

(GUEST OPINION)

Changing How the World Works

THE ELEMENTS OF SMART GRID

BY JOHN E. KELLY III

EVERY NOW AND THEN, CONDITIONS demanding major change are undeniable. And for reasons no one wanted, that's where we are today. With the global economy in flux, and our financial markets restructuring themselves, this isn't just a period of turmoil – it's a period of discontinuity.

multi-channel transactions, online communities and registrations.

So, no one would disagree that the world is now connected – economically, technically and socially. But being connected is not sufficient. The bigger issue is that the systems connecting us just aren't smart enough.

Consider just how much energy we waste.

With little or no intelligence in the power grids to balance loads or monitor power flows, they lose enough electricity annually to power India, Germany and Canada for an entire year. And if the U.S. grid alone were just 5 percent more efficient, it would be like permanently eliminating the fuel and greenhouse gas emissions from 53 million cars.

Congested roadways in the United States cost \$78 billion annually in the form of 4.2 billion lost hours and 2.9 billion gallons of wasted gas – and that's not even counting the impact on the quality of the air we breathe.

Clearly, we're going to have to run a lot smarter and more efficiently, especially as we seek the next areas of investment to drive economic growth. It's encouraging to see how some companies and institutions are rethinking their systems today and applying technology in new ways.

For example, utilities in countries like the United States, Denmark, Australia, Canada and Italy have built – or now are building – digital grids to monitor their energy systems in real time. This enables them to fix outages much faster, and to source and distribute power more intelligently. It also makes the integration of traditional and new sources of power possible, providing end-to-end insight across all forms of energy.

Pacific Northwest National Laboratory has shown how homeowners can reduce energy costs up to 10 percent by using IBM software to turn ordinary thermostats into day traders for energy, ensuring the best cost for the customer while enabling them



John E. Kelly III / Photo courtesy IBM

Our energy systems are not immune. For more than a century we have systematically built a productive, yet complex infrastructure that is now dated and overstressed. Add to that myriad new market forces that are increasing the need for greater network reliability, efficiency and flexibility.

Businesses and institutions everywhere are dealing with more data than ever, and they're just not able to keep pace. While more data are available, proportionally less information – and radically less information created in real time – is being effectively captured, managed, analyzed and made available to those who need it.

Millions of devices are communicating with one another – from credit cards with radio frequency identification chips to household appliances connected to the Internet. And, as individuals, we are creating millions of new digital footprints with our

to become active participants in the grid to improve efficiency and reliability.

Leveraging a breakthrough technology known as concentrator photovoltaics, IBM researchers are developing efficient photovoltaic structures that could significantly reduce the cost, minimize the complexity, and improve the flexibility of producing solar electric power.

For the first time, massively powerful computers – often connected to sensor arrays and input devices through high-speed networks – are enabling us to turn data into information. We are crossing a new threshold in our ability to capture, process, model, evaluate, aggregate, prioritize, forecast and analyze how the world's major economic, social and physical systems work in fundamentally new and deeper ways. In other words, we have a real opportunity to help our planet become a lot smarter.

Smart systems are transforming not only energy grids, but also global supply chains and water management. They are ensuring the authenticity of pharmaceuticals and the security of currency exchanges.

What's more, the opportunity to become smarter goes beyond institutions and businesses. Smart infrastructure is becoming the basis of competition

among nations, regions and cities.

Today, investment and work flows to the countries, regions and cities that offer smart infrastructure – everything from efficient transportation systems, modern airports and secure trade lanes, to transparent and trusted markets, to reliable energy grids.

Together, we can build a cleaner, more efficient grid, one that meets the needs of a digital and highly interactive economy, and one that maintains affordability, reliability, safety and security for every consumer. Engineering an intelligent utility network is the first critical step in building a smarter planet, bringing new tools, techniques and technologies in a network of devices aligned for supreme performance.

What gets in the way of progress isn't the blueprint, or the readiness of the technology, it's the ability of leaders to get people to support very different ways of doing things.

We must seize this moment.

For people of vision and courage, this period of discontinuity is a period of enormous opportunity. Our success will be measured not by surviving the storm, but by changing the game.

John E. Kelly III is an IBM senior vice president and the director of IBM Research.