

EXHIBIT 30

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE SECRETARY

_____)
In the Matter of)
Florida Power & Light Company) Docket No. 52-040 and 52-041
Combined License Application for)
Turkey Point Units 6 & 7)
_____)

DECLARATION OF DR. MARK A. COOPER

I, Dr. Mark A. Cooper, do hereby declare as follows:

1. My name is Dr. Mark A. Cooper. I reside at 504 Highgate Terrace, Silver Spring, Maryland.
2. I have a Ph.D. from Yale University and have been providing economic and policy analysis for energy and telecom for almost thirty years. I have been the Director of Energy and the Director of Research at the Consumer Federation of America for 27 years, although the opinions I express in this testimony are my personal opinions and not those of the Consumer Federation. I am a Fellow at various universities on specific issues, including the Institute for Energy and the Environment at Vermont Law School. I have testified over 100 times before public utility commissions in 44 jurisdictions in the U.S. and Canada on energy and telecommunications issues and about twice as many times before federal agencies and Congress on a variety of issues, including energy and electricity.
3. I have provided expert testimony for the Southern Alliance for Clean Energy (“SACE”) before the Florida Public Service Commission (“FL PSC”) dealing with the early cost recovery for the proposed nuclear reactors at Turkey Point in 2009 and 2010 for the Nuclear Cost Recovery Clause (“NCRC”) dockets. Copies of that testimony, to which I refer in this declaration, are provided as Attachments 1 and 2 respectively. A copy of my resume with energy related activities is included in my 2010 NCRC testimony.
4. I am familiar with the application of Florida Power & Light (“FPL”) for a combined license (the “COL”) for Units 6 & 7. I have reviewed excerpts of the Environmental Report (the “ER”) prepared by FPL in the COL applications to the U.S. Nuclear Regulatory Commission (the “NRC”).
5. I have been asked by SACE to review and give my opinion upon FPL’s analysis in the ER regarding (1) the need for power and demand forecasts, and (2) Demand Side Management (“DSM”) and renewable energy alternatives.

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6. I conclude that the issues raised by contentions 8 and 9 regarding the need for power, demand forecasts, DSM, and renewable energy alternatives are consistent with the issues I raised in the FL PSC proceeding. Additionally, I conclude that (1) the energy forecasting in the ER suffers from the same inadequacies as FPL's forecasting in the FL PSC proceeding, (2) the electricity demand forecast information in the ER is flawed and outdated and (3) there are viable alternatives to nuclear power. Over two years ago the FL PSC approved the Certificate of Need for Units 6 & 7, relying on data that was from 2007 and earlier. The fundamental assumptions on which the FL PSC analysis was based have proven to be far off the mark. Additionally, the process for review at the FL PSC does not include a comprehensive analysis of the full range of alternatives available to the utility. The NRC should not rely on analysis that is out of date, incomplete or erroneous.

7. In support of contention 8.1, in my 2009 Testimony (included as attachment 1), I concluded that the projected load growth on which the Certificate of Need was based did not reflect the new realities that the Turkey Point reactors are likely to face (2009, pp. 8-9). In 2009 I estimated that the decline in load growth would push the need for Units 6 & 7 out by half a decade from the original date. In fact, FPL has moved their in-service date back, hoping demand will pick up (2010, pp. 4-5, 12-14).

Moreover, the analysis FPL placed before the Florida Commission rests on a fundamental contradiction that undermines the justification for the reactors. The assumption of the adoption of Federal environmental policies that put a price on carbon is critical to the FPL's need analysis, but the likelihood that such a policy would come with mandates for greater efficiency and renewables is nowhere reflected in the analysis submitted to the FL PSC. Modeling HR2454, the piece of legislation that has progressed the farthest in Washington, D.C., I estimate that the need for the proposed new reactors would be pushed out by as much as two decades (2009, 16-20; 2010, 17, 24-26).

I have also identified a number of other factors that lead me to conclude that the reactors are not viable in the long-term (2009, pp. 204; 2010, pp. 6-8). The most important of these include natural gas prices (2009, pp. 11-13; 2010, p. 20) and financial risks (2009, pp. 25-30; 2010, 35-41).

8. Regarding contention 8.2, in my 2009 and 2010 Testimony I note that the regulatory review process in Florida is not well integrated or comprehensive. A full range of alternatives is not reviewed and system wide need, resource flexibility and excess capacity are never considered (2009, pp. 33-36; 2010, pp. 35-38, 42).

9. Regarding contention 9, in my 2009 and 2010 Testimony I have noted that efficiency and renewables have not received adequate attention in the analysis of alternatives (2009, pp. 20-22; 2010, pp. 32-34).

10. I am providing this declaration in support of the Petition for Intervention.

I declare under penalty of perjury that the foregoing is true and correct.

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Date: 8/17/10

DECLARANT: Mark Cooper
Executed in Accord with 10 CFR 2.304(d)

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Nuclear Plant Cost)
Recovery Clause)
)
)
_____)

DOCKET NO. 090009-EI
FILED: July 15, 2009

DIRECT TESTIMONY OF DR. MARK COOPER

ON BEHALF OF
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1 **IN RE: NUCLEAR PLANT COST RECOVERY CLAUSE**
2 **BY THE SOUTHERN ALLIANCE FOR CLEAN ENERGY**
3 **FPSC DOCKET NO. 090009-EI**
4 **DIRECT TESTIMONY OF**
5 **DR. MARK COOPER**

6

7 **Introduction and Qualifications**

8 **Q. Please state your name and address.**

9 A. My name is Dr. Mark Cooper. I reside at 504 Highgate Terrace, Silver Spring,
10 Maryland.

11

12 **Q. Briefly describe your qualifications**

13 A. I have a Ph.D. from Yale University and have been providing economic and
14 policy analysis for energy and telecom for almost thirty years. I have been the Director
15 of Energy and the Director of Research at the Consumer Federation of America for 27
16 years, although the opinions I express in this testimony are my personal opinions and not
17 those of the Consumer Federation. I am a Fellow at various universities on specific
18 issues, including the Institute for Energy and the Environment at Vermont Law School.
19 I have testified over 100 times before public utility commissions in 44 jurisdictions in the
20 U.S. and Canada on energy and telecommunications issues and about twice as many
21 times before federal agencies and Congress on a variety of issues, including energy and

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1 electricity. A copy of my resume with energy related activities is attached as Appendix
2 A.

3 **Purpose and Summary of Testimony**

4 **Q. What is the Purpose of your testimony?**

5 A. I have been asked by the Southern Alliance for Clean Energy (“SACE”) to examine
6 the long-term feasibility of Florida Power & Light’s (“FPL”) Turkey Point 6 & 7
7 Reactors (“Turkey Point”) and Progress Energy Florida’s (“PEF” or “Progress”) Levy
8 Nuclear Reactors (“Levy”) (collectively “reactors” or “projects”) as required by F.A.C.
9 Rule 25-6.0423(5)(c)5.

10

11 **Q. Please summarize your findings.**

12 A. I have identified dramatically changed circumstances since affirmative
13 determinations of need were made by this Commission for these reactors and present in
14 my testimony evidence on the current marketplace, regulatory, technological, and
15 financial risks of these reactors proposed for construction in Florida by Progress and FPL.
16 These changed circumstances and resulting risks lead me to conclude that completion of
17 the Turkey Point and Levy reactors is no longer feasible in the long term and that
18 incurring additional costs on these reactors would not be prudent.

19 The decisions by Progress and FPL to build these nuclear reactors were based on four
20 important assumptions that have been called into question in the time since the evidence
21 was filed in their petitions for determination of need (“Need Docket”).

22 (1) They assumed a high rate of demand growth.

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1 (2) They downplayed the contribution that efficiency and renewables can make to
2 meet the need for electricity.

3 (3) They assumed high prices for fossil fuels based on both commodity prices and the
4 belief that public policy would put a high price on carbon.

5 (4) They used a low estimate of the cost of nuclear reactors.

6 The impact of the changed factors on these assumptions that have developed since
7 the Need Docket can be summarized as follows:

8

9 **Market Factors**

10 Declining Demand Eliminates need for large quantity of new generation

11 Falling price of natural gas Makes natural gas more attractive

12 **Regulatory Factors**

13 Efficiency/renewable standards Reduces need for non-renewable generation

14 Carbon cost reduction Makes low carbon resources less attractive

15 **Technological Factors**

16 Nuclear cost uncertainties Raises prospects of cost overruns

17 Growing confidence in Makes alternatives more attractive
18 cost and availability of
19 alternatives

20 **Financial Factors**

21 Tight Financial markets Makes finance more difficult

22 Increasing concerns on Makes finance more expensive
23 Wall Street about
24 Nuclear reactors

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1 Any of these changed factors alone could demonstrate that completion of these
2 reactors is not feasible in the long term. Taken together, these factors thoroughly
3 undermine the case that the companies have tried to make to demonstrate the long-term
4 feasibility of these nuclear reactors at this time. The evidence presented by the
5 companies to the Commission does not take these changed factors fully into account and
6 does not reflect the highly uncertain future that nuclear reactors face.

7 If the Commission were to merely conclude that the changes in conditions make
8 the future highly uncertain, that conclusion alone would argue strongly against continuing
9 with these reactors. In an uncertain environment, the assets a prudent person acquires
10 should be flexible, have short lead times, come in small increments and not involve the
11 sinking of large capital costs. The characteristics of nuclear reactors are the antithesis of
12 those best suited to an uncertain environment. They are large, “lumpy” investments that
13 require extremely long lead times and sink massive amounts of capital. Therefore, it
14 would be imprudent to allow the companies to incur any more expenses or recover those
15 costs from ratepayers at this time because the companies have failed to demonstrate the
16 long-term feasibility of completing the reactors.

17 There are other factors that will be documented by other witnesses that reinforce
18 the conclusion that the reactors are no longer feasible in the long-term, including the
19 failure of some of the projects to obtain regulatory approvals, which were being counted
20 on to stay on schedule and uncertainties and delays in the Nuclear Regulatory
21 Commission (“NRC”) licensing process. While one can point to some positive
22 developments in the policy space, such as the possibility of the creation by the U.S.

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1 Congress of a Clean Energy Development Authority, these are vastly outweighed by the
2 negative developments.

3

4 **Q. How is your testimony organized?**

5 A. First, I set forth how I approach the analysis of the long-term feasibility of these
6 proposed nuclear reactors. Next, I define the conditions that have developed since the
7 Need Dockets that have changed the terrain of nuclear reactors and describe in qualitative
8 terms how these conditions impact the long-term feasibility of the nuclear reactors. Then
9 I provide quantitative evidence to support my conclusions. The bulk of my analysis
10 focuses on the FPL evidence because FPL has presented a recent recalculation of its need
11 analysis. I also raise some concerns that the changes in the economic landscape highlight
12 some aspects of the methodology that FPL has developed specifically to evaluate nuclear
13 reactor economics that may be distorting the picture presented to the Commission.

14 In contrast, Progress has presented little tangible evidence that it is actually
15 conducting any ongoing analysis, other than the statement of its witnesses that they are
16 thinking about the relevant issues. However, all of the concerns raised about the
17 proposed FPL reactors apply with even greater force to the Progress reactors. The case
18 for building reactors was weaker in the case of Progress than FPL. Progress had higher
19 reserve margins, a more diverse fuel mix, and higher costs for the Levy nuclear reactors,
20 because it is a site that does not have an existing reactor. While all of the changes I have
21 discussed in the case of FPL also affect Progress, Progress has suffered a unique setback,
22 having been forced to shift its schedule by 20 months and renegotiate its EPC contract
23 with the vendor.

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1

2 **Q. Are you sponsoring any exhibits to your testimony?**

3 A. Yes, I am sponsoring the following exhibits:

4 MNC-1: Impact Of Declining Demand On Summer Peak Load

5 MNC-2: Natural Gas Wellhead, Henry Hub And Futures Prices

6 MNC-3: Projected Natural Gas Prices Compared To Nymex Futures Prices

7 MNC-4: Projections Of Carbon Compliance Costs

8 MNC-5: Estimates Of Potential Mid-Term Efficiency Savings: By State

9 MNC-6: Estimates Of Costs Of Alternatives To Meet Electricity Needs

10 MNC-7: Impact Of Climate Policy On Peak Load: FPL

11 MNC-8: Impact Of Climate Policy On Peak Load: Progress

12 MNC-9: Estimates Of Nuclear Reactor Overnight, Costs: 2001-2009

13 MNC-10: Nuclear Operators, Reactor Cancellations And Moody's Downgrades

14 MNC-11: Standard And Poor's Credit Profile Considerations

15 MNC-12: Diversity Of Resource Under Various Technology Scenarios

16 MNC-13: The \$1/Kw Cost Factor

17 MNC-14: The Narrow Margin In FPL's Breakeven Analysis

18

19 **ANALYZING THE RISK FACTORS**

20 **Approach**

21 **Q. How do you approach the analysis of the long-term feasibility of the nuclear**
22 **reactors?**

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1 A. The rule adopted by the Commission requires an assessment of the long-term
2 feasibility of the projects. I believe a thorough review of the projects is vital to protect
3 the public interest. In a competitive marketplace firms must constantly review whether
4 their investment decisions continue to be economically viable and justified in light of the
5 changing market, technological, financial and regulatory conditions. For utility services
6 that are offered under franchise monopoly conditions subject to regulatory oversight, the
7 commission is charged with protecting the public from imprudent actions by the utility.
8 It must ensure that utilities exercise the same vigilance with respect to the prudence of
9 their actions as firms in a competitive market.

10 This regular review of the long-term feasibility of a project is particularly
11 important in the case of nuclear reactors, which are, by their nature, extremely vulnerable
12 to these four types of risk. As very large investments that take a long time to construct,
13 and produce large quantities of electricity, they represent a huge quantity of inflexible,
14 sunk costs. These investments are incapable of responding to change. They are
15 inherently “go-no-go” decisions that should be made before costs are incurred. Because
16 of their size and nature, the Commission needs to address the long-term feasibility of the
17 projects before additional, substantial costs have been incurred.

18 The companies are well aware that this proceeding requires an affirmative
19 showing of the long-term feasibility of completing these reactors. FPL has redone its
20 breakeven analysis under new sets of assumptions. Progress states that it is considering a
21 wide range of factors that affect the decision to proceed. However, Progress has
22 presented no “detailed analysis” as required by Rule 25-6.0423(5)(c)5 demonstrating the
23 long-term feasibility of completing the Levy project.

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1 The factors that FPL has reanalyzed are appropriate for a decision on whether
2 these projects should proceed, and these are the factors that the Commission should be
3 looking at as the ultimate arbiter of prudence and long-term feasibility. Exercising this
4 judgment before money is spent is infinitely preferable to arguing about it after the
5 money has been spent. Both companies assert that, having reviewed recent changes in
6 the factors that affect the decision to build these reactors, it is prudent to continue and
7 that the completion of the reactors is feasible. However, the companies' review of the
8 changes now faced by these reactors is cursory and insufficient to justify that conclusion.

9 .

10 **MARKETPLACE CONDITIONS**

11 **Demand**

12 **Q. Have there been changes in the marketplace that affect the long-term**
13 **feasibility of these nuclear reactors?**

14 A. Yes. There has been a dramatic change in the marketplace since the companies
15 prepared their need analyses in the respective need dockets. The nation has plunged into
16 the worst recession since the Great Depression. Some even call it a depression.
17 Moreover, there is a growing recognition that this change is not simply a severe dip in the
18 business cycle, but rather a major shift in the economy. The spending binge on which the
19 U.S. embarked for a decade, in which households and business became highly leveraged,
20 is likely over. A massive amount of household wealth was destroyed when the housing
21 market bubble burst. Retirement accounts have been devastated by the collapse of the
22 stock market.

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1 Ironically, the decade on which the projections were based in the need docket
2 coincided almost exactly with the decade in which the housing and consumption bubbles
3 were pumped up by excessive leverage. That level of growth was unsustainable. It is my
4 opinion that the shift in consumption is permanent and signals slower growth in the
5 future. However, even if this were just a severe downturn in the business cycle, it would
6 affect the demand for electricity sufficiently to raise questions about the long-term
7 feasibility of these new nuclear reactors.

8

9 **FPL**

10 **Q. Is there evidence that load growth has changed in the FPL service territory?**

11 A. Yes there is strong evidence of a dramatic reduction in consumption that
12 should sharply reduce projected load growth. FPL provides sufficient detail to examine
13 closely the problem of excess capacity created by the nuclear reactors, as shown in
14 Exhibit MNC-1, page 1. The reduction in peak demand between the 2008 and 2009
15 feasibility analysis is striking. In 2017, which is a crucial year in the 2008 analysis
16 because that was the year the reserve margin hit the limit of 20 percent, the 2009-
17 projected peak is 11 percent lower than the peak projected in 2008. Under the 2009
18 projection, the FPL does not reach the 2017 peak projected in 2008 until 2022, five years
19 later. By 2040, the projected peak is 20 percent lower.

20

21 **Q. Is this dramatic shift in demand fully reflected in the 2009 Economic**
22 **Analysis?**

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1 A. With a dramatic decline in demand, averaging between 10 and 11 percent in the
2 decade between 2010 and 2020, all else equal, one would expect to see an equally
3 dramatic increase in FPL's reserve margins. That is not the case. With a drop in the
4 summer peak of more than 10 percent in 2017, FPL shows only a 1 percent increase in
5 reserve margin. In order to achieve that level, it must use the flexibility of natural gas
6 plants to react to the decline of projected peak demand. Comparing Schedule 8 in the
7 2008 and 2009 10-year plans, we can see natural gas plants moved back a year or two,
8 reduction of inactive reserves and elimination of some additions altogether, while making
9 room for the Turkey Point reactors. Thus in contrast to the ten year time horizon needed
10 for nuclear reactors, the short time frame for deploying gas alternatives is much more
11 flexible for dealing with the uncertainties in demand.

12

13 **Progress Energy**

14 **Q. Is the Progress demand projection similar to that of FPL?**

15 A. The demand reduction projected by Progress is substantial, but much lower than
16 that projected by FPL, as shown in Exhibit MNC-1, page 2. From the peak in 2007 to the
17 trough in 2010, Progress shows a 2.5 percent decline in peak, compared to FPL, which
18 shows a 6.2 percent decline. FPL assumes a more vigorous growth of peak from 2010
19 forward, but the depth of the decline in the recession still leaves it with a projected peaks
20 in 2017 that is almost 10 percent lower than in the 2008 10-yr plan. For Progress, the
21 reduction in the projected peak for 2017 is only about 2.6 percent lower.

22 To put these declines in demand into perspective, I note that taken together, the
23 reduction in projected peak summer demand between the 2008 and 2009 10-year plans is

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1 almost 3500 MW, which exceeds the combined capacity of three of the four reactors.
2 Since these utilities represent just under three quarters of the total statewide peak summer
3 demand, and assuming the other utilities in the state have suffered similar reductions in
4 demand, the lowering of the peak statewide in the past year would exceed the capacity of
5 all four plants being considered in this docket.

6 There are two important implications from this change in demand. First, a lack of
7 demand can undermine the long-term feasibility of the reactor. This played a critical role
8 in the cancellation and abandonment of nuclear reactors in the 1970s and 1980s. Back
9 then, it was oil price shocks and rate shock that undermined demand. Today it is the
10 great recession and, as I describe below, climate policy, that can undermine demand, but
11 the historical experience teaches us that inadequate demand can definitely render nuclear
12 reactors infeasible in the long term. Second, hoping to sell pieces of the plant – either
13 with off system sales at wholesale or equity stakes – in an attempt to salvage failing
14 economics brought on by declining demand may not be feasible with a state-wide
15 reduction in demand.

16

17 **NATURAL GAS PRICES**

18 **Q. Are there other market changes that the Commission should consider?**

19 A. Yes, the price of gas, which plays a central role in Florida, bears close scrutiny.
20 Natural gas was the best alternative to nuclear in the economic analysis of the FPL Need
21 Docket, and FPL has focused on gas in this proceeding. In that Need Docket analysis,
22 the variable cost of gas accounts for 90 percent of the difference between the nuclear

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1 scenario and the gas scenario, and the cost of natural gas is the single largest determinant
2 of the variable cost by far.

3 In this proceeding, FPL concludes that the prospects for nuclear reactors have
4 actually brightened because of rising fossil prices – both commodity prices and carbon
5 compliance costs. “The primary reasons for the projected general increase in the
6 economic advantage of the Turkey Point 6 & 7 project, compared to the 2007 Need
7 Determination filing, are: (i) currently projected higher natural gas costs, particularly in
8 the early years; and (ii) higher projected environmental compliance costs.” (Florida
9 Power & Light Company, Docket No. 0900009-EI, Responses to Staff’s Second Set of
10 Interrogatories, Interrogatory No. 45, page 1 of 1).

11 This conclusion does not comport with the emerging reality. As shown in Exhibit
12 MNC-2, page 1, the price of natural gas has not only tumbled, but it has separated from
13 the price of oil. There are a number of reasons that natural gas might not continue to
14 track oil as closely in the future as it has in the past. It is much more of a regional market
15 than oil. There is increasing optimism about natural gas resources. There are efficiency
16 programs targeted at natural gas consumption in the climate change legislation moving
17 through Congress, which may free up supply and put downward pressures on price.
18 Finally, there is considerable evidence that a significant part of the volatility in the
19 natural gas market over the past decade was caused by excessive speculation brought on
20 by excessive deregulation. The rise in prices and volatility was coincident with the
21 creation of what is known as the Enron loophole and the entry of index traders into the
22 market. There are strong regulatory and legislative measures being put into place to

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1 prevent excessive speculation from again afflicting energy markets. In short, the past
2 decade should be the exception, rather than the rule in natural gas markets.

3

4 **FPL**

5 **Q. Please provide empirical evidence to support your concerns about the**
6 **natural gas projections employed by FPL.**

7 A. The evidence relies on futures prices. As shown in Exhibit MNC-2, page 2, the
8 Henry Hub futures price, which is the standard base for natural gas pricing, is a near
9 perfect predictor of natural gas wellhead prices. As shown in Exhibit MNC-2, page 3, the
10 Henry Hub price is a near perfect predictor of Florida prices for gas for electric utilities.

11 Exhibit MNC-3, page 1 shows that the dramatic change in natural gas prices is not
12 reflected in the FPL's analysis. The price of natural gas shown in FPL's "Key
13 Assumption" analysis, is a cross between the mid and the high estimates from the Need
14 Docket. These very high price projections stand in sharp contrast to the prices that
15 prevail in the natural gas futures market. Exhibit MNC-3-page 1 shows the August
16 futures price for Nymex Henry Hub natural gas, in years matching those used in the need
17 docket. On average, the natural gas price in the "Key Assumption" page is about 50
18 percent higher than the Nymex price.

19 Needless to say, overestimating the single most important factor in the economic
20 analysis can have a huge impact on the economic calculation made by the company.
21 The Nymex futures prices are a lot closer to the low gas cost scenario from the FPL 2007
22 Need Docket than they are to the "Key Assumptions" prices used by the company in this

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1 feasibility assessment. In the Need Docket, two of the three nuclear cost scenarios had
2 higher overnight costs than the break even capital cost point in the low gas case.

3

4 **PROGRESS ENERGY**

5 **Q. Do Progress Energy's natural gas prices raise similar concerns?**

6 A. Yes. The assumed natural gas prices used by Progress suggest a dramatic shift in
7 the relationship between the price of natural gas for utilities in Florida and the futures
8 price of gas, as shown in Exhibit MNC-3, page 2. For most of the past decade, the price
9 of gas for electric utilities in Florida tracked the futures price closely, but in the past three
10 years the gap between Florida utility gas prices and futures prices grew, then declined.
11 Compared to Nymex futures prices, the natural gas prices used by Progress suggest a gap
12 between Florida prices and futures prices of \$2 to 3\$ per mmbtu greater than the
13 historical pattern. The differences represent 20 to 30 percent of the assumed price.

14

15 **Q. Did the low gas cost scenario also have low environmental costs?**

16 A. Yes it did and I will examine the issue of compliance cost in the analysis of
17 regulatory conditions.

18

19 **REGULATORY CONDITIONS**

20 **Q. Should regulatory conditions enter into the Commission's evaluation of the**
21 **long-term feasibility of these reactors?**

22 A. Yes. The companies' Need Docket analyses were driven by assumptions about
23 federal regulatory policy. The companies have put a high price on carbon in their

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1 economic analyses. Without the high price on carbon, the economics of nuclear reactors
2 would look very different. To my knowledge, the state of Florida has not put a price on
3 carbon, nor is it contemplating doing so. Thus, the companies have decided to pursue
4 these projects and the Commission has allowed cost recovery based, in part, on
5 assumptions about federal climate change policy.

6

7 **Q. Are you suggesting that the Commission should not take future climate**
8 **change policy into account when considering the long-term feasibility of these**
9 **reactors?**

10 A. Quite the contrary. I believe the Commission should take federal policy into
11 account when considering the long-term feasibility of these reactors, since that is a major
12 source of regulatory risk to state decisions. However, I believe the Commission must
13 take the entirety of federal policy into account. The prospect of federal climate change
14 legislation is growing. The idea of putting a price on carbon is only a part of the
15 legislation that is moving through the Congress. H.R. 2454, the American Clean Energy
16 and Security Act, the first piece of climate change policy legislation to pass a house of
17 Congress, does not simply put a price on carbon directly. Rather, it establishes an
18 elaborate scheme of allowances to emit carbon, which will indirectly set a price on
19 carbon. Moreover, policies other than putting a price on carbon, particularly policies to
20 promote efficiency and renewables, play a large role as well.

21

22 **Q. Please describe the full suite of federal policies that affect the long-term**
23 **feasibility of these nuclear reactors.**

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1 A. On the supply-side, the legislation has a renewable energy standard that would
2 require utilities to meet an increasing part of their load with renewables. Within a
3 decade, they would be required to get 20 percent of their generation from renewables,
4 with as much as 8 percent of that total coming from efficiency. At the same time, the
5 legislation includes a number of provisions that have sharply lowered projections of the
6 cost of carbon credits, such as efficiency and renewable mandates, subsidies for carbon
7 control technologies and domestic and international offsets. All of these lower the
8 demand for allowances and therefore the price. This means that the assumed compliance
9 costs of fossil fuels are lower than projected by the companies in prior proceedings and
10 this proceeding.

11 On the demand side, there is a substantial mandate for energy efficiency. This is
12 embodied, in part, in the ability to meet 40 percent of the renewable resource standard
13 with efficiency and, in part, in dramatic improvements in building codes and appliance
14 standards. Mandates to improve the energy efficiency of new buildings by 30 percent in
15 the near term and 50 percent in the longer term will have a substantial impact on energy
16 demand over the life of the reactors being considered in this proceeding. Funds from
17 certain allowances are set-aside to improved efficiency, particularly for natural gas.
18 Similarly, the American Recovery and Reinvestment Act of 2009 includes a huge
19 increase in funding to improve the energy efficiency of existing buildings. As the
20 efficiency of buildings and appliances improves, the demand for electricity and natural
21 gas declines.

22 These regulatory factors – increased renewables, lower demand through
23 efficiency, and a lower price on carbon – must be considered in the evaluation of

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1 alternative scenarios for future supply of electricity. Extracting only the price of carbon
2 from the policy landscape and inserting it in the economic analysis, while ignoring the
3 other aspects of policy, distorts the picture being presented to the Commission. These
4 other policies would further undercut the claim that nuclear reactors are feasible in the
5 long-term. Many of these other aspects have been part of the climate change policy
6 debate for quite some time. Taken together, these changes on the demand side, as well as
7 the renewable standard, will have a substantial impact on the need for new non-renewable
8 generation and undermine the long-term feasibility of building these reactors.

9

10 **FPL**

11 **Q. Would the cost of compliance of fossil fuels be affected as a result of these**
12 **policies?**

13 A. One would expect that it would. Decreasing demand for allowances due to the
14 efficiency and renewable policies and access to low cost offsets would depress the price.
15 In its “Key Assumptions” FPL has increased the price of carbon compliance above the
16 highest level from the 2007 analysis. As Exhibit MNC-4, page 1 shows, the long run
17 price under all the environmental scenarios has more than doubled. As Exhibit MNC-4,
18 page 2 shows, the “Key Assumption price” is roughly equal to the Env II price. In 2040
19 the price is almost 50 percent higher than the EPA estimate of carbon costs in the wake of
20 HR 2454. Over the 25-year period, the key assumption price on carbon is over 35
21 percent higher than the EPA price. In fact, the EPA prices are close to the Env I price.

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1 **Progress**

2 **Q. Does the compliance cost assumption of Progress suffer from similar**
3 **problems?**

4 A. Yes. As shown in Exhibit MNC-4, page 3, the EPA compliance costs associated
5 with HR 2454 are slightly lower than those listed in the Progress prudency filing. The
6 high cost scenarios are way above the most recent projections. Focusing attention on the
7 low range of estimates dramatically alters the perspective the Commission should take on
8 the proposed reactors. In the case of Progress, the reactors were as likely to fail the
9 economic test as pass it with carbon compliance costs in the low range.

10

11 **Q. Would the cost of natural gas be affected by the suite of federal policies?**

12 A. Yes. The EPA analysis indicates a 20 percent reduction in the cost of gas in 2025.
13 The delivered cost of gas for electricity in 2025 is lower than the Henry Hub futures price
14 in 2021.

15

16 **TECHNOLOGICAL CONDITIONS**

17 **Efficiency and Renewables**

18 **Q. Should changing technological conditions factor into the analysis of the long-**
19 **term feasibility of these reactors?**

20 A. Yes. While climate policy is seen as giving a direct advantage to reactors by
21 putting a price on carbon, that policy does much the same for other technologies. In fact,
22 there are ways in which the alternative technologies are likely to receive an even larger
23 boost. There are also many programs targeted at various technologies that are in earlier

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1 stages of development that may enjoy larger cost reductions as the science advances and
2 the scale of production ramps up.

3 I believe there are three technological developments that are shifting the terrain in
4 ways that disfavor nuclear reactors – the availability and cost of conserved energy, the
5 availability and cost of renewables, and the availability and cost of nuclear reactors.

6

7 **Q. Please describe the emerging terrain for efficiency technologies.**

8 A. There is a growing consensus that the cost of many alternatives is lower than that
9 of nuclear reactors. For efficiency, the change in the terrain is largely a matter of
10 increasing confidence that substantial increases in efficiency are achievable at relatively
11 low cost. The detailed analysis of potential measures and the success of some states at
12 reducing demand through energy policies have increased the confidence that efficiency is
13 a reliable option for meeting future needs for electricity by lowering demand, as shown in
14 Exhibit MNC-5.

15 I believe that the technology of efficiency has come into much sharper focus in
16 the past year. Numerous studies of the potential for and cost of improvements in
17 efficiency in the residential, commercial and industrial sectors have shown that large
18 quantities of energy can be saved at relatively low cost, as summarized in Exhibit MNC-
19 5. One study was done specifically for Florida, which found that aggressive policies to
20 reduce energy consumption could lower demand by 20 percent at a cost of less than 3.5
21 cents per kWh.

22 Thus, independently of any regulatory mandate, as the technology of efficiency is
23 proven out, the Commission should consider greater reliance on it as part of the least cost

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1 approach to meeting the need for electricity. The combination of regulatory and
2 technological changes will drive efficiency into the electricity sector, undermining the
3 long-term feasibility of the reactors.

4

5 **Q. Please describe the emerging terrain of renewables.**

6 A. The concern with climate change has sharpened the focus on the cost and
7 availability of renewable technologies. For renewables, the change is in strong cost
8 reductions that are expected as new technologies ramp up production. As shown in
9 Exhibit MNC-6, paged 1 and 2, in half a dozen studies the cost of alternatives that
10 included renewables and/or efficiency, every analyst found several non-fossil resources
11 less costly than nuclear.

12 The only two technologies on which there is a wide difference of opinion about
13 cost are solar photovoltaics and nuclear, as shown in Exhibit MNC-6, page 3. The other
14 technologies included in recent studies there is much better agreement. The combination
15 of regulatory and technological changes will drive renewables into the electricity sector,
16 undermining the long-term feasibility of the reactors.

17

18 **Q. How do the regulatory and technology changes alter the context for assessing**
19 **the long-term feasibility of these reactors?**

20 A. They dramatically alter the context. HR 2454 intends to lower demand for
21 nonrenewable generation resources. It could do so significantly. The renewable energy
22 standard (“RES”) builds to 20 percent by 2022. Improvements in the building codes start
23 quickly with a 30 percent reduction in consumption from new buildings by 2010 and

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1 build to a 50 percent reduction by 2014 for residential building and 2015 for commercial
2 buildings. Additional improvements of 5 percent are called for every three years after
3 2017/2018. Revenue for retrofitting of existing buildings would begin when the
4 allowances go into force. Appliance efficiency standards will unfold over time. Studies
5 by the American Council for an Energy Efficient Economy suggest that the building
6 codes, appliance standards and retrofitting of existing buildings could lower demand by
7 as much as 7 percent. The renewable energy standard would be on top of the building
8 code, appliance standards and retrofit impacts, pushing the theoretical total reduction of
9 demand for nonrenewable generation past 25 percent, but there are a number of
10 mechanisms that would lower that impact. In particular, states that cannot or choose not
11 to expand renewables can make alternative compliance payments of \$25 per MWh to
12 states that exceed the combined efficiency renewable energy standard.

13 On a national average basis, the EPA projects a 10 percent reduction in demand
14 and growth in renewables equal to 1.1 percent of demand.¹ An earlier analysis suggests
15 the weatherization program in the American Recovery and Reinvestment Act would
16 lower demand by 1.4 percent.² The impact varies from state-to-state, however. The
17 American Council for an Energy Efficient Economy estimated the impact of the
18 improvement in building codes and appliance standards in Florida would be 20 percent

¹ EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress, 6/23/09, p. 26

² Contrast EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress, 6/23/09, p. 26, with EPA Preliminary Analysis of the Waxman Markey Discussion Draft: American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress, 4/20/09, p. 23. the former includes the effect of the ARRA in the reference case, the latter does not. I attribute the difference to the ARRA

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1 above the national average.³ In a state where so much efficiency is available at less than
2 2.5 cents per KWh, it would make sense to petition for the maximum efficiency
3 contribution to the RES (8 percent) and develop as much renewable energy as is
4 economic, before sending money to California, Washington, Minnesota and
5 Massachusetts. Combining these factors, a reasonable range for the impact on Florida
6 would be a 10 to 20 percent reduction in the demand for non-renewable generation.⁴

7

8 **FPL**

9 **Q. What impact does including the efficiency and renewable policies in HR 2454**
10 **have on FPL's projections for load growth and demand for nonrenewable resources**
11 **such as nuclear reactors?**

12 A. They would have a major impact. The 20 percent scenario is described in Exhibit
13 MNC-7, page 1. Under this scenario, FPL does not reach the peak for 2017 projected in
14 the Need Docket until 2036. Exhibit MNC-7, page 2 presents the 10 percent scenario,
15 and under this scenario, FPL does not reach the peak projected in the Need docket for
16 2017 until 2028. The combination of the great recession and H.R 2454 climate policy
17 extends the decision horizon by one to two decades. In an uncertain environment, that is
18 a lot of breathing room. Utilities should be managing their resources to accommodate this

³ Energy Savings from Codes and Standards Count Towards EERS Savings Goals, available at
<http://www.aceee.org/energy/national/EERSscsavings.pdf>

⁴ The American Council for and Energy Efficient Economy puts the savings from Title I and Title II of HR2454 at 5.4 quads in 2020 and 12.2 quads in 2030. These savings work out to 12.2 percent of the energy consumed in the electricity sector and in 2020 and 25.6 percent of the energy consumed in 2030 (see HR. 2454 Addresses Climate Change Through a Wide Variety of Energy Efficiency Measures, available at http://www.aceee.org/energy/national/HR2454_Estimate06-01.pdf)

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1 shift and the first thing they should do is take the least flexible projects out of the queue,
2 such as new nuclear reactors.

3

4 **Progress**

5 **Q. What is the impact of including the efficiency and renewables scenarios on**
6 **Progress Energy's load growth and demand for nonrenewable resources?**

7 A. It is in the same direction, but smaller because the company assumes a
8 smaller near term impact of the recession on the growth of demand, as shown in Exhibit
9 MNC-8. The peak load for 2017 projected in the 2008 10-year plan does not occur until
10 2034 under the 20 percent scenario (Exhibit MNC-8, page 1) and 2026 under the 10
11 percent scenario (Exhibit MNC-8, page 2). Moreover, the 2017 peak has considerable
12 excess capacity above the reserve margin requirement of 20 percent, which adds several
13 years to a projection of when generation resources become constrained.

14

15 **Q Do the analyses presented to the Commission by the companies reflect these**
16 **developments?**

17 A. It does not appear to. The demand projections appear to reflect the effects of the
18 "great recession" to differing degrees, but not the aggressive efficiency policy embodied
19 in the legislation that passed the House of Representatives. There is no hint of a
20 renewable energy standard of 12 to 20 percent.

21

22 **NUCLEAR REACTOR COSTS**

23 **Q. Please describe the uncertainties about the cost of nuclear reactors.**

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1 A. For nuclear reactor costs, the evidence on technology points in the opposite
2 direction. Early in this decade vendors and contractors at the Department of Energy
3 produced very low estimates of the cost of nuclear reactors, claiming that things have
4 changed since the first generation of reactors. In the eight years since those initial,
5 promotional studies were released, the estimate of the cost of nuclear reactors has
6 increased dramatically, especially among Wall Street and independent analysts. As long
7 as the costs placed before the Commission are “non-binding,” the Commission must be
8 aware of the growing uncertainty about the cost of nuclear reactors. As long as they are
9 “non-binding,” the prospect of cost escalation places ratepayers at risk, especially where
10 costs for construction work in progress is being granted.

11 In fact, the extreme uncertainty about nuclear reactor costs has caused FPL to
12 create a whole new framework for evaluating options. As FPL put it in the Need Docket:

13 The second difference in the economic analysis approach step that
14 developed the CPVRR costs for the resource plans is that no generation or
15 transmission capital costs associated with Turkey Point 6 & 7 were
16 included in the analysis. The reason for this is that *FPL does not believe it*
17 *is currently possible to develop a precise projection of the capital cost*
18 *associated with new nuclear units with in-service dates of 2018-on.*

19 Consequently, FPL’s economic analysis approach normally used to
20 evaluate generation options has been modified to include a second
21 economic analysis step.” (“Need Study for Electrical Power, Docket No.
22 07-0650-EI, Florida Power and Light Company, October 16, 2007, pp.
23 104-105, emphasis added).

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1 In the 21 months since that statement was made, there have been dozens of
2 studies of the projected costs of nuclear reactors. The cost in 2008 \$ have ranged from a
3 low of just under \$2400/kW to a high of just over \$10,000/kW, as shown in Exhibit
4 MNC-9.

5 As described in the FPL need study, FPL's cost estimate was derived from an
6 early low estimate for a different type of reactor and its current estimates remain in the
7 low range of projections. Each of FPL's estimates (low, middle and high) is in the
8 bottom quarter of the comparable estimates. The wide range of cost scenarios considered
9 within each of the studies attests to the uncertainty that afflicts all of the studies and to
10 which FPL has testified.

11 The two conclusions I would draw from this analysis are (1) the range of costs
12 considered by FPL is narrow and too low and (2) the uncertainty is huge. This only
13 reinforces my opinion that the prudent course would be to avoid rigid, expensive choices,
14 especially if there is time to let the uncertainties diminish before decisions must be made.

15

16 **FINANCIAL CONDITIONS**

17 **Q. What financial factors are affecting the long-term feasibility of these**
18 **reactors?**

19 A. There are two categories of factors – the general financial environment and the
20 specific plant finance. The general environment for raising large sums of money has
21 clearly deteriorated. Money is tight. How long that will last and the nature of the long-
22 term environment remains to be seen.

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1 In a sense, the marketplace, regulatory and technological risks combine with the
2 nature of nuclear reactors to create the severe financial risk that nuclear reactors face.
3 The financing of the construction of large nuclear reactors has also come under greater
4 scrutiny by Wall Street.

5 A recent special comment by Moody's underscores the challenges that these huge
6 projects pose. Moody's identifies the developments in the project and regulatory areas
7 that are positives for nuclear reactor construction, but still concludes that the negatives
8 are a great concern and declares that it "is considering taking a more negative view for
9 those issuers seeking to build new nuclear power plants" (p. 1) because "We view nuclear
10 generation plans as a "bet the farm" endeavor for most companies, due to the size of the
11 investment and length of time needed to build a nuclear power facility." (p. 4).

12 Moody's goes on to outline the complex factors affecting nuclear reactor
13 construction and operation.

14 Project risks are somewhat more clear today than during the last build
15 cycle, in the 1970s, since we now have a track record that measures
16 nuclear power's operating performance; strong plant economics due to
17 low fuel cost; proven efficient and safe operating capabilities; new and
18 refined regulatory procedures; and more certainty over reactor designs
19 before construction begins. (p. 2)

20 Much has changed since the last major nuclear-generation construction
21 cycle (1965-1995). The industry has learned from experience, including
22 up-front regulatory oversight of development and investment; streamlined

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1 federal NRC approval procedures; and enhanced construction cycles and
2 techniques.

3 In addition, new environmental regulations, specifically those aimed at
4 reducing carbon dioxide emissions; appear well positioned for near-term
5 implementation. These environmental developments should otherwise
6 bolster the case for new nuclear generation, as it is viewed as one of the
7 only large-scale generation technology with a no-carbon footprint. (p. 7)

8 On the other side, there are a host of issues and challenges in Moody's view that
9 weigh in the opposite direction. In each of the important areas of risk, uncertainties and
10 challenges abound.

