



APP-104: Harvesting Thermal Energy To Power Asset Monitors in a Factory



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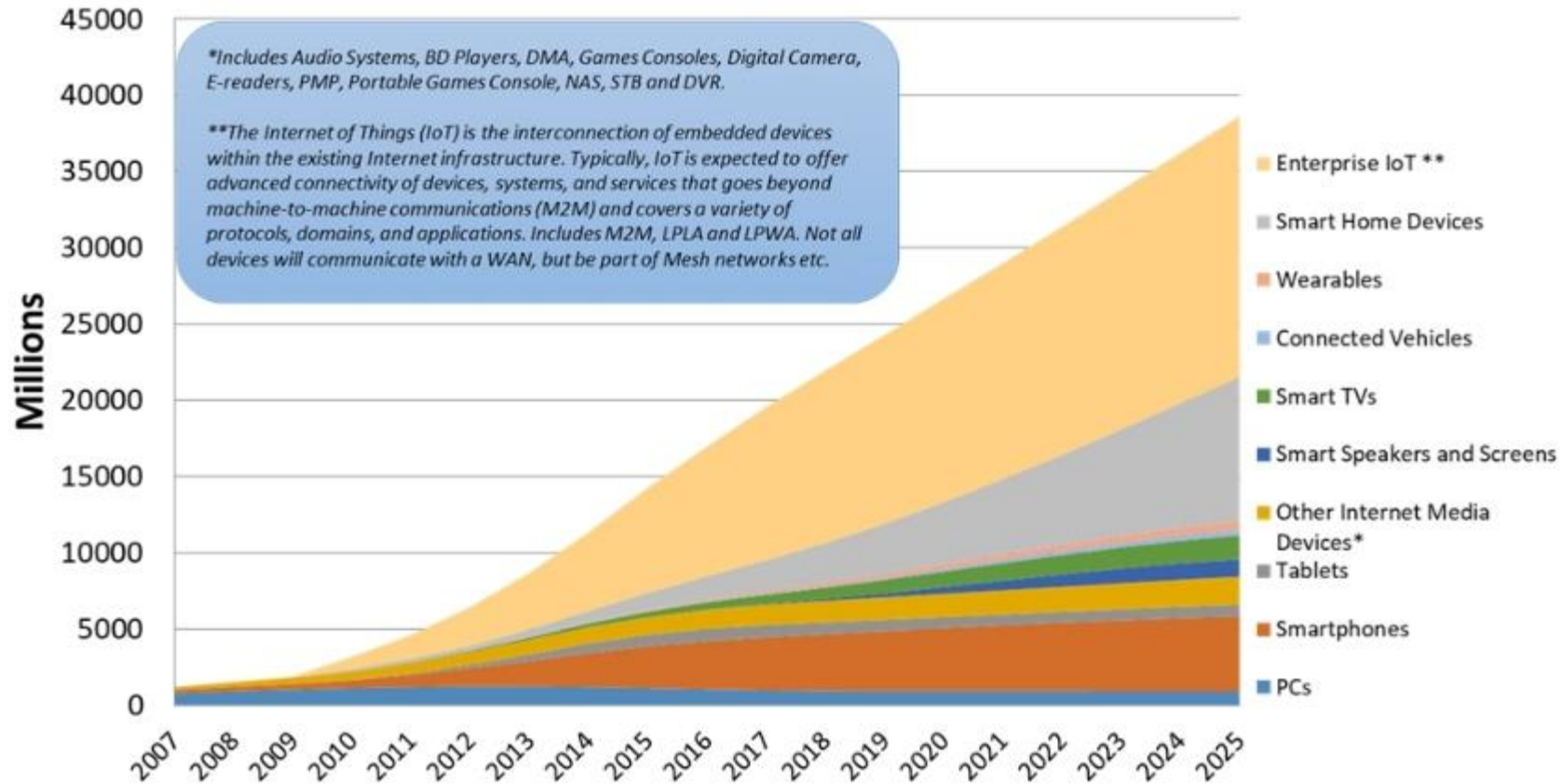
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Co-Founder and CTO



