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Expanding Our Electric Transmission Network:

Consumers Have an Interest at Stake

Robert W. Gee
The Gee Strategies Group

Prepared for

EEI Edison Electric Institute

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Robert W. Gee served as an Assistant Secretary at the U.S. Department of Energy from 1997 – 2000 where he was responsible for devising the country's domestic and international energy policy.

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Edison Electric Institute (EEI) is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI works closely with its members, representing their interests and advocating equitable policies in legislative and regulatory arenas. In its leadership role, the Institute provides authoritative analysis and critical industry information to its members, Congress, government agencies, the financial community, and other influential audiences.

Many important issues dealing with electricity and the future of the electric industry are being debated among the public, policymakers, and other thought leaders across the country. This report has been prepared to help advance the public dialogue on these critical issues.

For more information about electricity issues and EEI, please visit our Web site at www.eei.org.

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Executive Summary

Since 1995 investment in electric transmission has been declining while demand for electricity is increasing. As a result, the transmission grid is significantly congested, impairing reliability and preventing lower-cost power from reaching consumers.

Expanding the transmission system will benefit consumers by reducing the possibility of outages; promoting affordable and stable power prices; and encouraging the construction of cleaner, more efficient power plants.

The costs of electric transmission lines on average represent a small portion of the total delivered cost of electricity to the consumer. Any new transmission investment has the potential of yielding benefits far outweighing costs.

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"[A] n expanded effort to build electricity transmission lines . . . is a pressing national interest . . . [M]odernizing the electricity grid . . . would make blackouts less likely and reduce the nation's overall need for power plants by allowing electricity to be shared among different regions."

WASHINGTON POST Editorial
July 5, 2001

Americans Embrace Change

One of the hallmarks of our country is that Americans generally accept the fact that things change. We are not a static country. We are accustomed to the idea that economic prosperity and improvement of our lifestyles are premised on altering economics and technology.

Some may recall the advertising slogan, "This is no longer your father's Oldsmobile". But it was more than just a sales pitch. It symbolized the common recognition and acceptance that modernization affected all the goods and services on which we relied. It also meant that we welcomed this change because it elevated our living standard to the highest in the world. Americans proudly championed this fact all over the globe.

This premise continues to hold true in virtually every way we live. It has been realized in the food we eat, our modes of travel, how we receive goods and services, and how we communicate. Significant change now has occurred in the way we generate and receive electricity. It also means that we must again embrace this change to continue to realize its benefits.

Prologue: The Way Things Were

Over the last 100 years when electricity use was expanded throughout our country, the necessary poles, transmission lines, power plants and transformers were built to meet the needs of our communities. Utility companies were formed either by private investors or public entities such as municipalities to assume the risky burden of financing and constructing this needed infrastructure, and to plan how much to build based upon population and economic growth estimates.

Although a variety of different private and public entities assumed these responsibilities, they shared a common characteristic: a *local* focus. Thus, whenever they planned and built a new power plant, transmission or distribution line, their purpose was always to serve the needs of the local community or city.

Local concerns were sufficient because the growing population and commerce were occurring near city centers, and utilities sited power plants and transmission lines in those communities to serve the resulting demand. In addition, costs and technology limitations of transmitting power over long distances prevented utilities at that time from extending their reach much further beyond their limited areas.

Because of the high costs of building these facilities, the local utility became the only supplier of electric service for each community. Consequently, it grew into a monopoly whose rates and services were not subject to competition. The policy prevailing in our country at that time, however, was not to promote competition for utility services since that could lead to needless duplication of facilities and large economic waste.

Accordingly, states allowed the utility to be the exclusive service provider by conferring on it a franchise for a particular service territory. In exchange for this franchise, its rates and services were regulated by states and, in some cases, by municipalities as well.

In certain instances, utilities found it economically more advantageous to serve their customers from means besides those power plants owned by them. Specifically, they purchased power generated by neighboring utility systems that had temporary surplus capacity or whose costs of power were lower owing to a number of variables, such as the type of fuel used.

Utilities entered into long-term agreements to enable economic transactions as well as to ensure reliability.