11 The inherent nature of the projects continues to be a challenge and creates
12 marketplace and technological risk.

13 The sheer size, cost and complexity of new nuclear construction projects
14 will increase a utility's or power company's business and operating risk
15 profile, leading to downward rating pressure. The length of a nuclear
16 construction effort also entails lengthy regulatory reviews and potential
17 delays in recovering investments, changing market conditions, shifting
18 political and policy agendas, and technological developments on both the
19 supply and demand side. (p. 5)

20 Notwithstanding the fact that public policy has created favorable conditions for
21 reactor construction in some aspects of regulation, there are other aspects that pose
22 continued risk at in both execution risk and regulatory risk.

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1 While a constructive regulatory relationship will help mitigate near-term
2 credit pressures, we will remain on guard for potential construction delays
3 and cost overruns that could lead to future rate shock and/or disallowances
4 of cost recovery. Given the lengthy construction time needed for nuclear
5 projects, there is no guarantee that tomorrow’s regulatory, political, or fuel
6 environments will be as supportive to nuclear power as today’s. (p. 7)
7 Less clear today is the effect that energy efficiency programs and national
8 renewable standards might have on the demand for new nuclear
9 generation. National energy policy has also begun eyeing lower carbon
10 emissions as a key desire for energy production—theoretically a huge
11 benefit for new nuclear generation—but the price tags associated with
12 these development efforts are daunting, especially in light of today’s
13 economic turmoil. It isn’t clear what effect such shifts, or changes in
14 technology, will have for new nuclear power facilities. (p. 2)

15 The result of these market, regulatory and technological uncertainties and risks is
16 to create financial pressure on projects, pressures that are reflected by project specific
17 concerns and the general turmoil in the credit markets.

18 Given these long-term risks, a company’s financial policy becomes
19 especially critical to its overall credit profile during construction. In
20 general, we believe a company should prepare for the higher risk
21 associated with construction by maintaining, if not strengthening, its
22 balance sheet, and by maintaining robust levels of available liquidity
23 capacity. (p. 5)

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1 Credit conditions are yet another question. Few, if any, of the issuers
2 aspiring to build new nuclear power have meaningfully strengthened their
3 balance sheets, and for several companies, key financial credit ratios have
4 actually declined. Moreover, recent broad market turmoil calls into
5 question whether new liquidity is even available to support such capital-
6 intensive projects. (p. 2)

7 Moody's continues to see execution risk in these projects and points to the history
8 of the financial difficulties that utilities building reactors in the 1970s and 1980s as
9 instructive for evaluating current projects.

10 Moody's is considering applying a more negative view for issuers that are
11 actively pursuing new nuclear generation. History gives us reason to be
12 concerned about possible significant balance-sheet challenges, the lack of
13 tangible efforts today to defend the existing ratings, and the substantial
14 execution risk involved in building new nuclear power facilities. (p. 2)

15 **Q. Do these concerns apply to the nuclear reactors proposed by FPL and**
16 **Progress?**

17 A. Yes. As I have shown above these marketplace, regulatory and technology risks
18 weigh heavily on the proposed Florida reactors. The execution risk remains a serious
19 concern as well. In the case of Florida, where both of these reactors before the
20 commission are still awaiting approval for the 16th and 17th revision in its "standard"
21 design, where the NRC has determined that one utility could not proceed under a Limited
22 Work Authorization ("LWA") and therefore has been forced to delay the project and
23 renegotiate its EPC contract, paying fees just to stand in line, and where the developer of

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1 the prototype has shelved its plans to make its project the “model,” Moody’s concerns
2 seem well founded and the assumption that execution risk has been solved deserves to be
3 questioned.

4 The downgrades of utility ratings cut to the heart of the problems encountered by
5 the industry during “the last major nuclear-generation construction cycle (1965-1995).”
6 As shown in Exhibit MNC-10, I have identified 68 firms that engaged in the construction
7 or operation of nuclear reactors in the U.S. Of those 68 firms, three quarters endured
8 cancellation of at least one plant and half suffered a ratings downgrade. Both of the
9 utilities involved in this proceeding suffered downgrades. Cancellations are the ultimate
10 proof of that reactors can become infeasible and financial risk plays a key role in
11 triggering the cancellation.

12 Moody’s is not the only Wall Street firm to recognize the challenges facing
13 nuclear reactors, as shown in Exhibit MNC-11. Even at a promotional conference,
14 Standard and Poor’s noted that “challenges for the industry participants abound” (p. 18).
15 Even recognizing that there are positive aspects of the current environment, as Moody’s
16 did, Standard and Poor’s identifies more aspects of the current situation that are negative.
17 Interestingly, even with a loan guarantee, Standard and Poor’s sees significant financial
18 issues. The utilities proposing the reactors in Florida are not on the list for the first round
19 of loan guarantees, so the challenges facing these projects are even greater.

20 Thus, the Commission needs to be sensitive to the potential financial risks of
21 these plants. Credit downgrades raise the cost of capital and can have a significant impact
22 on the cost of electricity and undermine not only the long-term feasibility of the reactors,
23 but also the viability of the utility.

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1 Let me stress again that the importance of uncertainty is a key fact for the
2 Commission to take into account and the importance of demand projections. One of the
3 key factors contributing to the bust of the nuclear boom of the 1970s was the inability or
4 unwillingness of utilities that had become committed to nuclear construction to cope with
5 reduced demand growth. The oil price shocks of the 1970s and the rate shock of the
6 1980s destroyed the demand that the nuclear reactors were intended to supply.

7 Today we have a similar demand shock created by the great recession and the
8 pending climate change policy. It is highly unlikely that demand will reach the levels
9 predicted in the Need Dockets for decades. Between the two utilities, FPL and Progress
10 have lowered their projection of peak demand for 2017 by almost 3700 MW. That is
11 equivalent to the capacity of three of the four units they are planning to build. Climate
12 change policy could reduce the need for nonrenewable capacity by another 3300 to 6600
13 MW in their service territories in the next two decades. The chance that Florida will
14 actually need these four reactors should climate change legislation be enacted along the
15 line of HR 2454 is virtually zero. If climate change legislation were not enacted now or
16 in the future, the carbon compliance prices assumed by the companies would not come to
17 pass. In that case, the reactors could not be justified on economic grounds. Either way,
18 these reactors are not feasible in the long-term.

19

20 **DIVERSITY**

21 **Q. Do the other goals the Florida legislature has set for the electricity sector**
22 **alter your conclusion?**

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1 A. Not at all. The goal of promoting diversity of resources to lower vulnerability to a
2 variety of threats argues for efficiency and renewables just as much as nuclear.
3 Efficiency is the most reliable form of meeting needs because it is always on. Lowering
4 demand lowers the reliance on all other forms of energy. Renewables also provide
5 diversity.

6 To evaluate the effect of alternatives on the diversity of sources, I have calculated
7 an index known as the HHI index. The index is used frequently in economics to evaluate
8 the concentration of markets. In fact, the Merger Guidelines of the Department of Justice
9 and the Federal Trade Commission are written in terms of the HHI. The index is
10 calculated by taking the share of each entity making up the market (in this case the share
11 of the resource in the total) squaring it, summing the squares and multiplying by 10,000
12 to clear the fraction. A monopoly or utility reliant on a single source would have an HHI
13 of 10,000 $[(1 * 1) * 10,000]$.

14 Exhibit MNC-12 shows the HHI for three scenarios for both FPL and Progress. It
15 has the nuclear and gas scenarios from the Need Docket and contrasts this to an
16 efficiency and renewables scenario in which HR 2454 induced efficiency and renewables
17 are at 15 percent (half way between the 10 and 20 percent scenarios discussed above).
18 Efficiency is assumed to be 12 percent of the total resource, while incremental
19 renewables are set at 3 percent. In both cases, the efficiency and renewable mix is more
20 diverse than either the nuclear or the gas scenarios, when one counts efficiency as a
21 “resource.”

22

23 **ECONOMIC ANALYSIS**

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1 **FPL's Breakeven Analysis**

2 **Q. Is the breakeven analysis the common approach to making the comparison**

3 **between alternatives?**

4

5 A. No. Because FPL is unsure of the cost of nuclear reactors it has created a new

6 methodology to evaluate one option, whether or not to build nuclear reactors.

7 The typical methodology is a levelized cost comparison of the different alternatives.

8

9 **Q. Are there aspects of the break-even analysis that bear close scrutiny in light**
10 **of the changed conditions you have identified?**

11 A. Yes there are several aspects. At a general level, the breakeven analysis

12 improperly narrows the scope of the review. Generally, analysts calculate the projected

13 cost per kilowatt-hour. Each alternative would be considered on its merits. In the

14 breakeven analysis, FPL compares two or three large-scale alternatives. It does not ask

15 whether other alternatives would be less costly.

16 More specifically, there are two aspects of the breakeven framework that FPL has

17 developed which should be examined carefully in light of the changing conditions I have

18 identified. These aspects are escalation and excess capacity.

19

20 **Q. Please describe your concerns about escalation.**

21 A. The wide variation in the projected costs of power from nuclear reactors stems

22 from a difference of opinion over the overnight costs and escalation of construction costs.

23 In the FPL analysis cost escalation is equal to one-quarter of the overnight costs and it is

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1 treated separately from overnight costs. FPL assumes a zero real cost escalation. That is,
2 the rate of increase in the cost of construction equals the rate of inflation. Many other
3 studies assume significant, real cost escalation.

4 FPL calculated a fixed cost recovery factor, which is the cumulative present value
5 of the revenue requirement per \$1/kW of overnight capacity (the \$1/kW factor). It is not
6 clear to me how the escalation of construction costs is included in the calculation of the
7 revenue requirement. It could have been embedded in the stream of costs as a percentage
8 of the construction cost. If one wants to test an alternative escalation rate, one would
9 have to modify the calculation of the \$1/kW recovery factor. The \$1/kW factor has
10 changed significantly between 2007 and 2009, as shown in Exhibit MNC-13. The
11 decline in the implicit \$1/kW factor accounts for between one-tenth and one-quarter of
12 the increase in the breakeven capital figure.

13

14 **Q. Please describe your concerns about excess capacity.**

15 A. The breakeven analysis essentially calculates how much nuclear capacity can be
16 purchased with the variable cost savings from building new nuclear reactors. Over 90
17 percent of the savings comes from variable costs, largely fuel costs. In other words,
18 nuclear capacity is paid for with fuel cost savings. The analysis proceeds in two steps.
19 First, the system costs are calculated with and without nuclear capital costs, then the cost
20 of building nuclear reactors is compared to the amount of money available from the
21 savings.

22 The operating cost estimates should not include excess production and the
23 variable costs associated with that production. If capacity is idled because of excess, then

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1 the carrying cost of that excess should be subtracted from the savings. These are costs
2 that would not be incurred if the system were “right” sized. Because nuclear reactors
3 come in larger units and have higher capital costs, while natural gas units are small, lower
4 in capital cost and have higher operating costs, ensuring that the model takes these
5 differences into account become more important when demand declines and excess
6 capacity increases.

7 Absorbing excess capacity with “off-system” sales raises two issues. First, to the
8 extent that off-system sales are claimed, the net costs of production and net revenues
9 should be deducted from the system cost total for purposes of the breakeven analysis.
10 Second, in an environment where demand is slackening and reserve margins are rising all
11 around, the assumption that off-system sales can take place should be examined.

12 The cost of operating the system is driven by assumptions about plant capacity,
13 capacity factors and heat rates. The 20 percent reserve margin creates a circumstance in
14 which the implicitly capacity factor (80 percent) is lower than the assumed capacity
15 factors for the major alternatives being compared. The reserve margin is the insurance
16 premium that Floridians pay to ensure that the lights stay on. Reserves in excess of the
17 reserve margin are excessive. Over a long time horizon, the ability to match supply and
18 demand (plus the reserve margin requirement) should be rewarded. If excess capacity is
19 used to make off-system sales, those revenues should be subtracted from the system costs
20 in the break-even analysis.

21 While the excess capacity is a few percentage points spread over a number of
22 years, it can make a difference if it is handled properly. The economic advantage
23 claimed for nuclear is actually quite small, when compared to the total costs of the

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1 system. As shown in Exhibit MNC-14, using the high capital costs and the 2007 \$1/kW
2 factor, but leaving all other assumptions alone, the cost advantage of nuclear is less than
3 five percent in eight of the nine cost cases. The handling of excess capacity in the
4 context of such a small difference between system costs with and without nuclear
5 reactors could be quite important.

6

7 **Progress**

8 **Q. Does the economic analysis offered by Progress raise similar concerns?**

9 A. Yes. While Progress has pursued a more traditional approach to assessing the
10 economics of nuclear reactors compared to other options, its analysis raises concerns that
11 are similar to those I have expressed for FPL. The excess capacity question is important
12 in the case of Progress because its base case already has a large excess above the reserve
13 margin requirements and the large project creates even greater excess.

14 This is particularly important in the case of Progress because it has argued that the
15 construction periods of the two reactors must be kept close together to achieve cost
16 savings. Since the economic analysis is done at the average cost of the two reactors and
17 the link between them in time is so tight, this project is not really two 1100 MW reactors,
18 it is one 2200 MW project. If the decision were made to drop the second reactor, the cost
19 of the first reactor would rise and the Commission would have to redo the whole
20 economic analysis at a much higher cost. Slackening demand growth drives a time
21 wedge between the first and second units, as it takes more time for demand growth to
22 reduce the excess capacity resulting from the addition of large units. Progress does not

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1 need the second units as quickly and capturing the cost economies of the rapid build
2 creates excess capacity that last longer.

3 This obviously ties directly to the cost escalation issue. Progress used a single
4 point estimate for cost, which was between FPL's mid and high point, but the cost is
5 nonbinding from the Commission's point of view and is being renegotiated in light of the
6 long slippage in schedule. The Commission is being asked to allow the recovery of
7 hundreds of millions of dollars of costs from a project, whose total cost, and therefore
8 long run feasibility, are unknown in the context of an industry that suffered severe cost
9 overruns in the past and is exhibiting a rapid run up in cost projections.

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1 **Q. Please summarize your conclusions.**

2 A. The small cost advantages claimed for these nuclear units in the future
3 underscores how important all of the changing conditions I have identified are. The
4 Florida legislature has created an environment that provides incentives for nuclear
5 reactors, but it has not written a blank check nor created a blindfold. The utilities and the
6 Commission must act prudently within the confines of the incentive structure the
7 legislature has established. In this prudence review the utilities ask for cost recovery for
8 these proposed nuclear reactors by constructing an economic analysis that gives nuclear a
9 slight, or 4-5 percent, cost advantage. However, that analysis rests on a series of
10 assumptions that are no longer consistent with reality, if they ever were – high demand
11 growth, very little contribution from efficiency and renewables, high fossil fuel costs, and
12 low nuclear reactor costs.

13 My testimony has identified seven factors that are moving strongly against
14 nuclear reactors. Any one of the seven could reverse the conclusion reached by the
15 utilities that nuclear reactors are less expensive.

16 (1) Slowing demand growth due to a major shift in the economy

17 (2) Moderating natural gas prices

18 (3) Federal policies to require a growing role of efficiency and renewables

19 (4) Moderating CO2 compliance costs

20 (5) Improving technology and cost of efficiency

21 (6) Improving technology and cost of renewables

22 (7) Escalating nuclear reactor costs.

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1 Given that all seven of these factors are moving strongly against nuclear reactors,
2 it is highly likely that the reactors will cost consumers much more than the alternatives.
3 And, given that relatively little has been spent on the proposed reactors now, this is the
4 moment for the Commission to take the required hard look at the long-term feasibility of
5 the completion of these reactors. Spending more on nuclear reactors and allowing the
6 utilities to recover those costs from ratepayers would be imprudent.

7

8 **Q. Does this conclude your testimony?**

9 A. Yes it does.

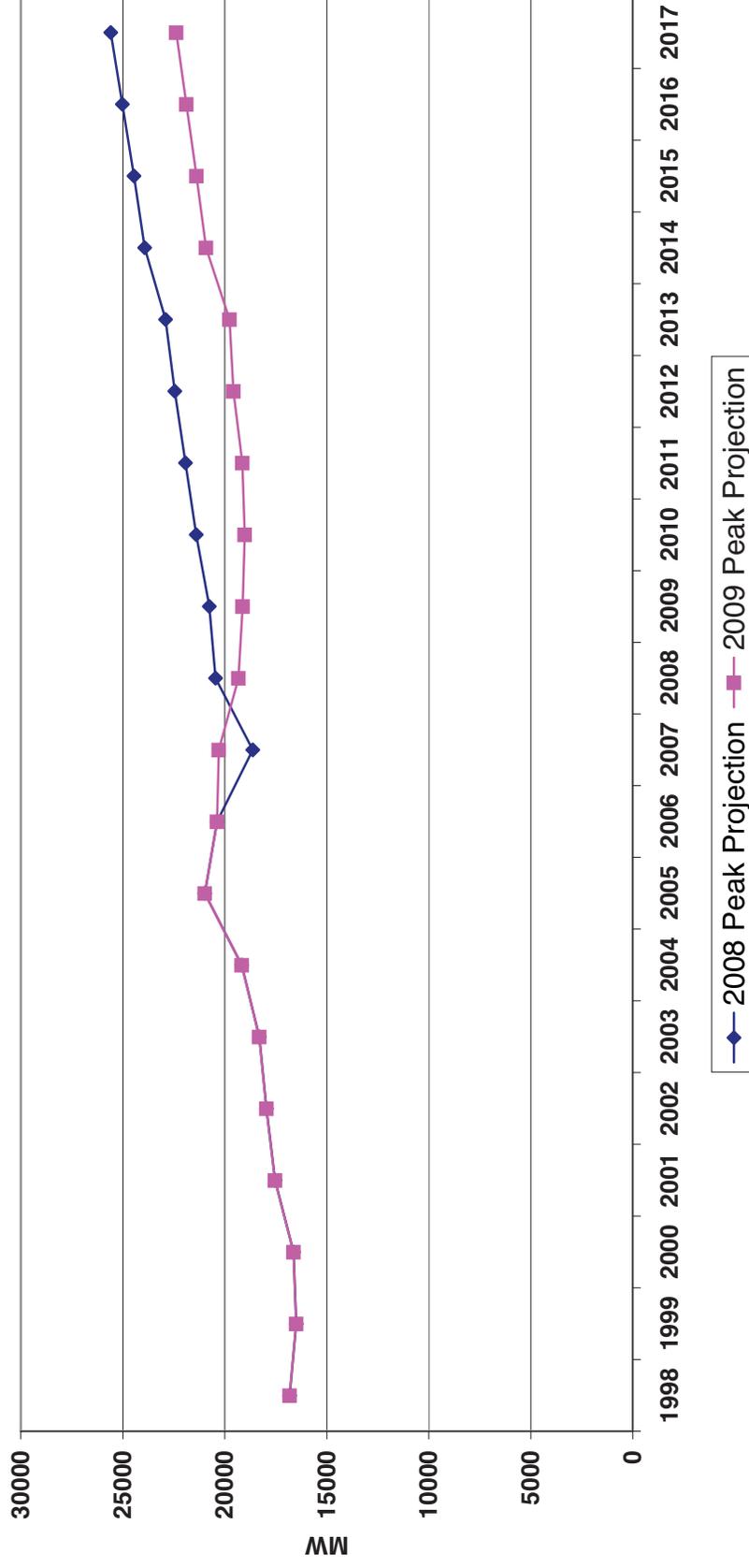
EXHIBIT 30

EXHIBITS ACCOMPANYING DIRECT TESTIMONY OF MARK N. COOPER

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IMPACT OF DECLINING DEMAND ON SUMMER PEAK LOAD

THE IMPACT OF DECLINING DEMAND ON FPL SUMMER PEAK LOAD

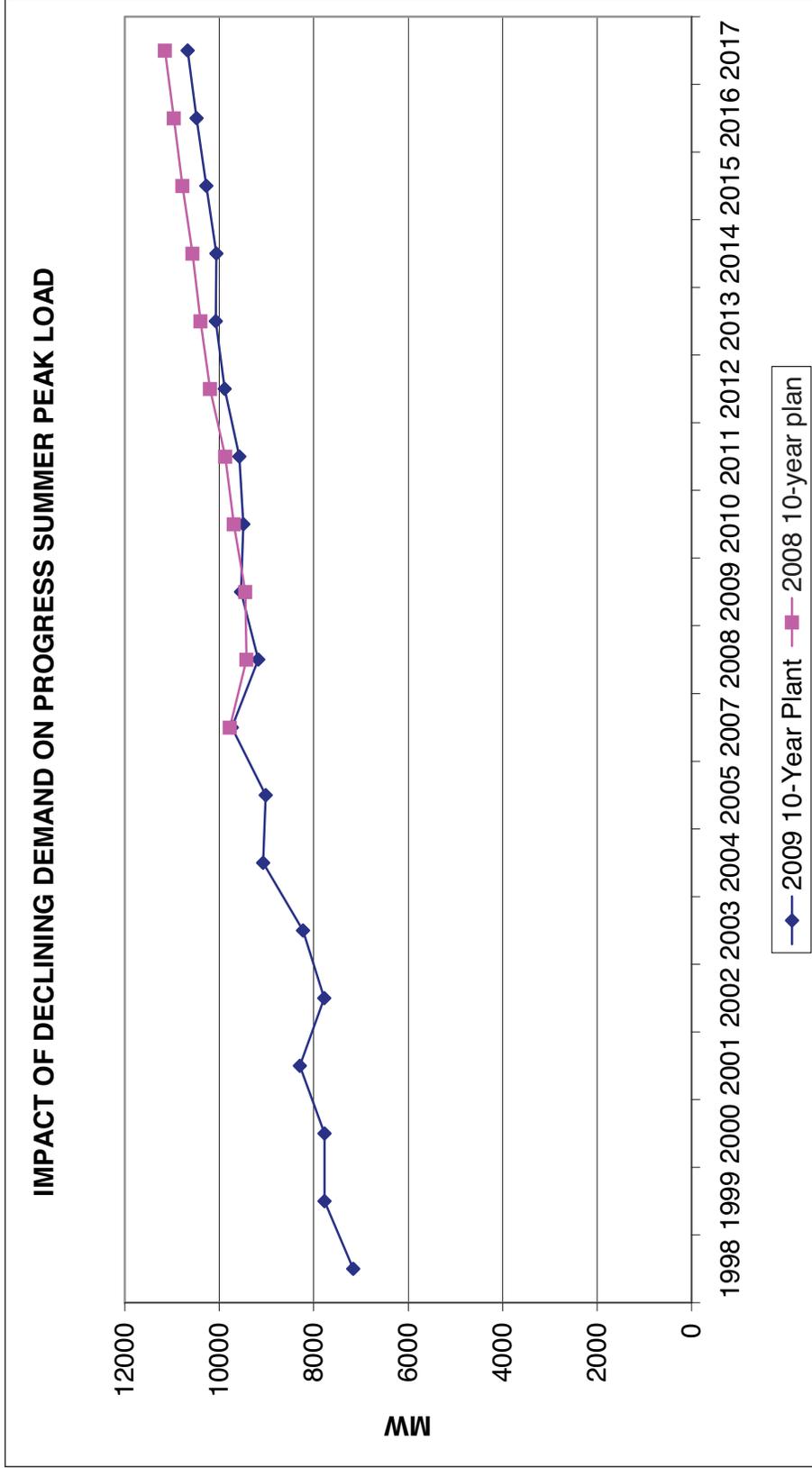


Source: 2008 10-year plan, p. 40; 2009 10-year plan, p. 45.

EXHIBIT 30

Docket No. 090009-EI
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Exhibit MNC-1
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IMPACT OF DECLINING DEMAND ON SUMMER PEAK LOAD

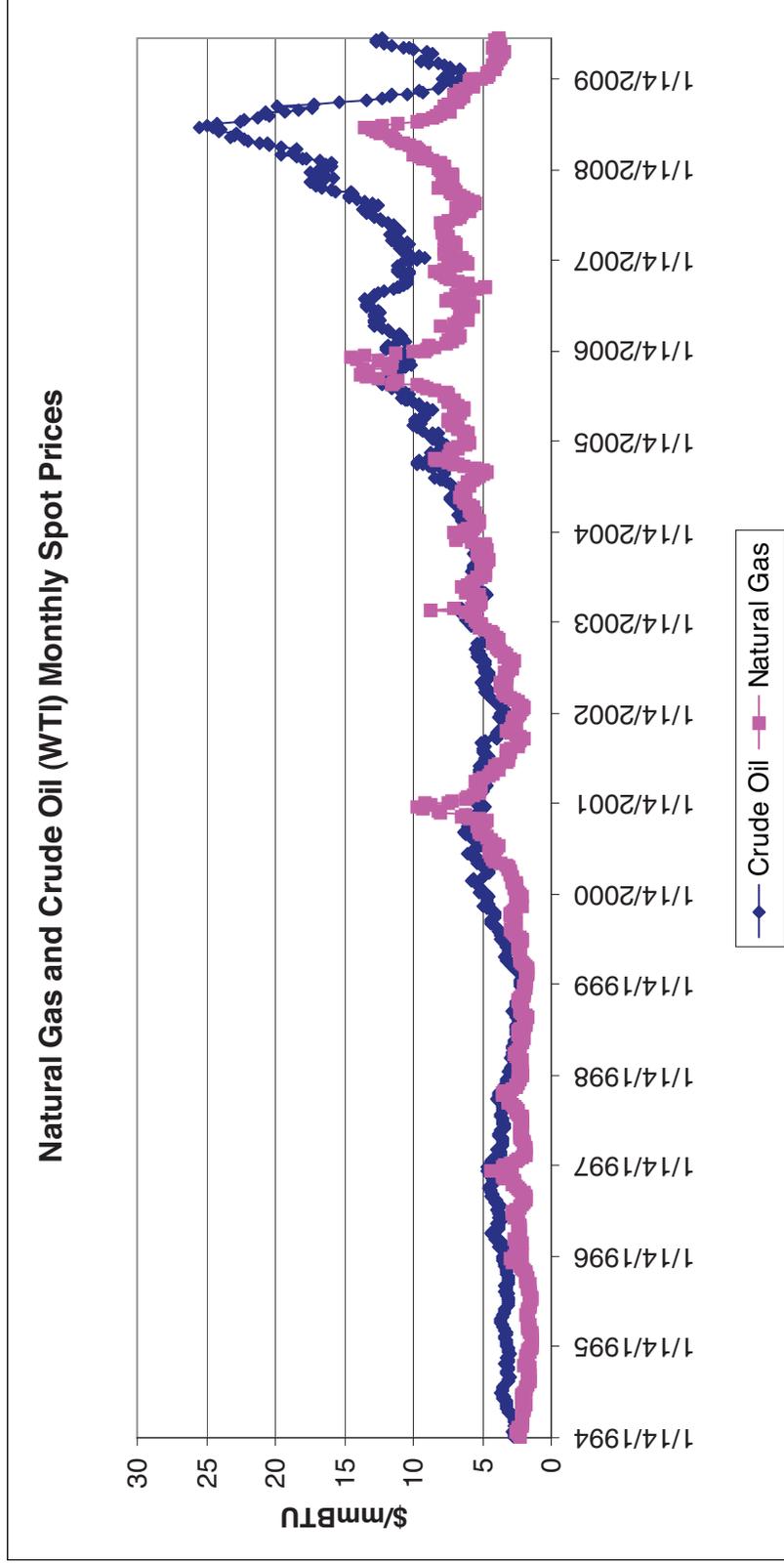


Source: 2008 10-year plan, p. 2-7; 2009 10-year plan, p. 2-6.

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NATURAL GAS WELLHEAD, HENRY HUB AND FUTURES PRICES

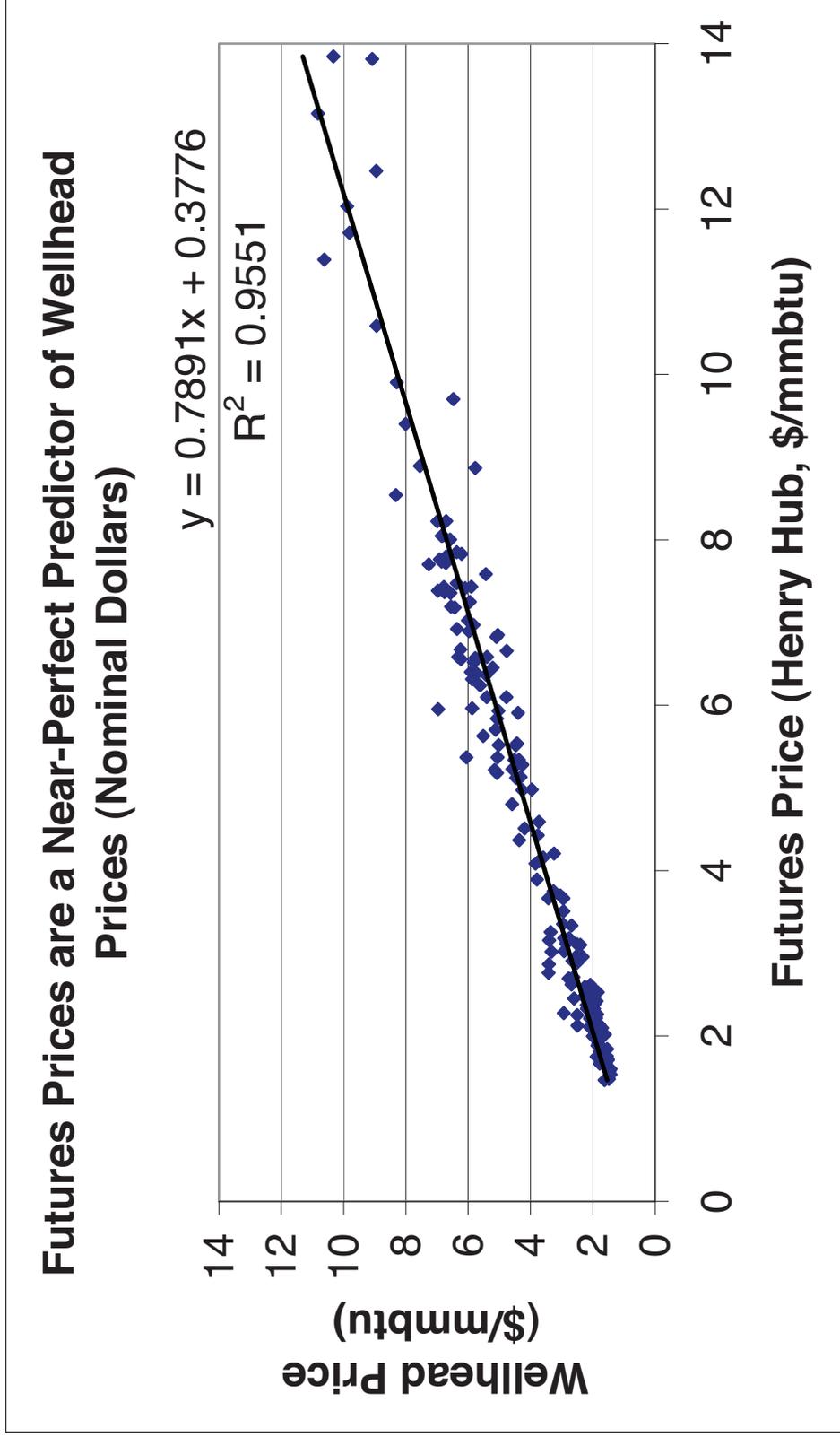


Source: Energy Information Administration, Petroleum Spot Prices, http://tonto.eia.doe.gov/dnav/pet/xls/PET_PRI_SPT_S1_M.xls
Natural Gas Future Prices, Contract 1: http://tonto.eia.doe.gov/dnav/ng/xls/NG_PRI_FUT_S1_M.xls

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NATURAL GAS WELLHEAD, HENRY HUB AND FUTURES PRICES



Source: Energy Information Administration: http://tonto.eia.doe.gov/dnav/ng/ng_pri_fut_s1_m.htm,
http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm, visited 7/11/2009

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NATURAL GAS WELLHEAD, HENRY HUB AND FUTURES PRICES

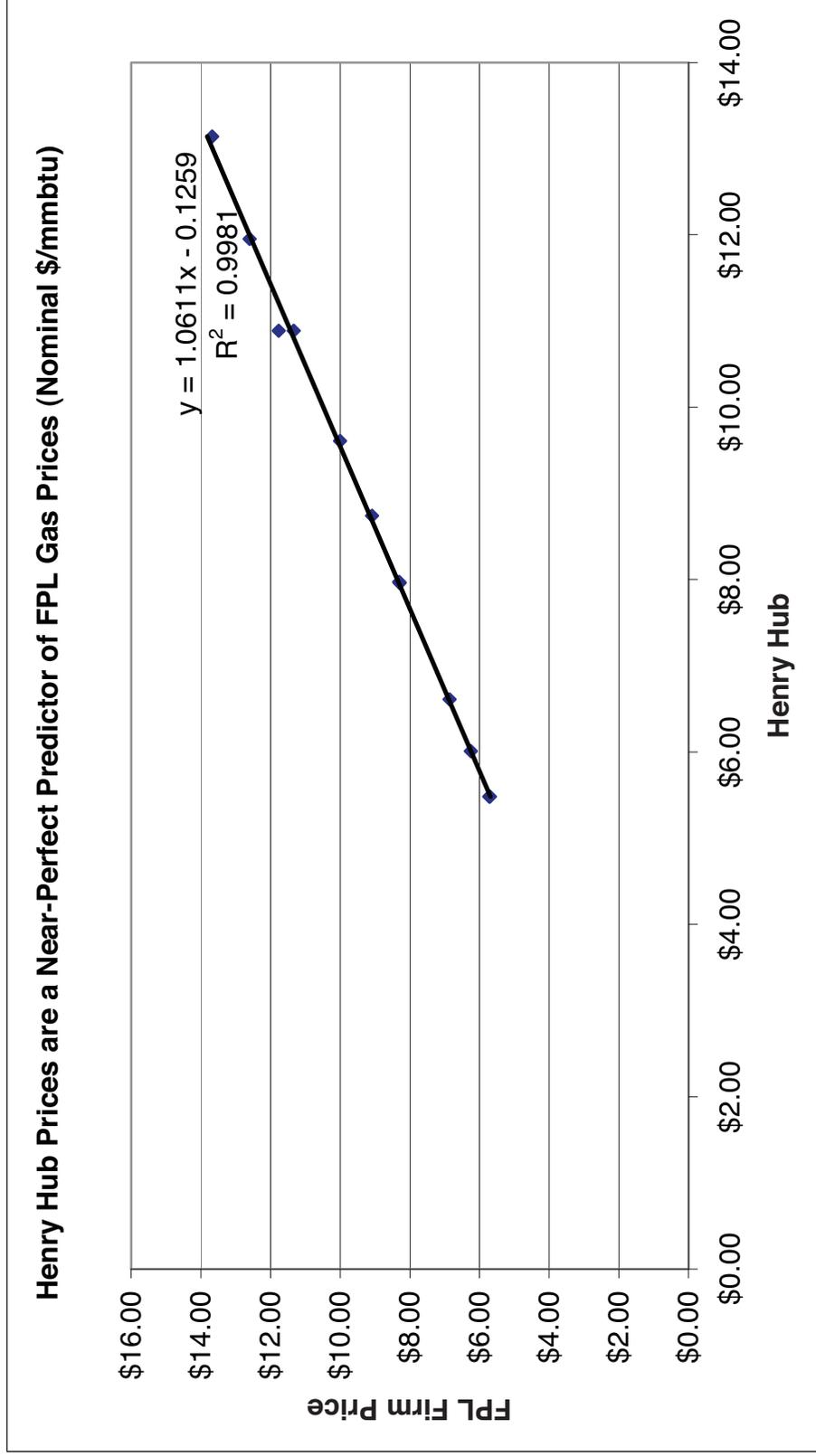


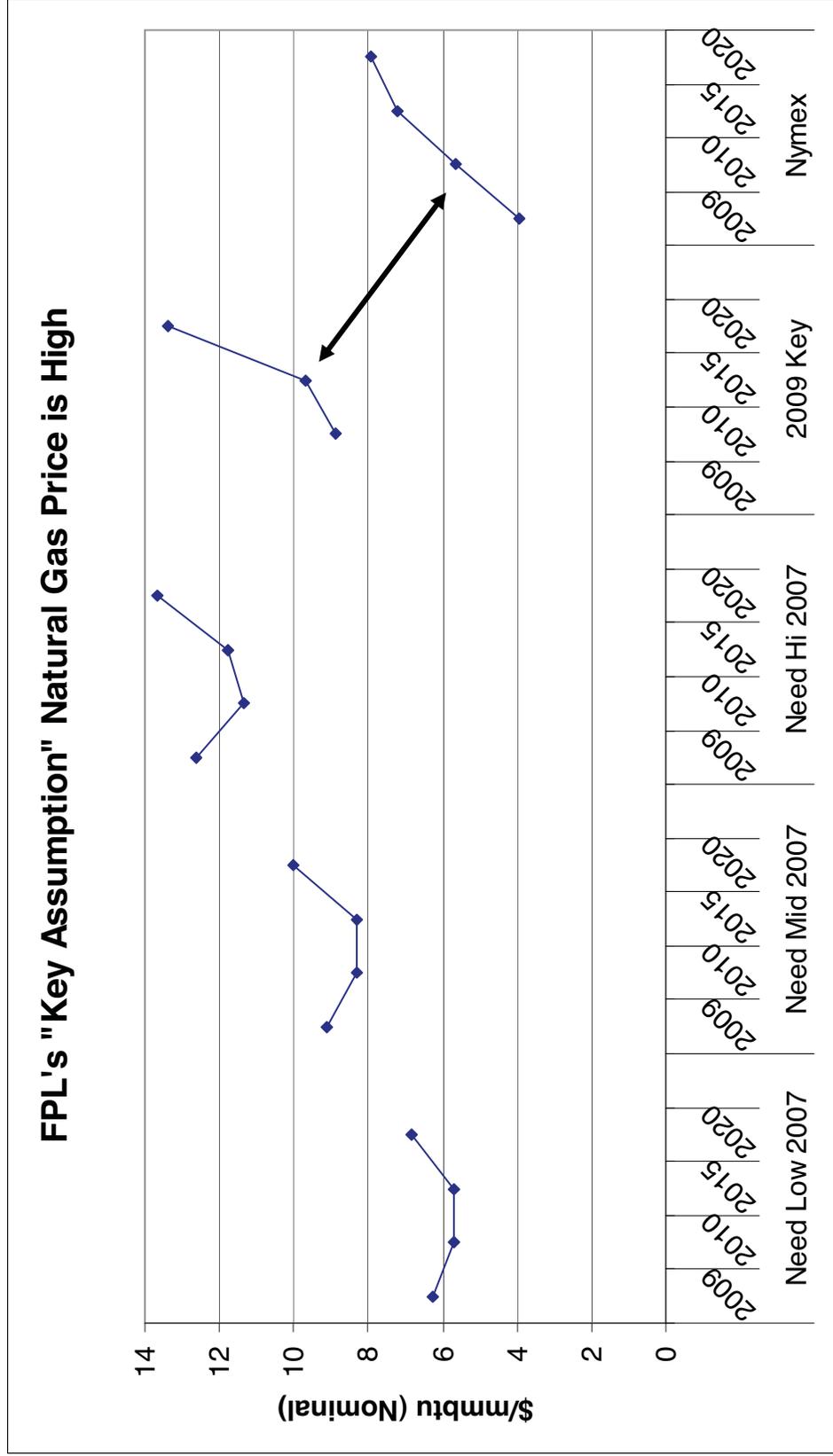
EXHIBIT 30

Source: FPL Need Study for electrical Power Docket No. 07-0650, Appendix E

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Docket No. 090009-EI
 Exhibit MNC-3
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PROJECTED NATURAL GAS PRICES COMPARED TO NYMEX FUTURES PRICES

