

WANTED

Power Supplies (a.k.a. Batteries)

Power supplies for personal electronics, Internet of Things remotes, cell phones that won't:

- Fail because we didn't take time/trouble to recharge them
- Need to be serviced/replaced

And that are:

- Cheap
- Safe
- Simple substitutes
- Scalable



Value Proposition

Ambient Thermal Electric Converters (ATEC)

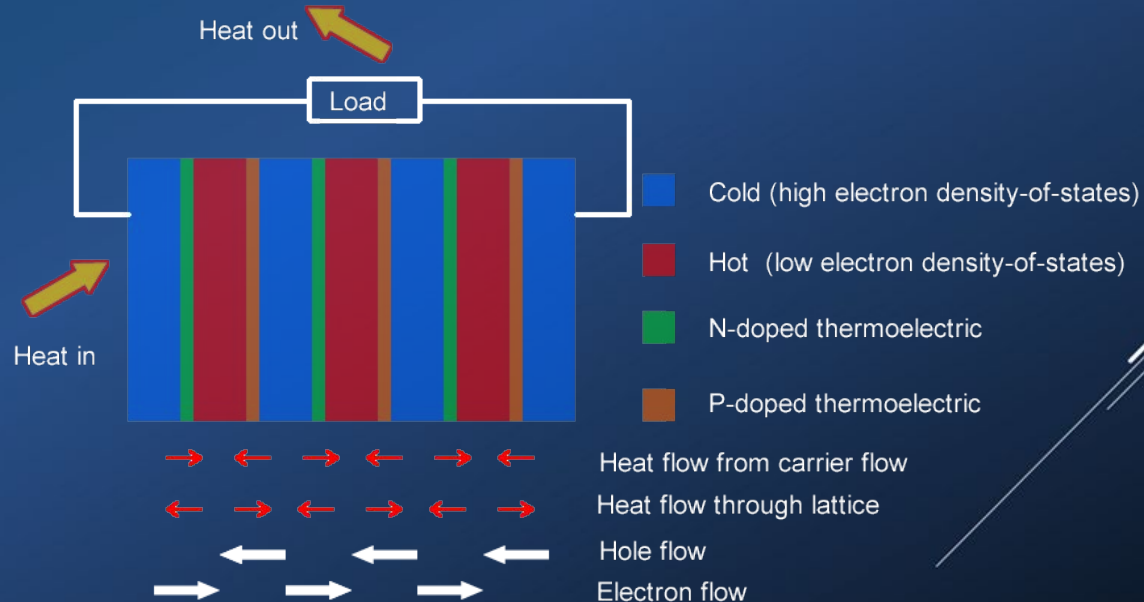
Our ATECs will:

Save time: Changing batteries is time and effort wasted, particularly in hard-to-reach places.

Save money: Our ATEC-based battery replacements match rechargeables first cost, and last forever.

Underlying Magic of the **Impossible**

Our ATEC structure makes use of quantum-mechanical behavior of electrons in semiconductors between materials of differing composition. It will replace the energy drawn from a load on it by absorbing heat from its environment. Thus, it converts environmental heat (at ambient temperature) and **produces electricity with no other input.**



Business Model

We will:

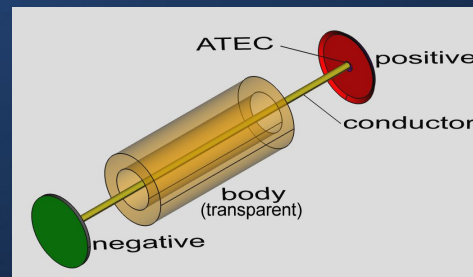
- Manufacture and use and/or sell ATEC parts, usually encapsulated in JEDEC 0603 form (0.06"x0.03") or with an AA Battery wrapper
- To jump start production, license our ATEC technology.
- Make and sell long-life battery replacements in standard sizes **plus 0603**

ATEC Structure	
Materials	Thickness
Top metal contact	5 microns
HgCdTe active layers	to 500 microns
n-Si substrate	500 microns
Bottom metal contact	5 microns

