DRAFT REPORT

Chapter 2 Generation Adequacy
Trends and obstacles confronting greater contribution from generation resources
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Chapter 2. Generation Supply Adequacy

GENERATION TRENDS

During the late 1990's and early 2000's, overall base load generation construction declined as generators were reluctant to commit resources to an unsettled regulatory and developing market based environment. In that same time frame, non-dispatchable or variable land-based wind resources began to gain a foothold in mid-western areas. In the U.S. alone, non-dispatchable resources have continued to grow from 2,013 megawatts in 1990 to 16,114 megawatts in 2007. Geothermal has decreased by about 372 megawatts while solar has increased by 184 megawatts and wind by 13,817 megawatts in this same time frame.[2] With this unused level of capacity, there is the potential for these resources to contribute substantially more to energy supply adequacy.

Declining Growth Rates

Ten-year generation growth rates have actually declined from a maximum growth rate of 4.08% in the 70's to 1.29% during the 2000-2007 time frame. The net summer capacity ten-year growth rates have declined from a maximum growth rate of 9.22% in the 50's to 3.0% during 2000-2007.(Figure 2-1) [3] While electricity generation growth rates have fallen significantly, capacity growth rates have declined almost twice as much. Generation is not being built at anywhere near historical growth rates and the absence of significant quantities of new generation is a critical concern.

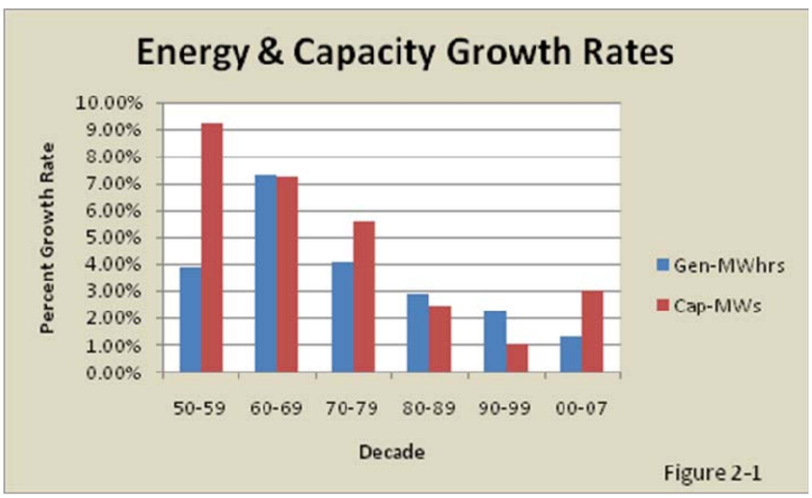

Figure 2-1

[1] Chairman, Director, Maryland Energy Administration
[2] Energy Information Administration, Table 8-11c, http://www.eia.doe.gov/emeu/aer/elect.html
[3] Ibid, Electricity Tables 8.2a, 8.11a and 8.11b

Adequacy of Supply

The North American Electric Reliability Corporation's (NERC's) forward look estimates a peak load growth of 16.6% over the next ten years and points out in their most recent Long Term Reliability Assessment Report that some geographic areas face concerns with potentially inadequate generation resource safety margins to meet peak load conditions. While the 2007 report cited considerable concern with inadequate reserve margins, the 2008 report has soften that concern, noting new generation plans and a peak demand reduction of 1.0% due principally to demand response increases. The report cites an approximate 4.2% improvement in reserve margin over the 2007 level, but notes continuing resource shortages in western Canada and the desert southwest. [4]

It should be noted that forecasting capacity growth over the next ten years is not an exact science. In regulated state jurisdictions that require capacity planning, there may be a level of confidence with new capacity estimates, but in market based regions the forecast accuracy is severely limited. RTO's offer opportunity for all potential generation projects to be reviewed and studied, but a small percentage may actually be built and interconnected. Additionally, with shorter time frames for new gas plants, it is unlikely that plans for these assets extend much beyond a three (3) to four (4) year future timeframe. A forecast declining reserve margin may be more representative of past history than a realistic picture of the futures.

New generation is one important key to maintaining system reliability and states play a major role in securing that new generation. In state regulated environments, vertically integrated utilities are typically charged by state commissions to maintain resource adequacy which can include cost recovery for generation to satisfy adequate reserve margins. States may impose capacity planning mandates on utilities and typically control the siting process. Regional Transmission Organizations, recognizing capacity shortages as reserve margins shrink, have introduced forward capacity markets to provide financial incentive for new capital investments, [5] in effect a premium payment to stimulate new generation and to help maintain reserve margins and adequate reliability.

Aging Plants

The generation infrastructure in the U.S. continues to age. Although recent gas and renewable plants have helped to moderate that concern, the U.S. continues to rely on generation capacity reserves built in the 1980's and 1990's. As those older units are retired, the development of new generation resources will be essential. In 1995 the average age of utility generation plants was approximately 40 years. As we have added new gas fired generation and renewables, that average age has been reduced to 37 years in 2007. While an improvement over previous years, new generation must continue to come forward to provide for a secure energy future.

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[4] North American Electric Reliability Corporation, 2008 Long-Term Reliability Assessment Report, October 2008,pages 8-9.
[5] Ibid, , page 10.

Changing Portfolio Mix

In addition to less generation being built in the U.S., the 2007 profile of generation capacity[6] has changed significantly from that of the 1990's. In 1990 the preponderance of capacity was coal at 42.6%, natural gas at18.3%, nuclear at 14.0% and petroleum at 10.8%. By 2007 the generation capacity mix contained significantly less coal and petroleum, a bit less nuclear but over twice as much gas fired capacity. In 2007 coal accounted for 31.9% of capacity; natural gas increased to 39.0%, nuclear decreased to 10.3% and petroleum was cut in half to only 5.9%. While geothermal decreased slightly, bio mass increased, solar increased slightly and wind grew by over a factor of 8 (Figure 2-2)[7]. In 2007 with the recent addition of less costly and cleaner gas plants, the portfolio percentage of gas fired generation capacity exceeded all other forms.

More Costly Plants

New generation plants are much more expensive then their historical counterparts. Driven in part by added environmental requirements and rising resource prices, new plant costs have more than doubled in the past 10 years. A conventional natural gas combustion turbine plant can be built for approximately $500,000 per megawatt (MW) or about $150-$200 million for a plant. A combined cycle gas plant, the most commonly built new generation, is typically in the 200 to 400 MW size, costing around $700,000 per MW, or roughly $200-$400 million for a plant. Conversely a new IGCC plant with carbon sequestration would run over 3.5 times as much or roughly $1.4 billion directly comparable to approximate off-shore wind farm costs.[8]

The shift in the portfolio mix to cleaner, more costly fuels and more costly renewable generation, coupled with slower demand growth creates a new paradigm in the U.S., - one which favors shorter term, low cost, higher return investments over higher cost, longer term, lower return investments. While that seems to be the approach du jour in both regulated and unregulated U.S. areas, the energy and operating costs, ultimately paid by consumers, may well be higher for low cost plants and lower for high cost plants depending on fuel prices and dispatch times. In dynamic, changing industries without long term policy direction and commitment, investors, whether public or private, will tend to favor the short term approach. The challenge in the generation industry is to attract the longer term base load commitments, insulated as much as possible from changing federal policies to reduce investment risk and financial premiums.

