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BEFORE: Commissioner William T. Culpepper, III, Presiding
Chairman Edward S. Finley, Jr.
Commissioner Lorinzo L. Joyner
Commissioner Bryan E. Beatty
Commissioner Susan W. Rabon

Volume 2

IN THE MATTER OF:

Investigation of Integrated Resource Planning in North Carolina - 2008 and 2009.

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E X H I B I T S

COMISSIONER CULPEPPER: Good afternoon. Let's come to order and resume these proceedings. Mr. Runkle, I believe you are still cross-examining the witnesses.

MR. RUNKLE: Yes. Thank you, sir.

continued CROSS-EXAMINATION BY MR. RUNKLE:

Q Mr. McMurry, I want to ask you these questions, but if some of your colleagues need to add or chime in, please, have them do so.

In looking at the January 2010 revised IRP, looking at Pages 50 and 51, Tables 4.2 and 4.3.

A I think I'm looking at the right plan. Would it be Pages 49 and 50?

Q Yes, sir. I'm sorry.

A Okay. I've selected it.

Q Can you tell us what the differences are in the Tables 4.1 and 4.2?

A I would defer to Dr. Stevie to answer that.

Q Dr. Stevie, do you want to take a crack at it?

A Sure. Table 4.1 represents the base case projection of energy efficiency impacts that I discussed in my testimony. And 4.2 represents a higher case, what we considered the high case, where after the first 5 years, we assumed a level of impact of 1 percent of retail sales each year until we hit the level of market

potential. Actually, I should clarify, that is what was considered cost effective economic potential.

Q And looking at the base case, that looks at the, as I understand from the Save-A-Watt Dockets, E-7, Sub 831, the Save-A-Watt program was looking at for the first 4 years of the program looking at a 2 percent savings; is that correct?

A I will accept that. I don't remember the exact number. But I will accept that.

Q It might have been 1.9 percent, but it was roughly -- it was approximately 2 percent. Is that your base case then in the projected load in Table 4.1?

A It is the base case. Keep in mind this assumes that the load impacts for the first 4 years were replicated again starting in year five, then replicated again starting in the 9th year of the planning horizon.

Q So under Duke's base case, there is 2 percent for the first 4 years and then an additional 2 percent through the next 5 years and then an additional 2 percent for the next 5 years.

A I wouldn't characterize it that way because the percentages will change as you go through time with load growth. So the level of impacts in bundles as they repeat will go up, but the percentage won't go up at the same

rate.

Q So the amount of actual kilowatt hour saved is the same for each of the bundles, but the percentage changes because demand may change or usage may change?

A That's correct. I think by the year 2020, it gets up into the 4 1/2 to 5 percent range.

Q And does it stay at that range for -- in your base case it stays the same for about 4.5 to 5 percent?

A Well, there are no incremental impacts after that, so the percentage would actually decline slightly over time because of load growth.

Q Now, looking at Table 4.2, which is characterized as the High Case Projected Load Impacts. How does this work out? There's 2 percent for the first 4 years from the Save-A-Watt Order and then 1 percent after that?

A It's after 5 years. So the fifth year actually replicates the first year or the first bundle. Then after that it's at 1 percent of retail sales. I should mention for the high case we did make an adjustment to the impacts. I think this is an important issue that we became aware of is that as relates back to the load forecast is that when you think about loads, one of the things that affects the level of load the customers use, one of the things that affects that is the price of

energy. So if we had a projection of a declining price of energy, you would expect the loads to be higher. If the price of energy is higher, you would expect loads to be lower. Well, in our plan we have a projection of an increasing price of electricity. So one of the things that consumers are going to do is to conserve as a result of facing higher prices.

How are they going to conserve? Well, one of the things that we think they will do is take advantage of our energy efficiency programs. So we wanted to avoid any double counting that could be occurring as a result of an increasing price causing consumers to use less energy versus the energy efficiency impacts from our programs. So we had to discount the impacts in our energy efficiency programs somewhat for that impact of rising energy prices. We only did that for the high case here. And we did it for the incremental impacts that are in this high case. So that's why these numbers may look a little different. We were adjusting somewhat for some of the price effects that cause conservation.

Q But these price effects don't just influence people's participation in Duke controlled programs, they might lead people to do energy efficiency measures on their own; is that correct?

A Yes, that's true.

Q And if the prices go way up, people are either going to participate in Duke's program or go about finding something they can do by themselves?

A That's right. But the issue here is really to avoid double counting. So you have to make some judgment calls on that.

Q So in -- this is a revision to the IRP, it's a -- 2009 is really not the full filing, it's sort of an add on. Which of these two cases are you going to use in your 2010 projections? Your 2010 IRPs?

MS. NICHOLS: I want to object. I think Mr. Runkle may have mischaracterized the revised 2009 IRP. We included the base case and the high case in the original IRP and then updated in response to the Commission's Order in the central docket. So I don't think that is something that we just created at the end of -- in January 2010.

MR. RUNKLE: I stand corrected. That's a decent explanation of the process.

COMISSIONER CULPEPPER: All right, proceed.

BY MR. RUNKLE:

Q Now, we really have two cases that you are presenting to the Commission at this time in your IRP. Which one is Duke going for in the future? I guess, Dr.

Stevie, which one are you going to recommend that Duke follow?

A We really haven't discussed that internally at this time. If I were to recommend something at this point, I would continue to recommend the base case. But, again, that's still yet to be determined.

Q How does the Order in the Save-A-Watt Docket E-7, Sub 831, change Duke's consideration of the base case versus the high case?

A You'll have to clarify that for me. I'm not sure.

Q My understanding of the Order in the Save-A-Watt was that Duke's projected energy efficiency programs would be the high case. If I'm incorrect in that, please, let me know.

A If I remember correctly, it was that Duke was supposed to spend up to 1 percent of sales or 1 percent of revenues. It was not 1 percent of impacts or 1 percent of load.

Q Now, in developing the different scenarios of base case and high case, do you look at other programs by other utilities in North Carolina and other states?

A Certainly. I mention that, I think, in my testimony is that the set of programs that were proposed in the Save-A-Watt program included programs that we had

experience with in other jurisdictions as well as information that we gleaned from discussions in the collaborative as well as external consultants. And we continue to do that.

In fact, I know that there's two or three programs that we are looking at right now to bring forth to the Commission.

Q And you will be proposing additional energy efficiency programs over the years to meet either the base case or the high case?

A That's the plan, yes.

Q And so -- Within Duke is there a group that looks specifically at the energy efficiency programs in other states and other utilities in developing these new programs?

A There is a group that is specifically looking and working on designing new programs. I guess that's it. I'm saying yes.

Q I think that's all on the energy efficiency. I just have a couple questions about the growth. I guess, Mr. McMurry, we may be back to you on the growth forecast.

A Ask the question, and we will figure it out.

