UNITED STATES SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES

TESTIMONY OF THAD HILL

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Oversight Hearing on Electric Grid Reliability and Security

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Good morning Chairman Landrieu, Ranking Member Murkowski and members of the Committee. Thank you for inviting me to speak this morning on "Keeping the Lights on – Are We Doing Enough To Ensure the Reliability and Security of the U.S. Electric Grid?" My name is Thad Hill. I am President and Chief Operating Officer of Calpine Corporation and will assume the role of Chief Executive Officer this May.

Calpine is an Independent Power Producer with more than 29,000 Megawatts (MW) of generation capacity from 94 power plants in 20 states, and is the largest independent power producer measured by power produced, almost enough to power 30 million homes. We sell our power into competitive wholesale electricity markets, including PJM. We are not a regulated utility receiving a guaranteed return. Rather, we compete against other generators to sell wholesale power into markets where the purchasers are utilities and other suppliers who then deliver the power to their retail customers. So the economics of supply and demand are fundamental to our business.

About 95% of the electricity generated by Calpine's fleet is from natural gas-fired power plants. Overall, Calpine burns more than 10% of all natural gas consumed by the power industry, making us one of the largest consumers of natural gas in the U.S., and the largest among all power generators. Despite our size, Calpine's fleet is the cleanest among the major players in America's independent power generation sector.

In the PJM market, Calpine owns approximately 5,000 MW of generating capacity and virtually all our plants run on natural gas. Particularly relevant to today's discussion, nearly 90% of this capacity also has the capability to burn oil as a primary or back-up fuel, with onsite oil tanks. This dual fuel capability was specifically designed into the system to allow Calpine's assets to continue generating even under extreme conditions such as we witnessed this January.

My key message here today is that the competitive electric sector – in particular PJM, which covers much of the mid-Atlantic and the Midwest, and which I believe is most of the focus of this panel – is in solid shape to transition over the next several years from one supported by older, less efficient and more costly coal plants to one supported by newer, more efficient, less expensive and cleaner natural gas plants. At Calpine, we believe that competition yields the best results – that relying on entrepreneurialism and the free market creates more value than central planning or government picking winners and losers. There is significant new investment occurring in the mid-Atlantic power and gas markets – including our own brand new gas fired power plant under construction in Dover, Delaware. These investments are being made due to the game-changing discovery of shale natural gas, the existence of a competitive market with a set of rules, and a commitment by the stakeholders to seeing the market function. Although this market is not perfect, changes to address some of the issues are underway, and grid reliability is secure.

But before going deeper into the evolution of the mid-Atlantic grid over the next couple of years, let me first pause and discuss the recent extreme weather events and the lessons I think are important regarding how the grid is managed going forward.

<u>January Extreme Weather and Winter Preparedness:</u> Early in January, record winter load and several unit outages caused some risk of a reliability event in PJM – specifically on January 7. There has been much written and said about this event – but at its core, the issue was that more than 40,000 MWs of generation

was forced off-line when load was at its highest. On that day, PJM set an all-winter peak load record of 141,286 MW and, at the same time 22%, or 40,200 MW, of the generation fleet was unable to come online and produce power, a term the industry calls a "forced outage". The January 7th forced outage rate was two to three times higher than PJM's typical winter forced outage rate of seven to ten percent, and together with the very high load level, created tight system conditions.

The primary problem on January 7, and to a lesser degree later in the month, was that generators weren't ready for the extreme cold. *More than three quarters*, or 30,000 MW, of the forced outages were associated with equipment breakdowns, startup failures, and other problems related to operating in extremely cold temperatures. These problems occurred across all generation types with 9,000 MW of gas and more than 14,000 MW of coal being affected. This wasn't a fuel supply problem; it was a winter preparedness problem.

There is already evidence that the forced outage issue has been partly corrected due to competitive market forces: In each of the extreme cold weather events occurring subsequent to January 7th, generator forced outages were significantly lower and, as a result, there was more than 10,000 *additional* MW available to PJM to meet the needs of electricity consumers. There is more work to be done. An increased focus on cold weather preparedness will inevitably bring the forced outage rate down even further.

Indeed, in response to January's system conditions, PJM has begun to review its market and operational rules to improve performance of the system for next year. Some of the recommendations already emerging from PJM and stakeholder discussions include requiring resources to perform regular winter capability testing, improving communications, and enhancing emergency procedures.

In addition to mechanical and other failures leading to plant outages, there were 9,300 MW of outages because of gas curtailments – situations in which gas-fired generation did not have a firm contractual right

to the pipeline transportation nor did they have backup fuel like we have at most of our power plants in the PJM region. In response, PJM is undertaking important discussions on whether and how to define a "firm fuel requirement" for generators that commit to sell capacity to the grid. This means that in order to receive payment for providing capacity, generators must have mechanisms in place to guarantee fuel availability for a pre-specified period of time. Whether this concept is ultimately implemented through a "carrot" or a "stick" approach, Calpine believes all suppliers should have strong incentives to meet capacity supply obligations they've made to PJM, especially during times of system stress.[1]

Another key learning from January is the increasing need to tighten power and gas market coordination, especially in terms of daily operating decision-making. Although this lack of alignment did not create a reliability issue, it was responsible for price volatility and constrained how gas-fired generators could respond to changing system conditions. The Federal Energy Regulatory Commission (FERC) has opened a proceeding to address this issue. In a Notice of Proposed Rulemaking issued in March, FERC set a six month deadline for the natural gas and electric industries to better align their schedules. FERC also issued a "strawman" proposal that Calpine believes will result in meaningful improvements to this process. Other changes may be needed as well to better coordinate the electric and gas markets, such as changes to allow better coordination of gas deliveries over weekends and on Mondays.

