



Powercast *simply wire free™*
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WHITE PAPER

ENVIRONMENTAL BENEFITS

Introduction

Implementation of the Wireless Power Platform™ creates numerous environmental benefits. Specifically, the Wireless Power Platform retards the growth of energy consumption by enabling more efficient energy usage behaviors. Furthermore, the Wireless Power Platform reduces the amount of waste generated from the growing number of mobile and stationary devices. The Wireless Power Platform advances a more ecologically friendly use of technology.

Powercast Enables Sensors That Lead to a Greener World

Wide-scale adoption of sensor networks is predicated on easy installation and integration. By eliminating the costly installation of hard-wired power and communication, wireless power and communication significantly lower the adoption barriers for sensor networks. The costs of hard-wired power and communication are substantial in hazardous environments such as power plants. The environmental benefits of wireless sensor networks go beyond the materials savings of wire, conduit, and insulation.

Considerable emphasis is being placed on increasing energy efficiency in production operations¹. Hence, more money is being spent applying process control methodologies to offsites, utilities, and electricity sections of plants which have traditionally been less capital intensive. Implementing a wired sensor system on existing equipment may be limited by cost, logistics, and available space. Therefore, wireless sensor networks are used to capture the economic and environmental value of making the offsites, utilities, and electricity sections of production facilities more energy efficient. By making wireless sensor networks tractable, the Powercast Wireless Power Platform stimulates an improved use of energy. Wireless sensor networks in the office environment allow for optimal usage of lighting (e.g., dimming lights when sunshine is available, turning off lights if no one is present in the room). Furthermore, wireless temperature and humidity sensors can be used to optimize climate control within an office building (heating and cooling) and to identify areas where capital improvements may lead to operational savings (e.g., window replacement, insulation, etc.). Approximately 95% of the energy usage in office space is dedicated to lighting (40%) and HVAC (55%)², indicating that offices adopting wireless sensor networks powered by the Powercast Wireless Power Platform can obtain significant reductions in energy consumption and related costs.

Powercast Reduces High-tech Waste

The digital revolution has dramatically improved quality of life by adding a large number of devices to our daily lives. Unfortunately, the explosion of modern devices has precipitated a potential environmental crisis: the accumulation of large volumes of potentially hazardous waste in the form of batteries, power adapters, and power supplies. Implementation of the Powercast Wireless Power Platform will mitigate the overloading of limited landfill capacity with high-tech waste.

The world market for batteries continues to grow 20% faster than GDP (5% per year)³. Worldwide, roughly 112 billion batteries are produced each year⁴. Demand for batteries is expected to grow rapidly due to the proliferation of mobile consumer devices and the broader adoption of wireless sensor networks. The demand for batteries in the wireless sensor space alone will be enormous. For example, a network of 132 commercial sensors may require 9 tons of batteries⁵. An estimated half billion wireless sensor nodes will be deployed by 2010.⁶ Over a 3 to 5 year period, one quarter-ounce battery in each sensor projects to 125 million pounds of potential battery waste from wireless sensors alone. Consumer electronics also accounts for a substantial portion of battery waste in the US. 350 million rechargeable batteries are purchased annually in the US alone, a portion of which are used to power wireless sensors, cellular phones, computer peripherals, and other devices⁷. Continuous recharging of batteries via the Powercast Wireless Power Platform has the potential to reduce the huge waste stream of batteries to a mere trickle.

Furthermore, the Powercast Wireless Power Platform reduces the toxicity of discarded batteries. Current rechargeable batteries consist of potentially environmentally damaging nickel-cadmium, nickel metal hydride, and lithium ion components. Nickel-cadmium batteries, labeled as hazardous waste by the US government, can leak dangerous amounts of cadmium into the environment. High levels of cadmium can damage the central nervous system and cause psychological disorders in humans. Similarly, both nickel metal hydride and lithium ion batteries contain compounds which, through excessive exposure, can cause serious adverse health effects. Exposure to lithium can cause shock, vomiting, and lung edema. Excessive exposure to nickel can cause birth defects, asthma, chronic bronchitis, and heart disorders, and increase the chances of developing multiple types of cancer⁸.



