Distributed Energy from Waste Heat

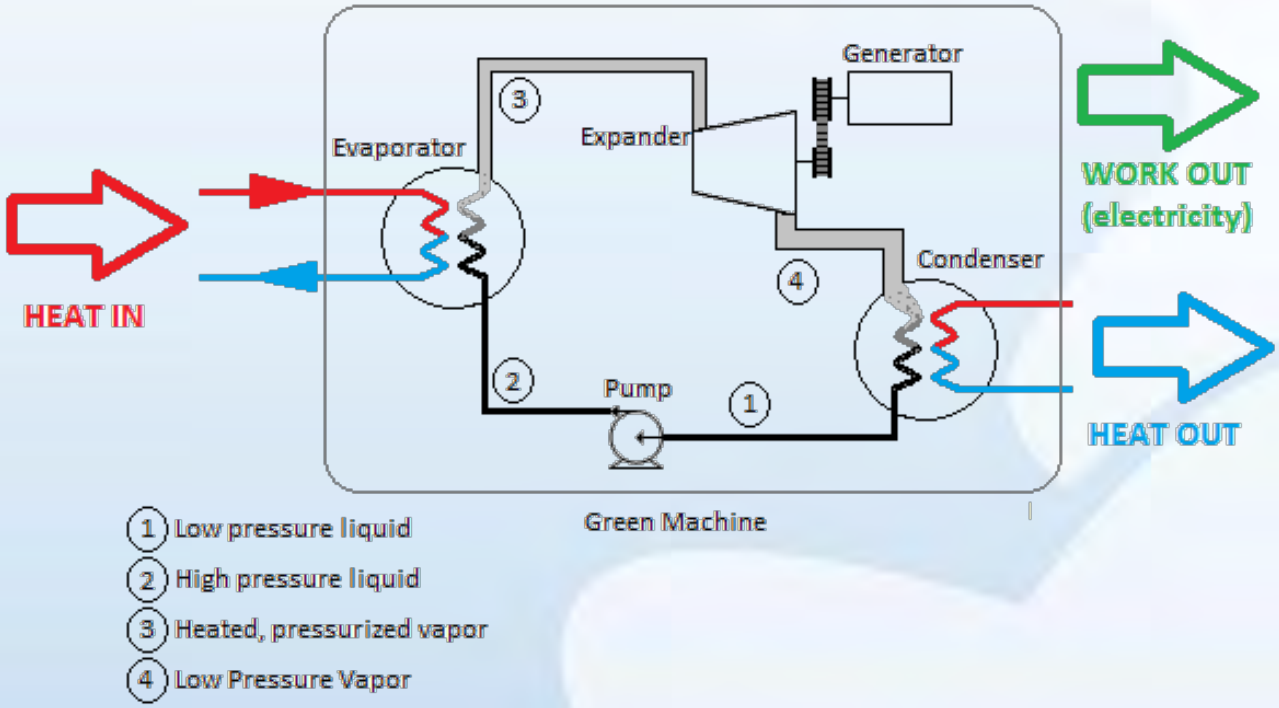
Market leader in small scale (<100 kWe) heat-to-power systems

Productized, packaged solutions for established distribution channels

Series 4000 Green Machine

- Released August 2011
- Up to 65 kWe power output
- 100 kWe in development
- 20 installed, 18 in transit
- 70,000+ hours fleet operation
- 98%+ availability

How It Works



Example on a geothermal well:

Hot Water In

Cooler Water Out

kW Output

Applications

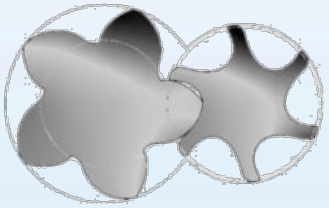
Waste Heat Sources:
Stationary or Marine Engines
Oil and Gas Process Heat
Other Process Waste Heat
Down Cycle Condensing

Renewable Heat Sources:
Geothermal/Oil & Gas Wells
Biomass Boilers
Solar Thermal

Project Values

+ Better fuel/power/emissions output ratios = ↑ Efficiency
+ Distributed Power Generation
+ CHP potential

