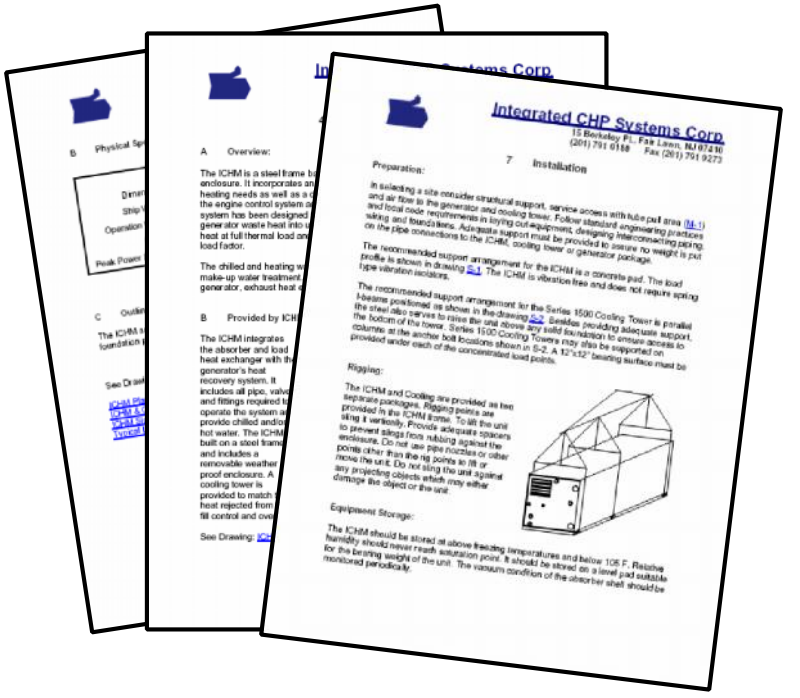
Installation

- Steel Skid
- Rigging Points
- Outdoor Enclosure
- Flanged Piping Connections
- Single Electric Connection
- Single Control Connection
- Remote Cooling Tower



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Service & Maintenance

- The ICHM is designed to allow service access to all major components.
- York Service provides commissioning and maintenance contracts.

YORK® INTERNATIONAL CORPORATION

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Benefits

- Cost Effective – saves 30% on installed cost over stick-built systems.
- Pre-Engineered – integrated thermal system for IC engine application.
- Prefabricated – built as a modular package under controlled conditions.
- Single Power & Control Connections – easy installation and data acquisition.
- Reliable – design, fabrication and commissioning by one company.
- National Service Network – complete service through York International.

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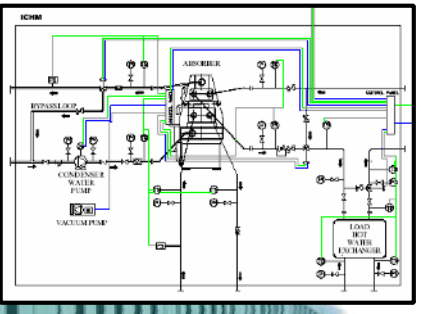
Additional Benefits

- One Company responsible for design, fabrication and commissioning.
- Integrated Controls & Safeties
- Reduced Start-up Issues
- Outdoor Enclosure
- Compact Size



