
**BEFORE THE
PUBLIC SERVICE COMMISSION
STATE OF GEORGIA**

**ON BEHALF OF GEORGIA POWER)
COMPANY APPLICATION FOR)
CERTIFICATION OF UNITS 3 AND 4 AT) DOCKET NO. 27800-U
PLANT VOGTLE AND UPDATED)
INTEGRATED RESOURCE PLAN)
)**

**DIRECT TESTIMONY OF DAVID A. SCHLISSEL
ON BEHALF OF
SOUTHERN ALLIANCE FOR CLEAN ENERGY**

**PUBLIC VERSION
CONFIDENTIAL INFORMATION REDACTED**

DECEMBER 19, 2008

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Docket No. 27800-U
Direct Testimony of David A. Schlissel

1 **Q. What is your name, position and business address?**

2 A. My name is David A. Schlissel. I am a Senior Consultant at Synapse Energy
3 Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

4 **Q. Please describe Synapse Energy Economics.**

5 A. Synapse Energy Economics ("Synapse") is a research and consulting firm
6 specializing in energy and environmental issues, including electric generation,
7 transmission and distribution system reliability, market power, electricity market
8 prices, stranded costs, efficiency, renewable energy, environmental quality, and
9 nuclear power.

10 Synapse's clients include state consumer advocates, public utilities commission
11 staff, attorneys general, environmental organizations, federal government and
12 utilities. A complete description of Synapse is available at our website,
13 www.synapse-energy.com.

14 **Q. Please summarize your educational background and recent work experience.**

15 A. I graduated from the Massachusetts Institute of Technology in 1968 with a
16 Bachelor of Science Degree in Engineering. In 1969, I received a Master of
17 Science Degree in Engineering from Stanford University. In 1973, I received a
18 Law Degree from Stanford University. In addition, I studied nuclear engineering
19 at the Massachusetts Institute of Technology during the years 1983-1986.

20 Since 1983 I have been retained by governmental bodies, publicly-owned utilities,
21 and private organizations in 28 states to prepare expert testimony and analyses on
22 engineering and economic issues related to electric utilities. My clients have
23 included the New Mexico Public Regulation Commission, the General Staff of the
24 Arkansas Public Service Commission, the Staff of the Arizona Corporation
25 Commission, the U.S. Department of Justice, the Commonwealth of
26 Massachusetts, the Attorneys General of the States of Massachusetts, Michigan,
27 New York, and Rhode Island, the General Electric Company, cities and towns in

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1 Connecticut, New York and Virginia, state consumer advocates, and national and
2 local environmental organizations.

3 I have testified before state regulatory commissions in Arizona, New Jersey,
4 Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina,
5 South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, Rhode
6 Island, Wisconsin, Iowa, South Dakota, Georgia, Minnesota, Michigan, Florida
7 and North Dakota and before an Atomic Safety & Licensing Board of the U.S.
8 Nuclear Regulatory Commission.

9 A copy of my current resume is attached as Exhibit DAS-1.

10 **Q. On whose behalf are you testifying in this case?**

11 A. I am testifying on behalf of the Southern Alliance for Clean Energy. (“SACE”)

12 **Q. Have you testified previously before this Commission?**

13 A. Yes. I presented testimony in Commission Docket No. 22449-U.

14 **Q. What is the purpose of your testimony?**

15 A. Synapse was retained to review the testimony filed by Georgia Power Company
16 (“Georgia Power” or “the Company”) and to provide testimony about the possible
17 costs and risks of proceeding with the proposed Plant Vogtle Units 3 and 4
18 nuclear power plants.

19 **Q. What research have you undertaken in preparing this testimony?**

20 A. As part of my ongoing work, I regularly review nuclear industry and other
21 publicly available documents regarding the estimated costs of proposed nuclear
22 power plants in the United States and the costs and experiences of nuclear power
23 plants under construction overseas. For this specific project, I reviewed the
24 testimony filed by Georgia Power and the data responses provided by the
25 Company to discovery submitted by the Commission Staff. In addition, I
26 examined other public information regarding the proposed Plant Vogtle Units 3
27 and 4.

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1 **Q. Have you been able to conduct discovery in this proceeding?**

2 A. No. Georgia Power has refused to answer any discovery from SACE other than to
3 refer us to responses it had provided to data requests submitted by the
4 Commission Staff that were similar to the questions SACE asked.

5 **Q. Is it prudent for Georgia Power to commit to a long-term capital-intensive**
6 **project like Plant Vogtle Units 3 and 4 at this time?**

7 A. No. Despite what the Company claims in its application and supporting
8 testimony, there is great uncertainty concerning the ultimate cost and schedule for
9 Plant Vogtle Units 3 and 4, the need for the project, and its relative economics
10 versus other alternatives including energy efficiency, renewable resources and
11 gas-fired plants. It would be more prudent in these uncertain times to avoid a
12 massive multi-billion dollar commitment to a single and extremely expensive
13 generating project. Instead, the Company should adopt more flexible options
14 (such as natural gas and additional DSM and renewable resources) to address any
15 needs it currently anticipates it may have in 2016 and 2017 and to revisit the need
16 for and the relative economics of the proposed Plant Vogtle Units 3 and 4 in the
17 future when other AP 1000 plants have been licensed by the U.S. Nuclear
18 Regulatory Commission (“NRC”) and there is actual construction and operating
19 experience with the currently untested design.

20 **Q. What are the major risks and uncertainties facing Georgia Power and the**
21 **proposed Plant Vogtle Units 3 and 4 at this time?**

22 A. The major uncertainties facing Georgia Power and Plant Vogtle Units 3 and 4 are:

- 23 • No nuclear power plants have been licensed under the Nuclear Regulatory
24 Commission’s (“NRC”) new Combined Construction and Operating
25 (“COL”) licensing process. Thus, there is no certainty as to how long the
26 licensing process will take. This is especially true given that the NRC is
27 already facing the need to conduct simultaneous reviews of the COL
28 license applications that have already been filed, with more applications
29 expected to be filed in 2009 and 2010. In addition, many of these
30 applications reflect new and untested nuclear generation technologies.
31 Moreover, the NRC staff personnel have no recent experience with

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1 reviewing construction and operating licenses for new nuclear plants.
2 Under these circumstances, it is unclear whether a COL will be issued for
3 Plant Vogtle Units 3 and 4 under the Company's proposed schedule that
4 would allow construction to begin in time for Unit 3 to start operations in
5 2016 and Unit 4 in 2017. In fact, preliminary evidence suggests that the
6 schedule for one of the first applications for a COL, i.e., by South Carolina
7 Electric & Gas, has slipped by perhaps 8 months since the application was
8 filed with the NRC.

