The Maryland Public Policy Institute

THE MARYLAND ELECTRICITY MARKET

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The Maryland Public Policy Institute

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A Primer

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1. INTRODUCTION

ON APRIL 8, 1999, MARYLAND GOVERNOR PARRIS GLENDENING signed the Electric Utility Industry Restructuring Act. The signing marked the beginning of the end of the state's regulated-monopoly electricity industry that had operated for much of the 20th century. In its place, Maryland would embrace a "deregulated"[1] market in which consumers would purchase electricity at market-established rates. At the time of the legislation's adoption, deregulation efforts of various designs were underway in most other Northeast states, Texas, and California.

Prominent Annapolis policymakers hailed the legislation, which passed both houses of the General Assembly by overwhelming margins. "This bill is too important for Maryland's future to hold up further," Glendening told the press[2] immediately after the bill received final approval from the legislature. "Bringing competition will drive prices down," predicted State Senate President Thomas V. Mike Miller Jr.[3], one of the chief architects of the legislation.

But lawmakers' appraisal of deregulation would change dramatically over the next seven years. In February 2006, one of Maryland's largest power utilities, Baltimore Gas and Electric (BGE), announced plans to raise its residential electricity rate 72 percent. Legislators responded by excoriating BGE and branding the 1999 legislation a failure.[4, 5]

Why did lawmakers see such promise in deregulation in 1999, only to change their minds so dramatically by 2006? And why, today, is there little interest in Annapolis in discontinuing this supposedly failed policy?[6] These are some of the questions this paper seeks to answer.

This paper is intended to help readers better understand the issues involved in electricity policy. It is often said that electricity policy presents a host of hopelessly complex issues. The technical details of the power industry are indeed complex, but the public policy issues are fairly straightforward. This does not, however, mean there is a single "correct" policy solution. Instead, like much of domestic policy, there are different policy proposals that each offer various tradeoffs between costs and benefits, and the net result of those tradeoffs vary for different groups of Marylanders. Therefore, it is especially important that Marylanders understand the issues involved and participate in the policy discussion.

This paper presents a brief overview of the industry and its history, and explains how its regulation evolved. The paper then discusses why traditional electricity market regulation fell into disfavor and was replaced by deregulation, both in the United States and other developed nations. Special attention is given to the unfolding and aftermath of Maryland's deregulation. The paper concludes with some thoughts on how Maryland can pursue better electricity policy.

2. THE ELECTRICITY INDUSTRY

Before discussing electricity industry regulation and deregulation, it is helpful to have a basic understanding of how the industry functions, and especially how it responds to the demand cycle. The demand cycle lies at the heart of Maryland's electricity challenge, and good electricity policy must address it.

2.1 The Basics The electricity industry can be divided into four separate components:

Generation — The production of electricity

Transmission — The movement of electricity across high-voltage, high-capacity power lines from the source of generation to geographic areas where it will be consumed

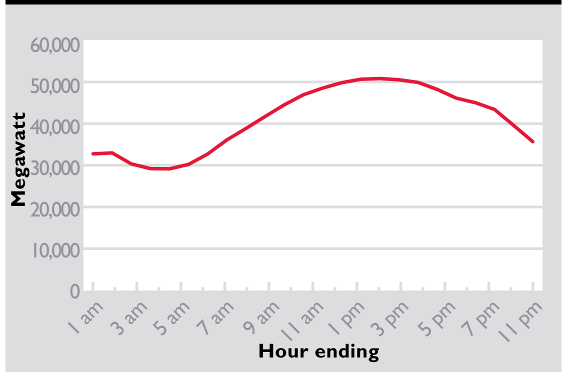
Distribution — The "stepping down" of electricity to low-voltage, low-capacity lines that deliver it to end-users such as individual homes and businesses

Marketing — The promotion and billing for electricity services

As will be explained in Sections 3 and 4, monopoly power utilities — either publicly-owned, or shareholder-owned and heavily regulated — have historically undertaken all four of these components. In recent decades, however, some firms have come to specialize in individual components. For instance, independent merchant generators only produce electricity, which they can then sell on the wholesale market to utilities that need additional generation. The electricity can then be delivered to the utility over transmission lines operated by a third party, such as PJM Interconnection, which services much of the Northeast, including Maryland. As will be discussed in Section 2.2, the emergence of specialty firms can be helpful in meeting the demand cycle; later sections will discuss how the separation of these components made deregulation possible.

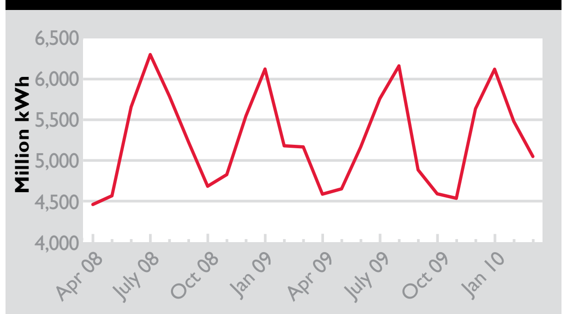
2.2 The Demand Cycle The electricity market experiences large, cyclical shifts in demand throughout the day and throughout the year. *Figure 1* shows the variation in demand on a recent day for

FIGURE 1 PJM FORECASTED CONSUMPTION JUNE 22, 2010



SOURCE: PJM Interconnection

FIGURE 2 ELECTRICITY CONSUMED IN MARYLAND APRIL 2008 - MARCH 2010

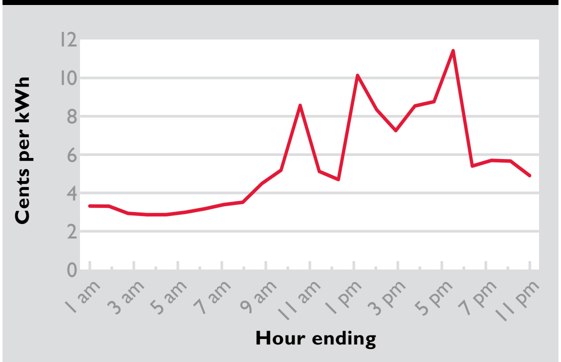


SOURCE: U.S. EIA, Electric Power Monthly *(July 2009-June 2010). Tables 5.4.A*

PJM Interconnection. The pattern is understandable: demand ramps up as the workday begins, and peaks from the mid-afternoon to the early evening when customers are doing housework and preparing dinner. (The particular day depicted in this figure is in early summer, so the demand for air conditioning further increased the mid-afternoon peak.) *Figure 2* shows the variation in monthly demand for electricity in Maryland over a two-year period. Again, the pattern is understandable: demand intensifies during the cold of winter and the heat of the summer, when furnaces and air conditioners are in heavy use. Not surprisingly, the wholesale market price for electricity moves upward as demand intensifies, and declines as demand falls (see *Figures 3* and *4*).

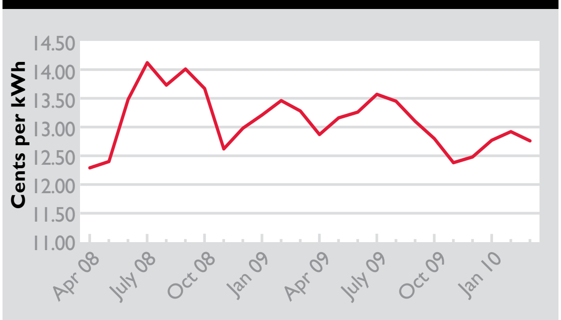
Electricity production and consumption[7] must be balanced across the grid, or else the grid will experience harmful brownouts (if there is insufficient supply) or power surges (if there is excess supply). In the United States, electricity typically

FIGURE 3 PJM LOCATION MARGINAL PRICE JUNE 22, 2010



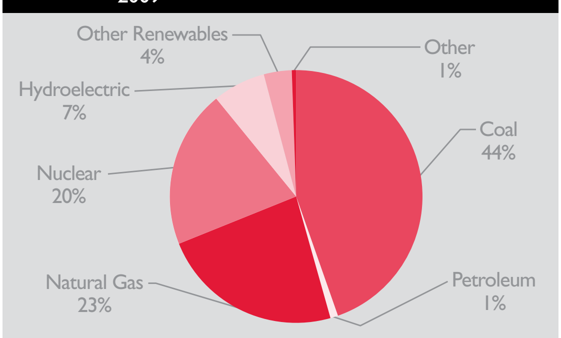
SOURCE: PJM Interconnection

FIGURE 4 AVERAGE MONTHLY PRICE FOR ELECTRICITY IN MARYLAND APRIL 2008 - MARCH 2010



SOURCE: U.S. EIA, Electric Power Monthly *(July 2009-June 2010). Tables 5.6.A*

FIGURE 5 U.S. NET GENERATION BY ENERGY SOURCE 2009



SOURCE: U.S. EIA, Electric Power Monthly, *June 2010, Tables 1.1*

is sold at a constant retail price (i.e., at fixed rates). Hence, price changes cannot be used to moderate consumer demand at peak periods. Instead, supply response is the principal means of maintaining balance: more and more generators must be brought online as demand increases, and taken offline as demand falls.

