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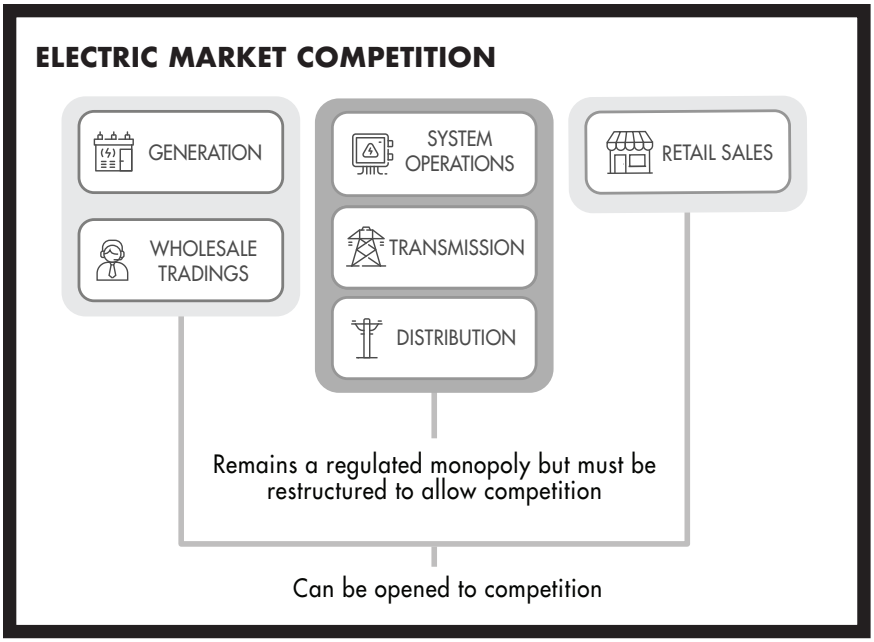
SECTION ELEVEN: THE CONCEPTS OF MARKET RESTRUCTURING AND COMPETITION

The term deregulation is commonly heard in discussions about the electricity market. This, of course, is a misnomer. There is no such thing as deregulation in a market where key sectors are and will remain dominated by regulated monopolies. Even in sectors such as generation and retail sales, where competition can work effectively, the nature of electricity will result in all market participants competing in an environment of ongoing regulatory involvement. Consider, for instance, that a system operator must balance supply and demand at all times, that one market participant's actions potentially impact everyone on the grid, and that disturbances travel quickly throughout regions. And then consider the value our society places on electric service. You can see why regulation must play a role in all sectors of the business to ensure safe and reliable service. So again, deregulation is not really what we are experiencing in the electric industry — what we have is market restructuring. And by market restructuring, we mean changes in regulatory rules that alter control, ownership, or regulatory mechanisms of specific industry sectors resulting in increased competition.



Due to the integrated nature of the traditional electric business, we must consider restructuring of all market sectors if we are to introduce competition into any of them. Failure to do so would create a facade of competition without truly creating an environment that can allow it to work. The sectors where we can introduce competition

are generation, wholesale trading, and retail sales. Transmission, system operations, and distribution services are monopoly functions, at least for the foreseeable future, but must be modified to allow for competition in other sectors.

We discussed what the different market structures might look like after restructuring in Section Nine. In this section we will discuss the concepts that support a successful competitive market structure and the implementation steps necessary to get there. These concepts are especially important to understand because the U.S. has no uniform vision of how to structure electric markets. Some states and regions have moved far down the road to competition while others have not at all. And there is no clear federal policy for moving to unified markets. Thus, we can assume that anyone involved in the industry will be entangled in market structure uncertainties for quite some time.

Why Restructuring to Facilitate Competition?

As you will soon learn, restructuring is a messy business. It costs a lot of money, market participants are forced to learn new ways of doing business, regulators lose control over market activities, and in some cases outcomes do not always benefit customers. So why bother?

