Restructuring Recharged

The Superior Performance of Competitive Electricity Markets 2008-2016

Philip R. O'Connor, Ph.D

April 2017

TABLE OF CONTENTS

LISTING OF FIGURES

LISTING OF TABLES

INTRODUCTION

It's been a solid two decades since state and federal policymakers began taking steps to end the traditional monopoly regulatory approach to determining electricity prices for consumers. Twenty years ago federal regulators adopted rules promoting competition in regional wholesale electricity markets and the first states adopted programs to promote competition in retail electricity markets.

Providing considerable historical context, our study's author observes that traditional monopoly regulation served the nation well for about a century. But beginning in the 1970s the monopoly fabric started to fray. The resulting sweeping regulatory reforms of the railroad, trucking and telecommunications industries set the stage for similar reforms introducing competitive market forces into the energy sector.

These reforms congealed in the 1990s with considerable momentum nationally for competition in electricity—that is until the well-intentioned but poorly-conceived market restructuring in California imploded. This prompted a number of states to reconsider opening their retail markets to competition. To their credit more than a dozen states and the District of Columbia persevered, adopting electricity market restructuring programs that avoided the pitfalls of California and benefited the interests of consumers and the overall economy and the environment.

As the study explains, we now have a strong data set of two decades' experience with two sets of states:

- Those that adopted competitive reforms promoting market forces in the electricity sector, and
- Those that chose to maintain the traditional regulated monopoly approach.

The data are compelling, showing that consumers are considerably better off with competition than monopoly regulation:

- Electricity prices in states with competitive retail markets have trended downward while prices have risen in states with monopoly regulation.
- Power plant investment in competitive markets is tempered by market forces, while in monopoly states new plant investments are made on the backs of captive ratepayers who are on the hook financially if the investment proves to be a poor economic decision.
- The power plants in competitive markets tend to operate more efficiently, because they are dependent on returns from the marketplace. In contrast, power plants under monopoly regulation receive their investment plus a rate of return regardless of the performance of the power plant. The efficiencies gained by power plants in competitive markets therefore produced not only economic but environmental gains.

As our authors note, the compelling disparity between competition and monopoly regulation is setting the stage for a second round of electricity restructuring as states once again confront the fact that monopoly regulation is not ideal because it serves the interests of utility investors over the interests of electricity customers. So this has become a driving force for states to consider a competitive market in favor of the state's citizens.

But perhaps the stronger driving force behind this pending second wave of competitive electric industry restructuring is the panoply of consumer-empowering technological innovations that promise to further transform the way consumers use electricity and interact with their electricity provider. These technologies will prosper in competitive states where monopoly barriers to entry have been removed.

This trend will be driven further in competitive markets as competing suppliers vying for customers innovate to differentiate themselves from their competitors. Real-time pricing complemented by state-of-the-art meters and thermostats will empower customers as never before. Monopoly regulation is inherently inhospitable to this wave of innovation, our author points out.

The bottom line is that consumers want and expect choices. They have them in nearly every other area of their lives. That is why there is a dizzying array of colorful options as we walk down the aisle of our neighborhood grocery store. That's why automobiles come in numerous and customizable configurations and colors, and why we have innumerable telecommunications options beyond the old black rotary phone that prevailed under monopoly regulation. Competition is at the heart of our economy and way of life everywhere—except electricity.

As we prepare to soon enter the third decade of the 21st century, it makes little sense to cling to a monopoly regulatory model for electricity that is a vestige of 19th century economic thinking and a barrier to the efficient clean-energy economy that consumers and policymakers seek to embrace.

Darrin Pfannenstiel
President
Retail Energy Supply Association

OVERVIEW

As retail electricity competition in the United States reaches two decades since its commencement, a second wave of electricity industry restructuring is gathering force. The incompatibility of the traditional vertical monopoly model with new, converging conditions makes forward-looking reforms a necessity.

- The allocation of electricity generation and business **risks to consumers** in regulated monopoly states leads to inefficient consumer and investor decisions which have led to overall increases in electricity prices relative to choice states.
- The electric industry has endured a **decade of flat-load** and there is no end in sight.
- **Generation dys-economics** have rendered obsolete the traditional verities of power plant investment based on a belief in predictable fuel prices, technology trends and consumer preferences.

Digital customer sovereignty is overpowering the idea that customers are merely "ratepayers" who can be easily categorized and limited to a few restrictive pricing, product and service offerings that lack innovation and the ability to empower customers in today's digital environment. There is compelling evidence of the superior economic performance since 2008 of the 14 competitive retail jurisdictions, when compared to the 35 monopoly states:

- Prices in competitive states have trended downward while in monopoly states prices have been rising, producing a double-digit gap in average price changes when adjusted for inflation.
- Competitive markets have attracted investment in generation at rates comparable to monopoly states.
- Competitive states increased production well above changes in load, while in monopoly states production has declined relative to load growth.
- Power plants in competitive states have higher capacity factors than plants in monopoly states and are taking better advantage of low natural gas prices.

The impending second wave of restructuring in monopoly states will be characterized by:

- The unbundling of delivery and power supply rates;
- The devolution of power plants from utility rate base to competitive status;
- Fair stranded-cost compensation for utilities exiting monopoly supply;
- Neutrality in the treatment of distributed energy resources; and
- The opportunity for new entrants and utilities to provide innovative products and services to customers in a competitive environment.

NOTE ON DATA SOURCES

There are two key sources of the electricity industry data used in the preparation of the illustrations in this paper. Figures 4, 5 and 6 draw on information from the annual report on competitive electricity accounts and loads issued by DNV GL, the authoritative industry information firm. Figures 7 through 25 rely of data from the U.S. Energy Information Administration.[1]

SECTION 1: PRELUDE TO COMPETITIVE RESTRUCTURING 1975-1995

The first wave of competitive electricity industry restructuring in the late 1990s was preceded by a tsunami of regulatory reform in telecommunications, transportation and energy network industries.

A bipartisan movement commencing in the late 1970s revised regulatory policies to embrace change rather than to resist fundamental shifts in technology, consumer attitudes and economic relationships. Policy reforms at the federal and state levels provided a model for the introduction of competition and customer choice into the electricity sector.

The movement from regulation and central planning to competitive markets in energy was intimately connected to global conditions—especially the international petroleum market and the Cold War. The struggle between socialist central planning ideology and capitalist free market philosophy provided context and language for what would become the debate over the merits of economic regulation versus competitive market structures in the energy sector on the domestic front.

Converging Conditions—Energy Price Surges & Stagflation

A cataclysmic harbinger of things to come was the oil embargo following the Yom Kippur War in late 1973. For

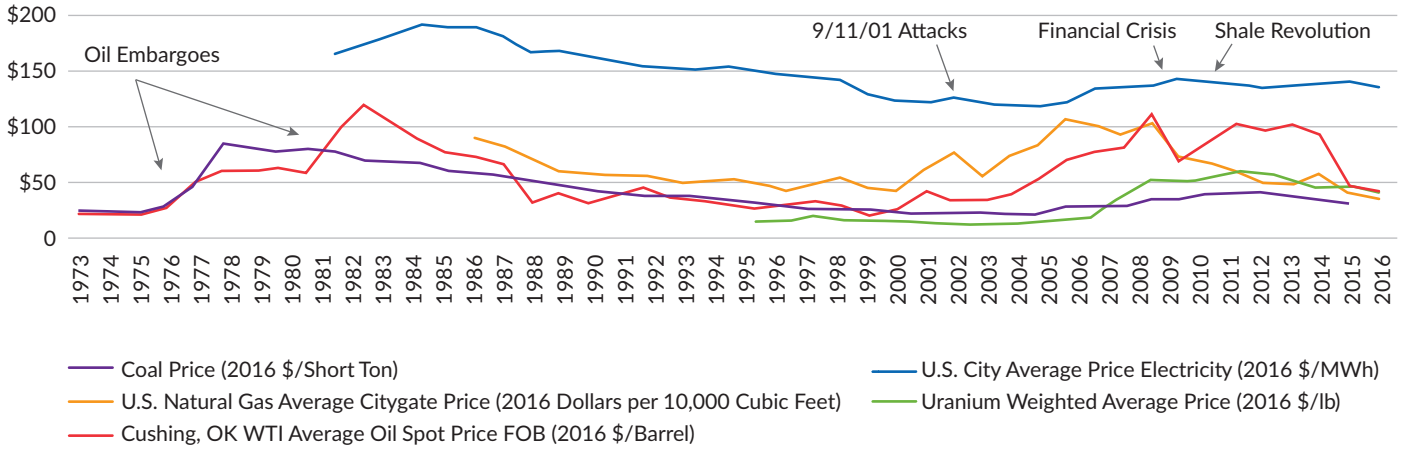
nearly a decade afterward, U.S. public policy was hostage to the "energy crisis."[2] In a succession of presidential messages and addresses between 1971 and 1980, Richard Nixon and Jimmy Carter anticipated and responded to the original 1973-74 embargo and the disruption following the 1979 Iranian revolution.[3]

Dramatic increases in oil and other fuel prices in domestic and international markets initially precipitated well-intentioned yet often misbegotten policies, producing adverse unintended results. Energy price increases were both a cause and a result of broader economic trends, the most significant of which were high interest and inflation rates.

The oil price surges in the 1970s were accompanied by corresponding dramatic price increases in coal and natural gas. As shown in Figure 1, inflation-adjusted prices for raw fuels were at historic, economic shock-inducing levels. Further, natural gas was in short supply for industrial processes and for winter home heating. There were long lines at gasoline service stations and rationing not seen since World War II. Electricity prices were driven up as fuel prices rose. Coal prices experienced a different dynamic as Western surface mining began to take market share, eventually pushing coal prices downward.

Figure 1: Energy Commodity Price Trends

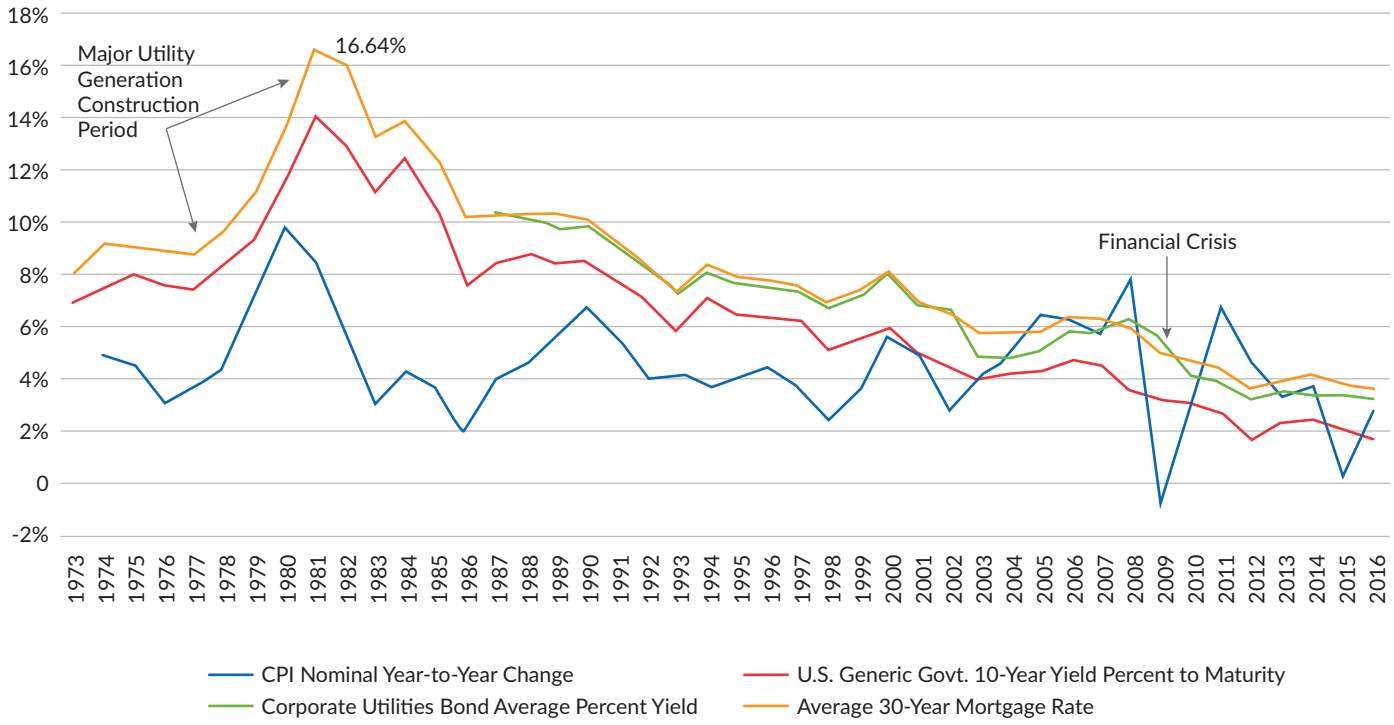
Events in the 1970s caused unprecedented energy prices



Steep increases in energy prices reverberated across the economy, interacting with other conditions and policies. Figure 2 shows the steep rise in inflation and the cost of money from the mid-1970s and into the early 1980s. There was an especially pernicious impact on the electric industry, which was in the midst of a major power plant construction program. Utility borrowing costs and bond yields tracked closely with general inflation, government bond yields and home mortgage interest rates.

Figure 2: CPI, Bond, Mortgage Rate Trends

Energy shocks contributed to extraordinary high costs of funds



From Regulation to Markets in Network Industries

The dividing line between success and failure of policies aimed at addressing the troubles that emerged in the 1970s is that more regulation failed, while reliance on market forces generally yielded favorable results.

It has been nearly four decades since the 1978-1982 "deregulation" of airlines, railroad, interstate trucking and intercity bus service. While each of these transportation segments had its own historical path, all were intimately connected. Their respective regulatory structures had evolved out of the seminal experience of railroad regulation inaugurated in the late 19th century. The logic and procedures of railroad regulation were extended to other modes of transportation, in every case becoming inexorably more bureaucratized and byzantine.

Regulated network industries facing changed conditions have often asked regulators to reinforce the boundaries of their protected markets. For example, potential competitors or even customers seeking alternatives have been subjected to regulatory proceedings characterized by delay and expense that often resulted in prohibition or onerous conditions. Incumbent players often opted for "small ball" regulatory accommodations aimed at relieving the pressure of external conditions. For example, incumbent utilities have requested flexibility in providing customized pricing for certain large customers with the ability to shift production to other locales, or to self-build rather than buy service or goods from the regulated industry. Other customers would keep paying higher prices and might be required to make up for the price reduction for favored customers.

While accommodation measures delay the day of reckoning, they share the central flaw of adherence to a regulatory model that is out of step with new conditions. Preservationist measures to shield monopolies from the impact of external conditions, which routinely fall short, serve to inform customers, policymakers, regulators and incumbents of the need for fundamental reform.

Albro Martin, in his definitive 1992 economic history of the railroads,[4] described the problem of the highly prescriptive and rigid railroad model that had evolved for network industries:

> *The view of regulatory agencies is static; life, in or out of the regulated enterprises, is dynamic. Change—subtle, gradual, and, one hopes, prepared for—is the actuality. Commissions act as though nothing changes until they rule. What is more accurate is that everything changes while the effective forces*

in society are chained to the mast, and, as the poet says, we are left with a sense of loss. This has always hampered economic growth in America, especially when the vitality of critical underlying services is concerned.

