



2016 Hot Water Forum

Scaling a GIWH Rental Managed Service Business Mode

Presenter: Daniel Flohr, CEO

February 22, 2016



What We Do

We supply electric utilities and our partners with networked “smart grid” technologies for 24/7 real-time, grid-scale measurement and control of electrical devices.

Our focus is on:

- ◆ Grid Management Where Renewable Energy is Increasing
- ◆ Transformational Grid-scale Energy Storage
- ◆ Grid “Ancillary Services” including Frequency Regulation
- ◆ Generation and Enhanced + Legacy Demand Response

We supply software, hardware, support services and patent licensing.



Grid Interactive Electric Water Heaters

150 GW of Storage: In Place Today

- ◆ >50 Million Electric Water Heaters in US/Canada
- ◆ Generationally replaced every 8-12 years by homeowner
- ◆ >4 million new units deployed each year
- ◆ Using 3-4% of all US Electric Generation >350 GWH / Day
- ◆ Efficient, easy to control and extremely time-shiftable
- ◆ 10x-100x less expensive than any other Energy Storage Technology



“Electric water heater storage is the most cost-effective form of energy storage available and has enormous potential to help PJM integrate the projected 33,000 MW of wind and 9,200 MW of solar energy...” ***Terry Boston, former CEO, PJM***



SEQUENTRIC's Variable-Capacity Grid Interactive Water Heater

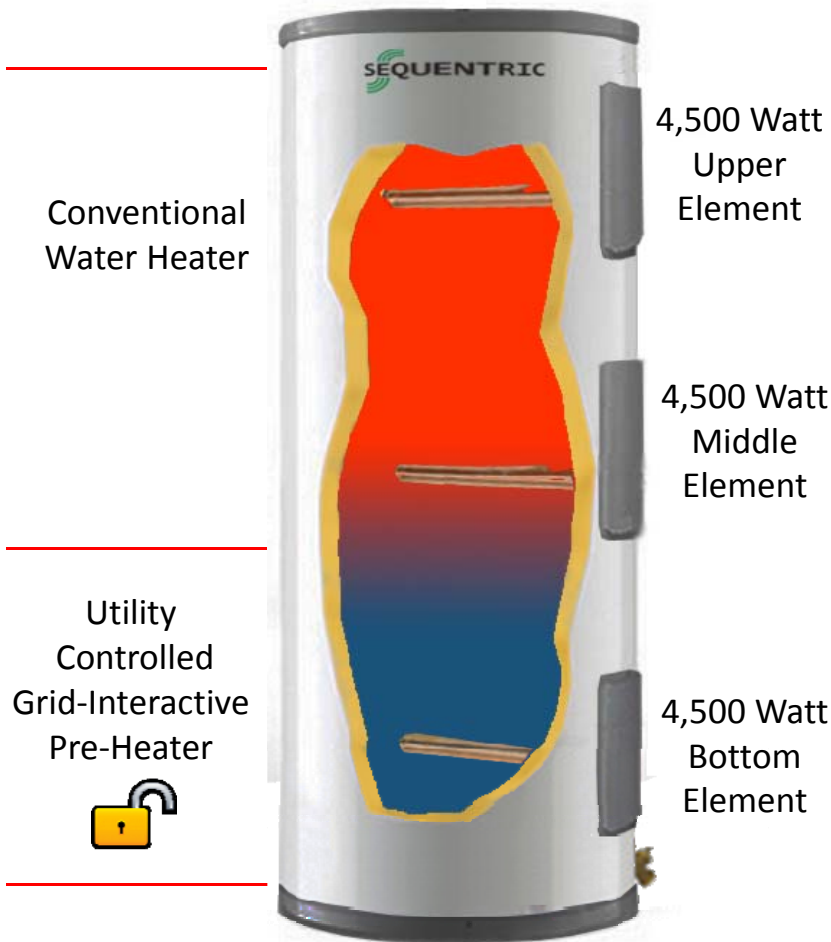
Grid Controlled Pre-Heating

- ◆ 100% Control of KWH Input
- ◆ Pre-Heat Buffer Prevents Cold Showers
- ◆ Deployed as Replacement
- ◆ Safe and Reliable
- ◆ Extraordinarily Capable
- ◆ UL / CSA
- ◆ .94 UEF

Manufactured By:



Fully Tested By:



US Patents 8,121,742 8,571,692 8,897,632 with others pending
Canada 2,710,508, 2,830,426 allowed with others pending



Our Dispatched “Internet of Things”

Grid-Edge Devices



Real-Time Telemetry



Aggregation Servers, Decision Engines & Databases Inside Secure Data Centers



Algorithms Prioritizing Dispatch for Highest Value Problems and/or Opportunities in Real-Time