Q So, in Docket E-7, Sub 909, which was Duke's last rate case, Application Exhibit D there was either a

forecast of retail growth for the next 6 years. Are you familiar with that?

A (by Mr. Stevie) I am.

Q So, Dr. Stevie, in looking at that Exhibit D, which was in the rate case, it's also, for the Commission, it's also Dr. Blackburn's Exhibit 4, which we will talk about when he testifies. So, Dr. Stevie, looking at the retail expected growth for 2010, is it higher or lower than 2009?

A Well, the exhibit from Dr. Blackburn's testimony is something I address in rebuttal testimony. I'm not sure to go into that now or how we proceed.

Let me just clarify, I guess, one thing is that that projection was after the impacts of energy efficiency. And that's why the numbers are relatively flat.

Q So those -- the numbers in the rate case forecast reflect energy efficiency, are those Duke controlled energy efficiency programs or energy efficiency across the board?

A It would be a reflection or projection of load after energy efficiency. So I'm not sure I understand what you mean by --

Q You were saying it reflects energy efficiency.

That's not just Duke's energy efficiency programs, it's energy efficiency that anybody could have whether it's a Duke program or not?

A Well, given that a load forecast reflects the level of load that's projected that encompasses everything, that forecast was then reduced for the projection of energy efficiency impacts of the company's programs.

Q So, in looking at it from the other side then, growth over the next -- that Duke projects growth to be flat over the next 6 years because of energy efficiency?

A (By Mr. Riddle) I would say in part, yes.

Q You're going to need to explain that just a touch then.

A (By Mr. Riddle) There are other things impacting load growth besides just energy efficiency. As discussed in my testimony, we look at economic factors; we look at the price of energy, and those would have an impact on load growth as well.

Q And so given those considerations, economics, energy efficiency and perhaps some other criteria, that Duke's load growth is flat over the next 6 years; is that correct?

A Yes.

Q Now, starting in 2015, does Duke project that its growth will continue to be flat?

A I believe if you go to my revised Exhibit 3, and as far as what we used in the revised IRP that we filed in January, the 15-year growth rate and load is 1.5 percent. That's after energy efficiency impacts.

Q So, I'm just trying to get some ideas. So for the first 6 years it is flat, and then it goes up 1.5 percent after that?

A No, that growth rate is calculated from 2009 to 2024.

Q So after - It's flat until 2014, and then the average between 2009 and 2024 is 1.5 percent?

A That's an average annual growth rate over those 15 years, yes.

Q And at the same time, we are expecting in the high case Save-A-Watt projection of 1 percent additional energy efficiency during that same time period from 2012 or 13 until 2024?

A (By Dr. Stevie) I think we're mixing retail and wholesale -- retail and total load. And that's where the confusion may be is that the retail sales are flat for the 6 years, but the total load is still growing.

Q The total load is growing because of wholesale

sales?

A In the first 6 years and continuing thereafter.

Q Okay. In looking at the growth rate -- so we've got flat retail, Duke's load is only growing because of the wholesale --

MS. NICHOLS: Objection. I don't believe that's what the witness said.

COMISSIONER CULPEPPER: I will sustain that objection. Ask him another question.

Q Yes, sir. Now, the retail growth from 2009 to 2014 is flat. And then you are saying the growth of the total growth for Duke is increasing at 1.5 percent over that? If it's not wholesale, what is it?

A (By Mr. Riddle) The forecast does assume that the economy recovers, and over the long term we will have experienced economic growth.

Q In economic growth on the retail side or wholesale side?

A Both.

Q Starting in -- then you're projecting on the retail side starting in 2015 that there will be a considerable amount of economic growth?

A There will be economic growth, yes. I'm not sure what you mean by considerable.

Q There will be economic growth. Can you characterize what percent of the growth rate is economic growth? What percent is wholesale growth?

A Let's see. We're projecting a slightly less than 1 percent growth in retail and slightly more than about 3.5 to 4 percent wholesale over the 15-year period.

Q In that 3 to 4 percent increase in wholesale, is that new wholesale customers?

A That's existing wholesale customers.

Q So the wholesale customers will be increasing their demand higher than the rest of the retail customers?

A That's correct.

MR. RUNKLE: I've got no further questions. Thank you.

COMISSIONER CULPEPPER: Who's next?

CROSS-EXAMINATION BY MS. THOMPSON:

Q Good afternoon, gentlemen. Gudrun Thompson with the Southern Environmental Fund representing several of the environmental interveners in this proceeding.

Mr. McMurry, I will start with you and sorry about the arrangement here. It's a little hard to make eye contact. In your capacity as Director of Integrated Resource Planning you are responsible for directing the resource planning process for the company?

A That's correct.

Q And did you oversee the development of the 2009 resource plan?

A Yes, I did.

Q How long have you been in your current position?

A Since March of 2008.

Q Would I be -- How many resource plans have you been involved with -- overseeing?

A Two.

Q The 2008 and 2009 plan?

A Actually, 2008, 2009 and then revised 2009.

Q And you described the resource planning process starting on Page 5 of your direct testimony. I'd like to just walk through that process. As part of that process, the company gathers information about its existing resources; is that correct?

A That's correct.

Q Does that information include emission allowance costs?

A Yes.

Q And data is also gathered on the cost of additional resource options?

A That's correct.

Q Does that data include things like O&M costs and

emissions costs?

A Yes.

Q Then, I'm sorry, I just need to get to where I'm asking my questions.

And you explain on Page 6 of your testimony that quantitative analyses are conducted to identify combinations of options that will meet customer energy needs while minimizing costs? That's at Page 6, Lines --

A That's correct.

Q Is that the resource screening phase that's discussed at Page 64 of the revised 2009 IRP?

A That's really done in the screening phase and to end of the detail analysis stage. In the screening stage we analyze what types of portfolios would be developed and arrange sensitivities. And once we develop those portfolios to be analyzed in more detail, we use a lot of the same sensitivities but a much more sophisticated model.

Q So after you do that resource screening, the company then identifies potential portfolios that can be tested under base assumptions and sensitivities; is that right?

A That's correct.

Q And is this the phase that's discussed in the IRP

on Pages 66 and 67 under the headings Develop Various Portfolio Options and Conduct Portfolio Analysis?

A Give me just a second. What was your question?

Q If after -- You testify on Page 6, Lines 11 through 13 of your direct that after the initial resource screening stage, the company identifies potential portfolios.

A That's correct.

Q And then tests them under certain base assumptions and sensitivities. I'm just making sure I understand that that's the phase that's discussed on Pages 66 and 67 of the IRP under the headings, Develop Various Portfolio Options and Conduct Portfolio Analysis; is that right?

A I mean the screening phase would be Develop Portfolio Options. That's what we did the screening. And then Conduct Portfolio Analysis, detailed analysis, we go through each one of the sensitivities outlined on Page 67.