Thus, to enable those purchases, utilities entered into long-term power purchase and coordinating agreements to enable economic transactions as well as to permit exchanges of power from time to time to ensure that the "lights stayed on" — a concept known in the utility industry as "reliability". They also built interconnecting transmission lines to serve those purposes.

For a number of successive generations, this arrangement worked well. The local utility was the main entity generating, transmitting and distributing electric power to all homes and businesses. Whenever new utility plant or line construction occurred, the local community understood its need and purpose, and generally most citizens agreed with the idea that population and economic growth brought needed expansion of the means for generating and delivering electricity.

How Things Have Evolved

During the last thirty years two factors have had a profound influence on the electric utility business. One was economic. Under the common assumption that larger power plants were necessary to provide more affordable power per kilowatt-hour (kWh), many utilities built large-scale power plants to serve their customers' future needs. Federal and state governments also encouraged this building either through tax incentives or other means.

However, high gasoline prices and interest rates – accompanied by the recessionary slowdown in the 1970's — resulted in many utilities building plant capacity well beyond the immediate or foreseeable needs of customers in their service territories. The high costs of surplus capacity spawned a consumer backlash that resulted in state regulators taking a harsher look at allowing costs to be assumed by ratepayers. This, in turn, made utilities much less willing to invest needed capital in long-term generation projects under a more skeptical regulatory environment.

Another factor was technological, but with broad economic implications. Bigger plants were no longer necessarily better. At minimum, bigger did not necessarily mean more affordable or more environmentally cleaner electric power. From advances realized through research and development in jet propulsion technology, it became possible to build smaller, more efficient – and cleaner — natural gas combined-cycle power plants to meet increasing power needs.

Previously, the optimum size of power plants had been over 500 megawatts (MW) with a ten-year period to build and run it. Smaller units in the 50 to 100 megawatt range with a construction period of only one year had replaced these. Moreover, these newer plants could produce power at much lower costs ranging from 3 to 5 cents per kWh versus 4 to 7 cents for a coal-fired plant and 9 to 15 cents for a nuclear power plant.

Technological advances also were seen in electric transmission, now making it possible to transmit power at greater distances and at higher voltages with a minimum loss of power along the way. These combined advances meant that it was now economically possible for a utility to serve customers from longer distances using technology that was cheaper and more readily deployable. It also

Technological advances were now making it possible to transmit power at greater distances and at higher voltages.

meant that a customer might no longer be required to rely just on that power generated and sold by its traditional utility.

Over time, federal statutory and regulatory policies enabled the creation of new electric generation power firms, comprised of companies either totally independent of the traditional utility or separated from the utility's distribution and transmission businesses by the creation of separate but affiliated corporations. Prices for power sold by these newly created power producers in wholesale markets would no longer be regulated but instead be established by whatever the market would bear.

Armed with these newer, lower-cost generation technologies — coupled with the advances in transmission technology allowing movement of power over longer distances — these new power producers were permitted to construct plants outside of the traditional regulatory oversight process.

That regulatory procedure had required states to determine whether each plant was needed and how much the utility could charge based on its costs. In lieu of this cumbersome system, these new companies were subject only to environmental laws and regulations governing siting, and to the vagaries of the market to determine how much they could earn to recover their costs. Today, these independent power producers generate roughly 20 percent of the electricity consumed in our country.

Additionally, the rise of unregulated power being sold at various points throughout our country's power grid prompted the creation of new players in the electricity business: power marketers. These businesses were able to create a market by identifying and matching buyers and sellers of electric power in wholesale markets. They performed an invaluable service by making feasible the new way of pricing unregulated power at levels set by the market – just like any other commodity such as soybeans and pork bellies.

This meant that consumers could be assured of not paying more for electricity than what the market would bear, and to avoid the problem of utilities building unwanted or unneeded generation for which consumers had to pay as had occurred under the old system of regulation.

Today: Growing Demand and Volume in Regional Power Markets

With the growth and acceleration of our country's economy, demand for electric power has grown. From 1949 to 1999, while the population of the United States expanded 83 percent, the amount of electricity sold by utilities grew 1,180 percent.