- 9 • Construction cost uncertainty represents the most significant risk for a new
10 nuclear power plant -- no nuclear power plant with an AP 1000 design has
11 been constructed, let alone operated, anywhere in the world. Without such
12 actual experience, the estimated costs of proposed units such as Plant
13 Vogtle Units 3 and 4 are highly uncertain. The actual costs of the existing
14 generation of nuclear power plants were, on average, between two to three
15 times the costs that were estimated during licensing or at the start of
16 construction. And this does not include the experiences of the most
17 expensive nuclear power plants like Plant Vogtle Units 1 and 2 whose
18 actual costs were more than ten times the initial cost estimated by Georgia
19 Power.
- 20 • The first AP 1000 project to actually begin construction has just been
21 started in China and has a scheduled completion date of late 2013.
22 Currently unanticipated problems may be experienced during the
23 construction or initial operation of this project or of the other initial AP
24 1000 plants that will require extensive, expensive and time-consuming
25 modifications to the design of Plant Vogtle Units 3 and 4.
- 26 • Perhaps as many as 15 to 20 other nuclear construction projects (including
27 five other AP 1000 projects with a total of ten plants in the Southeast
28 alone) may be underway in the U.S. at the same time as Plant Vogtle Units
29 3 and 4. This will create competing demands on the manufacturing
30 capacity required to fabricate large structural components and equipment,
31 craft labor, engineering labor and project management personnel, NRC
32 licensing and oversight resources, and required construction commodities.
- 33 • For these reasons, there also is significant uncertainty as to whether
34 Georgia Power will be able to achieve the accelerated construction
35 schedules that would be required for Plant Vogtle Unit 3 to start
36 commercial operations in 2016 and Unit 4 in 2017.
- 37 • Contrary to what Georgia Power may claim, its contract with
38 Westinghouse and Stone & Webster will allow for [REDACTED], the
39 costs of which would have to be borne by the Company's ratepayers.
- 40 • The Company's need for the 1,000 MW of capacity and associated energy
41 represented by Plant Vogtle Units 3 and 4 may be significantly delayed if

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1 the current economic recession is a deep and long as is currently
2 anticipated.

3 • The need for and relative economics of the capacity and energy
4 represented by Plant Vogtle Units 3 and 4 also will be affected by how much
5 cost-effective demand side management can and will be implemented and
6 what cost-effective renewable resources will be developed.

7 • The relative economics of Plant Vogtle Units 3 and 4 also will be affected
8 by the policies that are adopted by the federal government to address
9 global climate change. While reducing greenhouse gas emissions is an
10 essential goal, DSM and renewable resources may represent less
11 expensive and faster alternatives for reducing greenhouse gas emissions
12 than investing \$6.4 billion or more in a single and expensive project like
13 Plant Vogtle Units 3 and 4.

14 **Q. Is Georgia Power Company willing to expose shareholders to any of these**
15 **risks and uncertainties associated with building Plant Vogtle Units 3 and 4?**

16 A. No. The Commission staff asked Georgia Power whether the Company was
17 willing to assume any responsibility if the actual project costs are substantially
18 higher than the estimated costs because the indices in the EPC Agreement by
19 which costs would be escalated were underestimated. The Company's response
20 was "No, the Company's shareholders will not invest capital in the project
21 without a reasonable assurance of cost recovery."¹ In other words, the Company
22 will seek to have ratepayers bear the risks of higher project costs.

23 **Q. Does Georgia Power have any incentive to continue to pursue building Plant**
24 **Vogtle Units 3 and 4 in spite of the significant uncertainties that the project**
25 **faces?**

26 A. Yes. The addition of the massive investment to rate base can be expected to
27 improve the Company's earnings. This is especially true in early years if the
28 Company is allowed to finance its investment in Plant Vogtle Units 3 and 4 by
29 adding CWIP to rate base. As the Company has indicated, the break-even year
30 for using CWIP is [REDACTED]. This means that ratepayers could be paying

¹ Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-43.

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1 higher rates for [REDACTED] years than if the project were financed under more
2 traditional ratemaking without CWIP.

3 *Regulatory Uncertainty*

4 **Q. When does Georgia Power currently anticipate that a combined**
5 **Construction and Operating License (“COL”) for Plant Vogtle Units 3 and 4**
6 **will be issued by the U.S. Nuclear Regulatory Commission (“NRC”)?**

7 A. Georgia Power has said that it anticipates that the COL for Plant Vogtle Units 3
8 and 4 will be issued in the July to September 2011 timeframe.²

9 **Q. Is there any uncertainty in the schedule for the licensing of Plant Vogtle Units 3**
10 **and 4 by the NRC?**

11 A. Yes. Even though the NRC has approved Westinghouse’s AP 1000 standardized
12 design, there remains significant uncertainty as to when the NRC will issue a
13 COL for Plant Vogtle Units 3 and 4

- 14 • No new nuclear has completed the NRC’s new COL licensing process.
15 Thus, it is uncertain how long the licensing process actually will take. This
16 is especially true given that, according to the NRC’s website, 17 COL
17 applications already have been received, with more expected to be filed in
18 2009 and 2010. The NRC will have to process many of these COL
19 applications at essentially the same time. In addition, the NRC has not
20 licensed any new nuclear power plants since the 1980s so it is unclear
21 whether the lack of staff resources or the lack of recent experience in plant
22 licensing reviews will slow down the review process.
- 23 • The then-current AP 1000 design was certified by the NRC in 2006.
24 However, Westinghouse has since submitted two design amendments
25 (Rev. 16 and Rev 17) for the AP 1000. The issuance of the COL for Plant
26 Vogtle Units 3 and 4 is dependent on the NRC issuing an amended design
27 certification reflecting these two proposed Revisions. According to
28 Georgia Power, the key date was to be the issuance of a Final Safety
29 Evaluation Report in March 2010, however, a schedule change is
30 anticipated due to the submittal of the new revision to the design
31 certification (i.e., Rev. 17) that was submitted in September 2008.³ The

² Georgia Power Company response to Staff Data Request No. STF-TN-6-2.

³ Georgia Power Company response to Staff Data Request No. STF-TN-6-3.

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1 NRC's website indicates that there is not yet a new schedule for the
2 review of the two most recent Revisions to the AP 1000 design. As a
3 result, it not known when the NRC will certify the amended AP 1000
4 design and what impact this will have on the Plant Vogtle Units 3 and 4
5 COL licensing process.

- 6 • The AP 1000 reference plant application is for TVA's proposed Bellefonte
7 plant. According to Georgia Power, the issuance of the COL for Plant
8 Vogtle Units 3 and 4 is dependent on the NRC successfully completing its
9 review of the standard AP 1000 material for the reference plant
10 application.⁴ Georgia Power had said that a critical schedule item for the
11 Plant Vogtle Application was the NRC's issuance of the Bellefonte "Draft
12 SER for open items not including Chapter 2" which had been scheduled
13 for April 2009.⁵ According to the NRC's website, the issuance of this
14 report already has slipped to the end of September 2009.
- 15 • Georgia Power also has said that the issuance of the COL for Plant Vogtle
16 Units 3 and 4 is dependent on the NRC meeting its targeted milestones
17 and the milestones established by the NRC's Atomic Safety and Licensing
18 Board ("ASLB") for the mandatory and contested hearing required on the
19 COL application. However, the ASLB has not yet issued a schedule for
20 the hearing on the Plant Vogtle Units 3 and 4 COL application and is not
21 expected to do so until late in 2008 or early in 2009.

22 Consequently, it is reasonable to expect that there will be some, perhaps
23 significant, slippage in the schedule for issuance of the Plant Vogtle Units 3 and 4
24 COL. It also is possible that some significant design flaws or problems will be
25 identified during the NRC's review of the Bellefonte AP 1000 reference plant
26 application or during its review of any of the other AP 1000 projects for which
27 licenses are being sought. The discovery of such significant design flaws or
28 problems could further delay the issuance of a COL. Such delays could then be
29 expected to push back the start of construction and endanger the proposed 2016
30 and 2017 target dates that Georgia Power has announced for the start of
31 commercial operations.

32 Indeed, even Georgia Power has acknowledged that "It is difficult to predict when
33 other companies will be successful in receiving licensing from NRC and

⁴ Id.
⁵ Id.

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1 certification from their State regulators to be able to begin construction.”⁶ The
2 same is true for Georgia Power itself with regard to the receipt of the COL for
3 Plant Vogtle Units 3 and 4 from the NRC.

