

On March 13, 2012, Silicon Flatirons Center held a conference entitled, *An Electric Grid for the 21st Century*, the latest in a series of conferences on creating a “smart grid.” The panels focused on both opportunities and challenges stemming from smart grid, specifically (1) opportunities for innovation as a result of new energy usage information; (2) privacy issues surrounding energy usage data; (3) physical and cyber security issues with a connected grid; and (4) how utility incentives affect smart grid opportunities.

By: Mark Wiranowski, University of Colorado Law School, Class of 2012

Panel I: Energy Usage Information and Opportunities for Innovation

William Boyd, a professor at Colorado Law, moderated the first panel and focused the panel on both private sector opportunities for innovation and the role of government in regulating energy usage information. Professor Boyd first asked about the Green Button Initiative. Mr. Nick Sinai, Senior Advisor to the CTO, White House Office of Science and Technology Policy, explained the initiative as a set of principles about consumer access to energy usage data, set forth by the federal government for state energy regulators to consider. Ms. Zahra Makoui of the Advanced Technology Integration Department at Pacific Gas & Electric (PG&E) noted that PG&E was an early proponent and that California’s embrace of uniform standards across utilities was a key success factor in providing consumers with access to their energy data. Mr. Justin Segall, founder and EVP of Simple Energy, described Green Button as an enabler of innovation by companies that varied behavior responses by consumers. Dr. Sunil Cherian, Chief Executive Officer of Spirae, noted that real-time data, when available, will be a much more powerful enabler of innovation and behavioral response.

Professor Boyd posited that many consumers may not care about their energy usage and asked how we get them to care. Mr. Segall framed the problem as motivational—either for behavior change or investment in automation—rather than informational. He explained his company’s solution of applying social gaming principles, based on behavioral psychology, to energy use. Ms. Makoui hypothesized that the ingredients that will motivate Californians to care more about energy use probably include higher energy costs, energy rates that increase with more total use, and some kind of gaming or behavioral emphasis. Mr. Sinai suggested that providers of other services might incorporate energy management and that conservation of energy may not be the best way for companies to monetize energy management services. For example, home automation or security may be a more compelling value proposition for consumers.

Professor Boyd asked about trends in interoperability standards and their effect on distributed generation. Mr. Sinai described standards as the foundation for economies of scale in other innovation and consumer empowerment efforts. Dr. Cherian said that energy resources, including generation, storage and control, are generally moving downstream. This change upsets utility business models and operations, necessitating intelligence on the distribution grid sufficient to handle many dynamic endpoints.

Professor Boyd asked whether energy usage information and innovation is a backdoor way to return to retail competition, which had mixed results and political fallout a decade ago. Mr. Sinai indicated that a digitized grid will enable as much competition as regulators choose to

permit. Mr. Segall stated that a smart grid does change the value proposition to consumers and that either utilities or other private entities will need to compete to provide that value. Ms. Makoui noted that PG&E already thinks like a private company about customer retention. Dr. Cherian likened the smart grid, and the competition that it enables, to a genie already out of the bottle.

Finally, Professor Boyd asked how to organize the learning process, given that smart grid will take a lot of time and money. Dr. Cherian noted that our policy framework and our policymakers need to account for some failures in our progression towards a smart grid. Ms. Makoui asserted that we need to keep the larger goals in mind, including reliability, safety and customer satisfaction, and that smart grid is a means to those ends.

Panel II: The Privacy Issues Raised by the Smart Grid

Paul Ohm, a Professor at Colorado Law, moderated the second panel on privacy. He framed the privacy issue as a balancing of benefits versus harms. Professor Ohm first asked what kinds of privacy issues should be considered in the context of smart grid. Mr. Larry Plumb, Executive Director of Emerging Issues & Technology Policy at Verizon, suggested that we should conceptually separate the grid from the “smart home.” The home is beyond the scope of utility regulation, so privacy issues can be addressed using the same frameworks already used by network telephone and cable providers. In contrast, Ms. Jennifer Urban, Assistant Clinical Professor of Law and Director of the Samuelson Law, Technology & Public Policy Clinic at University of California – Berkeley, suggested that we should consider the regulated utility first because data will flow from the consumer, up to the utility, then outward to third parties. Mr. Bill Levis, Director of the Office of Consumer Counsel for the State of Colorado, agreed that utilities have always used consumer data for grid operations. He asserted that the real dispute is over who owns this data.

