UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

Certification of New Interstate Natural Gas Facilities Docket No. PL18-1-000

COMMENTS OF

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I appreciate the opportunity to submit comments in response to the Federal Energy Regulatory Commission's ("Commission" or "FERC") Notice of Inquiry ("NOI")[1] to evaluate its 1999 Natural Gas Policy Statement.[2] I, like many others, applaud the Commission's timely and important decision to take a fresh look at how the agency reviews proposals to certificate new interstate natural gas facilities.

I. INTRODUCTION AND BACKGROUND

As background, I am a Senior Advisor at Analysis Group Inc., where I provide policy, economic and strategy consulting in the electric and gas industries. I have worked for many

[1] Notice of Inquiry, *Certification of New Interstate Natural Gas Pipeline Facilities*, 163 FERC ¶ 61,042 (2018), Docket No. PL18-1-000 (hereinafter "NOI").

[2] Statement of Policy, *Certification of New Interstate Natural Gas Pipeline Facilities*, Docket No. PL99-3-000; 88 FERC ¶ 61,227 (September 15, 1999), Order Clarifying Statement of Policy, Docket No. PL99-3-001, 90 FERC ¶ 61,128 (February 9, 2000), Order Further Clarifying Statement of Policy, Docket No. PL99-3-002, 92 FERC ¶ 61,094 (July 28, 2000) (hereafter "Policy Statement").

decades on issues relevant to the matters being considered by the Commission in this proceeding. Among other things, my work has involved: regulation of public utilities and other entities in the electric and gas industries; the siting of energy infrastructure; ratemaking and performance of energy-delivery systems; wholesale energy markets; and environmental analysis and policy design related to the power generation and other sectors.[3]

In November of 2017, I wrote a white paper, "Natural Gas Pipeline Certification: Policy Considerations for a Changing Industry."[4] In it, I concluded that many changes have occurred

[3] My formal CV is attached to these comments as Attachment-SFT-1. For approximately 35 years, I have been involved in issues related to regulation of public utilities in the electric and gas industries, and with respect to energy and environmental economics. During this period, I have worked as a utility regulator, an energy/environmental policymaker, a consultant, an academic, and an expert witness. I have been a consultant and advisor to investor- and publicly owned energy companies, grid operators, government agencies, large and small energy consumers, environmental organizations, foundations, Indian tribes, and other organizations. Before becoming a consultant, I held several senior policy positions in state and federal government, having been appointed by elected executives of both political parties: I served as the Assistant Secretary for Policy at the U.S. Department of Energy, and held senior positions in the Massachusetts state government as Secretary of Environmental Affairs, Commissioner of the Department of Public Utilities, and Executive Director of the Energy Facilities Siting Council. I have testified before state regulatory agencies and legislatures, and before Congress, FERC, and state and federal courts. I have written extensively on issues in the electric and gas industries. My Ph.D. in regional planning is from Cornell University. I previously taught at the University of California at Irvine, and at the Massachusetts Institute of Technology. I am a Visiting Fellow in Policy Practice at the University of Chicago's Energy Policy Institute and a member of the advisory councils of the New York University Law School's Institute for Policy Integrity and Duke University's Nicholas Institute for Environmental Policy Solutions. I currently serve as: chair of the External Advisory Council of the National Renewable Energy Laboratory; chair of ClimateWorks Foundation; and a director of World Resources Institute, the Energy Foundation, Resources for the Future, and the Keystone Center. I recently chaired the U.S. Department of Energy's Electricity Advisory Council and was a member of the National Academy of Sciences, Engineering and Medicine's committee on resiliency of the U.S. electric system. I was co-lead convening author of the Energy Supply and Use chapter of the National Climate Assessment, facilitated NAESB's discussions and processes to harmonize practices in the electric and gas industries, and served on the Secretary of Energy's Advisory Board (including its shale-gas subcommittee).

[4] I have attached this report to these my comments as Attachment-SFT-2. In these comments, I refer to this report as "Tierney White Paper." That paper was sponsored by the Natural Resources Defense Council, as are these comments.

in the gas industry in the two decades since the Commission issued its Policy Statement in 1999. I urged the Commission to take another look at its policy guidance to determine what revisions might now be needed.

I was pleased when the then-new Chairman McIntyre announced on December 17, 2017, that the changes in the industry did warrant a reassessment of how the agency was reviewing new gas facility proposals.[5] (This was a position previously supported by Commissioner LaFleur.[6]) And I was further heartened when the Commission issued its NOI in April 2018.

In the NOI, the Commission identified four general issues to explore: (1) its reliance on precedent agreements to demonstrate need for a proposed project; (2) the potential exercise of eminent domain and landowner interests; (3) the Commission's evaluation of alternatives and environmental impacts under the National Environmental Policy Act ("NEPA") and the Natural Gas Act ("NGA"); and (4) the efficiency and effectiveness of the Commission's certification processes.

I focus my comments on the Commission's first topic: potential adjustments to the Commission's determination of need. This issue is core to the agency's determination of whether a proposed project is in the public interest and therefore needed for the "public convenience and necessity." I will directly or indirectly address the Commission's Questions

[5] FERC News Release, "FERC to Review its 1999 Pipeline Policy Statement," December 21, 2017.

[6] *See* Commissioner LaFleur's dissents in: *Atlantic Coast Pipeline* (Docket No. CP15-554-000), October 13, 2017; and *Mountain Valley Pipeline, LLC and Equitrans, L.P.* (Docket Nos. CP16-10-000 and CP16-13-000), October 13, 2017)

A1 through A10. Additionally, some of my comments on need issues are also relevant to Questions B1, B3, B4, C2-C7, and D1.

In preparing these comments, I have relied on my direct experience as a state utility regulator, a senior federal energy policy official, a state cabinet officer for environmental affairs, as well as the head of a state agency charged with considering whether to approve the siting of proposed energy facilities. I also have relied upon my decades of experience as an observer and analyst of energy markets and policy, and of the economic and environmental consequences of energy infrastructure regulation, investment and use in the United States.

II. SUMMARY: THE COMMISSION SHOULD REVISE ITS POLICY STATEMENT AND ADMINISTER IT LOYALLY IN THE FUTURE

Much of what was said explicitly in the Policy Statement (especially regarding Need Determinations[7]) is still appropriate. But important changes are appropriate, both in a revised statement as well as in practice. I respectfully recommend that the Commission largely retain the Policy Statement, as long as there are specific changes and updates as explained further below. And I also encourage the Commission to follow this newly revised policy loyally so as to support decisions in the public interest. (*Commission Question A1*).

I offer the following recommendations, summarized here and explained further below.

[7] In these comments, I am capitalizing certain terms (e.g., Need Determination; Need Analysis; All Relevant Factors; Relevant Interests) to highlight certain approaches, methodologies, and findings that are part of the Commission's formal Section 7(c) reviews of facility applications. Additionally, my use of the phrase "Need Determination" is short form for FERC's determination that a project is required by the public convenience and necessity, and my use of the phrase "Need Analysis" is short form for the analysis that FERC conducts to make the Need Determination.

- Recommendation #1: Need Determination as the Threshold Question. The Commission should treat the Need Determination as the core threshold question in the agency's reviews of facility proposals, rather than the question of whether existing customers would subsidize the project. (*Commission Question A1*)

- Recommendation #2: Comprehensive Need Analysis and Net-Benefits Assessment. The Commission should apply a more systematic and comprehensive Need Analysis in reviews of facility applications, with a burden on each applicant to demonstrate net benefits to support a finding that the proposed project is needed. There are several components to this recommendation #2: First, benefits must outweigh costs. Second, the Need Analysis should presume that each proposed facility will have some adverse impacts and require a demonstration of net benefits. Third, the benefit/cost framework that the Commission should use in its Need Analysis does not need to be formulaic with all impacts expressed in a common unit of measure (e.g., dollars). Fourth, the applicant should have the burden to present a comprehensive analysis of benefits and costs. Fifth, the Commission should explicitly conduct its Need Analysis in a way that acknowledges that an economic analysis also includes consideration of externalities (or impacts), whether the latter can be fully monetized or not. Sixth, FERC's Need Analysis should not rely on the "proportional adverse effects" approach in its reviews, and instead should replace it with a more systematic requirement that each applicant identifies the array of benefits and array of adverse effects. (*Commission Questions A1, A2, A3*)

- Recommendation #3: Implement an "All Relevant Factors" Approach. The Commission should implement the All Relevant Factors approach in practice. Although this approach was supported in the Policy Statement, the Commission's reviews in practice have diverged from implementing the All Relevant Factors model for determining need. (*Commission Question A1*)

- Recommendation #4: Broaden Scope of "Relevant Interests." With respect to its Need Analysis, the Commission should expand its examination of Relevant Interests in a revised statement of policy, and in practice, so that it goes beyond the three sets of core interests (i.e., existing customers of the pipeline; competing pipelines and their customers; and affected landowners/communities) described in the Policy Statement. Given the public interest standard, the definition should include much more explicitly a broader set of interests in considering potential adverse economic impacts on assorted parties. Although the current Policy Statement views potential beneficiaries of a proposed project in quite broad terms, the Policy Statement's approach (and FERC's implementation of it) focuses on identifying and assessing adverse impacts on a narrow set of Relevant Interests. This is out of balance. (*Commission Questions A1, C6*)

- Recommendation #5: Minimize Reliance on Precedent Agreements. The Commission should modify its reliance on precedent agreements as sufficient demonstration of need. In instances where there are no affiliate relationships among the counterparties, a precedent agreement may be helpful to inform a Need Demonstration, but it is not sufficient to show that the project is consistent with the public interest. Where there are

affiliate arrangements, the precedent agreement may be presented, but should be afforded little weight without a demonstration of and/or inquiry by FERC into whether the precedent agreement reflects the exercise of vertical market power. (*Commission Questions A3, A4, A5*)

- Recommendation #6: Include Regional Considerations. The Commission should introduce into the Need Analysis an examination of many regional considerations associated with whether a new project is needed. Examples of such regional considerations are: the existence and utilization of other pipelines in the region; broad regional market trends; and state energy and environmental policies in the affected region. This review should rely on quantitative metrics where reasonably available (including but not limited to monetized benefits and monetized costs), as well as on qualitative/non-monetary analyses. (*Commission Questions A9, A10, C2, C6, C7*)

- Recommendation #7: Consider Both Positive and Negative Impacts of the Use of Natural Gas. The Commission should incorporate into the Need Analysis a review of the beneficial and adverse impacts associated with use of natural gas, as the current Policy Statement invites. Other federal reviews of infrastructure projects (such as road or bridge projects) include, for example, the air-pollution implications of use of the road or bridge, rather than just the emissions associated with siting and constructing the project. FERC could incorporate information from the NEPA reviews of gas-facility projects, along with other information, to incorporate such information into the Need Analysis and Need Determination. This could be done on a reasonableness basis, using

the best information available during the development of the record on which the Commission makes its decision. (*Commission Questions A6, A7, A8, C4*)

- Recommendation #8: Give Great Weight to Adverse Impacts Where Eminent Domain Will Be Sought. The Commission should give great weight to adverse impacts on land owners and local communities in the Need Determination where the applicant seeks to exercise eminent domain procedures. Even though the Commission's issuance of a certificate does not itself empower a pipeline company to condemn private property, it is what enables a pipeline company to make the case to a court that such a taking of private property is in the public convenience and necessary. Such a Need Determination should be significantly informed and influenced by the disproportionate adverse impacts borne by landowners and neighbors of a facility proposed primarily for the benefit of others. (*Commission Questions A2, B1, B3, B4*)

In the rest of my comments, I provide my views about the economic and policy rationales for how the Commission should implement its authority and responsibility to review new interstate natural-gas facility proposals. These rationales serve as the basis for my recommendations about revisions that are needed in the Policy Statement (and its implementation) to make it consistent with a robust and strong public-interest standard.

I respectfully encourage the Commission to consider and adopt my recommendations as consistent with the public interest.

III. THE POLICY STATEMENT SHOULD BE MODIFIED WITH RESPECT TO THE NEED DETERMINATION IN REVIEWS OF NEW PROJECTS

My review of FERC's approvals of pipeline applications leads me to offer several recommendations for ways that the Commission should modify the Policy Statement and then implement that revised policy in the future. Here are my recommendations, along with my reasoning in offering them to the Commission for its consideration.

Recommendation #1: Need Determination as the Threshold Question (*Question A1*[8])

The Commission should treat the Need Determination as the fundamental threshold issue in agency reviews to determine whether approval of a new natural gas facility is in the public interest under Section 7(c) of the NGA. This would be a departure from the current practice of administering a threshold question of whether existing customers would subsidize the project.

In my view, the public-interest standard is the North Star to guide the kinds of revisions that are needed in the Policy Statement and agency processes going forward. The Commission's review of gas facility projects is grounded in the provision of the NGA "that the business of transporting and selling natural gas for ultimate distribution to the public is affected with a public interest, and that Federal regulation in matters relating to the transportation of natural gas and the sale thereof in interstate and foreign commerce is necessary in the public

[8] Commission Question A1: Should the Commission consider changes in how it determines whether there is a public need for a proposed project?

interest[.]"[9] This "public interest" foundation is core to how the Commission should determine whether a specific facility proposal satisfies the public convenience and necessity.

As the NOI acknowledges, the "public convenience and necessity standard encompasses all factors bearing on the public interest."[10] The NOI further highlights the U.S. Supreme Court's statement that: "in order to give content and meaning to the words 'public interest' as used in the [Federal] Power and [Natural] Gas Acts, it is necessary to look to the purposes for which the Acts were adopted. In the case of the Power and Gas Acts it is clear that the principal purpose of those Acts was to encourage the orderly development of plentiful supplies of electricity and natural gas at reasonable prices."[11]

That finding – to encourage the *orderly* development of plentiful supplies of electricity and natural gas at *reasonable* prices – signifies that the intention of the NGA is not to promote a plentiful supply of natural gas at any cost or in any manner, but to do so in an orderly and reasonable way.

Long-standing principles of utility regulation in support of the public interest have a deep and broad foundation in economics, which, as FERC has recently stated, is the bedrock of its own reviews of gas facilities.[12] As explained in the seminal text on utility regulation (Bonbright *et al.*):

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[9] 15 U.S.C. § 717(a).

[10] NOI, page 5.

[11] *NAACP v. Federal Power Commission*, 425 U.S. 662, 669-70 (1976).

[12] "If the proposed project will not have any adverse effect on the existing customers of the expanding pipeline, existing pipelines in the market and their captive customers, or the economic interests of

> The goals or rationales of regulation in the public interest may be economic (to correct market failures)…. The traditional public interest view of regulation is to protect consumers against high or discriminating prices or unreliable service…. [M]ost existing regulatory programs are based upon several different rationales…: (1) natural monopoly; (2) prevention of undue price discrimination; (3) externalities; (4) conservation of resources: (5) informational disparities; (6) destructive, ruinous, or cutthroat competition; and (7) other justifications.[13]

The Commission's bread-and-butter regulation of utilities focuses squarely on issues relating to the first two rationales. But they are not the only economic rationales that an economic regulator should use to guide its decisions. As explained further in Bonbright *et al.*, the third economic rationale is also critically important:

> the "market failure" rationale for regulation involves the presence of external economies and diseconomies, or external benefits and costs. An externality or spillover occurs when there is a benefit or cost enjoyed by or imposed on other members of society by the activities of a producer or consumer that are not enjoyed or borne exclusively by the direct causer.[14]

The NGA and the Policy Statement recognize the importance of addressing externalities in Certificate reviews, because the actions of the applicant and the consumer of its services are not the only interests affected by an approval of new facilities to provide gas-transportation services. Other people are affected by the private decisions of pipeline service providers and shippers. Taking these external effects of pipeline projects into account is fundamentally

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landowners and communities affected by the route of the new pipeline, then no balancing of benefits against adverse effects would be necessary….If residual adverse effects on the three interests are identified, after efforts have been made to minimize them, then the Commission will proceed to evaluate the project by balancing the evidence of public benefits to be achieved against the residual adverse effects. *This is essentially an economic test*." Policy Statement, pages 18-19 (emphasis added).

[13] James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates*, Second Edition, Public Utility Reports, 1988 (hereafter referred to as "Bonbright *et al.*"), page 33.

[14] Bonbright *et al.*, page 37.

consistent with sound economic regulation. And as explained further below, the public interest standard should take into consideration the external effects of pipeline construction and operations on a broad set of public constituencies, not just on the economic interests of "existing customers of the expanding pipeline, existing pipelines in the market and their captive customers, or the economic interests of landowners and communities affected by the route of the new pipeline."[15]

Two more of Bonbright *et al.*'s economic rationales for utility regulation – conservation of resources and informational disparities – are also relevant to how the Commission, as an economic regulator, should review facility applications. First, the NGA's purpose of assuring the *orderly* development of facilities exhibits an inherent respect for the conservation of scarce resources. This is an economic concept, with the NGA giving the Commission the responsibility to conserve scarce resources where the market cannot be relied upon to allocate them efficiently and fairly. Second, the Commission's procedural rules that are intended to provide multiple opportunities for public participation reflect the fact that there are informational shortcomings in the market; as such, many parties that are potentially affected by the development of facilities and the use of their services often, if not usually, lack the technical expertise or access to information that would enable them to recognize health or other hazards associated with such infrastructure. This economic rationale for regulation supports a view that the Commission has the responsibility to stand in to protect affected parties as the agency

[15] Policy Statement, pages 18-19.

administers its public-interest responsibilities, and to do so through as fulsome a record as necessary to assure this protection.

These multiple economic rationales for the Commission's regulation of the entry of proposed new gas-delivery facilities guide the framework that FERC should use in determining whether a project proposal is in the public interest. As such, the question of whether a new facility is needed is the core of this review.

To symbolize and highlight the importance of the Need Determination as the threshold question that FERC must answer, the Policy Statement should be revised so that the threshold question is no longer whether the new project would be subsidized by existing customers. If the Commission's policy is that it will only approve proposals where they are not subsidized by existing customers, then FERC should make this a requirement, rather than the "threshold question." Or, if the Commission would conceivably tolerate proposals where subsidies might arise, then the Commission should include such anticipated subsidies as part of identifying "adverse impacts on existing customers" and then weigh it along with other positive and negative aspects of the proposed project as part of the benefit/cost analysis, as discussed further below.

Recommendation #2: Comprehensive Need Analysis and Net-Benefits Assessment *(Questions A1, A2*[16]*, A3*[17]*)*

The Commission should apply a more systematic and comprehensive Need Analysis in the agency's reviews of natural gas facility applications, with a burden on each applicant to demonstrate net benefits in order to support a finding that the proposed project is needed.

As the Policy Statement itself recognizes,[18] the Need Analysis should include a diverse set of potentially beneficial and adverse factors. Such factors might include some of the types of impacts mentioned in the Policy Statement, along with others. For example, such factors might include:

- consumer cost impacts, on existing customers or new customers of the pipeline;
- the costs of pipeline expansion relative to alternatives;

[16] Commission Question A2: In determining whether there is a public need for a proposed project, what benefits should the Commission consider? For example, should the Commission examine whether the proposed project meets market demand, enhances resilience or reliability, promotes competition among natural gas companies, or enhances the functioning of gas markets?

[17] Commission Question A3: Currently, the Commission considers precedent agreements, whereby entities intending to be shippers on the contemplated pipeline commit contractually to such shipments, to be strong evidence that there is a public need for a proposed project. If the Commission were to look beyond precedent agreements, what types of additional or alternative evidence should the Commission examine to determine project need? What would such evidence provide that cannot be determined with precedent agreements alone? How should the Commission assess such evidence? Is there any heightened litigation risk or other risk that could result from any broadening of the scope of evidence the Commission considers during a certificate proceeding? If so, how should the Commission safeguard against or otherwise address such risks?

[18] "The public benefits may include such factors as the environmental advantages of gas over other fuels, lower fuel costs, access to new supply sources or the connection of new supply to the interstate grid, the elimination of pipeline facility constraints, better service from access to competitive transportation options, and the need for an adequate pipeline infrastructure." Policy Statement, page 16.

- impacts on the reliability of natural gas supply to end-use customers;
- impacts on air emissions (both positive or negative, with respect to different air pollutants) associated with transporting and consuming the gas delivered by the pipeline;
- the alignment of the proposal with states' policies relative to use of fossil fuels and greenhouse-gas ("GHG") emissions over the long term; and
- the implications for firm gas delivery and use for electric-system reliability.

Notably, the Commission's reviews of the positive and negative environmental impacts of a proposed facility occur in two contexts: (1) in the agency's review of the project under NEPA[19]; and (2) in the Commission's Need Determination on specific project proposals under Section 7(c) of the NGA. In the latter context, the Commission has stated that under "the NGA, the Commission will take into account all information in the record from the applicant, parties to the proceeding, commenters, and the environmental document to determine whether a proposed project is required by the public convenience and necessity."[20]

That may well be true, but it is not the same as whether FERC's Need Determinations under the Section 7(c) of the NGA have been relying on records that fully ensure that there is a comprehensive assessment of potential benefits and costs to a broad range of constituencies and systems. As I said in my recent report on Section 7(c) reviews since 1999:

[19] NEPA, 42 U.S.C. §4321 et seq.

[20] NOI, page 6.

> Even while approving virtually all applications, FERC's certification reviews have grown more substantial and complex over time, in part as a result of active participation by stakeholders in the application proceedings. These decisions have added detail to the agency's application of the Policy Statement principles. In nearly all cases, however, FERC's approvals of pipeline proposals have generally found that the following conditions have been met: (1) the project is financially supported by other than existing customers; (2) the project is needed, as demonstrated by contracts and/or precedent agreements indicating a prospective customer base; (3) the project will not adversely interfere with existing pipeline routes, customers, or markets; and/or (4) the project has taken steps to minimize identified adverse impacts on landowners and communities.[21]

The Policy Statement concluded that one of its intentions was to avoid unnecessary rights-of-way and the potential for overbuilding.[22] Yet since 1999, the Commission has approved over 400 pipeline applications, adding more than 180 billion cubic feet per day (Bcf/d) of pipeline capacity, while denying only two applications.[23] This amount of additional capacity on the interstate pipeline system is significant, considering that the average consumption of natural gas in the U.S. during January 2017 was 93.1 Bcf/d, and the all-time peak-day consumption was 137 Bcf/d during the 2014 Polar Vortex.[24]

In pointing out this petition-approval record, I am not asserting that any particular project was not, in fact, needed. Rather, I am raising concerns about whether the Need

[21] Tierney White Paper, page 12.

[22] Policy Statement, page 29.

[23] Tierney White Paper, pages 1, 2 and 12. In 2011, FERC denied the application of the Turtle Bayou Gas Storage Company to construct and operate a natural gas storage facility in Texas (135 FERC ¶ 61,233 (2011)), and in 2016, FERC denied the application of Jordan Cove Energy Project to site, construct, and operate a liquefied natural gas (LNG) export terminal and associated facilities in Oregon along with the application of the Pacific Connector Gas Pipeline to connect the Jordan Cove LNG facility with the interstate pipeline system (154 FERC ¶ 61,190 (2016)).

[24] Tierney White Paper, pages 1 and 2.

Determinations in every one of those cases was grounded on a fulsome record of benefits relative to costs. A broader review of need (beyond precedent agreements) is important to provide the Commission with a more balanced and thorough record of benefits and costs so that the Commission can determine whether a project is in the *public* interest – its duty under the NGA.

Further, in contrast to the Policy Statement's guidance that the Commission's Need Determination may include any public benefits associated with *delivery*[25] and *use* of natural gas (e.g., advancing clean air objectives,[26] which can only occur as a result of *using* the delivered gas), as recently as March 2018, the Commission stated that "the Commission's authority under section 7 of the NGA has no direct connection to the production or end use of natural gas."[27]

The Policy Statement expressed the Commission's position (as of 1999) that

> [a]n effective certificate policy should further the goals and objectives of the Commission's natural gas regulatory policies. In particular, it should be

[25] Recent research has focused on the emissions associated with natural gas production and delivery. For example with respect to emissions of methane (a potent GHG): "Methane emissions from the U.S. oil and natural gas supply chain were estimated using ground-based, facility-scale measurements and validated with aircraft observations in areas accounting for ~30% of U.S. gas production. When scaled up nationally, our facility-based estimate of 2015 supply chain emissions is 13 ± 2 Tg/y, equivalent to 2.3% of gross U.S. gas production. This value is ~60% higher than the U.S. EPA inventory estimate, likely because existing inventory methods miss emissions released during abnormal operating conditions. Methane emissions of this magnitude, per unit of natural gas consumed, produce radiative forcing over a 20-year time horizon comparable to the CO2 from natural gas combustion. Significant emission reductions are feasible through rapid detection of the root causes of high emissions and deployment of less failure-prone systems." Alvarez et al., "Assessment of methane emissions from the U.S. oil and gas supply chain," *Science*, June 21, 2018.

[26] "The public benefits may include such factors as the environmental advantages of gas over other fuels[.]" Policy Statement, page 16.

[27] *See*, *Florida Southeast Connection, LLC*, 163 FERC ¶ 61,158, at 8-9 (2018) (hereafter referred to as the "Sabal Trail Order"), page 7.

> designed to foster competitive markets, protect captive customers, and avoid unnecessary environmental and community impacts while serving increasing demands for natural gas. It should also provide appropriate incentives for the optimal level of construction and efficient customer choices…. [Further, the Commission intended] to provide an analytical framework for deciding, consistent with the goals and objectives stated above, when a proposed project is required by the public convenience and necessity.[28]

Those goals – serving demands for natural gas, fostering competitive markets, protecting captive customers, avoiding unnecessary environmental and community impacts – remain sound objectives for the Commission's Section 7(c) certification approach going forward. But the Commission's current practice in implementing its Policy Statement does not afford the Commission with the benefit of a full record on which it can assess whether a proposed facility has net benefits relative to costs from the *public*'s perspective, and whether approval of a proposed facility indeed avoids "unnecessary environmental and community impacts" and provides "appropriate incentives for the optimal level of construction."[29]

There are several components to this recommendation #2, described below. This recommendation, in conjunction with the others, would lead to more robust records for decision on pipeline applications. (I have provided an example in Attachment-SFT-3 of the types of filing requirements and other information that might be brought to bear in a more systematic and comprehensive Need Analysis, based on this and my other recommendations.)

[28] Policy Statement, page 13.

[29] For example, the Policy Statement's current methodology calls for: (a) examining adverse impacts on a limited set of "Relevant Interests" and then (b) determining whether the alleged benefits are proportional to those impacts. This does not satisfy the Policy Statement's stated goal of providing "analytical framework for deciding, consistent with the goals and objectives stated above, when a proposed project is required by the public convenience and necessity."

- *First, benefits must outweigh costs*. The showing of need is in essence a benefit/cost framework, where the benefits need to exceed the costs. This is not exactly the same as a "balancing" approach as suggested in the Policy Statement, because it would require a finding of net benefits, and not merely that the benefits are balanced with the costs or that benefits are proportional to adverse impacts.[30] The Policy Statement is now inconsistent in that in some instances, it points to the need for benefits to outweigh adverse impacts,[31] and in some instances, it calls for a balancing of positive and negative impacts.[32] The Commission's policy should be consistent on this point: The benefits of a proposed project should exceed costs; if not, the project does not receive the Commission's approval.

- *Second, the Need Analysis should presume that each proposed facility will have some adverse impacts and require a demonstration of net benefits*. Experience with certification of natural gas facilities over the past two decades has made it clear that virtually every project imposes adverse impacts of one form or another, whether upon the Relevant Interests or other constituencies affected by the project's construction and operations. Impacts include tensions with potentially incompatible land uses vis-à-vis pipeline rights of way and/or exclusion zones associated with LNG facilities, or impacts of air emissions from

[30] Policy Statement, pages 14, 18-19, and 27-28 with respect to "balancing," and on pages 25-27 on "proportional" benefits relative to adverse impacts.

[31] Policy Statement, pages 19, 23, 25-28 (see for example, "In sum, the Commission will approve an application for a certificate only if the public benefits from the project outweigh any adverse effects.")

[32] Policy Statement, pages 14, 18–19, and 27-28.

storage facilities or pipelines. The fact that adverse impacts will presumptively occur represents a stronger position than is currently in the Policy Statement, which states that "[o]f course, elimination of all adverse effects will not be possible in every instance."[33] A revised policy statement should say that it is presumed that there will be negative impacts, and there should be incentives to minimize them. One incentive is the need to demonstrate that benefits exceed costs and to do so based on a comprehensive record.

- *Third, the benefit/cost framework that the Commission should use in its Need Analysis does not need to be formulaic with all impacts expressed in a common unit of measure* (e.g., dollars). It can include both quantitative metrics as well as qualitative ones, leaving it to the Commission to apply judgment in determining whether benefits exceed costs. The appropriate benefit/cost framework should require: (a) a demonstration of benefits in various forms;[34] (b) an identification and assessment of costs;[35] and (c) a finding that benefits exceed costs (adverse impacts), so that the project will lead to net positive benefits. Thus, a project whose benefits were equal to costs would not proceed.

- *Fourth, the applicant should have the burden to present a comprehensive analysis of benefits and costs*. The analysis should not be limited to the impacts on Relevant Interests and should have a broad definition of types of benefits and burdens associated with construction

[33] Policy Statement, page 23.

[34] Benefits should include those associated with the construction and operation of the facility and the use of the gas it delivers.

[35] Costs should include adverse impacts on Relevant Interests, as well as to other parties and members of the public who are affected by negative externalities associated with the project.

and operation of the facility. (See further recommendations on this point, below.) As the court stated in remanding the Sabal Trail decision back to FERC: "when an agency thinks the good consequences of a project will outweigh the bad, the agency still needs to discuss both the good and the bad."[36]

- *Fifth, the Commission should explicitly conduct its Need Analysis in a way that acknowledges that an economic analysis also includes consideration of externalities (or impacts), whether the latter can be fully monetized or not*. As an economic regulator, FERC should conduct its reviews of new natural gas facilities in a way that incorporates the implications of market imperfections (e.g., positive and negative externalities). This is consistent with Bonbright *et al.*'s third economic rationale for utility regulation,[37] as described above.)
    - On the benefits side of the equation, the Policy Statement already invites applicants to identify and discuss positive externalities associated with a project and the use of its delivered gas (e.g., "increasing electric reliability, or advancing clean air objectives"[38]). The Commission's Need Analysis should do a more thorough job of developing the record on the negative-externalities side of the ledger.

[36] Sabal Trail Order, page 25. Note that the quoted text was part of the court's discussion of the Commission's obligations under NEPA, I am citing it here for the purpose of encouraging FERC to look at the full "good and bad" of project impacts as part of the agency's Need Determination as well.

[37] Bonbright *et al*., page 37: The "'market failure' rationale for regulation involves the presence of external economies and diseconomies, or external benefits and costs. An externality or spillover occurs when there is a benefit or cost enjoyed by or imposed on other members of society by the activities of a producer or consumer that are not enjoyed or borne exclusively by the direct causer."

[38] Policy Statement, page 25

- Some externalities are relatively amenable to quantification and/or monetization. For example, public benefits associated with improvements in air quality are routinely translated into economic terms in both governmental policy analysis and private contexts. Some improvements in reliability on the electric system are also amenable to monetization.[39] Economic analysts often estimate the impacts on natural gas prices and basis differentials that are expected to result from new gas-delivery capability into various regions. All of these are examples of externalities associated with the installation of a new gas facility. Similarly, GHG emissions associated with the gas-supply chain and the use of natural gas should also be quantified and can certainly be monetized (as I discuss further, below).

- But not all impacts – whether positive or negative – need be monetized. The Commission has experience in analyzing information in records that includes both quantitative and qualitative information.

- My point is that in the context of benefit/cost analyses, an economic analysis is not just limited to impacts on prices or consumers' rates, or on any residual adverse effects on Relevant Interests. This reframing would introduce a change into the current Policy Statement, which suggests that the examination of

[39] Regarding the latter, there are methodologies and data that allow for estimation of the monetary value associated with outages. For example, there is a publicly available tool (called the Interruption Cost Estimate ("ICE") Calculator tool) that was developed through funding by the U.S. Department of Energy. *See* https://eaei.lbl.gov/tool/interruption-cost-estimate-calculator and https://icecalculator.com/home.

benefits and costs in the Need Determination should be primarily from an economic framework because the NEPA review focuses on environmental impacts.[40] FERC's revised policy statement should state affirmatively that identifying and quantitatively evaluating environmental externalities associated with gas-facility projects are appropriate parts of the Commission's economic analysis. This acknowledgement will also require some changes in the Commission's own nomenclature in certificate orders.[41]

- This reframing will add some technical complexity and use of agency resources to FERC's review of applications, but the Commission should not shortchange its Need Determination in the name of administrative efficiency. Certificating a pipeline is an act with large consequences for others besides the two counterparties seeking to buy and supply delivery services for natural gas. These consequences – both positive and negative – even go beyond those for

[40] See, for example, Policy Statement, pages 18-19. Also, the NOI includes language (on pages 18-19) that indicates the Commission's recognition of this broader definition of economic assessment: "The Commission's environmental analyses have come to adopt a more expansive consideration of property rights issues, so issues that previously might not have been routinely reviewed in the environmental document – e.g., a project's potential impact on property values, community development, employment, tax revenue, GHG emissions, and disadvantaged populations – now are. Thus, these issues are, in effect, considered twice, once *in the context of the Policy Statement assessment focusing on economic impacts*, and again in the NEPA review focusing on environmental impacts. Economic impacts on landowners and surrounding communities can be, and often are, mitigated, for example, through alternative routing of the proposed rights-of-way, co-location with existing utility corridors, and negotiating the purchase of rights-of-way." (emphasis added)

[41] For example, in the March 2018 Sabal Trail Order, the Commission's majority stated at pages 18-21 that "The Commission Does Not Use Monetized Cost-Benefit Analysis." The discussion almost entirely focuses on whether the NEPA process requires a cost-benefit analysis. That is entirely different that the obligation that agency has to examine benefits and costs under the NGA, including monetary and non-monetary ones, in order to determine whether a new project is needed and in the public interest.

competing suppliers, existing customers and affected landowners and communities. Making decisions on matters involving technically complicated records is not new to the agency. And the fact of having to resolve difficult issues affecting myriad interests does not relieve the agency of the need to do it.

– *Sixth, FERC's Need Analysis should not rely on the "proportional adverse effects" approach in its reviews, and instead should replace it with a more systematic requirement that each applicant identifies the array of benefits and array of adverse effects*. The Policy Statement says that:

> The amount of evidence necessary to establish the need for a proposed project will depend on the potential adverse effects of the proposed project on the relevant interests. Thus, projects to serve new demand might be approved on a lesser showing of need and public benefits than those to serve markets already served by another pipeline.... There is no reason for an applicant to do a new market study of its own in every instance[.][42]

Further, the Policy Statement described a sliding scale approach where the "more interests adversely affected or the more adverse impact a project would have on a particular interest, the greater the showing of public benefits from the project required to balance the adverse impact."[43] This is not reasonable, in light of the many broad interests affected by the siting, construction and operations of gas infrastructure. It is hard to identify an *a priori* reason why "projects to serve new demand" should not go through a rigorous and disciplined review of whether the negative consequences of constructing and operating a new facility to serve that new demand exceed the benefits of doing so. Similarly, there should be no *a priori* presumption, as now exists in the

[42] Policy Statement, page 25.

[43] Policy Statement, page 26.

> Policy Statement, that a facility should be approved if the facility's developer is "able to acquire all, or substantially all, of the necessary right-of-way by negotiation prior to filing the application, and the proposal is to serve a new, previously unserved market, [and that the proposed project] would not adversely affect any of the three interests."[44] Instead, the public interest is broader than this framework would consider.[45] The Commission's policy for its Need Analysis should set forth minimum standards for what is introduced in support of a Need Determination, rather than tying the "amount of evidence necessary" to the "potential adverse impacts on the relevant interests."

Recommendation #3: Implement the "All Relevant Factors" Approach (*Question A1*)

The Commission should implement the "All Relevant Factors" approach in practice. Although this approach was referenced as the core criteria in the Policy Statement,[46] in practice, the Commission's reviews have diverged from implementing the "All Relevant Factors" model for determining need for a proposed project.

As the Commission has explained its authority, it may deny an application if, and only if, a balancing of factors weighs against authorization of the proposed project.[47] The Policy

[44] Policy Statement, page 26.

[45] Recall that the Policy Statement invites a broad interpretation of interested and affected parties on the benefits side of its Need Analysis, but focuses only on the three sets of Relevant Interests. Policy Statement, page 16 (for a description of a set of potential beneficial factors) and page 26 (for a description of the three Relevant Interests).

[46] Policy Statement, page 23 ("Rather than relying only on one test for need, the Commission will consider all relevant factors reflecting on the need for the project.").

[47] Policy Statement, page 28 ("In sum, the Commission will approve an application for a certificate only if the public benefits from the project outweigh any adverse effects.").

Statement explains that relevant factors reflecting the need for (or benefits that could result from) the project might include, but would not be limited to: "precedent agreements; demand projections; potential cost savings to consumers; or a comparison of projected demand with the amount of capacity currently serving the market." [48] Adverse effects could include economic, operational, competitive, environmental, or other effects on the Relevant Interests.[49]

Additionally, the Policy Statement indicates that a Need Determination may include other factors, including public benefits associated with serving unserved demand, "lower costs to consumers…increasing electric reliability, or advancing clean air objectives,"[50] all of which specifically refer to anticipated purposes and end-uses of the natural gas to be delivered through the proposed facility and to the impacts of those end-uses on parties other than those typically viewed as "Relevant Interests" in the Policy Statement.[51] Even "serving demand" is tied inherently to the delivery and use of gas, because few parties would buy delivery services without intending to ever use the commodity itself.

In practice, however, the Commission tends to look at a limited set of relevant factors (i.e., reliance on precedent agreements) as the basis for establishing need for the project.[52] This

[48] Policy Statement, page 23 ("Rather than relying only on one test for need, the Commission will consider all relevant factors reflecting on the need for the project.").