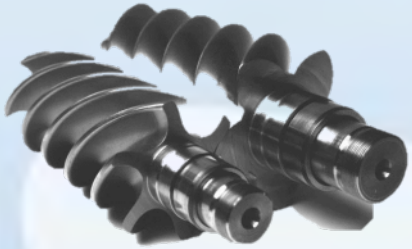
IP & Competitive Advantages



Patented ORC Technology
Issued Patents: one owned and one exclusively licensed
Patent Applications: three owned

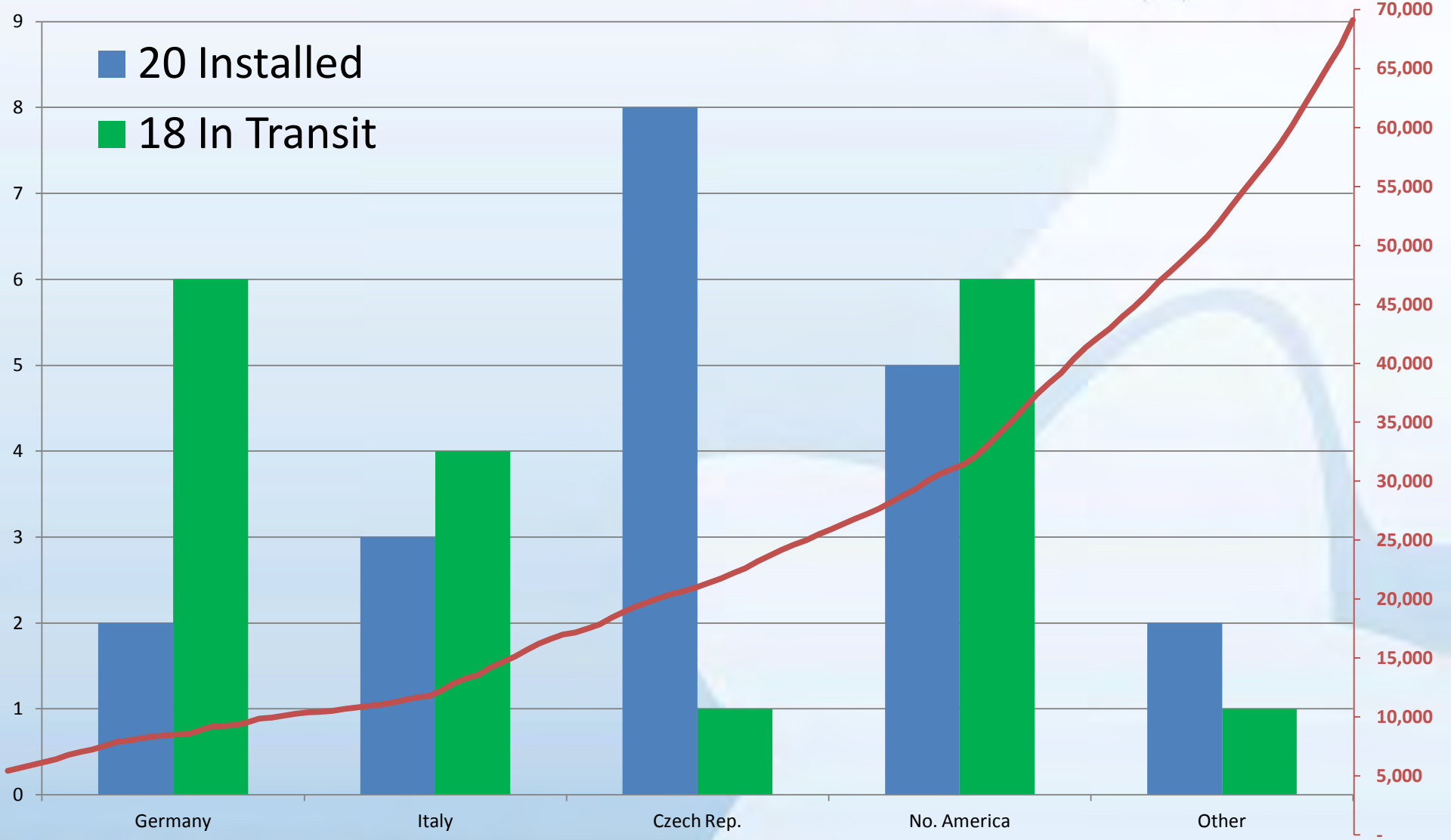
Robust, proven twin screw expander
- Allows "wet" operation
- Rotates at 4,300-4,800 RPM
- Variable output range