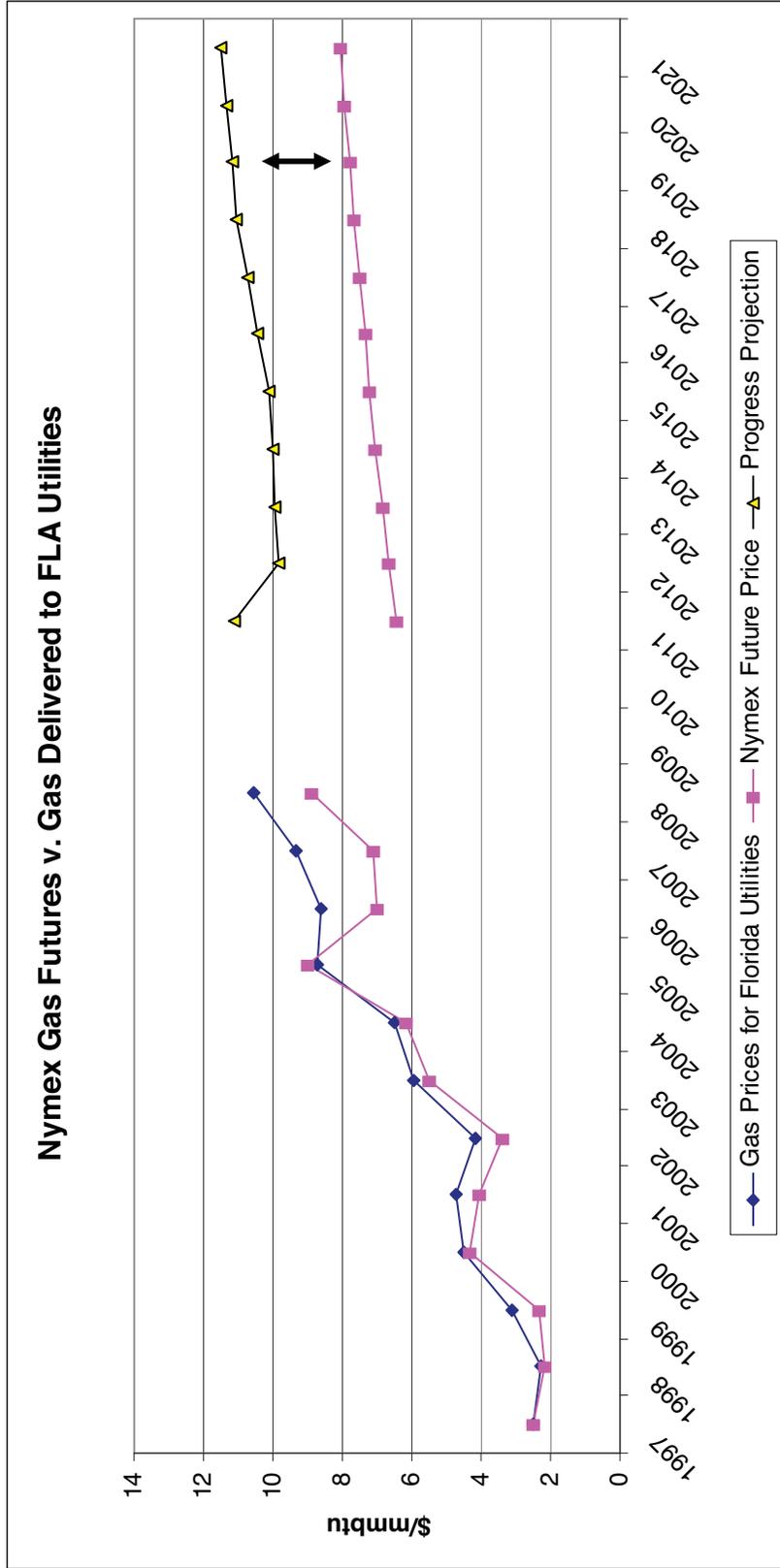


Source: FPL Need Study for Electrical Power Docket No. 07-0650, Appendix E; Nymex Futures Contract, http://www.nymex.com/ng_fut_csf.aspx, visited 7/11/2009

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PROJECTED NATURAL GAS PRICES COMPARED TO NYMEX FUTURES PRICES

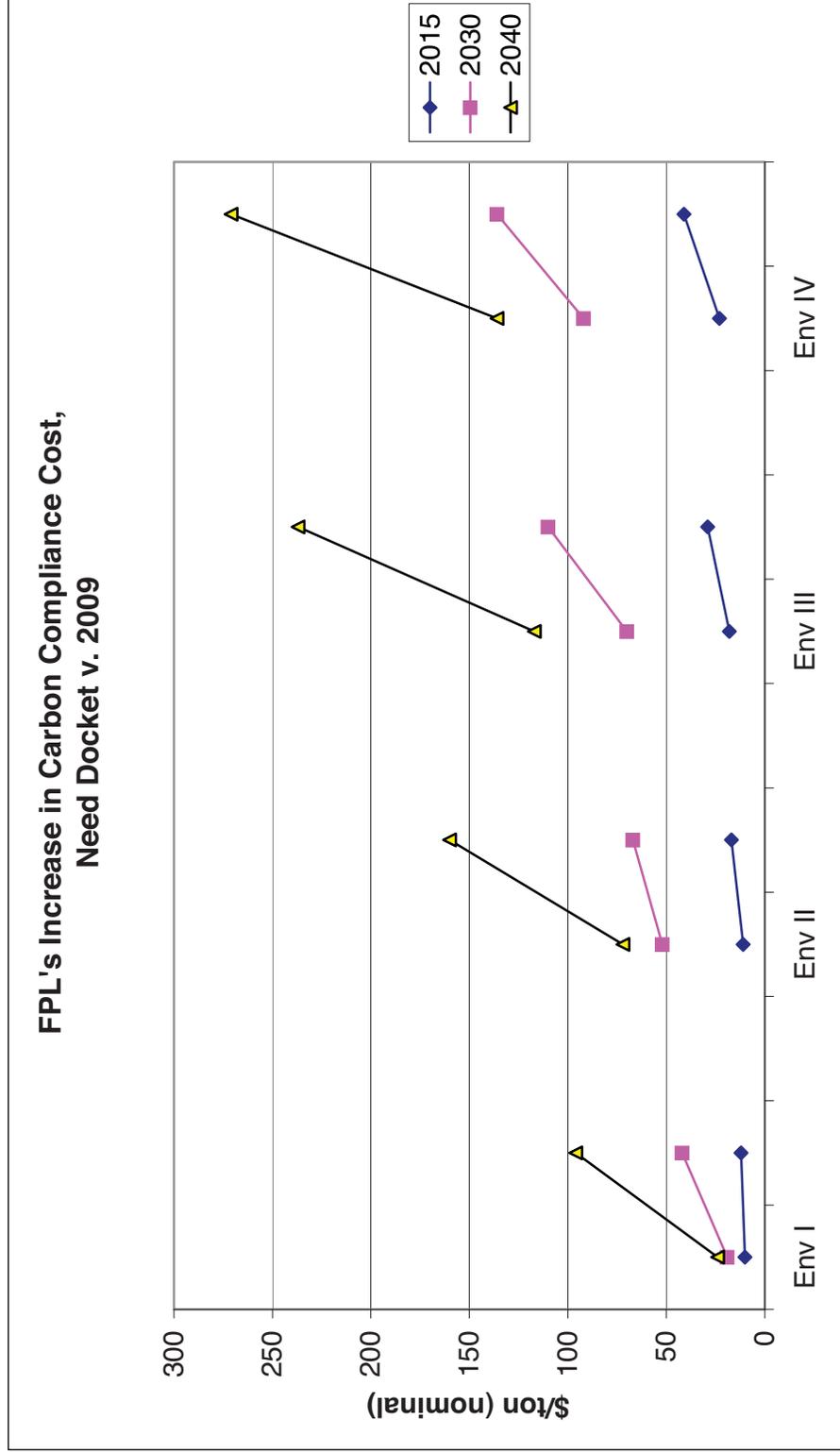


Source: Testimony of Garry Miller, Docket No. 090009, May 1, 2009, Exhibit GM-1, page 2 of 2; Energy Information Administration, Annual Natural Gas Futures Contract 1, http://tonto.eia.doe.gov/dnav/ng/xls/NG_PRI_FUT_S1_M.xls
 Annual Florida Gas Price Sold to Electric Power Companies; <http://tonto.eia.doe.gov/dnav/ng/hist/n3045fl3a.htm>;
 FPL Need Study for electrical Power Docket No. 07-0650, Appendix E;
 Nymex Futures Contract, http://www.nymex.com/ng_fut_csf.aspx, visited 7/11/2009

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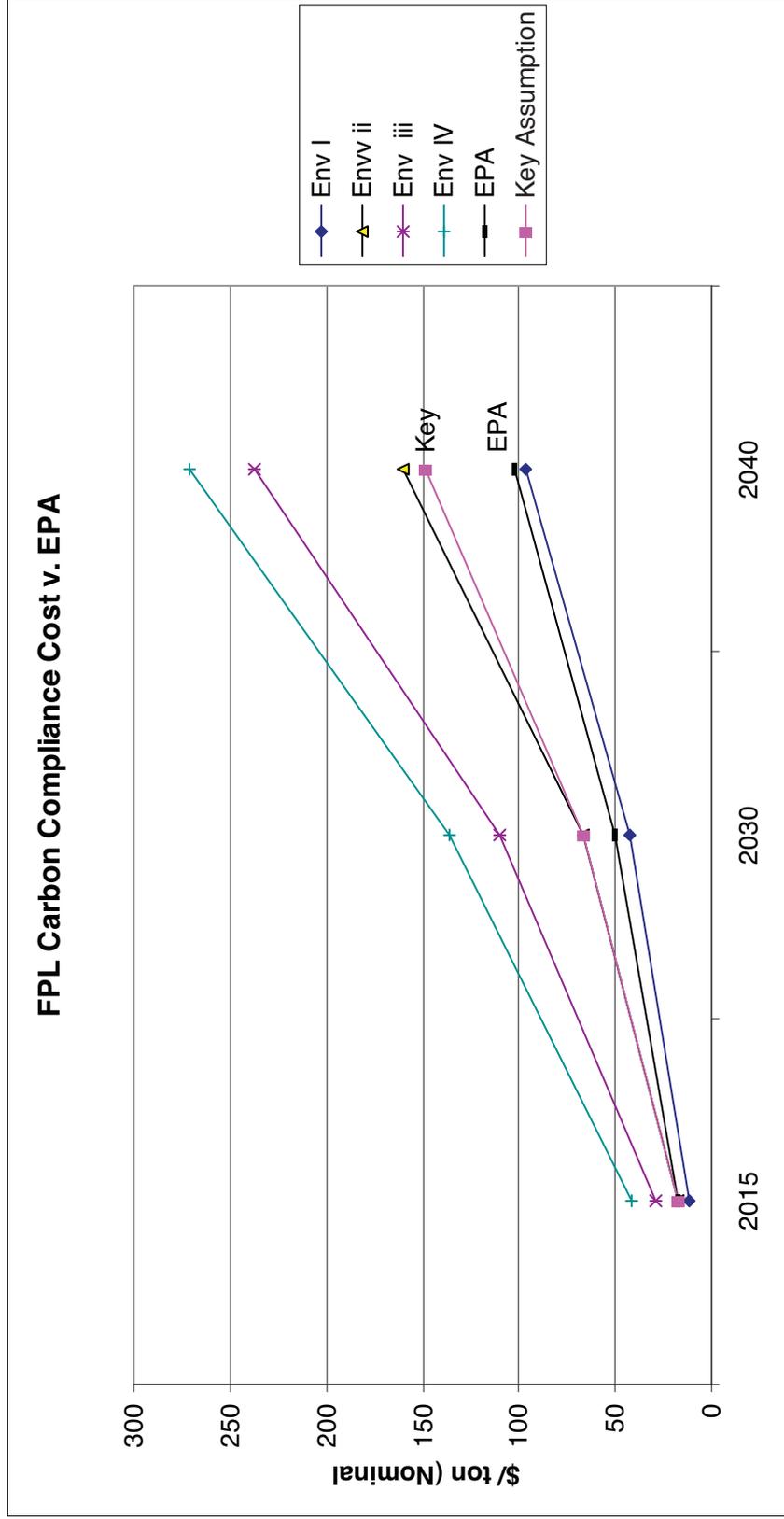
PROJECTIONS OF CARBON COMPLIANCE COSTS



Source: Florida Power and Light, Need Study for Electrical Power, Docket No. 070650-EI, Appendix F, page 3 of 4; Florida Power and Light Docket No. 090009 EI, OPC's Third Set of Interrogatories, Question No. 47, p 1 of 2.

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PROJECTIONS OF CARBON COMPLIANCE COSTS

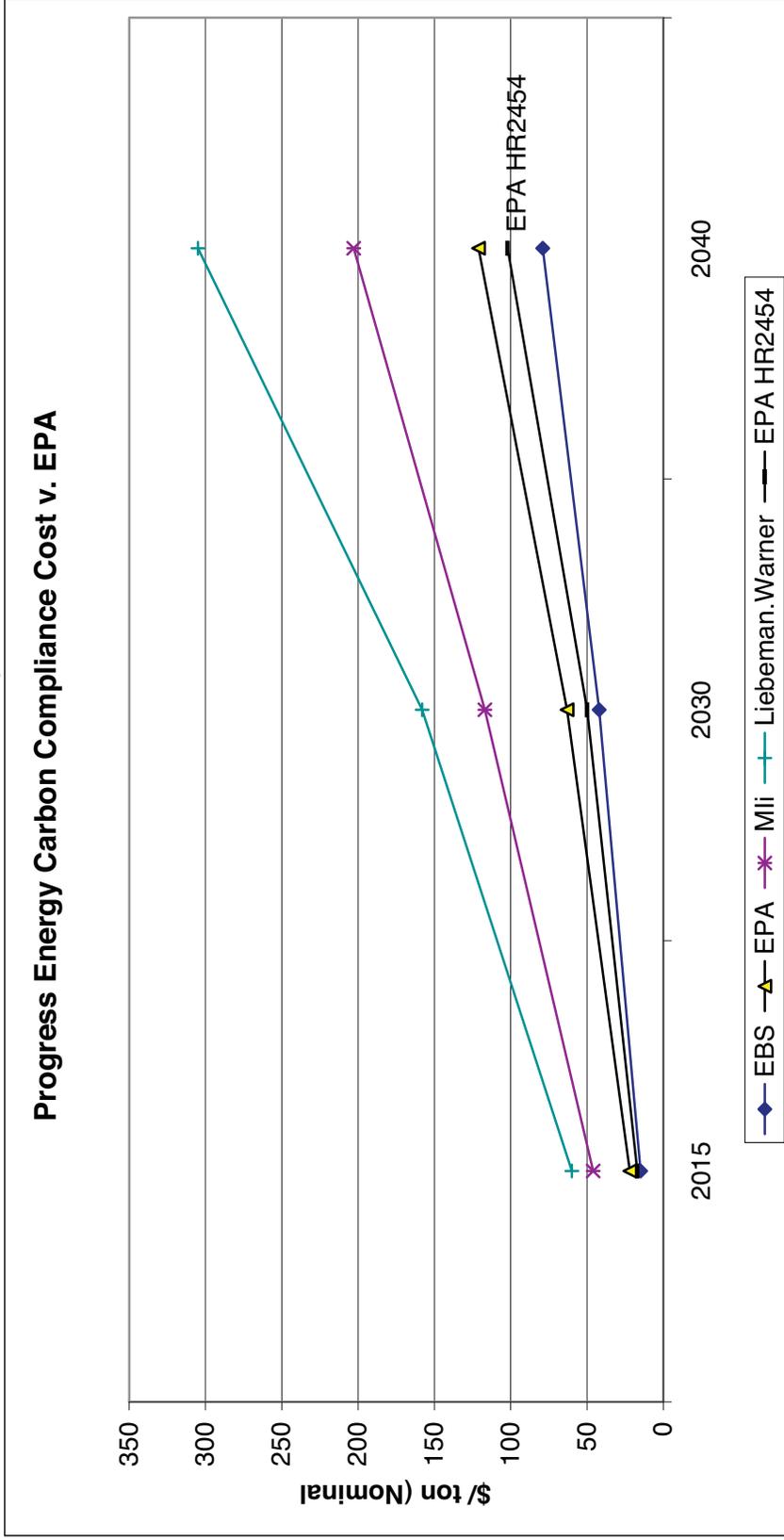


Source: Florida Power and Light, Docket No. 090009 EI, OPC's Third Set of Interrogatories, Question No. 47, p 1 of 2; EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress, 6/23/09, p. 14, using the highest price and converting real to nominal dollars at the 2.5% rate of inflation assumed by FPL

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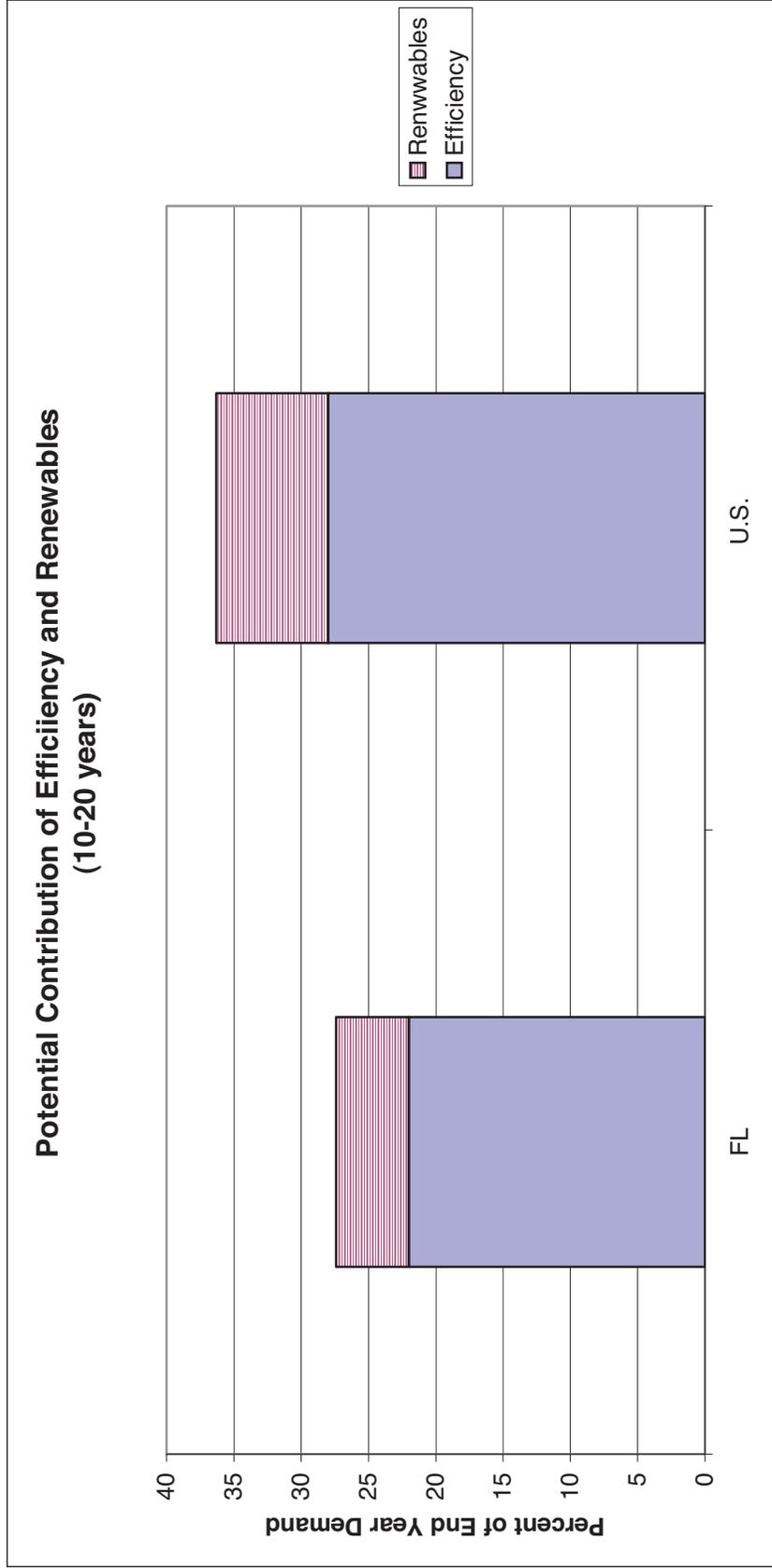
PROJECTIONS OF CARBON COMPLIANCE COSTS



Source: Testimony of Garry Miller, Docket No. 090009, May 1, 2009, Exhibit GM-1, page 1 of 1; EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress, 6/23/09, p. 14, using the highest price and converting real to nominal dollars at the 2.5% rate of inflation assumed by FPL

EXHIBIT 30

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ESTIMATES OF POTENTIAL MID-TERM EFFICIENCY SAVINGS



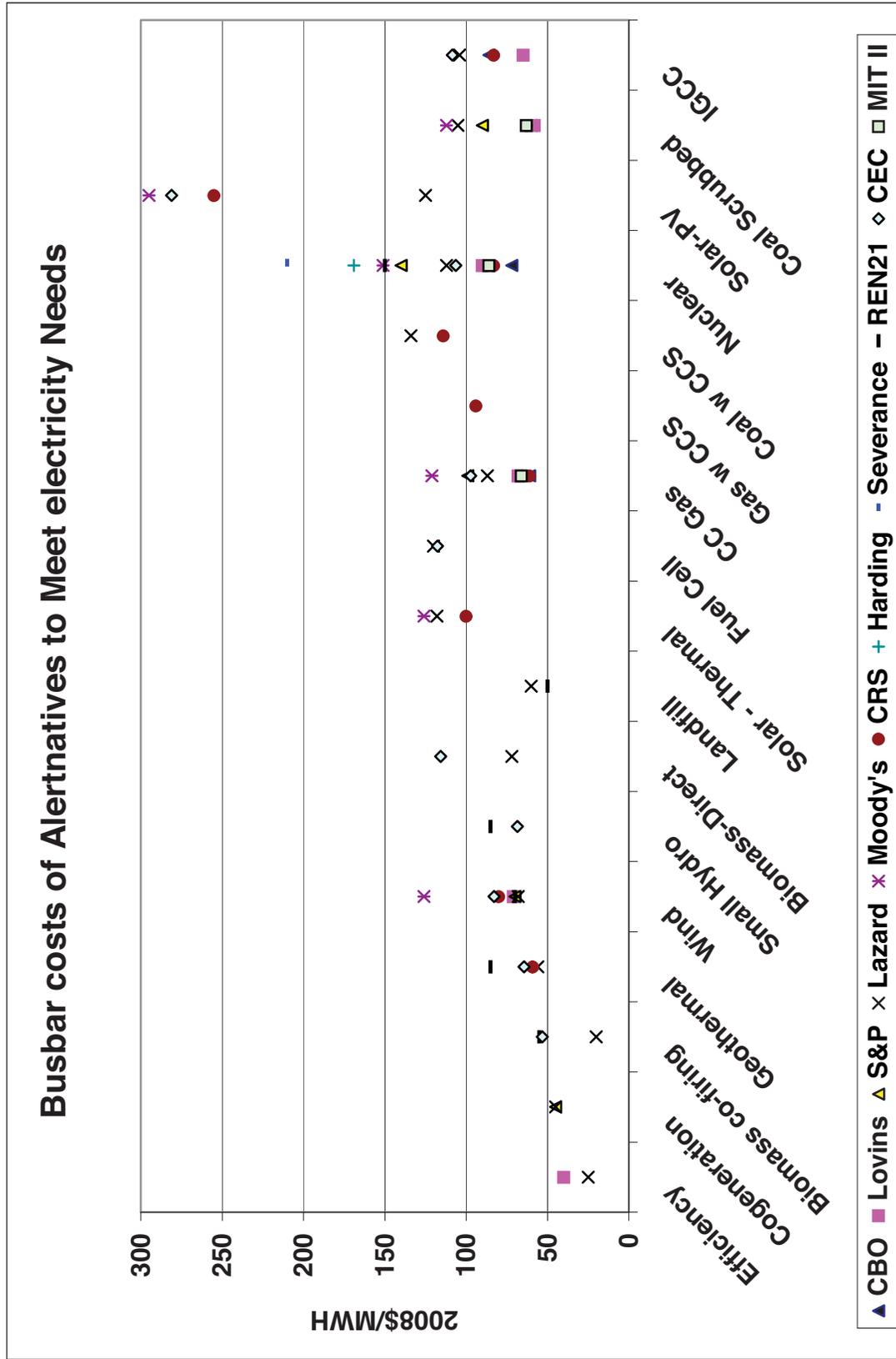
ESTIMATES OF POTENTIAL MID-TERM EFFICIENCY SAVINGS

Source: Florida is from Elliott, R. Neal, et al. *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands*, American Council for an Energy Efficient Economy, June 2007, p. 9, 12. The national average is the simple average individual state studies in the following. American Council of an Energy- Efficient Economy, et al., 2009, *Shaping Ohio's Energy Future*, March 2009, p.13, 15, 17. American Council of an Energy-Efficient Economy, et al., 2008, *energizing Virginia: Efficiency First*, September 2008, p. 14, 16, 18. American Council for an Energy-Efficient Economy, 2007, Howard Geller, et al., *Utah Energy Efficiency Strategy: Policy Options*, November 2007. American Council for an Energy- Efficient Economy, 2007, *energizing Virginia: Efficiency First*," September 2008. Beck, Frederic, et al. 2002, *Powering the South: A Clean & Affordable Energy Plan for the Southern United States*, REPP, January 2002. Ecotope, Inc., American Council for an Energy-Efficient Economy, Tellus Institute, Inc., 2003, *Energy Efficiency and Conservation Measure Resource Assessment*, (Energy Trust of Oregon Inc., January 2003. Elliott, R. Neal, et al., 2007, *Potential for Energy Efficiency, Demand Response and Onsite Renewable Energy to Meet Texas' Growing Electricity Needs*, American Council for an Energy-Efficient Economy, March 2007. Laitner, John "Skip," Maggie Eldridge, and R. Neal Elliot, 2007, *The Economic Benefits of an Energy Efficiency and Onsite Renewable Energy Strategy to Meet Growing Electricity Needs in Texas*," American Council for an Energy-Efficient Economy, September 2007. Optimal Energy Inc, et al., 2003, *Energy Efficiency and Renewable Energy Resource Development Potential in New York State*, August 2003. Prindle, William, R. Rooney, Tom, et al., 2004, *Estimating the Potential for Cost Effective Electric and Peak Demand Savings in Connecticut*, 2004 ACEEE Summer Study on Energy Efficiency in Buildings, 2004. Southwest Energy Efficiency Project, *The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest*, November 2002, p. 3-13. Stoft, Steven, *The Economics of Conserved-Energy "Supply" Curves*, Program on Workable Energy Regulation, April 1995.

Wyandotte Municipal Services Optimization Plan, Michigan Public Service Commission, Case No. U-18558, p. 6.

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 ESTIMATES OF COSTS OF ALTERNATIVES TO MEET ELECTRICITY NEEDS



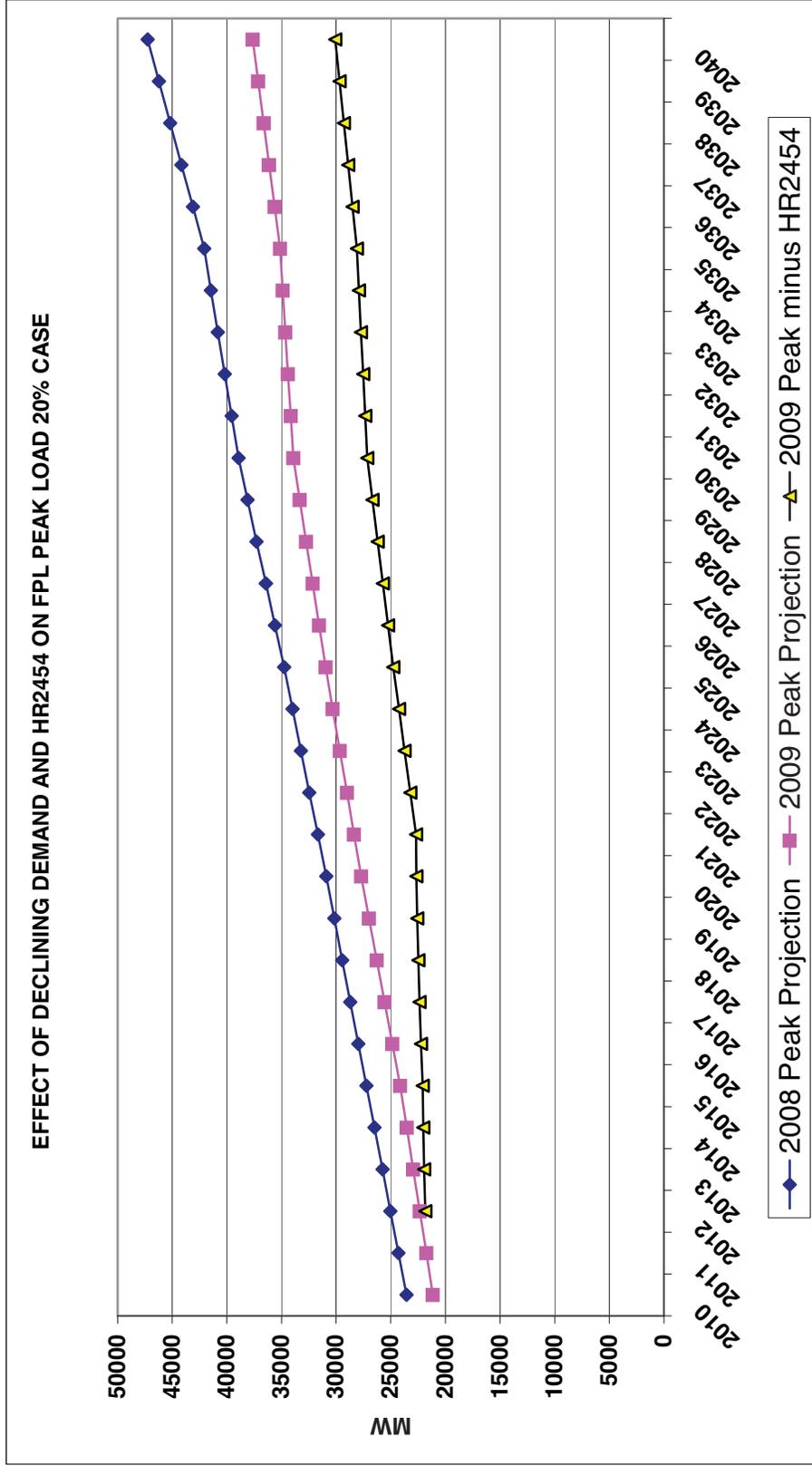
ESTIMATES OF COSTS OF ALTERNATIVES TO MEET ELECTRICITY NEEDS

Sources: Congressional Budget Office, 2008, *Nuclear Power's Role in Generating Electricity*, May 2008, p.13; Kaplan, Stan, 2008, *Power Plants: Characteristics and Costs*, Congressional Research Service, November 13, 2008, Appendix B; Deutch, John, M. et al., 2009, *Update of the MIT 2003 Future of Nuclear Power*, MIT Energy Initiative, 2009; p. 6; Du Yangbo and John E. Parsons, 2009, *Update on the Cost of Nuclear Power*, Center for Energy and Environmental Policy Research, May 2009, MIT II; Joel Klein, 2007, *Comparative Costs of California Central Station Electricity Generation Technologies Cost of Generation Model*, ISO Stakeholders Meeting Interim Capacity Procurement Mechanisms, October 15, 2007, p. 14; Lazard, 2008, *Levelized Cost of Energy Analysis—Version 2.0*, June 2008, p. 10; Lovins Amory, and Imran Shiekh, and Alex Markevich, 2008b, *Nuclear Power: Climate Fix or Folly?*, December 31, 2008.Draft, p. 2; Moody's, 2008, *New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities*, May 2008, p. 15; **Renewable Energy Policy Network for the 21st century, 2008, *Renewables 2007: Global Status Report*, 2008; Severance, Craig A. 2009, *Business Risks and Costs of New Nuclear Power*, January 2, 2009; Standard and Poors, 2008b, *Assessing the Credit Risk of Competing Technologies for New U.S. Nuclear Power Plants*, August 13, 2008, p. 11.**

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IMPACT OF CLIMATE POLICY ON PEAK LOAD: FPL

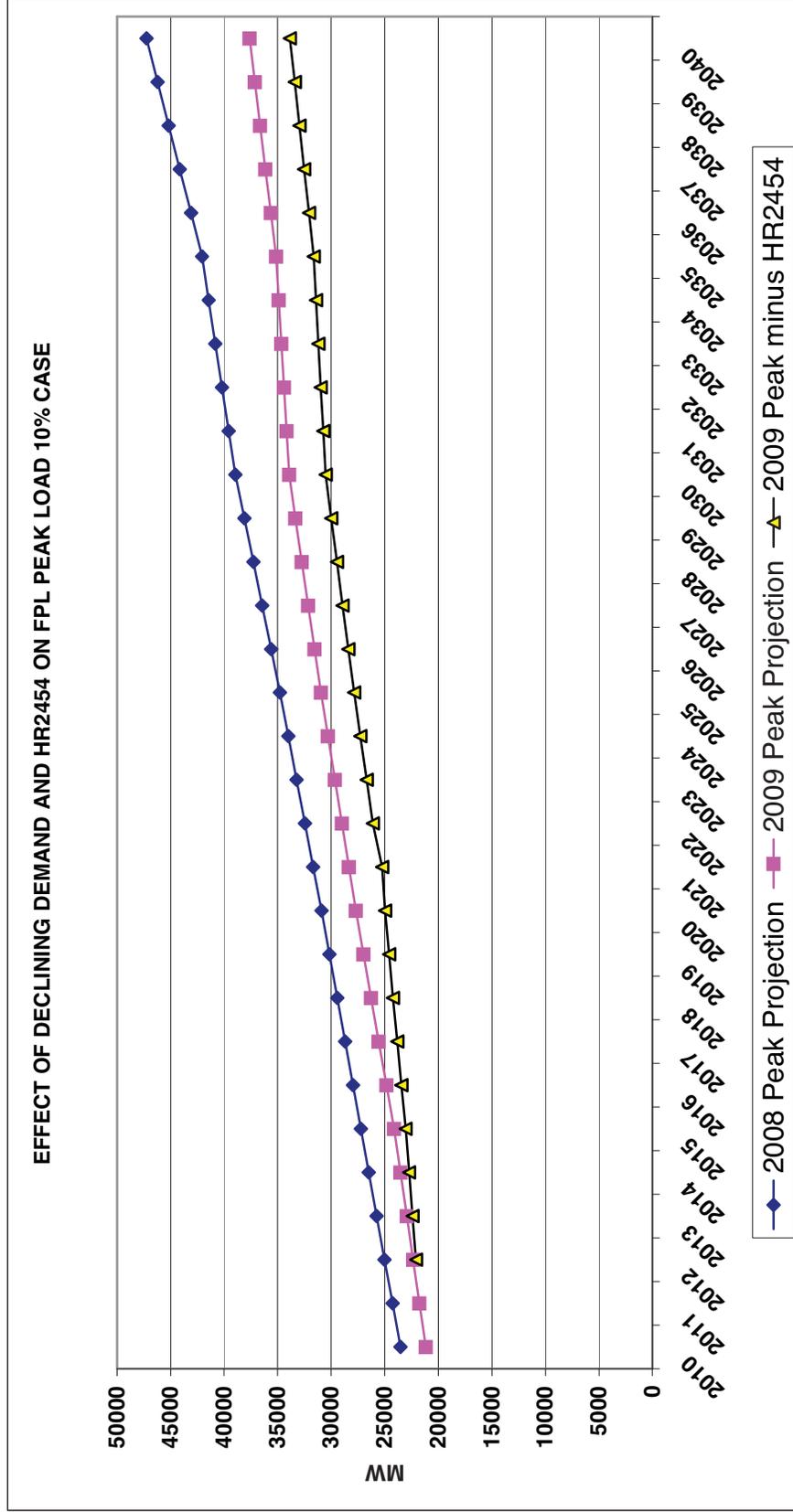


Source: Direct Testimony of Steven R. Sims, Docket No. 090009-EI, SRS-1;
 linear interpolation of five-year interval data. H.R. 2454 is set at 20% below 2009 Peak Projection

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IMPACT OF CLIMATE POLICY ON PEAK LOAD: FPL

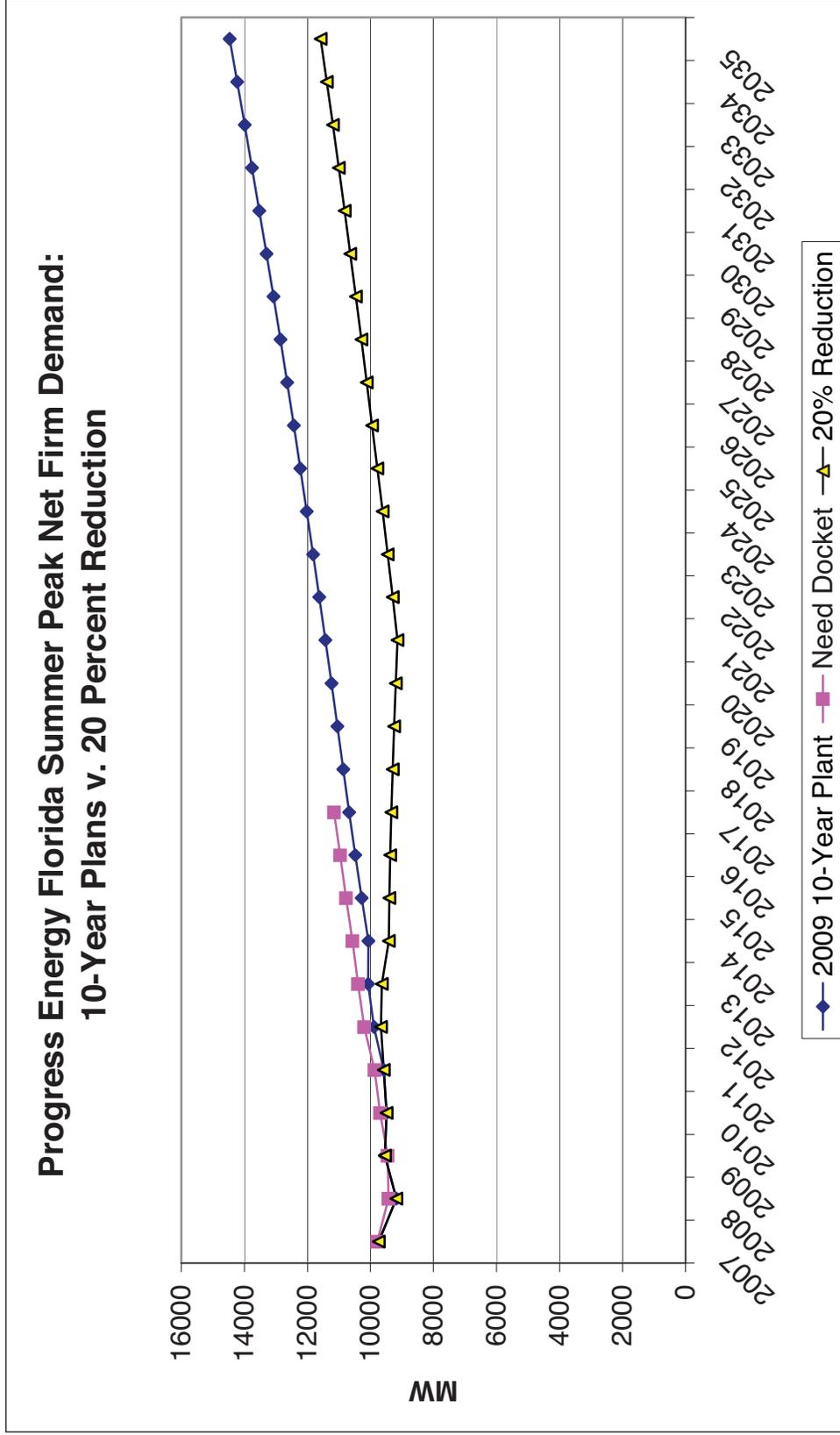


Source: Direct Testimony of Steven R. Sims, Docket No. 090009-EI, SRS-1;
linear interpolation of five-year interval data. H.R. 2454 is set at 20% below 2009 Peak Projection

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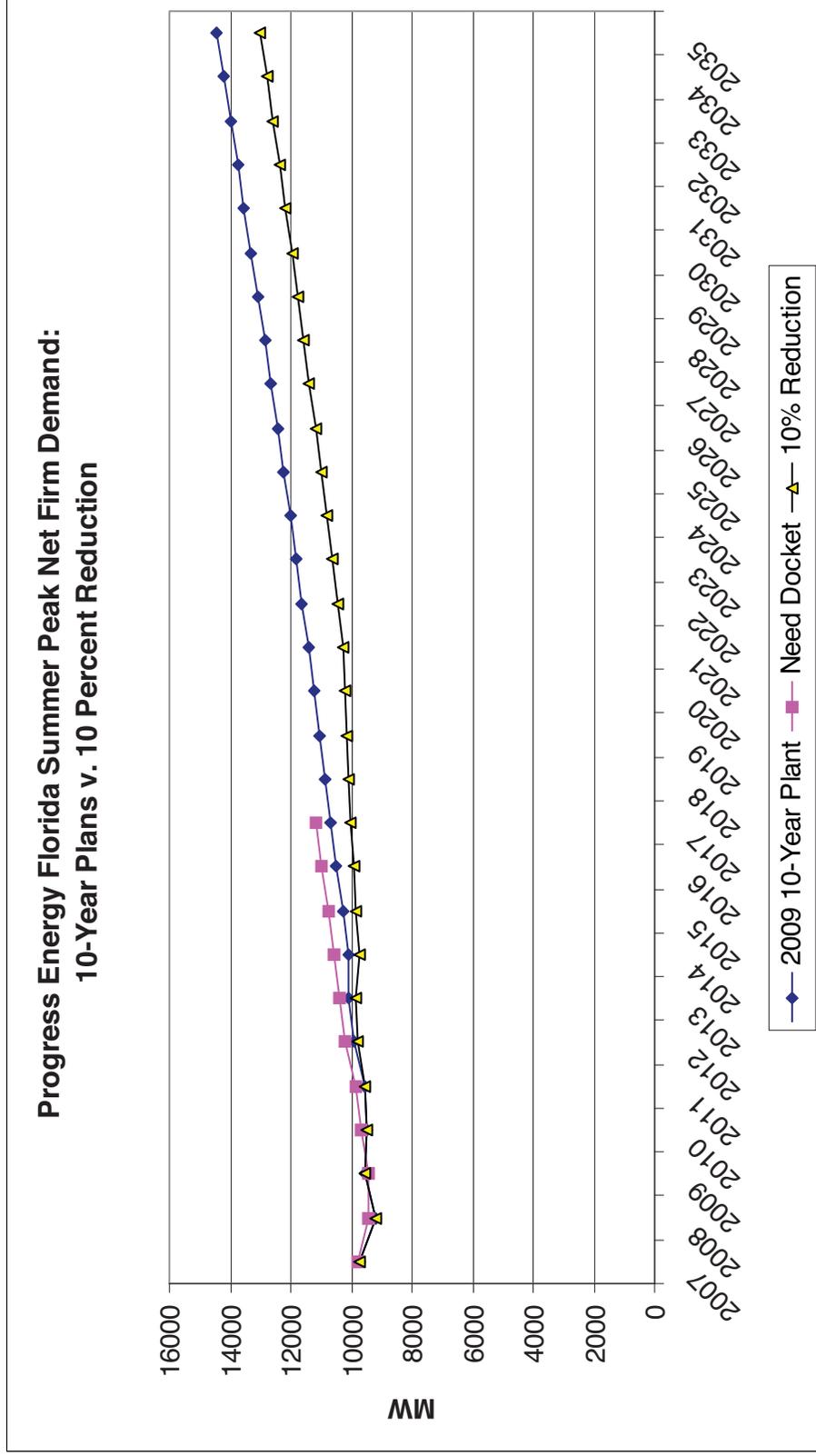
IMPACT OF CLIMATE POLICY ON PEAK LOAD: PROGRESS



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IMPACT OF CLIMATE POLICY ON PEAK LOAD: PROGRESS



Source: 2008 10-year plan, p. 2-7; 2009 10-year plan, p. 2-6.
H.R. 2454 set at 20% of projection

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ESTIMATES OF NUCLEAR REACTOR OVERNIGHT, COSTS: 2001-20089 (2008\$ derived with the GDP deflator)

Original Estimate	Date of Estimate	Source of Estimate	Overnight Cost kW		
			Low	Mid	High
SAIC	2001	U of C	2300	2300	2300
SAIC	2001	U of C	1840	1840	1840
SAIC	2001	U of C	1570	1570	1570
SAIC	2001	U of C	1295	1295	1295
Scully	2002	U of C	1434	1434	1674
Sandia	2002	U of C	2131	2131	2131
EIA	2003	U of C	215	2015	2217
EIA	2003	U of C	1241	1563	1784
MIT	2003	MIT	1175	2350	
U of C	2004	U of C	1380	1725	2070
TVA	2005	TVA		1853	
CEC	2007	CEC		3021	
Keystone	2007	Keystone	3018		3018
Harding	2007	Harding		3329	
South Texas 3&4	2007	CRS	2931	3214	3754
Turkey Point 3&4	2007	FPL	3179	3678	4644
Calvert 3	2007	CRS		5778	
Levy 1&2	2008	CRS		4260	
Summer 2&3	2008	CRS		4387	
Vogtle	2008	GA PUC		4381	
Callaway 1	2008			4250	
Duke	2008	Lovins		4800	
S&P	2008	S & P		4100	
EIA	2008	EIA		3400	
CRS	2008	CRS		3900	
CBO	2008	CBO		2358	
Lazard	2008	Lazard	3750		5250
Moody's	2008	Moody's		6250	
Severance	2008	Severance	3596	4070	
MIT II	2009	MIT		4092	
Bell Bend	2009	PPL			9375
Harding - Medium	2009	Harding 09	5524	7263	9217
Harding -	2009	Harding	6189	8184	10383

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High		09			
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ESTIMATES OF NUCLEAR REACTOR OVERNIGHT, COSTS: 2001-20089

Sources: Congressional Budget Office, 2008, *Nuclear Power's Role in Generating Electricity*, May 2008, p.13; Deutch, John, M. et al., 2009, *Update of the MIT 2003 Future of Nuclear Power*, MIT Energy Initiative, 2009; p. 6; Du Yangbo and John E. Parsons, 2009, *Update on the Cost of Nuclear Power*, Center for Energy and Environmental Policy Research, May 2009. Energy Information Administration, 2009, "Electricity Market Module," *Annual Energy Outlook*, March 2009, p. 89. Harding, Jim, 2007, "Economics of Nuclear Power and Proliferation Risks in a Carbon-constrained World," *Public Utilities Fortnightly*, December 2007, p. 71; Harding, Jim, 2009, Economics of Nuclear Reactors and Alternatives, Carnegie/NPEC Conference, February 2009; p. 7; Joskow, Paul, 2006, *Prospects for Nuclear Power a U.S. Perspective*, May 19, 2006; Kaplan, Stan, 2008, *Power Plants: Characteristics and Costs*, Congressional Research Service, November 13, 2008, Appendix B.; Keystone Center, 2007, *Nuclear Power Joint Fact-Finding*, June 2007, p. 42; Joel Klein, 2007, *Comparative Costs of California Central Station Electricity Generation Technologies Cost of Generation Model*, ISO Stakeholders Meeting Interim Capacity Procurement Mechanisms, October 15, 2007, p. 14; Lazard, 2008, *Levelized Cost of Energy Analysis—Version 2.0*, June 2008, p. 10; Lovins Amory, and Imran Shiekh, and Alex Markevich, 2008b, *Nuclear Power: Climate Fix or Folly?*, December 31, 2008, Draft, p. 2; MIT, 2003 *The Future of Nuclear Power*, 2003, p. 42; Moody's, 2008, *New Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities*, May 2008, p. 15; Schlissel, David and Bruce Biewald, 2008, *Nuclear Power Plant Construction Costs*, Synapse, July 2008, p. 2; Severance, Craig A. 2009, *Business Risks and Costs of New Nuclear Power*, January 2, 2009; Standard and Poors, 2008b, *Assessing the Credit Risk of Competing Technologies for New U.S. Nuclear Power Plants*, August 13, 2008, p. 11; Tennessee Valley Authority, 2005, *ABWR Cost/Schedule/COL Project at TVA's Bellafonte Site*, August 2005, p. I-7; University of Chicago, 2004, *The Economic Future of Nuclear Power: A Study Conducted at the University of Chicago*, August 2004.

