

ORIGINAL

**BEFORE THE GEORGIA PUBLIC SERVICE COMMISSION**

Verification of Expenditures Pursuant to Georgia	]	
Power Company's Certificate of Public	]	
Convenience and Necessity for Plant Vogtle	]	
Units 3 and 4 Seventeenth Semi-annual	]	Docket No. 29849
Construction Monitoring Report; Proposed	]	
Forecast Cost and Schedule Revisions; and	]	
Determination of Continuation or	]	
Cancellation of the Project	]	

**Direct Testimony of**

**Peter A. Bradford**

**On Behalf of**

**Southern Alliance for Clean Energy**

**December 1, 2017**

ORIGINAL

**Introduction**

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

**Q. PLEASE STATE YOUR NAME, ADDRESS AND CURRENT POSITION.**

A. My name is Peter A. Bradford. My business address is PO Box 497, Peru, Vermont, 05152. I am an adjunct professor at Vermont Law School and President of Bradford Brook Associates, a firm specializing in advising on utility regulation, energy policy and nuclear power issues

**Q. WHAT EXPERIENCE RELEVANT TO THIS PROCEEDING DO YOU HAVE?**

A. I was a utility regulatory commissioner almost continuously from 1971 until 1995. I chaired the Maine Public Utility Commission (PUC) (1974-5 and 1982-87) and the New York Public Service Commission (NYPSC) (1987-95). During this time, I was involved in several power plant siting proceedings – including nuclear plants - that included determining the need for the proposed facility as well as reasonable rates and prudently incurred costs.

During my terms as a state regulator the Maine Yankee and Nine Mile Point 2 units came into service and were reflected in the rates I was involved in setting. New York’s other five nuclear units’ costs were also regulated by the NYPSC, as were aspects of the Maine utilities’ shares in several New England nuclear units regulated by the Maine PUC.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

Also during these years, the commissions on which I served had to deal with large construction cost overruns at the Seabrook (New Hampshire) and Shoreham (New York) nuclear plants. Ultimately, Shoreham was cancelled as was Unit 2 at Seabrook. The Maine utilities sold their shares in Unit 1 at Seabrook at what seemed at the time to be a substantial loss but at what turned out to be favorable terms when construction of that unit experienced substantial further unanticipated delays and cost overruns.

Since 1995, I have taught several courses related to energy policy, utility regulation and nuclear power at Yale and at Vermont Law School as well as in seminar programs at the Institute of Public Utilities and elsewhere. I have also worked with the Regulatory Assistance Project and have testified before numerous state utility regulatory commissions. In 2008 and 2009, I testified before the Florida PSC on behalf of a large industrial customer regarding the Levy County units and the North and South Carolina regulatory commissions on behalf of environmental groups as to the likelihood of excess costs, cost overruns and delays at the Lee units. All four units, since cancelled, were Westinghouse AP1000s.

**Q. PLEASE DESCRIBE YOUR EXPERIENCE WITH NUCLEAR POWER PLANT LICENSING, ECONOMICS AND NATIONAL SECURITY AS A MEMBER OF THE U.S. NUCLEAR REGULATORY COMMISSION (NRC).**

**A.** I was a commissioner on the NRC between 1977 and 1982 during which time the Commission issued more than twenty nuclear power construction permits and operating

1 licenses - more licenses, I believe, than have been issued during any five-year period since  
2 that time. These licenses required an assessment of the need for the proposed facility  
3 pursuant to the National Environmental Policy Act.

4  
5 The NRC was also responsible for licensing of nuclear exports (primarily nuclear fuel and  
6 nuclear power plants) as well as review of U.S. approvals of retransfers of spent fuel  
7 originating in the U.S. for reprocessing in other countries. These reviews were to assure  
8 that U.S. national security and nonproliferation objectives were protected through  
9 compliance with the criteria contained in the U.S. Nuclear Nonproliferation Act of 1978.

10 The NRC was required by law to consult with the Departments of State and Energy  
11 regarding proposed agreements with other nations, including the "123 Agreements" that are  
12 still today a primary legal basis for nuclear commerce between the U.S. and other nations.

13  
14 **Q. PLEASE DESCRIBE OTHER RELEVANT EXPERIENCE THAT YOU HAVE**  
15 **HAD IN YOUR CAREER.**

16  
17 **A.** I was a member of the National Association of Regulatory Utility Commissioners  
18 (NARUC) from 1971 until 1995 and served as its president in 1987. I served on NARUC's  
19 Electric, Gas and Communications Committees as well as on the Subcommittees on  
20 Nuclear Waste and Nuclear Economics. I was also the liaison between the Nuclear  
21 Regulatory Commission and NARUC and have testified before the U.S. Congress at least  
22 50 times on issues relating to nuclear power.

1 **Q. HAVE YOU HAD EXPERIENCE WITH NUCLEAR ENERGY ISSUES SINCE**  
2 **LEAVING STATE REGULATION?**

3  
4 I participated in the 2006 National Research Council of the National Academy of Sciences  
5 panel evaluating the alternatives to continued operation of the Indian Point nuclear units in  
6 New York. I was also a member of the 2007 Keystone Center Nuclear Power Joint Fact  
7 Finding project, which identified points of agreement among a broad range of  
8 constituencies, including nuclear power plant owners and builders, on issues relating to  
9 nuclear power costs and the role of nuclear power in combating climate change.

10  
11 I chaired and served on the three-member Public Oversight Panel that supervised the  
12 legislatively mandated comprehensive reliability audit of the Vermont Yankee nuclear  
13 power plant, concluding that the plant could be expected to operate reliably over its  
14 remaining licensed life. I am one of Vermont's two representatives on the Texas/Vermont  
15 Low Level Radioactive Compact Commission, which oversees aspects of a low-level waste  
16 disposal site in Andrews County, Texas.

17  
18 In other countries, I have participated in projects 1) evaluating the need for new nuclear  
19 units as an option for replacing the Chernobyl site in Ukraine for the European Bank for  
20 Reconstruction and Development, 2) evaluating new nuclear power and decommissioning  
21 costs in Armenia and 3) evaluating the regulatory structure and likely safety level of the  
22 Mochovce nuclear plant in Slovakia. I have consulted in several countries – including

1 China, India, Russia, Korea, Japan, and Kazakhstan – on issues pertaining to utility  
2 regulation and to nuclear power.

3  
4 Most of my consulting work abroad concerned the preparation and enactment of energy  
5 and regulatory laws and policies as well as the operation of regulatory commissions. Many  
6 of these projects involved blending regulatory frameworks with power market principles.

7  
8 My resume is attached as Attachment 1 to my testimony.

9  
10 **Q. HAS GEORGIA POWER SHOWN ITS RECOMMENDED COURSE OF ACTION**  
11 **WITH REGARD TO VOGTLE 3 AND 4 TO BE REASONABLE AND IN THE**  
12 **BEST INTERESTS OF ITS CUSTOMERS?**

13  
14 **A.** No. This is an immensely important moment for the Vogtle project, for its customers and  
15 for the economy of Georgia. Georgia Power Company, whose every important forecast  
16 of cost, of schedule and of the cost of alternatives has been wrong by more than enough  
17 to have invalidated the project before and since its original certification now seeks the  
18 Commission's credulity and permission to spend nearly as much all over again to  
19 complete the two nuclear power plants it once said would be operating by now. The  
20 Company's request is based on forecasts presented by many of the same people who have  
21 been so devastatingly wrong to date. The Owners' estimated cost for Georgia Power to  
22 complete its share of the project is now more than \$6 billion (\$4.5 billion in capital cost),  
23 bringing its estimated share of the total project cost to \$12.17 billion (\$8.77 billion in

1 capital cost), roughly twice the cost estimate provided to and approved by the PSC in  
2 2009. The Company has spent \$4.44 billion (McKinney testimony, p. 23)<sup>1</sup> only to find  
3 itself financially further from project completion now than it was when it began. Indeed,  
4 the net present value to Georgia Power customers of completing the Vogtle units as  
5 compared to cancelling them is, by the Company's own calculations, lower today than it  
6 was when the project was certified eight years ago. This is despite the multibillion-dollar  
7 expenditures by Georgia Power plus additional billions by the other owners and by  
8 Westinghouse. As Messrs. Hayet and Kollen point out (Hayet/Kollen, 16<sup>th</sup> VCM  
9 testimony, p. 15), the value of completing a well-conceived project should increase not  
10 decline as money is spent, so this is a nearly unbelievable and a deeply undesirable  
11 accomplishment, attained to the best of my knowledge only by a few other nuclear  
12 projects.

13  
14 Almost every forecast made with such assurance by the Company - in the face of  
15 considerable skepticism from the PSC Staff, from SACE and from others over the years -  
16 has proven expensively wrong. Costs have been much higher, and – far from being  
17 firmly controlled by new construction methods – have risen repeatedly. The scheduling  
18 certainty supposedly brought on by one stop NRC licensing and modular AP1000  
19 construction has been a mirage. Meanwhile, natural gas prices – and the forecasts of  
20 almost every independent analyst – have continued their downward trend in the face of  
21 repeated warnings of upward volatility from Georgia Power Company. Load has still not

---

<sup>1</sup> As I understand Messrs. Hayet and Kollen (16<sup>th</sup> VCM testimony, p. 8), the Company calculations reflect amounts collected by the Company and do not include several hundred million more dollars collected from customers, ostensibly to cover federal income taxes.

1 reached precertification levels. The construction management expertise that seemed to  
2 make the Engineering, Procurement and Construction (EPC) Agreement with  
3 Westinghouse a reasonable allocation of risk between Westinghouse and the Company  
4 turns out not to have been – the PSC is only now being told by Georgia Power – “in  
5 Westinghouse’s wheelhouse” after all.

6  
7 One might expect that a company bringing this stew of dashed expectations before a  
8 Commission charged by law to assure just and reasonable rates and the rejection of  
9 imprudently incurred costs would be sufficiently humbled to offer new customer  
10 protections, above and beyond those put in place to date. But, in fact, the reverse is the  
11 case. The protections for customers in the EPC Agreement between the Owners and  
12 Westinghouse were a fundamental basis for the PSC’s 2010 finding that “the EPC  
13 agreement has reasonably balanced the risks between the Company and the Consortium”.  
14 Yet those protections now have been eliminated by the Westinghouse bankruptcy. As a  
15 result, any continuation of Georgia Power’s past cost underestimates will no longer be  
16 borne by the project contractors but will flow through to its customers excepting only the  
17 reduced profit margin provided by the Vogtle Supplemental Information Review (SIR)  
18 stipulation and any costs disallowed for imprudence. Georgia Power’s record to date and  
19 the fact that the units have a long way to go suggest a high probability of further cost  
20 overruns and delays. The search for what Wall Street calls “the dumb money”, that is the  
21 investor who takes an inordinate share of the risk in return for a nominal share in  
22 whatever returns may be realized, now aims inexorably at Georgia Power’s customers.

23



1 If the Company has its way, the Commission will approve the reasonableness of paying  
2 the original cost estimate for the same reactors twice over, even though the absence of the  
3 reactors on the dates they were originally alleged to be needed has caused no shortages,  
4 and their substitutes have cost far less than the Vogtle reactors would have.

5  
6 As I will show later, the Company has not performed either the market tests or the  
7 analyses necessary to make a convincing showing under these extraordinary  
8 circumstances that completion of the Vogtle units is justified. Nor is it willing to  
9 complete the units if it must assume for its shareholders the risk of many likely events  
10 identified in their own testimony as “known risks” – a number of which would more than  
11 eliminate the net present value benefit that the Company asserts will flow from  
12 completing Vogtle.

13  
14 **Q. HOW SHOULD THE COMMISSION APPROACH THE DEFINITION OF**  
15 **REASONABLENESS FOR PURPOSES OF THIS PROCEEDING?**

16  
17 **A.** I very much agree with the approach suggested two decades ago by the National  
18 Regulatory Research Institute (NRRI), the research arm of the nation’s utility regulators,  
19 in a report written during the era when nuclear construction cost overruns led to a  
20 dramatic increase in prudence and reasonableness reviews compared to previous  
21 regulatory history. NRRI correctly noted that “In applying the standard of  
22 reasonableness under the circumstances commissions, in some instances of high risk  
23 projects, have required a higher-than-normal standard of care to compensate for the high

1 risks associated with project decisions...The public has the right to demand the use of  
2 superior tools and techniques to build nuclear generating facilities at the lowest  
3 reasonable cost. When the risk of harm to the ratepayer is greater, the standard of care  
4 expected from a reasonable person is higher.” (NRRI, *The Prudent Investment Test in the*  
5 *1980s*, 1985, p. 59).

6  
7 **Q. WHAT IS THE BEST WAY TO MEASURE THE REASONABLENESS OF**  
8 **DECIDING TO INCUR THE COSTS TO COMPLETE VOGTLE?**

9  
10 **A.** The true measure of excess cost is the difference between the cost of completing Vogtle  
11 and the cost of meeting the customers’ electricity needs in other ways. Of course, in  
12 making this judgment, one must take into account the uncertainty of the different cost  
13 estimates as well as the flexibility of different resource procurement plans to adjust when,  
14 as inevitably will happen, events overrule forecasts. At a time when fully completed and  
15 operational nuclear plants in other parts of the country are having to seek special rate  
16 increases to protect them from their inability to compete with the output of new natural  
17 gas plants, energy efficiency and the constantly falling costs of renewable energy, the  
18 dilemma with which Georgia Power Company and the Westinghouse bankruptcy have  
19 confronted the PSC requires a far more thorough analysis of the available alternatives  
20 than Georgia Power has chosen to offer in this proceeding.

1 **Q. HAS GEORGIA POWER PROVEN THAT COMPLETING VOGTLE IS LIKELY**  
2 **TO BE THE LEAST EXPENSIVE WAY TO MEET ITS CUSTOMERS' FUTURE**  
3 **NEED FOR ELECTRICITY?**

4  
5 **A.** No. Indeed, given the importance of this proceeding, it would be hard to overstate the  
6 inadequacy of the analysis of alternatives to completing Vogtle performed by Georgia  
7 Power Company. The Company's approach would return Georgia to the era when power  
8 systems were built around fixed concepts of "baseload", "intermediate load" and "peak  
9 load" without any recognition of the great extent to which load following generation,  
10 computer control, grid enhancement (often expending the potential for power purchase  
11 agreements), load management, flexible resources, energy efficiency and energy storage  
12 had revised this paradigm.