The goal of a market structure should be to benefit customers by fostering reliable service, reasonable prices, fairly predictable bills, and to encourage innovation in the services provided. Many would argue that the first century of vertically integrated utilities did an effective job of meeting those criteria, at least until issues with nuclear generation and rising oil prices arose. Beginning in the 1970s, some utilities were forced to raise rates due to cost overruns on nuclear construction (largely due to changing safety regulations during the construction process) and the rise in fuel costs. Coupled with a general philosophical trend toward deregulation of U.S. industries (including airlines, natural gas, and telecom) this led to a reconsideration of the benefits and necessity of vertical monopoly utilities. As the value of opening electric markets to competition was (and continues to be) considered, several important questions arose:

- Can a competitive generation sector provide lower prices than regulated utility generation?
- Can competitive generation and wholesale marketing sectors result in adequate or improved reliability of supply?
- Will efficiencies resulting from a competitive wholesale trading marketplace result in lower prices?
- Will innovation in competitive retail services provide customer benefits that outweigh any negative aspects of competition?

Various market observers would answer these questions differently, and given the difficulty of determining the benefits of competition, no one yet has the answers. Many would say that competition has worked well in U.S. natural gas markets, where prices have fallen dramatically when supply is robust but then have risen just as dramatically when supply is tight. Meanwhile reliability has been enhanced, and new services have offered market participants more choices. Some would contend that electric competition is now providing similar benefits in some regions of the U.S.

The European Union, which in 1999 committed itself to competitive generation and retail sales markets across all its member countries, lists its reasons for restructuring as follows[1]:

- to increase efficiency by introducing competitive forces into the electricity market
- to eliminate distortions in competitive conditions that cause enormous price differentials among member states
- to lower prices relative to the U.S. and Australia
- to improve essential public services for all customers
- to reduce the need for expensive reserve capacity by integrating markets
- to reduce resource waste that results in pollution
- to give customers the right to choose services that match their needs
- to improve customer service provided by electricity companies

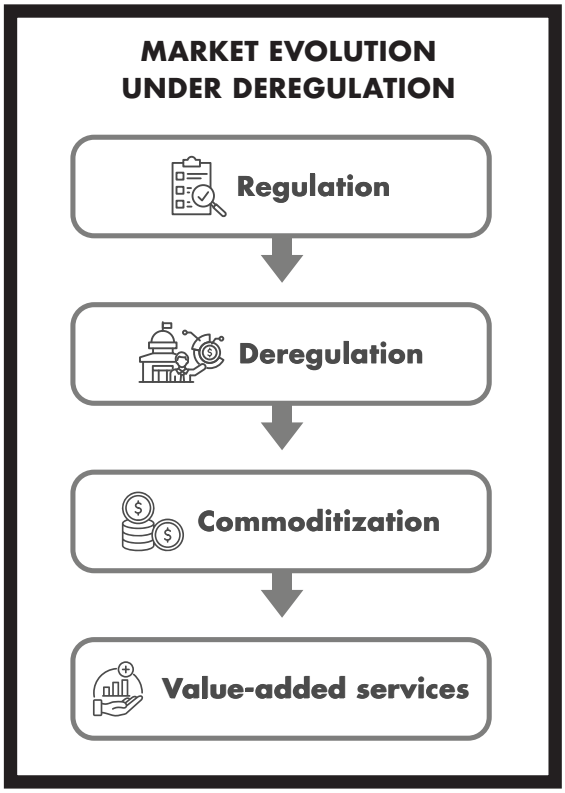
Whether these benefits will be achieved is an open question, but few can argue the validity of these reasons for restructuring electric markets. In the end, it simply comes down to the question of what creates more benefits for consumers — a marketplace driven by competition or one controlled by regulation?

Market Evolution under Deregulation

Market restructuring is not an overnight process. It takes a long time to implement, there are many bumps in the road, and impacts of policy choices may not appear for many years. Consider what has happened in the airline and telecom industries. While the process has taken decades to evolve (and is still evolving) for these industries, does anyone doubt the benefits to consumers? For anyone old enough to remember the days of the vertical AT&T phone monopoly, simply consider the multitude of services avail-

[1]Summarized from Opening Up to Choice, available at: http://europa.eu.int/comm/energy/electricity/publications/doc/electricity_brochure_en.pdf

able today compared to the plain black dial phones of the past.



To put the process of market evolution under deregulation in perspective, let's consider four phases of market evolution — regulation, deregulation, commoditization, and value-added services. These four phases provide an excellent framework from which to review the changes that may occur with restructuring in a specific region (remembering that different sectors will be at different phases in different states and regions in the U.S.). While the generation, wholesale trading, and retail sales sectors will likely mature through these phases, they may not do so simultaneously but rather at different times in different regions. And in some regions they may even remain regulated or may go back to regulated after initially being deregulated. In almost all cases the transmission, system operations, and distribution sectors will remain in the regulation phase, though regulation will have to be restructured to recognize the changes in the competitive sectors.