Fuels, Transport and Storage

With the majority of energy still generated from baseload coal fired plants, the availability, quality and cost of coal is critical to meeting our future energy needs. In similar fashion, new, recently added gas fired capacity has the same concerns with gas supply. In 2007, there were no

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[6] EIA defines Generation Capacity as "the maximum output, commonly expressed in megawatts (MW), that generating equipment can supply to system load, adjusted for ambient conditions." Capacity represents the level of generation output available from existing plants and is different than the actual energy generated by those plants. While gas may now be the largest capacity resource, it does not run as often as base load coal or nuclear plants which currently provide the majority of megawatt-hour energy for consumers.

[7] Energy Information Administration http://www.eia.doe.gov/emeu/aer/elect.html, Electricity Tables 8.2a, 8.11a and 8.11b

[8] Ibid, Electricity Table 38

significant fuel disruptions or related generation shortages; however, weather was relatively milder with limited hurricane impacts. In past years, fuel supply has seen volatile periods due to overwhelming storm damage, labor disputes or storage/transportation issues. An adequate supply of fuel with appropriate reserves is essential for lighting our new world.

In the EIA Annual Energy Outlook 2008 with Projections to 2030, future long-term coal production varies considerably, depending on the assumptions made in the study forecast. With slower economic growth and added carbon concerns, the short-term outlook for coal production is anticipated to range from stable to 5% growth.[9] Western mine mouth coal prices are anticipated to decrease by approximately 6% to $1.14 per million BTU by 2020. However, coupled with higher mining labor and transportation costs, delivered coal prices are anticipated to be relatively stable through 2030.

Natural gas supply and use is much more price dependent. Higher gas prices tend to stimulate production while at the same time curtailing gas fired generation unless absolutely needed for reliability. Lower gas prices provide more economic electric generation without stimulating new exploration and development. While most residential, commercial and industrial customers must rely on gas at market price, electricity generation has coal, nuclear, oil and other substitutes that can be used when gas prices are high. The EIA Outlook for gas is a gradual depletion of existing 48 state and shallow water reserves to be replaced by new higher cost Alaskan gas finds, deep water finds and unconventional production (coalbed methane, tight sandstones, and gas shales). At moderately higher prices and with declining domestic and Canadian production, liquified natural gas (LNG) imports continue to increase to meet domestic demand requirements. While the annual level of LNG imports may vary due to global market prices, they are expected to continue a gradual increase. Overall domestic gas production is expected to grow modestly through 2030, dependent on market price variations and supplemented by LNG imports.

Storage and transportation of fuels, while seemingly stable at this time, remains one of the key future concerns in the fuel industry. With a growing reliance on LNG, there is a question whether the U.S. has adequate storage facilities. In Europe, where there is also a heavy dependence on LNG, storage sites are limited and mid-winter deliveries are a typical method of supply. Should the U.S. experience a significantly colder winter, when LNG deliveries are not available to U.S. markets, the lack of added storage facilities could become readily apparent.

While some coal is trucked to nearby power plant sites, the largest portion of coal continues to make its way from mine to market via rail car. There are concerns that disruption of rail transport for rail line maintenance or train maintenance can have severe repercussions for the energy industry. In 2005, due to adverse weather and accumulated coal dust on track beds, there were two derailments coming out of the Powder River Basin area, a major western supplier. Shortages in rail supply result in users depleting their own emergency stockpiles and requiring added transport to re-establish stockpiles. In addition rail transport costs have continued to increase to cover added maintenance and diesel fuel costs. Rail carriers have expressed concern that consolidation savings are no longer available and higher rates are needed to ensure continued growth of the rail infrastructure to meet increasing demand.[10]

[9] EIA Annual Energy Outlook 2008 with Projections to 2030, http://www.eia.doe.gov/oiaf/aeo/coal.html

[10] Energy Information Administration, http://www.eia.doe.gov/oiaf/aeo/otheranalysis/cti.html

Reliability and Cost Challenges for Renewables

The recent tremendous growth in renewable wind generation, while beneficial, has also created reliability challenges. Wind and solar, often referred to as variable resources, are not as controllable as a plant fired by coal, nuclear or gas. Recent experience in Texas, one of the largest wind producing states, demonstrated serious reliability and pricing concerns when large areas of the state experienced high temperatures and low winds for extended periods of time. Lack of generation during peak load periods forced emergency measures and dispatch of higher cost generation. As renewable variable resources continue to grow, reserve margins, particularly of controllable plants, become increasingly important.

Renewables continue to face price competition from base load generation facilities. As high voltage transmission grids are expanded and permit the efficient flow of energy from further distances, the level of competition is likely to rise. Renewable generators will need to look for new ways to control costs in larger competitive markets. Technology advances and continued funding for energy research are essential to overcome reliability and cost challenges.

Combined Heat and Power Generation

Combined heat and power (CHP) systems, also known as co-generation, can play a key role in providing new cost-effective and efficient energy systems. While typical generation plants have relatively low efficiencies, CHP generates both electrical and thermal energy with resulting higher efficiencies. These higher efficiencies reduce environmental emissions and energy losses since the thermal energy is typically used near the generation source.

Combined heat and power installations grew significantly during the 1980's and early 90's. CHP provided 10,000 megawatts of electric capacity in 1980 and increased that to 44,000 megawatts by 1993[11]. Most of these facilities were installed at large industrial sites where there was also a need for thermal energy. However, between 1990 and 2007, overall CHP thermal BTU output actually declined by approximately 4.2%.[12] For the electric power sector only, thermal BTU output has increased from 251,635 billion BTUs in 1990 to 363,843 billion BTUs in 2007 or 44.6%.[13]

CHP can be an effective approach to improving energy efficiencies, particularly where there is a productive use of the thermal energy output. Using electric for equipment needs and thermal energy for heating and cooling in close proximity to loads can offer significant efficiencies of operation and reduced environmental impact.

Distributed Generation

Another factor in providing generation adequacy for the new paradigm will be the role that distributed electric generation plays in meeting our energy needs. While not necessarily competitive at today's costs for base load generation, it does offer savings when used to reduce peak demands. The Energy Information Administration (EIA) forecasts almost 5,000 MW of

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[11] http://www.aceee.org/pubs/ie983.htm
[12] Energy Information Administration, http://www.eia.doe.gov/emeu/aer/elect.html, Table 8-3a
[13] Ibid, Table 8-3b

this type of capacity by 2010, with assumptions on reduced costs leading to continued growth in this sector of generation.

In addition, distributed generation can offer two big advantages over centralized base load plants. Having multiple smaller generation units distributed throughout a system enhances system security making it more difficult to eliminate all generation sources. Second, generation added near the point of consumption, offers improved reliability, lower losses and can serve to free up additional line capacity, delay new infrastructure investment and help hold down consumer delivery costs. However, challenges remain to sort out what "back-up" power arrangements are required for those using distributed generation and how it can be most effectively integrated.