The movement toward competitive markets in regulated network industries also extended to oil, telecommunications and then gradually to natural gas.

An Unbroken Line of Federal Regulatory Reform

Table 1 shows the sequence of federal policies that unshackled American consumers and large elements of the economy from complex regulatory rigidities that had developed for over a century. At the same time, there also was significant liberalization of economic regulation and cartel-style pricing in financial services.[5]

TABLE 1: TIMELINE OF FEDERAL DEREGULATION OF MAJOR NETWORK INDUSTRIES

Industry	Policy	Key Features
Airlines	Airline Deregulation Act of 1978	Airfare deregulation, liberalization of market entry and exit, emphasis on safety, eventual dissolution of Civil Aeronautics Board.
Railroads	Railroad Revitalization & Regulatory Reform Act of 1976	Set guidelines for eased regulation, greater pricing freedom, implemented Conrail.
Railroads	Staggers Rail Act of 1980	Pricing freedom unless lack of competition and effective elimination of collective ratemaking, access to rail networks of competing carriers.
Interstate Trucking	Motor Carrier Act of 1980	Freedom from bureau pricing, liberalized route entry and exit.
Oil	Executive Order 12287: Decontrol of Crude Oil and Refined Petroleum Products—January 1981	Ended price controls on domestic crude and refined products.
Intercity Bus	Bus Regulatory Reform Act of 1982	Created zones of price freedom, liberalized entry and exit and route determination, allowed federal pre-emption.
Telephone	1982 Modified Final Judgment Consent Decree in antitrust suit *United States vs. AT&T*	Set a schedule for separation of long distance and local exchange service and 1984 break-up of AT&T.
Telecommunications	Telecommunications Act of 1996	Modernized regulation under Communications Act of 1934 by moving from an emphasis on accommodating monopoly to fostering competition by liberalizing entry and exit and pricing oversight in voice and data transmission and in cable television.
Natural Gas	Natural Gas Policy Act of 1978	Aimed at alleviating shortages, set new maximum lawful prices for new production, and reduced barriers between intra- and interstate markets.
Natural Gas	1985 FERC Order 436	Pipelines would provide non-discriminatory transport of customer-owned gas at prices negotiated with producers
Natural Gas	Wellhead Decontrol Act of 1989	Wellhead price decontrol.
Natural gas	1992 FERC Order 636	Mandated unbundling of pipeline gas commodity and transport services, essentially ending gas merchant sales; full nondiscriminatory access including storage.

The central reality is that American public policy has been on a journey toward an increased reliance on market forces and customer choice. The magnitude of the changes in regulatory policy is evident in the reduction of the percentage of GDP burdened by price regulation—from nearly 12% in 1975 to less than 3% in 2006.[6]

What remains of prescriptive price regulation is now a vestige of simpler times. Electricity is the main outlier, accounting for a large portion of the remaining scope of government price regulation.

Network industries that were pushed into the world of competition and customer sovereignty interacted with one another to accelerate change. The market demanded greater efficiency and more rapid innovation in providing services to customers in ways that regulation could not accommodate. For example, airline deregulation propelled development of vastly improved jet engine turbines for better fuel efficiency, laying the foundation for the scaling up of turbine technologies to compete in electric power production. Thus, as a free market in fuels produced massive quantities of low-priced natural gas that could be moved over an open-access pipeline network, large and efficient natural gas turbines were there to compete against coal-fired boilers.

As regulatory reform in network industries matured in the two decades following the late 1970s, it was time to address the obvious question—What about electricity?

The central reality is that American public policy has been on a journey toward an increased reliance on market forces and customer choice. The magnitude of the changes in regulatory policy is evident in the reduction of the percentage of G.DP burdened by price regulation—from nearly 12% in 1975 to less than 3% in 2006.

SECTION 2: THE TRANSITION TO COMPETITION IN THE ELECTRIC INDUSTRY 1996-2008

It was inevitable that electricity, the most ubiquitous and foundational network industry, would experience the competition debate. The successful reform experience in other network industries naturally led to consideration of how market principles could be applied to electricity.[7]

Legislation at the state level to allow retail electricity supply competition, starting in the late 1990s, was preceded by more than a decade of questioning, discussion and debate.[8] The movement to electric retail choice was neither precipitous nor incautious. State and federal governments have their own spheres of regulatory authority over electricity, as has been the case with natural gas and telecommunications. The full flowering of retail competition and customer choice has required complementary reforms at both levels.[9]

Federal Electricity Restructuring Policy

Congress passed the 1978 Public Utility Regulatory Policies Act (PURPA) during the same flurry of reform activity that modernized regulation of airlines, railroads, trucking and started the reform process in the natural gas industry. PURPA required electric utilities, which were almost universally vertically integrated monopolies at that time, to purchase power from qualifying facilities (QF) that satisfied various conditions. While the primary aim of the QF provision was to encourage the use of such resources as biomass and small hydro, the key result was to produce practical evidence that the modern grid could accommodate generation sources that were neither owned nor operated by traditional monopoly utilities.

Federal electricity restructuring policy developed incrementally, focused on the wholesale (sale for resale) and bulk-transmission segments of the industry. Meanwhile, the traditional regulatory division of labor was left in place, with retail supply and delivery under state jurisdiction.

Table 2 shows the sequence of Congressional and Federal Energy Regulatory Commission (FERC) actions affecting the wholesale electric generation industry through 2012. The stepwise federal approach gradually provided for market-based pricing of wholesale electricity transactions, open-access transmission free of discrimination and preferences, and development of competitive markets for ancillary services and demand-side resources. Federal regulators created a framework for the establishment of large, regionally-organized competitive markets for capacity and energy, which are also known as Regional Transmission Organizations (RTOs).

TABLE 2: MAJOR FEDERAL ELECTRICITY RESTRUCTURING POLICIES 1978-2012

Industry	Key features
Public Utility Regulatory Policies Act (PURPA) 1978	Utilities required to purchase power from non-utility generators at state-set avoided cost. Goals were greater efficiency in energy production through cogeneration and through electricity and gas conservation by consumers.
Clean Air Act Amendments 1990	Tradable allowances for coal-fired power plants to meet gradually-declining sulfur-dioxide emission limits; created a national market model for electricity industry environmental compliance.
Energy Policy Act of 1992	Created new class of independent power producers, Exempt Wholesale Generators (EWG), exempt from various restrictions under the Public Utilities Holding Company Act of 1935 (PUCHA) renewable electricity production tax credit.
FERC Electricity Mega NOPR (1995)	Although withdrawn, provided the theoretical basis for competitive wholesale electricity with open-access transmission and the mitigation of market power due to generator control of transmission and provisions for stranded cost recovery by incumbent utilities affected by competitive restructuring.
FERC Order 888 (1996)	Promoted wholesale electricity competition through open-access nondiscriminatory transmission access and stranded cost recovery.
FERC Order 889 (1996)	Created the Open-Access Same-Time Information System (OASIS) for users to electronically arrange for open-access transmission services.
FERC Order 2000 (1999)	Established principles for Regional Transmission Organizations (RTOs), independence from market participants, geography, authority over dispatch and short-term reliability and other grid operations.
FERC Order 2003 (2003)	Provided standardization of generator interconnection agreements and procedures.
Energy Policy Act of 2005	Repealed Public Utilities Holding Company Act of 1935, easing obstacles to mergers, other restructuring; renewable electricity production tax credit; required net metering offer by public utilities; Department of Energy (DOE) to designate National Interest Electric Transmission Corridors.
FERC Order 674 (2006)	Conditions for market-based wholesale rates for public utilities.
FERC Order 890 (2006)	Set standards of conduct to prevent undue discrimination and preferences in open-access transmission.
FERC Order 697 (2007)	Provided for market-based pricing of transmission ancillary services.
American Recovery & Reinvestment Act of 2009	Grants for accelerated smart grid and advanced meter deployment; renewable production tax credits.
FERC Order 745 (2011)	Established standards and compensation for demand response by customers in RTOs.
FERC Order 1000 (2011)	Standards for RTO transmission planning and cost allocation.

Over three decades, federal policymakers and regulators were adopting new policies promoting market forces that deliver greater value to customers and society than does traditional regulation.

Over three decades, federal policy makers and regulators were adopting new policies promoting market forces that deliver greater value to customers and society than traditional regulation.

Precursors to Competitive Electricity Reform in the States

As pressures on the traditional vertical monopoly increased in the late 1980s and through the 1990s, there were incremental accommodations by state regulators. However, these accommodations kept in place the traditional principle that most business risk associated with electricity generation would continue to rest on the shoulders of consumers. Regulatory modifications included fuel adjustment clauses, special "economic development" rates to retain at-risk load, and including in rates the costs of construction work in progress (CWIP).[10]

By the mid-1990s, there was a substantial body of opinion among academics, state and federal policymakers, energy regulators, utility managers, investors, and business consumer organizations that there was a strong case for electricity competition at the customer level. The general influence of regulatory reform in other sectors was being felt in electricity. Conditions were upsetting the universal acceptance of the vertically integrated monopoly structure and operation of the electricity supply and delivery industry.

Specific conditions, which converged in more pronounced ways in California, Texas and in the states in the northeastern quadrant of the country, were incompatible with the methods of traditional monopoly regulation. Such factors included:

- Growth in electricity consumption had slowed considerably compared to the historical pattern. Strong demand growth had been a pillar of the industry's ability to rapidly expand the network while achieving lower per-unit pricing.
- As large-scale power plant construction projects that had suffered extended delays and budget overruns came to completion, significant rate increase requests engendered resistance.
- Political and environmental activism became a major force in the consideration of utility issues by state legislatures and regulatory commissions.
- Prices surged in response to the fuel and economic conditions of the 1970s and 1980s, creating disadvantages in retention of manufacturing and otherwise inhibiting job creation. There were significant differences in electricity rates between adjacent states and even within states across different utility service territories.
- Utility commissions disallowed large amounts of investment in newly-finished power plants for inclusion in utility rates for recovery from consumers.

Long-developing dissatisfaction with the performance of the monopoly model reached critical mass. The dysfunctional relationship between real-world conditions and a regulatory regime designed under quite different historical conditions became impossible to ignore.

Principles & Implementation of Retail Electricity Choice

As some states considered competition at the retail level, stakeholders had the benefit of experience of competitive reform in other sectors. It had been demonstrated that a monopoly model was no longer necessary for a well-functioning network industry.

The principles and methods of implementation listed in Table 3 were applied in a variety of ways by different states, reflecting local utility, consumer and political conditions. In every case, the adoption of electricity retail choice was a largely collaborative process aimed at attaining substantial stakeholder agreement.[11]

TABLE 3 - PRINCIPLES & IMPLEMENTATION OF RETAIL CHOICE 1995-2007

Principle	Implementations
Supply competition and freedom of pricing and customized pricing & service terms	Generators, wires utilities and marketers joined Regional Transmission Organizations (RTO) regulated by FERC to participate in capacity and energy markets; Competitive suppliers not subject to pricing tariffs; Customers allowed to join buying groups.
Delivery network open access to prevent discrimination and preference for affiliated generation	Traditional bundled service rates were separated into supply- and cost-based delivery components; Nondiscrimination rules were put in place and terms and conditions for all users were standardized; Electronic data interchange protocols between competitive suppliers and delivery utilities were set.
Adaptive industry and utility reorganization for efficiency and flexibility	Regulatory rules and procedures for utilities to form holding companies, merge, divest and spin off generation were simplified and accelerated.
"Stranded cost" recovery for above-market power plant utility investment	Utilities were allowed to impose non-bypassable charges on delivery service to reasonably compensate utilities for power plant investment approved under traditional regulation that has proven uneconomic.
Transition period to assure a smooth change from vertical monopoly service to customer choice	Customer eligibility for choice phased in, with larger customers going first and residential customers going last; Incumbent bundled rate freezes extended for set periods to hold harmless smaller customers; Stranded cost charges would end on a set date.

In just a few years, about two dozen states adopted policies aimed at opening electricity to retail competition. The movement was interrupted by the 2000-2001 California "energy crisis" resulting from a uniquely ill-designed and poorly-implemented market construct. While the direct effects were confined to certain Western states, the psychological and political fallout was national.

Two things are worth noting. First, no other state adopted California's poorly-conceived practice of mandated reliance on a day-ahead energy-only market for procurement of utility supplies for residential and other small customers. This market design did not allow for hedged or fixed-price transactions between counterparties.[12]

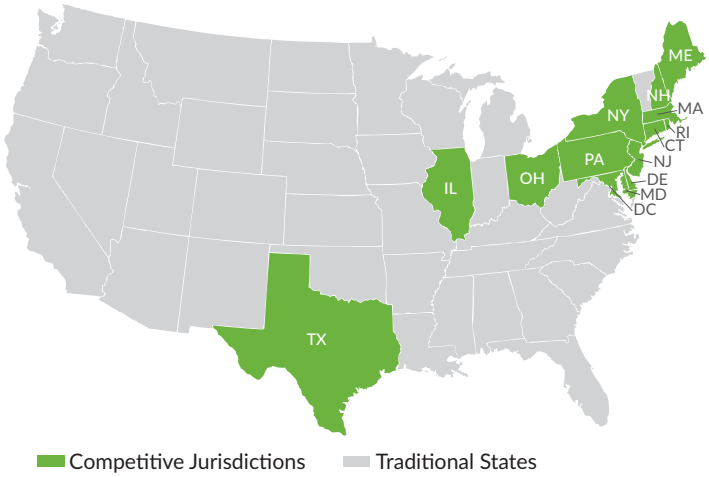
Second, California regulators and policymakers took precisely the wrong actions in the face of supposed supply shortages and price manipulation made possible by the poor program design. They exacerbated the situation by failing to adhere to prescribed transition rules and then locked in long-term contracts at high prices with state-backed power purchases. The repercussions of these decisions are still being felt today.

Despite California, in the end, 14 jurisdictions (13 states and the District of Columbia) persevered for nearly two decades in implementing retail customer choice. These 14 markets, shown in the map in Figure 3, account for one-third of U.S. electricity power production and consumption. Several other states—including California, Michigan, Arizona, Oregon, Nevada and Montana—allow limited portions of total load to be served competitively at retail, while denying the great majority of customers a choice of supplier.[13] These hybrid states are regulated largely under the traditional monopoly model and are treated accordingly in this paper.

Fourteen jurisdictions persevered for nearly two decades in implementing retail customer choice. These 14 markets account for one-third of U.S. electricity power production and consumption.

FIGURE 3: 14 Customer Choice Jurisdictions

These 14 jurisdictions (13 states plus Washington, D.C.) each have enabled Retail Choice for nearly all customers. These jurisdictions represent nearly 1/3 of all electricity consumption in the Continental U.S.



The Transitional Decade 1998-2007

Each of the 14 competitive jurisdictions proceeded at different speeds and in different ways during the transitional decade. By 2007, phase-ins of customer class eligibility and the collection of stranded-cost charges had reached their prescribed end points in most states. The transitional decade witnessed a cautious, stepwise approach that set the stage for ongoing evolution and growth in competitive retail markets. Regulation would continue to adapt to this new model.

