Closing the Gap towards Net Zero Energy Appliances

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Panel 1. Foundations of future energy policy

What is a Net Zero Energy Appliance? "ZEAP"

- Stand-alone device
- Powered by an integral renewable energy source, (or dedicated supply sold with the product)
- If grid-connected, exports energy equal to the amount consumed over a specified period
- May include the capacity to store energy

Current applications and markets

- Many in remote areas:
  - Marine navigation equipment (solar)
  - Hand cranked radios, lamps and lanterns and mobile phones (kinetic)
- Thermostatic radiator valve (thermal)
- Hue lighting switch (kinetic)
- Sensors used to monitor a wide variety of conditions in buildings, the environment, soils & plants, or humans
  - 250 million ‘self-powered’ sensors in use by 2022

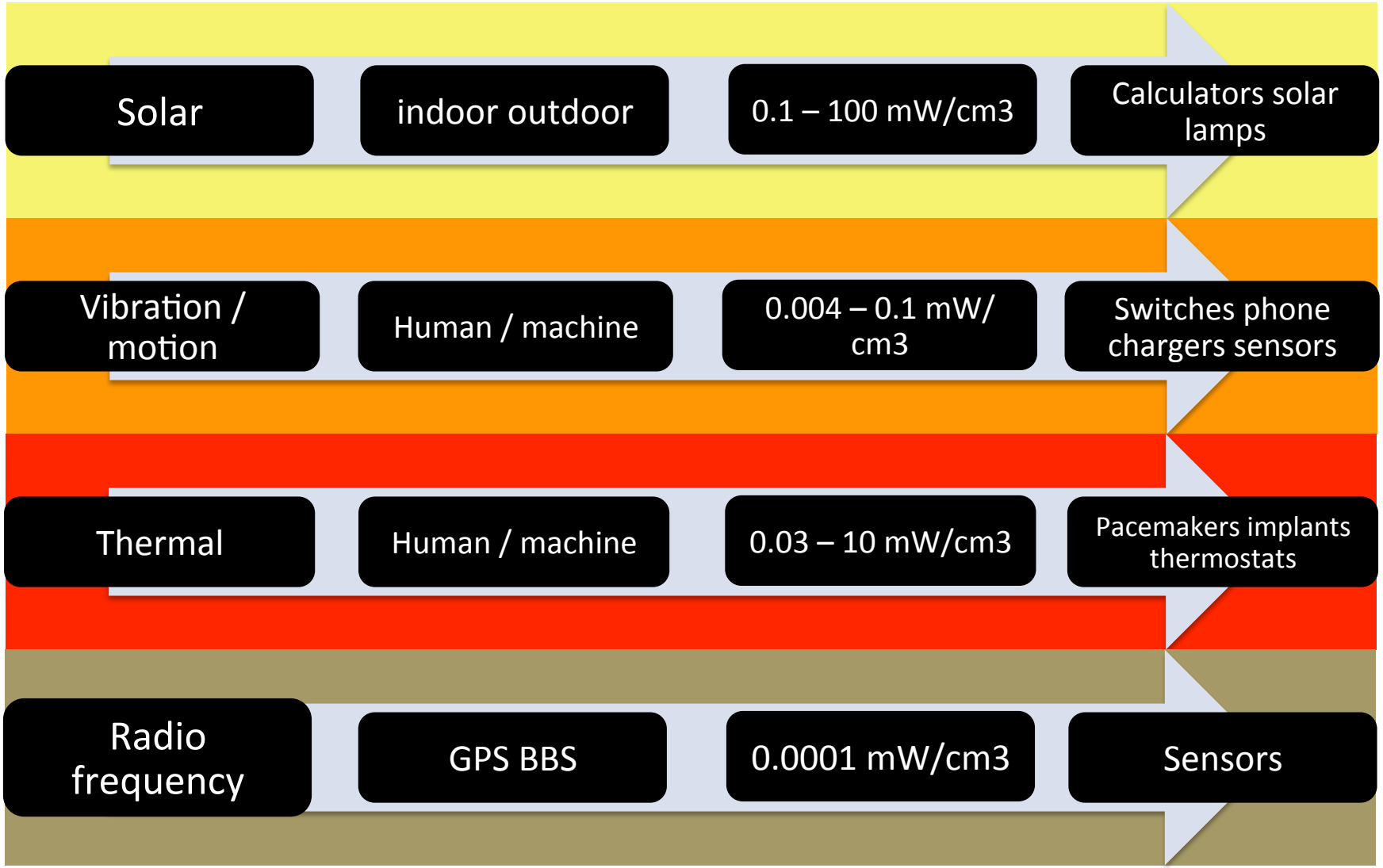
Current applications and markets

POWERAMP dynamic speed bump that is able to transfer energy from vehicles passing over it