Per-capita average consumption of electricity in 1999 was seven times as high as in 1949. That increase in total volume has been accompanied during the previous decade by an increase in the number of power sales across the grid. As Chart 1 illustrates, wholesale sales by power marketers have increased dramatically from 1994 through 1999.

What does this mean? Well, for starters, this dramatic increase in sales volume has led to a simultaneous increase in complexity in the types and numbers of wholesale power transactions. By itself, this wouldn't necessarily be significant except for two additional factors.

The first is that the utility industry has undergone major restructuring over the last several years. This has resulted in many contiguous or neighboring systems to be combined into a single system, allowing greater operating efficiencies and the transmission of power over longer distances to serve more customers over wider territories. In some instances, the utility's various functions of transmission, generation and distribution have been divided into separate companies. Some of these new separate companies have been sold to new owners.

Wholesale Power Marketers' Sales Are Increasing

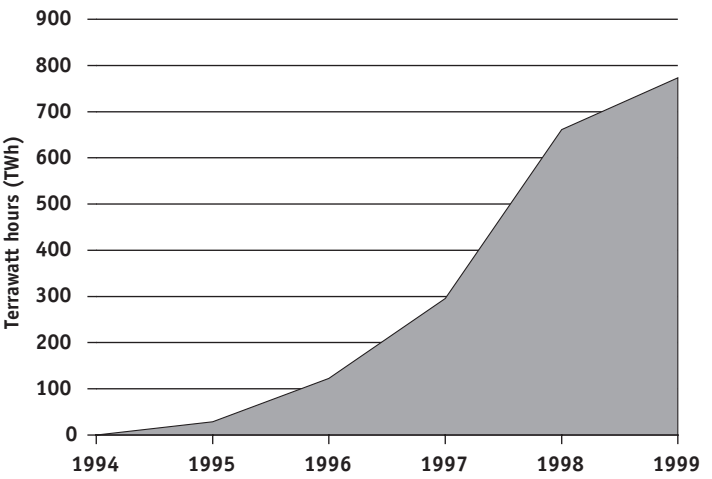


Chart 1

Source: PA Consulting based on data from Resource Data International's Powerdat

The second is that the transmission grid is being used in a fashion vastly different from that for which it had been designed. Power plants are no longer being built and sited to serve local customer franchise territories as the utilities did traditionally. Rather, within limits imposed by environmental and siting laws, they can and are being built anywhere a transmission line is located to allow them to interconnect to serve ever widening geographic markets.

Power is being fed in from literally thousands of points for the purpose of being transmitted to thousands of customers located at distant points. Today, the electric transmission system functions as a network, requiring a great deal of coordinated planning, management and operation.

All these changes now mean that electricity markets are no longer local but regional. This has benefited consumers by allowing more power sellers and marketers participating in larger geographic areas to compete with one another. This ensures that prices are kept affordable.

But it also means that the power transmission grid is being asked to do much more today than ever before – and to do it differently. Transmission lines built a generation ago by local utilities to serve local customers are like small country roads now being asked to accommodate the movement of cross-country interstate highway traffic. Like small country roads, it's not surprising that they are having a difficult time handling all those eighteen-wheelers.

We've Got a Problem

It's no secret that our country is expected to require more electricity — a lot more if we want a growing economy.

Some expert projections show that we are going to require 28 percent more electricity between 1997 and 2020. The U.S. Department of Energy projects an increase of more than 225 gigawatts in generation capacity between now and 2020, a 31 percent increase. When you add new capacity to replace retired units, the figure grows to more than 363 gigawatts.

Three hundred sixty-three gigawatts are equivalent to 1200 new, 300-megawatt natural gas plants. Or to put it another way, it is almost equivalent to adding the current electricity grids of Japan and Germany combined to the U.S. power supply in the next 20 years.

Just as our demand for greater volumes of power is becoming more urgent, so is the need for heightened power "quality", or an assurance that the "lights stay on" to an even greater degree than that to which we've been accustomed in the past. This is because of the demands of our new "digital" economy.