Q Okay. Thank you. So, in your testimony on Pages 8 to 9 of your direct, you discuss the number of key issues, what you identified as key issues or uncertainties that were considered in the 2009 IRP -- the revised 2009 IRP?

A That's correct.

Q And these include things like nuclear cost, greenhouse gas regulations, fuel prices; is that right?

A Yes, and there's others.

Q And others. And the company makes certain base assumptions with regard to those factors when you're developing your IRP; correct?

A Yes.

Q And then do you run sensitivities to account for uncertainty about those assumptions?

A That's correct.

Q Now with respect to -- on Page 9 -- with respect to demand side management or energy efficiency you say that one of the uncertainties is whether an investment in DSM or EE -- I'm sorry. When I say DSM, I mean demand side management and energy efficiency I will call EE -- one of the uncertainties is whether an investment in DSM or EE will be treated equally with investments in a generating plant; is that correct that you stated that in your testimony?

A That's correct.

Q Now, North Carolina Statues and Commission Rules do allow for recovery of costs -- recovery of lost revenues and an incentive for new DSM and EE investments; correct?

A That's correct.
Q And the Commission has recently approved the company's modified Save-A-Watt approach to compensation through DSM and EE measures; is that correct?
A That's correct.
Q So despite any of uncertainties that you mentioned in your testimony, the company did consider DSM and EE resources in developing the revised 2009 IRP; right?
A Correct.
Q Now, on Page 15 of your direct, you discuss two scenarios -- two DSM and EE scenarios. One is a base case and one is a high case; correct?
A That's correct.
Q And were those put together and provided to you by Dr. Stevie's department?
A Yes.
Q Now, on Page 15, Lines 13 through 15 of your testimony, you say that the base case was cost effective at the screening stage and thus was included in all portfolios; is that right?
A That's correct.
Q You also indicate that on Page 15, Line 20 that the high case was also cost effective?
A That's correct. I would like to explain a little

bit on the high case. One reason we looked at it in a good bit of detail when we were analyzing the high case, it assumes that you have for the total amount of gigawatt hours that you have about half industrial and half residential in meeting that. I think it was 15 percent retail sales or something close to that. And when you start looking at those upper percentages and actually have 10, 11, 12 percent, if the industrials or residential, if either one does not meet their goal of about half of the gigawatt hours saved, it has to be made up by the other residential. Then it can quickly become non-cost effective. It's something we worked hard at this past year. They must all come together in order for that statement of the high case to be cost effective. If the industrials opt out, which I heard earlier today, that is certainly a risk. Then if you had this specific goal and residential had to make that up, I wouldn't be able to make the statement that I made on Line 20.

Q So you are saying there's some uncertainty as to whether the high case would be cost effective?

A That would be correct.

Q I think I will be asking Dr. Stevie some questions about that, so I will leave that for now.

Let me ask: The high case was not included as a

resource option as those are discussed on Pages 64 and 65 of the IRP; is that right?

A We ran a resource option with the base case and then we ran a resource option with the high case. And it was selected in both cases. I just wanted to make clear there's is more risk with the high case than there is with the base case.

Q So you are saying that the high case was not just run as a sensitivity, it was actually run as a resource -- it was modeled as a potential resource option?

A We evaluated both the base case and the high case and found both programs to be cost effective. But we used the base because these are the programs we have approved and taken a measured approach, and as I outlined on the high case, some of the risks associated with committing to that plan at this time.

Q Can you point me to the place in the -- well can you point me to the place in the revised 2009 IRP where the company explains why it selected the base case as a preferred option rather than the high case?

A It may have been discussed, but it may take a while for me to find it. I don't know that it was discussed.

Q So you just adjusted now that the reason that the

high case was net selected was because of uncertainties, I guess, as to whether those impacts would come to fruition?

A That's correct.

Q Now, there is uncertainty or risk associated with other resources in the IRP; correct?

A There is.

Q And for all of those uncertainties, the company has to use the best information that is available to it; right?

A That's correct.

Q I assume you have internal analysts and/or outside consultants who could help provide you with the best information?

A Yes.

Q Now, on Page 9 of your testimony, Lines 18 through 20, you state that the planning process considers a wide range of assumptions and uncertainties? I'm sorry, that's at Page 9, Lines 18 through 20.

A Yes.

Q I'd like to talk a little bit about the retirement assumptions. And you discuss some changes in your testimony between the 2008 IRP and the revised 2009 IRP with respect to assumptions about coal plant retirements?

A That's correct.

Q You state on Page 13 of your testimony that Buck Units 5 and 6 and Lee Units 1,2,3 were soon to be retired in 2020. And you said based on the continued increase regulatory scrutiny from an air, water and waste respective. Now when you say, waste, what type of waste are you referring too?

A That would be like fly ash.

Q What some of us might call coal combustion waste?

A Not all of it is called coal combustion waste. The term is used very broadly in the testimony presented. When we reuse about all of the chips and bi-products and we reuse a large portion of the fly ash none of the regulatory bodies do they refer to it as coal combustion waste. They refer to it as coal combustion products or bi-products. The term waste when you reuse that much of a substance, I don't think it's applicable.

Q How about if we agree upon coal ash, is that acceptable?

A I'd rather use coal combustion bi-products.

Q We'll go with coal combustion bi-products. I think I have some things to ask you about that, but I will save that for your rebuttal.

Going back on Page 18 of your direct, you talk about diversification of resources. And you note

that alternatives to new nuclear or coal include natural gas fired generation.

A Can you point to the specific line?

Q I'm sorry. Page 18, Lines 7 through 11?

A Thank you.

Q Are you there?

A Yes.

Q And you state that the addition of the Lee Nuclear Station will need less dependents on natural gas for coal fire generation?

A I will need to read that paragraph real quick. That's correct.

Q Now, actually I can't remember the last question I asked you. So additionally, it will mean less dependents on gas or coal. And you also state that it would allow the adding the Lee Nuclear station would allow for diversification of resources; correct?

A That's correct.

Q Now, I'd like to direct you to the system energy pie charts in McMurry Graph 2, which is at the top of Page 18 of your direct.

A Okay. I might turn to it in the IRP. It's on Page 59 of the IRP.

Q I'm going to keep referring to the testimony

because I have it open to that page or to McMurry Graph 2.

Now the 2010 energy chart, pie chart, shows that gas-fired generation, both CT and CC units is really just a tiny sliver of total energy; is that correct?

A That's correct.

Q Then if we move over to the 2029 pie chart, gas generation is what I would call more than a sliver, but still a small slice; is that accurate?

A I don't know if that's a small slice or not. That's adding 1200 megawatts of combined cycle generation. The energy here can change if combined cycles run more. They could easily increase. So that's 6 percent. I don't know if you say that is small or not.

Q Okay. Now the nuclear generation in 2010 represents 52 percent of the total energy; correct?

