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# *What Gives You the Right? Consumption Data Access Rights and Retail Competition in the Electric Power Industry*


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**What Gives You the Right? Consumption Data Access Rights and Retail Competition in the Electric Power Industry**

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## I. Introduction

This paper addresses a market design issue in electricity restructuring: institutional adaptation to technological change, and how that adaptation affects rivalry in retail electricity markets. The effects of digital communication technology innovation over the past three decades are beginning to affect the electric power industry and the retail markets for electric power service. Fourteen states and the District of Columbia have nominally restructured their electricity regulation such that entry into retail markets is now legal. Most large commercial and industrial customers can choose among retail providers and different services, but small commercial and residential customers have seen little or no rivalry – except for Texas.

Although the electric power industry has (paradoxically) been one of the least innovative industries in the modern economy, advances in digital communication technology could be finding potential residential customers in retail electricity markets. For example, several startups are working on commercializing in-home displays that provide detailed, timely information to the customer on several dimensions, including

- Quantity of electricity consumed in real time, or other time-scales shorter than the traditional one-month billing cycle;

- Price paid per kilowatt hour (kWh);
- Total expenditure since last bill;
- Forecast weather and electric prices;
- Amount being generated from rooftop solar panels, if installed; of that amount, amoung being sold back to the market; and
- The environmental footprint of the consumer's current generation portfolio (the "green/gray" mix).

Furthermore, these intelligent digital devices can enable consumers to automate their responses to price signals, to changes in the green/gray generation mix, or to emergency request from the system operator to reduce consumption. These devices are, or will be, *transactive*.

However, this retail rivalry for residential customers does not exist (except for Texas). Bringing about the vision of a vibrant retail market that this example suggests requires not only technology, but also institutional change. Specifically, state-level regulation of retail electricity prices has been slow to allow retail customers (especially residential customers) to choose dynamic pricing that varies over time. Part of this reticence has been due to regulated utilities being generally unwilling to make the economic and political arguments for investing in the enabling technology – the digital two-way communicating meter to monitor and transmit a household's consumption, and to communicate data to the customer.[1] These institutions are changing, though, due to the combination of increasing fuel and construction costs, increasing concern about the environmental effects of energy use, and increasing availability of intelligent end-use devices to engage individual control and energy efficiency.

[1] A network of ubiquitous digital two-way communicating meters is not necessary for such retail products and services, but they do reduce entry costs in retail markets.

As these nascent retail markets evolve, both digital meters and intelligent consumer devices will generate unprecedented amounts and types of data, on the various dimensions of electricity consumption noted above (as well as others). One set of institutions that will increasingly be important is the rights to access and use those consumption data. Who holds those rights, and who should? New digital technologies are creating new use rights questions. In particular, the bundle of rights to access and use consumption data can be economically significant.

To put the prospective electricity issues in context, consider the example of mobile phone number portability. The phone number originated as a unique identifier of a specific location within a proscribed area on a physical wires network. Before the invention and widespread adoption of mobile phone technology, the right to determine the assignment of a specific phone number to a specific customer was not a very valuable right. The technology and the regulatory structure did not exist to make the individual's right to keep a phone number regardless of physical location either feasible or particularly valuable. But the proliferation of mass-market mobile phone networks, and the transition to mobile telephony as the primary means of communication and identification for many consumers, means that this right now has value. Moreover, as more mobile phone companies entered the industry, consumers increasingly placed value on the right to retain a given number regardless of provider. If they had that right, then we could reasonably expect more rivalrous competition in retail mobile phone markets; however, the central office-based definition of that right allowed firms to retain numbers if their customers chose to leave their service. The customary property rights definition over the phone number persisted, so a consumer comparing across competing firms would have to relinquish what had become a valuable right if s/he switched to another provider. In other words, institutions did not adapt seamlessly to technological change, and the inertia in adaptation created a potentially anti-competitive environment. In recognition of the changes in the value of a consumer's right to retain a phone number, the Federal Communications Commission initiated an institutional change process, redefining the right to use a phone number as resting with the consumer. The primary justification for this change was the potential anti-competitive effects of retaining the old property rights definition, given how the technology had changed and how the new technologies realigned the values associated with different property rights definitions.

This example illustrates the rights-related effects of innovation: innovation makes some rights valuable that had not heretofore been valuable, and the juxtaposition of this realignment with pre-existing legal institutions can act as entry barriers with anti-competitive consequences. Technological change produces a variety of beneficial outcomes – new products and services, new industries (and the obsolescence of some existing ones), lower production costs for existing products and services, and new net benefits of property rights. The mobile phone number portability example illustrates the more general idea that the values of property rights are actually endogenously determined in innovation and growth processes. This observation raises important questions for innovation and competition policy: given that formal property rights are often defined by legal institutions, do those legal institutions adapt to the effects that innovation has on the values of property rights? If they do adapt, do they do so quickly or slowly? How does that adaptation affect the creation of value from innovation (i.e., growth), the pace and rate of growth, and the distribution of those benefits?

Ideas and models from new institutional economics (NIE) are particularly useful in analyzing these questions, because of the connection between innovation and transaction costs. Institutions influence outcomes, such as the welfare effects of and the type and extent of innovation and new technology adoption, when transaction costs are nonzero. Regulatory and competition policy serve as institutions that define and enforce property rights;

empirically, however, as innovation changes the values of property rights, the adaptation of these institutions to those changes occurs with a lag, or may not occur, with real economic consequences. Thus the theoretical framework for this paper rests on a simple Coase (1959, 1960) question: what is the efficient allocation of rights?

This paper focuses specifically on one possible consequence of slow institutional adaptation to technological change – the persistence of pre-innovation property rights institutions constituting an entry barrier in retail consumer markets. In particular, we use existing research on entry barriers and on the experience of mobile phone number portability to examine consumption data access and use rights, and to discuss the relevance of this consequence in an area in which innovation's effects are impending: retail electricity service.

We address this question in the context of current, ongoing "smart grid" technological change in the electric power industry. Although the industry still largely uses the electro-mechanical technologies of the late 19th and early 20th centuries, digital communication innovations are entering the electric power industry. The innovations that are most relevant to the questions in this analysis are the digital two-way communicating meter (smart meter, or advanced meter) and digital two-way communicating end-use devices to enable consumers to understand, monitor, and modify their electricity consumption. Unlike the analog meter, from which it is costly to extract data on real-time consumption, digital meters can record real-time consumption, even down to the appliance level if the customer's appliances and devices are two-way communication-enabled. Digital meters and devices can also communicate that more granular information to the consumer, to the wires utility, and/or to the retailer. Moreover, the two-way communication capabilities mean that the utility or the retailer can communicate data to the consumer, such as price signals, the fuel portfolio (green/gray mix) that is currently generating the power that the customer is using, and requests from the system operator to curtail consumption because of a system emergency. These technologies create myriad new possible value propositions for consumers in the form of new retail products and services.