[49] Policy Statement, pages 14, 23.

[50] Policy Statement, page 25.

[51] *See* also: *FPC v. Transcontinental Gas Pipe Line Corp*., 365 U.S. 1 (1961).

[52] Tierney White Paper, page 12. Also, the NOI itself acknowledges the principal role played by precedent agreements in Need Determinations: "Nineteen years have passed since the Commission issued the Policy Statement…. That period has seen significant changes, such as:…(4) customers routinely entering into long-term precedent agreements for firm service during the formative stage of potential projects and the use of those precedent agreements as applicants' principal evidence of the need for their

is concerning because it confounds the words and meaning of the Policy Statement which was intended to provide a non-exhaustive menu of potentially relevant factors, not to circumscribe the Commission's reliance on only one potentially relevant factor. In fact, the Policy Statement itself said that a "drawback" of its then-current policy was that it relied too heavily on contracts to demonstrate market demand and that using "contracts as the primary indicator of market support for the proposed pipeline project also raises additional issues when the contracts are held by pipeline affiliates."[53]

The Policy Statement endorsed this "All Relevant Factors" approach explicitly:

> Rather than relying only on one test for need, the Commission will consider all relevant factors reflecting on the need for the project. These might include, but would not be limited to, precedent agreements, demand projections, potential cost savings to consumers, or a comparison of projected demand with the amount of capacity currently serving the market…. The types of public benefits that might be shown are quite diverse but could include: meeting unserved demand; eliminating bottlenecks; access to new supplies; lower costs to consumers; providing new interconnects that improve the interstate grid; providing competitive alternatives; increasing electric reliability; or advancing clean air objectives. Any relevant evidence could be presented to support any public benefit the applicant may identify. This is a change from the current policy which relies primarily on one test to establish the need for the project.[54]

This "All Relevant Factors" framing of the Need Analysis is still appropriate and should be retained for the benefits side of the Need Determination, as well as incorporated into a

projects[.]" Further on page 46, the NOI states that "[i]n practice, the Commission does not look 'behind' or 'beyond' precedent agreements when making a determination about the need for new projects or the needs of the individual shippers."

[53] Policy Statement, page 16.

[54] Policy Statement, pages 23, 25.

revised Policy Statement for the adverse impacts side as well. The change that is now needed is for the Commission to execute its reviews in a way that is consistent with these statements and lessen its reliance on precedent agreements as sufficient to demonstrate need, as discussed further below.

Recommendation #4: Broaden Scope of "Relevant Interests" (*Questions A1, C6*[55])

The Commission should broaden its application of a "Relevant Interest" approach in policy and in practice so that the concept of 'relevant interests' goes beyond the three sets of core or major interests – existing customers; competing pipelines and their customers; and affected landowners/communities – described in the Policy Statement. A revised Policy Statement should include "the public" more explicitly in considering potential adversely affected parties.

In some respects, the Policy Statement itself sends mixed messages about "relevant interests" (or "affected interests" or "major interests"):

> In deciding whether a proposal is required by the public convenience and necessity, the Commission will consider the effects of the project on all the affected interests; this means more than the interests of the applicant, the potential new customers, and the general societal interests.
>
> Depending on the type of project, there are three major interests that may be adversely affected by approval of major certificate projects, and that must be considered by the Commission. These are: the interests of the applicant's existing customers, the interests of competing existing pipelines and their

[55] Commission Question C6: As part of the Commission's public interest determination, should the Commission consider changing how it weighs a proposed project's adverse environmental impacts against favorable economic benefits to determine whether the proposed project is required by the public convenience and necessity and still provide regulatory certainty to stakeholders?

> captive customers, and the interests of landowners and surrounding communities. There are other interests that may need to be separately considered in a certificate proceeding, such as environmental interests.[56]

Although the impacts of a facility are clearly important to the Relevant Interests and therefore to the Commission, this issue is actually a subset of the broader core question of whether the project imposes negative impacts or costs on to one or another sets of relevant constituencies. The Need Determination should affirmatively attempt to elicit information from applicants and parties with respect to the broader set of potentially adversely affected people.

For example, the current approach does not fully examine the question of adverse impacts of an under-utilized facility where that approach focuses on whether "the pipeline bears the [financial] risk for any new capacity that is under-utilized."[57] Knowing that some investor is willing to come forward to bear that risk of a project is relevant but must be tempered with the fact that Commission-approved infrastructure projects that move into construction and operation are very long-lived, with economic and environmental consequences for others that extend well beyond the horizon of the investor. This aspect of the Commission's approach does not address whether the fact of surplus capacity is consistent with the public interest.

[56] Policy Statement, page 23.

[57] Policy Statement, page 21. Further, this part of the Policy Statement's methodology has no impact whatsoever when the applicant is a new company, which has been the case in several recent high-profile applications. *See*, for example, *Mountain Valley Pipeline, LLC and Equitrans, L.P.* (Docket Nos. CP16-10-000 and CP16-13-000), 161 FERC ¶ 61,043 (October 13, 2017), pages 12-13; and *Rover Pipeline LLC, Panhandle Eastern Pipe Line Company, LP, and Trunkline Gas Company, LLC* (Docket Nos. CP15-93-000, CP15-93-001, CP15-94-000, and CP15-96-000), 158 FERC ¶ 61,109 (February 2, 2017), page 16.

The public has an interest in the risk of overbuilding and in avoiding unnecessary rights-of-way, and the NGA's purposes include the orderly development of gas infrastructure (but not at any cost). In a recent study examining the implications for 2030 natural gas demand presented by declining technology costs for non-fossil generating units, by customers' interest in clean energy, and by likely incremental policy steps to control GHG emissions, RMI identified $32 billion of proposed gas pipelines that are exposed to the risk of stranded cost.[58] The Policy Statement's methodology should take that stranded cost risk into account, and adequately address the fact that this could lead to overbuilding and dis-orderly development of new natural gas facilities, which would be inconsistent with the NGA.

In the Policy Statement and its application generally since then, there has been an implicit presumption that new pipelines without adverse impacts on Relevant Interests should be approved. The Policy Statement says that the Commission should conduct a threshold review of whether there are any adverse impacts on Relevant Interests (and what the applicant had done to mitigate or eliminate them).[59] The Policy Statement indicates that this approach is aimed at creating incentives for the applicant to minimize and mitigate impacts.[60] According to

[58] Mark Dyson, Jamil Farbes, and Alexander Engel, "The Economics of Clean Energy Portfolios: How Renewable and Distributed Energy Resources Are Outcompeting and Can Strand Investment in Natural Gas-Fired Generation," Rocky Mountain Institute, 2018. www.rmi.org/insights/reports/economics-clean-energy-portfolios

[59] Policy Statement, pages 18-28.

[60] Policy Statement, page 18.

this approach, though, if there are no adverse impacts on Relevant Interests, then the Commission does not compare and balance benefits against adverse impacts. [61]

There are at least two problems with this approach as outlined in the Policy Statement. First, recent history has made it clear that there are virtually no pipeline proposals that have no adverse impacts on others (whether "others" is defined as the Relevant Interests or more broadly to include society). Limiting the comparison of project benefits (to society) to costs (to Relevant Interests) is too narrow, given that "the public" (as in the "public interest" and the "public convenience") is much broader than those three sets of stakeholders identified in 1999. For example, states may have a strong interest in whether the Commission does or does not approve facility proposals, due to those states' policies, but the Policy Statement's definition of Relevant Interests does not include states' interests.

Second, a finding that there are adverse impacts of a proposed project should not be a predicate for a balancing test, but rather a test of whether the benefits exceed the costs. An economic benefit/cost evaluation needs to include both monetary and non-monetary considerations and value (as I discussed above), and may require the application of judgment by the Commission. The fact that FERC will need to apply judgment is not new: judgment is also required in a balancing test.

[61] Policy Statement, page 19 ("If residual adverse effects on the three interests are identified, after efforts have been made to minimize them, then the Commission will proceed to evaluate the project by balancing the evidence of public benefits to be achieved against the residual adverse effects. This is essentially an economic test. Only when the benefits outweigh the adverse effects on economic interests will the Commission then proceed to complete the environmental analysis where other interests are considered.").

The current Policy Statement's approach is imbalanced because it considers broadly defined benefits and narrowly defined interests. The Commission should revise the Policy Statement to require applicants to provide information on potential adverse effects on other parties in addition to the Relevant Interests, and this should be part of the Need Analysis. And then, in practice, FERC should affirmatively assure that the records of its cases reflect this broad view of potential costs of projects.

Recommendation #5: Minimize Reliance on Precedent Agreements (*Questions A3, A4,*[62] *A5*[63])

FERC should minimize reliance on precedent agreements as sufficient demonstration of need. In practice since the issuance of the Policy Statement, FERC has found that the existence of contracts (and in particular, precedent agreements) is sufficient to demonstrate need.[64] This contrasts with the language in the Policy Statement that appropriately invites applicants to present other information besides precedent agreements or contracts to support a showing of market demand. In fact, the Policy Statement itself noted that the "reliance solely on long-term contracts to demonstrate demand does not test for all the public benefits that can be achieved by a proposed project."[65]

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[62] Commission Question A4: Should the Commission consider distinguishing between precedent agreements with affiliates and non-affiliates in considering the need for a proposed project? If so, how?

[63] Commission Question A5: Should the Commission consider whether there are specific provisions or characteristics of the precedent agreements that the Commission should more closely review in considering the need for a proposed project? For example, should the term of the precedent agreement have any bearing on the Commission's consideration of need or should the Commission consider whether the contracts are subject to state review?

[64] "In practice, the Commission does not look 'behind' or 'beyond' precedent agreements when making a determination about the need for new projects or the needs of the individual shippers." NOI, page 46.

[65] Policy Statement, page 16.

The language in a revised Policy Statement needs to clarify that while the Commission will consider contracts as some evidence of need, such agreements, standing alone, are not sufficient to demonstrate Need. The Policy Statement could further clarify that in instances where there are no affiliate relationships among the counterparties, a precedent agreement may be part of the demonstration of need, but it is not sufficient, because market demand is only one factor and the Need Analysis should incorporate the range of benefits and costs and rely upon a record reflecting "All Relevant Factors."

The Policy Statement should further clarify that where there are affiliate arrangements, the precedent agreement may be presented but should be afforded little weight without a demonstration of and/or inquiry by FERC into whether the precedent agreement reflects the exercise of vertical market power. The reason for distinguishing the latter from the former cases (i.e., precedent agreements among affiliates, versus among non-affiliated counterparties) stems from the potential for affiliates to attempt to exercise vertical market power in establishing a justification for a new infrastructure project.

As the Commission noted in the NOI: "To date, the Commission has not distinguished between affiliate and non-affiliate precedent agreements in considering the need for a proposed project"[66]; and "[i]n practice, the Commission does not look 'behind' or 'beyond' precedent agreements when making a determination about the need for new projects or the needs of the individual shippers." [67]

[66] NOI, page 47.

[67] NOI, page 46.

But given the increasing number of facility projects that are proposed by pipeline companies and supported by precedent agreements with affiliated companies, it seems appropriate for the Commission to modify its Policy Statement with regard to reliance on precedent agreements among affiliated companies as sufficient demonstrations of Need.

In other segments of the Commission's work, the agency is a sophisticated supervisor of questions of market power, both horizontal and vertical market power. FERC has a history of exercising vigilance to address the risk that affiliates will exercise vertical market power in providing non-affiliated parties with non-discriminatory access to needed delivery facilities (e.g., electric and gas transmission). The Commission has taken countless steps over the years to structure its regulatory policies and supervision of the industry to mitigate the potential adverse impacts on customers and on competition.[68]

[68] The Commission has long recognized the potential for affiliate abuse, notably in its landmark orders relating to the provision of non-discriminatory access to gas-transportation service and to electric-transmission service, including standards of conduct among affiliates providing such services to themselves and to others (see for example FERC Order 636 (1992); Order 890 (2007); Order 717 (2008), Order 787 (2013), and Order 807 (2015)). An example of the Commission's acknowledgement of and concern for the exercise of vertical market power can be found in its 2007 Notice of Inquiry on "Cross-Subsidization Restrictions on Affiliate Transactions":

> Affiliate Transactions in the Context of Market-Based Rate Authorizations: Historical Approach. The Commission began considering proposals for market-based pricing of wholesale power sales and attendant cross-subsidy issues in 1988. At that time, the Commission acted on market-based rate proposals filed by various wholesale suppliers on a case-by-case basis. In doing so, the Commission considered whether there was evidence of affiliate abuse or reciprocal dealing involving the seller or its affiliates. As the Commission explained, "[t]he Commission's concern with the potential for affiliate abuse is that a utility with a monopoly franchise may have an economic incentive to exercise market power through its affiliate dealings." The Commission also stated its concern that a franchised public utility and an affiliate may be able to transact in ways that transfer benefits from the captive customers of the franchised public utility to the affiliate and its shareholders. Where a franchised public utility makes a power sale to an affiliate, the Commission is concerned that such a sale could be made at a rate that is too low, in effect,

The Commission should bring the same perspective to its certification of new gas facilities, in light of their very-long-lived nature, the risk of overbuilding, and an approval process that may well lead to subsequent court proceedings in which private property can be condemned for public purposes.

The Commission could modify its approach in at least one of two ways: (a) It could clarify to prospective applicants in a revised Policy Statement that precedent agreements with affiliates will be accorded a rebuttable presumption of little weight in the Commission's Need Determination, and that in any event, the applicant will need to provide a broader demonstration of benefits and market demand. Or, (b) The Commission could itself investigate whether a particular precedent agreement suffers from the potential exercise of market power, or whether there are protections in place (e.g., the existence of a state regulatory approval that new gas capacity is needed for either local distribution company service or for serving a power plant that will take firm gas transportation service).

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transferring the difference between the market price and the lower rate from captive customers to the market-regulated affiliated entity…." (footnotes in original are omitted)

Cross-Subsidization Restrictions on Affiliate Transactions (Docket No. RM07-15-000), 120 FERC ¶ 61,061 (July 20, 2007), pages 3-4. Footnote 6 in the cited text above references prior FERC decisions addressing affiliate-transaction issues: Footnote 6: *Boston Edison Company Re: Edgar Electric Energy Co.*, 55 FERC ¶ 61,382, at 62,137 n.56 (1991) (Edgar). See also *TECO Power Services Corp.*, 52 FERC ¶ 61,191, at 61,697 n.41, order on reh'g, 53 FERC ¶ 61,202 (1990) ("The Commission has determined that self dealing may arise in transactions between affiliates because affiliates have incentives to offer terms to one another which are more favorable than those available to other market participants.")

Recommendation #6: Include Regional Considerations (*Questions A9,*[69] *A10,*[70] *C2,*[71]*C6, C7*[72])

The Commission should introduce into the Need Analysis much greater information about regional considerations that could affect whether (or not) a new facility is needed. Such regional considerations should include, for example:

- the existence and utilization of other pipelines;
- competing project proposals to serve similar demand in the region;
- broad regional market trends (e.g., increasing penetration of generating capacity that does not rely on natural gas) that could affect demand for natural gas in the near term and longer term;

[69] Commission Question A9: Should the Commission assess need differently if multiple pipeline applications to provide service in the same geographic area are pending before the Commission? For example, should the Commission consider a regional approach to a needs determination if there are multiple pipeline applications pending for the same geographic area? Should the Commission change the way it considers the impact of a new project on competing existing pipeline systems or their captive shippers? If so, what would that analysis look like in practice?

[70] Commission Question A10: Should the Commission consider adjusting its assessment of need to examine (1) if existing infrastructure can accommodate a proposed project (beyond the system alternatives analysis examined in the Commission's environmental review); (2) if demand in a new project's markets will materialize; or (3) if reliance on other energy sources to meet future demand for electricity generation would impact gas projects designed to supply gas-fired generators? If so, how?

[71] Commission Question C2: Are there any environmental impacts that the Commission does not currently consider in its cumulative impact analysis that could be captured with a broader regional evaluation? If so, how broadly should regions be defined (e.g., which states or geographic boundaries best define different regions), and which environmental resources considered in NEPA would be affected on a larger, regional scale?

[72] Commission Question C7: Should the Commission reconsider how it uses the Social Cost of Carbon tool in its environmental review of a proposed project? How could the Commission use the Social Cost of Carbon tool in its weighing of the costs versus benefits of a proposed project? How could the Commission acquire complete information to appropriately quantify all of the monetized costs/negative impacts and monetized benefits of a proposed project?

- state energy and environmental policies in the affected region that could lead to lower demand for gas due to mandated reductions in carbon emissions from states' economies;
- state regulatory action on either natural gas contracts and/or the siting of new gas-fired generation facilities.

And the Commission should call for evidence involving both quantitative metrics (including but not limited to monetized benefits and monetized costs), and qualitative/non-monetary analyses.

Consistent with an All Relevant Factors approach in a benefit/cost framework for determining Need, the Commission should modify its Policy Statement so that facility applicants provide information about regional considerations, including those that work for the project proposal and those that work against it. For example, the Commission may want to give significant weight to state regulatory approvals that indicate need (or the absence of need) for new gas transportation capacity. Similarly, the Commission should consider the implications for future demand for natural gas associated with state statutes requiring significant reductions in GHG emissions from activities in the state's energy and other economic systems.

Such an approach would be consistent with the purpose of the NGA "to encourage the *orderly* development of plentiful supplies of electricity and natural gas at reasonable prices." [73] This means that FERC should not presumptively approve facilities to promote the availability of "plentiful supplies" at any cost or in any fashion; rather, the Commission should conduct its

[73] NOI, citing *NAACP v. Federal Power Commission*, 425 U.S. 662, 669-70 (1976) (emphasis added).

Need Analyses in a way that promotes and supports orderly development. A Need Analysis that takes place without the benefit of considering regional issues increases the possibility of Section 7(c) decisions that produce dis-orderly development. Using a regional analysis would help ensure only "orderly development" and guard against *dis*orderly development.

Introducing regional considerations into the Commission's Need Analysis would not mean that FERC itself would become a planning agency; nor would it require the Commission to overstep its authority in any way to compel construction of new facilities.[74] Rather, the Commission could require facility applicants to do their own regional analysis or plans as part of what they present to the Commission to demonstrate Need and whether the project satisfies the public interest rather than solely the needs of identified shipper customers.

At a minimum and as part of preparing for the Commission's Need Analysis, the applicants could be asked to demonstrate how they have conducted stakeholder meetings on regional trends or policies that affect near-term and long-term demand for natural gas. This could be a pre-filing requirement. Or, if not required but encouraged by the Commission, the existence of a bona-fide regional planning/stakeholder process could be given weight by the Commission in its Need Determination. As a stronger incentive for applicants to conduct regional, open and collaborative regional planning processes, with stakeholder involvement,

[74] I note the Commission's statements on page 8 of the majority's recent order on the remanded Sabal Trail Order: "The Commission has not historically engaged in planning the development of natural gas capacity…. [footnote 35: The Commission's authority to compel construction of facilities is extremely limited. *See* section 7(a) of the NGA, 15 U.S.C. § 717f(a) (2012).] Under section 7 of the NGA, the Commission must determine whether a proposed project is or will be required by the present or future public convenience and necessity…."

the Commission could revise its Policy Statement to indicate that any proposal that is filed without the benefit of having been informed by such a process would face a higher burden to demonstrate need.[75]

Further, the Commission should explore ways to consider regional issues in its Need Analysis and Need Determination in situations in the future where two competing pipelines are vying to build facilities to serve a common market, and file their Section 7(c) applications separately and at different (but not significantly different) times. In such instances, the Commission should modify its Policy Statement to clarify that the applicants' Need Analyses must incorporate regional information to enable the Commission to compare the facility proposals. Additionally, FERC could require, to the extent feasible, applicants to provide information about information in the Resource Reports about other facility proposals in the region that are underway or before the Commission and then issue information requests to update the information during the review of facility proposals. Approaches such as these are important to avoid wasteful duplication of investment, potential under-utilized existing natural-gas delivery capacity, unnecessary environmental and community impacts, and/or the needless exercise of eminent domain, consistent with the expressed goals of the Policy Statement.[76]

[75] Presumably there would be ways to engage market participants with an interest in how the natural gas market operates or develops over time and do so without raising antitrust concerns.

[76] "An effective certificate policy should further the goals and objectives of the Commission's natural gas regulatory policies. In particular, it should be designed to foster competitive markets, protect captive customers, and avoid unnecessary environmental and community impacts while serving increasing

Recommendation #7: Consider Both Positive and Negative Impacts of the Use of Natural Gas

(*Questions A6,*[77]*A7,*[78] *A8*[79]*, C4*[80])

The Commission should incorporate into the Need Analyses and Need Determination the positive and negative impacts associated with use of natural gas, as the current Policy Statement invites, but as the Commission has implemented selectively in recent cases. This recommendation has several elements and I encourage the Commission to take a more consistent approach in practice.

First, the current Policy Statement directly and appropriately invites applicants to present information about the anticipated implications of using the natural gas that can or will be

demands for natural gas. It should also provide appropriate incentives for the optimal level of construction and efficient customer choices." Policy Statement, page 13.

[77] Commission Question A6: In its determinations regarding project need, should the Commission consider the intended or expected end use of the natural gas? Would consideration of end uses better inform the Commission's determination regarding whether there is a need for the project? What are the challenges to determining the ultimate end use of the new capacity a shipper is contracting for? How could such challenges be overcome?

[78] Commission Question A7: Should the Commission consider requiring additional or alternative evidence of need for different end uses? What would be the effect on pipeline companies, consumers, gas prices, and competition? Examples of end uses could include: LDC contracts to serve domestic use; contracts with marketers to move gas from a production area to a liquid trading point; contracts for transporting gas to an export facility; projects for reliability and/or resilience; and contracts for electric generating resources.

[79] Commission Question A8: How should the Commission take into account that end uses for gas may not be permanent and may change over time?

[80] Commission Question C4: In conducting an analysis of a project, should the Commission consider calculating the potential GHG emissions from the downstream consumption of the gas? If so, should the Commission base this calculation on total consumption, or some other amount? What information would be necessary for the Commission to reliably and accurately conduct this calculation? Should the Commission also evaluate the significance of these downstream impacts? If so, what criteria would be used determine the significance of these impacts?

transported via a new facility: "public benefits may include such factors as the environmental advantages of gas over other fuels, lower fuel costs ... increasing electric reliability, or advancing clean air objectives."[81] As I have pointed out previously, the proposed facility could not result in increased electric reliability unless the gas is used (e.g., in a power generator with quick-start and load-following capability). Similarly, the facility could not provide the mentioned environmental advantages of natural gas relative to other fuels unless the gas is used (e.g., in a home heating system rather than oil, and/or in a power plant instead of burning coal). Consumers cannot enjoy the promised benefits of lower fuel costs unless they actually use the gas. In other words, FERC's Need Determination reviews already provide opportunities for applicants to discuss the impacts of *using* the gas, not just transporting it.

And yet, ironically, in its Sabal Trail Order in March of 2018, the Commission said that its "authority under section 7 of the NGA has no direct connection to the production or end use of natural gas." Literally speaking, the Commission's authority over delivery facilities is the very thing that enables producers and end users to connect. And further in the same order, the Commission said that certain public benefits of a proposed facility (specifically mentioning "increasing electric reliability") "accrue from the proposed project itself, not from the end use of the transported natural gas."[82] But how could that facility improve electric reliability without the end-users (e.g., gas-fired power plants; gas-fired distributed-energy technologies) actually using the gas?

[81] Policy Statement, pages 16, 25.

[82] Sabal Trail Order, page 20.

Thus, as recently as March of 2018, the Commission has entertained examination of the benefits of burning gas delivered by a Section 7(c) facility,[83] but decided not to give weight to the negative impacts of burning gas also delivered by the same facility.[84]

I note that other federal agencies have not adopted so narrow a view when they examine the environmental implications of a new infrastructure project (such as a new road or bridge project). Even a casual internet search suggests that NEPA reviews of *road* and *bridge* projects assume that vehicles will travel on those infrastructure facilities and, appropriately, the environmental reviews of these projects consider the energy use and/or air-emission impacts of cars and trucks driving many miles *on* the new road or bridge and on other parts of the

[83] Sabal Trail Order, page 20.

[84] In the Sabal Trail Order, page 13, the Commission explains its decision to not take into account the GHG emissions associated with using natural gas:

> In addition, the vast majority of the lifecycle GHG emissions associated with the natural gas delivery chain are a result of the end use of the natural gas, not the construction or operation of the transportation facilities subject to the Commission's jurisdiction. Thus, the downstream GHG emissions associated with a proposed project are primarily a function of a proposed project's incremental transportation capacity, not the facilities, and will not vary regardless of the project's routing or location…. The only way for the Commission to reflect consideration of the downstream emissions in its decision making would be, as the court observed, to deny the certificate. However, were we to deny a pipeline certificate on the basis of impacts stemming from the end use of the gas transported, that decision would rest on a finding not 'that the *pipeline* would be too harmful to the environment,'[footnote 64] but rather that the *end use* of the gas would be too harmful to the environment. The Commission believes that it is for Congress or the Executive Branch to decide national policy on the use of natural gas and that the Commission's job is to review applications before it on a case-by-case basis."

Regarding the final sentence in that statement, I note that the incorporation of impacts of using natural gas into Need Determinations would not lead the Commission to become a policy maker on the use of natural gas; it would only put the Commission into the position of determining whether a particular proposed project is in the public interest, taking All Relevant Factors and all benefits and costs into account. That is exactly the responsibility assigned to FERC under the NGA.

transportation system as a result of the road or bridge being built and operated.[85] The NEPA reviews of the other agencies go beyond the anticipated environmental impacts of siting, constructing and operating the infrastructure project, presumably because the very purpose of such a project is to enable its use by parties seeking to drive vehicles on highways and bridges. Also, the new road and/or bridge facilities might help to alleviate congestion in the broader region, with implications for lower vehicle emissions of GHG and other air pollutants.[86] (The agencies conducting the reviews do not have jurisdiction over how vehicles use the facilities, just as FERC does not literally regulate the use of gas transported by FERC-jurisdictional pipelines or LNG facilities.) FERC should similarly incorporate environmental-impact information associated with the use of natural gas (such as GHG emissions) into its NEPA analyses, as well as in its Need Determinations.

The Commission should endeavor to incorporate the positive and negative impacts associated with use of natural gas, and to do so on a best-efforts basis, using the best

[85] Two examples of such Environmental Impact Statements ("EIS") for a road or bridge project are:
(a) the EIS for the I-25 Valley Highway project in Colorado (https://www.codot.gov/library/studies/i-25-valley-highway-EIS/newchapter_4); see in particular Section 4 on air quality, https://www.codot.gov/library/studies/i-25-valley-highway-EIS/newchapter_4/feis_ch4sec5_airquality.pdf/view; and
(b) the EIS for the Goethals Bridge Replacement Project in New York and New Jersey (https://www.panynj.gov/goethalseis/eis/feis_downloads.html. See in particular Section 5 (Environmental Consequences), and in particular Sections 5.19 through 5.21, which describe the expected use of the bridge by vehicles and characterize the associated impacts on energy use by the vehicles, and the air-pollution emissions (including carbon dioxide), air quality and public health impacts associated with those vehicles driving on the bridge. https://www.panynj.gov/goethalseis/pdfs/feis/section_05.pdf).

[86] For example in the case of the Goethals Bridge Replacement Project, the EIS examined such implications. See page 5-171 of https://www.panynj.gov/goethalseis/pdfs/feis/section_05.pdf.

information available during the development of the record on which the Commission will decide whether to approve a project proposal.

The Commission's revisions to its Policy Statement should clarify how it will expect applicants to help create a record of how the gas will be used, in order to inform the Need Determination. This might include references to information from the applicant's precedent agreements, the regional plans or analyses, or other forms of documentation to serve as proxies for how the gas would be used. Such information could be supplied through resource reports prepared in support of the pre-filing process and the application itself.

Second, there are many tools available to help with presenting information about the use of natural gas and with the Commission's examination of its impacts. Examples of such tools are: production simulation models to estimate the performance of regional electric systems with and without the addition of new pipeline capacity, a load-flow analysis of the electric grid with and without the new pipeline capacity feeding supply into different parts of the electric grid; air-emissions modeling to indicate how the use of natural gas in power plants or vehicles might help a region attain or maintain air quality standards; and the Social Cost of Carbon methodology for monetizing the impacts of GHG emissions. These are relevant, known, and helpful methodologies for examining the consequences of siting, constructing, and operating new natural gas delivery facilities.

The Commission is familiar with such types of studies and reviews them in other contexts (e.g., part of the application for market-based rate authority for power plants; and simulation studies presented by regional grid operators). With respect to production-

simulation modeling, this analytic tool helps to identify the economic impacts for electricity consumers of introducing greater gas-delivery capability and enabling potential cost savings to consumers. In the second example, electric load flow analysis allows for insights into the role the new gas capacity and gas supply might play in enhancing or worsening congestion on the electric system. In the third example, air-emission modeling of power production facilities can help to identify the impact of the new delivered natural gas on the emissions of local air pollutants and the ability of a region to improve or worsen its air quality. In the fourth example (i.e., the Social Cost of Carbon), the tool assists in determining the economic impacts of combusting natural gas in power plants and other end-uses of natural gas.

Such tools are well-known and are in commercial use. They can help develop more complete records on which the Commission can make its Need Determinations for facility proposals. These tools do not themselves indicate whether a project would, *on balance*, have positive or negative *net* benefits, but they can shed light on outcomes that are important to a broader set of stakeholders beyond the Relevant Interests. The Commission should modify its policy to encourage the use of these and other tools as relevant to and part of building records of benefits and costs of project proposals to determine whether they are in the public interest.

Incorporating the results of such analyses will not, however, remove the need for the Commission to exercise its judgment in evaluating quantitative and qualitative evidence about a proposed project's anticipated benefits and anticipated costs. It is unlikely that the Commission will ever have a record of decision that identifies every possible consequence (whether positive, or negative, or neutral) and does so with complete accuracy. Even in the best

cases, all such outcomes are projections based on assumptions and historical data. But that reality does not relieve the Commission of its responsibility to encourage the development of robust records, to do its best to review and consider quantitative and qualitative evidence of various forms and on various issues, and to apply its judgment in weighing evidence of different kinds and in making public-interest determinations on specific projects.

Given the weighty authority and responsibility that the NGA assigns to FERC to promote the *orderly* development of natural gas facilities, it is incumbent upon the Commission to ensure that its records of decision are robust. Doing so will help enhance the credibility of its decisions at a time when that credibility is being sorely tested (and contested) and the Commission is experiencing a new norm of contentious and acrimonious reviews.[87]

Recommendation #8: Give Great Weight to Adverse Impacts Where Eminent Domain is Sought (*Questions A2, B1,*[88] *B3,*[89] *B4*[90])

Finally, the Commission should give great weight to adverse impacts on land owners

[87] *See* my discussion of the increased opposition to Commission reviews of natural gas facility applications in my Tierney White Paper, pages 29-30.

[88] Commission Question B1: Should the Commission consider adjusting its consideration of the potential exercise of eminent domain in reviewing project applications? If so, how should the Commission adjust its approach?

[89] Commission Question B3: For proposed projects that will potentially require the exercise of eminent domain, should the Commission consider changing how it balances the potential use of eminent domain against the showing of need for the project? Since the amount of eminent domain used cannot be established with certainty until after a Commission order is issued, is it possible for the Commission to reliably estimate the amount of eminent domain a proposed project may use such that the Commission could use that information during the consideration of an application?

[90] Commission Question B4: Does the Commission's current certificate process adequately take landowner interests into account? Are there steps that applicants and the Commission should implement to better take landowner interests into account and encourage landowner participation in the process? If so, what should the steps be?

and local communities in the Need Determination where the applicant seeks to exercise eminent domain procedures. Even though the Commission's issuance of a certificate does not itself empower a pipeline company to condemn private property, having that certificate is what enables a pipeline company to attempt to convince a court that such a taking of private property is in the public convenience and necessary.

In making this recommendation, I do not intend to suggest that the Commission does not already care about what happens to property owners whose land might be condemned in a subsequent court proceeding. As a former state utility regulator and head of a state energy facility siting agency, I am certain that every FERC commissioner considers those property owners' interests in a very sober way.

Rather, I make this recommendation as a straightforward encouragement that FERC state affirmatively in a revised policy statement that the Commission recognizes the burdens on local property owners, neighbors of the facility proposal, and local communities, and will give those peoples' views great weight in the agency's Need Determination.

Rarely are directly affected landowners or neighbors the explicit beneficiaries of the services to be provided by a new natural gas facility, yet they bear the burden of hosting infrastructure that is largely for the benefits of the buyers, sellers and transporters of the gas. Where eminent domain is anticipated to be used, the Commission should be particularly deliberate in encouraging meaningful participation of such parties and in giving great weight to the fact some families and other landowners bear a disproportionate impact of infrastructure development.

The credibility of the agency's facility review process depends upon continued and even greater demonstrated effort to recognize the disparate distribution of positive and negative impacts on different constituencies.

I respectfully offer this and the prior recommendations in part to help build a stronger basis on which the Commission can show the public that it undertakes its significant responsibilities with seriousness, respect and due consideration of the fact that the burdens of facilities are shouldered by parties other than those who directly benefit from the "convenience and necessity" of infrastructure projects.

ATTACHMENTS

Attachment SFT-1: CV of Tierney

Attachment SFT-2: Tierney White Paper: "Natural Gas Pipeline Certification: Policy Considerations for a Changing Industry

Attachment SFT-3: Example of Revised Filing Requirements for Facility Proposals

Attachment SFT-1

CV of Susan F. Tierney

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Dr. Tierney, a Senior Advisor at Analysis Group, is an expert on energy economics, regulation, and policy – particularly in the electric and gas industries. She has consulted to businesses, government, tribes, environmental groups, foundations, and other organizations on energy markets, economic and environmental regulation and strategy, and energy projects. Her expert witness and consulting services have involved market analyses, wholesale and retail market design, contract disputes, resource planning and procurements, regional transmission organizations, the siting of electric and gas infrastructure projects, electric system reliability, ratemaking for electric and gas utilities, clean energy resources, climate change and carbon-emission-reduction policy, and other environmental policy and regulation. She has participated as an expert in civil litigation cases, regulatory proceedings before state and federal agencies, and business consulting engagements.

Previously, she served as the Assistant Secretary for Policy at the US Department of Energy. She was the Secretary of Environmental Affairs in Massachusetts, Commissioner at the Massachusetts Department of Public Utilities, Chairman of the Board of the Massachusetts Water Resources Authority, and Executive Director of the Massachusetts Energy Facilities Siting Council.

Dr. Tierney has authored numerous articles and speaks frequently at industry conferences. She serves on a number of boards of directors and advisory committees, including chairing the External Advisory Council of the National Renewable Energy Laboratory (NREL), and chairing the board of ClimateWorks Foundation. She is a trustee of the Barr Foundation, and a director of the World Resources Institute, Resources for the Future, the Energy Foundation, and the Keystone Center. She is a Visiting Fellow in Policy Practice at the University of Chicago's Energy Policy Institute; and a member of the advisory councils at New York University's Policy Integrity Institute, Duke University's Nicholas Institute for Environmental Policy Solutions, Columbia University's Center for Global Energy Policy, and the New York Independent System Operator (NYISO). She is a member of the Advisory Committee of the National Academy of Sciences Climate Communications Initiative, and was recently a member of the NAS' Committee on Enhancing the Resilience of the Nation's Electric Power Transmission and Distribution System." She recently chaired the Department of Energy's Electricity Advisory Committee, co-chaired the NAESB Gas-Electric Harmonization Committee, and was co-lead author of the energy chapter of the National Climate Assessment. She chaired the Policy Subgroup of the National Petroleum Council's *Prudent Development* study of the natural gas and oil resource base in North America, and served on the US Secretary of Energy Advisory Board. Previously, she chaired or co-chaired several non-profit organizations (the National Commission on Energy Policy; the Massachusetts Ocean Commission) and was formerly a director of several public companies (EnerNOC; Evergreen Solar; Zegen; Catalytica Energy Systems).

She taught at the Department of Urban Studies and Planning at MIT and at the University of California at Irvine, and has lectured at Harvard University, Yale University, New York University, Tufts University, Northwestern University, and University of Michigan. She received NARUC's Mary Kilmarx Award in 2015. She earned her Ph.D. and M.A. in regional planning at Cornell University and her B.A. at Scripps College.

EDUCATION

1980	Ph.D., regional planning, Cornell University
1976	Masters of Regional Planning, Cornell University
1973	B.A., art history, Scripps College *Studied political science at L'Institute d'Etudes Politiques, Paris, France*

PROFESSIONAL EXPERIENCE

2003–Present	Analysis Group, Inc., Boston, MA and Denver, CO *Senior Advisor (April 2014–Present)* *Managing Principal (July 2003–March 2014)*
1999–2003	Lexecon, Inc., Cambridge, MA (formerly The Economics Resource Group, Inc.) *Senior Vice President*
1995–1999	Economics Resource Group, Inc., Cambridge, MA *Principal and Managing Consultant*
1993–1995	US Department of Energy, Washington, DC *Assistant Secretary for Policy*
1991–1993	Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Boston *Secretary of Environmental Affairs*
1988–1991	Commonwealth of Massachusetts, Department of Public Utilities, Boston, MA *Commissioner*
1984–1988	Commonwealth of Massachusetts, Energy Facilities Siting Council, Boston, MA *Executive Director*
1983–1984	Commonwealth of Massachusetts, Executive Office of Energy Resources, Boston, MA *Senior Economist*
1982–1983	Commonwealth of Massachusetts, Energy Facilities Siting Council, Boston, MA *Policy Analyst*
1982	National Academy of Sciences, Washington, DC *Researcher*
1978–1982	University of California at Irvine, Irvine, CA *Assistant Professor*

SELECTED CONSULTING EXPERIENCE

- **Various Confidential Engagements**
  Including power sales agreements, fuel contracts, investment strategy, project development, and other electric and gas industry matters.

