Greening Technology and Medical Equipment: Research for a Greener Future

By LAURA BRANNEN
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EnergyStar estimates that the healthcare sector spends $6.5 billion on energy alone. With focused attention, healthcare has recognized the value of building and operating more sustainable, energy-efficient buildings--value in terms of high performance building that save significant dollars. Lighting and HVAC loads, two of the largest pieces of the energy pie, have been reduced in newer buildings by up to 50 percent. As these energy uses are reduced and the size of the total energy pie is reduced, attention is shifting to equipment plug loads, which can be as high as 20 to 25 percent of a facility's overall energy pie.

We propose that we can do better. There's reason to believe, that if asked, manufacturers can design more efficient equipment. Before the 1970s, refrigerators were hugely inefficient and often the largest energy users in homes. That decade's energy crisis forced a new look at the energy use of household appliances. The result is that today's refrigerators use an average of 50 percent less energy than models made in 1974. It's time to ask the same of the medical equipment industry.

If fact, it's happening in Europe. The European Union Commission recently partnered with device manufacturers to commit to reduce the average energy consumption by new ultrasound projects by 25 percent by 2012. In this EU example, just one more efficient ultrasound saves 400,000 kWh/year, which is enough to power over 90 EU houses for one year. Imagine if these kinds of efficiencies were spread to other medical equipment.

Having so many devices with a plug, where do we prioritize our efforts? Many facilities would like to know about the energy use of various pieces of equipment, but manufacturers have not been required to disclose actual energy use of their products, in all energy modes (or states of operation), so that information has not been widely available.

Designing and Planning

If we had a better understanding of the different power load requirements for various states of operation, could we design our electrical/power systems differently? Are there opportunities to better understand equipment utilization and design energy load requirements around various power modes?

Standardizing terminology around the various power states of operation is a good step. Many devices draw energy even when switched off. Some devices go into sleep or stand-by

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mode, but do they still use so much energy that they should just get turned off? Understanding these power states is important, they are summarized below—from high to low intensity:

- Inrush current, input surge current or switch-on surge refers to the maximum, instantaneous input current drawn by an electrical device when first turned on. Alternating current may draw several times the normal full-load current when first energized.
- ON/Active – The power state in which the product is connected to a power source and is actively producing output, as well as performing any of its additional functions.
- Sleep – The reduced power state that the product automatically enters, without actually turning off, after a period of inactivity. The product returns to Active mode within a predetermined period of time in response to various external stimuli.
- Standby – The lowest power consumption condition when the product is connected to the mains electricity supply and used in accordance with the manufacturer's instructions. Standby mode should not be confused with Sleep mode or other reduced power modes it is generally different (and consumes less power than self-initiated modes). Certain devices are not equipped with power switches but employ power management to reduce power use during periods of inactivity. For these devices, the Standby and Sleep modes are the same.
- Off-phantom– The power state that the product enters when it has been manually or automatically switched off but still connected to the mains. This mode is for bringing the unit into Ready mode by the manual power switch.

If we understood the energy consumption for every piece of equipment for every state, how might we design our energy systems differently, and maximize equipment utilization? Could we work with the manufacturers to get this information, and better yet, to encourage them to redesign devices to use less energy?

There is no rating program for medical equipment, such as the federal government's EnergyStar program, which compares the energy use of things such as buildings and home appliances against their competitors, to provide the necessary transparency of energy use figures that would allow comparisons. But if this kind of energy information was available, users would have the data to make decisions with a rating system. Either way, users need the data.

Monitoring for Real Time Energy Use

Circuit-level monitoring enables the real-time tracking of energy by room or area, or by individual pieces of equipment. M+NLB along with our environmental performance division BLUE, have partnered with Panoramic Power as part of a collaboration supported by the Israel-US Bi-National Industrial Research and Development (BIRD) Foundation. This partnership is focused on developing and testing a low-cost, nonintrusive, real-time circuit level monitoring platform.

Circuit level monitoring provides a finer resolution of data to provide evaluation of energy conservation measures, dynamic sub-metering, equipment failure prediction, electrical fault detection, systems benchmarking, and other benefits. The partnership has developed a survey to collect information to help further understand the opportunities for this technology, and also help define the value proposition for the potential applications.

