Distributed Generation Comes Full Cycle

21st Century Solution

for

An Uncertain and Dynamic

Future of Power Supply

by

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Introduction

With the nationwide move towards the deregulation of wholesale electric markets, the formation of ISOs and RTOs, and fears of deteriorating grid reliability, some in the electric industry fear a period of economic chaos and harm to municipally owned electric utilities as the industry adopts competition as the new way of doing business. If a shift away from vertically integrated utilities providing centrally generated electricity and reliable transmission service is going to impact the bottom-line of the public power utility sector, what can these predominantly smaller utility systems do to survive and flourish? For many in the public power sector, locally owned and managed distributed generation will be an extremely versatile tool in guaranteeing an economic and reliable supply of energy to their customers. The question is: "Can a nationwide system of small generating plants provide for a truly stable and manageable utility network? And if so, how can such distributed generating resources be best utilized for the benefit of the smaller independent distribution utilities?"

Foundation of the Industry

Most electrical consumers have grown up believing the electrical industry began with the construction of large electrical generating plants connected to consumers by long miles of high-voltage transmission lines. However, such was not the formation of the electric industry. The first thirty years of the electrical age were defined by the inventive genius of Thomas Edison and George Westinghouse. Their development of practical generators coupled with the manufacture of incandescent and arc streetlights brought the gas streetlight era to a close and heralded the dawn of electrically illuminated cities. In the process, electric light plants sprouted up across America. The electrical age was born, and with it hundreds of municipally owned electric utilities with small generating plants at the heart of their systems.

It would take several decades before the construction of the Niagara and St. Lawrence River projects, as well as Hoover and Grand Coulee Dams, which would turn the power of rushing water into electricity. Along with these large hydro generation facilities came the requisite construction of transmission lines to transport electrical power to distant customers. During the same time period, numerous coal-fired steam generating plants joined the nation's generation pool, many being built at the sites of vast coal deposits.

Throughout the remainder of the twentieth century, high capacity transmission systems were built by various utilities to serve their own territories. At first, lines were built to transport energy from large base-load plants to urban load centers serving each utility's customers. As the various utilities expanded by buying or merging with other utilities, longer transmission lines were added to allow centrally-generated power to flow throughout a utility's service area. For reliability reasons, a number of neighboring utilities interconnected their transmission networks in order to support each other's systems. Eventually, power reliability pools were developed as a number of large utilities interconnected their systems providing for improved reliability and some economic benefits. A

resultant by-product was the development of a limited wholesale power market between utilities.

By 1965, the vertically integrated utility industry was relying on the transfer of power from one regional system to another for reliability as well as economic purposes. In the Northeast, for example, a block of hydropower was typically purchased from Ontario Hydro or Hydro Quebec by Northeast utilities to supply cities from Boston south to Washington, DC. That power may have been cheap, but the transmission system that had evolved was not as robust and reliable as many presumed. On November 2 of that year, it took only twelve minutes for a failure at a power facility in Canada to trigger a cascade of electric system failures down the East Coast, eventually affecting 30 million people over an area of 80,000 square miles.

The 1965 Northeast blackout resulted in increased regulation of the nation's transmission facilities by the Federal Power Commission (now the Federal Energy Regulatory Commission). The Commission placed a renewed emphasis on the reliability of the transmission system and required power pools to beef up their local generating resources. Even with decades of increased regulation, however, the Northeast blackout of August 2003 again revealed the continuing fragile condition of the nation's transmission system. This blackout was the largest in United States history with its effects penetrating virtually every segment of society throughout the Northeast.

Role of Large Regional Utilities

Today, industry observers are concerned that the electrical infrastructure, which evolved under the old regulatory regime, will not function as well in the free market as advocates of competition would have us believe. These observers predict a period of higher power supply costs and coupled decrease in reliability well into the future.

If this should be the case, what is the solution for local municipally owned electric utilities? First, it must be recognized that long-established investor-owned utilities no longer play the predominant role as in previous years. Many of these utilities are divesting themselves of their older, larger generating plants, most of which were built in the utility growth years of the 1950s and 1960s when the industry was attempting to achieve greater economies of scale. Today, a number of these base load plants are nearing the end of their useful lives and environmental as well as market questions dictate that many will likely be closed instead of being rebuilt. The list of suspect plants includes both coal-fired and nuclear plants. Of the latter, some nearing the end of their forty-year licenses will not be re-licensed. For example, Maine-Yankee, one of five nuclear stations supplying power to New England, was selected for closing in 1999. In addition, the integrity of the aging transmission backbone on which the safe, reliable flow of electrical power depends is being brought into question. A recent study by the PJM RTO revealed that the average age of high voltage transmission system transformers will soon exceed thirty-five years.

At the same time that aged large-scale plants may be closing, electrical consumption in the United States is projected to rise significantly. These trends, coupled with the deregulation of the wholesale

electrical industry in 1992, have combined to create a volatile wholesale market for electric energy to supply hungry consumers.

Across the nation, consumers of electricity have been promised lower electricity costs from competitively priced electricity. The promise of cheaper electricity brought about by electric deregulation depends on two key resources: large amounts of economic base-load generation and the capacity of the nation's electric transmission system to transport the power. As capable as the regulated utility world was to generate and deliver electricity in the past, the future deregulated one may not be able to deliver on the promises of improved costs and improved reliability for the consumer.