- **Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison Company**
  Prepared a white paper on a future structure for California's resource-adequacy and wholesale market structure in a low-carbon power system. (2018)
- **Analysis Group, Inc.**
  Prepared a white paper about the rebound effect in estimating the impacts of changes in federal fuel-economy and greenhouse gas emissions standards. (2017–2018)
- **Merck Family Foundation**
  Analyzed the economic impacts of the Regional Greenhouse Gas Initiative's third compliance period, 2015–2017. (2018)
- **Commonwealth Edison (ComEd)**
  Provided expert testimony before the Illinois Commerce Commission on regulatory policy issues related to a proposed microgrid pilot project. (2017)
- **Natural Resources Defense Council**
  Prepared a white paper on changes in the natural gas industry since 1999 when the Federal Energy Regulatory Commission issued its Policy Statement related to certification of new gas pipelines. (2017)
- **New York State Research and Development Administration**
  Provided support to NYSERDA and the New York Department of Public Service on issues relevant to the New York "REV" proceeding. (2017–Present)
- **Hewlett Foundation**
  Supported strategy development for the Foundation's Environment Program. (2017)
- **Advanced Energy Economy Foundation and American Wind Energy Association**
  Coauthored a white paper on wholesale power markets and electric system reliability and resilience. (2017)
- **Entergy Vermont Yankee**
  Provided expert testimony before the Vermont Public Service Board on the public benefits of the proposed sale of Vermont Yankee to NorthStar. (2016–2018)
- **Dominion Energy**
  Analyzed the implications for carbon emissions and consumer costs of a hypothetical shutdown of the Millstone Nuclear Station in Connecticut. (2017–Present)
- **Protect the Granite State**
  Analyzed the economic implications of the proposed Northern Pass Transmission project for New Hampshire and New England. (2017)
- **Environmental Defense Fund**
  Authored a white paper on challenges facing the US coal industry in the 21st Century. (2016)
- **Merck Family Fund**
  Coauthored a white paper on potential design issues relating to trading of carbon-emission credits between RGGI states and other states under the US EPA's Clean Power Plan. (2016)

- **Consolidated Edison and Southern California Edison**
  Authored a white paper on the role of distributed energy resources in distribution utility planning and operations. (2016)
- **Hawaii Gas Company**
  Provided expert testimony before the Hawaii Public Utilities Commission on issues related to the proposed merger of the Hawaii Electric Companies and NextEra. (2015–2016)
- **The Energy Foundation and Merck Family Fund**
  Coauthored report on the economic impacts of the Regional Greenhouse Gas Initiative's (RGGI's) second three years of implementation during 2012–2014. (2015)
- **State of Delaware**
  Provided expert testimony before the Delaware Superior Court on issues related to the impact of the RGGI program on electricity customers and the economy in Delaware. (2015–2016)
- **NEXUS Gas Transmission**
  Coauthored a report on the market for natural gas in the state of Ohio. (2015)
- **Electric Power Supply Association**
  Coauthored a report for EPSA on the design of State Plans to align with organized wholesale markets in response to the US Environmental Protection Agency's (EPA's) Proposed Clean Power Plan. (2015)
- **Baltimore Gas and Electric, Pepco Holdings Inc. and PHI's affiliates Pepco, Delmarva Power, and Atlantic City Electric**
  Provided expert testimony before the Federal Energy Regulatory Commission on the need for and risks associated with transmission investment. (2015)
- **Exelon Generating Company LLC**
  Analyzed alternative generation technologies and the consistency of Exelon's proposal to construct a natural-gas fired peaking unit with Massachusetts energy and environmental policies. (2015)
- **The Energy Foundation**
  Coauthored reports on reliability issues related to the US EPA's proposed Clean Power Plan. (2014–2015)
- **New England Power Generators Association**
  Analyzed the impact of legislative proposals in Massachusetts to direct electric utilities to enter into long-term power supply agreements with Canadian hydropower companies. (2014, 2015)
- **Spectra Energy**
  Provided expert report in Maine regulatory proceeding related to the potential for the State of Maine to enter into a contract to support natural gas pipeline infrastructure in New England. (2014)
- **The Energy Foundation and Merck Family Fund**
  Coauthored report on the consumer impacts of the US EPA's proposed Clean Power Plan. (2014)
- **Exelon Corporation and Pepco Holdings, Inc.**
  Analyzed customer and state economic benefits of the proposed merger. (2014–2015)
- **Major electric utility**
  Conducted independent review of the company's internal customer and shareholder analyses of long-term resource options. (2014)

- **Major merchant generating company**
  Conducted valuation of assets. (2014)
- **Entergy Wholesale Commodities**
  Provided strategic advice on wholesale and retail market issues in the Northeast power markets. (2013–2016)
- **Hualapai Tribe**
  Provided strategic advice regarding energy resource development and valuation of electric transmission rights of way. (2014–2017)
- **Barr Foundation**
  Prepared a report on the impacts of the Massachusetts Green Communities Act of 2008 on the Massachusetts economy. (2013–2014)
- **Five California Utilities (LADWP, PG&E, SCE, SDG&E, SMUD)**
  Served on the four-person expert independent advisory panel for the third-party study of integration of renewable energy into California's Electric System. Contributed to report titled "Investigating a Higher Renewables Portfolio Standard in California." (2013–2014)
- **State of Colorado**
  Prepared expert report on behalf of the three public utility commissioners in Colorado, in support of the complaint against them on implementing Colorado's renewable energy standard under alleged violations of the interstate commerce clause. (2013–2014)
- **Energy Foundation**
  Wrote white paper on the implications for electric system reliability of the US EPA's implementation of its authority under Section 111(d) of the Clean Air Act, to regulate greenhouse gas emissions from existing power plants. (2013–2014)
- **Major engineering, construction and project management company**
  Prepared an expert report on electric market conditions in a dispute surrounding cancellation of a major power plant. (2012–2017)
- **Ambri (battery company)**
  Analyzed energy system issues related to integration of renewables on a military base. (2013–2014)
- **Advanced Energy Economy Institute**
  Facilitated workshop for state utility commissioners in Midwest states, on advanced energy technologies and related regulatory issues. (2013)
- **Environmental Defense Fund – North Carolina**
  Testified on energy efficiency program design issues. (2013)
- **Advanced Energy Economy Institute (with the New England Clean Energy Council and the New England Conference of Regulatory Utility Commissioners)**
  Supported workshop on advanced energy technologies and related regulatory issues. (2013)
- **Lawrence Berkeley National Laboratory Energy Program**
  Provided support on regulatory issues at the NJ Board of Public Utilities on smart grid workshop. (2013)

- **Advanced Energy Economy Ohio**
  Provided testimony before the Ohio Senate Public Utilities Committee in support of the Ohio Energy Efficiency Resource Standard. (2013)
- **Pepco Holdings Inc., and its operating affiliates, Potomac Electric Power Company, Delmarva Power & Light Company, and Atlantic City Electric Company**
  Provided testimony in support of appropriate incentives for investment in electric transmission. (2013)
- **Baltimore Gas and Electric Company**
  Provided testimony in support of appropriate incentives for investment in electric transmission. (2013)
- **Advanced Energy Economy Institute**
  Survey of CEOs of advanced energy companies doing business in California, with regard to the state's energy and environmental policies. (2012–2013)
- **NSTAR and Cape Wind**
  Provided testimony in support of the long-term power purchase agreement of NSTAR and Cape Wind. (2012)
- **Energy Foundation**
  Conducted strategic planning for the China Sustainable Energy Program. (2012)
- **Pacific Gas & Electric Company**
  Provided testimony on ratemaking issues for PG&E's proposed pipeline safety enhancement plan. (2012)
- **COMPETE Coalition**
  Provided testimony on energy efficiency as part of the performance of state and wholesale electric markets in New Jersey. (2011)
- **Compressed Air Energy Storage Company**
  Confidential engagement to analyze regional wholesale markets for baseload and renewable energy power generation. (2011)
- **Merck Family Foundation**
  Analyzed the economic impacts of the funds collected through the auction of allowances under the Regional Greenhouse Gas Initiative. (2011)
- **American Clean Skies Foundation Corporation**
  Analyzed the reliability and air emission issues associated with potential retirement of the Potomac River Generating Station. (2011)
- **Colorado Public Utilities Commission**
  Analyzed the Colorado solar photovoltaic incentive program. (2011)
- **Exelon Corporation and Constellation Energy (Baltimore Gas & Electric)**
  Analyzed the economic impacts on the Maryland economy associated with the proposed clean-energy commitments tied to the proposed merger of Exelon and Constellation Energy. (2011–2012)

- **New England Power Generators Association**
  Analyzed competition issues associated with the proposed merger of Northeast Utilities and NSTAR. (2011)
- **Dominion Generation**
  Analyzed the proposed state tax on output from in-state power generation. (2011)
- **Exelon Corporation and Clean Energy Group**
  Analyzed electric industry issues involved in responding to the US EPA's air emission regulations. (2010–2015)
- **Major electric distribution company and independent power producer**
  Analyzed the net benefits of retiring a set of generating units, and replacing it with a long-term contract to provide power from a gas-fired power plant and biomass power plant. Modeled locational energy prices, capacity prices, and revenue streams in the region. (2010)
- **Major electric utility company**
  Analyzed changing fuel-market conditions affecting the value of gas-fired power generation in the context of litigation. (2010)
- **Commonwealth Edison Company**
  Analyzed the ratemaking issues for an electric distribution utility with respect to energy efficiency program effects in Illinois. (2010–2011)
- **National Grid – Massachusetts electric distribution companies**
  Analyzed the market for and other attributes of the long-term contract for power from the Cape Wind project. (2010)
- **Spectra Energy (with the Interstate Natural Gas Association of America)**
  Analyzed the markets for natural gas, and analysis of the implications of the US EPA's Advanced Notice of Proposed Rulemaking on PCBs. (2010–2011)
- **Renewable energy company**
  Analyzed transmission access, planning, cost allocation and siting conditions in regions through the US. (2010–2011)
- **Indian tribe in Midwest**
  Analyzed the value of an oil pipeline right-of-way. (2010)
- **Dominion Generation**
  Analyzed the proposed legislation in Connecticut to establish a windfall profits tax on all generating assets located in the state. (2010)
- **Transmission consortium**
  Analyzed cost-allocation models for an interstate transmission project involving transmission utilities and merchant transmission companies. (2009–2010)
- **Massachusetts renewable energy trust**
  Analyzed transmission-related models and considerations for the development of offshore renewable energy. (2009)

- **Major electric utility**
  Developed business models and approaches for deploying energy efficiency within the context of the American Climate and Energy Security Act framework. (2009)
- **Major industrial electricity consumer**
  Assisted in analyzing the implications of the American Climate and Energy Security Act for the company, in light of impacts on energy prices and trade considerations. (2009)
- **National Grid**
  Assisted in developing a revenue decoupling mechanism for retail distribution service, and providing expert witness assistance in electric and natural gas distribution rate cases in Massachusetts, Rhode Island, New York, and New Hampshire. (2009–2011)
- **Sandia Pueblo**
  Assisted in valuing a transmission corridor on tribal reservation land. (2008–2011)
- **Major electric and gas company**
  Provided analytic and strategic support for company's development of a business plan for energy efficiency and other energy-related investments on the customer side of the meter. (2008)
- **AEP Transmission**
  Prepared a white paper on the design and cost allocation framework for a high-voltage transmission system designed to support renewable and other resources. (2008)
- **Reliant**
  Prepared study assessing competition in the wholesale and retail electricity markets in ERCOT. (2008)
- **Major environmental organization**
  Analytic and strategic support for utility ratemaking policies for advancing energy efficiency in many states. (2008–2012)
- **New York Independent System Operator**
  Supported strategic planning and assessment for the Board of Directors. (2008–2010)
- **Commonwealth Edison Company**
  Provided testimony on ratemaking policy issues relating to regulatory lag. (2008)
- **Energy Association of Pennsylvania (EGA)**
  Analyzed of proposed legislation to cap retail electricity rates in Pennsylvania after the expiration of rate caps. (2008)
- **National Association of Regulatory Utility Commissioners (NARUC)**
  Prepared study on best practices relating to state regulatory agency policies and utility practices on competitive procurement of resources to serve retail electricity customers. (2007)
- **KeySpan/Boston Gas**
  Analyzed of the implications of utility ratemaking for valuation of utility assets for property taxation purposes. (2008)
- **Electric company**
  Analyzed of state's retail and wholesale power market structure. (2008)

- **Electric company**
  Prepared expert report on electric industry structure in the 1990s and 2000s. (2007–2008)
- **Major electric company**
  Provided analytic support for company's development of strategic plan for company-wide greenhouse gas reduction commitments. (2008)
- **Sierra Pacific Power Company**
  Provided testimony on policy issues relating to the use of historic, future, and hybrid test years in state utility rate cases. (2007–2008)
- **Harvard University**
  Provided strategic assistance relating to regulatory issues affecting the planning and design of Harvard's "green campus" development in Allston Landing. (2007–2008)
- **Public Service Gas & Electric Company of New Jersey (PSEG)**
  Provided assistance in facilitating the development of a policy to address "leakage" of greenhouse gas emissions associated with the adoption of a cap-and-trade program in various Northeast states and the interstate sales of electricity in various Northeast/MidAtlantic power markets. (2007)
- **Electric Power Supply Association**
  Prepared white paper on economic, environmental, and regulatory trends in the electric industry (2007).
- **Sempra Energy Company – San Diego Gas & Electric Company and SoCalGas Company**
  Provided testimony on policy issues relating to the provision of financial incentives to electric and gas utilities for the successful provision of energy efficiency programs. (2007)
- **PECO Energy Company**
  Provided advice on various economic and policy issues relating to electric industry restructuring policy. (2007). Provided testimony on issues relating to the market for alternative energy credits and the proposal of PECO to voluntarily solicit, procure, and bank alternative energy credits. (2007)
- **Commonwealth Edison Company**
  Provided testimony on issues relating to the relationship of auctions for wholesale supply for basic service customers and alternative proposals for utility resource procurement. (2007)
- **ISO New England**
  Assisting Regional Transmission Organization in scenario planning process examining various future technology mixes for New England's electric system. (2006–2007)
- **PJM**
  Preparing report on market monitoring functions performed under various federal regulatory agencies with responsibility to oversee electricity and energy markets (i.e., the Federal Energy Regulatory Commission and the Commodities Futures Trading Commission). (2006–2007)
- **Major Industrial and Power Plant Company**
  Assisted company (located outside of New England) in analyzing market and negotiating the price and other terms and conditions for long-term gas supply (2006–2007). Assisted company in valuing a power plant asset. (2007)

- **State of North Carolina**
  Provided expert witness services on electric utility economics and regulatory issues, on behalf of the North Carolina Attorney General in a nuisance lawsuit to require the Tennessee Valley Authority to put in place air pollution control equipment on coal-fired power plants in TVA's system. (2006–2008)
- **Major Regional Transmission Organization**
  Performed analysis of market conditions and trends, and benchmarking market rules and reliability performance with other comparable organizations – in support of RTO's strategic planning process. (2006–2007)
- **Special LNG Committee, Commonwealth of Massachusetts**
  Prepared report on the need for natural gas and liquefied natural gas in the Northeast, the need for LNG facilities, the role of government in the LNG facility siting process, and other issues relating to LNG proposals in the Commonwealth. Provided on *pro-bono* basis to the Commonwealth. (2006)
- **Ute Indian Tribe of the Uintah and Ouray Reservation**
  Prepared a report on economic and policy issues relating to use of tribal lands for energy rights-of-way, as called for in Section 1813 of the Energy Policy Act of 2005. (2006)
- **New York ISO**
  Prepared white paper on fuel diversity issues in the New York market. (2008)

  Prepared white papers on long-term contracting issues in states with restructured electric industries, and on the economic foundations for single-clearing-price markets versus pay-as-bid markets. (2007)

  Performed economic benefit/cost study of the introduction of competition into the wholesale electric market in the region. (2006–2007)
- **Commonwealth Edison Company**
  Provided testimony on appropriate ratemaking principles for recovery of pension-related costs in proceeding to set rates to go into effect following the transition period. (2006)
- **Commonwealth Edison Company**
  Provided testimony on economic principles associated with single-price auction design versus pay-as-bid auction design, for the procurement of wholesale power supplies to meet the needs of retail all-requirements customers. (2006)
- **Exelon Corporation**
  Provided analysis of designs of mandatory carbon control policies. (2005–2007)
- **Sonosky, Chambers, Sachse, Endreson & Perry, LLP, on behalf of various Indian Tribes**
  Provided analysis in support of comments filed with the Departments of Interior and Energy with respect to the study of energy rights of way on tribal land which was called for in Section 1813 of the Energy Policy Act of 2005. (2005–2006)

  Provided analysis in support of various tribal negotiations with energy companies with respect to valuation of energy rights of way on tribal reservation lands. (2007)
- **Electric utility company**
  Performed independent evaluator services in procurement for power resources. (2005–2006)
- **Power Generation Company**
  Provided analysis of product market development in MidWest and Eastern RTOs. (2005)

- **New England Energy Alliance**
  Prepared a white paper on energy infrastructure needs in the New England states. (2005)
- **Committee on Regional Electric Power Cooperation (of the Western Interstate Energy Board)**
  Provides research on market monitoring for Western wholesale electric markets. (2005–2007)
- **Southern California Edison Company**
  Provided Independent Evaluator services for a competitive procurement of new long-term generation resources and renewable resources. (2005)
- **LNG / Interstate Gas Pipeline project – Duke Energy/Excelerate project**
  Prepared regional market study for the project proposed for Massachusetts. (2004–2005)
- **Electric Generating Company**
  In a contract dispute, provided expert witness services relating to whether changes in a region's wholesale power market rules nullified a power sales agreement. (2004–2006)
- **Louisville Gas & Electric and Kentucky Utilities**
  For two vertically integrated electric companies, provided expert witness services in a state investigation of which regional transmission approach satisfies state policy objectives. (2004)
- **Independent Generating Company**
  For a power company owned by commercial lenders in a Northeast power market, provided consulting services to monitor state regulatory policies and actions with respect to utility regulation and environmental regulation, and legislation affecting power plants. (2004)
- **Major Electric and Gas Company**
  Performed confidential study of the benefits, costs and current conditions in certain wholesale and retail electric power markets. (2004–2005)
- **Regional Transmission Organization**
  For a confidential project, analyzed market monitoring and mitigation approaches. (2004–2005)
- **Major Commercial Bank**
  For a confidential project, advise with regard to electric industry restructuring and profitability of large energy marketer and trading organization. (2004–2005)
- **Consumer Energy Council of America**
  For a group of electric industry market participants, regulators, and interest groups, prepared white papers on the need for transmission enhancements in US power markets. (2004)
- **Retail electric company**
  Provides confidential analysis of business models and regulation approaches for providing retail electric service in the state. (2004)
- **Independent system operator**
  Provided confidential analysis and research on aligning retail and wholesale market policies. (2004)
- **California State attorney general**
  Provided expert witness services with regard to state resource adequacy & planning practices. (2004)

- **Pacific Gas & Electric Company**
  Provided expert witness services relating to the public benefits of the settlement between PG&E and the California Public Utility Commission, to enable PG&E to emerge from bankruptcy. (2003)
- **Independent power company**
  Provided consulting advice on economics of compliance strategies for air and water permits. (2003)
- **Major public utility company**
  Provided expert advisory services to a buyer of power supplies relating to the pricing and other terms for a long-term purchase power agreement. (2003)
- **Duke Power**
  Provided expert advisory services relating to rate-making and other regulatory practices. (2003)
- **Exelon Generation**
  Provided strategic advice and analytic services relating to market conditions affecting the client's generating assets in New England. (2003)
- **Entergy Services Inc.**
  Provides services as the independent monitor of Entergy's Fall 2002, Spring 2003, and Fall 2003 Requests for Proposals for Supply-Side Resources. (2002–2005)
- **Power generation company in New England**
  Provided expert testimony in contract dispute regarding allocation of uplift costs in an agreement concerning the supply of wholesale power for standard offer service. (2002)
- **Connecticut Light and Power Company**
  Provided expert testimony in contract dispute regarding allocation of congestion costs in an agreement concerning the supply of wholesale power for standard offer service. (2002–2003)
- **Ocean State Power**
  Provided arbitration services in a dispute regarding a gas purchase contract between Ocean State Power and ProGas Ltd. (2002–2003)
- **Regional independent system operator**
  Provided strategic advice on regional transmission organization strategy. (2002)
- **PJM Interconnection**
  Provided advice to the appointed mediator as part of the Alternative Dispute Resolution process, in a dispute involving PJM and a market participant. (2002)
- **Duke Energy Corporation**
  Provided analysis on strategic issues in gas and electric regulatory policy for Duke Energy's corporate office, including with regard to code of conduct issues, wholesale competition, regional transmission organization policy. (2001–2002)
- **Pacific Gas and Electric Corporation**
  Provided expert witness testimony in proceedings of the FERC on public benefits of the proposed restructuring of PG&E assets as part of its emergence from bankruptcy. (2001–2002)
- **Massachusetts Renewables Trust**
  Provided assistance in support of the Trust's renewables and power quality program. (2001–2002)

- **Major electric holding company**
  Prepared an analysis of the regulatory policies for reviewing merger applications in states where potential merger candidates are located. (2001)
- **Western Massachusetts Electric Company**
  Provided expert testimony in contract disputes regarding allocation of congestion costs in agreements concerning the supply of wholesale power for standard offer service. (2001–2002)
- **The Energy Foundation**
  Researched and wrote a white paper on California's process for permitting new power plants. (2001)
- **Cross-Sound Cable Company**
  Provided expert testimony regarding public benefits of proposal to construct merchant transmission facility across Long Island Sound. (2001–2002)
- **Major independent power company**
  Provided expert witness support in litigation surrounding power plant development project, involving viability of project's environmental and siting permitting. (2001–2004)
- **MASSPOWER Inc.**
  Mediator in a contract dispute involving pricing of power purchases. (2001)
- **NRG Energy and Dynegy**
  Provided expert witness support in regulatory proceeding to review these companies' acquisition of power plants being divested by Sierra Pacific and Nevada Power. (2001)
- **Occidental Chemical Corporation**
  Provided expert witness support and economic analysis of a major electric utility's transmission policies and practices, and review of the proposed RTO. (2000)
- **PP&L Global**
  Provided economic and environmental analysis and expert witness support for proposal to build the Kings Park Energy power plant in Long Island, New York. (2000)
- **Calpine Corporation**
  Provided economic and environmental analysis and expert witness support for the Wawayanda power project in Rockland County, NY and for the Towantic power plant in Oxford, Connecticut. (2001)
- **American National Power, Calpine, El Paso, NRG Energy, Sithe, Southern Energy**
  Provided support for the development of a proposal for a Regional Transmission Organization for New England. (2000–2001)
- **Duke Energy/Maritimes and Northeast Pipeline**
  Provided expert reports on the market and environmental impacts of new natural gas infrastructure and supply in New England and the public benefits of the Maritimes and Northeast Phase III and Hubline project. (2000–2003)
- **Arkansas Electric Distribution Cooperatives and Arkansas Electric Cooperative Corporation**
  Provided expert witness support and analysis on economic and public policy issues associated with various aspects of wholesale and retail competition in Arkansas. (2000–2001)

- **TransÉnergie U.S.**
  Provided expert testimony regarding public benefits of proposal to construct merchant transmission facility. (2000–2001)
- **Conectiv**
  Provided strategic wholesale market analysis and support for procurement of supplies for distribution utility company's provision of Basic Generation Services to retail customers. (2000)
- **SCS Energy Corp. – Astoria Energy**
  Provided economic and environmental analysis and expert witness support for proposal to build new power plant in New York City. (2000–2001)
- **HEFA Power Options**
  Provided strategic advice regarding wholesale power market for retail buyers' group. (2000–2003)
- **Major real estate development company**
  Provided strategic support for configuration of electric and gas infrastructure for large regional mixed-use development project. (2000–2001)

TESTIMONY

- **Many confidential expert reports, testimonies, declarations, affidavits, and depositions in confidential arbitrations and mediations.**
- **Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison Company**
  Before the *California Public Utility Commission*, in the matter of the Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Annual Local and Flexible Procurement Obligations for the 2019 and 2020 Compliance Years, Rulemaking 17-09-020, July 10, 2018.
- **Dominion Energy Nuclear Connecticut**
  Before the *Connecticut Public Utilities Regulatory Authority*, in the matter of implementation of Public Act 17-3, Docket No. 18-05-04, May 2018.
- **Dominion Energy Nuclear Connecticut**
  Before the *Connecticut Department of Energy & Environmental Protection and Public Utilities Regulatory Authority,* in the matter of DEEP's and PURA's joint proceeding to implement the Governor's Executive Order Number 59, Docket No. 17-07-32; affidavit, January 8, 2018.
- **Commonwealth Edison Company (ComEd)**
  Before the *Illinois Commerce Commission*, in the matter of ComEd's petition concerning the implementation of a demonstration distribution migrogrid, Docket No. 17-0331, rebuttal testimony submitted October 27, 2017; surrebuttal testimony, November 20, 2017.
- **On her own behalf**
  Before the *House Committee on Energy and Commerce, Subcommittee on Energy,* Hearing on "Powering America: Defining Reliability in a Transforming Electricity Industry, October 3, 2017 (testimony dated September 12, 2017, the original date of the hearing).
- **NorthStar Decommissioning Holdings, LLC, NorthStar Nuclear Deocommissioning Company, LLC, NorthStar Group Services, Inc., LVI Parent Corp., NorthStar Group Holding, LLC, Entergy Nuclear Vermont Investment Company, and Entergy Nuclear Operations, Inc.**
  Before the *Vermont Public Service Board,* in the matter of the Joint Petition to transfer ownership of

Entergy Nuclear Vermont Yankee, LLC, Docket No. 8880, December 16, 2016.

- **Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC, Entergy Nuclear FitzPatrick, LLC, and Entergy Nuclear Operations, Inc.**
  Before the *New York Public Service Commission*, in the matter of the Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Case 15-E-0302, Affidavit of Susan Tierney Regarding the Staff White Paper on a Clean Energy Standard, April 21, 2016.
- **Environmental and Public Health Respondent-Intervenors (Natural Resources Defense Council, Environmental Defense Fund, Sierra Club, Center for Biological Diversity, American Lung Association, Clean Air Council, Clean Wisconsin, Conservation Law Foundation, and Ohio Environmental Council, West Virginia Highlands Conservancy, Ohio Valley Environmental Coalition, Coal River Mountain Watch, Kanawha Forest Coalition, Mon Valley Clean Air Coalition and Keepers of the Mountains Foundation)**
  Before the *US Court of Appeals for the District of Columbia Circuit*, Nos. 15-1365 and Consolidated Cases, *In re: West Virginia, et al.*, on Petitions for the US EPA, prepared declaration, December 8, 2015.
- **New England Power Generators Association (NEPGA)**
  Before the *Massachusetts Joint Committee on Telecommunications, Utilities and Energy*, Hearing on Clean Energy Procurement, Transmission and Financing, Statement on SB 1965 (An Act relative to energy sector compliance with the Global Warming Solutions Act), September 29, 2015
- **Natural Resources Defense Council, Environmental Defense Fund, Sierra Club, Center for Biological Diversity, Clean Air Council, Clean Wisconsin, and Conservation Law Foundation**
  Before the *US Court of Appeals for the District of Columbia Circuit*, Nos. 15-1277 & 15-1284 in Re: West Virginia, et al., and in Re: Peabody Energy Corp., on Petitions for Extraordinary Writ, prepared declaration, August 31, 2015.
- **Pepco Holdings, Inc., and its operating affiliates, Potomac Electric Power Company, Delmarva Power & Light Company, and Atlantic City Electric Company**
  Before the *Federal Energy Regulatory Commission*, in Delaware Division of Public Advocate, *et al.*, v. Baltimore Gas and Electric Company and Pepco Holdings Inc., Docket No. EL13-48-000, April 3, 2013; prepared answering testimony, June 2, 2015; and prepared cross-answering testimony, August 21, 2015.
- **Hawaii Gas Company**
  Before the *Public Utilities Commission of Hawaii*, in the Matter of the Application of Hawaiian Electric Company, Inc., Hawaii Electric Light Company, Inc., Maui Electric Company, Limited, and NextEra Energy, Inc., for Approval of the Proposed Change of Control and Related Matters, Docket No. 2015-0022, answering and direct testimony filed July 20, 2015, rebuttal testimony, October 5, 2015. Cross-examination under oath, February 9, 2016.
- **Delaware Department of Natural Resources and Environmental Control**
  Before the *Superior Court of the State of Delaware in and for Sussex County*, C.A. No. S13C-12-025 RFS, in Re: David T. Stevenson, et al., v. Delaware Department of Natural Resources and Environmental Control and David S. Small, prepared affidavit, July 15, 2015, prepared affidavit, September 8, 2016; prepared affidavit, June 7, 2016; prepared affidavit, June 2, 2017; deposition, August 9, 2017; testimony at trial, December 4, 2017.
- **On her own behalf**
  Before the H*ouse Committee on Science, Space and Technology*, Subcommittee on the Environment and Subcommittee on Energy, Hearing on the US Energy Information Administration Report: Analysis of

the EPA's Clean Power Plan, June 24, 2015.

- **Baltimore Gas and Electric, Pepco Holdings Inc. and PHI's affiliates Pepco, Delmarva Power, and Atlantic City Electric**
  Before the F*ederal Energy Regulatory Commission*, in the Matter of Delaware Division of the Public Advocate, et. al., v. Baltimore Gas and Electric Company, et al, Docket Nos. EL13-48-001 and EL15-27-000 (Consolidated), June 2, 2015.
- **On her own behalf**
  Before the *House Committee on Commerce and Energy*, Subcommittee on Energy and Power, Hearing to Examine EPA's Proposed 111(d) Rule for Existing Power Plants and the Proposed Ratepayer Protection Act, April 14, 2015.
- **Exelon Generating Company LLC**
  Before the *Massachusetts Energy Facilities Siting Board* for Approval to Construct a 200 MW Simple Cycle Combustion Turbine Generating Facility in the Town of Medway, Massachusetts, Exelon West Medway, LLC/Exelon West Medway II, LLC, EFSB Docket No. 15-1/D.P.U. 15-25, March, 2015; cross-examination under oath, December 8, 9, and 14, 2015.
- **On her own behalf**
  Before the *House Committee on Investigations and Government Oversight*, Subcommittee on Interior, Hearing to Examine the Impacts of EPA Air and Water Regulations on the States and the American People, February 26, 2015.

- **Exelon Corporation and Pepco Holdings, Inc.**
  Before the *District of Columbia Public Service Commission*, In the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., prefiled direct testimony (June 18, 2014); rebuttal testimony (December 17, 2014); testimony under cross-examination (April 8, 2015); direct testimony in support of Settlement Agreement, October 20, 2015; testimony under cross-examination, December 4, 2015.
- **On her own behalf**
  Before the F*ederal Energy Regulatory Commission*, Technical Conference on Environmental Regulations and Electric Reliability, Wholesale Electricity Markets, and Energy Infrastructure, Docket No. AD15-4-000, February 19, 2015.
- **Exelon Corporation and Pepco Holdings, Inc.**
  Before the *Maryland Public Service Commission*, In the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., prefiled direct testimony (August 19, 2014); rebuttal testimony (January 7, 2015); testimony under cross-examination (January 26–27, 2015); post-settlement testimony (March 27, 2015); supplemental post-settlement testimony (April 14, 2015); testimony under cross-examination (April 15, 2015).
- **Algonquin Gas Transmission and Maritimes & Northeast Pipeline (Spectra Energy)**
  Before the *Maine Public Utilities Commission*, Investigation of Parameters for Exercising Authority Pursuant to the Maine Energy Cost Reduction Act, 35-A M.R.S.A. § 1901, Docket No. 2014-00071, testimony under cross-examination, July 11, 2014, and August 8, 2014.
- **Exelon Corporation and Pepco Holdings, Inc.**
  Before the *Delaware Public Service Commission*, In the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., prefiled direct testimony (June 27, 2014), rebuttal testimony (January 12, 2015).
- **Exelon Corporation and Pepco Holdings, Inc.**
  Before the *New Jersey Board of Public Utilities,* In the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., prefiled direct testimony (June 27, 2014), rebuttal testimony (December 10,

2014)

- **Exelon Corporation and Pepco Holdings, Inc.**
  Before the *District of Columbia Public Service Commission,* In the Matter of the Merger of Exelon Corporation and Pepco Holdings, Inc., prefiled direct testimony (June 18, 2014), rebuttal testimony (December 17, 2014).
- **On her own behalf**
  Before the *Oregon State Legislature*'s House Interim Committee on Revenue, Senate Interim Committee on Finance and Revenue, on "Consideration of the Feasibility and Implications of a Clean Air Tax or Fee in Oregon: Implementing Greenhouse Gas Emission Reduction Policies – Experience from Other States," January 15–16, 2014.
- **On her own behalf**
  Before the *US House of Representatives Energy and Commerce Subcommittee on Energy and Power*, "Hearing on EPA's Proposed GHG Standards for New Power Plants and H.R. _, Whitfield- Manchin Legislation," November 14, 2013**.**
- **Joshua Epel, James Tarpey, and Pamela Patton, et al.**
  Before the *US District Court of the State of Colorado*, on behalf of Joshua Epel, James Tarpey, and Pamela Patton (commissioners of the Colorado Public Utilities Commission), and Environment Colorado, Conservation Colorado Education Fund, Sierra Club, The Wilderness Society, Solar Energy Industries Association, and Interwest Energy Alliance, in re: *American Tradition Institute and Rod Lueck, v. Epel at al*., Civil Action Number 11-cv-00859-WJM-BMB, expert report, November 7, 2013.
- **On her own behalf**
  Before the *Federal Energy Regulatory Commission*, in the Matters of Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators," Docket No. AD13-7-000, re: considerations for the future, September 9, 2013.
- **On behalf of Entergy Nuclear Vermont Yankee**
  Before the *US District Court, District of Vermont,* in Central Vermont Public Service Corporation and Green Mountain Power Corporation v. Entergy Nuclear Vermont Yankee, Docket No. 2:12-cv-10-wks, expert report, May 8, 2013.
- **Environmental Defense Fund and North Carolina Sustainable Energy Association**
  Before the *Public Utilities Commission of North Carolina*, Docket E-7, SUB 1032, August 7, 2013.
- **Advanced Energy Economy Ohio**
  Before the *Ohio Senate Public Utilities Committee* in support of the Ohio Energy Efficiency Resource Standard, April 9, 2013.
- **Pepco Holdings, Inc., and its operating affiliates, Potomac Electric Power Company, Delmarva Power & Light Company, and Atlantic City Electric Company**
  Before the *Federal Energy Regulatory Commission*, in Delaware Division of Public Advocate, *et. al*., v. Baltimore Gas and Electric Company and Pepco Holdings Inc., Docket No. EL13-48-000, April 3, 2013.
- **Major engineering, construction and project-management company**
  Prepared an expert report on electric market conditions in a dispute surrounding cancellation of a major power plant, 2012.
- **Baltimore Gas and Electric Company**
  Before the *Federal Energy Regulatory Commission*, in Delaware Division of Public Advocate, et al., v. Baltimore Gas and Electric Company and Pepco Holdings Inc., Docket No. EL13-48-000, April 3, 2013.
- **NSTAR Electric Company and Cape Wind LLC**

Before the *Massachusetts Department of Public Utilities*, in the Petition of NSTAR Electric Company for Approval of a Proposed Long-Term Contract for Renewable Energy with Cape Wind Associates, LLC Pursuant to St. 2008, c. 169, §83, Prefiled Direct Testimony, March 30, 2012; testimony under cross-examination, August 2, 2012.

- **Pacific Gas and Electric Company**
  Before the *California Public Utilities Commission*, in the Rulemaking on the Commission's Own Motion to Adopt New Safety and Reliability Regulations for Natural Gas Transmission and Distribution Pipelines and Related Ratemaking Mechanisms, Rulemaking 11-02-019, Rebuttal Testimony filed on February 28, 2012; testimony under cross-examination, March 20, 2012.
- **COMPETE Coalition**
  Before the *New Jersey Board of Public Utilities*, In the Matter, In the Matter of the Board's Investigation of Capacity Procurement and Transmission Planning, Docket No. EO11050309, October 14, 2011.
- **On her own behalf**
  Before the *US House Energy and Commerce Committee*, Subcommittee on Energy and Power, EPA Regulations and Electric System Reliability, September 14, 2011.
- **On her own behalf**
  Before the *US Senate Environment and Public Works Committee*, Subcommittee on Clean Air and Nuclear Safety, June 30, 2011, Oversight Hearing: Review of EPA Regulations Replacing the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR).

