



Generating Clean Power from Waste Heat

INTRODUCTION

Q3 2018

WASTE HEAT TO POWER



Highlights

- Founded in 2005
- Patented & Patent-Pending Technology
- 72 Operational Machines
- Acquired by BITZER in 2016

ElectraTherm's Power+ Generator®

- Commercial Release August 2011
- Up to *150 kWe Power Output
- More than 980,000 Hours Run Time



THIS IS SMART POWER®



BITZER INTEGRATION

BITZER is the world's largest independent manufacturer of refrigeration compressors

- BITZER 2016 Revenue: ~\$680M Euros
- Employees Worldwide: 3,400

June 2017: ElectraTherm headquarters relocated to the BITZER production facility in Flowery Branch, Georgia.



GLOBAL INSTALLATIONS



Austria
Czech Republic
France
Germany
Italy
Japan
Romania
Slovakia
United Kingdom
United States



DIVERSE APPLICATIONS

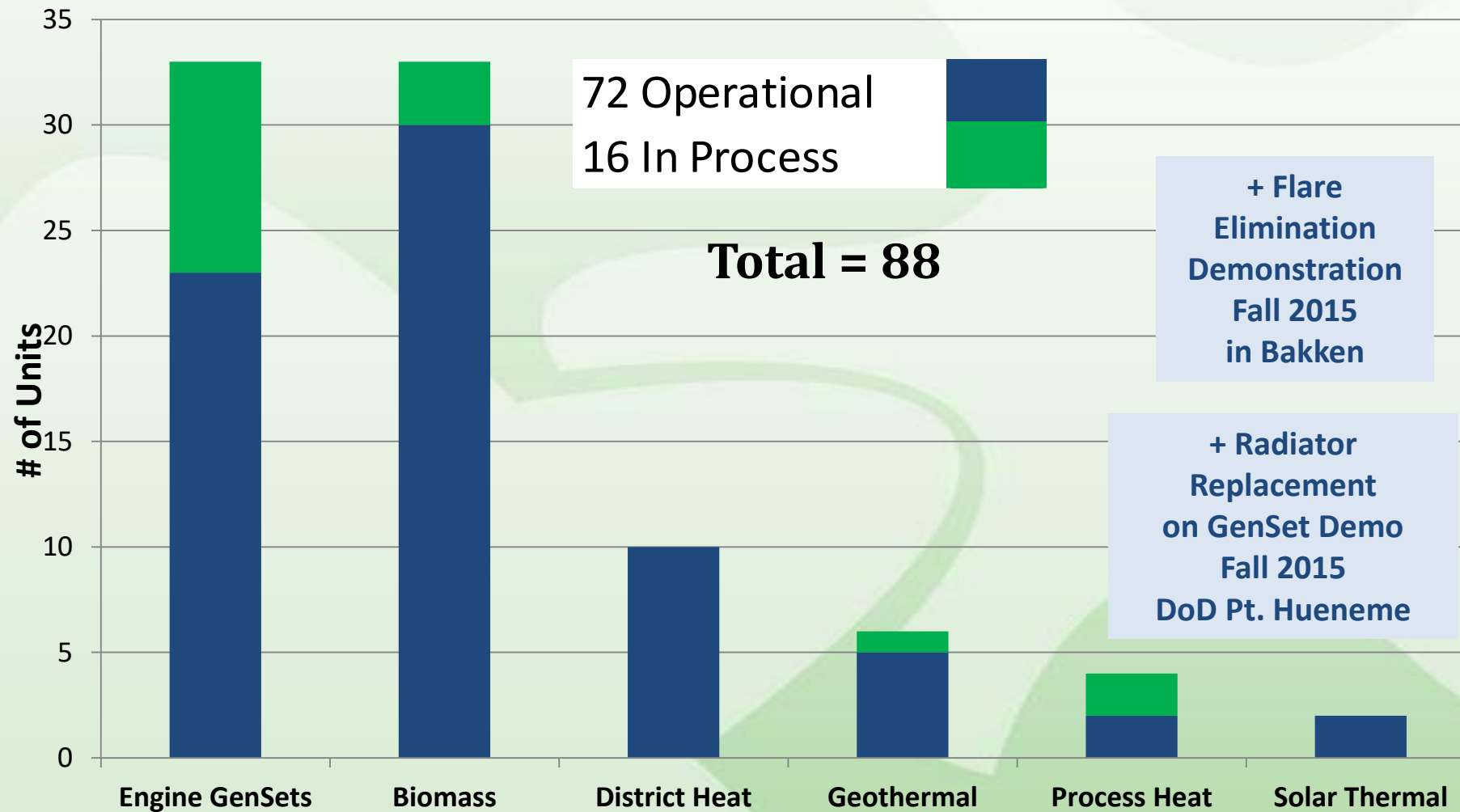
HOT WATER is the fuel (85-150°C/185-302°F)