13  
14 One searches the Company's 17<sup>th</sup> VCM Report in vain for any serious effort to compare  
15 the costs of completing Vogtle with the cost of the range of alternative approaches  
16 available to meet its customers' electricity needs. The Company has done a detailed  
17 comparison of the cost of completing Vogtle only against a stand-alone 1000MW gas-  
18 fired alternative.

19  
20 As to the gas-fired alternative, the PSC Public Interest Advisory Staff (PIA Staff) has  
21 shown that – despite a history of overstating likely future gas prices – the Company  
22 continues to use a flawed forecasting methodology dependent on a single forecast rather  
23 than a combination of informed forecasts. As recently as June of this year, Messrs. Hayet

1 and Kollen (16<sup>th</sup> VCM testimony, p. 20) showed Vogtle to be uneconomic relative to the  
2 gas-fired alternative in seven of the nine cases that they looked at, taking automatic  
3 ratepayer protections from the SIR Stipulation into account (Hayet/Kollen 16<sup>th</sup> VCM  
4 testimony, pp. 14-15). The only cases in which completing Vogtle remained economic  
5 were those involving charges for carbon emissions. However desirable such charges  
6 might be, no such legislation seems likely either in Georgia or in Washington in the near  
7 future. Furthermore, the Vogtle cost estimates and completion dates have increased by  
8 enough to reverse the PIA Staff verdict even in these two cases in the months since these  
9 analyses were performed.

10  
11 Equally importantly, the Company has failed to analyze completion of Vogtle in  
12 comparison to a package of alternatives that included gas as well as expanded energy  
13 efficiency and load management, grid enhancements and renewable resources that  
14 included not just variable renewables such as wind and solar but renewables that are not  
15 weather dependent. In justifying this omission, the Company says that a preliminary look  
16 at an alternative consisting solely of a massive investment in solar and batteries sufficed  
17 to show that further review of these alternatives was superfluous. This unreasonably  
18 constrained analysis biases the evidence and denies the Georgia PSC the evidence it  
19 needs to make the momentous decision before it on a fully informed basis.

20  
21 In fact, the U.S. has extensive experience with nuclear power plant cancellations and with  
22 how the cancelled plants are replaced. More than half of all the nuclear plants ever  
23 announced in the U.S. were cancelled. The cancellation of these 130 reactors has not

1 caused power shortages any time or anywhere, but this is not because another large  
2 “baseload” plant or two has replaced the absent nuclear units. Instead, combinations of  
3 reduced demand, gas-fired generation, load management programs and – in recent years –  
4 diverse sources of renewable energy have taken their place. Of course, during the last  
5 round of nuclear construction, coal also played a role in this replacement, but that has  
6 been far less the case in this century.

7  
8 The same paradigm also applies to situations in which plants are delayed for long periods  
9 past the time when they were originally thought to be needed. Indeed, as of the 2009  
10 certification proceeding for this case, Georgia Power’s IRP forecast that the Vogtle units  
11 would come on line in 2016-2017, just in time to help to avoid a 1500MW capacity  
12 shortfall (2010 Certification Order, p. 4). The Vogtle units will miss these dates by a  
13 wide margin, but the Company has not commissioned another large new plant to replace  
14 them. Instead, Georgia Power has relied on its existing fleet plus combinations of  
15 alternatives (plus lower-than-forecast load growth), which have completely met its needs  
16 at costs low enough to mitigate the rate impacts of the money spent on Vogtle.

17  
18 Despite the clear history of cancelled nuclear plant replacements, of which no prudent  
19 utility management could possibly be unaware, Georgia Power has testified in these  
20 hearings that it did not consider an alternative that combined diverse resources to replace  
21 the Vogtle units (Chiock/Poroch cross-examination, pages 1288-89). **Thus, the**  
22 **Company willfully excluded the proven scenario that has replaced nearly all the**  
23 **U.S. nuclear plants that have ever been cancelled, closed or delayed.** This incomplete

1 approach to combinations scenarios cannot possibly establish the reasonableness of the  
2 Company's recommendation to continue with Vogtle with most of the risk now shifted to  
3 Georgia Power's customers.

4  
5 Finally, the Company's assertions of an increasing need for capacity in the years after the  
6 plants come on line are based in part on expiring power purchase agreements. However,  
7 the Company has made no showing that the agreements cannot be renewed, perhaps on  
8 better terms for customers than they provide now in light of current and forecast market  
9 conditions.

10  
11 **Q. HOW MUCH CREDIBILITY SHOULD THE COMMISSION AFFORD TO**  
12 **GEORGIA POWER WITNESSES IN THIS PROCEEDING?**

13  
14 **A.** There are several reasons for the Commission to treat Georgia Power's testimony with  
15 extreme skepticism. This does not mean that the Commission needs to find intentional  
16 deception, but it does reinforce the need for the PSC to avail itself of the market test  
17 approaches that I set forth below.

18  
19 The reasons include 1) the staggering amounts and frequency by which events since the  
20 certification of this project have contradicted Georgia Power Company's best judgments  
21 and projections; 2) the bias established by the extent to which these Company  
22 misforecasts have always favored project completion; and 3) the extent to which Georgia  
23 Power Company conclusions regarding the need and justification for new nuclear units

1 have flown in the face of decisions by all of their fellow industry executives to cancel or  
2 indefinitely defer new nuclear construction once gas prices fell and showed no likelihood  
3 of rising to levels at which new nuclear would be competitive, especially (but not  
4 necessarily) in the absence of expected load growth or a high carbon price.

5  
6 **Q. WHAT IS THE SIGNIFICANCE IN THIS CONTEXT OF DECISIONS TO**  
7 **CANCEL NUCLEAR PROJECTS ELSEWHERE?**

8  
9 **A.** As I discuss later, many of these projects were planned and announced in the context of  
10 state policies highly favorable to new nuclear capacity and similar to those prevailing in  
11 Georgia. The enthusiasm which these would-be owners felt for their units was  
12 comparable to that of Georgia Power and Southern Company for Vogtle. None of these  
13 units were cancelled because of environmental or political opposition. Instead executives  
14 of a dozen or more utilities – executives probably of no worse or better repute with the  
15 NRC or their state regulators than their counterparts in Georgia – concluded that  
16 changing economic circumstances had eliminated the justification for the projects.

17  
18 To take a well-publicized example from among the companies that cancelled the 20  
19 “nuclear renaissance” reactors in the last eight years, John Rowe, former CEO of Exelon  
20 during the time that it cancelled its proposed units at Victoria County in Texas), told an  
21 interviewer in early 2012, “Let me state unequivocally that I’ve never met a nuclear  
22 plant that I didn’t like. Having said that, let me also state unequivocally that new ones  
23 don’t make any sense right now” (<http://enenews.com/forbes-nuclear-power-longer->

1 viable-source-new-energy-excelons-ceo-retired-ealier-march). Months earlier Exelon  
2 had produced a widely distributed low carbon energy plan (Exelon 2020) ranking by cost  
3 its many options for lowering its carbon emissions (See Attachment 2 to my testimony,  
4 which I've used in my law school classes to illustrate nuclear power's excess cost even  
5 among low carbon options). New nuclear ranked third from the highest in cost of 19 low  
6 carbon building blocks, many of which provided as much or more energy as a new  
7 reactor.

8  
9  
10 **Q. ARE YOU URGING GEORGIA REGULATORS TO RELY ON THE**  
11 **PREDICTIONS OF CONSULTANTS SUCH AS YOURSELF OVER THE**  
12 **EXPERIENCED WITNESSES WHO HAVE IN FACT MET THE NEEDS OF**  
13 **GEORGIANS FOR RELIABLE AND REASONABLY PRICED ELECTRICITY**  
14 **FOR MANY YEARS?**

15  
16 **A.** This is a question that goes to the heart of the dilemma that regulators face in proceedings  
17 such as this. However wrong the Company witnesses have been about the project under  
18 review, however implausible their claims about the unknowable future, they are the team  
19 on the field.

20  
21 This was very much the dilemma that my fellow Commissioners and I at the Maine  
22 Public Utilities Commission (PUC) faced with regard to the Seabrook nuclear station in  
23 the early 1980s. After repeated cost overruns had led to the bankruptcy of the lead owner



1 (Public Service Company of New Hampshire) and the cancellation of the proposed  
2 Seabrook 2 reactor, the Maine PUC undertook its own investigation of whether the three  
3 Maine utilities (all then vertically integrated) should continue their involvement in the  
4 project. The utilities wanted to remain in the project. They asserted that a new project  
5 structure and a new construction manager with a record of completing nuclear plants on  
6 time and on schedule would assure that the history of cost overruns would come to an end  
7 and that the projected value of Seabrook of \$2000 per KW would benefit Maine  
8 customers. The new project manager testified that he was 100% confident that Seabrook  
9 1 would be completed by the end of 1986.

10  
11 Reluctant to substitute our judgement for that of the officials who were responsible for  
12 assuring Maine's power supply but deeply troubled by the extent to which we had relied  
13 on years of predictions that had proven terribly wrong, we decided to devise a market test  
14 of the utility assertions that the power would be worth the projected \$2000 per kW  
15 completion value. My fellow commissioners and I ordered the Maine utilities to offer to  
16 sell their shares (*Maine Public Utilities Commission: re Investigation of Seabrook*  
17 *Involvements by Maine Utilities, Docket 84-113, December 13, 1984*). The offers they  
18 received did not approach \$2000 per kW for delivery on the completion date. The market  
19 had spoken with decisiveness and confidence that we on the PUC might have lacked  
20 based on our own limited foresight in the face of the one-sided prophecies of the utility  
21 witnesses.

1 The Maine utilities then agreed to make their best efforts to sell their shares. A  
2 Massachusetts utility purchased these shares for approximately \$800 per kW. The price  
3 was below the sunk costs in the project, which caused the PUC (and me personally) to be  
4 sharply criticized in the nuclear industry and the financial press at the time. However, the  
5 Massachusetts utility that bought the Maine utility shares then went bankrupt because the  
6 completion costs escalated far above the projected value. The sale clearly saved Maine  
7 customers' money and trouble compared with continuing involvement in the project.

8  
9 In issuing our order that the Maine utilities make their best effort to sell their share in  
10 Seabrook, the Maine PUC noted that the normal remedies of disallowance for  
11 imprudence and for unreasonable expenditures would not suffice to protect customers in  
12 the case of Seabrook. That was because the potential penalties were very large and the  
13 utilities' financing capabilities had already been strained by the expenditures they had  
14 made to date. Disallowances that further weakened their financial position had the  
15 potential to cost the customers as much in future financing costs as they might save them  
16 in disallowed Seabrook costs.

17  
18 **Q. ARE THERE LESSONS FOR GEORGIA IN MAINE'S EXPERIENCE WITH**  
19 **SEABROOK?**

20  
21 **A.** I think so, though one must always be careful in generalizing from one utility service  
22 territory to another. While Southern Company's financial condition is more robust than  
23 was that of Public Service Company of New Hampshire, it too has faced great financial

1 stress, both at Vogtle and at Kemper. Georgia Commissioners can expect to hear, as we  
2 did in New England and New York, that further major disallowances for imprudence  
3 would not, however justified they might be, actually be able to save the customers any  
4 money due to higher financing costs that would result from the utility's weakened  
5 condition. The argument will be that the riskier a borrower Southern Company becomes,  
6 the lower its bond rating will fall. And, of course the lower the bond rating, the higher  
7 the interest rate that must be paid. Similar reasoning will be put forward with regard to  
8 the outlook for investment in Southern Company stock.

9  
10 Of course, the effect of such reasoning is to nullify customer protections that might  
11 otherwise result from prudence disallowances and to do so at the very time when large  
12 cost overruns or instances of imprudence make these protections most necessary.

13 The lesson of this scenario is for regulators to be wary of relying too heavily on post-  
14 completion prudence reviews as a complete safeguard of customer wellbeing.

15  
16 **Q. ARE YOU AWARE OF ANY OTHER INSTANCES IN WHICH A VERTICALLY**  
17 **INTEGRATED UTILITY AVOIDED A MAJOR POWER ACQUISITION FOR**  
18 **WHICH IT WAS SEEKING REGULATORY APPROVAL ONLY AFTER THE**  
19 **REGULATORY COMMISSION REQUIRED THAT THE PROPOSED PROJECT**  
20 **BE TESTED AGAINST A COMPETITIVE SOLCITATION?**

21  
22 **A.** Yes. When Central Maine Power Company (CMP) sought certification to build a  
23 transmission line and enter into a 29- year commitment to purchase 300MW of power

1 from Hydro-Quebec, the Maine PUC required that CMP first run a competitive  
2 procurement for 300MW of power. The resulting bids, which came largely from  
3 independent power producers, were lower than the cost of the transmission line and the  
4 power purchase. The Commission declined to certify the line and the purchase, and CMP  
5 dropped its proposal and purchased from the best bidders, ultimately concluding also that  
6 it did not need the full 300MW of power (*Central Maine Power Company, Re: Petition of*  
7 *Certificate of Public Convenience and Necessity for Proposed Purchase of Generation*  
8 *Capacity and Energy from Hydro-Quebec, Docket 88-111, January 23, 1989, especially*  
9 *pp. 103-118*). The result was a substantial savings to Maine customers and a boost to  
10 Maine economic development.

11  
12 **Q. CAN YOU PROVIDE ANY OTHER EXAMPLES OF A COMPANY**  
13 **CONDUCTING A COMPETITIVE PROCUREMENT BEFORE GOING**  
14 **FORWARD WITH A MAJOR CAPITAL INVESTMENT COMMITMENT?**

15  
16 **A.** Of course, the competitive power markets that now produce well over 50% of the  
17 electricity generated in the U.S. do this automatically. Long term decisions as to what to  
18 build and short-term decisions as to what to run are made through competitive processes  
19 that include not only all forms of generation but also energy efficiency, load management  
20 and – increasingly – electricity storage.