A That's correct.

Q Then in 2029 it drops slightly to 51.2; is that right?

A Yes.

Q Can you explain to me how -- Going back to your point that continued development of Lee Nuclear would allow for continued diversification of resources. Can you explain that in light of these pie charts where nuclear goes from 52 percent to 51.2 percent?

A Yes. The difference between 2010 and 2029, we added two Lee Nuclear units. And you see the percentage of the system is about the same. You should also notice that coal decreased by over 10 percent. And even in the combine cycles and combustion turbines did increase. You can also see that -- see how additional renewables, DSM, hydro stayed about he same. It actually went down a little bit. I'm not sure why. But there's much more diverse mix in 2029 pie chart than there is 2010 pie chart. That's what I see.

Q Okay, thank you, Mr. McMurry, I think that is all the questions I have on your direct.

Dr. Steve, I have a few questions for you. I think we already established this, but, Dr. Stevie, in your role as Managing Director of Customer Market and Analytics for Duke Energy Business services, were you involved in the preparation of the alternative DSM/EE cases that were provided to Mr. McMurry for the IRP analysis?

A I was responsible for providing the projections of the energy efficiency impacts for base and high case.

Q That was my next question. You prepared a base case and a high case. And the base case on Page 16 of your direct testimony, you say the base case relies on the

programs approved under the company's Save-A-Watt -- modified Save-A-Watt programs; is that correct?

A That's correct.

Q Bear with me for just one moment, I need to get to your testimony in my notebook. And you assumed that, I think, you explained that you assume that the energy efficiency programs continue for 2 additional 4-year periods of bundles?

A Yes.

Q So that amounts to a 12-year projection; is that right?

A That's correct.

Q What happens in the last 3 years of the 15-year planning horizon?

A The level of impacts are assumed to remain the same -- an accumulative level of impacts.

Q So you are not adding any more bundles in that last 3 years; is that right?

A That's right.

Q Now, on Page 17 of your testimony, Lines 6 to 13, you explain that energy efficiency impacts were scaled up to be consistent with the projected impacts in the Save-A-Watt settlement agreement in Docket E-7, Sub 831. But you assumed that the company only achieved 85 percent

of those projected impacts; is that right?

A That's correct. In the initial design of the Save-A-Watt programs -- the set of Save-A-Watt programs, we had a plan for those. Those were scaled up in the third and fourth year. But currently at this point in time, we don't have a way to achieve the impacts in those third and fourth years. So we have taken a little more conservative route for the third and fourth year, and went back to 85 percent of the impacts for that third and fourth year.

Q Okay. And under that base case, that 85 percent of impacts Duke projects to achieve cumulative energy savings of 7 percent in 15 years; is that right?

A The -- Under the base case we have projected by the year 2020 that's in the 4.5 to 5 percent range, that does not -- that says a percent of retail sales. That doesn't include any incremental impacts that would occur as a result of the conservation on the parts of customers as a result of increasing energy prices. That is how you get up to the 7 percent.

Q So the 7 percent -- I'm sorry, could you just tell me the number again that was attributable to the company's programs?

A It was for the year 2020, 4.5 percent.

Q What would that be -- So the remainder is attributable to what?

A For the 7 percent?

Q Right.

A As I talked about before with Mr. Runkle, there is other conservation that is factored into the load forecast that is a result of increasing the projection of increasing energy prices. So as energy prices go up, there's going to be some conservation that occurs. And that is going be -- the actual impacts are going to be in the mix of what the company's programs are able to achieve and what the consumers are able to achieve.

Q So that's what might be referred to as price -- the effect of price induced conservation?

A Correct.

Q Now, for your high case you assume the same level of impacts as the base case for the first 5 years. But then increase that at 1 percent of retail sales each year until the economic potential is reached; is that right?

A Yes.

Q And then explain in the IRP on Pages 67 and 68 under high case energy case route in approximate 15 percent in decrease in retail sales of the planning horizon?

A Where is this on Page 67?

Q Let me find that. Well, I must have my citation wrong. Does that sound correct to you that under the high case you would have approximately a 15 percent decrease in retail sales?

A By which year?

Q Over the planning horizon.

A That's approximately close by the year 2029 under the high case. We have estimated it at 13.5 percent. But when you add in some of the price impacts, it gets quite a bit higher than that. I don't have the number for that, but I know it's probably in the 17, 18, 19 percent range.

Q So 13.5 percent by 2029?

A In the high case.

Q Now, the IRP states on Page 48 -- let me check to make sure I have that right -- states that the Save-A-Watt approach could address approximately half of the 2015 new resource needs?

A That may be a question for Mr. McMurry.

Q Okay. Let's see, I can direct you to it. It's at the very end -- it's the last sentence in the first paragraph on Page 48 of the IRP, the last clause of that sentence, Save-A-Watt approach could address approximately half of the 2015 new resource need, Mr. McMurry or Dr.

Stevie.

A (By Mr. McMurry) I just found the sentence. I'm sorry for not responding.

Q Take your time.

A That's correct.

Q And is that referring to the base case?

A That's correct.

Q Did the company perform an analysis of how much of the 2015 resource need could be addressed with energy efficiency under the high case?

A I'm not really aware that we did. The large majority of this is coming not from energy efficiency but from demand response. When we said resource needs, that is a capacity need. And that's what that sentence is really addressed too. So, and as you can see, the contribution of peak energy efficiency is not as big a player as demand response.

Q Okay. So you are talking about capacity -- when you said resource needs, that's capacity they are talking about?

A In that particular sentence, yes.

Q Did the company do an analysis of how much of that capacity could be met with -- could be addressed with -- demand response or demand side management under the high

case?

A This is referring to base case. No, we did not use the high case in this scenario. But as we said before by 2015 you are looking 1100 megawatts of demand response and 236 of energy efficiency. And in the high case, you are looking at 258 megawatts. So there's just not a big difference between the base case and the high case before 2015 from the capacity standpoint that would be met with demand response or energy efficiency.

MS. THOMPSON: Okay. Thank you. I think the rest of my questions are related to rebuttal testimony. I believe that is all I have on direct. Thank you.

COMISSIONER CULPEPPER: Do you have any questions, Mr. Olson?

MR. OLSON: I have a few for Mr. Smith.

CROSS-EXAMINATION BY MR. OLSON:

Q I have some questions for Mr. Smith. Good afternoon, Mr. Smith.

A Good afternoon.

Q Is it Duke's interpretation of a compliance plan that what is to be discussed is the compliance for the year in which that plan is being submitted?

A The compliance plan covers the year in which it is submitted plus the subsequent two calendar years.

Q So the statements on Page 9 of your testimony that relates to poultry and swine set-asides, you say you're not discussing compliance with regard to those requirements because they are outside the compliance period. That's based on your interpretation, you don't have to do that?

A Could you direct me to the sentence, please?