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Regulation

This phase is characterized by the dominance of regulation and lack of competition across the delivery chain. Transactions are generally highly structured and usually long-term in nature. Prices are fixed, buyers and sellers are relatively few, barriers to market entry are significant, vertically integrated utilities dominate the marketplace, and customer choices are minimal. Prices are cost-of-service-based with little or no flexibility, and decisions to invest in infrastructure or innovation are highly influenced by the support (or lack thereof) of regulators.

Prior to 1992, the U.S. electricity industry was in the regulation phase. Utilities or closely aligned generation agencies owned most generation and all transmission and distribution and they operated their systems as a unified whole. Customers had little choice but to buy electric supply from their local utility.

Deregulation

In the deregulation phase, rules are loosened in some sectors and barriers to entry are broken down to allow competition to come into the market. As the number of competitors increases, transactions become more flexible and customers attempt to benefit from increasing choice and competition. Regulation still controls much of the way business is transacted, but it is designed to encourage a level playing field among competitors and to foster competition in sectors that have been opened. Services in the competitive sectors (which may include generation, wholesale trading, and retail sales) become more diverse and may be tailored to individual customers. While system operations remains highly regulated, prices for services such as day-ahead and real-time energy, reserves and financial transmission rights become market-based. Transmission and distribution prices remain cost-of-service-based, but distribution and utility supply rates evolve to reflect the changes in wholesale prices across the day.

EXAMPLES OF ELECTRIC SERVICES IN THE MARKET PHASES

Regulation

- Utility distribution services
- Transmission services
- System operations
- All sectors in states where full vertical integration remains in effect

Deregulation

- Electric supply sold to large customers by wholesale marketers
- Power purchased by utilities from independent power producers or wholesale marketers
- Competitive markets facilitated by Independent System Operators (ISOs)

Commoditization

- Electric supply sold to all customers by non-utility suppliers such as retail marketers or community aggregators
- Robust wholesale electricity trading in highly liquid competitive markets facilitated by ISOs or power exchanges

Value-added Services

- ESCO services sold to industrial and commercial customers
- Financial services available to finance projects and manage risk
- Combined commodity services (electric, gas, telecom, etc.) sold by retail marketers
- Distributed energy resources aggregated by service providers to provide services in wholesale markets or for sale to utilities

Commoditization

In the commoditization phase of the market maturation cycle, competition has taken hold. Numerous market participants compete and trading volumes are high. Prices are market-sensitive and volatile. Regulations act mainly to prevent market manipulation and to ensure fair access to monopoly infrastructure. Transactions become simplified and transferable among buyers and sellers. Financial markets arise where risks can be managed. Transactions that used to be secured with a phone call between old friends are now handled electronically with buyers and sellers often blind to each other's identity. The return on investment in infrastructure such as generation is purely based on market demand. Now shareholders of competitive companies carry the risk of bad management decisions. If a power plant is built and market conditions don't support its cost (as has happened to numerous such investments in recent years) no one pays except the shareholders (and maybe the bondholders) of the generation company.

Under commoditization, there is price transparency — meaning market prices are known to all participants — there are no barriers to the transfer of commodities between willing buyers and sellers, no one entity has market power, and there are no regulatory protections.

Value-added Services

In this final phase, participants attempt to add value (and increase profits) by adding services their cus-

VALUE-ADDED SERVICES

Facilities management — Monitoring and maintaining a customer's equipment to increase efficiency of use and to minimize repair costs.

Energy management — Monitoring customers' usage patterns and identifying ways to reduce energy costs through technological or behavioral modifications.

Demand side management — Managing energy usage through the use of technology to reduce overall energy costs.

Pricing and risk management — Offering pricing options to match the customer's business needs and appetite for price risk.

Power quality — Using technology installed on the customer's premises to reduce voltage spikes and other power fluctuations.

Reliability — Using technology installed on the customer's premises to reduce the probability of a power outage.

Combined commodity — Combining electricity with other utility services such as natural gas, telecom, and broadband to minimize customer hassle.

Billing options — Offering alternate ways to pay for electric services and providing accounting and other related services.

Distributed energy resources — Offering installation, financing, operation, and aggregation of demand side management, distributed generation, and distributed storage.