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NUCLEAR OPERATORS, REACTOR CANCELLATIONS AND MOODY'S DOWNGRADES

Operator	Current Operator	Cancelled Plant	Moody's Downgrade	Period	Highest Grade	Lowest Grade	Ranks Moved
Alabama Power & Light	1	1	1	1975-1987	A2 FMB	Baa3	4
Amerern/Union electric	1						
Indiana Michigan/AEP	1	1	1	1973-1979	A2 FMB	Baa2	3
<u>Arizona Public Service Co.</u>	1	1	1	1981-1993	A2 FMB	Baa3	4
<u>Baltimore Gas & Electric Co./Constellation</u>	1	1	1	1974-1979	A2 FMB	A2	--
<u>Boston Edison Co.</u>	1						
<u>Carolina Power & Light Co.</u>	1	1					
Central Maine Power	1						
Cincinnati Gas & Electric Co.	1	1					
<u>Cleveland Electric Illuminating Co./First Energy</u>	1	1	1	1981-1993	Aa2 FMB	Baa3	7
<u>Commonwealth Edison Co./Exelon</u>	1	1	1	1968-1990	Aa2 FMB	Baa1	5
<u>Connect. Power & Light</u>	1	1		1972-1978	Aa2 FMB	A2	3
<u>Consolidated Edison Co.</u>	1	1	1	1972-1978	A2 FMB	Baa2	3
<u>Consumers Power Co.</u>	1	1	1	1969-1974	Aaa FMB	Aa2	2
Delmarva Power & Light Co.	1						
<u>Detroit Edison Co.</u>	1	1	1	1985-1992	Baa1 SS	Baa2	1
<u>Duke Power Co.</u>	1	1					
Duquesne Power	1	1	1	1974-1988	Aa2 FMB	Baa2	6
<u>Florida Power & Light Co.</u>	1	1	1	1972-1984	Aa2 FMB	A2	3
<u>Florida Power Corp.</u>	1						
Georgia Power Co./Southern Company	1	1	1	1975-1990	Baa2 FMB	Baa2	--
Gulf States Utilities Co./Entergy	1	1		1980-1988	A2 FMB	Ba3	7

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Houston Lighting & Power Co.	1	1	1987-1994	A2 FMB	A3	1
Illinois Power Co./Amergen	1	1	1984-1989	A2 FMB	Baa3	4
Iowa Power & Light Co.	1	1	1973-1977	Aa2 FMB	Baa2	6
Jersey Central Power & Light Co./First Energy	1	1	1968-1980	A2 FMB	Ba2	6
Kansas City G & E	1	1	1982-1986	Baa2 FMB	Baa3	1
Long Island Lighting Co.	1	1	1972-1990	Aa2 FMB	B2	12
Metropolitan Edison/Amergen	1	1	1973-1984	A2 FMB	B2	9
Louisiana Power & Light/Entergy	1	1	1983-1988	Baa3 FMB	Ba2	2
New England Power Co.	1	1	1971-1992	Aa2 FMB	A1	2
Niagara Mohawk	1	1	1968-1988	Aaa FMB	Baa2	8
New York State Electric & Gas	1	1				
Northeast Nuclear Energy Co.	1	1	1973-1985	Aa2 FMB	Baa2	6
Northern Indiana Public Service Co.	1	1	1970-1976	Aa2 FMB	Aa2	--
Northern States Power Co.	1	1				
Nuclear Management Company	1	1				
Ohio Edison Co./First Energy	1	1	1983-1988	A1 FMB	A1	--
Pacific Gas & Electric Co.	1	1	1973-1991	Aaa FMB	Baa3	9
Philadelphia Electric Co.	1	1	1982-1986	Aa2 FMB	A2	3
PPL	1	1				
Portland General Electric Co.	1	1	1975-1981	A2 FMB	A2	--
Potomac Electric Power Co.	1	1	1970-1987	Aa2 FMB	Baa2	6
Power Authority of the State of New York	1	1	1976-1990	Aa2 FMB	A3	4
Progress FLA	1	1	1980-1991	Baa2 FMB	Caa2	9
Progress Carolina	1	1				
Public Service Colorado	1	1	1973-1987	Aa2 FMB	Aa3	1
Public Service Co. of New Hampshire	1	1				
Public Service Company of Oklahoma	1	1				
Public Service Electric & Gas Co.	1	1				
Public Service of Indiana	1	1				
Puerto Rico Water Resources Authority	1	1				

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<u>Puget Sound Power & Light Co.</u>	1	1	1978-1986	Baa2 FMB	A3	2
<u>Rochester Gas & Electric Corp.</u>	1	1	1969-1975	Aa2 FMB	A2	3
<u>San Diego Gas & Electric Co.</u>	1					
<u>SC Electric & Gas</u>		1	1979-1985	A2 FMB	A1	1
<u>Southern Company</u>	1					
<u>Southern California Edison Co.</u>	1	1	1979-1985	Aa2 FMB	Aa2	--
<u>System Energy Resources Inc.</u>	1					
<u>Tennessee Valley Authority</u>	1					
<u>TXU</u>	1					
<u>Toledo Edison Co./First Energy</u>	1	1				
<u>Union Electric Co.</u>	1	1				
<u>Virginia Electric & Power Co./dominion</u>	1	1				
<u>Wisconsin Electric Power Co.</u>	1	1				
<u>Woolf</u>	1					
Total Unique	22	50				35

Source: Moody's "New Nuclear Generation: Ratings Pressure Increasing," Special Comment, June 2009; pp. 11-12;
Cancelled plants are from <http://clonemaster.homestead.com/files/cancel.htm>; Current owners from <http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/usnuclearpowerplantownersoperatorsholdingcompanies/>; as Moody's only rated investor owned utility reactors owned or cancelled by rural co-ops of munis are not included.

STANDARD AND POOR'S CREDIT PROFILE CONSIDERATIONS

Business risk profile

New Technology Risk 

Construction Risk 

How much risk is mitigated by EPC contract?  

Nuclear operating exposure will increase 

Regulatory framework for recovery of investment 

Financial risk Profile

Debt imputation: 25% for projects vs. 50% for regulated utilities 

Even with DOE guarantee, debt loads can increase significantly 

80/20 vs. 60/40 capital structure 

Despite DOE guarantee, debt service will be fully accounted for 

Ability to recover cash return on work in progress 

Source: Dimitri Mikas, “Financing New Nuclear Construction & Implications for Credit Quality,”
Is there a Nuclear Renaissance, p. 20 Standard and Poor’s May 28, 2009, arrows
point in the direction of the impact on risk

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DIVERSITY OF RESOURCE UNDER VARIOUS TECHNOLOGY SCENARIOS

Resource	FPL		PEF		Efficiency	
	No Nuclear % of total	Gas % of total	No Nuclear % of total	Gas % of total	% of total	% of total
Coal	6.95	6.95	24	20	20.4	
Gas	73.70	70.00	56	36	47.6	
Oil	1.75	1.95	5	3	4.25	
Nuclear	17.30	20.80	12	38	10.2	
Other	0.30	0.30	3	3	8	
Efficiency					8.00	9
HHI	5782	5385	3890	3158	2949	

Source: FPL, average of scenarios at FPL Need Study for electrical Power Docket No. 07-0650, p. 117, PEF: Testimony of John Benjamin Crisp, Docket No. 080148-EI, JBC-8, page 1 of 1;

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THE \$1/KW COST FACTOR

Total Cost Even Diff. 2007	Break Cost 2007	Implicit \$1/kW Factor 2007	Total Cost Even Diff. 2009	Break Cost 2009	Implicit \$1/kW Factor 2009	2009 Breakeven @2007 Factor	Factor Change as % of Break even change
6325	3206	1.972863	9909	5234	1.893198	5022.649	10.42165
8965	4543	1.973366	11943	6308	1.89331	6052.097	14.49876
9994	5065	1.973149	12892	6810	1.893098	6533.718	15.83277
10512	5327	1.973343	14352	7581	1.893154	7272.936	13.66743
11207	5680	1.973063	15334	8099	1.89332	7771.671	13.53157
12148	6157	1.973039	13981	7385	1.893162	7086.024	24.3466
13222	6701	1.973138	14965	7905	1.893106	7584.364	26.63087
13711	6949	1.97309	16377	8650	1.893295	8300.18	20.56553
14367	7281	1.973218	17415	9199	1.893141	8825.685	19.46377

Source: Testimony of Steven R. Sims, Docket No. 070650-EI, Exhibits SRS-7 and SRS-8; Direct Testimony of Steven R. Sims, Docket No. 090009-EI, Table 45

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THE NARROW MARGIN IN FPL'S BREAK-EVEN ANALYSIS

Nuclear w/o Capital	Capital Cost (Case A)	No Nuclear		Nuclear advantage % of Gas
		Gas	Gas	
122528	131940	132437	132437	0.4
143521	152933	155464	155464	1.6
153171	162583	166063	166063	2.1
168265	177677	182617	182617	2.7
164719	174131	190583	190583	8.6
175249	184661	178700	178700	-3.3
174367	183779	189332	189332	2.9
189638	199050	206015	206015	3.4
196670	206082	214085	214085	3.7

Source: Direct Testimony of Steven R. Sims, Docket No. 090009-EI, Table 45;
 Capital costs calculated as Case A multiplied by \$1/kW cost factor.

EXHIBIT 30

APPENDIX A

CV OF DR. MARK COOPER WITH ENERGY RELATED ACTIVITIES

MARK N. COOPER

504 HIGHGATE TERRACE

SILVER SPRING, MD 20904

(301) 384-2204

markcooper@aol.com

EDUCATION:

Yale University, Ph.D., 1978, Sociology

University of Maryland, M.A., 1974, Sociology

City College of New York, B.A., 1968, English

PROFESSIONAL EXPERIENCE:

President, Citizens Research, 1983 - present

Senior Fellow for Economic Analysis, Institute for Energy and the Environment, Vermont
Law School - Present

Research Director, Consumer Federation of America, 1983 - present

Fellow, Stanford Center on Internet and Society, 2000 - Present

Fellow, Donald McGannon Communications Research Center, Fordham University, 200 5-
present

Director, Digital Society Project, Consumer Federation of America, 2002 - Present

Associated Fellow, Columbia Institute on Tele-Information, 2003-2006

Principle Investigator, Consumer Energy Council of America, Electricity Forum, 1985-1994

Director of Energy, Consumer Federation of America, 1984-1986

Director of Research, Consumer Energy Council of America, 1980-1983

Consultant, Office of Policy Planning and Evaluation, Food and Nutrition Service, United
States Department of Agriculture, 1981-1984

Consultant, Advanced Technology, Inc., 1981

Technical Manager, Economic Analysis and Social Experimentation Division, Applied
Management Sciences, 1979

EXHIBIT 30

Research Associate, American Research Center in Egypt, 1976-1977

Research Fellow, American University in Cairo, 1976

Staff Associate, Checchi and Company, Washington, D.C., 1974-1976

Consultant, Division of Architectural Research, National Bureau of Standards, 1974

Consultant, Voice of America, 1974

Research Assistant, University of Maryland, 1972-1974

TEACHING EXPERIENCE:

Lecturer, Washington College of Law, American University, Spring, 1984 - 1986, Seminar in Public Utility Regulation

Guest Lecturer, University of Maryland, 1981-82, Energy and the Consumer, American University, 1982, Energy Policy Analysis

Assistant Professor, Northeastern University, Department of Sociology, 1978-1979, Sociology of Business and Industry, Political Economy of Underdevelopment, Introductory Sociology, Contemporary Sociological Theory; College of Business Administration, 1979, Business and Society

Assistant Instructor, Yale University, Department of Sociology, 1977, Class, Status and Power

Teaching Assistant, Yale University, Department of Sociology, 1975-1976, Methods of Sociological Research, The Individual and Society

Instructor, University of Maryland, Department of Sociology, 1974, Social Change and Modernization, Ethnic Minorities

Instructor, U.S. Army Interrogator/Linguist Training School, Fort Hood, Texas, 1970-1971

PROFESSIONAL ACTIVITIES:

Member, Advisory Committee on Appliance Efficiency Standards, U.S. Department of Energy, 1996 - 1998

Member, Energy Conservation Advisory Panel, Office of Technology Assessment, 1990-1991

Fellow, Council on Economic Regulation, 1989-1990

Member, Increased Competition in the Electric Power Industry Advisory Panel, Office of Technology Assessment, 1989

Participant, National Regulatory Conference, The Duty to Serve in a Changing Regulatory Environment, William and Mary, May 26, 1988

Member, Subcommittee on Finance, Tennessee Valley Authority Advisory Panel of the Southern States Energy Board, 1986-1987

EXHIBIT 30

Member, Electric Utility Generation Technology Advisory Panel, Office of Technology Assessment, 1984 - 1985

Member, Natural Gas Availability Advisor Panel, Office of Technology Assessment, 1983-1984

Participant, Workshop on Energy and the Consumer, University of Virginia, November 1983

Participant, Workshop on Unconventional Natural Gas, Office of Technology Assessment, July 1983

Participant, Seminar on Alaskan Oil Exports, Congressional Research Service, June 1983

Member, Thermal Insulation Subcommittee, National Institute of Building Sciences, 1981-1982

Round Table Discussion Leader, The Energy Situation: An Open Field For Sociological Analysis, 51st Annual Meeting of the Eastern Sociological Society, New York, March, 1981

Member, Building Energy Performance Standards Project Committee, Implementation Regulations Subcommittee, National Institute of Building Sciences, 1980-1981

Participant, Summer Study on Energy Efficient Buildings, American Council for an Energy Efficient Economy, August 1980

Member, University Committee on International Student Policy, Northeastern University, 1978-1979

Chairman, Session on Dissent and Societal Reaction, 45th Annual Meeting of the Eastern Sociological Society, April, 1975

Member, Papers Committee, 45th Annual Meeting of the Eastern Sociological Society, 1975

Student Representative, Programs, Curricula and Courses Committee, Division of Behavioral and Social Sciences, University of Maryland, 1973-1974

President, Graduate Student Organization, Department of Sociology, University of Maryland, 1973-1974

HONORS AND AWARDS:

American Sociological Association, Travel Grant, Uppsala, Sweden, 1978

Fulbright-Hayes Doctoral Research Abroad Fellowship, Egypt, 1976-1977

Council on West European Studies Fellowship, University of Grenoble, France, 1975

Yale University Fellowship, 1974-1978

Alpha Kappa Delta, Sociological Honorary Society, 1973

Phi Delta Kappa, International Honorary Society, 1973

Graduate Student Paper Award, District of Columbia Sociological Society, 1973

EXHIBIT 30

Science Fiction Short Story Award, University of Maryland, 1973

Maxwell D. Taylor Award for Academic Excellence, Arabic, United States Defense Language Institute, 1971

Theodore Goodman Memorial Award for Creative Writing, City College of New York, 1968

New York State Regents Scholarship, 1963-1968

National Merit Scholarship, Honorable Mention, 1963

PUBLICATIONS:

ENERGY

Books and Chapters

“Recognizing the Limits of Markets, Rediscovering Public Interest in Utilities,” in Robert E. Willett (ed), Electric and Natural Gas Business: Understanding It! (2003 and Beyond) (Houston: Financial Communications: 2003)

"Protecting the Public Interest in the Transition to Competition in New York Industries," The Electric Utility Industry in Transition (Public Utilities Reports, Inc. & the New York State Energy Research and Development Authority, 1994)

"The Seven Percent Solution: Energy Prices, Energy Policy and the Economic Collapse of the 1970s," in Energy Concerns and American Families in the 1980s (Washington, D.C.: The American Association of University Women Educational Foundation, 1983)

"Natural Gas Policy Analysis," in Edward Mitchell (Ed.), Natural Gas Pricing Policy (Washington, D.C.: American Enterprise Institute, 1983)

Equity and Energy: Rising Energy Prices and the Living Standard of Lower Income Americans (Boulder, Colorado: Westview Press, 1983)

Articles and Papers:

“The Failure of Federal Authorities to Protect American Energy Consumers From Market Power and Other Abusive Practices,” *Loyola Consumer Law Review*, 19:4 (2007)

“Too Much Deregulation or Not Enough,” *Natural Gas and Electricity*, June 2005

“Real Energy Crisis is \$200 Billion Natural Gas Price Increase,” Natural Gas and Electricity, August 2004

“Regulators Should Regain Control to Prevent Abuses During Scarcity,” Natural Gas, August 2003

“Economics of Power: Heading for the Exits, Deregulated Electricity Markets Not Working Well,” *Natural Gas*, 19:5, December 2002

“Let’s Go Back,” Public Power, November-December 2002

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"Conceptualizing and Measuring the Burden of High Energy Prices," in Hans Landsberg (Ed.), High Energy Costs: Assessing the Burden (Washington, D.C.: Resources For the Future, 1982)

"Energy Efficiency Investments in Single Family Residences: A Conceptualization of Market Inhibitors," in Jeffrey Harris and Jack Hollander (Eds.), Improving Energy Efficiency in Buildings: Progress and Problems (American Council for An Energy Efficient Economy, 1982)

"Policy Packaging for Energy Conservation: Creating and Assessing Policy Packages," in Jeffrey Harris and Jack Hollander (Eds.), Improving Energy Efficiency in Buildings: Progress and Problems (American Council for An Energy Efficient Economy, 1982)

"The Role of Consumer Assurance in the Adoption of Solar Technologies," International Conference on Consumer Behavior and Energy Policy, August, 1982

"Energy and the Poor," Third International Forum on the Human Side of Energy, August, 1982

"Energy Price Policy and the Elderly," Annual Conference, National Council on the Aging, April, 1982

"Energy and Jobs: The Conservation Path to Fuller Employment," Conference on Energy and Jobs conducted by the Industrial Union Department of the AFL-CIO, May 1980

Research Reports

A Consumer Analysis of the Adoption of the California Clean Cars Program in Other States: Florida, Consumer Federation of America, November 2008

Climate Change and the Electricity Consumer: Background Analysis to Support a Policy Dialogue, Consumer Federation of America, June 2008

Ending America's Oil Addiction: A Quarterly Report on Consumption, Prices and Imports, Consumer Federation of America, April 2008

A Consumer Analysis of the Adoption of the California Clean Cars Program in Other States: Arizona, Consumer Federation of America, March 2008

A Step Toward A Brighter Energy Future, Consumer Federation of America, December 2007

A Consumer Analysis of the Adoption of the California Clean Cars Program in Other States: New Mexico, Consumer Federation of America, November 2007

Not time to Waste: America's Energy Situation Is Dangerous, But Congress Can Adopt New Policies to Secure Our Future, Consumer Federation of America, October 2007

Technology, Cost and Timing, Consumer Federation of America, July 2007

Florida's Stake in the Fuel Economy Battle, July 2007

Big Oil v. Ethanol, Consumer Federation of America, July 2007

Too Little, Too Late: Why the Auto Industry Proposal To Go Low and Slow on Fuel Economy Improvements Is Not in the Consumer or National Interest, Consumer Federation of America, July 2007

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The Senate Commerce Committee Bill Is Much Better For Consumers and The Nation Than the Automobile Industry Proposal, Consumer Federation of America, June 2007

Rural Households Benefit More From Increases In Fuel Economy, Consumer Federation of America, June 2007

A Consumer Pocketbook And National Cost-Benefit Analysis of “10 in 10”, Consumer Federation of America, June 2007

Time to Change the Record on Oil Policy, Consumer Federation of America, August 2006

50 by 2030: Why \$3.00 Gasoline Makes the 50-Miles Per Gallon Car Feasible, Affordable and Economic, Consumer Federation of America, (May 2006)

The Role of Supply, Demand, Industry Behavior and Financial Markets in the Gasoline Price Spiral (Prepared for Wisconsin Attorney General Peggy A. Lautenslager, May 2006)

Debunking Oil Industry Myths and Deception: The \$100 Billion Consumer Rip-Off (Consumer Federation of America and Consumers Union, May 3, 2006)

The Role of Supply, Demand and Financial Markets in the Natural Gas Price Spiral (prepared for the Midwest Attorneys General Natural Gas Working Group: Illinois, Iowa, Missouri, Wisconsin, March 2006)

The Impact of Rising Prices on Household Gasoline Expenditures (Consumer Federation of America, September 2005)

Responding to Turmoil in Natural Gas Markets: The Consumer Case for Aggressive Policies to Balance Supply and Demand (consumer Federation of America, December 2004)

Record Prices, Record Oil Company Profits: The Failure Of Antitrust Enforcement To Protect American Energy Consumers (Consumer Federation of America, Consumers Union, September 2004)

Fueling Profits: Industry Consolidation, Excess Profits, & Federal Neglect: Domestic Causes of Recent Gasoline and Natural Gas Price Shocks (Consumer Federation of America and Consumers Union, May 2004)

Spring Break in the U.S. Oil Industry: Price Spikes, Excess Profits and Excuses (Consumer Federation of America, October 2003)

How Electricity Deregulation Puts Pressure On The Transmission Network And Increases It's Cost (Consumer Federation of America, Consumers Union and U.S. PIRG, August 2003)

A Discouraging Word (or Two, or Three, or Four) About Electricity Restructuring in Texas, Pennsylvania, New England and Elsewhere Consumer Federation of America, U.S. Public Interest Research Group and Consumers Union, March 2003)

All Pain, No Gain: Restructuring and Deregulation in the Interstate Electricity Market (Consumer Federation of America, September 2002)

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- U.S. Capitalism and the Public Interest: Restoring the Balance in Electricity and Telecommunications Markets (Consumer Federation of America, August 2002)
- Electricity Deregulation and Consumers: Lesson from a Hot Spring and a Cool Summer (Consumer Federation of America, August 30, 2001)
- Ending the Gasoline Price Spiral: Market Fundamentals for Consumer-Friendly Policies to Stop the Wild Ride (Consumer Federation of America, July 2001)
- Analysis of Economic Justifications and Implications of Taxing Windfall Profits in the California Wholesale Electricity Market (Consumer Federation of America and Consumers Union, June 13, 2001)
- Behind The Headlines Of Electricity Restructuring A Story Of Greed, Irresponsibility And Mismanagement Of A Vital Service In A Vulnerable Market (Consumer Federation of America, March 20, 2001)
- Reconsidering Electricity Restructuring: Do Market Problems Indicate a Short Circuit or a Total Blackout? (Consumer Federation of America, November 30, 2000)
- Mergers and Open Access to Transmission in the Restructuring Electric Industry (Consumer Federation of America, April 2000)
- Electricity Restructuring and the Price Spikes of 1998 (Consumer Federation of America and Consumers Union, June 1999)
- The Residential Ratepayer Economics of Electric Utility Restructuring (Consumer Federation of America, July 1998)
- Consumer Issues in Electric Utility Restructuring (Consumer Federation of America, February 12, 1998)
- A Consumer Issue Paper on Electric Utility Restructuring (American Association of Retired Persons and the Consumer Federation of America, January, 1997)
- Transportation, Energy, and the Environment: Balancing Goals and Identifying Policies, August 1995
- A Residential Consumer View of Bypass of Natural Gas Local Distribution Companies, February 1988
- The National Energy Security Policy Debate After the Collapse of Cartel Pricing: A Consumer Perspective, January 1987
- The Energy, Economic and Tax Effects of Oil Import Fees, October 25, 1985
- The Bigger the Better: The Public Interest in Building a Larger Strategic Petroleum Reserve, June 12, 1984
- The Consumer Economics of CWIP: A Short Circuit for American Pocketbooks, April, 1984
- Public Preference in Hydro Power Relicensing: The Consumer Interest in Competition, April 1984
- Concept Paper for a Non-profit, Community-based, Energy Services Company, November 1983

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The Consumer and Energy Impacts of Oil Exports, April 1983

Up Against the Consumption Wall: The Impact of Rising Energy Prices on Lower Income Consumers, March 1983

A Decade of Despair: Rising Energy Prices and the Living Standards of Lower Income Americans, September 1982

The Impact of Rising Energy Prices on the Delivery of Public Service by Local Governments, August 1982

The Impact of Rising Energy Prices on the Low Income Population of the Nation, the South, and the Gulf Cost Region, July, 1982

A Comprehensive Analysis of the Impact of a Crude Oil Import Fee: Dismantling a Trojan Horse, April 1982

The Past as Prologue II: The Macroeconomic Impacts of Rising Energy prices, A Comparison of Crude Oil Decontrol and Natural Gas Deregulation, March, 1982

The Past as Prologue I: The Underestimation of Price Increases in the Decontrol Debate, A Comparison of Oil and Natural Gas, February 1982

Oil Price Decontrol and the Poor: A Social Policy Failure, February 1982

Natural Gas Decontrol: A Case of Trickle-Up Economics, January 1982

A Comprehensive Analysis of the Costs and Benefits of Low Income Weatherization and Its Potential Relationship to Low Income Energy Assistance, June 1981

Summary of Market Inhibitors, February 1981

Program Models and Program Management Procedures for the Department of Energy's Solar Consumer Assurance Network Project: A Rapid Feedback Evaluation, February 1981

An Analysis of the Economics of Fuel Switching Versus Conservation for the Residential Heating Oil Consumer, October 1980

Energy Conservation in New Buildings: A Critique and Alternative Approach to the Department of Energy's Building Energy Performance Standards, April, 1980

The Basics of BEPS: A Descriptive Summary of the Major Elements of the Department of Energy's Building Energy Performance Standards, February, 1980

TESTIMONY:

FEDERAL AGENCIES AND COURTS

“Initial Comments of the Consumer Federation of America,” Remedying Undue Discrimination through Open Access Transmission Service and Standard Electricity market Design, Federal Energy Regulatory Commission, Docket No. RM-01-12-000, October 15, 2002

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- “An Economic Explanation of Why the West and South Want to Avoid Being Infected by FERC’s SMD and Why Market Monitoring is Not an Effective Cure for the Disease,” SMD Market Metrics Conference, Federal Energy Regulatory Commission, October 2, 2002
- “Motion To Intervene And Request For Rehearing Of The Consumer Federation Of America,” before the Federal Energy Regulatory Commission, San Diego Gas & Electric Company, Complaint, v. All Sellers of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange, Docket Nos. EL00-95-000 et al,
- “Reply Comments of the Consumer Federation Of America,” before the Federal Energy Regulatory Commission, San Diego Gas & Electric Company, Complaint, v. All Sellers of Energy and Ancillary Services Into Markets Operated by the California Independent System Operator and the California Power Exchange, Docket Nos. EL00-95-000 et al,
- “Consumer Federation Of America, Request For Reconsideration Regional Transmission Organizations,” Federal Energy Regulatory Commission, Docket No. RM99-2-000; Order No. 2000, January 20, 2000
- "Comments of the Consumer Energy Council of America Research Foundation," before the Environmental Protection Agency, 40 CFR Part 73, July 5, 1991
- "Joint Comments of the Consumer Federation of America and the Environmental Action Foundation," Federal Energy Regulatory Commission, Dockets Nos. RM88-4, 5,6-000, July 18, 1988
- "Comments of the Consumer Federation of America on the Initiation of National Security Investigations of Imports of Crude Oil and Refined Petroleum Products," Notice of Investigation Under Section 232 of the Trade Expansion Act of 1962, U.S. Department of Commerce, January 28, 1988
- "Comments of the Consumer Federation of America on the Department of Energy's Study of the Impact of Falling Oil Prices on Crude Oil Production and Refining Capacity in the United States, U.S. Department of Energy, November 30, 1986
- "Comments of the Consumer Federation of America on the Notice of Proposed Rule making Issued May 30, 1985," before the Federal Energy Regulatory Commission, Docket No. RM85-1-000 (Part A-D), July 15, 1985
- "Utility Fuels, Inc. v. Burlington Northern Railroad Co., Fort Worth and Denver Ry. Co, and Atchison, Topeka and Santa Fe Ry. Co, before the Interstate Commerce Commission, Docket No. 39002, December 16. 1983, on Behalf of Utility Fuels, Inc.
- "In the Matter of Coal Rate Guidelines -- Nationwide, ExParte No. 347 (Sub No. 1)," before the Interstate Commerce Commission, July 28, 1983
- "Federal Energy Conservation Programs," before the United States Environmental Protection Agency, July 14, 1981
- "Building Energy Performance Standards," before the Department of Energy, March 27, 1980

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"Comment on the Incremental Pricing Provisions of the Natural Gas Policy Act," before the Federal Energy Regulatory Commission, Docket No. RM 80-10

FEDERAL CONGRESSIONAL

"Excessive Speculation In Energy Commodities," Agriculture Committee, United States House of Representatives, July 10, 2008

"Oversight of Energy Markets and Oil Futures Contract," Joint Hearing of the Senate Appropriations Subcommittee on Financial Services and General Government and The and the Committee on Agriculture, Nutrition and Forestry United States Seante, June 17, 2008

"Energy Market Manipulation and Federal Enforcement Regimes," Committee On Commerce, Science And Transportation, United States Senate, June 3, 2008

"Consumer Effects of Retail Gas Prices," before the Judiciary Committee Antitrust Task Force, United States House of Representatives, May 7, 2008

"Pumping up Prices: The Strategic Petroleum Reserve and Record Gas Prices," Select Subcommittee on Energy Independence and Global Warming, United States House of Representative, April 24, 2008

"Prices at the Pump: Market Failure and the Oil Industry," House Judiciary Committee, May 16, 2007

"Price Gouging," Senate Committee on Commerce, Science and Transportation, May 23, 2006

"Gasoline: Supply, Price and Specifications," House Committee on Energy and Commerce, May 10, 2006

"Antitrust Should Promote Competition on Top of Well Regulated Infrastructure Platforms," Antitrust Modernization Commission, December 5, 2005

"Testimony of Mark Cooper on behalf of The Consumer Federation of America and Consumers Union on the Status of the U.S. Refining Industry," Subcommittee on Energy and Air Quality, Committee on Energy, U.S. House of Representatives, July 15, 2004

"Testimony of Dr. Mark N. Cooper on Behalf of the Consumer Federation of American and Consumers Union on Environment Regulation in Oil Refining," Environment and Public Works Committee, May 12, 2004

"Testimony Of Dr. Mark Cooper, On Behalf Of Consumer Federation Of America And Consumers Union On Crude Oil: The Source Of Higher Prices? Before The Senate Judiciary Committee, Antitrust, Competition Policy And Consumer Rights Subcommittee, April 7, 2004

"Testimony Of Dr. Mark Cooper, Director Of Research On Gasoline Price Volatility," Senate Commerce Committee, October 9, 2003

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- “Statement of Dr. Mark Cooper on Behalf of the Consumer Federation of America and Consumers Union on The Federal Response to the 2003 Blackout: Time to Put the Public Interest First,” Subcommittee on Oversight of Government Management, The Federal Workforce and the District of Columbia, Committee on Government Affairs, United States Senate, September 10, 2003
- “Statement Of Dr. Mark Cooper on Electricity Markets: California,” Subcommittee On Energy And Air Quality House Energy And Commerce Committee’s Subcommittee, March 22, 2001
- “Testimony of Dr. Mark N. Cooper on behalf of the Consumer Federation of America and Consumers Union,” Electricity Restructuring at the Federal Level, Subcommittee on Energy and Power, U.S. House of Representatives, October 6, 1999
- “Testimony of Dr. Mark N. Cooper on Electricity Competition: Consumer Protection Issues,” before the Subcommittee on Energy and Power, Energy and Commerce Committee, United States House of Representatives, May 26, 1999
- “Testimony of Dr. Mark N. Cooper on The Regulation of Public Utility Holding Companies,” Committee on Banking, Housing, and Urban Affairs, United States Senate, April 29, 1997
- "Testimony of Dr. Mark N. Cooper on Behalf of the Consumer Federation of America and the Environmental Action Foundation on Exempting Registered Holding Companies from the Public Utility Holding Company Act for Diversification into Telecommunications," Committee on Energy and Commerce, United States House of Representatives, July 29, 1994
- "Testimony of Dr. Mark N. Cooper on Regulatory Reform in the Electric Utility Industry," before the Committee on Energy and Natural Resources, U.S. Senate, March 14, 1991
- "Testimony of Mark Cooper and Scott Hempling on Electric Utility Policies of the Federal Energy Regulatory Commission," before the Subcommittee on Environment, Energy and Natural Resources of the Government Operations Committee, U.S. House of Representatives, October 11, 1990
- "Testimony of Dr. Mark N. Cooper on Independent Power Producers and the Public Utility Holding Company Act of 1935" Subcommittee on Energy and Power, Committee on Energy and Commerce, United States House of Representatives, September 14, 1989
- "Testimony of Dr. Mark N. Cooper on Acid Rain Legislation, Subcommittee on Energy and Power, Committee on Energy and Commerce, United States House of Representatives, September 7, 1989
- "Joint Testimony of the Consumer Federation of American and the Citizen Labor Energy Coalition on Bypass of Natural Gas Local Distribution Companies," before the Subcommittee on Energy Regulation and Conservation, Committee, on Energy and Natural Resources, United States House of Representatives, September 29, 1988
- "Independent Power Producers and the Public Utility Holding Company Act of 1935, Subcommittee on Energy and Power of the Energy and Commerce Committee, U.S. House of Representatives, September 14, 1988

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- "Joint Testimony of the Consumer Federation of American and the Citizen Labor Energy Coalition on Bypass of Natural Gas Local Distribution Companies," before the Subcommittee on Energy and Power, Energy and Commerce Committee, United States House of Representatives, May 25, 1988
- "Administrative Modifications in the Implementation of the Public Utility Regulatory Act of 1978," before the Committee on Energy and Natural Resources, U.S. Senate, February 2, 1988
- "Excess Deferred Taxes," before the Subcommittee on Select Revenue Measures, Ways and Means Committee, U.S. House of Representatives, December 14, 1987
- "Electric Utility Regulation," Testimony before the Subcommittee on Energy and Power of the Energy and Commerce Committee, U.S. House of Representatives, September 23, 1987
- "Oil Industry Taxes," before the Committee on Finance, U.S. Senate, June 5, 1987
- "Comprehensive Natural Gas Legislation," before the Subcommittee on Regulation, Committee on Energy and Natural Resources, U.S. Senate, May 20, 1987
- "Comprehensive Natural Gas Legislation," before the Subcommittee on Regulation, Energy and Natural Resources Committee, U.S. Senate, May 20, 1986
- "Electric Utility Regulation," before the Subcommittee on Energy Conservation and Power, Energy and Commerce Committee, U.S. House of Representatives, March 20, 1986
- "Oil Import Fees," Committee on Energy and Natural Resources, U.S. Senate, March 20, 1986
- "Recent Developments in the Natural Gas Industry," before the Subcommittee on Energy Regulation and Conservation of the Energy and Natural Resource Committee, U.S. Senate, July 11, 1985
- "The World Energy Outlook," before the Subcommittee on Environment, Energy and Natural Resources of the Government Operations Committee, United States House of Representatives, April 1, 1985
- "Legislative Proposals Governing Construction Work In Progress," before the Subcommittee on Energy Regulation of the Energy and Natural Resources Committee, United States Senate, April 12, 1984
- "Legislation Affecting Oil Company Mergers," before the Subcommittee on Energy and Mineral Resources of the Committee on Energy and Natural Resources, United States Senate, April 10, 1984
- "Review of Federal Policies Affecting Energy Conservation and Housing," before the Subcommittee on Housing and Community Development of the Committee on Banking, Finance and Urban Affairs, United States House of Representatives, March 21, 1984
- "The Export of Alaskan Crude Oil," before the Subcommittee on East Asian and Pacific Affairs of the Committee on Foreign Relations, United States Senate, July 19, 1984

