# Sparatech Thermal Electric Device

## A custom design for OEM

- A new product offering per Customer requirements
- Low cost per watt DC electric generator
- Design as wrap around on surface of pipe
- Installation needs to simple and easy without the need of contractor ( electrical or mechanical )
- Device needs to capture waste heat that is continuous 8 hours + a day
- Temperatures range 100 degree C -800 degree C
- Chimney ,Oven & Stove direct heat application is first area
- Server market adds Microfluidic to the design
- Process market energy efficiency work with Radnor Tech this is same modular as chimney oven & stove

# J Lyons Marketing a technology marketing firm that promotes  new enabling technology

**A marketing company  that a paid consultant to exposure the "latest & greatest "**

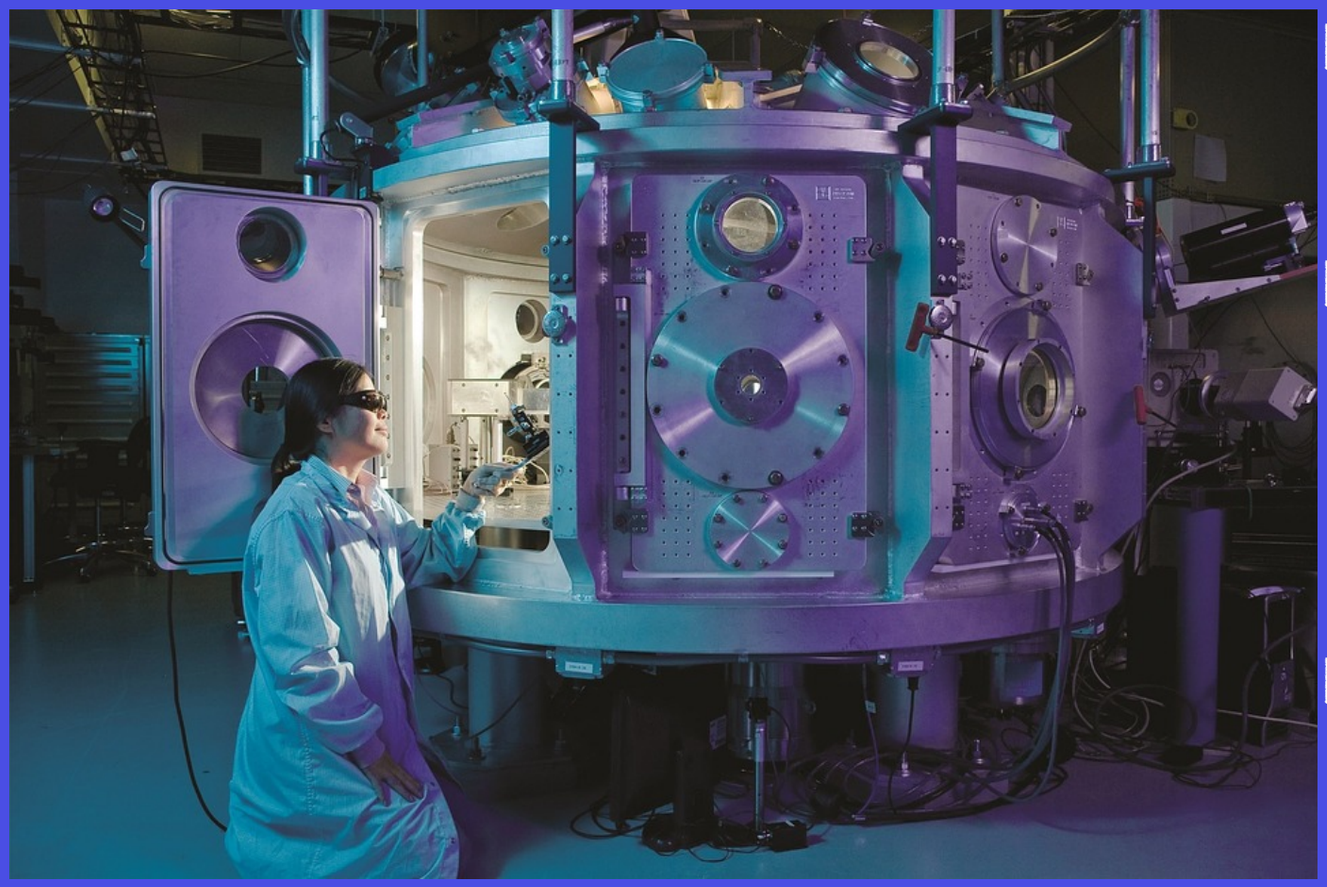
- *JLM  has the " inside track '' with Fortune 500 OEM's*