Evolution of The Electricity and Gas Market Infrastructure**:** Let me turn now to the question of the electric supply mix going forward. As noted earlier, we are in an era of tremendous change within the electric power industry. Several older, less efficient and more costly coal plants are retiring, while newer, more efficient, cheaper, and cleaner gas-fired units are taking market share, supplemented by renewable units and increasing use of demand response.

[1] As noted earlier, nearly 90% Calpine's capacity in the PJM region has the capability to burn oil as a primary or back-up fuel, with onsite oil tanks.

Specifically in PJM, there are approximately 15,000 MW of expected retirements over the next three years. Most of this is coal-fired, and a smaller portion consists of older gas and oil-fired resources. This old, inefficient generation is being replaced by nearly 11,600 MW of new generation capacity, mostly natural gas fired, 4,230 MW of new imports from other markets adjacent to PJM, and a little more than 3,400 MW of new demand response and energy efficiency resources.

When we do the math, these subtractions and additions mean that by the summer of 2017 PJM expects to have significantly more generation capability than it needs. In industry terms, the summer reserve margin in PJM is expected to be 21.1%, or 5.5% higher than the target.[2] Further, Calpine estimates that the winter reserve margin will be even higher, in the 21% to 25% range, based on winter forced outages in the 7-10% range. In other words, even including forced outages, PJM will have plenty of supply relative to expected demand.

To be clear, despite this changing resource mix, coal is by no means going away. In fact, by 2017, we expect coal generation in PJM to represent approximately one-third of PJM capacity. This isn't a war on coal. It is a market-driven move towards newer, more efficient, cleaner generation.

Concurrent with the expansion of natural gas fired capacity, there is also a significant expansion of the pipeline infrastructure occurring in the Northeastern US. Information from the Energy Information Administration shows that approximately $2.8 billion is expected to be spent over the next two years on natural gas expansion projects, representing approximately 5.5 Billion cubic feet/day of new pipeline capacity in the Northeastern United States.[3] Calpine burns 2.1 -2.5 billion cubic feet/day, so this new pipeline capacity is large enough to serve more than two new companies the size of Calpine. Finally, we note that, overall, pipeline companies have announced approximately 25 projects scheduled to be in

[2] http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2016-2017-base-residual-auction-report.ashx
[3] http://www.eia.gov/todayinenergy/detail.cfm?id=10511#capacity

service over the next 3-4 years that will move approximately 15 Billion cubic feet/day from the Marcellus Shale region to markets east of the Rockies. While it is unlikely all of these projects will materialize, they represent total capital expenditures of $12-$18 billion, and could fuel more than 130,000 MW of gas-fired generation.

The Power Market: As I've described above, the market signals are broadly working to incentivize investment in new electric and gas market infrastructure. However, markets are not perfect and some level of ongoing optimization is required. The very good news is that many of the tweaks needed to remove market distortion and ensure efficient deployment of capital is well underway.

One issue policymakers must deal with sooner rather later is that non-market interventions, such as the wind Production Tax Credit (PTC), may be leading to premature retirements of certain baseload resources, potentially impacting the reliability of the future resource mix. The current structure of the PTC subsidizes wind resources in the energy market to the point where wind generators will pay others to take power that is otherwise unneeded, in order to maximize their benefit from the PTC. So, while the wind resources cannot generally be counted on to provide energy during extreme winter or peak summer conditions, the effect of the PTC is to take revenues from resources that can supply the market. The PTC interferes with market forces and is no longer necessary.

Yet another distortion to markets comes from demand response (DR), which is provided by customers that are paid to curtail their load when asked by PJM. DR competes against traditional supply side resources in PJM's capacity market to commit to providing reliability when needed by the system. As a result of a significant policy focus on growing this segment of electricity business, DR has become an increasingly large part of PJM's resource mix. This summer, DR will account for approximately 8% of PJM's peak resource needs, yet PJM can not call on the resource unless it is experiencing "emergency" conditions, nor is the vast majority of it required to be available to provide reliability during the winter.

PJM has recently proposed to FERC a package of DR rule changes that will address some of these issues, and we're hopeful FERC will approve them shortly. But, we think more needs to be done. To the extent DR is counted on for providing reliability to the system, it should be available year-round like other generators, and should be able to be called prior to PJM declaring a system emergency.

There are also other market changes in various phases of consideration at PJM and before FERC, including: changes to limit imports into the region from neighbors, changes to ensure capacity that is committed in an auction is actually built, and others.

In summary, there are three points I'd like to leave you with: First, the bulk power electric system in PJM – while undergoing a transition - is in great shape from a reliability stand point. PJM is well equipped to manage the transition. While its role may be diminished, coal will continue to play a critical role in meeting the region's reliability needs. But cheap American gas and its associated expanding infrastructure is poised to play a much larger role than before – not only in power generation but more broadly in our country's industrial efforts Second, the power market is working well – it is incenting new investment – and in the case of older, less efficient generation, it is sending the appropriate retirement signals. We do not think that regulatory or governmental interference in functioning markets can lead to better outcomes – we must continue to rely on the free market. While some changes in market rules over time will certainly be required, PJM and FERC have all the necessary tools to enact these. Finally, while the events of January in the mid-Atlantic were volatile, the system worked. There are, however, certainly some improvements necessary, as examples: the fuel availability and coordination issues that I discussed today. Again, PJM and FERC have the right processes and authority to put in place these and other changes.

Thank you again for the opportunity to testify on these important issues.