Brainstorm: Power

What business or developmental opportunities do you see in your space for the smart grid?

Matthew Tyler, ON Semiconductor, www.onsemi.com [1]

As the term “Smart Grid” expands beyond its original concept due to granular load shedding and information based behavior, so do the potential solutions and touch-points to the grid. There is a greater need than ever for suppliers to provide a broad portfolio of products and solutions for the Smart Grid and everything that connects to it. We are seeing an evolution of Home Area Networks (HAN) and Neighborhood Area Networks (NAN) and the ways in which metrology and communications might expand in these areas. We are also seeing growth opportunities in areas that support and optimize the grid including the need for greater energy efficiency and power optimization as well as the increased functional demands on Microcontrollers and communications solutions for next generation end-markets.

One specific area of growth is in Point of Load (POL) energy metering solutions that are easy to integrate. Traditional metering solutions come with a lot of integration overhead and potential in-line manufacturing costs requiring a great deal of trimming and calibration. The need to merge predictive system usage information with true POL monitoring will yield significant value to the end user as long as the total system cost is low enough for broad integration.

Ross Sabolcik, Silicon Laboratories, www.silabs.com [2]

The smart grid, and in particular the smart metering and communications infrastructure, requires robust and reliable performance, which drives the need for underlying semiconductor building blocks in the areas of wireline and wireless communications, safety and isolation, computation, sensing and timing (clock generation and frequency control).

As a high-performance, analog-intensive mixed-signal semiconductor company, Silicon Labs is helping customers build these robust smart grid solutions. Leveraging high-performance wireless radio links to interconnect the metering mesh networks tied to a wide range of computational cores ranging from 8-bit through 32-bit, developers can create optimized computation and communication networks for the smart grid. These communication networks are being standardized by several organizations including the IEEE 802.15.4 G/E committees. Underlying this communication infrastructure is the need for high-performance and frequency-flexible timing solutions to co-ordinate and synchronize the networks, sensing subsystems to measure electricity usage or water and gas flow, and robust CMOS-based digital isolation technology to ensure precise electricity measurement, meet safety requirements, provide anti-tampering features and shield sensitive communication buses from noise.

Smart grid system design requires expertise in fusing high-performance, high-reliability analog functionality with digital systems to sample and control the infrastructure and provide sophisticated metrology and sensing capabilities. Silicon Labs provides this system integration expertise, coupled with a comprehensive range of mixed-signal ICs essential for smart grid applications.

Mel Berman, TDK-Lambda Americas, www.us.tdk-lambda.com/lp [3]

There are many different views of what constitutes the “Smart Grid” and indeed its definition and scope is still evolving. However, I think we all agree with the main goals of the “smart grid,” which is: to maximize the efficiency of existing power generation and transmission, develop alternative/renewable power sources and utilize the power we have more efficiently. Towards this end, I recently had my home’s electric and gas meters replaced by smart meters, courtesy of the local utility provider. This change has put some meter-readers out of work, but will enable the utility company to monitor, in real time, the electricity usage of communities, towns and cities and adjust their power generation and resource

allocations more quickly and efficiently.

TDK-Lambda is a technology provider to many facets of the “Smart Grid.” For example, we have provided ac-dc power supplies and dc-dc converters to electric vehicle re-charging stations that are being installed worldwide. We have provided products to power the motors that optimize the angle of solar panels/reflectors which are used to generate electricity. Our products are powering backlighting LEDs used in LCD panels that can provide visual data concerning the usage and control of smart home energy systems, the electric grid and power generating facilities. Most power generating and transmission stations are located in remote areas, especially new solar and wind turbine power farms. Therefore, we have focused on expanding the field life of our power products (e.g., by designing with 10-year rated capacitors), since maintenance calls to remote locations can be very expensive and disruptive. And, we continue to develop smaller and higher-efficiency power products (90% and greater) to reduce the power that would otherwise be wasted; to power the next generation of “smart grid” devices.

Harvey Wilkinson, Ioxus, www.ioxus.com [4]

Currently, ultracapacitors are being used in utility meters to provide power required to remotely query the meters and gather and provide usage data. They are ideal for this application because of the very long cycle life, high burst power and wide temperature operating range. On a related application, ultracapacitors can provide backup power for grid transmission and distribution communications when the grid has a power outage. Having a long, maintenance free life, an ultracapacitor is much better suited for this application than a battery.