- **Exelon Corporation and Constellation Energy Group**
  Before the *Maryland Public Service Commission,* In the Matter of the Merger of Exelon Corporation and Constellation Energy Group, Case No. 9271, prefiled direct testimony (May 25, 2011); rebuttal testimony (October 12, 2011), supplemental testimony (December 15, 2011), testimony under cross-examination (November 10, 2011, January 25, 2012).
- **New England Power Generators Association**
  Before the *Massachusetts Public Utilities Commission,* In the Matter of the Joint Petition for Approval of Merger [of Northeast Utilities and NSTAR] Pursuant to G.L. c. 164 , § 96, Docket D.P.U. 10-170, prefiled direct testimony (May 20, 2011); testimony under cross-examination (July 15 and 18, 2011).
- **Commonwealth Edison Company**
  Before the *Illinois Commerce Commission*, Investigation of Proposed General Increase in Electric Rates of Commonwealth Edison Company, Docket No. 10-0467, ComEd Exhibit 13.0, prefiled direct testimony (filed June 30, 2010); rebuttal testimony (filed November 22, 2010); surrebuttal testimony (filed January 2, 2011), testimony under cross-examination (January 18, 2011).
- **National Grid: Massachusetts Electric Company and Nantucket Electric Company**
  Before the *Massachusetts Department of Public Utilities*, Investigation as to the Petition of Massachusetts Electric Company and Nantucket Electric Company each d/b/a National Grid for approval by the Department of Public Utilities of two long-term contracts to purchase wind power and renewable energy certificates, pursuant to G.L. c. 169, § 83 and 220 C.M.R. § 17.00 et seq. – Docket D.P.U. 10-54 (the Cape Wind contract proceeding), prefiled direct testimony (filed June 4, 2010), rebuttal testimony (filed September 1, 2010), testimony under cross examination (September 8, 13, 14, 23, 24, 2010).
- **National Grid: Boston Gas Company, Essex Gas Company, Colonial Gas Company**
  Before the *Massachusetts Department of Public Utilities*, Investigation as to the Propriety of Proposed Tariff Changes, Docket No. D.P.U. 10-55, prefiled direct testimony (filed April 16, 2010); testified under cross-examination, June 28–29, 2010.

- **National Grid: EnergyNorth Natural Gas, Inc., d/b/a National Grid NH**
  Before the *New Hampshire Public Utilities Commission*, Investigation as to the Propriety of Proposed Natural Gas Tariff Changes, Docket DG 10-017, prefiled direct testimony (filed February 26, 2010).
- **National Grid: Niagara Mohawk Power Corporation**
  Before the *New York Public Service Commission*, Investigation as to the Propriety of Proposed Electric Tariff Changes, Docket No. 10-E-0050, prefiled direct testimony (filed January 29, 2009), rebuttal testimony (filed August 2010).
- **National Grid: Narragansett Electric Company**
  Before the *Rhode Island Public Utilities Commission,* Investigation as to the Propriety of Proposed Tariff Changes, Docket No. R.I.P.U.C. 4065, prefiled direct testimony (filed June 1, 2009; testimony under cross-examination, November 4, 2009).
- **National Grid: Massachusetts Electric Company and Nantucket Electric Company**
  Before the *Massachusetts Department of Public Utilities*, Investigation as to the Propriety of Proposed Tariff Changes, Docket No. D.P.U. 09-39, prefiled direct testimony (filed May 15, 2009; testimony under cross-examination, August 7 and 25, 2009, and September 8, 2009).
- **Amerada Hess Corp., et al.**
  Before the *District Court of the United States for the Southern District of New York*, on behalf of Amerada Hess Corp., et al., in *City of New York v. Amerada Hess Corp. et al.*, Case No. 1:00-1898, testimony in deposition, May 12, 2009.
- **State of North Carolina**
  Before the *District Court of the United States for the Western District of North Carolina*, on behalf of North Carolina in *State of North Carolina, ex rel. Roy Cooper, Attorney General, v. Tennessee Valley Authority*, Case No. 1:06CV20, testimony in deposition, May 17, 2007; testimony at July 22, 2008.
- **KeySpan Energy Delivery (National Grid)**
  Before the *Massachusetts Appellate Tax Board*, Boston Gas Company, d/b/a KeySpan Energy Delivery New England v. City of Boston, Docket No. F275055-F275056 (FY 2004), F279207-F279208 (FY 2005), F284088-F286194 (FY 2006), testimony and cross-examination, May 20–21, 28, June 4, 2008.
- **Commonwealth Edison Company**
  Before the *Illinois Commerce Commission*, Investigation of Proposed General Increase in Electric Rates of Commonwealth Edison Company, Docket No. 07-0566, ComEd Exhibit 18.0, prefiled rebuttal testimony (filed April 12, 2008).
- **Sierra Pacific Power Company**
  Before the *Public Utilities Commission of Nevada*, In the Matter of the Application of Sierra Pacific Power, filed pursuant to NRS 704.110(3), for authority to increase its general rates charged to all classes of electric customers to reflect an increase in annual revenue requirement, Docket No. 07-12 (filed December 3, 2007), Prefiled Direct Testimony; cross examination, April 17–18, 2008.
- **Amerada Hess Corp., et al.**
  Before the *District Court of the United States for the Southern District of New York*, on behalf of Amerada Hess Corp., et al., in *County of Suffolk and Suffolk County Water Authority v. Amerada Hess Corp. et al.*, Case No. 1:00-1898, testimony filed October 1, 2007.
- **Sempra Energy Company – San Diego Gas & Electric Company and SoCalGas Company**
  Before the *California Public Utility Commission*, Order Instituting Rulemaking to Examine the Commission's post-2005 Energy Efficiency Policies, Programs, Evaluation, Measurement and Verification and Related Issues, Rulemaking Docket 06-04-010 (Filed April 13, 2006), testimony filed May 3, 2007, cross examination, May 29, 2007.

- **Commonwealth Edison Company**
  Before the *Illinois Commerce Commission*, Investigation of Rider CPP of Commonwealth Edison Company, and Rider MV of Central Illinois Light Company d/b/a AmerenCILCO, of Central Illinois Public Service Company d/b/a/ AmerenCIPS, and of Illinois Power Company d/b/a Ameren IP, pursuant to Commission Orders regarding the Illinois Auction, Docket No. 06-0800, testimony filed April 6, 2007; cross-examination, April 24, 2007.

- **PECO Energy Company**
  Before the *Pennsylvania Public Utility Commission*, Petition of PECO for Approval of (1) a Process to Procure Alternative Energy Credits During the AEPS Banking Period, and (2) A Section 1307 Surcharge and Tariff to Recover AEPS Costs, Prefiled Direct Testimony, March 19, 2007.

- **Masspower**
  Before the *Superior Court Department of Suffolk County*, Massachusetts, Massachusetts Municipal Wholesale Electric Company v. Masspower, et al., Civil No. 05-02710 (BLS1), on the changes in conditions in the electric industry in New England as they relate to Masspower's performance under its power supply agreement with MMWEC; Expert Report, September 11, 2006; oral testimony under cross examination at trial, October 16–17, 2006.

- **Commonwealth Edison Company**
  Before the *Illinois Commerce Commission*, Proposed general increase in electric rates, general restructuring of rates, price unbundling of bundled service rates, and revision of other terms and conditions of service, Docket No. 05-0597, Rebuttal Testimony, January 30, 2006; Surrebuttal Testimony, March 14, 2006; oral testimony under cross-examination, March 23, 2006. Testimony on rehearing, September 20, 2006.

- **Commonwealth Edison Company**
  Before the *Illinois House of Representatives, Electric Utility Oversight Committee*, on the Pay-as-Bid versus Uniform Price Auction Approach To Procurement of Wholesale Power for ComEd's Full-Requirements Customers, January 18, 2006, Springfield, Illinois.

- **Louisville Gas & Electric Company and Kentucky Utilities Company**
  Before the *Kentucky Public Service Commission*, Application of LG&E and KU to transfer functional control of their transmission assets, Direct Testimony, November 19, 2005.

- **Western Massachusetts Electric Company**
  Before the S*uperior Court Department of Norfolk County*, Massachusetts, Alternative Power Source, Inc., v. Western Massachusetts Electric Company, Civil Action No. 00-1967, on the allocation of costs related to transmission congestion in wholesale power contract for standard offer service. Expert Report, September 19, 2001; deposition, October 15, 2001; testimony at trial, July 15, 2005.

- **Entergy Louisiana, Inc. and Entergy Gulf States Inc.**
  Before the *Louisiana Public Service Commission*, Application of Entergy Louisiana, Inc. for Approval of the Purchase of Electric Generating Facilities and Entergy Gulf States, Inc. for Authority to Participate in Contract for the Purchase of Capacity and Electric Power, Docket No. U27836, January 21, 2005.

- **Louisville Gas & Electric Company and Kentucky Utilities Company**
  Before the *Kentucky Public Service Commission*, Investigation Into The Membership of Louisville Gas and Electric Company and Kentucky Utilities Company In The Midwest Independent Transmission System Operator, Inc., Case No. 2003-00266, September 29, 2004; Supplemental Rebuttal Testimony, January 10, 2005; testimony at hearing, June 2005.

- **Entergy Services Inc.**

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"The Evolution of Utility and Regulatory Reform in the U.S.," 2018 e21 Forum #1: Toward a 21st C. Electric System in Minnesota, March 20, 2018.

"The Natural Gas/Electricity Nexus," Keystone Energy Board meeting, Keystone CO, February 9, 2018.

"Critical Aspects of Transitioning to Competitive Energy Markets from a Wholesale and Retail Perspective & Renewable Energy Procurement in Restructured Markets," Committee on Energy Choice, State of Nevada, Las Vegas, November 7, 2017.

"Firm With Trump Cabinet Ties Scores $300M Puerto Rico Power Contract," On Point radio show on restoration of Puerto Rico's electric grid, WBUR/NPR, October 25, 2017.

"Beyond Baseload? Electricity Markets and Reliability," Keystone Energy Board meeting, Washington, DC, October 24, 2017.

"The Future of Baseload in the West," Committee on Regional Electric Power Cooperation (CREPC), Reno, October 17, 2017.

"Regulatory Paths Forward for a Clean Grid," Harvard Law School, Cambridge, October 13, 2017.

"This Thing about Coal and Nukes," Grid Geeks Podcast, October 6, 2017.

"What Do Americans Think about the Direction of Energy and Climate Policy?" EPIC, University of Chicago, October 4, 2017.

"Preparing for the Future: Challenges and Opportunities of Modernizing the Grid," NextGrid Illinois conference, Chicago, September 28, 2017.

"Designing America's Energy Future," National Renewable Energy Laboratory's 40th Anniversary meeting on energy innovation, Golden, CO, September 20, 2017.

"The Future of Power Markets in a Low Marginal Cost World: Electricity Sector Overview," Resources for the Future, September 14, 2017.

"The National Academy of Sciences Report on Electric System Resiliency: Natural Gas and Electric System Interdependencies," NAESB, September 7, 2017.

"Valuing Distributed Energy Resources," Aspen Energy Policy Forum, July 2017.

"The Road from Paris: A Conversation with the Former Secretary of Energy Ernie Moniz," Aspen Ideas Festival, July 2017.

"How Policy Choices Today Will Impact the Future of Electric Power," Edison Electric Institute, Annual Meeting, Boston, MA, June 12, 2016.

"Big Think Presentations on the Future of Retail Electricity Service," California Public Utilities Commission and California Energy Commission, Joint En Banc on Changing Nature of Consumer and Retail Choice in California, Sacramento, CA, May 19, 2017.

"Energy Resources: The Right Mix – or Mix It Up? Is What We Need Compatible With The Region's Energy Goals?" Northeast Energy and Commerce Association, Mystic, CT, May 10, 2017.

"Comments at the FERC Technical Conference on Certain Matters Relating to State Policy Initiatives Affecting Wholesale Energy and Capacity Markets Operated by Eastern Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs): ISO New England Inc., New York Independent System Operator, Inc., and PJM Interconnection, L.L.C.,," Washington, DC, May 2, 2017.

"Utility of the Future: Valuing Distributed Energy Resources," Electric Power Research Institute (Research Advisory Committee), Tempe, AZ, March 7, 2017.

"Navigating the Energy and Environmental Policy Landscape," Nicholas School for the Environment, Duke University, Washington, DC, February 15, 2017.

"What is Next for the EPA's Carbon Regulations for Existing Power Plants?" NARUC Electricity Committee and the Energy Resources and the Environment Committee, Washington, DC, February 14, 2017.

"Carbon: A risk or an opportunity?" NARUC Energy Resources and the Environment Committee, Washington, DC, February 14, 2017.

"Managing the Energy Transition: Exploring Pathways to Deep Decarbonization," Bipartisan Policy Center, Washington, DC, December 8, 2016.

"The Clean Power Plan and Beyond: What to Expect in 2017…" NYU School of Law – Institute for Policy Integrity, New York, NY, November 15, 2016.

"Location, Location, Location, and the Value of Distributed Energy Resources," NARUC Annual Meeting, La Quinta, CA, November 14, 2016.

"Value of 'DER' to 'D': The role of distributed energy resources in local electric distribution system reliability," Presentation to NARUC Committee on Electricity, November 14, 2016, La Quinta, California.
"State Electric Industry Policies and Organized Wholesale Electricity Markets," Presentation to the NYISO Environmental Advisory Council, Albany, NY, November 4, 2016.

"Existing nuclear units and potential policy solutions: Approaches in other states beyond Illinois," Chicago, IL, October 18, 2016.

"Existing Nuclear Units – and New York's Clean Energy Standard," presentation to the NARUC Energy Resources and the Environment Committee – Monthly Conference Call, September 16, 2016.

"Understanding the Evolving Trends in the Eastern Interconnect," Duke Nicholas Institute for Environmental Policy Solutions/Great Plains Institute/Bipartisan Policy Center, An Expert Stakeholder Workshop – Power Sector Trends in the Eastern Interconnect: Implications for Environmental Policies & Investments, Atlanta, September 13, 2016.

"What does the U.S. need to do to meet its climate goals? Why Nuclear? How Much and How Fast?" Aspen Institute Forum on the Future of Nuclear Energy, Aspen, August 10, 2016.

Testimony of Susan F. Tierney, Ph.D. Before the Democratic Platform Committee, US Progress on Clean Energy Policy, Phoenix, June 17, 2016.

"Value of "DER" to "D": The Role of Distributed Energy Resources in Local Electric Distribution System Reliability," presentation to the MidAtlantic Conference of Regulatory Utility Commissioners (MACRUC), Williamsburg, VA, June 21, 2016.

"How does New Jersey Achieve a Low-Carbon Future?" New Jersey Spotlight conference, Trenton, NJ, June 3, 2016.

"Potential federal and state actions that could help address financial risks facing many existing nuclear power plants," US Department of Energy's Summit on Improving the Economics of America's Nuclear Power Plants, Washington, DC, May 19, 2016.

"New England's Electricity 'Restructuring:' Successes, disappointments, and what's next," 150th meeting of the New England Electricity Restructuring Roundtable, Boston, MA, May 18, 2016.

"Clearing the Way: Pioneering New York's Clean Energy Standard," Albany, NY, May 11, 2016.

"Electricity markets in transition," Annual Energy Summit of Columbia University's Center for Global Energy Policy, New York, NY, April 27, 2016.

"Value of "DER" to "D": The Role of Distributed Energy Resources in Local Electric Distribution System Reliability," presentation to the California Public Utility Commission's "Thought Leaders Forum," April 21, 2016.

"Transforming Power Systems: Challenges and Solutions," Annual meeting of the Joint Institute for Strategic Energy Analysis, NREL, Golden, CO, March 31, 2016.

"Background and Context: Eras of Electric Utility Industry (in 5 Minutes!)," New Orleans City Council/ Entergy New Orleans Electricity Symposium, March 22, 2016.

"Affordability, Cost Containment, and Economic Development: Complying with the Clean Power Plan," 3-N meeting (NARUC, NASEO, NACAA) on How State Agencies Are Working Together, Washington DC, February 11, 2016.

"Evaluating Clean Power Plan Pathways in a Dynamic Electricity Sector," Conference on Navigating the EPA's Clean Power Plan: Charting a Course for the Southeast, sponsored by Duke University Nicholas Institute for the Environment, Orlando, January 28, 2016.

NASEO/DOE/EIA, "2015 – 2016 Winter Energy Outlook Conference," National Press Club, Washington, DC, October 6, 2015.

"Outlook for Energy," Clinton Foundation Global Initiative, New York, NY, September 28, 2015.

"Reactions to the Clean Power Plan," NARUC Electricity Committee, Arlington, VA, August 14, 2015.

"Trends in national climate policy," Institute for Sustainable Cities, June 18, 2015.

"EPA's Clean Power Plan and its potential effects on system reliability," Mid-American Regulatory Commissioners (MARC) Conference, Milwaukee, June 8, 2015.

"Proposed Reliability Mechanisms for the Clean Power Plan," Bipartisan Policy Center Workshop, National Press Club, Washington DC, May 9, 2015.

"EPA's Proposed Clean Power Plan: Testing the tires, looking under the hood… How far does it take us toward a clean, modern electric system?" Cornell University, Ithaca, NY, November 2014.

"Readying States for New Greenhouse Gas Rules in the Electricity Sector," National Governors Association – Workshop for Governors' Energy Advisors, Washington, DC, September 22, 2014,

"Natural Gas and Renewable Energy Synergies: Challenges and Opportunities," North American Energy Standards Board (NAESB), Board Meeting, Houston, September 10, 2014.

"America's Electricity Evolution: New Policies, Regulations, and Technologies Converging to Change the Future of Power Production and Use," 2014 NASEO Annual Meeting, Savannah, September 2014.

"Implications for Energy, Economy, and Environment Under the Proposal," Environmental Council of the States (ECOS), Washington DC, July 31, 2014.

"Regional Options and Strategic Choices," NARUC Workshop on Regional Compliance Options for Sec. 111d, Washington DC, July 28, 2014.

"111d in Big D: Compliance Options, Regional Approaches, and Where We Go from Here," NARUC, Dallas, July 16, 2014.

"The National Climate Assessment: What Risks Lie Ahead for the Energy Sector?" NARUC, Dallas, July 14, 2014.

"The EPA's new Clean Power Plan proposal: Some suggestions for state action now," National Association of Clean Air Agencies, Washington, DC, July 13, 2014.

"Changing electric industry dynamics: The role of regulation," Aspen Institute Energy Policy Forum: Electricity Structure and Regulation, July 7, 2014.

"Natural Gas and Renewable Energy Synergies: Challenges and Opportunities," Synergies of Natural Gas and Renewable Energy: 360 Degrees of Opportunity, Center for the New Energy Economy (CNEE), Joint Institute for Strategic Energy Analysis (JISEA), Gas Technology Institute (GTI), Bloomberg New Energy Finance, New York, NY, July 1, 2014.

"EPA's Clean Power Plan," Bipartisan Policy Center, June 18, 2014.

"GHG Emission Reductions From Existing Power Plants Under Section 111(d) of the Clean Air Act: Options to Ensure Electric System Reliability," Electricity Advisory Committee, US Department of Energy, May 8, 2014.

"Climate Solutions: The role of existing nuclear power," Center for Climate and Energy Solutions, Washington, DC, April 28, 2014.

"Electric Power Systems: The Outlook for Electric Transmission: Where You Stand Depends Upon Where You Sit," Harvard Law School, March 20, 2014.

"Section 111(d) of the Clean Air Act: Drivers of Power Sector CO2 Reductions," Bipartisan Policy Center Workshop on GHG Regulation of Existing Power Plants under the Clean Air Act: Policy Design and Impacts, Washington, DC, December 6, 2013.

"The World of Abundant Natural Gas in the U.S.: Looking Ahead for Power-Sector Implications," presentation to the Keystone Energy Board, Washington, DC, October 30, 2013.

"Energy: From the Last to the Next 150 years," keynote address to the Energy Forum of Boston College's Sesquicentennial Celebration, October 25, 2013.

"Capacity Markets in the Northeast: A Preview of Comments at the FERC Technical Conference on Centralized Capacity Markets in RTOs/ISOs," presentation to the Independent Power Producers of New York, Saratoga Springs, New York, September 10, 2013.

"Opportunities and Risks of Shale Gas Development," presentation to the Governors' Policy Forum on Shale Energy Development, National Governors Association, Denver, September 9, 2013.

"The National Climate Assessment (Draft): Chapter on Energy Supply and Use," presentation to the National Association of Regulatory Utility Commissioners, Denver, July 23, 2013.

"Climate Change Preparedness in New Jersey: Utilities – Leading Practices and Trends Nationally," presentation to the New Jersey Climate Adaptation Alliance, Rutgers University, New Brunswick, May 21, 2013.

"Is New England Over-Reliant on Natural Gas?" presentation to the 20th Annual Energy Conference of the Northeast Energy and Commerce Association, Groton CT, May 21, 2013.

"Jevons' Boomerang: Is the rebound effect real? If so, is the effect negative or positive?" presentation to the EE Global Conference, Washington, DC, May 20, 2013.

"Framing the Issues: Growing Tensions at the Interface of the Natural Gas and Electric Industries," presentation to the MIT Energy Initiative (MITEI) Symposium on "Growing Concerns, Possible Solutions: Gas/Electric Interdependence," April 16, 2013.

"Unconventional Natural Gas: The Fracking Debate," Northeast Gas Association, Providence RI, March 15, 2013.

"Unconventional Natural Gas: Trends, Opportunities, and Challenges with America's New Energy Resource, Center for the American West series on "FrackingSENSE: What We Know, What We Don't Know, and What We Hope to Learn about Natural Gas Development," Boulder, Colorado, March 5, 2013.

"Global Energy Security: Upcoming challenges and opportunities (from a U.S. vantage point)," Tufts University Energy Conference – Powering Global Energy Security, Medford, Massachusetts, March 3, 2013.

"Old Made New – Conventional Resource Innovation in the 21st Century," MIT Energy Conference, Boston, March 2, 2013.

"The Evolving Energy Landscape: Standing at the Crossroads in 2013," Keynote Address, Kellogg School of Management Energy Conference, Northwestern University, Chicago, February 13, 2013.

"The Starting Point: Interconnection/Grid Planning in the Face of Diversity, Technical Complexity, Uncertainties, Challenges, Opportunities," Three Interconnections Meeting, NARUC/DOE, Washington DC, February 6, 2013.

"Electric Power Systems: The Outlook for Electric Transmission: Where You Stand Depends Upon Where You Sit," Yale University School of Forestry/Management, February 5, 2013.

"Electric Power Systems: The Outlook for Electric Transmission: Where You Stand Depends Upon Where You Sit," New York University Law School, February 4, 2013.

"The Future of Energy," DOE Energy All Stars, Department of Energy, January 19, 2013.

"The Economic Impacts of RGGI's First Three Years," Columbia University Law School – Center for Climate Change Law, Conference on the Future of the Regional Greenhouse Gas Initiative, New York, City, October 22, 2012.

"Reality Check on Energy Conditions," New Hampshire Energy Summit, Concord, NH, October 22,

2012. "Natural gas and renewables: Curious bedfellows," Renewable Energy Law & Policy Summit,

University
of Denver Sturm College of Law, October 19, 2012.

"Smart Grid and Air Emissions," Gridweek, Washington DC, October 4, 2012.

"C3E Women in Clean Energy Symposium," Keynote Address, Boston, September 28, 2012.

"Natural Gas: Risks and Opportunities – Shale Gas, Hydraulic Fracturing, and Other Facts," EPA Region 1 seminar, Boston, MA, September 27, 2012.

"Finding the Sensible Middle: Policies and Institutional Roles in Unconventional Gas Development," Unconventional Gas Research Forum, Board on Energy and Environmental Systems, National Academy of Sciences, Washington DC, September 11, 2012.

"Unlocking the Potential of Regional Collaboration," California ISO Stakeholders Symposium, Sacramento, September 6, 2012.

"The Context for Compliance with EPA Air Regulations: Power Market Conditions," EPA/DOE/NETL/ EPRI/AWMA Power Plant Air Pollution Control Mega-Symposium, Baltimore, August 20, 2012.

"Finding the Sensible Middle: Unconventional Gas Development," 24th Annual Natural Gas Strategy Conference & Executive Forum, August 15, 2012.

Intelligence Squared US debate: "No fracking way: The natural gas boom has done more harm than good," against the proposition (with team mate, Joe Nocera (*New York Times*)), Aspen, Colorado, July 1, 2012.

"What, Me, Worry? The New Outlook for Natural Gas in New England - How Will Natural Gas Impact New England's Electricity Markets and Reliability," New England Restructuring Roundtable – June 15, 2012.

"China's Energy Challenges and Policy Responses: Observations from a U.S. Vantage Point," Connecticut
College Vietnam Program, June 15, 2012.

"Economic Impacts of RGGI: Following the Dollars," presentation to the RGGI Board, June 2012.

"The Energy Scene: Update on a Few Key Issues," presentation to the Ozone Transport Commission, April 23, 2012.

"Shale Gas: Analyzing Risks and Opportunities," Society for Risk Assessment, Boston University – April 9, 2012.

"Sustainable Energy Highway," New York State Energy Highway Summit, April 4, 2012.

"Electric and Natural Gas Markets – Interactions, Opportunities, Challenges (with a focus on Texas)," Gulf
Coast Power Association Spring Meeting, April 3, 2012.

"Natural Gas: Risks and Opportunities – Shale Gas, Hydraulic Fracturing, and Other Facts," Tufts University – Fletcher School, March 29, 2012.

"Fracking and Shale Gas, Part I: Impacts on Energy Markets and Massachusetts," Boston Bar Association, March 6, 2012.

"Electric Power Systems: "The Outlook for Electric Transmission: Where You Stand Depends Upon Where You Sit," Harvard Law School, February 16, 2012.

"Natural Gas: Policy Recommendations of the NPC, SEAB, and BPC," Energy, Utility and Environment Conference 2012, January 30, 2012.

"Economic Impacts of RGGI: Following the Dollars," Energy, Utility and Environment Conference 2012, January 30, 2012.

"Electric Power Systems: "The Outlook for Electric Transmission: Where You Stand Depends Upon Where You Sit," Yale University School of Forestry and Environmental Studies, January 24, 2012.

"U.S. Renewable Energy Policy: Overview, with comparisons to European approaches," presentation to the Wharton School, January 3, 2012.

"The Truth about Fracking," presentation to the New York Energy Forum, December 19, 2011.

"The Clean Energy Economy," presentation to the Environmental Lawyers, Environmental League of Massachusetts," November 30, 2011.

"Outlook for the Electric Generating Fleet: Effects of the Upcoming EPA Regulations," presentation to the Harvard Kennedy School Energy Policy Series, November 28, 2011.

"The National Petroleum Council's "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources," panel discussion at the NARUC Annual Meeting, St. Louis, November 15, 2011.

"The Future of U.S. Energy Policy: What happens when we assume no changes in the near term…?" Wharton Energy Conference – Energy Frontiers: A Global Perspective, Philadelphia, October 28, 2011.

"Natural Gas: Risks and Opportunities (* with an emphasis on shale gas developments)," Harvard University Center for the Environment – Future of Energy Series, Cambridge, October 26, 2011.

"An Expanded Toolkit – Environmental Regulations, Natural Gas, and Modernizing the U.S. Generating Fleet," Great Lakes Symposium on Smart Grid and the New Energy Economy, Chicago, October 19, 2011.

"Pricing in a Western Energy Imbalance Market: Market Clearing Price versus Pay-As-Bid Pricing." Western Interstate Energy Board – Webinar on the Energy Imbalance Market," October 18, 2011.

"Federal and State Legislative and Regulatory Outlook: Connecting the Dots: Options for Upcoming Electric Resources," Emerging Issues Policy Forum, Amelia Island, October 9, 2011.

"Environmental Challenges Associated with Meeting Future Energy Needs: The role of shale gas?" National Association of Clean Air Agencies, Cleveland, October 4, 2011.

"Facing tough realities: Upcoming Energy and Environmental Issues – With a Focus on Electricity and Natural Gas," National Association of Clean Air Agencies, Cleveland, October 4, 2011.

"Assessing Natural Gas' New Promises and Controversies: Strategies to Improve the Safety & Environmental Performance of Shale Gas Extraction," Wisconsin Public Utilities Institute, University of Wisconsin at Madison, October 3, 2011.

"The Outlook for Natural Gas: Role of Shale Gas," EnerNOC EnergySMART Conference, Boston, September 27, 2011.

"The Outlook for Natural Gas: What does shale gas look like?" NECA Fuels Conference, Marlboro, MA, September 27, 2011.

"Facing tough realities: Upcoming Energy and Environmental Issues – With a Focus on Electricity and Natural Gas," Environmental Council of the States, Indianapolis, September 25, 2011.

"Electric Reliability Under EPA's New Air Regulations: What We Know, and What We Can Do About What We Don't Yet Know," National Association of State Energy Offices, September 12, 2011.

"The Future of Electricity Generation in the U.S. – A Modest Set of Observations," 19th Annual MIT-NESCAUM Endicott House Symposium (Opportunities for Technology and Policy Innovation in Energy and Environment), August 18, 2011.

"Unconventional Approaches: Part of the Electric Industry's Response to Upcoming EPA Regulations," panel on Infrastructure Reliability and Adequacy at the Aspen Energy Policy Forum ("Changing Currents – Turbulence for the Electric Industry: Is Reliability a Real Issue for power plants given the EPA rules?), Aspen, July 5, 2011.

"What we know, what we might know, and what we know we don't know yet," joint meeting of the NARUC, NASEO, and NACAA states, Baltimore, June 23, 2011.

"Facing tough realities: Energy and environmental issues in 2011 and beyond," joint meeting of the NARUC, NASEO, and NACAA states, Baltimore, June 23, 2011.

"China's Energy Challenges and Policy Responses: Observations from a U.S. Vantage Point," Connecticut
College Vietnam Program, June 16, 2011.

"Strategies for Addressing Change at FERC and the RTOs: A new lens on responding to near-term changes," FERC/RTO Training Session, panel on "Beyond Reliability: Economics, driving efficiency, demand response, and clean energy," Sponsored by the Institute Policy Integrity, New York, NY, July 15, 2011.

"'May you live in interesting times…': The Regulators' Tool-Kit in an Era of Uncertainty," Western Conference of Public Service Commissioner, Denver, June 14, 2011.

"Dirty to Clean? The Future of Electric Power in America," CERES Conference 2011, Oakland, CA, May 12, 2011.

"EPA Regulations, Power Generation Capacity & Reliability," presentation to the MIT Center for Energy & Environmental Policy Research Workshop, Cambridge, MA, May 5, 2011.

"The Electric Industry's Response to EPA's Upcoming Regulations: Options for Owners and Others," presentation to the Energy Bar Association, Panel on Environmental Regulations, Washington, DC, May 4, 2011.

"Framing the Issues: Energy and the Environment," keynote address to the Health Effects Institute, Boston, May 2, 2011.
"Federal Air Pollution Regulations Affecting Fossil Power Plants: Current issues, implications, strategies," presentation to the 6th Annual Conference on Tribal Energy in the Southwest: New Opportunities for tribal projects, new policies, regulations and markets, Law Seminars International, Phoenix, April 29, 2011.

"China and U.S. Energy and Environmental Policy Challenges: Learning from Each Other, In It Together," presentation to China Energy & Environment Conference, Harvard University, April 9, 2011.

"EPA's MACT, Water Cooling Intake and Transport Rules: What now for power generation?" presentation to SNL Energy Webinar, April 12, 2011.

"Policies for a Secure Energy Future: Issues in Supply and Demand," presentation to the Aspen Institute Congressional Program's meeting on Energy Security: Policy Considerations in the New Congress, San Juan, Puerto Rico, February 22–27, 2011.

"Responding to EPA's Regulations Affecting Coal Plants: Using a 21st Century Toolkit (or, upgrading to the "Champ" from the "Classic")," presentation to the Panel on Environmental Regulations and Impacts on Electricity System Infrastructure, 2011 DOE/NARUC National Electricity Forum, Washington, DC, February 16, 2011.

"Responding to EPA's Regulations Affecting Coal Plants: Using a 21st Century Toolkit (or, upgrading to the "Champ" from the "Classic")," presentation to the Roundtable on the EPA Regulations, NARUC Winter Meeting, Washington, DC, February 14, 2011.

"Local, State and Regional Coordination and Solutions: Non-conventional capacity and energy resources," presentation to the Bipartisan Policy Center's Workshop on Power Sector Environmental Regulations, Washington, DC, January 19, 2011.

"Renewable Energy in New England," presentation to the New Hampshire Business and Industry Conference, Concord, New Hampshire, December 7, 2010.

"Framing the Issues: Energy and the Environment," presentation to the annual meeting of the National Academy of Public Administration, Washington, DC, November 18, 2010.

"Toolkit for Ensuring Reliable, Economic Responses to EPA's Proposed Air Regulations," presentation on the panel on "The Climate Syndrome: Without Congressional Action, What Do State Regulators Need to Know?" NARUC Meeting, Atlanta, Georgia, November 17, 2010.

"Challenges for Recovering Costs During a Push for Cleaner Generation and More Efficient Energy Use," Law Seminars International conference (Utility Rate Cases), Boston, November 9, 2010 (conference co-chair).

"Public Policy for Advanced Energy Technology," presentation to the New York Advanced Energy Technology Conference, New York, NY, November 8, 2010.

"Energy Future: Bridging the Gap," presentation to the Wharton Energy meeting, Philadelphia, October 28, 2010.

"Upcoming Power Sector Environmental Regulations: Framing the issues about potential reliability/ cost impacts," presentation to the National Commission on Energy Policy Workshop on Power Sector Environmental Regulations, Washington, DC, October 22, 2010.

"Vulnerability of the Gulf Coast Energy Infrastructure," presentation to the Deltas 2010 – World Deltas Dialogue, America's Energy Coast Policy Forum on The Future of the U.S. Gulf Coast Energy Infrastructure in the Face of Changing Climate," New Orleans, October 20, 2010.

"Today's Energy Landscape: Scanning the terrain – with tips for a safe journey," presentation to the annual meeting of the National Association of State Energy Officials, September 30, 2010.

"2020: What can we expect? Where we are now, and how it influences where we'll be a decade from now," Law Seminars International conference, "Energy in the Northeast," September 29, 2010.

"Today's Energy Landscape: Exploring economic, environmental and technological trends," presentation to the annual meeting of the Independent Power Producers of New York, September 22, 2010.

"Transforming America's Energy Systems: Challenges and opportunities along the nation's coastal and marine environments," Annual Lecture at the Metcalf Institute, University of Rhode Island, June 8, 2010.

"New England at the Crossroads: The Intersection between Regulatory Policy and Future Energy Supply," presentation to the Northeast Energy and Commerce Association, 17th New England Energy Conference, Green Thumb on the Scale: Impact on Future Energy Choices, June 8, 2010.

"Is Competition Dead?" presentation to the Annual Meeting of the New England Conference of Public Utility Commissioners, May 17, 2010.

"Why it is so Darn Hard to Adopt Advanced Energy Technologies, But So Worth the Effort," presentation to the Tufts University Energy Conference, "The Evolution of Energy," April 17, 2010.

"The Prospects for Natural Gas, Coal, and Nuclear Power in America's Energy Future," discussions with members of Congress at the Aspen Institute's Congressional Program on Energy Security and Climate Change: Policy Challenges for the Congress, April 6–10, 2010.

"Why is Modernizing Our Energy Technologies So Darn Hard, But Worth the Effort?" presentation to the MIT Energy Initiative Lecture Series, February 2, 2010.