Real-Time Dispatch
OFF and ON



Environmental & Situational Inputs

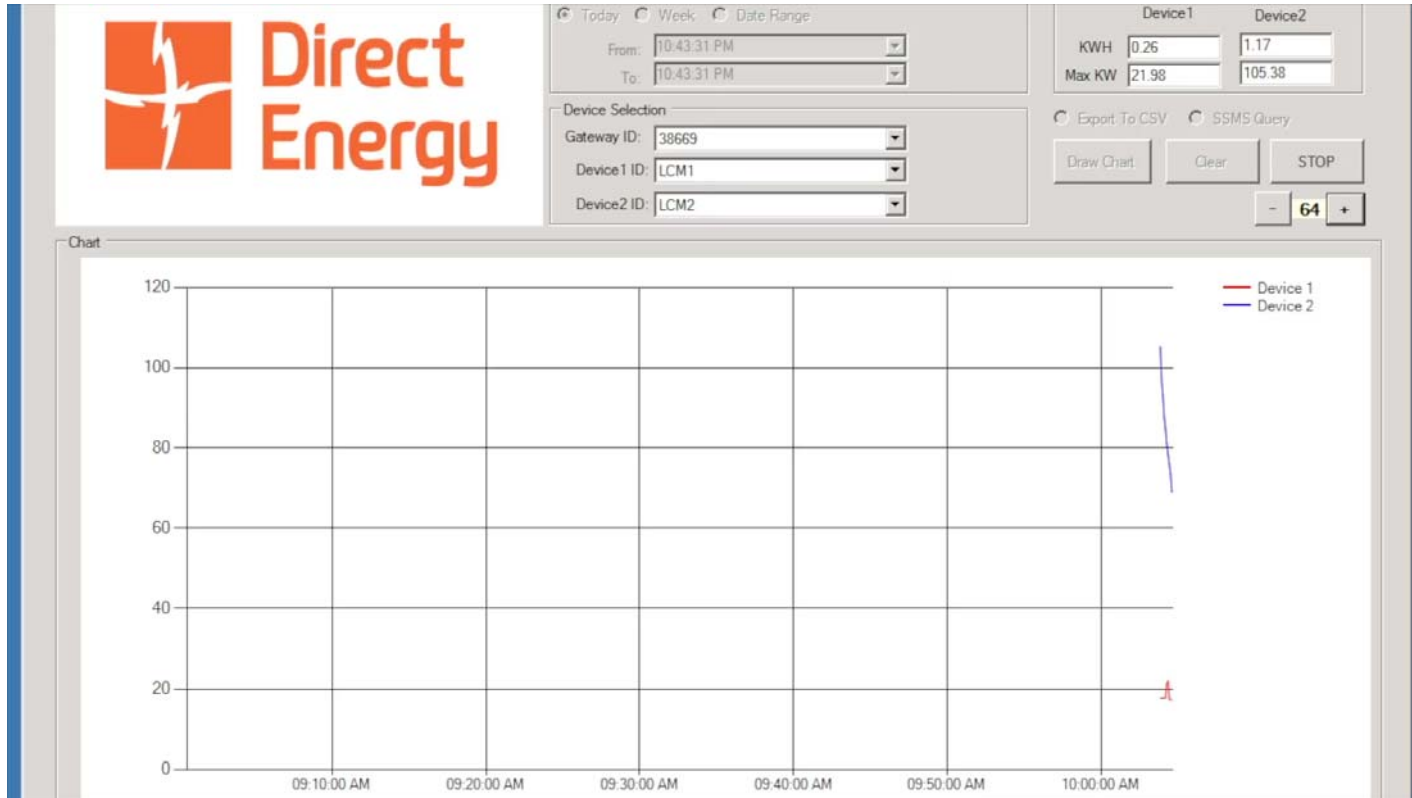
- ◆ Real-time and Forecasts Weather Data
- ◆ Grid Infrastructure Data and Signals
- ◆ Energy Market Data
- ◆ OpenADR and 3rd Party Interfaces
- ◆ Customer Web Interfaces

Problems And Opportunities

- ◆ Grid Emergency Response
- ◆ Ancillary Services
- ◆ Frequency Regulation
- ◆ Virtual Storage
- ◆ Neutralizing Variability
- ◆ Curtailment Avoidance
- ◆ Energy Cost Arbitrage
- ◆ Legacy Demand Response
- ◆ Long Run LMP Targeting
- ◆ Distribution Optimizations
- ◆ Plant Efficiency Improvements
- ◆ Micro-Scale IRP & Asset Placements



FERC Order 755 Result: Water Heaters Following PJM's Fast AGC RegD Signal



Regulation Generating Approximately \$0.40 Per Water Heater Per Day



FERC Order 755 Result: Water Heaters Following PJM's Fast AGC RegD Signal



Regulation Generating Approximately \$0.40 Per Water Heater Per Day



How Do We Scale GIHW?