IoT Devices are Proliferating Rapidly

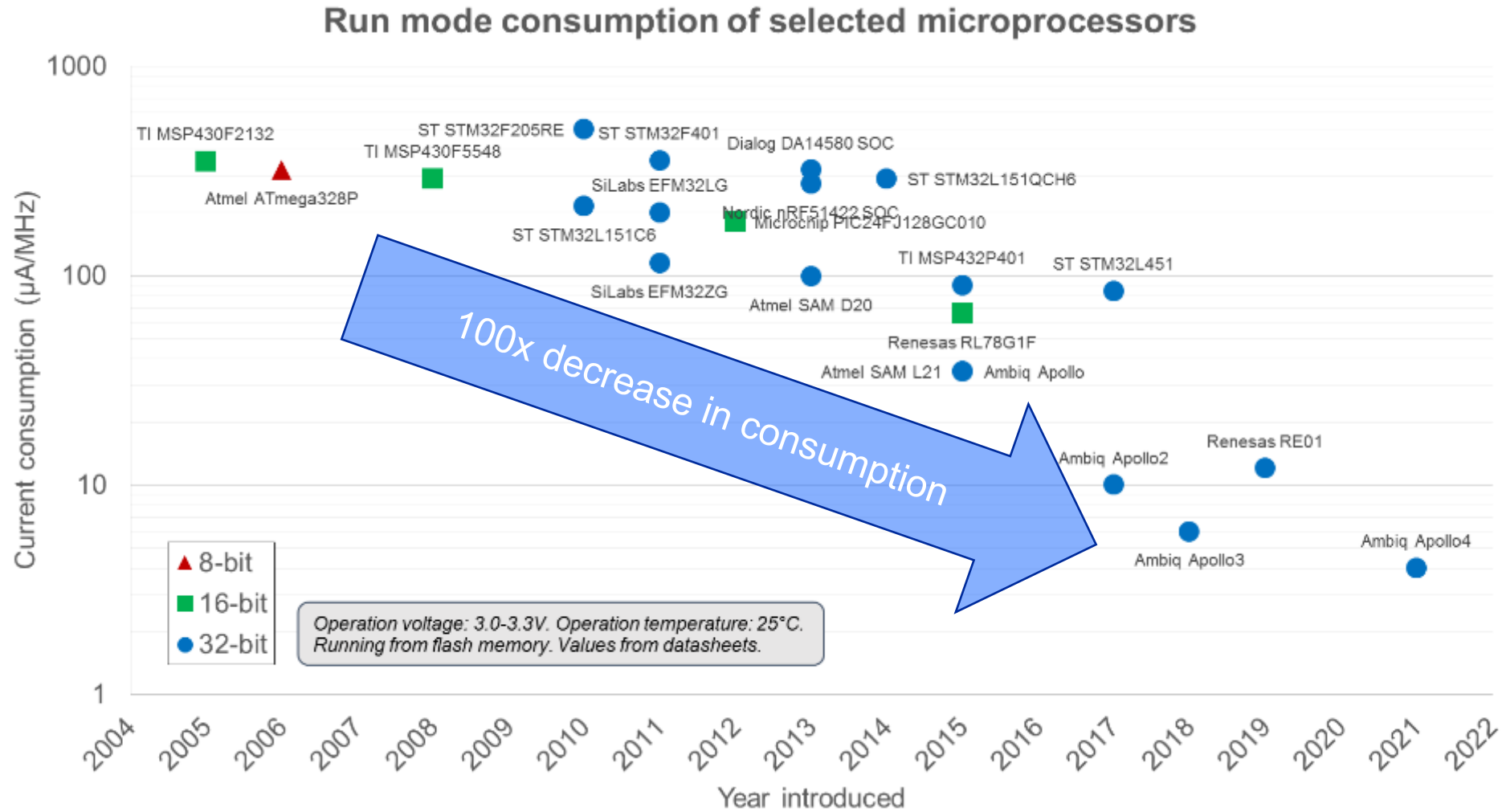
STRATEGYANALYTICS

Global Connected and IoT Device Installed Base Forecast

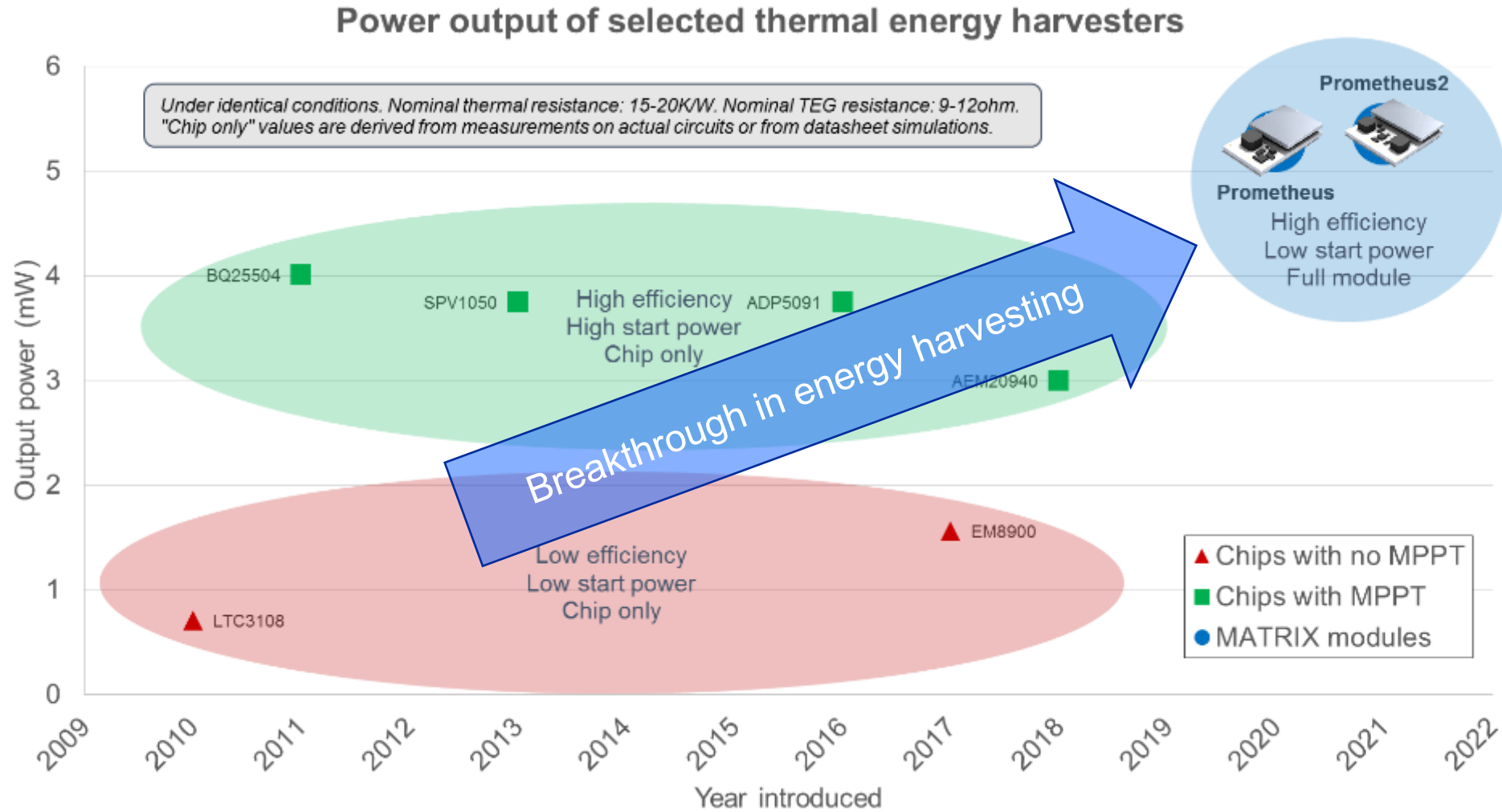


Source – Strategy Analytics research services, May 2019: IoT Strategies, Connected Home Devices, Connected Computing Devices, Wireless Smartphone Strategies, Wearable Device Ecosystem, Smart Home Strategies