SERVICE ON BOARDS OF DIRECTORS (PUBLIC COMPANIES, PRIVATE COMPANIES, NON-GOVERNMENTAL ORGANIZATIONS)

Trustee, Barr Foundation (2016–Present)

Chair, ClimateWorks Foundation Board of Directors (2013–Present)

Member and Vice-Chairman, World Resources Institute Board of Directors (2009–Present)

Chair, Energy Foundation Board of Directors (2000– 2011); Vice-Chair (1999–2000); Director (1997–2011); Director (2013–Present)

Member, Keystone Board of Directors (and Member, Keystone Energy Board) (2016–Present)

Member, Resources for the Future Board of Directors (2014–Present)

Member, Alliance to Save Energy Board of Directors (2011–Present)

Member, EnerNOC, Inc. Board of Directors (February 2010–May 2013)

Member, Evergreen Solar, Inc. Board of Directors, 2008–2011)

Member, Ze-gen Inc. Board of Directors, 2009–2011)

Member, Renegy Holdings Board of Directors, 2007–2009)

Member, Clean Air Task Force Board of Directors, 2008–2013)

Member, Catalytica Energy Systems Inc. Board of Directors (2001–2007)

Member, Climate Policy Center Board of Directors (2001–2007)

Member, NorthEast States Center for a Clean Air Future, Board of Directors (1998–2010)

Chair, Clean Air–Cool Planet / Climate Policy Center Board of Directors (2004–2009); Director (1999–2014) Member, ACORE (American Council on Renewable Energy) Board of Directors (2006–2007)

Member, Electric Power Research Institute (EPRI) Board of Directors (1998–2003, 2005–2006)

Chair, Electricity Innovations Institute, Board of Directors, (2002–2004); Director (2001–2002)

Director, The Randers Group (subsidiary of Thermo TERRATEK) Board of Directors (1997–2000)

Director, Thermo ECOTEK Corporation Board of Directors (1996–1999)

OTHER PROFESSIONAL ACTIVITIES

Member, Advisory Committee of the National Academy of Sciences Climate Communications Initiative (2018)

Chair, Computational Sciences and Energy Analysis Technical Review Panel, National Renewables Energy Laboratory (2018)

Visiting Fellow in Policy Practice at the Energy Policy Institute at the University of Chicago (EPIC) (2017–Present)

Chair, External Advisory Council, National Renewables Energy Laboratory (2009–Present)

Member, Columbia University, Center for Global Energy Policy (2014–Present)

Member, New York Independent System Operator, Environmental Advisory Council (2004–Present)

Chair and Member, Electricity Advisory Committee (Department of Energy) (2015–2017)

Member, National Academy of Sciences Committee on Enhancing the Resiliency of the Nation's Electric Power Transmission and Distribution System (2015–2017)

Chair, Aspen Institute Energy Policy Forum (2015)

Member, Innovation Review Panel, "51st State" Initiative of the Solar Electric Power Association (2015)

Chair, External Review Panel for the Clean Energy Ministerial (2015)

Chair, Aspen Institute Energy Policy Forum (2014)

Participant in studies of the Colorado State University's Center for Clean Energy Economy ("*Powering Forward: Presidential and Executive Agency Actions to Drive Clean Energy in America*") (January 2014)

Co-Lead Convening Author, Energy Supply and Use Chapter, National Climate Assessment (2012–2014)

Member, Committee on Risk Management and Government Issues in Shale Gas Development, of the National Academy of Sciences, Board on Environmental Change and Society (of the Division of Behavioral and Social Sciences and Education) (2013–2014)

Co-chair, Bipartisan Policy Center's Cyber-security and the Electric Grid project (2013–2014)

Co-chair, National American Energy Standards Board (NAESB) Gas-Electric Harmonization Committee (2012, 2014)

Alliance Commission on National Energy Efficiency Policy (2012–2013): Report "Energy 2030: Doubling Energy Productivity by 2030" (February 2013)

Bipartisan Policy Center – Energy Project (2011–Present): Report ("America's Energy Resurgence: Sustaining Success, Confronting Challenges" (February 2013)

US Secretary of Energy Advisory Board (July 2010–May 2013). Member of the Natural Gas Subcommittee examining shale gas development. (2011–2013)

Chair, Policy Subgroup of the National Petroleum Council's study on North American Gas and Oil

Resource Development (2010–2011)

Visiting Professor, Department of Urban Studies & Planning, Massachusetts Institute of Technology

(Spring 2010)

Massachusetts Clean Energy Grand Prize Judge (2010)

World Resources Institute: Chair of Presidential Search Committee (2011)

Co-Lead, Department of Energy Agency Review Team, Obama/Biden Presidential Transition Team, Washington DC, while on full-time leave for four months from Analysis Group (2008–2009)

Chair, Massachusetts Ocean Advisory Commission (2008–2010)

Member, Blue Ribbon Commission on Cost-Allocation Issues for Transmission Investment, WIRES (2007)

Member, National Academy of Sciences Committee on Enhancing the Robustness and Resilience of

Electrical Transmission and Distribution in the United States to Terrorist Attack (2005–2008)

Member, National Commission on Energy Policy, Member (2002–2011); Co-chair (2009–2011)

Member, Advisory Committee, Carnegie Mellon Electricity Industry Center (2001–2009)

Member, Policy Advisory Committee, China Sustainable Energy Project–A Joint Project of The Packard Foundation and The Energy Foundation (1999–2014)

Co-Chair, Energy/Environment Working Group, Governor Deval Patrick Transition Team (2006–2007)

Presenter, Economic Issues, National LNG Forums, US Department of Energy, Boston MA; Astoria, OR (2006)

Chair of the Technical Review Panel, Critical Infrastructure Protection Decision Support Systems (CIP-DSS), Argonne, Los Alamos and Sandia National Laboratories (2006)

Advisory Council member, New England Energy Alliance (2005–2006)

Chair of the Laboratory Direction's Division Review Panel for the Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory (2005)

Chair, Ocean Management Task Force, Commonwealth of Massachusetts (2003–2004)

Co-Chair, RTO Futures: Regional Power Working Group (2001–2002)

Member, Florida Energy 2020 Study Commission, Environmental Technical Advisory Committee (2001)

Technical Advisor, Mid-Atlantic Area Council/PJM, Dispute Resolution Procedure (1998–2008)

Member, "ISO-New England" (Independent System Operator) Advisory Committee (1998–2003)

Member, United States Department of Energy, Electricity Reliability Task Force (1996–1998)

Member, Harvard Electricity Policy Group (1993–2005)

HONORS AND AWARDS

Mary Kilmarx Award for lifetime work on good government, clean energy and the environment, presented by NARUC's Committee on Energy Resources and the Environment (November 2015)

Lifetime Achievement Award, US Department of Energy/MIT/Clean Energy Ministerial C3E (Clean Energy Education & Empowerment) Initiative (2014)

Champions Award, Charles River Watershed Association (2013)

Leadership Award, New England Women in Energy and the Environment (2013) Clean Energy Hall of Fame, New England Clean Energy Council (2012)
DOE Women in Clean Energy Initiative, C3 Ambassador (2012)

Climate Champion Award, Clean Air – Cool Planet (2009)
Distinguished Alumna Award, Scripps College, Claremont, CA (1998)
Award for Individual Leadership in Public Service, *The Energy Daily* (1995)

Special Recognition Award, Outstanding Contribution to the Industry, Assn of Energy Engineers (1994)

Leadership Award, National Association of State Energy Officials (1994)

Commencement Speaker and Honorary Doctorate of Laws, Regis College, Weston, MA (1992)

Attachment SFT-2

Tierney White Paper:

"Natural Gas Pipeline Certification: Policy Considerations for a Changing Industry"

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Natural Gas Pipeline Certification

Policy Considerations for a Changing Industry

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Analysis Group

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Acknowledgments

This report reviews the changing circumstances regarding the production, transportation, and consumption of natural gas in the United States and the potential impact of these changes on federal policies governing the certification and pricing of new interstate natural gas pipeline developments.

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The report, however, reflects the judgment of the author alone.

About Analysis Group

Analysis Group provides economic, financial, and business strategy consulting to leading law firms, corporations, and government agencies. The firm has more than 800 professionals, with offices in Boston, Chicago, Dallas, Denver, Los Angeles, Menlo Park, New York, San Francisco, Washington, D.C., Montreal, London, Brussels, and Beijing.

Analysis Group's energy and environment practice area is distinguished by expertise in economics, finance, market modeling and analysis, regulatory issues, and public policy, as well as significant experience in environmental economics and energy infrastructure development. We have worked for a wide variety of clients including (among others) energy producers, suppliers and consumers; utilities; regulatory commissions and other public agencies; tribal governments; power system operators; foundations; financial institutions; and start-up companies.

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I. Executive Summary

FERC's 1999 Policy Statement: Under Section 7(c) of the Natural Gas Act of 1938 (NGA), the Federal Energy Regulatory Commission (FERC, or Commission) has jurisdiction to review proposals to construct new infrastructure for interstate transportation of natural gas. FERC's authority spans issues related to the need for and location of the proposed facilities, the method and level of investment recovery, and the environmental impacts associated with a proposed project. FERC reviews proposals on a case-by-case basis in order to determine whether to issue a Certificate of Public Convenience and Necessity (Certificate, or CPCN) and, if so, whether to attach conditions on it. Once FERC has approved a proposed facility, the project developer may exercise eminent domain to acquire privately held land for the purpose of constructing and operating the facility.

For nearly two decades, FERC's assessment of gas-transportation proposals has been guided by its 1999 Statement of Policy (Policy Statement), which reflects the agency's consideration of gas industry issues and needs at the time the statement was issued. In the 1999 Policy Statement, FERC expressed its intention to ensure that its certification decisions would strike an appropriate balance between enhancing market competition and the potential for overbuilding natural gas infrastructure, with a focus on how to best balance public benefits, on the one hand, against potential adverse impacts to landowners, communities, and the environment, on the other.

In the 1999 Policy Statement, FERC stated its intention to ensure that its certification decisions would strike an appropriate balance between:

- enhancing market competition and supporting market demand
- avoiding the potential for overbuilding gas infrastructure and the potential adverse impacts to landowners, communities, and the environment.

Since 1999, FERC has approved virtually all of the hundreds of pipeline applications submitted to the agency.

In 1999 FERC sought to clarify its certification policy so that the Commission could better determine whether to issue a Certificate for interstate pipeline facilities.[1] FERC had concluded that in the context of changes leading up to 1999, such clarification was needed. The conditions at the time included:

- The relatively recent deregulation of upstream natural gas production and sales;
- The restructuring of the natural gas industry so as to encourage competition by unbundling and separating gas delivery transportation from commodity supply;
- The potential for competition among suppliers, potential deliverers, and potential users for use of capacity on the interstate system;
- The desire to create incentives for investment in and additions of new gas delivery capacity; and
- Anticipated continued growth in demand for natural gas.

Decades of significant change: Since 1999 FERC has approved approximately 400 pipeline applications for an additional 180 billion cubic feet per day (Bcf/d) of pipeline capacity. This amount of additional capacity on the interstate pipeline system is significant, considering that the average

[1] Statement of Policy, Certification of New Interstate Natural Gas Pipeline Facilities, Docket No. PL99-3-000; 88 FERC ¶ 61,227 (September 15, 1999), Order Clarifying Statement of Policy, Docket No. PL99-3-001, 90 FERC ¶ 61,128 (February 9, 2000), Order Further Clarifying Statement of Policy, Docket No. PL99-3-002, 92 FERC ¶ 61,094 (July 28, 2000) (hereafter "Policy Statement"), at 13-14.

consumption of natural gas in the U.S. during January 2017 was 93.1 Bcf/d, and the all-time peak-day consumption was 137 Bcf/d during the 2014 Polar Vortex.[2]

Significant changes have occurred in the patterns and pricing of the production, transportation, and use of natural gas in the nearly two decades since FERC issued its 1999 Policy Statement. Production and demand have increased substantially. Much of the new production in the past decade has taken place in parts of the country – like the Marcellus and Utica shale regions in the mid-Atlantic portion of the Appalachian Mountains, with the Utica region extending into the Midwest – that previously had been much less active in gas production and closer to many consumption regions in the Eastern states. Natural gas prices are relatively low. The power sector's use of gas has increased significantly, in part due to the enormous quantity of gas-fired generating capacity added since 2000, the cost-competitiveness of producing power at efficient natural gas power plants, relative to many coal-fired power plants, and the flexible operational attributes of gas-fired generating capacity.[3]

Significant changes have occurred in the gas industry since 1999, including the addition of gas delivery capacity equivalent to double the average use of natural gas on a peak winter day.

Although there is interest in some regions to add pipeline capacity to alleviate wintertime gas-transportation constraints (and the pricing impacts that result),[4] some industry observers are increasingly concerned about the potential to overbuild capacity on the interstate system in light of anticipated transitions in the nation's energy system in the future.[5] And there are growing questions about FERC's balancing of public benefits versus adverse consequences in the context of case-by-case review of applications.

The past several years have also witnessed an acceleration of pipeline siting and certification challenges and concerted actions by affected landowners, neighboring homeowners, municipalities, environmental groups, and other interested parties. They are raising concerns about the potential adverse impacts and risks associated with siting new pipeline projects, especially given current and future trajectories of carbon and methane emissions from energy production, delivery and use. The associated increased use of hydraulic fracturing, or fracking, to extract gas to be transported by pipeline has also been a concern, given the health and safety risks of this relatively new gas-extraction technology.

Views on the need for more pipeline capacity vary – with some market participants interested in adding more pipelines to alleviate delivery constraints in some regions, and with other observers concerned about the potential to overbuild the system, given anticipated transitions in the nation's energy systems.

[2] Energy Information Administration (EIA), "Natural Gas Monthly," March 2017, https://www.eia.gov/naturalgas/monthly/archive/2017/2017_03/ngm_2017_03.php; EIA, "Record winter withdrawals create summer storage challenges," June 12, 2014, https://www.eia.gov/naturalgas/review/winterlookback/2013/#tabs_Consumption-4.

[3] EIA, "Electric Power Monthly," September 2017, "Table 1.1 Net Generation by Energy Source: Total (All Sectors), 2007-July 2017," https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01.

[4] M. Cusick, "Northeast needs more gas pipelines, says new report," Pennsylvania State Impact, April 25, 2017, https://stateimpact.npr.org/pennsylvania/2017/04/25/northeast-needs-more-gas-pipelines-says-new-report/; A. Kovski, "Fast Growth Coming for Northeast Shale Gas Pipelines," Bloomberg BNA, March 5, 2017, https://www.bna.com/fast-growth-coming-n57982084782/.

[5] J. Shelor, "Marcellus/Utica On Pace for Pipeline Overbuild, Says Braziel," Natural Gas Intelligence, June 8, 2016; http://www.naturalgasintel.com/articles/106695-marcellusutica-on-pace-for-pipe-line-overbuild-says-braziel; J. Blum, "There is a risk of overbuild for Texas pipelines," August 26, 2017, http://www.houstonchronicle.com/business/energy/article/There-is-a-risk-for-an-overbuild-for-Texas-11969059.php.

The degree of public participation in FERC's meetings, hearings, and other proceedings has increased substantially. FERC's decisions are subject to active litigation. Although in August 2017 courts upheld some FERC decisions, the Court of Appeals for the District of Columbia Circuit remanded FERC's approval of three gas pipelines in the Southeast U.S. after finding that FERC should have provided more environmental information on the greenhouse gas (GHG) emissions that would result from burning the gas that the pipelines would carry.[6]

These many and complicated changes that have occurred since FERC's 1999 Policy Statement warrant a fresh look at whether the approach adopted in that policy and applied in certification dockets since then still remains appropriate and, if not, what changes are now reasonable and necessary for FERC to fulfill its responsibilities under the Natural Gas Act. Changing industry conditions, combined with the principles espoused by FERC at the time of the last Policy Statement, support the conclusion that circumstances are now ripe for FERC to undertake a new and careful review of its policy guidance regarding pipeline certification.

Given the many and complicated changes that have occurred in the gas industry in the two decades since the 1999 Policy Statement, the time is ripe for FERC to take a fresh look at its policy guidance regarding pipeline certification.

Key Factors Warranting a Refresh of FERC's 1999 Policy Statement: Here are the key factors that are driving the need for a refresh of FERC's pipeline certification guidance:

- ***Significant industry changes led to adoption of the 1999 Policy Statement, but rapid industry changes and trends since then call into question the policy's continued appropriateness.*** In 1999, FERC sought to clarify its certification policy so that the Commission could better determine whether to certificate interstate pipeline facilities. At that time, significant changes in the industry prompted FERC to review and clarify its policy: changes in regulation, market conditions, industry actors, and the nature of stakeholder concerns that were underway at that time. Since then, the degree of change in the gas industry – in gas production, delivery, and consumption, and in the level and character of local-government, landowner, and other stakeholder concerns and activism about gas production and delivery – has grown faster and more intensively than in the period preceding the 1999 review. The complexities of these issues and the inter-relationships among many of the post-1999 trends across the gas and electricity industries raise important questions about the continued appropriateness of FERC's certification policy.

- ***A new, generic proceeding is a better forum than individual case dockets for addressing implications of wide-ranging industry changes and trends.*** Some of the trends described in this report suggest a need to apply the current FERC certification policy in different ways but still on a case-by-case basis; other trends support a need to shift the standards or information requirements

[6] U.S. Court of Appeals for the District of Columbia, *Sierra Club et al. v. FERC*, No. 16-1329, decided August 22, 2017, https://www.cadc.uscourts.gov/internet/opinions.nsf/2747D72C97BE12E285258184004D1D5F/$file/16-1329-1689670.pdf. The court found that FERC had not carried out its responsibility under the National Environmental Protection Act (NEPA) to prepare an adequate environmental impact statement (EIS). The D.C. Circuit also found that FERC violated NEPA a few years before the *Sierra Club* decision, when FERC failed to address various impacts related to a proposed project. U.S. Court of Appeals for the District of Columbia, *Delaware Riverkeeper v. FERC,* 753 F.3d 1304 (D.C. Cir. 2014).

that FERC uses to balance public benefit with adverse consequences, including reconsideration of how information is weighted in the balance. This stands as a compelling reason for why FERC should take a fresh look at its certification policy. For example, although the Policy Statement currently provides that the greater the adverse effect of a pipeline project, "the greater the showing of public benefits from the project required to balance the adverse impact," individual FERC dockets and related litigation are not the ideal places for parties to hold conversations and inquiry about the scope of benefits and adverse consequences (and trade-offs) that should be undertaken by FERC in its reviews. This is the type of conclusion that FERC reached in deciding two decades ago to open inquiries into its certification policies for new natural gas facilities.

> Dockets on individual pipeline proposals – where it is technically and procedurally challenging for non-technical people to provide meaningful input – are not the ideal place for parties to weigh in on the scope and distribution of benefits and adverse consequences that FERC should take into consideration in its reviews of project proposals.
>
> Indeed, this is the very type of conclusion that FERC reached in deciding two decades ago to open inquiries into its certification policies. .for new natural gas facilities.

- ***The meaning and application of FERC goals have evolved over the decades.*** In the 1999 Policy Statement, FERC summarized that its goals in reviewing its pipeline certification process were to "foster competitive markets, protect captive customers, and avoid unnecessary environmental and community impacts while serving increasing demands for natural gas. It should also provide appropriate incentives for the optimal level of construction and efficient customer choices." In 2017, these goals remain valid, but their meaning and application have evolved through a complex set of changes that have occurred in the larger energy industry and in natural gas markets in particular. The criteria guiding FERC's determination of whether a proposal balances public benefits against potential adverse consequences deserve new attention.

- ***The interaction of gas and electric industries suggests a need for integrated assessment of both markets.*** Significantly, the interaction of the potential demand for new gas transmission capacity by local gas distribution companies (LDCs) and power plants complicates the assessment of market need and suggests the potential benefit of more structured and integrated assessments of market demand in pipeline certification cases. This is increasingly recognized in various regions – particularly in the Northeast U.S. – where the nearly exclusive winter LDC demand for natural gas for heating occurs alongside a rapidly growing dependence on gas to meet electric system reliability needs in both summer and winter. There and elsewhere, the availability of gas-transportation capacity during summer peak periods and the economic incentives embedded in market designs in many organized wholesale power markets to date have led to little demand for firm gas-transportation service by merchant power companies. This has introduced claims of power-system reliability challenges and opened the door to evaluations of economic alternatives to the development of new interstate pipeline capacity. These circumstances increase the complexity of natural gas "market need" assessments and point to the potential benefits in FERC certification reviews of considering regional and integrated evaluations of energy needs. A refresh is thus

warranted to enable FERC to "strike the proper balance between the enhancement of competitive alternatives and the possibility of over building" natural gas infrastructure.[7]

- ***Other factors originally highlighted in FERC's 1999 Policy Statement remain important but warrant a reassessment in light of changes*.** Changes in the gas and electric industries and an increasingly active and oppositional context in which FERC's pipeline certification cases occur indicate the need for review of factors FERC initially emphasized. These factors include:
  - the relevance and magnitude of pre-certification contractual commitments and/or precedent agreements;
  - the nature of relationships between pipeline developers and natural gas LDC, electric utility, and/or independent power producer affiliates;
  - the balancing of public benefits against adverse impacts in an era of debate over power system reliability implications and accelerating evidence of and concern over GHG emissions and climate-change risks resulting from current and future combustion of natural gas;
  - complications in assessing need and impacts across pipeline owners in an era of rapidly expanding changes and growth in production regions and consumption patterns; and
  - trade-offs across the interests of gas-consuming populations and those of communities impacted by gas infrastructure.

Given these many considerations, it is timely for FERC to look once again at the standards it will apply to future applications to construct new natural gas facilities. Opening a new docket to solicit comment on various issues would be an appropriate vehicle through which FERC could obtain broad public input and fresh consideration of the substantial recent and ongoing developments in energy industries and what changes in its certification policy may be appropriate and necessary in light of these transitions.

> Given the important roles that natural gas resources play in the U.S. economy, the many changes underway in the energy systems that will likely affect future natural gas production, delivery, and use, and the importance of FERC administering its responsibilities under the Natural Gas Policy Act in a judicious manner, FERC should take a fresh look at the 1999 Policy Statement.
>
> Such an inquiry would support the goal the Commission stated in 1999: "In considering the impact of new construction projects on existing pipelines, the Commission's goal is to appropriately consider the enhancement of competitive transportation alternatives, the possibility of overbuilding, the avoidance of unnecessary disruption of the environment, and the unneeded exercise of eminent domain."

[7] Policy Statement, at 2.

Questions that FERC might consider in a review of its certification process include:

- Should FERC develop more prescriptive standards for reviewing applications for new pipelines, in light of the increasingly uncertain forecasts of the need for incremental pipeline capacity?
- Do changes underway in both the gas and electric industries – and the increasingly strong interrelationship between them – warrant a more integrated assessment of sectoral demand and electricity market forces in assessing natural gas pipeline need?
- Should FERC require regional planning regarding gas transportation resources similar to the regional planning requirement imposed on electric transmission owners?
- Should FERC apply a higher threshold standard and greater scrutiny with respect to demonstration of need, market demand, and public benefit where an affiliate (e.g., gas LDC, electric utility, and/or independent power producer) is involved in the proposed project?
- Should determination of need for a proposed pipeline project be the threshold determination (instead of the current threshold determination, which is whether the project could proceed without subsidies from existing customers)?
- Should FERC's balancing of benefits against adverse impacts be expanded to include noneconomic factors (e.g., should environmental impacts be among the adverse impacts FERC considers while applying the balancing test)?
- Should FERC give deference to state regulatory approvals (e.g., of contracts between pipeline companies and affiliated shippers including either local distribution companies or power plants) only when such approvals involve a regulatory review of whether such contracts represent the least-cost method of serving such demand, taking into account other strategies (e.g., energy efficiency in the case of an LDC contract, or dual-fuel capability at the power plant, or application of technologies to increase throughput on existing pipeline capacity)?
- Should FERC require a demonstration of need and public benefit based on a showing that non-pipeline alternatives have been considered as options to meet the demand of shippers (e.g., an integrated gas/electric resource plan or an integrated gas/electric reliability study, energy efficiency programs in the case of an LDC contract, dual-fuel capability at a power plant, or adoption and application of technologies to increase throughput on existing pipeline capacity)?
- Should FERC impose a greater burden to show that a pipeline is needed when it is proposed to gain market share rather than to meet new market demand?
- How should FERC's policy take into account the views of a variety of interested constituencies (including competitors, customers, landowners, local communities, and others affected directly and indirectly by the pipeline and by the impacts of gas combustion), many of whom may have limited access to resources to participate as full parties in specific pipeline-review cases?
- How should FERC weigh the relative distribution of benefits and burdens across those interested and affected constituencies?
- How should FERC take into account the potential for stranded costs of new pipeline capacity that is later determined to be no longer needed in light of changes in the nation's current and future energy mix?
- Should FERC consider new ways for pipeline applicants to internalize the long-term monetary and non-monetary risks associated with near-term capacity investment decisions?

II. Context: FERC's Policy Statement and Certification Process

FERC'S 1999 Policy Statement

Under Section 7(c) of the Natural Gas Act of 1938, FERC has jurisdiction over the review of proposals to construct new infrastructure for the interstate transportation of gas. In order for a company to site and construct a new facility (and to take land for the project through eminent domain), that company must receive a Certificate of Public Convenience and Necessity (CPCN) from FERC. [8] (This is sometimes called FERC's "certification authority" or "Section 7(c) Certification Authority.") FERC reviews project proposals on a case-by-case basis to determine whether to issue a CPCN and, if so, whether to attach conditions to it.

On September 15, 1999, FERC issued a Statement of Policy regarding Certification of New Interstate Natural Gas Pipeline Facilities.[9] This Policy Statement reflected FERC's review of extensive comments submitted by interested parties and its own experience in applying its certification authority in prior years.[10] FERC had been exploring issues related to then-current policies on certification and pricing of pipeline projects in light of changes that had taken place in the industry leading up to the late 1990s. FERC stated that it sought to ensure that its policies would strike an appropriate balance between enhancing market competition and the potential for overbuilding natural gas infrastructure, with a focus on how to best balance market demand, on the one hand, against potential adverse impacts to landowners, communities, and the environment, on the other.

Leading up to the Policy Statement, FERC sought input on (among other things) several key natural gas policy issues in play at the time, including:[11]

- Whether FERC should look in more detail at market conditions behind the contracts and/or precedent agreements included as evidence of market demand in CPCN cases;
- Whether it was appropriate for FERC to distinguish in its certification reviews between contracts or precedent agreements with affiliates versus non-affiliates, and/or to subject such proposals to a different or higher level of scrutiny;
- Whether FERC should allow rolled-in rate treatment for projects based largely on meeting the needs of a company's affiliate; [12]
- Whether it was appropriate for FERC to apply a different level or standard of review for proposals that were not for market expansion but were instead designed significantly or primarily to compete for market share currently met through existing infrastructure; and

[8] 15 U.S.C. §717f(c).
[9] Policy Statement.
[10] Comments were submitted to FERC in response to a Notice of Proposed Rulemaking, Regulation of Short-Term Natural Gas Transportation Services, Docket No. RM98-10-00063 Fed. Reg. 42982, 84 FERC ¶ 61,087 (1998) and a Notice of Inquiry, Regulation of Interstate Natural Gas Transportation Services, Docket No. RM98-12-000, 63 Fed. Reg. 42974, 84 FERC ¶ 61,087 (July 29, 1998).
[11] Policy Statement, at 2-3.
[12] Rolled-in rate treatment for pipeline projects occurs when "the costs of an expansion are rolled into a pipeline's existing cost of service and rates are re-set accordingly." Regulatory Research Associates (RRA), "FERC and Natural Gas Pipeline Regulation – A Primer," May 27, 2016. By contrast, a non-rolled-in rate is one where the incremental costs of new pipeline projects are charged only to the users of the new facilities.

- Whether and how FERC might expedite applications that do not require eminent domain or that address landowner issues through developers' pre-filing activities.

FERC explained how its consideration of these issues was influenced by many factors: changes underway in the gas industry, challenges raised in evaluations of then-recent pipeline proposals, and the anticipated growth in demand for gas.[13] The Commission recognized that it had not formally distinguished between projects that served new versus existing markets, or between projects that served affiliates versus non-affiliates.[14] The Commission further noted that facility proposals had experienced increased objections by landowners and communities regarding the exercise of eminent domain to acquire land needed for the project.[15] Finally, FERC wanted to consider the implications of increasing demand for gas, stemming from the deregulation of electric generation, the restructuring of the electric industry in many states in the 1990s, and the emergence of gas-fired combustion turbines and combined cycles as the technologies of choice for new electric generating capacity.[16]

Thus, FERC's purpose in issuing the 1999 Policy Statement was to review the changes underway in the gas industry and its user sectors, gather input from stakeholders, and develop an approach for reviewing requests for CPCN approvals that furthered the goals of FERC's regulatory policies, which included (1) fostering competitive markets, (2) protecting captive customers, (3) avoiding unnecessary environmental and community impacts while serving increasing demands for gas, and (4) providing appropriate incentives for the optimal level of construction and efficient customer choices.[17]

In the Policy Statement, the Commission identified the criteria that FERC would apply going forward to seek to balance the public benefits of new development against potential adverse consequences, in deciding whether to authorize the construction of major new pipeline infrastructure and grant a CPCN. The analytic steps identified by FERC included the following:[18]

- A certificate application would first undergo a threshold assessment of whether it would be able to proceed without any subsidies from the proponent's existing customers.
- Next, the application would be evaluated for whether the applicant had attempted to minimize adverse economic impacts on the customers of the developer, on other pipelines in the market or their captive customers, or on landowners affected by the pipeline route. This step was intended to motivate the applicant to mitigate any adverse effects before filing an application.
- In instances where a project would not have adverse economic impacts on the developer's customers, on other pipelines in the market or their captive customers, or on the economic interests of landowners or communities affected by the pipeline route, FERC would not need to apply a balancing of benefits against adverse effects.

[13] Policy Statement, at 1-2.
[14] Policy Statement, at 14-15.
[15] Policy Statement, at 15.
[16] See, e.g., P. Hibbard, S. Tierney, and K. Franklin, *Electricity Markets, Reliability and the Evolving U.S. Power System*, Section IV, June 2017, http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_markets_reliability_final_june_2017.pdf.
[17] Policy Statement, at 13.
[18] Policy Statement, at 18-19.

- But if such "residual" adverse economic effects *were* identified, the Commission would proceed to evaluate the project through a balancing test, weighing the evidence of public benefits against expected adverse effects. The Commission noted that this was primarily an economic test, and only where analysis indicated that economic benefits would outweigh adverse economic impacts would FERC then proceed to consider adverse environmental impacts.

FERC viewed the requirement that a project not include subsidization from existing ratepayers as addressing most of the potential adverse economic impacts, by requiring that a project be financially viable on its own given its costs, development challenges, and market interest.

For projects that required a balancing of benefits against adverse impacts, FERC said it would review all relevant factors related to the need for and benefits of the project, including precedent agreements, demand projections, estimated consumer cost savings, indications of access to supply, and whether the project was designed to meet new demand, to support electric grid and pipeline network reliability, and to advance clean air objectives.[19] FERC clarified that it would focus on the balancing of economic interests with an eye toward fostering workable competition in the industry, but in ways that would not harm existing customers or provide incentives to overbuild. Additionally, FERC would continue to conduct a full NEPA review for each project.[20]

The Policy Statement indicated that the amount of evidence required, and the categories of harm and benefit reviewed, would be determined on a case-by-case basis with a view toward proportional impact. While the Commission would not require that a specific percentage of a proposed project's capacity be under commitments, FERC indicated that the filing of contracts would constitute significant evidence of demand for the project. FERC also noted that a proposal with multiple non-affiliate contracts might present a greater indication of need than a proposal backed only by a precedent agreement with an affiliate. FERC noted additional aspects of a proposal that could significantly expedite project approval, such as the acquisition of necessary rights of way without significant need for eminent domain, or a filing to meet new demand as opposed to adding to an existing market.[21]

Finally, FERC stated its expectation that developers would conduct a pre-filing process to identify and potentially address significant landholder and other stakeholder issues early in the process, so as to expedite FERC's review. The process would include review of potential pipeline routes. Developers would initiate the process with a request to FERC approximately eight months prior to the filing of the formal certificate application.[22]

[19] Policy Statement, at 25.
[20] National Environmental Policy Act, 42 U.S.C. §4321 et seq. FERC is the designated lead agency coordinating NEPA compliance and other federal approvals in reviewing pipeline certificate applications. An Act to Ensure Jobs for Our Future with Secure, Affordable, and Reliable Energy, Pub. L. 109-58, 119 Stat. 594 (coded 42 U.S.C. 15801), Sec. 313.
[21] Policy Statement, at 25-26.
[22] P. Parfomak, "Interstate Natural Gas Pipelines: Process and Timing of FERC Permit Application Review," Congressional Research Service, January 16, 2015 (hereafter "CRS 2015"), at 1-2.

The Certification Process

With that Policy Statement clarifying how FERC would exercise its certification authority going forward, FERC has subsequently reviewed pipeline applications through a formal certification process. As depicted in Figure 1, the process appears relatively linear, but in practice there are many instances where the developer files additional information in supplements at various points in the process, which complicates not only FERC's review but also various stakeholders' participation and ability to comment.

The process formally begins with an application to FERC for a CPCN under Section 7 of the NGA and FERC's certification regulations.[23] Among other things, the application must contain a description of the project, route maps and alternatives, construction plans, a list of all statutory and regulatory approvals required from other agencies, milestones and schedules, and various environmental reports studying potential impacts on the environment, cultural resources, land use, and other impacts.[24]

Upon receiving a certificate filing, FERC issues a public notice and commences the application review process with a scoping of environmental issues.[25] FERC may issue a preliminary determination of need based on non-environmental factors and then begin the examination of the environmental impacts of the proposal in an Environmental Impact Statement (EIS) under NEPA.[26] Throughout, there are several opportunities for public input for both the environmental review and more generally.

Following its environmental review, FERC issues a draft EIS, which it finalizes after public comment. After issuing a final EIS, FERC makes a final determination on the certificate application. If granted, FERC's order states the terms and conditions of the approval, the approved pipeline route, and any required mitigation measures. FERC's certificate approval grants the developer eminent domain authority.[27] Parties may ask FERC to reconsider all or parts of its order, and if the rehearing period passes with continued FERC approval, FERC may issue a notice to proceed with construction activities.[28]

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[23] As noted above, approximately seven to eight months prior to submitting the formal certificate filing, a project developer may request to use FERC's pre-filing process to facilitate the certification and development process through pre-filing outreach with affected governmental entities and property owners, improvements in the certificate filing and investigation of impact-mitigation measures.

[24] CRS 2015, at 2-3.

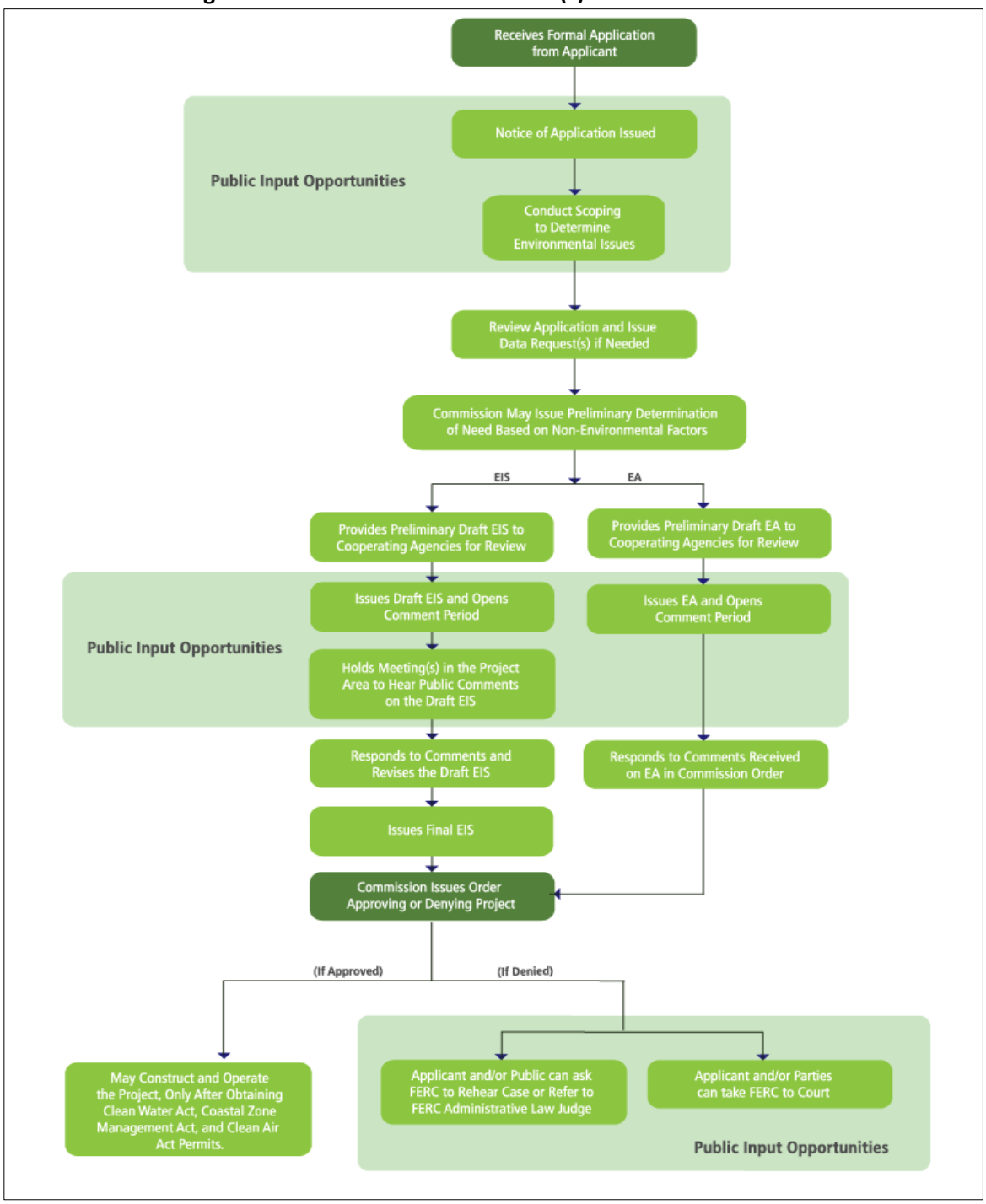
[25] FERC, "Processes for Natural Gas Certificates—Application Process" web page (hereafter "FERC web page"), https://www.ferc.gov/resources/processes/flow/gas-2.asp, accessed July 30, 2017.

[26] As shown in Figure 1, some projects may not need an EIS, if the agency with NEPA responsibilities for projects makes a finding in an Environmental Assessment (EA) that there is no significant impact on the environment.

[27] 15 U.S.C. §717f(h). Some have also deemed FERC's certificate approval as preempting state or local siting and zoning requirements. According to the Congressional Research Service, "[w]hen the pipeline company receives a certificate of public convenience and necessity from FERC, state or local laws that conflict with FERC's exercise of its jurisdiction under federal law or would pose an obstacle to construction of the pipeline (e.g., local zoning laws) are preempted unless FERC requires the company to comply with them as a condition of granting the certificate. The NGA specifically preserves state authority over pipeline projects under the federal Clean Air Act (CAA), Clean Water Act (CWA), and Coastal Zone Management Act (CZMA). However, state authority under these laws remains subject to federal administrative and judicial oversight and review." B. Murrill, "Pipeline Transportation of Natural Gas and Crude Oil: Federal and State Regulatory Authority," Congressional Research Service, March 28, 2016, Summary page. https://fas.org/sgp/crs/misc/R44432.pdf. However, some parties are contesting FERC's eminent-domain and preemption authorities: See, for example: M. Hand, "Landowners challenge pipeline developer, saying taking property is unconstitutional," Think Progress, July 28, 2017, https://thinkprogress.org/landowners-file-lawsuit-over-use-of-eminent-domain-942679e7e040/; M. Cusick, "Federal court rejects Constitution Pipeline's lawsuit against NY," StateImpact, August 18, 2017, https://stateimpact.npr.org/pennsylvania/2017/08/18/federal-court-rejects-constitution-pipelines-lawsuit-against-ny/.

[28] CRS 2015, at 5-6.

Figure 1: Overview of FERC Section 7(c) Certification Process



FERC web page.

Pipeline Certification Reviews

FERC has approved more than 400 pipeline applications since the 1999 Policy Statement, which led to approval of an additional 180 Bcf/d of capacity to the gas transportation system. Rejections of Section 7 applications have been the rare exception – only two rejections -- as described below.[29]

Even while approving virtually all applications, FERC's certification reviews have grown more substantial and complex over time, in part as a result of active participation by stakeholders in the application proceedings. These decisions have added detail to the agency's application of the Policy Statement principles. In nearly all cases, however, FERC's approvals of pipeline proposals have generally found that the following conditions have been met: (1) the project is financially supported by other than existing customers; (2) the project is needed, as demonstrated by contracts and/or precedent agreements indicating a prospective customer base; (3) the project will not adversely interfere with existing pipeline routes, customers, or markets; and/or (4) the project has taken steps to minimize identified adverse impacts on landowners and communities.