- Biomass Boilers
- Reciprocating Engines
- Methane Utilization
- Geothermal/Oil & Gas Wells
- Process Heat



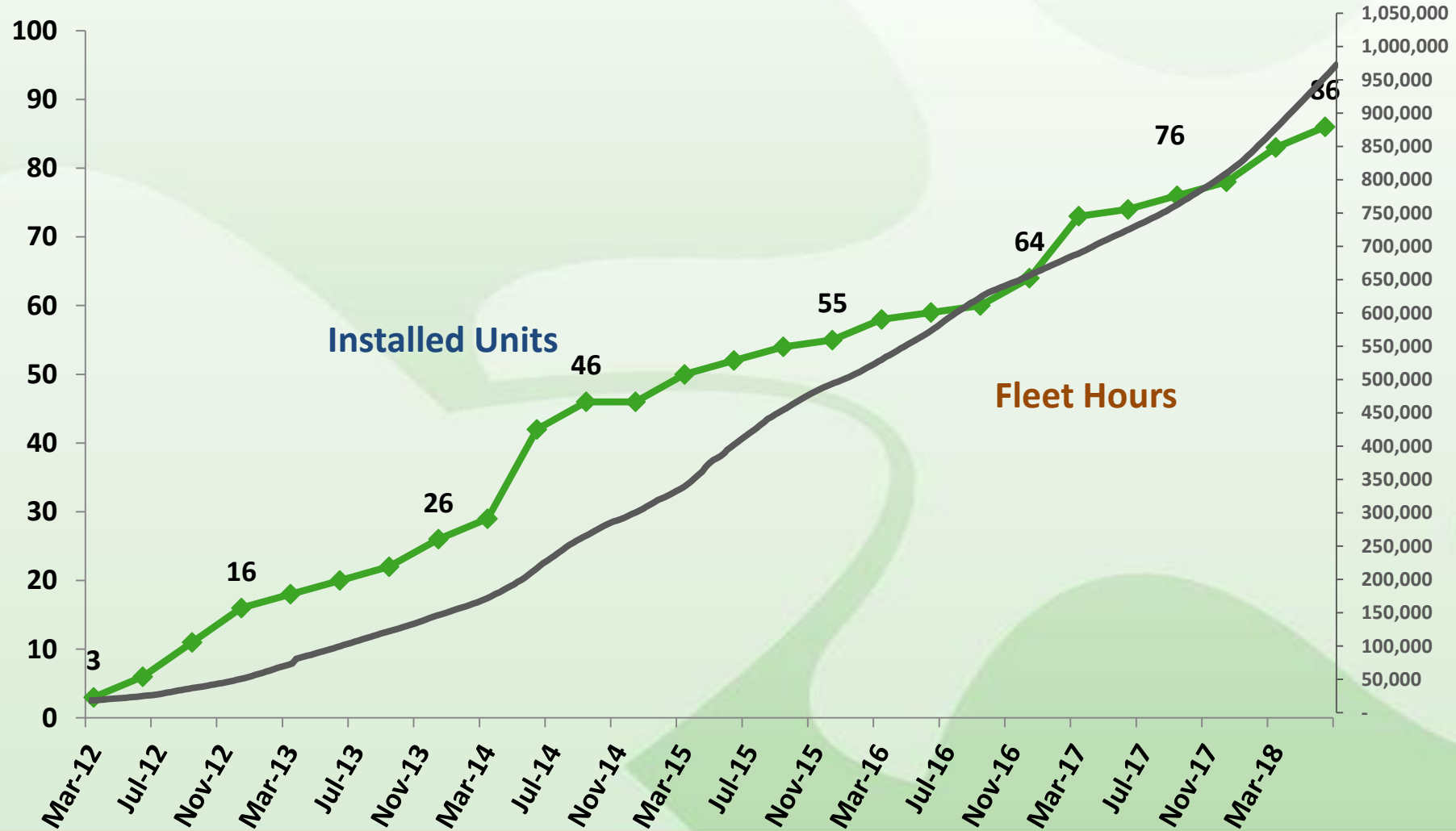
FLEET PROFILE BY APPLICATION

(**Operational** is the running Fleet, **In Process** is pending commissioning, production and backlog)