Q Yes. If you look in your testimony, Page 9, and it carries over to the following page. The response to the question: Has Duke Energy Carolinas developed and implemented plans to comply with the REPS, swine and poultry waste set-aside of NC General Statutes 62-133(A). And you respond by saying, yes, you have. Then you say you don't include it in the plan though because you didn't have to. Am I mischaracterizing that?

A Well, the compliance obligation begins in 2012 which is beyond the planning horizon for the REPS compliance plan.

Q You are saying you have some plan in mind, but you just haven't included it in this documents; is that a fair characterization with your answer?

A I would say the intent of that is we are planning for those requirements although they remain beyond the planning horizons. So we haven't addressed specifically

in the compliance plan how we will meet those requirements.

Q Are you familiar with what's going on with the joint motion for modification to those requirements?

A Yes, I am.

Q So given what your understanding of what's happening there, would your answer in response to this question change at all?

A No.

Q Do you agree with the proposed allocation that has been presented to the Commission?

A The pro rata allocation?

Q Yes.

A Yes

Q In the summary testimony you say that Duke Energy Carolinas intends to meet the statutory REPS requirements in its 2009 REPS compliance plan provides an operating blueprint. Do you have an opinion whether Duke Energy Carolinas is going to meet its statutory REPS requirements?

A Yes, I do. We intend -- I believe we will meet them.

Q In that response, are we talking about for the short term or up until the requirements go into effect in

2021, I believe?

A Our compliance plan covers 2009, 10 and 11. And we're confident that we will meet the obligations that are within that compliance plan. I would also add that we are confident that we are in a good position to meet the compliance requirements that begin in 2012 for several years. And I would say the one possible exception to that is the swine waste and poultry waste set-asides that remain a particular challenge for us. And we have continued to pursue efforts to meet those requirements. But that is one area that we are most uncertain about.

Q Besides those areas, can you identify any other areas that might an obstacle in meeting your requirements under the REPS provision?

A Are you speaking about specifically within the REPS compliance plan planning horizon?

Q No. I'm talking about through 2021. The best you can estimate. Nobody knows what the future is going to hold, but I'm just saying, sitting here today is there anything that would suggest you might have problems meeting those requirements?

A Aside from the -- we run several different sensitivities, several different scenarios, and we show that we will be in compliance. Most of our internal

planning reports are 10-year reports, and they go through 2019. And within that horizon, we are forecasting that we will be able to meet requirements within the cost caps and certainly there's based on actions we've taken to date, and based on near term actions that we feel very confident will occur depending on the different scenarios there's different years in which we would need to take subsequent actions, but we feel confident that with our ability to comply with the requirements.

Q You state in your summary that the compliance plan in 2009 is a blueprints of sorts for going forward and how Duke intends to meet its obligation; is that correct?

A That's correct.

Q Looking at Page 6 of your direct testimony the answer beginning on Line 9, it says, I will start on Line 10. It says, Duke Energy has focused on the balance and diversified approach of utilizing existing or new Duke Energy Carolinas owned generation assets to the purchase of energy from renewable energy resources available in the market, Duke Power purchase agreements and three, the purchase of unbundled renewable energy certificates from both in-state and out-of-state suppliers to satisfy the requirements. Is that the blueprint?

A That is a summary description of our strategy to

comply with the REPS requirements.

Q So when you refer to a blueprint, is that what you are referring too?

A I don't want to make more of the word blueprint than needs to be. But it just simply refers to the REPS compliance report in its entirety, it explains in detail the manner in which we contend to meet the requirements for the planning horizon.

Q How much of your obligation will be met through company-owned generation of the renewable energy?

A I don't have a specific answer to that. It likely would be different resource by resource.

Q I'm not -- I'm just asking you how many RECS do you think you will from company-owned generation, and of those RECS you get through that process, how much would that be of the whole? Over half? Seventy-five percent? Or do you know?

A I can maybe answer that question better if you pointed to a specific year. The answer of what number of RECs that would come from any initiative whether it is a company-owned project or project owned by someone else, those projections change year by year based on the activity on that particular project.

Q That's fair enough. I'm not going to belabor it

and go through year by year.

A I don't want to be difficult. I'm just trying to understand the question. And, again, I would just characterize it as: Our intent is to have a balance and we've spoken about this. For purposes here, I would describe it as being -- the intent -- is for a balanced approach as we view renewable resources growing over time and the importance and contribution to the generation mix, we want to have some competencies in the development and operation of those types of resources. And there's particular opportunities where we feel like we are able to deliver the best results for our customers by owning and operating those resources directly. And, likewise, there are many opportunities where we feel like the best solution is contract with a third party where we do not those advantages. And the best answer for customers is to contract with others.

Q But it's fair to say that once you owned the asset, you're not going to shut it down and start buying from other people; isn't that correct?

A I haven't thought about it that way. I'm not -- I guess I would say, I'm not certain I could answer that conclusively in a way that would apply to all circumstances. An example would be the co-firing at a

particular company-owned fossil station and there's been discussion here from other witnesses about the retirement dates of different coal stations. So in some cases we are, in fact, planning to utilize company-owned generation resources for renewable energy compliance. But those resources would, in fact, be shut down at some point in the future potentially.

Q Let's talk then just quickly about your distributed generation solar photovoltaic program. Can you give me an idea of how much of your compliance obligation will that particular program satisfy in the year of 2013?

A If I can locate certain files, give me a minute.

Q Sure.

A Well, this actually is somewhat difficult question to address because of the banking and the specific RECs that we would utilize -- that we would retire -- to meet that obligation could RECs that have been generated in prior years. But I guess to answer the question in a helpful way, we are projecting our solar energy target in -- which year did you --

Q I said 2013.

A 2013 we are projecting that to be 39 gigawatt hours or 39,000 megawatt hours. And our distributed

generation solar PV program is projected to contribute 13,400 megawatts approximately towards that total.

Q If I understand what you're saying is that your compliance requirement or obligation in 2013 is 39 gigawatt hours?

A Yes.

Q And of that you are anticipating that you will have 13,000 megawatts?

A Megawatt hours.

Q I'm not real quick on that, is that roughly 13 gigawatts? Is that how it works?

A 13 gigawatt hours compared to the 39 gigawatt hour target.

Q So roughly a third will come from your program?

A That's correct.

Q Can you give me an estimate of how much you're planning to rely on unbundled renewable energy certificates from out of state in your compliance requirements?

A I would say that our reliance on -- Are you speaking specifically to solar or in general?

Q Let's talk about solar in 2010?

A Okay. In 2010, we have taken steps to acquire a quantity of RECs that is approximately equal to the 25

percent out-of-state capability. And the reasons for that are that the cost of out-of-state solar energy RECs are a fraction of what we found them to be in state. And we've also -- we have taken steps to in essence utilize that 25 percent level.