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Powercast Reduces High-tech Waste *continued*

While Powercast technology can recharge (or trickle charge) any type of battery, the technology is most amenable to recharging alkaline batteries. Powercast technology permits practical recharging of alkaline batteries via slow trickle charging instead of full discharge-charge cycles, which severely limit alkaline battery life. Alkaline batteries are preferable from an environmental standpoint, due to their slow static discharge rate, which makes them more efficient energy carriers. Newer alkaline batteries contain almost no mercury and can be safely disposed of in landfills. Thus, the Powercast Wireless Power Platform reverses the trend away from alkaline batteries, which produce less hazardous waste and are made in a more environmentally benign manner than other rechargeable batteries⁹.

The digital revolution has also produced a proliferation of power bricks and power adapters. The accumulation of high-tech waste is accelerating, since each succeeding generation in this short product cycle segment typically requires a different design from the previous iteration. Hence, with every hardware upgrade or adoption of a new device, another power supply and/or charger displaces the older model into the landfill. By reducing the need for such devices, the Powercast Wireless Power Platform will eliminate a portion of the 3.2 million tons of electronic waste that enter US landfills each year¹⁰.

Powercast Reduces Fuel Consumption

Wiring in vehicles can be reduced through the Powercast Wireless Power Platform. Creating opportunities for weight reduction on aircraft, motor vehicles, and ships by unwiring components, Powercast technologies reduce fuel consumption. The environmental benefit is particularly appealing when it reduces the consumption of bottom-of-the-barrel, unclean bunker fuel oil used in commercial shipping. Real-time location systems (RTLS) and RFID inventory tracking hold considerable potential to reduce the fuel used in managing the supply chain. The Wireless Power Platform enables RTLS and RFID technology to be more effective and efficient, thereby reducing the amount of fuel consumed in investigating, checking (and re-checking), and transporting inventory.

Powercast Lowers the Risk of Environmental Catastrophes

The Powercast Wireless Power Platform facilitates key system upgrades for reducing the probability of catastrophic events at sensitive civilian installations such as power plants, refineries, and chemical plants. Unauthorized access to process control computer systems allowed the Bhopal tragedy¹¹ to occur. Improved security in both computer networks and physical facilities is essential to reducing the probability of harmful environmental accidents from sabotage, error, and terrorism. The Powercast Wireless Power Platform permits the implementation of considerably more secure smart-card-based ac-

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cess control systems. Undesired nefarious entry to sensitive civilian sites may also be prevented through the implementation of a wireless sensor network powered by the Powercast Wireless Power Platform. Furthermore, the Powercast Wireless Power Platform allows for the implementation of correlated sensor networks for early fault detection and identification, allowing problems such as chemical or odor release to be rectified before they affect the surrounding community.

An Ecologically Friendly Alternative to Solar Cells

Though often hailed as a staple of green power, solar cells can produce potentially damaging environmental effects. Chemicals required for the production of certain types of solar cells can pose a significant threat to manufacturing employees and the ozone if not handled properly. Solar cells also contain cadmium, which, as stated above, constitutes an environmental disposal hazard¹². The adoption of the Powercast Wireless Power Platform would diminish these undesirable effects by providing a more ecologically sound energy harvesting alternative.

About Powercast

Powercast, LLC, was founded in 2003 to develop the groundbreaking concept of the Wireless Power Platform. Since its inception, Powercast has broadened its portfolio, grown its skilled management team, and increased its exceptional engineering staff. Today Powercast and its clients are at the forefront of an exciting new wirelessly powered world.

For More Information

Powercast, LLC

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- 1 <http://www.exxonmobil.com/Corporate/campaign/energynow/efficiency.asp>
- 2 Frost and Sullivan "World Wireless Sensors and Transmitters Markets" 31 May 2006.
- 3 <http://www.batteryuniversity.com>, <http://www.imf.org>
- 4 <http://www.batteriesdigest.com>
- 5 <http://www.llnl.gov/str/JulAug01/Hills.html>
- 6 <http://www.sensicast.com/>
- 7 <http://www.earth9111.org>
- 8 <http://www.lenntech.com>
- 9 <http://www.transportation.anl.gov>
- 10 <http://metro-region.org>
- 11 <http://www.bhopal.com/faq.htm#faq0>
- 12 <http://www.nrel.gov>