  **Main concentration  with startups , spin-off companies  and research institutions**

- **A natural fit for entrée with Fortune 500**

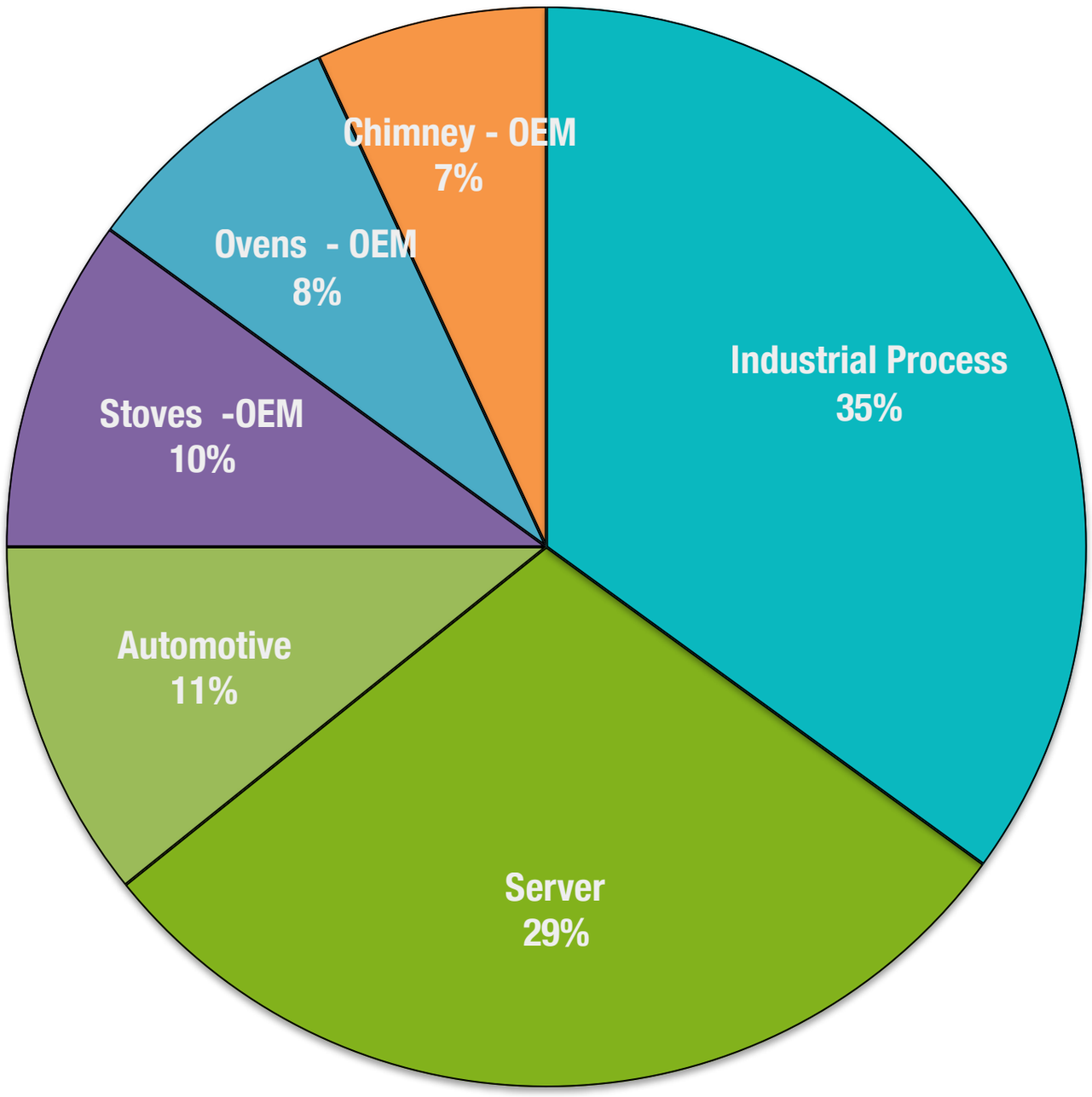
- **JLM has 25 + years experience  and relationships**

