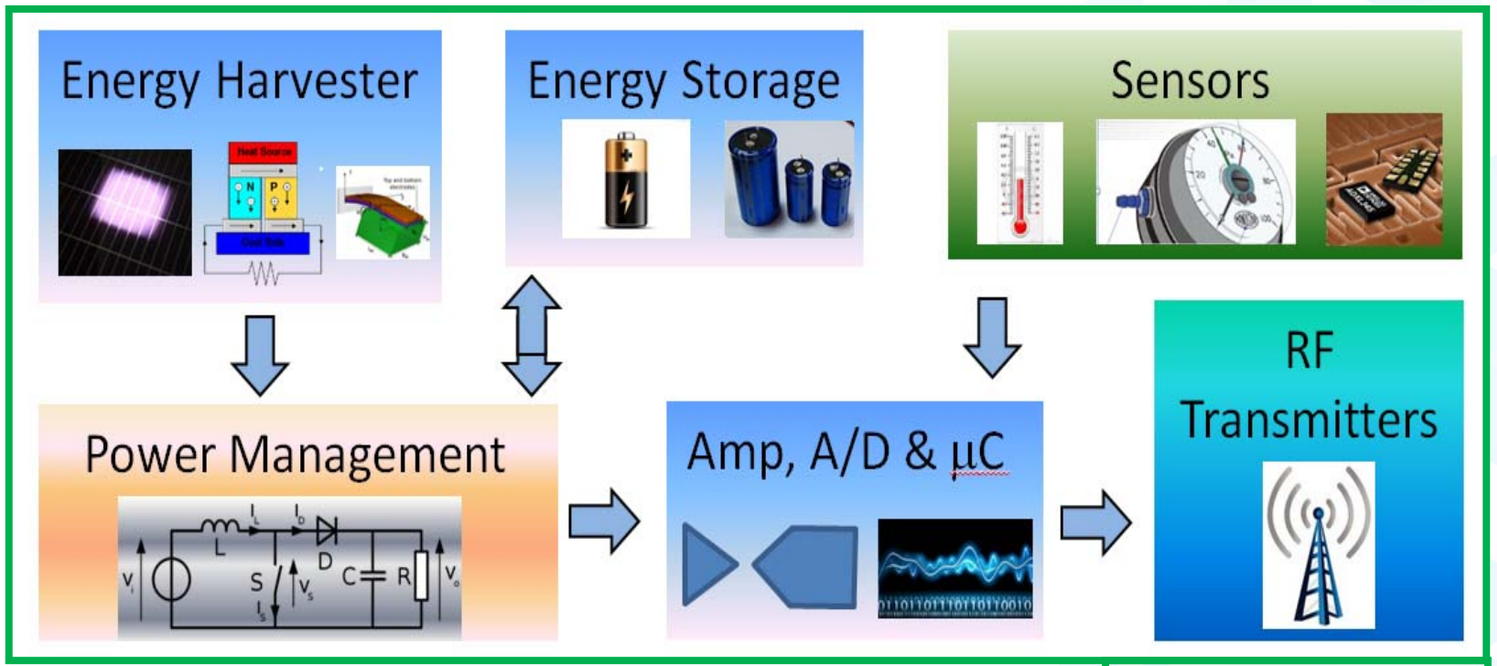
Fast-Tracking Sustainable IoT : Accelerating the Path through Energy Harvesting Ecosystems