What was once deemed necessary and sufficient to ensure continued reliability in our "old" manufacturing economy has been transformed in the new "digital" environment. Increasingly, the leading companies who manufacture components or provide services in our high technology industry are recognizing the value of an uninterrupted power supply. With increasing reliance on e-commerce just to maintain routine operations, some sites now require 100 percent reliability with redundancy. They just can't afford a "hick-up" on the grid because of the recovery and lost business opportunity costs. Consequently, these businesses seek greater power quality at a premium.

On a positive note, the market is spurring developers to take steps to get more electric supply on the grid by a combination of actions. Companies are exploring and producing more natural gas reserves, modernizing our technologies to provide for cleaner uses of coal and improving technology to extend the useful lives of our nuclear power plants. We also are planning, siting and building a record number of new natural gas fired power plants at various points throughout our country.

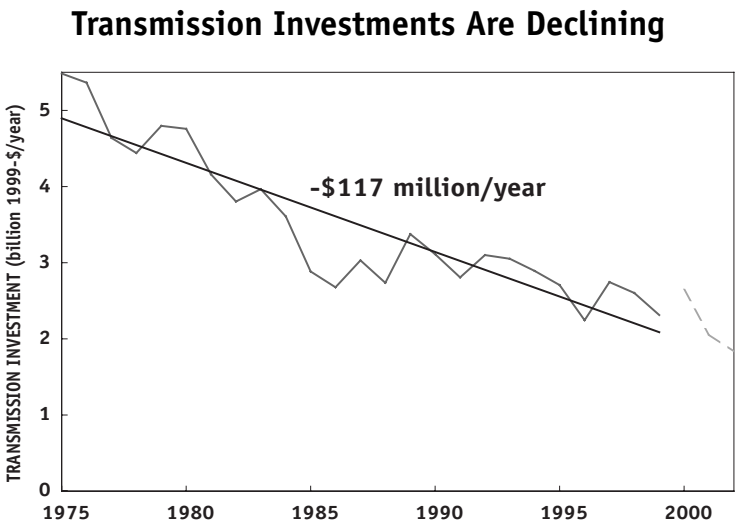


Chart 2. Annual transmission investments from 1975 through 1998 and projections for 1999 through 2001.

Source: E.Hirst, "Transmission Crisis Looming?" *Public Utilities Fortnightly*, September 15, 2000

But the sobering news is that we haven't kept pace by also paying attention to the building of sufficient transmission lines, or namely the way we intend to transmit and deliver all that additional power. Chart 2 depicts data showing that transmission investments (in constant, inflation-adjusted dollars) have been declining for almost 25 years at an average rate of $115 million per year.

To make matters more disquieting, over the last five years our increased use of the transmission system is starting to stray significantly from the volume of transmission investment we have in place, as depicted in Chart 3.

As this demonstrates, until 1995 we didn't pay much attention since the total volume of new net transmission investment still exceeded or equaled the use of the electric system during peak periods. But the ensuing period shows a sharp decline in transmission investment dollars as contrasted with increasing peak use. This unfortunate trend suggests that those country roads may be on the verge of

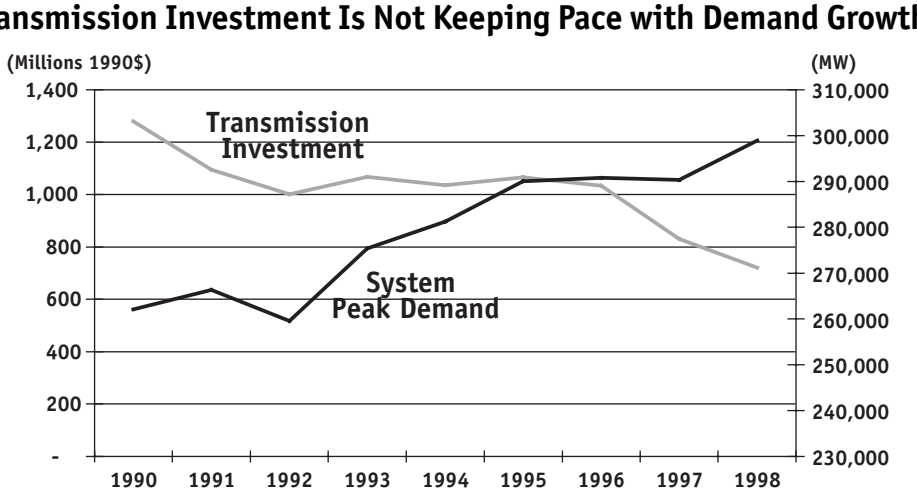


Chart 3. U.S. net new transmission investment vs. system peak demand growth

Source: PA Consulting based on data from the UDI database

giving out — or we are going to have to live with a lot less electricity during times when we need it most.