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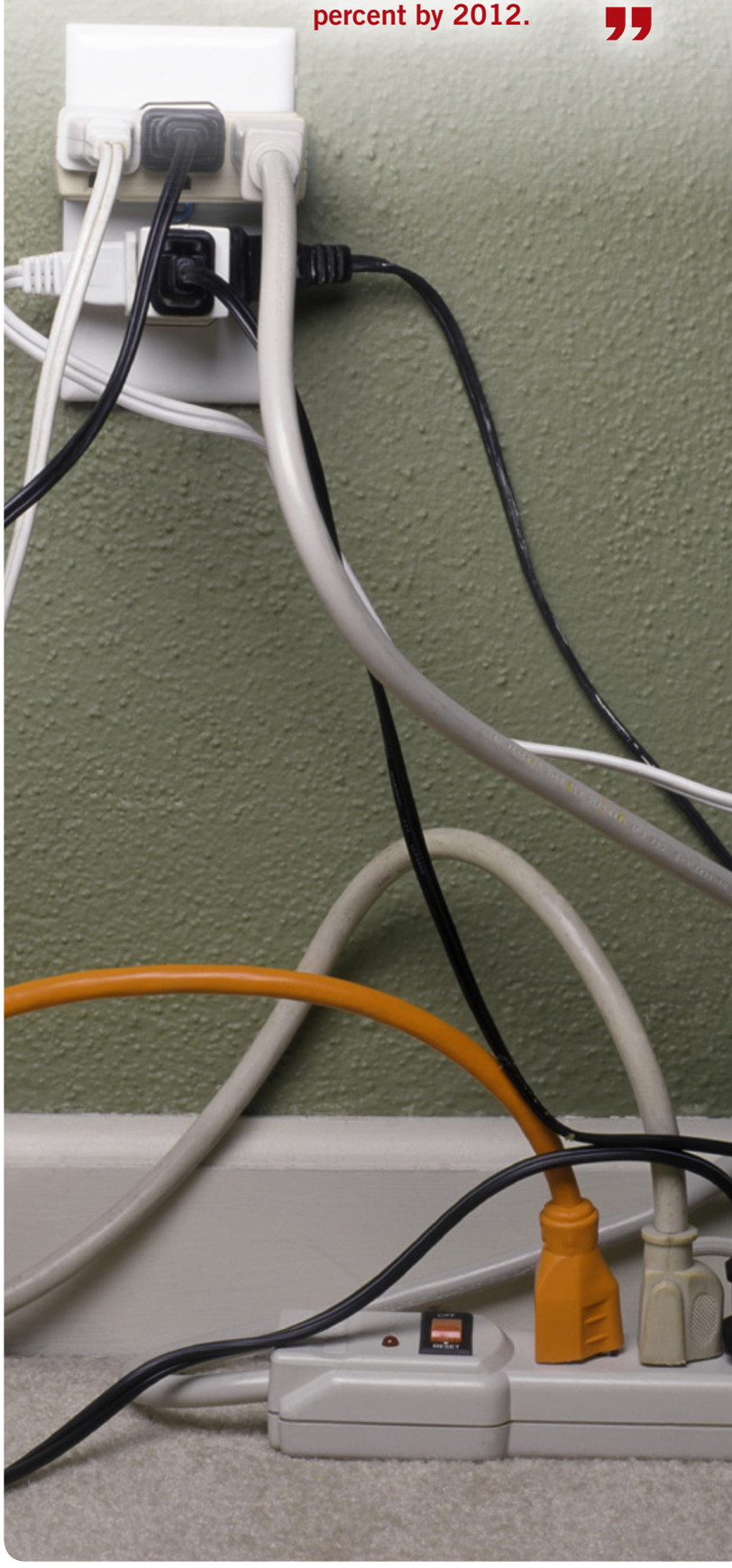

Christian Lindmark , Associate Principal, Technology with Mazzetti Nash Lipsey Burch

In 2009, M+NLB partnered with Lawrence Berkeley National Laboratories and others to create a relatively simple spreadsheet that today has well over 1500 records for nameplate data for a variety of types of medical equipment. Today, M+NLB continues the work and hopes to coordinate the delivery of a free, open-sourced, web-based database to be used by the healthcare community to:

- Plan and design for medical equipment loads
- Work collectively with the manufacturing community
- Prioritize efforts to reduce energy loads for high energy consuming equipment that address risk, cost and operational implications during design and implementation but also in ongoing operations

The database will be designed for ease of use and access but be monitored and maintained to ensure only quality data is used in calculations. It will be designed for manufacturers to upload nameplate data already available in spec sheets. It will allow for manufacturers to upload actual energy use that will provide for protocol—anticipated average use on a 24/7 basis—and for facilities to measure and enter actual (estimated average) use.

