



Testimony of Cheryl L. Roberto
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Before the
United States Senate
Committee on Energy and Natural Resources
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“Keeping the lights on –
Are we doing enough to ensure the reliability and security
of the US electric grid?”

Madam Chairman and distinguished members of the Committee, I appreciate the opportunity to appear before you today. My name is Cheryl Roberto and I serve as the Associate Vice President, EDF Clean Energy Program for the Environmental Defense Fund (EDF).

EDF is not your typical environmental organization, and – as a former state regulator and electric system executive -- I likely do not fit your stereotype of an environmental activist. At EDF, we work to solve the most critical environmental problems using market-based solutions. We use a uniquely effective approach, drawing on science, economics, partnerships and ardent bipartisanship. We have a long history of working collaboratively with corporate partners, beginning in 1990 when EDF worked collaboratively with McDonalds to reduce the company's solid waste, including from those foam "clamshell" containers.

We recognize that technological innovations like horizontal drilling and hydraulic fracturing have enabled us to tap vast new reserves of natural gas in the U.S. This has been good for our economy, and it could be good for our environment – but only if we take action to address the very real risks to public health, the environment, and our climate that come along with increased gas production and use. In just the past few months, we worked closely with the administrations of Colorado Governor John Hickenlooper, Wyoming Governor Matt Mead, and Ohio Governor John Kasich as they formulated common-sense leak detection and repair requirements to reduce methane emissions from leaking valves, connectors and other equipment at oil and gas well sites.

I lead EDF's Clean Energy Program, a national effort in which we work with utilities, state regulatory commissions, legislatures, governors and other stakeholders in the nineⁱ states in which more than one half of US electricity is produced and consumed. Our goal is to reform utility regulation and market rules so that customers can choose clean-energy options with the same ease they currently access traditional sources of electricity. The policies we promote include: aligning market incentives for utilities and third-party entrepreneurs to reward investments in clean energy; ensuring that the

market values clean resources fairly; improving consumer access to data and information; advancing clean energy financing mechanisms that connect customers to private capital; and optimizing electric grid efficiency.

I am a former utility regulator and a former electric system operator. Prior to joining EDF last summer, I served as a commissioner on the Public Utilities Commission of Ohio, my home state and one long dependent upon coal-fired generation. As a member of the National Association of Regulatory Utility Commissioners (NARUC) I served as: vice chair of the Critical Infrastructure Committee and a member of the Electricity Committee, the board of directors for the National Regulatory Research Institute, and Task Force for Environmental Regulation and Generation. I was tapped by NARUC to co-chair the National Electricity Forum 2012, a national conference addressing cutting-edge issues and potential collaborations to successfully modernize the nation's electricity infrastructure. I served and continue to serve on the executive committee for a national network of more than 200 utilities, financial service companies, energy service companies, commissioners, and consumer advocates working toward the goal of achieving deployment of all cost-effective energy efficiency by 2020.

I have provided testimony before the Federal Energy Regulatory Commission's (FERC) Technical Conference on Reliability of the Bulk Power System, in anticipation of environmental rules for mercury and air toxics. The testimony that I prepared received the unanimous, bi-partisan support of my colleagues on the Ohio Public Utilities Commission. Prior to my appointment to the commission, I served for six years as the Deputy Director and then Director of the City of Columbus, Ohio Department of Public Utilities. My duties there included running the City's electric distribution utility. That hands-on experience meeting the daily needs of electricity customers while protecting the financial integrity of the system gave me a keen appreciation for the real-world demands of system reliability.

The clear message that I want to share with you today is that, with or without new environmental regulations, market-based changes -- including those that are reducing

the number of older, coal-fired power plants -- are transforming our electricity system but our electricity system can still meet our reliability needs. As a former regulator and system operator, no one puts a higher premium on the safety and reliability of our electric system than I do. While the fundamental nature of our electric grid is transforming irreversibly, I am confident that this transition can be accomplished without sacrificing either cost-effectiveness or safety and reliability. Our national commitment to reliability is non-negotiable, but we need to recognize that the electricity systems we built in the last century, and the regulations that govern them, are no longer adequate – either to ensure reliability, or to accommodate the rapid changes in technology, consumer needs, environmental standards, and the changing marketplace.

