

Building New American Prosperity through Smarter and More Secure Infrastructure

American infrastructure has been crumbling around its citizens in the last decade. This year marked the 6th anniversary of Hurricane Katrina and the 4th anniversary of the I-35W bridge collapse in Minneapolis, Minn. Fortunately, the frequency of these tragedies pales in comparison to the number of blackouts, water main breaks and traffic gridlocks we experience every day. While blackouts and water main breaks aren't national tragedies, in the long run, they will be costly to our nation's prosperity. As a nation, we must urge our government and private industries to invest in America's infrastructure or risk becoming an obsolete player on the world stage.

Infrastructure investment isn't limited to building new roads and filling potholes, it also includes the "invisible" infrastructures Americans rely on, such as the electric power grid and communication systems. It is easy to forget about these lynchpins of our daily lives -- that is, until the power goes out or your phone line is dead during an emergency. We must build a bridge to a 21st century economy supported by smarter, more secure and high-quality infrastructure.

The electrical power grid system has been hailed by the National Academy of Engineering as the 20th century's most influential engineering innovation of our civilization. Even so, American progress with the electrical power grid has stalled. Power outages cost Americans anywhere from \$80-188 billion each year and, excluding extreme weather and disasters, on average last 92 minutes a year in the Midwest and 214 minutes in the Northeast.

Japan averages only 4 minutes of power outages each year.

We've wasted 10 years arguing the role of the public and private sector while our global competitors adapt and innovate. The only industry in America that spends less than the electric sector on research and development are pulp and paper producers. We need to renew public/private partnerships, cut red tape and reduce the cloud of uncertainty on the return on investment in infrastructure modernization and upgrades.

To upgrade our nation's infrastructure, the federal government must demonstrate a prolonged commitment to funding strategically selected and judiciously monitored research. Industry must also commit to modernizing and investing in the technology federal research dollars develops.

The world's electricity supply must triple by 2050 to keep up with the demand created by the proliferation of digital technology. Twitter alone—with 1 billion tweets sent a week, at 0.025 watt-hours per tweet—is responsible for an additional 2500-megawatt hours per week of demand on the power grid that did not exist before the application's advent. That is enough to power 7,000 houses for an entire week.

America's long-term goal ought to be transitioning our power grid system on to a Smart Grid. The end vision of the Smart Grid consists of a highly developed electrical platform that engages consumers, enhances efficiency, ensures reliability, and enables integration of renewable energy and electric transportation.

One key money and power-saving element of the Smart Grid is its ability to measure how and when consumers use the most power. This information allows consumers to be charged variable rates for energy, based upon supply and demand. This variable rate will incentivize consumers to shift their heavy use of electricity to times of the day when demand is low.

The total cost of a stronger transmission system would be about \$82 billion over the next decade. Additionally, to create a smarter end-to-end power delivery system, we must invest between \$17 and \$24 billion annually over the next 20 years.

Investment in a Smart Grid would nearly pay for itself by reducing stupendous outage costs, a savings of \$49 billion per year, and improving energy efficiency, a savings of \$20.4 billion per year. Likewise, through Smart Grid-enhanced energy efficiency, by 2030 carbon dioxide emissions from the electric sector would be reduced by 58 percent.

Americans should not accept or learn to cope with increasing blackouts, nor should we rest on the notion that the technical know-how, political will, or money to bring our power grid up to 21st century standards do not exist. The truth is, as a nation we must and absolutely can meet the power needs of a pervasively digital society if the United States wishes to maintain its role as a global economic and political leader. The best of American innovation is yet to come and the Smart Grid must be part of our future.

Massoud Amin witnessed the 1977 NYC blackout, the 9/11 tragedies in DC/VA, and the collapse of the I-35W bridge in Minneapolis. He works on enabling smarter, more secure and resilient infrastructures. He *is* leading extensive R&D efforts in smart grids and infrastructure security and is a leading expert on the U.S. electricity grid. Before becoming the Honeywell/H.W. Sweatt Chair in Technological Leadership, a professor of Electrical and Computer Engineering, and a University Distinguished Teaching Professor at the University of Minnesota, he directed all Infrastructure Security, Grid Operations/Planning, Energy Markets, Risk and Policy Assessment at the Electric Power Research Institute (EPRI) in Palo Alto. Prior to 9/11 he led mathematics and information sciences at EPRI, worked on self-repairing energy infrastructures, pioneered R&D in "smart grid" and coined the term in 1998, and led the development of over 24 technologies transferred to industry.