Microprocessors (and Sensors) are More Efficient



Energy Harvesting (and Storage) is More Capable



Leading IoT Applications



Building Infrastructure

Imagine millions of beacons and sensors deployed without battery charging headaches.



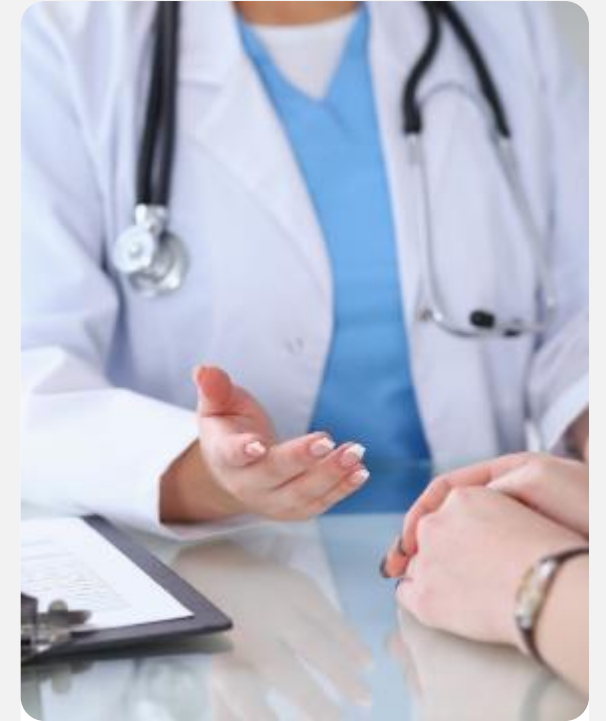
Industrial

Replace the need for disposable battery pack systems – for good.



Agriculture & Farming

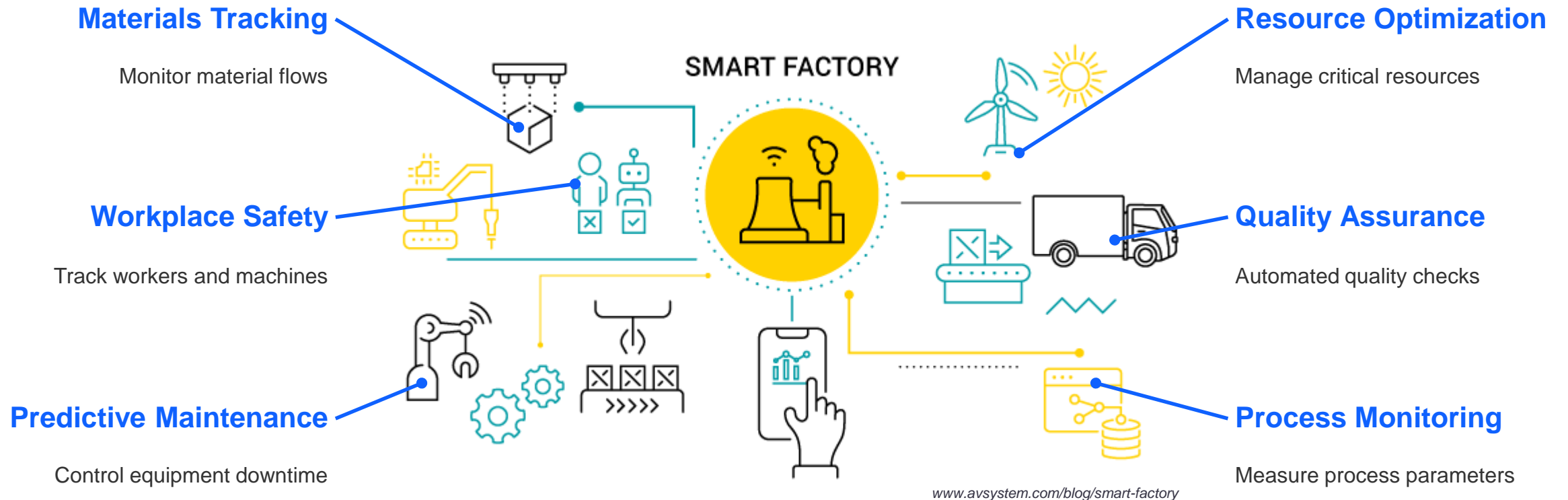
Measure and report soil quality & irrigation, environmental conditions, livestock tracking and more.