Baoxing Chen

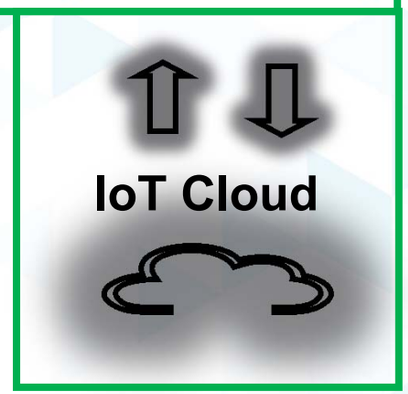
ANALOG DEVICES

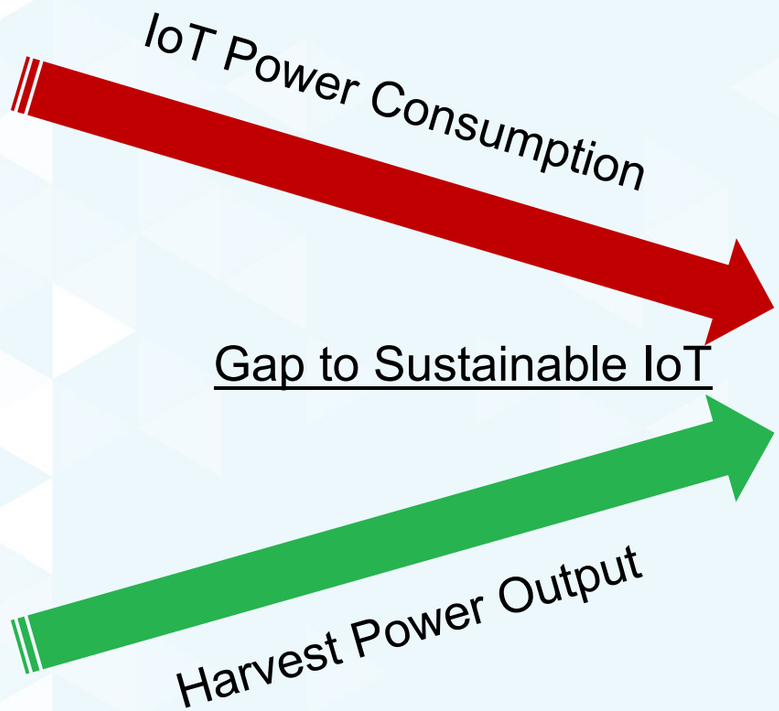
AHEAD OF WHAT'S POSSIBLE™

Energy Harvesting Technology Inter-Dependencies



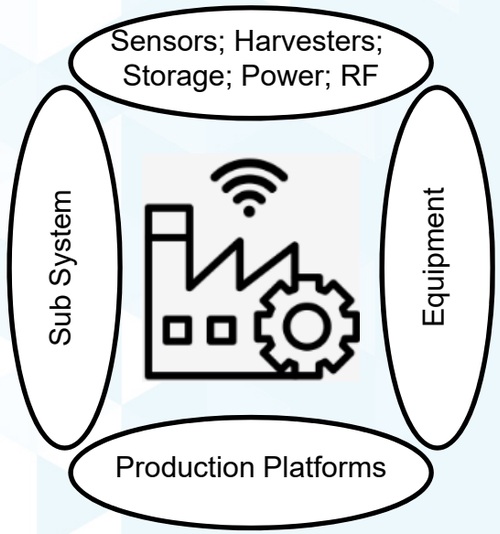
- More power to be generated
- Less power to be consumed
- More intelligence more power
- More dynamic power bigger storage



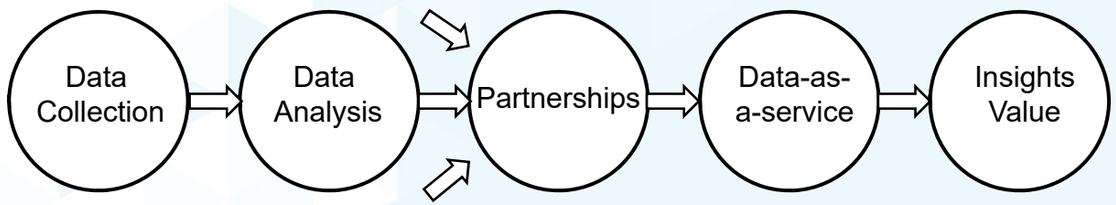


Energy Harvesting System Solutions and Ecosystem Partnership for Fast-Tracking IoT Adoption

- Component innovation is not enough: hardware performance is not the only bottleneck
- Data analytics is the main bottleneck and value for IoT
- Energy harvesting system solutions essential for its adoption for IoT
- CBM for predictive maintenance is an example
- Partnership with equipment makers and factory production solution providers essential