4 *Construction Cost Uncertainty*

5 **Q. Is there any reasonable range of certainty regarding the ultimate**
6 **construction cost of Plant Vogtle Units 3 and 4?**

7 A. No. There is great uncertainty regarding the project’s ultimate construction cost.
8 In fact, construction cost uncertainty represents the most significant risk facing a
9 new nuclear power plant.

10 **Q. What are the reasons for this great uncertainty?**

11 A. There are a number of factors for the great uncertainty regarding the ultimate
12 construction cost of Plant Vogtle Units 3 and 4:

- 13 • The AP 1000 is an untested design. No plant with the design has actually
14 been built and operated anywhere in the world. There is only a very
15 limited track record for building any nuclear plant with a new generation
16 nuclear technology.
- 17 • Georgia Power’s projected overnight cost for Plant Vogtle Units 3 and 4 is
18 significantly lower than the estimated overnight costs of the other AP
19 1000 projects proposed to be built in the Southeast in the same relative
20 time frame.
- 21 • Power plant construction costs have skyrocketed in recent years due to a
22 surging global demand and a worldwide competition for design and
23 construction resources, equipment and commodities. The proposed
24 worldwide renaissance of nuclear power will increase that competition so
25 that a larger number of generating projects will be competing for the same
26 resources. Indeed, perhaps as many as 17 or more nuclear construction
27 projects could be underway in the United States at the same time, with
28 many of those projects being built in the Southeast. These projects will be
29 competing for many of the same manufacturing, engineering, labor and
30 management resources.

⁶ Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-17.

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- 1 • There is a reduced infrastructure in the U.S. for building new nuclear
2 power plants: many experienced construction workers have retired and
3 have been replaced with new, less experienced workers – this may lead to
4 reduced labor productivity; there are fewer workers with the specialized
5 skills required for building new nuclear power plants; suppliers who
6 provided nuclear quality equipment and materials during the construction
7 of the existing generation of nuclear plants no longer do so; as a result
8 there is a tight supply chain with potential bottlenecks.
- 9 • The recent construction experiences of other nuclear plants with untested
10 new generation designs suggests that the actual cost of building Plant
11 Vogtle Units 3 and 4 may be significantly higher than Georgia Power now
12 acknowledges and that construction may take substantially longer than the
13 Company now predicts.

14 **Q. Is it widely accepted that the estimated costs for new nuclear power plants**
15 **are very uncertain?**

16 A. Yes. For example, Lew Hay, Chairman and CEO of Florida Power & Light has
17 told a meeting of the World Association of Nuclear Operators that “although
18 suppliers keep quoting overnight costs of \$2500 to \$3500 per kilowatt, I believe
19 the all-in costs are likely to be much higher – possibly twice as much once you
20 factor in owners’ costs such as land, cooling towers, switchyard, etc., interest
21 during construction and cost escalation due to inflation and cost overruns. And of
22 course we have to have a contingency as well.”⁷

23 Moody’s Investor Services has warned about the short-comings of nuclear power
24 plant cost estimates: “All-in fact-based assessments require some basis for an
25 overnight capital cost estimate, and the shortcomings of simply asserting that
26 capital costs could be “significantly higher than \$3,500/kw” should be supported
27 by some analysis. That said, Moody’s can not confirm (and all of our research
28 supports our conclusion) definitive estimates for new nuclear costs at this time.
29 Moody’s can assert with confidence that there is considerable uncertainty with

⁷ “How much, for some utilities, the capital costs of a new nuclear power plant are prohibitive,”
Nuclear Engineering International, November 2007, at page 27.

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1 respect to the capital cost of new nuclear and coal-fired generating
2 technologies...”⁸

3 Moody’s further noted that “Throughout our due diligence process, Moody’s has
4 not been able to make a finite determination of the range for the all-in cost
5 associated with new nuclear. As a result, we believe the ultimate costs associated
6 with building new nuclear generation do not exist today – and that the current cost
7 estimates represent best estimates, which are subject to change.”⁹

8 An article in the August 2008 of Nuclear Engineering International similarly
9 noted:

10 What is clear is that it is completely impossible to produce definitive
11 estimates for new nuclear costs at this time. The fact that the USA and
12 other leading nuclear nations have not been building plants for some
13 time, and also that most current reactor designs have not yet been built
14 to completion, suggests that there is considerable uncertainty with
15 respect to the capital cost of new nuclear and other generating
16 technologies.¹⁰

17 The same article also explained:

18 Clearly some of today’s increased cost estimates can be attributed to
19 including more things than before – but to what extent have costs risen
20 owing to the lack of skilled workers, supply bottlenecks for imported
21 heavy components, significant increases in key commodity prices, and,
22 in the case of the USA, the devaluation of the dollar against other
23 leading currencies.

24 Rising commodity prices seem to have taken a lot of the blame for the
25 increased cost estimates, but this seems rather unfair. Steel, cement,
26 copper and other important commodities have indeed risen rapidly in
27 prices, but these only account for a small proportion of the costs of a
28 modern nuclear power plant, perhaps less than 5% of the total. What
29 really matters is the competence and capability of the manufacturers
30 and vendors in the supply chain, where there is huge value added.

⁸ *New Nuclear Generation in the United States*, Moody’s Investor Services, October 2007, at page 8.

⁹ *Id.* at page 10.

¹⁰ *Comment: Escalating Costs of New Build: What Does It Mean?*, Nuclear Engineering International, August 31, 2008, at page 12.

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1 Take, for example, the ultra-heavy forgings needed to make reactor
2 pressure vessels. Japan Steel Works (JSW) has an effective monopoly
3 on this business, at least for now. The raw steel for these may cost only
4 \$1 million, but the price of the completed forging, sitting at the heart
5 of the reactor, may well be \$100 million and above. Pinch points in the
6 current supply chain are having an obvious influence on costs. The
7 number of suppliers in many key areas is now rather small and few
8 have surplus capacity, hence prices will be marked upwards. Only a
9 good run of reactor orders will likely change this position, as
10 companies invest in new facilities to mop up demand.

11 Turbine equipment makers also are very busy, with strong global
12 demand for new power stations of all kinds. The International Energy
13 Agency (IEA) has estimated that the power generation sector will
14 require some \$10 trillion of investment worldwide in the period to
15 2030. This is a huge sum and vendors will be able to extract premium
16 prices until demand slackens. Labour cost estimates for new nuclear
17 build are also rising sharply – not so much to do with wage inflation as
18 higher estimates of the hours of labour input needed to complete a
19 plant. It is reasonable to assume that new reactors in the USA will
20 likely take longer to build than the most recent Japanese reactors,
21 which have been as low as 40 months, given the lack of recent build
22 experience. The delays at both EPR projects in Finland and France
23 also suggest that caution is needed in this area.

24 In time, it should prove possible to control some of these costs,
25 through a combination of skill and luck. The global economy may
26 cool, cutting demand, and causing the commodity price increases to
27 reverse, while production capacities of those in the supply chain will
28 likely increase, stimulating price competition.¹¹

29 Even though there is now a worldwide economic slowdown, there still is a very
30 substantial global demand for power plant design and construction resources,
31 equipment and commodities. At the same time, the United States, China and the
32 European Union have said that they will begin very significant stimulus spending
33 packages which will include infrastructure repairs and improvements. The
34 incoming U.S. administration has indicated that this nation's stimulus spending
35 program also will provide significant funds for renewable resources and energy

¹¹ Id.

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1 efficiency. Such stimulus spending will increase the demand for some of the same
2 resources and commodities that are used to build new nuclear power plants.