Best fit to market
ET's ORC technology aligns with best market opportunities
= low temperature (<240°F, 116°C)

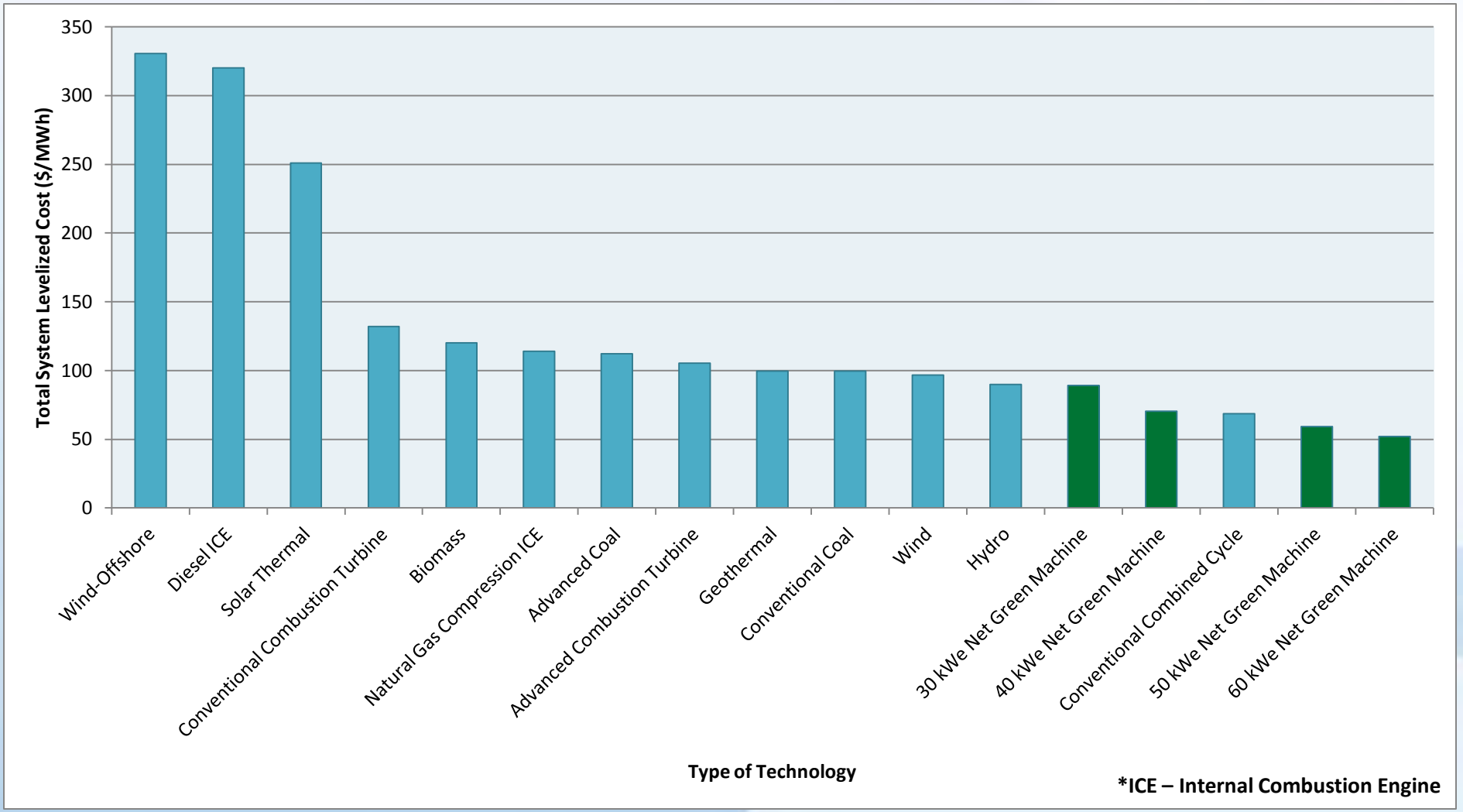


Accepts a range of input parameters…
170 GPM @ 190-240°F (11 l/s @ 88-116°C) hot side input
200 GPM @ 40-100°F (13 l/s @ 4-38°C) for condensing