Industrial IoT Ecosystem



Ecosystem Mini Workshop Agenda

Chen	**Baoxing**	**ADI**	***Fast-Tracking Sustainable IoT: Accelerating the Path through the Energy Harvesting Ecosystem***
Aiello	**Orazio**	**Univ of Genoa**	***UBIGIOT: Ultra-Low Design-Effort, Energy-Efficient and Battery-Indifferent Sensor Node for the Green Internet of Things***
Zahnstecher	**Brian**	**PowerRox**	***The Power Sources Manufacturer's Association (PSMA): Where the Power Electronics and Power IoT Ecosystems Converge***
Roundy	**Shad**	**Univ of Utah**	***ASSIST: Vigilant Health Monitoring through Self-powered Wearable Technologies***
Nico	**Valeria**	**Univ of Limerick**	***CONNECT: Energy Research for Sustainable IoT Solutions***
Weddell	**Alex**	**Univ of Southampton**	***The UK Energy Harvesting Network***
Brown	**Thomas**	**Tor Vergata Univ of Rome**	***The Energy Harvesting Roadmap***

ADI Technologies Across Applications

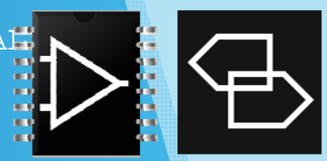
ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™

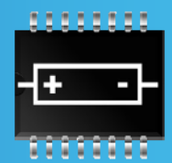
ANALOG & MIXED-SIGNAL
Converter, Amplifier, Interface, Isolation