This marshalling of additional generation during peak demand lies at the heart of Maryland's electricity woes. The marginal cost of electricity (i.e., the cost of adding an additional unit of supply) varies greatly across the demand cycle. Peak power is expensive, with a wholesale price that is multiple times the price of off-peak electricity. That is because "peakers" (i.e., generators that are brought online to meet escalating demand) must earn enough revenue during their brief periods of operation to justify their capital and operating costs. As will be discussed in Section 2.3, peakers employ different technologies and different fuels than "baseline" generators that operate more regularly. These differences are intended to provide the most cost-efficient supply response to the demand cycle.

When energy experts worry about Maryland's future supply of electricity and its cost, their concern is about meeting peak demand. If the peaks can be moderated even slightly, that would greatly benefit Maryland consumers.

2.3 Meeting Demand The United States uses a variety of methods to generate electricity (see *Figure 5*). The most common methods use the burning of coal (the source of 44 percent of the nation's electricity in 2009) or natural gas (23 percent), or nuclear fission (20 percent).[8] Given the particular economics of each method, the electricity industry calls on different forms of generation at different times as demand moves toward its peak, and idles different forms of generation as demand falls away from the peak. It is not uncommon to find that 10-15 percent of capacity may come into service less than 1 percent of the time — at moments at the absolute peak of demand.[9]

Capital and fuel costs for different generation methods are shown in *Tables 1* and *2*. These costs vary dramatically from one to another. The lowest-capital cost generators are natural gas-fired (assuming that carbon capture technology is not employed), followed by onshore wind and coal-fired power. The most expensive forms are nuclear, biomass, offshore wind, geothermal, and solar power. However, those latter forms of generation have the lowest fuel costs — so low that they are not comparable to the numbers in *Table 2*. Unfortunately, some of these latter forms of gen-

TABLE 1 CAPITAL COSTS FOR NEW GENERATION 2007 DOLLARS PER KWH

	CLASS	2015 DELIVERY	2030 DELIVERY
COAL	SCRUBBED (NEW PLANT)	$2,056	$1,964
	INTEGRATED COAL-GASSIFICATION (IGCC)	$2,352	$2,141
	IGCC + CARBON CAPTURE	$3,411	$3,006
NATURAL GAS AND OIL	COMBINED CYCLE	$962	$918
	ADVANCED COMBINED CYCLE (ACC)	$941	$851
	ACC + CARBON CAPTURE	$1,840	$1,590
	CONVENTIONAL TURBINE	$670	$640
	ADVANCED TURBINE	$628	$545
ALTERNATIVE TECHNOLOGIES	FUEL CELLS	$5,066	$4,104
	ADVANCED NUCLEAR	$3,255	$2,951
	BIOMASS	$3,682	$3,012
	LANDFILL GAS	$2,541	$2,426
	GEOTHERMAL	$4,456	$4,661
	CONVENTIONAL HYDROPOWER	$2,358	$2,157
WIND	ONSHORE	$1,935	$1,918
	OFFSHORE	$3,758	$3,395
SOLAR	THERMAL	$4,665	$3,660
	PHOTOVOLTAIC	$5,707	$4,539

NOTE: Data shown are for "total overnight cost," assuming future prices are steady with current prices.

SOURCE: U.S. EIA, Report DOE/EIA-0554, 2009, Table 8-13

eration have poor reliability (e.g., wind turbines provide little electricity on low-wind days, solar plants cannot operate at night), and the minimal ability to store electricity[10] does not allow for their production to be saved for later use when those sources are unavailable.

Given those considerations, the electricity industry calls on generation that is reliable, has low operating cost, but also has high capital cost, to provide baseline power. These generating assets are predominantly coal-fired or nuclear. Because they are operating and selling power at (almost) all times, these assets justify their high capital cost; in essence, their capital cost is spread over all consumers at all hours of the day.

To supplement baseline supply during peak periods, the industry calls on generation that is reliable and has low capital cost, but has high operating cost. Because the fixed costs of these assets are low, the industry can afford to allow peakers to sit idle for much of the day or year. However, when they are in use, peakers must sell their power at a price that recoups their capital and operating costs.

In electricity markets with fixed rates, the rate will equal the *average* total cost of generation for all assets that are employed. That means that in times of low consumption and low generation costs, consumers pay rates that are much higher than the cost of generating the electricity they are using. That extra revenue then goes to help cover the cost of peakers that operate in periods of high demand, when their costs are higher than the fixed rates. Conversely, in markets with varying rates, such as the PJM Interconnection wholesale market, the rates reflect marginal cost. In these markets, peakers will only operate at times when rates cover the peakers' costs.

Unreliable sources of power, such as solar and wind, are not a good fit for either baseline or peak

TABLE 2	FUEL COSTS BY GENERATION SOURCE DOLLARS PER MILLION BTUS (2009 AVERAGE)
COAL	$2.21
NATURAL GAS	$4.70
PETROLEUM LIQUIDS	$9.95
PETROLEUM COKE	$1.62

SOURCE: U.S. EIA, Electric Power Monthly, *June 2010, Table 4.1*

production. Because solar and wind power are available sporadically, they cannot be counted on for baseline generation, which power companies must draw on continuously. (This is disappointing because it would be of great environmental benefit to replace the burning of high-emission, carbon-intensive coal.) And because they cannot be dispatched on command, these power sources cannot serve as peakers. As a result, solar and wind are seen primarily as providing "bonus" power that can reduce the burning of fossil fuel, but cannot be relied upon to replace dependable generating assets.[11]

3. HISTORY AND REGULATION[12]

To understand why deregulation became so attractive to Maryland and other Northeast states in the 1990s, it is helpful to briefly review the history of the commercial power industry and understand how the industry and its regulation evolved. Like most American industries, it is a story of technological and financial innovation, coupled with politics and economics.

3.1 Evolution Of The Industry Commercial power in the United States dates to September 1882, when Thomas Edison opened the Pearl Street Station generating plant in Manhattan. The small plant's coal-fired reciprocating steam engines turned generators that supplied current for a few hours each night. Because of resistance in power lines, the low-voltage direct current could only be transmitted a short distance, so the plant could only supply its immediate neighborhood. Pearl Street Station initially supplied a few dozen customers, and ultimately a few hundred, including the New York Times Company. Soon, other plants popped up in New York and other urban areas, likewise supplying power to their immediate neighborhoods.

This industrial organization would change in the next decade, following George Westinghouse's opening of the massive Niagara Falls hydroelectric plant in 1896. The plant produced high-voltage alternating current, which could be transmitted long distances and used in heavy industry, such as the factories 20 miles away in then-bustling Buffalo, New York. About the same time, coal-fired plants were replacing their reciprocating engines with large, more-efficient steam turbines that could turn larger generators and produce more power.

Along with these technological innovations came major financial and business advances. In the 1920s, Sam Insull in the Midwest and Alfred Lee Loomis and Landon Thorne in the South demonstrated that commercial power could be economically viable and financially attractive across broad areas, not just in dense metropolitan areas. As a result of these technical and economic developments, the small neighborhood electricity plants began to give way to large central plants located outside urban areas. Electricity was transmitted from the plants over large high-voltage transmission lines and delivered to industrial users, and converted to lower voltage and delivered to households and small businesses over distribution lines. Large central power stations supplying extensive electrical grids became the electricity industry standard by the mid-20th century, both in the United States and other developed countries around the world.

It is important to appreciate why this industrial organization became standard. The centralized plants realized important efficiencies of scale and scope that made commercial power attractive to both consumers (who wanted low-priced, convenient energy) and investors (who wanted good returns). What proved particularly efficient was that power suppliers were *vertically integrated* (i.e., the supplier owned and operated the generators, transmission lines, and distribution lines). Vertical integration overcame important engineering and economic challenges to commercial electricity. On the engineering side, the production and consumption of electricity across the grid must be balanced at all times, as noted in Section 2.2. On the economic side, separation of the generation and delivery of electricity into independent businesses could result in opportunistic behavior between the two types of firms and perhaps even lead to costly fights over quasi-rents (i.e., excess profits). Vertical integration avoided that mischief and the combined entity was better able to manage the grid. Put simply, vertical integration in the mid-20th century electricity industry was efficient: it lowered costs and improved product quality.

3.2 Rise Of Regulation The economic and engineering benefits of large, vertically integrated electricity providers made the providers into natural monopolies. Small suppliers of electricity faced economic pressure to consolidate in order to lower their costs, increase their customer base, and improve the quality of their product, while potential competitors faced considerable difficulties trying to enter a market where an efficient, consolidated supplier already existed. Thus, in the early decades of the 20th century, there was immense consolidation in the electricity industry as early, independent firms combined to form larger, more efficient (but also more monolithic) companies. By the late 1920s, just 16 electric power holding companies controlled more than 75 percent of all U.S. generation.