Various issues are typically raised through public comment, intervention in the proceedings or legal filings by individual or groups of landowners, states, localities, and various other stakeholders (such as local, regional, or national environmental organizations and business associations). For example, in its 2016 decision on the Florida Southeast Connection projects (sometimes called the Sabal Trail decision), FERC noted some parties' concerns about potential conflict-of-interest issues associated with the projects' investments to serve affiliated companies' demand, but FERC found that an affiliation between project shippers and pipeline owners is not by itself evidence of self-dealing, from the perspective of project need determination.[30] FERC came to the same finding about self-dealing concerns raised with respect to affiliate long-term precedent agreements in the Constitution Pipeline case.[31] And in a recent case (Atlantic Sunrise), FERC found that parties' concerns about overbuilding of pipeline capacity in the Southeast were not a basis to turn down the certification application, and noted that current underutilization did not necessarily indicate low demand for capacity in the future.[32]

While FERC has undertaken hundreds of pipeline certification reviews since issuing the 1999 Policy Statement, it has almost universally found project applicants to have sufficiently demonstrated need and/or benefits so as to warrant project approval under the principles and guidelines contained in the Policy Statement. In the two instances where FERC has rejected Section 7 proposals, FERC found the applicants had failed to show that the project's public benefits outweighed its adverse impacts. For example, in its 2011 denial of the Turtle Bayou Gas Storage Company's proposal to construct and

[29] As described further below, in 2011 FERC denied the application of the Turtle Bayou Gas Storage Company to construct and operate a natural gas storage facility in Texas (135 FERC ¶ 61,233 (2011)), and in 2016 FERC denied the application of Jordan Cove Energy Project to site, construct, and operate a liquefied natural gas (LNG) export terminal and associated facilities in Oregon along with the application of the Pacific Connector Gas Pipeline to connect the Jordan Cove LNG facility with the interstate pipeline system (154 FERC ¶ 61,190 (2016)).
[30] Florida Southeast Connection LLC, et al., 154 FERC ¶61,080 (2016), "Order Issuing Certificates and Approving Abandonment" (Docket Nos. CP14-554-000, CP15-16-000 and CP15-17-000). In this decision, FERC authorized three connected projects submitted by the Florida Southeast Connection, LLC, the Transcontinental Gas Pipe Line Company, LLC, and Sabal Trail Transmission, LLC.
[31] Constitution Pipeline Company, LLC, and Iroquois Gas Transmission System, LP, 149 FERC ¶ 61,199 (2014), "Order Issuing Certificates and Approving Abandonment" (Docket Nos. CP13-499-000 and CP13-502-000).
[32] Transcontinental Gas Pipe Line Company, LLC, 158 FERC ¶ 61,125 (2017), "Order Issuing Certificate" (Docket No. CP15-138-000).

operate a natural gas storage facility in Texas, FERC found that the applicant had failed to meet the criteria of the Policy Statement. No proposed pipeline capacity had been subscribed under any precedent agreements, the applicant failed to get rights to the sole landowner's land, and there was only a generally asserted need for gas storage.[33]

More recently, FERC denied the application for the 232-mile Pacific Connector Pipeline, having found that the applicants "failed to demonstrate a need for the project sufficient to outweigh the potential harm to the economic interests of landowners whose property rights might be taken by exercise of the right of eminent domain….Pacific Connector had neither entered into any precedent agreements for its project, nor had it conducted an open season….The order found that the generalized allegations of need proffered by Pacific Connector did not outweigh the potential for adverse impact on landowners and communities."[34] In the same decision, FERC also rejected the proposed Jordan Cove Liquefied Natural Gas (LNG) Terminal because it was "an integral part of a single project [with the Pacific Connector] to export domestic gas supplies and the terminal project is not feasible without a pipeline to transport gas to the terminal."[35]

Thus, in situations where FERC has determined that an applicant failed to demonstrate that the public benefits of a project outweigh its adverse impacts, FERC has rejected proposed projects. In the vast majority of cases, however, FERC has exercised its balancing test in a way that has led to project approvals. And in a recent 2-to-1 vote approving two pipelines in the same general vicinity, the commissioner voting against approval explained in a dissent her concerns that the pipelines would serve similar markets, that they would have significant adverse environmental impacts in the affected regions (especially when the combined impacts of the two pipelines were taken into consideration), that the record indicated there might be alternative approaches with significant environmental advantages over the pipelines' construction as proposed, and that a broader review of need (beyond precedent agreements) could help FERC better balance environmental impacts with project need and benefits.[36,37]

[33] Turtle Bayou Gas Storage Company, LLC, 135 FERC ¶ 61,233 (2011), "Order Denying Application for Certificate Authorizations" (Docket No. CP10-481-000), with language quoted in Jordan Cove Energy Project, LP, and Pacific Connector Gas Pipeline, LP, 154 FERC ¶ 61,190 (2016), "Order Denying Applications for Certificate and Section 3 Authorization" (Docket No. CP13-483-000 and Docket No. CP 13-492-000).

[34] Jordan Cove Energy Project, LP, and Pacific Connector Gas Pipeline, LP, 157 FERC ¶ 61,194 (2016), "Order Denying Rehearing," Docket No. CP13-483-001 and Docket No. CP13-492-001 (hereafter "Jordan Cove Rehearing Order"), at 2.

[35] Jordan Cove Rehearing Order, at 3.

[36] These two pipelines are Atlantic Coast Pipeline, LLC, Dominion Transmission, Inc., Piedmont Natural Gas Company, Inc. 161 FERC ¶ 61,042 (2017), "Order Issuing Certificates" (Docket Nos. CP15-554-000, CP15-554-001, CP15-555-000, CP15-556-000); and Mountain Valley Pipeline, LLC, and Equitrans, LP, 161 FERC ¶ 61,043 (2017), "Order Issuing Certificates and Granting Abandonment Authority" (Docket Nos. CP16-10-000 and CP16-13-000).

[37] Commissioner Cheryl LaFleur's dissent in each docket stated, among other things, that: "Deciding whether a project is in the public interest requires a careful balancing of the need for the project and its environmental impacts. In the case of the ACP and MVP projects, my balancing determination was heavily influenced by similarities in their respective routes, impact, and timing. ACP and MVP are proposed to be built in the same region with certain segments located in close geographic proximity. Collectively, they represent approximately 900 miles of new gas pipeline infrastructure through West Virginia, Virginia and North Carolina, and will deliver 3.44 Bcf/d of natural gas to the Southeast. The record demonstrates that these two large projects will have similar, and significant, environmental impacts on the region….Both projects appear to be receiving gas from the same location, and both deliver gas that can reach some common destination markets. Moreover, these projects are being developed under similar development schedules….Given these similarities and overlapping issues, I believe it is appropriate to balance the collective environmental impacts of these projects on the Appalachian region against the economic need for the projects. In so doing, I am not persuaded that both of these projects as proposed are in the public interest. I am particularly troubled by the approval of these projects because I believe that the records demonstrate that there may be alternative approaches that could provide significant environmental advantages over their construction…. I believe that the needs determinations for these projects highlight another issue worthy of further

III. Factors Affecting FERC Certification Review Policies

FERC's issuance of its 1999 Policy Statement was closely tied to the changes underway in the natural gas industry at the time, as noted earlier. These changes included structural shifts in the industry, increasing challenges in the review of pipeline proposals, and the anticipated growth in natural gas demand.[38] Increased opposition to development proposals, complex market and pricing dynamics associated with increasing capacity, and the shifting of demand growth to electricity generation required a "refresh" of the Commission's evaluation of pipelines against the broader natural gas policy context.

As of the late 1990s, the industry had undergone major regulatory restructuring and deregulation for more than a decade. Drilling, exploration, and production were growing quickly, in large part due to the enactment and implementation of the Natural Gas Wellhead Decontrol Act of 1989, which deregulated gas production. The Fuel Use Act, which for a period of time had prevented natural gas from being used for many industrial and power-production applications, had by then been repealed.[39] FERC took steps over the 1980s and early 1990s to unbundle gas supply from gas-transportation and to assure that gas shippers had access to gas transportation capacity on a nondiscriminatory basis.[40] Deregulation of the natural gas industry had evolved significantly by the mid-1990s.[41]

Demand was also growing, driven by economic growth and the addition of new gas-fired generating capacity.[42] A key concern at the time was limited transportation infrastructure after a decade of turbulence in the industry. These conditions were viewed particularly by the gas industry and many federal policy makers as necessitating expansion of the infrastructure needed to collect, store, import, and transport gas, and to serve new electric power demand growth with a unique pattern of peak demand needs (e.g., summer-peaking systems and competition with winter heating demand for capacity on the transportation system).[43] Infrastructure investment was deemed needed both to access frontier

discussion. The Commission's policy regarding evaluation of need, and the standard applied in these cases, is that precedent agreements generally are the best evidence for determining market need… I believe that careful consideration of a fuller record could help the Commission better balance environmental issues, including downstream impacts, with the project need and its benefits. I fully realize that a broader consideration of need would be a change in our existing practice, and I would support a generic proceeding to get input from the regulated community, and those impacted by pipelines, on how the Commission evaluates need." (Footnotes in the original are omitted here.)

[38] Policy Statement, at 1-2.

[39] Powerplant and Industrial Fuel Use Act of 1978, Pub. L. No. 95-620, 92 Stat. 3289. An Act to Repeal and Amend Certain Sections of the Powerplant and Industrial Fuel Use Act of 1978, Pub. L. 100-42, 101 Stat. 310.

[40] https://www.ferc.gov/legal/maj-ord-reg/land-docs/restruct.asp. Also, Rick Smead, "Price Instability in the U.S. Natural Gas Industry Historical Perspective and Overview," prepared for the Bipartisan Policy Center's Task Force on Natural Gas Market Stability, July 15, 2010, at 17-18, http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/Introduction%20to%20North%20American%20Natural%20Gas%20Markets_0.pdf.

[41] Many "industry observers mark the beginning of the deregulated era for the gas industry with the start of the spot market for natural gas. The genesis of the spot market for natural gas started with the large volumes of gas that were released as a result of the settlements between producers and pipelines over their gas supply contracts that occurred because of [FERC] Order 380 in 1984. [Order 380…eliminated gas costs from the pipeline minimum bill … (and) in essence, enabled customers (i.e., LDCs) to break prior commitments with pipelines and shop for the least expensive gas supplies from other states. This represented a major change in the industry's structure and quickly changed contracting practices.] The combination of this 'released gas' and the declining demand at the time resulted in large volumes of excess supply (i.e., the 'gas bubble' or excess deliverability that lasted for about 15 years)." North American Electric Reliability Corporation (NERC), "A Primer of the Natural Gas and Electric Power Interdependency in the United States," December 2011 (hereafter "NERC Gas Primer"), at 7 and 8, http://www.nerc.com/files/gas_electric_interdependencies_phase_i.pdf.

[42] National Petroleum Council (NPC), "Balancing Natural Gas Policy," September 2003, at 17.

[43] NPC, "Meeting the Challenges of the Nation's Growing Natural Gas Demand," 1999 (hereafter "NPC 1999"), at 10.

supply basin resources more distant from markets and to provide for distribution in more populous areas subject to more challenging siting and easement procedures and protests.[44,45] The FERC Policy Statement was seen as necessary for and supportive of achieving needed natural gas infrastructure expansion.[46]

Major Changes in the Natural Gas Industry Have Occurred Since the 1999 Policy Statement

The time is ripe for FERC to review its 1999 Policy Statement. There is strong reason for such a review, considering FERC's rationales in 1999 for evaluating its criteria for reviewing pipeline certification applications and for issuing the policy guidance, and also considering the significant changes that have occurred in the nearly two decades since 1999, including:

- substantial additions of pipeline capacity to transport natural gas,
- substantial growth in natural gas production,
- major locational shifts in natural gas production and pipeline capacity additions relative to demand,
- changes in the price of natural gas,
- growth in and changes in the pattern of demand in different sectors, and
- transformations in the character and levels of gas imports and exports.

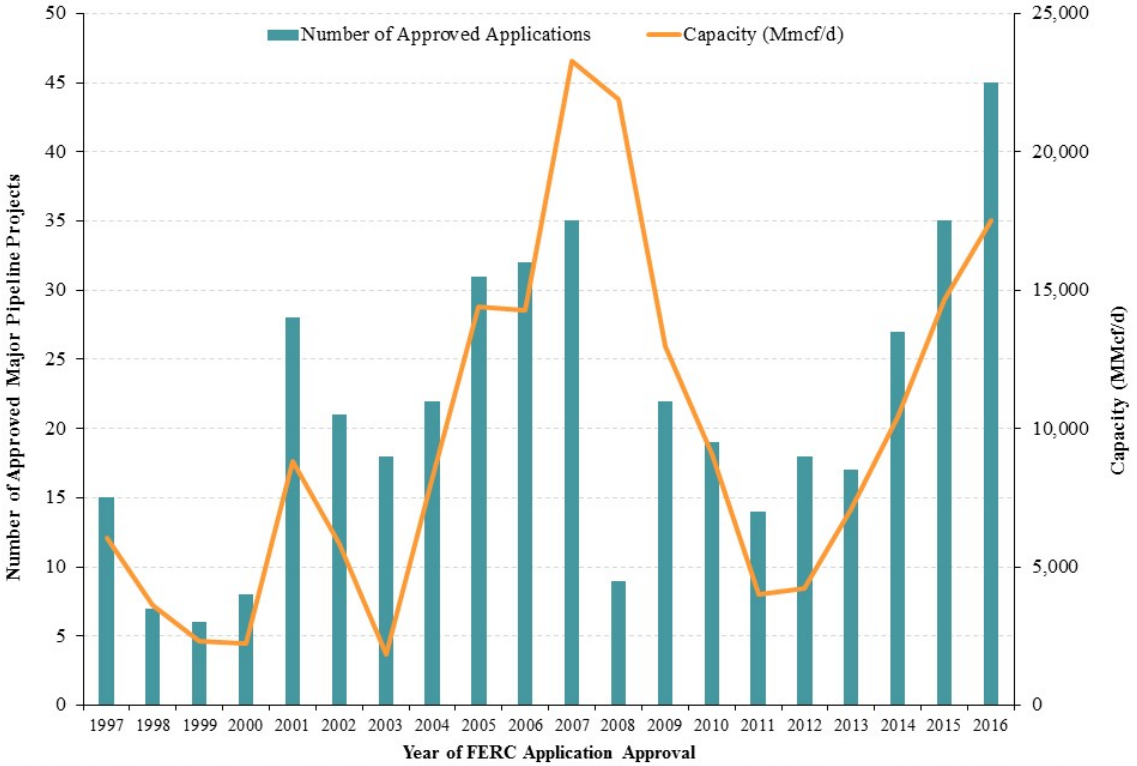
Further, the circumstances surrounding FERC's assessment of need and the level of participation in proceedings to review pipeline development impacts have changed in fundamental ways.

This combination of changes has significantly altered the context for natural gas pipeline investment, siting and construction and the factors that FERC should be considering in pipeline certification cases.

Significant increases in approved pipeline certifications and pipeline capacity: In the first 10 years after FERC's issuance of the Policy Statement, there have been steady approvals of new pipeline capacity in the U.S. (See Figure 2 for FERC-approved applications since 1997, along with the amount of pipeline capacity reflected in those FERC approvals, by year.) From 2000 through 2004, pipeline companies received approvals to add between 2 and 9 Bcf/d of gas transportation capacity each year.[47] During the next five years, capacity approvals increased even more, averaging more than 17 Bcf/d of capacity additions each year from 2005 through 2009. (Figure 2 shows capacity associated with FERC approvals in MMcf/d, with 1,000 MMcf/d equaling 1 Bcf/d.)

[44] NPC 1999, at 48.
[45] NPC, "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources," 2011 (hereafter "NPC 2011"), at 52.
[46] NPC 2011, at 52.
[47] Given limitations in the publicly available time series data that summarize gas-delivery capacity approval and additions in a consistent fashion, this discussion of capacity additions has been broken into two time periods: 2000-2004 and 2005-2009.

Figure 2: Approved Major U.S. Pipeline Projects (Number) vs. Capacity Added (MMcf/d) (1997-2016)



Note: Chart includes approved pipeline applications and those projects' associated capacity additions in the year of application approval. This does not represent capacity in service, or capacity coming online in any given year.

Source: FERC.

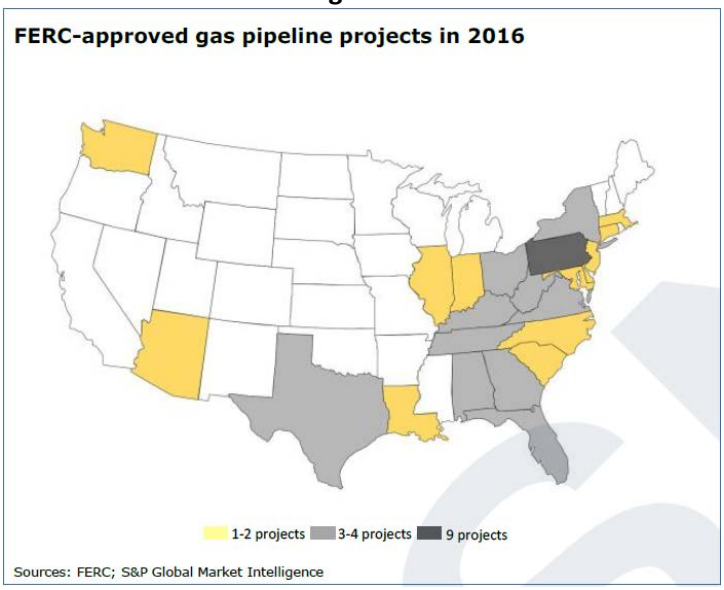
There was a drop-off in applications in 2008, reflecting the impact of the recession as well as the existence of high natural gas prices in the previous few years, which dampened demand and interest in adding new gas transportation capacity. Pipeline certification applications picked up considerably with the emergence of shale gas and declining gas prices in the post-2008 period.

From 2007 through 2016 alone, FERC approved 234 gas pipeline projects, more than half the number approved since the Policy Statement was issued in 1999. These projects amounted to 121 Bcf/d in total incremental capacity approvals, with 10,250 miles of pipe estimated to cost approximately $51.2 billion. For context, average use of natural gas during 2016 was 75.11 Bcf/d, and average daily use during a month with seasonally high use of gas (January 2017) was 93.1 Bcf/day.[48]

The impact of shale gas on development of pipeline capacity in the past decade has been significant: In 2016 alone, pipeline approvals were geographically concentrated in the Marcellus region in Pennsylvania and other parts of Appalachia, where (as described further below) gas production has increased dramatically in recent years.[49] See Figure 3.

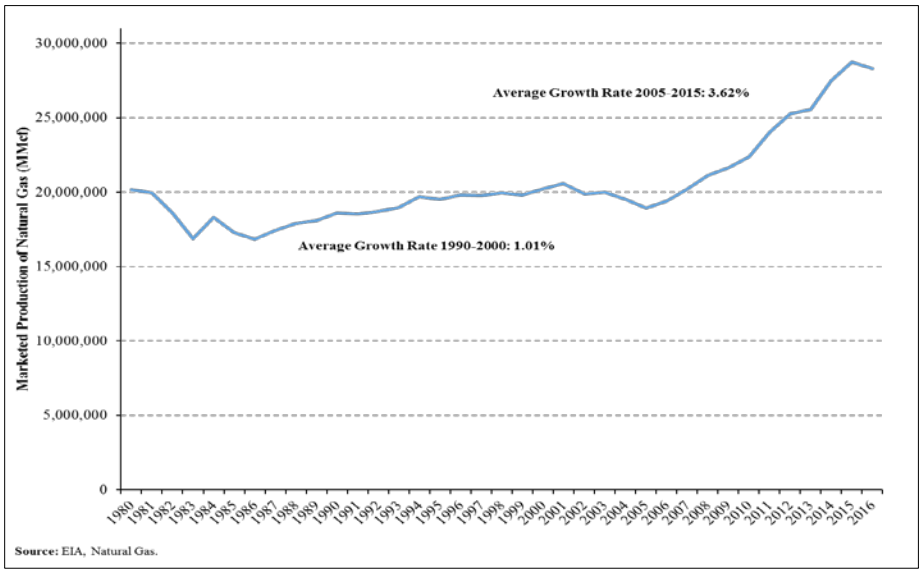
[48] EIA, "Natural Gas Monthly," March 2017 (for January 2017); and EIA, "Short Term Energy Outlook," September 2017, Table 5a, "U.S. Natural Gas Supply, Consumption, and Inventories."
[49] RRA, "An Overview of FERC Approval of Natural Gas Pipeline Projects from 2007–2016," March 9, 2017.

Figure 3:



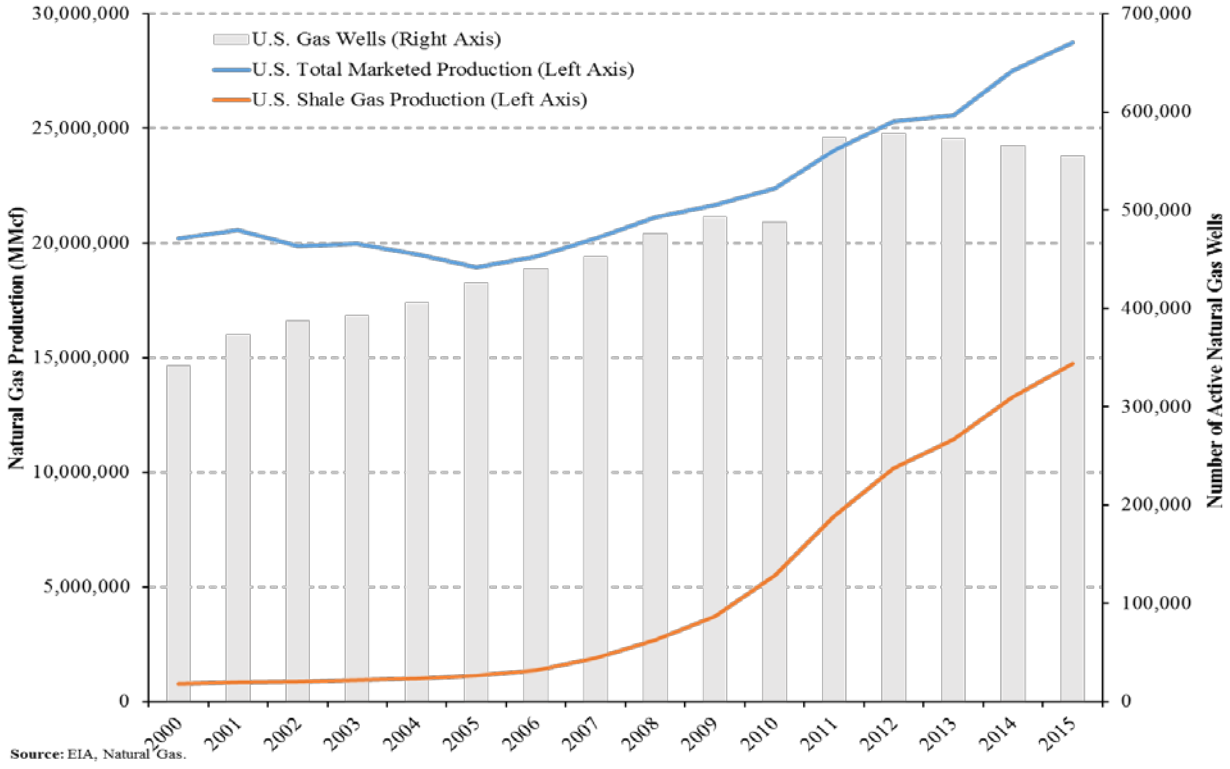
Substantial growth in natural gas production: U.S. gas production has grown significantly in the years since FERC's Policy Statement. Growth in domestic production accelerated in particular in the decade following the emergence of shale gas in the U.S. around 2006–2008. As shown in Figure 4, average annual growth in marketed domestic production of natural gas was just over 1 percent per year from 1990 to 2000; from 2005 to 2015 the growth rate was 3.6 percent per year on average. Between the mid-1980s and the mid-1990s, marketed natural gas production levels grew from around 17 trillion cubic feet (Tcf) annually to just over 20 Tcf; by contrast, between 2005 and 2015, output averaged nearly 28 Tcf. This new high represented a 65-percent increase from the levels of the mid-1980s. (Note that 1 Tcf equals 1,000 Bcf, or 1,000,000 MMcf of natural gas.)

Figure 4: U.S. Total Marketed Production of Natural Gas (MMcf) (1980-2016)



Changing location of natural gas production changes location of pipeline capacity additions: The dramatic increase in natural gas production since the mid-2000s is fundamentally due to the large and rapid growth in shale gas production.[50] Figure 5 compares marketed natural gas production (from Figure 4) with the annual trends in U.S. shale gas production and the total number of gas wells in the United States. As shown, the increase in overall gas production is directly due to the nearly 12 Tcf increase in shale gas production from 2005 through 2015.

Figure 5: U.S. Natural Gas Production (MMcf) and Natural Gas Wells (Number) (2000-2016)



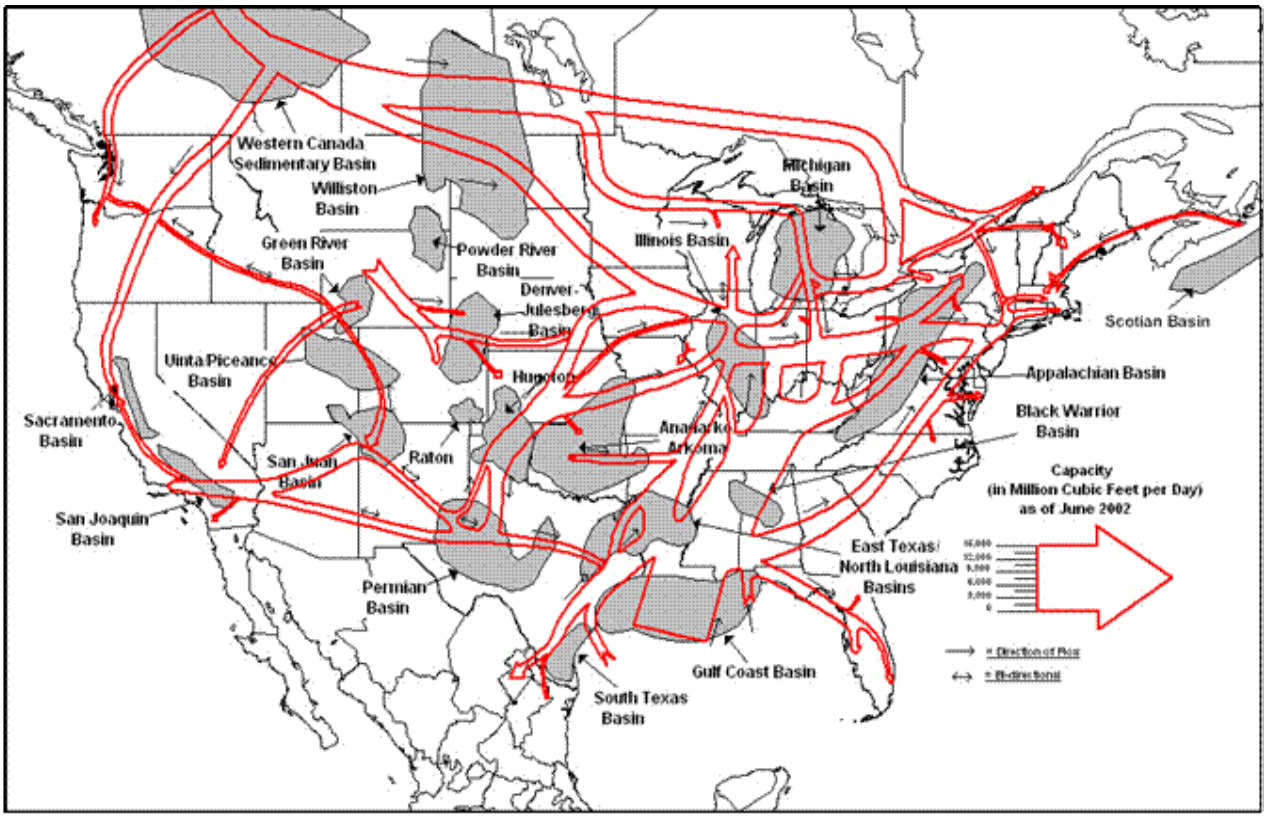
This increase in shale gas production has changed the geographic locus of domestic production, shifted the flows on the interstate pipeline network (changing the nature of market demand and impacts on competitors), and dramatically altered the nature of U.S. imports/exports of natural gas. Historically, domestic gas production occurred in Texas and the adjacent Southwest and Gulf Coast states, with major interstate pipelines emanating from those regions and connecting to gas-consuming regions elsewhere. This has changed since the conditions that existed in 1999, when FERC issued its Policy Statement.

Figure 6 depicts the volume and direction of flows (outlined in red pathways) on the gas transportation system as of 2008, with production basins indicated in the background. On the map, the

[50] EIA, "Marcellus, Utica provide 85% of U.S. Shale Gas Production Growth Since Start of 2012," *Today In Energy,* July 28, 2015 (hereafter "EIA Marcellus/Utica"), https://www.eia.gov/todayinenergy/detail.php?id=22252.

width of the red pathways indicates the capacity to move gas away from a production region. By far, the region with the most transportation capacity a decade ago was the Gulf Coast.

Figure 6: U.S. Natural Gas Pipeline Systems as of 2008



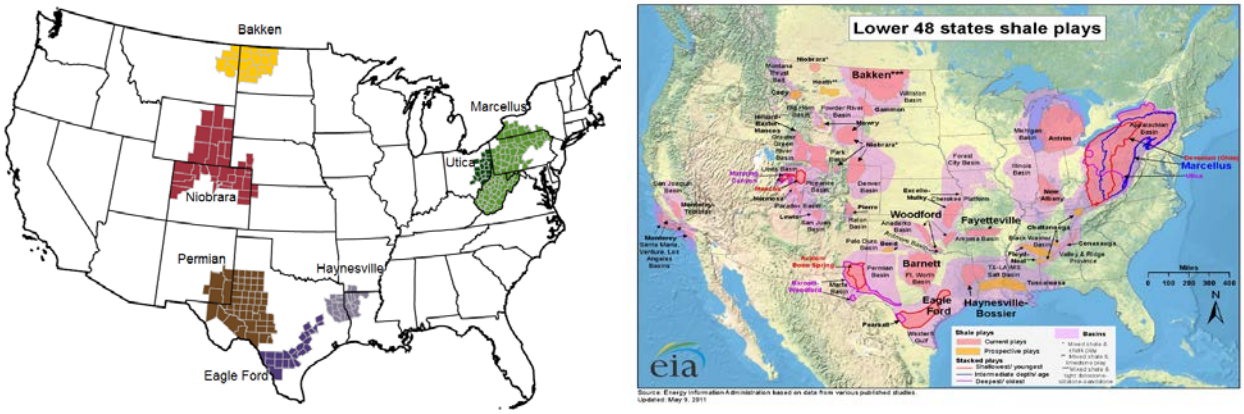
Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, Gas Transportation Information System

https://commons.wikimedia.org/wiki/File:Map_US_Natural_Gas.gif[51]

Although production of natural gas is still strong in the Gulf region (and elsewhere), the location of incremental production has changed in the past decade. Figure 7 shows the many shale-gas-producing regions in the U.S. But, as shown in Figure 8, production in the Marcellus and Utica regions in the Mid-Atlantic and Northeast regions has grown nearly 13-fold from 2010 to 2017 alone and has been the primary source of shale gas in the U.S. An EIA study found that the Marcellus and Utica shales constituted 85 percent of the overall increase in natural gas production since 2012.[52] Even as shale gas development in the Mid-Atlantic states has dominated market dynamics in the Northeast, the traditional Permian/Eagle Ford/Haynesville basins in the Gulf Coast region have still led in production of natural gas in the U.S. as a whole.[53] (See Figure 9.)

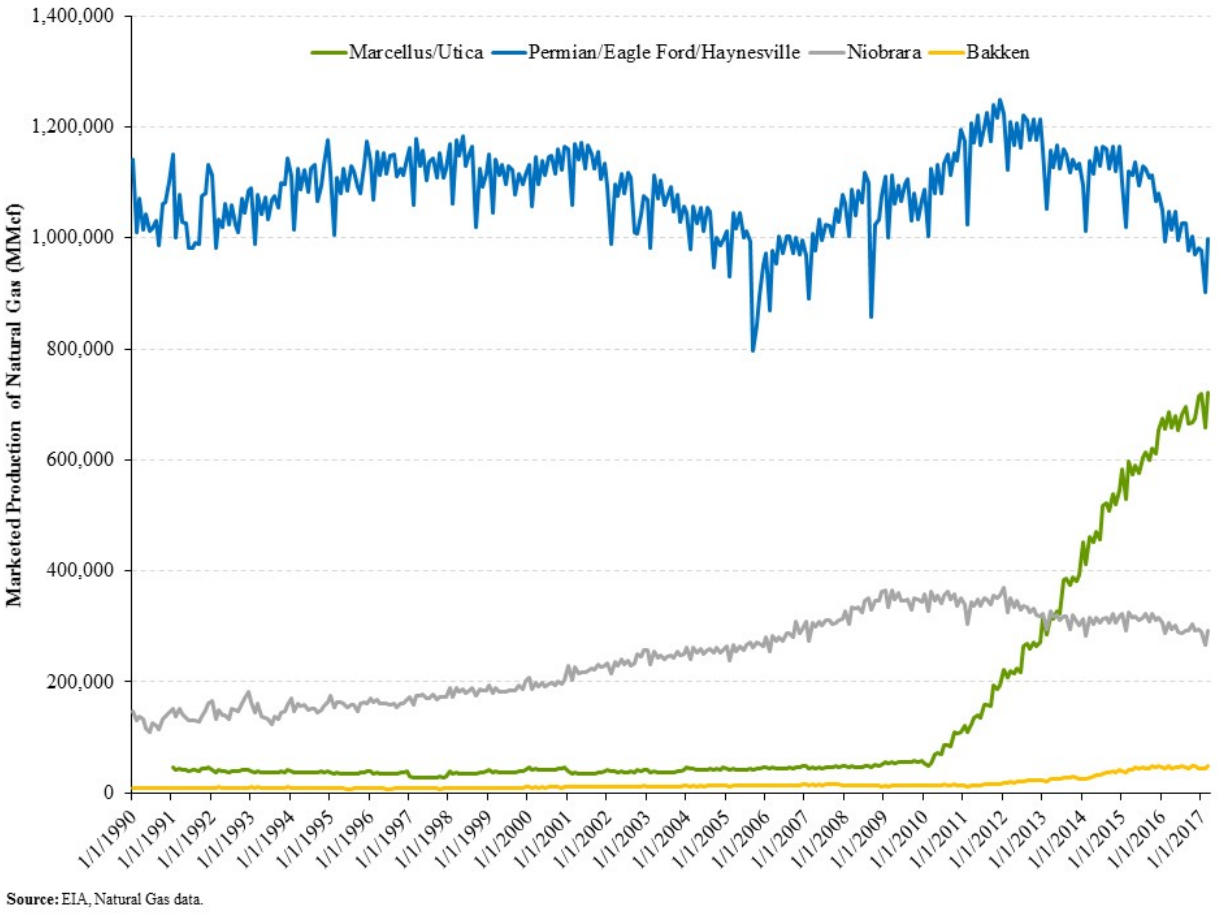
[51] EIA's website did not include this archived version of the 2008 flows on the gas-pipeline system, necessitating reliance upon this source.
[52] EIA Marcellus/Utica.
[53] Shale gas production in the Permian Basin region has flattened off at about 400,000 to 500,000 MMcf per year, whereas the production levels in Marcellus/Utica/Antrim region continue to rise. See Figure 9 for annual production of shale gas only.

Figure 7: Shale-Gas Producing Regions and Shale Plays



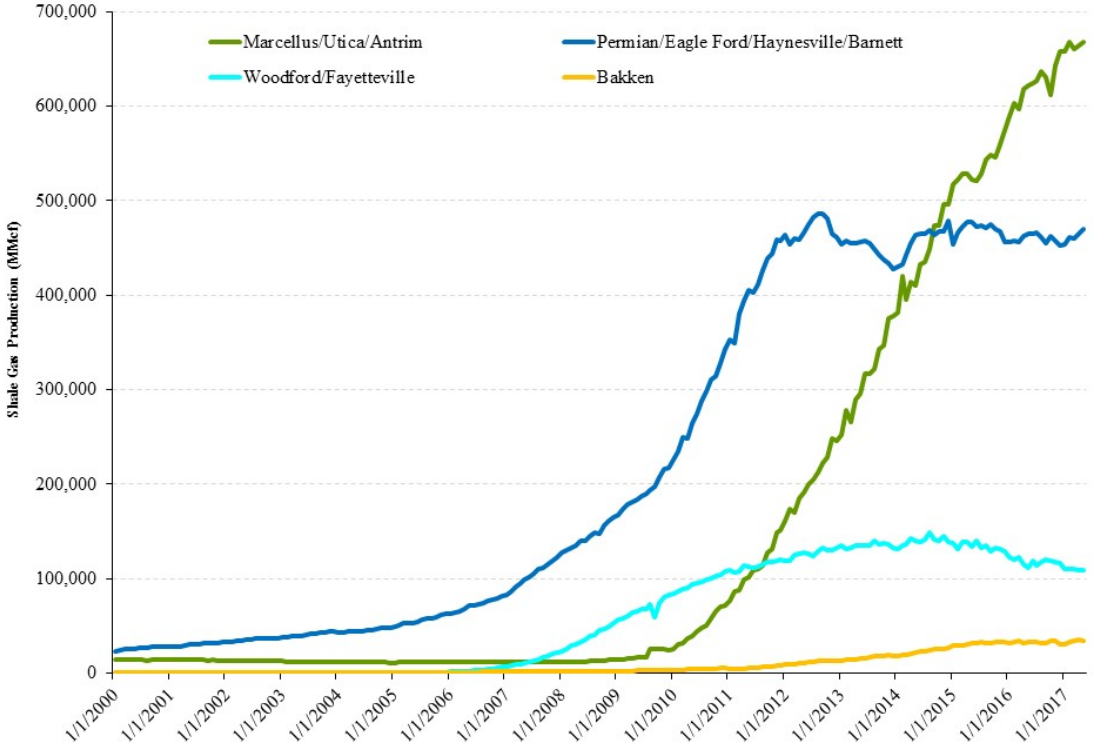
Source: EIA for both maps

Figure 8: U.S. Marketed Production of Natural Gas by Major Gas Region (MMcf) (1990-2017)



Source: EIA, Natural Gas data.

