

# Microturbine Product Technology

## Ingersoll Rand Energy Systems

Presentation to:



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# Products and Services



Climate Control Technologies



Industrial Technologies



Security Technologies

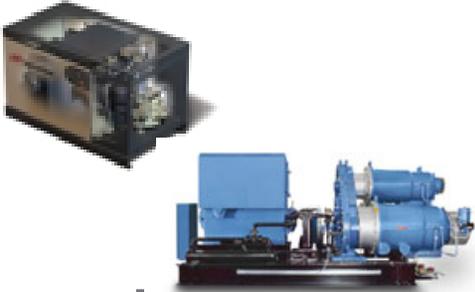
Construction Technologies



Compact Vehicle Technologies



Air Solutions



Productivity Solutions



Energy Systems

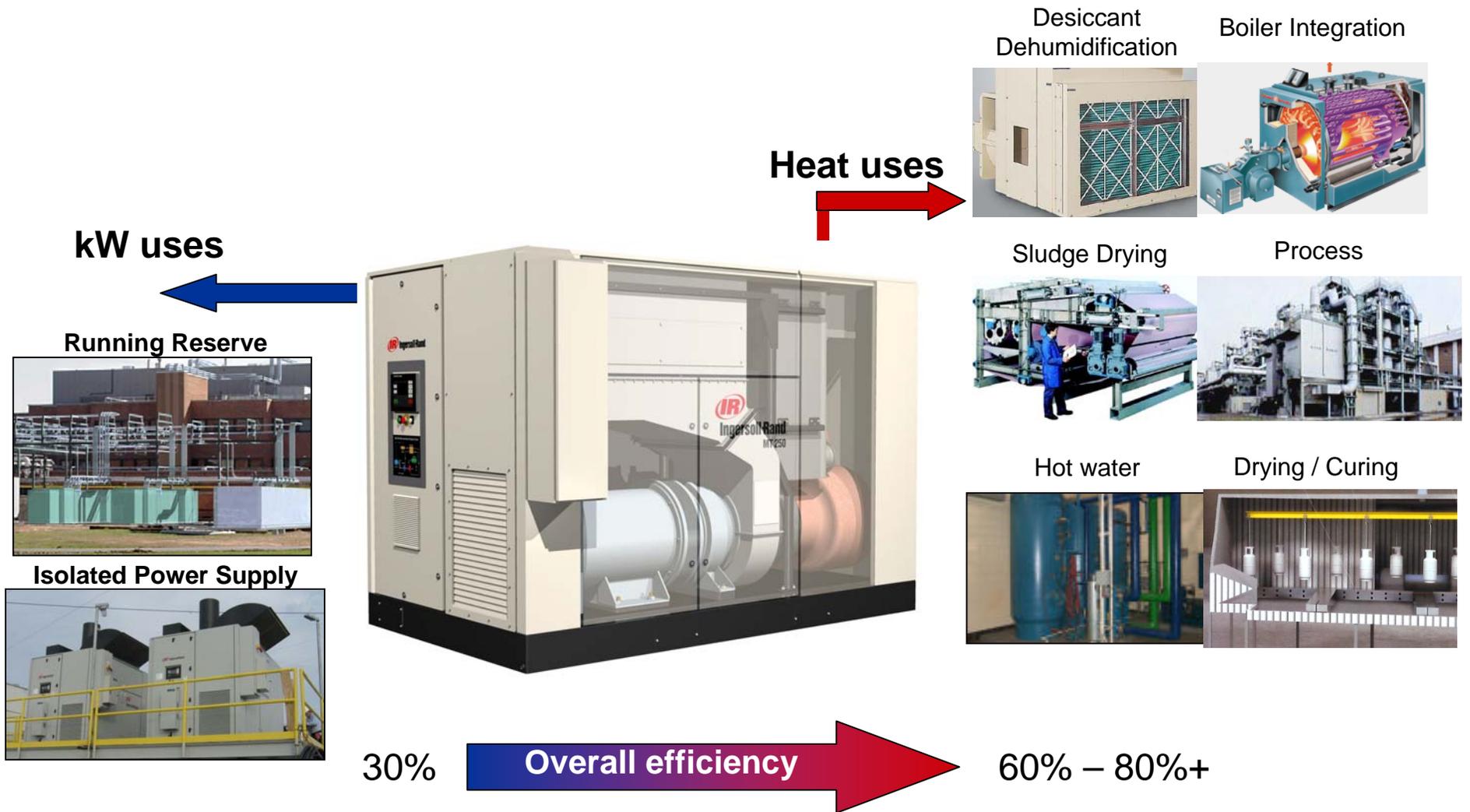


# MT250 Microturbine – Energy Distribution

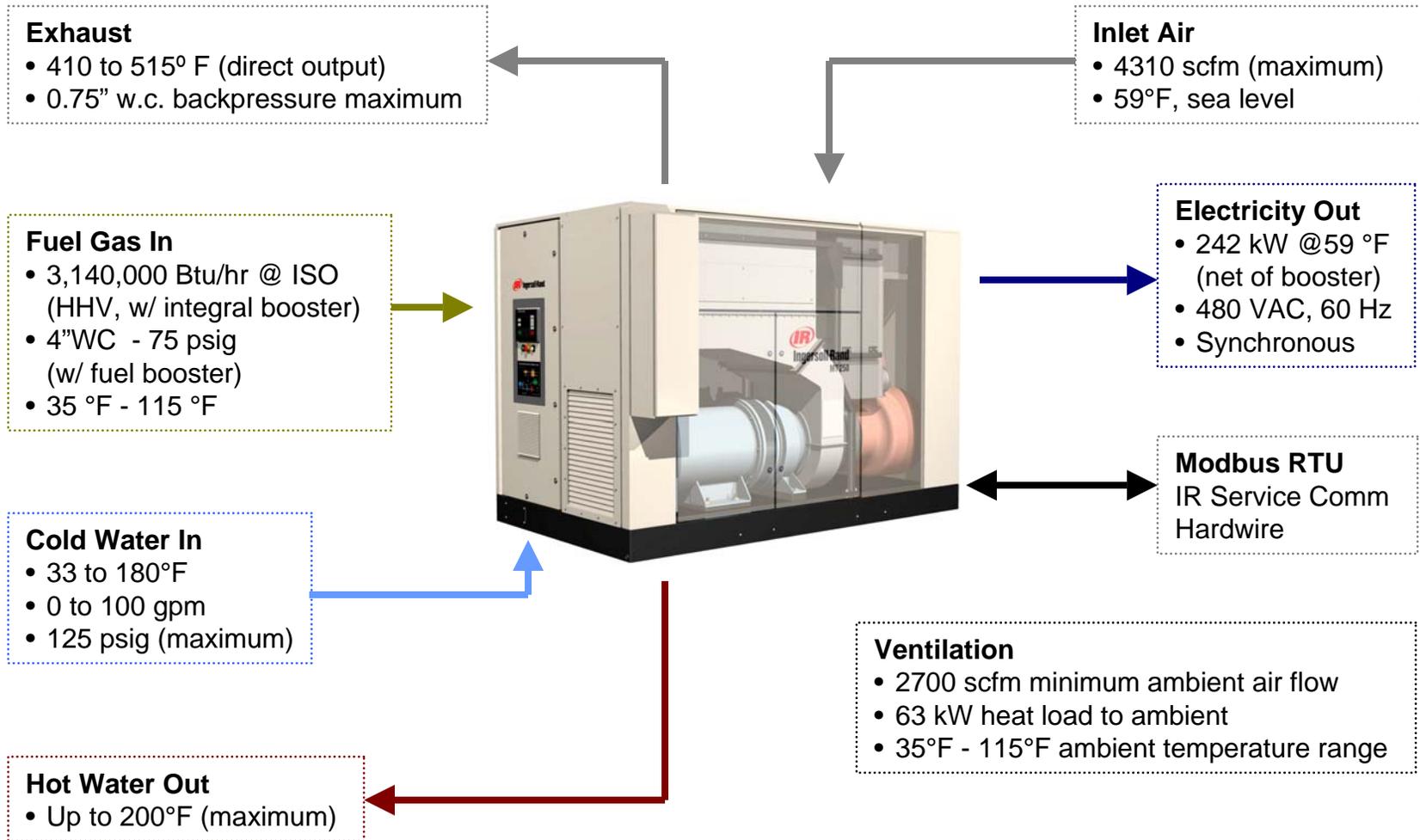
## Typical Energy Distribution at ISO Conditions