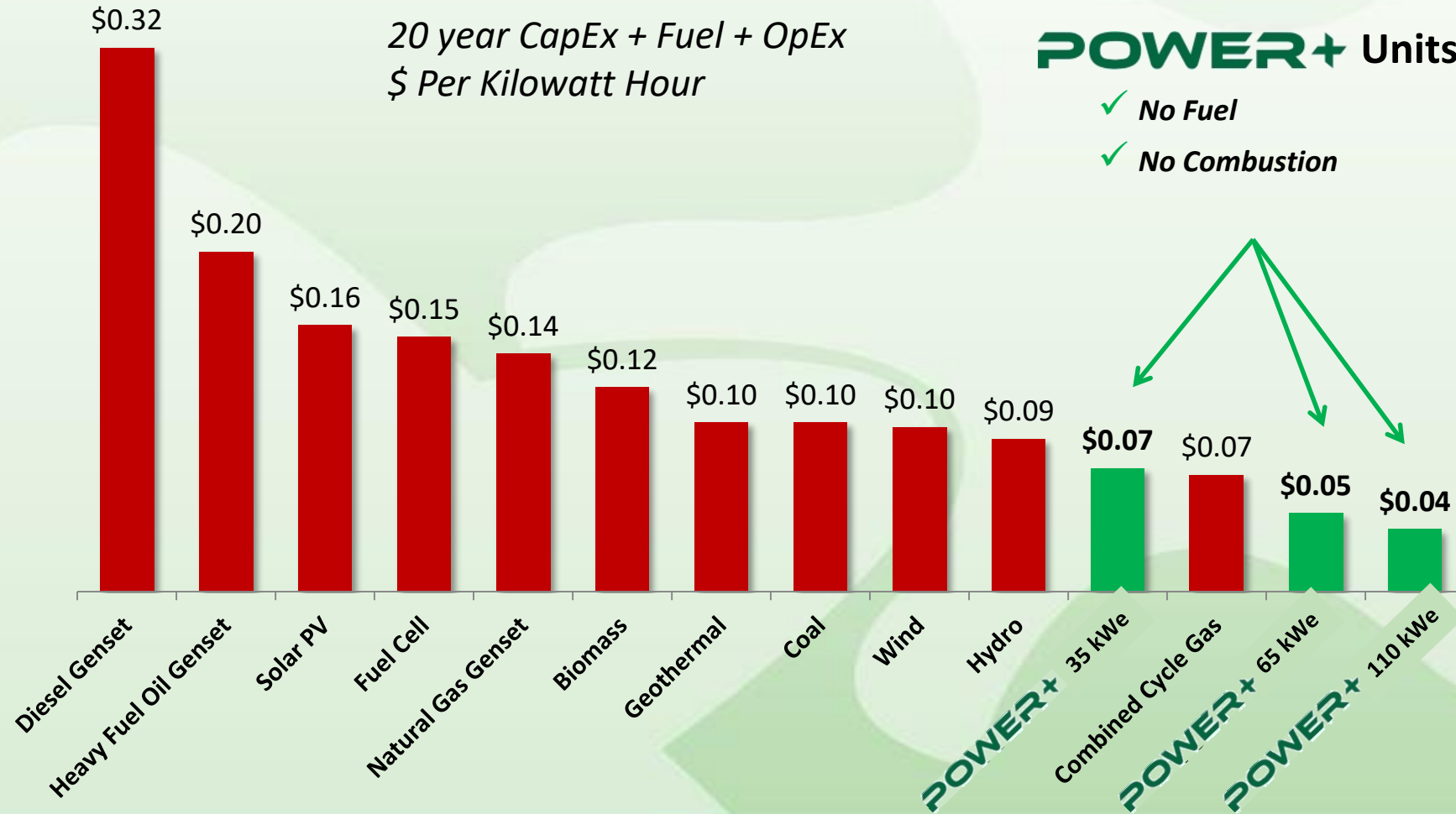
POWER+ GENERATOR CUMULATIVE FLEET

(Includes demonstration sites and R&D projects)