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- "Economics of Natural Gas Deregulation," before the Joint Economic Committee, United States Congress, April 15, 1983
- "Bills to Amend the Export Administration Act," before the Subcommittee on International Finance and Monetary Policy of the Committee on Banking, Housing and Urban Affairs, United States Senate, April 14, 1983
- "Reauthorization of the Export Administration Act," before the Subcommittee on International Economic Policy and Trade of the Committee on Foreign Affairs, United States House of Representatives, April 12, 1983
- "Pending Natural Gas Legislation," before the Subcommittee on Fossil and Synthetic Fuels of the Committee on Energy and Commerce, United States House of Representatives, March 22, 1983
- "Energy Conservation and Jobs," before the Subcommittee on Energy Conservation and Power of the Committee on Energy and Commerce, United States House of Representatives, March 15, 1983
- "Natural Gas Hearings," before the Committee on Energy and Natural Resources, United States Senate, March 10, 1983
- "The Impacts of Various Energy Tax Options," before the Subcommittee on Fossil and Synthetic Fuels of the Committee on Energy and Commerce, June 15, 1982
- "Various Energy Tax Options," before the Subcommittee on Energy and Agricultural Taxation of the Committee on Finance, United States Senate, June 9, 1982
- "Natural Gas Policy and Regulatory Issues," before the Committee on Energy and Natural Resources, United States Senate, March 23, 1982
- "The Economic Implications of Natural Gas Deregulation," before the Subcommittee on International Trade, Finance and Security Economics of the Joint Economic Committee, United States Congress, February 18, 1982
- "The Implementation of Title I of the Natural Gas Policy Act of 1978," before the Committee on Energy and Natural Resources, United States Senate, November 5, 1981
- "The National Home Weatherization Act of 1981," before the Subcommittee on Energy Conservation and Supply of the Committee on Energy and Natural Resources, United States Senate, July 15, 1981
- "An Alternative Energy Budget," before the Subcommittee on Energy Conservation and Power of the Energy and Commerce Committee, United States House of Representatives, February 27, 1981
- "Institutional Analysis of Policy Options to Promote Energy Conservation in New Buildings," before the Subcommittee on Energy Development and Applications of the Committee on Science and Technology, United States House of Representatives, September 25, 1980
- "Building Energy Performance Standards," before the Subcommittee on Energy Regulation of the Committee on Energy and Natural Resources, United States Senate, June 26, 1980

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STATE AND PROVINCE

- “Prefiled Testimony Of Dr. Mark N. Cooper On Behalf Of The Virginia Citizen Consumers Council,” In The Matter Of Application Of Virginia Electric And Power Company For Approval Of A Functional Separation Plan, Virginia State Corporation Commission, Case No. Pue000584, August 24, 2001
- “Direct Testimony Of Dr. Mark N. Cooper On Behalf Of The Attorney General Of Oklahoma, Before The Oklahoma Corporation Commission Application Of Ernest G. Johnson, Director Of The Public Utility Division, Oklahoma Corporation Commission, To Require Public Service Company of Oklahoma To Inform The Commission Regarding Planning Of Energy Procurement Practices And Risk Management Strategies And For A Determination As To Appropriate Methods To Lessen The Impact Of Energy Price Volatility Upon Consumers, Cause No. Pud 2001-00096, May 18, 2001
- “Direct Testimony Of Dr. Mark N. Cooper On Behalf Of The Attorney General Of Oklahoma, Before The Oklahoma Corporation Commission Application Of Ernest G. Johnson, Director Of The Public Utility Division, Oklahoma Corporation Commission, To Require Oklahoma Gas and Electric Company To Inform The Commission Regarding Planning Of Energy Procurement Practices And Risk Management Strategies And For A Determination As To Appropriate Methods To Lessen The Impact Of Energy Price Volatility Upon Consumers, Cause No. Pud 2001-00095, May 18, 2001
- “Direct Testimony Of Dr. Mark N. Cooper On Behalf Of The Attorney General Of Oklahoma, Before The Oklahoma Corporation Commission Application Of Ernest G. Johnson, Director Of The Public Utility Division, Oklahoma Corporation Commission, To Require Arkla, A Division of Reliant Energy Resources Corporation To Inform The Commission Regarding Planning Of Energy Procurement Practices And Risk Management Strategies And For A Determination As To Appropriate Methods To Lessen The Impact Of Energy Price Volatility Upon Consumers, Cause No. Pud 2001-00094, May 18, 2001
- “Direct Testimony Of Dr. Mark N. Cooper On Behalf Of The Attorney General Of Oklahoma, Before The Oklahoma Corporation Commission Application Of Ernest G. Johnson, Director Of The Public Utility Division, Oklahoma Corporation Commission, To Require Oklahoma Natural Gas Company To Inform The Commission Regarding Planning Of Energy Procurement Practices And Risk Management Strategies And For A Determination As To Appropriate Methods To Lessen The Impact Of Energy Price Volatility Upon Consumers, Cause No. Pud 2001-00097, May 14, 2001

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- “Statement of Dr. Mark N. Cooper before the Governor’s Task on Electricity Restructuring,” Las Vegas Nevada, November 30, 2000
- “Testimony of Dr. Mark N. Cooper on Behalf of the Arizona Consumers Council,” In the Matter of the Competition in the Provision of Electric Services Throughout the State of Arizona, The Arizona Corporation Commission, January 21, 1998
- “Direct Testimony of Dr. Mark N. Cooper on Behalf of the Virginia Citizens Consumers Council,” Virginia Electric Power Company, Application of Approval of Alternative Regulatory Plan, State Corporation Commission of Virginia, December 15, 1997
- “Electric Industry Restructuring: Who Wins? Who Loses? Who Cares?” Hearing on Electric Utility Deregulation, National Association of Attorneys General, November 18, 1997
- “Direct Testimony of Dr. Mark N. Cooper in Response to the Petition of Enron Energy Services Power, Inc., for Approval of an Electric Competition and Customer Choice Plan and for Authority Pursuant to Section 2801 (E)(3) of the Public Utility Code to Service as the Provider of Last Resort in the Service Territory of PECO Energy Company on Behalf of the American Association of Retired Persons,” Pennsylvania Public Utility Commission v. PECO, Docket No. R-00973953, November 7, 1997.
- “Policies to Promote Universal Service and Consumer Protection in the Transition to Competition in the Electric Utility Industry,” Regulatory Flexibility Committee, Indiana General Assembly, September 9, 1997
- “Testimony of Dr. Mark N. Cooper on Behalf of the American Association of Retired Persons,” Application of Pennsylvania Power and Light Company for Approval of its Restructuring Plan Under Section 2806 of the Public Utility Code, Pennsylvania Public Utility Commission, Docket No. R-00973954, July 2, 1997
- “Testimony of Dr. Mark N. Cooper on Behalf of the American Association of Retired Persons,” Application of PECO Company for Approval of its Restructuring Plan Under Section 2806 of the Public Utility Code, Pennsylvania Public Utility Commission, June 20, 1997
- “Statement of Dr Mark N. Cooper,” Project on Industry Restructuring, Public Utility Commission of Texas, Project No. 15000, May 28, 1996
- “Direct Testimony of Dr. Mark N. Cooper Submitted on behalf of The American Association of Retired Persons, before the Public Service Commission, State of New York, In the Matter of Competitive Opportunities Case 94-E-0952 New York State Electric and Gas Co. 96-E-0891; Rochester Gas and Electric Corp. 96-E-0898 Consolidated Edison Company of New York, Inc. 96-E-0897
- “Statement of Dr. Mark N. Cooper to the System Benefits Workshop,” Project on Industry Restructuring, Project No. 15000, before the Public Utility Commission of Texas, May 28, 1996
- "Statement of Dr. Mark N. Cooper, Joint Hearing on the Public Utility Holding Company Act of 1935," Committees on Finance and Technology and Electricity, National Association of Regulatory Utility Commissioners, February 28, 1989

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"On Behalf of the Evelyn Soloman, Proceeding on Motion of the Commission as to the Rates, Charges and Regulations of Niagara Mohawk Power Corporation, Case Nos. 29670 and 29671," before the State of New York Public Service Commission, February 16, 1988

"On Behalf of Mississippi Legal Services Coalition in the Matter of the Citation to Show Cause Why the Mississippi Power and Light Company and Middle South Energy Should not Adhere to the Representation Relied Upon by the Mississippi Public Service Commission in Determining the Need and Economic Justification for Additional Generating Capacity in the Form of A Rehearing on Certification of the Grand Gulf Nuclear Project," Before the Mississippi Public Service Commission, Docket No. U-4387, August 13, 1984

"The Impact of Rising Energy Prices on the Low Income Population of the Nation, the South, and the Gulf Coast Region," before the Mississippi Public Service Commission, Docket No. U4224, November 1982

"The Impact of Rising Utility Rates on he Budgets of Low Income Households in the Region of the United States Served by the Mississippi Power Company and South Central Bell Telephone Company," before the Chancery Court of Forrest County, Mississippi, October 6, 1982

"The Impact of Rising Energy Prices on the Low Income Population of the Nation, the South and the Gulf Coast Region," before the Mississippi Public Service Commission, Docket No. U-4190, August 1982

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Nuclear Plant Cost)
Recovery Clause)
)
)
_____)

DOCKET NO. 100009-EI
FILED: July 8, 2010

DIRECT TESTIMONY OF DR. MARK COOPER

ON BEHALF OF
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1 **IN RE: NUCLEAR PLANT COST RECOVERY CLAUSE**
2 **BY THE SOUTHERN ALLIANCE FOR CLEAN ENERGY**
3 **FPSC DOCKET NO. 100009-EI**
4 **DIRECT TESTIMONY OF**
5 **DR. MARK COOPER**

6 **INTRODUCTION AND QUALIFICATIONS**

7 **Q. Please state your name and address.**

8 A. My name is Dr. Mark Cooper. I reside at 504 Highgate Terrace, Silver Spring, Maryland.
9

10 **Q. Briefly describe your qualifications**

11 A. I have a Ph.D. from Yale University and have been providing economic and policy analysis
12 for energy and telecom for almost thirty years. I have been the Director of Energy and the Director
13 of Research at the Consumer Federation of America for 27 years, although the opinions I express in
14 this testimony are my personal opinions and not those of the Consumer Federation. I am a Fellow at
15 various universities on specific issues, including the Institute for Energy and the Environment at
16 Vermont Law School. I have testified over 100 times before public utility commissions in 44
17 jurisdictions in the U.S. and Canada on energy and telecommunications issues and about twice as
18 many times before federal agencies and Congress on a variety of issues, including energy and
19 electricity. A copy of my resume with energy related activities is attached as Exhibit MNC- 20.
20

21 **PURPOSE, OVERVIEW AND SUMMARY OF TESTIMONY**

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

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1 A. I have been asked by the Southern Alliance for Clean Energy (“SACE”) to examine the
2 long-term feasibility of completion of Florida Power & Light’s (“FPL”) Turkey Point 6 & 7
3 Reactors (“Turkey Point”) and Progress Energy Florida’s (“PEF” or “Progress”) Levy Nuclear
4 Reactors (“Levy”) (collectively “reactors” or “projects”), and to determine whether or not it is
5 reasonable and/or prudent for FPL and PEF to incur any additional costs on these proposed reactors
6 given current economic and other uncertainties.

7

8 **Q. Please provide a general overview of your testimony.**

9 A. In a mere four years since the passage the Florida Renewable Energy Technologies and
10 Energy Efficiency Act of 2006, which sought to promote nuclear power in the state, the “nuclear
11 renaissance” in Florida has been reduced to the largest investor - owned utilities in the state, PEF and
12 FPL, urging the Commission to allow them to charge ratepayers hundreds of millions of dollars to
13 do nothing more than hold their place in a line of proposed nuclear projects at the Nuclear
14 Regulatory Commission. The number of utilities in the line has shrunk dramatically as other
15 proposed new nuclear projects have been cancelled around the country. For PEF and FPL, the
16 movement of the line has slowed to a crawl, and reserving their place in the line has little if any
17 value to the Florida ratepayers because the line is almost certainly leading nowhere any time soon.

18 Ironically, this sad state of affairs represents significant progress from last year. In contrast
19 to the utilities’ testimony in last year’s cost recovery docket (Docket No. 090009-EI), PEF and FPL
20 now admit that the economics of nuclear reactor construction are highly uncertain. For FPL the
21 uncertainty is so great and the risks so high that they now say they have not determined whether they
22 will actually build these proposed new reactors in the state.

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1 Progress hopes that a five-year delay will resolve the uncertainty, but maintains that it is still
2 committed to construction.

3 The movement in the utility positions is in the direction I pointed them in my testimony last year, but
4 they have not moved far enough, and as a result, additional millions of ratepayer dollars have been
5 wasted and more is proposed to be wasted over the coming years. Furthermore, while PEF and FPL
6 promise a thorough economic review before they make the momentous decision to proceed with
7 construction of these proposed reactors, in the interim they continue to ask that the Florida
8 ratepayers foot the bill, without a well-grounded showing that completion of these reactors is
9 feasible in the long-term. In my opinion, it is not reasonable or prudent to allow PEF and FPL to
10 incur additional costs of these proposed reactors from Florida ratepayers so that the utilities can do
11 nothing more than sit in line until they themselves determine if completion of the reactors is feasible.
12 This is a decision that the Commission can and should make now.

13 In light of these developments, in my testimony I repeat two of my primary
14 recommendations that I made in my testimony last year. First, the Commission should not allow the
15 recovery of the line-sitting fee from ratepayers. If anything, the Commission should only allow a
16 small sum to allow FPL and PEF to continue to monitor and study the nuclear option.

17 Second, the Commission should develop a comprehensive and careful template for
18 evaluating the build-no-build decision, when, if ever, it is presented to the Commission.

19

20 **Q. Please summarize your findings.**

21 A. In the 2009 nuclear cost recovery proceeding, Docket 090009-EI, I presented evidence that
22 the fundamental economics of nuclear reactor construction no longer supported the construction of

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1 new reactors in Florida, if they ever did. I emphasized the dramatic changes, for the worse, in key
2 variables that affect the economics of nuclear reactors:

- 3 • declining natural gas costs,
- 4 • declining estimates of carbon prices,
- 5 • declining demand due to the economic slowdown,
- 6 • reduced need for nonrenewable generation due to likely efficiency and renewable
7 mandates in climate change legislation,
- 8 • rising projections of nuclear construction costs, and
- 9 • the high degree of uncertainty in the economic environment that new reactors face.

10 All of these factors are still at work and many have continued to develop in a manner that further
11 undermines the long-term feasibility of ever completing these proposed nuclear reactors in Florida.
12 As a result, it is neither reasonable nor prudent to incur additional costs for these proposed reactors.

13 The decisions by Progress and FPL to seek to build these proposed nuclear reactors were
14 based on a number of important assumptions that have been called into question in the time since the
15 evidence was filed in their petitions for determination of need (“Need Docket”), as well as the
16 evidence filed in Docket 090009-EI. More specifically:

17 (1) They assumed a high rate of demand growth. While the utilities have lowered their demand
18 projections in testimony filed this year, they still have not recognized the full implications of
19 lowered demand in the evaluation of the proposed reactors in the timing and pattern of need
20 for new generation assets.

21 (2) They downplayed the contribution that efficiency and renewables can make to meet the need
22 for electricity. The utilities continue to fail to incorporate the impact of these policies on

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1 demand growth and the need for non-renewable generation in the evaluation of the proposed
2 reactors.

3 (3) They assumed high prices for fossil fuels based on high commodity prices. While they have
4 lowered those projections in testimony filed this year, they have not lowered the price
5 projections to accord with reality.

6 (4) Based on the belief that public policy would put a high price on carbon, they assumed natural
7 gas would be much more costly than the latest analysis prepared by the EPA indicates.

8 While they have lowered their estimates of the price of carbon, they are still too high and
9 have not dealt with the possibility that carbon taxes may be delayed, or that flexibility may
10 be built into the allowance regime to keep costs low and make emissions allowances
11 available.

12 (5) They used a low estimate of the cost of nuclear reactors. Although they have raised these
13 estimates in testimony filed this year as compared to last year, both PEF's and FPL's
14 estimates remain well below estimates of other analysts. Furthermore, PEF and FPL have
15 not offered a firm, fixed cost estimate or proposed any mechanism to insulate ratepayers
16 from future cost increases.

17 (6) They assumed that the design review of the AP-1000 reactor technology would proceed
18 quickly, but that has proven to not be the case. The 17th revision is still unresolved, while
19 contentions have been admitted at the Nuclear Regulatory Commission.¹

20 (7) They use an approach to modeling the need for generation that systematically biases the
21 results in favor of construction of nuclear reactors. Slowing demand growth makes it even

¹ Lyash, p. 9, notes that the Atomic Safety Licensing Board, "ruled on their contentions and admitted parts of three contentions to the LNP COL.

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1 more important to properly value the flexibility of generation resources, including, but not
2 limited to, natural gas generation, that can add needed increments to capacity but do not
3 require long lead times like nuclear reactors.

4 The impact of the changed factors on these assumptions that have developed since the Need
5 Docket and Docket 090009-EI can be summarized as follows:

6 **Market Factors**

7 Declining Demand Eliminates need for large quantity of new generation

8 Falling price of natural gas Makes natural gas more attractive

9 **Policy**

10 Uncertainty Federal carbon policy is not defined

11 State policies supporting nuclear or alternative resources

12 remain uncertain

13 **Regulatory Factors**

14 Efficiency/renewable standards Reduces need for non-renewable generation, such as nuclear

15 Carbon cost reduction Makes low carbon resources less attractive

16 **Technological Factors**

17 Nuclear cost uncertainties Raises prospects of cost overruns

18 Growing confidence in Makes alternatives more attractive

19 cost and availability of
20 alternatives

21 **Financial Factors**

22 Tight Financial markets Makes finance more difficult

23 Increasing concerns on Makes finance more expensive

24 Wall Street about
25 nuclear reactors

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1 **Execution Risk**

2 Design problems Raises questions about the ability to execute and
3 Increasing cost estimates the long-term feasibility of completing these proposed reactors

4 In Mr. Lyash’s testimony, Progress identifies many of these risks lumped together as
5 “enterprise risk.” Whatever we call them, they combine to make it clear that the construction of the
6 proposed new nuclear reactors is not feasible, and incurring substantial costs to continue to pursue
7 these projects at this time is imprudent. Exhibit MNC-1 defines the six categories of risk I use in the
8 evaluation of nuclear reactors and identifies over three dozen specific risks. Exhibit MNC-2 notes
9 how the early assumptions made generally to justify nuclear reactor construction and create the
10 illusion of a nuclear renaissance have proven to be incorrect. Exhibit MNC-3 identifies the risks and
11 uncertainties that Progress now cites as reason to delay the project. These are the same factors that
12 have led FPL to defer the decision to build Turkey Point 6 and 7.

13 Any of these changed factors alone could demonstrate that completion of these reactors is not
14 feasible in the long term, and that incurring additional costs on these proposed reactors is neither
15 reasonable nor prudent. However, taken together, these factors thoroughly undermine the case that
16 the companies have tried to make to demonstrate (1) the long-term feasibility of these nuclear
17 reactors at this time and (2) the prudence of incurring additional costs on these proposed reactors.
18 The evidence presented by the companies to the Commission does not take these changed factors
19 fully into account and does not reflect the highly uncertain future that nuclear reactors face.

20 If the Commission were to merely conclude that the changes in conditions make the future
21 highly uncertain, that conclusion alone would argue strongly against continuing to invest ratepayer’s
22 money for these reactors. In an uncertain environment, the assets a prudent person acquires should
23 be flexible, have short lead times, come in small increments and not involve the sinking of large

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1 capital costs. The characteristics of nuclear reactors are the antithesis of those best suited to an
2 uncertain environment. They are large, “lumpy” investments that require extremely long lead times
3 and sink massive amounts of capital. Therefore, it would be imprudent to allow the companies to
4 recover any more costs from ratepayers at this time because the companies have failed to
5 demonstrate the long-term feasibility of completing the reactors.

6 There are other factors that will be documented by other witnesses that reinforce the
7 conclusion that these reactors are not feasible in the long-term, and that as a result it is not prudent to
8 incur additional costs, including the failure of some of the projects to obtain regulatory approvals,
9 which were being counted on to stay on schedule and uncertainties and delays in the Nuclear
10 Regulatory Commission (“NRC”) licensing process. While one can point to some positive
11 developments for the construction of nuclear power plants, such as the possibility of the creation by
12 the U.S. Congress of a Clean Energy Development Authority, these are vastly outweighed by the
13 negative developments.

14

15 **Q. Are you sponsoring any exhibits to your testimony?**

16 A. Yes, I am sponsoring the following exhibits:

17 Exhibit MNC-1: Risk Factors Facing Construction Of New Nuclear Reactors

18 Exhibit MNC-2: Unrealistic Assumptions Masking The Real Economics Of Nuclear Reactors

19 Exhibit MNC-3: Increasing Risks Facing Nuclear Reactor Construction Projects

20 Exhibit MNC-4: Negative Events In The Nuclear Renaissance

21 Exhibit MNC-5: Exelon’s View Of The Deteriorating Nuclear As A Carbon Abatement Option

22 Exhibit MNC-6: Projected Natural Gas Prices Compared To EIA Projections

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- 1 Exhibit MNC-7: The Decade Of Volatile Natural Gas Prices May Have Been The Exception, Not
- 2 The Rule
- 3 Exhibit MNC-8: Declining Peak Load Projections: Progress
- 4 Exhibit MNC-9: Declining Peak Load And Capacity Needs Progress
- 5 Exhibit MNC-10: Declining Peak Load Projections: FPL
- 6 Exhibit MNC-11 Declining Peak Load And Capacity Needs: FPL
- 7 Exhibit MNC-12: Projections Of Carbon Compliance Costs
- 8 Exhibit MNC-13: Projections Of Overnight Construction Costs
- 9 Exhibit MNC-14; Declining Cost Of Renewables
- 10 Exhibit MNC-15: Flexible Gas Additions Lower Revenue Requirements
- 11 Exhibit MNC-16: Cumulative Cost Difference: Flexible v. Lumpy Treatment of Natural Gas
- 12 Generation Additions
- 13 Exhibit MNC-17: Nuclear Construction Pressures Capital Requirements
- 14 Exhibit MNC-18: Overnight Costs As A Predictor Of Net Savings: FPL
- 15 Exhibit MNC-19: The Risk of Nuclear Reactors in the Eyes of Industry Analysts
- 16 Exhibit MNC-20: C.V. of Dr. Mark Cooper

17

18 **Q. How is your testimony organized?**

19 A. First, I briefly summarize my testimony from Docket 090009-EI. I then discuss the
20 changing approaches of both PEF and FPL from Docket 090009-EI to the current docket due to the
21 profound and fundamental changes in the economic landscape facing new nuclear reactor
22 construction, and the fact that, although the approaches have changed, PEF and FPL continue to
23 utilized flawed analyses to reach the conclusion that building these proposed new nuclear reactors

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1 remains feasible and prudent. Next, I discuss and rely upon the opinions that other experts,
2 specifically Wall Street analysts and other electric utility executives, have in regards to new nuclear
3 construction. I then proceed to reevaluate the risk factors that I identified in my testimony in
4 Docket 090009-EI and update my 2009 analysis with a focus on recent developments. Finally, I
5 quantify the benefits of retaining flexibility in generation resources rather than continuing to
6 imprudently spend money on these proposed nuclear reactors which are not feasible in the long term.

7

8 **Q. Please briefly summarize your testimony in Docket 090009-EI.**

9 A. In my testimony in the 2009 Nuclear Cost Recovery proceeding I concluded that the
10 proposed new nuclear reactor construction is uneconomic, uncertain and risky. I presented evidence
11 on the marketplace, policy, regulatory, technological, execution and financial risks of these reactors
12 proposed for construction in Florida by Progress and FPL. I showed that, whatever the
13 circumstances might have been in the 2008 Need Determination Proceeding, circumstances had
14 dramatically changed since affirmative determinations of need were made by this Commission for
15 these reactors. These changed circumstances and resulting risks led me to conclude that completion
16 of the Turkey Point and Levy reactors was no longer feasible in the long term and that incurring
17 additional costs on these reactors would not be prudent.

18

19 **Q. Have your conclusions regarding long-term feasibility and the prudence of incurring**
20 **additional costs on these reactors changed since the time of your testimony last year?**

21 A. No. In fact, my conclusions have been only been further substantiated by developments
22 occurring since my testimony last year. In fact, PEF and FPL have now been forced to admit the
23 extreme uncertainty surrounding construction of new nuclear reactors, and, as a result, the utilities

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1 have resorted to mere “line sitting” in the hopes that the Commission will continue to approve costs
2 for these proposed reactors until the utilities are in fact ready to decide whether or not it would be
3 beneficial to their bottom lines to actually construct the reactors.

4

5 **Q. Have the utilities changed their approach from Docket 090009-EI?**

6 A. Yes, but not enough. In Docket 090009-EI, the companies rejected the suggestion that they
7 be required to update their economic analyses for purposes of demonstrating long-term feasibility,
8 claiming that it did not make sense to let short-term changes in economic projections affect long-
9 term decisions. However, both FPL and PEF underestimated the profound and fundamental changes
10 in the economic landscape facing new nuclear reactor construction. As the adverse economic
11 evidence continued to mount, the utilities have had to belatedly concede that their approach in 2009
12 could not be credible in 2010. When shifts in key economic variables appear to be permanent, or at
13 least long-term, it would be imprudent and irrational for the utilities not to adjust the economic
14 analyses on which they base their decisions. This year PEF and FPL have modified their economic
15 analyses and both now admit that building a new nuclear reactor today would be imprudent. The
16 Commission should acknowledge this admission as progress.

17 Unfortunately, the progress stops short of the correct conclusion. The utilities continue to
18 recommend the imprudent expenditure of ratepayer funds, and the methodology they apply to
19 evaluate the long-term feasibility of these reactors is fundamentally flawed. For example, FPL states
20 in its Petition for Approval of Nuclear Power Plant Cost Recovery (May 3, 2010, p. 8):

21 The developments at the national level, state level and project level needed for a clear
22 path to construction have not achieved a high level of predictability. Therefore
23 expenditures beyond those required to obtain the necessary licenses, permits and
24 approvals would be premature in 2010 and 2011.

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1 By continuing to seek the necessary licenses, permits and approvals, FPL is
2 maintaining progress toward delivering the benefits of new nuclear generation to
3 FPL's customers without experiencing unnecessary costs or schedule risks. Once this
4 phase of the project is complete, FPL will be able to review the then-existing
5 economics, the accumulated experience of other new nuclear projects and the state
6 and federal energy policy environment in its consideration of project next steps

7

8 **Q. Do you agree with FPL's assessment?**

9 A. I whole heartedly agree with the first and last sentences, but thoroughly disagree with the
10 middle two sentences. FPL is correct in stating that now is not the time to be committing resources
11 to the construction of nuclear reactors. However, FPL is incorrect in stating that it would be prudent
12 to continue to expend funds to seek permits, licenses and other approvals. The expenditure of over
13 \$28 million for FPL in 2010 and 2011 for those purposes is a total waste of ratepayer money and
14 therefore imprudent. FPL does not need to be seeking these licenses in 2010 and 2011 in order to
15 bring the reactors on line in 2022, when they might be needed, if they are ever needed.

16

17 **Q. What about Progress Energy Florida?**

18 A. Progress takes a somewhat different view. Having signed an EPC contract very early in the
19 overall process, it has chosen to remain fully committed to building the proposed LNP reactors,
20 although on a much longer time schedule, "deferring significant capital expenditures to a later time
21 period when the Company may benefit from, among other things, additional certainty with respect to
22 federal and state energy policy, plant licensing, and improved financial conditions. More
23 importantly, our decision moves forward with the EPC agreement, and thus preserves the long-term
24 benefits of nuclear generation for the Company and its customers in Florida." (Testimony of Lyash,
25 p. 6). While FPL states "the developments at the national levels, state level and project level needed

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1 for a clear path to construction have not achieved a level of predictability” to create “a clear path to
2 construction,” Progress hopes the uncertainties will resolve themselves in time to validate its
3 conclusion that the nuclear reactor is beneficial. Progress and its shareholders should bear the risk of
4 this ill-considered gamble, not ratepayers. Meanwhile, Progress is seeking to have ratepayer pay in
5 excess of \$164 million to keep its place in line.

6 The difference between the FPL and the Progress positions may be the result of the fact that
7 Progress has signed an EPC and is liable for penalties if it backs out of the contract. If the risks and
8 uncertainties surrounding nuclear generation that have become so clear lead the Commission to
9 conclude that these proposed reactors are no longer feasible, the cancellation fees should certainly
10 not be recoverable from ratepayers. The Commission should make this clear immediately.

11

12 **Q. What aspects of the analysis do PEF and FPL have in common?**

13 A. While the two utilities take different positions with respect to whether they are moving ahead
14 with actual construction of the proposed reactors, both FPL and PEF’s analyses continue to make
15 erroneous assumptions, all of which favor nuclear reactors. These erroneous assumptions lead them
16 to erroneously conclude that nuclear power will be needed in the mid-term and will be less
17 expensive than meeting demand with combined-cycle gas plants. These erroneous assumptions in
18 the 2010 analyses include, but are not limited to, the following:

- 19 • The cost of natural gas used in the analyses is still higher than projections by the U.S.
20 Department of Energy Information Administration (“EIA”).
- 21 • The cost of carbon is still higher than the U.S. Environmental Protection Agency
22 projects from the energy bill that has passed one house of Congress.

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- 1 • The utilities have also failed to take the full implications of climate change policy into
2 account. Both FPL and PEF assume a price of carbon is going to be imposed, but at
3 the same time ignore the efficiency and renewable mandates that are likely to be
4 included in any climate change legislation. As a result, they propose to build new
5 reactors well before there will be a need for them to meet system reserve margin
6 requirements if climate change policy is enacted.
- 7 • Their electricity and financial models do not reflect the problem of excess capacity
8 and the value of being able to add natural gas generation resources in smaller
9 increments and with shorter lead times than large central station facilities like nuclear
10 reactors.

11

12 **Q. What conclusions can you draw based on these erroneous assumptions made by PEF**
13 **and FPL?**

- 14 • A. Taking these erroneous assumptions into account, I reach two specific
15 conclusions about the long-term feasibility of the proposed FPL and PEF reactors:
16 First, contrary to the utility findings that nuclear reactors are a little less costly than
17 natural gas – saving ratepayers about \$ 5 billion in discounted, 2010 dollars in the
18 base case – my analysis demonstrates that they are likely to be more expensive,
19 costing ratepayers \$10 to \$20 billion more in discounted, 2010 dollars.
- 20 • Second, because of the high cost and other inherently unattractive economic
21 characteristics of new nuclear reactors (long-lead time, sunk costs), it will be at least a
22 decade, probably two, and maybe even more, before nuclear generation can

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1 potentially become cost competitive with the other options available in a carbon
2 constrained world. During this long time frame, the economics of other options can
3 change dramatically. Therefore, it is imprudent to spend ratepayer funds on nuclear
4 reactors at present, especially given that the utilities are at present merely line sitting
5 as I discuss in more detail below.

6 These two findings reinforce my overall conclusion, that spending hundreds of millions of
7 dollars of ratepayer funds today so that PEF and FPL can continue to sit in the line waiting to build
8 new nuclear reactors is imprudent, unreasonable, and wasteful. In fact, the imprudence of
9 continuing to spend ratepayer money on these projects is symbolized by the fact that the generation
10 resources that these projects would bring on line would not even appear in the utility's ten year site
11 plan for another two years, if then.

12

13 **Q. If the reactors will not be needed for such a long time, why are the utilities continuing to**
14 **seek ratepayer funds to develop them?**

15 A. For both utilities the primary concern now is line sitting. For example, Progress Energy
16 Florida claims to need to stay in line because of the activity in the industry.

17 If we terminated the EPC agreement and cancelled the project, the nuclear option will
18 be lost for the foreseeable future as both private (the Consortium and other vendors)
19 and federal (the NRC) resources shift to nuclear projects under development
20 elsewhere in the country or around the world. Our decision therefore preserves for
21 our customers and the Company the long term benefits of fuel portfolio diversity,
22 reduced reliance on fossil fuels for energy production, carbon free energy generation,
23 and base load capacity at a low cost fuel source that nuclear generation provides
24 (Lyash, p. 6).

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1 FPL makes a similar argument, claiming that the decision to move forward is just around the
2 corner, based in part, on a fiction that the nuclear industry is thriving and therefore FPL must move
3 ahead quickly, or lose its place in line.

4 The input representing the greatest risk for the Company is skilled labor trained to
5 construct advanced nuclear facilities. At this time, however, FPL does not anticipate
6 any major problems with respect to procurement of raw materials, long lead
7 components, or skilled workers. Nevertheless, with development in the nuclear
8 industry gaining steam, competition for these resources will increase (Testimony of
9 Reed, p. 49).

10 The suggestion that the vendors are in the driver's seat and the utilities will lose their chance
11 if they do not continue to spend ratepayer funds does not accord with reality. The vast majority of
12 projects in the U.S. have been delayed or cancelled, as summarized in Exhibit MNC-4. There is
13 little demand for the technology the Florida utilities have chosen.² Frankly, if the supply-train is
14 stretched as thin as the utilities suggest, the danger of delays and escalating costs is probably much
15 greater than being bumped out of the line because once the project starts, delays escalate, which is
16 what drove cost escalation during the first nuclear building cycle.

17

18 **Q. Do other experts share your view of the economics of nuclear reactors have continued**
19 **to deteriorate?**

20 A. Yes. Both FPL and Progress claim that the economics of nuclear reactors have improved
21 dramatically since the Need Determination two years ago. The analysis of FPL claims that the break
22 even capital cost – the amount of money FPL could spend on nuclear construction in overnight costs

² The number of reactors under construction outside of Russia and China has been basically flat increasing from 21 to 24 since the certificate of need was issued, <http://www.world-nuclear.org/info/reactors.html>. The vendor for both FPL and Progress appears to have a total of 4 units under construction, all in China, http://ap1000.westinghousenuclear.com/ap1000_nui_ic.html. In the U.S. two projects using this technology appear to be ahead of the Florida reactors (Georgia and South Carolina), but there does not appear to be a crowd behind them. One AP-1000 has been delayed, the other abandoned.

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1 – has increased by more than one-third since the need determination in 2008.³ For Progress, the mid
2 fuel, no CO2 scenario has gone from a negative \$3 billion to a positive \$1 billion.⁴ However, this is
3 the opposite of what most analyses say, including those of Wall Street utility analysts and other
4 utilities.

5 My review of utility industry analysts on Wall Street and elsewhere finds that they generally
6 see the economics of new nuclear reactors moving in the opposite direction than what PEF and FPL
7 claim, as demonstrated by Exhibit MNC-19. They definitely do not see an improvement. Some of
8 the biggest nuclear utilities have also concluded that the economics have become so unfavorable that
9 they have abandoned their plans for new nuclear reactors at present. A most stunning example was
10 provided in a recent analysis from the CEO of Exelon. See Exhibit MNC-5. In his evaluation the
11 cost of nuclear has more than doubled, and nuclear has moved well down in the list of options for
12 carbon abatement. In the 2008 view, new natural gas was somewhat less costly than nuclear, but by
13 2010, gas was seen as much less costly. The CEO of Entergy, another major nuclear utility, has
14 expressed similar sentiments.⁵ The service territory conditions that J. Wayne Leonard indicates led
15 him to the conclusion that “no same [sic] businessman would currently build a nuclear power plant”
16 – plentiful reserves and slow growth – are exactly the conditions in which the Florida utilities now
17 find themselves. Cushioned by the promise of cost recovery from the ratepayers, PEF and FPL have
18 simply failed to adjust adequately to the new reality.

19

20 ANALYSIS OF RISK FACTORS

³ Sim, 2009, Table 45, inflated at 1.03 per year to \$5456, compared to Sim 2010, Ex. SRS-1.

⁴ Progress Energy Florida, *Levy Nuclear Project NCRC Updated Life-Cycle Net Present Worth (CPVRR) Assessment*, Exhibit JL-3, 2007 results inflated at 2 percent per year.

⁵ Thomson Reuters, *Entergy at Thomson Reuters Global Energy Summit-Houston*, May 24, 2010.

EXHIBIT 30

1 **Q. Have you updated your analysis of the risk factors since you prepared your testimony**
2 **in Docket 090009-EI based on recent developments?**

3 A. Yes. I have reevaluated how each of the categories of risk that affects new nuclear
4 construction in Florida, with an emphasis on the importance of recent developments. In each case I
5 also show the benefits of waiting to make the build-no build decision and the folly of incurring costs
6 while we are waiting. While FPL has decided to wait, Progress has declared it is going ahead with
7 the construction decision, just on a slower time line. The self-serving economic analysis of nuclear
8 reactors that both utilities present still indicate that these proposed new reactors are the preferred
9 option. My analysis indicates otherwise.

10

11 **MARKETPLACE RISK**

12 **Natural Gas Prices**

13 **Q. Are the utilities' projected natural gas prices still a concern to you?**

14 A. Yes. There are two key components of gas costs in this analysis – the commodity cost and
15 the compliance cost. Both are overestimated by both FPL and PEF.

16 In regards to commodity cost, the reality of lower natural gas prices is slowly sinking in.
17 However, both utilities continue to overestimate the price of natural gas. As shown in Exhibit MNC-
18 6, using the EIA long-term projection of wellhead natural gas prices and adding in the cost of
19 transportation, I find that the utilities have projected prices that are higher than indicated by EIA by
20 about 13 percent (14 percent undiscounted, 12 percent discounted). Since natural gas prices account
21 for two-thirds or more of the total cost of gas generation, this represents almost a nine percent
22 overestimation of the cost of the project. That difference alone is large enough to reverse the
23 conclusion that gas is more expensive in most of the scenarios analyzed by the utilities.

EXHIBIT 30

1 I discuss compliance costs below under the analysis of policy risk.

2

3 **Demand**

4 **Q. Have there been changes in demand that affect the long-term feasibility of these nuclear**
5 **reactors and the prudence of incurring additional costs on the proposed reactors?**

6 A. Yes. There has been a dramatic change in the marketplace, and demand more specifically,
7 since the companies prepared their need analyses in the respective need dockets and the testimony in
8 Docket 090009-EI. The nation has plunged into the worst recession since the Great Depression.
9 Some even call it a depression. Moreover, there is a growing recognition that this change is not
10 simply a severe dip in the business cycle, but rather a major shift in the economy. The spending
11 binge on which the U.S. embarked for a decade, in which households and business became highly
12 leveraged, is likely over. A massive amount of household wealth was destroyed when the housing
13 market bubble burst. Retirement accounts have been devastated by the collapse of the stock market.

14 Ironically, the decade on which the projections were based in the Need Determination
15 coincided almost exactly with the decade in which the housing and consumption bubbles were
16 pumped up by excessive leverage. That level of growth was unsustainable. It is my opinion that the
17 shift in consumption is permanent and signals slower growth in the future. However, even if this
18 were just a severe downturn in the business cycle, it would affect the demand for electricity
19 sufficiently to raise questions about the long-term feasibility of these new nuclear reactors.

20 A reduction in the growth rate of demand has two implications for large central station
21 facilities like nuclear reactors. Since both FPL and Progress have excess capacity at present,
22 slowing demand growth pushes the date at which new generation will be needed farther into the

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1 future. In my 2009 testimony I estimated that the need for the nuclear reactors was at least half a
2 decade away.

3 In 2017, which is a crucial year in the 2008 analysis because that was the year the reserve
4 margin hit the limit of 20 percent, the 2009-projected peak is 11 percent lower than the peak
5 projected in 2008. Under the 2009 projection, the FPL does not reach the 2017 peak
6 projected in 2008 until 2022, five years later.⁶

7
8 In the current proceeding the utilities affirm my calculations, having pushed the in-service dates to
9 the 2021-2023 period.

10 Slower demand growth has a second effect. It makes smaller increments to capacity
11 preferable since lumpy generation additions create excess capacity. Excess capacity that is capital
12 intensive imposes unnecessary costs on consumers. To avoid this excess capacity, I later
13 demonstrate that it is preferable for PEF and FPL to build a series of natural gas-fired power plants
14 instead of these proposed nuclear reactors.

15

16 **Q. Have the utilities reflected this change in demand in their analysis?**

17 A. Yes, they have pushed their expected in-service dates out by about four or five years. The
18 online dates for these reactors are now more than a decade away, beyond the ten-year plan, 2021 and
19 2022 for Progress, 2022 and 2023 for FPL. That delay makes it unnecessary, imprudent and
20 unreasonable to continue incurring the costs of licensing today. This becomes even more apparent
21 when the impact of likely energy efficiency and renewable energy mandates are taken into account,
22 as I discuss below in the policy risk section.

23

24 **Q. How does waiting to make a build-no-build decision reduce marketplace risk?**

⁶ Cooper, 2009, p. 9 line 51.

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1 A. The uncertainty about both natural gas prices and demand growth are likely to diminish. In
2 both of these areas we are coming off of unprecedented events. The decade of growth in demand
3 prior to the need determination was extremely high. Repairing the economy and learning whether it
4 is on a whole new trajectory will take time, and continuing to incur costs on these proposed nuclear
5 reactors during this time is in my opinion unreasonable and imprudent.

6 Similarly, the volatile natural gas prices were unique to the past decade. That decade may be
7 the exception, rather than the rule, as Exhibit MNC-7 suggests.