21

1 **Q. WHAT LESSONS FROM THESE EXPERIENCES WITH BLENDING**  
2 **COMPETITIVE PROCESSES WITH FULLY REGULATED UTILITIES HAVE**  
3 **YOU LEARNED THAT MAY BE OF ASSISTANCE IN GEORGIA?**

4  
5 **A.** First, it is both possible and highly informative to blend market tests with a fully  
6 regulated utility structure. These bidding systems are a crucial supplement to studies and  
7 plans and will produce many surprises - most of them pleasant - as long as the potential  
8 participants have good reason to believe that the process will be open and transparent,  
9 with the most beneficial bidders standing the best chance of actually obtaining contracts.  
10 There is just no way for even the best regulators and forecasters to know the full technical  
11 and commercial potential of the rapidly evolving power supply and load management  
12 marketplaces.

13  
14 **Q. WERE YOU INVOLVED IN ANY OTHER CASES IN WHICH A CANCELLED**  
15 **NUCLEAR PLANT WAS REPLACED AT LESS COST THAN THE COST TO**  
16 **COMPLETE IT?**

17  
18 **A.** The only other cancelled nuclear plant case with which I was directly involved was the  
19 Shoreham nuclear power plant on Long Island in New York. I chaired the New York  
20 PSC during the proceedings reviewing and approving the settlement that determined that  
21 Long Island Lighting Company (LILCO) customers would be best served by LILCO's  
22 not operating the Shoreham plant.

23

1 In some ways that case was as noteworthy as Seabrook in the context of the present  
2 Vogtle review, because even after the plant was virtually complete in 1989, the owning  
3 utility's study (with which the NYPSC staff's study agreed) showed a net present value  
4 of only \$300 million from running it. In short, the net present value of running a plant  
5 completed at a \$5 billion cost (some eight times higher than the original forecast), was  
6 very slight.

7  
8 This came about largely because natural gas had become abundant and inexpensive and  
9 energy efficiency programs and independent power production were far outperforming  
10 the expectations used to justify proceeding with Shoreham construction. On Long Island  
11 then as in Georgia today, load had fallen well short of expectations, further undermining  
12 the value of the Shoreham power. Indeed, when LILCO agreed not to run Shoreham, the  
13 loss of that 890MW generator seemed to leave the utility capacity deficient for the  
14 following summer. Through an urgent program of load management, targeted  
15 maintenance and the construction of smaller gas turbines, power shortages of any kind  
16 were averted. Indeed, during one August heat wave, LILCO was a net seller of power to  
17 utilities in Washington D.C., so LILCO power wound up air conditioning the very U.S.  
18 Department of Energy (DOE) offices in which outraged federal officials were writing up  
19 jeremiads on how Long Island without Shoreham was destined for blackouts.

20  
21 In hindsight, it seems likely that the net present value of operating the plant might well  
22 have been negative. Like Vogtle, most of the benefits of operation would have occurred  
23 in the second half of the plant's life, that is, after 2010. But the low natural gas prices of

1 the last decade would have cut the projected present value - which was based largely on  
2 forecasts of rising fuel prices - by far more than the \$300 million net present value  
3 estimate of 1989. Of course, other factors point the other way. For example, nuclear  
4 plant capacity factors increased greatly in the 1990s, suggesting that Shoreham would  
5 have operated more efficiently than the studies projected, so it would take a detailed  
6 study to reach a conclusion one way or the other on the net economic benefits of the  
7 settlement. I mention the issue here just to show how easily a net present value as small  
8 as the one claimed by Georgia Power for finishing and running Vogtle can be reversed by  
9 future events of a sort that we have already experienced with some frequency in the past.  
10

11 **Q. WHAT DOES THE SHOREHAM EXPERIENCE TELL US ABOUT THE**  
12 **LIKELIHOOD OF POWER SHORTAGES IN GEORGIA IF THE VOGTLE**  
13 **UNITS ARE NOT COMPLETED OR SUFFER SUBSTANTIAL FURTHER**  
14 **DELAYS?**

15  
16 **A.** There is no reason that the absence of the Vogtle units should cause power shortages as  
17 long as Georgia Power plans accordingly. Shoreham's absence caused LILCO to be short  
18 of its actual estimated load – not just its required reserve - within months. As I have  
19 testified, LILCO met this challenge with room to spare. Georgia Power would not even  
20 fall below its required reserve until after the Vogtle units are expected. Furthermore,  
21 Georgia Power has several years before even its own projections show a shortage not of  
22 absolute capacity but in relation to its ample reserve requirement. Several nuclear plants  
23 have closed with notice of two years or less recently without causing power shortages or

1 rate increases. New York and California expect to be able to close their 2200MW  
2 nuclear sites in eight years or less without causing shortages or increases in carbon  
3 emissions.

4  
5 **Q. WHAT MIGHT GEORGIA POWER COMPANY HAVE DONE AND STILL DO**  
6 **TO ESTABLISH THAT THE POWER TO BE GENERATED BY THE VOGTLE**  
7 **UNITS IS REALLY WORTH THE ADDITIONAL \$6 BILLION AND COUNTING**  
8 **THAT THEY PRESENTLY ESTIMATE THAT THEY AND THEIR**  
9 **CUSTOMERS WILL PAY FOR IT?**

10  
11 **A.** Two possibilities resulting from the examples I have just set forth occur to me. First, the  
12 Company or an independent party under rigorous supervision could conduct a  
13 competitive procurement to meet a substantial part of the Company's likely requirements  
14 over the next two decades. I am aware that the Company conducted such a competitive  
15 procurement as part of its decision-making process in choosing to build Vogtle 3 and 4,  
16 but the fact that it received no competitive bids leads me to believe that that process could  
17 be improved upon in today's market conditions. After all, the estimated costs to  
18 complete Vogtle are well above the costs of units and combinations of resources  
19 currently being chosen in most of the country's competitive power markets. Testimony  
20 in the Company's Integrated Resource Plan (IRP) proceeding shows that it has ample  
21 experience with competitive procurement processes. The results of such a competitive  
22 solicitation would provide an objective indication of the value of completing Vogtle. In  
23 the Seabrook and Hydro-Quebec cases that I mentioned above, the Maine utilities had



1           been satisfying their obligations to buy competitively priced power from independent  
2           power producers by running such power auctions even before the respective Commission  
3           decisions. The results – both as to the quantity of the alternatives and the reasonableness  
4           of their price – had far bettered the forecasts and had provided something of a yardstick  
5           for the value of continuing to build Seabrook or building the new line to Hydro Quebec.

6  
7           Second, the Company could be required to offer some of its share of Vogtle for sale  
8           immediately. If the power is really worth anything like the above \$6000 per kilowatt  
9           estimated Vogtle completion cost, the bids should reflect that. After all, several of  
10          Georgia’s neighbors have had to cancel nuclear projects of their own and ought to be  
11          interested in acquiring shares in Vogtle if the price were attractive for their customers.  
12          Though one must note that Duke Power apparently rejected whatever opportunity it was  
13          offered to take part in the recently cancelled AP1000 reactors at V.C. Summer in South  
14          Carolina. Of course, if no bids approaching the Company’s estimated per kilowatt cost to  
15          complete Vogtle were received, that would indicate that completing Vogtle is not worth  
16          the price that Georgia customers will be asked to pay.

17  
18  
19   **Q.   THE COMPANY ASSERTS THAT – DESPITE VERY HIGH CONSTRUCTION**  
20   **COSTS – VOGTLE UNITS 1 AND 2 ARE NOW THE “CROWN JEWELS” OF**  
21   **ITS GENERATION FLEET AND THAT THIS HISTORY JUSTIFIES**  
22   **PROCEEDING TO BUILD UNITS 3 AND 4 EVEN IF THE COSTS OF**  
23   **COMPLETION ARE VERY HIGH. IS THIS ECONOMICALLY CONVINCING?**

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

A. No. This conclusion is clearly fallacious. Many projects with very high construction costs followed by low operating costs can be made to look beneficial if one focuses only on the operational years, especially the later years. Indeed, this mode of analysis would obviously conclude that wind and solar were crown jewels based on their even lower operating costs. An assessment of whether or not a power plant’s lifetime rate impact is beneficial to customers must consider both construction costs and operating costs from the time construction begins. When the time value of the customers’ money is taken into account, it is almost impossible for low operating costs in the later years of a plant’s life to make up for excessively large construction costs and expensive early years, as was the case with Vogtle units 1 and 2. In part this is because the time value of the money paid in the negative early years grows at a compound rate. In part it is because of the greater uncertainty attaching to the benefit numbers twenty years or more in the future than to the negative numbers piling up even as construction continues. Put another way, a buyer today would pay only a few pennies for a relatively certain dollar of benefit sixty years from now. That dollar of benefit in sixty years is worth next to nothing at all today if it depends heavily on uncertainties like high natural gas prices, substantial demand growth, no further Vogtle construction cost escalation, an end to the declining cost of renewables and storage, and highly successful operation of the two new, first-of-a-kind Vogtle units.

Furthermore, one need only look at the debates now raging in several states where power is sold through power markets to see that nuclear plant operating costs are not low enough relative to other sources to merit “crown jewel” status. The fact is that many

1 such plants are now insisting (with the recent support of the U.S. Department of Energy)  
2 that they must have their operating costs subsidized to the tune of billions of dollars in  
3 rate increases if they are to compete successfully with power from other sources. Such  
4 targeted subsidies are not sought in cost-of-service regulated states like Georgia because  
5 operating costs are provided automatically through the rate setting equations, but the need  
6 for these nuclear operating plant-driven rate increases clearly contradicts claims of  
7 immense benefits from nuclear power plant operation offsetting high construction costs.

8  
9 Lastly, as to operational reliability, it is true that the U.S. operating nuclear fleet  
10 maintains capacity factors above 90% for reactors after their initial years of operation.  
11 However, these numbers do not include the 20 or more reactors that have been shut down  
12 long before the end of their licensed lives. Nor do they include the years lost by the 52  
13 reactors that have been closed for more than a year by operational mishaps or by weather  
14 related events such as the flooding that led to a three-year shut down at Fort Calhoun in  
15 Nebraska. There is no reason to doubt that most of these units too were regarded as  
16 “crown jewels” until the events that shut them down.

17  
18 **Q. ARE THE VOGTLE UNITS USEFUL AS A HEDGE AGAINST AN INCREASE**  
19 **IN THE FUTURE PRICE OF NATURAL GAS?**

20  
21 **A.** Not really, because the same economic and reliability benefits can be obtained more  
22 inexpensively. A certain amount of gas storage and fuel substitution is possible, as is  
23 purchasing from multiple sources and pipelines. All nongas sources, including energy

1 efficiency, provide a hedge against rising gas prices. Furthermore, gas price forecasters  
2 do not foresee a major sustained gas price rise for decades. The cost of electricity from  
3 the completed Vogtle units will be far too expensive to be a sensible hedge against up and  
4 down fluctuations in gas prices, even if the upward movement goes as high as any in the  
5 past 20 years and lasts a year or two. Simply put, completing the Vogtle units as a hedge  
6 against such price movement is like buying an insurance policy that costs more than the  
7 event being insured against, something no rational buyer would do knowingly.

8  
9 **Q. HAVE YOU TAKEN INTO ACCOUNT THE VALUE OF THE VOGTLE UNITS**  
10 **AS A SOURCE OF “BASELOAD” ELECTRICITY?**

11  
12 **A.** Yes, but the Vogtle units are far too expensive for the diminished benefit that “baseload”  
13 power plants provide in today’s electric power systems. The importance of baseload  
14 electricity in today’s electric systems is considerably less than it was even when the  
15 Vogtle units were being planned. It will diminish even more by their new projected in-  
16 service dates. Combinations of gas fueled units with various renewables, with energy  
17 efficiency, with load management, with enhanced grid capabilities and with energy  
18 storage are fully capable of providing highly reliable, 24 hour-per-day electricity at lower  
19 costs than completing Vogtle. Georgia Power has done no detailed analysis  
20 demonstrating that this is not the case, a glaring failure given the billions of dollars that it  
21 is demanding its customers put at risk.

1  
2 **Risks Remaining as to Vogtle Completion**  
3

4 **Q. HAS GEORGIA POWER DEMONSTRATED THAT ITS ESTIMATED COST TO**  
5 **COMPLETE VOGTLE 3 AND 4 HAVE A HIGH PROBABILITY OF BEING THE**  
6 **UPPER LIMIT OF THE PROJECT COMPLETION COSTS?**  
7

8 **A.** No. The Company is asking the Commission to accept the classic nuclear construction  
9 cost curve forecast that has proven erroneous far more often than it has proven correct. If  
10 this were graphed, past forecasts would be a series of steep, upward sloping lines. But  
11 today is the point, or hinge, beyond which the cost forecasts suddenly flatten out and  
12 become predictable over the four and five years that the Company hopes will suffice to  
13 complete the two units. Most nuclear projects have many such forecast graphs, with this  
14 year's hinge all too often anchoring next year's steepest incline.  
15

16 It is true that the Company has analyzed different scenarios and has assigned probabilities  
17 to many of its forecasts, but Vogtle 3 and 4, like its namesake units and a good many  
18 others, has already left quite a number of plausible scenarios discarded in its wake.  
19  
20

21 **Q. WHY DO YOU ASSERT THAT THE VOGTLE PROJECT'S COMPLETION**  
22 **HAS NOT BEEN SHOWN TO BE REASONABLE AND IN THE BEST**  
23 **INTERESTS OF THE COMPANY'S CUSTOMERS?**

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

A. There are several reasons. In addition to those discussed earlier, one measure of the reasonableness of any utility’s decisions is the decisions made by other reasonable utilities facing similar circumstances. That standard weighs heavily against Georgia Power’s proposal to expose its customers to the risks of building Vogtle 3 and 4.

Twenty of the 26 reactors whose applications were docketed at the Nuclear Regulatory Commission (NRC) between mid-2007 and mid-2009 (the so-called “Nuclear Renaissance” applications) have been cancelled, including the six AP1000s at the Summer, Lee and Levy County sites just this year. The cost estimates (on a per MW basis) to build some of these projects were, at the time of cancellation, very likely lower than Georgia Power’s present estimate of the cost to complete Vogtle. The four uncanceled “renaissance” reactors other than Vogtle have been indefinitely deferred. Applicants for five other reactor licenses, as to which the NRC had received expressions of intent to file in 2009 and 2010, decided not to do so.