3 **Q. Have the estimated costs of proposed nuclear power plants increased**
4 **significantly in recent years?**

5 A. Yes. As recently as the years 2000-2002, the industry and Department of Energy
6 were talking about overnight costs of \$1,200/kW to \$1,500/kW for new nuclear
7 units.¹² This range of estimated overnight costs suggested total plant costs of
8 between \$2 and \$4 billion per new nuclear unit. The MIT *Future of Nuclear*
9 Study in 2003, increased the estimated prices of new nuclear plants to \$2,000/kW,
10 not including financing costs.

11 However, the estimated costs for new nuclear power plants began to increase
12 significantly starting in about 2006-2007. For example:

- 13 • A June 2007 report by the Keystone Center estimated an overnight cost of
14 \$2,950/kW for a new nuclear plant. With interest, this figure translated to
15 between \$3,600/kW and \$4,000/kW.¹³
- 16 • In October 2007, Moody's Investor Services estimated a range of between
17 \$5,000/kW and \$6,000/kW for the total cost of new nuclear units
18 (including escalation and financing costs) but acknowledged that this cost
19 estimate was "only marginally better than a guess."¹⁴

20 Also in October 2007, Florida Power & Light ("FPL") announced a range of
21 overnight costs (i.e., no escalation or financing costs) for its two proposed nuclear
22 power plants (total of 2200MW) as being between \$3,108/kW and \$4,540/kW.

23 FPL also estimated the total cost of the project (including escalation and financing
24 costs) as being between \$5,492/kW and \$8,081/kW. These estimated costs

¹² An overnight cost estimate is what the plant would cost if it could be built "overnight." Overnight cost estimates are regularly used in the industry. They do not include escalation or financing costs.

¹³ *Nuclear Power Joint Fact-Finding*, The Keystone Center, June 2007.

¹⁴ *New Nuclear Generation in the United States*, Moody's Investor Services, October 2007, at page 11.

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1 translated into a projected total cost of \$12.1 billion to \$17.8 billion, for just two
2 1100 MW plants.¹⁵

3 Other companies also have raised their nuclear construction cost estimates. For
4 example, in 2007 TVA estimated the cost of its two proposed AP 1000 plants at
5 Bellefonte at somewhere in the range of \$6.4 to \$7.1 billion. However, TVA has
6 recently acknowledged that the two unit facility, similar in design to Plant Vogtle
7 Units 3 and 4, might cost as much as \$17.5 billion to build, including escalation
8 and financing costs.¹⁶

9 **Q. What are the reasons for the dramatic increases in the estimated costs of new**
10 **nuclear power plants?**

11 A. The increased estimated costs for today's new generation of nuclear plants are
12 due, in large part, to a fierce worldwide competition for the resources,
13 commodities and manufacturing capacity needed in the design and construction of
14 new power plants. This competition has led to double-digit annual increases in
15 the costs of key power plant commodities such as steel, copper, concrete, etc. At
16 the same time, as explained in an article in the Wall Street Journal, new nuclear
17 power plants are being proposed "amid a growing shortage of skilled labor; and
18 against the backdrop of a shrunken supplier network for the industry."¹⁷

19 The worldwide demand also is straining the limited capacity of EPC
20 (Engineering, Procurement, and Construction) firms and equipment
21 manufacturers. The limited number of manufacturers and suppliers could cause
22 bottlenecks in construction if, as expected, there are multiple orders for new
23 power plants in the U.S. and abroad.

24 For example, there are only two companies that have the heavy forging capacity
25 to create the largest equipment/components in new nuclear plants – Japan Steel

¹⁵ Direct Testimony and Exhibits of Steven D. Scroggs on behalf of Florida Power & Light in
Docket No. 07-0650, dated October 2007.

¹⁶ www.tennessean.com/20081209/GREEN02/812090342/1001/RSS6001.

¹⁷ *New Wave of Nuclear Plants Faces High Costs*, Wall Street Journal, May 12, 2008, at page B1.

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1 Works and Creusot Forge in France.¹⁸ The demand for heavy forgings will be
2 significant because the nuclear industry will be waiting in line alongside the
3 petrochemical industry and new refineries for the material.¹⁹

4 At the same time, two decades ago there were about 400 suppliers of nuclear plant
5 components and 900 so-called nuclear stamp, or N-stamp, certifications from the
6 American Society of Mechanical Engineers. Today there are fewer than 80
7 suppliers in the U.S. and fewer than 200 N-stamp certifications.²⁰ Indeed, the
8 chairman of the Nuclear Regulatory Commission has said publicly (in early 2007)
9 that it appears now there will be a great reliance on overseas companies to
10 manufacture plant systems and components.²¹ He said that the NRC would need
11 to inspect the quality of the manufacturing programs in foreign firms to ensure
12 substandard materials or equipment don't end up installed in plants. He also
13 cautioned that it would take more time to inspect foreign-made components than
14 it would to check quality control of U.S.-manufactured components. The heavy
15 reliance on overseas suppliers also will lead to cost increases due to the
16 continuing weakness of the U.S. dollar relative to other currencies.

17 The worldwide competition for power plant design and construction resources,
18 equipment and commodities means fewer bidders for work, higher prices, earlier
19 payment schedules and longer delivery times. Long lead times (six years or so)
20 are expected for key plant components. The demand and cost for both on-site
21 construction labor and skilled manufacturing labor also have escalated.

22 Moody's has summarized the increased risks associated with the international
23 competition for power plant resources as follows:

24 Dramatic increases in commodity prices over the recent past,
25 exacerbated by a skilled labor shortage, have led to significant
26 increases in the over-all cost estimates for major construction projects

18 "Supply chain could slow the path to construction, officials say," *Nucleonics Week*. February 15,
2007, at page 13.

19 Id.
20 Id.
21 Id.

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1 around the world. In the case of new nuclear, the very detailed
2 specifications for forgings and other critical components for the
3 construction process can add a new element of complexity and
4 uncertainty. As noted previously, labor is in short supply and
5 commodity costs have been extremely volatile. Most importantly, the
6 commodities and world wide supply network associated with new
7 nuclear projects are also being called upon to build other generation
8 facilities, including coal as well as nuclear, nationally and
9 internationally. Nuclear operators are also competing with major oil,
10 petrochemical and steel companies for access to these resources, and
11 thus represent a challenge to all major construction projects.”²²

12 **Q. Is it reasonable to expect that the current environment for building new**
13 **nuclear power plants will continue for the foreseeable future?**

14 A. Yes. There is no reason to expect that the worldwide competition for resources or
15 the existing supply constraints and bottlenecks affecting nuclear power plant costs
16 will clear anytime in the foreseeable future. In fact, it is reasonable to expect that
17 the competition for resources and supply bottlenecks may intensify as more
18 nuclear power plants are slated to begin construction in the U.S. and around the
19 world.

20 **Q. What are the announced construction start dates for the AP 1000 projects**
21 **being proposed in the United States?**

22 A. The following information has been released concerning start dates for
23 construction of the other AP 1000 projects being proposed in the U.S.:

- 24 • South Carolina Electric & Gas expects to start construction of two AP
25 1000 at its existing Virgil Summer site in April 2011.
- 26 • Progress Energy of Florida plans to begin construction of the Levy
27 Nuclear Power plant in early 2012.²³

²² *New Nuclear Generation in the United States*, Moody’s Investor Services, October 2007, at page 9.

²³ Progress Energy Carolina also seeking licenses for two AP 1000s plants at its Shearon Harris Plant outside Raleigh, North Carolina. However, the Company has said that no final decision has yet been to achieve build the plants but if such a decision is made to move forward, the plants could be online by 2016 and 2017. This would suggest that construction would begin in 2011 or at about the same time as Plant Vogtle Units 3 and 4.