Micropelt uses temperature difference between the radiator and the ambient to drive the valve actuator as well as the wireless communication with the room controller

Power Wellies at the Glastonbury Festival - boots with a thermoelectric panel in the sole for charging mobile phones

Typical energy sources for ZEAP

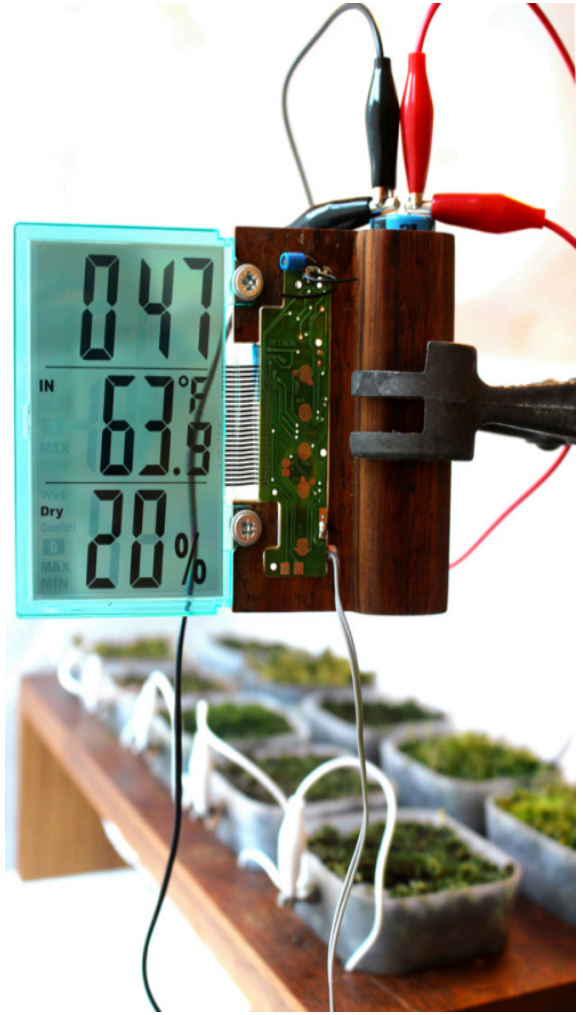


R & D to commercialisation

- Medical applications:
  - self-generation avoids battery replacement in medical implants – reduced risk of infections
  - self-powered artificial cardiac pacemaker operated by a flexible piezoelectric
- Phone charging: a button sized self-charging battery that can scavenge energy from low temperature sources of heat

R & D to commercialisation

- A LED powered by electricity generated from a silk moth cocoon
- Plant-e powering roadside displays from electricity generated by waste organic material