# Sparatech Design engage with engineering on advance manufacturing process



- World's leading Research Institute Sintef , VTT , CSIRO
- World's leading technology universities spin -offs companies . MIT , Imperial College , Tegma ,
- Fortune 500 commercialization of new technology / new products

# Heat Waste Coverage




**Heat Waste markets is in the beginning stages today mostly set up in industrial processing plants. Radnor Tech could be positioned as the market leader as lowest cost per watt**

# Chimney - Stove OEM's

## Sparatech First DC Generator Power By Fire Heat

**Market leaders waiting on demo units HHT,Duravent ,Exodraft, HWAM,Baker Pride,Blogetts,MagicHeat - $50M market**

**Our Licensee Thermal Electronics Corp makes TEG Power modules for custom assemblies per OEM requirements**

# Chimney Specs For DC Generator

Sparatech has all space required and very high temperature running continuous , it appears ideal for HHT first product

Area and Heat Quality : It all depends on the fireplace you want to be, Glass is anywhere from 350F to 475F on tempered units, ceramic units are 550F too 800F. In the firebox it is from 500-900F. You tell us what you need, surface area, temperature range and we will apply Sparatech device

1. IFT 2.0 ECM stand by current : 30 mA @ 6V, active (powers valve) : 225 mA @ 6V for 3 secs, then settles to 75 mA continuous while burner activated
2. IFT 2.0 PACM stand by current : 22 mA @ 5V, active under full load : 150 mA if HM1 to HM4 + Fan load active
3. IFT 2.0 PACM load with LEDs : crystal whites with 9 x light bars 3.3 A @ 12V
4. IFT 2.0 PACM load with secondary burner : 0.3 A @ 12 V solenoid valve on fully open mode.

Charles Miller Hearth Expert Electrical Engineer

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HEARTH&HOME technologies
The Hearth Experts

www.hearthnhome.com | www.fireplaces.com

HHT makes 300,000 new chimney systems a year circulating air today the power is done by AC ( plug in ) , Sparatech design to be DC

Sparatech Thermal Electronics Corp www.thermoelectric-generator.com ( our licensee ) based on evaluation can provide complete package Sparatech modular is the " guts " then need to add the electronics for the DC conversion and air coolant for Seebeck effect . Total cost should be under $50.00 and sell $200

Others pending : DuraVent I Security Chimneys Neill E. Anderson Vice-President National Accounts

" I have run this up the flagpole again and as I said before we are really interested in that this dovetails with what we are doing like hand in glove. The issue here is that this technology will accentuate our products but it is out of our wheelhouse in general. Once the concept is proven by HHT and there is working prototype we are absolutely ready to evaluate performance and move ahead but prior to that time we have not way to evaluate the opportunity although if the product works as advertised it will be tremendous. We will be a good partner but we cannot commit until we know it works and we can quantify cost and what is produced. We have some amazing ideas you haven't thought of as well and are anxious to move ahead at the right time. Please keep me posted on progress. Thank you. "