Accurate information about the energy use of medical equipment will allow facility managers and owners to make informed choices about what they buy and how they operate it. Collaboratively, we can begin to work with manufacturers to gather this information that will enhance our continued and robust industry wide efforts to reduce energy and costs and improve the environmental impact of our healthcare facilities at a critical time—now and into the future. ■

About the Authors

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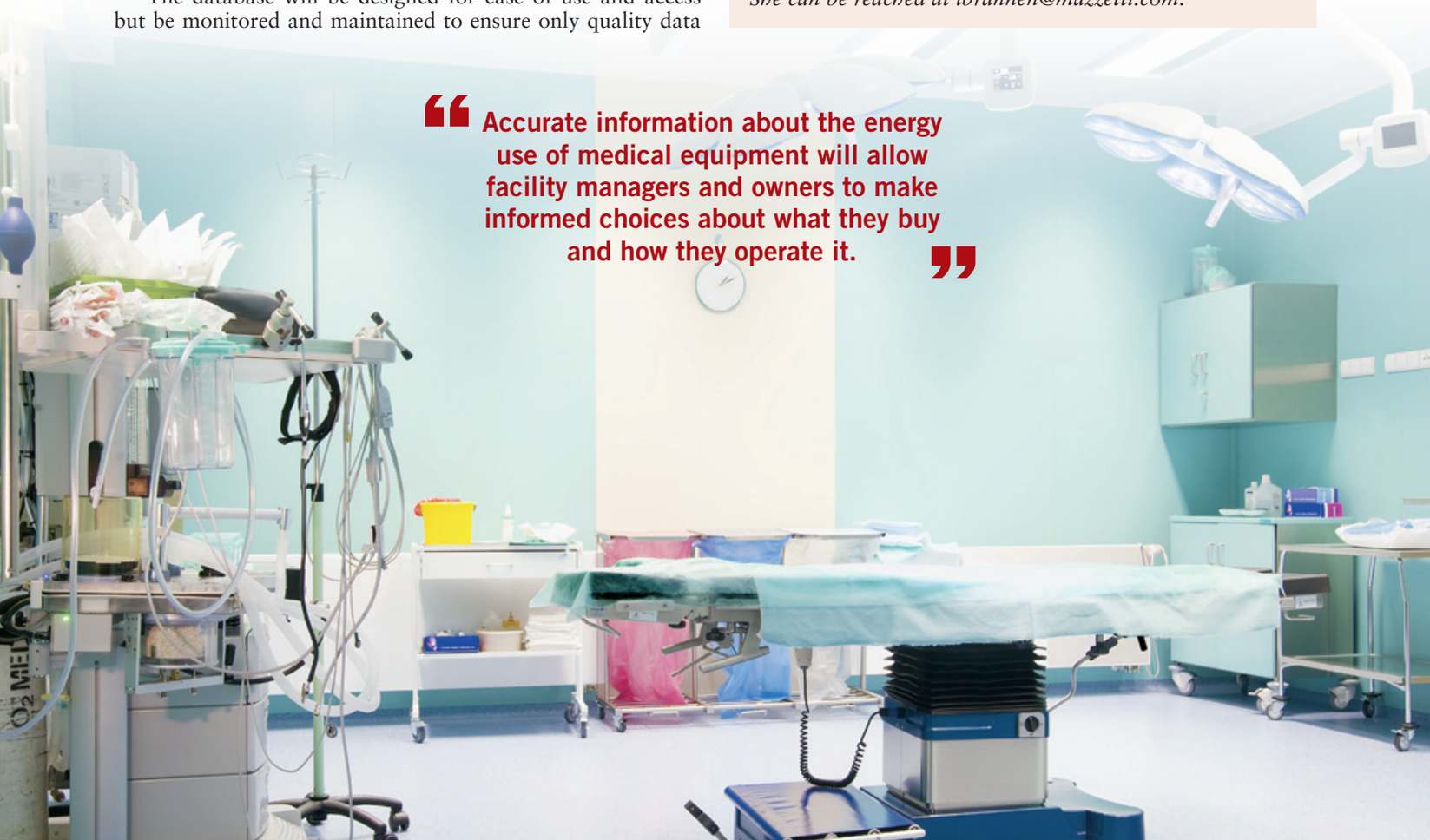

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