Follow the Money

- ◆ The "Provider" need not be an electricity retailer (FERC 755, 745)
- ◆ New classes of substantial and disruptive revenue opportunities derivable from Grid Interactive Water Heaters
- ◆ Great examples of successful "non-traditional" water heater programs
- ◆ Pressure on grid operators trying to manage variability of renewable generation
- ◆ New business models focused on monetizing "Connected Home" opportunities
- ◆ Pressure on Coops / Munis in era of rising costs and decreasing KWH sales
- ◆ Financial pressure on large parts of population
- ◆ Population very used to leasing and managed services



Who Needs to Buy In?

Two Sales Have to Be Made

Program Provider:

- ◆ Required under the enabling legislation
- ◆ Target specific opportunities and locations
- ◆ Demonstrate extraordinary ROI and Growth Opportunities

Hot Water User:

- ◆ Awareness of programs as alternatives to “calling the plumber”
- ◆ Education of benefits going from “Water Heater as a Product” to “Hot Water as a Service”



The Return on Investment: Huge But 100% At Risk

Revenues (Goal: Maximize)

- ◆ Lease Income >\$100 / Yr
- ◆ Frequency Regulation (Geographically Limited) >\$160 / Yr
- ◆ Peak Shedding \$10 / Yr
- ◆ Contracted and Managed Storage (Geographically Limited)
- ◆ Opportunistic Electricity Purchasing \$20-\$40 / Yr
- ◆ Emergency Resource

Deployment and Operating Costs (Goal: Minimize)

- ◆ Water Heater and Installation
- ◆ Operating and Service Costs



And Now the Consumer: Historically Every 8-12 Years.....



Cost to Replace a Hot Water Heater

Updated: January 2016

Hot Water Heater Replacement Cost Calculator		Zip Code	Heaters		
		<input type="text" value="98006"/>	<input type="text" value="1"/>	<input type="button" value="Update"/>	
Item		Quantity	Low	High	
Water Heater Cost		1 heater	\$576.18	\$647.75	
Non-discounted retail pricing for: 50 gallon capacity, 11,000 watt electric heater. 0.95 energy factor. 70 gallons per hr recovery rate at 90F temperature rise. 12 yr limited warranty.FALSE					
Water Heater Labor		5 hrs	\$326.59	\$563.43	
Labor estimate to replace hot water heater. Disconnect and remove existing heater. Mount and secure new heater. Connect vent to existing vent ducting. Connect water to existing supply lines. Leak and cycle test. Includes planning, equipment and material acquisition, area preparation and protection, setup and cleanup.					
Water Heater Materials and Supplies		1 heater	\$40.06	\$46.05	
Cost of related materials and supplies typically required to replace hot water heater including: connectors, fittings and mounting hardware.					
Water Heater Debris Disposal Costs			\$20.00	\$25.00	
Costs to load and haul away old materials and installation waste.					
Totals - Cost to Replace Hot Water Heater - 1 heater			\$962.82	\$1,282.23	



\$1,000+ Immediate Replacement Cost

OR



<\$12/month Managed Service

Changing The Consumer's Deployment Possibilities

- ◆ Shift from high up-front cost to a low on-going payments
- ◆ Hot Water as a Managed Service
- ◆ Shifts responsibility from homeowner to trusted partner
- ◆ Participation in utility TOU, Off-Peak Water Heating or Renewable Tariffs
- ◆ Leak detection/notification, App support with “Vacation” and “High Use” modes
- ◆ 3rd party insurance covers damage
- ◆ Model long proven in Canada and US
- ◆ Being “Green” helping integrate renewables and moving away from fossil fuels



Where We Are Today: Seeking Specialized Situations

Some Projects and Deployments:

- ◆ With partner **Direct Energy**, now certified, on-line and providing PJM frequency regulation and peak load shedding
- ◆ Plans underway to replace ~30K already owned water heaters in OH
- ◆ Large Muni in New England with a population of electric and OIL fired water heaters (500+ per year and more when/if oil prices rebound)
- ◆ Small Muni in California with 100% electric water heating and large PV generation. Private label managed lease program for grid stabilization, energy storage, and (soon) CAISO frequency regulation demonstration
- ◆ Large Muni in California with a large population PV solar homes and the associated grid problems they are trying to manage. Using our pre-heating technology for frequency and voltage regulation, as well as opportunistic energy buying opportunities.



Our Big Challenges

DOE FTC (Hopefully Short Term)

- ◆ No UEF to EF Conversion Factors Yet (Today?)
- ◆ No UEF FTC Consumer Labels Finalized Yet
- ◆ Not legal for us to ship newly manufactured product yet

Connectivity and Bandwidth

- ◆ Freq. Reg. requires IP transport of ~150 Bytes/Sec/Home (highly compressed)
- ◆ Bandwidth / Year = 1 Netflix video
- ◆ AMI Orders of Magnitude to Limited (Real-Time 25 bits / Second /Home)
- ◆ Homeowner Broadband Usable but Problematic
- ◆ Cellular IP "M2M" very well suited but still expensive (but dropping)
- ◆ Legacy Analog TV "White Space" well suited for Coops/Munis geographies



THANK YOU

www.sequentric.com