ELECTRICITY RESTRUCTURING IN THE UNITED STATES

Markets and Policy from the 1978 Energy Act to the Present

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The electric utility industry in the United States is technologically complex, and its structure as a classic network industry makes it intricate in business terms as well, so deregulation of such a complicated industry was a particularly detailed process. Steve Isser provides a detailed and comprehensive analysis of the history of the transformation of this complex industry from the 1978 Energy Policy Act to the present, covering the economic, legal, regulatory, and political issues and controversies in the transition from regulated utilities to competitive electricity markets. The book is a multidisciplinary study that includes a comprehensive review of the economic literature on electricity markets, the political environment of electricity policy making, administrative and regulatory rule making, and the federal case law that restrained state and federal regulation of electricity. Dr. Isser offers a valuable case study of the pitfalls and problems associated with the deregulation of a complex network industry.

Steve Isser, PhD, JD, is the president of Energy Law & Economics, Inc. His work has been published in *Mathematical Modeling*, *Review of Policy Research*, and *Public Utility Fortnightly*, as well as two books on oil economics and politics.

To My "Pack," and the memory of its departed members, and my wife Rhonda, the heart and soul of the Pack

Tables

Figures

Acronyms

AC	Alternating Current
AEP	American Electric Power
AGC	Automatic Generation Control
ALJ	Administrative Law Judge
ANWR	Artic National Wildlife Refuge
APPA	American Public Power Association
ATC	Available Transmission Capacity
BACT	Best Available Control Technology
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CAIR	Clean Air Interstate Rule
CAISO	California Independent System Operator
CDWR	California Department of Water Resources
CEC	California Energy Commission
CFTC	Commodities Futures Trading Commission
Com Ed	Commonwealth Edison
Con Ed	Consolidated Edison of New York
CONE	Cost of New Entry
CPUC	California Public Utility Commission
CSW	Central and SouthWest Corporation
CTC	Competitive Transition Charge
DC	Direct Current
DOE	Department of Energy
DOJ	Department of Justice
DSM	Demand Side Management

EDF	Environmental Defense Fund
EEI	Edison Electric Institute
EPAct	Energy Policy Act
EPRI	Electric Power Research Institute
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
FCM	Forward Capacity Market
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
FTC	Federal Trade Commission
FTR	Financial Transmission Right
HHI	Herfindahl-Hirschman Index
ICAP	Installed Capacity
ICE	Intercontinental Exchange
IOU	Investor Owned Utilites
IPP	Independent Power Producer
IRP	Integrated Resource Planning
ISO	Independent System Operator
ISO-NE	Independent System Operator–New England
LaaR	Load Acting As a Resource
LECG	Law and Economics Group
LMP	Locational Marginal Prices
LSE	Load Serving Entity
MAPP	MidContinent Area Power Pool
MISO	Midwest Independent System Operator
NAAQS	National Ambient Air Quality Standards
NARUC	National Association of Regulatory Utility Commissioners
NEPA	National Environmental Policy Act
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Corporation (formerly Council)
NIETC	National Interest Electric Transmission Corridor
NIMBY	Not In My Back Yard
NO_x	Nitrous Oxides
NOPR	Notice of Proposed Rule making
NRDC	Natural Resources Defense Council
NSPS	New Source Performance Standards
NSR	New Source Review

NYISO	New York Independent System Operator
NYMEX	New York Mercantile Exchange
NYPP	New York Power Pool
OASIS	Open Access Same-time Information System
OATT	Open Access Transmisson Tariff
PJM	Pennsylvania–New Jersey–Maryland Interconnection
$PM_{2.5}$	Small Particulate Matter (under 2.5 microns)
POLR	Provider of Last Resort
PPA	Purchased Power Agreement
PSD	Prevention of Significant Deterioration
PUHCA	Public Utilities Holding Company Act of 1935
PURPA	Public Utility Regulatory Policies Act of 1978
QF	Qualifying Facility
REP	Retail Electric Provider
RPM	Reliability Pricing Model
RTG	Regional Transmission Group
RTO	Regional Transmission Organization
SCADA	Supervisory Control and Data Acquisition
SCED	Security Constrained Economic Dispatch
SIP	State Implementation Plans
SO_2	Sulfur Dioxide
SPP	Southwest Power Pool
TLR	Transmisson Loading Relief
Transco	Transmission Company
TTC	Total Transmisson Capability
VoLL	Value of Lost Load
WSCC	Western Systems Coordinating Council
WSPP	Western Systems Power Pool