Q Would it be fair to say that's a strategy that is consistent throughout your planning process for your obligations ongoing past 2021?

A I don't think so. I would say that we will continue to evaluate that as strategy and will be mindful of the difference in cost between RECs that are available within the state and RECs that are available from outside the state. To the extent they are comparable in cost, we believe it would be -- we would lean more towards the in-state resources. But at present out-of-state RECs for both the solar energy requirement as well for the general requirement are a small fraction of the cost of in-state renewable energy certificates. If that situation were to persist over time and we were able to procure out-of-state RECs at a small fraction, we would have a biased to do that as the most cost effective solution for our customers.

Q Thank you. Are you familiar with the requirement that bundled RECs produced and sold from a facility that's

located outside the geographic boundaries of North Carolina are considered to be in-state RECs? Do you understand that?

A Yes, I understand that.

Q Can you tell me of the power purchase agreements that you entered into to date, how many of those agreements are with facilities that are located outside the geographic boundaries of North Carolina?

A I -- of a bundled power purchase agreement, I do not think there are any. We have entered into one transaction that probably bears some explanation where it's a landfill gas facility located in South Carolina. And for a set of circumstances, we have entered into a tariff-based contract for the power under one agreement and a REC purchase agreement separate from that. So I guess in taking those two contracts in conjunction, that would be one out-of-state REC or one out-of-state renewable energy facility that's located in South Carolina that would meet the requirements of an in-state resource. There may be one hydro facility that would be characterized similarly.

Q Just to clarify that first transaction you were talking about, the energy is being sold separate from the RECs or --

A Duke Energy Carolinas is the buyer of both the energy and the RECs. However, they just happen to be under different contractual agreements.

Q And in that circumstance Duke is taking the position then that those RECs are in-state RECs?

A That's correct.

MR. OLSON: I have no further questions.

COMISSIONER CULPEPPER: Mr. Styers?

MR. STYERS: I have no questions for these witnesses.

COMISSIONER CULPEPPER: Ms. Mitchell?

MS. MITCHELL: No questions.

COMISSIONER CULPEPPER: You have come in here kind of late in the game.

MR. CARMICHAEL: Yes, sir. I'm Carson Carmichael here on behalf of the Carolina Industrial Group for Fair Utility Rates.

COMISSIONER CULPEPPER: Welcome, Mr. Carmichael. Do you have any cross-examination?

MR. CARMICHAEL: No questions.

COMISSIONER CULPEPPER: Thank you. Mr. Green?

CROSS-EXAMINATION BY MR. GREEN:

Q I have a couple of questions following up on what Mr. Olson had about the Duke solar project. It's my

understanding -- it's been a while since we did that docket -- but I think the equipment and the energy that it generates through the solar project belonged to Duke; is that right?

A (By Mr. Smith) That's correct.

Q So the people who participated in the project will be paid some sort of rent or compensation for the use of their roof top?

A That's correct. It's a roof top lease model where Duke Energy Carolinas is the owner of the generation system. And the electricity is delivered directly to our plant as opposed into the host.

Q So the way that solar generation will go towards Duke's RECs is just straight through the energy that is produced by those projects; is that correct?

A It's the energy in conjunction with the RECs that are produced from those projects.

Q So Duke would also be buying some RECs that are connected to that generation?

A No, we would own them because of we were the owners of those particular projects. The electricity and the RECs do not have to be purchased from another entity.

Q But those RECs could be used -- probably will be used -- to meet your RECs requirement?

A Absolutely, yes.

Q How do you price those when you use those? How do you judge what it actually costs the company?

A I guess the way to answer that is the Order in that docket prescribes in some detail how the cost should be allocated towards the REPs Rider and towards other cost recovery mechanisms. And we would follow the specifics of that Order. It refers specifically to a threshold mark that was derived based on request for proposals for solar energy resources. And it specifies some allocation of the cost to the REPs Rider and other mechanisms based on that threshold.

Q So it sounds like it's some sort of comparison to what the market price of other RECs are as a general rule?

A Yes, that's correct.

MR. GREEN: Thank you.

COMISSIONER CULPEPPER: Ms. Edmondson?

CROSS-EXAMINATION BY MS. EDMONDSON:

Q Mr. McMurry, pursuant to the Commission's Order on advanced notice in E-7, Sub 923, Duke filed a revised 2009 IRP, Appendix F to address the issue of undesignated load.

A That's correct. Can I turn to it?

Q Sure, please do.

A Okay.

Q And pursuant to that Order, Duke specifically addressed which wholesale customers which it had original expectations to?

A That's correct.

Q And what process did Duke undergo to determine how it -- this reasonable expectation?

A I don't think that I can give a complete answer to that. We have a wholesale origination group that gives us this information. And when we receive this Order, we met with them and we read the language in the Order. And I guess it's an estimate. But we tried to use the kind -- we thought we had a 50 percent chance of serving this customer within the next foreseeable future, not too far off, then we become 50 percent probability. If it was greater than that we included it as a reasonable expectation to serve.

Q *What do y'all consider as a foreseeable future?*

A I can't give an exact answer to that. I would say two years if the contract had not started in the next two years, something further than that we would probably wait until our next IRP to see if we had a reasonable expectation to serve that customer.

Q And you apply that criteria to each individual contract?

A That's correct.

Q And each contract has different facts and circumstances?

A Absolutely.

Q And the status of each contract differs?

A That's correct.

Q And would you agree there's a certain amount of subjectivity in determining whether there's a reasonable expectation to serve a particular load?

A Yes.

MS. EDMONDSON: That's all I have.

COMISSIONER CULPEPPER: Redirect, Ms. Nichols?

MS. NICHOLS: Yes, just a few.

REDIRECT EXAMINATION BY MS. NICHOLS:

Q Mr. McMurry, when Mr. Runkle was asking you questions about the coal retirements, you talked about the emissions of Buck 3 and 4 and then Cliffside 6. Do you recall that line of questions?

A Yes.

Q You talked about the retirement of Cliffside Units 1 through 4 when Cliffside 6 comes online. Do you remember that?

A That's correct.

Q And you talked about the Cliffside Order requiring

the retirement of approximately a thousand megawatts of coal units on a prescribed schedule. When you mentioned the Cliffside Order, were you referring to the Commission's CPCN in this proceeding or the air permit?

A Probably be the CPCN. I'm really not sure. They kind of go hand in hand.

Q Are there requirements that come out of the CPCN in both the air permit that derives certain retirements of older coal units?

A Yes.

Q And Mr. Runkle also asked you about the possibility of retiring some of these units earlier based on potential additional environmental regulations. Do you recall that line?

A I don't remember him asking that.

Q Let me ask you this: Can you speak to what flexibility the company has within its revised 2009 IRP to address potential new environmental limitations and requirements on coal generation?