There is nothing necessarily malevolent about natural monopoly. It simply means that the industry operates most efficiently with just one provider for a geographic area. However, natural monopolies have the opportunity to abuse their market position by charging higher prices and providing lower-quality goods to their captured consumers. Policymakers in the early 20th century recognized this danger, but they also appreciated the efficiency that gave rise to natural monopoly. As a result, state governments, and later the federal government under the 1935 Public Utility Holding Company Act, decided not to break up the giant electric companies. Instead, they established special regulatory structures that provided government oversight of electricity prices and required government approval of such activities as new plant construction. In return for being regulated, the utilities' monopoly positions and customer bases were protected by state law, and state public service commissions (PSCs) were required to set electricity rates at levels that guaranteed utility profitability.

This "regulated monopoly" form of industrial organization dominated the power industry in the United States and the rest of the developed world for much of the 20th century. Because of stable fuel prices and the United States's steady industrial growth following World War II, supply and demand for electricity in the century's middle decades were fairly predictable and thus easily manageable. As a result, the rigid economic and regulatory structure of the electricity industry was relatively free of disruptive shocks. That would change in the century's later decades.

4. DEREGULATION

The regulated monopoly model seemed to serve electricity consumers and producers well. But it suffered some important flaws.

One flaw was fixed electricity rates. The lengthy, politicized process of gaining state PSC approval for electricity rate changes meant that market-derived prices could not be used to moderate demand and assist utilities in maintaining the all-important balance between supply and demand.[13] Instead, as noted in Section 2.3, utilities maintained that balance by building vast generation capacity that would then sit idle much of the time, awaiting spikes in demand. Vast excess capacity is an effective, but very expensive, strategy to avoid imbalances.

Another flaw in traditional electricity industry regulation was that utilities faced no market competition on rates, and the state PSCs were required to approve electricity rates at profit-generating levels. As a result, utilities were protected from the effects of bad business decisions that received PSC approval — such as the over-construction of, and overpaying for, capacity.

A third flaw was that regulators would not permit the utilities to earn windfall profits, including the profits that would result from successful market innovation. Without such profits, utilities had little incentive to experiment with new ideas in generation, transmission, and demand management. Instead, state regulators were responsible for determining if a utility's operations and planning were sufficiently innovative and efficient, and resulted in good prices for the public. If the PSCs failed in this all-but-impossible duty, then consumers shouldered additional cost.

4.1 Stress On The System As noted at the end of Section 3.2, these flaws caused few problems in the mid-20th century. The U.S. economy grew steadily following World War II, which resulted in predictable growth in electricity demand. Likewise, the supplies of inputs (chiefly coal) for U.S. electricity generation were relatively dependable, though droughts occasionally caused problems for

TABLE 3 RESIDENTIAL, COMMERCIAL AND INDUSTRIAL ELECTRICITY RATES — SELECT STATES AND YEARS AVERAGE PRICE IN CENTS PER KWH

	1990			1998			2009		
	RES.	COMM.	IND.	RES.	COMM.	IND.	RES.	COMM.	IND.
CALIFORNIA	9.98	9.46	7.28	10.59	9.49	6.49	15.08	14.04	10.56
CONNECTICUT	10.01	9.11	7.55	11.95	10.01	7.70	20.28	15.93	15.36
IDAHO	4.87	4.25	2.62	5.28	4.34	2.92	7.67	6.50	5.27
KENTUCKY	5.69	5.37	3.58	5.61	5.30	2.91	8.39	7.66	4.95
MAINE	9.30	8.03	5.96	13.02	10.33	6.61	15.41	12.53	10.12
MARYLAND	7.22	6.71	5.10	8.44	6.82	4.14	15.16	12.14	10.01
MASSACHUSETTS	9.66	8.56	7.89	10.60	9.35	8.18	17.30	18.02	11.46
NEW YORK	11.44	10.47	5.78	13.62	11.44	4.95	18.48	15.56	10.81
NORTH CAROLINA	7.84	6.42	4.77	8.01	6.35	4.63	10.19	8.07	6.04
PENNSYLVANIA	9.22	8.09	5.97	9.87	8.24	5.60	11.73	9.60	7.20
TENNESSEE	5.69	6.09	4.69	6.32	6.28	4.17	9.30	9.47	6.66
VIRGINIA	7.25	6.06	4.27	7.51	5.61	3.82	10.75	8.19	6.91
WEST VIRGINIA	5.90	5.36	3.56	6.29	5.56	3.78	7.82	6.69	5.20
WYOMING	5.97	5.17	3.47	6.28	5.25	3.38	8.54	7.28	4.84

SOURCE: U.S. EIA, Electric Power Monthly, *June 2010, Table 5.3*

the hydroelectric-dependent West. Though technological advances in energy continued, the basic power industry model of giant turbines turned by coal-produced steam or falling water proved enduring. As a result, relatively few shocks disrupted the mid-century U.S. electricity market, and the traditional industry organization and its regulation proved adequate.

But that stability disappeared in the latter part of the 20th century. First, many U.S. utilities (with substantial incentives from the federal government) invested heavily in nuclear-powered generation, which was believed at the time to be the source of secure, ultra-low cost electricity. Then, in response to 1970s concerns about the nation's energy supply, federal and state lawmakers adopted a series of ill-conceived energy policies, highlighted by Congress's passage of the Public Utilities Regulatory Policy Act of 1978 (PURPA). The legislation mandated that utilities, under the direction of state PSCs, enter into long-term purchasing agreements with independent "merchant generators" so as to increase supply. Nuclear plant construction ultimately proved far more difficult and costly than originally expected, and the long-term contracts under PURPA proved vastly overpriced. State PSCs then dutifully passed the costs of those poor investments on to ratepayers.

By the 1980s and 1990s, those costs were weighing heavily on consumers in the United States and other developed countries that had followed similar policies. In the Northeast and California, where power demand grew dramatically in the latter part of the 20th century, electricity rates were much higher than elsewhere in the nation (see *Table 3*). In response to the escalating prices, large users of electricity — led by heavy industry — began looking to relocate to areas where electricity was cheap and plentiful. Appealing locations included Appalachia and the Midwest, where the population exodus earlier in the century had left behind underutilized, cheap-to-operate "old coal" power plants that were not subject to the plant-specific environmental controls contained in the 1970 and 1977 Clean Air Act amendments.

4.2 Preparing For Deregulation Facing the prospect of losing those industries and the many (often unionized) jobs they provided, Northeastern states and California responded with a novel policy solution: instead of the heavy users relocating to places with cheap electricity, the high-cost states would allow generators in such low-cost states as Kentucky, West Virginia, Idaho, and Wyoming to sell their electricity in the high-cost states. This solution became technologically feasible following the Great Northeast Blackout of 1965, when utilities began interconnecting their balkanized power grids so as to allow the transfer of power from one utility to another during emergencies.

In order for electricity to be purchased from out-of-state generators, lawmakers in Washington, D.C. had to amend federal law to allow the formation of competitive wholesale markets in bulk electricity. States also had to end the protected-monopoly status of utilities and instead open their markets to independent entrants. Some states embraced wholesale-only deregulation, which meant that utilities in high-cost states could purchase supply from lower-cost generators. Other states went so far as to deregulate retail: individual households and businesses could purchase electricity directly from different generators. Proponents of deregulation believed that, by taking these steps, the electricity industry would experience the reduced prices and market innovations experienced in other U.S. industries that deregulated in the 1970s and 1980s.[14]

Federal policymakers met the former requirement with provisions contained in the 1992 Energy Policy Act. For states, the policy response was more complex, as the states had to overcome three significant problems in order to deregulate. Below is a brief description of each problem, as well as the policy that was typically adopted to resolve it.

4.2.1 Divestiture States that wanted to deregulate and create an electricity marketplace had to neutralize the natural monopoly advantage of the incumbent vertically integrated power companies. That advantage was in the "wires": local distribution and transmission are economically impractical to duplicate. Independent power producers had to rely on the incumbent utility's power lines to deliver the independents' electricity (for a fee), which meant the independents were vulnerable to discrimination by the incumbent utility. If the owners of those grids had the ability and incentive to provide their own generators with preferential access to the wires, they could manipulate this position in such a way as to thwart the benefits that competition could bring to consumers.

To overcome that problem, deregulating policymakers usually require the incumbent utilities to separate the distribution and transmission components of their operation from the generation component. This is typically done either through divestiture of the generating assets or by implementing "open access" rules that require the transmission and distribution side of the utility to treat merchant generators no differently than its own generators. The utility's distribution component remains a regulated utility, tasked only with providing the wire network that delivers electricity to consumers.