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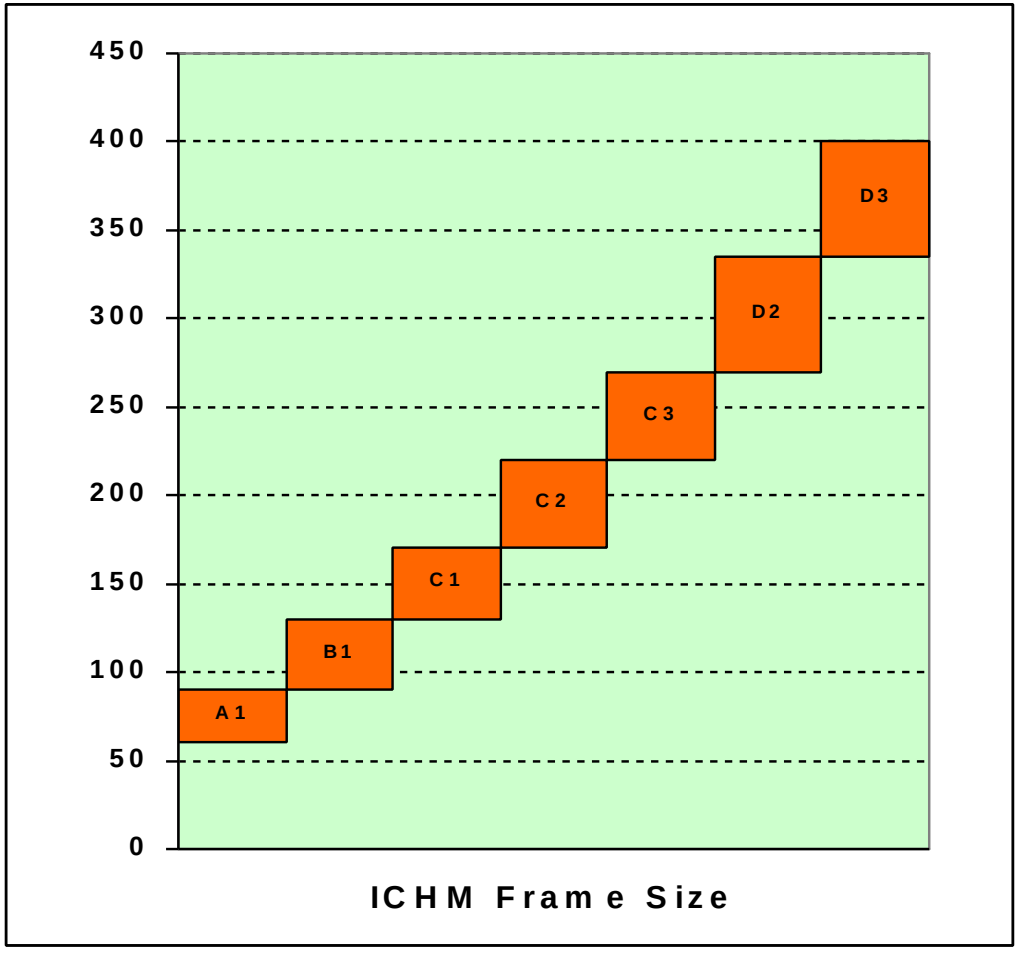
ICHM Range

- The ICHM comes in 7 frame sizes for engines from 250 kW to 2 MW.
- Cooling output ranges from 65 tons to 400 tons.



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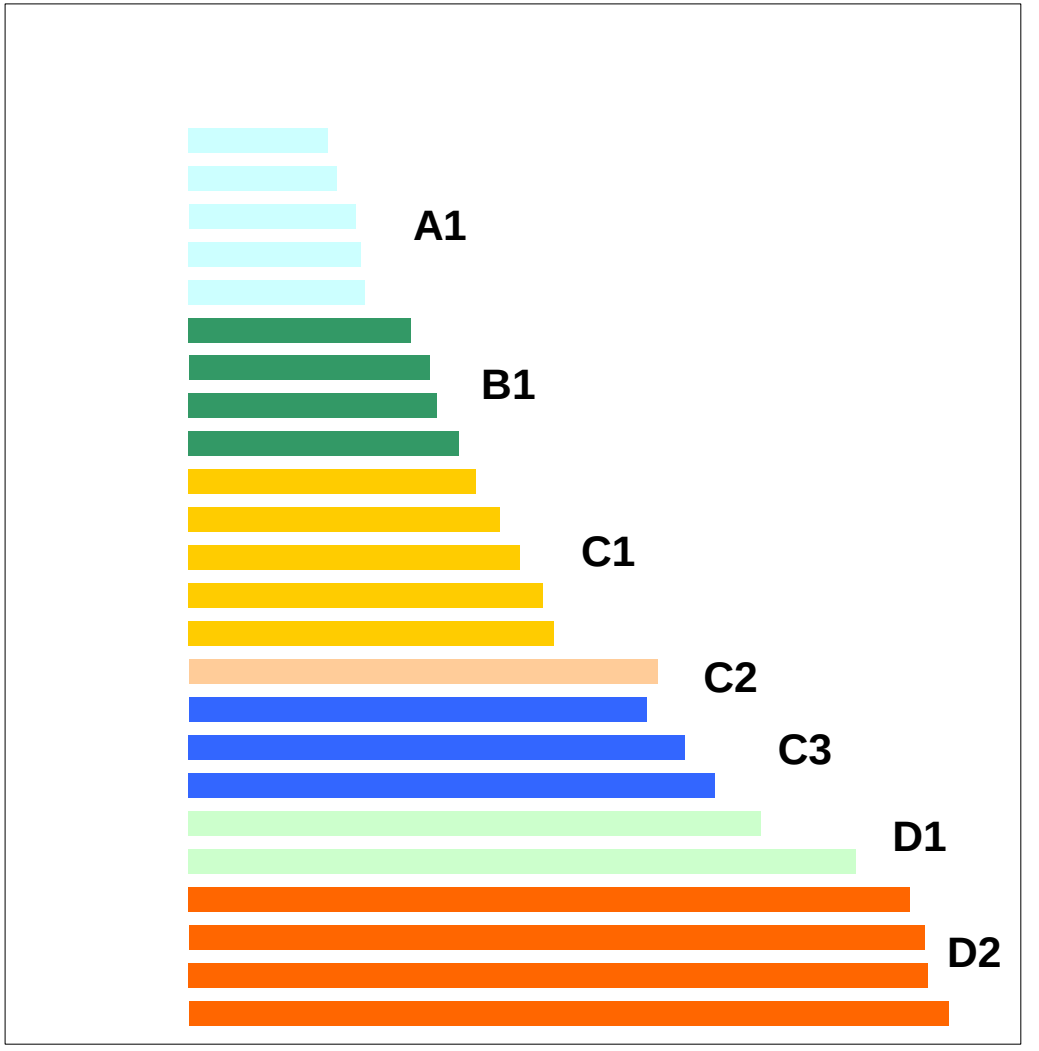
ARI FL Performance