When considering the prospects of such a changing future, one might ask why local distributing utilities faced with rising loads and volatile markets would not simply import power over the transmission lines from regions with excess generation resources. The answer is twofold. First, those large utilities possessing excess generation are bidding their generation into the volatile wholesale markets in hopes of gaining improved profit margins. And second, as previously mentioned, the nation's electrical transmission system was not designed for a competitive industry operating across vast regions of the United States.

The Myth of the National Electrical Grid

The basic fact is, no unified national electrical grid exists to effectively deliver competitively-priced electricity to all consumers. The national grid is actually a patchwork of interconnected regional systems with many bottlenecks at their interfaces that act as physical impediments to large scale electrical transport north-south and east-west across the continent. Why, one might ask, don't we have an electrical interstate transportation system similar to the interstate highway system where unfettered and reliable trade could function? The answers lie in finance and politics. Prior to the federal deregulation of the wholesale electricity market in 1992, there were few economic incentives for large utilities to spend millions of dollars to build lines and import bulk power from neighboring utilities. Each utility earned a guaranteed rate of return on power plant investments in its own territory and had little incentive to import lower cost power from neighboring utilities. The incentive was to build large power plants in their own territories and earn more return on the investment. Consequently, transmission lines connected to other utilities were built more for regional reliability purposes than for power acquisition.

When the cost of construction for large-scale power plants became so expensive during the 1970s and the 1980s, state public service commissions began to more tightly control utility investment. The result was an exodus of investors from the electric utility world to the lure of more lucrative markets. Thus, during the 1980s and 1990s while large generating stations were aging, few were being replaced. Instead, utilities began downsizing to prop-up ledger sheets and increase investors' returns.

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Ever since the Eisenhower Administration in the 1950s, Congress has futilely attempted to pass a substantive national energy policy act that would bring about the construction of a national transmission system. Today, our nation is still mired in the equivalent of a labyrinth of undersized, poorly-connected, privately-owned toll roads. In many areas of the nation, each transmission utility is still left to decide which freight will pass on its lines and at what cost. Additionally, environmental concerns have slowed or prevented the construction of new and desperately needed high capacity transmission lines. During the last decade, such environmental concerns led to the abandonment of plans for two 500 kV transmission lines across western Pennsylvania and western Virginia. Both lines would have helped connect generation resources in the Mid-West with load growth regions on the Eastern Seaboard. With national resistance to new transmission system construction and little incentive to increase the capacity of interstate transmission ties, municipally owned utilities could be caught in a difficult squeeze between rising wholesale power prices and the expectation of retail consumers to see steady or even falling retail rates.

Economic and Reliable Power for the Consumers

One bright spot coming out of this dilemma could be action by Congress to bolster the reliability of the electrical industry through tougher national policing rules. Congress still hopes to pass a national reliability mandate to empower the Federal Energy Regulatory Commission to develop a new reliability agenda. Though the positive effects for consumers will be years away, this initiative is still a hopeful one.

A second and more near-term solution is the opportunity to take advantage of improved generation technology and install smaller distributed generating plants throughout the nation. This concept received national attention during the year 2000 when United States Department of Energy Secretary William Richardson toured the United States proclaiming the urgent need for the construction of small scale distributed generation plants. Bill Richardson was correct. No other solution will reach rapidly growing electric loads fast enough. Political and legal squabbles over who reaps the financial benefits from interstate and inter-utility transmission line construction will continue to plague the rebuilding of our transmission grids for years to come. Even with the ultimate settlement of the political and legal battles, environmental concerns will continue to present formidable obstacles to the siting of new high capacity transmission lines.

The previously discussed plan to create a tougher reliability mandate for the nation will actually serve to advance the acceptance and integration of distributed generating plants across a national network. Central to the plans for a stronger FERC and a more powerful NERC to enforce tougher reliability standards will be the creation of integrated computer networks, which will link the federal organizations with each of the regional utility control networks already in place. This combining of

separate utility information networks into large scale regional systems is beginning to take place and will help ensure that individual generation plants are properly monitored and coordinated into large regional pools of economic and reliable generation. In the end, the nation's electrical system will be supported by an increased number of small dispersed generating plants, thereby providing for greater redundancy and with less reliance on the limited transmission interconnections that exist today.

Solution for the Local Municipal Utility

When it comes to the evolution of the electric utility industry, it seems that history is repeating itself. From the dawn of the electrical age in the 1880s through the early years of the twentieth century, locally placed, small generating stations energized our towns and cities with light and power for citizens and industry alike. For many in the arenas of public power, the "electric light" is once again beginning to dawn with the realization that what was so necessary for growth and stability one hundred years ago is once again the answer; i.e., local distributed generation It now appears that control of one's own energy resources will be as paramount to the success of municipal utilities in the early years of the twenty-first century as it was at the beginning of the twentieth century. Reliable, cost-effective electrical power will be key to sustainable commercial, industrial, and residential growth. In a deregulated marketplace, however, governmental agencies and vertically integrated utilities cannot be depended upon to make this happen. Wise public power managers and planners should seriously consider investment in on-site generation resources as vital components of their overall power supply plans. Local generation properly integrated with wholesale power supply planning will provide crucially important tools to enable public utilities to navigate through a future sea of economic and reliability adjustments. Years ago, availability of reliable and cost effective electrical service was taken for granted; today it must be planned for through new creative approaches. New market intelligence will be needed and new tools will be required. One of the most important of these will be the use of distributed generation resources.

Contact

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