Short Term Alternatives

There are some relatively shorter term alternatives to increasing generation availability in the U.S. Adding transmission infrastructure to more effectively use existing generation capacity could be a viable option to provide access to more distant generation. Also adding energy efficiency and new demand response programs that provide opportunity for energy consumers to conserve or turn off equipment and reduce consumption during peak usage/pricing timeframes could help to reduce peak load and extend generation resources. Aggressive energy efficiency and demand response programs can certainly delay generation requirements in states with slower load growth, but ultimately, substantial increases in demand will have to be met with increased generation resources to light our energy future.

2010 Trends

If current trends continue, there is a general consensus that:

- U.S. reserve margins will continue to decrease;
- Construction of renewable and distributed resources will continue accelerating;
- Reliability will become more heavily dependent on transmission infrastructure;
- Gas fired generation will continue to dominate new plant growth; and
- Nuclear or coal base load generation, if constructed, will be a much more costly endeavor.

MAJOR OBSTACLES IN THE NEW WORLD

As with most generation technologies, there are obstacles that have limited the development and deployment of these resources. These obstacles range from high level political, economic and environmental concerns to basic technological and physical restrictions, covering a wide range of variables. In general, while these resources have different trends, their obstacles or barriers to greater use of these resources have many common elements, differing mostly in magnitude. This section will address the broader, common obstacles that restrict greater contributions of generation resources to our energy security.

Achieving Economic Viability

For new base load or renewable generation to come forward and provide the resources needed to ensure our electric reliability, it will be necessary to demonstrate a solid economic viability. To do this, project developers will have to overcome four principal obstacles.

1. **Achieving maximum return at minimum risk** - All things being equal, investors choose to maximize return and minimize risk. And in response, generation companies have understandably developed similar risk adverse behaviors. The return in the electric industry is mostly inelastic due to state regulation or capped energy market prices. There is limited commensurate benefit for generators to pursue the higher risk projects with multiple unknowns. The economics and risk factors in today's world have identified gas fired facilities and wind farms as the least risk investments, particularly where the projects have a guaranteed sale contract or can receive regulated recovery of capital investments. Gas fired facilities are relatively inexpensive to construct, require shorter lead times and have reduced environmental cost exposure. Wind farms have somewhat higher capital costs, but a guaranteed free fuel for the life of the plant. If the goal is to achieve economic viability for large coal or nuclear base load generation, a mechanism must be found that minimizes the business risks associated with such projects. Economic viability for base load generation is dependent on reducing risk factors and increasing potential returns. Financial risk is a key barrier to new generation development.

2. **Overcoming the boom/bust cycle** - Given a risk adverse behavior, generators are reluctant to invest in generation projects until prices are sufficiently high to guarantee an acceptable return. Given that larger generation projects become available in typically large blocks of capacity after lengthy lead times, one can understand why the utility industry seems to have typical boom/bust cycles of investment. A few large projects, coming to fruition in any one year, can satiate the market demand after which it will take increasing shortfalls in generation, raising capacity prices to acceptable investment levels. The construction of smaller gas or wind powered projects can occur much more quickly to take advantage of capacity shortages with higher return on investment. The reality of the boom/bust cycle limits large base load capacity investment opportunity to those times when demand and prices are significantly higher, reinforcing the cyclic investment process. Economic viability of new projects during low demand times will require policies and actions designed to stabilize investment returns and both capacity and energy prices despite swings in consumer demand.

3. **Growing long term contracts –** In changing markets and regulatory environments, there is a great reluctance for purchasers as well as suppliers to enter into long term agreements. With the potential for extreme variations on any number of fronts, it is difficult enough to write a short term contract, let alone one that extends for 20 or more years. Changes to the generation or transmission landscape, environmental requirements, siting and development hurdles, regulatory review and a myriad of other variables can reduce a contract to out-of-market pricing very quickly. However, for generation companies seeking to build new capacity and looking for external financing, long term contracts are essential. In addition, the development of long term contracts would also serve to help dampen the boom/bust cycle by creating more stable returns, not subject to

the vagaries of demand and supply pricing. The economic viability of many generation projects is contingent on purchase power agreements and policies that support the negotiation and adoption of long term contracts.

4. **Assuring asset cost recovery** – Investor insecurity related to recouping capital investment costs for a new plant is a definite barrier to economic viability. Whether in an organized market arena or vertically regulated jurisdiction, there are concerns related to asset cost recovery. In organized markets, the generator is left to recover costs through capacity and energy profit payments. Only recently have actual capacity markets been created and even there, there are market limits on the level and duration of payments. In regulated markets, cost recovery is dependent on the regulatory authority and the determination of prudency with respect to the investment. While a bit more certain and somewhat less risky, the return on investment is also limited.

   Another concern is the ever increasing development costs associated with new generation and particularly with new technologies. Generation companies are spending increasing amounts of time and dollars to meet planning, permitting, siting and interconnection requirements in many areas. While the recovery of hard asset costs may not be an issue, the recovery of significant development costs can be more problematic and subject to higher levels of scrutiny. In the case of cost recovery for both hard asset and development costs, regulatory approaches that minimize uncertainty and market rules that provide longer term certainty will help to minimize this barrier.

Facing Political and Regulatory Uncertainty

As noted by the French philosopher Voltaire, "Doubt is not a pleasant condition, but certainty is an absurd one." Although one should never expect absolute certainty, one of the biggest barriers after economic viability is the continuing political and regulatory uncertainty and its impact on potential new generation projects. Federal legislators are unable to produce a comprehensive energy plan or establish long term energy policies. Production tax credits, investment tax credits and grant programs have typically been renewed in small short term increments. A reluctance to deal with climate change, carbon reductions and air quality issues places a thick shroud of fog over generation opportunities that may never see the light of day. Our real challenge may not be how to get generation built, but how to establish a longer term certainty on the critical issues that can help improve the economic viability of generation projects.

There are three (3) distinct uncertainties that impede the progress to secure new generation. They include the duration of grants and tax incentives, climate/environmental issues and market or regulatory changes.

1. **Grants and tax incentives** – In combination with the government bail out of financial institutions during the 2008 economic crisis, Congress extended the production tax credit for renewables through 2009. Production tax credits (PTC), set to expire December 31, 2008, were extended for one year to stimulate renewable generation. Established in 1992, the only long period of certainty for the PTC was from the initial inception through 1999. According to the Washington Post, the alternative energy industry has learned not to take the tax credit for granted. Wind generation has had its PTC lapse three times – in

1999, 2001 and 2003. According to the American Wind Energy Association, new installed wind capacity declined by 93%, 73% and 77%, during those time frames.[14]

Concurrent with the production tax credit uncertainty, the investment tax credits for certain renewable facilities were also scheduled to expire in December 2008. This was a critical issue, particularly for the higher cost renewable ventures such as solar. This credit was recently extended for eight (8) years in the same 2008 economic crisis bill. While it was good to see this extension, it would be even more helpful if Congress were to think in terms of 20 to 30 years for generation resources.