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- 1 • Duke Energy Carolinas plans to initiate construction of the two units at
2 Lee Nuclear Station in 2012 and 2013.
- 3 • Florida Power & Light is planning to start safety related construction for
4 Turkey Point Units 6 and 7 in 2013 and 2015.²⁴
- 5 • TVA expects to receive a COL for Bellefonte Units 3 and 4 in 2011. It has
6 not indicated when it will begin construction.

7 It appears that each of these two-unit projects, plus an additional twelve or more
8 other nuclear projects, many also having two units, may be under construction at
9 the same time as Plant Vogtle Units 3 and 4.

10 **Q. Is it reasonable to expect that having so many nuclear projects underway at**
11 **the same time as Plant Vogtle Units 3 and 4, including the five other AP 1000**
12 **projects, will increase competition on procurement, craft labor, engineering**
13 **labor and project management personnel?**

14 A. Yes. It is reasonable to expect that having such a large number of nuclear projects
15 competing for the same limited equipment manufacturing, craft labor, engineering
16 labor and project management personnel will lead to increased costs.

17 **Q. Has Georgia Power assessed the impact of having multiple AP 1000 projects**
18 **underway at the same time as Plant Vogtle Units 3 and 4?**

19 A. Yes. Georgia Power has essentially said that because it was the first to sign an
20 EPC Agreement with Westinghouse, it is a favorable position relative to other
21 projects competing for the same project materials.²⁵

22 **Q. Is there any guarantee that, in fact, Plant Vogtle Units 3 and 4 will receive**
23 **priority over other AP 1000 projects?**

24 A. Not that I have seen. Moreover, it is quite possible that the schedule for Plant
25 Vogtle Units 3 or 4 will slip for any one of a number of possible reasons, e.g.,
26 delays in the regulatory review process or unexpected construction issues. As a

²⁴ Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-16.
²⁵ Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-18.

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1 result, Plant Vogtle Units 3 and 4 may not receive priority for resources over
2 other AP 1000 projects.

3 **Q. How does Georgia Power's currently estimated cost for Plant Vogtle Units 3**
4 **and 4 compare to the estimated costs of AP 1000 plants being proposed by**
5 **other U.S. utilities?**

6 A. The estimated overnight costs for the AP 1000 projects being proposed by
7 Georgia Power, Duke Energy Carolinas, Progress Energy, Florida Power & Light,
8 TVA and SCANA and Santee Cooper are presented in Table 1 below. As can be
9 seen, the range of overnight costs presented by Georgia Power for Plant Vogtle
10 Units 3 and 4 is significantly lower than the ranges of overnight costs estimated
11 for the other AP 1000 projects for which overnight cost data has been made
12 available to the public.

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Table 1: AP 1000 Project Overnight Cost Estimates

Utility	Project	Estimated Overnight Cost
Georgia Power	Plant Vogtle Units 3 & 4	\$3,200 to \$3,500/kW ²⁶
Progress Energy	Levy Nuclear Plant Units 1 & 2	\$4,260/kW ²⁷
Florida Power & Light	Turkey Point Units 6 & 7	\$3,108/kW to \$4,540/kW ²⁸
SCANA and Santee Cooper	Summer Units 2 & 3	\$4,340/kW ²⁹
TVA	Bellefonte Units 3 & 4	\$2,550/kW to \$4,725/kW ³⁰
Duke Energy Carolinas	Lee Nuclear Station Units 1 & 2	\$5,000/kW ³¹

Q. Is it reasonable to expect that currently unanticipated problems may be encountered during the construction and/or initial operations of the new AP 1000 plants in China that could affect the cost of building and operating Plant Vogtle Units 3 and 4?

A. Yes. One clear lesson from the existing generation of nuclear power plants is that significant problems may be discovered during construction or operations of new plants that will require modifications and, consequently, increased costs at other plants with the same or similar designs. For this reason, it is reasonable to expect that the actual costs of the plants listed in Table 1 above may be substantially higher than the estimated costs presented in this Table.

²⁶ *Southern Nuclear Operating Company's Response to the Licensing Board's Order of October 17, 2008*, in NRC Docket No. 52-011-ESP, dated November 7, 2008, at page 23.

²⁷ Florida Public Service Commission, Order No. PSC-08-0518-FOF-EI in Docket No. 080148-EI, at page 10

²⁸ Testimony of Steven D. Scroggs on behalf of Florida Power & Light in Florida Public Service Commission Docket No. 070650-EI, at Exhibit SDS-7.

²⁹ *EPC Contract Signed for New Reactors*, Nuclear News, July 2008, at page 26.

³⁰ *Estimates for New Nuclear Plant Rise*, Chattanooga Times Free Press, December 12, 2008, at page A1.

³¹ Duke Energy Carolinas November 3, 2008 Letter to the Chief Clerk of the Public Service Commission of South Carolina in Docket No. 2005-356-E.

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1 **Q. But doesn't the EPC agreement that Georgia Power has signed with**
2 **Westinghouse and Stone & Webster protect the Company and ratepayers**
3 **against significant construction cost increases?**

4 A. [REDACTED]

5 **Q. Does the EPC Agreement cover all construction-related project costs?**

6 A. [REDACTED]

7 **Q. Doesn't Georgia Power indicate in its response to one of the Staff Data**
8 **Requests that there is approximately [REDACTED]?**

9 A. [REDACTED]

10 **Q. When discussing the risk of scope increases affecting the project's cost and**
11 **schedule, Georgia Power states that "The Company is in control of Owner**
12 **control changes and does not intend to request changes in scope except to the**
13 **extent the value of the change to the ratepayer equals or exceeds the cost of**
14 **the change.³² Do you believe that this commitment will have a significant**
15 **impact in mitigating project costs?**

16 A. No. I believe it is reasonable to expect that power plant owners only make
17 changes in project scope when necessary or if they believe that the value of the
18 change to the ratepayer equals or exceeds the cost of the change. In other words, I
19 don't believe that plant owners agree to scope changes either frivolously or in
20 order to pad the project cost. Having said that I believe that the most significant
21 risks for project scope increases involve the untested AP 1000 design and the very
22 real possibility that currently unanticipated problems that will be expensive to
23 address will be experienced or identified through the construction and operation
24 of other AP 1000 plants or during the construction of Plant Vogtle Units 3 and 4
25 themselves. That was the history of the first generation of nuclear power plants in
26 the 1970s and 1980s. It also is quite possible that the NRC will require

³² Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-5, at pages 6-7.

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1 modifications to the design and construction of Plant Vogtle Units 3 and 4 as a
2 result of problems identified during the construction of other AP 1000 plants. In
3 other words, I believe that the Company will face the prospect of having to
4 approve unavoidable scope changes. Moreover, the calculus of whether a scope
5 change will produce greater value to the ratepayer will change over time as the
6 Company's investment in the plants increases – at that point the evaluation of the
7 value of a scope change to the ratepayer will have to include the payment of the
8 sunk costs that have already been invested in the project.

9 **Q. Has Georgia Power conducted any sensitivity studies to identify its maximum**
10 **cost exposure under the EPC contract?**

11 A. No.³³ However, the Company has estimated its expected costs for Plant Vogtle
12 Units 3 and 4 at 50%, 75% and 85% confidence levels. The results were as
13 follows:

14 [REDACTED]

15 **Q. Is it possible that the total cost of Georgia Power's share of Plant Vogtle**
16 **Units 3 and 4 will exceed even these levels?**

17 A. Yes. Given the untested AP 1000 design and skyrocketing nuclear construction
18 costs, it is reasonable to expect that the actual cost of the Company's share of
19 Plant Vogtle Units 3 and 4 may well exceed even the [REDACTED] total "85%
20 confidence level" cost.