How much more transmission capacity do we anticipate in the future? Experts at the North American Electric Reliability Council, the voluntary electric industry association that looks after the adequacy, safety and security of the country's entire electric grid, say that we don't have on the drawing board much more than 4 percent in planned transmission line expansions over the next decade.

Congestion Management Procedures Increased Dramatically in 2000

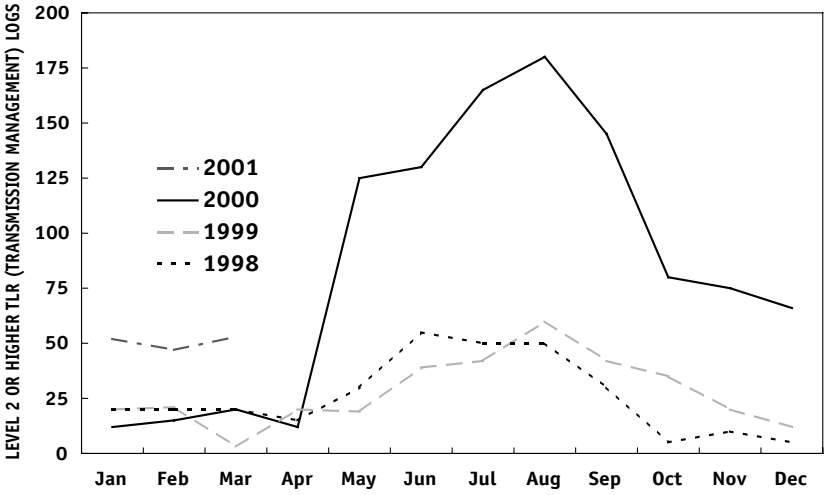


Chart 4

Source: ABB, taken from Eastern Interconnection

The lack of sufficient transmission capacity has already begun showing up in the form of congestion in parts of our country's electric system. Congestion occurs when the volume of requested deliveries for power at a given point in time exceeds the physical capabilities of the electric grid to perform such deliveries. The grid operator that oversees the functioning of the transmission system in the eastern United States has recently been required to implement measures to relieve congestion dramatically as shown in Chart 4.

These relief measures increased only modestly (10 percent) between the years 1998 and 1999. But year 2000 saw a leap of greater than 200 percent from the prior year. The continuation of this trend ultimately poses a threat for the continued reliability of the system.

The western part of the United States has also been affected by congestion. California has one major transmission line linking the southern and northern part of the state known as Path 15. Early in 2001, on some days the grid operator for the California system had to curtail power deliveries in Northern California, even though additional power generation was available in Southern California to meet this demand. Path 15 was loaded to its maximum safe reliability limit and there simply was no way to move additional energy into Northern California without risking the reliability of other parts of the grid in other western states.

Consumers Would Benefit From More Transmission Facilities

What should be done? We obviously need to find better ways to manage our consumption of electricity by improving how we conserve and use energy. But simply limiting the amount of power consumers will use for the foreseeable future won't be sufficient since it would only mitigate the rate of growth, and not reduce the overall level of consumption. Moreover, it won't do anything to remedy the escalating transmission line congestion. Among our choices, the best answer is to increase and upgrade our electric transmission lines.