This question arises not only in the context of ongoing technological change, but also in a policy context of piecemeal regulatory restructuring in the electric power industry. Regulatory restructuring is currently a patchwork in the U.S. because local distribution and retail sale of electric power services is regulated by state public utility commissions. The states that have implemented some form of regulatory restructuring all allow competitive entry into wholesale markets and the generation portion of the value chain; those that have not implemented restructuring do not have organized wholesale power markets, and retain the vertically-integrated, regulated utility industry structure with entry barriers throughout the value chain. A subset of the states that have implemented restructuring allows retail competition and competitive entry into retail markets; however, even in those states, the incumbent utility generally serves as the default service provider.[2]

The default service contract is a retail contract for those customers who "choose not to choose". Typically the wholesale procurement of the electricity commodity to serve that contract is done through long-term contracts to buy a given amount of power at a fixed price, to minimize the commodity cost to the default service customer. While ensuring that default customers pay the lowest possible prices for "plain vanilla" electricity service, structuring the default contract this way can serve to deter entry by making it difficult to compete against such a low price for basic service. Entrants in retail markets frequently compete through product differentiation, but potential product

[2] The exception is Texas, which has removed all retail entry barriers, and which determined its default service providers through an auction process.

differentiation has been limited due to the inability to send and receive detailed customer information; in other words, the infrastructure has not had the communications capabilities to enable that kind of product differentiation, even in nominally competitive retail markets.

Digital communication technology raises a host of property-rights-related questions that have never been particularly relevant with traditional regulation, under which the vertically-integrated monopoly utility was the sole wires company and the sole retail provider to each customer. If that utility monopoly access to consumer data persists as retail markets open up to competition, and the utility can block access to those data, does that property right definition constitute an entry barrier? Why is access to meter data valuable? Does the consumer have a right to access and/or use the data that the meter generates? Does the consumer own the consumption data? Does the consumer have the right to grant access to their data to third parties, such as retailers, or is the default that third parties have that access and consumers must opt out? In combination with the default service contract, historical data access rights can create layered entry barriers.

The slow pace of institutional change in the electric power industry means that this issue is not yet at the forefront of policymaker attention, but the pace of technological change and the increasing pressures on state policymakers to analyze and implement smart grid policies is bound to increase attention to the legal treatment of consumer data. Thus this paper is primarily a discussion paper focusing on issues surrounding (1) the endogeneity of the values of use rights in dynamic processes of technological change, (2) the relationship among new digital technology, consumer data, and product differentiation, and (3) the potential entry barrier characteristics of inertial rights definitions.

Section II of the paper describes the technological and regulatory environment in the electric power industry. Section III provides a brief case study of the number portability issue in mobile telephony, to help define the context in which competition policy questions are likely to be relevant in the electric power industry. Section IV uses the entry barrier literature to explore more precisely how access rights to consumer data could constitute an entry barrier in retail electric service markets, and presents a brief discussion of the current state-level policies regarding access to consumer data from electric meters. Section V concludes.

## II. The Electric Power Industry: Technological Change and Regulatory Institutions[3]

The generation of electricity today remains fundamentally the same as it was a century ago: rotating a magnet inside a coil of wire. The actual rotation of the magnet can be derived from a variety of fuel sources: coal, nuclear energy, natural gas, water, wind, solar, biomass, among others. There are three general types of generators: baseload, peaking, and load-following or cycling. The most expensive to build but most efficient generators are called baseload generators and cover the greater part of electricity demand. Peaking units, while cheapest to build, are the most expensive to run. These typically supply the electricity in excess of what the baseload generators supply. The load-following or cycling unit operates when demand is beyond what baseload generators supply, but not yet at the point where peaking units must be used. It falls between the two types of generators in terms of cost of construction and operation. Differences in the fixed costs and variable costs of these generation technologies drive differences in the marginal cost of

[3] For a more extensive discussion of U.S. regulation and restructuring, technological change, and market design issues beyond those described here, see Kiesling (2008).

generating electricity across time, and therefore differences over the course of a day in electricity prices in wholesale power markets.

Because storing electricity is prohibitively costly given existing technology, the network must have the capability to generate electricity and then to transport it in real time. Electricity is delivered to consumers through transmission lines and distribution facilities. Utility companies use high voltage power lines to transmit electricity over long distances; then transformers reduce the voltage as electricity passes from transmission lines to distribution lines before reaching the consumer. The U.S. electricity transmission grid comprises three large synchronized alternating current networks with 150 separate control areas superimposed on the three networks, where vertically integrated utilities or groups operate through power pooling arrangements. There are also organized regional wholesale markets through which utilities buy and sell electricity among one another; these transactions are regulated by the Federal Energy Regulatory Commission (FERC).

## A. Retail Regulation and Restructuring

The electricity industry is the last remaining industry to be regulated fully as a public utility. This regulation has four elements: control of entry, price fixing, prescription of quality and conditions of service, and the imposition of an obligation to serve (Kahn 1988, Vol. I p. 3). The regulated firm has historically been a vertically-integrated, private, investor-owned utility. This vertical integration was initially driven by technological necessity, due to the physical difficulty of separating the technologies along the supply chain into distinct transactional units. By the beginning of the 20$^{th}$ century, the largest driver of vertical integration was the combination of substantial economies of scale (and then subadditivity of costs as firms provided multiple products) and economies of scope across the generation-transmission-distribution-retail value chain.

State-level economic regulation of the electric utility industry, which began in Wisconsin and New York in 1907, was a product of Populist attitudes toward large firms. Utility regulation granting exclusive monopoly franchises with obligations to serve everyone in their geographic territory reflected a desire to constrain both corrupt municipal politicians and greedy businesses. The legality of such regulation relies on the precedent established in *Munn v. Illinois* (1887), in which the judge found that the state could regulate private economic activity when such regulation was deemed "in the public interest" (Hirsh 1999, p. 18).

Over the past three decades, combined cycle gas turbine (CCGT) generation technology developed outside of the industry, and other innovations decreased the economies of scale in power generation. An exogenous technological change thus changed both the economics of generation and the economics of the vertically integrated firm; it was no longer the case that the only profit maximizing organizational structure in the industry was the vertically integrated firm with large-scale central generation. Competitive wholesale markets became possible, although they remained illegal through the early 1990s.

The next meaningful institutional change at the federal level was the Energy Policy Act of 1992, which dramatically expanded competitive incentives and dynamics and created the potential for wholesale electricity markets. EPAct 1992 liberalized wholesale trade of the electricity commodity at the federal level. Heretofore, utilities only traded to meet emergency needs, which meant that few high-voltage interconnections existed among service territories. This legislative change led to nascent wholesale markets, especially in areas like the mid-Atlantic region and New England, which had pre-existing power pool operations platforms to facilitate those emergency trades.

Economic theory suggests that such liberalization would lead to competition, which would lead to lower electricity commodity prices, leading to lower retail rates as those lower prices were passed through to consumers. This prospect was particularly appealing in states with cost overruns from nuclear plant construction; thus the first states to pursue state-level restructuring were Pennsylvania, Illinois, Maine, Massachusetts, and California. Other states soon followed (including New York and Maryland); currently 20 states and the District of Columbia have passed restructuring legislation. Of those 21 jurisdictions, 14 states and DC have allowed retail competition and have lowered the legal barriers to entry in the retail sales of electric power services to end-use customers.