21 **Q. How accurate have the nuclear industry's construction cost estimates been in**
22 **the past?**

23 A. Until the 1970s, building new nuclear power plants appeared to be a relatively
24 low risk investment because construction and operating costs were relatively
25 stable and easy to predict. However, starting in the 1970s, the costs of building
26 new nuclear power plants began to spiral out of control. As a result, the actual

³³ Georgia Power Company response to Staff Data Request No. STF-GDS-WRJ-1-27.

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1 costs of new plants were two to three times higher than the costs that had been
 2 estimated during licensing or at the start of construction.

3 Consequently, the nuclear industry has a very poor track record in predicting plant
 4 construction costs and avoiding cost overruns. Indeed, as shown by data in a study
 5 by the Department of Energy, the actual costs of 75 of the existing nuclear power
 6 plants in the U.S. exceeded the initially estimated costs of these units by over 200
 7 percent. The following table shows the overruns experienced by these 75 nuclear
 8 plants by the year in which construction of the nuclear power plant began.³⁴

9 **Table 2: U.S. Nuclear Plant Cost Overruns**
Projected and Actual Construction Costs for Nuclear Power Plants

Construction Starts	Average Overnight Costs ^a			
	Number of Plants ^b	Utilities' Projections (Thousands of dollars per MW)	Actual (Thousands of dollars per MW)	Overrun (Percent)
Year Initiated				
1966 to 1967	11	612	1,279	109
1968 to 1969	26	741	2,180	194
1970 to 1971	12	829	2889	248
1972 to 1973	7	1,220	3,882	218
1974 to 1975	14	1,263	4,817	281
1976 to 1977	5	1,630	4,377	169
Overall Average	13	938	2,959	207

Source: Congressional Budget Office (CBO) based on data from Energy Information Administration, An Analysis of Nuclear Power Plant Construction Costs, Technical Report DOE/EIA-0485 (January 1, 1986).

Notes: Electricity-generating capacity is measured in megawatts (MW); the electrical power generated by that capacity is measured in megawatt hours (MWh). During a full hour of operation, 1 MW of capacity produces 1 MWh of electricity, which can power roughly 800 average households. The data underlying CBO's analysis include only plants on which construction was begun after 1965 and completed by 1986.

Data are expressed in 1982 dollars and adjusted to 2006 dollars using the Bureau of Economic Analysis's price index for private fixed investment in electricity-generating structures. Averages are weighted by the number of plants.

- a. Overnight construction costs do not include financing charges.
- b. In this study, a nuclear power plant is defined as having one reactor. (For example, if a utility built two reactors at the same site, that configuration would be considered two additional power plants.)

10

³⁴ This table was taken from the May 2008 report by the Congressional Budget Office, *Nuclear Power's Role in Generating Electricity*, at page 17.

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1 The **average cost overrun** for these 75 nuclear units was **207** percent. In other
2 words, the actual average cost of the plants was about triple their estimated costs.

3 In fact, the data in the previous table understates the cost overruns experienced by
4 the U.S. nuclear industry because (1) the cost figures do not reflect escalation and
5 financing costs and (2) the database does not include some of the most expensive
6 nuclear power plants built in the U.S. – e.g., Comanche Peak, South Texas,
7 Seabrook, and Vogtle. For example, the cost of Plant Vogtle Units 1 and 2
8 increased from \$660 million to \$8.7 billion in nominal dollars – a 1,200 percent
9 overrun.

10 **Q. What were the consequences of the cost overruns experienced by the existing**
11 **generation of nuclear power plants in the United States?**

12 A. There were a number of significant consequences. First, only one-half of the
13 nuclear power plants that were proposed were actually built and ratepayers
14 frequently had to bear many millions of dollars of sunk costs for abandoned
15 projects. Second, the cost of power from completed nuclear power plants became
16 much more expensive for ratepayers than the proponents had claimed. In some
17 instances this led to rate increases so large that they spawned the term “rate
18 shock.”.

19 Rising construction costs also led to severe financial problems for many of the
20 utilities that were building the nuclear power plants. One investor-owned
21 company, Public Service Company of New Hampshire, and several public power
22 utilities filed for Chapter 11 bankruptcy protection due to financing difficulties
23 associated with the Seabrook nuclear plant. Several other companies nearly went
24 bankrupt due to financial difficulties from their nuclear power plant construction
25 projects. In addition, the Washington Public Power System defaulted on \$2.25
26 billion in municipal bonds in 1983 after it had failed to complete construction of
27 two nuclear power plants.

28 Rising nuclear power plant costs also led to more than ten billion dollars of write-
29 offs and cost disallowance from utility rate bases. Finally, when many expensive

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1 nuclear power plants were sold or divested to affiliates during restructuring efforts
2 in some states, ratepayers were left paying hundreds of millions of dollars of
3 “stranded” plant costs.

4 **Q. Is it reasonable to expect that the industry will experience significant cost**
5 **overruns if it builds new nuclear power plants in the United States?**

6 A. Yes. Given the industry’s poor track record in estimating plant costs and the
7 substantial uncertainties associated with building new nuclear power plants (as I
8 have discussed above), it is reasonable to expect that the actual costs of new
9 plants, like Plant Vogtle Units 3 and 4, will be much higher than the industry now
10 claims. At the same time, it does appear that the nuclear industry has learned
11 some important lessons from the problems experienced during the building and
12 operation of the existing generation of nuclear power plants and, therefore, can be
13 expected to avoid some of those problems.

14 For example, Georgia Power has identified a number of actions that it is taking to
15 mitigate the risks associated with Plant Vogtle Units 3 and 4.³⁵ These appear to
16 be reasonable and should have some impact on avoiding some of the significant
17 problems that were experienced during the construction of the existing generation
18 of nuclear power plants. But it is not reasonable to expect that the Company’s
19 actions will mitigate or avoid all of the risks especially the untested AP 1000
20 design, the possibility that multiple projects will be competing for the same
21 design and construction resources and equipment manufacturing capacity and the
22 reality that new nuclear power plants have not been built in the U.S. for almost
23 two decades (other than for TVA finishing its Watts Bar Plant).

24 Even just a 50 percent cost increase would mean that new plants like Plant Vogtle
25 Units 3 and 4 would be extremely expensive, perhaps costing as much on an
26 “all-in” basis as \$20-25 billion, or more, just for two nuclear units. Such an
27 increase of only 50 percent would be substantially below the 200 percent to 300

³⁵ Georgia Power Company responses to Staff Data Requests Nos. STF-GDS-WRJ-1-4 and 1-5.

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1 percent overruns that the industry experienced in building the nation’s existing
2 nuclear power plants.

3 *Construction Schedule Uncertainty*

4 **Q. What is the planned construction schedule for Plant Vogtle Units 3 and 4?**

5 A. Georgia Power expects to receive a COL from the NRC in the June-September
6 2011 timeframe and to begin operations at Plant Vogtle Unit 3 in 2016 and at Unit
7 4 in 2017. This would represent a total construction duration of approximately
8 five years for Plant Vogtle Unit 3.

9 **Q. Have any AP 1000 plants actually achieved such a short construction**
10 **duration?**

11 A. No. No AP 1000 plants have been built anywhere in the world. As I indicated
12 earlier, the first AP 1000 plants to be built any where in the world have recently
13 started construction in China.

14 **Q. Have any new generation nuclear plants actually achieved such short**
15 **construction schedules?**

16 A. No. The Olkiluoto 3 power plant in Finland was the first truly new generation
17 nuclear unit to begin construction. Construction began in 2005 with a scheduled
18 completion date of 2009 but Olkiluoto has experienced many problems. Indeed, it
19 is reported that completion of the plant is currently two to three years behind
20 schedule and the currently estimated cost of the plant has increased by between
21 33% and 50% or about \$2 billion.³⁶ A second EPR project has been under
22 construction in France for approximately a year and has also experienced some
23 problems due to quality concerns.³⁷

³⁶ For example, see “Second top TVO executive leaving Olkiluoto-3,” *Nucleonics Week*, June 26, 2008, at page 1, and “The Start-Up of Finland’s Olkiluoto-3 May Be Delayed,” *Nuclear News*, November 2008, at page 12.