Value-based — Offering services based on value desired by the customer — hot water, conditioned air, lighting, etc. — rather than based on energy commodity.

tomers will value to the sale of commodity. In many instances, market restructuring has led to razor-thin commodity margins, so marketers are forced to develop customer-focused services that will improve profits for the seller. Because one kWh of electricity delivered through the distribution system is the same as another, value-added services are the best way for participants to increase market share. As the availability and affordability of distributed energy resources (DERs) increases, consumers have growing service options from entities other than the utility. In a competitive retail electricity marketplace, most marketers must rely on value-added services to attain reasonable market share and profits. Low price alone is not enough to sustain a market position.

The Necessary Components for a Competitive Marketplace

The electric industry is different from any other industry for the various physical reasons we have discussed. And because of the complexities involved with operating the electric grid, it is extremely difficult to design a competitive market that functions effectively. The numerous vested interests that have built up over the past 100 years make it even harder to change anything. When changes are achieved, these same vested interests attempt to skew the new markets in their favor. The goal of a competitive marketplace is to create a liquid market with many buyers and sellers coming together in freely negotiated business arrangements. Given the many peculiarities of the electricity business, it is necessary to identify the components required for a functioning competitive market and the necessary steps to implement changes to achieve this market. First we will consider the necessary components, and then we will discuss implementation.

Supply-side Competition

The first key requirement for a functioning competitive market is many sellers. In a perfectly competitive market, no seller has enough market share to affect the market price of the commodity sold. With adequate competition customers can simply go to another supplier if any seller attempts to raise prices above what the market supports. Evaluating supply-side competition in the electric industry is somewhat more complicated. In a given marketplace there may be many sellers for most hours out of the year, but during a few specific hours (peak hours or times when units are down for maintenance) there may no longer be a liquid market. During these times, certain suppliers may have the opportunity to exert market power. Worse yet, suppliers may be able to cause these situations to occur by purposely removing generation from the market (by taking it down for maintenance during a critical hour). Thus it is necessary to encourage new generation construction in the marketplace, to encourage adequate transmission to let geographically remote suppliers compete, to find mechanisms that encourage

utilities to divest of generation, and to carefully review any regulatory protections that would favor existing generation units. In the absence of a fully competitive supply market, regulators must revert to regulatory solutions that include price caps, bidding restrictions, generation availability requirements, and/or rules on when planned maintenance is allowed. It should be noted that sufficient generation capacity is an additional requirement for a competitive market. There may be any number of generators supplying a given market, but without sufficient capacity the market is beholden to them in the same way it is if there is no competition. Some regions have implemented mandatory capacity markets to ensure sufficient generation resources. Others leave it to the market to determine capacity amounts but implement price or other controls when capacity falls below a specified level.

Fair Access to Transmission

The need for many suppliers goes hand in hand with the need for fair access to transmission. If a supplier cannot access transmission, it cannot get its supply to market. Some markets in the U.S. have benefited less from new independent generation than expected because transmission issues have prevented these units from fully functioning in the marketplace.

Establishing fair access to transmission is one reason for creating an Independent System Operator (ISO) that, in addition to other responsibilities, is responsible for allocating transmission access. The ISO is not controlled by any market participant (unlike the wheeling model, where transmission access is controlled by the incumbent utility). Rules must be developed that give every market participant the same opportunity to use transmission and to allocate transmission access based on fair criteria — usually who is willing to pay the most. Any existing firm transmission rights contracts would ideally be bought out; otherwise certain market participants gain favored access to the system. And in some cases where constraints in the existing transmission system impede open trading, market rules must foster new transmission construction. Rules must also be developed that determine how the new transmission is paid for so that costs are allocated fairly to the market participants who benefit from it and to determine the terms for new generation interconnecting to transmission.

Liquid Day-ahead and Real-time Markets

The variable nature of electric loads and some electric supply resources requires market participants to be able to buy and sell quickly as these quantities change close to the time at which electricity is consumed. To manage variations, liquid short-term markets

available to all participants are important. These are best managed by a centralized electronic platform designed for large numbers of trades with transparent pricing. This is typically achieved through day-ahead and real-time markets facilitated either by the ISO or by an independent power exchange.