Figure 9: U.S. Shale Gas Production by Major Shale Gas Region (MMcf) (2000-2017)



Note: Only shale gas production is included.
Source: EIA, Natural Gas data

The growth in shale gas production in nontraditional gas-producing regions in the U.S., the associated changes in production in traditional regions and the changes in U.S. imports and exports of natural gas have strongly affected the quantity, location and purpose of pipeline development and use in the past decade.

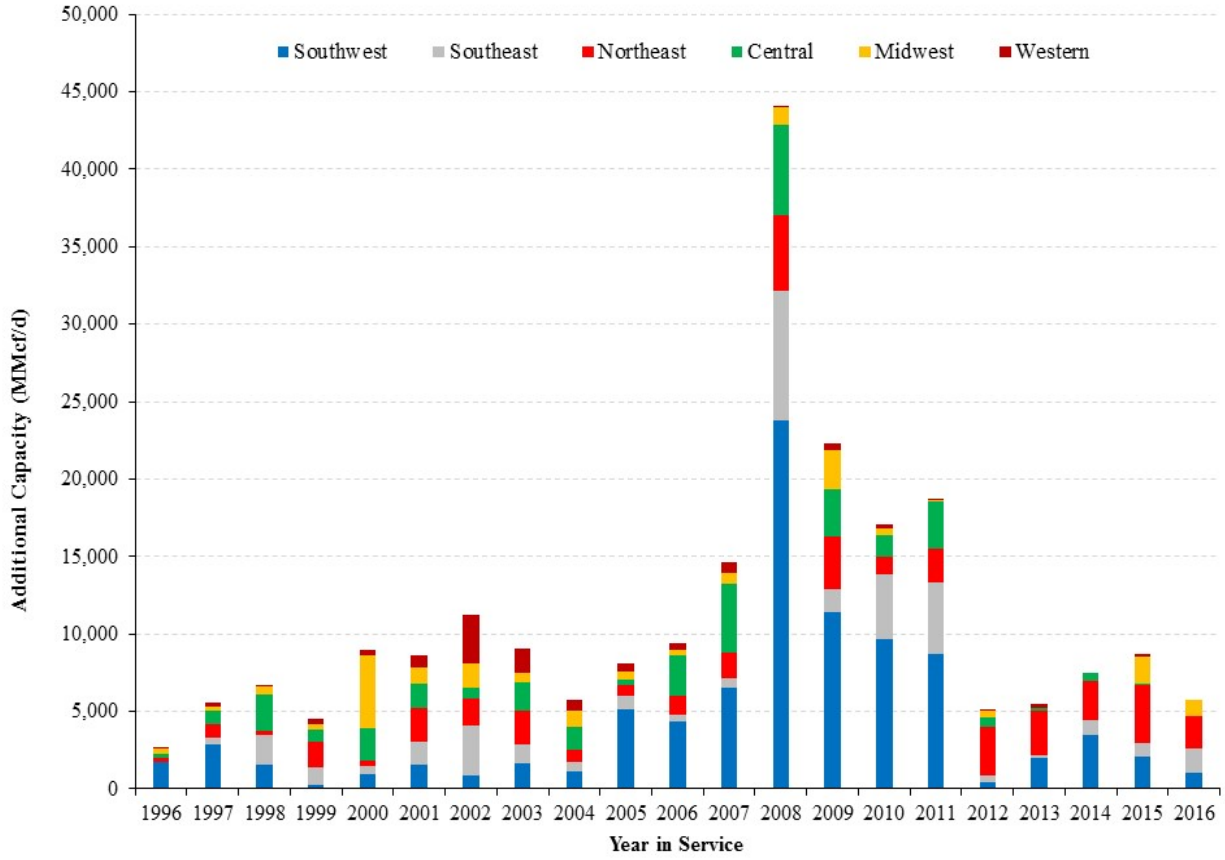
Figure 10 shows the actual annual U.S. gas pipeline capacity additions (by the year in which the pipeline capacity entered commercial service) over the past 20 years, by region.[54] Growth in pipeline capacity additions was greatest in the mid-2000s, with just under 118 Bcf/day of capacity added from 2007 through 2011. Given the land-acquisition/engineering/construction period that follows upon a FERC approval, these capacity additions reflect applications originally submitted to and/or approved by FERC in the few years preceding the year in which capacity was added. (The spike in capacity coming on line in 2008 reflects the high level of pipeline capacity in the many dozen FERC applications approved in the few years before 2008.[55]) The capacity that entered service from 2007 through 2011 was more than

[54] According to definitions of the EIA, the Northeast region includes ME, NH, VT, MA, RI, CT, NY, PA, NJ, WV, VA, MD, DE, and DC; the Southeast region includes KY, TN, NC, SC, GA, AL, MS, and FL; the Midwest region includes OH, MI, IN, IL, WI, and MN; the Central region includes MO, IA, KS, NE, SD, ND, MT, WY, CO, and UT; and the Southwest region includes LA, AR, TX, OK, and NM. For the purposes of the chart, pipelines located exclusively in the Gulf of Mexico have been included in the Southwest region. The West region includes AZ, CA, NV, ID, OR, and WA (and, for purposes of the chart, Alaskan pipelines have been included in the West).

[55] In Figure 2, the annual amounts of capacity reflect the Bcf/d associated with the FERC-approved applications in a particular year. In Figure 10, the amounts of capacity reflect the year the pipeline project finished construction and entered commercial operations.

half of all capacity additions between 2000 and 2016. These additions, particularly in the past decade, occurred primarily in the Northeast, where the majority of incremental shale-gas production occurred and where there are active markets for incremental gas supply. This is particularly true since 2012.

Figure 10: U.S. Natural Gas Annual Transmission Pipeline Capacity Additions by Region (1996-2016)



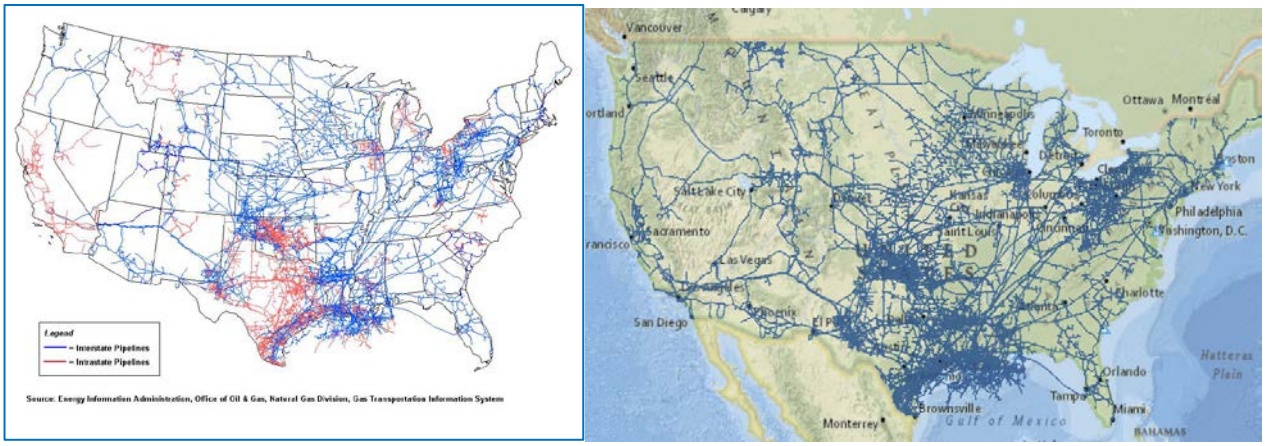
Note: Chart includes capacity added by year in service. This is different from Figure 2 in that Figure 2 displays capacity additions by year of FERC application approval.

Source: EIA.

The current U.S. pipeline system reflects the effect of this incremental pipeline capacity addition. Figure 11 (on the left) shows the pipeline system as it existed as of 2009, with the Southwest/Gulf Coast area representing a significant concentration of pipeline infrastructure. By 2016, the capacity in that region still represents a major share of the nation's total, but the additions in the Northeast now account for an increased share of total capacity on the interstate system.

Figure 11: U.S. Natural Gas Pipeline Systems

Pipelines as of 2009 **Pipelines as of Mid-2017**



Source: EIA, https://www.eia.gov/naturalgas/archive/analysis_publications/ngpipeline/ngpipelines_map.html (for 2009 map); EIA, https://www.eia.gov/state/maps.php (for 2017 map).

Gas commodity price increases: The abundance of natural gas resources and production in the U.S. has in turn had a stark impact on the price of natural gas, and gas prices are currently quite low. Figure 12 shows an overlay of monthly Henry Hub gas prices on top of monthly U.S. marketed production. From the mid-1990s to the mid-2000s, production remained relatively constant, but gas prices were rising, primarily due to increased demand in the electric power sector.[56] (See Figure 13.) During the mid-2000s, production increased and gas prices started to drop, and gas prices have remained relatively low since then. The average gas price for 2008 was $8.86/MMBtu, whereas the average Henry Hub price in 2016 was only $2.52/MMBtu – a 72-percent decrease in price in an 8-year span.[57]

Changes in demand for natural gas by different customer segments: The decline in gas prices has driven significant fuel switching in the electric power sector (primarily from coal to natural gas). In 2005, natural gas made up 22 percent of U.S. electricity generation, with coal contributing 47 percent. In 2016, gas-fired generation surpassed coal generation, with gas making up 33 percent of generation compared with 31 percent for coal.[58] Figure 13 shows the dramatic growth in demand for natural gas in the electric sector, compared with demand in other sectors over the past 20 years. In terms of absolute consumption, the power sector today uses more gas than any other sector, a notable change from the mid-90s, when the electric sector trailed both residential and industrial consumption.[59]

[56] FERC Staff Report, "High Natural Gas Prices: The Basics," December 2005, https://www.ferc.gov/legal/staff-reports/high-gas-prices-1.pdf.
[57] EIA, "Henry Hub Natural Gas Spot Price," https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm (accessed on October 29, 2017).
[58] SNL Financial data. Also, EIA, "Competition Between Coal and Natural Gas Affects Power Markets," *Today in Energy,* June 16, 2017, https://www.eia.gov/todayinenergy/detail.php?id=31672.
[59] EIA, "U.S. Natural Gas Consumption by End Use."

Figure 12: Monthly Average Henry Hub Natural Gas Spot Price ($/MMBtu) and Marketed Gas Production (MMcf) (1997-2017)

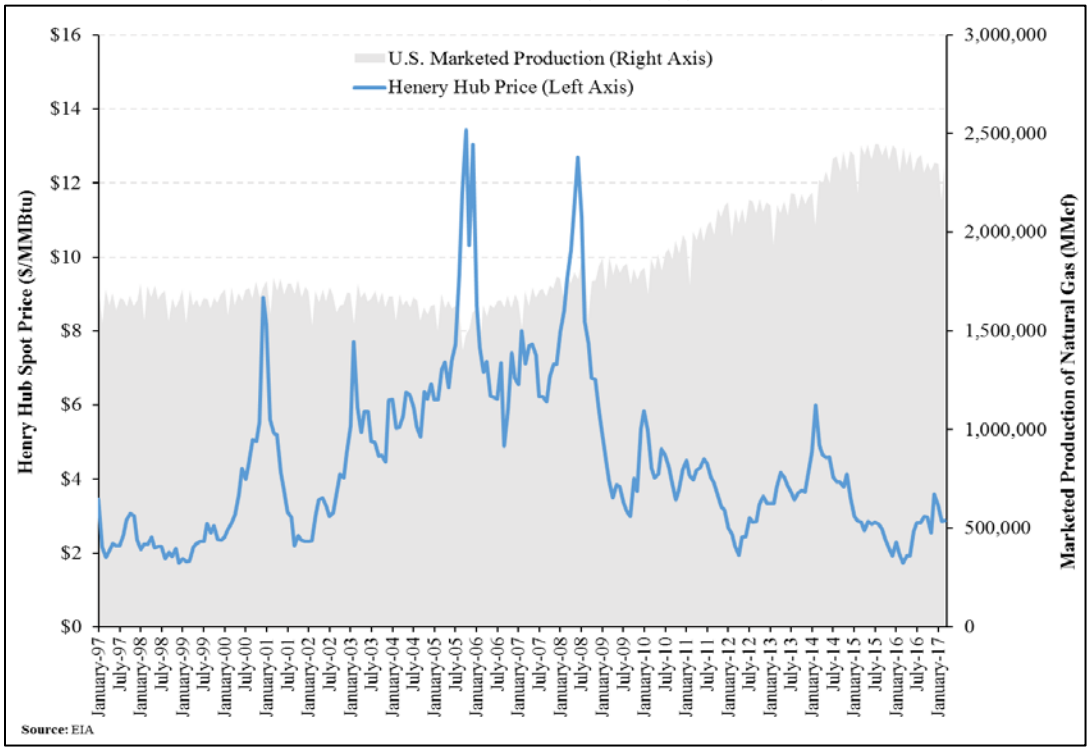
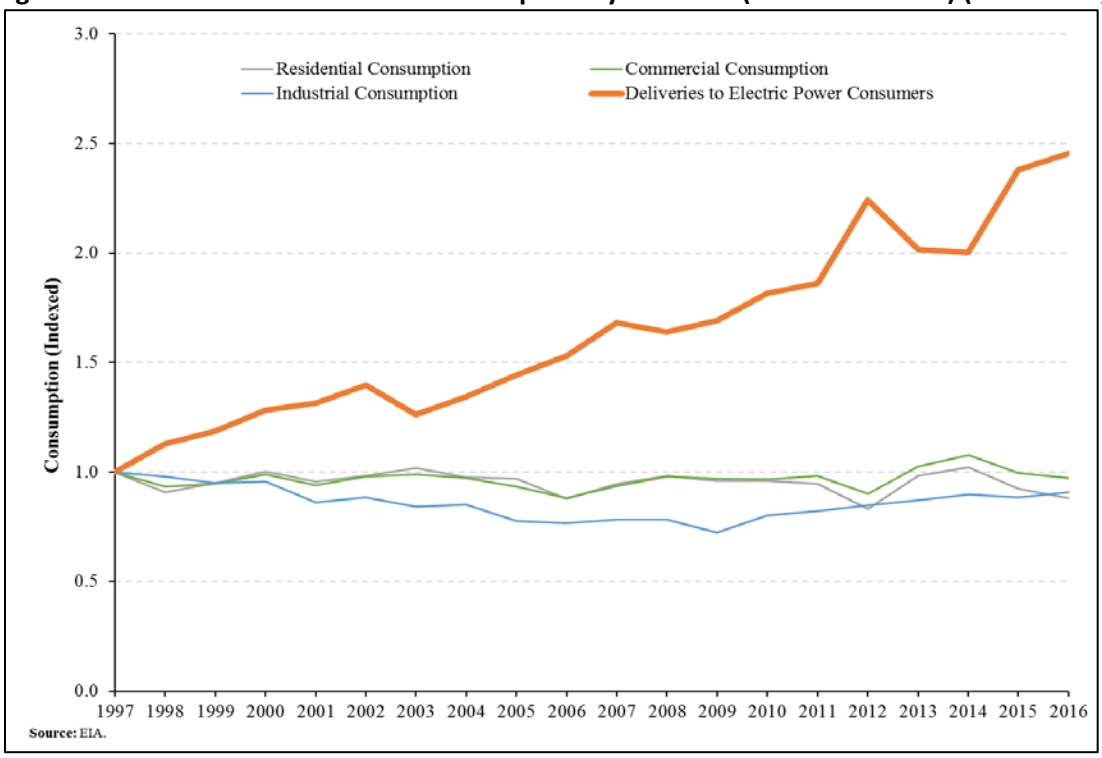


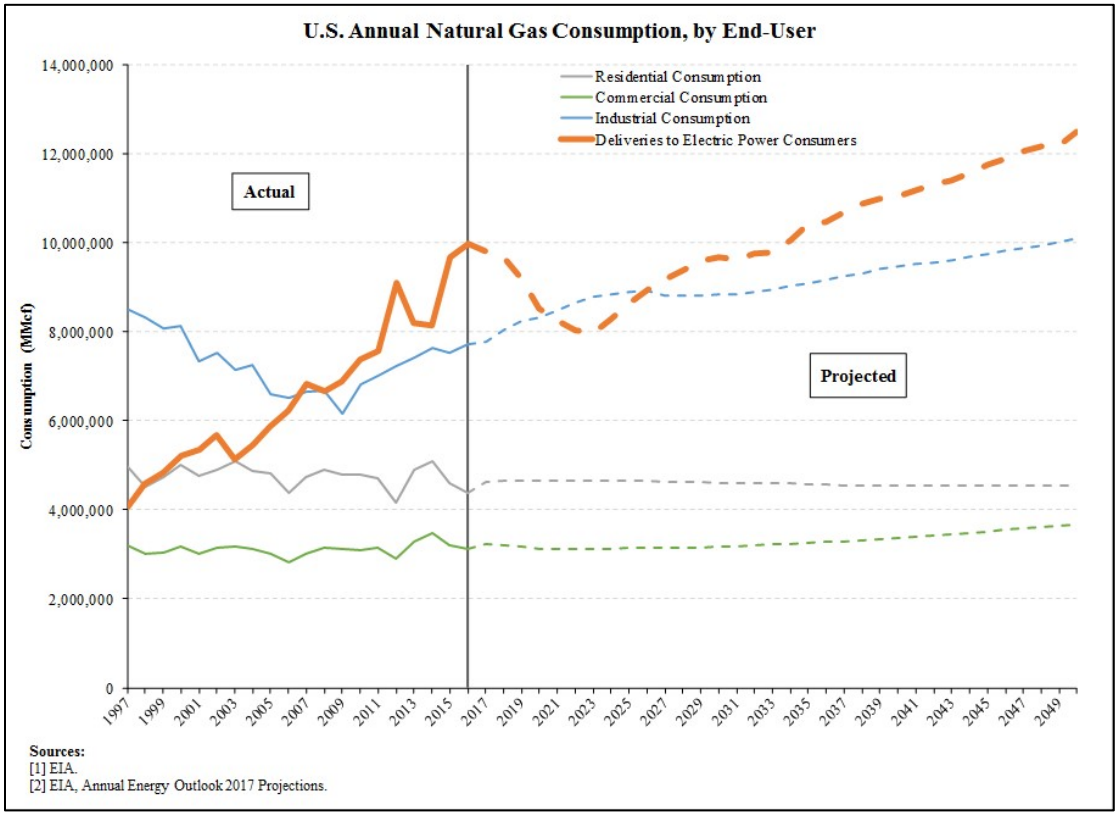
Figure 13: U.S. Annual Natural Gas Consumption by End User (Indexed to 1997) (1997-2016)



EIA projects that this trend will continue in future decades (in the absence of new policies, which is a core assumption in EIA's long-term forecasts).[60] EIA estimates that gas used for power generation will grow substantially, well outpacing the use of gas in the residential and commercial sectors (anticipated to remain relatively flat), and even ahead of growth in consumption in the industrial sector (estimated to see modest increases in gas use). (See Figure 14.)

This outlook for greater use of gas for power generation adds uncertainty to the usage patterns on the interstate gas-pipeline system. Power plants have patterns of output that vary by season, with peak demand for generation during the summer months, when capacity to move gas is generally available, and with a second but lower peak during winter months, when there may be greater competition for access to existing pipeline capacity in different parts of the pipeline system. Even as the power sector is expected to increase its demand for natural gas, the electric system is evolving rapidly with the entry of more renewable resources, which will affect patterns of output at gas-fired power plants. These factors, combined with additional production of shale gas in the Marcellus and Utica regions, could create a more dynamic landscape of continually shifting and unpredictable flows on the interstate gas pipeline system.

Figure 14: U.S. Annual Natural Gas Consumption by End User, Actual and EIA Forecast (1997-2050)

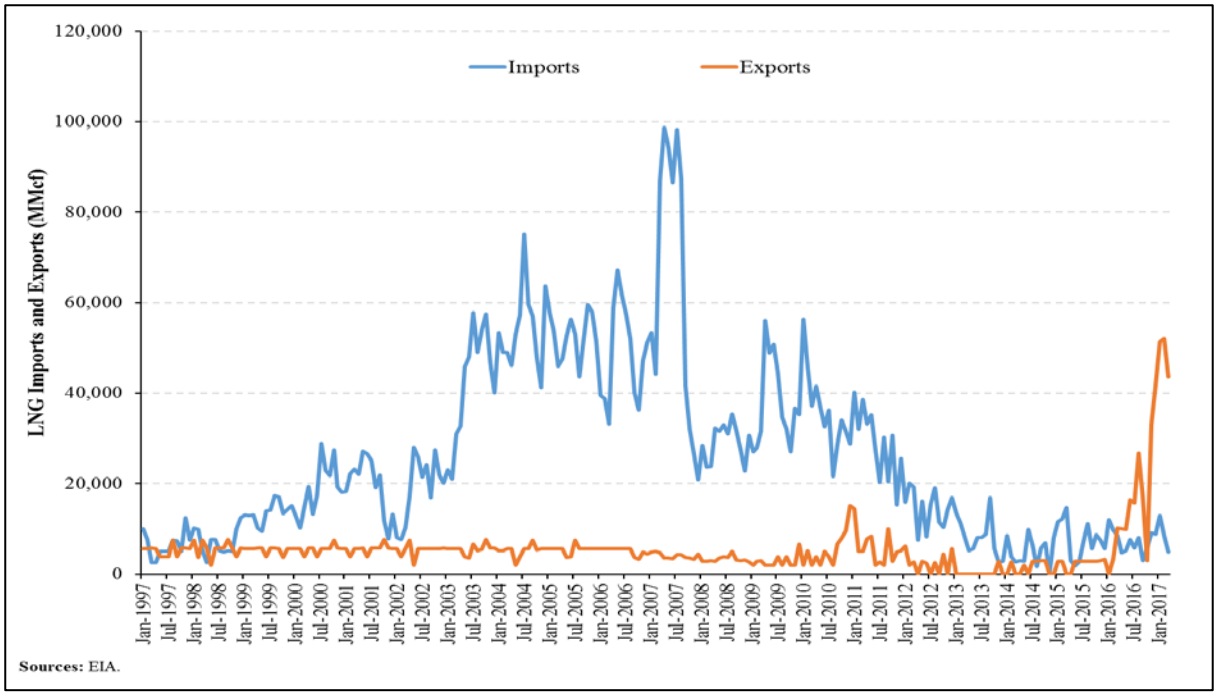


[60] EIA, *Annual Energy Outlook 2017,* January 2017, https://www.eia.gov/outlooks/aeo/.

These changing circumstances in the market for natural gas point to the need to examine these dynamics quite explicitly as part of reviews of proposed pipeline additions.

From imports to exports of natural gas: Despite increased demand from the electric power sector, production in the U.S. has grown so substantially that there is now a surplus of natural gas (i.e., higher levels of gas production than consumption in the U.S.). The excess supply is a reversal of the nation's historical posture as a net importer of natural gas.[61] Figure 15 shows this transformation over the past 20 years. Natural gas imports (especially in the form of LNG) spiked in the mid-2000s, but as production has increased, imports have declined and exports have grown substantially over the past two years.

Figure 15: U.S. Liquefied Natural Gas (LNG) Imports and Exports (1997–2017)



Other Changes Affecting the U.S. Energy System Have Occurred Since 1999

Many other changes have also taken place since 1999 and have altered the context in which gas-transportation facilities come before FERC for a certification review. These changes, in combination with the fundamental shifts in the natural gas industry discussed above, provide a strong rationale for FERC to evaluate the guidance contained in its 1999 Policy Statement, with an eye toward evolving it to ensure its relevance in certification proceedings over the next decade.

Changes for FERC to consider include near-term transitions in the electric system that are likely

[61] EIA, "United States Expected to Become a Net Exporter of Natural Gas This Year," *Today in Energy,* August 9, 2017, https://www.eia.gov/todayinenergy/detail.php?id=32412.

to affect the role of gas for power supply; increasing opposition to natural gas infrastructure; changes in the state of climate science; impacts from climate change; and potential longer-term transitions in the nation's energy portfolio as discussed in deep-decarbonization analyses.[62] As described further below, these changes introduce countervailing pressures with respect to the incremental need for gas-delivery capacity additions and raise questions about how various types of impacts of such facilities and systems might affect the need for and risks associated with new pipeline capacity additions in the near term and the long run.

Although FERC is not an environmental regulator, the Commission's exercise of its certification authority introduces environmental issues into its reviews, in terms of both public benefits and adverse impacts. Increasingly, local, regional and even global impacts associated with use of natural gas as an energy resource are introduced into Section 7 facility reviews. Moreover, FERC is required to address environmental impacts pursuant to its obligations under NEPA.[63]

While FERC's jurisdiction over the environmental impacts of energy production and use may be limited, these issues will undoubtedly continue to be part of the agency's review of proposed new gas infrastructure and will influence the quantity and nature of pipeline-certification reviews going forward. This seemed clear even before the recent decision of the D.C. Circuit Court of Appeals on the need for FERC to review the environmental impacts of the use of natural gas transported across Section 7 facilities.[64] It is now even more certain.

For this reason, this paper reviews the many changes that have occurred since 1999 in the nation's electric system, in public attitudes about siting energy facilities, in what is known about the changing climate, and in what is anticipated with respect to a much lower-carbon energy portfolio in the future.

Transitions in the U.S. electric system: The nation's electric system is in the midst of a major transformation, one that has already affected the demand for natural gas and for facilities covered by FERC's certification authority in recent years.[65] Among the many changes that have occurred since 1999:

- significant additions of gas-fired and renewable-energy generating capacity (see Figure 16);

[62] There is a growing body of literature on the need to decarbonize the nation's energy systems in order to address the worst impacts of climate change. This literature assumes not only that in order to meet the targets for GHG-emission reductions consistent with a 2°C maximum change in average global temperatures adopted in the Paris Climate Accord, it will be necessary to reduce emissions in the power sector, but also that it will be necessary to electrify energy uses in sectors that now rely on direct energy use of fossil fuels. See, for example, J. Jenkins and S. Thernstrom, "Deep Decarbonization of the Electric Power Sector: Insights From Recent Literature," Energy Innovation Reform Project, February 2017 (hereafter "Jenkins & Thernstrom Literature Review"), http://innovationreform.org/wp-content/uploads/2017/03/EIRP-Deep-Decarb-Lit-Review-Jenkins-Thernstrom-March-2017.pdf. A recent addition to the deep decarbonization literature is the Natural Resources Defense Council (NRDC) report *America's Clean Energy Frontier: The Pathway to a Safer Climate Future*, September 2017, https://www.nrdc.org/resources/americas-clean-energy-frontier-pathway-safer-climate-future.

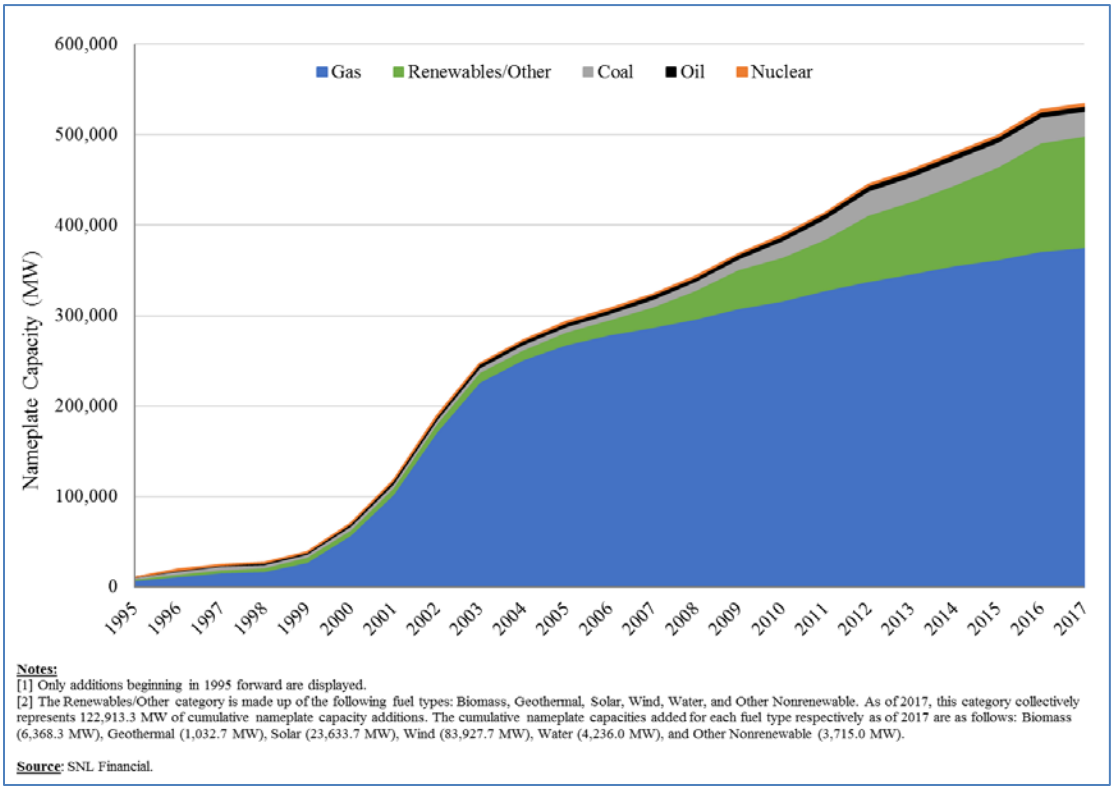
[63] NEPA, 42 U.S.C. §4321 et seq.

[64] U.S. Court of Appeals for the District of Columbia Circuit, *Sierra Club et al. v. FERC*.

[65] U.S. Department of Energy, "Staff Report to the Secretary on Electricity Markets and Reliability," August 2017; Quadrennial Energy Review Task Force, "Transforming the Nation's Electricity System," Second Installment Report of the Quadrennial Energy Review, January 6, 2017; P. Hibbard, S. Tierney, and K. Franklin, "Markets, Reliability and the Evolving U.S. Power System"; J. Chang et al., "Advancing Past 'Baseload' to a Flexible Grid: How Grid Planners and Power Markets Are Better Defining System Needs to Achieve a Cost-Effective and Reliable Supply Mix," prepared for NRDC by the Brattle Group, June 26, 2017; National Academy of Sciences, "Enhancing the Resilience of the Nation's Electricity System," July 20, 2017.

- retirements of older and less efficient fossil-fueled generating assets;
- increases in gas-fired generation in the past decade, in part as a result of its cost advantages relative to coal-fired power production and the ability of gas-fired plants to operate flexibly;
- relatively flat demand for electricity;
- increased deployment of distributed energy resources (e.g., solar, wind, microgrids, demand-response capability, fuel cells, small-scale storage, energy efficiency, and combined heat and power systems) on customers' premises or otherwise located close to customer loads; and
- the introduction of "smart grid" software systems and physical devices allowing greater operational visibility and operational controls on the electric grid.

Figure 16: U.S. Power Supply Capacity Additions by Fuel Type; Cumulative, 1995-2017[66]



Notes:
[1] Only additions beginning in 1995 forward are displayed.
[2] The Renewables/Other category is made up of the following fuel types: Biomass, Geothermal, Solar, Wind, Water, and Other Nonrenewable. As of 2017, this category collectively represents 122,913.3 MW of cumulative nameplate capacity additions. The cumulative nameplate capacities added for each fuel type respectively as of 2017 are as follows: Biomass (6,368.3 MW), Geothermal (1,032.7 MW), Solar (23,633.7 MW), Wind (83,927.7 MW), Water (4,236.0 MW), and Other Nonrenewable (3,715.0 MW).

Source: SNL Financial.

FERC is very familiar with the changing character of the electric grid and the complex set of technological, economic, environmental, and policy factors driving such changes. Over the past few years, for example, FERC commissioners and/or staff have conducted several technical conferences that explore the implications of such changes and have solicited public comments on these issues.[67] FERC

[66] P. Hibbard, S. Tierney, and K. Franklin, "Electricity Markets, Reliability, and the Evolving U.S. Power System," at 31 (SNL Financial data).
[67] See, for example, the following administrative records and documents:

- the June 22, 2017, Reliability Technical Conference Regarding the Bulk-Power System (Docket No. AD17-8-000);
- the May 1, 2017, Technical Conference on State Policies and Wholesale Markets Operated by ISO New England Inc., New York Independent System Operator, Inc., and PJM Interconnection, LLC (Docket No. AD17-11-000);
- the June 1, 2016, Reliability Technical Conference (Docket No. AD16-15-000);
- the February 19, 2015, Technical Conference on EPA's Clean Power Plan (AD15-4);
- the September 25, 2013, Technical Conference on Centralized Capacity Markets in RTOs/ISOs (AD13-7-000); and

staff have also prepared numerous reports on related issues in recent years.[68]

Many of these trends have contributed to increased demand for natural gas by the power sector, as explained above. But some of them – such as the increasing penetration of large-scale renewable projects, small-scale non-fossil distributed energy resources, operational controls on the system, and flat demand – together may have the effect of dampening, offsetting, and/or significantly altering the shape of the demand for natural gas in the years ahead.

Opposition to gas pipelines and related facilities: Opposition to gas pipelines and LNG facilities has been common in the industry for decades (and was in fact mentioned in the 1999 Policy Statement).[69] In recent years, however, the level and intensity of opposition to pipeline expansions and new pipelines has increased substantially. The diverse opponents to pipeline projects raise a variety of concerns, including not only those highlighted in the Policy Statement, like the taking of private property and impacts on land values, but many others, including environmental impacts, safety issues, and community impacts. These issues now show up relatively routinely in the comments of members of the public and intervenors in FERC dockets on pipeline and LNG facility applications. As described by former Chairman Norman Bay and Commissioner and former Chairman Cheryl LaFleur, protesters now show up at Commission meetings and personal residences.[70] The increased intensity of opposition to facilities is one of the reasons cited by former Chairman Bay for his belief that FERC should consider revising its certification policy.[71]

The new norm is for longer reviews with more extensive comments and questions from the public. More concerns are being raised in many of those comments about the need for better opportunities for meaningful public input in the context of dockets (which involve complicated technical information and formal administrative procedures), and there are increasing concerns about Commission policy more broadly. Advocacy in opposition to new infrastructure and new projects has increased, as has litigation about project approvals. There is stronger and more organized public outreach, and in many cases greater scrutiny by politicians whose constituents are affected by pipeline proposals.[72]

- five regional conferences held in August 2012 on issues at the intersection of the gas and electric industries, described in the "Staff Report on Gas-Electric Coordination Technical Conferences" (Docket No. AD12-12-000), November 15, 2012.

[68] See, for example, periodic staff reports on the state of the markets, demand response, gas-electric coordination, reliability, and energy infrastructure, https://www.ferc.gov/legal/staff-reports.asp.

[69] See, for example: "Under section 7(h) of the NGA, a pipeline with a Commission-issued certificate has the right to exercise eminent domain to acquire the land necessary to construct and operate its proposed new pipeline when it cannot reach a voluntary agreement with the landowner. In recent years, this has resulted in landowners becoming increasingly active before the Commission. Landowners and communities often object both to the taking of land and to the reduction of their land's value due to a pipeline's right-of-way running through the property. As part of its environmental review of pipeline projects, the Commission's environmental staff works to take these landowners' concerns into account, and to mitigate adverse impacts where possible and feasible." Policy Statement, at 15.

[70] Then-Chairman Cheryl LaFleur, National Press Club Speech, January 27, 2015, https://www.ferc.gov/media/videos/lafleur/2015/012715-lafleur.pdf.

[71] In explaining this position, then-Chairman Bay cited the "increased controversy" surrounding pipeline infrastructure as well as the "considerable public interest" associated with concerns over the production of gas, methane emissions, and the use of fracking. FERC, National Fuel Gas Supply Corporation Empire Pipeline, Inc., Docket Nos. CP15-115-000 CP15-115-00, "Order Granting Abandonment and Issuing Certificates," February 3, 2017, https://www.ferc.gov/CalendarFiles/20170203194955-CP15-115-000.pdf.

[72] H. Northey, "Developers Face 'New Reality' of Protests, Longer Reviews," Greenwire, June 3, 2016, https://www.eenews.net/stories/1060038277; C. Kunkel and T. Sanzillo, "Risks Associated with Natural Gas Pipeline Expansion in Appalachia,"

A constitutional and statutory challenge to FERC's pipeline permitting process has also been launched recently. The lawsuit maintains that FERC's certification process violates the U.S. Constitution and the Natural Gas Act by allowing privately owned pipeline developers to take private property through eminent domain.[73]

More intense opposition to new pipeline projects has thus emerged in parallel with the increased demand for natural gas in different customer segments. Just as there are complex drivers affecting the market-demand side of the issue, there are complex factors affecting the character of the opposition. Many opponents raise concrete and specific concerns about the practical impacts of particular proposals and do not think that FERC properly balances such impacts against market demand for natural gas.