Recognizing the urgency of the problem, in the spring of 2001 two members of the Federal Energy Regulatory Commission, the federal agency charged with regulating the wholesale electric power market, supported this response. Commissioner William L. Massey stated that:

> Unfortunately, the interstate delivery system for electricity has not kept pace with the needs of the market. The high voltage transmission grid is the interstate highway system for electricity commerce. It is critical for keeping the lights on and for delivering cheaper power. However, it is well known that very little new transmission has been built over the last decade and current plans will not keep pace with electricity demand.[1]

Similarly, Commissioner Linda K. Breathitt observed that:

> [W]ith regard to transmission expansion, the electric delivery system that exists in the U. S. today was never intended to carry the volume of electricity that is currently being traded. This system was originally constructed by vertically integrated utilities to move power from their generating plants to their customers. It was never envisioned to carry the amount of interstate transactions occurring today. This increased trading volume is leading to congestion and could be a threat to reliability. Obviously something needs to be done to enlarge and upgrade the Nation's electric transmission system.[2]

[1] Remarks of Commissioner William L. Massey, Federal Energy Regulatory Commission, The McGraw-Hill Companies 2001 Symposium "Federal Role in Evolving Energy Markets", Washington, D.C., May 23, 2001.

[2] Remarks of Commissioner Linda K. Breathitt, Federal Energy Regulatory Commission, Canadian Electricity Association Third Annual Washington Forum, March 27, 2001.

From a consumer standpoint, expanding the electric transmission network is superior to all other options for a number of reasons. The advantages of having a wider transmission network include:

- Obviating the need to build more power plants in densely populated urban areas.
- Improving the quality of our environment by encouraging cleaner power generation.
- Enhancing reliability by increasing system flexibility.
- Making power prices more stable and affordable.
- Representing a good investment for consumers based on their value.

Transmission lines would preclude the need to build more power plants in densely populated areas.

In some urban areas of our country, the steep demand for power during peak periods outstripping supply has prompted an urgent examination of available alternatives. In certain cases, the lack of transmission has required building more power plants in the city – an unpopular but necessary measure. This is demonstrated vividly by the power availability problems plaguing New York City and the Eastern United States.

Earlier this year, the Chair of the New York Public Service Commission, Maureen Helmer, testified before a state legislative committee that her commission has required that at least 80 percent of New York City's peak power requirements be met by generation located in the city owing to transmission constraints preventing any greater volume of power from being imported from elsewhere.

This meant that the city would be responsible for about 8,428 MW out of a peak of 10,535 MW required for this summer. However, since the city had available only 8,031 of in-city capacity as of February 15, it meant that a shortfall of 397 MW would have to be filled by additional generation built in or near the city. Adding salt to the wound is the fact that the Canadian and Maritime provinces north of the New England states have about 4,000 MW of surplus power capacity ready to serve New York City and those states but for the fact that transmission bottlenecks prevent that power from being imported.

Since power can't be imported, New York City is proceeding with the building of more power plants in the city, accompanied by a state commission-ordered program to encourage conservation measures to ensure sufficient supplies this summer. But in a highly encouraging sign, Chairman Helmer also announced that the commission and the state's independent system operator would investigate the feasibility of expanding the state's transmission system. The study, which will

incorporate efforts already underway to identify areas where New York's existing transmission system can be upgraded, will identify areas where new transmission lines may be desirable, for both inter and intra-state purposes.[3]

Transmission lines would encourage cleaner, more efficient power plants to replace more costly, less efficient ones.

Advanced power generation technologies now allow newer generation natural gas-fired power plants to operate with greater efficiencies and lower emissions. This means less expensive power, lower fuel consumption and cleaner air.

But because of transmission bottlenecks, some of these plants may never get past the drawing board. This is because often the available transmission capacity has already been committed to power generated from older, less efficient plants with higher air particulate emissions.

Again, this problem is exemplified by New York City and southeastern New York State where some of the oldest, least efficient, and most expensive plants are situated. Because of the lack of transmission capacity, coupled with heightened consumer demand for power, it is unlikely that any of these plants will be retired soon. The result is a double whammy for consumers: both higher power costs and lessened air quality. Expanded transmission capacity could reverse this unfortunate trend.

More transmission capacity would lessen the likelihood of power outages.

The electrons that make up electric power don't run in a straight, linear direction. Instead, under the laws of physics, they run in various directions wherever transmission capacity exists. The power generated from a particular power plant thus doesn't go straight to your home or business.

Rather, our electric transmission and distribution system resembles a web through which multiple plants feed power into the grid. To keep the lights on, power must be fed in simultaneously from these multiple points.