Unbiased System Operations

In addition to allocating transmission and potentially facilitating short-term markets, the system operator must operate the system to ensure reliability and balance supply and demand in real time. This can work only if the system operator has dispatch control of the generation assets serving the system. As loads grow, units must be ramped up. As loads fall, units must be ramped down. And sometimes, units must be redispatched from desired schedules due to locational issues. In a competitive market, generation owners are understandably reluctant to turn dispatch control of their units over to another entity unless they are convinced that the entity is running those units in an unbiased manner. Thus exists the requirement for a truly independent ISO.

Demand-side Competition

To ensure market liquidity, there must be many sellers and many buyers. One without the other does not make for a fully competitive market. Sellers cannot be tied to selling to a single utility procurement group — doing so simply creates a buyers' monopoly that must be regulated. To have a competitive market there must be the opportunity for end-use customers to buy directly from suppliers rather than through their utility. The way to create the largest number of buyers is to completely remove the utility from offering supply services. This has been done and can work. But many states are reluctant to open markets simultaneously to all customers, and experience has certainly shown that there can be advantages to phasing in customer choice. Many argue that enough buyers can be created by allowing only large commercial and industrial customers the choice of supply. Since they make up significant demand in terms of load (even if not in terms of number of accounts) this is often enough to create market liquidity. Another way to increase buyers is to allow aggregated groups of smaller customers to buy directly. Some states are providing this opportunity through programs like municipal aggregation where cities buy power on behalf of groups of customers.

A second key requirement on the demand side is to create markets where buyers become responsive to short-term electricity prices. By this we mean a market in which high wholesale prices will encourage buyers to curtail their usage until prices fall. Many current market structures do not provide for this as end users often pay average utility

prices that are fixed for at least a year at a time. If wholesale prices spike to the equivalent of $5/kWh, end users in a traditional market have little incentive to care — they will likely continue to run their air conditioners at full tilt because they are paying the utility average price of $.10/kWh. This perhaps is one of the biggest factors in arguing for electric restructuring. If customers don't get price signals (and therefore do not have the opportunity to refuse the use of high-priced power), there is nothing to restrain market power and bad business decisions by utility executives and/or regulators except after-the-fact corrections by regulators. The key to facilitating demand response to price is to create an infrastructure that gives customers the appropriate tools. This requires meters with hourly data that can be accessed by customers in real time, some means of communicating hourly prices to customers, an ISO market structure that allows loads to bid into markets in the same way that generation participates, aggregators who can work with groups of customers to facilitate market participation, and/or utility programs that incentivize customers to reduce loads given certain market or grid conditions.

Distribution without Impediments to Competition

Also critical for a functioning competitive market are distribution services that foster, not impede, customer choice. Several service issues are critical:

- providing access to meter data for both customers and marketers
- providing default suppliers for customers who don't choose or can't find a marketer
- determining whether the utility will be allowed to offer supply services, and, if so, setting an equitable price
- determining how societal programs such as support for low-income customers and environmental programs will be paid for
- setting rules for customers who choose to utilize DERs, including stand-by rates, interconnection charges, and the opportunity to sell excess power and other services back to the grid
- determining how transition costs associated with restructuring will be allocated
- determining how costs are allocated between distribution and supply services

Many a budding competitive market has been stymied by just two of these factors — how the default rate is set for utility supply services (if it's too low, no marketer can compete) and how meter data is made available to marketers (without meter data, marketers can't bill their customers).

Opportunities for Hedging Risks

Prices in competitive markets — especially for a commodity like electricity — are volatile. Electricity prices fluctuate rapidly based on supply and demand. Demands at 6 p.m. are often double what they are at 6 a.m. This means twice as much generation is required, at much higher prices. And as gas prices fluctuate, availability of hydrpower comes and goes, wind and solar output varies, hot or cold weather drives demand, and large units go down for maintenance, price fluctuations from $0/MWh to $500/MWh are not unusual. In some markets prices can even go negative (meaning generators pay to put power on the grid) or go as high as $5,000 per MWh. Many market participants cannot handle such fluctuations. Thus regulators must always be cognizant of creating stable rules and market structures that can help foster the development of financial markets for risk hedging.

Creating a Competitive Market

Now that you understand the requirements for a competitive electric marketplace, let's look at the issues involved in its actual implementation. As we have seen repeatedly in the U.S., the move from a regulated monopoly market structure to a competitive one is no simple task. Regulators and legislators have several key issues they must address if the transition is to be successful. These include how to create a competitive generation sector, how to ensure adequate transmission capacity, how to create a functioning ISO with viable trading arrangements, how to transition to customer choice, how to regulate the remaining transmission and distribution assets, and how to ensure reliability.