Another important federal government policy revolves around loan guarantees for various energy related projects. The Energy Policy Act of 2005 authorized DOE to issue loan guarantees to eligible projects that avoid, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases and employ new or significantly improved technologies. However, such authority is limited by congressional funding approvals. In 2008, Congress authorized $38.5 billion in loan guarantee authority for innovative energy projects. Of the total provided, $18.5 billion is set aside for nuclear power facilities, $2 billion for advanced nuclear facilities for the "Front-end" of the nuclear fuel cycle, $10 billion for renewable and/or energy efficient systems and manufacturing and distributed energy generation/transmission and distribution, $6 billion for coal-based power generation and industrial gasification at retrofitted and new facilities that incorporate carbon capture and sequestration or other beneficial uses of carbon and $2 billion for advanced coal gasification.[15] According to a DOE loan guarantee announcement in October 2008, DOE had received 19 Part I applications from 17 electric power companies for federal loan guarantees to support the construction of 14 nuclear power plants in response to its June 30, 2008 solicitation. The applications reflect the intentions of those companies to build 21 new reactors, with some applications covering two reactors at the same site. The nuclear industry is now asking for $122 billion in loan guarantees, significantly exceeding the $18.5 currently allocated.[16] Needless to say, the dependency on congressional funding puts a short term spin on certainty. It may be available this year, but for those projects, planning to apply for these loans in future years, it may not be there when needed. The long term policies, needed to ensure a 15-20 year certainty, are not always available.

2. **Climate and Environmental Issues -** Carbon reduction and climate change mitigation top the list of environmental uncertainties. Ten (10) Northeast and Mid-Atlantic states and several Western states have already enacted mandatory carbon reduction plans. The Regional Greenhouse Gas Initiative (RGGI) establishes a cap and trade program to reduce carbon emissions 10% by 2019. The Western Climate Initiative, which includes 7 western states and several Canadian Provinces seeks a 15% reduction of carbon emissions below 2005 levels by 2020 by employing a cap and trade program. And lastly, Congress most recently considered the carbon issue with proposals for a carbon tax or national cap and trade program. As of this writing, a national effort remains an uncertainty. The question appears no longer if, but when and how carbon reductions will become mandatory throughout the U.S. However, the uncertainty of program size/goals

[14] Washington Post, "Energy Boost," Anita Huslin, Staff Writer, Monday, April 14, 2008, Page D01
[15] Department of Energy, Loan Guarantee Program, http://www.lgprogram.energy.gov/
[16] Ibid, http://www.ne.doe.gov/newsroom/2008PRs/nePR100208.html

and whether it will be a tax or cap and trade effort continues to cloud the horizon. The most recent price of carbon emissions as established in the September 25, 2008 RGGI auction was $3.07 per ton but that could vary depending on supply and demand. Building any type of carbon emitting plant in today's environment automatically adds more cost with uncertainty on how much it may ultimately cost.

There are also regulatory uncertainties associated with air pollutants, chiefly SO_x, NO_x and mercury. On March 10, 2005 the Environmental Protection Agency (EPA) issued the Clean Air Interstate Rule (CAIR), designed to achieve the largest reduction in air pollution in more than a decade. CAIR established caps for SO_2 and NO_x emissions across 28 eastern states and the District of Columbia. In a closely related action, the EPA also formulated a Clean Air Mercury Rule to further reduce pollution throughout the U.S.[17] While utilities committed to major investments for compliance, others were challenging the rule in court. On July 11, 2008 the District of Columbia Court of Appeals issued an opinion in *State of North Carolina v. Environmental Protection Agency's (EPA) Clean Air Interstate Rule (CAIR) and the associated Federal Implementation Plan*, finding that the program had several "fatal flaws."[18] The Court of Appeals finding basically overturned the CAIR and placed other state environmental issues in question. In August, the Court of Appeals extended an EPA deadline for filing a rehearing appeal to September 24, 2008 at which time the EPA filed a petition for rehearing.[19] With Federal clean air requirements unknown and an Administration working through its last few months in office, this uncertainty may remain, pending court action on the rehearing appeal.

There is also the uncertainty associated with the Environmental Protection Agency's (EPA) approach to the Clean Water Act. Most recently with the overturning of the Clean Water Act, Section 316(b) provisions, generators may be required to replace once through cooling cycles with closed loop cooling towers.[20] The uncertainty on this issue can pose significant costs for new and existing generators and would reduce the capacity of existing resources through added parasitic loads and unit retirements. In a recent special assessment, NERC reported the potential impact of retrofitting once through cooling systems with closed loop cooling systems. Studies projected a 2015 decline in reserve margins from 14.7% to 10.4% when both retirements and cooling system parasitic loads were taken into consideration. That represents an approximate 49,000 megawatt loss of U.S. capacity by 2015.[21]

3. **Market or Regulatory Changes –** While many states continue to regulate vertically integrated utility companies and plan for new generation, deregulation and the establishment of Regional Transmission Organizations (RTOs) have brought forth a host of uncertainties. Markets and market rules continue to change and develop and the rules

[17] Environmental Protection Agency, http://www.epa.gov/cair/
[18] McDermott, Will & Emory, July 15, 2008, http://www.mwe.com/index.cfm/fuseaction/publications.nldetail/objectid/90f784c5-fcbe-4e12-a1b4-39b76e4da002.cfm
[19] EPA website, http://www.epa.gov/airmarkets/progsregs/cair/docs/CAIR_Rehearing_Petition_as_Filed.pdf
[20] North American Electric Reliability Corporation, 2007 Long-Term Reliability Assessment Report, October 2008,pages 29, 30
[21] North American Electric Reliability Corporation, 2008-2017 NERC Capacity Margins: Retrofit of Once-Through Cooling Systems at Existing Generating Facilities, page 4

can be significantly different between RTOs. While the advent of central capacity markets, and particularly forward markets, helped to create some capacity price certainty, it was only for relatively short periods of time. The introduction of energy efficiency in capacity markets has created another competitive challenge to generation companies and added uncertainty. RTOs such as the California Independent System Operator and the Midwest Independent System Operator, why trying to mitigate interconnection barriers, are modifying interconnection cost allocations creating financial uncertainty. Efforts are being made on both coasts to integrate environmental concerns and to help facilitate the entry of variable renewables into the market place. Economic dispatch is being replaced, albeit gradually with Enviro/Economic dispatch. And while these are all admirable goals, they create uncertainty.

At state levels, the regulation landscape also continues to change. States that fully supported deregulation in the late 90's and have participated in market dynamics are looking at ways to change energy procurement practices and considering long term commitments outside of existing markets. Even where a competitive market may exist, energy procurement is beginning to look at other options, introducing added uncertainty.

Coping with Construction, Operating and Labor Issues

Sept 2007 – Sept 2008 Commodity Price Increases	
Steel Mill Products	38.2%
Concrete Products	4.3%
Copper	4.2%
Turbines-Gens	8.6%
Private Industry Labor	3.3%
Electric Power Generation	12.9%

Source: Bureau of Labor Statistics[22]

NEW GENERATION IS EXPENSIVE!