Some states, like Texas and Pennsylvania, successfully used their restructuring to enable utilities and merchant generators to create value for consumers. Others, like California, encumbered their market design process with so many political constraints that needed investments in capacity were deterred and consumers suffered substantial harm. This patchwork of experiences, in combination with the discovery of abusive trading practices by Enron and other market participants, reduced the liquidity of wholesale markets and contributed to a debt crisis for energy companies.

In most states the restructuring legislation focused on some form of wholesale unbundling (either functional separation or structural divestiture). Retail competition was delayed as part of the political bargain to induce utilities to agree to the restructuring proposal. For example, Pennsylvania's retail rate caps phase out over 10 years and have not yet been removed; Maryland's phased out over six years and expired in July, 2006, and Illinois' rate caps phased out over 10 years and expired in

December, 2006. Another part of the political bargain was the payment of stranded costs to utilities, to compensate them for costs they had borne and generation investments they had made in anticipation of rate recovery over the 30-plus years during which the assets depreciated. Utilities bargained for these stranded costs and received them in addition to any revenue they earned from selling generation facilities.

Thus the currently market and industry structure in electricity is complicated and varies by state. In restructured states that have nominal retail competition, the incumbent's function is as a (regulated) wires company, usually without a retail function. However, the role of the incumbent as the default service provider for residential and small commercial customers means that the incumbent is still active in the retail market. The embodiment of the "public interest" regulatory objective in the default service contract has led to the use of long-term procurement contracts to minimize the commodity cost portion of the default service rate, and this low-priced basic service has proven to be an effective entry barrier in all states with nominal retail competition (except for Texas). Residential customers see very little rivalry for their business, and these limited retail markets persist despite the opportunity cost – the potential value creation brought about through technological change, as described previously.

A series of bad experiences and events have caused the national move toward restructuring and competition to stall. The California electricity crisis of 2000-2001 brought home two very painful lessons about restructuring and institutional change: restructuring in a complex network industry is harder than neoclassical theory would predict, and institutions matter. In this case, the institutions are the market and regulatory institutions comprising the market design that is largely unnecessary in more organic market processes.

The next formal federal institutional change was the Energy Policy Act of 2005, passed by Congress in August 2005. The most sweeping energy legislation since the late 1970s, EPAct 2005 ranged from subsidies for clean coal technology R&D to changing Daylight Savings Time. Its electricity provisions included support for demand response and smart metering policies, and provided the first formal institutional impetus to the states to examine digital technology and dynamic pricing benefits and costs.

## B. Digital Technology and Retail Electric Power Services

Despite the lack of technological innovation within the electric power industry, some forms of exogenous technological change are beginning to change the investment decisions facing firms and regulators. Two areas where digital communication technology has affected the electric power industry are the metering of consumption and digital devices on the consumer side of the meter. These technologies, particularly the digital meter, will create the consumption data that are the focus of this analysis.[4] Broadly speaking, the meter is an "outside the home" device owned and operated by the wires company, while end-use devices in the home are owned and operated by the customer.

The end-use meter is the primary technology that enables the utility/retailer to monitor consumption. This century-old metering technology is electro-mechanical and is an analog (i.e., continuous in time and amplitude) technology for generating consumption data. A watt-hour meter relies on a dial that runs continuously, and consumption between any two observations *i* and *j* is simply ($Q_j$-$Q_i$). Moreover, gathering these consumption data

[4] Digital metering and devices are a subset of a broader category of technologies called "smart grid" technologies. Smart grid technologies are the communications network, remote sensor, and automated response technologies that, when embedded in an electric power wires network, can enable that network to be more reliable, to be self-healing, to be more secure against attack, and to achieve more efficient degrees of capacity utilization. See Modern Grid Initiative (2007) and other resources available at http://www.netl.doe.gov/moderngrid/index.html for more discussion.

requires human observation – meter readers must take physical observations of the dial's setting at each interval. The typical watt-hour meter that most utilities use predates the increased power and sophistication of semiconductor technologies, and it also predates the development of data recording technologies in the 1950s. The core of the watt-hour meter technology became standard in the 1890s with the development of the induction-motor watt-hour meter that could measure electricity use on alternating current (AC) systems (Dahle 2003). Utilities have used this meter to measure the amount of energy consumed, but the meter is not sophisticated enough to provide time-specific information about current flow, even though semiconductor technologies make such metering feasible and inexpensive. To this day, the watt-hour meter still requires a meter reader, adding substantially its variable costs. Utilities have a large installed base of end-use watt-hour meters in homes, offices and businesses, and the total energy use information from these meters is used to determine the utility's "revenue requirement", or the amount of revenue they are allowed to keep to ensure that they earn the regulated rate of return.

Some innovation began to proliferate in metering in the 1990s with automatic meter reading (AMR). AMR uses either handheld, mobile, or network technologies to capture the analog meter's current setting, these technologies gather the data from the individual meters using communication by radio frequency (RF), by powerline, or by wired or wireless telephony. For example, a meter reader could use a probe to prompt the AMR device to provide the meter reading, or a meter reader could drive down a street with an RF receiver to capture the RF recordings from each meter. While economizing on meter reading costs, AMR does little to increase the functionality of the analog meter. The frequency, or granularity, of the consumption data is a function of reading frequency, which itself continues to be a function of the labor cost of the human interface. An AMR system still requires human interaction to communicate data from the consumer, and it does not communicate information to the consumer.

One of the most important capabilities that even AMR systems lack is the ability to communicate timely information about consumption, prices, and opportunity costs to the consumer. A customer with an AMR-enabled meter still only receives information feedback on the quantity and cost of consumed electricity at the end of the month, when the bill arrives. Furthermore, a retail service provider cannot communicate price signals, or any other dimension of service quality to which the consumer could respond on short timescales by changing their electricity consumption. Similarly, the system operator (who is charged with maintaining system balance and service reliability) cannot communicate information about any impending system imbalance to the customer, so s/he is incapable of responding in a timely manner to reduce consumption in ways that could mitigate the system imbalance.

Advances in digital communication technology have created the potential for functionality that supercedes the limitations of existing AMR. The two main changes in functionality are digital data recording and two-way communication capability. Digital data recording means that the meter can provide the retailer and/or consumer with fine-grained, timely consumption information. We cannot overstate the importance of this capability; it undergirds much of the possible retail competition and product differentiation that could occur in retail electricity markets. Digital data recording makes real-time pricing possible, makes time-of-use or peak-load pricing easier, and also makes it possible to capture data on such dimensions as the type of fuel that is being used in real time to generate electricity that the customer is consuming. The two-way communication capability reinforces this set of values by enabling both the communication of information from the consumer for billing purposes and the communication of information to the consumer (price signals, generation green/gray mix, system condition) to empower the consumer to make more precise decisions to control his/her individual electricity use.

This digital, or smart, metering network is known as advanced metering infrastructure (AMI). AMI is a metering system that records customer consumption (and possibly other parameters) at least hourly and that provides for daily or more frequent transmittal of measurements over a communication network to a central collection point. AMI transmits the necessary information among the end-user, retailer and system operator so that all parties can make appropriate, informed decisions.