None of these cancellations or deferrals can be attributed to environmental or political opposition. All were on economic grounds. This means that all of the utility (or nonutility) generation owners whose hopes constituted the “Nuclear Renaissance” have reviewed the impacts of their projects on their customers’ rates and reliability and have concluded that building the nuclear units would not be a reasonable use of funds at this time. Here we have an exceptionally clear showing of the conclusions reached by comparable utility executives to cease exposing customers to more risk.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

Secondly, aside from aspects of the now-renounced EPC with Westinghouse, Georgia Power has not established a strong track record of protecting its customers' best interests in the context of building Vogtle. Nowhere does the Company assert – and it could not credibly do so – that it would undertake to build the Vogtle units from scratch starting today. It is beyond serious debate that the full cost of the Vogtle units is far higher than the amount necessary to fulfill the needs of Georgia Power's customers by other means.

**Q. HAS GEORGIA POWER COMPANY SHOWN THAT THE DISTRIBUTION OF PROJECT RISKS BETWEEN ITS CUSTOMERS AND ITS SHAREHOLDERS IS REASONABLE AND EFFICIENT?**

**A.** No. Under the framework now demanded by Georgia Power if it is to complete the Vogtle units, the customers will be asked to bear a much larger proportion of the risks than they did before Westinghouse renounced the EPC.

**Q. PLEASE EXPLAIN.**

**A.** The EPC with Westinghouse was in many respects a turnkey contract. That is, Westinghouse agreed, with certain exceptions, to accept a fixed price for its work and turn the completed project over to Georgia Power. The magnitude of the risks accepted by Westinghouse is now clear. This contract and similar arrangements at the V.C.

1 Summer project in South Carolina have – in combination with the immense cost overruns  
2 at these two projects – bankrupted Westinghouse, long one of the premier nuclear power  
3 plant and nuclear equipment purveyors in the world.

4  
5 Georgia Power did well to secure the fixed price protections in its contract negotiations  
6 with Westinghouse. I consider the crucial concerns for the reactor builders in the 2007-  
7 2009 time frame to have been particularly well categorized by Christopher Crane, now  
8 the CEO of Exelon, as quoted in a March 6, 2008 Nucleonics Week article:

9  
10 Engineers and construction contractors for new nuclear  
11 plant builds must be prepared to share risks by guaranteeing  
12 timely, on-budget performance in their contracts,  
13 Christopher Crane, chief operating officer of Exelon  
14 Generation, said in a February 27 interview.  
15 When the current US power reactor fleet was built, “the  
16 risk was always on the owner,” but all companies involved  
17 in “engineering, procurement, construction or any subset of  
18 one of those items” must be “responsible to execute to  
19 expectations” if new nuclear projects are to succeed, Crane  
20 said. In the 1970s and 1980s, some utilities faced bankruptcy  
21 and ratepayers were forced to bear the costs of “mismanagement,  
22 project overruns, productivity issues and just bad  
23 design,” but “there was not a contractor that I ever remember  
24 that did anything other than profit wildly. So, the model  
25 has got to change,” he said.

26 In practice, parties to new nuclear contracts must “figure  
27 out in advance what [costs] in the contract would be fixed  
28 and what would be variable,” and “bounds” must be set on  
29 the “allowable percentage of error or rework,” Crane said.  
30 Construction contractors must be “accountable” for meeting  
31 a certain level of productivity and delivering “quality of  
32 work within a reasonable band of acceptance.” Hedging and  
33 other long-term procurement strategies must account for  
34 inflation in future prices for copper, steel, concrete and  
35 other key commodities. Such an approach has never before  
36 been used for a power reactor construction project in the  
37 US, Crane said.



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

But Georgia Power's successful adherence to these principles in its negotiations at that time is also the measure of what the customers have lost as a result of the Westinghouse bankruptcy. The new model and contractor accountability considered fundamental for nuclear construction by Mr. Crane are now out the window as far as Vogtle is concerned, replaced by faith (which I will show to be unfounded) in allegedly unique nuclear power attributes so essential that the customers should bear the lion's share of risks unacceptable to lenders or investors or other potential owners in order to obtain them. The customers are slated to bear these risks unless this Commission adopts reasonable protections as discussed in my testimony.

The risks are immense. Nuclear construction is, as Georgia well knows, a complex and demanding process. Not only do we have the history of this project and its predecessor at Vogtle, but more than half of the nuclear plants ever announced in the U.S. were cancelled, many after the expenditure of hundreds of millions of dollars, even billions in some cases, including recent ones in South Carolina and Florida. Many of those that were completed experienced cost overruns in the hundreds of millions of dollars, with some overrunning their original estimates by well over a billion dollars. Multiyear delays were commonplace.

The early cost recovery statute passed by the Georgia legislature imposes more risks on customers than was the case during the previous nuclear construction era. The customers' obligation to pay for cancelled plants has fewer exceptions. The prudence

1 reviews are potentially less comprehensive. Because the customers start paying sooner,  
2 even delays unaccompanied by cost overruns are more expensive to customers. The  
3 extent of these increased risks has been playing out in the context of similar statutory  
4 provisions leading to customer payments of nearly \$900 million for the cancelled Levy  
5 County units in Florida and is now manifesting itself in South Carolina, where the state  
6 government and utility customers are suffering buyers' remorse in the face of utility rate  
7 claims of several billion dollars spent on the V.C. Summer units.

8  
9 **Q. WHY DOES ASSIGNING MOST OF THE RISK ASSOCIATED WITH THE**  
10 **COMPLETION OF THE VOGLE UNITS TO THE CUSTOMERS INVITE**  
11 **INEFFICIENT PRICING AND PROJECT MANAGEMENT?**

12  
13 **A.** Sound business and risk management principles require that risks should flow to the  
14 entities best able to manage them and most likely to reap the rewards of good  
15 management. In the case of nuclear power plant construction, with its extremely high  
16 costs and risks, adherence to these conservative principles is especially important. Power  
17 plant owners and managements have more information, more expertise, more training  
18 and more time for construction management than utility regulators, to say nothing of the  
19 customers represented by those regulators. They are well compensated to perform  
20 exactly these functions, whereas utility regulators have a multitude of other  
21 responsibilities. In most states, including Georgia, the top executives of large nuclear  
22 utilities receive compensation well in excess of the total of the salaries of all of the state's  
23 utility commissioners.

1  
2 Provided that Georgia adopts ratemaking and regulatory policies such that shareholders  
3 benefit most as a result of courses of action that produce the best results for their  
4 customers and for their service territory, power plant owners acting on behalf of their  
5 stockholders will manage the risks of power plant construction and investment better than  
6 state utility regulators. If Georgia Power Company must bring the Vogtle units on line at  
7 prices approximating those that would be charged for the best and lowest cost alternative  
8 for Georgia, then and only then will the Company's management have every incentive to  
9 measure whether the costs and risks will be worth more than the alternatives available to  
10 Georgia customers.

11  
12 And finally, only if Georgia regulators lock in the customer benefits with as much  
13 certainty and tenacity as Company management protects shareholders and as bondholders  
14 insist upon provisions protecting themselves can Georgia Power customers feel that their  
15 asserted benefits in the Vogtle project will be forthcoming in the event that the project  
16 does go forward.

17  
18 **Q. HASN'T THE COMMISSION ALREADY TAKEN AMPLE MEASURES TO**  
19 **PROTECT THE CUSTOMERS?**

20  
21 **A.** The return on equity disallowances and opportunities for future prudence reviews written  
22 into the stipulations approved in VCM 8 and the SIR proceeding a year ago are of course

1 vital, but they alone will not protect the customers from the risks and excess costs that  
2 they are now being asked to assume.

3  
4 For one thing, those protections are not triggered by the difference between Vogtle costs  
5 and the cost of alternatives, which is the real measure of customer exposure to harm from  
6 the Vogtle projects.

7  
8 For another, the stipulations were put in place before the cost overruns and delays were  
9 announced in VCM 17. However adequate they may have been when adopted, they were  
10 crafted while the protections of the EPC were still in place, and the potential harm to  
11 customers seemed limited accordingly. Today, when Georgia Power demands that  
12 customers take on far more of the construction risk, a set of penalties that focuses only on  
13 allowing a somewhat reduced level of profit are no longer proportionate to the losses that  
14 customers will bear in the event that the Company is again unable to control project costs.

15  
16 Finally, it is possible that at Vogtle – as I have shown was argued at Seabrook and  
17 Shoreham (page 17 above) – the appropriate prudence disallowances will be so large as  
18 to have a negative impact on the creditworthiness of Georgia Power so great that the  
19 increases in the Company’s costs of capital will be alleged to offset the benefits of the  
20 disallowances to the customers.

21

1 **Q. DOES THE ENHANCED INVOLVEMENT OF SOUTHERN NUCLEAR**  
2 **PROVIDE HIGH ASSURANCE EITHER OF MORE EFFECTIVE COST**  
3 **CONTROL OR OF GREATER TRANSPARENCY?**

4  
5 **A.** No. Southern Nuclear has no recent record in nuclear construction. Moreover, both  
6 Southern Nuclear and Georgia Power Company are subsidiaries of Southern Company,  
7 whose Kemper power project in Mississippi has resulted in costs triple the original  
8 certified amount as well as multiple lawsuits and regulatory proceedings alleging serious  
9 suppression and withholding of vital cost and scheduling information from investors and  
10 regulators. If the allegations in these proceedings prove valid, Southern Company's  
11 corporate culture is not likely to provide enhanced cost control or transparency to the  
12 Vogtle project.

13  
14 **Q. DOES THE SELECTION OF BECHTEL TO COMPLETE THE VOGTLE**  
15 **PROJECT PROVIDE ASSURANCE THAT THE PROJECT'S HISTORY OF**  
16 **COST OVERRUNS AND DELAYS WILL COME TO AN END?**

17  
18 **A.** No. Bechtel has extensive nuclear construction experience, but it also has its own history  
19 of cost overruns, schedule delays and plant cancellations. Even the best nuclear plant  
20 constructors have had significant cost overruns. Georgia has experienced the team of  
21 Southern Nuclear and Bechtel before. The \$8 billion cost overrun that they presided over  
22 at Vogtle Units 1 and 2 still rank among the largest cost overruns in U.S. nuclear history.  
23 By way of further example, Bechtel was extensively involved in the recent completion of

1 the Watts Bar 2 nuclear unit in Tennessee, a project that took twice as long and cost twice  
2 as much as TVA projected when it made its restart decision in 2007. At the Hanford  
3 reservation in Washington State, Bechtel serves as contractor to the Department of  
4 Energy for the construction of the Waste Treatment Plant. The cost estimate for that  
5 facility in 2006 was \$12.3 billion, with completion expected in 2022. In December 2016,  
6 the estimate for completing a portion of the facility became \$16.8 billion with a court-  
7 ordered start-up date of 2036.

8  
9 In the past history of nuclear power plant construction, Bechtel was the contractor for  
10 some of the largest cost overruns in nuclear history, including Limerick 1 and 2, Hope  
11 Creek, San Onofre 2, Susquehanna 1 and Grand Gulf as well as cancelled plants at  
12 Zimmer and Bellefonte. At the San Onofre 2 plant in California in 1977, Bechtel  
13 presided over one of the nuclear industry's most publicized and embarrassing  
14 construction mishaps when it installed a 420-ton reactor vessel backwards and didn't  
15 realize that it had done so for several months.

16  
17 Of course, neither Watts Bar nor the Hanford project is directly comparable to building  
18 Vogtle. Likewise, of course, Bechtel had its share of the lower cost (which isn't to say  
19 inexpensive) nuclear plants. My point isn't to fault Bechtel's history but to establish that  
20 hiring Bechtel does not assure an end to unpleasant surprises and cost overruns.

21  
22 Finally, this is not the PSC's first exposure to a project reorganization that was supposed  
23 to put an end to runaway costs and allow confidence that future schedules would be met.

1 Indeed, it is not even two years since the “Definitive Settlement Agreement” – under  
2 which Westinghouse became the sole prime contractor by taking over Chicago Bridge  
3 and Iron and bringing in Fluor as its construction contractor. The hoped-for  
4 improvements in cost control and scheduling were not realized, and Westinghouse  
5 declared bankruptcy just over a year later. Reorganizations and new contractors have  
6 never been panaceas in the history of nuclear construction. Indeed, they introduce their  
7 own uncertainties. The announcement of a new reorganization should be a basis for a  
8 greater degree of customer protection, not a reduction.

9  
10 **Q. SHOULD THE COMMISSION APPROVE THE NEW PROJECT**  
11 **MANAGEMENT STRUCTURE AS REQUESTED BY GEORGIA POWER**  
12 **COMPANY ON PAGE 6 OF THE 17<sup>TH</sup> VCM REPORT?**

13  
14 **A.** No. As has been demonstrated by the several failures in the project management  
15 structures put before the Commission to date, this is a complex issue. If all goes well  
16 from here on out, there will be no need for the Commission ever to opine on the project  
17 management structure. If, however, the project is beset by further cost overruns and  
18 delays, the prudence and reasonableness of the management structure may require  
19 detailed review of a type not possible on this record and in this time frame. Before taking  
20 steps toward adding the costs under the revised management structure to rate base, the  
21 Commission should have the benefit of the post-completion full prudence review – with  
22 expert testimony on behalf of affected stakeholders – before deciding on the  
23 reasonableness of the revised management structure.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

**Q. WHAT SAFEGUARDS DO YOU RECOMMEND THAT THE GEORGIA PSC ADOPT TO PROTECT CUSTOMERS FROM FURTHER COST OVERRUNS AND DELAYS IN BUILDING VOGTLE?**

**A.** The Commission has already shown that it is sensitive to the need to provide incentives to prevent costs from spiraling out of control. Specifically, it has reduced the Company’s allowed return on equity and has indicated that the return will be reduced further. Unfortunately, these incentives have proven inadequate for reasons set forth on pages 33-34 above.