³⁷ For example, see “Regulator stops flow of concrete at Flamanville,” *Nuclear Engineering International*, June 18, 2008, at page 4.

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1 **Q. Should the Commission rely on Georgia Power’s projected construction**
2 **schedule for Plant Vogtle Units 3 and 4?**

3 A. No. The schedule should be viewed as highly uncertain for the following reasons:

- 4 • The AP 1000 is an untested design – design certification by the NRC does
5 not guarantee that the total plant design will be without flaws or that
6 significant problems will not be experienced during construction.
- 7 • If construction begins when Georgia Power currently plans, there will be
8 little lead time from the other AP 1000 construction projects in China to
9 correct for design or construction problems and no lead time from other
10 domestic U.S. AP 1000 construction projects.
- 11 • Supply chain bottlenecks or constraints may lead to longer than expected
12 lead times for critical plant equipment or there may be transportation-
13 caused delays in shipping.
- 14 • The history of large construction projects suggests that significant delays
15 will be experienced, especially for new technologies.
- 16 • Multiple nuclear construction projects in the U.S. will be completed for
17 limited engineering and construction resources and for limited equipment
18 manufacturing capacity.
- 19 • The use of the modular construction process is untested in the United
20 States.

21 **Q. Is the construction schedule established in the EPC Agreement subject to**
22 **change?**

23 A. [REDACTED]

24 **Q. How does the current construction schedule for Plant Vogtle Units 3 and 4**
25 **compare with the construction durations for the existing generation of**
26 **nuclear power plants?**

27 A. As I noted earlier, the planned construction schedule for Plant Vogtle Unit 3 is
28 approximately five years between the receipt of a COL from the NRC and start of
29 commercial operations. The actual construction durations of existing large (i.e.,
30 800 MW or larger) pressurized water reactor plants that began safety-related

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1 construction after 1973 averaged 125 months or almost ten and one-half years.³⁸
2 This experience suggests that the planned construction schedule for Plant Vogtle
3 Unit 3 is extremely optimistic even if it is assumed that the industry is able to use
4 lessons learned from the construction of existing nuclear power plants to
5 significantly improve construction schedules.
6

³⁸ Construction duration is here measured as being between the first placement of structural concrete and the start of commercial operations.

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Fuel Diversity

Q. Georgia Power emphasizes in its Certification Application the dependence of its capacity mix on natural gas-fired generation and the sensitivity of natural gas generation to fuel price fluctuations.³⁹ Do you agree that this Commission should be concerned about an undue dependence on any one fuel such as coal, natural gas or nuclear?

A. Yes. I agree that the Commission should be concerned about any Company's over-dependence on any single fuel. However, capacity mix is not the appropriate measure of Georgia Power's dependence on the different fuels. Instead, the Commission should look at the percentage of energy generated by each fuel type. If it does so, the Company's dependence on natural gas-fired generation is much lower than is suggested in Georgia Power's Certification Application.

For example, in its Certification Application, Georgia Power emphasizes that gas-fired capacity now comprises [REDACTED] of its capacity mix and that without the addition of Plant Vogtle Units 3 and 4, "natural gas will comprise roughly [REDACTED] of the Company's capacity mix by 2017."

However, the Company has provided the following information concerning its mix of energy supply in 2007 and 2017 without Plant Vogtle Units 3 and 4.

Table 3: Georgia Power Company Fuel Mix (by Energy)

Fuel	2007	2017 (without Vogtle 3 and 4)	2017 (with Vogtle 3 and 4)
Coal	[REDACTED]	[REDACTED]	[REDACTED]
Nuclear	[REDACTED]	[REDACTED]	[REDACTED]
Hydro	[REDACTED]	[REDACTED]	[REDACTED]
Oil and Gas	[REDACTED]	[REDACTED]	[REDACTED]

³⁹ For example, see *Georgia Power's Application for the Certification of Units 3 and 4 at Plant Vogtle and Updated Resource Plan*, at pages 2, and 9

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1 Thus, the Company would not be as dependent on natural gas without Plant
2 Vogtle Units 3 and 4 as it suggests in its Certification Application – even if Plant
3 Vogtle Units 3 and 4 were replaced by gas-fired plants.

4 **Q. Are there other alternatives than building Plant Vogtle Units 3 and 4 for**
5 **reducing Georgia Power’s dependence on natural gas and coal-fired**
6 **generation?**

7 A. Yes. Adding non-carbon emitting renewable resources and demand side
8 management programs also would reduce the Company’s dependence on natural
9 gas-fired generation as well as reducing Georgia Power’s emissions of greenhouse
10 gases.

11 *Flaws in Georgia Power’s Analyses of the Economics of Plant Vogtle*
12 *Units 3 and 4*

13 **Q. Have you identified any flaws or biases in the economic analyses that Georgia**
14 **Power has presented in its Certification Application or in its responses to**
15 **Staff Data or Hearing Requests?**

16 A. Yes. I have identified a number of flaws and biases in the Company’s economic
17 analyses of Plant Vogtle Units 3 and 4 and alternatives:

18 1. It does not appear that the Company has examined a reasonable range of
19 possible construction costs for Plant Vogtle Units 3 and 4 in its economic
20 analyses -- As noted in Table 1 above, Georgia Power is projecting a much
21 lower cost for Plant Vogtle Units 3 and 4 than other utilities have forecast
22 for their proposed two unit AP 1000 projects. [REDACTED]. It would
23 have been prudent to examine sensitivity scenarios where the cost of Plant
24 Vogtle Units 3 and 4 was comparable to the costs projected by the other
25 utilities that are proposing to build AP 1000 plants.

26 2. It also does not appear that the Company has assumed a reasonable range
27 of possible delays for Plant Vogtle Units 3 and 4 in its economic analyses
28 – the largest delays that the Company [REDACTED]. Given the
29 uncertainties I have discussed, it would have been prudent for the
30 Company to examine scenarios with more extensive regulatory and
31 construction delays.

32 3. Georgia Power Company used very high natural gas prices in its economic
33 analyses.

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1 4. It appears that the Company only allowed the model to choose among
2 coal, gas and natural-gas fired alternatives. The amounts of renewable
3 resources and DSM appear to have been pre-determined and input as set
4 values into the model. Instead, the Company should have allowed the
5 model to select the optimal amounts of renewable resources and DSM,
6 based on cost and availability, that would be included in the lowest cost
7 expansion plans.

8 5. [REDACTED]

9 6. The Company examined too limited a range of possible future CO₂
10 emissions allowance or CO₂ tax prices.

11 **Q. Why it is important to consider reasonable ranges of construction costs and**
12 **in-service dates when examining the economics of proposed supply-side**
13 **alternatives?**

14 A. Risk and uncertainty are inherent in all enterprises. But the risks associated with
15 any options or plans need to be balanced against the expected benefits from each
16 such option or plan.

17 In particular, parties seeking to build new generating facilities and the associated
18 transmission face a host of major uncertainties, including, for example, the
19 expected cost of the facility, future restrictions on emissions of carbon dioxide,
20 and future fuel prices. The risks and uncertainties associated with each of these
21 factors needs to be considered as part of the economic evaluation of whether to
22 pursue the proposed facility or other alternatives.

