IMPACT OF REGULATIONS ON ELECTRIC DISTRIBUTION MARKET

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ABSTRACT

For decades the electric market, from generation to consumption, was monopolized and regulated. The regulators mainly concentrated on regulating prices charged by utilities to their captive customers both at the wholesale and retail or distribution levels. The United States was one of the first countries to implement deregulation first at the power generation level and allow open access to the bulk transmission system. The Federal Energy Regulatory Commission ("FERC") in USA issued a well known series of Orders namely 888, 1000 and 2000 which made the bulk transmission lines common carriers and the operation of the transmission systems were transferred to Independent Systems Operators/ Regional Transmission Organizations (ISOs/RTOs). The ISOs/RTOs not only started controlling bulk transmission, they started operating and managing wholesale capacity, energy and ancillary service markets. These markets also provided ISOs/RTOs control over the dispatching of generators. The open access and competition at wholesale or bulk level was followed by the deregulation at the distribution level also which provided end users the opportunities to obtain power from non-utilities suppliers. The new environment also offered opportunities to the electric industry as well as customers to explore the means to increase efficiency and reduce the cost of generation, transmission, distribution and utilization which resulted in new inventions such as the new means to conserve power, the smart grid and distributed generators. The ISOs/RTOs not only relied on generators to balance their systems, they also started encouraging Demand Side Management resources and distributed generators to provide electric products to the wholesale markets.

This paper will provide a brief history of various U.S. laws and regulations at the wholesale and retail levels and their impact on the U.S. and global electric markets. The paper will also provide insight into the future market developments such as supplies, demand and prices in the global electricity market.

INTRODUCTION

The U.S. and Western European electric industry expanded rapidly during the 1950s and 1960s and the electric industry prices declined with the new and more efficient power generation technology. Then, in 1970s and 1980s, came the era of mega sized coal fired power and nuclear plants. Due to the cost overruns of these plants, combined with the increased fuel prices and inflation, electric prices started escalating rapidly. In 1978, the Public Utility Regulatory Policy Act, which was a part of the US National Energy Act of 1978, (the Author was involved in the formulation of these acts) required utilities to purchase power from Independent Power Producers (IPPs) and Qualifying Facilities (QFs) at their avoidable costs which resulted in encouraging IPPs and the large customers to install QFs, small and medium size generators. This was the first time when significant amount of non utility owned and Distributed Generators ("DGs") were installed. New mega generators, high electric prices, IPPs, QFs and energy conservation resulted in excess electric capacity. At the same time a few court cases in the USA compelled the regulated electric utilities to allow wheeling of power from third parties or to sell at least a part of power supplies to their wholesale customers at competitive or non regulated prices. The author was involved in all these cases. This situation also encouraged utilities to file transmission tariffs with the FERC which allowed wholesale buyers to purchase and transmit electricity from third parties. This situation caused the implementation of a number of new laws, rules and regulations leading to unprecedented changes in the highly regulated electric utility industry which are summarized below.

SUMMARY OF IMPORTANT U.S. LAWS, RULES & REGULATIONS

1. The Energy Policy Act of 1992 emphasized the energy conservation and development of renewable energy and alternative fuels. This Act established a new category of Exempt Wholesale Generators (“EWG”) which were unregulated and started providing wholesale power at market or unregulated prices.

2. On April 24, 1996, FERC issued its famous Order 888 which required utilities to unbundle their power supply rates and allow open access to their transmission facilities. Order 888 was the first real step towards electric market deregulation resulting in a competitive market.

FERC recognized that the full competition in the wholesale power market was hindered by the existence of over 100 transmission facilities owners and 140 separate control/dispatch areas. Therefore, on December 20, 1999, FERC issued Order 2000 which encouraged the utilities to form Independent System Operators (ISOs) or Regional Transmission Organization (RTOs) and transfer the operational control of their transmission facilities to ISOs/RTOs. In the beginning, the ISOs/RTOs mainly concentrated on transmitting bulk power in a more efficient and economic way. Then the ISOs/RTOs established wholesale power markets allowing participants to sell and purchase various electric products such as capacity, energy and ancillary services (such as load following, voltage control and balancing services, reactive power, etc.).