Medical

Ambulatory patient health monitoring without worrying about battery replacement.

Asset Monitoring in the Smart Factory



Thermal Energy Harvesting is Ideal for the Factory

No maintenance

Eliminate need for battery replacement and labor costs



Motors
Pumps



Boilers
Furnaces

Deploy faster

Install on existing assets without adding cables



Generators
Engines

Next-Gen Asset Monitors



HVAC
Refrigerators

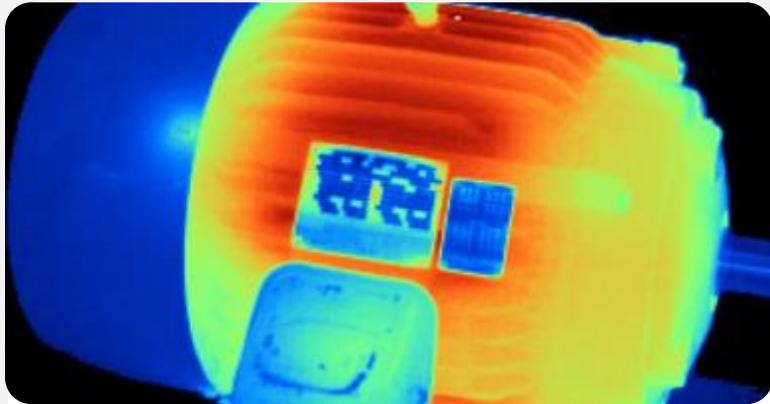


Steam Traps
Valves or Pipes

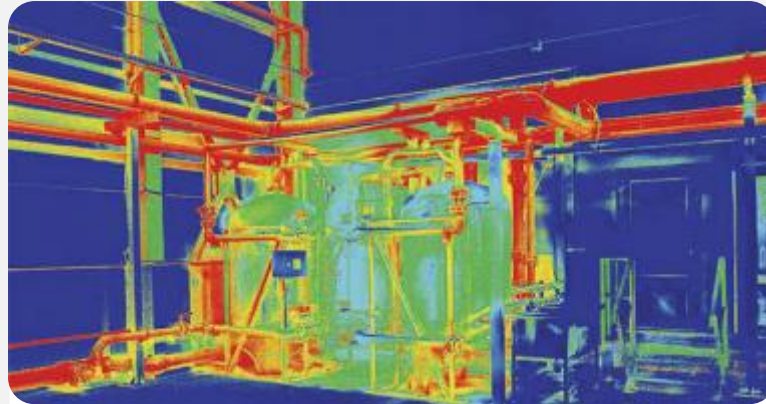
Easy to design

Harvest energy from equipment heat

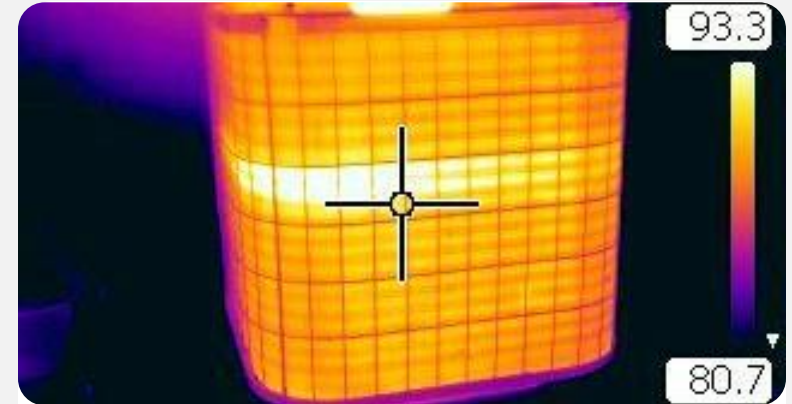
Heat is Everywhere



Pump or Motor



Boiler or Furnace