The nation’s electricity system stands at a transformative crossroads, which was not fully apparent just six or seven years ago. We have seen a massive and dynamic reduction in the price of natural gas as a result of developments in horizontal drilling and hydraulic fracturing of shale. By all appearances, abundant domestic natural gas will be our reality for the foreseeable future, making natural gas in many instances a cheaper alternative for electricity generation than coal. “Coal-fired power plants in the United States have been under significant economic pressure in recent years because of low natural gas prices and slow electricity growth demand,” according to the Energy Information Administration.ⁱⁱ Beyond the market-price advantage of natural gas, aging coal-fired generation plants built decades ago (75% of all coal-fired plants in the United States are more than thirty years old with a typical useful life of forty yearsⁱⁱⁱ) will require new investments to keep up with market changes, as well as to conform to evolving environmental rules.

It would be a mistake, however, to attribute the economic challenges faced by coal plant operators solely, or even largely, to environmental standards -- as a 2012 study performed for EDF makes clear: “The sharp decline in natural gas prices, the rising cost of coal, and reduced demand for electricity are all contributing factors in the decisions to retire some of the country’s oldest coal-fired generating units. These trends started well before EPA issued its new air pollution rules.”^{iv} Moreover, coal plant operators are not

alone in the challenges posed by America's abundant new gas supplies. Nuclear power faces economic challenges from the availability of natural gas.^v In short, we are seeing market-based changes in fuel choices for centralized electricity generation that have markedly shifted our energy landscape.

The change in fuel for large- or utility-scale electricity generation units, however, is not even the most significant part of the transformation. The very model of centralized, utility-scale generation itself is no longer sacrosanct. The costs of distributed generation technologies such as solar photovoltaics, battery storage, fuel cells, geothermal energy systems, wind, and micro turbines are falling with renewable options becoming available at a level equivalent near to where natural gas prices were just a few years ago. And Energy productivity is rising. In the last 40 years, the United States has experienced a 300% increase in economic output with less than a 50% increase in energy used to produce it.^{vi}

The U.S. Energy Information Administration (EIA) actually projects that average energy use per person will decline between 2011 and 2040.^{vii} In our digital world, consumers have demands for power quality and reliability that have not been adequately served from electricity cascading from centralized generation plants through miles of transmission and distribution lines. In fact, power outages due to severe weather impacting our distribution system (not our generation plants) cost between \$18 billion and \$33 billion *per year*. These figures do not include losses from major storms like Hurricane Ike or Sandy.^{viii} Falling natural gas prices reduce the operational costs of natural gas-fueled combined heat and power systems.

Customers are increasingly interested in how distributed generation, on its own or working in concert with the power from the grid, can meet their needs. Increased integration of intermittent renewable sources, such as wind, mean that distributed resources including demand response have added value to the operators of the centralized grid – also driving interest in investment and adoption of distributed resources. The Edison Electric Institute, the association representing all U.S. investor-owned electric companies published a report last year acknowledging and describing

this “disruptive challenge” to the model upon which our electric service has been based for the past century.^{ix} Not all utilities see this disruption as only a challenge --some utilities see this transformation as an opportunity: “Hardly expecting the nation's grid to collapse with the advent of more distributed generation, heads of three major U.S. utility companies see customer interest in generating their own power as a prime opportunity to focus on their wires business and new, potentially profitable customer service offerings.”^x

Our system is transforming from a one-way power delivery network in which customers passively receive electricity to a two-way flow of both power and information in which customers both receive and produce electricity. The utilities are becoming a platform for integration of the full range of energy services. The two-way system is animated by customers who are now receiving information about their usage (when and how much they use) and price signals indicating moment-by-moment the changed value of electricity. We see instances of distributed resource alternatives smoothly integrated into the grid with no preference given to the incumbent centralized generation. The proliferating diversity of options is providing opportunities to customers to hedge risk for both price and reliability (for example, customers may find that their electric vehicle may be plugged back into their home to provide power to ride out storm outages.)