On the customer side of the meter, digital technologies are increasingly available that reduce the cost of sending prices to people and their devices. Gale et. al. (2008) catalogs a variety of end-user technologies, from price-responsive appliances to wireless home automation systems, that can communicate electricity price signals to consumers, keep data on their consumption, and be programmed to respond autonomously to trigger prices that the consumer chooses based on his/her own preferences. Moreover, such technologies enable autonomous response based on other dimensions of consumer preferences and choice, such as willingness to pay for different levels of power quality, reducing consumption at the margin when additional consumption would shift from renewable generation to fossil fuel generation (green/gray margin), and whether or not to charge the battery in the plug-in hybrid vehicle or draw from that battery to power the home, depending on current retail electricity prices. These end-use devices complement AMI by increasing ways that consumers can control and manage their own electricity consumption, by introducing opportunities to bundle electric service with other technology products and services, and by decreasing the cost to consumers of making those active, dynamic consumption decisions.

These digital end-use technologies include home energy management systems and intelligent devices such as grid-friendly appliances. A variety of established and startup companies are offering home energy management systems, using home connectivity either from Ethernet or electrical wiring in the home. A new web-enabled home energy system (or subsystem) typically involves a base controller set up on a cable or DSL line that oversees a local home network that operates either via the home power line, Ethernet or wireless. The network consists of either plug-based control modules or wireless sensors and controls. These systems will enable two features that can contribute substantially to consumer value creation, and also raise the types of property rights issues that are the focus of this analysis:

- Internet-based *access to the energy management system* through a web application; this access can include remote access by either the customer or another party, such as the retailer or the system operator; and
- Ability to automate customer responses to information – the energy management system and the devices in the home can be *transactive*.

Digital intelligence can also be distributed even more deeply in the home through transactive devices such as grid-friendly appliances (Chassin & Kiesling 2008). Grid-friendly appliances are appliances, such as water heaters, refrigerators, and clothes dryers, that consume substantial amounts of electricity but have thermal properties that enable them to be functional while responding autonomously to dynamic price signals or other types of information (e.g., system emergency notification, switch from green to gray generation). Appliances with such digital intelligence can make individual demand autonomously transactive, because the consumer can program the home energy management system to have the devices respond to price signals and other information in accordance with individual preferences.[5]

The underlying vision of this dynamic retail electricity market is that the combination of ubiquitous low-cost communications, wireless and wired; IP-standardization; low-cost mesh sensors and modules make precise, real-time and on-demand electricity management a low-cost increment to investments already being made to serve other needs (e.g., security, web connectivity). As a result, many new entrants can offer new customer-centric products and services. These opportunities could create a "customer pull", which in turn (or in parallel) can fuel the need for regulators to adopt new electricity rates which will favor utilities to invest in advanced metering infrastructure and smart grid technologies.

C. Electricity Consumption Data Issues

Digital technology creates the potential for a vast amount of precise individual-level, and even appliance-level, consumption data, which can be useful in creating new products and services. These new technologies, new products, and new services have great market potential, but the incentives for entrepreneurs to realize that potential rely on some important questions regarding property rights institutions with respect to consumption data use and access rights. Two of those questions are:

- *Privacy*: Can consumers trust that only authorized parties (such as a retail service provider) will have access to their consumption data?
- *Rivalry*: Will these products and services come to market if the incumbent can block entrant retailer access to

[5] Another parallel development that is facilitating the growth in these products and services is the development of and coordination on industry standards for interoperability of these devices on home networks. Groups such as the Zigbee Alliance and OpenHAN (home area network) provide coordination on interface standards that reduce the likelihood that customers will buy devices that rely on a proprietary communication architecture.

consumption data? What is the consumption data access right definition that respects individual privacy while reducing transaction costs and customer acquisition costs that could act as an entry barrier in retail electricity markets?

Institutional change allowing retail market changes (such as dynamic pricing, product differentiation, retail choice, and competitive retail markets) will make the rights to access those consumption data valuable to parties other than the traditional utility – valuable to the potential retailer, valuable to the consumer.

What rights do these parties have to access and use these new data? What rights should they have? Traditional utilities, which under retail competition will transition to being wires companies, could claim a right based on their ownership of the meters that create and gather the data (note, however, that this idea is inconsistent with precedents over similar issues in Internet data). Consumers, on the other hand, can claim a right because their activities and decisions are the origins of the data, so they have a claim in both an economic and a privacy sense. One substantial challenge is that the primary technology for creating and accessing the consumption data is the meter. In most cases, the utility/wires company will own and operate the meter.[6]

## III. Comparative Case Study: Number Portability

Number portability is a recent example in which technological change led to a change in the value of a particular right, and

[6] Another issue related to consumption data and customer access is the merits or problems of direct load control (DLC), in which the utility or retail provider have remote access to a customer's home to change their electricity consumption. An example of a retail DLC program is receiving a rebate on your bill if you allow the utility/retailer to access your air conditioner to cycle it on and off in response to system requirements. The access issues associated with DLC are beyond the scope of this paper.

how the institutional structure evolved to adapt to those changes. It is an illustrative example of institutional adaptation to technological change, not a direct parallel to the consumption data access issues in electricity. Here we present a summary of the issues, and a review of some of the economic analyses of them.

## A. Issues

As part of its objective of stimulating competition in retail telephony, the Telecommunications Act of 1996 mandated number portability for wireless carriers and set a compliance date of June 30, 1999.[7] In 1997, the Cellular Telecommunications & Internet Association (CTIA), a wireless industry advocacy group, filed a petition with the Federal Communications Commission (FCC) requesting forbearance from the regulation. The FCC applied a three-pronged approach in analyzing whether or not to grant forbearance. Specifically, they analyzed whether the following statuatory conditions for relief from the regulatory requirement were met:

1. Enforcement of such regulation or provision is not necessary to ensure that the charges, practices, classifications or regulations by, for or in connection with that telecommunications carrier or telecommunications service are just and reasonable, and are not unjustly or unreasonably discriminatory;

2. Enforcement of such regulation or provision is not necessary for the protection of consumers; and

3. Forbearance from applying such provision or regulation is consistent with the public interest.

The FCC initially considered these conditions met and granted a forbearance, delaying implementation of wireless number portability until November 24, 2002. The FCC specfically rejected the request that the portability requirement be shelved

[7] See Kessing (2005) for an extended discussion of the history of wireless portability in the United States, from which this paper draws.

permanently. In July 2001, Verizon filed a petition with the FCC asking for a permanent reprieve from the regulatory requirement. A majority of wireless providers joined this petition.

In July 2002, the FCC used this three-pronged analysis but changed its ruling, concluding that portability was necessary to further the public interest as a result of the continuing expansion and development of the wireless industry. For example, by this time many consumers were using their wireless phone as a replacement for (and competitor to) landline service, a choice that could be fostered by requiring portability. Prior to this ruling, the wireless industry had argued that portability was not needed to foster competition because the market was already competitive, with 30 percent of subscribers switching providers each year [NYTimes 2002]. The FCC granted a one-year delay, and wireless portability was mandated to be in place by November 24, 2003. Verizon and the CTIA filed an appeal with the D.C. Circuit Court of Appeals, arguing that the FCC had exceeded its statuatory authority in imposing portability (a claim dismissed on procedural grounds) and that the FCC had misapplied the second prong of the test.