Transitioning Generation

As long as generation remains part of a vertical utility and is subject to cost coverage in utility rates, there cannot be a fully competitive supply sector because these assets will benefit from cross-subsidies not available to independent generators. Options for opening up the generation sector include ordering the utilities to separate generation functions into a subsidiary company (and regulating activities between the newly created subsidiaries with market affiliate rules), encouraging the utilities to sell off generation assets (known as divestiture), requiring utilities to give up control of generation by auctioning off rights to blocks of generation capacity, or setting specific limits on the market share any one generation entity is allowed to own and control.

An additional generation transition issue is how to deal with generation assets that may not be well-suited to a competitive environment. Examples include nuclear generation

(due to its inability to ramp up and down and the need to cover capital costs that may have been allocated to customers over a long number of years), QFs (due to laws that require utilities to take QF output), and supply provided by DERs. Often regulators must create a category for nuclear generation and QFs that is called regulatory "must take." This requires the system operator to take the output regardless of price. Mechanisms must also be established for generators that must run due to locational transmission issues that prevent power from being brought into a demand zone. These facilities are called "must run." Regulators must then come up with a mechanism to allocate the costs of must-take and must-run generation to consumers. Regulators or legislators may also wish to encourage the development of renewable generation for the societal benefit of a cleaner environment. A common solution is a renewable portfolio requirement. A portfolio requirement sets a percentage of generation that each market participant must obtain from renewable energy. An alternative is to offer tax credits or other economic incentives for building renewable generation. And as discussed in Sections Nine and Ten, regulators must create rules that foster market participation by DERs.

Creating a Robust Transmission Market

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As we have seen earlier in this book, creating supply choice does little to open a competitive market without also ensuring adequate transmission access so that suppliers can easily compete in all areas of the market without being stymied by transmission congestion or the inability to interconnect new supply. Given current and pervasive opposition to transmission construction in the U.S., this is a significant issue. It appears that the best solution may be the creation of transmission-only companies that are regulated under traditional rate-of-return methods. These companies can significantly expand earnings only by expanding rate base (i.e., by building new transmission), which should strongly incentivize them to work with local communities to develop acceptable solutions for the construction of new transmission. Also important is moving from local transmission planning based on reliability needs to a broader regional planning process that also considers market benefits. A related issue is how to handle existing long-term transmission agreements. Such agreements, if they control a significant amount of transmission capacity, will prevent a competitive market from evolving.

Finally, in areas where transmission congestion is prevalent, market participants must often pay transmission congestion costs that are in excess of the standard transmission rate. Since this creates a significant financial uncertainty, it is important to create mechanisms that market participants can use to lay off this risk. This is done by creating a mechanism called FTRs, or financial transmission rights. FTRs are auctioned periodically and allow buyers to lock in congestion costs associated with a specific trans-

mission path. There is also a need for long-term management of congestion price risk to allow new generation projects to develop without excessive uncertainty. Thus ISOs are beginning to consider creating long-term financial transmission rights.

Creating an Unbiased System Operator

There is no way around it — there must be an independent unbiased system operator for a competitive market to function. In the U.S., this has been accomplished by the creation of ISOs. Establishing an ISO requires cooperation between the states and FERC, since ISOs are FERC-jurisdictional (except in Texas) yet the utilities that will give up the system operations function are state-jurisdictional. And if utilities are not willing to voluntarily turn control of their systems to the ISO, regulators must be willing to incentivize them to do so. As we have discussed elsewhere, the structure of the ISO's trading arrangements is critically important. If the rules are flawed, market consequences can be severe. Fortunately, we now have some good operating experience from various ISOs in the U.S. and around the world, and our knowledge of what works and what doesn't is expanding rapidly. An alternative to ISOs are independent Transmission System Operators (TSOs) who manage system operations functions but leave market facilitation to power exchanges. This has been done in many European markets.

Transitioning to Customer Choice

Transitioning to customer choice is perhaps even more critical than all the other issues we've discussed. The efforts to create competition are a moot point if customers choose not to participate. Critical issues include customer education, avoiding the temptation to give customers the option to stay with the utility at fixed prices that do not reflect market fluctuations, and letting the market develop sufficiently before dumping customers into the fray. Many observers now believe that it makes most sense to first allow large customers to choose, then transition into customer choice for smaller customers as markets mature. Also important is the creation of balanced mechanisms to fairly compensate DER owners who provide grid services without placing undue burdens on those without DERs.

