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Book Review

America's Grid: Past and Uncertain Future, Gretchen Bakke. A Review of "The Grid: The Fraying Wires Between Americans and Our Energy Future", Bloomsbury, New York (2016)

The Grid is an anthropologist's perspective on the unique historical circumstances surrounding the development of the North American electrical utility industry, the electrical grid that developed with that industry, and obstacles currently faced in a transition to renewable energy. The well told and documented tale reminds one of the quotation from Tolstoy's *Anna Karenina*: "All happy families are alike; each unhappy family is unhappy in its own way." As we struggle with a global effort to make the transition to renewable energy, there is an enormous temptation to look for a single theory or perspective that sheds light on the structural dynamics underlying this challenging chapter in human history. Gretchen Bakke's anthropological training and sensitivity to the nuances of cultural particularism allow her to tease out what is unique to the circumstances surrounding the North American electrical grid, and how it has come to be so unhappy in its own way.

Bakke begins by outlining the physics of electricity for those not familiar with the science. She then moves on to the scientific and technical foundations of power production and distribution. At each step she reminds the reader that "the grid" is a technological artifact, and like any other tool created by human society, it carries the imprint of culture. In other words, the North American grid can only be fully understood by examining North American culture generally, and business and political culture in particular.

Her analysis starts by examining the very beginnings of electrical production, distribution, financing, and marketing in New York and Chicago with Thomas Edison, George Westinghouse, and Samuel Insul in the late 19th century. She documents how these pioneers used technology, marketing, and economics in an effort to reconcile electrical demand and production. This dilemma, carried into the 21st century, is the leitmotif of the book.

Several of the book's more intriguing and potentially useful sections for policy makers reflect good anthropological research methods. For example, her section on the Xcel energy company's failed effort between 2009 and 2014 to develop a "Smartgridcity" in Boulder, Colorado, one of America's most progressive cities, is a classic cultural anthropological analysis of the failure of society to accommodate technological change. This is an instructive contrarian tale told to a world too willing to assume that every technical innovation is quickly adopted and that technological innovation is an unobstructed easy glide-path to sustainable energy. How and why educated Boulder residents turned their backs on the dream of a "SmartGridHouseCarComboPack" is told with humor and empathy for both residents and policy enthusiasts. Xcel had assembled nearly all of the computerized smart technology components needed to smooth out and reconcile the troubling fluctuations and dis-connects in electrical demand and production that lie at the

heart of bringing massive new renewable energy sources online and rationalizing use patterns. Bakke shows that, in this case (and by extension for all energy policy makers), the biggest challenge was public resistance, not electrical resistance.

Ultimately *The Grid* attempts the daunting task of outlining a transition to a more resilient grid, an example of what Nassim Nicholas Taleb, author of *The Black Swan*, refers to as an "anti-fragile system". As Bakke demonstrates, the North American grid is shockingly susceptible to 'black swans' including squirrels and tree limbs that routinely take out transformers and take down power lines. Her data on the causes and economic consequences of ever-increasing numbers of black-outs in North America is an alarming wake up call.

Bakke explores the rise of renewable energy in the United States and its repeated collisions with the limitations of the US grid. She traces the explosion of renewable energy in the US to a clause (Section 210) in the Public Utility Regulatory Policy Act of 1978. One US Senator's desire to provide for a garbage incinerator, to function as a co-generation plant in his state, opened a legal back door for initially small scale, and then for industrial scale renewable electricity producers to cash in on the existing grid. The example is one of Bakke's many wonderful explorations of the unintended consequences of energy policy making, the lack of coherence in efforts to address the limitations of the grid, and the roadblocks the current grid presents to the wider adaption of renewables in North America.

It is laudable that a cultural anthropologist has taken time to immerse herself in energy policy and technology. Bakke brings unusual balance and sober expectations to a topic that could easily become too narrowly focused on either technology or policy alone. Bakke's breadth of understanding is best demonstrated when she looks into the multiple, widely dispersed and very localized, events that have driven American consumers into the energy marketplace as small scale producers with huge implications for America's faltering grid. Here is one example:

"The Great Gale of 2007 [a Pacific Northwest storm that knocked out power for weeks for the second time in just a few years -Editor] did not bring about the awaited Left Coast ecotopic, green revolution, nor did it help to affirm a Libertarian do-it-yourself-bugger-the government's meddling agenda. It was rather that mild mannered townsfolk, people with no alternative stance, people who would rather the government and the utilities did their job, had simply had enough. When I say that the world changed in December 2007, I mean that nonradicals began to take what would have been, even a year earlier, considered radical action. Townsfolk turned away from utility-provided electricity and invested their own money (these were still boom years) to make something better. . . Nice people, middle-of-the-road people, are building resiliency into the infrastructures of daily life, not because they are opposed

to grid-provided electricity on ideological grounds but simply because they are sick of its not working well enough to meet even the most modest expectations. . . Even though everyday actions of average people tend to get the least fanfare and least public exposure, in the case of our grid these are precisely the activities that have set the tone for the revolution this infrastructure is currently undergoing at its edges. This is not a revolution in opposition to current structures of power, but rather a revolution that moves in concert with them.” (Bakke, 214–215)

In the end, *The Grid's* examination of efforts to design and build resilient localized grids is both inspiring and discouraging. Hopeful examples include: increasing numbers of industrial scale alternative energy production facilities across the USA, efforts by the US military to develop mobile diversified alternative energy systems for combat zones, industrial and institutional mini-grids that can stand alone, and various neighborhood efforts at transitioning to renewables and more dependable sources of electrical power.

However, while *The Grid* is an excellent roadmap of how we got to where we are, it provides only a fuzzy GPS map for the future. This is not because of the author's failings, but is rather a reflection of the enormity of the task, the cultural inertia in which the North American grid is wrapped, and the increasing challenges posed by cyber-attacks. *The Grid* leaves the reader feeling somewhat stranded, as the author is stranded by a winter black-out in Montreal in the book's afterword.

Like the author, I find myself writing in anguish, somewhat overwhelmed by local uncertainties that can overpower my ability to embrace a grand solution. I look at the world from Vermont, just as our regional and national newspapers are full of stories of a cyber-attack on one nearby Vermont city's electrical system, purportedly by Russian hackers. National news stories set this story in the context of reports of cyber-attacks aimed at the Ukrainian grid, and predictions from US intelligence experts telling us a massive attack on the US grid is not a matter of if, but when.

Even without the issues surrounding cyber-security, there is much to be done to upgrade the North American electrical grid. Knowing how we got into this mess is an important first step toward addressing the problems.

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