Thus, deregulation only exposes the generation portion of the electricity industry to the incentives and discipline of market forces. Transmission and distribution continue to have the economic benefits and problems of natural monopoly, and thus remain under the traditional regulated-monopoly model, with PSC oversight and rate-setting (for distribution services) that guarantee profitability. Not surprisingly, these regulated distribution monopolies face the same "protected from their bad business decisions" criticisms that their vertically integrated predecessors faced.

But even with these "open access" rules, the distributor-utility may not really act independently of its spun-off and sold-off generating assets. The sold-off assets often end up in the hands of parent companies of the distributor-utilities. This could be an efficient, consumer-benefiting outcome for much the same reason that the old vertically integrated firms were efficient: it allows for economies of scope in grid management and promotes the balancing of generation and consumption. But the incentives remain for distributor-utilities to discriminate against competing merchant generators in order to force consumers to buy electricity from generators owned by the distributor-utilities' parent companies.

4.2.2 Transition States that attempted to create a retail market in electricity faced a second challenge: how to prepare consumers for such a dramatic change. Electricity was always something that was provided by *the* power company at fixed rates, but now consumers were to choose from competing power companies that would likely offer different rate structures. Large commercial and industrial consumers, who demanded the move to deregulation, had ample monetary incentive to study the retail electricity market and make informed buying decisions, and merchant generators had similar large financial incentive to market to those large consumers. But small consumers — especially individual households — had less financial incentive to become savvy electricity customers, and electricity suppliers had less incentive to reach out to individual small consumers.

Lawmakers who embraced retail competition typically adopted a two-step approach to deregulation. First, deregulation would only occur at the wholesale level: utilities would begin purchasing electricity on the wholesale market at the best price. The utilities would then charge their customers PSC-approved rates that reflected wholesale market prices.

As part of this step in deregulation, some states required the utilities to sell the purchased electricity to customers at a lower rate than they had been charging under regulation. This politically appealing requirement seemed feasible because, during the 1990s, wholesale market electricity prices were falling as a result of technological advancements in natural gas-fired generation, deregulation of the natural gas supply, and the new ability of low-cost suppliers to sell electricity to wider geographic areas. Policymakers and market observers believed those trends would continue well into the future. Some distributor-utilities were able to enter into long-term, low-price contracts with merchant generators, which ensured that the utilities would remain profitable despite having to resell electricity at the mandated lower rates. Some individual customers could choose to forgo this "standard offer service" and instead buy their electricity directly from merchant generators — in essence, diving into the retail market early. But few residential and small business consumers chose to do so because standard offer service presented such a bargain.

Later in the transition period, the retail electricity market would open. Policymakers envisioned consumers of all sizes becoming active shoppers, searching for good deals. If some consumers failed to make this jump, states that adopted a retail market would require the utilities to continue supplying standard offer service, but the rates would adjust to reflect the market prices that the distributor-utilities had to pay for power. The state PSCs would oversee the distributor-utilities' subsequent contracts with merchant generators and the standard offer service rate setting, to protect consumer interests, but even standard offer service consumers would be subject to price changes in the electricity marketplace.

4.2.3 Stranded Costs Deregulating states faced a third problem: how to overcome opposition from incumbent utilities, which were about to lose the valuable security of their regulated monopoly status and instead be exposed to the marketplace. The greatest opposition came from utilities saddled with heavy capital costs from the construction of nuclear power plants and state-imposed PURPA obligations. Those utilities complained that deregulation was an unfair "changing of the rules in the middle of the game": they would have made different business decisions had they known they would lose their protected status. The incumbent utilities, facing lower-cost independent generators, feared they would not be able to survive financially.

Most deregulating states simply chose to pay off the incumbent utilities in order to remove their opposition. State policymakers stipulated that, for a specified period, all electricity customers, no matter what generator provided their power, would be assessed a "stranded cost recovery fee" that would go to the incumbent utility. The resulting revenue typically was not enough to offset the loss that the utilities claimed they faced,[15] but it was enough to purchase their acquiescence. Merchant generators, however, were not pleased that their customers were to be assessed a tax to pay off their competitors.

4.3 Success And Failure Interestingly, most of the states that deregulated electricity were states that historically have been more aggressive in market regulation, while states with a more laissez-faire history were more likely to retain traditional electricity market regulation (see *Table 4*). A possible explanation for this difference is that the more regulatory states came to outstrip the local supply of electricity, creating the need to import cheap power from distant generators. A related explanation is that heavily unionized states may tend to be more regulatory, but the rising cost of electricity in the Northeast threatened blue collar union jobs and created a mandate for electricity deregulation.

Whatever the reason, states that chose to deregulate their electricity markets in the 1990s initially appeared to have made a good policy choice. Large consumers and utilities did initially find suppliers that could provide electricity at lower cost than under regulation. This happened despite the fact that little of the ultra-cheap electricity from states like Kentucky ultimately flowed to high-rate states. Those interstate flows were blocked

TABLE 4 ELECTRICITY MARKET STRUCTURE BY STATE AS OF 1/1/2010

DEREGULATED STATES	
CONNECTICUT	NEW HAMPSHIRE
DELAWARE	NEW JERSEY
DISTRICT OF COLUMBIA	NEW YORK
ILLINOIS	OHIO
MAINE	PENNSYLVANIA
MARYLAND	RHODE ISLAND
MASSACHUSETTS	TEXAS
MICHIGAN	
DEREGULATION BEGUN, BUT NOW SUSPENDED	
ARIZONA	NEVADA
ARKANSAS	NEW MEXICO
CALIFORNIA	OREGON
MONTANA	VIRGINIA
TRADITIONALLY REGULATED STATES	
ALABAMA	MISSOURI
ALASKA	NEBRASKA
COLORADO	NORTH CAROLINA
FLORIDA	NORTH DAKOTA
GEORGIA	OKLAHOMA
HAWAII	SOUTH CAROLINA
IDAHO	SOUTH DAKOTA
INDIANA	TENNESSEE
IOWA	UTAH
KANSAS	VERMONT
KENTUCKY	WASHINGTON
LOUISIANA	WEST VIRGINIA
MINNESOTA	WISCONSIN
MISSISSIPPI	WYOMING

Source: U.S. EIA

by congestion on transmission lines, which limited the distance that power can be shipped,[16] and by lawmakers in the low-cost states who passed laws to keep the cheap electricity at home.[17] Instead, lower-cost providers with minimal legacy costs began operating in and around deregulated states. Consumers were pleased with the initial lower rates, large industrial and commercial consumers quickly became active consumers in the retail electricity market, and electricity generators became measurably more careful with their capital investments[18] — or else they went bankrupt.[19]

However, that success was countered with more discouraging results in the mid-2000s. When the initial state-mandated lower electricity rates under deregulation began to expire in the early 2000s, fossil fuel prices were rising (see *Figure 6*). As a result, wholesale prices soared, driving up standard offer service rates. Moreover, in states that attempted retail competition, a robust residential retail market never materialized. Though supply in the retail market for industrial and commercial electricity consumers is competitive, supply in the residential market typically is comprised of the incumbent utility offering standard offer service and some niche competitors that offer "alternative energy," typically wind power,[20] but that offer little price competition. The benefit of clearly lower prices that deregulation had brought to other markets did not materialize in electricity, to the chagrin of policymakers.

4.3.1 California No discussion of U.S. electricity deregulation is complete without a brief look at the California electricity crisis of 2000-2001. The crisis was a perfect storm of bad weather, bad policy design, bad politics, and bad behavior by power suppliers.

The genesis of the crisis, surprisingly, is the multi-year drought that California began suffering in the late 1990s. The state is heavily dependent on hydroelectric power; from 1995 to 1998, 26.5 percent of California electricity was produced from conventional hydroelectric generation and pumped storage.[21] The drought curtailed hydroelectricity, lowering its share of California's electricity supply to 21.4 percent in 1999, 18.9 percent in 2000, and just 12.7 percent in 2001. The time period 2000-2001 also brought a very hot summer followed by a very cold winter, which increased Californians' electricity demand at the same time the drought reduced supply.[22]

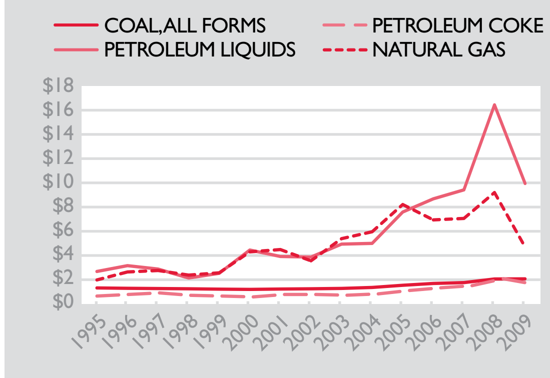
In 1996 when the California legislature adopted wholesale-only electricity deregulation, it required the incumbent utilities to partially divest their generating assets and instead purchase electricity on the day-ahead and "spot" (immediate) markets. The legislature also froze retail rates for electricity. As a result, when demand for electricity soared in California in 2000-2001 at the same time that hydroelectricity was declining sharply, the incumbent utilities were forced to purchase electricity on the wholesale market at extremely high prices that they could not pass on to customers. Wholesale prices that had fluctuated between $20 and $50 per megawatt hour since the mid-1990s suddenly surged upward, at one point topping $400 in late 2000.[23] As a result, the utilities began hemorrhaging money, especially in southern California. Pacific Gas and Electric would ultimately file for bankruptcy because of the losses and Southern California Edison would receive a $3.3 billion rescue deal from the state.[24]

Adding to the misery, a few merchant generators began gaming the market. They took advantage of congested power lines to claim bonuses for supposedly reducing congestion, and they idled some generation in order to drive up spot prices, then sold their power at the inflated price.[25] Usually, this strategy is unsuccessful in competitive markets, but in periods of peak of demand and little excess capacity to provide competition, the strategy can yield windfalls.