As one observer has noted, "Activists opposed to the oil and gas industry argue, for example, that building thousands of miles and billions of dollars' worth of new pipeline infrastructure effectively locks the nation into many more decades of fossil fuel development at a time, they say, when it should be transitioning to cleaner forms of energy. But for others …, the concerns are more local. They complain that state and federal regulators are often too quick to approve new projects that come with real risks….With gas pipelines, some worry about the cumulative effects of methane leaks, which can significantly worsen air quality and compound global warming. Gas pipelines are also highly pressurized, generating concerns about explosions."[74]

Pipeline opponents are also raising concerns that requests for more pipeline capacity reflect inappropriate and anticompetitive practices. They point to the use of affiliate contracts to support the need for proposed pipeline projects, with the risk of undue costs to ratepayers if arrangements with affiliates do not reflect true LDC need and yet allow pipelines to be built.[75]

Changes in the science of climate change: In the nearly two decades since 1999, the scientific consensus about climate change has greatly increased, both in terms of human influences on climate conditions and in terms of the impacts of the changing climate. The 1995 report of the Intergovernmental Panel on Climate Change (IPCC) was the most recent one available at the time FERC

Institute for Energy Economics and Finance, April 2016, https://www.eenews.net/assets/2016/05/25/document_daily_03.pdf; P. Moskowitz, "With the Boom in Oil and Gas, Pipelines Proliferate in the U.S.," YaleEnvironment360, October 6, 2014 (hereafter "Boom in Oil and Gas"), http://e360.yale.edu/features/with_the_boom_in_oil_and_gas_pipelines_proliferate_in_the_us; R. Nemec, "Pipeline Building Boom: Is It Coming to Your Area Anytime Soon?" *Pipeline & Gas Journal*, April 2017, https://pgjonline.com/2017/04/03/pipeline-building-boom-is-it-coming-to-your-area-anytime-soon/; then-Chairman Cheryl LaFleur, National Press Club Speech.

[73] U.S. District Court for the District of Columbia, *Bold Alliance et al. v. FERC et al.,* case 1:17-cv-01822, filed September 5, 2017, https://www.law360.com/dockets/download/59af249ee944eb2a3c000001?doc_url=https%3A%2F%2Fecf.dcd.uscourts.gov%2Fdoc1%2F04516206606&label=Case+Filing.

[74] P. Moskowitz, "Boom in Oil and Gas."

[75] Environmental Defense Fund (EDF), Petition for a Declaratory Ruling that Precedent Agreements and Transportation Agreements Are Subject to Review Under Public Service Law Section 110(4), New York Public Service Commission Case No. 17-G-0610, filed October 2, 2017, http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?MatterCaseNo=17-g-0610&submit=Search; Oil Change International, "Art of the Self-Deal: How Regulatory Failure Lets Gas Pipeline Companies Fabricate Need and Fleece Ratepayers," September 2017, http://priceofoil.org/content/uploads/2017/09/Gas_Pipeline_Ratepayer_Report.pdf; Sierra Club, Antitrust Issues Raised by the Nexus Gas Transmission Project, FERC Docket No. CP16-22-000, filed at Federal Trade Commission and Department of Justice, November 16, 2016, https://www.sierraclub.org/sites/www.sierraclub.org/files/blog/P.%20Gallagher%20to%20OPC%20re%20NEXUS%2011-16-16.pdf; Sierra Club, Antitrust Complaint Against Dominion Resources, Inc., filed at the Federal Trade Commission, June 23, 2016, http://wp.vasierraclub.org/LetterInFull.pdf.

issued its 1999 Policy Statement. (The IPCC issues assessments periodically, and not annually.) The 1995 IPCC assessment (the so-called Second Assessment) concluded: "The balance of evidence suggests a discernible human influence on global climate."[76] Since then, the IPCC's findings have become progressively strong, and the scientific community now has 95 percent confidence (i.e., the IPCC scientists believe it is "extremely likely") that "human influence has been the dominant cause of the observed warming since the mid-20th century."[77] Among the IPCC's findings since 1995:

- In 2001 (from the IPCC's Third Assessment): "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."[78]
- In 2007 (from the IPCC's Fourth Assessment): "Warming of the climate system is unequivocal… Most of the observed increase since the mid-20th century is very likely [i.e., greater than 90 percent probability] due to the observed increase in anthropogenic [human-caused] greenhouse gas concentrations."[79,80] Also: "It is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)… Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level."[81]
- In 2013 (from the IPCC's Fifth Assessment, the most recent one published): "It is extremely likely [95 percent confidence] that human influence has been the dominant cause of the observed warming since the mid-20th century."[82,83] Also: "Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes… This evidence for human influence has grown since [the fourth assessment]… It is extremely likely more than half of the observed increase in global average surface temperature from 1951 to

[76] "The balance of evidence, from changes in global mean surface air temperature and from changes in geographical, seasonal and vertical patterns of atmospheric temperature, suggests a discernible human influence on global climate." IPCC, *Climate Change 1995: Second Assessment Report of the IPCC*, 1995, at 5, https://www.ipcc.ch/pdf/climate-changes-1995/ipcc-2nd-assessment/2nd-assessment-en.pdf. Further, the 1995 assessment stated on page 22: "Since the 1990 IPCC Report, considerable progress has been made in attempts to distinguish between natural and anthropogenic influences on climate."

[77] IPCC, "Summary for Policy Makers," *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the IPC*C, https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SPM_FINAL.pdf.

[78] IPCC, "Climate Change 2001: The Scientific Basis," Contribution of Working Group I to the *Third Assessment Report of the IPCC*, 2001, at 10 ("Summary for Policy Makers"), https://www.ipcc.ch/ipccreports/tar/wg1/pdf/WG1_TAR-FRONT.PDF.

[79] "The IPCC describes how it uses language to describe the level of certainty or uncertainty that exists surrounding a particular finding. With regard to "very likely" language, the IPCC has explained: "Where uncertainty in specific outcomes is assessed using expert judgment and statistical analysis of a body of evidence (e.g., observations or model results), then the following likelihood ranges are used to express the assessed probability of occurrence: virtually certain >99%; extremely likely >95%; very likely >90%; likely >66%; more likely than not > 50%; about as likely as not 33% to 66%; unlikely <1%." IPCC, "Climate Change 2007: Synthesis Report," Contribution of Working Groups I, II and III to the Fourth Assessment Report of the IPCC, 2007 (hereafter "IPPC 2007"), at 27, https://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_full_report.pdf.

[80] IPPC 2007, at 2.

[81] IPPC 2007, at 2, 72.

[82] In the 2013 report's "Summary for Policy Makers" (at 2, footnote 4): "The following terms have been used to indicate the assessed likelihood of an outcome or a result: virtually certain 99–100% probability, very likely 90–100%, likely 66–100%, about as likely as not 33–66%, unlikely 0–33%, very unlikely 0–10%, exceptionally unlikely 0–1%. Additional terms (extremely likely: 95–100%, more likely than not >50–100%, and extremely unlikely 0–5%) may also be used when appropriate." IPCC, "Climate Change 2013: The Physical Science Basis," 2013.

[83] IPCC, "Summary for Policy Makers," 2013.

> 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together."[84]

Changes in climate impacts: In parallel, the state of knowledge about the impacts of climate change has advanced substantially since 1999. For example, the most recent congressionally mandated National Climate Assessment was published by the U.S. government in 2014. As the assessment stated, "A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences."[85] The assessment reached the following conclusions:

> Over recent decades, climate science has advanced significantly. Increased scrutiny has led to increased certainty that we are now seeing impacts associated with human-induced climate change. With each passing year, the accumulating evidence further expands our understanding and extends the record of observed trends in temperature, precipitation, sea level, ice mass, and many other variables recorded by a variety of measuring systems and analyzed by independent research groups from around the world. It is notable that as these data records have grown longer and climate models have become more comprehensive, earlier predictions have largely been confirmed. The only real surprises have been that some changes, such as sea level rise and Arctic sea ice decline, have outpaced earlier projections.
>
> What is new over the last decade is that we know with increasing certainty that climate change is happening now. While scientists continue to refine projections of the future, observations unequivocally show that climate is changing and that the warming of the past 50 years is primarily due to human-induced emissions of heat-trapping gases. These emissions come mainly from burning coal, oil, and gas, with additional contributions from forest clearing and some agricultural practices.[86]

The 841-page National Climate Assessment includes extensive and detailed information on the impacts of climate change on various sectors of the economy (e.g., agriculture, forestry, energy production and use, human health) and regions of the country. (Excerpts from the high-level overview are included in the text box "Climate Change and the American People," below.) As noted in the 2014 assessment, "Americans are noticing changes all around them." The summer and fall of 2017 displayed examples of extreme weather events and climate change impacts: massive forest fires in the Pacific Northwest[87] and in Northern California,[88] an all-time high temperature in San Francisco,[89] flooding in Houston after Hurricane Harvey dumped record-breaking amounts of rain,[90] and devastation to Puerto

[84] IPCC, "Summary for Policy Makers," 2013.
[85] http://nca2014.globalchange.gov/report.
[86] J. Melillo, et al., eds., *Climate Change Impacts in the United States: The Third National Climate Assessment, 2014,* U.S. Global Change Research Program, 2014, doi:10.7930/J0Z31WJ2, http://nca2014.globalchange.gov/highlights/overview/overview.
[87] https://www.nasa.gov/image-feature/goddard/2017/smoke-and-fires-light-up-pacific-northwest.
[88] http://www.cnn.com/2017/10/10/us/california-fires-napa/index.html.
[89] https://weather.com/forecast/regional/news/west-heat-wave-all-time-record-heat-early-september-2017.
[90] https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/08/29/harvey-marks-the-most-extreme-rain-event-in-u-s-history/?utm_term=.d4380049131b.

Rico and the U.S. Virgin Islands caused by Hurricane Maria.[91] In 2016, the earth's temperature was the highest on record—with 2015 holding the previous record, and 2014 holding the record before that.

Climate Change and the American People

Climate change, once considered an issue for a distant future, has moved firmly into the present. Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing climate-related changes that are outside of recent experience. So, too, are coastal planners in Florida, water managers in the arid Southwest, city dwellers from Phoenix to New York, and Native Peoples on tribal lands from Louisiana to Alaska. This National Climate Assessment concludes that the evidence of human-induced climate change continues to strengthen and that impacts are increasing across the country.

Americans are noticing changes all around them. Summers are longer and hotter, and extended periods of unusual heat last longer than any living American has ever experienced. Winters are generally shorter and warmer. Rain comes in heavier downpours. People are seeing changes in the length and severity of seasonal allergies, the plant varieties that thrive in their gardens, and the kinds of birds they see in any particular month in their neighborhoods.

Other changes are even more dramatic. Residents of some coastal cities see their streets flood more regularly during storms and high tides. Inland cities near large rivers also experience more flooding, especially in the Midwest and Northeast. Insurance rates are rising in some vulnerable locations, and insurance is no longer available in others. Hotter and drier weather and earlier snow melt mean that wildfires in the West start earlier in the spring, last later into the fall, and burn more acreage. In Arctic Alaska, the summer sea ice that once protected the coasts has receded, and autumn storms now cause more erosion, threatening many communities with relocation.

Scientists who study climate change confirm that these observations are consistent with significant changes in Earth's climatic trends. Long-term, independent records from weather stations, satellites, ocean buoys, tide gauges, and many other data sources all confirm that our nation, like the rest of the world, is warming. Precipitation patterns are changing, sea level is rising, the oceans are becoming more acidic, and the frequency and intensity of some extreme weather events are increasing. Many lines of independent evidence demonstrate that the rapid warming of the past half-century is due primarily to human activities.

The observed warming and other climatic changes are triggering wide-ranging impacts in every region of our country and throughout our economy. Some of these changes can be beneficial over the short run, such as a longer growing season in some regions and a longer shipping season on the Great Lakes. But many more are detrimental, largely because our society and its infrastructure were designed for the climate that we have had, not the rapidly changing climate we now have and can expect in the future. In addition, climate change does not occur in isolation. Rather, it is superimposed on other stresses, which combine to create new challenges.

National Climate Assessment, 2014, Introduction (pages 1-2),
http://s3.amazonaws.com/nca2014/high/NCA3_Climate_Change_Impacts_in_the_United%20States_HighRes.pdf?download=1

The Fourth National Climate Assessment is underway, and a draft of the report was made public in June 2017. The draft states that "new observations and new research have increased our understanding of past, current, and future climate change since the Third U.S. National Climate Assessment (NCA3)…. Since NCA3 [in 2014], stronger evidence has emerged for continuing, rapid, human-caused warming of the global atmosphere and ocean. This report concludes that 'it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence.' The last few years have also seen record-breaking, climate-related weather extremes, the three warmest years on record for the globe, and continued decline in

[91] https://www.washingtonpost.com/news/post-nation/wp/2017/09/20/hurricane-maria-takes-aim-at-puerto-rico-with-force-not-seen-in-modern-history/?utm_term=.4c9377caa535.

arctic sea ice. These trends are expected to continue in the future over climate (multidecadal) timescales. Significant advances have also been made in our understanding of extreme weather events and how they relate to increasing global temperatures and associated climate changes. Since 1980, the cost of extreme events for the United States has exceeded $1.1 trillion."[92]

Changes in the long-term outlook for a much lower-carbon energy system: Since FERC issued its 1999 Policy Statement, there has been a growing body of analyses assessing the types of long-term changes in energy production and use that will be consistent with limiting the effects of climate change on average global temperatures to no more than 2°C. Such analyses, often referred to as the "deep decarbonization" literature, explore the implications of reducing anthropogenic greenhouse gas emissions globally by approximately 80 percent below current levels of emissions by 2050. Unlike the EIA's long-term energy outlook, whose projections (by design) are based on an assumption of no new changes in public policy, and whose results were described previously, these assessments explicitly attempt to model the types of changes in patterns of energy usage that would be required to reduce emissions to these levels. The targeted emissions reductions reflected in these studies are aligned with the national commitments in the 2015 Paris Accord and are consistent with the assessment conducted as part of the 2016 U.S. Mid-Century Strategy report.[93]

A 2017 literature review of 30 deep decarbonization studies published since 2014 points to several themes from the body of work.[94] The dominant conclusion is that the "electric power sector is widely expected to be the linchpin of efforts to reduce greenhouse gas (GHG) emissions…To reach these [emission-reduction] goals, the power sector would need to cut emissions nearly to zero, while expanding to electrify (and consequently decarbonize) portions of the transportation, heating, and industrial sectors." The themes that emerge include the following observations (with quoted excerpts from the 2017 literature review):

> [T]here is strong agreement in the literature that a diversified mix of low-CO_2 generation resources offers the best chance of affordably achieving deep decarbonization.[95]
>
> A low-carbon power sector must expand to electrify and decarbonize greater shares of transportation, heating, and industrial energy demand as part of a strategy for economy-wide emissions reductions.[96]
>
> By contrast, reaching near-zero emissions will require virtually all unabated coal- and gas-fired power plants to be replaced by zero-emissions sources.[97]

[92] U.S. Global Change Research Program, Climate Science Special Report (CSSR), Final Clearance 28 June 2017 Fifth-Order Draft (5OD), at 11, https://assets.documentcloud.org/documents/3920195/Final-Draft-of-the-Climate-Science-Special-Report.pdf.
[93] White House, "United States Mid-Century Strategy for Deep Decarbonization," November 2016, https://unfccc.int/files/focus/long-term_strategies/application/pdf/mid_century_strategy_report-final_red.pdf.
[94] Jenkins & Thernstrom literature review. "These studies employ a variety of methods, including detailed power system optimization models, higher-level energy-economic and integrated assessment models, and scenario-driven exercises. They also span different scopes, from the regional to national to global, and they entail different research objectives." Jenkins & Thernstrom literature review, at 1. See also NRDC, *America's Clean Energy Frontier.*
[95] Jenkins & Thernstrom literature review, at 1.
[96] Jenkins & Thernstrom literature review, at 2.
[97] Jenkins & Thernstrom literature review, at 3.

> Deep decarbonization may require a significantly different mix of resources than more modest goals; long-term planning is important to avoid lock-in of suboptimal resources. It is important to emphasize that the lowest-cost portfolio of resources suited to achieving moderate emissions reductions may differ dramatically from the portfolio needed to efficiently reach deep decarbonization goals. These conclusions suggest that if power generation resources are built out without considering long-term decarbonization objectives, costly "lock-in" of a suboptimal resource portfolio is possible. Installed capacities of wind, solar, uncontrolled natural gas, and low-capture-rate CCS [carbon capture and sequestration] plants that are suitable for achieving mid-term objectives could all exceed their optimal share for substantially decarbonized power systems.[98]

This literature review highlights the results of a diverse body of analyses that point to the need for continued changes in the nation's energy system in the decades ahead in order to help avoid the worst efforts of climate change. It is always risky to forecast too far into the future regarding how energy systems may change. However, the climate change and decarbonization literature suggests that the role of natural gas over the next decades may fall somewhere between that of a short-term and a long-term transitional resource, depending on the economics of low-carbon technologies and the pace of public concern and political change.

One implication is that in the absence of significant technological advances that allow for the retrofitting of existing gas-fired power plants with CCS equipment and systems, and/or the deployment of new gas-fired generation facilities designed to incorporate CCS systems, natural gas may evolve to play a much more limited role in future energy systems than might be imagined today. The analyses indicate further that much less gas may be used directly for heating and cooling systems in buildings. And in light of the long-lived nature of energy infrastructure (such as gas pipelines), prudence would dictate taking a hard look at the implications of such long-term projects in pipeline certification cases (to look at the potential for stranded assets, for example, if new gas transportation systems are approved and constructed and go into operation).

This discussion of deep-decarbonization analyses is not meant to provide a dispositive viewpoint on the future track of energy infrastructure development. FERC's pipeline certification process, however, results in long-term infrastructure development and the incurrence of significant up-front capital investments. In this context it is important to consider the combination of climate, economic, and policy influences that are already driving a significant transformation in energy production and use and that may further accelerate this transformation going forward.

The literature points to an increasing degree of uncertainty surrounding the long-term outlook for natural gas demand – and for the useful life of new delivery infrastructure investments that it depends on. The uncertainty raises important questions, at least, for the level of new pipeline capacity that is needed to meet national energy market needs (and that may become stranded under some future scenarios). A recent report by analysts at Goldman Sachs, for example, points to gas transportation capacity outpacing demand in Appalachia, with new pipelines there being only partially

[98] Jenkins & Thernstrom literature review, at 3.

filled.[99] Such recent outlooks, in conjunction with the decarbonization studies, provide insights that tend to offset the view typically shared by developers of gas transportation infrastructure (described above), who foresee a long-term and sustained growth in demand for natural gas in the U.S.

IV. Recommendations for Federal Pipeline Certification Policy, Given the Implications of a Rapidly Changing Industry

The many changes that have occurred in the nearly two decades since FERC's 1999 Policy Statement warrant a fresh look at whether the guidance adopted at that time and applied in certification dockets since then still remains appropriate and, if not, what changes are now appropriate in order for FERC to fulfill the facility-review functions mandated under the Natural Gas Act. In light of the many substantial changes in the nature of natural gas supply and demand that have occurred since 1999, are occurring today, and will likely occur over the next decade, the time is ripe for FERC to undertake a structured and collaborative review of its pipeline certification guidance and policy.

The motivation for FERC to review its pipeline certification guidance and policy is similar to what it was in 1999. At that time, FERC was considering evidence and insights about changes then underway in the gas industry that, in the Commission's view, warranted evolution of FERC's policies on certification and the pricing of new construction projects. FERC's goals in 1999 were to "foster competitive markets, protect captive customers, and avoid unnecessary environmental and community impacts while serving increasing demands for natural gas. It should also provide appropriate incentives for the optimal level of construction and efficient customer choices."[100]

Those goals may still be relevant today, but their meaning is likely to be different, and additional guidance seems appropriate to us in light of the complex set of changes that have taken place in the larger energy industry and in natural gas markets in particular. Various aspects of FERC's 1999 Policy Statement guidance deserve new attention, with the overall goal of deciding what factors should be considered in determining whether new pipeline construction is needed.

In 1999, FERC sought to clarify its policy so that the Commission could better determine whether to issue a CPCN for interstate pipeline facilities.[101] FERC concluded that in the context of changes leading up to 1999, such clarification was needed. The conditions at the time included:

- The relatively recent deregulation of upstream natural gas production and sales;

[99] "Appalachia gas pipeline capacity will outpace demand in the coming years, according to Goldman Sachs Group Inc., even as the U.S. energy market and overseas buyers consume more gas produced in the Northeast. In the short term, electric power plants will balance the market as they continue switching from coal to natural gas. But in Goldman's analysis, researchers predict that rising gas demand simply as a function of fuel-switching tails off in time, as efficient combined-cycle power plants, wind power, solar panels and a declining number of coal retirements cut into the rise in gas demand…. Analysts there expect new Appalachia region pipeline additions to accelerate through 2018 and ahead of large increases in demand slated for 2019…. 'Beyond rising gas burn, we believe that balancing the U.S. gas market in 2018–20 will require that new Appalachia pipelines remain only partially filled as they come online,' Goldman analysts wrote." D. Iaconangelo, "Appalachian Pipeline Capacity To Outpace Demand – Report," *E&E News*, September 26, 2017, https://www.eenews.net/energywire/2017/09/26/stories/1060061647.

[100] Policy Statement, at 13.

[101] Policy Statement, at 13-14.

- The restructuring of the natural gas industry so as to encourage competition by unbundling and separating gas delivery transportation from commodity supply;
- The potential for competition among suppliers, potential deliverers, and potential users for use of capacity on the interstate system;
- The desire to create incentives for investment in and additions of new natural gas delivery capacity on the interstate pipeline system; and
- Anticipated continued growth in demand for natural gas.

Nearly two decades later, interstate natural gas markets and their relationships to larger energy systems reflect quite different conditions. There have been many changes since 1999, including:

- Significant additions to capacity on the interstate gas pipeline system;
- Substantial growth in domestic gas production in various basins around the U.S., with especially strong growth in the Marcellus/Utica region in the past decade;
- Relatively low commodity prices for natural gas in recent years;
- Large increases in U.S. consumption of natural gas;
- Major power-sector transitions that have increased power plants' use of gas, with those changes reflecting the enormous quantity of new gas-fired generating capacity added to the power system since 2000, the cost-competitiveness of gas-fired generation compared with output at less efficient coal plants, and the flexible operational attributes of gas-fired capacity;
- Heightened concerns among landowners, local groups, and others regarding the taking of property and adverse impacts associated with siting individual pipeline projects;
- Increased concerns regarding the potential to over build capacity on the interstate pipeline system in light of further transitions in the nation's energy system;[102]
- The availability of technologies and practices in both the gas and electric systems that may allow more-efficient utilization of existing infrastructure and could mitigate the need to add new gas transportation capacity; and
- Growing questions regarding FERC's application of its balancing test regarding public benefit versus adverse consequences in the context of reviewing specific applications.

Given the complexities of these issues and the interrelationships among many of the post-1999 trends, the current content and implementation of FERC's certification policy should be reassessed. These trends support a shift in the standards or information requirements that FERC should use to balance public benefit with adverse consequences, including reconsideration of how information is

[102] For example, a 2015 DOE study ("Natural Gas Infrastructure Implications of Increased Demand from the Electric Power Sector," February 2015) made the following findings:
- "Diverse sources of natural gas supply and demand will reduce the need for additional interstate natural gas pipeline infrastructure." (at vi)
- "Higher utilization of existing interstate natural gas pipeline infrastructure will reduce the need for new pipelines." (at vi)
- "Incremental interstate natural gas pipeline infrastructure needs in a future with an illustrative national carbon policy are projected to be modest relative to the Reference Case" (which did not include a national carbon policy) (at vi)
- "While there are constraints to siting new interstate natural gas pipeline infrastructure, the projected pipeline capacity additions in this study are lower than past additions that have accommodated such constraints (at vii)

weighted in the balance. These very complexities stand as a strong reason for FERC to take a fresh look at its policy.

For example, the Policy Statement currently provides (on page 27) that the "more interests adversely affected or the more adverse impact a project would have on a particular interest, the greater the showing of public benefits from the project required to balance the adverse impact." The actual dockets on specific cases (and litigation related to them), however, are not likely to be the ideal place for parties to deliberate over the scope of benefits and adverse consequences (and trade-offs) that should be considered routinely by FERC in its reviews. This is the type of conclusion that FERC reached in deciding two decades ago to open inquiries into its certification policies for new natural gas facilities.[103] A broad review of policy will allow diverse parties to comment on these issues generically, rather than taking them in up the context of individual pipeline dockets (which are technical and procedurally challenging for meaningful input by non-technical people).

The many changes underway in the natural gas and electric industries warrant a close evaluation of how need is demonstrated in pipeline certification cases. Specifically, it seems timely to revisit the many issues raised during the last review two decades ago, in consideration of the fundamental shifts that have taken place in market dynamics, supply and demand factors, and industry relationships.

With respect to affiliate commitment questions, FERC, in consultation with stakeholders, may wish to quantitatively and qualitatively reassess the role of affiliate contracts and precedent agreements in pipeline certification proposals, given the evolution of industry relationships over the past 20 years. In this context, it would be appropriate to evaluate quantitatively how the role of affiliate commitments has evolved in pipeline proposals over time. FERC may also wish to seek relevant background information on the nature of LDC customer-need determinations in state regulatory processes to understand contextually the drivers of demand from affiliated companies. With respect to electric sector affiliations, FERC could assess the regulatory policies and market factors driving electricity fuel supply decisions and transportation procurements and commitments. To the extent that there exists a qualitatively different set of circumstances and drivers around affiliate relationships and transactions, FERC may conclude that it is appropriate to adjust its guidance in that respect.

The combination of power sector demand as the dominant driver of natural gas demand growth, on the one hand, and the potentially fundamental transition underway in the electric industry, on the other, raises new and challenging questions, the answers to which could improve the quality and

[103] The Commission issued the Notice of Proposed Rulemaking (NOPR) in Docket No. RM98-10-000 (Regulation of Short-term Natural Gas Transportation Services) in 1998, and the Notice of Inquiry (NOI) in Docket No. RM98-12-000 (Regulation of Interstate Natural Gas Transportation Services) on July 29, 1998. In addition, the Commission held a public conference on June 7, 1999. The Policy Statement explains at 2: "Information received in these proceedings as well as recent experience evaluating proposals for new pipeline construction persuade us that it is time for the Commission to revisit its policy for certificating new construction not covered by the optional or blanket certificate authorizations. In particular the Commission's policy for determining whether there is a need for a specific project and whether, on balance, the project will serve the public interest. Many urge that there is a need for the Commission to authorize new pipeline capacity to meet the growing demand for natural gas. At the same time, others already worried about the potential for capacity turnback, have urged the Commission to be cautious because of concerns about the potential for creating a surplus of capacity that could adversely affect existing pipelines and their captive customers. Accordingly, the Commission is issuing this policy statement to provide the industry with guidance as to how the Commission will evaluate proposals for certificating new construction."

efficiency of FERC's certification review process and associated pipeline project development. Questions relate to the implications of incentives in wholesale electricity market structures for fuel-supply choice and for demand for gas in various regions of the country; the potential for changing electric industry circumstances to fundamentally shift – one way or the other – the need for incremental gas-delivery infrastructure; the impact of state resource planning and procurement requirements, as well as fuel supply cost-recovery policies, in altering the seasonal requirements for gas-fired generating resources; the ability of new technologies and operational practices to use existing gas-delivery infrastructure more efficiently; and the implications of state carbon-reduction policies and integrated assessments of regional electricity supply and demand for the need to consider non-gas alternatives for meeting future demand growth (including in the context of NEPA reviews). While most of these issues are not necessarily new, they are undoubtedly changing in meaningful ways and at an accelerated pace, in a manner that could have important implications for the information collected and assessed in FERC certification reviews on a going-forward basis.

Opening a new docket to solicit comment on various points would be an appropriate vehicle by which FERC could obtain broad public input and fresh consideration of the substantial recent and ongoing changes in energy industries and what changes in FERC's certification policy may be appropriate in light of these transitions. The questions that could be posed for comment might raise some of the same types of issues examined by FERC two decades ago, as well as other ones raised by the trends of the past two decades. Examples of such questions include:

- Should FERC develop more prescriptive standards for reviewing applications for new pipelines, in light of the increasingly uncertain forecasts of the need for incremental pipeline capacity?
- Do changes underway in both the gas and electric industries – and the increasingly strong interrelationship between them – warrant a more integrated assessment of sectoral demand and electricity market forces in assessing natural gas pipeline need in Section 7 proceedings?
- Should FERC require regional planning regarding gas transportation resources similar to the regional planning requirement imposed on electric transmission owners?
- Should FERC apply a higher threshold standard and greater scrutiny with respect to demonstration of need, market demand, and public benefit where an affiliate (e.g., gas LDC, electric utility, and/or independent power producer) is involved in the proposed project?
- Should determination of need for a proposed pipeline project be the threshold determination (instead of the current threshold determination, which is whether the project could proceed without subsidies from existing customers)?
- Should FERC's balancing of benefits against adverse impacts be expanded to include noneconomic factors (e.g., should environmental impacts be among the adverse impacts FERC considers while applying the balancing test)?
- Should FERC give deference to state regulatory approvals (e.g., of contracts between pipeline companies and affiliated shippers, including either local distribution companies or power plants)

only when such approvals involve a regulatory review of whether such contracts represent the least-cost method of serving such demand, taking into account other strategies (e.g., energy efficiency in the case of an LDC contract, or dual-fuel capability at the power plant, or application of technologies to increase throughput on existing pipeline capacity)?

- Should FERC require a demonstration of need and public benefit based on a showing that non-pipeline alternatives have been considered as options to meet the demand of shippers (e.g., an integrated gas/electric resource plan or an integrated gas/electric reliability study, energy efficiency programs in the case of an LDC contract, dual-fuel capability at a power plant, or adoption and application of technologies to increase throughput on existing pipeline capacity)?
- Should FERC impose a greater burden to show that a pipeline is needed when it is proposed to gain market share rather than to meet new market demand?
- How should FERC's policy take into account the views of a variety of interested constituencies (including competitors, customers, landowners, local communities, and others affected directly and indirectly by the pipeline and by the impacts of gas combustion), many of whom may have limited access to resources to participate as full parties in specific pipeline-review cases?
- How should FERC weigh the relative distribution of benefits and burdens across those interested and affected constituencies?
- How should FERC take into account the potential for stranded costs of new pipeline capacity that is later determined to be no longer needed in light of changes in the nation's current and future energy mix?
- Should FERC consider new ways for pipeline applicants to internalize the long-term monetary and non-monetary risks associated with near-term capacity investment decisions?

Given the important roles that natural gas resources now play in the U.S. economy, the many changes underway in the energy systems that will likely affect future natural gas production, delivery, and use in the future, and the importance of FERC administering its responsibilities under the Natural Gas Policy Act in a judicious manner, the time is right for a fresh look at the 1999 Policy Statement. Such an inquiry would support the goal the Commission stated in 1999: "In considering the impact of new construction projects on existing pipelines, the Commission's goal is to appropriately consider the enhancement of competitive transportation alternatives, the possibility of overbuilding, the avoidance of unnecessary disruption of the environment, and the unneeded exercise of eminent domain."

Attachment SFT-3

Example of Revised Filing Requirements for Facility Proposals

Attachment SFT-3

Hypothetical example:
Revised filing requirements for Section 7(c) projects
to help build a record focusing on "all relevant factors" (including regional issues)
for FERC's Need Determinations on new natural gas facilities

Hypothetical New Interstate Natural Gas Pipeline Proposal in New England

Assumptions in this example:

- Revised Policy Statement:
  - that FERC has modified its policy statement so that Section 7(c) applicants are expected to file applications that support a robust demonstration of need, including by providing documentation beyond precedent agreements and reflecting more comprehensive indications of need for new incremental pipeline capacity. The latter might include regional electric-system plans, state energy plans, state regulatory decisions related to conversions of various end-uses of energy to natural gas, state approvals of new energy facilities, state environmental plans or policies, and other state studies and planning/policy documents that provide indications of the near-term and long-term demand for natural gas in different sectors.

- An application for new incremental natural gas capacity into New England

Filing requirements for FERC's Need Analysis

- The applicant furnishes to FERC as part of its application, the following information:
  - The pipeline company's open-season process, including a process description and results, with provision of information on how shippers with precedent agreements intend to use the natural gas;
  - Information about any and all affiliate relationships among the pipeline company and any shippers that have signed precedent agreements;
  - Default mix of end-uses of natural gas in the region for the purpose of determining GHG and air emissions, for any gas deliveries not specifically identified as being targeted for a particular end-use sector;
  - Impacts on traditional Relevant Interests (e.g., existing customers; competing pipelines and their customers; and affected landowners and local communities);
  - Pipeline and other gas-delivery infrastructure in the regional market, with profiles of and data on their utilization patterns;
  - Local gas distribution company plans for changes in gas delivery and supply to core and non-core customers;
  - State and regional energy, climate and other environmental plans;
  - Generation mix and dual-fuel capacity of gas-fired power plants, including information on the ISO-NE's interconnection queue.

FERC review of sufficiency of filing:

- Upon review of the adequacy of the application with regard to documentation relating to these Need Analysis issues and to the extent not already submitted as part of the application, FERC requests information about various state and regional planning documents and other third-party studies relevant to the near-term and long-term demand for natural gas and gas-delivery into the region (including the implications for demand of state and regional environmental, power-market, economic development and other policies):
  - Assessment of the implications of state and regional energy and environmental policies and trends on the near-term and long-term demand for gas and gas delivery
  - Provision of information on state and regional energy and environmental plans, policies and resource studies
    - Connecticut:
      - Comprehensive Energy Strategy (2018), http://www.ct.gov/deep/lib/deep/energy/ces/2018_comprehensive_energy_strategy.pdf
      - Integrated Resource Plan (2015, with work underway to update it in 2018), http://www.ct.gov/deep/cwp/view.asp?a=4405&q=486946&deepNav_GID=2121%20
      - Global Warming Solutions Act, https://www.cga.ct.gov/2008/ACT/PA/2008PA-00098-R00HB-05600-PA.htm
      - Renewable energy standard, http://www.ct.gov/pura/cwp/view.asp?a=3354&q=415186
      - Act Concerning Zero-Carbon Procurement (2017), https://www.cga.ct.gov/2017/BA/2017SB-01501-R01SS1-BA.htm
    - Maine:
      - Renewable energy standard, http://programs.dsireusa.org/system/program/detail/452
    - Massachusetts:
      - Massachusetts Clean Energy and Climate Plan (2015), https://www.mass.gov/files/documents/2017/01/uo/cecp-for-2020.pdf
      - Clean Energy Standard (2017), http://www.massdep.org/BAW/air/cesf-amend.pdf
      - Green Communities Act, including renewable energy standard (2008), https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169
      - Global Warming Solutions Act (2008), https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter298, with Massachusetts Supreme Judicial Court ruling that the GWSA imposes mandatory reductions of GHG, https://cases.justia.com/massachusetts/supreme-court/2016-sjc-11961.pdf?ts=1463497383
      - An Act to Promote Energy Diversity (2016) to support solicitation of long-term contracts from (a) hydroelectric resources, and (b) off-shore wind https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter188
      - Renewable portfolio standard, http://programs.dsireusa.org/system/program/detail/479
    - New Hampshire:
      - Renewable energy standard, http://www.puc.state.nh.us/Sustainable%20Energy/Renewable_Portfolio_Standard_Program.htm
    - Rhode Island:
      - "Energy 2035: Rhode Island State Energy Plan" (2015), http://www.planning.ri.gov/documents/LU/energy/energy15.pdf
      - Renewable energy standard, http://www.ripuc.ri.gov/utilityinfo/res.html

- Vermont:
  - Clean energy solutions (state policy), http://climatechange.vermont.gov/our-climate-solutions/cleaner-energy
  - Renewable energy standard, http://puc.vermont.gov/electric/renewable-energy-standard
- Regional:
  - RGGI program, covering all six New England (and other) states, https://www.rggi.org
  - Information request to each state regarding its recent energy facility siting board actions relating to energy infrastructure
- ISO-NE studies and plans
  - Regional System Plan, https://www.iso-ne.com/system-planning/system-plans-studies/rsp/
  - Operational Fuel Security Analysis (2018), https://www.iso-ne.com/static-assets/documents/2018/01/20180117_operational_fuel-security_analysis.pdf
  - Interconnection queue composition (ongoing), https://www.iso-ne.com/system-planning/transmission-planning/interconnection-request-queue/
- Other studies or plans affecting regional energy resource mix, including alternatives to new incremental gas-delivery capacity. For example,
  - National Grid. Northeast 80x50 plan (2018), http://news.nationalgridus.com/wp-content/uploads/2018/06/80x50-White-Paper-FINAL.pdf
  - Hibbard and Aubuchon, "Power System Reliability in New England Meeting Electric Resource Needs in an Era of Growing Dependence on Natural Gas" (2015), http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/power_system_reliability_in_new_england.pdf
  - Energy efficiency plans in the region
  - Policies affecting dual-fuel capacity and operations on the electric system (e.g., air permits with 30-day limitation on operating on oil)

- To the extent not already submitted as part of the application, FERC requests that the applicant prepare an analysis that maps the implications of such market trends and state/regional policies for the benefits and costs of the project, using the all-relevant factors approach.
  - Benefits should include:
    - (a) quantitative metrics (e.g., changes in consumers' estimated fuel costs; changes in emissions of various air pollutants; changes in probability of curtailments of loads on the electric system and on the natural gas system; changes in building heating systems); and
    - (b) qualitative metrics (e.g., near-term support for integrating variable electricity resources; reduced price volatility in gas commodity costs).
  - Costs should include:
    - (a) quantitative metrics (e.g., incremental expenditures on fuel delivery); and
    - (b) qualitative metrics (e.g., near-term and long-term tensions vis-à-vis states' climate plans and policies; risk of stranded costs)
  - Comparison of benefits and costs

- FERC's review process will elicit commenters' and intervenors' views on documentation, benefits, costs, net benefits, etc.