In today's economic environment, the cost to plan, construct, own and operate a generation station is becoming a much larger obstacle to all companies. The raw materials that go into making up a power plant have seen significant increases in the past year and even more in the past 3 years. Steel has seen the largest increase, followed by copper, generating equipment and concrete. According to the U.S. Bureau of Labor Statistics, Electric power generation end product price (capacity, energy and ancillary services) has risen by 12.9% in the past year. General labor costs have increased by approximately 3.3% since September 2007. When taken together, a $1 billion generation project started in today's environment may well cost $3 billion after eight (8) years of material and labor cost escalations.

The generation industry is also facing a new global demand for electrical equipment and skilled craftsmen. With new fast paced generation construction in developing countries, demand for generators, steam turbines, boilers and related equipment has accelerated, driving up prices and extending order lead times. What once was a 6-12 month lead time for equipment orders has stretched into 2-3 year lead times. The number of skilled craftsmen, trained to work on generation systems, continue to decline as more of the workforce retires. Those that continue to

[22] U.S. Bureau of Labor Statistics; http://www.bls.gov/news.release/ppi.t02.htm; http://www.bls.gov/ppi/ppitable05.pdf;

work and move into the generation arena must be more flexible and able to move beyond domestic borders to command higher financial returns.

The utility industry is faced with an aging work force and knowledge loss that they are working hard to overcome. The NERC's *2008 Long-Term Reliability Assessment Report* highlighted the fact that while the industry's aging workforce poses a concern for system reliability, the industry is making progress in addressing the issue. In 2007 NERC reported, according to a recent Hay Group Study, that about 40% of senior electrical engineers and shift supervisors in the electricity industry will be eligible to retire in 2009.[23] An informal NERC survey of the industry found that 67% of participants thought there was a high likelihood there would be a reliability risk due to the occurrence of an aging workforce and lack of skilled workers.[24] Both electric and water utilities face the prospect of losing up to 60% of their top management and other key workers by 2010.[25]

Add to this the uncertainty of rising fuel costs. Central Appalachian coal has gone from $45.00 per short ton in October 2007, to $119.00 per ton on October 24, 2008. Henry Hub spot gas prices rose from $7.80 per MMBTU in June 2007 to $12.70 per MMBTU in June 2008, but with recent economic downturns have dropped to $6.50 per MMBTU in October 2008.. NYMEX heating oil futures went from $2.00 per gallon in June of 2007 to $3.80 per gallon in June 2008, but have also declined to $1.91 per gallon in October 2008. Crude oil futures have seen similar price swings moving from $65.00 per barrel in June 2007 to $131.00 per barrel in June 2008 and falling back to $65.00 per barrel in October 2008. Higher coal prices and volatile petroleum and natural gas prices, all subject to changing world wide demand, create a high level of uncertainty for generation projects.[26]

Adapting to the Need for Green

Climate change and environmental concerns, while not new, have recently gained much more support. As new air quality rules are written, generation projects will be expected to comply. And even here, the cost and technology for compliance is continuing to change. What historically was a relatively simple bag house process to eliminate power plant plume particulate has been transformed into a highly technical chemistry designed to minimize not only particulate, but pollutant gases and metal compounds, the cost of which can become an enormous burden for new projects.

Traditional generation creates process waste, no matter whether it's coal ash, spent nuclear fuel rods, cooling water or flue gas particulate. Some wastes, a natural outcome of the generation process, are a critical cost component of the generation process such as spent nuclear fuel storage or carbon dioxide sequestration with extremely high costs. Other wastes have much lower processing costs such as coal ash, or flue gas particulate and provide opportunity for recycling

[23] NERC Key Issues: Aging Workforce, http://www.nerc.com/page.php?cid=4|53|55

[24] North American Electric Reliability Corporation, Results of the 2007 Survey of Reliability Issues, October 24, 2007, page 6.

[25] Business Wire, June 18, 2007, http://www.allbusiness.com/services/business-services/4513937-1.html

[26] EIA; http://www.eia.doe.gov/cneaf/coal/page/coalnews/coalmar.html#spot; http://tonto.eia.doe.gov/dnav/pet/hist/rwtcd.htm; http://tonto.eia.doe.gov/dnav/pet/hist/rhonyhd.htm

into useful and perhaps environmentally acceptable products. Another difficulty for new generation projects, outside of the obvious waste disposal issues, is how to plan for the unknown costs related to waste requirements.

Permitting for new generation also creates uncertainties. States continue to try to simplify the permitting process by minimizing agency interfaces, but it still results in multiple agency applications to secure the necessary permits to build new generation. Cities, counties and various state agencies typically each have a process mandated by charter or state law. In addition, the permitting process in all states is becoming more transparent with active participation by state organizations, environmental, political and consumer groups The development permitting process is becoming a negotiation process whereby planned site use, environmental mitigation and infrastructure security are all subject to negotiable change. Add the preferences to use brownfield sites and revised negotiated generation plans can become unrecognizable when compared to original plans.

Interconnecting to the Transmission Grid

Interconnection with the transmission grid in a safe and reliable manner is of utmost importance for new generation. To ensure that the new generation can meet these requirements, the transmission owner or RTO typically requires a series of studies that identifies necessary upgrades and equipment requirements. While no one argues with the need for such studies, there is considerable concern with the time it takes to complete the studies and the on-going changes to the end result as system circumstances change. The requested study would typically determine deliverability and potential costs for interconnection; however, there can be a significant time lag in the study process due to the multiplicity of requests and the level of technical detail required in each study. It is not uncommon for project studies to take well beyond 6 months for completion. What may be a multi-million dollar investment for interconnection upgrades could turn out to be a much higher or lower cost as other potential projects change or elect not to move forward. This creates added uncertainty for potential project developers and can be a significant obstacle to moving forward on a project.

Beyond the facility study is the requirement for a formal interconnection agreement. At this point, the project must make a more significant capital commitment to move forward. Once an interconnection agreement is executed, most projects are anticipated to be viable and are included in future reliability studies. Again, the key concern is the uncertain time it can take to complete and execute the agreement.

While FERC has continued to ensure open access to the transmission gird, responsibility for the cost of such interconnection continues to vary across the nation. Cost allocation for network upgrades can vary from 100% paid by a generator in PJM, to a 50/50% split used by MISO, to a more recent pricing policy providing generators with a 100% refund of network upgrade costs necessary for interconnection.[27]

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[27] FERC Docket ER08-796, See ITC Midwest, LLC, 124 FERC 61, 150 (2008), and cases cited therein. FERC has approved a pricing policy filed by International Transmission Company, Michigan Electric Transmission Company and ITC Midwest under which a generator may receive 100% refund of Network Upgrade costs when a generator has at least a one year contract to serve the ISO's network customers or is designated as a network resource at time of commercial operation. In approving this policy, FERC indicated that a 100 percent reimbursement for Network Upgrades is just and reasonable, and that different rate proposals can be just and reasonable.