8

9 **POLICY RISK**

10 **Need for Non-renewable Resources**

11 **Q. Should policy considerations enter into the Commission's evaluation of the long-term**
12 **feasibility of these reactors and the prudence of incurring additional costs for these reactors?**

13 A. Yes. The companies' economic feasibility analyses were driven by assumptions about
14 federal regulatory policy. The companies have put a high price on carbon in their economic
15 analyses. Without the high price on carbon, the economics of nuclear reactors would look very
16 different. To my knowledge, the state of Florida has not put a price on carbon, nor is it
17 contemplating doing so. Thus, the companies have decided to pursue these projects and the
18 Commission has allowed cost recovery based, in part, on assumptions about federal climate change
19 policy.

20

21 **Q. Are you suggesting that the Commission should not take future climate change policy**
22 **into account when considering the long-term feasibility of these reactors?**

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1 A. Quite the contrary. I believe the Commission should take federal policy into account when
2 considering the long-term feasibility of these reactors, since that is a major source of regulatory risk
3 to state decisions. However, I believe the Commission must take the entirety of projected federal
4 policy into account. The idea of putting a price on carbon is only a part of the legislation that is
5 moving through the Congress. H.R. 2454, the American Clean Energy and Security Act, the first
6 piece of climate change policy legislation to pass a house of Congress, does not simply put a price
7 on carbon directly. Rather, it establishes an elaborate scheme of allowances to emit carbon, which
8 will indirectly set a price on carbon. Moreover, policies other than putting a price on carbon,
9 particularly policies to promote efficiency and renewables, play a large role as well.

10

11 **Q. Please describe the full suite of federal policies that affect the long-term feasibility of**
12 **these nuclear reactors.**

13 A. On the supply-side, the legislation that has passed the House has a renewable energy standard
14 that would require utilities to meet an increasing part of their load with renewables. Within a
15 decade, they would be required to get 20 percent of their generation from renewables, with as much
16 as 8 percent of that total coming from efficiency. At the same time, the legislation includes a
17 number of provisions that have sharply lowered projections of the cost of carbon credits, such as
18 efficiency and renewable mandates, subsidies for carbon control technologies and domestic and
19 international offsets. All of these lower the demand for allowances and therefore the price of
20 allowances. This means that the assumed compliance costs of fossil fuels are lower than projected
21 by the companies in prior proceedings and this proceeding.

22 On the demand side, there is a substantial mandate for energy efficiency. This is embodied,
23 in part, in the ability to meet two-fifths of the renewable resource standard with efficiency and, in

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1 part, in dramatic improvements in building codes and appliance standards. Mandates to improve the
2 energy efficiency of new buildings by 30 percent in the near term and 50 percent in the longer term
3 will have a substantial impact on energy demand over the life of the reactors being considered in this
4 proceeding. Funds from certain allowances are set-aside to improved efficiency, particularly for
5 natural gas. Similarly, the American Recovery and Reinvestment Act of 2009 includes a huge
6 increase in funding to improve the energy efficiency of existing buildings. As the efficiency of
7 buildings and appliances improves, the demand for electricity and natural gas declines.

8 These regulatory factors – increased renewables, lower demand through efficiency, and a
9 lower price on carbon – must be considered in the evaluation of alternative scenarios for future
10 supply of electricity. Extracting only the price of carbon from the policy landscape and inserting it
11 in the economic analysis, while ignoring the other aspects of policies, distorts the picture being
12 presented to the Commission. Factoring in these other policies would further undercut the claim that
13 nuclear reactors are feasible in the long-term. Many of these other aspects have been part of the
14 climate change policy debate for quite some time. Taken together, these changes on the demand
15 side, as well as the renewable standard, will have a substantial impact on the need for new non-
16 renewable generation and undermine the long-term feasibility of building these reactors.

17

18 **Q. What impact does including the efficiency and renewable policies in HR 2454 have on**
19 **projections for load growth and demand for nonrenewable resources such as nuclear reactors?**

20 A. They would have a major impact. Exhibits MNC-8 and MNC-9 set forth demand scenarios
21 that model the impact of the efficiency and renewable mandates in HR 2454 on the need for non-
22 renewable generation in the Progress territory.. It applies the national average results estimated in
23 the EPA analysis of the legislation to Florida. I have factored in planned retirements in this

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1 calculation. The results are similar to the analyses I provided in the 2009 Nuclear Cost Recovery
2 Proceeding. As shown in Exhibit MNC-9, under this scenario, Progress does not reach the peak
3 demand projected in the Need Docket for 2017 until 2040.

4 Exhibits MNC-10 and MNC-11 present a similar analysis for FPL. New resources to meet
5 the reserve margin requirement are not needed by FPL until 2037. Simply put, with the efficiency
6 and renewables factored in on top of the declining growth rate of demand, neither utility needs new
7 capacity to cover the reserve requirement out until well past 2030.

8

9 **Q. Are there constraints, other than the reserve margin requirement, that might affect the**
10 **utilities?**

11 A. Yes. In modeling the full impact of the climate legislation we must pay attention to the
12 mandates to reduce greenhouse gas emissions. Doing the minimum under HR 2454 is not enough
13 for long-term compliance. In the mid-term, allowances can be purchased to keep compliance costs
14 under control and economically attractive options are available beyond the minimum. Buying time
15 in the current environment, at least a decade, perhaps a quarter of a century, to develop the next
16 generation of low cost, low carbon resources is the key strategy.

17 Under the pending legislation, the entire industry will be working on the problem, as will the
18 public sector institutions. A full range of alternatives will be examined including more efficiency
19 and renewables, whose costs are projected to decline, new forms of storage, which will make
20 renewables more cost effective, expanded transmission that improves access to out of territory
21 renewables, carbon capture and storage, and nuclear generation. Using the maximum amount of time
22 possible to gather information before making these decisions is very valuable because it keeps
23 options open. National policy will be promoting the development of low cost, low carbon options.

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1 Florida ratepayers can benefit by keeping their options open rather than committing to a high cost,
2 long lead-time approach like nuclear reactors.

3

4 **Compliance Costs**

5 **Q. Are there other ways in which delaying the build/no-build decision is valuable in this**
6 **uncertain regulatory environment?**

7 A. Yes, several. First, and most obviously, the contours of climate policy will become clearer. It
8 is unclear that Congress will pass any climate legislation this year or that any legislation that passes
9 will put a price on carbon. Emphasis seems to be shifting to complementary policies that promote
10 or require efficiency and renewable, and this will have an impact on the need for non-renewable
11 generation and the cost of carbon, as well as the cost of natural gas. The targets and timing, as well
12 as the mechanisms for setting the price will have a big impact on the cost of carbon. However,
13 Commission approval of costs necessary for PEF and FPL to sit in line, as the utilities are
14 requesting, is simply a waste of ratepayers' money at this time and is not necessary in order to delay
15 the build/no-build decision.

16

17 **Q. Are the utility estimates of compliance costs still a concern?**

18 A. Yes. The analyses continue to be centered on compliance costs that are higher than those
19 projected by EPA, as shown in Exhibit MNC-12. FPL has dropped its highest cost compliance
20 scenario, but its mid case is still above the EPA estimate for HR 2454 and the Kerry Lieberman bill
21 in the Senate. Progress has a zero carbon cost analysis, but its mid-range estimate is still 30 percent
22 above the EPA estimate.

23

EXHIBIT 30

1 **Q. How does waiting to spend ratepayer moneys on these reactors reduce the policy risk?**

2 A. The uncertainty about federal policy is likely to diminish. With the need for generation
3 resources now farther out in the future and the large impact that federal policy can have on the need
4 for non-renewable resources, it would be prudent to wait to see what course federal policy takes
5 before committing any more resources to the reactors, especially resources which are only necessary
6 to allow PEF and FPL to continue to line sit, and certainly the resources that would be committed
7 with the build/no-build decision. The issues that will affect the need for the reactors in the federal
8 legislation include targets and timing of carbon reductions, mandates for alternatives and flexibility
9 in approaches, including the ability to purchase allowances at lower costs than building reactors.

10

11 **REGULATORY RISK**

12 **Q. What regulatory risks do nuclear reactors face?**

13 A. The major regulatory policy risk remains at the Nuclear Regulatory Commission. There are
14 continuing issues with the licensing of the generic design of the AP-1000 technology, as discussed in
15 more detail by Arnold Gundersen on behalf of SACE in this proceeding. The certification of a
16 standard design was supposed to be a key to speeding up the process. The design proposed by the
17 utilities/vendors has encountered numerous problems. Therefore, allowing PEF and FPL to spend
18 ratepayers' money to stand in line while the regulatory hurdles are passed provides no benefit
19 whatsoever to the ratepayers.

20

21 **Q. How can taking the maximum time possible to make the build, no-build decision lower**
22 **regulatory risk?**

EXHIBIT 30

1 A. The AP-1000 design will possibly have been certified and the licensing process at the NRC
2 may have become more routine after the initial plants have gone through the process. Later plants
3 will benefit from the smoother certification process.

4

5 **TECHNOLOGICAL RISK**

6 **Nuclear Reactor Costs**

7 **Q. Have the utilities increased their estimates of nuclear construction costs?**

8 A. Yes, but I still have the opinion that they are underestimating the costs. Furthermore, they have
9 still not offered firm, fixed prices. Therefore, these reactors are likely subject to ongoing future
10 increases, putting ratepayers at risk.

11

12 **Q. Please describe the uncertainties about the cost of nuclear reactors.**

13 A. As described in Exhibit MNC-13, early in this decade vendors and contractors at the
14 Department of Energy produced very low estimates of the cost of nuclear reactors, claiming that
15 things had changed since the first generation of reactors. In the eight years since those initial,
16 promotional studies were released, the estimates of the cost of nuclear reactors has increased
17 dramatically, especially among Wall Street and independent analysts. As long as the costs placed
18 before the Commission are “non-binding,” the Commission must be aware of the growing
19 uncertainty about the cost of nuclear reactors. As long as they are “non-binding,” the prospect of
20 cost escalation places ratepayers at risk, especially where costs for construction work in progress is
21 being granted.

22 In fact, the extreme uncertainty about nuclear reactor costs has caused FPL to create a whole
23 new framework for evaluating options. As FPL stated in the Need Docket:

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1 The second difference in the economic analysis approach step that developed the
2 CPVRR costs for the resource plans is that no generation or transmission capital costs
3 associated with Turkey Point 6 & 7 were included in the analysis. The reason for this
4 is that *FPL does not believe it is currently possible to develop a precise projection of*
5 *the capital cost associated with new nuclear units with in-service dates of 2018-on.*
6 Consequently, FPL's economic analysis approach normally used to evaluate
7 generation options has been modified to include a second economic analysis step."
8 ("Need Study for Electrical Power, Docket No. 07-0650-EI, Florida Power and Light
9 Company, October 16, 2007, pp. 104-105, emphasis added).

10
11 Similarly, Progress has recently increased the cost estimate previously placed before the commission
12 for construction of the LNP.

13 In the 33 months since that statement was made, there have been dozens of studies of the
14 projected costs of nuclear reactors. The cost in 2008 \$ have ranged from a low of just under
15 \$2400/kW to a high of just over \$10,000/kW. The Florida utilities' estimates are still in the low end
16 of the range of estimates. Recent cost trends in generation construction suggest that the utility cost
17 projections did not incorporate the run up in nuclear construction costs. Moreover, the cost of
18 construction for non-nuclear generation rose more slowly during the recent phase of price increases
19 and has fallen more quickly in recent months.

20 The two conclusions I would draw from this analysis are (1) the range of costs considered by
21 FPL and PEF is too narrow and too low, and (2) the uncertainty is huge. This only reinforces my
22 opinion that the prudent course would be to avoid rigid, expensive choices, especially if there is time
23 to let the uncertainties diminish before decisions must be made. The Commission should not allow
24 ratepayer funds to be spent to hold the utilities place in line or to fund a build, no build decision
25 made prematurely.

26
27 **Efficiency and Renewables**

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1 **Q. Should changing technological conditions factor into the analysis of the long-term**
2 **feasibility of these reactors?**

3 A. Yes. While climate policy is seen as giving a direct advantage to reactors by putting a price
4 on carbon, that policy does much the same for other technologies. In fact, there are ways in which
5 the alternative technologies are likely to receive an even larger boost. There are also many programs
6 targeted at various technologies that are in earlier stages of development that may enjoy larger cost
7 reductions as the science advances and the scale of production ramps up.

8 I believe there are two technological developments that are shifting the terrain in ways that
9 disfavor nuclear reactors, in addition to the uncertainties about nuclear technology discussed above –
10 the availability and cost of conserved energy and the availability and cost of renewables.

11

12 **Q. Please describe the emerging terrain for efficiency technologies.**

13 A. There is a growing consensus that the cost of many alternatives is lower than that of nuclear
14 reactors. For efficiency, the change in the terrain is largely a matter of increasing confidence that
15 substantial increases in efficiency are achievable at relatively low cost. The detailed analysis of
16 potential measures and the success of some states at reducing demand through energy policies have
17 increased the confidence that efficiency is a reliable option for meeting future needs for electricity
18 by lowering demand. At the same time that the policy process has opened a range of uncertainty and
19 flexibility, studies from three major national research institutions have sent a strong signal indicating
20 the direction that the effort to meet energy needs in a carbon-constrained environment must follow.

21 In fact, since I filed testimony in the 2009 cost recovery proceeding, three major national
22 research organizations have affirmed the potential of efficiency to contribute to an affordable, low
23 carbon future. The National Research Council (NRC), relying on a study by the Lawrence Berkeley

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1 National Laboratory (LBL),⁷ and McKinsey and Company⁸ concluded that efficiency could cut
2 energy consumption by 25 percent to 30 percent at costs that are far below the current and projected
3 future cost of new energy generation. The American Council for an Energy-Efficient Economy
4 (ACEEE) took a somewhat different approach by modeling the energy efficiency provisions of the
5 House bill. It found that, as passed, ACES would result in an 8 percent reduction in energy use
6 nationwide by 2030, relative to the *Annual Energy Outlook 2009* forecast.⁹ At the same time, the
7 ACEEE study found that more aggressive efficiency policies would save a great deal more energy,
8 approximately 27 percent, and produce much larger dollar savings. Another ACEEE that was done
9 specifically for Florida found that aggressive policies to reduce energy consumption could lower
10 demand by 20 percent at a cost of less than 3.5 cents per kWh.¹⁰

11 Thus, independently of any regulatory mandate, as the technology of efficiency is proven out,
12 the Commission should consider greater reliance on it as part of the least cost approach to meeting
13 the need for electricity. The combination of regulatory and technological changes will drive
14 efficiency into the electricity sector, undermining the long-term feasibility of the reactors and the
15 prudence of spending ratepayer money on these proposed reactors at this time.

16

17 **Q. Please describe the emerging terrain of renewables.**

⁷ National Research Council of the National Academies, *America's Energy Future*, August 2009. The National Research Council relied on a study from Lawrence Berkeley National Laboratory (Brown, Richard, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential*, September 2008).

⁸ McKinsey & Company, *Unlocking Energy Efficiency in the U.S. Economy*, July 2009.

⁹ Gold, Rachel, Laura, et al., *Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation*, American Council for an Energy Efficient Economy, September 2009), page 5.

¹⁰ Elliott, R. Neal, et al. *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands*, American Council for an Energy-Efficient Economy, June 2007

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1 A. The concern with climate change has sharpened the focus on the cost and availability
2 of renewable technologies. For renewables, the change is in strong cost reductions that are expected
3 as new technologies ramp up production, as shown in Exhibit MNC-14. The combination of
4 regulatory and technological changes will drive renewables into the electricity sector, undermining
5 the long-term feasibility of these proposed nuclear reactors and the prudence of spending ratepayer
6 money on these proposed reactors at this time.

7

8 **Execution Risk**

9 **Q. What is Execution Risk?**

10 A. This is the risk that the project will not be implemented on time and on budget. It focuses on
11 the internal management of the project by the companies. On the one hand, utilities tend to deny that
12 execution risk exists. On the other hand, they tend to blame the slippage in execution of the project
13 on other factors or actors, insisting that causes were beyond their control. This is most evident in the
14 case of Progress, which is attempting to explain a five-year delay in the LNP.

15 I believe the Commission should look back at PEF's decision to move forward with the
16 project to ensure that a similarly flawed analysis is not used this year to determine whether or not
17 completion of the LNP is feasible. Rushing ahead with the wrong project using models that distort
18 the decision are execution problems from the broader perspective of least cost planning

19

20 **Q. Can you quantify the benefits of making flexible investments in generating resources, as** 21 **compared to nuclear power plants?**

22 A. In my 2009 testimony I emphasized the importance of factoring excess capacity into the
23 analysis when I stated.

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1 The operating cost estimates should not include excess production and the variable
2 costs associated with that production. If capacity is idled because of excess, then the
3 carrying cost of that excess should be subtracted from the savings. These are costs
4 that would not be incurred if the system were “right” sized. Because nuclear reactors
5 come in larger units and have higher capital costs, while natural gas units are small,
6 lower in capital cost and have higher operating costs, ensuring that the model takes
7 these differences into account become more important when demand declines and
8 excess capacity increases....

9 Over a long time horizon, the ability to match supply and demand (plus the reserve
10 margin requirement) should be rewarded....

11 While the excess capacity is a few percentage points spread over a number of years, it
12 can make a difference if it is handled properly. The economic advantage claimed for
13 nuclear is actually quite small, when compared to the total costs of the system.¹¹

14 Having concluded that the need to meet the reserve margin should not be the driver of
15 generation investments with demand growth slowing, developing approaches that allow the
16 Commission to consider the differences between large, lumpy additions of capacity and smaller
17 more flexible additions becomes critical. This is one area where the utilities have done nothing, so I
18 have worked up an example of how important this consideration can be.

19

20 **Q. What data did you use to develop this example?**

21 A. I have used the detailed data on the CVPRR of the individual cost components provided by
22 FPL in the 2009 docket, since this is the only such detail that has been provided in any of the
23 dockets.¹² I use the high capital cost estimate from 2009, since that is close to the reference cases
24 used in this docket. I have adjusted the discount rate since that has a large impact on the present
25 value of costs. To make the adjustment, I inflated the 2009 PV numbers by the 2009 discount rate to
26 arrive at a real, undiscounted estimate of the revenue requirement. I discounted those costs at the
27 2010 discount rate. I have also adjusted the natural gas costs to the 2010 estimates. By using these

¹¹ Cooper Testimony in Docket 090009-EI, pp. 34-36.

¹² Response to Staff Seventh Set of Interrogatories Question 64, attachment 1, page 7 of 9.

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1 data provided by FPL, I am not agreeing with the cost inputs assumed by FPL in 2009 or 2010. This
2 example is used to show the relative overall costs of a different scenario of adding natural gas
3 generating capacity.

4 I used the 2009 capital costs as originally stated because several factors offset one another.
5 The weighted average cost of capital has been reduced from 10.2 percent to 8.4 percent, but the
6 capital cost of the project has been increased by 9 percent. Since I am focusing on the relative cost
7 of nuclear and gas, not the absolute numbers, the example provides good insight into the impact of
8 treating gas generation flexibly. In the 2009 analysis in the mid-gas, mid-compliance cost case, FPL
9 calculated gas as 7.5 percent more costly than nuclear (without the capital cost of the new reactors).
10 In the 2010 analysis, the difference was 7.7 percent.¹³

11

12 **Q. How do you model the impact of installing smaller gas fired units incrementally?**

13 A. FPL assumes that natural gas must be added in large increments that are roughly the same
14 size at roughly the same time. Ironically, they sequence two nuclear reactors (about 18 months
15 apart), but they do not sequence three combined cycle natural gas units to gain the economics of
16 sequencing. If gas is treated as a more flexible source of generation, which it is, the Commission
17 gets a very different picture of the relative economics.

18 Since FPL assumes three combined cycle units added at one time, Exhibit MNC-15 contrasts
19 a scenario in which gas plants are added in three separate steps five years apart. Progress adds
20 combined cycle units two at a time, suggesting there is some flexibility.

21 Exhibit MNC – 15 shows the small advantage that nuclear has in the FPL base case, because
22 FPL projects that the large capital costs are eventually offset by rising natural gas prices. However,

¹³ Compares Response to Staff Second Set of Interrogatories Question 45, attachment 1, to Sim Ex. SRS-10.

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1 the net effect of treating gas as a more flexible resource is to lower the cost of gas by 17 percent,
2 giving natural gas a cost advantage over nuclear that is larger than the base case advantage claimed
3 for nuclear.

4 Exhibit MNC-15 also shows the effect of flexible gas additions with gas prices set at EIA gas
5 projections. The combination of treating gas a resource that can be added in small increments and
6 using a more reasonable projected price of gas lowers the gas cost by almost one-quarter.

7 Finally, MNC-15 shows the impact of a ten-year delay in the online operation of the
8 proposed nuclear reactors. This would be consistent with the scenario in which climate policy
9 reduced need for non-renewable resources as discussed above. The gas scenario would be almost 40
10 percent less costly than the scenarios that bring these reactors on line in the early 2020s.

11

12 **Q. Do these results apply to Progress?**

13 A. The reference cases for the two utilities are quite similar. As noted above, the gas price and
14 carbon cost assumptions are similar. Progress has a slightly lower weighted average cost of capital
15 because of assumed lower borrowing costs and a slightly lower discount rate. In the end, their base
16 case results are quite similar, although that similarity is obscured by the methodology adopted by
17 FPL to back into the capital cost number. FPL calculates how much it could spend on the nuclear
18 project and still have it be less costly than gas. Progress estimates how much the nuclear project
19 would cost if it spent a specific amount on the nuclear project and then asks how much consumers
20 would save at the assumed cost of nuclear.

21 Using the data from the FPL scenarios, we can reconcile the two approaches. Exhibit MNC-
22 16 shows that for every \$1000/KW of overnight costs added to the nuclear project, the CVPRR of
23 the nuclear project increases by \$2.81 billion. Using FPL's high-end estimate of overnight costs of

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1 \$4950, which appears to be in the middle of the range considered by Progress, I calculate that FPL
2 claims the nuclear project saves consumers \$4.511 billion. This is quite close to the Progress mid-
3 fuel, mid- carbon cost case reference capital cost case, which claims consumers would save \$4.77
4 billion.

5 There are differences, however. Progress adds gas facilities in smaller increments. It has
6 more excess capacity in the early years and is retiring gas plants, which could be put into inactive
7 reserve. Moreover, Progress claims a very large cost savings by adding the two nuclear units in a
8 year apart (i.e. the first unit costs almost twice as much as the second, (Updated Life-Cycle Net
9 Present Works Assessment, JL -3, p. 3), which makes the increase in generation capacity from the
10 nuclear project extremely large in an environment with more slowly growing demand.

11 The purpose of this example is not to offer a precise estimate of the costs, but to impress
12 upon the Commission the importance of looking at the excess capacity issue and the value of the
13 addition of smaller and more flexible increments. The specific parameters and assumptions that are
14 applicable will affect the outcome of the analysis, but the order of magnitude of these effects
15 indicate that they are extremely important for the Commission to consider.

16

17 **Financial Risk**

18 **Q. Are there other quantifiable benefits of deferring the decision on nuclear construction**
19 **further than the time proposed by PEF and FPL?**

20 A. Yes. Utilities face capital constraints in the current environment and pursuing nuclear
21 projects will make them worse, as shown in Exhibit MNC-17. The near-term capital requirements of
22 nuclear reactors are much larger than those of gas plants. The financial ratios of the utilities can be

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1 analyzed with and without the nuclear project and the impact of the weaker ratios of the cost of
2 capital can be estimated.

3

4 **Q. Are there other capital cost issues that the Commission needs to aware of?**

5 A. Yes. The Commission must be careful not to establish a “Catch 22” that could ultimately
6 costs ratepayers billions. It recently lowered the return on equity allowed for FPL. This has the
7 effect of lowering the cost of capital-intensive project like nuclear reactors. FPL also uses the lower
8 ROE to lower the discount rate in its analysis of long-term feasibility in this docket. This has the
9 effect of increasing the net present value cost of alternatives with rising fuel prices, like natural gas.

10 However, FPL claims that the ROE set by the Commission may not be high enough to enable
11 it to attract capital for nuclear reactors.¹⁴ If the utility has trouble raising capital and the Commission
12 is convinced to increase the ROE, then the long-term feasibility analysis required as part of this
13 docket should be revisited, because both the changed ROE and discount rates will affect the results.
14 This is not just an accounting question. Nuclear reactors have a higher cost of capital because they
15 are more risky. It may be appropriate to use different costs of capital to assess different types of
16 projects. Alternatively, the Commission could estimate the cost to consumers of the increase in the
17 overall cost of capital resulting form the pursuit of the riskier project.

18 The Commission also needs to examine the discount rate used in the analysis. The utility is
19 conducting the analysis from the utility point of view, decreasing the discount rate when the ROE is
20 reduced. This has the anomalous effect of lowering the overall cost of both the nuclear and natural
21 gas projects at the higher cost of capital. The higher the return on equity, the higher the nominal

¹⁴ FPL response to OPC’s Third Set of Interrogatories, Interrogatory No. 40, p.1.

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1 value of the revenue requirement, but the lower the present value because the entire revenue
2 requirement (not just the capital cost revenue requirement) is being discounted at a higher rate.

3 A case can be made that the investments should be viewed through the eyes of the ratepayer,
4 not the utility. The ultimate objective of public utility regulation is to deliver reliable electricity at
5 the least cost to consumers. If we take least cost to mean to the consumer, then an argument can be
6 made that the consumer discount rate should be used. The utility cost of capital already reflects the
7 primary utility concern about the revenue requirement. The consumer discount rate and the utility
8 discount rate may or may not move in tandem. Moreover, utilities make choices that affect their cost
9 of capital, but not the consumer discount rate.

10

11 **Q. Please summarize your conclusions.**

12 A. As I predicted in Docket 090009-EI, dramatically changed circumstances surrounding the
13 licensing and construction of new nuclear reactors has forced PEF and FPL to push the possible
14 construction of these proposed nuclear reactors off into the future beyond the time horizon of the
15 ten-year planning process and even the extremely long lead time that they originally claimed was
16 needed to construct new reactors. Nevertheless, despite even more uncertainty at this point in time,
17 both PEF and FPL want to continue to spend ratepayer funds in the near term, even though those
18 expenditures would provide little benefit to ratepayers. Put simply, the near term expenditure of
19 funds to allow PEF and FPL to sit in line at the NRC is not only unnecessary, but also unreasonable
20 and imprudent. Ultimately, neither PEF nor FPL can demonstrate the long-term feasibility of these
21 proposed nuclear reactors if realistic assumptions are made about future demand and the cost of
22 various alternatives as I have discussed above.

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1 Instead of forcing ratepayers to pay for PEF and FPL to sit in line, the time that recent
2 developments afford the utilities and the Commission should be used to study the landscape and
3 gather information, as opposed to plowing ahead and continuing to spend ratepayer funds on
4 proposed reactors that increasingly look like bad decisions. Over the next few years the high degree
5 of uncertainty regarding all of the key parameters that affect the decision may be sharply reduced:

- 6 • Market factors including demand growth after the recession and gas prices.
- 7 • Federal climate policy including targets and timing of emission reductions, efficiency and
8 renewable mandates affecting the need for non-renewable generation, the existence,
9 mechanism and level of a price on carbon, flexibility in the purchase of allowances.
- 10 • Regulatory uncertainty in the NRC design certification and reactor licensing
- 11 • Technology factors including the cost of nuclear, particularly, first of a kind v. later costs,
12 and alternatives
- 13 • Financial pressures on the utility balance sheets may alleviate

14 The Commission can, and should, use this time to require the utilities to build and test
15 models that reflect a broader view of least cost generation supply.

16 Ultimately, spending valuable ratepayer dollars in the near term to advance projects that are
17 not feasible in the long-term is imprudent. The delays in projected online operation of these
18 proposed reactors should provide a respite from these spending of funds until the utilities can
19 demonstrate that completion of these proposed reactors is feasible in the long-term and that
20 continuing to incur costs on the reactors is reasonable and prudent.

21
22 **Q. Does this conclude your testimony?**

23 **A. Yes.**

RISK FACTORS FACING CONSTRUCTION OF NEW NUCLEAR REACTORS

Category

Technology risk stems from the fact that the new generation of nuclear reactors are new and uncertain. Cost estimates have increased dramatically over the past five years, doubling or tripling. At the same time, the technologies of alternatives, efficiency and renewables are stable and well known. Costs are declining and availability is rising

Policy risk stems from the fact that federal policy is in flux.

While nuclear advocates have looked to climate policy, which may put a price tag on carbon emissions, as a primary driver of the opportunity to expand the role of nuclear power, they have failed to take account of the equally strong possibility that climate policy will create a very substantial mandate for conservation and renewables, which will dramatically shrink the need for new, nonrenewable generating capacity

Regulatory risk stems from the chance that regulators will move slowly in approving reactors or authorizing their cost recovery. The new designs has proven challenging, with the reference designs going through dozens of revisions. Site-specific issues, which cannot be standardized, have proven contentious. While a few states have approved construction work in progress and other measures to ensure cost recovery, the vast majority has not.

Source

New Technology Risk
 Alternative technologies

Shifting focus
 Flexible GHG reductions

NRC Regulatory Reviews
 Loan Guarantee Conditions
 Rate Review

Specific Risks

First of a kind costs
 Long-lead time
 Efficiency potential identified
 Renewable cost declines

Emphasis on efficiency reduces need
 Emphasis on renewables reduces need
 Lowers carbon cost

Lack of Experience
 Change of requirements
 Design flaws and revisions
 Site specific contentions
 Taxpayer protections inhibit loans
 Recovery of costs challenged

Execution risk stems from the fact that these reactors are new and the industry does not have a great deal of capacity. Of the 20 projects that have applied for licenses at the Nuclear Regulatory Commission, eighteen have suffered from one or more of the following problems, delay, cancellation, cost escalation or financial downgrade.

Construction Risk	Lack of experience
	Counterparty risk
EPC contract uncertainties	Cost escalation and volatility
Size, cost and complexity	Cost overruns
	Delays

Marketplace risk on the demand-side flow from the current recession, the worst since the Great Depression, which has not only resulted in the largest drop in electricity demand since the 1970s, but also appears to have caused a fundamental shift in consumption patterns that will lower the long term growth rate of electricity demand dramatically. On the supply-side of the market, there are a host of alternatives that have lower cost to meet the need for electricity in a carbon-constrained environment and there is growing confidence in the cost and availability of alternatives.

Uncertain demand growth	Slowing due to recession
Uncertain fuel costs	Shifting due to debt and loss of wealth
Reactor Costs	Natural gas price decline
	Long lead time
	Cost overruns
	Rate shock reduces demand

Financial risk stems from all of the above risks and are magnified tight conditions in money markets and the fact that utility balance sheets are weak and too small to support the large size of nuclear reactor projects. The nature of the projects imposes additional financial risks, so much so that, for most utilities, the projects are so large that Moody's has called them "bet the farm" decisions.

General Conditions	Tight money
	New Liquidity requirements
	High-risk premiums
Utility Finance	Increased nuclear operating exposure
	Existing debt and need to refinance
	Financial ratio deterioration
	Rising cost of debt
	Limited & declining cash & equivalents
	Weak balance sheets
Project Finance	Underfunded pension plans
	High hurdle rate for risky projects
	Impact of large project
	Debt load and service burden impact
	Capital structure distortion

Source: Mark Cooper, *All Risk, No Reward* (Institute for Energy and the Environment, December 2009)

Unrealistic Assumptions Masking the Real Economics of Nuclear Reactors

Technology:

- **Assumption:** Nuclear cost projections were low, while the cost characteristics of alternatives were ignored. The contribution that alternatives (efficiency and renewables in particular) can make to meet the need for electricity was downplayed.
- **Reality:** Nuclear costs are much higher than originally claimed and remain highly uncertain. There is growing confidence in the cost and availability of alternatives that makes them more attractive.

Policy:

- **Assumption:** Public policy would put a high price on carbon and escalate the demand for nuclear because alternatives (especially efficiency and renewables) would not also be promoted by public policy.
- **Reality:** Efficiency/renewable standards are likely to play a large part in climate policy. This makes alternatives more attractive. Reliance on efficiency, international offsets, and other policies that provide flexibility in meeting greenhouse gas abatement goals lowers the cost of carbon.

Regulatory:

- **Assumption:** The standardized designs would lead to rapid approval of licenses and work authorizations. Loan guarantees would flow with little scrutiny and oversight.
- **Reality:** The standard designs have proven not to be so standard, with dozens of revisions forwarded to the Nuclear Regulatory Commission for evaluation. Site-specific issues cannot be standardized and they remain the object of important contentions.

Execution:

- **Assumption:** Standardized design and accelerated certification would enable utilities to quickly move into the construction phase. Low estimates of the cost of nuclear reactors would lead to rapid regulatory approval and support at the state level.
- **Reality:** Standardized designs have gone through numerous revisions. Site approvals remain contentious. Approval of loans has required more time and information than anticipated. Technological uncertainty raises prospects of cost overruns. First of a kind costs and lack of standard design raises construction risk and construction has not begun in the U.S., while projects abroad have encountered difficulties. Operating risks of new designs are unknown and foreign activities to not resolve these concerns.

Marketplace:

- **Assumption:** Demand growth and commodity prices for fossil fuels would remain high.
- **Reality:** Declining demand as a result of the “Great Recession” reduces need for large quantity of new generation. Falling price of natural gas makes natural gas more attractive. Growing confidence in lower cost alternatives makes them more attractive.

Finance

- **Assumption:** Financing would be readily available.
- **Reality:** Tight Financial markets make finance more difficult generally. The large size of the project relative to the balance sheets of utilities and the increasing concern about nuclear reactors makes capital market finance more expensive and difficult, if not impossible.

Source: Mark Cooper, *All Risk, No Reward (Institute for Energy and the Environment, December 2009)*

INCREASING RISKS FACING NUCLEAR REACTOR CONSTRUCTION PROJECTS

<u>Cooper Category</u>	<u>Areas of concern (p. 11)</u>	<u>Negative impact on nuclear build</u>
Regulatory:	Federal licensing and permitting State: DSM	NRC slippage (pp. 8-11) Lower demand (p. 24)
Policy:	Federal State	Failure to decide environmental policy (p. 31) Yucca Mtn. waste (p.37) EPA under Clean Air Act (p. 32) Legislative opposition to nuclear (p. 27) RPS standards (p. 30)
Technology	Capital intensity	Fixed, sunk costs (p. 15)
Marketplace:	Load growth, Consumer pocketbooks	Recession slowdown (p. 13) Inability to pay (p.12)
Financial:	Capital market reactions	Fewer internal funds (p. 13) Negative ratings (pp. 15-19)

Source: Page References to Direct Testimony of Jeff Lyash, Docket No. 100009, April 30, 2010

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NEGATIVE EVENTS IN THE NUCLEAR RENAISSANCE

Month	Event
Jan-08	MidAmerican cancels proposed Idaho reactor (1)
Feb-08	NRC suspends application for <i>South Texas Project</i> reactors because application is incomplete (NRG has since reapplied) (2)
Feb-08	Florida Power and Light revises cost estimates for <i>Turkey Point</i> reactors from around \$8 billion to \$24 billion (3)
Mar-08	Progress Energy triples cost estimates for <i>Levy County</i> reactors to \$17 billion (4)
Aug-08	Constellation increases cost estimates for <i>Calvert Cliffs</i> reactors from \$2 billion to \$9.6 billion (5)
Oct-08	Progress Energy increases cost estimates for <i>Shearon Harris</i> reactors from \$4.4 billion to \$9.3 billion (6)
Nov-08	Duke Energy increases cost estimates for <i>William States Lee</i> reactors from \$5 billion to around \$11 billion (7)
Dec-08	TVA increases cost estimates for <i>Bellefonte</i> reactors from \$6.4 billion to \$10.4 billion (8)
Mar-09	Entergy suspends application for <i>River Bend</i> reactor in Louisiana (9)
Mar-09	Entergy suspends application for <i>Grand Gulf</i> reactor in Mississippi (10)
Apr-09	AmerenUE cancels proposed <i>Callaway</i> reactor (11)
May-09	Exelon cancels two proposed <i>Victoria County</i> reactors (Has since reapplied for an Early Site Permit) (12)
May-09	Progress Energy in Florida announces at least a 20-month delay on planned reactors at <i>Levy County</i> (13)
May-09	PPL's cost estimates for one reactor at <i>Bell Bend</i> skyrockets from \$4 billion to \$13-15 billion (14)
May-09	Moody's downgrades PPL to negative outlook over proposed reactor at <i>Bell Bend</i> (15)
Jul-09	Moody's and Fitch downgrade SCE&G due to proposed <i>VC Summer</i> reactors (16)
Aug-09	TVA cancels three proposed reactors at <i>Bellefonte</i> site (17)
Aug-09	Constellation delays NRC's review of <i>Nine Mile Point</i> application to September 2010, a one-year delay (18)
Aug-09	NRC delays the scheduled publication of the final environmental review for Constellation's <i>Calvert Cliffs</i> in Maryland to February 2011, a delay of 13 months (19)
Aug-09	TVA delays proposed <i>Bellefonte</i> reactor from 2016 to 2020-2022 (20)
Sep-09	AP-1000 design in 17th revision; NRC announces more problems that will likely delay AP-1000 designs like <i>Shearon-Harris</i> , <i>Lee</i> , and <i>Vogtle</i> reactors
Sep-09	Duke delays <i>William States Lee</i> reactors from 2016 to 2021 (21)
Sep-09	Moody's gives negative credit rating to Oglethorpe over planned investment in <i>Vogtle</i> reactors (22)

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- Oct-09** NRC identifies significant safety issues with AP-1000 shield design, potentially signaling delays with over half of the proposed reactors in the US (23)
- Oct-09** New cost estimates for *South Texas Project* reactors go up \$4 billion, a 30% increase (24)
- Nov-09** Fitch downgrades SCANA over risks posed by SCE&G's two nuclear reactors at *VC Summer* (25)
- Nov-09** Areva announces plans to modify EPR reactor design at the request of safety bodies in the UK, France, and Finland (26)
- Dec-09** Unistar asks NRC to suspend application for *Nine Mile Point 3* reactor (27)
- Jan-10** FP&L announces that they'll suspend plans for *Turkey Point* reactors based on decision of Florida PSC to reduce proposed rate hike from \$1.26 billion to \$75.5 million (28)
- Jan-10** Progress Energy announces that they'll slow the *Levy County* process based on the same Florida PSC decision, in which they got none of a \$500 million rate hike request (29)
- Jan-10** Fitch puts FP&L (*Turkey Point* reactors) on ratings watch 'Negative' after decision by Florida PSC to not provide CWIP (30)
- Feb-10** Progress Energy extends delay on *Levy County* reactors to at least 36 months. (31)
- Feb-10** Toshiba/Westinghouse indicate that regulatory problems will in Florida (*Turkey Point* and *Levy County*) for up to 3 years. (32)
- Mar-10** FP&L announces delay of *Turkey Point* reactors past 2018, signals interest in federal loan guarantees. (33)
- Apr-10** Moody's downgrades FP&L from low to moderate risk over *Turkey Point* reactors. (34)
- Apr-10** NRC states that design-review certification of US-APWR will take at least an additional six months, shifting deadlines well into 2011. (35)
- May-10** Cost estimates move from \$17.2 billion for the two reactors to \$22.5 billion for *Levy County* reactors. (36)
- May-10** Fitch downgrades Progress Energy (*Levy County* and *Shearon Harris* reactors) to just above junk bond status. (37)
- May-10** TVA opts to go with old Babcock and Wilcox design for single reactor at *Bellefonte*, citing untested status of new designs. (38)
- May-10** The timeline for the two *Levy County* reactors has been pushed back again, with the first due in 2021, the second some 18 months later. The original timeline had the reactors set to come online in 2016 and 2018 respectively. (39)