Installed Base Status



Total Levelized Cost of Technologies



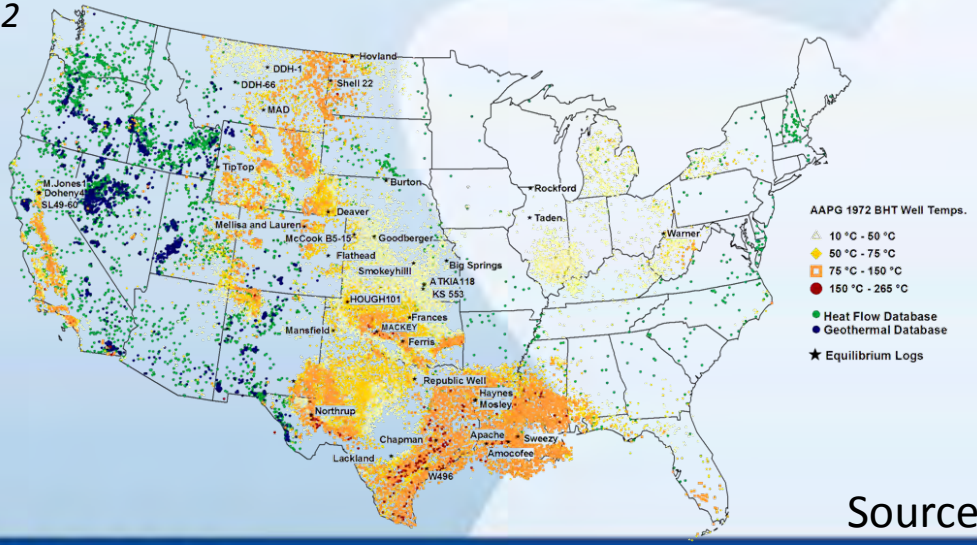
Sources:
US Energy Information Administration's Annual Energy Outlook 2012;
Cadmus Group 2012 Report

The US Opportunity

Co-Produced Water from Existing Wells

- The amount of water co-produced in the United States during oil and gas production is between 15-25 billion barrels per year.
- The near-term market potential for co-produced water resources is approx. 300 MWe.
- 2,000 – 4,000 BPD = 30-65kW Green Machine.
- ***The number of active wells today producing 176-257°F totals 80,320.***

Source: NREL Whitepaper "An Estimate of the Near-Term Electricity Generation Potential of Co-Produced Water from Active Oil and Gas Wells." Sept. 2012



Source: AAPG database

ElectraTherm awarded $982,000 from the U.S. Department of Energy (DOE).

Small-scale power generation from co-produced geothermal fluids

Oil & Gas Co-Production

Site: Laurel, Mississippi, USA
Gross Power Output Avg: 22kW
Total Run time: 1,136 Hours (Completed Demo)
Thermal Heat Input: 500kWt
Hot Water Input Range: 96°C
Hot Water Flow: 7.6 l/s
Ambient Temp Range: 16-41°C

Mobility: *Green Machine and air condenser loaded on a truck bed to remote location*

Ease of Installation: *Install time took 50 hours and could have been halved without wait times*

Geothermal in Europe

Gross Power Output Avg: 40kWe net
Thermal Heat Input: 700kWt
Hot Water Input Range: 105°C
Hot Water Flow: 10.1 l/s
Average Ambient Temp: 2°C

Commissioned in December 2012 in Romania
Customer is the local district heat utility

DOE Grant – Phase II

Containerized solution commissioned on Jan. 31, 2013

Site: Florida Canyon, Nevada, USA
Gross Power Output: up to 75kWe
Hot Water Input Range: 225-230F
Hot Water Flow: 150 GPM
Thermal Heat Input: 660kWt
Air Cooled Condenser

The Challenges

- Wells produce low hot water flows
  - SOLVED: ~150-200 gpm required. Small & distributed fits well.
- Most existing wells are not applicable to large scale power production
  - SOLVED: No need for aggregation of wells.
- "Hot" wells are not very hot (200F good/220F better/240F best)
- Difficulties/expense of onsite construction in remote locations
  - SOLVED: Containerized solutions minimize onsite construction
- Operating personnel & service support
  - Solved: Remotely monitored from Reno. Minimal service requirements.
- Economics (30% ITC + 10 cent power = <5 year payback)
  - + Benefits of extending lease of marginal wells?
  - + Avoiding cost of capping dormant wells?
- Not primary task of O&G producers







Visit us at Gulf Coast Green Energy's Booth

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LET'S CAPTURE IT