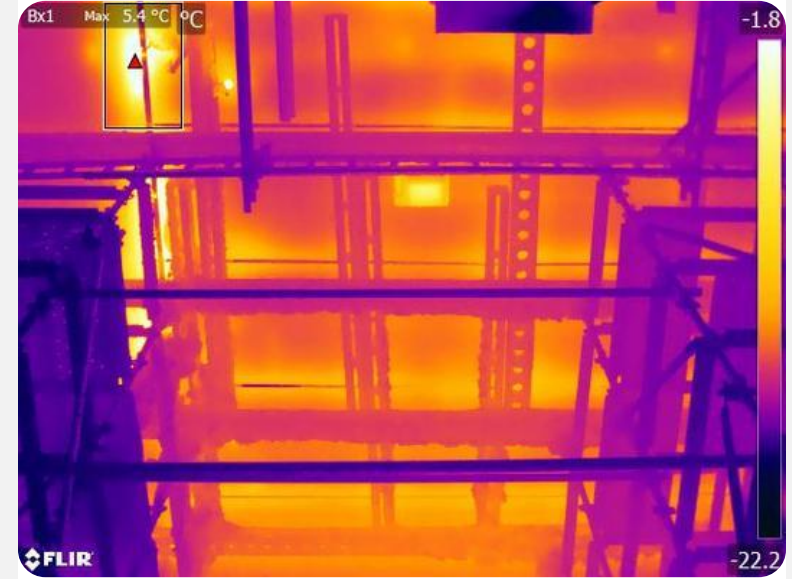
HVAC Radiator



Hot Fluid Piping



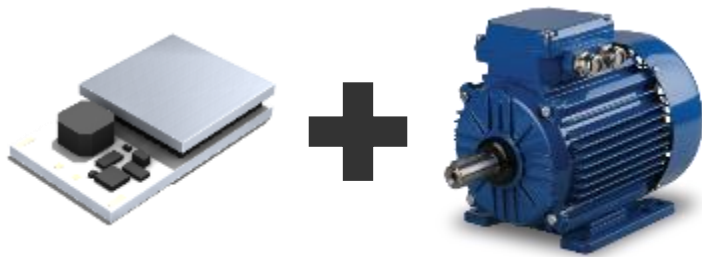
Transformer Equipment



Cold Room

Prometheus for Every Application

Small Gradients

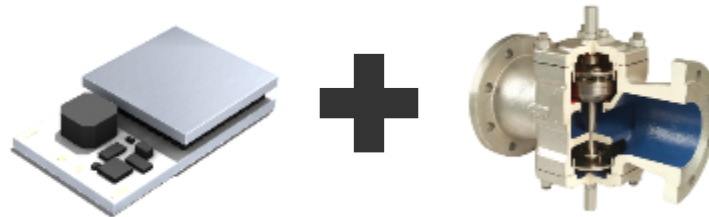


Standard
Prometheus

Pump body
 $\Delta T = 10^{\circ}\text{C}$

0.83mW @ 4.2V
0.82mW @ 3.0V

Larger Gradients

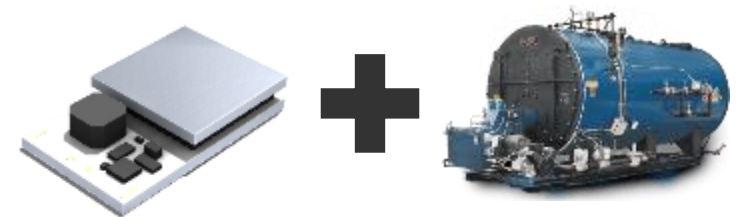


Extended Range
Prometheus

Steam trap
 $\Delta T = 64^{\circ}\text{C}$

20mW @ 4.2V
15mW @ 3.0V

Highest Power



High Power
Prometheus

Boiler
 $\Delta T = 143^{\circ}\text{C}$

53mW @ 4.2V
42mW @ 3.0V



Window Snip

Choose the right Prometheus for your project:

The most power

If power output is more important than size