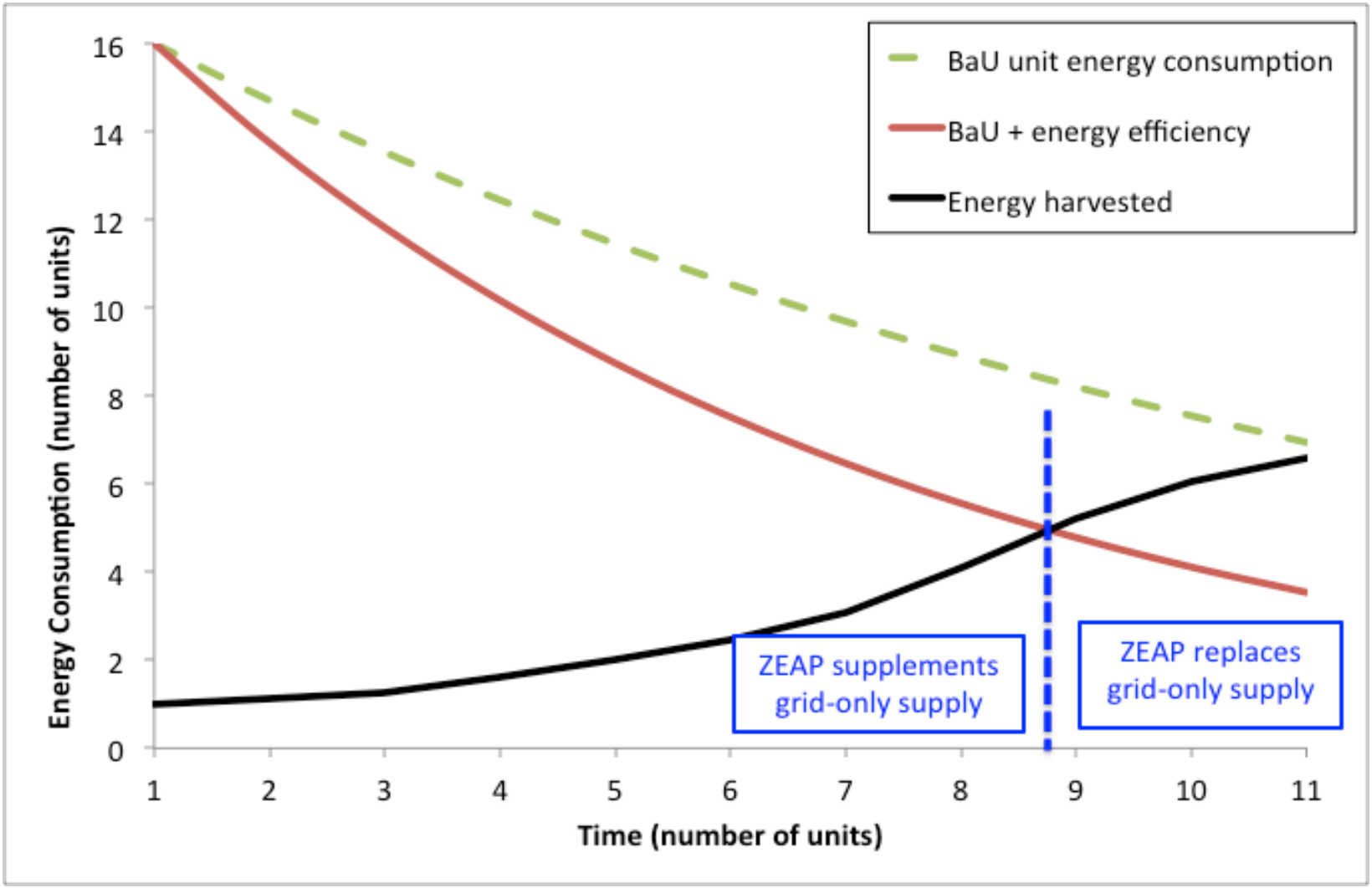
Summary

- ZEAPs have been available for some time
- Small energy applications driving growth
  - Most of the growth in ZEAPs is related to sensors
  - Numerous and often located where grid-connection is not viable
- Increase in type and performance of small energy generators
- Barriers include
  - High capital cost
  - Small and niche markets (e.g. navigation aids)
  - Use limitations (e.g. solar charging devices - limited indoors or cloud cover).
- Applications growing as devices become more efficient and local energy sources generators become more effective

Looking forward

- Growth in options for self-energy generation
  - "classical" (PV, motion and heat) to energy harvesting from organic sources
- Local energy storage
  - Improvements in efficacy and cost of battery technology
  - E.g. low cost paper batteries
- lowering the energy demand of applications
  - limitations of energy supply and storage an incentive to reduce energy demand to a minimum
  - Particularly in devices designed for remote locations.
  - E.g. Power management

Changing demand and harvesting



Implication for policy

- ZEAP developments can help policy-makers set more ambitious trajectories for appliances & equipment
- Appropriate now for:
  - Small appliances, devices and sensors
  - Some functions in larger appliances,
  - As aspirational goal for larger appliances

Net zero energy function (NZEF)

- As intermediate step to ZEAP
- Designate that function (e.g. network connectivity) should be a Net Zero Energy Function (NZEF)
  - i.e. no ‘external’ power to deliver this functionality
- Appliance policies assumes that a NZEF will be possible for all appliances where that function exists

Long term ZEAP ambitions

	F	E	D	C	B	A	A+	A++	A+++	NZE TV
EEI	1	0,9	0,8	0,6	0,42	0,3	0,23	0,16	0,1	0

Use of ZEAPS in Policy

- Investigate potential power sources for NZEF on network connectivity for appliances, and IoT
- Consider the introduction mandatory NZEF, or
- Remove some functional ‘allowances’
- For EU energy labels reserve top energy class for ZEAP (from 2020 say)
- Explore the feasibility of a special label for ZEAP
- Organize awards to recognise ZEAPs