POWER MANAGEMENT
Voltage Regulator, PMIC, Supervisory

RADIO FREQUENCY (RF)
Mixers, Amplifiers, Filters

EDGE PROCESSORS & SENSORS
DSP, MCU, Inertial, Optical



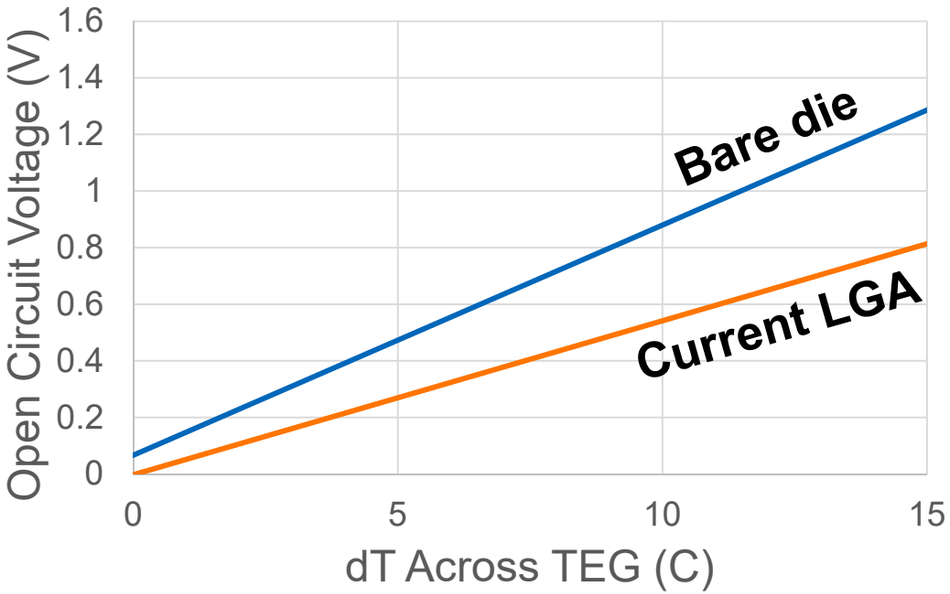


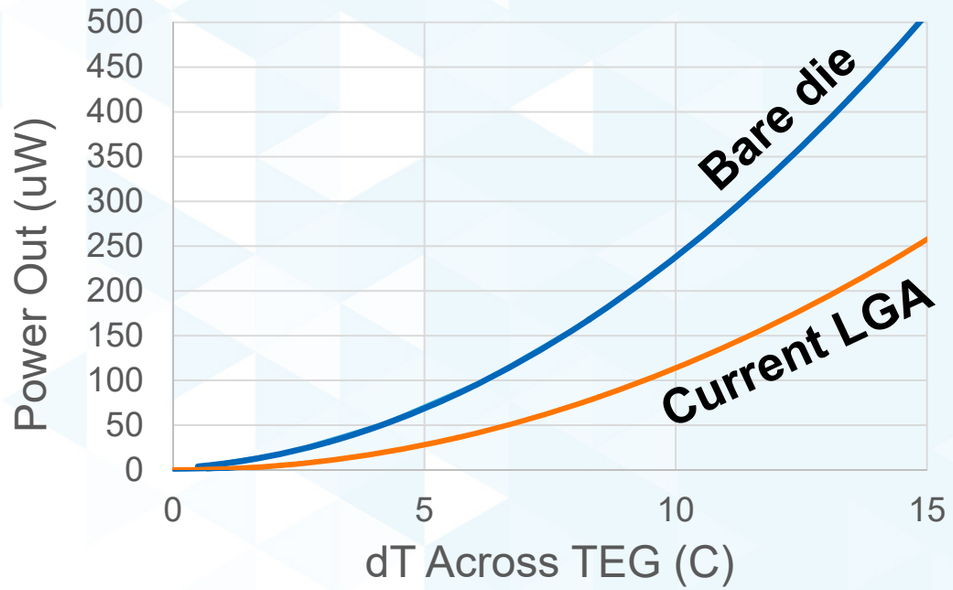
Solving complex design challenges **from DC to 100 GHz, nanowatts to kilowatts, sensor to cloud** across diverse markets

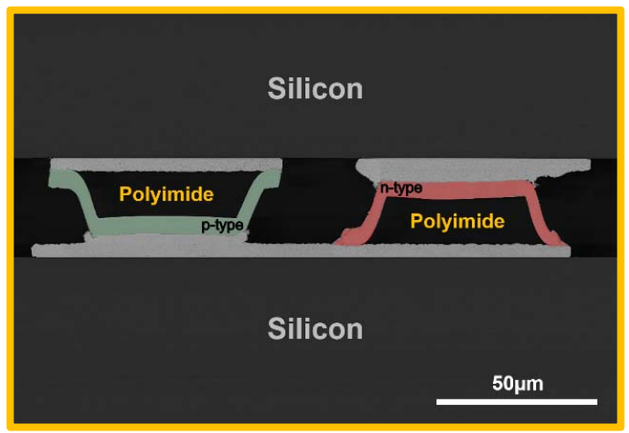
- Digitized Factories
- Automotive Ecosystems
- Communications & Cloud
- Digital Healthcare
- Immersive Consumer
- Aerospace