If a single plant is taken off-line for maintenance, the whole grid has to be reconfigured very carefully so that other plants can be scheduled to provide increased volumes of power to maintain the voltage support to keep the system up and running. If one plant "trips" or goes down unexpectedly, this triggers a

[3] PSC Chair Announces Five-Point Plan for Regional Energy Markets & Managing Demand for Electricity, Press Release, February 20, 2001.

series of rapid emergency procedures to keep the entire grid from going down. This all requires a great deal of instantaneous juggling – and a lot of worry.

Because we are demanding more of the transmission grid by building more plants and steeply escalating the number of power transactions, the entire grid is being stressed to the point that the "juggling" process to keep the system running is becoming much more difficult. This means that the potential risk of outages could be increasing because the grid can no longer be operated as flexibly as before.

More transmission capacity would restore — or at least minimize – some of that lost flexibility required to maintain reliability. From an engineering standpoint it would allow all those electrons to be reshuffled more quickly around the grid to meet emergencies or to prevent system outages.

Moreover, more transmission lines could enable back-up power located in one region to be moved to another region from greater distances across the grid. This would reduce the number of power plants that might otherwise be required closer to cities to prevent outages, and even minimize the required amount of local "reserve margins", which is surplus or stand-by power plant capacity required at all times to maintain reliability. Deferring the building of this local plant capacity translates into a more efficiently operated system, which ultimately means lower costs passed on to consumers.

More transmission lines would promote more affordable, stable prices of power to consumers.

Under the system that has evolved over the last several years, competition now sets the price by which power is sold in wholesale markets. This means that for the market to work properly, at least two measures must be in place. The first is an adequate number of sellers competing against one another. The second is having sufficient means of delivering that power, or the necessary transmission capacity. Having more transmission capacity can actually encourage greater competition among sellers, keep power costs to consumers more affordable and stabilize the prices consumers ultimately pay. How?

First, more transmission lines make possible the building of more plants owned by more sellers. When a developer of a potential plant seeks a site, several factors are weighed, including land availability, community acceptance, the proximity of a water source for cooling, use restrictions and where high power prices exist (suggesting the need for more generation capacity).

But a central factor is the location of available transmission capacity. If the plant can't get the power moved to the customer, it's pretty pointless to construct it. The extra capacity provided by new transmission lines encourages more plants to be

constructed to compete against one another. Additionally, more transmission capacity enables plant owners to have greater access to larger numbers of customers. This tends to encourage sales at lower prices since the plant owner is able to spread out its fixed costs over more customers.

Second, as mentioned previously, parts of the country are experiencing the effects of insufficient transmission capacity in the form of bottlenecks where demand is exceeding available local supply. Where that has occurred, consumers have had to pay more for the delivered price of power in the form of what are known as "congestion costs", or the costs incurred to provide that power because of a premium being charged in transmission-constrained areas. Building more transmission capacity would alleviate that congestion, thereby reducing the price that consumers must pay in those currently constrained areas.

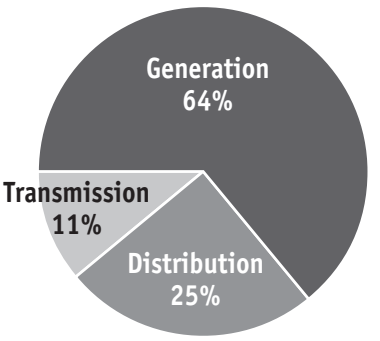
Finally, reducing bottlenecks on the transmission grid would allow for a greater movement of power by more sellers across parts of the grid during certain times of the year or day when it is most needed. The ability for more sellers to offer power supplies to meet peaks in demand blunts the volatility capable of occurring in a commodity-traded market, and minimizes the possibility of the market experiencing "price spikes" in the wholesale cost of power. This benefits consumers by stabilizing the short-term costs of power.

On the basis of value, transmission lines represent a good investment for the consumer.

Across the country, the costs of electric transmission lines on average represent just 11 percent of the total delivered cost of electricity to the consumer, as illustrated in the graphic.