Professor Ohm asked what the worst thing would be if electric usage information leaked out. Ms. Urban noted that the richness of the data, in some cases as granular as every six seconds, reveals appliance signatures, allowing an analyst to get a detailed picture of what is happening inside the home. In the U.S., this leads to worry about government surveillance of private individuals, whereas in the E.U., there is more concern about harm from private individuals or entities. Ms. Urban noted that the U.S. Supreme Court held that thermal imaging did constitute a search under the Fourth Amendment, so energy usage data would likely also be a search. Mr. Levis advocated against a mandatory approach to adoption of smart technologies and data collection. He asserted that privacy concerns can be mitigated by allowing those individuals with fewer privacy concerns to adopt voluntarily. Mr. Plumb suggested that more compelling benefits than energy management, such as home monitoring and security, would outweigh privacy concerns for many individuals. He also noted that companies must maintain great respect for individuals’ privacy concerns or public trust will be lost.

Professor Ohm asked about policy frameworks for regulation. Specifically, he noted that privacy scholarship has moved past discussion of ownership of data, yet the smart grid discussion still focuses on ownership. He also pointed out that the notice and choice discussion often devolves to a simplistic question of “opt-in” or “opt-out.” Mr. Levis stated that utilities must have access

to the data that they need in order to operate the grid, but aggregate data should suffice and raises far fewer privacy concerns. Ms. Urban said that regulators should think through use, access, and control issues. Mr. Plumb asserted that the pressing regulatory concern is policing the scam artists as distinct from honest brokers who will protect consumer privacy.

Professor Ohm summarized the White House “Green Paper,” which he described as the emerging regulatory framework. The Green Paper advocates a baseline of information privacy across industries, fair practice principles, FCC enforcement power, a Consumer Privacy Bill of Rights, and best practice leadership by the Commerce Department. Mr. Levis noted that the Public Utilities Commission (PUC) of Colorado passed regulations requiring consumers to opt-in before utilities can release their data, yet this has caused adverse impacts on low-income assistance and weatherization programs. Ms. Urban explained that the California PUC regulates only data above the meter that can be reasonably connected to a premise. Mr. Plumb praised the White House’s approach of a Consumer Bill of Rights that facilitates industry self-regulation and private third-party certification.

In the question and answer session, one audience member asked how far regulators should go to satisfy the most vocal privacy advocates. Mr. Levis expressed concern that regulators might mandate a rigid approach to consumer data. Ms. Urban stated that it is important to build a regulatory and technological system that can mitigate privacy concerns, rather than ignoring the issue and letting energy usage information become a “Wild West” without oversight. Another audience member asked whether block time data, with little granularity, renders privacy issues moot. Ms. Urban queried whether there is a sweet spot, with data that is granular enough for consumer and grid benefits but not so granular as to create serious privacy problems.

Panel III: Securing the Grid

Phil Weiser, Dean of Colorado Law, began the third panel by asking about the learning curve for utilities in securing the grid. Mr. Joshua Epel, Chairman of the Colorado Public Utilities Commission, asserted that regulators should be very nervous about the possibilities of security breach. Mr. Randy Huston, Director of IT Infrastructure and Smart Grid Deployment at Xcel Energy, suggested identifying the security breaches that would create the most drastic consequences, such as a breach related to a nuclear plant.

Dean Weiser noted that the telecommunications industry built an open network that spurred innovation but did not consider security. As a result, there are many attack vectors. Mr. Bao Le, Vice President of Corporate Development at Coalfire, explained that security in the electric generation industry used to mean physical security of power plants in a single location; now, with information technology integrated into the operation of electricity generation and transmission, anyone with an internet connection can pose a cyber-security risk.

Dean Weiser asked how to implement best practices. Mr. George Arnold, National Coordinator Smart Grid Interoperability at NIST, described the cyber-security working group, a collection of 650 professionals in energy, telecom and IT, who have modeled use cases and assessed vulnerabilities. Mr. Arnold noted that we are stuck with a legacy grid and cannot build a smart grid from scratch. Mr. Huston related an anecdote to illustrate the legacy grid. He explained that

Xcel Energy started an initiative to replace its pre-internet SCADA systems but aborted the project when it realized that the unconnected, but “ancient” SCADA technology was actually the safest technology for critical infrastructure.