# SP Industries -Harbor Group

- Sister Company Wilmad-LabGlass ( Vineland , NJ) is a leading manufacturer of NMR and EPR sample tubes and accessories, a diverse line of Laboratory Glassware and Scientific Equipment, as well as Precision Engineered Glass, OEM Quartz components and assemblies. Do have sister division for vapour deposition of metals and do 100% in-house including microfluidic channel
- SP Industries to make products for chimney,stove & ovens for DC power versus AC Power. The first to go from wired to wireless based on self power. The second market server market adding microfluidics - SP Industries is a manufacturer of specialty equipment, scientific glassware and thermal electric device is new market .
-Third market is manufacturing processs which is same modular products as chimney , stoves & oven just custom per application
-Harbour Group www.harbourgroup.com acquired SP Industries in 2015
- SP Industries CEO,VP of sales,head engineering are all under NDA

# SP Industries - Sparatech

- Option to be contract manufacturer or licensee start with SP Industries as manufacturer capabilities ( glass fabrication , metal bonding & microfluidics ) all 100 percent in-house

- Sparatech 's three markets OEM chimney -ovens , manufacturing process and server market

- Each vertical market can be set up license or spin out with Sparatech pending on our agreement. As example the server market can be license or acquired by Corning. The goal is each vertical be acquired by licensee with two year period

# Sparatech Spins-Off Process Market Forms Radnor Tech

A custom design for industrial applications

- Process market refineries,cement,steel, paper etc will all have custom requirements
- Sparatech Thermal Electric Technology set up a separate entity just for process market
- Offering lowest cost per watt converting wast heat to electric with energy reduction between 5-8 percent
- GDTC tire to oil conversion plant sign with Sparatech to set up a beta site
- SP Industies ( NJ ) will make all products
- Same Modular for Chimney, Stove & Oven just more customised

# Process Market

Massive amounts of energy are lost as waste heat through e.g. hot reactor walls, off-gases and cooling water. The utilization of heat waste  technology to recover some of this energy will have a great impact on the total energy efficiency.Sparatech - Radnor Tech is currently developing and testing with GDTC to recover waste heat from the process industry.

Firms of Interest

- Chevron Ventures invest $5M for refinery project need review data to move forward . US has 97 refineries and 56 are in state of Texas
- Lehigh Hanson at Heidelberg Technology Center Allentown needs to review data and would roll out globally based on pilot study
- P & G operate 230 plants largest paper plant Mehoopany , PA ( Bounty, Pampers / Luvs). Currently have MW wind Turbine and Natural gas MW turbine on site Marcellus shale , once to review data  as areas of interest
- Waste Heat Recovery  Firms as compliment their product offering companies include Orcan-Energy, EChogen Power Systems & Alphabet  Energy, Tegma
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# Sparatech - Radnor Tech

The U.S. industrial sector accounts for about one third of the total energy consumed in the United States and is responsible for about one third of fossil fuel related greenhouse gas emissions. It is estimated that somewhere between 20 to 50% of industrial energy input is lost as waste heat in the form of hot exhaust gases, cooling water, and heat lost from hot equipment surfaces and heated products. As the industrial sector continues efforts to improve its energy efficiency, recovering waste heat losses provides an attractive opportunity for an emission free and less costly energy resource. Numerous technologies and variations/combinations of technologies are commercially available for waste heat recovery. Many industrial facilities have upgraded or are improving their energy productivity by installing these technologies. However, heat recovery is not economical or even possible in many cases.

Note : Tegma Norway wants to cross license Sparatech design and doing evaluation

# GDTC

## GREEN DISTILLATIONTECHNOLOGIES CORPORATION LTD

- The Technology , known as " Destructive Distillation" Process that transforms whole , waste tires ( ELT ) into tradable commodities , oil/carbon/steel and soon ultra pure graphite

- The only waste is heat at 300 C continuous 24/7 as spend $400,000 on electric for a plant to run 24/7. Sparatech has offered & GDTC accepted an exclusive right to the installation of Sparatech 's technology in the tire recycling globally and install at every plant .