By 2008, in competitively restructured states:

- Most utility generation had been divested to unaffiliated firms or devolved to competitive generation affiliates, resulting in nearly half of all productive capacity in the country being owned and operated by a diverse array of non-utility companies;
- Utilities had been compensated for "stranded" investment in uneconomic generation;
- Large numbers of retail suppliers were offering competitively priced supply;
- Millions of customers, especially in the commercial and industrial classes, had embraced supplier choice;
- Nearly a majority of consumption in the 14 customer choice markets was satisfied by non-utility suppliers;
- Default service programs, mainly for residential and small business customers not choosing an alternative supplier, were functioning well, providing competitively priced supply, usually procured by utilities in the market and divorced from traditional rate-of-return price regulation; and
- Billions of dollars in new generation investment was made at similar paces in both monopoly and competitive states.

SECTION 3: COMPETITION vs MONOPOLY IN THE FLAT-LOAD ERA 2008-2016

The flat-load era commenced just as electricity retail choice was completing its transitional decade. There has been little to no growth in electricity demand since 2008. The customer choice model is demonstrating its superiority in coping with new conditions, including flat load.

The discontinuities between 21st century real-world conditions and those that were predicates for vertically integrated monopoly electricity regulation in the 20th century, have accelerated, expanded and deepened.

The Foundations of the Electricity Monopoly Model

Regulatory frameworks arise out of historical circumstances. Customarily prescribed by law, regulatory missions evolve within the confines of the principles upon which they are founded. As conditions drift from the initial circumstances, regulation can operate to hinder rather than to facilitate the operation of the industry to deliver benefits to consumers. Over time, electricity regulation began to focus more on ritual than results. It became increasingly characterized by resistance to change and institutional protection rather than leveraging change to enable added value for consumers.

Understandably, electricity regulation shared much of the underlying philosophy and policy objectives of railroad regulation that developed in the 19th century:[14]

- Avoid the wasteful duplication of capital. There was no need for competing networks of wires and capital-intensive central station power plants.
- Provide greater certainty for investment by assuring a protected geographic market, especially since the technology of the day made electricity a largely local business.
- Facilitate dramatic increases in technical, operational and financial efficiencies by providing for rapid

expansion of the wires network, scaling up of power plants and consolidation in a fragmented early-stage industry.

- Protect customers from unfairly discriminatory pricing and service terms by monopoly providers.

For much of the 20th century, the local electricity utility monopoly, conceived of as a vertically integrated business, from generation to the consumer meter, and even beyond, was spectacularly successful. The accrued benefits for the American people during this time frame virtually defy calculation.

Changing Conditions in the Electricity Industry

The success of traditional vertically integrated monopoly depended largely on conditions that were favorable to success. Things have changed so dramatically that in the 21st century conditions are nearly the opposite of those that prevailed when the monopoly system was born. Table 4 juxtaposes key conditions that prevailed for many decades and those that have developed since the 1970s.

For much of the 20th century, the local electricity utility monopoly, conceived of as a vertically integrated business, from generation to the consumer meter, and even beyond, was spectacularly successful. The accrued benefits for the American people during this time frame virtually defy calculation. But things have changed so dramatically that in the 21st century conditions are nearly the opposite of those that prevailed in the 19th century when the monopoly system was born.

TABLE 4: KEY CONDITIONS IN THE ELECTRICITY INDUSTRY

	20th Century Certainties	21st Century Dynamics
Load	Rapid load growth and network expansion, high correlation between load and GDP, load grows faster than costs.	Slow/flat load growth, mature network, weak relationship between load and GDP, fixed costs spread over static sales.
Generation	Reliable expectation that the larger and more capital intensive a central station power plant, the lower are life-time fuel costs and greater the efficiency.	Natural gas price, flexibility and environmental advantages edge out coal. Distributed resources and renewables gain market share.
Pricing	Volumetric rates based on average costs aimed at recovery of a "revenue requirement" do not convey accurate cost-of-service or market-price signals.	Global competition, ability of firms to shift operations and attract load in flat market creates demand for market-sensitive prices.
Network	Delivery wires network designed as a one-way system to deliver power from central stations to load centers and customers.	Wires system is re-conceptualized, digitized and operated as a platform for transactions among buyers and sellers.
Customers	Captive customers have few alternatives and little ability to affect utility supply behavior or pricing. Customer contact, billing and others services are exclusive domain of the local utility. Information from meters limited and restricted.	Customers seek more tailored services and pricing for all services, including energy. Smart meters produce enormous amounts of valuable real-time data. Suppliers must be sensitive to consumer expectations.

The evidence is accumulating in two broad areas—pricing and innovation—that competitive markets are delivering tangible benefits to all classes of customers. Meanwhile, traditional monopoly is stuck in a cycle of increasing prices to compensate for flat load, thus further dampening load growth and forcing prices up even more. The rigid rules inherent in monopoly regulation also frustrate creativity and modernization.

Growth of Customer Choice

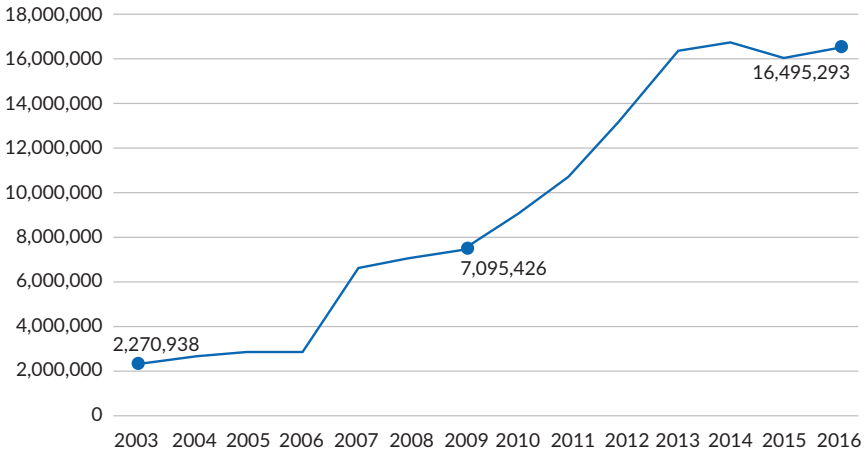
As shown in Figure 4, millions of residential retail electricity customer accounts are served with competitively sourced market-priced power supply. Between 2003 and 2008, the number of residential accounts served by non-utility providers more than tripled from about 2.3 million to 7.1 million.

Competitive accounts more than doubled again in the ensuing years. In the most recent four years, 2013-2016, competitively served residential accounts averaged more than 16.4 million annually.

Residential and small business customers taking utility default service are supplied with market-priced power procured in a competitive market. "Rate of return" pricing is a thing of the past in competitive retail jurisdictions.

Figure 4: Residential Switching Activity by Year

The number of switched residential accounts has grown seven-fold between 2003 and 2016



Commercial and industrial customers have embraced the opportunity to do business with competitive retail electricity suppliers. Consumers are responding as they did when other network industry service providers in natural gas, telecommunications and all forms of transportation were allowed to vigorously compete and innovate.

Figure 5: C&I Switching Activity by Year

More than 3 million C&I accounts are now served by non-utility suppliers

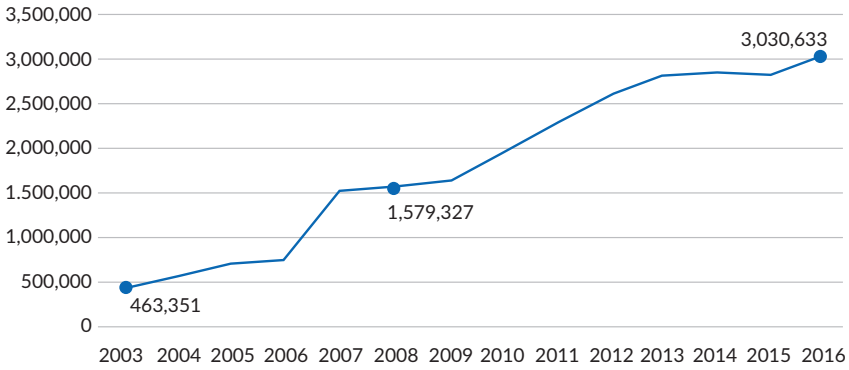


Figure 5 shows that between 2003 and 2008, the number of C&I customers served by non-utility suppliers grew 240%, from 436,000 to nearly 1.6 million. Competitive C&I accounts nearly doubled again between 2008 and 2013. In each of the four years, 2013-2016, competitive C&I accounts averaged more than 2.9 million, exceeding 3 million in 2016. C&I customers that have elected to take utility default service are billed at "rates" derived from market-based purchases in the competitive wholesale market.

In 2016, 72.3% of load eligible to switch in the 14 customer choice markets was served competitively with retail pricing and products by non-utility suppliers. Most of the remaining load in the 14 markets, a little less than one-third of total eligible load in those jurisdictions, is served with market-priced supply procured in the competitive wholesale market by wires utilities acting as default providers.

The nature of utility default service is often misunderstood or mischaracterized as the equivalent of traditional utility "rate of return" tariffed service under the monopoly model utility provided prior to restructuring. It is significantly different in several ways:

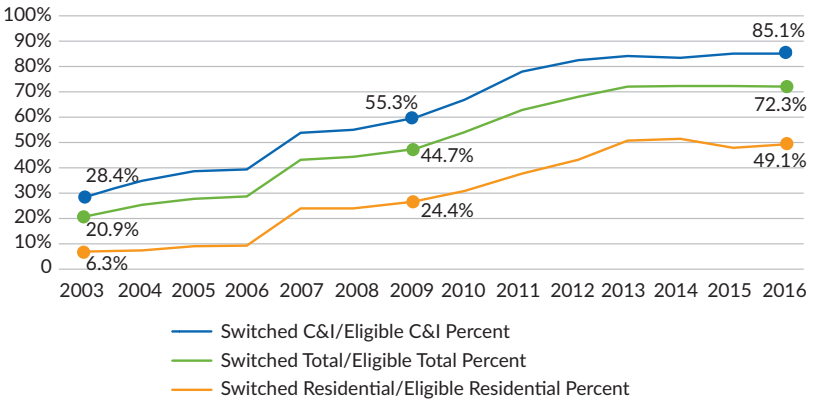
- Wires-only utilities that provide default service to non-choosing residential and small business customers generally do not earn a profit from providing the market-priced supply;
- Customers eligible for default service are generally free to switch from the utility and to choose service from a competitive supplier; and

- Default service supply is customarily procured through forward purchases made in a competitive market.

Figure 6 shows the upward trend in residential and C&I retail load served by non-utility suppliers.[15]

Figure 6: Percentage of Load Switched in the 14 Competitive Jurisdictions

The great majority of eligible load in the choice jurisdictions is served by competitive suppliers



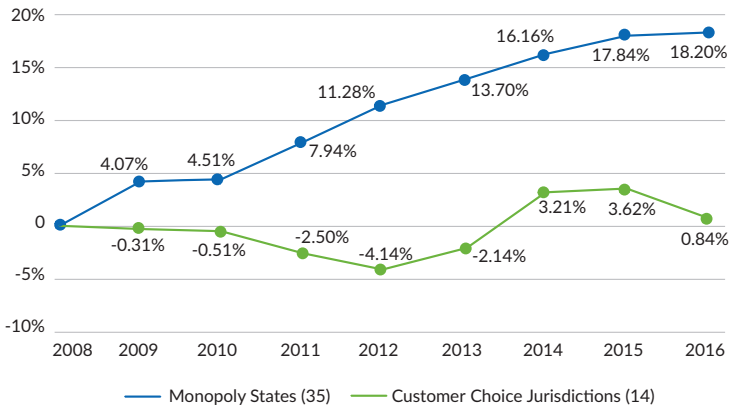
whereas a local wires delivery network still can be largely regarded as a natural monopoly. In competitive electricity markets, customers are in a similar position as they are in with other services and products.

The difference in risk allocation between monopoly and choice regimes is being manifested most clearly in the divergent electricity price trends during the flat-load era since 2008. Figures 7, 8, 9 and 10 show stunningly different price trends in the competitive jurisdictions compared to the monopoly states from 2008 through 2016. Weighted average prices in the group of 35 monopoly states have risen inexorably. By contrast, in the 14 competitive markets, commercial and industrial weighted average prices have trended significantly downward as residential prices have flattened.

Price Trend Divergence in the Flat-Load Era

The fundamental difference between traditional monopoly regulation and customer choice in electricity is in the allocation of risk. Under monopoly regulation, customers bear much of the technology, fuel and sales volume risk for investment in generation assets. In retail choice jurisdictions, while customers continue to share business risk with the local wires utility, power producers and supply intermediaries are largely at risk for changes in power market conditions, including fuel prices and technology disruption. The generation and supply sectors have the characteristics of a competitive industry,

Figure 7: Residential Weighted Average Percentage Price Change, Choice vs. Monopoly States, 2008-2016



Weighted average prices in the group of 35 monopoly states have risen inexorably. By contrast, in the 14 competitive markets, commercial and industrial weighted average prices have trended significantly downward as residential prices have flattened.

Figure 8: Commercial Weighted Average Percentage Price Change, Choice vs. Monopoly States, 2008-2016

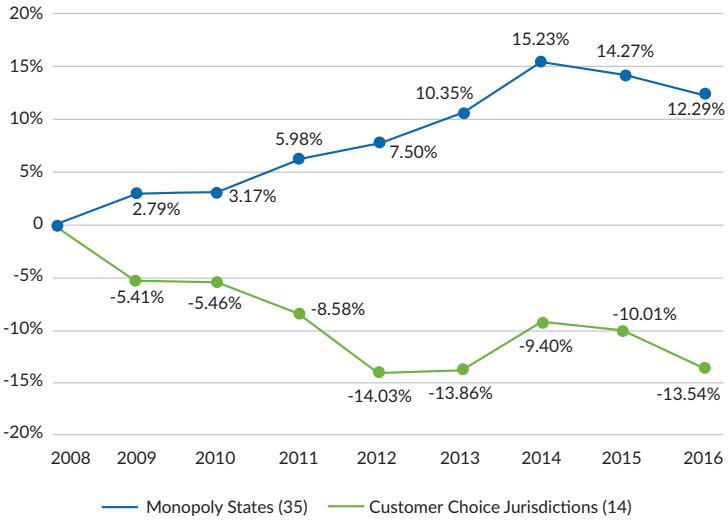


Figure 9: Industrial Weighted Average Percentage Price Change, Choice vs. Monopoly States, 2008-2016

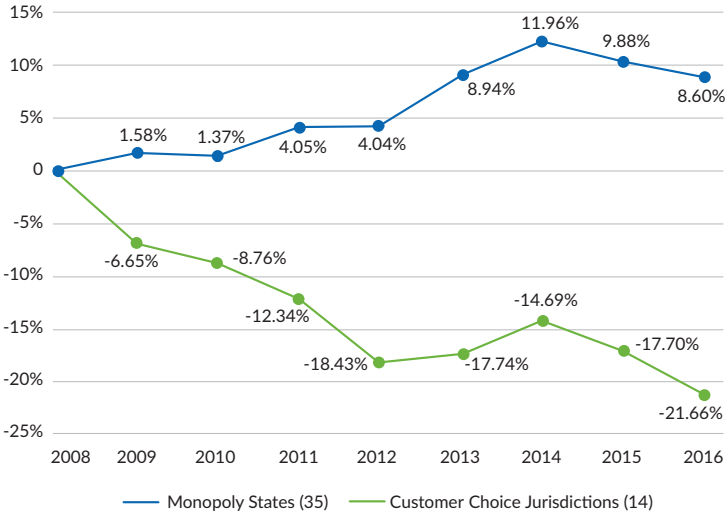
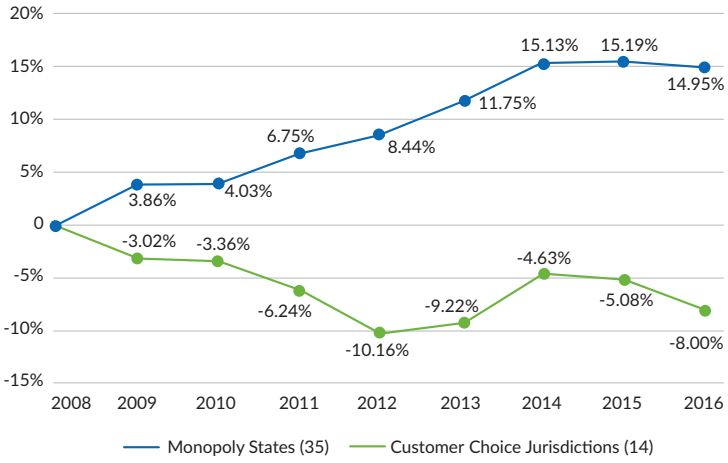


Figure 10: All-Sector Weighted Average Percentage Price Change, Choice vs. Monopoly States, 2008-2016



Advocates for the monopoly model sometimes promote the notion that residential, small-business and non-profit customers such as schools are disadvantaged by choice. The assertion is that large commercial and industrial customers will reap the bulk of the benefits and that competitive suppliers will "cherry pick." However, the data show that prices for residential customers in competitive retail markets have been on a favorable track alongside the benefits that have accrued to C&I customers. While percentage changes in price differ among the customer classes in both the monopoly and choice states, this is due in part to the greater volumes and more constant demand characteristics of larger customers. Additionally, the costs of delivery services allocable to residential and small business customers constitute a greater share of total price.