Approaching 1,000,000 Fleet Hours

LEVELIZED COST OF ELECTRICITY GENERATION



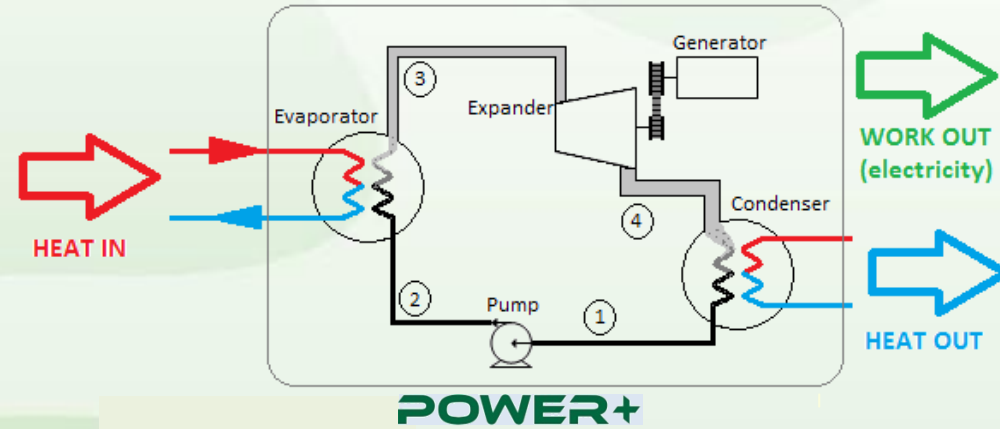
Source: US EIA's Annual Energy Outlook Data, ElectraTherm, Caterpillar



How It Works

Similar to Steam Cycle but Hot Water is the Fuel

POWER+ 4400



Biogas/Biomass Example:

Boiler



Hot Water



POWER+ 4400



**kWh Power
Output**

POWER+ FAMILY OF PRODUCTS

Model

Product

POWER+ 6500B

*Up to 150kW**

40'x8'x8' / 12.2x2.4x2.4 m
Packaged Solution



POWER+ 4400B

Up to 65kW

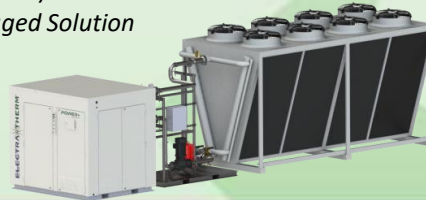


7'x7'x7' / 2.1x2.1x2.1 m
Standalone

POWER+ 4200B

Up to 35kW

40'x8'x8' / 12.2x2.4x2.4 m
Packaged Solution



ElectraTherm offers 3
output levels packaged
with cooling circuit or
standalone

Micro Geothermal

Generate Fuel-Free, Emission-Free Power with the **POWER+** Generator™

BENEFITS OF THE POWER+ GENERATOR:

- ✓ Distributed, renewable power generation
- ✓ Ease of installation, operation and maintenance
- ✓ Speed in start-up
- ✓ Low operational costs
- ✓ Robust, proven technology
- ✓ Modular and scalable to heat source
- ✓ Digital controls and remote monitoring