Interconnection cost allocation can be a significant issue for new generation projects, particularly renewables. These types of plants are typically sited close to fuel sources or in open rural areas. Wind farms need areas where there are consistent wind flows and commercial solar installations need significant open space. Transmission for interconnection may be nowhere near these locations. In Texas, recognizing renewable generation interconnection constraints, Senate Bill 20 laid the groundwork for large transmission lines to accommodate wind industry needs and to further accelerate the use of wind power in the state. The Texas Public Utilities Commission approved an approximate $5.0 billion dollar transmission investment to move 18,456 megawatts of wind power from West Texas and the Panhandle to metropolitan areas of the state. The cost for this transmission was estimated at $4.00 per month for every Texas rate payer but helped to eliminate the interconnection barriers for wind and solar in Texas while reducing overall energy prices.

KEY ISSUES BY GENERATION TYPE

While there are several major generic barriers to generation adequacy, each generation type also comes with its own specific concerns that challenge the development of viable projects. The following nine (9) types of generation projects have specific concerns that will need to be addressed either individually or in generic approaches.

1. **Biomass** generation tends to be smaller scale plants to minimize the difficulties with storing, handling and transporting large quantities of the necessary fuels. While coal has a heat value of 8,000 – 14,000 BTU per lb., wood and even dried switch grass has around 6,500 – 7,500 BTU per lb., requiring larger quantities of fuel to achieve the same BTU heat input to a generation process. On the opposite end of the spectrum, landfill gas has a 12,000 -13,000 BTU per lb. heat content, making it a renewable fuel of choice where available. While the cost of fuel may be competitive, the quantity to be handled can impose difficulties. Additionally, there is a need to manage a complex fuel cycle from start to finish to ensure consistent availability of fuel and to minimize price instability.

   Principally thought of as a wood burning plant or landfill gas plant, biomass generators are not considered utility scale enterprise. As such, biomass projects typically suffer from higher investment costs and a lack of venture capital for new projects. When and where biomass projects have been successful, there have generally been public policies designed to offer project incentives.

   As with other renewables, interconnection costs and the allocation of such costs can be a barrier to new projects. Since many of the projects are of a smaller size, they are often left to interface with local utilities at retail level distribution voltages. Unless they are willing or can sell energy to the local utility, there can be additional energy wheeling costs for handling the energy injection on the distribution system.

2. **Clean Coal Technologies and/or Integrated Gasification Combined Cycle (IGCC)** plants, no matter how you package them, are still power plants that require coal delivery and storage, produce a flue gas with carbon dioxide and have resulting wastes for disposal. Requirements for carbon capture, land use mitigation, emission

control/disposal and internal energy use required to maintain the gasification and emission processes rapidly increase the costs of such ventures. IGCC plants are estimated to use up to 30% of the power generated for support processes. Higher costs and lower outputs will require additional federal support if new IGCC or clean coal ventures are to be viable.

The desire for carbon capture and/or sequestration will add both cost and technological difficulties. The location of new plants will require transport of fuels to the site and/or transport of captured carbon to a sequestration location. Mine mouth coal plants may be replaced by coal plants located near subterranean ground formations that can store carbon, depending on which part of the energy cycle is more costly, fuel procurement or carbon sequestration. The availability of appropriate sites may well be a significant barrier to new coal generation depending on the type of underground formations that can accept and hold carbon emissions. Such sites may also have transmission interconnection barriers where they are far from existing facilities.

Coal generation also continues to have issues with waste storage and disposal. While there are efforts to recycle ash into useful processes, much of it winds up as landfill in carefully prepared dump sites to limit heavy metal ground water contamination. According to the American Coal Ash Association, the U.S. produced 125 million tons of coal combustion products in 2006. Of that amount, 43% was used beneficially, leaving approximately 70 million tons for disposal.[28].

Although new coal technologies offer significant improvement, public perception has not reduced barriers for these new plants. With the recent rise in coal prices coupled with environmental concerns, renewable generation appears to be the public's preferred solution. And while that solution is not without its own issues, it places new coal technologies at a competitive disadvantage in the quest for new project financing. Coal may need new policy incentives to maintain its share of base load capability in the U.S.

3. **Combined Heat and Power (CHP) and Distributed Generation (DG)** plants while exposed to the universal set of barriers previously discussed, also have their own significant concerns. There are site by site environmental and regulatory permitting requirements that can be costly and time consuming. In many states there are still onerous and expensive interconnection studies that are a significant barrier. In addition, the inherent high process efficiency for CHP or reduced losses from DG are not always recognized or rewarded for the avoided emissions. Additionally, some utilities charge backup or standby rates that can be a costly expense for interconnecting to the distribution grid. While there is tremendous opportunity for CHP and DG, it will take a concentrated effort much like that for renewable energy to achieve the efficiency and environmental benefits with this type of generation.

[28] American Coal Ash Association, http://www.acaa-usa.org/index.cfm

4. **Geothermal's** principal barrier is finding locations for economical energy production with minimal interconnection costs.[29]. Access to readily available heat sources in the earth often require access to rugged and difficult terrain Once an access point is identified, there are water table concerns, sustainability of heat flows, protected wilderness issues and certainly transmission interconnection availability. Of all the renewable generation technologies, geothermal provides the most challenging siting concerns.

   Other barriers include lower efficiencies of operation due to lower temperature steam and the environmental requirements to deal with a generally corrosive fuel containing some heavy metals. While geothermal plants are relatively clean in comparison to coal plants, there can be some harmful emissions and waste water that require special disposal processes. Additionally, geothermal plant sizes may be limited by the availability of steam and the geological heat transfer rates at the site.

   Geothermal plants, while environmentally cleaner than fossil fuel base load units, are not an inexpensive proposition. Financing for geothermal plants, given the higher cost of facilities and the risk of steam resource losses, is an on-going challenge.

5. **Hydroelectric** energy plants have continued to see steady growth. In the U.S. it has grown from 56 gigawatts in 1970 to more than 95 gigawatts in 2007. However, even with this growth, it has dropped to 10% of supply capacity, displaced mostly by the growth of natural gas power plants.[30] Barriers pertinent to new hydro plants are predominantly the environmental and social costs associated with location and transmission interconnection access. Dams can have major impact on marine animals and forested habitats, and in some instances, can displace homes and communities.

   Hydropower is also beginning to face a new phase of competition. New technologies such as tidal, wave and river generation facilities are being explored. Competition for financing may become a significant barrier in the face of new developing technologies.

6. **Natural Gas** has had relatively few barriers to its development as evidenced by the recent increases in gas fired capacity. One of the least expensive types of new generation and the quickest to build, natural gas is limited mostly by siting issues and availability of gas. However, there are carbon emission issues that may well slow the development of gas plants. Although a combined cycle gas plant can produce up to 70% less carbon emissions then a conventional coal plant, it still has the cost of its remaining 30% carbon emission to contend with.

