# Brainstorm: Low Power Designs

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Question: What are the primary drivers for developing low power designs? Cost savings, movement to green, longer life for batteries?

One of the most critical factors for component and board designers pursuing low power wireless designs is the overall power budget. By reducing the power demand of the radio, the designer can allocate more power to other things on the board, adding more features and capabilities, without having to go through a new cycle of development and testing. Low power wireless means it's easier to live within an existing design with regard to the power budget.

Using a low power radio is critical from the sensor and wireless enabled side that needs

*by John Carpenter, Karthik Kadirvel, Texas Instruments*

Over the past decade, the market has been pushing technology to produce lower power designs – especially for battery-powered products. This push can be attributed to several factors such as the need to increase usable time, reduce operating costs, and enable green-power alternatives. This article delves into these factors and explains how reduction of power consumption contributes to a sustainable planet.

*by Cees Links, CEO & Fou GreenPeak - Marketing Cl the ZigBee RF4CE group*

More and more wireless c around us in our homes a running on batteries: rem controls, thermostats, temperature, smoke and security sensors, etc. As a consequence, we have to replace or recharge those depleted batteries. This c quite a nuisance especial they start beeping in the of the night.

As a result of technology improvements, battery lif slowly lengthening. Howe the real solution is to mal devices that run of batter require much less power. developing smarter and r efficient radio chips in the wireless devices, enginee

to be as ultra-low power as possible. Even if designer has line power to drive the wireless sensor, they still have a power budget to deal with.

For OEMs or circuit developer, the cost savings are not as important as the integrity of the wireless signal. For them, the driver for low power wireless is more about cost and functionality, and for industrial and manufacturing end-users, it is more about reduced maintenance. Battery powered wireless means they no longer have to worry about maintaining cables and connectors that wear out from continual flexing and movement. End users also appreciate the ability to easily and cost efficiently re configure a factory floor without having to run new communication cables and power lines.

There is an interesting green factor. Because of the ability to control and monitor power usage, wireless sensors can provide energy use data that is actionable (fume hoods, current consumption of coolers/freezers in grocery stores, rooftop units). There is a lot of waste in these industrial systems, and by monitoring when these appliances are wasting power, and controlling it, it is possible to greatly slash real world energy use. For example fume hoods are often left open when not in use, allowing hot air to escape during the winter and cool air to escape during the summer.

In addition, by monitoring current usage in motors and

In battery-powered applications, such as mobile phones or music players, the lower power consumed by various integrated circuits (ICs) increases the device's operational time, which leads to longer time between charge cycles. Generally, batteries have a limited number of charge/discharge cycles. By increasing the usable time per charge/discharge cycle, total battery life is increased, which can significantly reduce the number of batteries being disposed of in landfills. Also, by reducing the frequency of charging, the load on the electrical grid is reduced, thus, reducing our carbon footprint.

In recent years, a considerable effort has been made to design perpetually-powered and battery free systems that operate from ambient energy. With recent increases in power harvested by various energy transducers combined with the reduced power consumed by electronics, perpetually-powered wireless sensor network (WSN) systems are now feasible. Examples of a few low-power ICs that enable a WSN include power management ICs (bq25504), microprocessors (MSP430), and radios (CC1101). These devices have the potential to revolutionize many industries including environmental monitoring, structural health monitoring, and agricultural monitoring. For instance, self-powered WSNs can be retrofitted to older non-green buildings to monitor room occupancy and to automatically turn off the lights and HVAC systems. This reduces

working towards the goal
developing wireless devic
can operate for years on
battery, that can be powe
longer than the estimated
the product itself. This go
also be reached with so-c
energy harvesters, but th
devices are usually too bu
and/or expensive for mas
adoption.

At the same time as ener
consumption is reduced,
additional range and
functionality is added. Th
generation low power wir
radio chips can provide a
of up to 150 feet, enough
enabling a remote contro
provide an interactive, tw
connection, to a central s
box (access point) and th
to the internet. For exam
GreenPeak Technologies
developing transceiver ch
that can be used in remot
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life of more than 10 years
key clicks per day – witho
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Low power wireless is gre
Batteries have a heavy ca
footprint, are packed with
metals and toxic chemica
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ultra low power radio chip
means that despite the
exploding growth in the n
of wireless devices in our
there does not have to be

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| compressors, you can tell if the bearings are going bad. Going bad, uses more energy. From a sensor standpoint, developers have been able to do that for years, but it wasn't feasible from a cost standpoint (too many wires back to a controller). Now with wireless, and the drive to save energy, it's viable. There's a value now. | the building's overall operating costs while also reducing the load on the grid. Another example is to use solar-powered WSNs in an open field to monitor the soil hydration level and turn the irrigation system on and off as needed. This saves water and prevents fertilizer run-off, which leads to a better crop yield with lower costs, and reduces the negative impact of excessive fertilizer runoff into our water drainage system.<br><br>In summary, lower power designs enable new applications that can reduce cost, decrease our dependence on fossil fuels, and make the planet a better place to live. | corresponding demand fo batteries. With the efforts make designs maintenan (in other words, only usin battery for the whole life this demand for more bat can be reduced and altho not a primary driver for lo power wireless – the environment definitely be |

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