The ICHM has been benchmarked with all the major US continuous duty, lean-burn natural gas engines.



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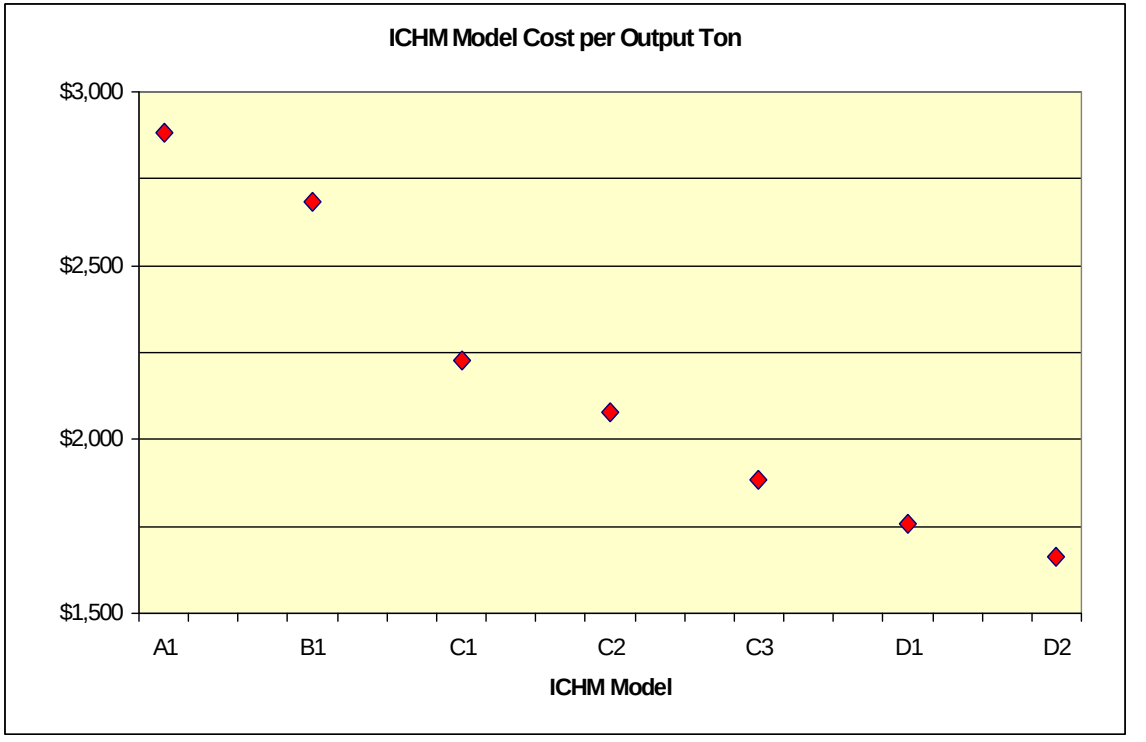
Economics

ICHM costs are below site constructed systems of comparable quality and components on an output basis.



Reduce Payback with Rebates
Simultaneous Hot Water increases Load Factor

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Economics

- ICHM output is major contributor to CHP profit

Engine Size		1,400 kW	ICHM Equipment Cost [1]	$	$560,000
ICHM Model		**D2**	ICHM Installation Cost [2]	$	$48,500
Cooling Output	Tons	**340**	Total ICHM Cost	$	$608,500
Cooling Season	Hrs/Yr	**3,000**	Total Rebate Amount	$	$0
Cooling Load Factor	%	**85**	Net ICHM Cost	$	$608,500
Heating Output	MBH	**5,900**			
Heating Season	Hrs/Yr	**4,500**	Annual Electric Power Cost Offset	$/Yr	$62,354
Heating Load Factor	%	**95**	Annual Natural Gas Cost Offset	$/Yr	$267,062
			Annual Total Energy Cost Offset	$/Yr	$329,415
Average Electric Power Cost	¢/kWh	**12**			
Average Natural Gas Cost	$/MMBH	**9.00**	ICHM Payback	Years	**1.8**
Chiller Efficiency	kW/Ton	**0.60**	ICHM 5-Year Contribution	$/Yr	**$207,715**
Boiler Efficiency	%	**85**	ICHM Contribution after 5 Years	$/Yr	**$329,415**
			Peak Electric Demand Reduction	kW	**204**
			Emissions Credit Output Value	kW	**1768**

Notes: 1 Cost includes FOB Site and Comissioning
2 Estimate based on typical installation requirements

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Modular CHP

- The ICHM is matched with each generator line for seamless control integration and optimized performance.