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[29] California Energy Quest, http://www.energyquest.ca.gov/story/chapter11.html Geothermal energy is referred to as any energy producing approach that uses the earth's heat or coolness to improve energy efficiency. As an example, ground water heat pumps can be thought of as a geothermal energy product, but for purposes of this paper, geothermal energy will be a generation system that uses the earth's heat to produce electric energy. There are many examples of geothermal plants, particularly in California where there are currently 14 plants in operation

[30] Union of concerned Scientist, http://www.ucsusa.org/clean_energy/renewable_energy_basics/how-hydroelectric-energy-works.html

Recent discussions around gas capacity have raised issues with respect to fuel availability. Is there sufficient gas and gas transmission capacity to support the level of plants planned and constructed? Future gas plants may well be dependent on the development of domestic shale gas reserves, additional LNG supplies and infrastructure to meet generation demand.

There are also questions with respect to recovering investment costs. Gas fired generation has historically been relatively high on the economic dispatch curve and run for shorter periods of time to meet peak loads. A potential barrier to new entry may be the ability of gas fired plants to secure enough capacity and energy revenues to recover investment costs.

7. **Nuclear** energy planning, if not actual construction, is experiencing a profound new birth with many different generation companies proposing projects. In 2007 the Nuclear Regulatory Commission (NRC) received five (5) applications for new plants. In 2008 the NRC expects to have thirteen (13) new applications.[31] While financing this level of capital expansion may be a barrier for some companies, the boom of new applications is not indicative of that concern. One applicant has noted that it expects to seek Department of Energy loan guarantees with specific financing likely to come from the Federal Financing Bank, a government entity managed by the U.S. Treasury Department.[32] With the potential for federal loan guarantees, pooled insurance plans and carbon emissions looming large, the nuclear energy industry hopes to provide long term stability for U.S. energy resources, but loan guarantees of $18 billion will be way over subscribed.

   A more serious barrier for new nuclear generation is the potential for significant cost growth. With continually escalating material and labor costs, a long term, 8-9 year construction project faces significant final cost uncertainty. This easily translates into financial risk and higher premiums for secured loans. And where previous nuclear construction projects suffered major cost overruns and left developers in serious financial straits, there will be extreme caution around financial commitments to new nuclear generation projects.

   The sheer size and capacity of new nuclear facilities also present challenges for the delivery of energy on the existing transmission grid. 1600 megawatt units will require significant transmission capacity to move energy to markets, but transmission infrastructure costs needed for this type of plant pale in comparison to the cost of the entire plant.

   Other barriers to new nuclear plants include the high cost of planning, development, siting, permitting and litigation where necessary. There are high costs of raw materials such as steel, concrete and uranium fuel with world wide demand creating

[31] Nuclear Regulatory Commission, Expected New Power Plant Applications, August 2008, http://www.nrc.gov/reactors/new-licensing/new-licensing-files/expected-new-rx-applications.pdf

[32] Gazette.Net, Nuclear Financing Scare, August 1, 2008, http://www.gazette.net/stories/080108/businew180449_32355.shtml

highly volatile prices. And although somewhat diminished at this time, there is the public perception and latent fear of a catastrophic and hazardous event.

Finally, waste disposal and an appropriate mechanism for the long-term storage of spent nuclear fuel await resolution.

8. **Oil** fired generation is continuing to decline in the U.S. With environmental concerns, rising prices and international dependency, it is no longer used in generation except in special circumstances. The principal barriers to new oil fired generation are the price for fuel, the uncertainty over fuel availability, the cost of carbon emissions and the fact that a perfect oil storm (all variables at highest prices) would leave these projects non-competitive.

9. **Solar** generation, both photovoltaic (PV) and thermal, have significant cost barriers to overcome as a new energy source. PV installations can cost up to 20-50 cents per kilowatt-hour before incentives, while concentrated thermal installation could cost 15-17 cents per kilowatt-hour.[33] These costs are currently keeping solar generation limited to those occasions where subsidies as available and public policy require use of renewable resources. While costs for both photovoltaic and thermal generation are continuing down, it has been very gradual.

   A substantial barrier for solar is finding appropriate locations where economies of scale can offer pricing benefits to the developer and where interconnection costs are still manageable. Solar projects need access to transmission with the capacity to take maximum output; however, there are many times during day and night when that transmission is not utilized. This is true for all variable resources that must plan for maximum output, but realistically have lower outputs because the sun does not shine and the wind does not blow all the time. Under utilized transmission capacity can add cost to this type of project.

10. **Wind** is the new gold rush in energy solutions. According to the American Wind Energy Association, U.S. wind farms now generate more electricity than any other nation in the world and are on track to expand by over 45% this year.[34] A key barrier to continuing wind development is the long-term uncertainty of the production tax credit as previously discussed. Long-term extension of this credit and higher prices for renewable energy credits are necessary to secure financing for new projects.[35]

    Wind is also a variable generation that must pay for high capacity interconnection resources, but typically only uses about 20-30% in daily generation output. Finding locations appropriate for facilities with manageable interconnection costs are also barriers for new wind efforts. However, states such as Texas are beginning to address this issue with major new transmission installed to prime wind generation sites. Another barrier for wind generation is the availability of turbines, blades and other

[33] http://www.solarbuzz.com/statsCosts.htm; http://news.cnet.com/Shrinking-the-cost-for-solar-power/2100-11392_3-6182947.html
[34] American Wind Energy Association, http://www.awea.org/
[35] WindPower Outlook 2008, http://www.awea.org/pubs/documents/Outlook_2008.pdf

materials. Heavy new demand in the industry has caused temporary shortages and higher prices.

Off-shore wind generation is another source of energy with similar barriers. Just recently Delaware announced a contract for the first off-shore wind farm, however, the project required a long term 20 year purchase arrangement and authorization for the company to be credited with 3 renewable energy credits for every one megawatt of renewable generation to provide the necessary financial viability for the project. Rhode Island and New Jersey have also announced the approval of $2.0 billion and $1.0 billion, off-shore wind farms, respectively, with state financial support.

Off-shore wind projects are typically twice as expensive as land-based units, but do offer the opportunity to serve high priced electricity markets in coastal areas. They have the added costs of constructing much higher foundations in a marine environment that must withstand both wind and wave turbulence. Due to the harsh environment, these facilities require additional maintenance and operating costs to ensure full lifecycle operation. Permitting for off-shore facilities is a second barrier and depending on location will generally include both state and federal requirements due to environmental and marine transit issues. The U.S. Minerals Management Service, charged with permit authority, just recently issued its draft permit requirements for off-shore wind farms in federal waters. However, with off-shore wind farm facilities extending from turbine location to substation landfall, the permitting process will involve almost every interested agency, both federal and state.

Wind farms, a high growth industry, are rapidly changing the reliability environment of transmission systems. Meeting reliability adequacy requirements with base load and on-call conventionally fueled peaking plants has been the typical approach, but with more wind and solar variable resources becoming available, there is a much larger portion of generation resources that are not dispatchable. Numerous large installations in relatively small weather pattern areas can create large voids of generation resources on peak demand days when most needed. Texas experienced this shortfall this past summer when western winds subsided across a large area requiring emergency generation with extremely high energy prices. As variable resources continue to be developed, reliability organizations will need to plan for enough flexible supply and/or demand resources and methods to integrate them to allow for system balancing with variable resources on the system. Developers, who wish to cluster units for economic advantage, may begin to see new siting barriers created by reliability concerns.