A Sure. In developing the 2009 IRP, we ran sensitivities on a lot of the unscrubbed coal units that we have not until this year designated to be retired. They are under a lot of pressure. And we ran sensitivities retiring as early as 2015. That's kind of

the -- if you look at the mercury requirements, the new ozone requirements, as you go across the new care replacement rule, there's going to be a big circle around 2015. It might be 2016, we don't know the firm date. And basically, that moves up that block to retirement is five years, and we would have capacity needs in the 2015 time frame. Also along the same -- If you look at the rest of our units across the system, the rest of our units from an environmental standpoint, I'm quite proud of it to be honest with you given I worked in the environmental area for 18 years, they are well controlled. They have state-of-the-art SO2 scrubbers and advanced NOX controls; passed large part thanks to the Clean Smokestacks Act this past 2002. All of those facilities that have scrubbers also have the ability to handle their ash in dry way. That also positions them well depending on the outcome of the coal combustion bi-product is, we should be seeing that this Spring.

Q Thank you. Dr. Stevie, there's some testimony about energy efficiency impacts that come from the company's programs versus consumers that take actions on their own behalf to reduce their energy consumption. I wanted to ask you if you could explain how energy efficiency trends or energy efficiency activities outside

of the company's EE Programs are captured in the load forecast?

A (By Dr. Stevie) Certainly. That gets captured in the load forecast, as I mentioned a bit earlier is that the forecast has embodied in it a projection of rising energy prices. And as energy prices rise, you would expect consumers to conserve or find ways to switch to alternate fuels or reduce electric energy consumption. And that conservation is embodied in the load forecast that Mr. Riddle puts together.

Q So that load forecast is -- That impact is captured in a load forecast before that date is provided to Mr. McMurry and his group to create the resource plant?

A Correct. That's why in the high case we reduced some of the projections of energy efficiency effects for some of those price induced conservation effects.

Q Then I wanted to ask you about the high case versus the base case. You indicated that the Company is still considering what it would use for the 2010 IRP, but in the 2009 IRP you recommended use of the base case. Can you explain why?

A Well, the base case is relying upon the programs that we had spent quite a bit of time putting together for the Save-A-Watt proposal. And we want to see how

those programs are performing, how customers are responding to those, as well as the additional new programs that could build onto this over time. But right now, we don't have those, and that will come with time. But they don't exist. I think prudence dictates that we rely upon the ones we know something about in terms of what gets put into the resource plan.

Q Is the company committed to pursuing all cost-effective energy efficiency?

A Yes.

Q And would you characterize the base case and high case as both potential outcomes that could occur as a result of pursuing all cost-effective energy efficiency?

A I think they could although I still think even though we are committed to try to achieve the 1 percent per year, I think the base case -- excuse me, the high case is quite a stretch.

Q And these will be either for Mr. Riddle or you, Dr. Stevie. There was discussion about load growth over the planning horizon and I just want to clarify the different ways that the Company looks at load growth. Can you tell me the retail load growth over the planning horizon for retail load both before energy efficiency impacts and after energy efficiency impacts?

A (By Mr. Riddle) With the energy efficiency as I spoke earlier, the retail load growth is approximately 1 percent; without the energy efficiency it's 1.3 percent.

Q And then that was specifically retail load. Can you tell me the same thing for to total load growth, total native load growth?

A For the total growth it was 1.2 with energy efficiency, 1.4 without.

Q And you talk -- Mr. Runkle asked you some questions about wholesale growth. I know in your direct testimony you spoke to the growth factor for wholesale customers. I wanted to ask you if you could elaborate on the reasons why the projected growth rates differ from retail, between wholesale and retail. I think that's on your testimony on Page 10 and 11.

A Basically in my testimony, I make a couple points: One, if you look at the historical growth between retail and these wholesale customers -- and you can see that a little bit in my Exhibit 2 -- none of the wholesale loads that run at the same rate as Duke's retail historically. And so when we project at this point forward, it's reasonable to expect that those growth rates will be different going forward as well. The other point is if these wholesale customers don't have the same customer or

mix of industrial and commercial and residential, so you would not expect based on those differences in the customer mix that their growth rates would be the same. The other point I make in my testimony is the contract that the central electric coop, the way it's structured is we begin serving just a portion of their load, and it's stepped up by a fixed percentage each year. So that in and of itself would indicate a growth rate that's dissimilar to Duke's retail.

Q So the growth rate for the central transaction is more driven by the nature of the step in of the contract than it is the --

A Natural.

Q -- natural growth of those customers' usage?

A That's correct, yes.

Q I think this question will go to Dr. Stevie and possibly Mr. McMurry. Ms. Thompson asked you a question about the risks associated with other resources as compared to -- Well, I think she asked you the question: Don't other resource options have risks associated with them? And I wanted to ask you to elaborate on the risks associated with energy efficiency as resource as compared to supply-side resources.

A (By Dr. Stevie) I suspect that's for me. One of

the risks associated with energy efficiency, of course, is the willingness of customers to participate. It's like the old adage, you can take a horse to water, but you can't make it drink. You can put programs out there that are cost effective, but there's no assurance that that's exactly what they're going to do. And it may be cost effective for someone to buy a new car as an example, but that doesn't mean they go out and buy that. Likewise, it may be cost effective to put in a compact fluorescent lightbulb, but again that doesn't mean necessarily that's what they are going to do. There are some risks actually being able achieve this in the market place. We are talking about marketing. And it has more uncertainty about it as a result.

Q Thank you. Mr. McMurry, you were asked questions by Ms. Thompson about the diversification of fuel supply and you referred to Page 59 of the IRP, the pie graphs.

A That's correct.

Q Ms. Thompson specifically asked you about the energy charts. I'd like for you to look at the capacity charts. And, if you could, in looking at the capacity, if you could speak to the changes in the fuel mix of the company's capacity between 2010 and 2029.

A Sure. I'm looking at Page 59 of the IRP if you

want to follow along. In 2010 we have a 27 percent nuclear, 15 percent gas, and 36 percent coal, 15 percent hydro and 4 percent purchases and 3.3 percent DSM. If you move out to 2029 you can see even with the addition of Lee Nuclear our capacity percentage-wise remains about the same. Our gas is increased substantially from a capacity standpoint to about 30 percent versus 15. And coal capacity is decreased from 36 to 24. That's the big changes. So it's from a balance standpoint, I think the pie looks pretty -- it looks like a pizza. But it looks pretty evenly distributed.

Q With respect to the energy charts, what drives the particular percentages of energy that is produced by that resource mix, that capacity?

A We have a resource stack of which we -- the most cost-effective units are dispatched first. As you can see the nuclear is our least-cost option long term from a production standpoint. So it has the greatest energy produced. One thing you can see in a carbon constraint future in 2029, one reason the coal megawatt hours has decreased in addition to the retirements is that the carbon price impact is less cost effective and puts them further down in the dispatch order. They don't run as much.