Micro Geothermal

Generate Fuel-Free, Emission-Free Power with the **POWER+** Generator™

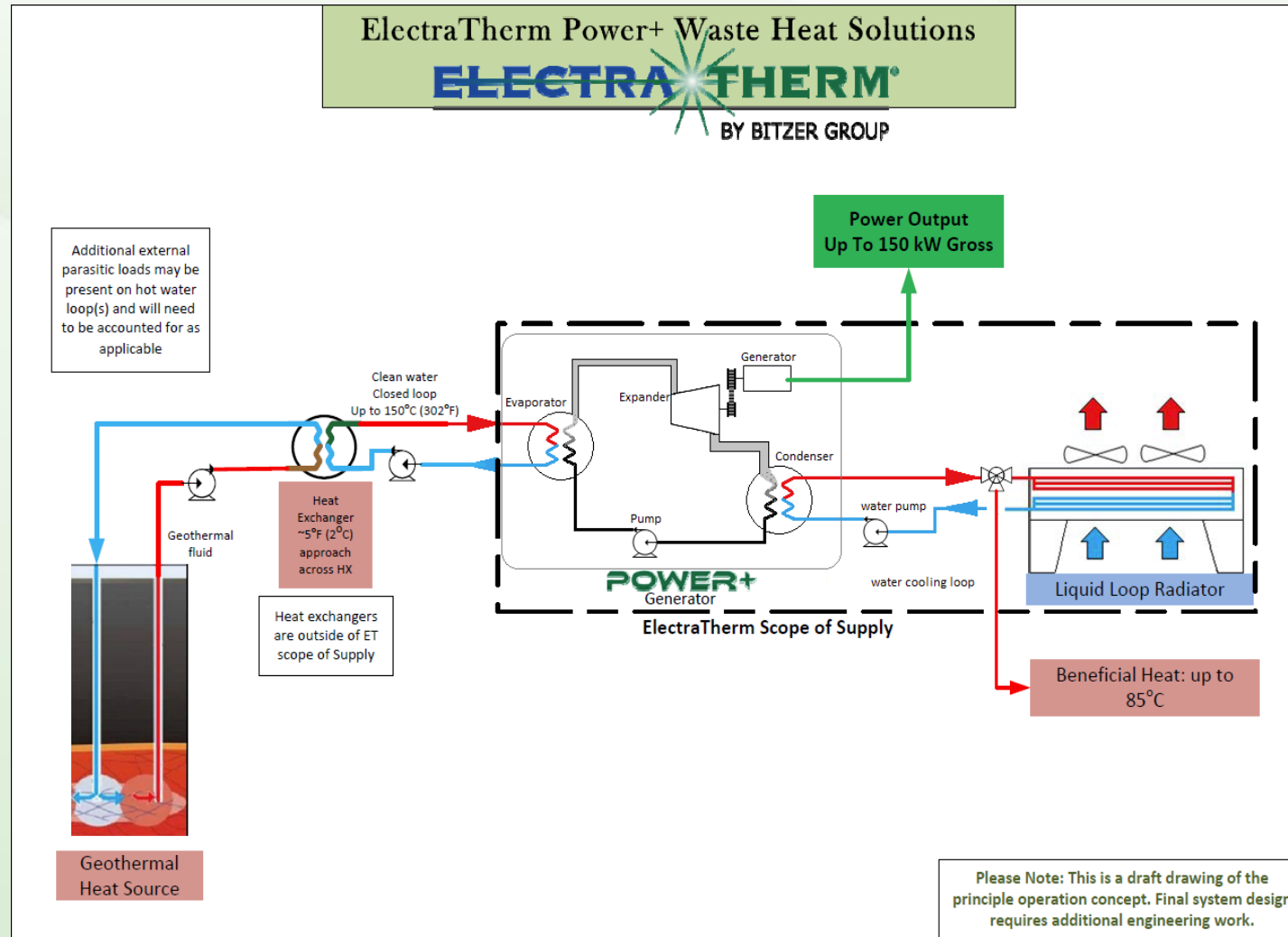
Case Study: Japan

- 110°C Hot Water
- 12.6 L/sec
- 60 kWe Gross Output