To staunch their losses, the utilities reduced demand by imposing "rolling blackouts," shutting off power to groups of customers for hours at a time. The blackouts provoked immense public outcry, pressuring California's political officials to find some resolution to the crisis. Governor Joseph "Gray" Davis stepped in, but instead of lifting the retail price freeze in order to encourage conservation and buttress the utilities, he negotiated long-term power contracts with suppliers that obligated Californians to pay $43 billion for electricity over the next 23 years.[26] The contracts resulted in the utilities paying less for wholesale electricity than what they had been paying on the spot and next-day markets, putting an end to the rolling blackouts. But within months of signing the contracts, as the weather moderated, hydroelectricity supply improved, and new sources of generation came online, the long-term contracts began to seem like a very bad deal for Californians. A second round of public outcry resulted in David being recalled from office in October of 2003.

The California crisis was initially seen as evidence that electricity markets should not be deregulated. Several states that were moving toward deregulation halted the policy change. In time, views on the episode have moderated, with some observers considering it to be a combination of bad circumstances, bad policy design, and bad behavior by some market participants that was not detected by regulators.

FIGURE 6 GENERATOR FUEL COSTS FOR MAJOR ENERGY SOURCES
Average Cost to Generate a Million BTUs



SOURCE: U.S. EIA, Electric Power Monthly, *June 2010, Table 4.1*

4.4 What's The Difference? Do consumers benefit from traditional electricity regulation, or from deregulation? Proponents of deregulation claimed that it would produce lower prices by subjecting producers to market competition, and would also offer consumers such "niche" choices as the ability to purchase wind-produced power. Regulation defenders responded that the traditional regulation offered the lowest prices by protecting consumers from the marketplace. In truth, both sides overpromised.

Under traditional regulation, the cost of electricity is determined by average capital and operating costs, as explained in Section 2.3. In light of a utility's overall capital and fuel costs, the PSC sets the rates that consumers must pay. Consumers cannot defect from this arrangement and purchase from an alternative supplier, even if the utility and the PSC approve business decisions that ultimately prove costly and ill-considered.

In a deregulated setting, consumers are not captured by their local generator. If the generator builds a plant that proves too costly, consumers in a deregulated retail market can switch to another provider and utilities in a deregulated wholesale market can switch to other merchant generators. On the other hand, consumers in a deregulated market are subject to movements in the market and, as explained in Section 2.3, prices are set at the margin. If demand intensifies or supply falls in the broader market, consumers will pay more for electricity even if their particular supplier has low costs. And if demand is low and supply is high, consumers can pay rates that — for some time at least — are below the supplier's total cost.

So, does regulation or deregulation result in the lowest electricity rates for consumers? Empirical evidence so far has been ambiguous. At times deregulation has appeared to lower prices, while at other times it has appeared to yield higher prices. Overall, a 2006 statistical analysis by MIT energy economist Paul Joskow found no consistent pattern in the trends in real industrial prices for states that implemented retail competition compared to states that had not.[27] Economic theory suggests that over the long term, the incentives unleashed by deregulation would yield lower prices. However, economic theory also suggests that there would be many times when electricity rates under deregulation would be higher than under traditional regulation: specifically, at times of high demand or low supply in the broader market.

5. DEREGULATION IN MARYLAND

Maryland's course toward electricity deregulation followed the narrative sketched in Section 4. Beginning in the mid-1990s, several large manufacturing firms in the state began petitioning Annapolis to allow them to purchase electricity from lower-cost suppliers.[28] Though Maryland's utility rates were not as high as those in the Northeast states that pioneered the electricity deregulation movement (see *Table 3* above), the manufacturers' pleas drew Annapolis's attention. Lawmakers did not want to see those employers, with workforces that were typically unionized and well-paying, move away.[29]

5.1 Legislation And Rules After more than a year of negotiations between pro-deregulation Maryland Senate President Thomas V. Mike Miller Jr. and deregulation-ambivalent House of Delegates Speaker Casper R. Taylor Jr., a general framework for deregulation was agreed upon in late 1998.[30] Maryland would initially deregulate electricity on the wholesale side, and then phase in retail deregulation in stages, depending on the size of the customer and the utility involved. But the legislation faced opposition from the incumbent utilities, led by BGE, which was saddled with heavy debt from capital investments in such facilities as its Calvert Cliffs Nuclear Power Plant.[31]

Deregulation proponents spent the early months of the 1999 General Assembly making concessions to various interests so as to clear the way for the deregulation bill. Governor Glendening's support was gained by the addition of some environmental provisions. Local governments that were dependent on revenue from special taxes assessed on utilities were awarded state grant money. BGE and the other incumbent utilities were mollified by payouts from a stranded cost recovery fee that would be assessed on all state electricity customers. To gain public support for the measure, lawmakers mandated that residential standard offer service rates under the initial wholesale deregulation would be between 3 and 7.5 percent lower than 1999 regulated rates. This rate cut would be in the form of a rate freeze instead of a cap, which meant that the rate could be neither raised nor lowered — regardless of what subsequently transpired in the wholesale market — for as long as the freeze was in place.

The House of Delegates passed the final legislation by a 95-34 margin and the State Senate by a 34-13 vote.[32] Despite the wide margins, the *Baltimore Sun* noted that many lawmakers professed to have little understanding of what the legislation contained. According to the *Sun*, "The lobbyists essentially wrote the deregulation bills that were filed early in the session, and they were personally involved in the revisions until the final product was printed."[33]

Though the new law was passed and signed, there were still several contentious issues to resolve. The two most prominent were the specific rates at which electricity would be frozen for the next few years, and the total amount of stranded cost payments that BGE and the other incumbents would receive.[34] Ultimately, the PSC decided to award BGE $528 million in stranded cost payments[35] while other utilities received smaller amounts. The Maryland utilities were able to negotiate long-term contracts with wholesale power providers at good prices, and the PSC froze rates at levels roughly equal to 1993 prices.[36]

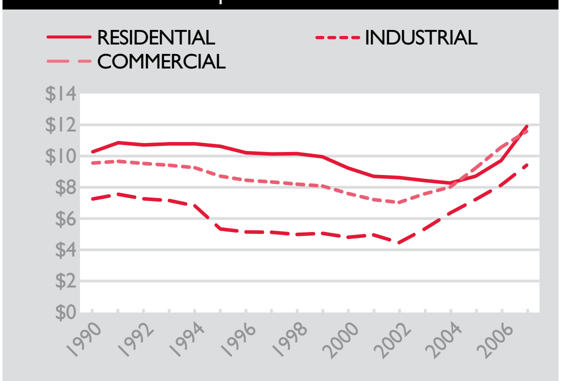
The PSC decisions were met with considerable criticism from merchant generators, consumer advocates, and free-market advocates, who all lamented that the universal stranded cost fee and the rate freeze would hobble alternative power providers. One *Sun* article noted that, despite the lower rates, some deregulation supporters were now second-guessing their position.[37]

5.2 Changing Conditions Deregulation supporters' doubts grew over the ensuing years, as rising

FIGURE 7 U.S. CITY GATE NATURAL GAS PRICES
Dollars per 1,000 cubic feet

SOURCE: U.S. EIA, Natural Gas Navigator, January 2010

FIGURE 8 AVERAGE REAL RETAIL PRICES
2007 cents per kWh



SOURCE: U.S. EIA, Form EIA-861, Table 8

fossil fuel costs pushed wholesale market electricity prices higher. Natural gas and coal prices heavily influence market electricity prices because two-thirds of U.S. electricity is produced from those two fuels. As we will see in Section 5.3, a spike in natural gas prices during the mid-2000s contributed heavily to the decade's higher electricity prices.[38]

Because Maryland residential electricity rates were frozen in the first few years after deregulation, most consumers were sheltered from the steady increase in wholesale electricity prices in the early 2000s. But those rates would not last forever. The freeze would expire in June 2004 for customers of PEPCO in central Maryland and Delmarva Power customers on the Eastern Shore, followed by BGE customers in June 2006, and finally Allegheny Power's customers in Western Maryland in June 2008.