Just as Georgia Power limits the risks to which the Company and its investors are exposed, the Commission needs with equal firmness to make a decision that does not expose Georgia customers to costs or risks that are open-ended and unlimited. If it accepts Georgia Power’s recommendation to proceed with the project, it should indicate that a firm upper limit on recoverable costs will be derived from the costs of meeting its customers’ needs via alternative scenarios of mixtures of resources determined through the processes that I have set forth earlier in this testimony. Essentially, the goal should be a project cost cap that assures a positive net present value for customers. Unfortunately, Georgia Power has not done an analysis of the real alternatives to proceeding with Vogtle that reveals just what such a cap would be, but this is not at all the same thing as invalidating the concept of a cap on the total recovery.



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

If an interim cap is needed, it could be derived from the Staff's calculation of the cost of a combined cycle gas facility. A cap – based on the cost of pursuing alternatives to Vogtle – on the total allowable Vogtle cost that may be recovered from customers would both provide protection to Georgia customers and clear guidance to Georgia Power Company as to reasonable completion costs.

Such a cap could be adjusted upwards over the remaining life of the project but only if both project costs and increases in the cost of alternatives justified such a modification.

**Q. ARE THERE EXAMPLES OF CAPPING ARRANGEMENTS AS TO NUCLEAR AND OTHER UTILITY CONSTRUCTION PROJECTS?**

**A.** There are. The Nine Mile Point 2 unit in New York was completed in the mid-1980s under just such a commission-imposed cap. Specifically, following large cost overruns, recoverable costs were capped at about \$4 billion. The completed plant cost several hundred million dollars more than that. The difference was, as I recall, absorbed by the lead owner, Niagara Mohawk Power Company. The NRRI study I cited earlier mentions caps on two projects (Seabrook and Millstone 3) in Connecticut as well as one in New Jersey (NRRI, pp. 76-78). Ratemaking for the Diablo Canyon plant in California was subject to a market-based cap with the consent of the plant owner. Limerick 2 in Pennsylvania was completed under a cost cap. Of course, Southern Company has experience completing the Kemper project under the complexities of the Mississippi

1 Commission's cost cap. As Mr. Crane's statement quoted above makes absolutely clear,  
2 industry hopes for a revival in nuclear construction require a demonstration that  
3 contractors and plant constructors can be made to share risks in a manner that protects  
4 utility customers.

5  
6 **Q. SHOULD SUCH A CAP ALLOW FOR AUTOMATIC INCREASES TO**  
7 **REFLECT SPECIFIED TYPES OF COST INCREASES BEYOND GEORGIA**  
8 **POWER'S CONTROL?**

9  
10 **A.** I would not recommend this. For one thing, the purpose of the cap is to establish as a  
11 reasonable ceiling the cost of alternative ways of meeting customer needs. If Georgia  
12 Power decides to expose its customers to the risks associated with nuclear construction, it  
13 won't necessarily mean that an event beyond the Company's control – an accident at a  
14 Chinese AP1000 requiring expensive modifications at Vogtle for example – should be  
15 passed on to customers.

16  
17 For another thing, automatic adjustment clauses are difficult to police and to enforce.  
18 The Company has every incentive to allocate costs to areas subject to adjustment.

19  
20 Finally, the Commission has the power to revisit the cap if circumstances produce a  
21 compelling case for doing so. Such a process with full staff review and public input will  
22 be more effective and more likely to inspire public confidence than increases produced  
23 by automatic adjustments.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22

**Q. SHOULD THE TOSHIBA GUARANTY BE USED TO REDUCE ESTIMATES OF “THE ACTUAL IMPACT ON CUSTOMERS” OF THE COST TO COMPLETE THE VOGTLE UNITS AS THE COMPANY SUGGESTS ON PAGE 7 OF THE 17<sup>TH</sup> ANNUAL CONSTRUCTION MONITORING REPORT?**

**A.** No. This money will be paid to Georgia Power Company whether or not the Vogtle units are built. It can be used to reduce “the actual impact” of any future course of action, including paying off sunk costs at Vogtle that would otherwise be charged to customers. It could also be used to construct alternatives to Vogtle to the extent that any are needed.

The Company’s calculation on page 7 is analogous to a teenager wanting to buy an \$80,000 sports car and arguing that an unconditioned \$50,000 bequest from a deceased relative means that the real cost of the sports car is only \$30,000.

**Q. IS THE STATUTORY PROHIBITION ON THE CUSTOMER BEING CHARGED FOR IMPRUDENTLY INCURRED EXPENSES APPLICABLE ONLY TO EXPENSES INCURRED BY GEORGIA POWER COMPANY, OR DOES IT APPLY ALSO TO IMPRUDENT EXPENDITURES RESULTING FROM THE CONDUCT OF ALL MEMBERS OF THE CONSORTIUM INVOLVED IN BUILDING THE VOGTLE UNITS?**

1 A. The principle that customers should not pay for imprudently incurred costs clearly applies  
2 to all imprudence in construction and operation. To conclude otherwise would be  
3 contrary to the historic application of the prudent investment standard and to its goals of  
4 furthering economic efficiency and deterring wasteful management. It would also  
5 eviscerate the customer protections intended by the standard and would diminish  
6 Company incentives to assure the implementation of prudent construction and operating  
7 practices.

8  
9 Customers do not cause contractor imprudence and are in no position to prevent it or to  
10 assure the avoidance of imprudent practices. It is the utility that enters into contracts and  
11 is in a position to insist that all necessary scheduling is done and followed throughout the  
12 construction process. It is also the Company, not the customer, that is in a position to  
13 inform both itself and the regulatory commission promptly of degradation in the  
14 construction process and in the financial competency of the prime construction  
15 contractor. These responsibilities and consequences of failure to discharge them must  
16 rest with the utility overseeing the construction.

17  
18 That said, it is true that the prudence standard as I have seen it applied focuses on  
19 decisions and actions by utility officials. To the extent it reaches decisions by  
20 contractors, it would normally do so by assessing the reasonableness and the prudence of  
21 decisions by the utility affecting their ability to monitor and to control costs.

22

1 And, of course, a cap establishing a ceiling on reasonable costs to be recovered from  
2 customers is also a safeguard against contractor imprudence, since costs above the ceiling  
3 cannot be passed on to customers, however they may originate.  
4  
5

6 **Q. WHAT WEIGHT SHOULD THE COMMISSION GIVE TO THE POSITION OF**  
7 **THE OTHER OWNERS OF THE VOGTLE PROJECT TO THE EFFECT THAT**  
8 **THEIR CUSTOMERS MUST BE TREATED THE SAME AS GEORGIA POWER**  
9 **WITH REGARD TO THE RISKS GOING FORWARD?**  
10

11 **A.** I have never seen a demand like this by the co-owners of a nuclear project. I don't see  
12 how the PSC can allow unregulated entities to require that it not exercise its statutory  
13 responsibilities. Georgia Power customers should not pay unreasonable rates or rates  
14 above those that the law allows. For the PSC to give in to such requirements would set  
15 an unfortunate precedent, inviting others to try to leverage contractual involvement in  
16 large projects into regulatory outcomes. The concerns voiced by the other Vogtle  
17 Owners need to be resolved among the Owners, not passed on to the one set of customers  
18 regulated by the PSC.  
19

20 **Q. IS GEORGIA POWER CORRECT IN ASSERTING THAT IF THE**  
21 **COMMISSION DOES NOT ACCEPT ALL OF THE CONDITIONS IN ITS**

1           **RECOMMENDATION, THEN IT SHOULD “CANCEL THE PROJECT”**  
2           **(TESTIMONY OF DAVID MCKINNEY AND JEROME HASWELL, P. 5)?**

3  
4    **A.**    No. This proposition misstates the role of the Commission and implies that it will be to  
5           blame for any adverse consequences of project cancellation. In fact, the role of the  
6           Commission is to assure that any project goes forward on terms that meet the statutory  
7           requirements, an assurance that the Company has not provided as to completing Vogtle.  
8           If the Commission accepts the recommendations I have made, it will provide that  
9           assurance. If the Company then chooses to cancel the project, that will be their decision,  
10          not the Commission’s.

11  
12   **Q.**    **DO YOU HAVE ANY OTHER CONCERNS BASED ON YOUR REGULATORY**  
13           **EXPERIENCE?**

14  
15   **A.**    Having been involved in several reviews of nuclear power plant costs, I am concerned to  
16           see how much information is withheld from public disclosure in this proceeding. For  
17           example, Georgia Power’s peak demand and reserve margin projections are redacted  
18           from Exhibit 9 of the VCM 17 report, and all components of the load and energy forecast  
19           are redacted from Exhibit 8. Georgia Power is, after all, a monopoly. Because the  
20           customers cannot buy power elsewhere, their primary ability to influence the prices that  
21           they pay lies in effective participation in regulatory proceedings. But with such basic  
22           information about the utility kept confidential, the press cannot effectively cover many of  
23           the issues in this proceeding, so customers cannot be well informed as to what is at stake

1 or the extent to which they might take exception to the Company's assessment of their  
2 needs. Consequently, various stakeholder groups are limited in their ability to assist the  
3 PSC with regard to the impacts of their decisions on constituent groups.

4  
5  
6 **Nonmonetary Issues**

7  
8 **Q. IS THE COMPANY'S PROPOSED COURSE OF ACTION JUSTIFIED BY**  
9 **NONECONOMIC OR UNMONETIZED EXTERNALITIES?**

10  
11 **A.** No. Several such externalities have been advanced in this proceeding. None of them  
12 support the Company's proposed shifting of risk onto the shoulders of Georgia Power  
13 customers. Indeed, to the extent that these externalities involve the national well-being,  
14 they are being paid for by U.S. taxpayers in the form of the production tax credits, the  
15 federal loan guarantees, the federal government's unique (to nuclear power) promise to  
16 take responsibility for long term disposal of the spent fuel or to pay the costs of storing it,  
17 and the Price-Anderson Act's implicit commitment that the U.S. taxpayer will pay for  
18 nuclear accident damages above some \$14 billion (as damages from the Fukushima  
19 meltdowns approach \$200 billion). The nuclear industry has testified repeatedly that it  
20 would neither build nor operate nuclear plants without the nuclear waste and insurance  
21 liability benefits that it gets from shifting these responsibilities onto the U.S. taxpayer.

1 There is no reason for Georgia consumers to pay a second time or to take on additional  
2 economic risk for national benefits for which U.S. taxpayers already pay a substantial  
3 price.

4  
5 **Q. WHAT CONTRIBUTION WILL COMPLETION OF THE VOGTLE UNITS**  
6 **MAKE TO FUEL DIVERSITY IN THE GEORGIA ENERGY SECTOR?**

7  
8 **A.** Even without Units 3 and 4 at Vogtle, Georgia has and would continue to have a more  
9 diverse electricity portfolio than many states. Nineteen states have no nuclear power at  
10 all. Only 14 states have a higher percentage of nuclear power than Georgia without  
11 Vogtle 3 and 4.

12  
13 Furthermore, implementation of cost-effective energy efficiency and load management  
14 addresses many of the same concerns as fuel diversity. These resources require no  
15 external fuel, and crisis situations – on the rare occasions that they occur at all – are more  
16 easily managed through load management. Nuclear power plants, which are relatively  
17 inflexible in their operation and which have their own vulnerabilities, are not suitable to  
18 the management of many types of crises. More nuclear power, for example, would not  
19 have helped during the California crisis of 2000-01 during which there was ample  
20 generation at all times, or the Northeast blackout of 2003. That blackout shut down all of  
21 the region’s nuclear plants, which were relatively slow to restart and therefore not helpful  
22 in restoring grid stability.



1 Vogtle, which would be the only four-unit site in the United States, would in some ways  
2 be uniquely vulnerable. The vulnerability of multiunit sites is illustrated both by  
3 Chernobyl, where the remaining 3 units ceased operation for an extended period  
4 following the 1986 accident and were all permanently closed by 2000 and by Fukushima  
5 Daichi, where four of the six units were destroyed by the 2011 accident. The Japanese  
6 government has since announced that the two remaining units will not reopen.

7  
8 This unique vulnerability of nuclear units to accidents in other reactors on the same site  
9 and even to accidents anywhere in the world must be taken into account when evaluating  
10 the reliability and diversity benefits of various fuel types.

11  
12 **Q. DO YOU AGREE WITH THE PROPOSITION THAT “STORED ENERGY**  
13 **RESOURCES OFFER A PREMIUM PRODUCT”?**

14  
15 A. No. Fuel storability is of course a factor to be considered, but it does not make one  
16 energy source more reliable (or more of a “premium product”) than another. For  
17 example, natural gas – which can in fact be stored to some extent – can be backed up  
18 with storable fuel oil as long as the power plant has the capability to burn both fuels.

19  
20 Nuclear plants have their own vulnerabilities to weather and other offsite problems.

21 Many plants operate under license conditions requiring them to scale back output when  
22 their cooling water discharges would exceed the thermal limits of the receiving water.

23 One plant (Oyster Creek in New Jersey) has chosen to close rather than build the cooling

1 towers that New Jersey considers necessary. Cooling issues are also a factor in the  
2 recently announced closings of Diablo Canyon and Indian Point. Cooling issues have  
3 also forced cutbacks in the French nuclear fleet and have contributed to France's still firm  
4 decision to cut its nuclear dependence from 79% to 55% by 2035.

5  
6 **Q. DOES THE EXTERNALITY CONCEPT OF "POLICY RESILIENCE" FAVOR**  
7 **JUSTIFY A PREMIUM PRICE FOR NUCLEAR POWER?**

8  
9 **A.** Nuclear power doesn't have appreciably more policy resilience than other electricity  
10 technologies, certainly not enough to command a premium price. Indeed, nuclear power  
11 is at least as vulnerable to state and federal policy decisions as other technologies and  
12 cannot be rescued from this vulnerability by statements of political support. New  
13 reactors are today illegal in some ten states. The long lead time and large upfront  
14 investment required to build reactors makes them inherently vulnerable to changes in  
15 public policy resulting from events anywhere in the world. The accident at Three Mile  
16 Island caused a rethinking of safety standards, including emergency planning zones that  
17 eliminated a number of potential U.S. nuclear sites. The accident at Fukushima raised  
18 troublesome and sometimes expensive U.S. safety issues for older boiling water reactors  
19 and for those in flood zones or areas of relatively high seismic activity. That accident  
20 also led Germany and some smaller countries to decide to phase out nuclear power, as  
21 Chernobyl did in Italy. The September 11, 2001 attacks in the U.S. required hardening of  
22 reactor designs against plane crashes, to pick an example with which Georgia Power and  
23 the other potential AP1000 sites are very familiar.