Andrew McBride, a lawyer for Verizon and the CTIA, said that portability was not necessary to foster competition in the wireless industry [NYTimes 2003]; he argued that “[t]he wireless industry is the most competitive telecommunications market on the planet, and what consumers say they value most in this market is price and coverage.”. Verizon Wireless had earlier contended that portability could cost the wireless industry $1 billion [NYTimes 2002]. Anne Hoskins, a lawyer for Verizon, argued that the regulation was wasteful, with expenses possibly reaching $50 million per year: “Our concern is that it is an expensive and capital-intensive mandate. Is this necessary to bring about competition? We believe the answer is no.” The FCC pointed to the example of other countries' wireless industries to argue that introducing portability could enhance compeition. In Hong Kong, after portability was introduced in 1999, customers were changing providers every 10 months. In the United States, prior to the introduction of portability, about one-third of customers changed providers in a given year [WaPost 2003]. Consumer groups pointed to Britain, Spain, and Australia as examples of companies who had successfully intrroduced portability without damaging their wireless telephone industries [NYTimes 2003]. In a survey, 40 percent of respondents selected "I don't want to change my current number" as a reason why they had stayed with their current provider [WaPost 2002]. Roger Entner, an industry analyst with the Yankee Group, argued that the cost to upgrade the networks was not the major cost of introducing portability; rather, the expense of maintaing the wireless networks and courting new customers to replace customers who leave would be the primary cost. He estimated that the "churn rate" in the industry could more than double, from 2.8 percent per month to 6 percent [NYTimes 2003].

The court eventually concluded that the FCC's application of rule was within the "arbitrary and capricious" standard required and upheld the FCC finding. The mechanics of portability were left to private negotiations between the carriers [San Jose Mercury News 2003]. Wireless carriers were allowed to charge a fee for porting, but the fee was not allowed to exceed the cost of providing portability, and wireless firms could offer to reimburse the fees as a way to compete for new customers. A last-minute appeal for an emergency injunction was filed with the D.C. Circuit by the United States Telecom Association days before the ruling was scheduled to go into effect, but the request was denied. Portability was then introduced in the top 100 Metropolitan Statistical Areas by the FCC deadline of November 24, 2003, and then extended nationwide within six months.

B. Analysis

This case illustrates the process of institutional adaptation to technological change in mobile telephony. Several economic analyses of number portability draw out the policy implications from a property rights perspective. Gans, King, and Woodbridge (2001) discuss the optimal regulation of local telephone number portability.[8] They point out that if the regulator allows the telephone service providers to pass on the costs related to portability to customers, the firms will have an incentive to pick technology with high per-customer costs. A potential solution to this problem is to compel the firm to bear the costs associated with developing portability, which gives the firm the incentive to choose the lowest cost technology. However, this approach reduces the customer's cost of porting to zero, resulting in an suboptimally high number of consumers choosing to switch providers as even customers who place next to zero value on being able to port their number will choose to do so. This outcome is inefficient because there are customer-specific costs to porting a number that the telephone companies must bear in addition to the technological upgrades that have to be made to the network in order to allow portability in general. These costs include one-time charges such as updating the database used by the telephone switches, as well as some ongoing technological costs depending on the porting technology deployed. The regulator must balance the competing, and seemingly contradictory, requirements that firms bear the cost in order to ensure the lowest cost technology is used and that customers bear the cost so the optimal number of participants switch.

Gans et. al. propose an alternative regulatory structure to avoid the problem of conflicting requirements, using the property rights allocation system proposed by Coase (1960). Specifically, the regulator could vest "ownership" of the number with either the firm or customer. As Coase showed, in the absence of transaction costs, the allocation of property rights will lead to the efficient outcome regardless of which party receives the

[8] They model the portability decision for local service, not mobile, although the two cases have many issues in common.

property; Gans et. al. assume the customer currently subscribing to the line becomes the owner. Following the standard Coaesan analysis, they show that allowing the customer to sell back the telephone number to the provider leads to the efficient outcome, so the lowest-cost porting technology is adopted by the firms and the correct number of customers switch. The authors also discuss several complications with the Coase solution. One problem is the possibility that a customer can claim s/he will switch telephone service providers in order to induce the firm to purchase the number even when not interested in switching. This one-time problem is inherent in the allocation of the new property right; however, it does not actually represent an inefficiency. Rather, it is a transfer from the current telephone provider to customers. A second difficulty is that of pricing new numbers in order to deter competition. If selling numbers makes it easier for the customer to switch between firms, then the firm currently serving the customer has an incentive to raise the price beyond the efficient level. However, this problem is alleviated by the competition among service providers for the new customer. Another problem is possible inefficiency in bargaining over the price of the number, since in practice the firm is likely to make a single, take-it-or-leave-it offer rather than negotiate the purchase of the number individually from every customer. Standard regulation, however, is no better in this regard, since it requires that there be a price put on the cost of porting. In fact, normal regulation can be worse, since the incumbent carrier is likely to have better information regarding both costs and the value of switching for customers than is available to the regulator.

Haucap (2003) discusses the efficiency of number portability for mobile phones. Switching costs, both direct fees and indirect costs associated with changing numbers such as printing new stationery, can make market entry more difficult, but there is no clear theoretical answer to whether requiring portability is efficient in terms of maximizing social welfare. He argues that the technological costs associated with developing portability can be substantial. He further suggests that high numbers of customers switching providers shows that it is unlikely that switching costs are an impediment to competition. Illari (2004), in contrast, discusses court rulings that concluded that high rates of customer turnover are insufficient to conclude that the lack of portability is not a barrier. The courts ruled that customer turnover could be even higher if portability was introduced and that having to change numbers is a barrier, even if not a total one. Ellig (2006) questioned whether to include the cost to firms of customer switching as a cost of regulation. He argues that if wireless is competitive, then customers should not suddenly switch providers when portability is introduced, and so an increase in switching associated with portability indicates that wireless providers were previously charging prices above the competitive level. Ellig suggests that reports from the FCC do not support the contention that local number portability caused price reductions. He also argues that there is another effect of portability on competition, since the presence of high switching costs may induce competition for new customers, so that the additional profit a firm earns from the presence of the additional costs is returned to customers in advance. In that case, portability would be of limited value to consumers in a competitive marketplace but more valuable if the existing providers have market power. Bryan (2004) notes that mobile telephone providers were allowed to increase fees in order to recover the costs of portability, and they chose to do so through fees added to individual bills. She argues that the introduction of portability may in fact decrease customer choice. Because of the technological costs associated with portability, the regulatory requirement to provide it could drive small firms entirely out of the market. Also, termination fees were increased and contract length extended in the wake of portability.

Lyons (2003) uses the staggered introduction of cellular number portability in different countries as a natural experiment to examine the impact of requiring portability with a cross-sectional analysis. Theoretically, the effect of the new regulation on price is indeterminate. Lyons identifies three effects portability can have on price: increased costs, competitive effects, and a loss of information for customers (who can no longer identify other users on their network by their telephone number). He finds that portability was associated with lower prices and increased customer switching, but only in countries that required porting in five days or less; however, very short porting times do not necessarily increase demand. High charges deter porting, but charging zero does not increase usage more than charging a low amount. Shin (2006) cites two effects of switching costs: they lower the elasticity of demand and increase competition for unattached consumers. In an empirical study, he concludes that cellular telephone portability has actually increased the barriers to switching because providers have innovated and use alternative strategies to lock in consumers (such as "friends and family" plans). He calculates that portability has led to a reduction in total welfare for society.