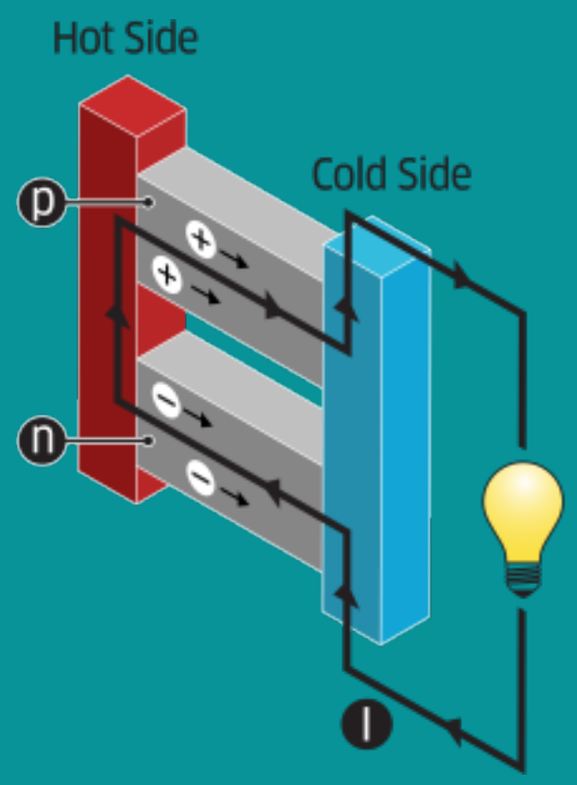
- GDTC will share data that can be used for the process market

Australian tire recycler to test new equipment from U.S. ( PR on heat energy recovery will be off the charts on a successful pilot)
https://www.tirebusiness.com/news/australian-tire-recycler-test-new-equipment-us

# TEGma- Waste Heat To Green Electricity

Sintef Norway main Research Institution has recommend Sparatech to Tegma as collaboration cross license
Sparatech uses no exotic costly materials and as a system approach developed micro-fluidics
Both approaches developed the lowest cost per watt by wide margin

A thermoelectric generator (TEG) can be defined as a low voltage high-current dc power with a linear I-V feature. Even though efficiencies for TEGs are as low as 3-8%, useful electricity generation is possible due to the great amount of heat emitted from almost any electric device.