Energy Terminology

Barrel	Standard measure for Crude Oil, there are 42 gallons per barrel
Btu	British Thermal Unit (measure of energy)
kW	Kilowatt (measure of capacity)
kWh	Kilowatt-hour (measure of energy)
Mcf	Thousand cubic feet
MMBtu	Million Btu
MW	Megawatt (1000 kW)
MWh	Megawatt-hour

Energy Conversion Rates

Coal	20.1 million Btu per ton (varies per type of coal)
Crude oil	5.850 million Btu per barrel
Electricity	3,412 Btu per kWh
Natural gas	1.022 million Btu per Mcf
Residual fuel oil	6.287 million Btu per barrel

Contents

Introduction

> Since all models are wrong the scientist cannot obtain a "correct" one by excessive elaboration. On the contrary following William of Occam he should seek an economical description of natural phenomena. Just as the ability to devise simple but evocative models is the signature of the great scientist so overelaboration and overparameterization is often the mark of mediocrity.
>
> Since all models are wrong the scientist must be alert to what is importantly wrong. It is inappropriate to be concerned about mice when there are tigers abroad.
>
> – George E. P. Box, "Science and Statistics," *Journal of the American Statistical Association* 71 (December 1976): 792

This book evolved out of what was originally planned as a one-volume work on the evolution of U.S. energy policy since the 1980s. It quickly became apparent that the topic was simply too complex to be contained in one book, so the project has morphed into a number of books. This book covers electricity restructuring in the United States from 1978 to the present.[1] The second book will cover oil and natural gas deregulation through the peak oil issue and shale gas development. The third book will focus on the future of energy, from global warming to new technologies. Since I plan to cover topics such as smart grid, renewable energy, and carbon markets in the future, I've given them cursory coverage in this volume.

[1] As opposed to deregulation, because what has become evident is that the electricity regulation has changed, but there are no unregulated electricity markets, nor will there be in the foreseeable future.

This book was written with academic rigor, but my intended audience are people who do things, not merely write about what others have done: energy lawyers, judges, consultants, regulatory commissioners, and their senior staff who want a deeper understanding of the industry. I have tried to tone down the more esoteric economic and legal concepts and banished many details to footnotes where the curious reader can go for guidance to the relevant legal cases and monographs.

This book is an economic/business history, and a case study of the complexities of transitioning from one regulatory regime to another, more diverse regulatory regime. History matters because one cannot understand the evolution of political decisions such as the passage of the Federal Power Act and the Energy Policy Acts of 1978 and 1992, nor how they shaped regulatory policy, investment decisions, and market outcomes, simply by the application of public choice models. Geography, technology, and politics caused different regions to have different incentives to welcome or resist restructuring and different means to encourage or resist its imposition. Federalism, ideology, and happenstance were as important in determining outcomes as the visible hand of politics and the invisible hand of the market. Regulatory choices determined market outcomes, since the set of rules and incentives that shaped the markets were the products of legislation and regulatory decisions. Market outcomes in turn influenced legislation and regulatory decisions, as economic actors invested resources into obtaining favorable decisions in the political and regulatory arenas.

This work is an unapologetic economic policy history that is more focused on description than theory. There has been a long-term trend in economics (and more recently political science) to denigrate qualitative analysis. Descriptive evidence is often given the pejorative name "anecdote." Ironically, this term has been used both ways, as "the plural of anecdote is data"[2] and "the plural of anecdote is not data."[3] To this observer, the confusion simply reveals a prejudice toward data that are quantifiable and easily organized into data matrices amenable to statistical manipulation. Anecdotes tend to be messy. Anecdotes that are simple observations are of limited value, but I would suggest that "anecdote"

[2] This phrase was coined by Raymond Wolfinger in 1969, but first appeared in print in Nelson W. Polsby, "Where Do You Get Your Ideas?" *PS: Political Science and Politics* 26 (1993): 83–87, http://blog.revolutionanalytics.com/2011/04/the-plural-of-anecdote-is-data-after-all.html (last visited May 1, 2012).

[3] This phrase has frequently been attributed to both Roger Brinner and George Stigler, but I cannot find a definitive source for its origins.

also applies to what are referred to as case studies, frequently created and applied by business professors, and economic histories, which unfortunately have fallen out of favor in the economics profession.[4] An economic history could be characterized as a more complete and thoroughly researched case study.[5] The value of economic history is that it allows economic theory and econometric results to be reviewed in light of their correspondence with reality. A good descriptive study will reveal nuances missed by theory and left out of econometric studies.