3. The Energy Policy Act of 2005 authorized loan guarantees for nuclear plants, renewables and other innovations to avoid greenhouse gases, biofuel and provided subsidies for wind and other alternative energy producers and demand response resources. It required utilities to offer net metering to customers which allows customers to get credit from their utilities for the power they generate. If their generation exceeds their consumption, they get paid by the utilities for the excess power. Also, this Act established federal reliability standards for transmission grids.

4. FERC's Order 679, issued in late 2006, provides additional economic incentives for building transmission facilities such as higher return on equity and assurance of cost recovery even if the construction is abandoned.

5. Energy Policy and Conservation Act of 2009 provided tax credits to business for energy efficient buildings and appliances.

6. On July 21, 2011, FERC issued Order 1000 which focused primarily on large scale, high voltage transmission projects serving regional and inter-regional needs. This Order required planning on regional and inter-regional basis and involvement of all stakeholders in the planning process. Order 1000 encourages interconnecting renewable energy resources to transmission grids and investment in and installation of transmission facilities by third parties, i.e. non utility investments in the transmission facilities. Order 1000 also provided guidelines for allocating costs on regional and inter-regional basis and assurance for cost recovery by the owners of the transmission projects.

EFFECT ON POWER MARKETS

All of the above laws and regulations resulted in open access to transmission, non-regulated wholesale power markets, regional transmission grids and expanded renewable energy resources.

In the beginning, the ISOs/RTOs relied mainly upon the generators to balance their systems. Then they started encouraging Demand Side Management (DSM) and Resources including DGs and behind the Meter Generators at the distribution level to sell capacity, energy and ancillary services in the wholesale market or curtail loads at the distribution level which would require lesser quantities of electric products. FERC orders also encouraged the ISOs/RTOs to interconnect the renewable resources by socializing the cost of such interconnects.

Deregulation and competitive process in the USA also encouraged similar competition and unregulated power market in Canada and Western Europe. Open access and the competition at the wholesale level also resulted in competition at distribution or retail levels and a number of States and provinces in North America and Europe started allowing retail customers to select their power suppliers.

The new competitive market environment resulted in new players in the electricity market such as power marketers and brokers with and without generating assets, ancillary services providers, load and/or DSM aggregators. This new market also encouraged new inventions such as automatic and real time meters, smart grid, highly efficient small and micro generators and renewable energy resources. The bad or side effect of the new market is a slowdown in the investment in the distribution facilities in the USA which are still regulated. Higher returns and faster cost recoveries are allowed by FERC for the transmission facilities as compared to the distribution facilities which are regulated by the States.

The implementation of Locational Marginal capacity and energy pricing combined with excess gas supplies and stricter environmental regulations has resulted in the increased installation of gas based generators and this trend is expected to continue in future. Any gas shortages could result in higher electric prices which may encourage the rebirth of nuclear power.

NEW REGULATIONS AND TECHNOLOGIES

The above described laws and regulations not only impacted the power supply market and transmission, they also caused the need for new regulatory processes and development of new technologies which are described below.

REGULATORY CHANGES

1. Utility Restructuring: A number of vertically integrated utilities in USA divested their generation assets and became only wire (transmission and distribution utilities). Some utilities such as Entergy sold their transmission assets also and primarily became a retail distribution utility.

2. Rate Unbundling: Prior to deregulation, customers paid one rate for their power supplies which included all charges. With the deregulation of wholesale power supply market, the power supply rates were unbundled into various components such as charges for capacity and energy supplies, transmission, ancillary services and distribution.

3. Rate Decoupling: The new emphasis on DSM, Load Control ("LC") and energy efficiency combined with high electric and energy prices have slowed down the load growth of electric distribution utilities. As a result, utilities in USA have been demanding from their regulators the permission to decouple their rates which assure them the recovery of other costs irrespective of KWh they sell and/or transmit through distribution lines to their customers. To date about 20 state commissions in USA have implemented some form of rate decoupling mechanisms. Such mechanisms generally negate any savings to customers if they implement DSM and LC Programs as their payments to utilities do not decline with a decline in their electric consumption. Therefore, some customer groups have started opposing mandatory DSM, LC, and Energy Efficiency Programs.