- An ICHM based CHP System provides the customer with an off-the-shelf modular solution. Its simplicity of installation, reliable performance and reduced cost achieve industry goals

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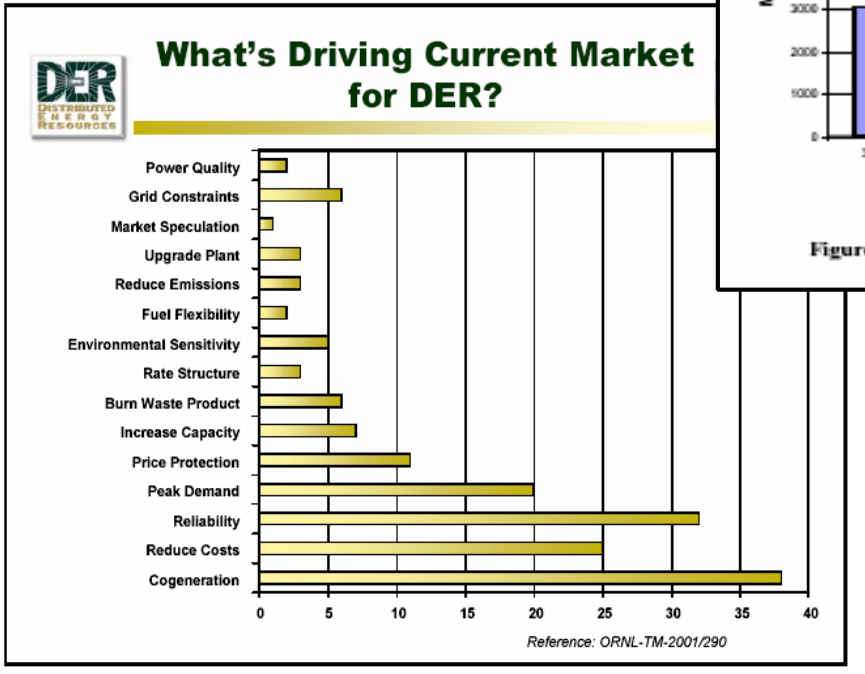
Markets

- Absorption based IC Engine CHP System



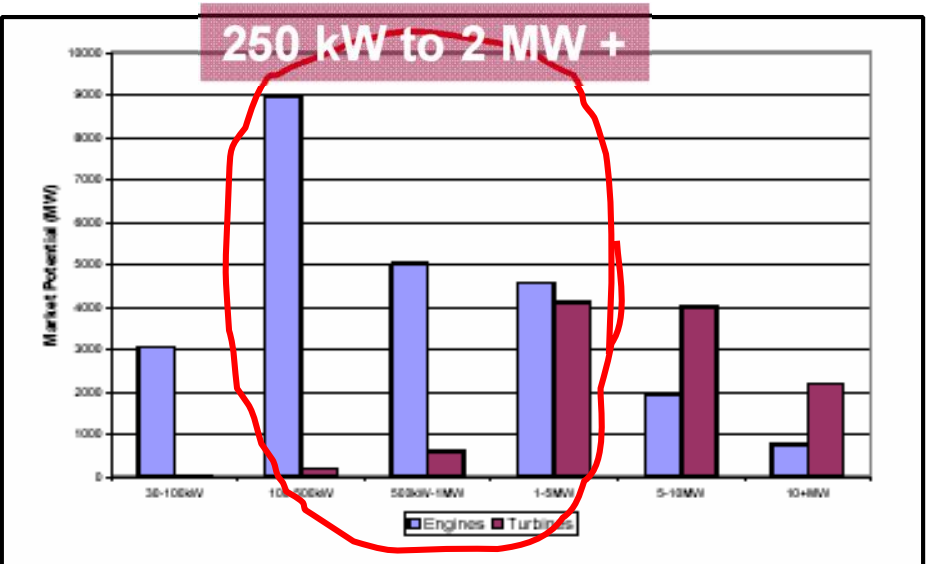


Figure 3-4. Market Potential for IES by Size and Type of CHP Prime Mover

Reference: EERE/ORNL Integrated Energy Systems for Buildings.

Questions

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