Continued Regulation of Transmission and Distribution

Regulators must continue to regulate the monopoly functions of transmission and distribution. Options range from traditional cost-of-service to various forms of performance-based ratemaking. It is critically important to vigilantly monitor any set of rules for signs that it may create barriers to competition.

Ensuring Reliability

One of the hottest issues in today's environment is how to ensure reliability in a competitive marketplace. Reliability breaks down into multiple issues — ensuring adequate supply capacity on a long-term and short-term basis, system flexibility, reserves, transmission, and ensuring sufficient investment in grid upgrades and maintenance. The latter issue can be handled by regulation of the distribution and transmission monopolies, just as it is under traditional markets. Ensuring adequate supply flexibility and reserves in the short term is an issue of trading arrangement design. Ensuring long-term supply and transmission is a more thorny issue. The general concept is that as supply drops, prices will rise. Higher prices encourage new generation or transmission, which enhances supply, causing prices to drop back down. And if you believe in competitive markets, it all works out to the consumers' benefit. Unfortunately, there are often numerous barriers to new generation — activists who block construction, uncertain returns given volatile electric prices, lack of transmission capacity, delays in transmission interconnection, and lack of capital for speculative construction. And if generation takes five or more years to build, what happens to customers in the meantime?

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Several options have been discussed and, in some cases, implemented. Initially many markets attempted to simply let the market work itself out. To do so, however, requires mechanisms that allow customers to respond to price. If prices get too high and the market structure permits customers to respond, they will likely use power in different ways or perhaps sign long-term contracts with suppliers to guarantee prices. However, concerns about rising prices and/or falling reliability have often led policymakers to conclude that the unique nature of electricity may not be well-suited to total dependence on markets. Many regions now give ISOs or state agencies the power to forecast future generating capacity needed to ensure reliability multiple years into the future. The ISOs or state agencies then allocate a capacity responsibility to each load-serving entity (LSE) based on its market share. The LSE is then obligated to make sufficient long-term supply arrangements to cover its allocated responsibility or be placed into a mandatory auction to acquire the needed capacity. An alternative to such an auction is to penalize entities that fail to provide sufficient capacity. Either way, the capacity obligation provides a long-term guaranteed revenue stream for supply resources, hopefully resulting in the construction of sufficient capacity.

Settlements

As you might imagine the shift to numerous market participants and multiple energy, reserves, and capacity markets creates the need for additional accounting and tracking

of transactions to ensure money flows to those providing necessary services. This important function is provided by a centralized entity that tracks thousands of power transactions and determines who is owed (and by whom) for each. For wholesale transactions this is typically handled by the ISO. For retail transactions, state regulators must designate an entity to manage usage data and issue bills.

Future Distribution Restructuring

To date, restructuring of electric markets has generally focused on wholesale markets and, in some cases, retail supply. As penetrations of DERs grow, regulators are forced to consider whether the distribution function should be restructured as well.

During wholesale restructuring, concerns over market power of utilities led to the formation of ISOs to ensure fair access to transmission and to facilitate non-biased wholesale markets. Some in the industry believe that a similar concept is required to allow owners and operators of DERs fair access into local and wholesale electric markets. Concepts include changing the role of the distribution utility into a Distributed Services Platform Provider (DSPP), creating an unbiased third-party Distribution System Operator (DSO), or the use of blockchains for peer-to-peer trading. The DSPP model is being implemented in New York state and will task distribution utilities with fulfilling three roles:

- distribution grid operator that can integrate high penetrations of DERs
- distribution market manager that manages power flows associated with DERs in real time and is responsible for creating opportunities for DER owners to monetize the provision of products and services to the distribution grid or to other local market participants
- intermediary between retail consumers and the wholesale marketplace so that aggregated DER services may be sold into wholesale markets

An alternative is to simply create an independent DSO that would serve the same role on distribution systems as the ISO serves on the transmission system and leave other functions to non-regulated market participants. Some in the industry have even suggested doing away with central control of distribution-level markets and instead using blockchain technology to allow all market participants to trade directly with each other. Any of these concepts will result in significant restructuring at the distribution level and open the door for new services and new market participants. As penetration of DERs grows, it appears that the next wave of restructuring may focus on the distribution system.