

Technology for the Future of Geothermal Development



June 18, 2008



UTC Power

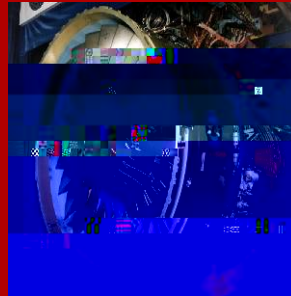
A United Technologies Company

UTC Power – a UTC Corporation

United Technologies: a \$54 billion company (2007)



UTC Power
Transportation Fuel Cells
& On-Site Power Solutions



Pratt & Whitney
Aircraft Engines,
Gas Turbines &
Space Propulsion



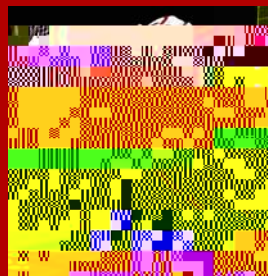
Carrier
Heating, Cooling
& Refrigeration



Otis
Elevators, Escalators &
People Moving
Systems



Sikorsky
Helicopters



Hamilton Sundstrand
Aerospace & Industrial



UTC Fire & Security
Security &
Fire Protection




UTC Research Center
Technology
Advancement

Benefits of Geothermal Power

- Energy independence – national priority
 - Improves our energy security and reduces dependence on foreign oil
- Environmentally friendly - provides clean and safe energy
 - Is renewable and sustainable
 - Zero emissions
- Generates continuous, reliable “baseload” power
- Cost competitive
- Conserves fossil fuels and contributes to diversity in energy sources
- Modular technology allows incremental development at remote sites
- Small powerplant footprint and little environmental impact
- Government mandates and incentives
 - Significant government mandates for green power
 - Attractive tax incentives

Equivalent Emissions Reduction

Avoided Emissions for a 1.0 MW system

	Annual Avoided CO ₂ Emissions		Annual Avoided NO _x Emissions	
	Tons	Equivalent acres of forest*	Tons	Equivalent number of cars**
PureCycle® system (95% availability)	6,045	1,270	10.80	570
Wind (25% availability)	1,585	335	2.86	150
Solar (14% availability)	885	185	1.60	85

* Equivalent acre of forest assumed to absorb 1.3 tons Carbon/acre/year (Ref: International Panel on Climate Change)

** Equivalent car assumed to generate 38 lbm/NO_x/year (Ref: US EPA)

Assumes full heat utilization

PureCycle® Power System

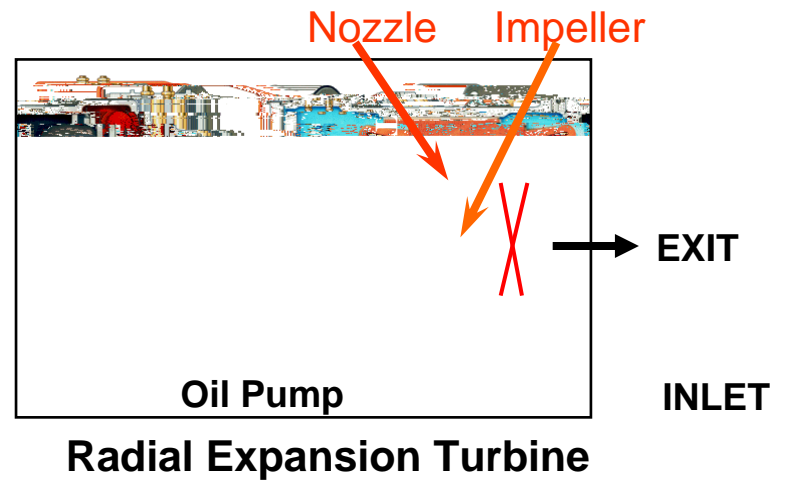
Organic Rankine Cycle



Geothermal Hot Water In – Power Out

Vapor Compression Cycle (VCC)

Organic Rankine Cycle (ORC)