These analyses of number portability lend insights to the case of electricity consumption data. In particular, they are grounded in the Coasean idea that the challenge of institutional design, and institutional adaptation, is to determine the efficient allocation of rights. Efficient rights allocation in this case involves not only reducing transaction costs, but also the reduction of potential anti-competitive effects of the rights allocation.

## IV. Electricity Consumption Data Rights As An Entry Barrier

In both the number portability case and the burgeoning electricity consumption data case, a primary policy question is whether a pre-existing right constitutes an entry barrier. In the number portability case, the FCC argued that the customer's lack of a portability right had anti-competitive effects in both wireless and local retail telephone markets. In the electricity consumption data case, if the incumbent utility exerts an exclusive right to consumption data, then competing retailers would find it costly to learn the preferences of potential customers, acquire new customers, and design products and services that they would find most profitable in expectation. Thus the policy question is whether such a right would constitute an entry barrier for potential retail entrants. This section surveys the entry barrier research and discusses this question in light of the entry barrier literature.

## A. Entry Barrier Literature

One of the most difficult problems with the idea of barriers to entry is obtaining a consensus on a clear definition of the concept. McAfee, Mialon, and Williams (2004) list no fewer than seven “principal definitions” of the term, and proceed to propose four new ones. In his seminal study of entry barriers, Bain (1956) defines the phrase in terms of cost and pricing power.

Barriers to entry are “the advantages of established sellers in an industry over potential entrant sellers, these advantages being reflected in the extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry.” For him, if free entry implies that price will be driven down to cost, then the correct measure of the strength of barriers to entry is the amount by which this price-cost margin is elevated. He identifies three characteristics of an industry giving rise to entry barriers: absolute cost advantages, product differentiation, and significant economies of scale. Bain also distinguishes between what he terms the “immediate condition of entry” and the “general condition of entry.” The immediate condition refers to the barriers faced by the firm or firms which can most easily enter into the market, which he characterizes as “the long-run price-minimal cost gap (for the most favored established firms) which is just short of sufficient (sufficient at the margin) to induce the entry of what we may call the most favored potential entrant or entrants.” That is, it is the entry barrier faced by the most competitive potential entrant. The general condition of entry refers to the succession of different values for the immediate condition of entry; that is, how the condition of entry changes as firms enter the market. Armed with this definition, Bain undertakes an empirical, cross-sectional analysis of industries to determine which have the most severe entry barriers. McAfee et. al. point out that his definition is flawed because it builds a consequence of entry barriers, raised prices, into the definition itself.

Stigler (1968) proposes a narrower definition of entry barriers. He explores the weakness of Bain's definition by considering the case of industry served by a monopolist because only one firm can exist with the current level of demand. While Bain's definition includes the economy of scale present here as an entry barrier, Stigler argues that the situation could equally be described as a barrier to entry created by inadequate demand. Stigler thus restricts barriers to entry to “differentially higher costs of new firms - others are location and advertising and product characteristics--which affect the demands of individual firms.'' He then discussed several implications of this definition. One is that capital requirements cannot be a barrier, because existing firms have to pay them as well as do entrants, so to the extent they are relevant, it is through economies of scale. Also, product differentiation is not a barrier under his definition, unless it costs more for a new firm to differentiate than it does an older firm. Stigler's definition also focuses the concept of free entry, which for him is “entry by firms suffering no cost differentials relative to existing firms. Free entry is compatible with huge capital requirements (which are a source, perhaps, of economies of scale).''

Ferguson (1974) defines barriers to entry as "factors that make entry unprofitable while permitting established firms to set price above marginal cost, and to persistently earn monopoly returns.'' For him, then, the "main nonlegal barriers to entry'' are increasing returns to inputs. He recognizes, though, that other factors besides what he calls barriers to entry affect the degree to which firms can price above cost: "Whether firms in an industry set prices which yield extranormal returns depends not only on barriers to entry but also on the state of competition among the established firms. Price competition among established firms may prevent prices from being raised to levels that yield monopoly returns, and nonprice competition among established firms may prevent extranormal returns from being earned, even if prices are raised above marginal cost.'' Ferguson distinguishes his definition from that of Bain, which includes absolute cost advantages and economies of scale, and that of Demsetz, which includes absolute cost advantages but excludes economies of scale. In contrast, under Ferguson's definition, "absolute cost advantages, in the absence of economies of scale, are a barrier to entry only if they permit existing firms to set prices above marginal cost, and earn persistent monopoly returns without attracting entry.'' Ferguson notes that the existence of rents is not sufficient to conclude there is a barrier to entry, since ownership of superior resources can lead to that result as well. Nor is it the case that absolute cost advantages would lead automatically to rents in Ferguson's setup: "Firms with absolute-cost advantages face perfectly elastic demands at the minimum-supply price of the higher-cost firms, and downward-sloping demands at lower prices. If the lower, but still upward sloping, marginal-cost curves of these firms intersect the horizontal portion of their demand curves, price will equal marginal cost and no monopoly power will exist.'' Thus empirical studies in the style of Bain are insufficient to detect the presence and strength of barriers to entry, since the consequence of a barrier depends on the cost functions faced by firms.

Demsetz (1982) points out a primary difficulty with these definitions by considering the example of a city requirement to purchase taxicab medallions. "Suppose it were true that such licenses, which may be resold subsequently, also must be purchased first from the city *at market-determined prices*. Insiders and outsiders face the same cost, the medallion price plus automotive costs, so Stigler's definition fails to identify the barrier, and since the price of the medallion must dissipate profit, so do Bain's and Ferguson's. [Emphasis in original]'' Demsetz argues that there is clearly a barrier present here, so the definition must be modified. Carlton (2005) agreed with this criticism of Stigler's conclusion of no entry barriers in this case, saying that ordinary usage of the English language would suggest that this type of restriction should be included in any definition of an entry barrier. For Demsetz, the "insider-outsider'' framework of previous work fails to assess the correct implications of barriers to entry for consumer welfare because it implicitly assumes that "consumer sovereignty will be served by allowing resources into the high profit industry.'' Furthermore, he argues that "the problem of defining ownership is precisely that of creating properly scaled legal barriers to entry.'' This is perhaps clearest in the case of intellectual property, with monopoly rights granted in order to give an incentive for innovation.

von Weizsacker (1980) argues that since economists implicitly assume a normative aspect to barriers to entry, in that their presence implies inefficiencies in the marketplace, the definition should explicitly include a welfare component. As he sees it, the problem with Stigler's definition of barriers to entry is that it cannot be used to generate policy or welfare conclusions, which is problematic because "the inefficiency connotation of the concept is by now deeply ingrained in the use of the term.'' He proposes an extension to Stigler's definition: "A barrier to entry is a cost of producing which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry and which implies a distortion in the allocation of resources from the social point of view.'' Carlton and Perloff (2005) adapt this definition but drop the requirement that welfare be lowered, defining a long-run barrier to entry as “a cost that must be incurred by a new entrant that incumbents do not (or have not had to) bear.”