1  
2 In the U.S., nuclear power seems at times to suffer from an almost inverse policy  
3 resiliency effect. After the 1980 election of President Reagan, the head of the nuclear  
4 trade association said the industry's hopes for more supportive policies put its reaction at  
5 "ecstasy, joy, pleasure and euphoria". But the next decade was the worst in nuclear  
6 history until that time, with dozens of reactors cancelled and no new orders. The 1990s  
7 by contrast contained few major pronuclear policies other than licensing process changes.  
8 But the industry, save for a few plant closings, generally thrived. Then came the 21<sup>st</sup>  
9 century and the so-called nuclear renaissance and the granting of all the policy support  
10 that the industry asked for between 2000 and 2010. So far, this support has led to another  
11 rash of expensive cancellations and closings.

12

13

14 **Q. WILL U.S. NONPROLIFERATION OBJECTIVES OR OTHER NATIONAL**  
15 **SECURITY ISSUES BE AFFECTED BY WHETHER OR NOT THE VOGTLE**  
16 **UNITS ARE COMPLETED?**

17

18 **A.** No. There is no connection at all between the completion of Vogtle and any major U.S.  
19 foreign policy concern. Even if Vogtle is completed on the schedule the company now  
20 forecasts, it will be far over its original budget and behind its original schedule. The  
21 industry's hope and that of the Bush and Obama Administrations that applications in this  
22 century would allow the industry to demonstrate that it could deliver plants "on time and  
23 on budget" (to say nothing of at a competitive price per kWh) are unfulfilled. There are

1 no other AP1000s in the U.S. pipeline, and the 2008-2018 nuclear renaissance story is not  
2 a helpful one for U.S. exports with or without the Vogtle units. Of course, plowing ahead  
3 at Vogtle in the event of any future overruns and delays will make this sad situation  
4 worse, not better.

5  
6 The U.S. leverage in nonproliferation discussions has not depended on our future reactor  
7 sales for many years. Our future leverage is going to have to come from the designs  
8 currently under development in the Department of Energy's advanced reactor program or,  
9 more likely, through our considerable continuing leverage as a customer owning the  
10 world's largest fleet of operating reactors. If the DOE programs are successful in  
11 developing reactors that can compete with today's least cost electricity options, Georgia  
12 would likely be better served by waiting for those competitive nuclear options to become  
13 available than by completing Vogtle 3 and 4.

14  
15 **Q. DOES THE RELIABILITY OF THE U.S. POWER SUPPLY AND THEREFORE**  
16 **OUR NATIONAL SECURITY DEPEND ON THE COMPLETION OF THE**  
17 **VOGTLE UNITS?**

18  
19 **A.** No. U.S. energy diversity and reliability might be enhanced by the development of  
20 failsafe and proliferation-proof reactor designs that were cost competitive. However,  
21 completion of Vogtle 3 and 4 will not to be steps in a cost competitive direction. The  
22 advanced reactor research programs are focused on different designs. Their success or  
23 failure does not depend on the Vogtle project.

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

Furthermore, I know of no correlation between the presence of nuclear power in a state and the reliability of its electric system. The 19 states without reactors have no less reliability than states with nuclear power, and states whose reactor(s) have closed have not seen reliability decline.

**Q. DOES THE COMPLETION OF THE VOGTLE UNITS HAVE ANY IMPLICATIONS FOR THE FUTURE OF SPENT FUEL REPROCESSING IN THE U.S.?**

**A.** No. Interest in reprocessing spent fuel to extract plutonium and uranium has waxed and waned in the U.S. government over recent decades. Until the mid-1970s, it was thought to be an integral part of our nuclear fuel cycle, along with breeder reactors. Following India's 1974 nuclear weapons test using materials supplied by the U.S. and Canada, President Ford suspended U.S. reprocessing and breeder programs because of concerns that some "peaceful" nuclear technologies might too easily be put to military uses and contribute to the spread of nuclear weapons. Sharing President Ford's concern, President Carter expanded the suspension.

President Reagan rescinded this suspension provided that private companies come forward to do the reprocessing. None were willing to. Interest in reprocessing fluctuated in the 1980s and 1990s. President George W. Bush attempted to revive interest in the technology through his Global Nuclear Energy Partnership, but private industry remained

1           unwilling to shoulder the costs and risks, especially as competitive pressure on the  
2           operating reactors grew in power market regions and supplies of natural uranium proved  
3           more than adequate.

4  
5           Insofar as I am aware, no law other than the law of economics prohibits reprocessing. It  
6           is a complex and difficult technology whose costs cannot be justified when – as now –  
7           there is no shortage of uranium to support a once through fuel cycle. Our only  
8           commercial reprocessing plant (at West Valley, NY) operated inconsistently for a few  
9           years in the 1970s before closing permanently and leaving the state of New York and the  
10          federal government with a \$2 billion bill for a thirty-year clean-up.

11  
12          There is very little interest in plutonium-based fuel cycles in the world today. Some  
13          experimental work continues, but reprocessing's drawbacks remain what they have  
14          always been – it is too expensive. It does not help to manage the overall waste problem.  
15          It narrows the policy separation between civilian and military uses of nuclear technology  
16          – the so-called “dual purpose” – that has been exploited to bring nuclear weapons to  
17          India, Pakistan, Israel and potentially Iran, a policy separation whose preservation has  
18          long been viewed by all presidents of both parties as essential to U.S. national security.

19  
20          In my judgment there is no likelihood of U.S. spent fuel being reprocessed on a timescale  
21          that makes any difference as to the Georgia PSC's decision to grant or deny the  
22          Company's requests as to the Vogtle units.

23

1 **Q. IS COMPLETION OF VOGTLE 3 AND 4 IMPORTANT IF THE U.S. IS TO DO**  
2 **ITS SHARE TO CONTROL GLOBAL CLIMATE CHANGE?**

3  
4 **A.** Because of the carbon impacts of construction and of the nuclear fuel cycle, nuclear  
5 power is not a zero-carbon resource, but it is preferable to fossil fuels, especially coal.  
6 The problem is the high cost of nuclear compared even to other low or zero carbon  
7 resources, as shown by Attachment 2 to my testimony. Since the graph in Attachment 2  
8 uses cost estimates that are several years old, the position of the estimate for new nuclear  
9 (which is consistent with Georgia Power’s estimated costs to complete the Vogtle  
10 project) will have worsened in comparison to some of the other options, notably wind and  
11 solar power. Each billion dollars devoted to a nuclear power plant would prevent far  
12 more carbon emissions if it were used to buy these less costly and easier to build  
13 resources first. One need only look at the U.S. “nuclear renaissance” experience to see  
14 how true this is.

15  
16 The laws passed a decade ago at the federal and state levels to stimulate nuclear  
17 construction were often justified in climate terms. However, since none of the  
18 renaissance plants have been completed, not a single molecule of carbon emissions has  
19 been avoided by a new U.S. reactor design in this century. Meanwhile customers and  
20 taxpayers are on the hook for more than \$15 billion in cancelled plant costs that will do  
21 nothing for the climate but that could have done a great deal if they had paid for  
22 alternative low carbon technologies, or even for coal-to-gas conversions.

23

1 During these “renaissance” years, the U.S. has in fact done a great deal to lower the  
2 carbon intensity of our economy. However, this progress has come from technologies  
3 that are rapidly deployed, flexible when events contradict judgment and often  
4 characterized by steadily declining costs. Unfortunately, these characteristics do not  
5 describe nuclear power in general or Plant Vogtle in particular.

6  
7 **Q. ARE THE JOBS AT PLANT VOGTLE CRITICAL TO GEORGIA’S ECONOMIC**  
8 **WELLBEING?**

9  
10 **A.** No state ever improved its overall economic well-being by paying higher electricity bills  
11 than necessary. Energy intensive industrial customers in New York and Maine  
12 (especially the pulp and paper industry in Maine) were quick to remind me of how easily  
13 corporate management could shift production to other states in response to electricity  
14 price changes. Independent power producers and energy efficiency installers also urged  
15 that job gains and losses in their industries be considered in comparison to the long-term  
16 jobs created at nuclear plants. Communities had similar concerns about disbursing tax  
17 base impacts state wide instead of to a few favored communities or counties.

18  
19 The record built in this proceeding tends to focus on the jobs at the Vogtle site as a stand-  
20 alone benefit, but what is really needed to assess this subject is a review of the net rather  
21 than the gross economic impacts of a decision to complete the Vogtle units.

22



1 **Q. PLEASE SUMMARIZE YOUR MAJOR RECOMMENDATIONS TO THE**  
2 **GEORGIA PSC.**

3  
4 **A.** As a former utility regulator, I approach these recommendations in the knowledge that no  
5 one who hasn't served on the Georgia PSC can appreciate the full scope of the dilemmas  
6 confronting the commission. The best I can do is to view what I have learned about the  
7 Vogtle situation in 2017 through the lens of my own experience of similar but not  
8 identical situations during my 25 years as a utility regulator and thereafter in other  
9 aspects of energy policy. None of us has the gift of prophecy. The best we can do is to  
10 try to bring relevant regulatory principles to bear on the evidence before us.

11  
12 My first recommendation is not to find the new cost and schedule to be a reasonable basis  
13 for going forward at this time. The Company has not presented an evaluation of the  
14 alternatives adequate to making such a determination. Nor should the PSC commit to  
15 allowing the Company to recover its actual investment to date in Vogtle 3 and 4 since  
16 such a commitment requires a prudence review.

17  
18 My second recommendation is that the PSC also not approve the Company's request that  
19 it find the new management structure reasonable at this time. The basis for this  
20 recommendation is set forth on page 38 of my testimony.

21  
22 My third recommendation is that the PSC immediately undertake a proceeding to develop  
23 a cap for the reasonable expenditures that may be charged to Georgia Power customers

1 for the completion of Vogtle 3 and 4. Such a proceeding should include a carefully  
2 overseen Request For Proposals process designed to ascertain the costs of meeting  
3 customer needs without Vogtle but using the full range of available alternative  
4 technologies other than coal.

5  
6 My fourth recommendation is that Georgia Power seek buyers for some of its ownership  
7 in Vogtle. The Company is very unlikely to need the full amount of Vogtle power to  
8 which it is entitled, so such a sale would spread the substantial Vogtle construction risks  
9 over a wider group of customers. The results of such an offer would also provide useful  
10 information as to what the real value of completing the Vogtle reactors is likely to be.

11  
12 **Q. DOES THIS COMPLETE YOUR TESTIMONY?**

13  
14 **A.** Yes, it does.  
15

## Attachment 1 – Resume of Peter A. Bradford

**PETER A. BRADFORD**  
P.O. BOX 497  
PERU, VERMONT 05152  
(802) 824-4296

### **PROFESSIONAL EXPERIENCE:**

Peter Bradford is an adjunct professor at Vermont Law School, where he teaches “Nuclear Power and Public Policy” and has taught “The Law of Electric Utility Restructuring”. He also advises and teaches on utility regulation, restructuring, nuclear power and energy policy in the U.S. and abroad. He was a member and chair of the Public Oversight Panel for the Comprehensive Vertical Assessment of Vermont Yankee Nuclear Power Plant and has served as an expert witness on investment in new nuclear power plants in several states. He is one of Vermont’s two representatives on the Texas/Vermont Low Level Radioactive Waste Disposal Compact Commission, and served on the advisory panel for the Bipartisan Policy Center project on nuclear waste. He has been a visiting lecturer in energy policy and environmental protection at Yale University and served on New York State’s 2012-13 Moreland Commission on Utility Storm Response

He served on the U.S. Nuclear Regulatory Commission from 1977 until 1982. During his term, the NRC undertook major upgradings of its regulatory and enforcement processes in the wake of the Three Mile Island accident.

He chaired the New York State Public Service Commission from 1987 until 1995 and the Maine Public Utilities Commission from 1982 until 1987. During these years, New York resolved its stalemate over the Shoreham nuclear power plant and Maine resolved its involvement in Seabrook, both on favorable economic terms. He was Maine's Public Advocate in 1982 and was President of the National Association of Regulatory Utility Commissioners during 1987.

Prior to becoming a member of the NRC, he had served on the Maine Public Utilities Commission (1971-1977) and was Chairman in 1974-1975.

He served on the 2007 Keystone Center fact finding collaboration on nuclear power and the 2006 National Academy of Sciences panel evaluating the alternatives to continued operation of the Indian Point Nuclear Power Plants in New York. He is also affiliated with the Regulatory Assistance Project, which provides assistance to state and federal energy regulatory commissions regarding economic regulatory policy and environmental protection.

He served on a panel advising the European Bank for Reconstruction and Development on how best to replace the remaining Chernobyl nuclear plants in Ukraine and also on an expert panel advising the Austrian Institute for Risk Reduction on regulatory agency issues associated with the opening of the Mochovce nuclear power plant in Slovakia. He advised the Vermont Legislature on issues relating to spent fuel storage at Vermont Yankee and the Town of Wiscasset, Maine, on issues related to the storage of spent nuclear fuel at the site of the former Maine Yankee nuclear power plant.

He has advised on electric restructuring issues and has testified on aspects of nuclear power, electricity and telecommunications restructuring in many U.S. states.

He has also advised on energy, telecommunications and water utility restructuring issues in China, Armenia, Azerbaijan, Canada, Georgia, India, Indonesia, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Samoa, South Africa and Trinidad and Tobago. He is a member of the Policy Advisory Committee of the China Sustainable Energy Program, a joint project of the David and Lucille Packard Foundation and the Energy Foundation.

Mr. Bradford was an advisor to Maine Governor Kenneth Curtis from 1968 to 1971, with responsibilities for oil, power and environmental matters. He assisted in preparing landmark Maine laws relating to oil pollution and industrial site selection and was Staff Director of the Governor's Task Force on Energy, Heavy Industry and the Coast of Maine.