This small percentage means that any new transmission investment has the potential of yielding dividends far outweighing costs. By encouraging competition to keep prices more affordable and stable, bolstering our ability to keep the electric grid more reliable, and encouraging the construction of cleaner power plants, transmission lines represent a tremendous value for consumers. They are a low-cost, high-value down payment for a safer, cleaner, more affordable energy future.

Contribution to the Delivered Cost of Electricity



Source: PA Consulting; *Financial Statistics of Major U.S. Investor-Owned Utilities 1996,* Energy Information Agency, Washington, D.C., March 1998; and *Financial Statistics of Major U.S. Investor-Owned Utilities 1996,* Energy Information Agency, Washington, D.C., December 1997.

CONCLUSION

Whether one relies on electric power to operate a business, or just to make toast for breakfast each morning, it's pretty obvious we must have a continuous, affordable supply of electricity to maintain and increase our standard of living. Americans have been fortunate thus far in having been the beneficiaries of visionary capital investment and technology that has yielded an electric power industry second to none.

But the intersection of technology and market changes today mandates that further investment in our transmission grid must occur for us to thrive. Because our country has always met every challenge confronting us, we must again marshal the determination to make this happen.

Electric Industry Terms

Ancillary Services — Services or tariff provisions related to generation and delivery of electric power other than simple generation, transmission or distribution. Ancillary services related to transmission services include: energy losses; energy imbalances; scheduling and dispatching; and system protection.

Direct Access — An arrangement in which customers can purchase electricity directly from any supplier in the competitive market, using the transmission and distribution lines of electric utilities to transport the electricity.

Distribution — The facilities of the electric system that deliver electricity from substations to customers. The distribution system "steps down" power from high-voltage transmission lines to a level that can be used in homes and businesses.

Federal Energy Regulatory Commission (FERC) — A federal agency, established in 1977, which regulates the wholesale electricity market, i.e., power and transmission sales and service between utilities and between utilities and non-utility generators. An independent agency of the Department of Energy, FERC is composed of five members appointed by the President and confirmed by the Senate. Commissioners serve five-year staggered terms, and each has an equal vote on all regulatory matters.

Gigawatt — One gigawatt equals 1 billion watts, 1 million kilowatts, or 1 thousand megawatts.

Grid — The transportation network (or "highway") over which electricity moves from suppliers to customers.

Kilowatt — A measure of electricity consumption equivalent to the use of 1,000 watts of power over a period of one hour. Ten 100-watt light bulbs burning for one hour would consume one kilowatthour of electricity.

Loss (Losses) — The general term applied to energy (kilowatthours) and power (kilowatts) lost in the operation of an electric system. Losses occur principally as energy transformations from kilowatthours to waste heat in electrical conductors and apparatus.

Megawatt – A unit of power equal to one million watts. Put another way, it's the amount of electric energy required to light 10,000 100-watt bulbs.

North American Electric Reliability Council (NERC) — A nonprofit organization formed in 1968 by the electric utility industry to ensure reliable, adequate power supply in North America. NERC plays an important role in establishing the standards, rules, and forms of cooperation that make a major contribution to system reliability.

Open Transmission Access – Enables all participants in the wholesale market equal access to transmission service, as long as capacity is available, with the objective of creating a more competitive wholesale power market.

Power Marketer — An individual who sells power that it either buys or generates on its own.

Public Utilities Commission (PUC) — A common name for the state regulatory agency that governs retail utility rates and practices and, in many cases, issues approvals for the construction of new facilities. There are regulatory commissions in all 50 states, as well as the District of Columbia. The state commissions generally vary in size from three to seven members, and most states provide that commissioners shall be appointed by the state governors. In some states, commissioners are elected. Also called Public Service Commission.

Reliability — The guarantee of system performance at all times and under all reasonable conditions to assure constancy, quality, adequacy and economy of electricity. It is also the assurance of a continuous supply of electricity for customers at the proper voltage and frequency.

Restructuring — Any of a number of changes made to utility industry structure to increase competition.

Expanding Our Electric Transmission Network: Consumers Have an Interest at Stake

Robert W. Gee has served as an Assistant Secretary at the U.S. Department of Energy, and as a state utility commissioner. He currently heads an energy and utility consulting firm in the Washington, D.C. area.

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