Figures 11 and 12 show the aggregate nominal and inflation-adjusted percentage changes in weighted average prices of delivered supply for the groups of 14 choice jurisdictions and the 35 monopoly states from 2008 through 2016.

Figure 11: Nominal Weighted Average Percentage Price Change by Customer Class, Choice vs. Monopoly States, 2008-2016

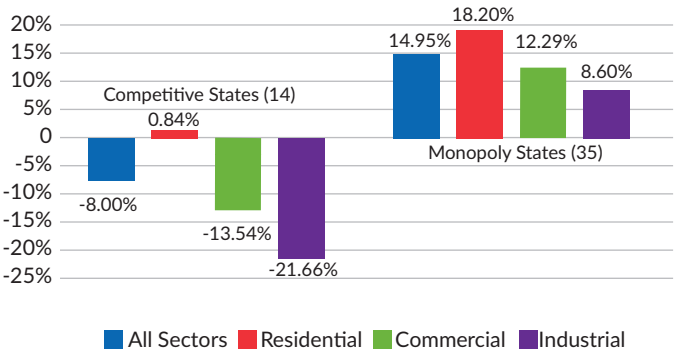
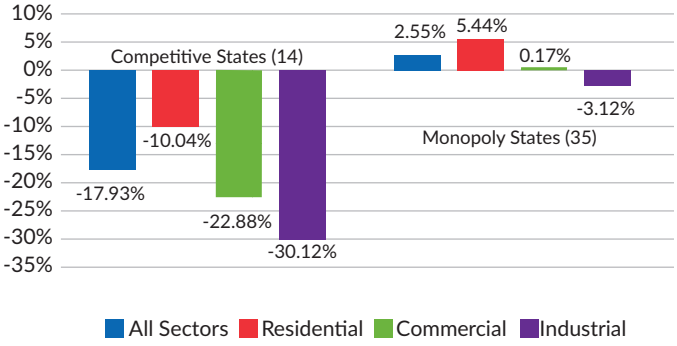


Figure 12: Inflation-Adjusted Weighted Average Percentage Price Change by Customer Class, Choice vs. Monopoly States, 2008-2016



The divergence in price trends between the group of states that have incorporated competitive markets and the group that has remained under monopoly regulation is neither accidental nor aberrational. It is a function of entirely different public policies that prescribe quite different ways in which supply prices are set and risks are borne.[16]

Traditional regulation sets supply prices on the basis of past capital investment and current costs of operation, with little regard for the actual economic value of the product. In competitive markets, supply prices are set by the dynamics of supply and demand.

The problem for consumers served by monopoly utilities in the flat-load era is not merely one of poor risk allocation. Traditional regulation necessarily sends inaccurate price signals. Because traditional rate setting is in great part retrospective, prices will tend to be set too high in periods of surplus in order to recover investment in power plants that are producing less power than anticipated. Similarly, traditional regulation distorts price signals, including setting prices too low in periods of impending shortage and too high in periods of surplus. This upside-down pricing is resulting in rising prices in monopoly states at the same time customers are restraining their electricity consumption from the grid. In choice jurisdictions, all customers have a clear line of sight to the economic value of electricity in wholesale markets. Price signals constitute some of the most valuable information for all stakeholders in a market. Accurate and timely price signals elicit efficient consumer and investor decisions. Poor price information encourages inefficient behavior.

The divergence in weighted average price trends between monopoly states and competitive markets is a widespread phenomenon. The price trends shown in the preceding illustrations are not the result of a few large monopoly states or competitive states skewing the numbers. Figures 13, 14, 15 and 16 show the state-by-state rankings for all states in the contiguous United States for percentage changes in average nominal prices for the three main customer classes and for all customer sectors. Competitive states dominate the lower end of the spectrum in each of the four customer class rankings.

Figure 13: State Ranking — Residential Price Percentage Change 2008-2016

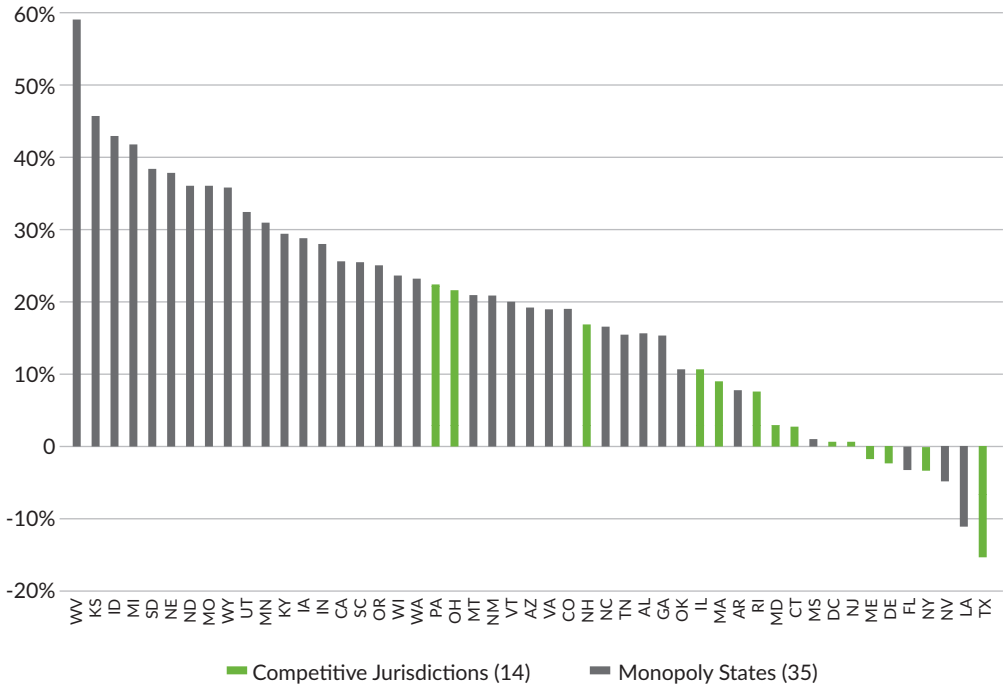


Figure 14: State Ranking — Commercial Price Percentage Change 2008-2016

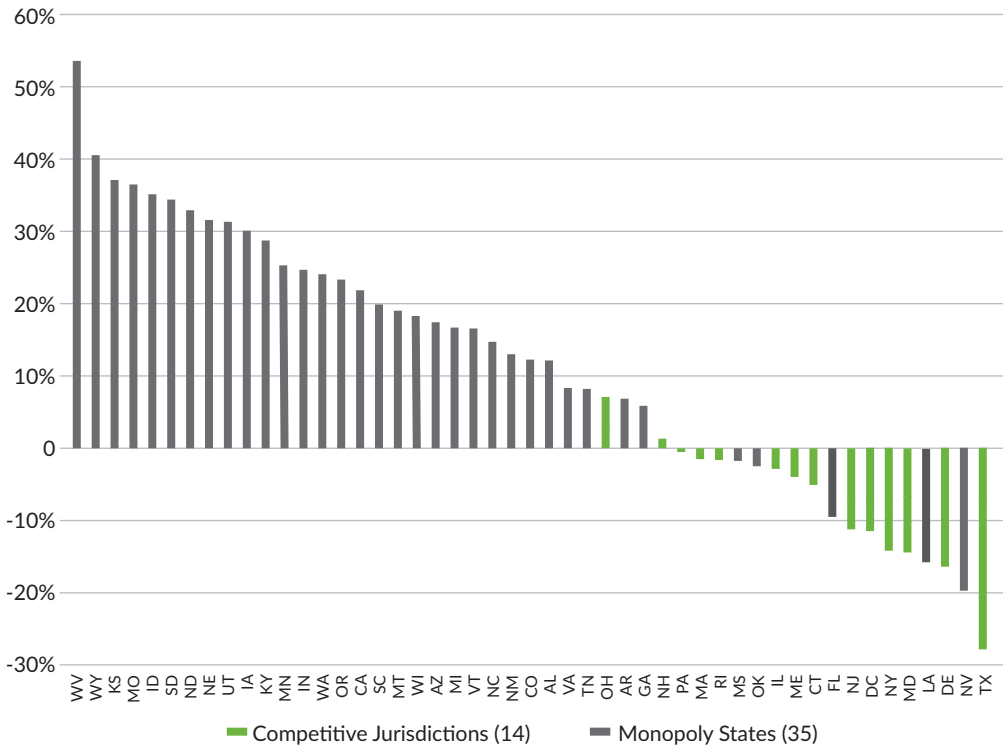


Figure 15: State Ranking — Industrial Price Percentage Change 2008-2016

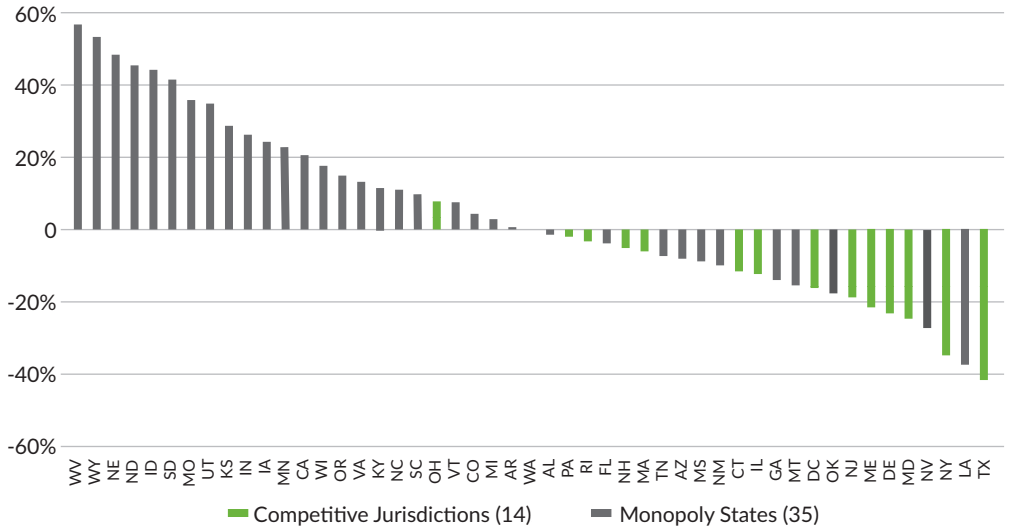
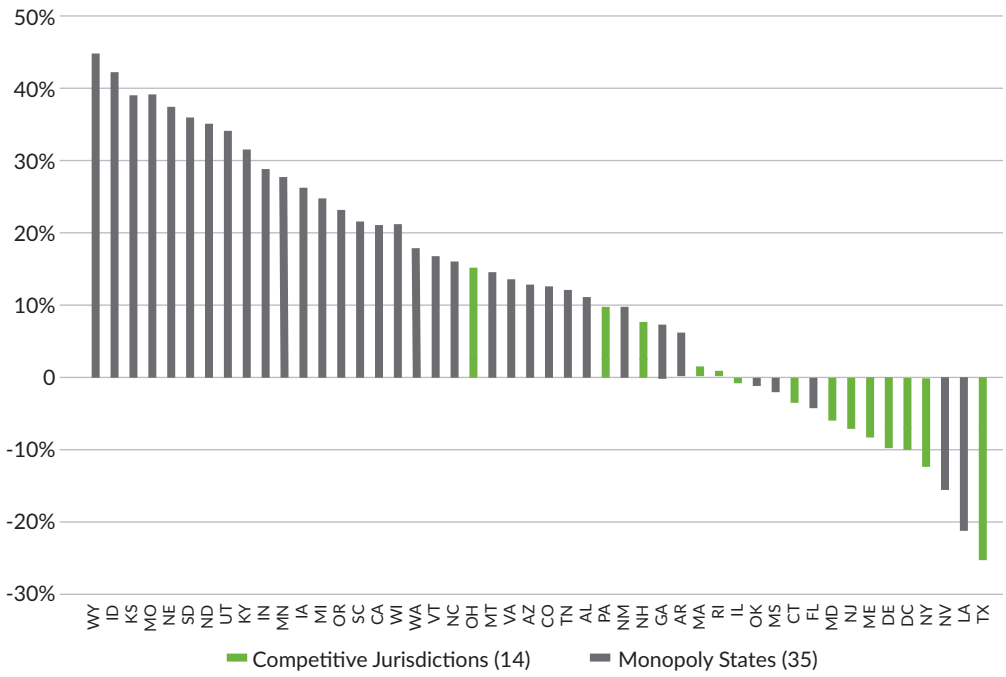


Figure 16: State Ranking – All-Sector Price Percentage Change 2008-2016



Price Volatility

Wholesale electric energy prices can be quite volatile in the course of a 24-hour period, as plants with different fuel costs are brought on line or taken off line in response to rising and falling demand. Seasonal wholesale prices will vary as well. Critics of customer choice who claim that end-use customer prices under competition are more volatile than under traditional monopoly regulation make a basic mistake when they conflate wholesale and retail prices.

Most customers in choice markets, whether C&I or residential, arrange competitive contracts with fixed prices for all or a substantial portion of supply. Unlike monopoly service, a competitive choice customer can enter into multi-year pricing contracts. At the same time, some customers in competitive markets elect to have part of their supply priced in the hourly day-ahead or real-time markets.

Table 5 shows that in the period 1997-2007, the transitional period for choice states, the weighted and unweighted average residential monthly price volatility was somewhat greater than in the monopoly states. In the flat-load era, since 2008, residential prices in choice states have been somewhat less volatile than in monopoly states. Over the entire period, 1997-2016, unweighted average price volatility was slightly less in competitive states and weighted average prices slightly more volatile.[17] The data simply do not support claims of systematically greater retail price volatility in competitive markets.