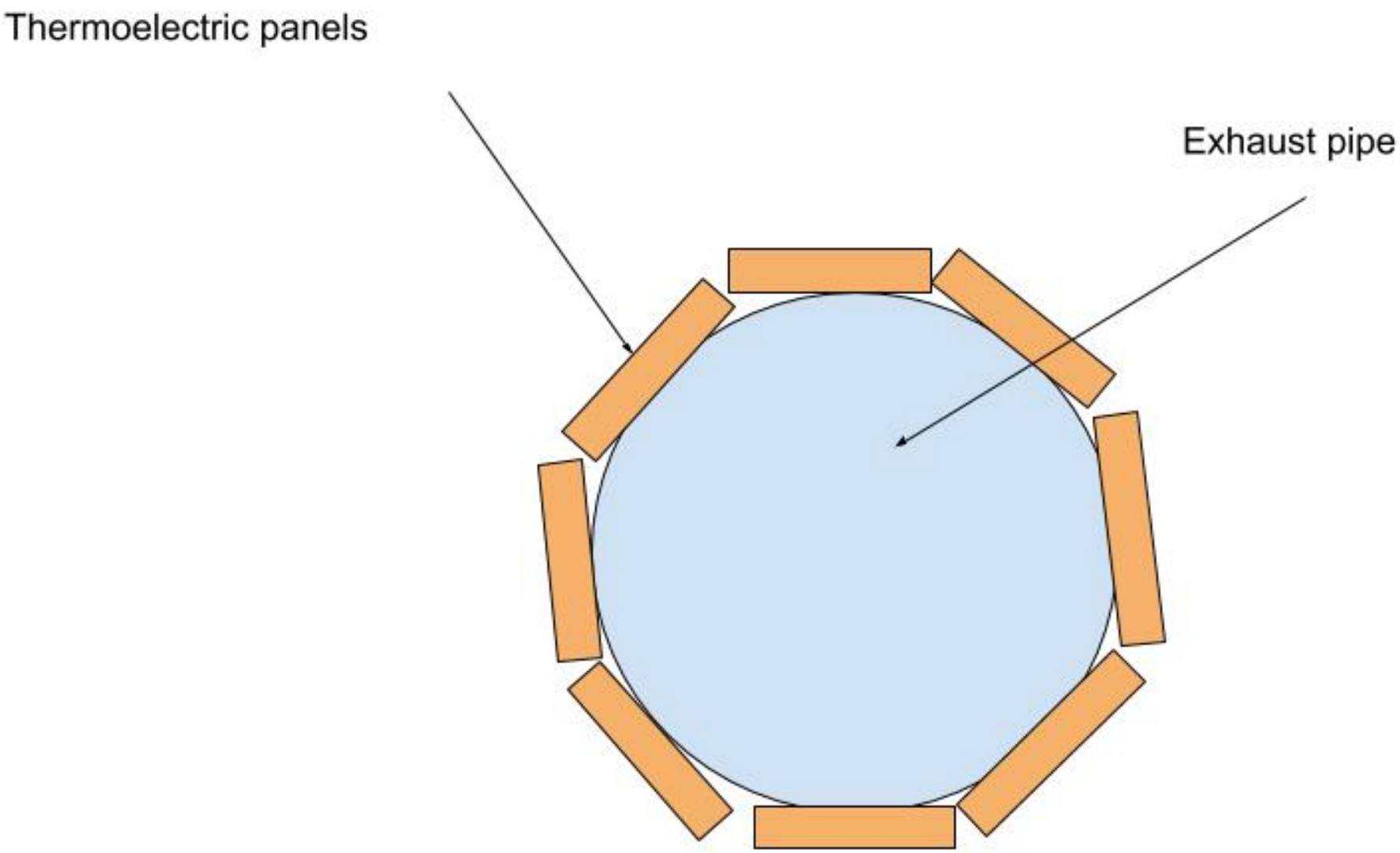
# Sparatech Design Concept

We need an updated NDA as original one has expired

Core of the design is one standard size that can be interconnected  either vertical or horizontal ( cover by NDA but need update )

# Sparatech -Heat Waste Apps

**Exhaust pipe design to capture heat external and convert to electric power . A simple installation requiring no contractor**



# A custom design for Server OEM

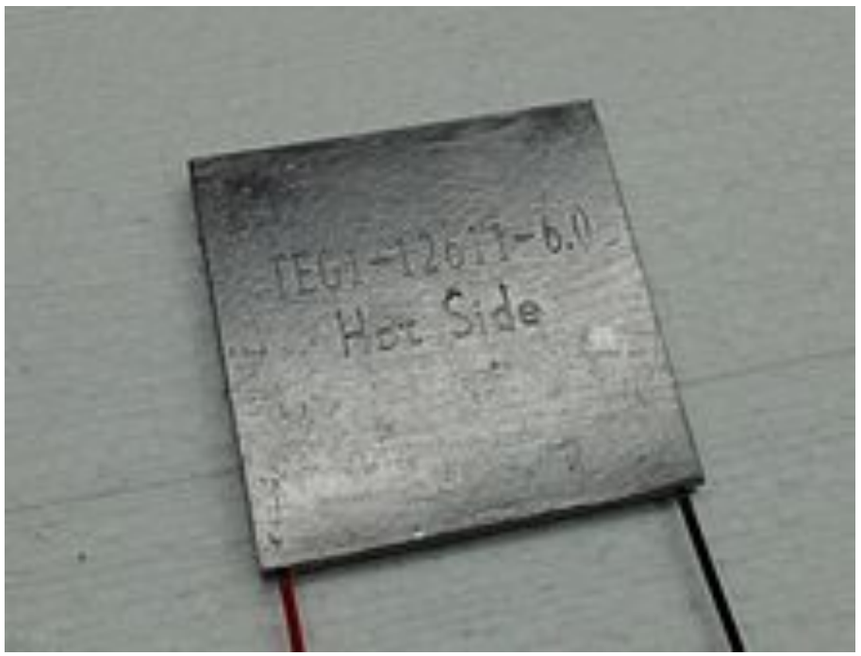
- A new product convert heat waste to electric instead of liquid cooling
- Low cost per watt DC electric generator
- Design microfluidic thermal electric device as heat is not continuous and requires for Seebeck effect
- Installation at the server rack level on the shelve non visible and no additional real estate
- Device capture waste heat to electric power
- Temperatures range 100 degree C -800 degree C
- Server energy efficiency is upgrade by wide margin
- Sparatech has two designs one constant heat and second variable heat
- Price points at $5-10 US dollars per six by six inch modular