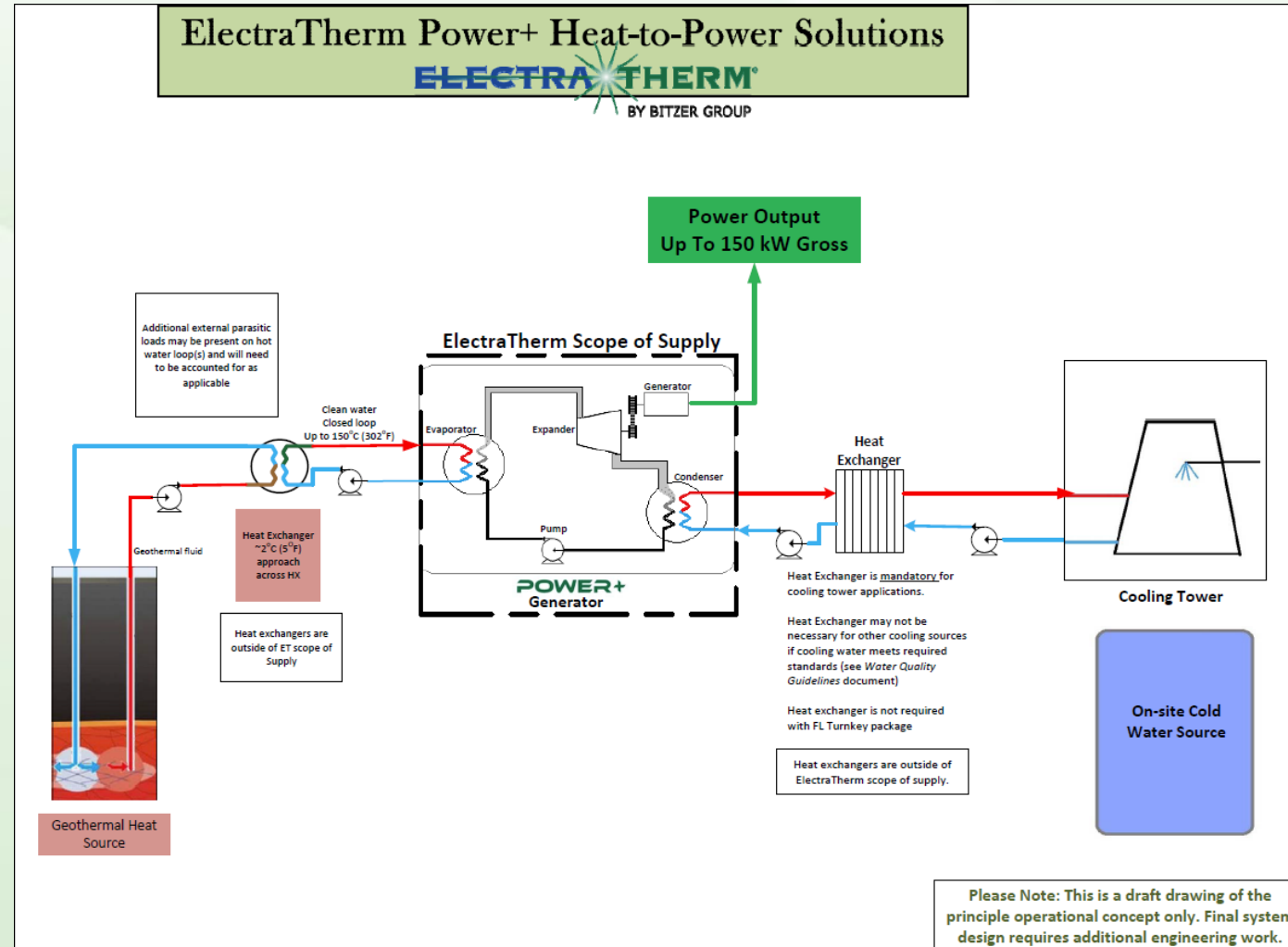


ElectraTherm's first Power+ Generator in Japan commissioned at an onsen in the town of Ogura.
The machine has accrued more than 15,000 hours of runtime & over 720,000 kWh to date.