I value the insights to be gleaned from academic economists (and strained out of reports by consulting economists), but this is not an economic analysis of electricity markets.[6] I am interested in the economic debates as they pertain to policymaking, and the consequences of adopting a specific economic conclusion or recommendation. So my focus is not on economic theory, but the adoption of theory to political positions, regulatory decision making, and actual market design and operation. In this context, I am less interested in the validity of economic models than their influence on politics and policymakers and how these economic models were transformed into operational concepts. There is quite a leap from equations in a paper to the complex software models and detailed market rules embedded in an electricity market.

One problem with the economists' approach to restructuring was the tendency to dismiss the institutional environment and the restrictions created by technological limitations and requirements, which had an important influence on the actual outcome of economic policy change.[7] Markets

[4] This trend has been proceeding for a few decades. Donald McCloskey, "Does the Past Have Use Economics?" *Journal of Economic History* (1976): 434–61. White claims there is still a place for economic history apart from Cliometrics; Euguene White, "The Past and Future of Economic History in Economics," *Quarterly Review of Economics and Finance* 36 (1996): 61–72. An interesting article uses geology, not physics, as the paradigm for economic history; Larry Neal, "A Shocking View of Economic History," *Journal of Economic History* 60 (June 2000): 317–34.

[5] I always thought business history was economic history, but it seems there is a serious intellectual divide between the two. I confess to being more of a business historian if those distinctions have meaning. Naomi Lamoreaux, Daniel Raff, and Peter Temin, "New Economic Approaches to the Study of Business History," *Business and Economic History* 26 (Fall 1997): 57–79. Case studies tend to be snapshots, focused on a single issue or strategy, while an economic or business history will range over a longer period or wider scope of issues.

[6] I recommend Steven Stoft, *Power System Economics: Designing Markets for Electricity* (New York, IEEE Press and Wiley-Interscience, 2002) as an accessible introduction to electricity economics.

[7] Paul Joskow, "Regulation and Deregulation after 25 Years: Lessons Learned for Research in Industrial Organization," *Review of Industrial Organization* 26 (2005): 176–77.

are created by and operate within a complex legal structure. Depending on the type of goods and transactions, tort, property, and contract law principles may apply. Depending on the market structure and the perceived existence of externalities, competition and environmental regulations may impact the transaction. There may be overlapping legal jurisdictions, federal, state, and local, that have authority over different aspects of a transaction. There may also be written and unwritten standards of behavior created by customary practice and industry associations.

Complex market/institutional systems such as the electricity industry tend to be characterized by path dependence and lock-in on multiple levels. Path dependence occurs when initial conditions are followed by a series of contingent (or chance) events whose influence on the path taken is larger than that of the initial conditions themselves. Contingency in organizational life can take many shapes (e.g., unexpected encounters, trial-and-errors leading to unattended consequences).[8] In a path-dependent pattern, selection processes during a critical juncture period are marked by contingency. Once a path has been contingently selected, various mechanisms can lead to its self-reinforcement, such as positive network externalities, increasing returns, sunk costs, or adaptive expectations. It becomes progressively more difficult to return to the initial point at which multiple alternatives were still available. Features of self-reinforcement are very common in organizational life.[9] A mechanism that decreases the relative attractiveness of alternatives will lock in one of the possible outcomes if no exogenous shock disturbs the system. Lock-in is a hard-to-escape situation. Because paths are selected contingently, lock-in can happen on any path. Path dependence potentially leads to a large diversity of outcomes owing to the stochastic nature of the underlying process.[10]

Path dependence is also the basis of a theory of institutional change. Institutions are seen as 'carriers of history' that maintain existing

[8] Jean-Philippe Vergne and Rodolphe Durand, "The Missing Link Between the Theory and Empirics of Path Dependence; Conceptual Clarification, Testability Issue, and Methodological Implications," *Journal of Management Studies* (2010): 741–43.

[9] W. Brian Arthur, "Competing Technologies, Increasing Returns, and Lock-In By Historical Events," *Economic Journal* 99 (1989): 126–28; Paul Pierson, "Increasing Returns, Path Dependence, and the Study of Politics," *American Political Science Review* 94 (2000): 263–66.

[10] Scott Page, "Path Dependence," *Quarterly Journal of Political Science* 1 (2006): 90; Jean-Philippe Vergne and Rodolphe Durand, "The Missing Link between the Theory and Empirics of Path Dependence: Conceptual Clarification, Testability Issue, and Methodological Implications," *Journal of Management Studies* (2010): 743.