# Seebeck Effect

The **thermoelectric effect** is the direct conversion of temperature differences to electric voltage and vice versa via a thermocouple.[1] A thermoelectric device creates voltage when there is a different temperature on each side. Conversely, when a voltage is applied to it, heat is transferred from one side to the other, creating a temperature difference. At the atomic scale, an applied temperature gradient causes charge carriers in the material to diffuse from the hot side to the cold side.

This effect can be used to generate electricity, measure temperature or change the temperature of objects. Because the direction of heating and cooling is determined by the polarity of the applied voltage, thermoelectric devices can be used as temperature controllers.

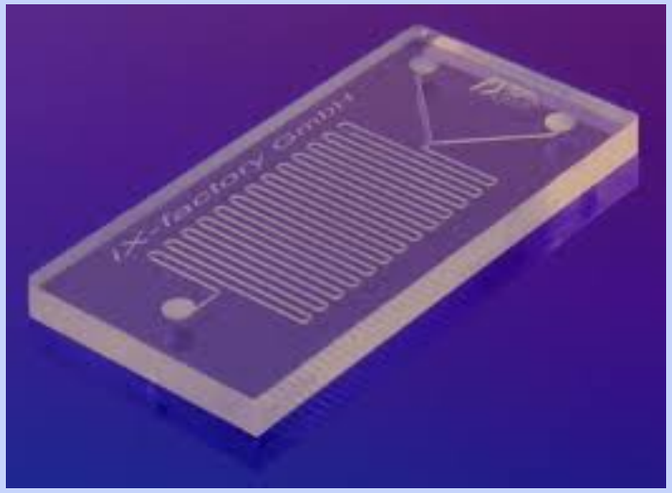
The term "thermoelectric effect" encompasses three separately identified effects: the **Seebeck effect**, **Peltier effect**, and **Thomson effect**. The Seebeck and Peltier effects are different manifestations of the same physical process; textbooks may refer to this process as the **Peltier–Seebeck effect** (the separation derives from the independent discoveries by French physicist Jean Charles Athanase Peltier and Baltic German physicist Thomas Johann Seebeck). The Thomson effect is an extension of the Peltier–Seebeck model and is credited to Lord Kelvin.

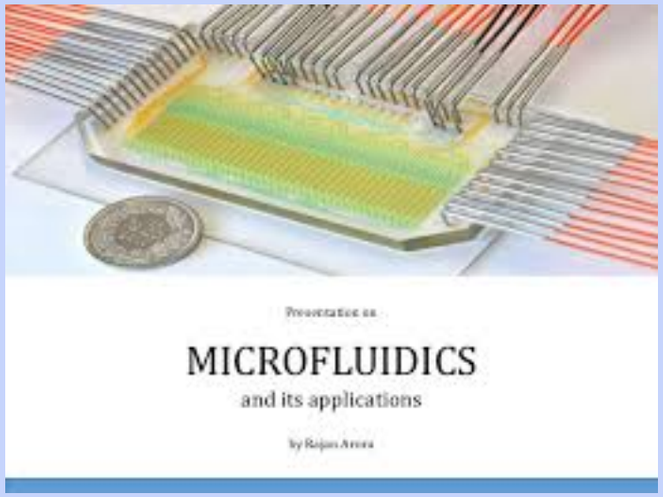


# Sparatech ’s server thermal electric uses Microfluidic Heat Exchanger,  A Unique Solution For Cooling Of The LatestElectronic Devices

Sparatech Thermal Electric Device using microfluidics makes it th lowest cost per watt on the market , a very simple design system