With market electricity prices moving higher and the first rate freeze expiration dates looming, the Maryland PSC in 2003 took action, extending the utilities' requirement to provide standard offer service. However, even with the extension, the frozen rates could not be continued because the long-term contracts that the utilities had signed with suppliers were about to expire. The utilities could not continue to re-sell electricity at the old rates because new contracts with merchant generators would be at considerably higher prices. As a result, the PSC instituted new regulations for standard offer service: utilities, under PSC oversight, would regularly solicit offers from merchant generators for supplying portions of the utilities' load for one to three years. (The PSC specified the mix of contract lengths for each utility.) The utilities, again under PSC oversight, would agree to the lowest-priced offers and the PSC would then oversee the rate-setting for the utilities' customers.[39]

The first experience in 2004 under the new rules was not too discouraging. Washington-area utility PEPCO had to raise its residential rates 12-16 percent[40] to cover the higher cost. That was an unpleasant one-year increase, but it did not seem so bad when one considers that the increase came on prices that were roughly at the same level as a decade ago.

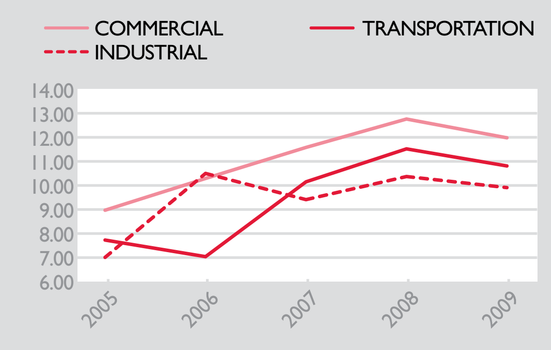
However, matters were about to get worse.

5.3 Shock To The System In late August 2005, Hurricane Katrina roared through the Gulf of Mexico, the first of three successive storms that would devastate the region. Along with the loss of life and destruction of property, Katrina and her sisters Rita and Wilma pounded the Gulf's natural gas extraction industry and the nation's natural gas distribution network. Some of the damage would take more than a year to repair.

Prior to the hurricanes, natural gas consumption in the United States and around the world had been increasing steadily. Industrial energy consumers saw natural gas as an appealing energy source: the fuel had a long history of low, stable prices, the equipment necessary to burn natural gas is inexpensive compared to other fuel sources, and natural gas's relatively low emissions lessened concerns that future environmental controls would damage natural gas-fueled industries.

However, as demand for natural gas rose, supply had difficulty keeping up. Natural gas, like most fossil fuels, cannot adjust quickly to sudden increases in demand, because new sources of gas

FIGURE 9 NOMINAL RETAIL ELECTRICITY PRICES
Cents per Kwh



SOURCE: U.S. EIA, Electric Power Monthly, *March 2006-March 2010, Table 5.6.B*

take time to locate and develop. In the short term, rising demand and constrained supply push prices higher. Hence, even before the hurricanes, natural gas prices were increasing (see *Figure 7*). As noted in Section 2.3, natural gas-fired turbines provide much of U.S. power above baseline. As a result, natural gas costs heavily influence electricity costs at the margin — in other words, as natural gas prices rise, market prices for peak electricity rise. Once the hurricanes hit and a large portion of the nation's natural gas production was shut-in in the late fall of 2005, natural gas prices spiked to three times their 2000 level, and electricity market prices jumped (see *Figure 8*).

By mid-February 2006, when BGE solicited wholesaler bids for standard offer service power, natural gas prices had slid back only a little from their peak. BGE and state officials knew the incoming bids would be unpleasant,[41] but even they had to be surprised by the results: in March it was announced that standard offer service rates would have to increase 72 percent beginning in June to cover the new supplier contracts. That translated to an additional $743 in electricity costs for the average BGE household over one year.[42]

The announcement generated immense, understandable public outcry, and state policymakers in Annapolis and Baltimore tried to respond. Unfortunately, the Maryland General Assembly was deep into its 2006 legislative session and was unable to cobble together a legislative response by *sine die*. That left it to Governor Robert L. Ehrlich and the PSC to find a solution within the confines of current law. The Ehrlich PSC produced a modest rate stabilization plan that gave consumers the option to have the increase phased in over several months. BGE would borrow money to cover the underpayments during the first few months of the phase-in, but consumers would later repay the borrowed amount with interest. The plan did little to appease consumers.

5.4 Power Politics Complicating the situation, 2006 was a gubernatorial election year in Maryland, and the fight would be especially bitter. Four years prior, Ehrlich had become the first Republican governor in the heavily Democratic state in a generation. Though he had high public approval numbers in 2006, he was also running for reelection at a time of strong public disenchantment with Republican President George W. Bush. Standing ready to oppose Ehrlich was Baltimore City's popular Democratic mayor, Martin O'Malley. Neither Ehrlich nor O'Malley had been involved in the 1999 deregulation legislation or PSC decisions — Ehrlich was in Congress at the time and O'Malley was on Baltimore's City Council — but electricity deregulation became a major issue in the campaign.

O'Malley fired the first volley in the political war over electricity by directing the City of Baltimore to file suit over the Ehrlich PSC's rate phase-in plan. The suit claimed that BGE's 72 percent rate hike was unwarranted and demanded access to BGE's bid solicitation records.[43] In May, Baltimore Circuit Judge Albert J. Matricciani Jr. issued a preliminary ruling in the city's favor, de facto killing the PSC's plan and re-exposing BGE customers to the June rate hike.

When the General Assembly left Annapolis in April, there were murmurs that the governor should call a special session later in the spring to address the situation. Following Judge Matricciani's decision, those murmurs intensified and Ehrlich called for the session to convene on June 13.

The session ultimately produced a sound rate relief plan. The lawmakers realized that, though wholesale electricity prices were unlikely to fall back to 1999 levels, they also would not stay at the high 2006 levels. The price spike was the product of unique circumstances and subsequent electricity contracts would likely push wholesale costs back down. So lawmakers needed only to spread out the cost of the 2006-2007 contracts over the next several years' rates, when wholesale prices would likely be lower, easing the shock to consumers. The resulting legislation mandated that the initial rate hike would be only 15 percent, with the rest of the cost of the wholesale electricity covered through borrowing by BGE.[44] The loans would be repaid at interest using money generated from a fee added to BGE customers' electricity bills for the next 10 years, plus money that the General Assembly hoped to extract from BGE following the revelation that stranded cost payments to the utility had proved exceptionally generous in light of subsequent market conditions. Some details of the rate relief plan were not beyond criticism. For instance, consumers could not opt out of the plan,[45] the plan did little to reduce consumption during the high-cost 2006-2007 period, and it was unclear just how much money the state could squeeze out of BGE. Yet overall, the plan had merit.

The legislation also mandated that the PSC revisit its 2003 decisions on how utilities carry out their contracting for standard offer service power. Lawmakers understood that, because the earlier PSC decisions had required BGE to put its entire load out for bid at one time, a fluctuation in the wholesale electricity market at the time of the solicitation could result in a dramatic change in rates, which is exactly what happened. The legislature intended for the PSC to diversify away some of that risk in future solicitations by reducing the amount of a utility's load that would be put out on bid at any one time, and awarding contracts to merchant generators of varying length. Like the rate relief plan, this was a sensible provision.

Unfortunately, the legislation was not without flaws that were the product of election-year politics. Democratic leaders in the legislature, along with O'Malley, were eager to characterize the rate hike as being the product of Ehrlich's "Republican" neglect of consumer interests and favoritism toward corporations, especially energy companies.[46] To further that theme, the Democratic leadership included a provision in the bill that would remove Ehrlich's appointees to the state PSC and replace them with appointees of the General Assembly's choosing. (That provision was ultimately struck down in court.) In response, following a day-long public hearing on the legislation, Ehrlich vetoed the legislation, although the General Assembly's rate relief plan used a more muscular version of the same strategy that Ehrlich's PSC had advanced just a few months earlier. The General Assembly ultimately overrode the veto in late June, making the bill law.[47]

5.5 Aftermath O'Malley defeated Ehrlich in the gubernatorial election that November, 53 percent to 46 percent. It is unclear whether the BGE controversy had much effect on the outcome, though it certainly appealed to highly partisan voters on both sides who were already going to vote for their party's candidate.