TABLE 5: RETAIL PRICE VOLATILITY MATRIX 1997 - 2016

Average Residential Monthly Price Volatility			
Residential		Unweighted	Weighted
1997-2016	Competitive	3.48%	2.91%
	Monopoly	3.18%	3.09%
1997-2007	Competitive	3.92%	3.32%
	Monopoly	3.24%	3.05%
2008-2016	Competitive	3.03%	2.39%
	Monopoly	3.11%	3.14%

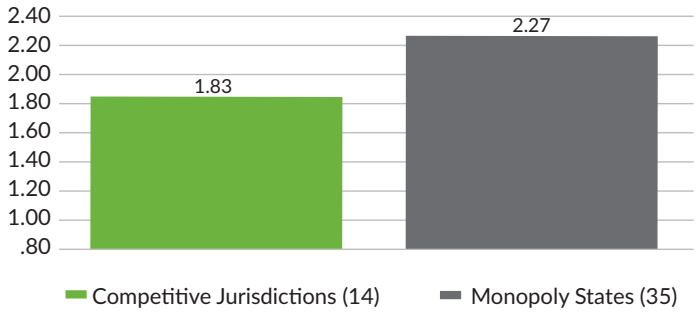
Attracting Capital

Advocates of traditional utility regulation often maintain that traditionally regulated vertical monopoly utilities are required for investors to have adequate assurances. The question then is whether competitive electricity markets have attracted capital for generating capacity.

Generation Effectiveness

"Generation Effectiveness" is the extent to which generating capacity additions have kept pace with consumption, as measured by the ratio of the percentage growth in generating capacity to the percentage change in consumption over the same time period. As shown in Figure 17, both monopoly and competitive states have added capacity since 1997 at nearly double the proportion of the percentage increase in electricity consumption.[18] Figure 17 also shows that both groups of states added capacity at comparable effectiveness ratios of approximately two times the increase in MWh consumption: 1.83 in the Customer Choice Jurisdictions and 2.27 in the Monopoly States.

Figure 17: "Effectiveness" Ratios, 1997-2016 [Summer Capacity (Δ%)]/[Consumption (Δ%)]

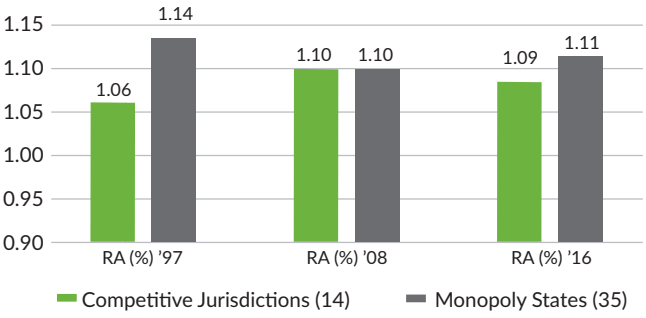


Resource Adequacy

A useful measure of "Resource Adequacy" in an electricity market or collection of markets is whether total annual generation production is equal to about 110% of total annual consumption. The 10% of production above consumption accounts for line losses and other production that does not reach the end-use meter. As shown in Figure 18, at the commencement of the competitive era in 1997, the 14 Customer Choice Jurisdictions, as a group, were net importers, generating 106% of total consumption. Thus, the group of 14 was a net importer. In contrast, the 35 Monopoly States, as a group, were net exporters,

generating 114% of total consumption. As the competitive era progressed, generation and consumption in the two groups of states were both at parity by 2008. In 2016, the resource adequacy ratios of the two groups were comparable, at 109% in the Customer Choice Jurisdictions and 111% in the Monopoly States.

Figure 18: Change in Resource Adequacy Factors, 1997, 2008 and 2016 (Generation Output/Consumption)



Capacity Factors

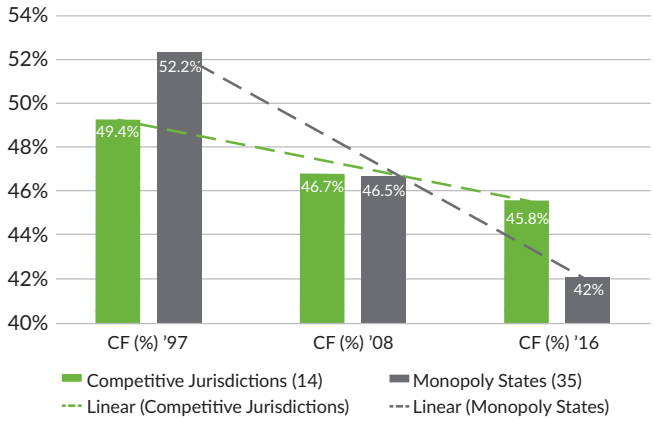
"Capacity Factor," a standard electric industry measure of a generator's operating efficiency, is the ratio of actual output to potential output if a generating unit were to operate at full capacity continuously.

As shown in Figure 19, both the monopoly states and competitive jurisdictions have experienced a decline in overall capacity factor percentages since 1997. This decline in capacity factors across the board is partly attributable to the significant deployment of renewable generation assets across the country which typically exhibit lower capacity factors than do traditional generating resources. Nevertheless, the decline in capacity factors in the monopoly states has been much more pronounced.

Figure 19 shows that in 1997, generation in the Choice Jurisdictions had an average capacity factor of 49.4%, whereas the Monopoly States' average capacity factor was higher at 52.2%. By 2008, however, average capacity factors in the Customer Choice Jurisdictions began to exceed those in the Monopoly States, 46.7% versus 46.5%. In 2016, the Competitive Jurisdictions had an average capacity factor of 45.8% compared to just 42.0% in the Monopoly States. The Customer Choice Jurisdictions have switched capacity factor positions with the Monopoly States since 1997.

Generation units in competitive states are on average newer than in monopoly states and have a greater share of generation comprised of natural gas and high-capacity factor nuclear. Generation in monopoly states is more heavily weighted toward coal. The changing economics of generation have been to the advantage of the types of generation that are more prevalent in the competitive states. Recent scholarly research indicates that competition elicits greater production efficiency compared to monopoly conditions.[19]

Figure 19: Change in Capacity Factors, 1997, 2008 and 2016 (Generation Output/Consumption)

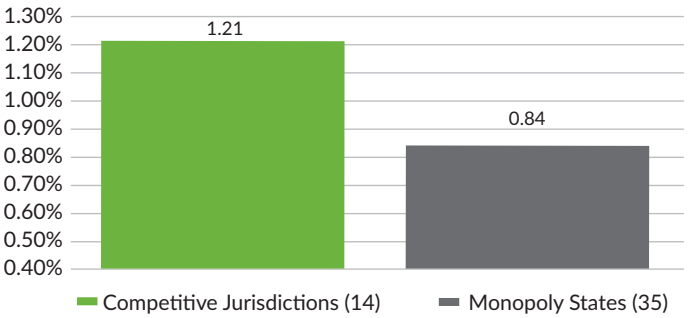


Generation Potency

"Generation Potency" is a measure of how well generating assets meet consumers' electricity usage requirements over time. The Potency ratio compares the percentage change in generation production to the percentage change in consumption over a period of time.

Figure 20 shows that in the Customer Choice Jurisdictions, production has increased at a ratio of 1.21 to the change in consumption, while in Monopoly States, production increased at a pace well below the percentage change in consumption, at a ratio of just 0.84. Thus, generation production in the Customer Choice Jurisdictions outpaced consumption, while in the Monopoly States consumption outpaced generation production.[20]

Figure 20: "Potency" Ratios, 1997-2016 [Generation Output (Δ%)]/[Consumption (Δ%)]



The Results of Customer Choice—As Favorable as Intended

The movement to customer choice and electricity competition had the goal of fostering the reflection of market forces and conditions more promptly and accurately than could traditional monopoly regulation.[21] The data show that:

- Customers embrace electricity choice when given the opportunity;
- As demand has flatlined, competitive retail prices have fallen or flattened, while monopoly prices have risen;
- Retail price volatility is not a distinguishing feature between monopoly and competitive markets;
- Investment in new, expanded competitive generating capacity has been attracted at nearly the same rate as for monopoly generation; and
- Generation assets in competitive states have been outperforming generation assets in monopoly states.

SECTION 4: COMPETITIVE INNOVATION

The Innovative Nature of the Electricity Industry

Innovation has been at the heart of the electricity industry since its birth. Once again, innovation has emerged as a defining characteristic of the sector, driven in no small part by the success of customer choice in supply.

In the late 19th century, the product being sold was light itself. Customers were charged by the lightbulb, rather than by the number of kilowatt-hours (kWh) used. The "war of the currents" over the basic technology of electricity production and delivery—direct versus alternating current—was epic. The names of the combatants are legend and remain in widespread use today—Edison, Westinghouse and Tesla. Electricity was quickly put to a myriad of creative uses, such as powering factory motors and replacing the horses that pulled streetcars. The product being sold had become highly versatile energy, sold by quantity (kWh) and peak demand (kW) as measured by the electromechanical metering technology of the time.

Safety dramatically improved, costs and prices fell, and electrically powered appliances in the workplace and homes proliferated.[22] The symbiotic relationship of rapidly increasing consumer applications and consumption of electricity with rapid scaling up of increasingly efficient central station power plants was a hallmark of the industrial age.

Modern Monopoly Is Inhospitable to Innovation

The critical element in electric industry innovation in the early decades was a competitive spirit as entrepreneurs struggled to be the first and the best. In later times, as the "natural" monopoly model[23] was adopted and the industry matured, regulation naturally elevated central planning over market forces and innovation. Regulatory tariffs, rate-making principles, and cost allocation methods must be general in their application and cannot be tailored to individual customer preferences. Regulated rates will generally be set at average cost for a small number of customer classes as defined by the utilities and regulators.

The inability of traditional monopoly regulation to respond to the increasing complexity of the modern economy and the varied preferences of individual customers stands in contrast to the innovation taking place in customer choice markets. Because customers in competitive markets are not captive to any competitive power supplier, providers

Innovation has emerged as a defining characteristic of the electricity sector, driven in no small part by the success of customer choice in supply. The inability of traditional monopoly regulation to respond to the increasing complexity of the modern economy and the varied preferences of individual customers stands in contrast to the innovation taking place in customer choice markets.

Under the choice model, the customer is at center stage. Customers are dealt with in a far different manner than found in the complex litigation arena before a rate-setting and tariff-approving regulatory agency.

must continually work to build relationships and to develop custom product offerings in order to retain customers and to gain market share. Conversely, a monopoly utility may often be in the unfortunate and highly unusual position for a business of fighting against its customers. Satisfying customers may take a back seat to protecting sunk investment, meeting complex regulatory requirements and resisting change.

Innovation Is Central to Choice Markets

Commercial and industrial businesses as well as residential customers in the 14 choice jurisdictions increasingly have access to pricing, product and service options that are rarely if ever available in the 35 traditional monopoly states. Fundamental to pricing innovation in choice states is that competitive suppliers are able to customize pricing for a customer's usage patterns and preferences. Further, as customer choice has emerged from its transitional period, C&I customers have increasingly focused attention on risk management and the tailoring of pricing to their operational and budgeting needs.

Table 6 summarizes some of the innovative customer options in choice markets.

Monopoly electric utility regulation was predicated over a century ago on conditions that no longer prevail. New dynamics and challenges make clear the inability of the monopoly framework to incrementally adapt. Flat load, radical shifts in generation economics and the digital surge are converging to create an environment to which traditional monopoly regulation is painfully unsuited.

TABLE 6 - INNOVATIVE PRICING, PRODUCTS & SERVICES IN CHOICE MARKETS

Fixed-Price Multi-Year Contracts	In monopoly states, utilities generally decide when to file for rate changes. In choice states, customers can choose multiyear price guarantees that in some markets may be as long as five years. Among other things, a business can lock in a key budget item for a known period of time.
Index Pricing	In choice markets, some customers will choose to buy power supply under various index-pricing arrangements. Options may include pricing on a monthly, daily or even hourly basis. Such deals may or may not include the cost of capacity, transmission or other ancillary cost values depending on the type of program selected by the customer.
Mixed Fixed & Index Pricing	Some customers will choose a mix of fixed and floating or index-based pricing. Some businesses also choose to purchase fixed-price "blocks" similar in shape to those acquired in the wholesale market in order to mitigate risk and achieve cost savings. A business may adjust its operations to control its usage and demand to save money.
Blend & Extend Pricing	Customers who have chosen a fixed-price or a mix of fixed- and index-pricing may choose to extend the duration of a supply contract if market prices move downward or if there is a concern about possible upward movement in price. This gives the customer the opportunity to have a more favorable price going forward under an existing contractual relationship based on their view of the market and their company's unique risk profile.
Real-Time Pricing	Real-time pricing is available for nearly all C&I customers and some residential customers in competitive jurisdictions from competitive suppliers, the local wires utility or the RTO. Some monopoly utilities provide real-time supply options to some C&I and residential customers under highly restricted conditions, including limiting the favorable prices to only a portion of supply or requiring payment of procurement charges or latent capacity fees. In choice markets, customers can simply access the real-time energy price, while not paying for capacity. Customers therefore can choose to bear the unhedged risk of short-term high prices in order to take advantage of both low on-peak and off-peak prices that can lead to overall cost savings on average.
Demand Response (DR)	Retail competitive markets allow customers to contract directly with RTOs, through wires-only utilities and/or through competitive suppliers. Demand reductions during peak periods are compensated on the same basis as supply. DR is less prevalent under monopoly models because participation is controlled by utilities that own generation against which DR competes.[24]
Renewable & Green Supply Blends	Customers in competitive states can usually choose the portion of supply that is produced by renewable (green) resources, rather than being limited to minimum levels mandated by state government policies that may prevail in some monopoly or competitive states.
Market Data, Analytics & Budget Reports	Many C&I customers receive energy market data and additional analytics in order to facilitate purchase decisions and budget planning. Such services operate in tandem with options for customers to blend and extend their contracts, for example. Some suppliers will work with customers to provide ongoing reports that integrate with firm budgeting when electricity is a key business expense.
Energy Efficiency Options & On-Bill Financing	Although many traditional vertical monopoly utilities offer energy efficiency programs, including on-bill financing, there can be inherent conflicts due to ownership of rate-based generation assets. In choice markets, while suppliers sell power, they have incentives to help customers achieve efficient energy use as a means of customer retention and as a business in and of itself. Many competitive suppliers enable efficiency project financing with charges for this service added to competitive supplier's commodity bills or through energy savings.
Distributed Energy Resources (DER)	Customers interested in locating DER on their premises can often work with competitive suppliers to optimize the value of the resources, unhindered by local monopoly tariffs and regulations which may limit customers in selling output into the market.
Integrated Home Solutions	Suppliers are offering residential customers smart thermostats, smart home automation and various applications to facilitate home energy and appliance management in order to optimize the value of market signals.

Another feature of competitive retail markets is that suppliers will vie with one another for ways to attract and keep customers. Suppliers are working with major airlines to offer frequent flyer rewards for customers who select them and with other entities such as cable and Internet providers to offer bundled packages with perks. Some provide free electricity on weekends. Others provide residential customers with digital games and contests that encourage energy efficiency and can educate children about energy usage.

In monopoly markets it is context, not people, that stifles innovation. People working in vertical monopoly utilities and regulatory agencies can be as innovative as any other people. It is the context that limits their creativity. They work in environments that have considerable focus on the defense and preservation of the status quo.