4. Infrastructure Surcharge: There is a higher emphasis on electric supply distribution reliability and installation of smart grid and meters which require substantial capital investments. As a result, utilities are seeking rate surcharges to recover these costs without filing a full rate case. Some customer groups are opposed to these surcharges as being a piecemeal ratemaking process. Some groups are also opposing the installation of smart grid and meters alleging that their benefits do not justify costs.

5. Aggregators: As it is generally not economical for small distribution customers to take advantage of the benefits of competitive market and DSM programs, a number of marketers and aggregators have become new players in the power market. They aggregate retail loads and seek power supplies at competitive prices and aggregate DSM resources in order to bid such resources into the wholesale market.

TECHNOLOGICAL CHANGES

1. Distribution Generators (DGs): Laws and rules providing tax breaks, net metering and economic incentives have encouraged the installation of DGs including micro generators and renewables even by small customers. Not only do the customers get tax subsidies and/or cash payments, they also realize savings by self generating power and getting paid by their utilities for excess power. For example, California has set a target of 12,000 MW of DG as a part of 20,000 MW planned renewable energy resources.

2. Demand Side Management (DSM) and Load Control: Besides the renewables and DGs, this is another fastest growing distribution market area. In order to encourage the full DSM technologies and utilization reach their full potential, the International Energy Agency (IEA) provides support for over 40 international co-operation and collaboration agreements in energy development and information dissemination. DSM has been playing a major role in providing a large part of the electric capacity in the wholesale market. During 2011, about 15,000 MW of DSM capacity was bid into PJM, the largest ISO/RTO in the USA.

3. Ancillary Services: As renewable power resources do not provide the needed ancillary services, increasing renewables require additional ancillary services. While traditional power plants will continue to provide ancillary services, the non-traditional resources such as energy storage, fly wheels and DSM are expected to provide ancillary services at retail levels. Lawrence National Laboratory at Berkley California is developing "Demand Response Optimization and Management System-Real Time' (DROMS-RT) which could reduce the need for ancillary services.

4. Smart Grid and Meters: As smart grids (both transmission and distribution) and meters provide more real time information, they facilitate the DSM and LC programs. Therefore, this market has also been increasing rapidly. At the end of 2011, more than 33 million US customers had smart meters. Electric Meters and Advanced Meter Infrastructure (AMI), with enhanced communication capabilities, are being more prevalent. As per a study by IMS Research, the smart or advanced meter market is expected to reach $13 billion in 2016. Most of this growth will be in North America and the European Union. Latin America, especially Brazil, and China and India, are also planning to spend over $40 billion during the next ten years. In Europe, smart meters have reached 50% penetration in some markets. Smart grids will focus on integration of renewable energy sources and DGS into the transmission and distribution grids. As per IMS Research, the investment in equipment supporting smart grid communications and networking

increased from $700 million in 2011 to $950 million in 2012. The investments in substation modernization and distribution automation is also expected to increase substantially. As per Pike Research, the total in the US smart grid market is projected to reach $13 billion per year by 2018. According to Zpryme, the global smart grid market could total $220 billion by 2020. Most of the smart grid investment will be concentrated in 10 countries namely, USA, Canada, China, India, Brazil, Germany, France, United Kingdom, Japan and South Korea.

5. Innovations: As necessity and economics are the main motivators for innovations, the high electric prices, power supply reliability and environment concerns would provide incentives to new innovations and technologies especially in the following areas:

a. Lower priced and more economic DGs including renewables
b. Electric Distribution facilities with reduced power losses
c. Electric storage facilities
d. Load control and management technologies
e. More real time electric utilization and load control information
f. Energy efficiency technologies

CONCLUSION

In the future, the new electricity market will result in more investment in gas fired generators, renewable energy resources, power transmission and DSM facilities, renewable energy and gas fired generators. The new investment will also encourage more innovations which should result in more efficient utilization of facilities and energy resources and probably in lower prices to customers than these would be otherwise.

AUTHOR'S BIOGRAPHY

Jatinder (Jay) Kumar is the President of Economic & Technical Consultants based in the Washington, DC metropolitan area. Mr. Kumar has been providing consulting services since 1972 related to all the issues involving public utilities mainly related to electric and natural gas and has been involved with almost all the rulemaking proceedings instituted by the US Federal Energy Regulatory Commission. He has testified in over 200 regulatory proceedings before FERC and in various jurisdictions in USA and Canada.