Base dimensions: 100 to 1000 microns



ATEC in 0603

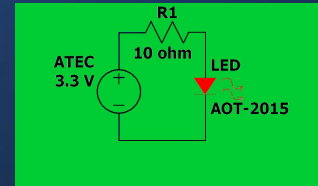


Generic
battery
configuration

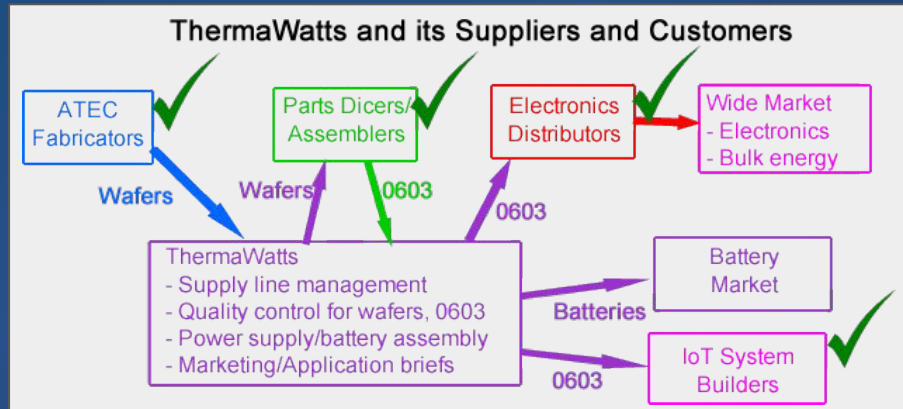
Go-To-Market Plan



- Begins with minimum viable product-performing ATEC parts
- Establish in-house ATEC fabrication capacity
- Arrange for assembly of ATEC parts into 0603 devices and conventional batteries
- Market to engineers through distributors by sending them samples, including a small board with a permanently-on LED.
- Market technology to energy, environmental, selected industry news outlets and interested organizations (Canary Media, Internet of Things press, DARPA, ...)
- License our technology to meet market demand.



Checkmarks indicate established contacts with players able to serve our initial production and marketing needs.



Competitive Analysis



Cost and Risk Comparisons for Battery Technologies

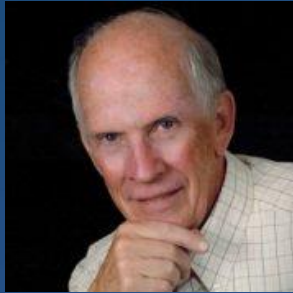
	First Cost	Lifetime Cost	Use Life Cost	Risk of Corrode/Explode	Cost of Corrode/Explode
Alkaline	\$.40	\$30 ¹	\$40 to \$20,000 ³	Low	Moderate-high
Li ion	\$2.00	\$60 ²	\$8 to \$4,000 ³	Moderate	Moderate-high
ATEC	\$1.00 ⁴	\$1.00	\$0	None	N/A

1. Cost to replace an needed (~yearly) over 20 years
2. Cost to replace an needed (~5 year) over 20 years
3. Cost to service an needed over 20 years (\$2 to \$1000, depending on location)
4. ThermaWatts expects to manufacture at <\$.25 per device, sell @ \$1

- A service call to replace a conventional battery can run hundreds of dollars. ATECs should run forever.
- ATECs contain micrograms of toxic metals Mercury and Cadmium, encapsulated in 0603 package.
- We shouldn't be threatened soon by competitive improvements in the existing market.

Management Team

Peter Orem, CEO and Chief Scientist
Physics, UC Santa Cruz



Frank Orem, Finance and Ops
Chem Eng & Ind.Eng, Stanford

Matt Graham, PhD, Oregon State Univ. Physics Dept., Technical Advisor

John Servo, Business Advisor

EPIR Technologies Inc; Fabrication

Markets and Sales Projections

Personal Electronics Market

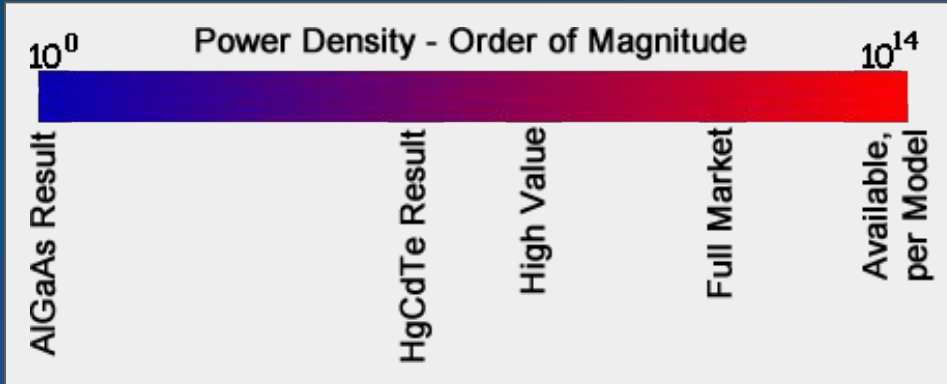
- Market for ATECs in cell phones, Internet of Things remotes, etc., (valued at \$10 to \$1000 each) is one to five billion parts a year for at least ten years.
- Gross sales rate for after two years: \$250 million, at a cost of <\$50 million.

Battery Replacement Market and Beyond

- Market for batteries will be major share of \$3 billion, at 75% profit of sales.
- In broad energy market, levelized cost will be 25% of any competition.

Exit strategy is licensing as a cash cow

Current Status, Accomplishments to Date, Timeline, and Use of Funds



- Current prototype version is at HgCdTe Result
- Next versions should get us to High Value (our MVP)
- Further optimization should get to Full Market.

Use of funding:

- \$300k - 400k => minimum viable product prototype
- \$200k => First Article run of 20k
- \$500k sets up production of 0603 packaging from First Article run
- \$2M => wafer production in-house
- Additional funds from current sales, equity, or loans

Step	Months
MVP prototype	10
First Article	+3
Wafers made in-house	+12

Ambient Thermal Electric Converter (ATEC) An Advanced Energy Conversion System

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