In choice states, the wide array of competing firms, the local wires utility and the regulators all operate in an environment in which customers are not one-dimensional "ratepayers" subject to a take-it-or-leave-it relationship with the electric utility. Under the choice model, the customer is at center stage. Customers are dealt with in a far different manner than found in the complex litigation arena before a rate-setting and tariff-approving regulatory agency. Monopoly regimes have "tariffs" and "rates," while competitive markets have "products" and "prices."

SECTION 5: UNSUSTAINABLE MONOPOLY

New Converging Conditions

Vertical monopoly electric utility regulation was predicated over a century ago on conditions that no longer prevail. Daily, the electricity industry trade press and other energy publications are replete with stories and analyses about the rapidly shifting electricity landscape. The new dynamics and challenges make clear the inability of the monopoly framework to incrementally adapt.

Flat load, radical shifts in generation economics and the digital surge are converging to create an environment to which traditional monopoly regulation is painfully unsuited. Basic changes have accumulated to the point that a combined monopoly over wires as well as generation supply is unsustainable.

1. The Flat-Load Era

Near-zero growth in the consumption of grid-delivered electricity is a new phenomenon. It is rooted in basic changes in the economy that are beyond the control of the electricity industry. The correlation between electricity consumption and economic growth, once strong and seemingly predictable, has weakened.

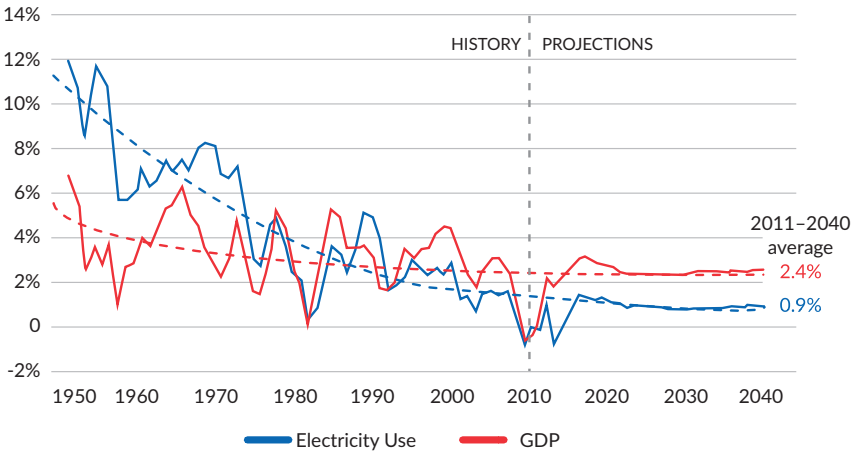
In 2013, the U.S. Energy Information Administration reported on the long-term change in the connection between electricity and Gross Domestic Product (GDP). Figure 21, drawn from that EIA report, shows that until the mid-1970s, electricity consumption generally grew at a considerably higher rate than did GDP. For a time thereafter, electricity and GDP growth rates were similar. In recent times, however, electricity growth has been considerably slower than GDP increase. Since the 2011 end-point of EIA's calculation, load has continued to be flat while GDP has increased. Of course, while EIA projects a continuation of the inverted relationship out to 2040, there can be no certainty about the future. This uncertainty contributes to the desire for flexibility in generation assets ownership.

While aggregate load trends for the 14 choice markets and 35 monopoly states are similar, the price response between the two groups based on form of regulation has been dramatically different. As has already been shown in Figures 7-12, the 14 competitive jurisdictions have significantly outperformed the monopoly markets from a price change perspective for all classes of customers across the country. In the 14 customer choice jurisdictions, all-sector weighted average prices have fallen by 8% since 2008, responding as prices would in any normal, competitive market to slack product demand. Meanwhile, prices in the 35 monopoly states, largely insulated by regulation from the downward price pressure of market forces, all-sector weighted average prices have risen nearly 15%. This 20-point spread in percentage price change between choice and monopoly states since 2008 is illustrated in Figure 11.

Figure 21: The Correlation of GDP & Electricity Consumption Has Weakened

U.S. electricity use and economic growth, 1950–2040

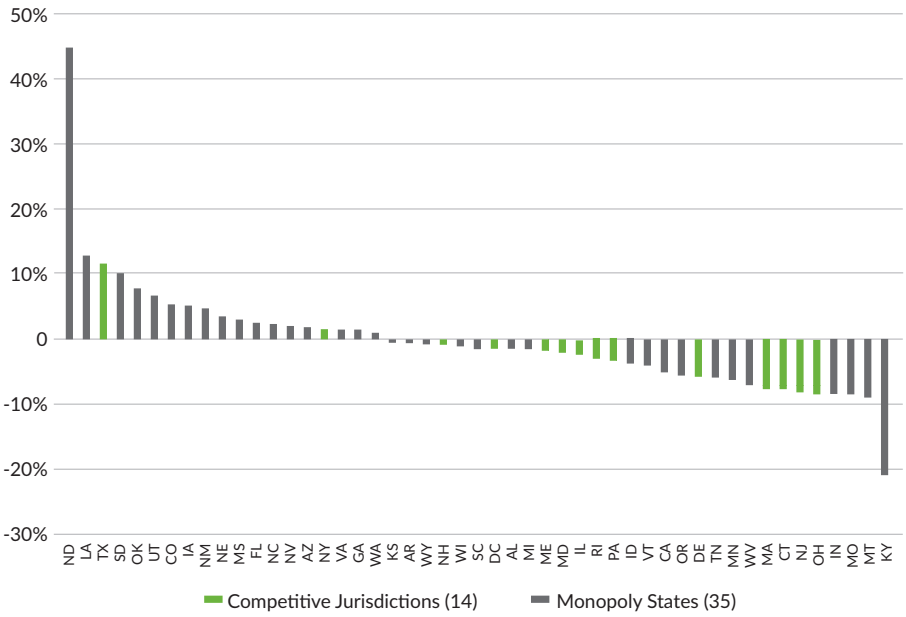
Percent growth (3-year compound annual growth rate) and trend lines



Source: U.S. Energy Information Administration, Annual Energy Outlook 2013 Early Release.

As shown in Figure 22, well more than half of all states lost load over this time period. Developments in the fossil fuel industry may explain why it is that certain states are at the high end of percentage change in consumption or at the low end. Some states with increased load have been beneficiaries of increased domestic oil and gas production. Some of the states with reduced load have suffered from reductions in coal mining.

Figure 22: State Ranking — Consumption Percentage Change 2008-2016



An argument has been advanced that in due course healthy load growth will return, allowing fixed costs to be spread over an expanding sales base and thus bringing down traditionally regulated prices. That argument is not accompanied by a description of the circumstances that will lead to such a consumption surge. Widespread deployment of electric vehicles and an expansion of manufacturing, while positives for electricity consumption, would fall well short of a load increases comparable to general economic growth.[25]

Equipment, lighting and appliances are all increasingly designed with energy efficiency as a central attribute. Further, in a low-growth electricity market, the grid is competing for load with distributed resources on the customer side of the meter.

Public policy has also been playing a role in restraining growth in consumption. State-based energy efficiency and conservation programs, often connected to expectations that decreased energy use will reduce emissions, have played a role in reducing consumption. These programs are often funded through assessments on all classes of utility customers in both competitive and monopoly states. Having an impact as well are federal energy efficiency standards and labeling disclosures for home appliances. National and state energy standards for new buildings and retrofits are prompting greater workplace, school and residence efficiency.

2. Generation "Dys-Economics"

Samuel Insull, a founding father of the 20th century's vertically integrated monopoly electric utility model, saw that success lay in achieving economies of scale across the business—in financing, fuel delivery, plant size, expanding interconnected network, and even in the deployment of home appliances.[26]

Traditional generation economics boils down to a simple rule of thumb: *The larger and more capital intensive the power plant, the cheaper will be the fuel and the more efficient will be the conversion of that fuel into usable energy*. The expectation has been that over the life of a power plant, favorable costs of production would deliver low prices while yielding growing profit. Everybody won. It worked—until it didn't.

In an era of flat load, the shale gas revolution and galloping technological development, the old rule of thumb now translates to "dys-economics." The once reliable idea that larger is better and cheaper has been upended. Certainties about the future have been replaced by a desire for flexibility in a risky world.

Nearly all currently operating coal-fired plants in the United States were built in the heyday of electricity growth over four decades ago. In contrast, the average age of natural gas combined cycle units is only 14 years,[27] with many of the plants brought into operation in competitive states during the choice era.

Since the commencement of the customer choice era, gas has been on track to ultimately overtake coal, both in terms of installed capacity and production. In 1997, coal accounted for 40.5% of summer capacity, while natural gas plants constituted less than 23%. By year-end 2016, coal's share of summer capacity was 25.0% compared to 41.5% for natural gas. Between 1997 and 2016, summer coal capacity had declined by over 44,000 MW of capacity, or 14.2%. In contrast, natural gas summer capacity grew by nearly 270,000 MW or 153%.

Similarly, by 2016 electricity production from coal output had declined by 605 billion kWh, thus falling from 53% of national generation in 1997 to 30.4% in 2016. Meanwhile, gas-fired production nearly tripled, increasing by more than 900 billion kWh. In 2016, gas accounted for 33.9% of national production, compared to less than 14% in 1997.

As the relative shares of electricity production from gas and coal plants flipped, there has been a steady contribution of nuclear[28] and a strong recent upswing in the role of renewables.

Figure 23: Generation Percentages by Energy Type in the 14 Competitive Jurisdictions, 2008 – 2016

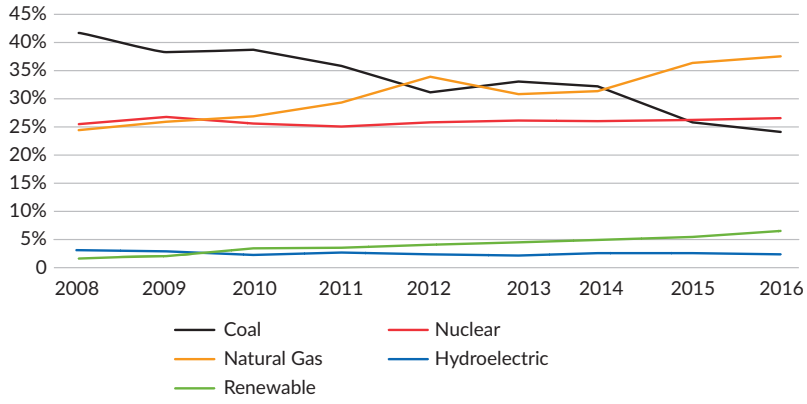


Figure 24: Generation Percentages by Energy Type in the 35 Monopoly States, 1990 – 2016

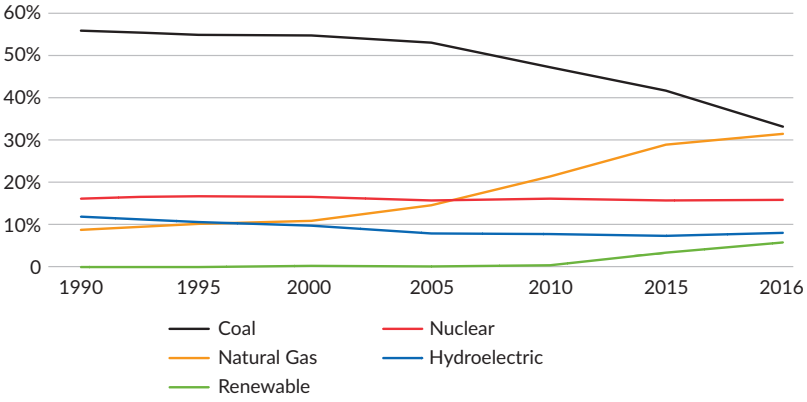
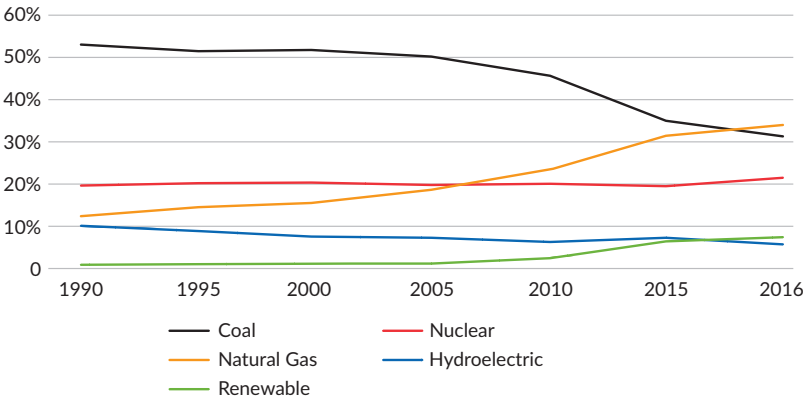


Figure 25: Generation Percentages by Source in the Lower 49 Jurisdictions, 1990-2016



Figures 23 and 24 show the 2008-2016 comparative changes in the market share of electricity production from the major sources in the 14 competitive jurisdictions and the 35 monopoly states respectively. Figure 25 shows that

2016 was the first year in which natural gas-fired electric power production exceeded that produced by coal.

Electricity customers in competitive retail jurisdictions have experienced the benefits of low gas prices more promptly and effectively than have those in monopoly states. There are several reasons:

- A greater share of generating capacity in monopoly states is accounted for by coal than in the customer choice markets where gas and nuclear are more prominent.
- In competitive markets, consumers pay only for the economic value of existing generating capacity, with prices set in open and transparent competitive auctions.[29]
- In the 14 choice markets, generating capacity is installed or taken out of service based on investor perceptions of the competitive economics. In the 35 monopoly states utilities build, contract or retire generating capacity under regulatory protocols that generally require consumers to pay for capacity irrespective of economic efficiency.
- Financial markets have demonstrated a willingness to make billions of dollars in equity investment and low-cost debt available for non-utility generation, contradicting the claim that only regulated monopoly could attract capital at favorable rates.
- Customers, especially commercial and industrial which account for more than 60% of consumption, have the flexibility to adjust contract terms and prices to take advantage of market developments.

3. Digital Customer Sovereignty

Customer empowerment is at the heart of the worldwide digital revolution. More than in any other age, individuals today can compare products, services, prices, quality, and provider reputation. Further, they can express satisfaction or dissatisfaction quickly and with impact.

Advances in communications, information analysis and management, Wi-Fi connected devices, energy controls and decision assistance are facilitating innovations in satisfying electricity customer preferences.

The monopoly model, however, is based on limiting choices. Customer sovereignty is anathema to the monopoly ethos that utility managers and regulators can divine customer needs and that customer preferences are of marginal relevance. Traditional regulation imposes rigid, broad-brush pricing, terms and conditions of service and customer class definitions. Strict limits on consumer options are intrinsic to monopoly.

Customer empowerment is at the heart of the worldwide digital revolution. The monopoly model, however, is based on limiting choices. Customer sovereignty is anathema to the monopoly ethos that utility managers and regulators can divine customer needs and that customer preferences are of marginal relevance.

The most significant digital development is the rapid adoption of Advanced Meter Infrastructure (AMI or smart meters) and other smart grid technology. AMI provides for two-way communication and the accumulation and organization of large amounts of individualized and aggregated electricity service and usage information. Smart grid technology more generally provides real-time information to network managers about grid conditions and operations down to specific geographic locations and individual customers, allowing for prompt and accurate diagnostic, prevention, maintenance and repair. Service restoration can happen more quickly after an outage and outage frequency can be reduced.[30]

Since 2007, the number of smart meters has grown from fewer than 2.5 million across all customer classes to nearly 65 million by year-end 2015. It is likely that by year-end 2017, AMI will have been extended to half of the 150 million meters in the country. Installed smart meters now exceed the number traditional meters.[31]

There are no particular differences in the pace of AMI deployment between delivery-only utilities in competitive markets and vertically integrated utilities in monopoly states. This is not surprising, given the attractiveness of smart meters to utilities for purposes of enhancing operational efficiency and the fact that deployment is a function of state-level regulatory decisions.