The smart grid will facilitate more renewable sources of energy such as solar and wind energy to be integrated and controlled on the grid. Ultracapacitors are being used now in pitch control systems of wind turbines to provide emergency power to protect the wind turbines in case of power outages during high wind situations. Most offshore wind turbines and increasingly more land-based wind turbines use ultracapacitors for this purpose.

Ultracapacitors can also be used in conjunction with lead acid batteries to provide frequency regulation ancillary services on the grid. The technology will meet the grid requirement for very fast response, frequently cycled power to closely balance the grid supply with load. In the longer term, as ultracapacitors increase in energy density several fold, they will be used in standalone systems to provide this

important grid regulation, particularly as more renewables are added to the grid.

Kishore Manghnani, Marvell, www.marvell.com [5]

In the immediate future, I see several development opportunities around the Smart Grid that will decrease unnecessary energy usage while driving new business opportunities for semiconductor companies like Marvell, consumer device and appliance manufacturers and the telecom industry.

In the coming years, as consumers see an increase in new devices connected to the Smart Grid, OEMS can capitalize on mobile devices that have new, embedded capabilities enabling effective management and control of energy consumption. Industrially, buildings and backhaul networks - including access-points, routers, gateways or mini/micro-servers – will become part of the Grid. And even in the enterprise, storage and networking will all speak with the Grid.

The semiconductor industry is pivotal in ensuring important advances that enable this larger ecosystem to thrive; the two most critical development areas are wireless connectivity and embedded intelligence. As vendors continue to develop more advanced devices for the home it is imperative that they leverage the most power efficient technology, as well as wireless capabilities that allow devices to communicate with one another.

Building these “smart” devices starts at the core with embedded intelligent processors that enable the highest performance with the lowest power consumption. For example, highly integrated, 32-bit microcontrollers are very cost-effective and enable tremendous power efficiency and seamless communication between devices.

With embedded wireless connectivity, consumers can more efficiently manage their devices, resulting in better energy-usage. No matter where they are, they can be alerted of the extra energy consumption, whether it’s a lamp left on or the AC at 65 degrees with nobody home. In addition, once connected, these devices can speak to the Smart Grid allowing participation in Utility programs and incentives. Furthermore, utility companies also can utilize the data and better manage the demand side of the energy equation, reducing their need for new power-plants and spinning reserve capacity (which is often expensive, and/or dirty-energy).

Brian Bedrosian, Broadcom, www.broadcom.com **[6]**

Adoption of Wi-Fi and Bluetooth wireless technologies in consumer electronics and appliances continues to grow. While the adoption of these connectivity technologies has been primarily driven by the desire to extend the user experience and provide monitoring and control functionality via mobile and internet connections, application to the “smart grid” electrical system is making these wireless connections increasingly relevant. In discussions of the smart grid, most observers tend to pay more attention to the connection from the home to the larger smart grid overlay network. However, without a robust and interoperable network within the home, the efficacy of the smart grid suffers.

Broadcom is working to integrate Wi-Fi into many home electronics and appliances, partnering with some of the best known brands to ensure that devices like washing machines and air conditioners have a cost effective and convenient mechanism for sharing status, power demand and other information with the broader grid. And beyond simply adapting our existing Wi-Fi solutions to this application, we’re working with the industry to manage the evolution of the Wi-Fi standard to make it more conducive to these applications, architecting new products that not only fulfill the in-home networking needs of a new spectrum of home devices, but also to facilitate broader smart grid connectivity.

Jerry Seams, TT electronics, www.ttelectronics.com **[7]**

Electrical grids around the world are undergoing a momentous transformation. The “smart grid” is finding its way into every developing and industrialized nation in the world. Smart grid technology is enabling an overhaul of utility delivery systems not seen since the advent of widespread electrical distribution in the early 1900’s. And who benefits from this new technology? We all do. Smarter electrical transmission and distribution helps us all by reducing greenhouse gas emissions, utilizing existing infrastructure more efficiently, reducing our utility bills and by making our air healthier to breathe.

Smart meters are a key component of the smart grid. Smart meters allow customers and electricity providers to better understand and control their power usage. Trends are easier to identify and electricity generation can be more closely matched to customer demand with less waste.

Smart meter manufacturers select components based on component properties and solutions often unique to smart meter design. Evaluating myriad component choices and complex performance characteristics for the best meter performance can be a challenging and time consuming process for design engineers. Smart meters must survive harsh environments, lightning strikes and power surges while accurately and continuously measuring high voltages and widely varying electrical currents for many years in a harsh outdoor environment.

TT electronics' broad offering of high energy pulse absorbing, robust current sense and precise voltage measurement resistors provide vital solutions for the specialized needs of smart meter design.

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