Power me up

A balanced mix

You need a balance of power and size

Perfect Balance

Smallest size

Size is the most important element for you

Let's make it small



SMART
FACTORY

MATRIX Prometheus

Energy harvesting has never been easier.



Order your Prometheus EVK today:

www.matrixindustries.com/choose

SMART
FACTORY



+

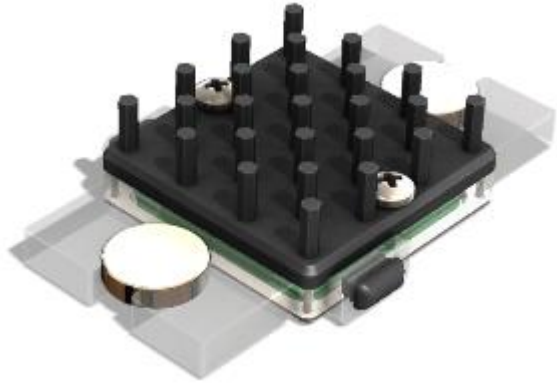


MATRIX Prometheus EVK + BG22 Thunderboard

Energy harvesting BLE sensor demo.



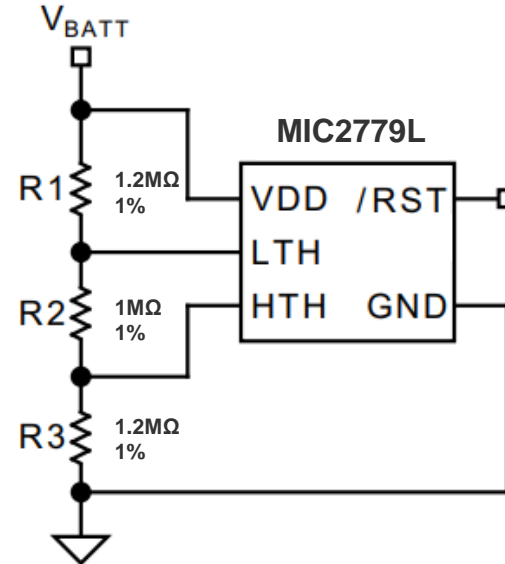
Key Components



- **Prometheus EVK**
 - Flat Surface Kit with Prometheus module
 - Output Voltage: 3.6V



- **Energy Storage**
 - Capacitors store energy from the Prometheus
 - Total Capacitance: 2000 μ F