However, there are significant differences between competitive and monopoly jurisdictions in the opportunities for consumer value and for improving the efficiency of the broader electricity system.

There are four main value streams flowing from the eventual universal deployment of smart grid and AMI. Only in one—utility delivery operations—can monopoly be regarded as being on equal footing with choice. In the three other value streams, choice markets are in a superior position to exploit digital deployment:

Utility Delivery Operations

The most immediate and direct motivation for AMI and smart grid deployment is the myriad of efficiencies brought to the routine functions of a local utility. These include meter-reading and billing automation, facilitation of service initiation and termination, identification of outage locations, feedback on service restoration, preventive diagnosis and more efficient dispatching of field crews. There are also fast-developing network applications, including voltage optimization and the more precise management of energy flows, all resulting in improved power quality and decreased line losses.[32]

Data Analysis

Careful analysis of the massive volume of data produced from the smart grid and AMI can enable important consumer benefits. The efficacy of energy efficiency programs can be better assessed. Consumption patterns can be analyzed and locales requiring increased delivery capacity can be better understood and more efficiently served. However, rigid tariffs under the monopoly model restrict consumer options and the utilization of data analyses. What little flexibility might be introduced in the monopoly context must be at the behest or sufferance of the local monopoly utility and approved in lengthy regulatory proceedings. In choice markets, customers and other participants will have far more freedom and flexibility in making use of the information and the services offered. Competing providers can test their creativity by offering pricing and products to customers that may be accepted or rejected, withdrawn or imitated and improved. Customers can more profitably adjust their consumption patterns or contract for innovative pricing and products based on individualized data analysis.

Customer Energy Management

Smart meters in a choice environment can be considerably more effective in assisting consumers in managing their energy than in a monopoly market. At the macro level, monopoly customers do not get the full benefit of aggregate load reductions since regulation raises rates to compensate utilities for investment in underutilized generating capacity. Depending on the rate designs of different monopoly utilities, there can be widely varying results from energy management efforts based on AMI-derived data. In choice markets, delivery and supply pricing are separate and costs are not comingled. The incentives and value of effective energy management are clearer and more understandable. Further, under choice consumer consumption changes are not likely to be defeated by the sort of significant mandatory change in rate design or cost recovery that can be effectuated under monopoly regulation. Energy produced on a customer's premises, including home rooftop solar, can be better valued and accommodated in a choice market with AMI since the true economic value of consumer-based supply can be ascertained and then mediated through smart meters.

The converging conditions that are radically altering the electricity world are the result of fundamental developments in the economy and technology. The tide cannot be ordered to recede in order to accommodate the traditional monopoly utility model.

Service Innovation

Knowledge is power. Competitive markets are proving to be learning laboratories for pricing and service innovation. As AMI becomes ubiquitous, the functionality of smart meters will increase as software improves and ideas develop. The value of the data and the associated functionality of data will be limited mainly by the degrees of freedom that customers and market participants will have. There is a world of difference between choice markets with a large number of participants provided wide latitude, and monopoly markets in which participants are highly restricted.

The converging conditions that are radically altering the electricity world are the result of fundamental developments in the economy and technology. The tide cannot be ordered to recede in order to accommodate the traditional monopoly utility model.

SECTION 6: THE PATH TO REFORM AND RESTRUCTURING

The Next Wave of Restructuring Has Begun

The converging conditions of flat load, generation "dys-economics" and digital customer sovereignty compel reform. While they may resemble conditions that emerged in the last quarter of the 20th century, the new conditions are considerably more fundamental. The next wave of competitive restructuring will take its own path and have its own character.

The first wave of restructuring looked to reform in analogous network industries for inspiration. Competitive electricity was unexplored territory in the mid-1990s. The next wave of electricity restructuring now has the benefit of two decades of practical experience in the transition from vertical monopoly to customer choice. In turn, the current competitive markets continue to develop and will be influenced by debate in the monopoly markets as they make the journey toward competition and choice.

There is near-daily evidence of growing interest in electricity choice and restructuring. The examples below, as of early spring 2017, may not all result in action in the near future. They are, however, indications that the monopoly status quo is no longer being accepted as a fact of life:

- In Nevada, 72% of voters in November 2016 endorsed a state constitutional amendment mandating the legislature takes steps to implement full electricity customer choice.[33] Citing the impending restructuring, the Nevada Public Utilities Commission did not approve a request by the state's main utility to acquire a gas-fired power plant from an IPP that would be placed into the utility's regulated rate base.[34]
- In California, where a flawed direct access model was limited over a decade ago in reaction to the California energy "crisis," Community Choice Aggregation (CCA) is now surging. Similar to municipal aggregation competitive supply programs in Illinois, New York, Ohio and several other competitive states, California CCAs have put an emphasis on renewable resource procurement. The growth in CCA programs has led the California Public Utilities Commission and the CA Energy Commission to initiate an in-depth inquiry into an expansion of direct access customer choice and the role that investor-owned utilities should play in a future in which customer-oriented technologies disrupt the traditional top-down electricity service model.
- In Washington State, Microsoft and the Utilities and Transportation Commission (UTC) have agreed on a plan that will allow Microsoft to enter into a special contract with the utility enabling Microsoft to procure supply from alternative suppliers from the wholesale market to including a significant percentage of renewables. In exchange, Microsoft has agreed to continue to fund the utility's energy efficiency and low-income programs and pay a multi-million dollar exit fee. Additionally, the settling parties acknowledge that the UTC Staff will request that the Commission open a docket for the purpose of conducting a broader discussion of alternative supply options for certain large customers sometime after the Microsoft proceeding has been resolved.
- In Michigan, after several years of effort, the state's major vertically integrated utilities failed in 2016 to eliminate the limited 10% choice program in that state. Michigan legislators favoring choice have announced that they are determined to reopen the issue to push for expansion of choice.
- In Arizona, Oregon and Virginia, commercial and industry customers are stepping up their requests to regulators to expand competitive pilot or limited choice programs and to allow access to renewable resources.[35]
- In Minnesota, legislation has been introduced to allow large industrial customers to access market-priced power supplies. The proposed measure is an alternative to such monopoly regulation choices as the 6.5% residential rate increase granted in March 2017 to a major utility to hold it harmless as it reduces rates for large mining and paper companies suffering from stiff competition. Further, market procurement by industrials is an alternative to utility ownership of new gas-fired generation to replace retiring coal-fired stations.[36]
- In Wisconsin, which once had the lowest average prices in the Great Lakes region but now has the highest, industrial customers are complaining that rising electricity prices are forcing consideration of shifting production to lower-priced states.[37]
- In Missouri, legislation has been introduced that would allow larger C&I customers to purchase renewable power supply.[38]

- In Indiana, C&I rates that were once enviably low are now higher than those in neighboring Illinois, a choice state. The state Chamber of Commerce has sponsored discussions about the relative merits of customer choice and monopoly.[39]
- Across the country, flat load and net-metering compensation issues have prompted both vertical monopoly and wires-only utilities to propose non-volumetric pricing more in keeping with cost-causation principles. While the regulatory decisions have been mixed,[40] the trend is nonetheless likely to accelerate. Vertical monopolies will tend to seek fixed charges several multiples greater than do wires-only utilities in order to compensate for uneconomic generation in a flat-load era.[41]
- Bills proposed in the 2017 Nebraska and Kansas legislative sessions that would unbundle rates and initiate a movement toward choice unbundling, while not likely to pass the first time around, indicate a growing awareness of the retail choice option for customers.

As was the case in the first restructuring wave, the politics and important transition details will vary across the states. FERC has substantial experience that was absent two decades ago. Nonetheless, there are five areas with which the next wave of restructuring will certainly deal.

Five Dimensions of the Next Wave of Competitive Restructuring

The first wave of competitive restructuring, while not a detailed roadmap for the next wave given the new converging conditions driving reform, will guide and inform as the next wave of restructuring efforts.

As the incompatibility of the traditional vertical monopoly with flat-load, generation dys-economics and digital customer sovereignty becomes more apparent, attention will be given to more forward-looking reforms. These reforms will build on one another to create a platform for comprehensive competitive restructuring.

Table 7 sets out five categories of reform that will contribute to the next wave of restructuring.

As was the case in the first wave of competitive restructuring in the late 1990s, the question is not so much whether reform will come, but how long it will take to implement the transition to competition and customer choice in current monopoly markets. The faster restructuring polices are adopted, the sooner consumers will reap the value.

TABLE 7: FIVE DIMENSIONS OF RESTRUCTURING

Dimension of Reform	Features of Reform	Rationale & Lessons Learned
Delivery Price Reform and Transparency: Unbundling, Non-Volumetric and Formula Rates	Monopoly utility rates should be unbundled into delivery and supply elements, just as in choice markets. All utilities, including wires-only companies, should be allowed to gradually institute non-volumetric rates for delivery based on such factors as demand and fixed monthly charges. All utilities, including wires-only utilities, should move to formula rate-making for delivery revenue and focus regulatory attention on periodic rate design reviews, as in Illinois.	Rate design has been neglected under monopoly regulation. Bundled rates in traditional monopoly utilities convey false information about the costs of delivery and supply. In choice markets, delivery charges for C&I customers are mainly based on peak demand and for residential customers on energy sales volumn. In the flat-load era, residential delivery charges under choice and bundled rates for all customer classes under monopoly regimes are disconnected from cost causation, thus sending inaccurate price signals.
Normalizing Generation and Supply Risk Allocation: Devolution from Rate-Base	Devolve generation assets from traditional monopoly utility rate-base by sale to other owners or by transfer to utility affiliates so that generation asset values are set in the market. Reallocate generation risk by assuring that customers do not bear the business risk for new generation.	Monopoly regulation imposes fuel, technology and load risk on customers, thereby distorting investment decisions. Devolution of rate-based generation to competitive status resolves the distortions of monopoly risk allocation. If incumbent utilities rate-base new generation in an uncertain world then the problem of customer-borne risk is repeated.
Monopoly Exit Strategy and Stranded Cost Recovery	Give stranded cost compensation to monopoly utilities for a reasonable portion of the regulated book value of devolved generation that is higher than the market value. All choice states did this years ago, using a variety of methods worked out in negotiations for the transition to energy choice.	As defensive measures fail, utilities will need an "exit strategy" from a failing regulatory scheme. The key to resolving utility resistance to retail customer choice and competitive supply will be mechanisms for compensating generation owning utilities for sunk investments in uneconomic generation assets.
Distributed Resources Neutrality and Demand Response	Create a level playing field for distributed energy resources. All resources would pay fair fees for use of the delivery network. RTOs can measure real-time environmental value of each resource. Demand response can be paid a market price.	Wires utility can provide a network platform facilitating utilization and proper pricing of distributed energy resources, including customer-owned assets and demand response.
Optimization of Competitive Service Offerings	Regulators can encourage creative services for all classes of customers by focusing on market rules and assuring that utilities will not use control of delivery for advantage in the provision of competitive services.	The digital revolution and customer empowerment create demand for product and service innovation. Competitive suppliers and wires utilities need opportunities for growth in a flat-load era.

As was the case in the first wave of competitive restructuring in the late 1990s, the question is not so much whether reform will come, but how long it will take to implement the transition to competition and customer choice in current monopoly markets. The wholesale competition and open-access transmission framework, overseen at the federal level, is well-formed and thoroughly tested. A large number of traditional monopoly utilities already participate to one degree or another in the competitive wholesale market.

At the retail level, state regulators and policymakers in monopoly states generally are not familiar with the nearly two decades of customer choice success. There may be a tendency to opt for long glide paths toward restructuring and the introduction of competition and retail choice. However, the record in the 14 jurisdictions that already have deeply embedded customer choice suggests that lengthy transition periods have delayed the full realization of competitive market benefits for some customers past the time necessary for a smooth conversion. This is understandable since there had been no experience in this sphere.

The sooner the debate proceeds and the faster restructuring polices are adopted, the sooner consumers will reap the value.

ABOUT THE AUTHOR

Philip R. O'Connor, Ph.D.

Philip R. O'Connor, Ph.D. is President of PROactive Strategies, a Chicago consulting firm providing advice in the energy and insurance industries. He is recognized as an expert on the transition of regulated industries to competition.

In addition to a lengthy career in the private sector, Phil has had extensive government and political experience, having chaired the Illinois Commerce Commission serving as Director of the Illinois Department of Insurance and as a member of the Illinois State Board of Elections. Six consecutive Illinois Governors have appointed him to various boards, commissions and transition committees.

From March 2007 to March 2008, Phil served in the U.S. Embassy in Baghdad, Iraq with the US Army Corps of Engineers and the U.S. Department of State as an advisor to the Iraqi Ministry of Electricity. A *magna cum laude* graduate of Loyola University of Chicago, Phil received his Masters and Doctorate in Political Science from Northwestern University.

Among his previous writing on electricity competitive restructuring are *Evolution of the Revolution: The Sustained Success of Retail Electricity Competition*, with Erin O'Connell-Diaz (July 2015) and *Customer Choice in Electricity Markets: From Novel to Normal*, (November 2010) both published by COMPETE Coalition; "The Grand Experiment: Has Restructuring Succeeded on Either Continent?" with Terrence L. Barnich, published in *Public Utilities Fortnightly*, February 2007; "Regulation and Relevancy: Assessing the Impact of Electricity Customer Choice," with John L. Domagalski in *ElectricityPolicy.com*, January 2013; "The Electricity Choice Debate: Conjectures and Refutations," with Jonathan A. Lesser, in *The Electricity Journal*, Aug/Sep 2014; and "A Five-Point Plan for the Next Wave of Electricity Restructuring," with Robert Bussa and Wayne Olson, in the May 2016 issue of *Public Utilities Fortnightly*.

Phil.OConnor@PROactive-Strategies.net
312-980-4860

Fadwa Dababneh

Fadwa Dababneh, who conducted the research on comparative retail price volatility for this paper, is a Ph.D. student in the Department of Mechanical and Industrial Engineering, at the University of Illinois at Chicago. She earned her B.S. and M.S. degrees in Industrial Engineering from the University of Illinois at Chicago in 2014 and 2016, respectively. Her research interests are in operations research, sustainable manufacturing, and demand side energy management.

Jared Spilky

Jared Spilky performed the calculations for and prepared many of the illustrations in this paper. Jared is an undergraduate in Industrial Engineering at Bradley University in Peoria, Illinois.

ENDNOTES

[1]DNV GL, the highly regarded international consulting and energy information firm, compiles information from state utility commissions and other sources to estimate a variety of statistics on retail electricity choice provided to subscribers in an annual Retail Energy Outlook Report. The U.S. Energy Information Administration (EIA) of the U.S. Department of Energy, publishes a comprehensive monthly data report, "Electric Power Monthly," that rolls up into annual and historical data sets on the American electricity industry. Figures 1 and 2 in this report are based on data from a variety of authoritative government and industry sources, including EIA, the Department of Labor's Bureau of Labor Statistics (BLS) and various Wall Street indices.