Technology Demonstration

Chena Hot Springs

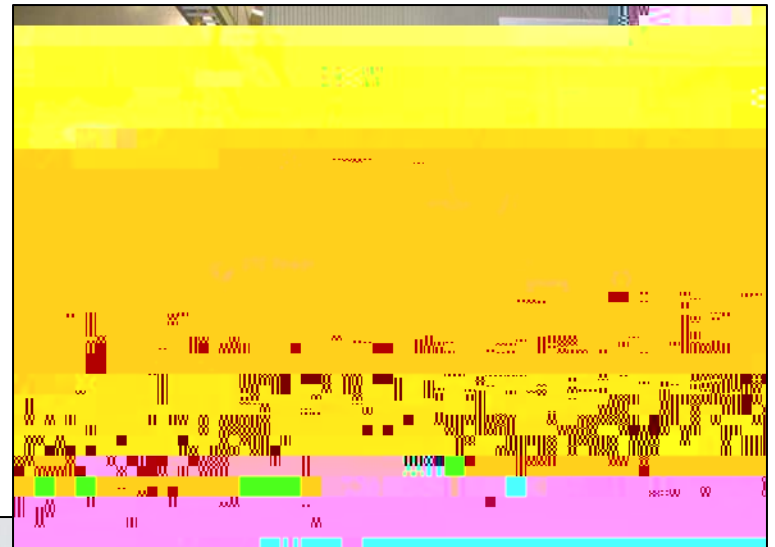
1st unit commissioned July 2006

2nd unit December 2006

74°C hot water resource

4 – 7°C cooling water available

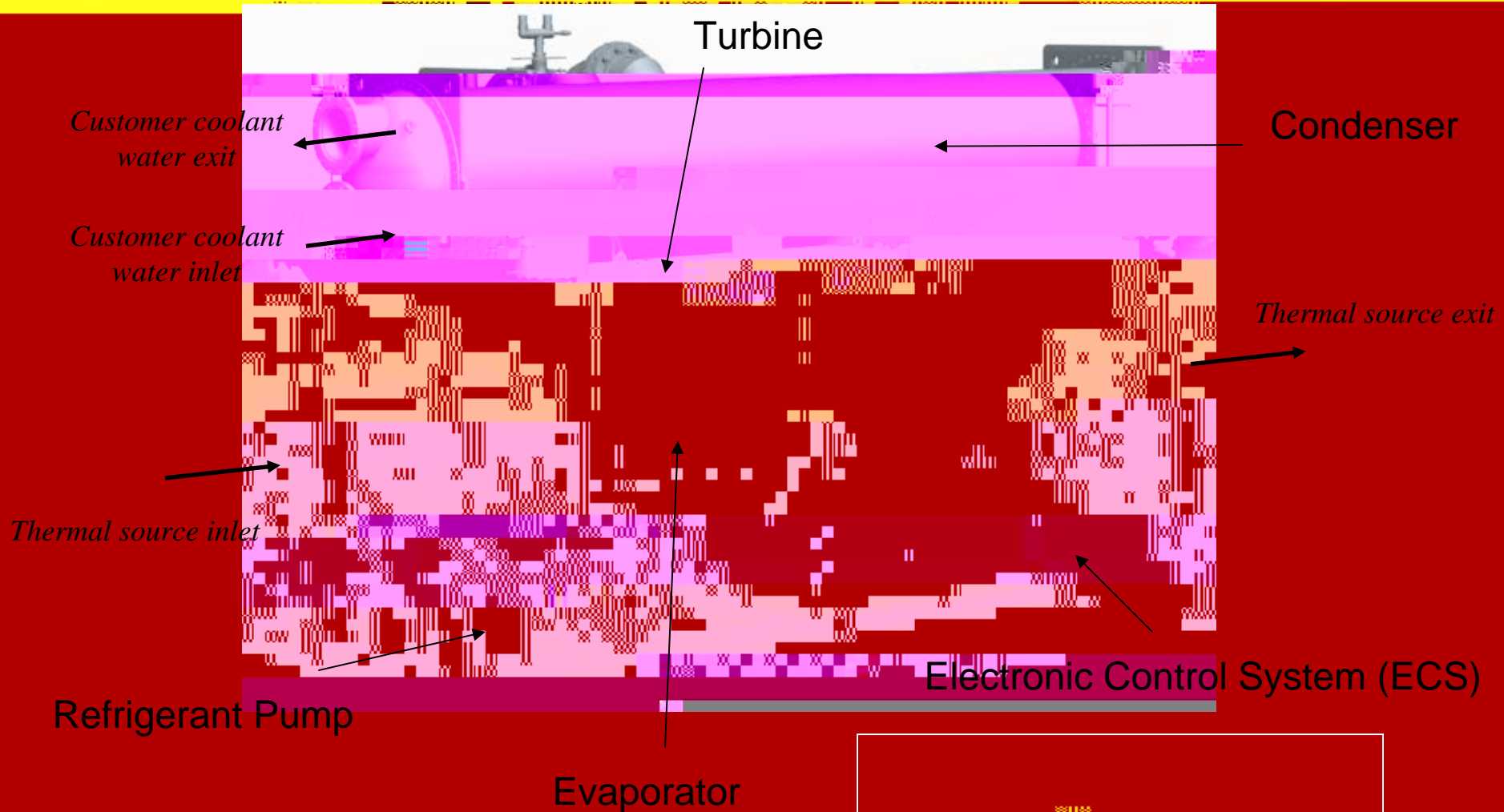
*Drivers: Off-Grid, base load sustainable
geothermal power*



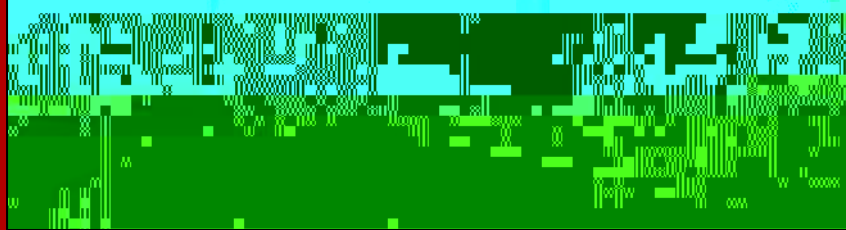
UTC Passport process is foundation for product development activity

- **Disciplined and structured process used across each UTC division**
- **Focus on risk management and gated control**
- **Standard work, process tools, lessons learned, and checklists**
- **Exit criteria: proven product that meets or exceeds**

Top Level Assembly



Production Units







Off-the-shelf production; rapid deployment

Low to moderate temps

Low cost modular skid

Full remote control

- No equipment operators required**

Full service contracts

PureCycle® Next Steps

Production ramp up for Model 280 system
Larger unit product development
Advanced low temperature development
Oil & Gas, industrial applications
International markets



Thank you

Ed Fichtel
Product Manager
PureCycle® Power System