Dean Weiser asked what role state regulators and the North American Reliability Corporation (NERC) should play. Mr. Epel suggested that the Colorado PUC is humble about its capacity and the magnitude of the possible threats, so the PUC has asked questions about how to protect core functionality and interact with the rest of the West. Mr. Le stated that standards are critical because energy supply and distribution is intertwined across North America. Mr. Arnold highlighted a tension in standards. They provide protection for small utilities without the capacity to develop their own systems for cyber-security, but they may hold back larger utilities that seek to develop more cyber safety. Mr. Huston noted that standards cannot replace common sense and experience because there is too much variability in operations and cyber threats.

Dean Weiser questioned whether there should be a more formal regulatory apparatus for cyber security beyond standard-setting. Mr. Le answered affirmatively. Mr. Epel suggested that standards may not be enough for critical energy consumers such as hospitals.

Panel IV: The Opportunities of the Smart Grid and the Issues of Utility Incentives

Former Colorado PUC Chairman Ray Gifford noted that consumer-facing smart grid falls in the domain of state regulators, who have considerable skepticism about smart grid at present. Ms. Lauren Azar, Advisor to Secretary Chu at the Department of Energy, noted that smart grid also includes the transmission grid, which is federally regulated. However, at the distribution level, she asserted that consumer demand and innovative technology companies will push regulators to react. Mr. Adrian Tuck stated that his company, Tendril Networks, is getting the most traction in jurisdictions with retail electric competition, including Australia. Mr. Tuck also made a forceful argument that the regulated utility model is “dead” because more affluent consumers will opt out through off-grid technologies, and the remaining vulnerable consumers will bear the capital and operational costs.

Mr. Gifford asked what lessons the electric generation industry can learn from the telecom industry, despite the fact that electricity cannot be “wireless.” Ms. Jennifer Richter, a Partner at Patton Boggs, LLP, stated that the telecom industry has benefited over time from deregulation. Ms. Azar expressed caution that full retail competition has created many challenges, including higher prices and dampened incentives to build sufficient generation capacity. Ms. Azar concurred with Mr. Tuck that consumers will leave the grid as renewable energy reaches price parity. Mr. Tuck related that paying for electricity is becoming unbundled from provision of that electricity. For example, Nissan partnered with a company that offered complete supply of electric power for the Nissan Leaf for the life of the car in exchange for a one-time fee; 86% of purchasers signed up.

Mr. Gifford asked whether price caps similar to those used in the telecom industry might be a better alternative for utility regulation. Ms. Richter suggested that price caps are a good alternative if utilities offer new and innovative services alongside the commodity of electricity because price caps could spur innovation. Ms. Azar indicated that the devil is in the details;

when Wisconsin instituted price caps, it produced mixed results because the incentives were not strong enough to spur utility efficiency. She also cautioned that price caps can incentivize utilities to underinvest in infrastructure. Mr. Tuck stated that price caps support demand response but that utilities and their regulators can circumvent the caps through many adders for various investments.

Mr. Gifford asked about spectrum needs for smart grid and utilities' stances. Ms. Richter described the approach of the FCC's National Broadband Plan, which presented three options to utilities: acquiring spectrum from commercial networks; sharing with public safety; or getting spectrum on their own to build networks. Ms. Richter opined that the government wants utilities to be interested in spectrum but that utilities have no interest. They have not pursued viable options to purchase available spectrum; instead, they have pursued the unlikely and lengthy process of trying to share spectrum with government.

Mr. Gifford questioned why utilities would ever want to invest in smart grid when smart grid could reduce electricity sales and diminish utilities' ability to cover their fixed costs. Mr. Tuck described "pilots-itis," whereby utilities are trying to look like they are doing something with smart grid without ever innovating or implementing. He suggested that utilities must be able to capture more of the value that sits on top of the grid, such as efficient appliances, or utilities will never innovate for efficiency. Ms. Azar posited that we will see a vicious cycle where utilities become a provider of last resort because higher costs will push more consumers off the grid, resulting in even higher costs. Mr. Tuck illustrated the mismatch in consumer demand and utility innovation by analogizing that if Verizon developed a new 4G network but required consumers to pay years in advance and didn't start to innovate applications to provide value until after the network rolled out in five years, consumers would never accept it. Mr. Tuck also suggested that innovation will happen through machine-to-machine apps and at the (unregulated) utility holding company level.