Before leaving office, Ehrlich's PSC conducted an analysis of the standard offer service bid solicitation rules. The PSC amended the rules as lawmakers envisioned, reducing the amount of load that would go to bid at any one time, mandating auctions at more than one time each year, and varying the length of the purchase contracts so as to diversify away some of the risk of a rate spike.[48]

Following his swearing-in as Maryland's 61st governor in early 2007, O'Malley issued a high-profile order to his new PSC to investigate the 2006 rate hike,[49] playing on his campaign claim that the hike was the product of BGE dirty dealing and Ehrlich's complicity with energy companies. However, later in the spring, O'Malley's PSC approved an additional 50 percent rate increase on BGE standard offer service customers. Ultimately, BGE customers ended up paying the same electricity rates that they would have paid if the original 72 percent hike had taken effect.[50]

Chastened by the 2006 episode, some Annapolis lawmakers have since proposed legislation to return Maryland to some form of traditional electricity regulation.[51] The benefit for consumers from those proposals is unclear: the re-regulated utilities would have to either build or purchase generating assets at current market prices, and the utilities would likely still have to purchase wholesale electricity at market rates during peak hours. Those proposals have gone nowhere, however, as the General Assembly seems to have little interest in attempting another overhaul of the state's electricity market structure.[52]

In the past two years, natural gas prices have fallen, as has the demand for electricity in the wake of the current recession. Wholesale electricity prices and electricity rates have followed suit. Average annual rates in Maryland for commercial, industrial, and transportation end-users have fallen since 2008 (see *Figure 9*), and residential end-user rates in 2010 have been lower than they were at the same time in 2009.[53] However, excluding California and the Northeast states, Maryland continues to have the highest average residential electricity rate in the continental United States, which is roughly the same position the state was in before deregulation.[54]

6. TOWARD BETTER ELECTRICITY POLICY

The General Assembly is hesitant to make further major changes to Maryland's electricity market, and understandably so. Nonetheless, there are a few policymakers who aspire to pass comprehensive legislation. Below are some thoughts for lawmakers to consider as they pursue electricity policies that would benefit Maryland consumers.

6.1 The choice between electricity regulation and deregulation is a choice between different sets of tradeoffs, not between a clear winner and loser As noted in Section 4.4, empirical evidence does not yet indicate whether traditional regulation or deregulation yields better rates for consumers over the long term. This does not suggest there is little difference between the two policy regimes.

Traditional regulation's fixed rates and the extensive PSC rate-approval process provide consumers with fairly stable electricity rates over long periods of time. Further, PSC oversight protects consumers from paying windfall profits to utilities, regardless of whether those profits would be the product of innovation or exercise of market power. Many consumers would consider these features of traditional regulation to be benefits.

On the other hand, traditional electricity regulation puts consumers, instead of utilities, at financial risk from utilities' bad business decisions. Also, fixed rates under traditional regulation incentivize customers to over-consume electricity during the highest-cost times and under-consume during lowest-cost times. This results in consumers paying more for electricity than they otherwise would. Many consumers would consider these features of traditional regulation to be disadvantages.

In a deregulated retail market, consumers can switch electricity providers, and in a wholesale-only deregulated market, utilities purchase electricity from merchant generators through competitive bidding. As a result, suppliers must compete on price. That does not mean that consumers will always experience low rates: in times of high demand and/or constrained supply, market prices for electricity will rise, even if some suppliers have low costs. But market forces will incentivize suppliers to find lower-cost ways of providing power, and in periods of low demand and/or ample supply, power providers will sell electricity at prices below total cost.

Given those considerations, it is difficult to argue that either electricity regulation or deregulation is better. Some consumers may be willing to pay slightly higher prices on average in order to be assured of stable prices and protected from paying windfall profits under traditional regulation. Other consumers may accept price variability in exchange for lower average prices over the long term under deregulation.

Consider that, in Maryland, more than 90 percent of residential consumers continue to rely on standard offer service, but more than 90 percent of large commercial and industrial consumers purchase their electricity from merchant generators.[55] It could thus be argued that Maryland's electricity deregulation failed in the residential market but succeeded in the commercial and industrial market, whereas traditional regulation succeeded in the residential market but failed in the commercial and industrial market.

6.2 Market signals are important When wholesale electricity prices rose in 2006, lawmakers understandably wanted to spare their constituents from higher rates. Hence lawmakers' claim that deregulation had failed: the price of electricity did not fall unabatedly, as some deregulation advocates had claimed it would.

Liberalized markets do not guarantee low prices — they guarantee only that prices will more accurately reflect conditions. If a market has a monopoly supplier, consumers will pay monopoly prices. If a market is competitive but competitors have high costs, consumers will pay high prices. Over time, competitive liberalized markets will encourage lower prices because consumers can switch from high-priced suppliers to lower-priced competitors. That does not mean markets will magically push prices lower if the underlying costs increase, which is what happened in the mid-2000s.

The 2006-2008 rate hikes provided an important incentive to consumers to moderate their demand while an important input was scarce. High electricity market prices can also incentivize competing firms to build new power plants and string new transmission lines, and incentivize consumers to shift to more efficient consumption patterns and invest in energy-saving technologies. Likewise, low prices can also incentivize consumers to shift to more efficient consumption patterns and incentivize investors to shift their resources to other, more pressing demands.

Lawmakers, in wanting to protect their constituents from price shocks, risk serious public harm by blocking price signals. Maryland's attempt to limit the 2006 BGE price spike resulted in greater electricity consumption than would have occurred otherwise, which means that for the next few years BGE customers will pay more than they should for the electricity they use. Public welfare is usually harmed when consumers do not get what they pay for, or do not pay for what they get. Lawmakers who are inclined to intervene in markets to protect consumers must be mindful that, in doing so, they risk disrupting market signals that ordinarily lead consumers to use electricity only when they are willing to pay what it costs to produce it.

6.3 Moderating the demand cycle would solve a lot of problems In recent years, some state policymakers have voiced concern[56] that nearly a third of the electricity consumed in Maryland is generated outside the state, and that the percentage of "imported" power is likely to rise in the future. They have called for state interventions to prompt the construction of new generation capacity in Maryland, as well as other policies to address what they perceive to be an important problem.

The use of power generated outside the state, in and of itself, seems to be of no more pressing concern than the use of cars produced in Detroit, Tennessee, or Japan. That is, if other locations can provide power cheaply and reliably, then why increase generation in Maryland where land is expensive and air quality is already poor? So long as there is adequate transmission capacity, it is unclear why consumers should care which side of the Potomac or the Mason-Dixon Line the power came from. The only real beneficiaries from these policies would be in-state generators, who would welcome Annapolis assistance in the form of subsidies and help in overcoming zoning, environmental, and community obstacles.

However, current transmission capacity into Maryland is heavily congested during peak periods of consumption, limiting the amount of additional demand that can be met.[57] Should that constraint be addressed through more efficient use of electricity by Maryland's consumers, increased in-state generation, or increased transmission capacity? Arguments can be made for each of those options.

Better arguments can be made for a fourth option: moderate the demand cycle. As discussed in Section 2.2, the cost of electricity soars during times of peak consumption, which is also when transmission lines are heavily congested. Instead of pushing consumers to buy more-expensive energy-efficient appliances or building more generating plants and power lines, the easiest, lowest-cost solution to Maryland's electricity problems would be to simply shift some of the peak demand to off-peak times when wholesale prices are lower and congestion is less.

Economists generally advocate the use of real-time pricing to moderate demand.[58] That is, instead of assessing a fixed rate for electricity at all times of the day and year (which results in consumers being charged too much for electricity when costs are low and too little when costs are high), rates would adjust in real time to reflect generation and transmission costs. Doing this would signal consumers to cut usage at peak times and shift consumption to off-peak so as to save money — what economists call "demand response."

Policymakers have been hesitant to adopt real-time pricing, in part because it typically includes the installation of expensive "smart meters" in homes and businesses to measure consumption and inform consumers of changing rates at different times of the day. Maryland's PSC recently rejected a BGE proposal to install smart meters out of concern for cost, even though a quarter of the cost was to be covered by a federal grant.[59] In its decision, the PSC expressed concern that, even with the grant and savings from demand response, the cost of the meters for residential customers would eclipse any savings.

Moderating the demand cycle does not necessitate smart meters for all homes and businesses. Demand response by just the largest peak-period consumers would yield immense benefits for all Maryland electricity users. Mandating that larger users who currently pay fixed-rate standard offer service switch to real-time pricing would provide those customers with incentive to moderate their heavy consumption during peak demand (whether by adopting greater energy efficiency or simply shifting their consumption pattern). There is empirical evidence that large electricity users respond to this incentive.[60] Their moderation would not only lower their overall electricity bill, but would also benefit all other Maryland electricity consumers by reducing overall peak demand. That would result in lower costs for all consumers and less demand for the expansion of generation and transmission.

6.4 Environmental goals should be pursued directly In recent years, several states, including Maryland, have adopted legislation mandating that a specific portion of the electricity consumed in the state be generated from so-called "renewable" sources. The Maryland legislation even goes so far as to spell out specific set-asides for individual types of generation.[61]

Several justifications are given for this policy, including that renewables promote "energy security," are more sustainable, and are environmentally sound. The first two justifications are not credible. The third justification has some merit, but a "renewable" mandate is an inefficient, and possibly counterproductive, policy for improving environmental quality.