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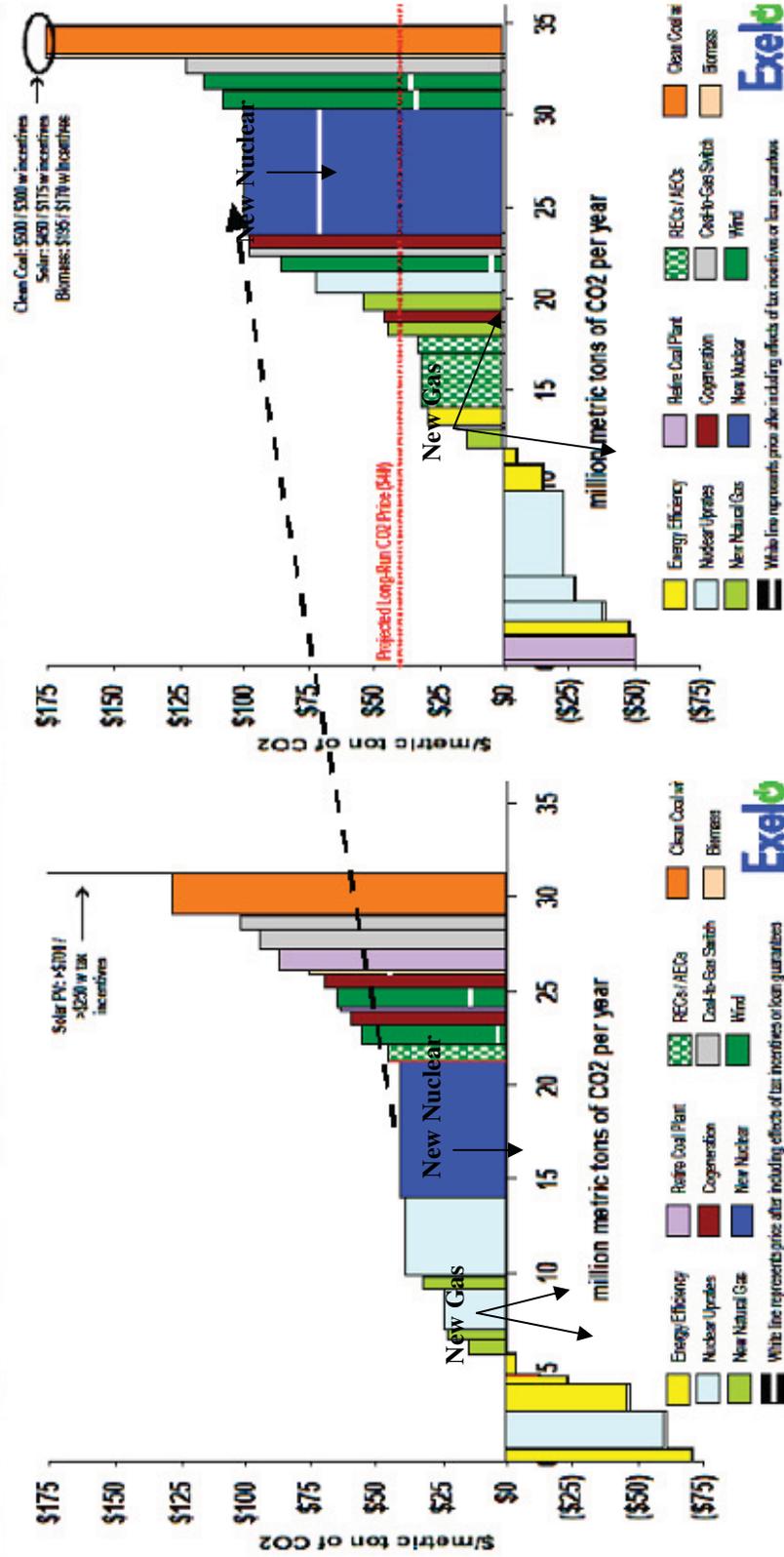
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EXELON'S VIEW OF THE DETERIORATING NUCLEAR AS A CARBON ABATEMENT OPTION
Exelon's View of Carbon Abatement Options - 2008 Exelon's View of Carbon Abatement Options - 2010

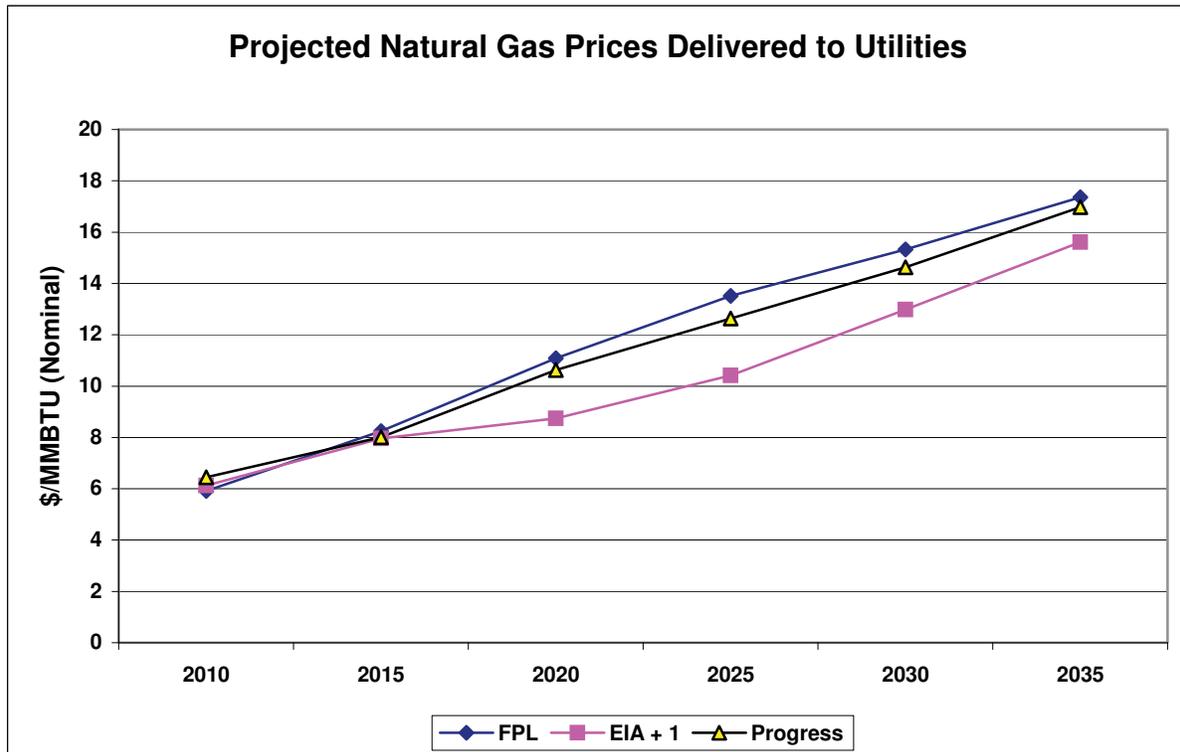


Source: John W. Rowe, *Fixing the Carbon Problem without Breaking the Economy*, Resources for the Future Leadership Forum Lunch, May 12, 2010

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PROJECTED NATURAL GAS PRICES COMPARED TO EIA PROJECTIONS

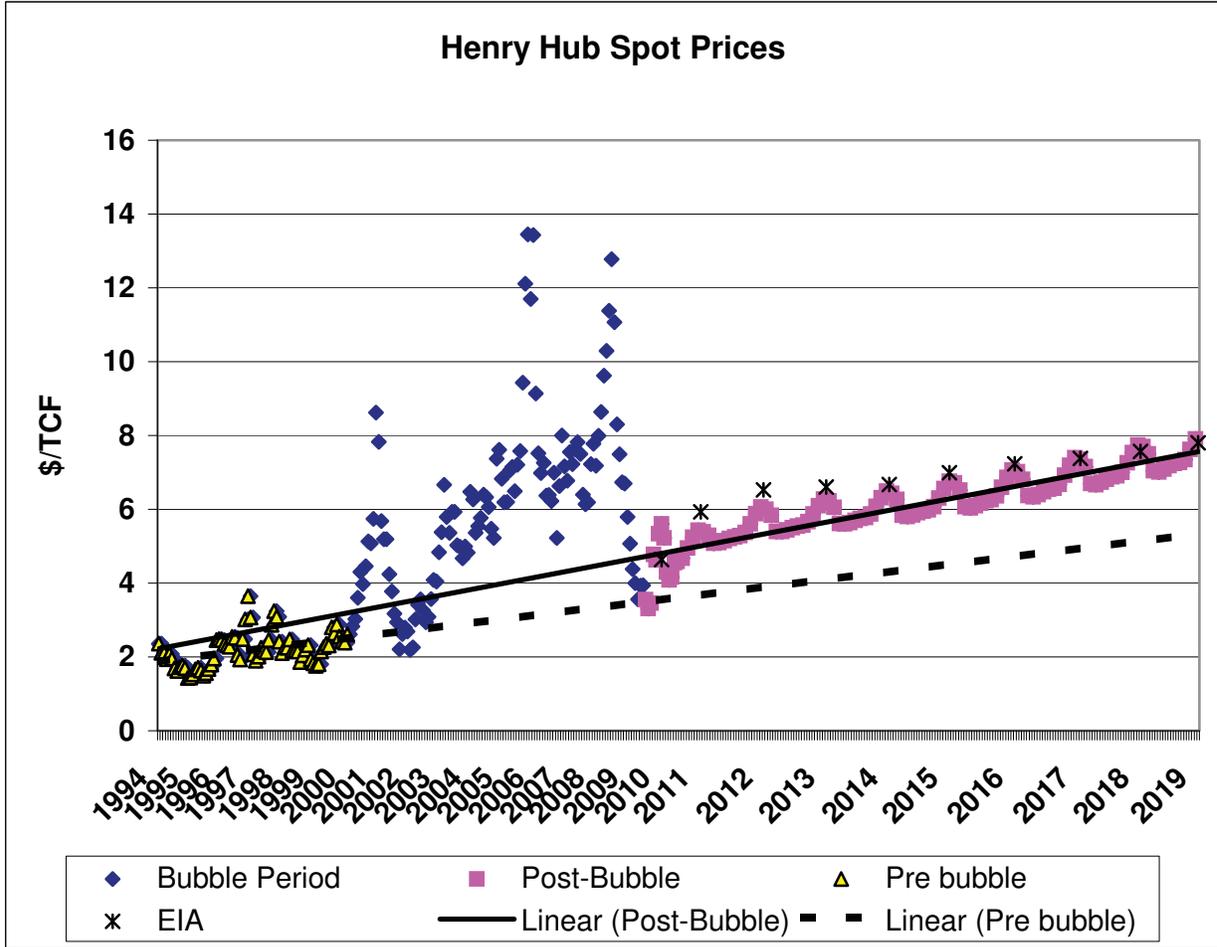


Source: FPL, Sims SRS-2, p. 1-of-1; PEF: Lyash, JL-3, p. 4 of 12. EIA, Annual Energy Outlook, Table 13. <http://www.eia.gov/oiaf/forecasting.html>

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THE DECADE OF VOLATILE NATURAL GAS PRICES MAY HAVE BEEN THE EXCEPTION, NOT THE RULE

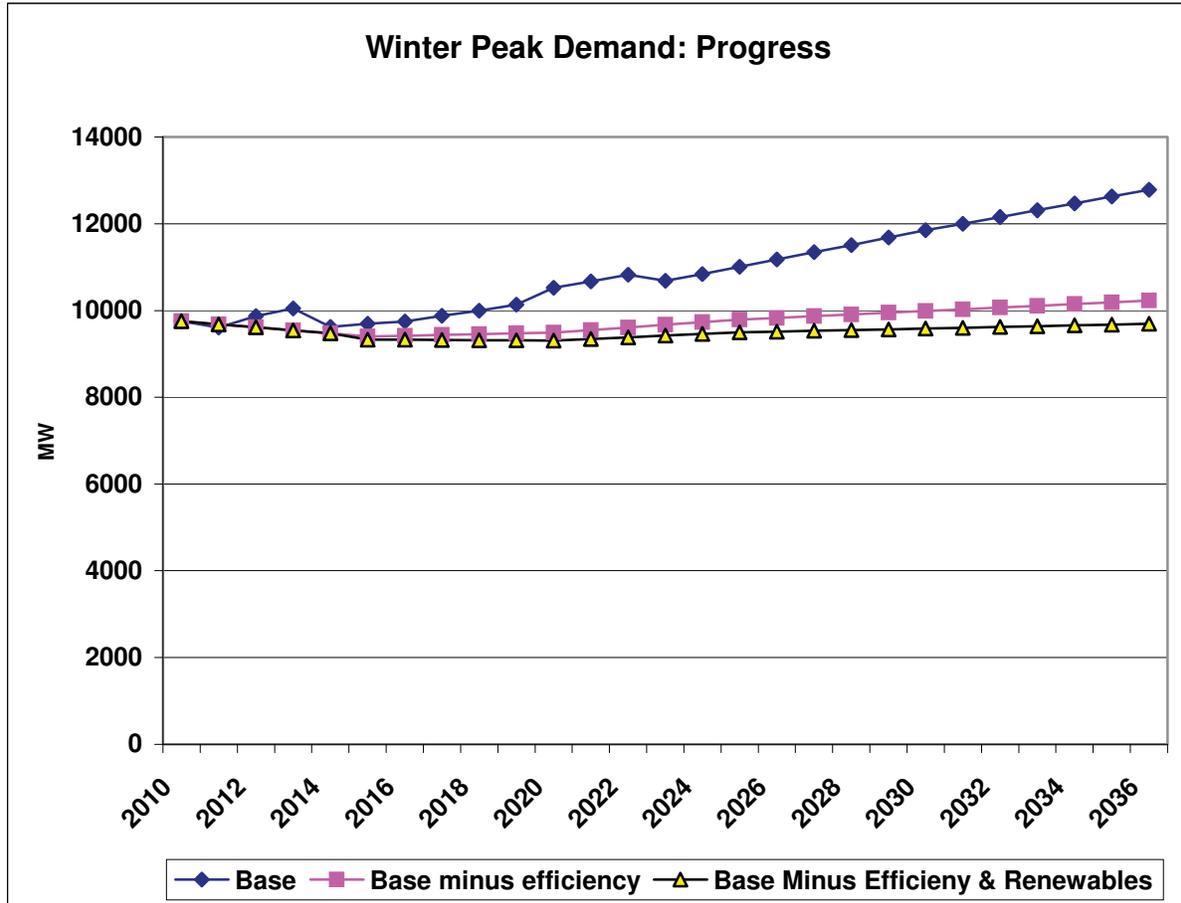


Source: Pre-bubble, Energy information Administration
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DECLINING PEAK LOAD PROJECTIONS

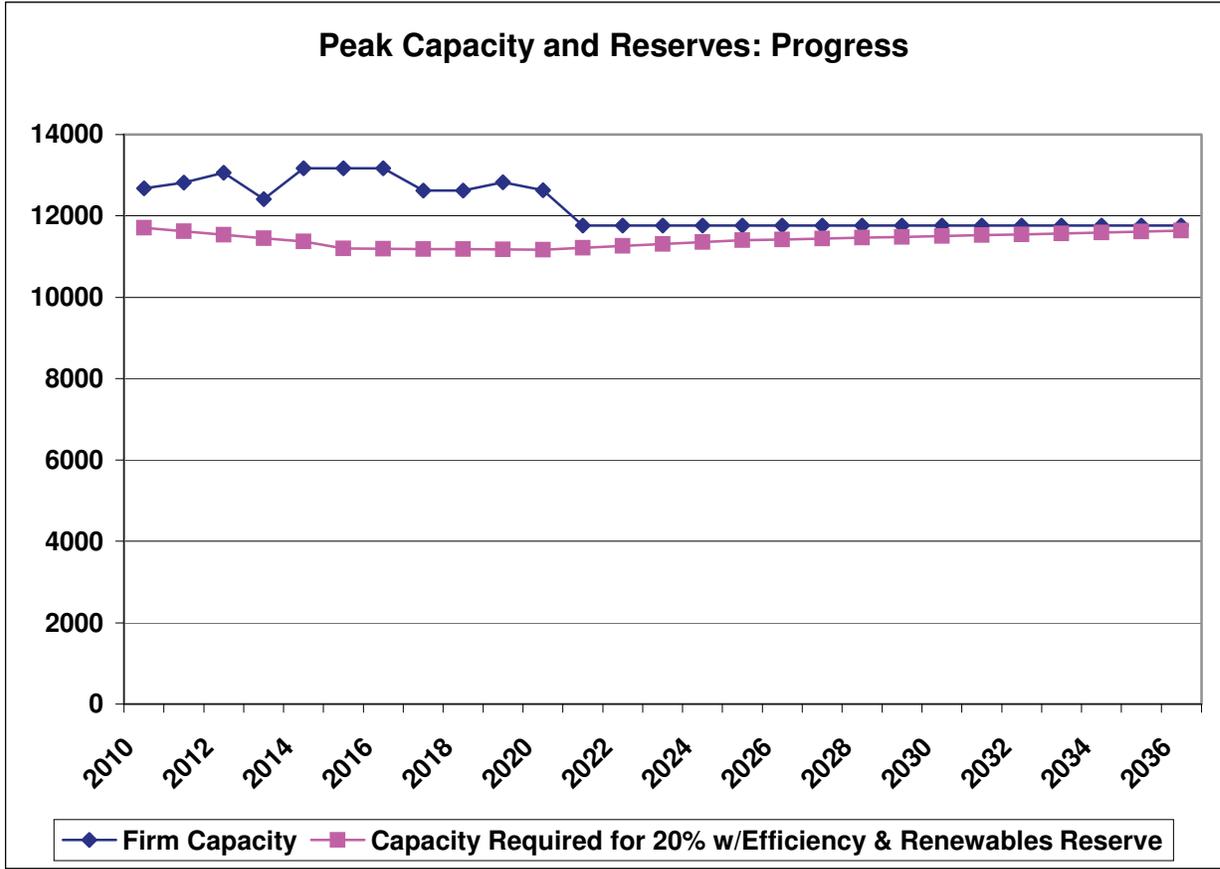


Source: Progress Energy Florida: Levy Nuclear Project NCRC, Updated Life-Cycle Net Present Worth (CPVRR) Assessment, p. 10; efficiency and renewables based on Environmental Protection Agency, *Supplemental EPA Analysis of the American Clean Energy and Security Act of 2009*, January 29, 2010, p. 38.

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DECLINING PEAK LOAD AND CAPACITY NEEDS

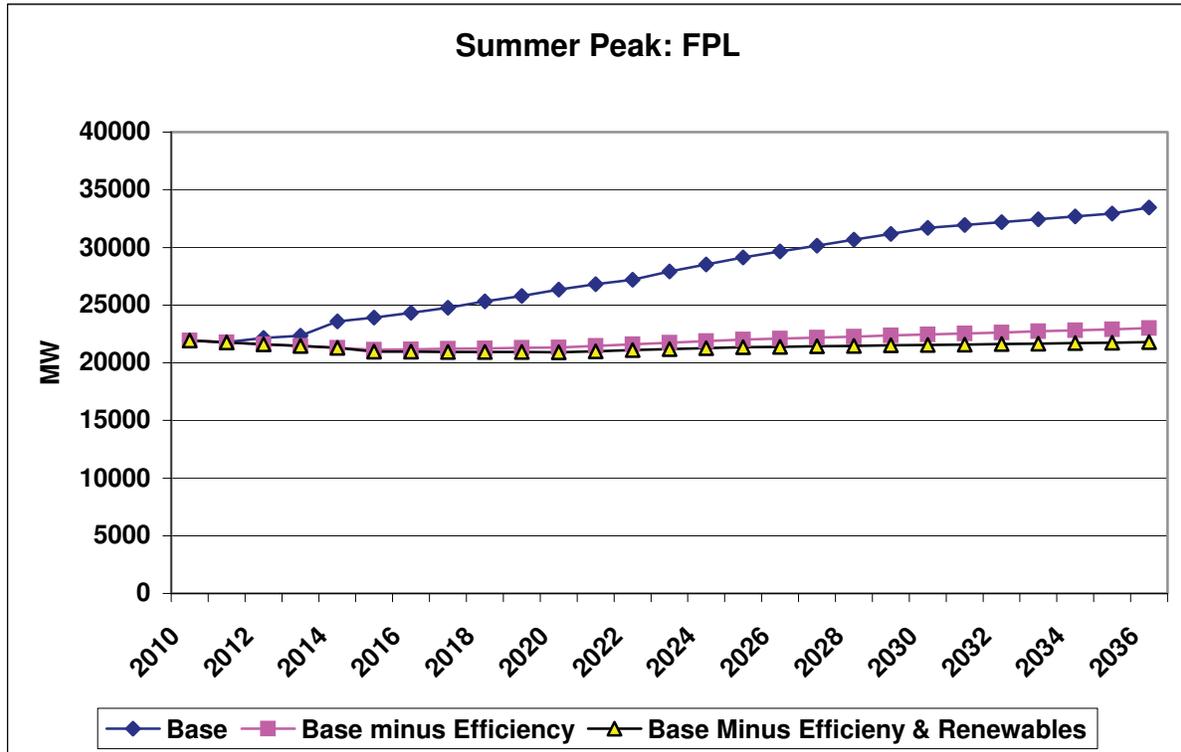


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DECLINING PEAK LOAD PROJECTIONS

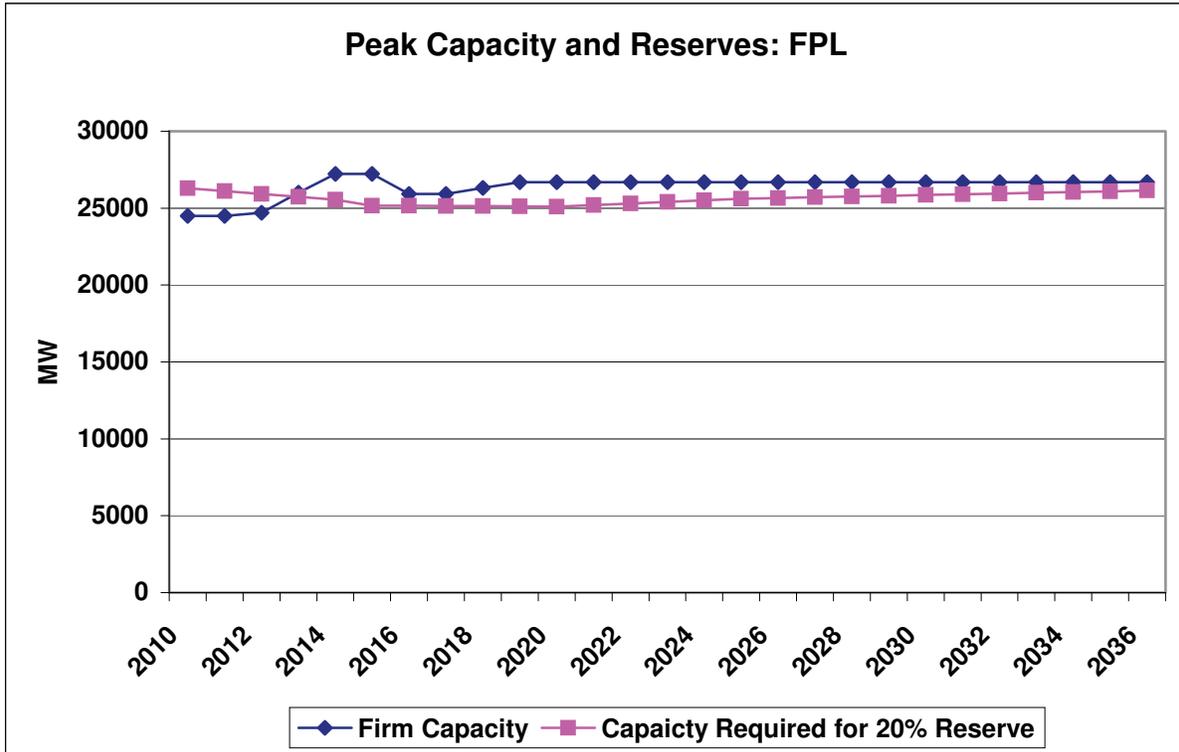


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DECLINING PEAK LOAD AND CAPACITY REQUIREMENTS

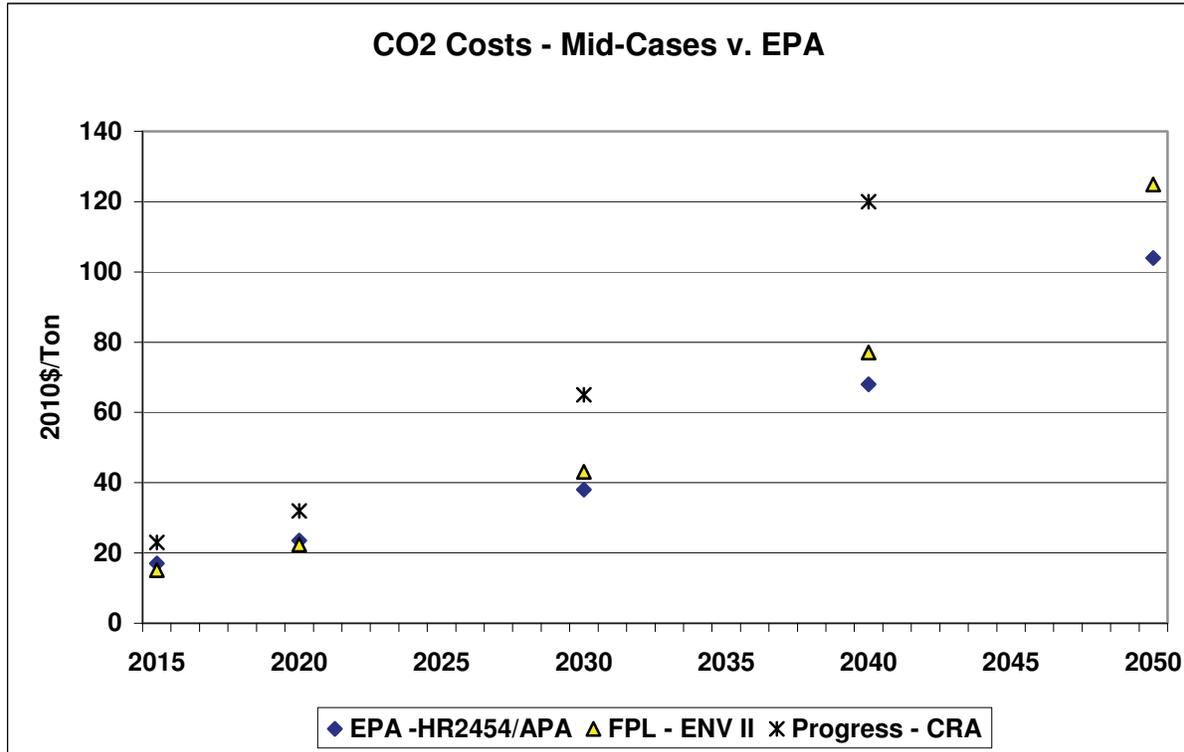


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PROJECTIONS OF CARBON COMPLIANCE COSTS



Source: Progress Energy Florida: Levy Nuclear Project NCRC, Updated Life-Cycle Net Present Worth (CPVRR) Assessment, p. 2; Testimony of Steven R. Sim, Docket No. 100009-EI, SRS-3, efficiency and renewables based on Environmental Protection Agency, *Supplemental EPA Analysis of the American Clean Energy and Security Act of 2009*, January 29, 2010, p. 18.

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PROJECTIONS OF OVERNIGHT CONSTRUCTION COSTS

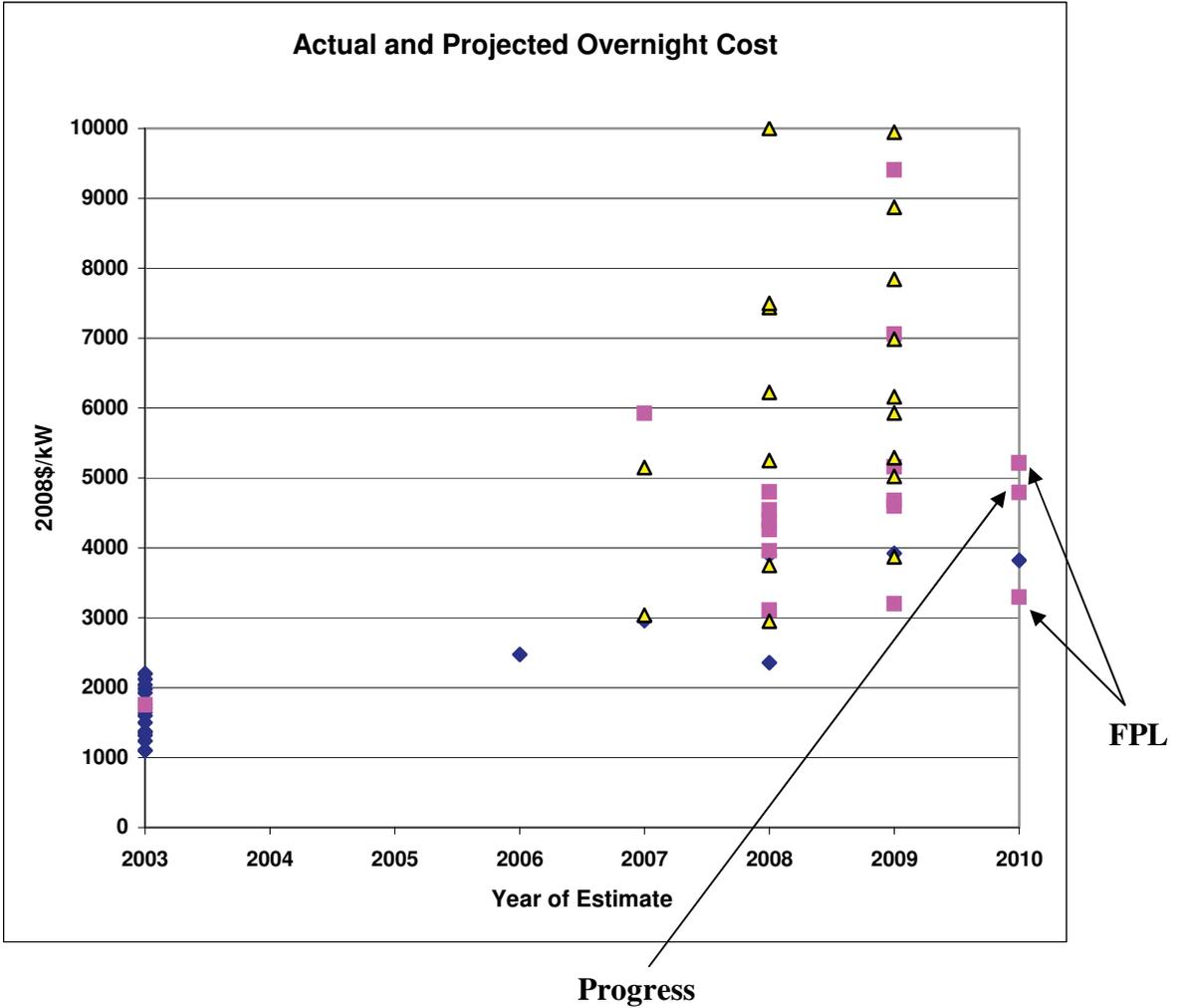


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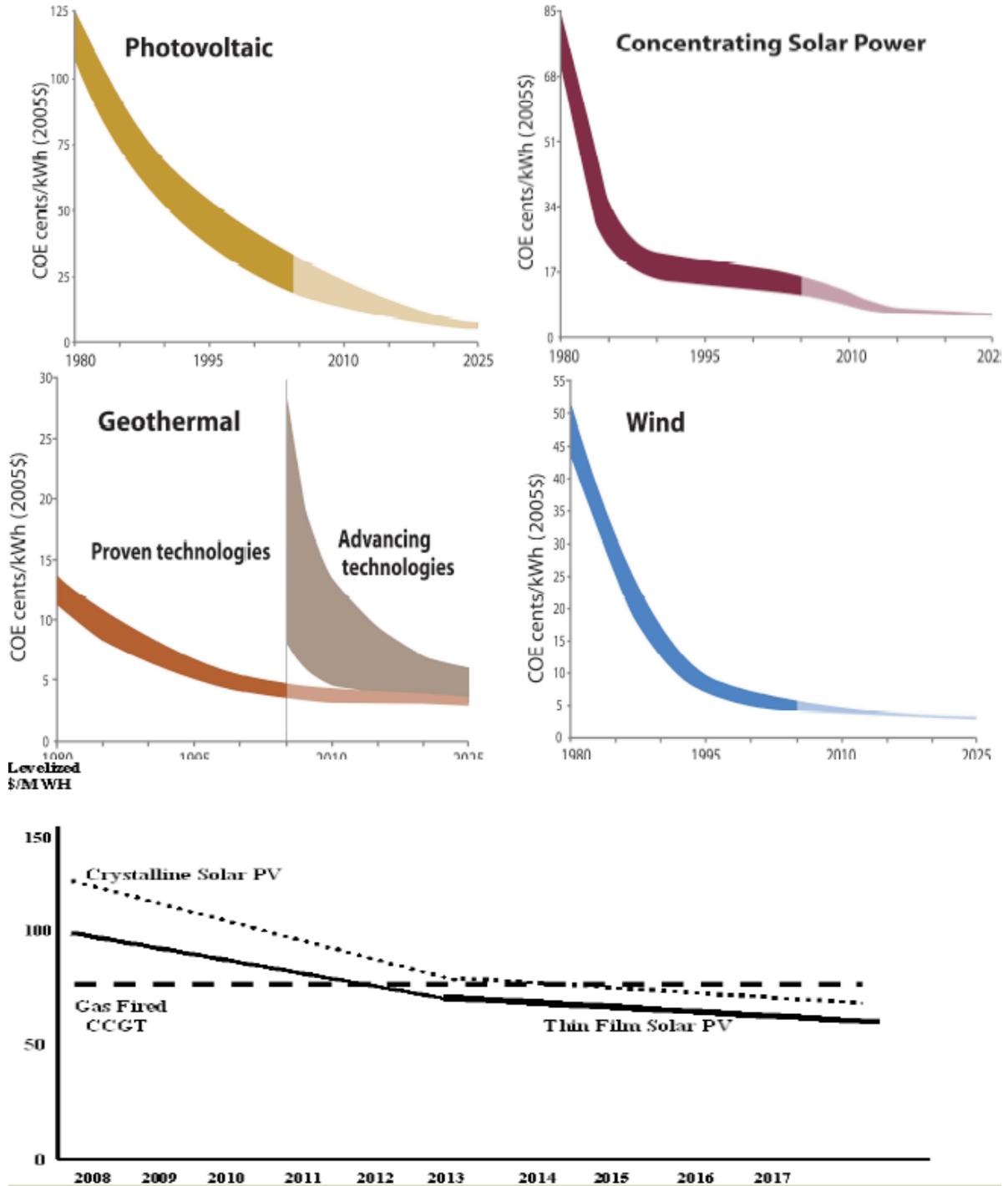
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DECLINING COST OF RENEWABLES



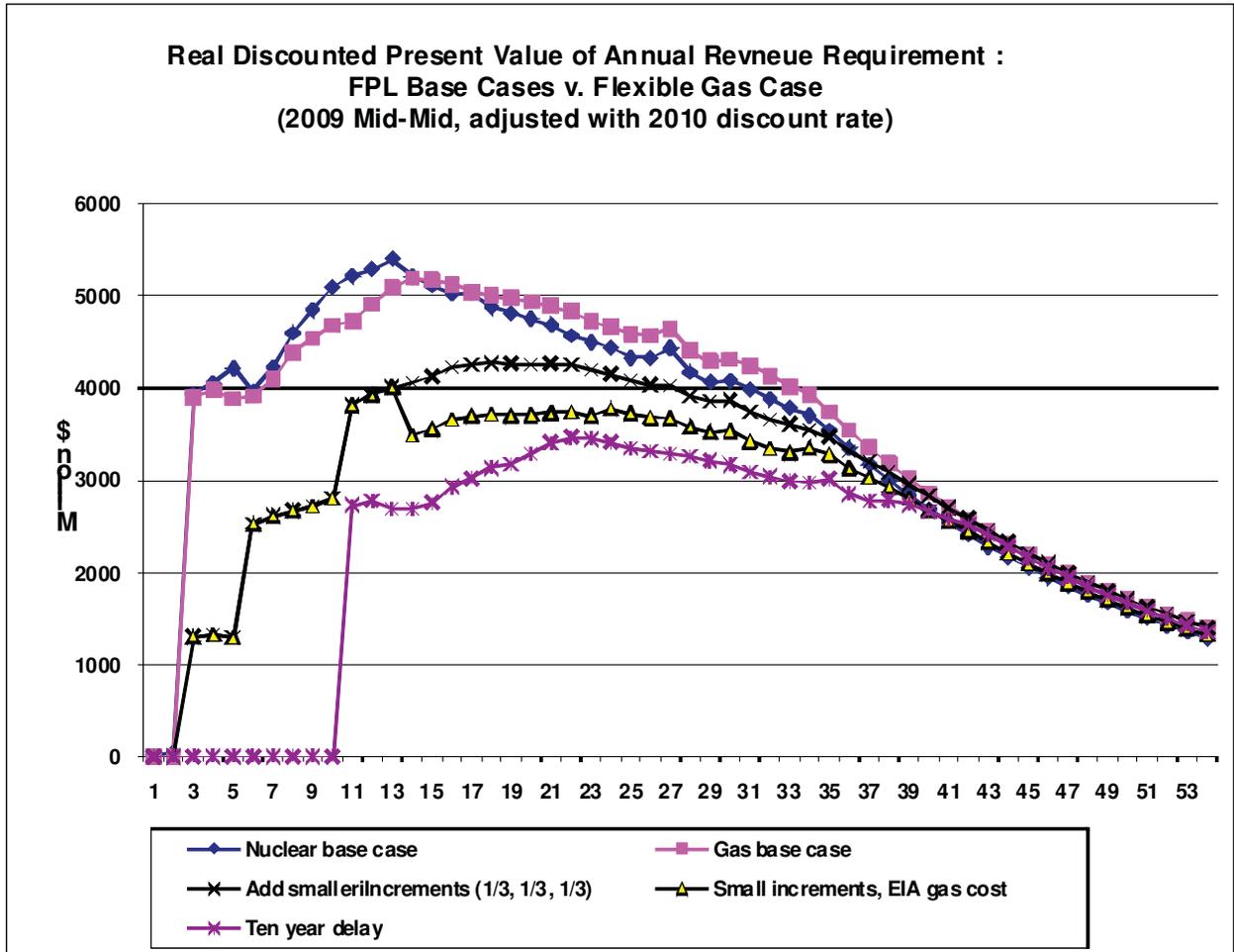
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FLEXIBLE GAS ADDITIONS LOWER REVENUE REQUIREMENTS

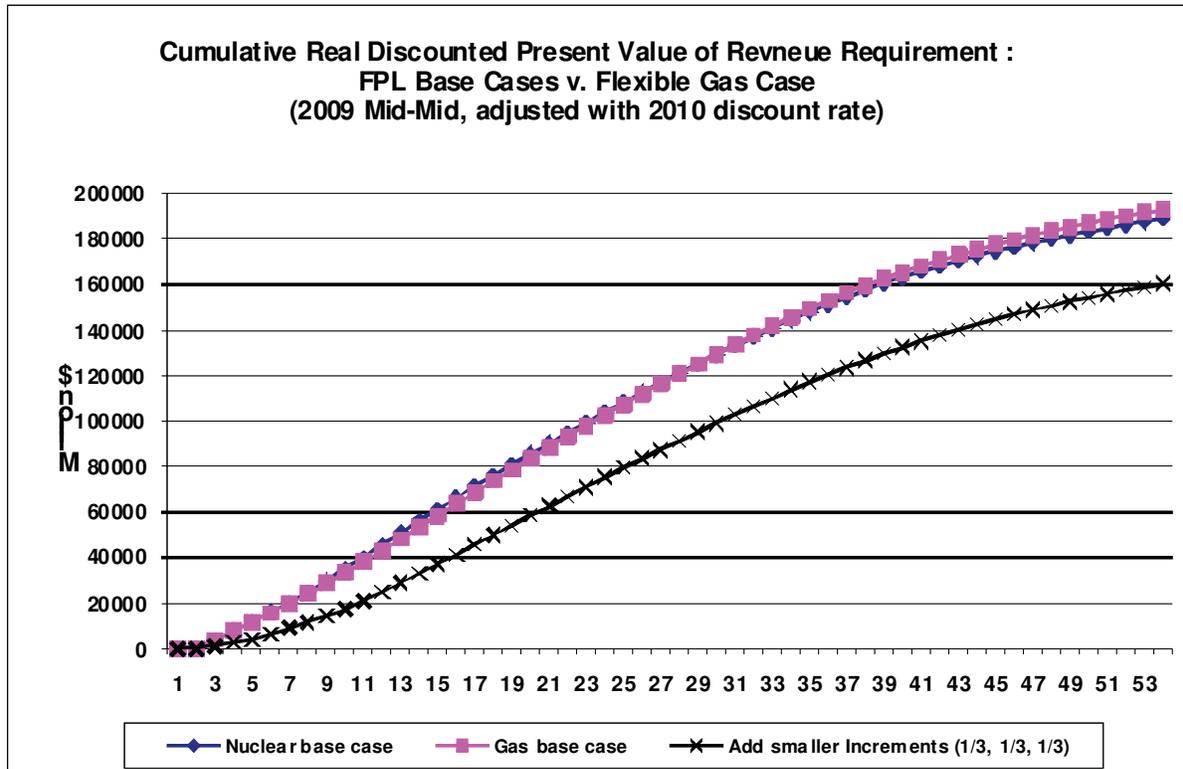


Source: Florida Power & Light, *Response to Staff's Second Set of Interrogatories*, Interrogatory No. 64, p. 7.