Changes in the energy landscape across the nation are significant -- but not to be feared. My home state of Ohio is a prime example. Each of the electric utilities in Ohio purchases the electricity its customers require through auction, or it is on a pathway to do so. Ohio consumers in the Duke Energy and AEP territories are increasingly able to participate in a two-way relationship with their utilities through technology platforms enabled by smart meter installation. Duke Energy has installed 426,000 smart meters. AEP has installed 110,000^{xi} and recently filed plans^{xii} with the Public Utilities Commission to add 900,000 more. Consumers with this technology platform will progressively gain more options to choose how, when, and even if they will use electricity -- and from what source. Consumers served by Duke Energy and AEP are already enjoying briefer outages – greater reliability --- due to a more responsive distribution system informed by smart grid investments. Consumers are participating

in energy efficiency opportunities and enjoying savings at levels we have not seen before.

The transformation of the grid – both as a result of the fuel-switching by central generators and the growth of distributed generation – does not need to impact reliability negatively. All indications are that, in fact, transformation will enhance reliability.

A number of factors point to continued confidence in the resilience of our grid. The first of which is market response. The PJM regional transmission organization holds auctions (called Reliability Pricing Model Base Residual Auctions or RPM) looking ahead three years, in order to secure enough generation for reliable grid operations. For the past three years, these auctions have both confirmed impending coal-fired plant retirements and provided reason for confidence that alternate strategies will successfully meet reliability and affordability needs.

In the most recent 2016/2017 PJM RPM Auction, approximately 9,000 MW of coal-fired generation offered into the auction failed to clear it.^{xiii} Approximately 4,000 MW coal-fired generation failed to clear the previous auction.^{xiv} These trends, shown on the first chart below, illustrate that coal-fired plants are becoming less economically competitive as less expensive options squeeze them out, a trend continued during the past three years. These coal-fired plants were replaced by a combination of gas-fired generation, renewables, energy efficiency, and demand response. At the same time, the winning auction prices have decreased significantly, as shown by the second chart below. Of particular note, 23% more energy efficiency cleared the 2016/2017 auction as compared with the prior year.^{xv} Thus, a market response alone successfully replaced the coal-fired power at a cost-effective rate.

Fig. 3 – Offered and Cleared Quantities of Coal and Gas.

