

(reprinted with permission from Modern Power Systems, February 2012)

Smart grid? We can do better

Who wants a stupid grid? Anyone? No? Right then, we're agreed - we all want a smart grid. Now all we have to do is decide what we mean.

The expression 'smart grid' has been around for several years, exciting mounting enthusiasm from a variety of constituencies. But these different constituencies also have different ideas as to what a smart grid might be or do. The starting point is always, of course, the shortcomings of the traditional electricity network. It is not exactly stupid, but it was designed to provide functions and fulfil criteria that are now decades out of date, using technology long since overtaken by innovation.

In recent years, far from offering beneficial redundancy and backup, as was the original purpose in the 1920s and 1930s, traditional electricity networks are now more often the cause of faults and outages, including spectacular blackouts even in rich countries. They are ill-suited to innovative forms of small-scale cleaner generation close to users, particularly when such generation is most appropriately connected directly to low-voltage distribution networks. In any case much if not most of existing traditional networks are well over half a century old, in serious need of replacement and renewal - a particularly daunting challenge in urban areas. Proponents of a smart grid, such as the international GridWise Alliance and Europe's Renewables Grid Initiative, argue that the time is propitious, an opportunity to seize.

What, then, might a smart grid do differently? How would it differ from the traditional, in technology and operation? What benefits would it offer, and to whom? Who would finance the towering investments entailed, and how? How would we get there from here? What pitfalls might lie in wait? In an attempt to address questions such as these, Perry Sioshansi, an experienced independent analyst and commentator based in California, has drawn together an impressive team of contributors from the US, Canada, Australia, New Zealand, France, Germany and South Korea to a book-length symposium entitled *Smart Grid: Integrating Renewable, Distributed and Efficient Energy*, just published by Elsevier.

The four section heads indicate the scope and depth of the discussion. Part I is 'Setting the Context: The What, Why, How, If and When of Smart Grid'; Part II 'Smart Supply: Integrating Renewable & Distributed Generation'; Part III 'Smart Infrastructure, Smart Prices, Smart Devices, Smart Customers, Smart Demand'; and Part IV 'Case Studies & Applications', from PJM, New Zealand and France. A brisk and wide-ranging introduction by Sioshansi sets the scene. The 19 chapters that follow, despite being by 19 different groups of authors, are readable and stylistically consistent, a tribute to Sioshansi's editorship. All the chapters also include copious references, valuable resources for anyone seeking deeper immersion in the topics.

As befits a symposium, their arguments and viewpoints reveal the differing perspectives and priorities that 'smart grid' advocates are now debating. They range from essentially minimal tweaks to traditional electricity system operation, such as remote reading of meters and remote central dispatching of loads, all the way through to comprehensive real-time two-way, autonomous self-stabilizing integrated operation of loads and generators, often decentralized, with business models to match. The differences are crucial, and controversial.

The fundamental question to be answered is straightforward: what do we want from electricity? Traditionally-minded electricity people want the system to keep doing what it has done for decades, only more efficiently: to deliver kilowatt-hours to customers, as many kilowatt-hours as they want, whenever they want them, at a price per kilowatt-hour that covers the total cost and returns a reasonable profit to the supplier. It is an entirely respectable aim, if unimaginative. But it falls far short of the true potential to transform electricity for the 21st century, and in doing so to transform both human energy systems and human society.

Many of Sioshansi's contributors recognize and acclaim such potential, explaining in some detail not only the technological but also the commercial, social and even psychological dimensions of the coming transformation. To give but one example: as small-scale cleaner local generation expands, accompanied by upgrades to high-performance user-technology, the traditional distinction between 'supply' and 'demand' for electricity, and the policy emphasis on 'supply', will gradually fade out of the picture. The price per kilowatt-hour will similarly fade into the background, as information flow becomes the key system function, and longer-term contractual relations for services become the norm.

A year ago, in the 30th anniversary issue of *Modern Power Systems*, January 2011, I suggested that innovative electricity systems could be the key to a coherent vision of a more secure, more equitable low-carbon, low-fuel future for the planet. Fostering whole-system thinking, optimizing investment and operation to deliver the services we want reliably, affordably and cleanly, we should be aiming much higher than merely a smart grid.

Who wants smart electricity? I'm glad you asked. Count me in.

(c) Walt Patterson 2012

Walt Patterson's most recent book is Keeping The Lights On: Towards Sustainable Electricity. His next, now under way, will be called Rethinking Energy.