Carlton (2005) shows that Bain's original definition of entry barriers suffered some severe drawbacks. In Carlton's view, Bain's definition and subsequent econometric analysis was valid if barriers determine the number of firms competing in the market, which thereby determines the competitiveness, and thus the profit margin, in a given industry. The problem is that the decision to enter is made on profitability, but profitability is itself dependent on the nature of the competitive game. Because the number of firms depends on this game-theoretic consideration, industries with the same external structure can have different outcomes. He considers the following example: “Imagine an industry that in one country (country A) is described by quantity (i.e. Cournot) competition, but in another country (country B) is cartelized with free entry into the cartel. As long as there is a fixed cost to entry, the price in country B will exceed that in country A, yet concentration in country A will exceed that in country B.'' According to Carlton, an even more fundamental problem with Bain's analysis is that it assumes factors are exogenous which are in fact determined in the market. For example, while Bain considers product differentiation as an external determinant of industry structure, in reality firms can to some degree determine the degree of differentiation, through investments in advertising or developing new products. He argues that “models that focus on only price competition may fail miserably to correctly predict industry concentration and consumer welfare when there are other product dimensions along which competition occurs. This is likely to be particularly true in industries requiring investment and creation of new products.''

Carlton levels additional criticism against the traditional notions of barriers to entry. First, he argues that what matters is not necessarily the long run or the short run (in which entry, by definition, is not possible), because the adjustment process to reach to long run may rule it out as an object of interest. Focusing instead on dynamics and introducing game-theoretic concepts changes the questions that can be answered: “One can ask not only whether price will eventually equal the competitive level, but also how long it will take before price reaches the competitive level. In response to, say, a merger that winds up raising price by 10 percent, how much of that price increase will be eroded by entry in two years or five years?'' The problems with the standard definitions become even more acute when uncertainty is introduced. In a simple model involving sunk costs and time dependence in demand (so that shocks to the demand equation reveal information about future demand), Carlton shows that it is not true that the lower and upper bounds on price are, respectively, the minima of the average variable cost curve and the average cost curve, as a simpler analysis would conclude. Dixit and Pindyck (1994) use a similar model in an analysis of the copper industry and find that producers earn what appears to be above competitive profits 60 percent of the time and below competitive profits 30 percent. In addition, the entry and exit thresholds are considerably wider with uncertainty. Without uncertainty, exit occurs at a price of $0.79 and entry at $0.88. With uncertainty and sunk investment, the bounds are $0.55 and $1.35 respectively. Carlton thus concludes that the focus for regulation and antitrust should not be on whether an entry barrier exists or not, but rather on how the industry will evolve, which leads to consideration of uncertainty and adjustment costs.

Gilbert (1989), in his chapter from the *Handbook of Industrial Organization*, assumes the following definition: “A barrier to entry is a rent that is derived from incumbency. It is the additional profit that a firm can earn as a sole consequence of being established in an industry.'' He criticizes Stigler's definition as overly restrictive, as it focuses on the cost difference between potential entrants and established firms. His example is that of an established firm committed to the monopoly output in a situation in which no firm can profitably enter. Entry is excluded, but there is no obvious cost advantage enjoyed by the existing firm. Gilbert also discusses a potential problem with the von Weizsacker welfare-based approach, as "competition could result in an excessive number of products as measured by total economic surplus, in which case von Weizsacker's approach would conclude there are 'negative' entry barriers in this industry. Welfare would be improved by making entry more difficult.''

This criticism brings up two points. First is the implication that it is somehow a deficiency that von Weizsacker's definition can lead to barriers to entry being positive for a particular market. Demsetz (1982) considers the example of requiring taxicabs to install airbags and seatbelts: "Even if the price of safety equipment equals its cost, and even if there were no bar to producing such equipment, would their not still be a barrier to putting taxis on the street? Surely, the answer is 'yes,' but the policy implications of that answer depend very much on the value judgments regarding the consequences of such barriers." The phrase "entry barrier" has normative implications, but Demsetz here shows why these can be problematic. Secondly, Gilbert uses total economic surplus in discussing the shortcoming of von Weizsacker's definition, but this is not an innocuous consideration. Schmalensee (2004) argues that the correct definition of barriers to entry to use depends on the welfare concept being considered. For the purposes of antitrust, he shows that the objective of United States policy is to maximize consumer surplus rather than total surplus, though this is not explicit in the law. He constructs relatively simple examples to show how using different standards of welfare can lead to different conclusions regarding the existence of antitrust barriers.

McAfee et. al., in an attempt to clear up confusion, abandon the quest for "the" definition of a barrier to entry. They distinguish between an "economic barrier to entry," which is "a cost that must be incurred by a new entrant that incumbents do not or have not had to incur" and an "antitrust barrier to entry," defined as "a cost that delays entry and thereby reduces social welfare relative to immediate by equally costly entry." Note first that every economic entry is an antitrust barrier. A market with no economic barriers to entry will "eventually" be efficient. An antitrust barrier is something than in an otherwise-efficient market reduces welfare relative to what it would be with no barriers present. The authors classify an economy of scale as an antitrust entry barrier, but not an economic one. They argue that because entry deterrence is "generally a short-run phenomenon" and that the issue of an industry only having the need, given current levels of demand, for a fractionally-sized additional factory is temporary in an industry experiencing growth, scale economies are not economic entry barriers but could be antitrust barriers, provided they reduce aggregate welfare by delaying entry. McAfee et. al. also draw a distinction between "direct" and "reinforcing" barriers to entry by defining a primary barrier to entry as "a cost that constitutes a barrier to entry on its own" and an ancillary barrier to entry as "a cost that does not constitute a barrier to entry by itself, but reinforces other barriers to entry if they are present." An example of an ancillary barrier is a scale economy. The reason is that for the incumbent's profits to be reduced, some customers must be induced to switch to the entrant, but customers may have brand loyalty which prevents them from doing so. So scale economies deter entry only given the presence of brand loyalty. Therefore, "Scale economies are ancillary entry barriers that reinforce primary entry barriers such as brand loyalty."

## B. Application to Electric Consumer Data (INCOMPLETE)

Carlton (2005) – cost entrant incurs, but not incumbent

Gilbert (1989) – rent derived from incumbency

Current State-Level Consumer Data Policies
-not all states have data-specific provisions
-not even all states with retail competition have specific provisions
-exception is Texas: clear, straightforward definition ELABORATE

# V. Conclusion (INCOMPLETE)

Inst adaptation to tech change and its effect on rivalry in retail markets. Tricky problems in the transition from regulation to competition, have to apply the tools of competition policy analysis to institutional design

Adaptation of industry and its institutions to changing economic and technological circumstances – continuous flexibility in allowing resources to be put to changing uses.

restructuring in a complex network industry is harder than neoclassical theory would predict, and institutions matter. In this case, the institutions are the market and regulatory institutions comprising the market design that is largely unnecessary in more organic market processes.

Layered entry barriers; cust data access may not be the predominant barrier in the presence of such issues as the design of the default service contract

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**Appendix: Summary of Existing State Legal Provisions Regarding Electricity Consumption Data**

State restructuring status available at **http://www.eia.doe.gov/cneaf/electricity/page/restructuring/restructure_elect.html**

**Arizona:**

Restructuring status: SUSPENDED
Regulation: After receiving written authorization, a load-serving entity is required to release customer billing data, including "consumption, demand, and power factor (if available)" for a 12-month period to an electric service provider specified by the customer.