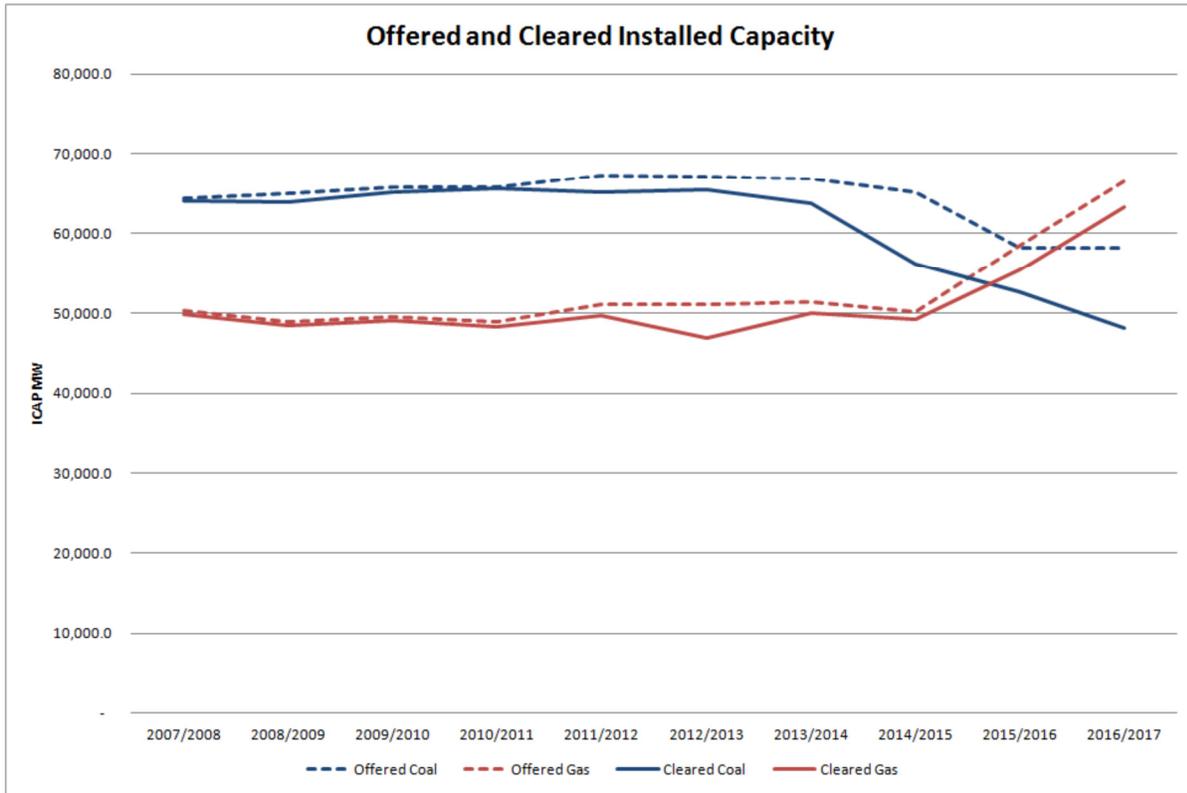
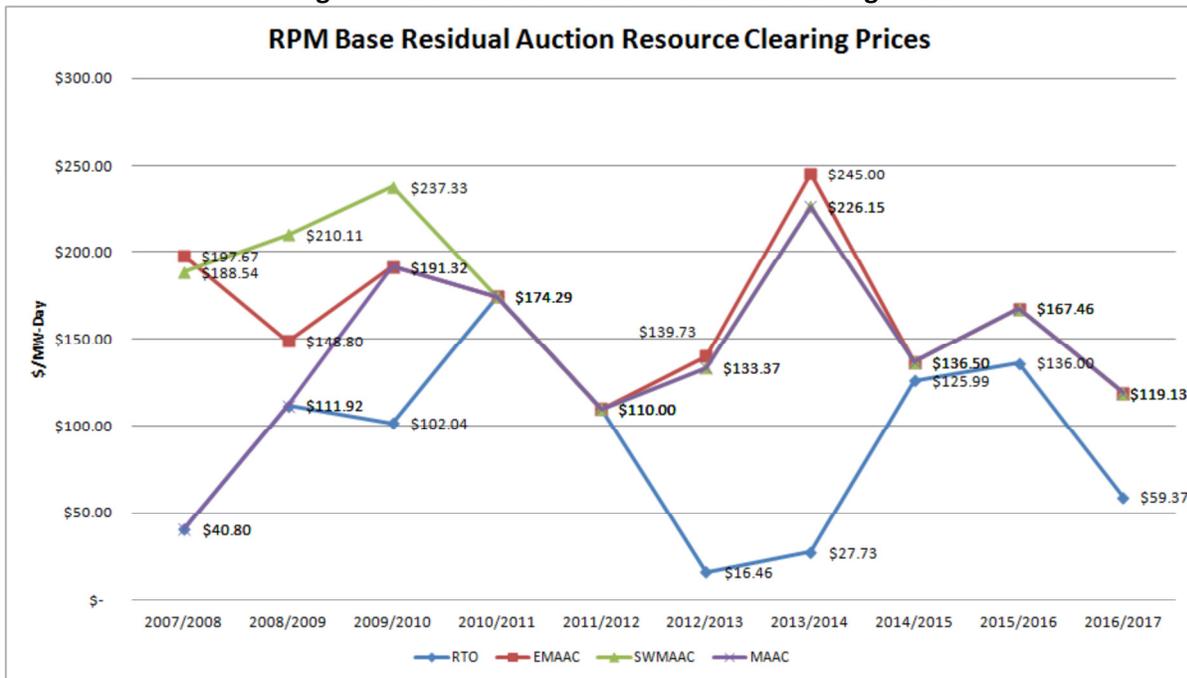


Fig. 2 – Base Residual Auction Resource Clearing Prices



The second reason for confidence that the grid will remain reliable during this on-going transition is that it has successfully managed each prior concern precipitated by environmental requirements. Most recently reliability concerns were raised when the Mercury and Air Toxics Standards were adopted as well as when the Cross-State Air Pollution Rule was adopted. Predictions by the U.S. Environmental Protection Agency^{xvi} and by the U.S. Department of Energy^{xvii} that reliability would not be impacted have proven accurate. Finally, during the most recent “polar vortex”, we saw the grid stressed by the combination of high demand and generation plant failures (including 13,700 MW of coal-fired plants which failed to perform)^{xviii} and yet it continued to perform well.