[2]Vito A. Stagliano, *A Policy of Discontent: The Making of a National Energy Strategy* (Tulsa, PennWell, 2001), xiii.

[3]Stagliano, 20 et seq.

[4]Albro Martin, *Railroads Triumphant: The Growth, Rejection & Rebirth of a Vital American Force* (New York, Oxford University Press, 2001), 388.

[5]For a timeline and discussion of financial industry deregulation, see Matthew Sherman, "A Short History of Financial Deregulation in the United States," (Center for Economic and Policy Research, Washington, DC, July 2009, http://cepr.net/documents/publications/dereg-timeline-2009-07.pdf)

[6]Brookings Institution scholars over the years have examined the results of the introduction of competition in regulated network industries. See Robert W. Crandall, "Extending Deregulation: Make the U.S. Economy More Efficient," a position paper prepared for Opportunity 08, a project of the Brookings Institution, February 2008. In addition to his estimates of economic benefits of deregulation of portions of the economy, Crandall opined prior to the flat-load era that "Potentially, the electricity sectors offers the greatest gains from further deregulation, although there is no consensus about the optimal mix of markets and regulation." https://www.brookings.edu/research/extending-deregulation-make-the-u-s-economy-more-efficient/

[7]The electricity regulatory reform trend has been evident outside the United States as well. Several Canadian provinces, Australia, New Zealand and the European Union have all introduced market forces into electricity, including privatization of sectors owned and operated by government, open wholesale markets and retail customer choice. In 2016, Japan and Mexico have also recently adopted retail choice policies.

[8]Academics were key initiators of the electricity competition discussion. The seminal work on the topic was that of MIT scholars Paul L. Joskow and Richard Schmalensee, *Markets for Power: An Analysis of Electrical Utility Deregulation* (Cambridge, MA, The MIT Press, 1983) and the prolific work of Harvard scholar William Hogan.

[9]Opposition to retail electricity customer choice was often justified by the claim that a more robust transmission system and well-ordered wholesale competition were pre-conditions. The actual historical record of retail competition has demonstrated that competitive development at the retail and wholesale levels were mutually supportive and could proceed in tandem, each revealing the need for improvements in the other.

[10]Utility investment was customarily included in rate base and reflect in rates only after the capital asset was operational and "used and useful." The magnitude of investment in new nuclear plants and the delays in construction were such that accumulating carrying costs on debt and equity began to dwarf the rest of the balance sheet. Some utilities borrowed in order to pay dividends to stockholders. In some states, regulators adopted a construction work in progress (CWIP) standard that permitted some of the investment in nuclear plants to be reflected in rates prior to operation. While having the effect of reducing ultimate large one-time rate increases, and even avoiding bankruptcies, the approach was highly controversial.

[11]For a detailed description of the principles, process and implementation of the Illinois competitive electric market, see "Electricity & Natural Gas Customer Choice in Illinois – A Model for Effective Public Policy Solutions (issued by the Illinois Chamber of Commerce, Illinois Manufacturers' Association, Illinois Retail Merchants Association and Illinois Business Roundtable, February 2014) at http://media.mlive.com/business_impact/other/Illinois%20Energy%20Reform%20Feb%202014%20final.pdf

[12]The California Public Utilities Commission failed to heed warnings that the day-ahead requirement for utilities was unwise. Other choice states, while differing from one another in the details, have not mandated day-ahead procurement for utilities charged with providing supply service to residential and small business customer who not choose a competitive supplier. Default service programs, sometimes called provider-of-last-resort service (POLR), differ among the states in a variety of ways. For example, in Illinois block supplies are procured by the Illinois Power Agency, a state government entity through multi-year, layered auctions, with annual reconciliations for energy balancing sales and purchase by utilities. In New York, utilities serve customers at monthly indexed prices. In Texas, competitive providers serve as providers of last resort on an assignment basis in place of wires utilities. The results vary as well, of course. If day-ahead prices are generally declining, then indexed pricing will seem preferable. Hedged prices guard against temporary spikes or periods of general wholesale price increases. In most choice states, residential and small business customers are able to choose competitor suppliers and preferred products rather than to take default service.

[13]Hybrid states are as varied in their approaches to limiting retail customer choice as are the choice states in the details of their market-based programs. In all cases, however, there is strong evidence of considerable customer demand for market access that is permitted to be satisfied under the rules. In Michigan, for example, more than twice as much load than the 10% permitted to access choice is enrolled in choice "queues." Industrial and commercial customers in Arizona, California and Oregon have participated in legislative and regulatory proceedings considering expanded market access. In Nevada, the constitutional amendment adopted by a 72% voter majority in the November 2016 election was originally promoted for the ballot by large customers dissatisfied with utility and regulatory obstacles to electricity retail competition.

[14]For a review of modern utility regulation, see Wayne P. Olson, *The A to Z of Public Utility Regulation*, (Reston, VA, Public Utilities Reports, 2015)

[15]The market share of municipal utilities and rural cooperatives differs significantly across the 14 choice states. They play a smaller roll in New York than in Texas, for example. In Texas, San Antonio and Austin are served by government-owned electric utilities exempt from choice. Rural cooperatives serve large expanses of the state's territory.

[16]A number of state-specific studies in recent years have underscored the benefits of adopting customer choice. In addition to the Illinois study cited in note 10, see"Electricity Customer Choice in Ohio: How Competition Has Outperformed Traditional Monopoly Regulation," Andrew R. Thomas, et al, Cleveland State University at http://engagedscholarship.csuohio.edu/urban_facpub/1416/; and "A Case Study of Electric Competition Results in Pennsylvania," Christine Simeone and John Hanger at http://kleinmanenergy.upenn.edu/paper/electricity-competition.

[17]U.S. Energy Information Agency monthly average prices for the residential customer classes were used in the analysis of differences in price volatility between the 14 choice jurisdictions and the 35 monopoly states. Weighted and unweighted absolute percent change in average prices were considered when building the dataset. The unweighted mean percentage change in average prices was calculated by taking the average absolute price change from one month to another by state. The weighted absolute percentage change was calculated by considering the percentage of sales in each state multiplied by the absolute percentage change. The data were categorized into three time periods for the analysis: (1) the full competitive era 1997-2016; (2) the choice transition period 1999-2007; and (3) the flat load era 2008-2016. A paired t-test was conducted using a 95% confidence threshold. The paired t-test computed the difference within each pair (Competitive vs. Monopoly) of volatility measures by month. Hypothesis tests were used to determine if differences among the means were statistically significant by comparing a Null Hypothesis with the Alternative Hypothesis. The Null Hypothesis suggested that the difference among the absolute percentage changes is equal to zero (i.e. Ho: μcompetitive - μtraditional=0). Meanwhile, the Alternative Hypothesis considers a two tailed, upper tailed, and a lower tailed test (i.e. H1: μcompetitive - μtraditional$\neq$0; μcompetitive - μtraditional>0; μcompetitive - μtraditional<0). If the P-Value is less than α=0.05 we reject the Null Hypothesis (Ho) in favor of the Alternative Hypothesis (H1) with 95% confidence.

[18]The Effectiveness ratio assumes a positive value for consumption growth in a group of states since 1997. Only Kentucky, Maine, Ohio, Oregon and Washington State have seen load decline in 2016 compared to 1997.

[19]Scholarly and academic literature has been accumulating that wholesale and retail electricity consumption is beneficial. For example, see Steve Cicala, "Imperfect Market versus Imperfect Regulation in U.S. Electricity Generation," National Bureau of Economic Research No. 23053, January, 2017; Agustin J. Ros, "An Economic Assessment of Electricity Demand in the United States Using Utility-Specific Panel Data and the Impact of Retail Competition on Prices," *The Energy Journal*, 38(4), 2017 (International Association of Energy Economics); Xuejuan Su, "Have Customers Benefited from Electricity Retail Competition?" *Journal of Regulatory Economics*, 47(2), 146-182, 2015.

[20]Looking forward, despite low electricity prices in PJM, the largest competitive wholesale market, S&P Global Market Intelligence reported in March 2017 that its affiliated S&P Ratings has "…pointed to some 15,000 MW of new gas-fired capacity to come online in PJM Interconnection by 2019…"

[21]For an analysis of the relative performance of choice and monopoly models see Philip R. O'Connor and Erin O'Connell-Diaz, "Evolution of the Revolution The Sustained Success of Retail Electricity Competition," July 2015, COMPETE Coalition, https://www.hks.harvard.edu/hepg/Papers/2015/Massey_Evolution%20of%20Revolution.pdf

[22]Sam Insull was a marketing as well as financial and engineering genius. One of his techniques for building load was to have Chicago Edison trucks go into neighborhoods and distribute free electric irons to homemakers to replace the heavy "sad irons" that had to be heated on stove tops.

[23]The essence of the natural monopoly theory is that in cases in which capital costs are high and incremental operating costs are low, a single supplier may bring cost efficiencies that would not be realized if capital investment were being replicated. Limits on entry avoids the sort of "ruinous competition" that caused so much turmoil in the 19th century railroad industry and contributed to several financial panics.

[24]The contrasting approaches of monopoly regimes and choice markets to elicit demand response commitments from customers can be seen by comparing the adjacent RTOs of PJM and MISO. PJM, in which most customers of its member utilities have choice, has a fully formed demand response program across its large regional footprint that is highly interactive with market prices. MISO, in which only a small percentage of customer have market access, does not have a, RTO-based program, relying instead on traditional interruptible and other demand control programs of individual utilities. Customers in the ComEd area in northern Illinois committed more than 1,000 MW of the 7,800 MW of total demand reduction commitments to PJM for 2016-17. The entire state of Michigan, with load roughly equal to that of ComEd, committed 771 MW in 2016. See "2016 Demand Response Operations Markets Activities Report: March 2017," 5-6 at http://www.pjm.com/~/media/markets-ops/dsr/2016-demand-response-activity-report.ashx and the Michigan Public Service Commission's data on demand response, p12 at http://www.michigan.gov/documents/energy/Michigan_EGEAS_Report__01_31_2017_550217_7.pdf

[25]A thoughtful and provocative report The Brattle Group presents a "counter narrative" to the death-spiral scenario. While largely in accord with the description of the converging conditions in this paper, the report sets out how electricity consumption could double between 2015 and 2050 if the heating and transportation sectors were to go 100% electric and how other transformations in technology and the economy also provide important growth opportunities for utilities. See "Electrification: Emerging Opportunities for Utility Growth," Jügen Weiss, Ryan Hledik, Michael Hagerty and Will Gorman (The Brattle Group, January 2017).

[26]The thrilling stories of the leaders of the electricity revolution a century ago are the story of American modernization, prosperity and improvement in the quality of life. See *Insull: The Rise and Fall of a Billionaire Utility Tycoon* (University of Chicago Press, Chicago, 1962), John F. Wasik, *The Merchant of Power: San Insull, Thomas Edison and the Creation of the Modern Metropolis* (Palgrave MacMillan, New York, 2006), Jill Jones, *Empires of Light: Edison, Tesla, Westinghouse, and the Race to Electrify the World* (Random House, New York, 2003) and Howard L. Platt, *Electric City: Energy and the Growth of the Chicago Area*, 1880-1930 (University of Chicago Press, Chicago, 2003).

[27]USEPA June 2014 Fact Sheet https://www.epa.gov/sites/production/files/2014-06/documents/20140602fs-important-numbers-clean-power-plan.pdf

[28]Although installed nuclear capacity has remained at just about 100,000 MW since the mid-1990, production has increased considerably, from about 673 billion kWh in 1995 to about 800 billion in 2016 due to an increase in capacity factor from 77.4% in 1995 to 92% in 2016. https://www.eia.gov/totalenergy/data/monthly/pdf/sec8_3.pdf

[29]Texas is unique among competitive jurisdictions in not having a capacity auction mechanism. ERCOT operates an energy-only market combined with bilateral wholesale contracts between generators supplier to attract investment in generation and to maintain adequate reserve margins. Adjustments have been made over the years. Customers generally enter into fixed-price power supply contracts.

[30]The U.S. Department of Energy has reported on operation results examined in case reviews of Smart Grid programs funded by federal grants at https://www.smartgrid.gov/files/EAC-Sept-24-2014.pdf

[31]See EIA Electric Monthly Update for February 2015 https://www.eia.gov/electricity/monthly/update/archive/april2015/

[32]For a discussion of voltage optimization and peak load reduction benefits of Smart Grid, see a U.S. Department of Energy report, "Voltage and Power Optimization Saves Energy and Reduces Peak Power" at https://www.smartgrid.gov/files/Voltage-Power-Optimization-Saves-Energy-Reduces-Peak-Power.pdf

[33]Casinos and other large users in Nevada, frustrated by the obstacles to power market access and to renewables and by high exit fees, successfully advocated a customer choice ballot proposition. Constitutional amendments in Nevada must be approved in two consecutive general elections, meaning that the proposition approved by voters in November 2016 will be on the ballot once again in November 2018. In the meantime, however, the legislature could reduce obstacle to customer choice in place under the current competition law. An executive order by the Governor (# 2017-03) designated Nevada's Lieutenant Governor to chair a study group on electricity choice http://gov.nv.gov/News-and-Media/Executive-Orders/2017/EO_-2017-03-Order-Establishing-the-Governor_s-Committee-on-Energy-Choice/

[34]On February 8, 2017, the Nevada PUC decided that "In response to the voters overwhelming support of the Energy Choice Initiative and the move toward a competitive marketplace for energy, the Commission denies NPC's request to acquire South Point…" see paragraph 106 at 59 of the PDF of order at http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2016-7/18652.pdf

[35]Arizona, Oregon and Virginia all enacted competitive restructuring law during the first wave, but aggressive monopoly utility opposition to customer choice has resulted in onerous conditions that frustrate market access.

[36]H.F. No. 2248, if enacted into law, would allow customers in Minnesota taking service at or above 69kV to procure some or all of their supply in market starting in January 2020. The residential rate increase to allow for a discount to retain at-risk industrial load is a classic admission that the regulated monopoly rates are above market and that the business risk falls on captive customers (http://www.startribune.com/minnesota-power-residential-customers-face-6-5-percent-rate-increase/415823804/)

[37]Indicative of discontent among Wisconsin industrial customers is a July 2016 newspaper op-ed by a steel company executive (http://archive.jsonline.com/news/opinion/time-to-restore-competitive-electricity-prices-b99757278z1-385887411.html).

[38]In Missouri, HB 439 would permit C&I customers to purchase renewable power supplies in the market. Companies including Walmart, Target, General Mills and General Motors have written to the Missouri House and Senate leadership in support of HB439 (http://midwestenergynews.com/2017/02/07/wal-mart-other-companies-back-missouri-bill-to-allow-power-purchase-agreements/).

[39]See the agenda for the August 2016 Indiana Chamber Energy Management Conference at http://www.indianachamber.com/index.php/indiana-conference-on-energy-management-conference-materials and the relevant materials at http://www.indianachamber.com/images/media/2016_conferences/energy/materials/5B_O'Connor_Morey.pdf

[40]For commentary on the overall results of non-volumetric rate design requests, see https://www.nrdc.org/experts/samantha-williams/theyre-ba-ack-fixed-fee-hikes-still-getting-nixed

[41]Samantha Williams of the Natural Resources Defense Council reported on the mixed results of utility requests for non-volumetric rates at https://www.nrdc.org/experts/samantha-williams/theyre-ba-ack-fixed-fee-hikes-still-getting-nixed, February 2017.


RESA
Retail Energy Supply Association