23 A common way of evaluating power plant construction cost and schedule risks is
24 to conduct a series of sensitivities during modeling that reflect a reasonable range
25 of costs and a reasonable set of potential in-service dates. Unfortunately, I have
26 not seen that Georgia Power has done this although it has examined ranges of
27 natural gas prices and CO₂ prices.

28 **Q. What is the basis for your conclusion that the Company used very high**
29 **natural gas prices in its economic analyses of Plant Vogtle Units 3 and 4?**

30 A. We have compared the Henry Hub natural gas prices used by the Company in its
31 modeling analyses with the NYMEX natural gas futures prices for the years 2009-

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1 2020 as of several different dates in 2008. As can be seen in Table 4, the EVA
2 High, EVA Mid, and SCS '09 forecast natural gas prices are significantly higher
3 than the NYMEX futures prices as of mid-August and mid-November 2008:

4 **Table 4: NYMEX Futures vs. Georgia Power Natural Gas Prices**
5 **(US\$ per million Btu)**

Year	NYMEX as of 8/11/08	NYMEX as of 11/13/08	EVA High	EVA Mid	EVA Low	SCS '09
2012	8.81	7.90	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2013	8.69	7.89				
2014	8.67	7.94				
2015	8.77	8.11				
2016	8.87	8.26				
2017	8.99	8.42				
2018	9.11	8.59				
2019	9.25	8.75				
2020	9.43	8.92				

6
7 [REDACTED]

8 **Q. Please explain what you meant by your conclusion that Georgia Power**
9 **examine too limited a range of possible future CO₂ prices.**

10 A. Yes. Synapse believes that the adoption of a comprehensive federal policy for
11 reducing greenhouse gas emissions is inevitable. We believe further that the
12 range of likely CO₂ emissions allowance prices under such a comprehensive
13 federal policy may be higher than the Company has assumed in its Certification
14 Application. In fact, we have recommended that in resource planning utilities use
15 a range of possible CO₂ emissions allowance prices between \$15/ton and \$45/ton,
16 levelized between 2013 and 2015, in 2007\$. By contrast, Georgia Power's range
17 of future CO₂ prices is only between REACTED.

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1 **Q. Wouldn't the use of higher CO₂ prices improve the relative economics of**
2 **Plant Vogtle Units 3 and 4 relative to natural gas-fired and coal-fired**
3 **capacity?**

4 A. Yes. However, the use of higher CO₂ prices also would improve the relative
5 economics of DSM and renewable resources, as well.

6 **Q. Have there been any significant changes in circumstances that justify a re-**
7 **examination of Georgia Power's need for the capacity from Plant Vogtle**
8 **Units 3 and 4?**

9 A. The entire nation, including the state of Georgia, is in the midst of a financial
10 crisis and an economic recession that is expected to be both long and deep. These
11 crises can be expected to have major impacts on the Company's peak load and
12 energy sales forecasts. Utilities around the nation, including the South, have
13 reported sharp decreases in electricity sales.⁴⁰ For example, Duke Energy
14 Carolinas third-quarter electricity sales were down 4.3 percent for the three month
15 period ending September 30, 2008 from a year earlier.

16 The Commission should withhold granting the Certification requested by Georgia
17 Power until it has had a full opportunity to evaluate the effect of the financial
18 crisis and economic recession.

19 **Q. Has the Company recently revised its capacity and energy needs as a result**
20 **of updates to its energy and peak demand forecast and planned capacity**
21 **additions?**

22 A. Yes. Georgia Power submitted a short two page letter in Docket No. 24505-U on
23 November 3, 2008 that updated its capacity and energy needs. However, no
24 details were provided. [REDACTED]. It is unclear from this letter what
25 adjustment Georgia Power had made to its projected annual peak loads or annual

⁴⁰ For example, see *Surprise Drop in Power Use Delivers Jolt to Utilities*, Wall Street Journal, November 21, 2008 and *Economy Slows Tennessee Valley Authority Sales*, Chattanooga Times Free Press, December 18, 2008.

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1 energy sales figures beyond the stated changes to its ten year compound annual
2 growth rates.

3 **Q. Do these numbers seem to be consistent with what you would expect during a**
4 **deep and long economic recession and a major financial crisis?**

5 A. No. We would expect substantial reductions in forecast energy sales and perhaps
6 peak loads as a result of the reduced industrial and commercial activity outlined in
7 reports such as the Federal Reserve Bank's Beige Book.

8 **Q. Did Georgia Power refuse to provide any information that SACE requested**
9 **concerning its need for the capacity and energy from Plant Vogtle Units 3**
10 **and 4?**

11 A. Yes. SACE asked Georgia Power to provide "any assessments prepared by or for
12 Georgia Power which examined the impact that the current economic slowdown
13 and/or the current financial crises can be expected to have on future peak loads
14 and/or energy sales in the Company's service area or the state of Georgia."⁴¹ The
15 two page November 3, 2008 letter was referenced as the only "response" to that
16 request. No additional information was provided.

17 At the same time, Georgia Power did not provide any of the following
18 information requested by SACE because the Commission Staff had not requested
19 the information in any of its Data Requests:

20 SACE-1.d. Assessments of the potential for Combined Heat and Power within
21 Georgia Power's service territory or in the service territories of any
22 parties to which it sells power.

23 SACE-1.e. Assessments of the potential for renewable resources within
24 Georgia Power's service territory or in the service territories of any
25 parties to which it sells power.

26 SACE-4.b. The evidence, studies, analyses, and assessments that shows that
27 1,900 to 2,200 MW represents the largest amount of demand
28 reduction that will be technically or economically achievable by
29 Georgia Power over the next decade.

⁴¹ Question 9.b. of SACE's First Data Request to Georgia Power Company in Docket No. 27800-U.

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- 1 SACE-9.a. Please state whether the Company considers the current economic
2 slowdown or the current financial crises to be “significant recent
3 developments.”
- 4 SACE-12. The economic forecasts prepared by or for Georgia Power since
5 January 1, 2008.
- 6 SACE-13. The weather-normalized and non-weather normalized energy sales
7 and peak loads experienced by Georgia Power for each year since
8 2000 and the formula(e) used to convert non-weather normalized
9 data into weather-normalized.

10 **Q. What are your conclusions regarding Georgia Power’s request for**
11 **certification to build Plant Vogtle Units 3 and 4?**

12 A. It is reasonable to expect that the construction cost of Plant Vogtle Units 3 and 4
13 may be substantially higher than Georgia Power Company has acknowledged and
14 it may take far longer to license and build the plants than the Company now
15 claims. Moreover, the Company has not demonstrated that Plant Vogtle Units 3
16 and 4 are the preferred option within a reasonable range of possible construction
17 costs, possible regulatory and construction delays, future natural gas prices, and
18 future CO₂ prices. The Company also has not provided persuasive evidence that it
19 still needs the capacity and energy from Plant Vogtle Units 3 and 4 in light of the
20 significantly changed circumstances represented by the ongoing financial crises
21 and economic recession. For these reasons, the Commission should not grant the
22 certificate requested by Georgia Power.

23 It would be more prudent in these uncertain times to avoid a massive multi-billion
24 dollar commitment to a single and extremely expensive generating project.
25 Instead, the Company should adopt more flexible options (such as natural gas and
26 additional DSM and renewable resources) to address any needs it currently
27 anticipates it may have in 2016 and 2017 and to revisit the need for and the
28 relative economics of the proposed Plant Vogtle Units 3 and 4 in the future when
29 other AP 1000 plants have been licensed by the U.S. Nuclear Regulatory
30 Commission (“NRC”) and there is actual construction and operating experience
31 with the currently untested design.

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- 1 **Q. Does this complete your testimony?**
- 2 **A. Yes.**