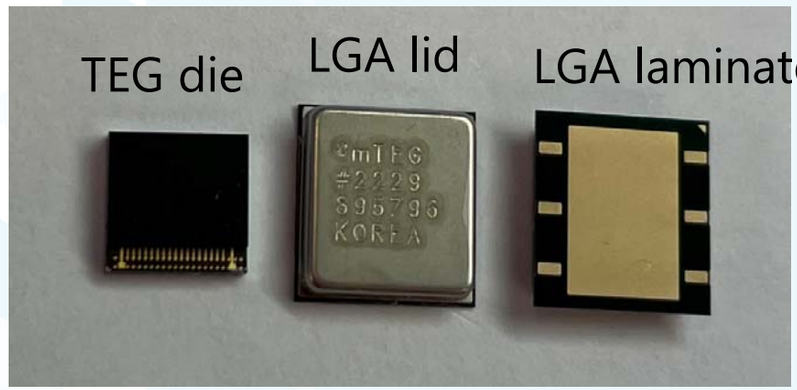
KEY GROWTH DRIVERS

ADI µTEG Performance



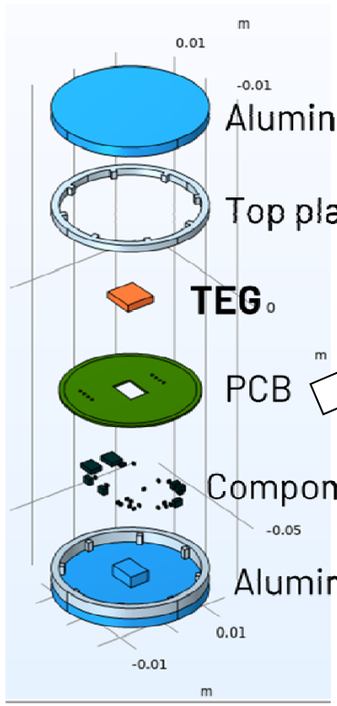


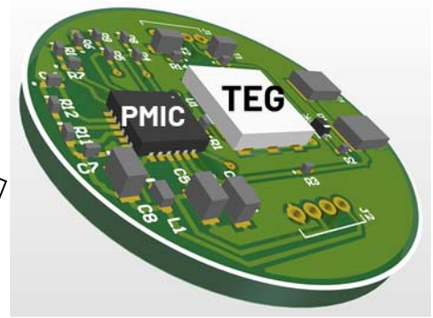




µTEG Systems

- TEG "Battery" eval platform:

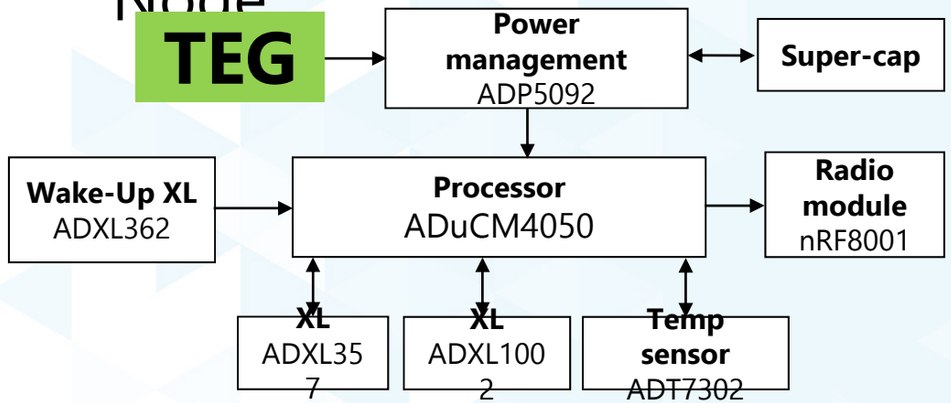


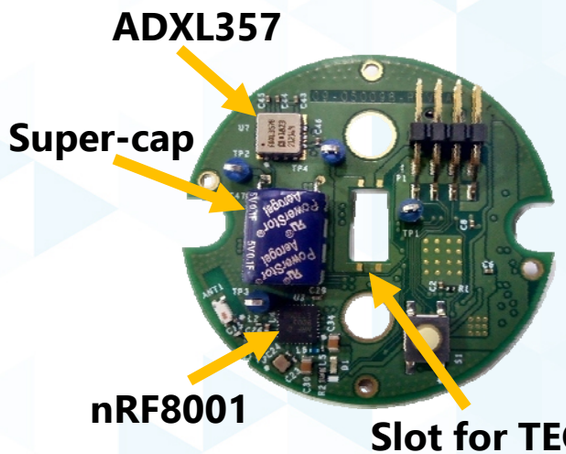


TEG "Battery" (ϕ=3cm, t=1cm)

- Characterize available temperature gradient and TEG power output
- Outputs: Regulated power output and V_{TEG}

- µTEG-powered CbM Sensor Node





ANALOG DEVICES Technology

- ***Sensors:*** Ultra-low power XL and temp sensing technology
- ***uC:*** 4 programmable active and sleep modes, SPI, I^2C and UART interfaces
- ***PMU:*** Ultra-low power, with MPPT and charge management