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USB Power from Fire Wood

By Gunter Pauli

This article introduces a fresh approach to USB-based power as one of the 100 innovations that shape "The Blue Economy". This article is part of a broad effort to stimulate entrepreneurship, competitiveness and employment.

The Market for USB-power

The annual world market for Universal Serial Bus (USB) drives by volume is projected to reach 10 billion units by 2015, estimated to generate $24 billion in revenues. The USB is a standard that allows devices to exchange data and simultaneously draw electricity from their host without requiring an independent power supply. While it originally had a battery, this has (fortunately) been eliminated. Prices are less than a dollar for a 512Mbit unit, to $40 dollars for a 32 GB device, with the top of the line the Kingston's 256 GB data traveller that is sold for just under one thousand dollars, powerful enough to store 50,000 images or 365 CDs. The USB is cheaper than the faster FireWire because there is no need for a dedicated chip.

The USB is the result of a collaborative effort amongst seven companies initiated in 1994. Compaq, DEC, IBM, Intel, Microsoft, NEC and Nortel wished to make it easier for external devices to connect to computers. Intel produced the first USB in 1995. No single company owns the rights. The latest super fast USB was released in 2010 capable of transferring up to 5GB per second, while decreasing power consumption. The combination of data transmission and power supply (5V DC) offers a double function that resembles the Blue Economy proposal of steering society towards sustainability by introducing multiple benefits. Realizing the opportunity to draw power beyond the limited supply the standard USB foresees, IBM, NCR and FCI/Berg developed a modified interface that can supply up to 6 A at either 5V, 12V or 24V DC for a broad range of peripheral devices.

Kingston Technology Co. Inc., a privately held company with revenues of $6.5 billion, is the world's number one memory module manufacturer with 40.3 percent market share, up from 27.5 in 2007. Perhaps the largest (and the only) European competitor is LaCie, the Paris designer memory maker controlled by Phillippe Spruch which is ten times smaller than Kingston in number of employees and twenty times in turnover. It does not come as a surprise that China is the largest unit manufacturer of USBs in the world.

The Innovation

There has been a race to cram more information into ever smaller USB devices. At the same time efforts have not been spared to reduce the energy consumption and increase the power versatility of the USB connection tool. An additional drive is geared towards more security, safeguarding data. A major innovation is the introduction of the wireless USB and portable USB power packs as offered by CurrentWerks. However, the core challenge remains that all

power is originally converted from a grid operating in high voltage (110 or 220 V) alternate current (AC) and that the conversion requires additional capital equipment causing a loss of heat and efficiency. Companies like Power Gorilla offer solar solutions, however this is generally quite expensive with full sets of solar panels and back-up batteries quickly costing a couple hundred dollars.

Jonathan Cedar received his Bachelor of Arts in Engineering and Environmental Science from Dartmouth College (Vermont) in 2003. Afterwards he traveled the world teaching mechanical and electrical systems on board of a research vessel. As a ship's engineer he learned how to become resourceful while at sea and on shore without a connection to the grid while in need of energy. He joined Smart Design in New York and worked for clients like Pyrex, OXO, Staples, Pepsi, Johnson & Johnson and Hewlett-Packard. Jon registered dozens of patents and has a 90 percent success rate in bringing ideas to the market. However his time at the high seas reminded him of the need to find energy anywhere.

Jon realized that open wood fires are maybe romantic on the beach, but inefficient, wasting a lot of potential energy, and creating toxic smoke due to incomplete combustion. He knew that stoves that blow air into the fire can improve combustion. This requires energy to power fans and most people who cook on wood have no access to the grid or batteries. He remembered his physics classes and integrated a power generating device that converts a fraction of the fire's thermal energy into electricity to power a fan, improving combustion. Once he realized the amount of energy available from solid state heat exchanges, he redesigned the supply of thermal energy to power small electronic devices such as mobile phones, LED lights, GPS and any other mobile unit that are all based on the USB 5 V DC standard.

The First Cash Flow

Jon realized that 3 billion people around the world cook their food on open fires. That is 40 percent of the world's population. Since open fires consume more wood, and indoor cooking causes toxic gases to pollute the air quality, Jon and his team designed a stove that uses half the wood of an open fire and reduces smoke emissions by more than 90 percent. The increased efficiency -if applied everywhere- could potentially cut global warming by 7 percent, reduce deforestation from wood collection and eliminate smoke that causes an estimated 1.6 million casualties each year. The stoves were tried in India, Ghana, Uganda and Kenya. The product under the brand name HomeStove will be launched by the middle of 2012. The success motivated Jon and his team to create BioLite, a start-up company based in New york. Pre-sales have started over the internet.

The Opportunity

While the developing world needs this solution immediately, the start-up company BioLite needs the cash flow to finance the roll-out of this innovation. Therefore, Jon and his team designed the CampStove to cook meals with nothing but twigs collected on the journey, eliminating the need for any petroleum gas. This responds to the needs of the outdoor sportsman. The same shape as a quart-size water bottle, the stove is light, quick to light up,

fast to boil and cook. In additional to the fire, light and heat, the excess temperature is also converted into electricity recharging phones, LED lights, GPS, computers, cameras and the like using the same heat exchange device as in the HomeStove. The interesting business model of Jon is to offer this first world application in parallel to the third world model in order to increase demand for the core solid state heat exchanger, with the opportunity to sell at a higher price, effectively cross-subsidizing the social product, while increasing demand, therefore reducing the unit cost, bringing clean, safe energy access to the developing and industrialized world without having to wait to get to learning curve. This is the design of a business model that integrates cash flows as proposed by The Blue Economy.

With advance sales over the internet building up at a premium price, it does set a standard for the integration of electricity generation where ever wood, wood pellets are used as a fuel, either out of necessity, or as a comfort provider. Every open fire in the North or the South will benefit from the standard USB electricity provider meaning that when the family gathers in front of the open fire, all power is provided to the LED lighting system in the house, all phones are charged, and no one should loose the tracks back home since the GPS is fully operational. The open fire technology as developed in Austria, Sweden, and Norway, already connected to the heating of water and air, now could make a quick extension to the generation of electricity.

The same logic can be extended to all solar, electric or gas water heaters. The hot water in the tank or flowing through the pipes should not sit there and wait to be blended with cold water to provide the ideal shower temperature, rather it should be powering energy efficient lights and charging whatever there is to be charged. This permits the elimination of AC/DC converters and ensure a multiple source of energy that will turn homes and buildings, North and South independent of the grid with a stable base load supply of electricity provided in DC using the universal USB standard.

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… Further information on the 100 innovations at www.theblueeconomy.org

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