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CUMULATIVE COST DIFFERENCE: FLEXIBLE V. LUMPY TREATMENT OF NATURAL GAS GENERATION ADDITIONS

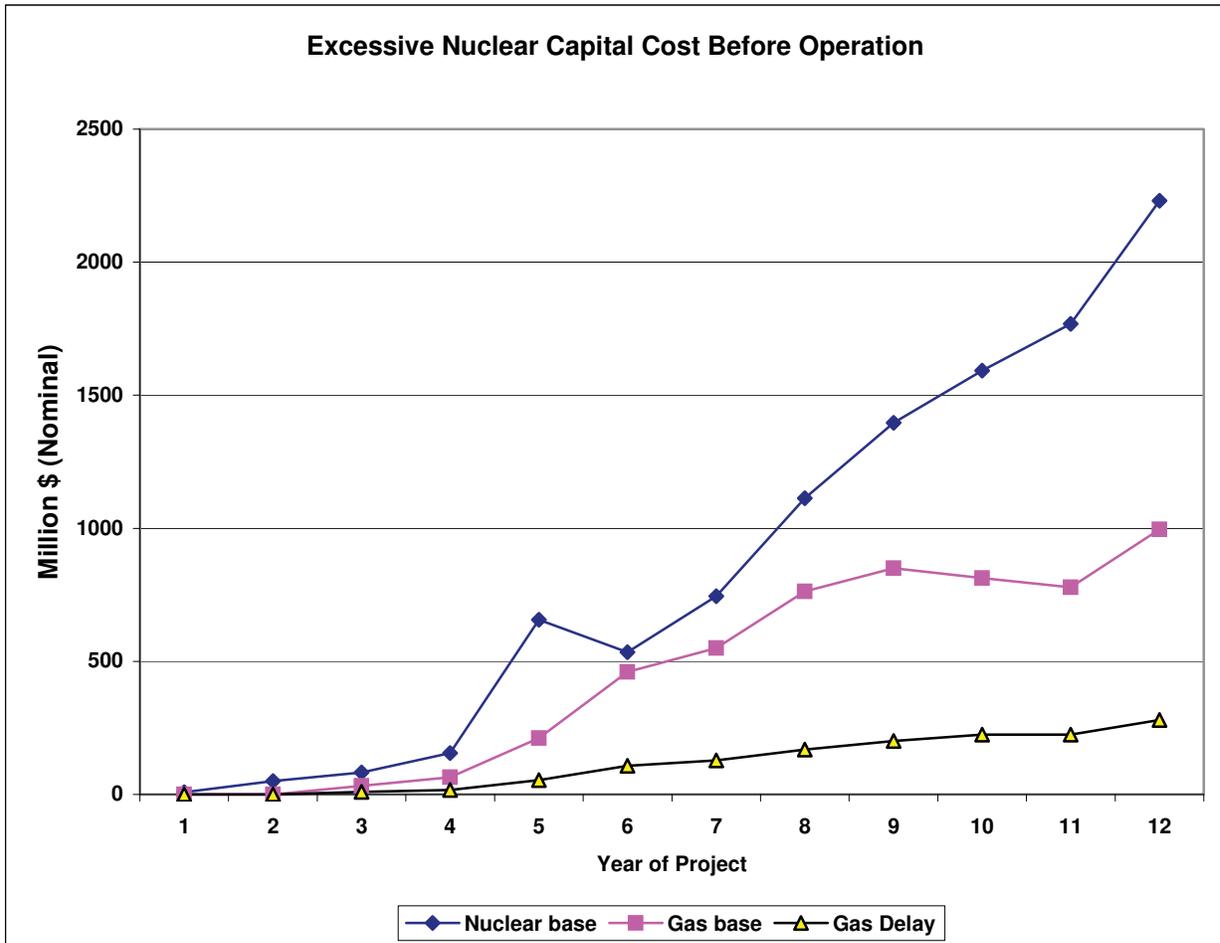


Source: Florida Power & Light, *Response to Staff's Second Set of Interrogatories, Interrogatory No. 64, p. 7*

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NUCLEAR CONSTRUCTION PRESSURES CAPITAL REQUIREMENTS

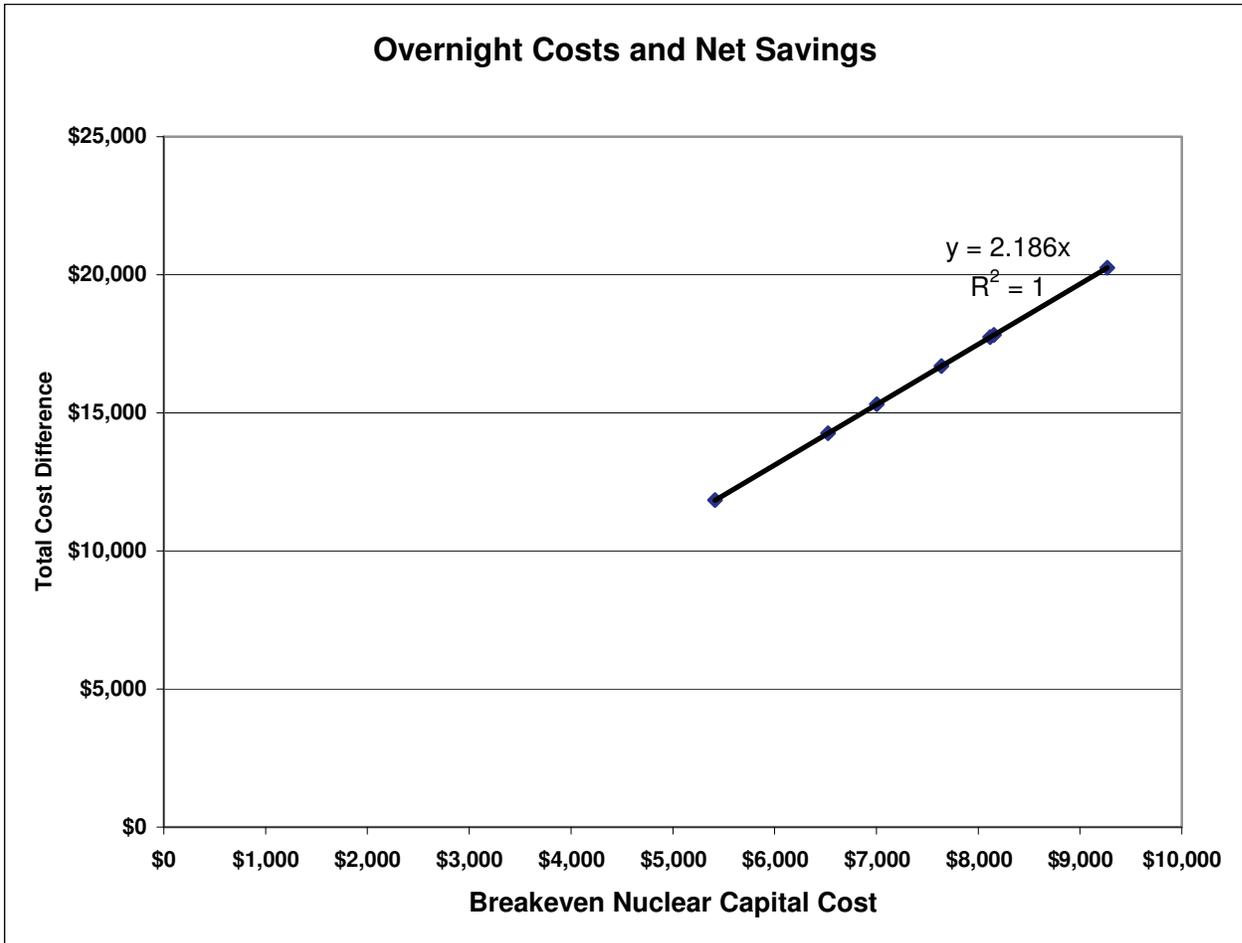


Source: Florida Power & Light, *Response to Staff's Second Set of Interrogatories, Interrogatory No. 64, p. 7*

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OVERNIGHT COSTS AS A PREDICTOR OF NET SAVINGS: FPL



Source: Testimony of Steven R. Sim, Docket No. 100009-EI, SRS-10.

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THE RISK OF NUCLEAR REACTORS IN THE EYES OF INDUSTRY ANALYSTS

EXCERPTED FROM

ALL RISK, NO REWARD FOR TAXPAYERS AND RATEPAYERS

**THE ECONOMICS OF SUBSIDIZING THE 'NUCLEAR RENAISSANCE' WITH
LOAN GUARANTEES AND CONSTRUCTION WORK IN PROGRESS**

**Mark Cooper
Senior Fellow for Economic Analysis
Institute for Energy and the Environment
Vermont Law School**

November 2009

III. THE RISK OF NUCLEAR REACTORS IN THE EYES OF INDUSTRY ANALYSTS

The following discussion demonstrates the basis of the framework for risk analysis laid out in the previous section by reviewing recent analyses of the challenge of constructing new nuclear reactors conducted by Wall Street firms¹⁵ and industry consultants.¹⁶

A. MOODY'S

Moody's has issued two special comments on new nuclear generating capacity that underscore the challenges that these huge projects face. In the initial comment in May 2008, after discussing the many challenges to building nuclear reactors, Moody's expressed the hope that utilities contemplating building reactors would take steps to prepare their balance sheets for the impact of these large projects.

Given these long-term risks, a utility's approach to its overall corporate finance policies becomes a critical factor in the overall credit profile assessment during the construction period. In general, Moody's incorporates a view that a utility company would prepare for the higher risk profile associated with construction by maintaining, or strengthening further, its strong balance sheet as well as maintaining robust levels of available liquidity capacity. This is a critical assumption since our preliminary analysis leads us to conclude that financial credit metrics will deteriorate meaningfully without the introduction of significant mitigating factors and/or other structural provisions.¹⁷

A year later, in June 2009, Moody's took a much dimmer view of the prospects for building nuclear reactors. While Moody's identifies the developments in the project and regulatory areas that are positives for nuclear reactor construction, it still concludes that the

¹⁵ Moody's *Nuclear Generating Capacity: Potential Credit Implications for U.S. Investor Owned Utilities*, May 2008; Moody's June 2009; Dimitri Mikas, "Financing New Nuclear Construction & Implications for Credit Quality," *Is there a Nuclear Renaissance*, p. 20; Standard & Poor's, May 28, 2009; Standard & Poor's, *Utilities Make Some Progress on New Nuclear Power, But Hurdles Still Linger*, March 9, 2009; Standard & Poor's, *For New U.S. Nuclear Power Plants, Liquidity Requirement Could be Substantial*, October 21, 2008; Standard & Poor's, *As Nuclear Power Renaissance Gains a Foothold in U.S., A Host of Details Needs Sorting Out*, March 7, 2008.

¹⁶ Stephen Maloney, *Financial Issues Confronting Nuclear Construction*, Carnegie Endowment for International Peace, November 13, 2008; Stephen Maloney, *Nuclear Power Economics and Risk*, Council on Foreign Relations, July 10, 2009; Edward Kee, *First Wave or Second Wave? It is time for US nuclear power plant projects with a first wave build strategy to consider moving to the second wave*, NERA, July 24, 2009.

¹⁷ Moody's, May 2008, p. 3.

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negatives are a great concern and declares that it “is considering taking a more negative view for those issuers seeking to build new nuclear power plants”¹⁸ because “we view nuclear

generation plans as a “bet the farm” endeavor for most companies, due to the size of the investment and length of time needed to build a nuclear power facility.”¹⁹ The change in attitude stemmed in part from deteriorating financial market conditions and the failure of the utilities contemplating building reactors to strengthen their financial positions.

Credit conditions are yet another question. Few, if any of the issuers aspiring to build new nuclear power have meaningfully strengthened their balance sheets, and for several companies, key financial credit ratios have actually declined. Moreover, recent broad market turmoil calls into question whether new liquidity is even available to support such capital-intensive projects.²⁰

In both documents, Moody’s identifies the cause and implications of these risks. The May 2008 document identified several sources of risk. The financial risks of the project are sharply increased by the execution risk, which is compounded by technology, marketplace and regulatory risks.

The complexity and long-term construction horizon associated with building new nuclear plant expose a utility to “material adverse change” conditions related to political, regulatory, economic and commodity price environments, as well as technology developments associated with supply and demand alternatives. These long-term risks expose a utility to back-end regulatory disallowance risk or other potential market intervention or restructuring initiatives by elected officials.²¹

The June 2009 Moody’s document reiterated these concerns.²² The inherent nature of these projects continues to be a challenge and creates marketplace and technological risk.

Notwithstanding the fact that public policy has created favorable conditions for reactor construction in some aspects of regulation, there are other aspects that pose continued risk in

¹⁸ Moody’s, June 2009, p. 1.

¹⁹ Moody’s, June 2009, p. 4.

²⁰ Moody’s June 2009, p. 2.

²¹ Moody’s May 2008, p. 5.

²² Moody’s June 2009, p. 5.

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both execution risk and regulatory risk.²³ Policy risk has increased due to the orientation of climate change policy toward promoting alternatives.

Less clear today is the effect that energy efficiency programs and national renewable standards might have on the demand for new nuclear generation. National energy policy has also begun eyeing lower carbon emissions as a key desire for energy production—theoretically a huge benefit for new nuclear generation—but the price tags associated with these development efforts are daunting, especially in light of today’s economic turmoil. It isn’t clear what effect such shifts, or changes in technology, will have for new nuclear power facilities.²⁴

Moody’s continues to see execution risk in these projects and points to the history of the financial difficulties that utilities building reactors had in the 1970s and 1980s as instructive for evaluating current projects.

Moody’s is considering applying a more negative view for issuers that are actively pursuing new nuclear generation. History gives us reason to be concerned about possible significant balance-sheet challenges, the lack of tangible efforts today to defend the existing ratings, and the substantial execution risk involved in building new nuclear power facilities.²⁵

One of the sources of this concern about the execution risk is the failure of those proposing to build new reactors to provide the detailed information that would be associated with a well-thought out investment of this size.

We remain concerned over the absence of details regarding key elements associated with the decision process to proceed with a project of this scale.

²³ Moody’s June 2009, p. 7.

The sheer size, cost and complexity of new nuclear construction projects will increase a utility’s or power company’s business and operating risk profile, leading to downward rating pressure. The length of a nuclear construction effort also entails lengthy regulatory reviews and potential delays in recovering investments, changing market conditions, shifting political and policy agendas, and technological developments on both the supply and demand side.

²⁴ Moody’s June 2009, p. 2.

While a constructive regulatory relationship will help mitigate near-term credit pressures, we will remain on guard for potential construction delays and cost overruns that could lead to future rate shock and/or disallowances of cost recovery. Given the lengthy construction time needed for nuclear projects, there is no guarantee that tomorrow’s regulatory, political, or fuel environments will be as supportive to nuclear power as today’s.

²⁵ Moody’s June 2009, p. 2.

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Information is needed regarding the all-in construction costs and break-down of those costs; the construction timeline and schedule; the Engineering, Procurement and Construction (EPC) contractual arrangements and the allocation of fixed versus variable costs within those arrangements; the financing structure, expected sources of financing and pro-forma capitalization; and, the ultimate impact on consumer rates.²⁶

The result of these market, regulatory and technological uncertainties and risks is to create financial pressure on projects, pressures that are reflected by project specific concerns and the general turmoil in the credit markets.

Given these long-term risks, a company's financial policy becomes especially critical to its overall credit profile during construction. In general, we believe a company should prepare for the higher risk associated with construction by maintaining, if not strengthening, its balance sheet, and by maintaining robust levels of available liquidity capacity.²⁷

B. STANDARD & POOR'S

Moody's is not the only credit rating agency to recognize the challenges facing nuclear reactors. Even at a promotional conference, a Standard & Poor's executive noted that "challenges for the industry participants abound."²⁸ While recognizing that there are positive aspects of the current environment, as Moody's did, Standard & Poor's identifies more aspects of the current situation that are negative. Interestingly, even with a loan guarantee, Standard & Poor's sees significant financial issues as described in Figure III-1.

²⁶ Moody's May 2008, p. 2.

²⁷ Moody's June 2009, p. 5.

²⁸ Dimitri Mikas, "Financing New Nuclear Construction & Implications for Credit Quality," *Is there a Nuclear Renaissance*, p. 20, Standard & Poor's, May 28, 2009.

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Figure III-1: Standard & Poor’s Credit Profile Considerations

Business risk profile	
New Technology Risk	↑
Construction Risk	↑
How much risk is mitigated by EPC contract?	↑↓
Nuclear operating exposure will increase	↑
Regulatory framework for recovery of investment	↑
Financial risk Profile	
Debt imputation: 25% for projects vs. 50% for regulated utilities	↑
Even with DOE guarantee, debt loads can increase significantly	↑
80/20 vs. 60/40 capital structure	↑
Despite DOE guarantee, debt service will be fully accounted for	↑
Ability to recover cash return on work in progress	↓

Source: Dimitri Mikas, “Financing New Nuclear Construction & Implications for Credit Quality,” *Is there a Nuclear Renaissance*, p. 20, Standard & Poor’s, May 28, 2009. Arrows point in the direction of the impact on risk.

Standard & Poor’s remains more positive on nuclear reactors than Moody’s, although it is quite clear that the subsidies from taxpayers and ratepayers are the key to the financing of these projects. In a March 2009 analysis entitled *Utilities Make Some Progress on New Nuclear Power, But Hurdles Still Linger*, the table of contents tells the story:

- Support for New Construction Varies from State to State
- The Licensing Process and Framework Remain Untested
- The DOE’s Loan Guarantees Figure in Several Financing Approaches
- For Credit Risk, Balance-Sheet Size is Important
- Recession and Falling Energy Prices Can Alter Perspectives

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The Need for Construction Contracts that Can Help Limit Exposure²⁹

This list includes two positive factors, which relate to the taxpayer (Department of Energy loan guarantees) and ratepayer (construction work in progress) funding of the reactors. Four of the six factors listed are sources of concern: regulatory risk (uncertain licensing), financial risk (credit and balance sheet), marketplace risk (recession and energy prices) and execution risk (construction contracts).

Standard & Poor's points out that the approach taken to support projects in the southeastern U.S. goes well beyond turning ratepayers into investors; it takes all of the risk off of the utilities by

- Allowing utilities to receive pre-approval for construction costs and schedules;
- Providing for periodic review to ensure compliance with schedules and budgets;
- Allowing for recovery of a cash return on "construction work in progress" costs for both equity and debt components;
- Preventing future regulatory commissions from reviewing the prudence of previously approved capital spending; and
- Allowing for recovery of abandoned investment and providing for inclusion of the completed plant in the "rate base" (the value of property on which a utility can earn a regulatory-specified rate of return) without a major rate case filing with the regulator.³⁰

Ironically, the efforts of the Department of Energy (DOE) to impose conditions on guaranteed loans that would help to mitigate the risk to the Treasury and protect the taxpayer in the event of defaults on the loan – i.e. a first lien for the Treasury and cross collateralization – are seen as creating "complications" and "challenges" for the financing of nuclear projects. That these conditions were imposed by the Bush administration, which had been very supportive of and helped to invent the term "nuclear renaissance," and the fact that the nuclear industry has lobbied hard to eliminate them underscore the risk that the loan guarantee program poses to taxpayers.

From a purely technical perspective, the loan guarantee program would work naturally with a transaction that is project-financed in the traditional sense. In

²⁹ Standard & Poor's, Hurdles Remain, p. 1.

³⁰ Standard & Poor's, Hurdles Remain, pp. 2-3.

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such a case, if the project falters, the sponsor can walk away and lose its equity, while the DOE takes control of the project assets and makes the lenders whole. Because of the DOE's requirement to have a priority lien over the project assets, regulated electric utilities applying under the program that lack a first mortgage bond indenture can facilitate a loan guarantee request, while the existence of a first mortgage bond indenture can introduce complications. Therefore, regulated utilities with first mortgage bond indentures will likely have to implement funding structures that satisfy the DOE's need while at the same time preserving compliance with their mortgage indentures.

Another challenge that has come up for companies pursuing new construction through a partnership arrangement under the DOE's program deals with the issue of how the department requires all participants to cross-collateralize each other's obligations. This essentially creates a situation where the project participants are jointly and severally liable. This arrangement differs from past projects that incorporated an undivided interest approach in which each participant was responsible only for its own portion of the project.³¹

The large size of the reactors figures into the loan guarantees. Utilities are attempting to find approaches that can fit into the loan guarantee program that let them share the reactors.

The traditional framework in which regulated utilities use on-balance-sheet financing to build generation plants while merchant generation companies use a project finance approach still holds largely true. However, companies are experimenting with various structures, including partnerships, and they are trying to take advantage of the DOE's loan guarantee program, whether they are regulated or merchant. Partnerships can be very appealing because they not only moderate or spread the construction and financing risk, but they can also help tailor an investment's size to a company's projected load in the time frame in which the plant will enter commercial operation. The loan guarantee program appeals to all participants – whether regulated or merchant, public or investor owned – because it can lower borrowing costs.³²

These highly technical financial discussions can be boiled down to a simple proposition. With the guaranteed loans equal to as much as 80 percent of the value of very risky projects, the DOE imposes two conditions on the loans that help to protect the

³¹ Standard & Poor's, Hurdles Remain, pp. 4-5.

³² Standard & Poor's, Hurdles Remain, p. 3.

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taxpayer's investment should the project falter. The DOE holds the first lien and all of the partners are liable for the entire project. Private sector lenders also want the first lien, which creates a conflict. The nuclear industry is pressing hard to eliminate these taxpayer protections.

The problem that the large size of these projects poses to their financing is a major component of the Standard & Poor's analysis.

Given the new plant's large projected cost, how big the companies' balance sheets are can be a significant factor in terms of how much credit risk we recognize. A new project that materially affects a company's size can introduce significantly more risk and necessitate that every other aspect of the company's business perform flawlessly to provide the necessary support to its credit profile, especially during the period when capital spending peaks and the financial profile becomes stressed. For a company whose nuclear project investment is small compared with its balance sheet, these same concerns apply but, in our view, are moderated to some extent. Balance-sheet size is also an important consideration in adjusting rates during the construction period (assuming regulators allow the company to get a cash return on its construction work in progress during construction), as well as in the final rate adjustment necessary to include the plant in rate base.

Finally, balance-sheet size relative to the size of the investment in the nuclear project can become an important factor if the company needs to abandon the project. While many regulated jurisdictions provide for recovery of the prudently incurred investment, the time for recovery of the investment remains fairly open. Thus for a company with a small asset base, recovering its abandoned investment in a nuclear plant over a long period of time can adversely affect its financial risk profile.³³

The Standard & Poor's analyst pointed out that "even with DOE guarantee debt loads can increase significantly."³⁴ The Standard and Poor's analysis provided estimates of the balance-sheet impact for three companies, showing that the nuclear project equaled 28 percent of total assets for Georgia Power, 76 percent for South Carolina Gas and Electric and 146 percent of Progress Energy.³⁵ Interestingly, Moody's has downgraded South Carolina Electric and Gas and issued negative advice on the Southern Company, the parent of Georgia Power.³⁶

³³ Standard & Poor's, *Hurdles Remain*, p. 4.

³⁴ Mikas, *Financing*, p. 20.

³⁵ Standard & Poor's, *Hurdles Remain*, p. 5.

³⁶ Moody's, *Changes Outlook of Southern and Three Subs to Negative*, September 1, 2009.

C. CONSULTING FIRMS

A November 2008 presentation by an analyst at Towers Perrin provided an early warning about the risk of nuclear reactor projects in the emerging economic environment.³⁷ An updated version of that analysis from July 2009 reinforces the initial observations.³⁸ The two areas where the analyst was well ahead of the curve in raising concerns were in the recognition of marketplace and financial risk.

The slowing of load growth and the decline of the cost of alternatives, particularly natural gas, were identified as undermining the case for nuclear reactor projects. The decline in demand reduces the need for new reactors. “With falling demand for power, current market conditions generally provide no compelling need or reason for many utilities to immediately take on any more risk than they already face.... The recession is showing no signs of the Government-promised abatement or any response to “stimulus” – demand is low.”³⁹ Weakened balance sheets resulting from declining sales reduce the ability of the utilities to undertake large projects. “In fact, utilities have very significant balance sheet and liquidity challenges in this market with no immediate or obvious resolution.... Therefore, many utilities have no basis [at this time] to count on organic growth to strengthen cash flows, balance sheets, or [offset] pension losses.”⁴⁰

The analysis identifies two forms of regulatory risk – uncertainty about project approval by an inexperienced, understaffed Nuclear Regulatory Commission and uncertainties about the allowance of cost recovery by state regulators. Specifically, the untested Combined Construction and Operation License process does not address issues not submitted for review, nor does it preclude subsequent ratchets arising from rulemakings. The gap from the former leaves open restatement of standards applied to such things as field engineering, which typically represent more than half of the overrun potential in any project.

Even with set regulatory requirements, projects face a host of execution risk problems, including the lack of current utility experience constructing reactors, the ability of management to oversee these projects, and the likelihood of the need to rework projects. Particularly notable here is the concern about the vendors and contracts to which many turn to look for help to reduce risk exposure.

The Towers Perrin analysis devotes the greatest attention to the worsening financial conditions, both in the broader financial market in general and for the utility sector in

³⁷ Stephen Maloney, *Financial Issues Confronting Nuclear Construction*, Carnegie Endowment for International Peace, November 13, 2008.

³⁸ Stephen Maloney, *Nuclear Power Economics and Risk*, Council on Foreign Relations, July 10, 2009.

³⁹ Maloney, *Economics and Risk*, 2009, pp. 4-5.

⁴⁰ Maloney, *Economics and Risk*, 2009, pp. 4-5.

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particular. Tightening credit and high-risk premiums, as well as federal credit policies are seen as raising the cost of long-term capital. At the same time, market dynamics lower the market capitalization of utilities, limiting their ability to invest. The balance sheets of utilities are weak and becoming weaker, a trend that caused Moody's to change its view in 2009. The analysis offers "some energy sector planning thumb rules":

- Always hedge your risk within your risk capital limits.
- Don't invest in projects claiming more than 10% of your assets.
- Risky issues call for higher returns... indicated returns for nuclear projects should be ~ 18-25% or more.⁴¹
- Uncertainty (i.e., risk) in initial estimates will grow over the course of a project at rates proportional to the square root of time.
- Since DCF [discounted cash flow] systematically underestimates compound risk and new construction faces significant irreversibilities, never base a risky or uncertain project's success solely on the NPV [net present value] or a DCF calculation.⁴²

The analysis focuses on the situation in which construction work in progress is not available and concludes that the long construction period creates a heavy burden on the financial risk profile of the utility. Finally, the analysis expressed concern about federal loan guarantees. It argues that the federal government is not a reliable counterparty and that credit conditions should raise concern about its ability to perform as counterparty.

Federal loan "guarantees" are risky. Remember: the Federal Government is not a reliable business partner. It is a serial breacher of agreements and its policies systematically fail to perform to forecast while always costing more than promised.

If a utility proceeds with the Federal Government as a guarantor, it would be prudent and responsible to apply risk management protocols normally reserved for high-risk counterparties.⁴³

Bottom line: Federal Government has proven itself an unreliable counterparty:

- Policies systematically fail to fulfill promises or hit their forecasts,
- A serial breacher of agreements,
-

⁴¹ Maloney, *Economics and Risk*, 2009, p. 10.

⁴² Maloney, *Economics and Risk*, 2009, pp. 10-11, 12, 24.

⁴³ Maloney, *Economics and Risk*, pp. 5, 23.

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- Paper thin Balance Sheets: Federal Government and FRB [Federal Reserve Board] both fail to meet IMF standards,
- Bond auctions show diminishing enthusiasm for more UST [U.S. Treasury] paper,
- Growing international sentiment to diversify off USD [U.S. Dollar] as reserve currency,
- Market concerns over UST “credit card balance.”⁴⁴

The weight of these risks and uncertainties led a Vice President of NERA Economic Consulting, a leading utility consulting firm, to recommend that utilities consider pushing off the decision to build nuclear reactors because

a first-wave project may face higher risks and costs, including scarce nuclear industry resources; uncertainties about carbon control and electricity demand; organized anti-nuclear efforts; some degree of first-of-a-kind (FOAK) risks and higher costs; and difficult markets for nuclear financing and funding.⁴⁵

Appendix B summarizes the reasons given in the NERA analysis, organized according to the framework used in this analysis. Those concerns parallel the discussion in this section.

⁴⁴ Maloney, Economics and Risk, p. 5... 23.

⁴⁵ Kee, p. 2.

APPENDIX B:

NERA Reasons to Consider Waiting to Construction Until the Second Wave of Reactors

Technology Risk:

A second-wave project that can avoid commitment to a reactor design (or that can switch reactor designs without large costs) should be able to choose from several standard reactor designs that will have been approved by 2014. As these approved reactor designs start construction, the degree of detailed engineering will be much higher than today and the approach to construction (i.e., modular construction) will be better known. Second-wave projects may also be able to learn from the outcomes of first-wave EPC contracts.

While the timing remains uncertain, there is a possibility that one or more alternate reactor designs (e.g., micro-reactors and Generation IV reactors) now in the research and development phase will be commercially available as an option for a second-wave project.

A first-wave project may face higher risks and costs, including scarce nuclear industry resources... some degree of first-of-a-kind (FOAK) risks and higher costs.

Policy Risk:

It is possible that the US approach to control carbon emissions will be in place by 2014, allowing a second-wave project sponsor to better understand the financial implications for new nuclear power plants.

New nuclear plants may benefit from programs or taxes that are targeted at controlling carbon emissions. A year ago, there was hope that a change of administration would result in quick and clear action on controlling carbon. This has not happened and any real action on carbon control may be delayed or watered down or both as a result of the economic recession.

DOE loan guarantees are a critical item, so the current limits suggest that only 2 or 3 plants will be built in the first wave. DOE Loan guarantees for nuclear remain limited to \$18.5 billion... Given the high cost estimates for new nuclear power plants, this will only cover a few nuclear units. Also, the terms, conditions, and costs of the DOE nuclear loan guarantees may not be attractive. DOE is reported to be negotiating with a short list of loan guarantee hopefuls; projects not in this short list may not have much chance of a loan guarantee.

Regulation Risk:

To the extent that a second-wave project has delayed the NRC COL process (i.e., the project has the ability to modify the COL application or other details), the lessons from the first-wave projects should provide a clearer view of the timing, issues, and potential for legal challenges to the COL process up to the COL approval point.

One or more new US nuclear power plants may have been built, approved, and placed into commercial operation, providing a much better view of how the NRC COL ITAAC process will work.

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Regulated first-wave projects will have placed nuclear plant investments into rate base (and into rates), providing some lessons and guidance for second-wave project sponsors, state regulators, and others.

Execution Risk:

New nuclear power projects outside the US may be close to completion and some may have started commercial operation, reducing uncertainty about total project cost, construction times, reactor design operating performance, modular construction approaches, market success of reactor designs and vendors, and other issues.

Second-wave project sponsors as well as investors, regulators, and others will have a clearer view of the costs of new nuclear power plants and the time required to build them. The differences in cost, time to construct, and operating performance across reactor designs and vendors will also be much clearer.

The learning during construction of the first-wave nuclear plants may allow second-wave buyers to obtain lower costs, less risk, and shorter and more certain schedules from EPC vendors. Modifications to detailed designs and construction approaches to improve quality, lower cost, and shorten time in construction may also be available.

There will be even more experience with new nuclear plants outside the US. Reactor vendors that are not now in the US market may have entered the US market based on the success of build programs outside the US, giving second-wave buyers more options.

Nuclear build experience so far is mixed. There was some hope that nuclear project development experience outside the US would resolve uncertainties to the benefit of the US projects that would follow, but this has not yet happened. The Olkiluoto EPR project has experienced significant cost overruns and delays and is now in arbitration proceedings and the Chinese have just started construction on the first AP1000 unit.

The nuclear fuel cycle, including the used fuel disposition issue and approach to re-processing used nuclear fuel, may be more settled. Several new uranium enrichment facilities may be operational in the US and uranium market prices may be more stable.

Marketplace Risk:

The impact on electricity demand and the need for new baseload generation due to the current economic recession, the building of renewable generation, and other factors will be better known.

Demand for electricity is growing at a slower rate in many parts of the US as a result of the current economic downturn, so that the projected need for baseload capacity may be less and later than the capacity need projected a year ago. For some utilities with industrial customers, this may be a significant change.

Current nuclear power plant cost estimates are high, even though these estimates are considered conservative and may mean fewer cost overruns when the projects are completed. However, the recent cost estimates are much higher than cost estimates from only a few years ago. As these higher nuclear cost estimates are incorporated into generation expansion planning models and policy analyses, new nuclear power plants may no longer be the least-cost generation expansion option.

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Financial Risk:

World financial markets are tight and financing any large capital project is difficult. Financing a new nuclear power plant would have been very difficult even without the financial crisis; with this crisis, it may not be possible to finance a new nuclear project. Financial markets will recover, but this may not happen in time for a first-wave project.

Also, the construction funding arranged by first wave developers may provide lessons for developers and lenders that will mean easier access to construction funding for second-wave projects. The real response of the stock market to new nuclear plant investment decisions will be known and will allow a second-wave sponsor to better assess its own decision to invest.

First-wave projects will have arranged and closed permanent financing, providing lessons and guidance for investors, lenders, and developers.

Source: Edward Kee, First Wave or Second Wave? It is time for US nuclear power plant projects with a first wave build strategy to consider moving to the second wave, NERA, July 24, 2009, pp. 4-6.

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EDUCATION:

Yale University, Ph.D., 1979, Sociology

University of Maryland, M.A., 1973, Sociology

City College of New York, B.A., 1968, English

PROFESSIONAL EXPERIENCE:

President, Citizens Research, 1983 - present

Research Director, Consumer Federation of America, 1983-present

Fellow, Stanford Center on Internet and Society, 2000-present

Associated Fellow, Columbia Institute on Tele-Information, 2003-present

Fellow, Donald_McGannon Communications Research Center, Fordham University, 2005-present

Senior Fellow for Economic Analysis, Institute for Energy and the Environment, Vermont Law School, 2009-present

Fellow, Silicon Flatirons, University of Colorado, 2009-present

Principle Investigator, Consumer Energy Council of America, Electricity Forum, 1985-1994

Director of Energy, Consumer Federation of America, 1984-1986

Director of Research, Consumer Energy Council of America, 1980-1983

Consultant, Office of Policy Planning and Evaluation, Food and Nutrition Service, United States Department of Agriculture, 1981-1984

Consultant, Advanced Technology, Inc., 1981

Technical Manager, Economic Analysis and Social Experimentation Division, Applied Management Sciences, 1979

Research Associate, American Research Center in Egypt, 1976-1977

Research Fellow, American University in Cairo, 1976

Staff Associate, Checchi and Company, Washington, D.C., 1974-1976

Consultant, Division of Architectural Research, National Bureau of Standards, 1974

Consultant, Voice of America, 1974

Research Assistant, University of Maryland, 1972-1974

TEACHING EXPERIENCE:

Lecturer, Washington College of Law, American University, Spring, 1984 - 1986, Seminar in Public Utility Regulation

Guest Lecturer, University of Maryland, 1981-82, Energy and the Consumer, American University, 1982, Energy Policy Analysis

Assistant Professor, Northeastern University, Department of Sociology, 1978-1979, Sociology of Business and Industry, Political Economy of Underdevelopment, Introductory Sociology, Contemporary Sociological Theory; College of Business Administration, 1979, Business and Society

Assistant Instructor, Yale University, Department of Sociology, 1977, Class, Status and Power

Teaching Assistant, Yale University, Department of Sociology, 1975-1976, Methods of Sociological Research, The Individual and Society

Instructor, University of Maryland, Department of Sociology, 1974, Social Change and Modernization, Ethnic Minorities

Instructor, U.S. Army Interrogator/Linguist Training School, Fort Hood, Texas, 1970-1971

PROFESSIONAL ACTIVITIES:

Member, Advisory Committee on Appliance Efficiency Standards, U.S. Department of Energy, 1996 - 1998

Member, Energy Conservation Advisory Panel, Office of Technology Assessment, 1990-1991

Fellow, Council on Economic Regulation, 1989-1990

Member, Increased Competition in the Electric Power Industry Advisory Panel, Office of Technology Assessment, 1989

Participant, National Regulatory Conference, The Duty to Serve in a Changing Regulatory Environment, William and Mary, May 26, 1988

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- Member, Subcommittee on Finance, Tennessee Valley Authority Advisory Panel of the Southern States Energy Board, 1986-1987
- Member, Electric Utility Generation Technology Advisory Panel, Office of Technology Assessment, 1984 - 1985
- Member, Natural Gas Availability Advisor Panel, Office of Technology Assessment, 1983-1984
- Participant, Workshop on Energy and the Consumer, University of Virginia, November 1983
- Participant, Workshop on Unconventional Natural Gas, Office of Technology Assessment, July 1983
- Participant, Seminar on Alaskan Oil Exports, Congressional Research Service, June 1983
- Member, Thermal Insulation Subcommittee, National Institute of Building Sciences, 1981-1982
- Round Table Discussion Leader, The Energy Situation: An Open Field For Sociological Analysis, 51st Annual Meeting of the Eastern Sociological Society, New York, March, 1981
- Member, Building Energy Performance Standards Project Committee, Implementation Regulations Subcommittee, National Institute of Building Sciences, 1980-1981
- Participant, Summer Study on Energy Efficient Buildings, American Council for an Energy Efficient Economy, August 1980
- Member, University Committee on International Student Policy, Northeastern University, 1978-1979
- Chairman, Session on Dissent and Societal Reaction, 45th Annual Meeting of the Eastern Sociological Society, April, 1975
- Member, Papers Committee, 45th Annual Meeting of the Eastern Sociological Society, 1975
- Student Representative, Programs, Curricula and Courses Committee, Division of Behavioral and Social Sciences, University of Maryland, 1973-1974
- President, Graduate Student Organization, Department of Sociology, University of Maryland, 1973-1974

HONORS AND AWARDS:

- American Sociological Association, Travel Grant, Uppsala, Sweden, 1978
- Fulbright-Hayes Doctoral Research Abroad Fellowship, Egypt, 1976-1977
- Council on West European Studies Fellowship, University of Grenoble, France, 1975
- Yale University Fellowship, 1974-1978

Alpha Kappa Delta, Sociological Honorary Society, 1973

Phi Delta Kappa, International Honorary Society, 1973

Graduate Student Paper Award, District of Columbia Sociological Society, 1973

Science Fiction Short Story Award, University of Maryland, 1973

Maxwell D. Taylor Award for Academic Excellence, Arabic, United States Defense
Language Institute, 1971

Theodore Goodman Memorial Award for Creative Writing, City College of New York, 1968

New York State Regents Scholarship, 1963-1968

National Merit Scholarship, Honorable Mention, 1963

PUBLICATIONS:

ENERGY

Books and Chapters

“Recognizing the Limits of Markets, Rediscovering Public Interest in Utilities,” in Robert E. Willett (ed), Electric and Natural Gas Business: Understanding It! (2003 and Beyond) (Houston: Financial Communications: 2003)

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"The Role of Consumer Assurance in the Adoption of Solar Technologies," International Conference on Consumer Behavior and Energy Policy, August, 1982

"Energy and the Poor," Third International Forum on the Human Side of Energy, August, 1982

"Energy Price Policy and the Elderly," Annual Conference, National Council on the Aging, April, 1982

"Energy and Jobs: The Conservation Path to Fuller Employment," Conference on Energy and Jobs conducted by the Industrial Union Department of the AFL-CIO, May 1980

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- “Reclaiming The First Amendment: Legal, Factual And Analytic Support For Limits On Media Ownership,” Robert McChesney and Benn Scott (Eds), The Future of Media (Seven Stories Press, 2005)
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“Round #1 in the Digital Intellectual Property Wars: Economic Fundamentals, Not Piracy, Explain How Consumers and Artists Won in the Music Sector,” Telecommunications Policy Research Conference, September 2008.

“When The Market Does Not Reign Supreme: Localism And Diversity In U.S. Media Policy,” *International Communications Association*, forthcoming, May 2008

“Minority Programming: Still at The Back of the Bus,” *International Communications Association*, forthcoming, May 2008, with Adam Lynn

“Traditional Content Is Still King as the Source of Local News and Information,” *International Communications Association*, forthcoming, May 2008

“Junk Science And Administrative Abuse In The Effort Of The FCC To Eliminate Limits On Media Concentration,” *International Communications Association*, forthcoming, May 2008.

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“New Media and Localism: Are Local Cable Channels and Locally Focused Websites Significant New and Diverse Sources of Local News and Information? An Empirical Analysis,” *Telecommunications Research Policy Conference*, September 2007, with Adam Lynn

“A Case Study of Why Local Reporting Matters: Photojournalism Framing of the Response to Hurricane Katrina in Local and National Newspapers,” International Communications Association, May 2007.

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- “Independent, Non-Commercial Video,” Beyond Broadcast, Berkman Center, Harvard University, May 12, 2006
- “Defining Appropriation Right in the Knowledge Commons of the Digital Information Age: Rebalancing the Role of Private Incentives and Public Circulation in Granting Intellectual Monopoly Privileges,” Legal Battle Over Fair Use, Copyright, and Intellectual Property, March 25, 2006
- “The Economics of Collaborative Production: A Framework for Analyzing the Emerging Mode of Digital Production,” The Economics of Open Content: A Commercial Noncommercial Forum, MIT January 23, 2006
- “From Wifi to Wikis and Open Source: The Political Economy of Collaborative Production in the Digital Information Age,” Journal on Telecommunications and High Technology Law, 5:1, 2006
- “Information is a Public Good,” Extending the Information Society to All: Enabling Environments, Investment and Innovation, World Summit on the Information Society, Tunis, November 2005
- “The Importance of Collateral Communications and Deliberative Discourse in Building Internet-Based Media Reform Movements,” Online Deliberation: Design, Research and Practice/DIAC, November, 2005
- “Collaborative Production in Group-Forming Networks: The 21st Century Mode of Information Production and the Telecommunications Policies Necessary to Promote It,” The State of Telecom: Taking Stock and Looking Ahead, Columbia Institute on Tele-Information, October 2005
- “The Economics of Collaborative Production in the Spectrum Commons,” IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks, November 2005
- “Independent Noncommercial Television: Technological, Economic and Social Bases of A New Model of Video Production,” Telecommunications Policy Research Conference, October 2005
- “Spectrum as Speech in the 21st Century,” The Public Airwaves as a Common Asset and a Public Good: Implications for the Future of Broadcasting and Community Development in the U.S., Ford foundation, March 11, 2005
- “When Law and Social Science Go Hand in Glove: Usage and Importance of Local and National News Sources, Critical Questions and Answers for Media Market Analysis,” Telecommunications Policy Research Conference, October 2004

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