# Combined Heat & Power Applications



# Interfaces



# Low Emissions Combustion

- 250 kW is 2007 CARB certified for natural gas fuels
- 70 kW is 2003 CARB certified for natural gas fuels
- Both also certified as compliant to East Texas TCEQ limits and new NJ permitting threshold limits

Emissions @100% load (250 kW)

NO<sub>x</sub> <0.07 lb/MWh  
CO <0.10 lb/MWh  
VOC <0.02 lb/MWh



# Accepts Wide Variety of Gaseous Fuels

Different microturbine models offered for fuels such as:

- natural gas from the pipeline
- methane from waste water treatment
- overhead vapors from oil recovery
- “waste gas” from petroleum refining
- land-fill gas
- propane



<i>Fuel</i>	<i>Required heat content<sup>a</sup></i>
Low Btu gas, level 1	350-575 Btu/ft <sup>3</sup> (13,000-21,400 kJ/m <sup>3</sup> )
Low Btu gas, level 2	500-800 Btu/ft <sup>3</sup> (18,600-29,800 kJ/m <sup>3</sup> )
Medium Btu gas <sup>b</sup>	700-1300 Btu/ft <sup>3</sup> (26,100-48,400 kJ/m <sup>3</sup> )
High Btu gas	1200-2500 Btu/ft <sup>3</sup> (44,700-93,100 kJ/m <sup>3</sup> )



# Experience

## Oil & Gas



### BP

Grand Isle, LA

2 – 250kW microturbines **+2 more**

#### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Combined heat & power



### Morningside Rose Garden

Lacombe, Alberta, Canada

4 – 70kW microturbines

#### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## ESCO - Commercial



### Wareham

Emeryville, CA

3 – 250kW microturbines

#### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy



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# Experience

## Associated Gas



**BSI, City of Commerce, CA**  
**(1) MT70**  
**Associated gas**

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Associated Gas



**Bridgemark, Placentia, CA**  
**(6) MT70 w/cogen**  
**Associated gas**

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Food & Beverage



**Valley Fig Growers, Fresno, CA**  
**(1) MT70 w/cogen**  
**Digester and natural gas**

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy



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# Experience

## Oil & Gas



**Kerr-McGee**  
Clearfield, UT

2 – 250kW microturbines + 2 more

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Combined Heat & Power & Dehumidification



**Utilimaster Corporation**  
Wakarusa, IN  
1 – 70kW microturbine



### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology

**2005 Governor's Awards for Environmental Excellence**



## Muni. Waste Water



**Sanitation District of Los Angeles County**  
Lancaster, CA  
1 – 250kW microturbine

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy



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# Experience

## Muni. Waste Water



**City of Millbrae WWTP**  
Hayward, CA  
1 – 250kW microturbine

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## LNG



**Southern CT Gas**  
Milford, CT  
1 – 70kW microturbine

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## High School



**New Bedford, MA**  
1 – 70kW microturbines  
Hot Water for Boiler System

### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy





# Experience

## Biogas



### Jamacha Landfill

San Diego, CA

4 – 70kW microturbines

#### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Combined Heat & Power & Backup Power



### Manchester Tank

Elkhart, IN

1 – 70kW microturbine &

1 – N130 Genset

#### Drivers



- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy

## Spinning Backup



Rahway, NJ

4 – 250kW microturbines

#### Drivers

- Reliability
- Environmental
- Health & safety
- Productivity
- Technology
- Energy



Valley Fig Growers



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# *Manchester Tank*



# IR Service - Where You Are Today