RECOMMENDED DOE ACTIONS

Lighting our new world's future, keeping energy affordable and minimizing environmental impacts will be the most challenging requirements for the new Administration. Encouraging and managing new generation technologies while removing barriers to their development will require bold new actions that are significantly different than historical efforts. Letting the generation industry stumble along, finding its own way, will likely result in market inefficiencies leading to reliability concerns, higher energy prices and a portfolio of facilities that serves only generator interests. It will be important for DOE to undertake aggressive and timely efforts to address market failures and to promote an optimum mix of generation resources.

DOE has recognized the need for bold new actions, most recently in its 20% Wind Energy by 2030 Report. As DOE notes, "The 20% Wind Scenario is not likely to be realized in a business-as-usual future. Achieving this scenario would involve a major national commitment to clean, domestic energy sources with minimal emissions of [green house gases] GHGs and other environmental pollutants.[36] It is policies such as this that will need to be supported by bold new actions.

What are the recommended actions that DOE should consider? The Energy Advisory Committee has identified seven (7) key actions to enhance generation development for DOE consideration.

1. REDUCE THE FINANCIAL RISK FACED BY NEW GENERATION DEVELOPERS.

The most significant barrier to new generation is establishing the financial viability of proposed projects. DOE needs to support policies, programs and legislation that minimizes the risk of cost recovery and maximizes available returns. Some new suggestions for consideration include the following:

- Generation developer cost recovery insurance pools whereby new projects may subscribe and qualify for partial cost recovery insurance. Such insurance pool would be limited to generation projects that employ new or enhanced technologies and have substantial planning and development costs.

- Continue to provide financial grants for new and enhanced technologies and expand grant programs to support planning and development of new generation projects that demonstrate clean and/or renewable and environmental benefits.

- Ensure the continuation of funding and availability of federal loan guarantees for new energy technologies.

2. PROMOTE POLICIES, PROCESSES AND LEGISLATION THAT INCREASES CERTAINTY OVER THIRTY YEARS.

Long term in the generation industry is considered the 30-40 year life of a plant. Yet, the political environment discusses and is now producing legislative changes almost annually. The conflict between the need for longer term consistency and short term reactions creates huge uncertainties for new generation and new technology development. The recent extension of the Production Tax Credit for one year and discussions around a possible Carbon program are examples of a clear, uncertain message to generation developers. The most recent National Governors Association Policy statement, NR-18, Section 18.1.3, further

[36] Department of Energy, 20% Wind Energy by 2030 Report, http://www.20percentwind.org/default.aspx

supports the need for longer term certainty and is a good source for additional recommendations. More specific suggestions include:

- Advocate the continuation and establishment of production tax credits and the expansion of investment tax credits for a much longer term to provide additional financial certainty for new generation projects.

- Promote the use of long-term contracts through preferential grants and loans for new technologies that agree to seek long term output contracts.

3. ADVOCATE POLICIES, PROCESSES AND LEGISLATION THAT PROMOTES NEW TRANSMISSION, SUPPORTS DEVELOPMENT OF A HIGH CAPACITY TRANSMISSION SYSTEM AND FAIRLY ALLOCATES TRANSMISSION INTERCONNECTION COSTS.

A basic barrier to all generation investment is the interconnection infrastructure needed to provide energy to the transmission grid. Investment in transmission facilities, particularly for renewables located in rural or remote areas, can be a significant part of the overall investment. Investment in the nation’s transmission system is essential so that the electricity generated throughout the U.S. can be delivered to urban centers that need the increased supply. Actions that DOE should consider include:

- Support the development of new transmission facilities that enhance the bulk energy flows and provide for major resource interconnections across the U.S.

- Advocate a fair and equitable interconnection cost allocation process that balances costs and benefits and is appropriate for the regional transmission managing entity.

4. PROMOTE IMPROVED PLANNING PROCESSES THAT EXPEDITE GENERATION FACILITY STUDIES AND INTERCONNECTION AGREEMENTS, AND CONSIDERS GENERATION SOLUTIONS FOR RELIABILITY.

Generation queues in RTO areas have a significant number of projects awaiting the facility studies which identify preliminary interconnection requirements and costs. Delays in the review process add uncertainty to projects and impact viability. Actions to enhance and improve that process include:

- Advocate improved and faster interconnection study processes to provide more accurate and timely information for generation developers.

- Consider a national review of generation planning processes in cooperation with NERC and other interested agencies.

- Promote a planning and review process that recognizes the need to view larger electric load balancing areas and to confirm that region reliability is supported by the existing diversity of generation sources, including variable generation, that exist outside defined regions.

- Consider providing transmission owners and RTOs the ability to secure new cost based generation to maintain system reliability when it becomes the most cost effective solution to help mitigate congestion and maintain reliability.

- Promote greater regional coordination and planning, consider re-establishing regional coordination offices and provide grants to support regional energy planning efforts.

5. ADVOCATE IMPROVED AND LONGER TERM CERTAINTY FOR AIR AND WATER QUALITY ENVIRONMENTAL REQUIREMENTS INCLUDING CARBON EMISSIONS

- Advocate the adoption of a long term national carbon policy, air quality rules and waste disposal that supports the development of new generation technologies and adds longer term environmental certainty for all generation companies.

- Adopt policies that coordinate the types of new generation needed with the environmental limitations imposed by legislation or regulatory actions.

- Support the adoption of new air and water quality standards that maintain environmental quality and create longer term certainty.

6. CONTINUE SUPPORTING NEW TECHNOLOGY DEVELOPMENT AND MAINTAIN OR IMPROVE DOE GRANT AND/OR LOAN GUARANTY PROGRAMS.

The development of new generation technologies depends on innovation and development. That, in turn, requires support for new research and development efforts. DOE needs to continue and enhance its support for new generation technologies.

- Adopt a long term funding plan that provides for a stable level of support for new generation programs and technologies and creates certainty of direction and purpose.

- Support efforts to make efficient cost-effective technology advancements and improved manufacturing processes in generation equipment.

7. SUPPORT THE DEVELOPMENT AND EXPANSION OF DISTRIBUTED AND RENEWABLE GENERATION.

With the demise of integrated resource planning in some energy markets, not all potential solutions to light our new world are necessarily reviewed and incorporated in regional plans.

- Support revisions to regional planning processes that permit RTOs to examine other cost effective options and to solicit both generation and energy efficiency responses as appropriate.

- Explore the potential for distributed, renewable generation and high efficiency CHP to supplant transmission solutions to ensure regional reliability.

- Support the development of reasonable and fair interconnection standards and tariffs for distributed generation.

- Support distributed generation emission requirements that are based on power output as opposed to fuel input to encourage more efficient use of fuels.