Microfluidics deals with the behaviour, precise control and manipulation of fluids that are geometrically constrained to a small, typically sub-millimeter, scale at which capillary penetration governs mass transport. Today a lot of electro-mechanical systems have been miniaturized and integrated by compact design, thermal management in a small volume should be simultaneously considered. As the devices or systems become smaller, heat flux increases in general. Therefore, an effective cooling strategy for the micro-devices is required especially when the cooling target is made from microfabrication processes. The microfluidic heat exchanger is one of the most promising devices for cooling down the electronic systems because it can be also made by the microfabrication processes[1]. This device which is also called microchannel heat sink has been considered as an effective heat removal tool and has caught much attention during the past decades, due to its advantages including high heat transfer performance, mild pressure loss and easy fabrication[2].



| Vendor | Vendor Revenue - M USD | Shipment Units |
|---|---|---|
| Dell EMC | 3,070.41 | 502,845 |
| HPE | 2,998.59 | 461,333 |
| **Inspur** | **1,082.65** | **203,285** |
| Cisco | 996.25 | 80,645 |
| Lenovo | 860.41 | 151,575 |
| Huawei | 744.10 | 145,441 |
| Self-Build/ODM | 1,234.29 | 475,488 |
| Other Vendors | 2,245.41 | 794,212 |
| Total | 13,232.12 | 2,814,825 |

- One of Sparatech partners GRC makes the coolant for our microfluidic for Sparatech and their main customer is Inspur that wants to evaluate demo
-Dell , HP & IBM all want to see a working units when available as the technology will make higher energy efficiency.
-Dell Gary Verdun is energy efficiency expert for all products and wants to approve Sparatech design as required a more energy efficient servers .
This is a mandate for all server manufacturers as data centres need to reduce their energy requirements

GRC GREEN REVOLUTION COOLING

The Immersion Cooling Authority

- GRC makes custom server racks which would design embedded microfluidic device on each shelve. Sparatech demo units GRC will do a full evaluation on the energy output which can be shared to server OEM's.

- The six of the top ten server manufacturers would do immediate evaluations once units and data are available.

- GRC two main customers for coolant servers are Supermicro & Inspur who will evaluate Sparatech units

- Lenovo server group innovation team will do an evaluation Ritch Russ Director, Strategic Technology Sourcing 1009 ThinkPlace, Morrisville, NC

- Dell Gary Verdun will do an evaluation as leads corporate initiatives that provided savings of over a billion of dollars in annual energy costs for customers. electric has Dell attention

# Cost of Running a DataCenter

IBM as cooling technology for data centers. IBM’s Jim Gargan, the VP responsible for IBM's System X cooling technology, predicts that by next year most businesses will spend more money to power and cool their data centers than they spent on the computer systems inside them. Data center managers are doing a poor job handling heat. A study of 19 computer rooms with more than 200,000 square feet of combined floor space done by the Uptime Institute, a research group, found they had 2.6 times the cooling capacity required, but wasted more than 60% of capacity because of poorly designed layouts and airflow, among other deficiencies. As a result, more than 10% of the server racks ran too hot.

# Sparatech Core Technology

DNA is thermal electric bonding three metals process  that highly reliable and “burn in “ to last life of the glass modular 20 years

Demo units made by vapour deposition are bing made now and will prove  each bond metal produce a volt the amount of electric power. Prior already demonstrate  but process was not vapour deposition which does high volume

All modulars have the same “ footprint ‘’ just engineered for OEM electric requirements

Adding microfluidics is just engineering design as Sparatech develop the channel for fluidic and SP Industries has manufacturing expertise .

# Sparatech - Angel Investment First Round

Angel Fund to " perfect “ the R &D units to except high volume manufacturing cost and electric performance for the three vertical markets:
OEM chimney , stoves and ovens

Radnor Tech Set up a separate entity for process market to design and engineer thermal electric devices

Server Market can be a separate entity and could be set up to be acquired by Corning.

First round can be a group of individuals , an angel investment group or one individual .

Looking up to one million .