Centralized generation plants will persist in an important role within our nation’s energy system. Some of these plants may continue to be coal-fired. EDF supports a flexible compliance framework for existing coal-fired plants to meet anticipated greenhouse gas rules that will deploy the most cost-effective solutions available, which include harvesting the vast amounts of widely available cost-effective energy efficiency. In order to facilitate maximum use of this resource, last month EDF offered concrete suggestions to U.S. EPA regarding the opportunity to account for energy efficiency as an element of compliance.^{xix}

Utility operators are embracing energy efficiency as a solution as well. As reported earlier this week, AEP CEO Nick Akins has urged that energy efficiency and renewable energy additions should serve as a pathway to greenhouse gas standards compliance for existing coal-fired generation:

In order to not add fuel to the fire already begun by MATS [EPA’s mercury and air toxics rule] and low gas prices, ... EPA should acknowledge early action measures taken by utilities to reduce their greenhouse gas emission profiles such as renewable energy additions and energy efficiency measures. In taking this step, the agency will be enabling utilities to move funds from environmental compliance to wires investments aimed at boosting reliability^{xx}

We have every reason to believe that an energy system that seamlessly knits together centralized and distributed generation is possible and will meet our energy

needs more reliably and cost-effectively. For instance, we know from a National Renewable Energy Laboratory study that renewable electricity generation technology commercially available *today* could meet 80% of our electricity needs every hour of every day in every region of the country by 2050, if we adopted a more flexible electricity system and we made the investment.^{xxi} Energy efficiency remains the most cost-effective means to meet our energy needs. In a recent comprehensive analysis by Lawrence Berkeley National Lab, the average cost of energy efficiency over the past three years has been a mere 2.1 cents/kWh.^{xxii}

In order to realize the benefits of all of this transformation, we need to unleash the innovation we see in the states. From my perspective as a former regulator and system operator in the State of Ohio, I strongly support active state engagement in the design of compliance strategies. I do so because I know that it works. Reliability of the grid is best protected when state utility commissions and state air agencies are empowered with flexible standards to work on their own or regionally to meet these challenges.^{xxiii}

State utility regulators have long recognized and trusted that energy efficiency and load management are effective tools for cost-effectively managing reliability.^{xxiv} They are leading the way in Hawaii, Illinois, and Ohio to ensure that customers have access to information about their energy usage and options to pay for clean energy alternatives with private capital. In California and Texas, they are clearing away arcane rules to ensure that their energy needs are met by “just-in-time” service – only generating when the power is needed and sending price signals to provide options to customers to dial back their demand when electricity would be more costly.

Massachusetts is investigating what it takes to have the most nimble grid that it can. Minnesota has established protocols to value distributed solar installations in a manner both fair to the utilities and to the home owners. Meanwhile, New Jersey and New York are implementing the lessons learned from Superstorm Sandy, by promoting resilient microgrids using combined heat and power and renewable generation sources. All across the country, utility regulators, utilities, clean-tech companies, and advocacy

organization such as EDF, are engaged in nurturing and implementing ideas for utility business models to support a transformed grid.

There is no great disagreement that the U.S. energy system is transforming. With or without additional environmental regulations, this transition is occurring. Our history and experience have demonstrated that we can weather it without threatening our uniform and non-negotiable commitment to reliability. But to do that, we do need to recognize that this is about far more than the relative market advantages and disadvantages of various energy sources. It is about tapping all of the tools at our disposal to ensure a robust, reliable and integrated energy system that is no longer dependent exclusively upon centralized generation. It is about a fundamental transformation that is happening across the country, one that can deliver benefits to electricity consumers, the economy, the environment, generators, innovators, and workers alike.