Mr. Bradford is the author of Fragile Structures: A Story of Oil Refineries, National Security and the Coast of Maine, a book published by Harper's Magazine Press in 1975. His articles on utility regulation and nuclear power have appeared in many publications, including The New York Times, The Washington Post, The Los Angeles Times, The Boston Globe, The Atlanta Journal Constitution, The Bulletin of the Atomic Scientists, and The Electricity Journal.

He is a 1964 graduate of Yale University and received his law degree from the Yale Law School in 1968.

He is married, has three children and lives in Peru, Vermont.

#### **PROFESSIONAL AFFILIATIONS:**

2011-present – Commissioner, Texas/Vermont Low Level Radioactive Waste Compact Commission

2013-2015 – Member Bipartisan Policy Center panel on disposal of high level nuclear waste.

1999-2015 - Member, Policy Advisory Committee, China Sustainable Energy Project (funded by the David and Lucille Packard Foundation and the Energy Foundation).

2012-13 – Commissioner, New York State Moreland Commission on Utility Storm Response

2007 – Member, Keystone Center project on the future of nuclear power

2006 – Member of the National Research Council Center on Alternatives to the Continued Operation of the Indian Point Nuclear Power Plants

1998-2002 - Member, Advisory Council, New England Independent System Operator

Nov. 1986-Nov. 1987 President, National Association of Regulatory Utility Commissioners

1977-1995 NARUC positions, Member, Executive Committee; Member, Electricity Committee (1977-1989); Member, Gas Committee (1989-1993); Member, Communications Committee (1975-1977); Board of Directors, National Regulatory Research Institute (1985-1987).

1975-1977, 1982-1986. Advisory Council, Electric Power Research Institute

1987-1995, Member of New York State Energy Planning Board

1987-1995, Member, Board of Directors, New York State Energy Research and Development Administration

1987-1995, Member, New York State Environmental Board;

1987-1995, Chair, New York State Energy Facilities Siting Board

1992-1994, State co-chair, New York State Task Force on Telecommunications Policy

Vice-chair, Board of Directors, Union of Concerned Scientists

Board of Directors, Nuclear Control Institute

## **EDUCATION:**

1964 *B.A.* History, Yale University, New Haven, CT

1968 *L.L.B.*, Yale University School of Law, New Haven, CT

## **AWARDS:**

Honorary Degree, Unity College, 1981.

Environmental Award, Natural Resources Council of Maine, 1979.

## **PUBLICATIONS**

### **Books**

*Fragile Structures: A Story of Oil Refineries, National Security and the Coast of Maine*, 1975, Harpers Magazine Press.

## Law Review

*Maine's Oil Spill Legislation*, Texas International Law Journal, Vol.7, No.1, Summer 1971, pp.29-43.

## Articles

“Wasting Time: Subsidies, Operating Reactors and Melting Ice”, Bulletin of the Atomic Scientists, January 2017, <http://www.tandfonline.com/doi/full/10.1080/00963402.2016.1264207?scroll=top&needAccess=true>

“Compete or Suckle: Should Troubled Nuclear Power Plants Be Subsidized?”. The Conversation, August 17, 2016; <https://theconversation.com/compete-or-suckle-should-troubled-nuclear-reactors-be-subsidized-62069>

“Delivering the Nuclear Promise: TVA’s Sale of the Bellefonte Nuclear Power Plant Site”, Bulletin of the Atomic Scientists, June 1, 2016, <http://thebulletin.org/delivering-nuclear-promise-tvas-sale-bellefonte-nuclear-power-plant-site9524>

“When the Unthinkable is Deemed Impossible: Reflections on Fukushima”, Bulletin of the Atomic Scientists, March 20, 2016, <http://thebulletin.org/commentary/when-unthinkable-deemed-impossible-reflecting-fukushima9268>

“What the EPA’s Clean Power Plan Means for Nuclear Energy”, Bulletin of the Atomic Scientists, September, 2015

“Why GOP Support for Subsidized Nuclear Energy is Confounding”, Bangor Daily News, July 11, 2015;

“Playing Chicken with Illinois Electric Rates Won’t Improve the Climate”, Crain’s Chicago Business, January 7, 2015;

“Foreword, World Nuclear Industry Status Report”, July 2013, WNISR, pp. 4-5, <http://www.worldnuclearreport.org/IMG/pdf/20130716msc-worldnuclearreport2013-lr-v4.pdf>;

“How to Close the U.S. Nuclear Industry: Do Nothing”, Bulletin of the Atomic Scientists, March, 2013, pp. 12-21;

“Transparency and Nuclear Regulation: A U.S. Perspective”, prepared for International Right to Know Day, Tokyo, September 2012;

“The Nuclear Landscape”, Nature, March 8, 2012, p. 151, <http://www.nature.com/nature/journal/v483/n7388/full/483151a.html>;

“Taxpayer Funding for Nuclear Power: Issues and Consequences”, Chapter 5 of Nuclear Power's Global Expansion: Weighing Its Risks, Henry Sokolski, ed.

<http://www.npolicy.org/userfiles/image/Taxpayer%20Financing%20for%20Nuclear%20Power,%20Precedents%20and%20Consequences.pdf.pdf>;

Book review, *The End of Energy*, The Wall Street Journal, May, 2011, <http://online.wsj.com/news/articles/SB10001424052748703421204576327370005700428>;

“Nuclear Power’s Search for the Taxpayer’s Wallet”, Blue Ridge Press, November 2010.

“Honey, I Shrunk the Renaissance: Nuclear Revival, Climate Change and Reality”, Electricity Policy.com, October, 2010, <http://www.electricitypolicy.com/bradford-5-18-11-final-edit.pdf>;

“Nuclear Loan Guarantees and Governmental Secrecy”, *The Atlanta Journal-Constitution*, June 22, 2010, <http://www.ajc.com/opinion/we-may-be-on-555182.html>;

“Minnesota’s Nuclear Moratorium”, *Twin Cities Pioneer Press*, March 3, 2010, [http://www.twincities.com/alllistings/ci\\_14506848?source=rss](http://www.twincities.com/alllistings/ci_14506848?source=rss);

“The Nuclear Renaissance Meets Economic Reality”, *Bulletin of the Atomic Scientists*, November-December 2009, [www.vermontlaw.edu/Documents/IEE/20100109\\_bradfordArticle.pdf](http://www.vermontlaw.edu/Documents/IEE/20100109_bradfordArticle.pdf);

“Massive Nuclear Subsidies Won’t Solve Climate Change”, *Madison Capitol Times*, November 3, 2009, [http://host.madison.com/ct/news/opinion/column/guest/article\\_37b3c6b1-dff6-5ef1-a21c-8a511e278961.html](http://host.madison.com/ct/news/opinion/column/guest/article_37b3c6b1-dff6-5ef1-a21c-8a511e278961.html);

“Nuclear Agency Needs Independent Appointees”, *Atlanta Journal Constitution*, September 17, 2009, <http://www.ajc.com/opinion/nuclear-agency-needs-independent-140954.html>

Contribution to *New York Times Forum “Choking on Growth: China and the Environment”*, *New York Times Online*, November 20, 2007, <http://china.blogs.nytimes.com/2007/11/20/answers-from-peter-bradford/#more-24>

Contributions to the *Bulletin of the Atomic Scientists* online forum on *Nuclear Power and Climate Change*, (with Amory Lovins and Stephen Berry), <http://www.thebulletin.org/roundtable/nuclear-power-climate-change/>, March-August, 2007

*The Economics of Nuclear Power* (with Steven Thomas, Antony Froggatt, and David Millbrow) for Greenpeace International, May, 2007

*Nuclear Power’s Prospects in the Power Markets of the 21<sup>st</sup> Century*, for the Nonproliferation Education Center, February, 2005;

*China’s National Energy Plan: Some Energy Strategy Considerations*, (with Thomas Johansson) *The Sinosphere Journal*, Spring 2004;

*Some Environmental Lessons from Electric Restructuring*, IUCN Colloquium on Energy Law for Sustainable Development, Winter 2004;

*Where Have All the Safeguards Gone?* Foreword to “Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-Tiered Holding Companies to Own Nuclear Power Plants” *The Star Foundation* August 7, 2002

*Nuclear Power after September 11*, *OnEarth*, December 2001.

*The Unfulfilled Promises of Electric Restructuring*, *Nor’easter*, summer 2001.

*Considerations Regarding Recovery of Strandable Investment*, *PUR Utility Quarterly*, December, 1997.

*Ships at a Distance: Energy Choice and Economic Challenge*, *The National Regulatory Research Institute Quarterly Bulletin*, Volume 18, Number 3, Fall, 1997, p. 287 (Originally the 1997 George Aiken Lecture at the University of Vermont).

Book Review: *The British Electricity Experiment - Privatization: the Record, the Issues, the Lessons*, *Amicus Journal*, June, 1997;

*Gorillas in the Mist: Electric Utility Mergers in Light of State Restructuring Goals*, *The National Regulatory Research Institute Quarterly Bulletin*, Spring, 1997.

*Til Death Do Us Part or the Emperor's New Suit: Does a Regulatory Compact Compel Strandable Investment Recovery?*, *PUR Utility Quarterly*, October, 1996;

*Electric Bargain's Cost Is Dirty Air*, *Newsday*, L.A. Times Features Syndicate, 4/18/96.

*A Regulatory Compact Worthy of the Name*, *The Electricity Journal*, November, 1995, pp.12-15;

*Paved with Good Intentions: Reflections on FERC's Decisions Reversing State Power Procurement Processes*, (with David Moskovitz), The Electricity Journal, August/September, 1995, pp.62-68;

*That Memorial Needs Some Soldiers and Other Governmental Approaches to Increased Electric Utility Competition*, The Electric Industry in Transition, Public Utility Reports & NYSERDA, 1994, pp.7-13;

*Market-Based Speech*, The Electricity Journal, September, 1994, p.85;

*In Search of an Energy Strategy*, Public Utilities Fortnightly, 1/15/92;

*Parables of Modern Regulation*, The Electricity Journal, November 1992, p.73;

Foreword to: *Regulatory Incentives for Demand Side Management*, Nickel, Reid, David Woolcott, American Council for Energy-Efficient Economy, 1992, pp. ix-xi;

*Boats Against the Current: Energy Strategy in Theory and Practice*, The Electricity Journal, October, 1991, p.64;

*The Shoreham War Has Got to End Now*, Newsday, 5/9/89;

*Parallel to the Nuclear Age*, Yale University 25th Reunion book, 1989;

Book Review: *Safety Second, A Critical Evaluation of the Nuclear Regulatory Commission's First Decade* IEEE Spectrum, February, 1988, p.14;

*Somewhere Between Ecstasy, Euphoria and the Shredder: Reflections on the Term 'Pro-nuclear'*, Journal of the Washington Academy of Sciences, Vol.78, no.2, June 1988, pp. 139-142;

Book Review: *Power Struggle: The Hundred Year War Over Electricity*, Amicus Journal, Winter 1987, pp. 46-47;

*Wall Street's Flawed Evaluation of State Utility Regulation*, Bangor Daily News, September 3, 1984;

*Reflections on the Indian Point Hearings*, New York Times, 1/83;

*Paradox and Farce: Trends in Federal Nuclear Energy Policy* Los Angeles Times, June 6, 1982;

*Keeping Faith with the Public*, Nuclear Safety, March-April, 1981;

*Regulation or Reassurance*, Washington Post, August 16, 1979;

*Report of the Governor's Task Force on Energy, Heavy Industry and the Maine Coast*, 1972;

*A Measured Response to Oil Port Proposals*, Maine Times, July, 1971.

### **Testimony Before Courts, State Utility Regulatory Commissions and the NRC Concerning Nuclear Energy**

Declaration regarding operation of the Diablo Canyon Nuclear Power Plants in the California power markets, September, 2014

In Re: License Renewal Application Submitted by Entergy Nuclear Indian Point 2 and 3 LLCs, NRC Docket Nos. 50-247-LR and 50-286-LR, declarations in November 2007 and February 2011, testimony December 2012;

Entergy Nuclear Vermont Yankee v. Peter Shumlin et al, U.S. District Court for the District of Vermont, September 2011;

In the Matter of Revised Application of Duke Energy Carolinas for Approval of Decision to Incur Nuclear Generation Project Development Costs, North Carolina Utilities Commission, March, 2011;

In re: Nuclear Cost Recovery Clause, Docket No. 090009-EI, Florida Public Service Commission, July 2009;

In re: Petition for Determination of Need for Levy Units 1 and 2 Nuclear Power Plants, Docket No. 080148-EI, Florida Public Service Commission, April, 2008;



Application of Duke Energy Carolinas, LLC for Approval of Decision to Incur Nuclear Generation Pre-Construction Costs, Docket No. 2007-440-E, Public Service Commission of South Carolina, March 2008;

In the Matter of Application of Duke Energy Carolinas to Recover Necessary Nuclear Generation Expenses, North Carolina Utilities Commission, March, 2008;

Investigation into General Order 45 Notice filed by Vermont Yankee Nuclear Power Corporation re: proposed sale of Vermont Yankee Nuclear Power Station and Related Transactions, Testimony Regarding Proposed Paragraph 15 of the Memorandum of Understanding, Docket 6545, Vermont Public Service Board, April, 2002

### **Selected Other Presentations Concerning Nuclear Energy**

*Did Nuclear Power Jump or Was It Pushed: Some Impacts of the Accident at Three Mile Island;*

Presentation at Dartmouth College symposium on 35<sup>th</sup> Anniversary of TMI, March 2014;

*Nuclear Power and Market Reform: Some Lessons from the U.S. and Europe;* Presentation to the Japan Renewable Energy Foundation, Tokyo, February, 2014;

*Early Cost Recovery for New Nuclear Reactors: The Downside,* Presentation to the Southeastern Conference of Utility Regulatory Commissioners, April 15, 2013;

*Don't Try This at Home: Japanese Nuclear Power Dilemmas,* Nonproliferation Education Center, November 28, 2012;

*Prices, Prophecies, Principles and the Future of Nuclear Energy,* 4<sup>th</sup> Japan-U.S. Joint Public Policy Forum, Tokyo, October 31, 2012;

*The Economics of New Nuclear Reactors,* St. Petersburg, Russia and Astana, Kazakhstan,, October 2012;

*Transparency and Nuclear Regulation,* International Right to Know Day Presentation, Tokyo, Japan, September 22, 2012;

*SMR Update: Are We Getting Closer to a Renaissance?,* Presentation to MidAmerican Regulatory Conference, June, 2012;

*Leadership in Nuclear Decisionmaking:* ASAN Plenum, Seoul, South Korea, April, 2012;

*New Nuclear Reactors Are to Climate Change What Caviar is to World Hunger,* Presentation to Yale Alumni in Energy, March 23, 2012

*Schrodinger's Renaissance: Anatomy of a Public Policy Fiasco,* presentation to Princeton Program on Science and Global Security, December, 2011

*After-Math: TMI, Fukushima and Nuclear Power's U.S. Prospects,* presentation to the American Bar association, October 2011;

*How Many Renaissances Will It Take to Build a New U.S. Nuclear Power Plant?,* presentation at the Aspen Institute, July 2011;

*Aside From That, Ms. Lincoln, How Do You Like Nuclear Risk?,* presentation to the New York Society of Security Analysts, March 2011;

*Nuclear Power Is to Fighting Climate Change as Caviar Is to Fighting World Hunger,* presentation at Columbia Law School Debate on Nuclear Energy, November, 2010.