6.4.1 Energy Security As noted in Section 2.3, 88.1 percent of U.S. electricity in 2009 was produced from coal, natural gas, and uranium-fueled generation. Among non-renewables, 98.3 percent of U.S. electricity came from those three sources.[62] Those fuels are secure. Some 97.7 percent of coal consumed in the United States comes from domestic sources, and the United States exports 2.5 times more coal than it imports.[63] Likewise, 97.9 percent of natural gas consumed in the United States is produced in the United States or Canada.[64]

U.S. supplies of uranium for nuclear power are more diverse: Only 14 percent of the compound U_3O_8 consumed in the United States in 2008 (the most recent year data are available) originated domestically. Another 42 percent came from Australia and Canada (the country with the world's largest uranium reserves, and the world's largest uranium exporting country, respectively). The remaining 44 percent came from a hodgepodge of nations in South America, Africa, and Eastern and Western Europe.[65]

It seems highly unlikely that Canada or Australia will become an enemy of the United States, and so it is difficult to characterize these three fuel sources as being insecure. In contrast, as noted in Section 2.3, "renewable" energy sources like wind and solar are not secure, especially at the hottest and coldest times when they are most needed.

6.4.2 Sustainability The U.S. Energy Information Agency estimates that, in 2005 (the most recent estimate available), the United States had 263.8 trillion short tons of total recoverable coal, and the world had 930.4 trillion short tons.[66] Those numbers compare to the 1.0 billion short tons of coal that the United States consumed in 2009 and the 7.2 billion that the world consumed in 2008.

For natural gas, the EIA estimates that the United States had 237.7 trillion cubic feet of proven reserves in 2009, and the world had 6,254.4 trillion cubic feet. Those numbers will rise significantly in coming years because recently developed natural gas drilling techniques are quickly expanding reserves.[67] In comparison, the United States consumed 22.8 trillion cubic feet of gas in 2009 and the world consumed 110.3 trillion cubic feet in 2008.

As for uranium, the EIA estimates that the United States has reserves of 539 million pounds of U_3O_8 at a maximum forward cost of $50 per pound, and 1,227 million pounds at $100 per pound. This compares to 53.4 million pounds of the compound purchased by U.S. civilian nuclear power plants in 2008.[68] Worldwide, uranium reserves are estimated to be between 3.6 million tons and 6.0 million tons.[69]

Overall, there appears to be ample supplies of coal, natural gas, and uranium to satisfy U.S. and global consumption for decades, if not centuries.

6.4.3 Environmental Quality In contrast to security and sustainability, policymaker concerns about the environmental effects of traditional power generation have merit. Burning coal is particularly carbon-intensive and produces considerable amounts of traditional pollutants ranging from sulfur dioxide and nitrogen compounds to mercury, volatile organic compounds, and particulate matter. Natural gas is much cleaner and less carbon-intensive than coal, but is still a source of pollution. Nuclear power is generally considered emission-free (ignoring heat discharge), but spent uranium and the possibility of catastrophic accident raise important environmental concerns. Policymakers, as defenders of the environmental commons, have a responsibility to consider the costs of pollution in electricity production, and thus it is understandable that they would want to discourage the use of these energy sources in favor of solar and wind power.

However, policymakers should be chastened by previous U.S. experience with promoting alternative energy. Consider the federal government's longtime — and expensive — promotion of "renewable" ethanol, an energy source that is more carbon-intensive, more polluting, more expensive, and more insecure than the oil it replaces.[70] Or consider the federal government's promotion of nuclear power, the nation's original "alternative energy" success story, which contributed to the rising electricity costs of the 1980s-1990s that ultimately led to electricity deregulation. By mandating the deployment of specific energy technologies, Maryland lawmakers risk adding to the list of alternative energy boondoggles that are nothing more than corporate welfare. Further, these mandates relieve energy companies of the responsibility of having to make difficult business decisions about capital investment and future costs.

Instead of mandates, Maryland lawmakers would be better advised to pursue a cleaner environment by assessing a fair price for pollution from all emission sources, not just conventional electricity production. The implementation of a Pigouvian tax or cap-and-trade policy[71] for carbon and traditional pollutants would force generators to be mindful of their emissions and would generate public revenues that could be used for environmental restoration. Just as important, it would make generators responsible for finding efficient ways to reduce emissions.[72]

6.5 CONCLUSION

As noted in Section 5.1, following the 1999 General Assembly vote to deregulate Maryland's electricity industry, many lawmakers conceded they did not understand the legislation or its underlying issues. That raises the question: if they did not understand, how could they expect consumers to be informed participants in a retail electricity market?

Hopefully, this paper will help readers to understand the issues involved in electricity regulation and deregulation. As noted in the introduction, these issues are not especially complex, if the reader understands the history and economics of commercial power. With this understanding, the reader can appreciate the tradeoffs underlying both regulation and deregulation.

Maryland electricity consumers are a highly diverse lot, bringing many different demands and values to the marketplace. Some want to utilize only "environmentally sound" power sources, others may be able to shift their demand easily, still others may be willing to tolerate less-than-perfect reliability in exchange for lower rates, and yet others may need the economic security of stable, fixed rates. Liberal, competitive retail markets are usually a good match for such diverse consumers because niche markets provide opportunities for profit.

Will Maryland's retail electricity market develop such diverse offerings, satisfying consumers? Or do the unusual characteristics of electricity — unable to be stored, requiring a transmission and distribution network that is a natural monopoly, having both residential and industrial/commercial consumers — limit its ability to be traded in competitive energy markets? These are questions that Maryland policymakers must consider going forward. Most important, they must consider that there has been great discontent with both electricity regulation and deregulation.

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1 Some energy policy experts bristle at using the term "deregulation" to describe the restructuring of the electricity market that states began embracing in the 1990s. They argue that the replacement of a heavily regulated monopoly regime with a heavily regulated market regime is not deregulation, and instead prefer the term "restructuring." However, the term "deregulation" is commonly used, and so will be used in this paper.
2 Timothy J. Wheeler, "Assembly OKs bill to choose power," *The Baltimore Sun*, April 3, 1999.
3 Wheeler, "Assembly OKs bill," April 3, 1999.
4 Steven Mufson, "In Md., Power to Stop Rate Hikes Is Limited," *The Washington Post,* June 8, 2006.
5 Matthew Mosk and John Wagner, "Divide Looms Over Rate Relief," *The Washington Post*, June 11, 2006.
6 Alan Brody and Sean R. Sedam, "Economic Matters chairman says no to re-regulation," *The Gazette*, November 6, 2009.
7 In this case, "consumption" includes electricity lost to resistance. The amount of electrical energy that is lost is considerable — more than what is ultimately used by consumers.
8 U.S. Energy Information Agency, *Electric Power Monthly* (DOE/EIA-0226), June 16, 2010.
9 Timothy J. Brennan, "Uniqueness Squared?" *Regulation*, Vol. 33, No. 3 (Fall 2010).
10 The use of batteries to store such large quantities of electricity is impractical. Large-scale "electricity storage" typically uses electricity during periods of excess supply to pump water into elevated reservoirs. That water is then used to produce hydroelectricity during periods of high demand.
11 Advocates of wind and solar power envision diversifying around the unreliability problem by establishing wind and solar farms in dispersed, more geographically conducive areas, such as the Northern Plains and the Southwest. The resulting electricity would then be sent across transmission lines to areas of heavy consumption. However, the cost and current heavy congestion on U.S. transmission lines limit the practicality of this strategy.
12 This section draws heavily on "Appendix A: History of the U.S. Electric Power Industry, 1882-1991," in U.S. EIA, *The Changing Structure of the Electric Power Industry 2000: An Update*, 2000.
13 Theoretically, state PSCs could adopt a schedule of varying prices under traditional regulation, but this did not occur.
14 For an overview of deregulation in the United States, see the collection of articles appearing in *Regulation*, Vol. 24, Nos. 2-3 (Summer and Fall 2002).
15 As will be discussed in Section 5.4, the stranded cost fears that seemed so appropriate in the late 1990s proved to be overstated by the mid-2000s. The natural gas price spike limited the price competition of gas-turbine plants and reduced (though did not eliminate) the financial losses that would have been experienced by utilities with nuclear plants or hefty PURPA contracts.
16 Douglas R. Hale, Thomas J. Overbye, and Thomas Leckey, "Competition Requires Transmission Capacity: The Case of the U.S. Northeast," *Regulation*, Vol. 23, No. 2 (Summer 2000).
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18 Catherine Wolfram, "The Efficiency of Electricity Generation in the U.S. after Restructuring," Center for the Study of Energy Markets, University of California Energy Institute Working Paper No. 111, June 2003.
19 Leonard Hyman, "A Financial Postmortem: Ten Years of Electricity Restructuring," *Public Utilities Fortnightly*, November 15, 2003.
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21 All data on California power generation are from the U.S. Energy Information Agency's *Electric Power Annual 2008*.
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