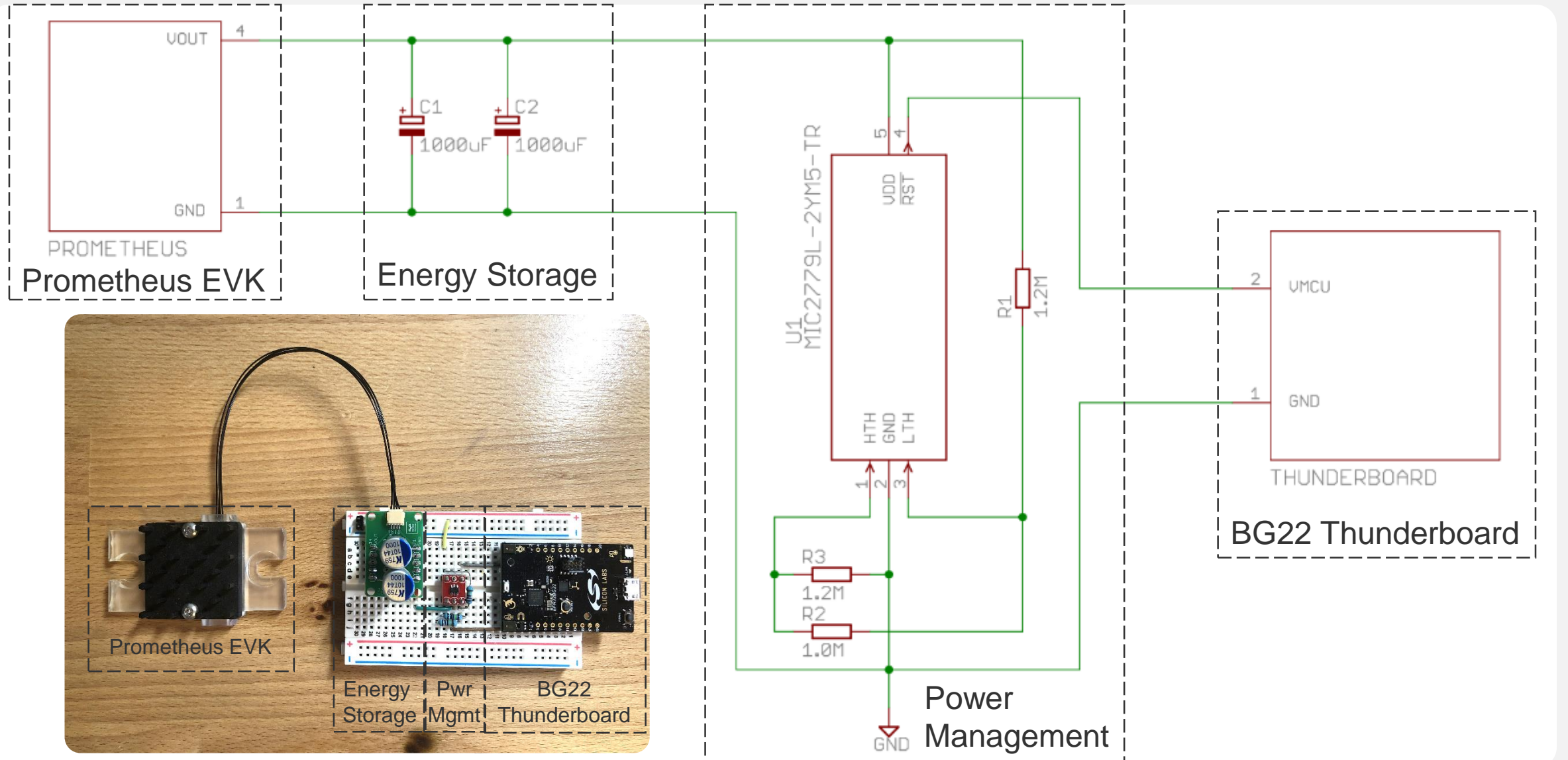


- **Power Management**
 - Voltage detector connects power to Thunderboard if capacitors are charged
 - Connect threshold: $V_{BATT} > 3.5V$
 - Disconnect threshold: $V_{BATT} < 2.0V$



- **BG22 Thunderboard**
 - Idle: Advertise BLE connection
 - While connected: Measure and send data
 - See LOC-204: Optimize IIoT with Wireless Asset Monitoring

Application Schematic



Demo Video





works with
BY SILICON LABS
VIRTUAL CONFERENCE