*Opt-in for transfer of data.*

**Arkansas:**

Restructuring status: SUSPENDED
Regulation: Electric utilities can release customer information only with the prior consent of the customer

*Opt-in, but not very clear on what data is included (all they say is "including name, address, and telephone number")*

**California:**

Restructuring status: SUSPENDED
Regulation: Written customer consent is required before customer information, including specifically "usage information" can be released.

*Opt-in.*

**Connecticut:**

Restructuring status: ACTIVE
Regulation: Unless a customer declines, a customer's name, address, telephone number, and rate class can be released to electric suppliers. However, any *additional* information, including more detailed usage information, requires a written release from the customer before it can be disseminated.

*Opt-in for usage data, though opt-out for rate class. I'm not totally sure what that is, though.*

**Delaware:**

Restructuring status: ACTIVE
Regulation: Written customer consent is required for the release of any customer information.

*Opt-in.*

**District of Columbia:**

Restructuring status: ACTIVE
Regulation: Written customer consent is required before a market participant can release information about a customer that is "about that customer" and "was supplied to the market participant or electric company by that customer."

*This is very unclear to me. What about information about a customer not "supplied" by that customer, say metering data? I'm not sure how this applies.*

**Illinois:**

Restructuring status: ACTIVE
Regulation: Written authorization is required before customer specific usage information can be provided to an alternative electric services provider. The utility is also allowed to charge a "reasonable fee" for supplying the data.

*Opt-in, with a provision for cost recovery.*

**Maine:**

Restructuring status: ACTIVE
Regulation: Transmission and distribution companies are required to provide competitive electricity providers with customer-specific information, including "a customer's kWh usage, maximum monthly demands (if recorded for billing purposes), and other customer-specific information, agreed upon by the competitive electricity provider and the transmission and distribution utility." The distribution company is allowed to charge to recover the "incremental costs" of providing the data. Before issuing the request, the competitive provider must obtain customer authorization; however, this may be obtained simply through "a notification in the competitive provider's terms of service document." The transmission company must obtain written evidence that customer authorization has been given before transferring any customer-specific information.

*This seems like "opt-in" for data transfer, but very weakly so, since it can just be included in the terms of service. Also interesting that they allow a fee to recover the cost of transferring the data.*

**Maryland:**

Restructuring status: ACTIVE
Regulation: The electric service provider is required to obtain customer consent before releasing customer information as defined in the code.

*Opt-in.*

**Massachusetts:**

Regulation status: ACTIVE
Regulation: In a finding from the utility commission, the regulators argue that the competitive process would be made more efficient if suppliers were provided access without having to obtain consent from each customer. They found that requiring competitive providers to contact potential customers twice is "incompatible with a mass-marketing strategy", so historic usage information was to be included on customer lists, and therefore "an 'opt-out' system better meets the legislative purpose of providing suppliers efficient access to information that would expand consumers' competitive options."

*Interesting how they explain here where the rule comes from. Also, they make it clear that the rule is 'opt-out'.*

**Michigan:**

Restructuring status: ACTIVE
Regulation:

**Montana:**

Restructuring status: SUSPENDED
Regulation: Written permission is required before individual customer data can be provided to third parties "except as provided by commission rule or order."

*Opt-in. The language is rather unclear, it almost sounds as though it only applies to natural gas providers, although I do not think that is what is meant. "No supplier, regulated distribution utility, transmission service provider, energy service provider, metering service provider, billing service provider, or other company or individual involved in the sale or delivery of natural gas, may disclose individual customer information to others without prior written consent from the customer except as provided by commission rule or order."*

**Nevada:**

Restructuring status: SUSPENDED
Regulation:

**New Hampshire:**

Restructuring status: ACTIVE
Regulation: New Hampshire requires written authorization from customers before customer information, including usage data, can be released.

*Opt-in.*

**New Jersey:**

Restructuring status: ACTIVE
Regulation: Customer consent is required before customer information can be disclosed to any third party.

*Opt-in.*

**New Mexico:**

Restructuring status: SUSPENDED
Regulation: Written permission is required before public utilities can disclose any individual customer information, which includes "information about the specific attributes of a single customer's energy usage such as demand, load factor, and usage characteristics," to any entity, including affiliates providing competitive service.

*Opt-out.*

**New York:**

Restructuring status: ACTIVE
Regulation: Energy service providers are required to obtain authorization from the customer authorization before requesting information. Upon request, a distribution utility will provide consumption history to energy service providers, where consumption history is exchanged electronically.

*Opt-in. The regulations define the data to be transferred; unclear whether this includes meter data from dynamic pricing or not.*

**Ohio:**

Restructuring status: ACTIVE
Regulation: Utilities are required to make customer-specific information available to other electrical companies on a "comparable and nondiscriminatory basis" unless the customer objects.

*Opt-out.*

**Oregon:**

Restructuring status: SUSPENDED
Regulation: Electric companies determine the proprietary customer information available to energy service providers subject to approval by the utilities commission. Electric companies are required to provide customers with demand less than 1MW an opportunity to opt-out of an information transfer.

*Opt-out for small customers, but not clear what data are included (since it is not defined, other than as being subject to commission approval).*

**Pennsylvania:**

Restructuring status: ACTIVE
Regulation: Electricity distribution companies and suppliers are prohibited from releasing customer data, including "historical billing data" (defined as "kWh consumption on-peak and off-peak or at some other prescribed interval of consumption and associated cost and, if applicable, at demand levels at the intervals recorded and associated costs of those demand levels"), unless the customer has been given notification and a method of notifying the company of their wish to restrict the disclosure of the information.

*This is an opt-out provision, clear about what data are included (and this would seem to cover data from smart meters).*

**Rhode Island:**

Restructuring status: ACTIVE
Regulation: The release of information is governed by the terms and conditions of the electric generation company. When there is nothing there governing the release of the information, then the regulations state that the information will be provided at the customer's request, at no charge, to competing providers as chosen by the customer.

*Opt-in* IF *the distribution company has no terms related to the distribution of information. Otherwise those rules govern it.*

**Texas:**

Restructuring status: ACTIVE
Regulation: Uniquely, the regulators in Texas allocate ownership of the data itself. Specifically, the current retail customer owns "all meter data related to the premise occupied by that customer, regardless of whether the meter owner is the customer, the owner of the premise, or a third party." Utilities are required to provide entities authorized by the customer access to the customers meter data "including meter data used to calculate charges for service, historical load data, and any other proprietary customer information."

*Not really opt-in or opt-out, just defined property rights.*

**Virginia:**

Restructuring status: SUSPENDED
Regulation: Competitive service providers are not allowed to disclose information unless authorized by the customer or unless the information is in the public domain. The local distribution company is required to provide a "mass list" of eligible customers to competitive service providers upon request, which includes for a given customer, "load profile reference category, if not based on rate class", and "up to twelve months of cumulative energy usage and annual peak demand information as available." Prior to disclosing this information, the distribution company must provide customers to have information removed (in total) from the mass list.

*Opt-out. Unclear if the information mentioned in the code would include that from digital meters or not.*