*It's Not A Renaissance Until You've Seen a Masterpiece: Nuclear Power and Climate Change in 2010,* Speech, Hannover, Germany, September 2010

*Better Never Than Late: Nuclear Power, Energy Policy and Climate Change,* Vermont Law School Hot Topics Lecture, June 2010

*Nuclear Regulatory Commission Oversight Hearing,* Senate Committee on Environment and Public Works, Subcommittee on Clean Air and Nuclear Safety, May, 2010;

*Testimony on Nuclear Loan Guarantees* Before the Domestic Policy Subcommittee of the U.S. House Oversight and Government Reform Committee;

*Nuclear Renaissance Myths and Realities*, Testimony before the Michigan Senate Energy Committee, Lansing Michigan, April 23, 2009;

*“Three Mile Island: Thirty Years of Lessons Learned”*, Testimony before the U.S. Senate Committee on Environment and Public Works, Subcommittee on Clean Air and Nuclear Safety, March 24, 2009;

*Don’t Call It A Renaissance Until They’ve Shown You a Masterpiece*; Italian Embassy/Brookings Institution Forum on “The Rise In Demand for Civil Nuclear Power”, Italian Embassy, December 9, 2008;

*Subsidies Without Borders: The Case of Nuclear Power*, Nonproliferation Policy Education Center and Marshall Institute forum, Washington, D.C., June 13, 2008;

*Nuclear Power: Are the Stars Aligned?* Harvard Electricity Policy Group; May 29, 2008;

*Nuclear Power As “Federal Infrastructure”*, Nonproliferation Policy Education Center, Prague, Czech Republic, March 18, 2008;

*Nuclear Power, Energy Security, and Climate Change*, Center for Energy and Environmental Security, University of Colorado Law School, Boulder, Colorado, February 1, 2008;

*Of Risks, Resources, Renaissances and Reality*, Institute of Public Utilities, Charleston, South Carolina, December 4, 2007;

*Nuclear Power and Climate Change*; Chicago Humanities Festival; November 10, 2007

*Risks, Rewards, Resources, Reality*; Briefing on the Loan Guarantee Provisions of the 2007 Energy Legislation; Environmental and Energy Study Institute; Washington, D.C., October 30, 2007

*Fool Me Twice? Rules for an Unruly Renaissance*: Carnegie International Nonproliferation Conference, Washington D.C., June 26, 2007

*Regulation, Reality and the Rule of Law: Issues for a Nuclear Renaissance*: Washington and Lee University, June 23, 2007.

*The Future of Nuclear Energy*, Bulletin of the Atomic Scientists Conference; University of Chicago, November 1, 2006

*Nuclear Power and Climate Change*, Society of Environmental Journalists, Burlington, Vermont, October 27, 2006

*Nuclear Power, Climate Change and Public Policy*, National Conference of State Legislatures, April, 2006.

*Electric Restructuring after Ten Years: Surprises, Shocks and Lessons*, State Legislative Leaders’ Foundation, November, 2005;

*Nuclear Power’s American Prospects*, Presentation to the California Energy Commission Nuclear Issues Workshop, August, 2005;

*Decommissioning Financing: Alternatives and Policies*, Conference on the Future of the Medzamor Nuclear Power Plant, Yerevan, Armenia, June 2005;

*The Value of Sites Capable of Extended Storage of High Level Nuclear Waste*, report for the Town of Wiscasset, Maine, December, 2004.

*Nuclear Power’s Prospects*, NPEC/FRS/CAP/CEA Workshop, Paris, October 2004;

*Did the Butler Really Do It? The Role of Nuclear Regulation in Raising the Cost of Nuclear Power*, Cato Institute, Washington D.C. March 2004;

*China’s Energy Regulatory Framework* China Development Forum, Beijing, November 17, 2003;

*China's National Energy Plan* (with Thomas Johansson) Background Reports to "China's National Energy Strategy and Reform", Development Research Center of the State Council, China Development Forum, November, 2003;

*Repeating History: Nuclear Power's Prospects in a Carbon-Conscious World* Yale School of Forestry and Environmental Studies, Leadership Council Meeting, October 24, 2003;

*What Nuclear Power Can Learn from Electric Restructuring, and Vice Versa*, Aspen Institute, July 5, 2003;

*Renewal of the Price Anderson Act* Testimony before the United States Senate Committee on Environment and Public Works Subcommittee on Transportation, Infrastructure and Nuclear Safety, January 23, 2002;

*Events Now Long Past: The 20-Year Road from Three Mile Island to Electric Utility Restructuring* TMI 20th Anniversary Commemoration, National Press Club, Washington D.C., March 22, 1999;

*Preparing Nuclear Power for Competition* NARUC Conference on "Nuclear Power in a Competitive Era: Asset or Liability?" January 23, 1997;

*Call Me Ishmael: Reflections on the Role of Obsession in Nuclear Energy Policy*, NARUC annual meeting, November 13, 1989;

*Nuclear Power and Climate Change*; Harvard Energy and Environmental Policy Center, January 13, 1989;

*Somewhere between Ecstasy, Euphoria and the Shredder: Reflections on the Term Pro-Nuclear* Symposium on Nuclear Radiation and Public Health Practices and Policies in the Post-Chernobyl World, Georgetown University, September 18, 1987;

*Searching the Foreseeable Past: Nuclear Power, Investor Confidence and Reality* Public Utilities Institute, East Lansing Michigan, July 30, 1987;

*Where Ignorant Armies Clash by Night: Relationships Among Nuclear Regulators and Regulated* NARUC/INPO Seminar on Nuclear Power Plant Safety and Reliability, January 22, 1987;

*Why Do We Have a Nuclear Waste Problem* Conference on Nuclear Waste, Naples, Maine, March 22, 1986;

*With Friends Like These: Reflections on the Implications of Nuclear Regulation* Institute of Public Utilities, Williamsburg, Virginia, December 13, 1982;

*A Framework for Considering the Economic Regulatory Implications of the Accident at Three Mile Island* Iowa State Regulatory Conference, May 20, 1982;

*The Man/Machine Interface* Public Citizen Forum, March 8, 1982;

*A Perspective on Nuclear Power* The Groton School, January 15, 1982;

*Reasonable Assurance, Regulation and Reality* ALI-ABA Course of Study on Atomic Energy Licensing and Regulation, September 24, 1980;

*Misdefining the National Security in Energy Policy from Machiasport to Three Mile Island* Environmental Law Institute, University of Maine, May 1, 1980

*Condemned to Repeat It? Haste, Distraction, Rasmussen and Rogovin* Risks of Generating Electricity, Seventh Annual National Engineers' Week Energy Conference, February 21, 1980;

*Lightening the Nuclear Sled; Some Uses and Misuses of the Accident at Three Mile Island* Seminar on the Problems of Energy Policy, New York University, November 21, 1979;

*The Nuclear Option: Did It Jump or Was It Pushed?* NARUC Regulatory Studies Program, August 2, 1979;

*How a Regulatory View of Nuclear Waste Management is Like a Horse's Eye View of the Cart* 90<sup>th</sup> NARUC Annual Convention, November 15, 1978;

*Sentence First: Verdict Later: Some Thoughts on the Level of Acclaim Thus Far Afforded the Nuclear Siting and Licensing Act of 1978* ALI-ABA Course of Study, September 28, 1978;  
*Some Observations on Recent and Proposed Changes in Nuclear Regulatory Commission Jurisdiction*, Atomic Industrial Forum Workshop on Reactor Licensing and Safety, April 5, 1978;

### **Other Papers**

*The Nexus between Energy Sector Reform and Democracy & Governance* (co-lead author), for USAID, February, 2005;

*Public Interaction in the Georgian Energy Regulatory Process: Case Study for the USAID Project on the Nexus between Democratic Governance and Energy Sector Reform*, April, 2004;

*Report on the Establishment of the State Energy Regulatory Commission of China* (with David Moskovitz, Richard Weston and Wayne Shirley) for the Energy Foundation and the World Bank, January, 2003;

*A Plan of Action for a Multisector Regulatory Commission in Armenia*, for USAID, February 2003.

*Economic Regulatory Issues in the Armenian Water Supply and Wastewater Treatment Sectors*, for USAID, January 2003;

*Some Potential Approaches to the Enforcement of License Conditions and Regulatory Orders in Armenia*, for USAID, June 2002

*The Process of Auditing Utilities: A Primer for the Energy Regulatory Commission of Armenia*, for USAID, June 2002

*Some Potential Approaches to the Difficulties of Enforcement of License Conditions and Regulatory Orders in Georgia and Other NIS Countries*, for USAID, December 2000.

*Public Interaction in the Georgian Energy Regulatory Process*, for USAID, September 2000.

*Regulatory Policy and Energy Efficiency: Considerations for Tariff Setting and Licensing*, for USAID, April 2000.

*Public Interaction in the Armenian Regulatory Process*, for USAID, July 1999.

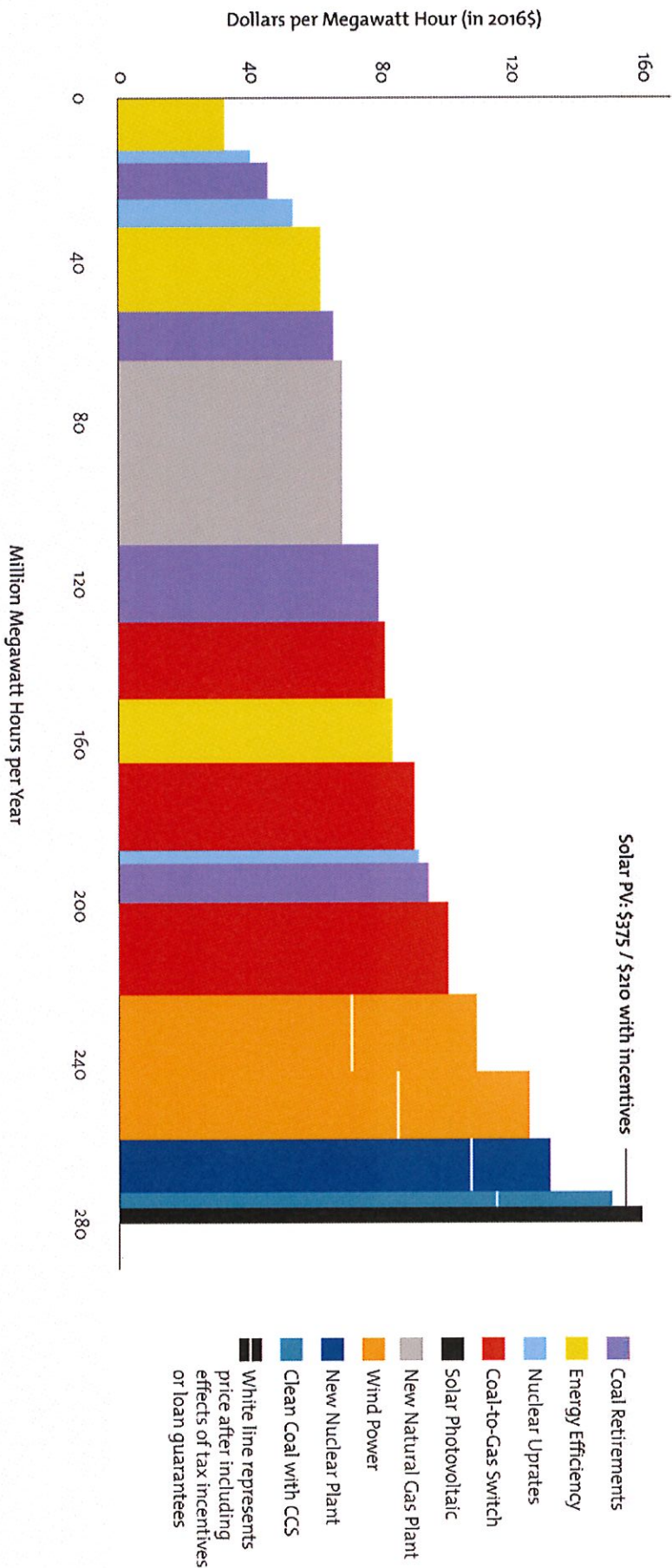
*The License as an Instrument for Regulation and the Furtherance of Competition in the N.I.S.*, for USAID, September, 1998.

*Applicability of U.S. Administrative Law Concepts to Regulatory Systems in the Newly Independent States*, for USAID, June 1998.

*Performance-Based Regulation in a Restructured Electric Industry*, (with Bruce Biewald, Paul Chernick, Susan Geller, Jerrold Oppenheim and Tim Woolf) for the National Association of Regulatory Utility Commissioners, November 1997.

# There are Cheap Ways and Costly Ways to Clean the Generation Fleet

## Levelized Cost of Clean Energy Options in PJM



Note: Adjusts for the market value of the generation's reliability and production profile.

Technology cost assumptions (in 2016 \$/kWh):  
 Combined-cycle gas turbine: \$1,300 - \$1,700  
 Wind: \$2,000 - \$2,500  
 Nuclear: \$5,000 - \$6,000  
 Clean coal with CCS: \$5,500 - \$6,500  
 Solar photovoltaic: \$3,000 - \$4,000