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- ⁱ Texas, Pennsylvania, Ohio, North Carolina, New York, New Jersey, Illinois, Florida, and California.
- ⁱⁱ “AEO2014 projects more coal-fired power plant retirements by 2016 than have been scheduled,” Today in Energy (U.S. Energy Information Administration) <http://www.eia.gov/todayinenergy/detail.cfm?id=15031>
- ⁱⁱⁱ http://www.eia.gov/energy_in_brief/article/age_of_elec_gen.cfm
- ^{iv} Tierney, Susan F. “Why Coal Plants Retire: Power Market Fundamentals as of 2012” (Analysis Group, February 16 and 24, 2012) http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/2012_Tierney_WhyCoalPlantsRetire.pdf
- ^v See generally AEO2014 Early Release Overview http://www.eia.gov/forecasts/aeo/er/early_elecgen.cfm
- ^{vi} America’s Energy Resurgence: Sustaining Success, Confronting Challenges, Bipartisan Policy Center’s Strategic Energy Policy Initiative, February 2013, p. 6 (“Bipartisan Policy Center Report”) <http://tinyurl.com/crp7uxm>
- ^{vii} Annual Energy Outlook 2013, released April 15-May 2, 2013 http://www.eia.gov/forecasts/aeo/chapter_market_trends.cfm
- ^{viii} “Economic Benefits of Increasing Electric Grid Resilience to Weather Outages” (Executive Office of the President, August 2013) http://energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf
- ^{ix} Kind, Peter *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Energy Business* (EEI, January 2013). <http://www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf>
- ^x Cordner, Christine, “Utility CEOs see distributed generation as opportunity, not threat” (SNL April 7, 2014)
- ^{xi} <http://www.puco.ohio.gov/puco/index.cfm/consumer-information/consumer-topics/smart-grid-in-ohio/>
- ^{xii} Case No. 2013-24.
- ^{xiii} PJM, 2016/2017 RPM Base Residual Auction Results at p. 29, Fig. 3 – Offered and Cleared Quantities of Coal and Gas.
- ^{xiv} Id.
- ^{xv} Id.
- ^{xvi} “Resource Adequacy and Reliability in the IPM Projections for the MATS Rule” http://www.epa.gov/ttn/atw/utility/revised_resource_adequacy_tsd.pdf
- ^{xvii} “Resource Adequacy Implications of Forthcoming EPA Air Quality Regulations,” (U.S. DOE December 2011) http://energy.gov/sites/prod/files/2011%20Air%20Quality%20Regulations%20Report_120111.pdf
- ^{xviii} In re: Winter 2013-2014 Operations and Market Performance in RTO and ISO, Statement of Michael J. Kormos Executive Vice President – Operations PJM Interconnection, L.L.C. (FERC Docket No. AD14-8-000, April 1, 2014) <http://www.ferc.gov/CalendarFiles/20140401084122-Kormos,%20PJM.pdf>
- ^{xix} Hibbard, Paul J. and Andrea Okie, “Crediting Greenhouse Gas Emission Reductions from Energy Efficiency Investments: Recommended Framework for Proposed Guidance on Quantifying Energy Savings and Emission Reductions in Section 111(d) State Plans Implementing the Carbon Pollution Standards for Existing Power Plants” (Analysis Group March 2014) <http://www.edf.org/sites/default/files/eemv-111d-recommended-framework.pdf>
- ^{xx} Cordner, Christine, “AEP CEO: Polar vortex should be a ‘red flag’ for EPA as it crafts greenhouse gas standards” (SNL, April 7, 2014)
- ^{xxi} National Renewable Energy Laboratory. (2012). Renewable Electricity Futures Study. Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory. http://www.nrel.gov/analysis/re_futures/
- ^{xxii} Ernest Orlando Lawrence Berkeley National Laboratory. (March 2014) The Program Administrator Cost of Saved Energy for Utility Customer-Funded Energy Efficiency Programs. Billingsley, M.A.; Hoffman, I.M.; Stuart, E.; Schiller, S.R.; Goldman, C.A.; LaCommare, K. <http://emp.lbl.gov/sites/all/files/cost-of-saved-energy-for-ee-programs.pdf>
- ^{xxiii} See Comments Submitted on Behalf of The PUCO by Cheryl Roberto, Commissioner to the FERC Reliability Technical Conference November 30, 2011 (Docket No. AD12-1-00) <http://www.ferc.gov/CalendarFiles/20111208072456-Roberto,%20PUCO.pdf>

^{xxiv} See NARUC resolution, “Energy efficiency and load management as cost-effective approach to reliability concerns” (July 23, 1999 concerns)
<http://www.naruc.org/Resolutions/Resolution%20Supporting%20Energy%20Efficiency%20and%20Load.pdf>