Geothermal - FL Turnkey System



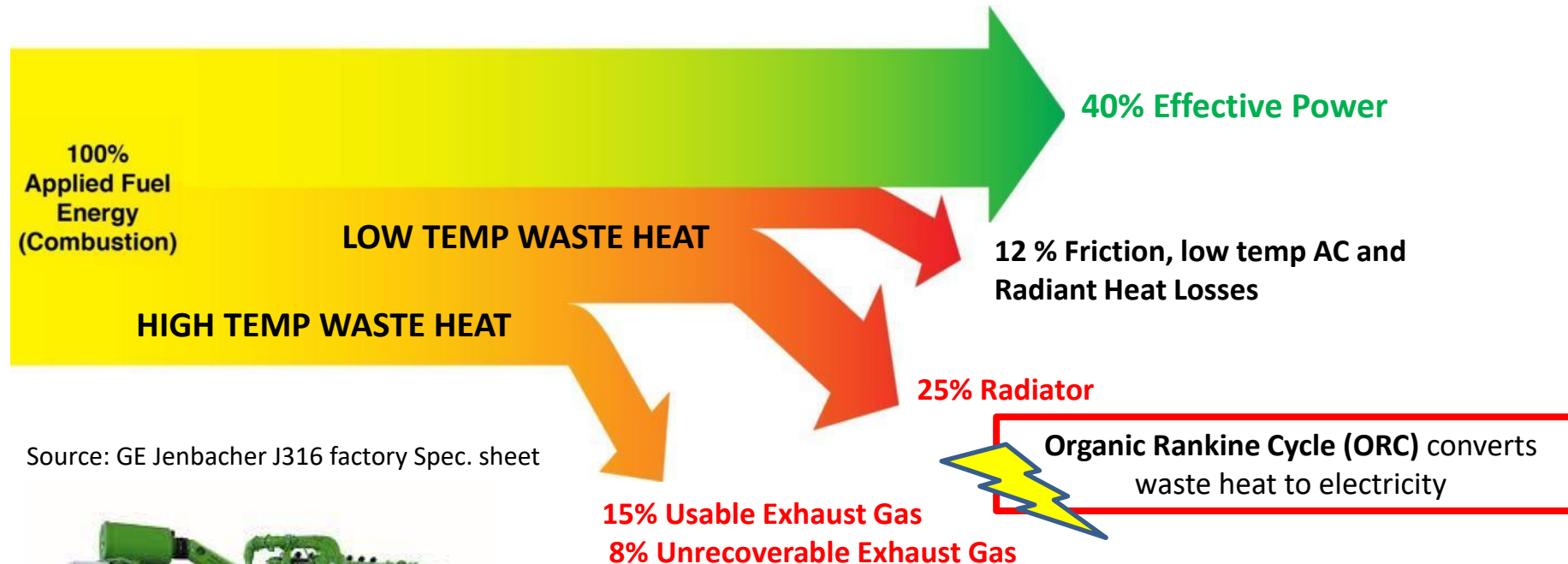
Geothermal with On Site cooling



WASTE HEAT FROM STATIONARY ENGINES

Engines used for prime power ,landfill gas, wastewater treatment plants, CHP

Ex. Jenbacher 316 (834 kWe)



Source: GE Jenbacher J316 factory Spec. sheet



**100,000+ Stationary Engines
Installed Worldwide**
.5-2 MW, Continuous Duty



US DEPT OF DEFENSE DEMONSTRATION

Development of the Radiator with a Payback

Benefits:

- Complete Engine Radiator Replacement
- Engine Cooling Independent of ORC Operation
- ORC Provides Hot Ambient Cooling Benefits
- 10% - 12%+ Improved Fuel Efficiency
- Easily Transportable
- Limited Site Construction
- Payback 2-3 years (diesel)

"The Radiator with a Payback"

Video at <https://youtu.be/fca0faX8R84>

*1.1 MW Cummins Genset and
Exhaust Gas Heat Exchanger*



POWER+ ORC

*Combined Engine
and ORC Radiator*

SHOWCASE INSTALLATIONS

(Unalaska/Wisewood/Ogura)



Unalaska, Remote Diesel



Japan, Micro-Geothermal



California, Biomass

BIOGAS FLAGSHIP SITES



Trechwitz, Germany



Trebova, Czech Rep.



Bratcice, Czech Rep.



Inning, Austria



Drahobudice, Czech Rep.



Slapanov, Czech Rep.



Kosova Hora, Czech Rep.



Grabsleben, Germany



Kaarssen, Germany



Valovice, Czech Rep.



Straznice, Czech Rep.



Lapouyade, France

IN SUMMARY

ElectraTherm's Heat to Power Generator Delivers:

- Distributed, renewable power production
- Ease of installation, operation and maintenance
- Low operational costs with strong ROI
- Robust, reliable, off-the-shelf components
- A modular solution that can scale to the heat source
- Digital controls with remote monitoring & standard interface



Thank you!

Simon Hiebendaal
Technical Sales Engineer

BITZER
www.bitzer.de

ElectraTherm
www.electratherm.com