Q How do fuel prices impact your -- what you see in an energy pic chart?

A If coal and gas prices were to go lower, then you would expect the capacity factor of the units to go up. That would be more cost effective. If gas went down further than coal, the energy watt could be easily doubled to 6 percent of combined cycle versus the 3 currently showing.

Q One last question. Mr. Smith, Mr. Olson went through with you your strategy for REPs compliance, but I noticed that you talked specifically about renewables. How does energy efficiency fit into the company's strategy for meeting the REPs requirements?

A Energy efficiency is a very critical component of our plans to comply with renewable energy and energy efficiency portfolio standard. The projections that we have internally that our other witnesses have spoken about are well in excess of what we're authorized to use under the 25 percent limitations. So, for many years to come we intend to maximize that capability to utilize energy efficiency to the fullest extent possible.

MS. NICHOLS: Thank you. Nothing further.

COMISSIONER CULPEPPER: Questions by the Commission?

(No response)

All right. Let me try one.

EXAMINATION BY COMMISSIONER CULPEPPER:

Q Dr. Stevie, the January 11, 2010 revision to the Duke Annual Report, Page 56 has a Summer projection of load capacity and reserves. Could you get that in front of you, I want to ask you something about that.

A I have it.

Q The group of figures across the top there under Item 1, Duke System Peak, those figures that start on 2010, I think it's 17,668, and then it just goes across the board there. My understanding from your testimony is that there is a certain amount of energy efficiency that's built into those figures; is that correct?

A (By Dr. Stevie) That's correct.

Q Now, I've gathered from your testimony, I heard you testify that where that factor comes from is the fact that in the these projections there is a rising energy price factor that is factored in, and that's lead to this energy efficiency factor that you've testified to that is encompassed in those figures; is that right?

A That's correct. It's what we call price induced conservation.

Q Lets me ask you this: Are there any other factors

such as generalize customer behavior that's reflected in those figures?

A That is hard to tell. But what would be included are, and this is in Mr. Riddle's forecasting models, is an increasing appliance efficiency that's embedded because of increasing efficiency standards. So that has an impact also to reduce the projections of sales running forward. I wasn't referring to that part of it. That's coming more from changes in standards over time.

Q Okay. Let me ask you, Mr. Riddle, I remember your testimony just a little bit under redirect examination, I believe, that with respect to the increase in the load forecast, I think you said that the projection now is that it will increase annually at the 1.2 percent rate and that includes energy efficiency; is that correct?

A (By Mr. Riddle) Yes, that would include the impacts of energy, the Company sponsored energy efficiency.

Q If it wasn't for those company programs and the energy efficiency that's gained through that, I believe your testimony was that it would increase 1.4 percent?

A Yes.

Q Now, with respect to your reduction of the 1.4 down to the 1.2, is there anything included in that

reduction other than energy efficiency gained from company programs?

A No.

Q There is nothing in your testimony with respect to those two figures that has anything to do with the customer -- just overall general customer -- behavior change?

A Well, as Dr. Stevie said, both of those numbers are influenced by the efficiencies built in the price induced conservation --

Q That is his figures before he gets to you. The way I understood y'all's testimony is that rising energy price factor that included in Dr. Stevie's figures, and he gets his figures before he gives them to you. Is that what y'all said?

A (By Dr. Stevie) Let me see if I can clear the air is that the load forecast Mr. Riddle puts together embodies or includes a projection of rising electric prices that results in his number at the top of this page. What I was referring to is that if we didn't have a rising electric price forecast these numbers at the top of the page would be even higher.

Q I understand that.

A It's not something that I'm doing it's something

he does.

Q Well, I guess what I am trying to figure out is whether it comes from the figures you come up with or figures that Mr. Riddle comes up with. I'm trying to figure out what are all the factors, energy efficiency factors, that are included in these figures. So far I've heard a rising energy price factor, I have heard the factor of the company's energy efficiency programs, I have heard a proposed factor, the fact that appliances are going to get more efficient over the years or at least that is the projection. And I'm trying to figure out are there any other factors because that's the only three I've heard you say.

A I think that pretty much sums it up.

Q Then let me get to this point, and it's all conjecture, I know that, everybody knows that. You just come up with the best you can. Let me give you a couple of examples: There are some people that something -- a light bulb is going to go off, if you will, and I don't mean to put a pun on this, but people are going to get more conscience about conserving electricity. I myself have started going out and looking at my meter. That's my situation. But look at seatbelts. In the 1980s nobody wanted to wear one. It couldn't even get passed by the

legislature. Now everybody wears a seatbelt or 90 percent factor. And that has changed. Again, that is conjecture. Who knew back in the mid 80s that everybody would be wearing seatbelt like now? The recent water shortage here in the triangle, I've been told has lead to a change in people's behavior such that even though we don't have the water shortage now that we had a few years ago, people are not are using -- are using 20 percent less water. And, again, we don't know what people are going to do in the future with respect to energy efficiency. You can't project guess work into your figures. That would not be proper. But what I'm getting around to is that there is a lot of people out there preaching that there's going to be this big change. A lot of people testify in these hearing, I've changed my behavior. And, of course, they are testifying to what they've done. But what I'm gathering from your testimony is that with respect to these figures, there is no projection whatsoever about that kind of behavior across the board with respect to energy efficiency that is included in any of these figures. Am I correct about that?

A I understand what you are saying. I think that is right. If impacts is something that becomes a model for years. But nothing has been included into this as far as

energy efficiency effects that would be hard to define and hard to measure and hard to pinpoint.

Q Speculation as far as you would say at this point in time. You can't base a plan on speculation. That's fair; right?

A Right. You are looking for things that you can point to that you believe are sustainable.

Q Right. Okay. Thank?

COMMISSIONER CULPEPPER: Anymore questions?

(No response.)

Questions on my questions from the Intervenors?

(No response.)

COMMISSIONER CULPEPPER: Utilities?

further REDIRECT EXAMINATION BY MS. NICHOLS:

Q Just one. I'm almost loathe to ask you this question. But I want to point you, Dr. Stevie, to Mr. Riddle's testimony on Page 12, Lines 22 and 23, over to the top of Page 13. I believe you just responded to Commissioner Culpepper that there is nothing about a change effect people's behavior that is incorporated in the load forecast. I did want to ask about an adjustment discussed in Mr. Riddle's testimony to account for Energy and Independence Security Act of 2007.

A Right. That would be incorporated. I know Mr.

Riddle has incorporated the projected impact in his load forecast.

Q That's beyond the econometric trend that are captured in the modeling?

A (By Mr. Riddle) That's correct. On the top adjustment because as we referred in my testimony, it is more of a step change than something that would be captured in the historical data on which the models are built. So when we know something like that and we can quantify that, it's prudent for us to include that in the forecast.

Q And what was that change that came out in 2007?

A The significant change was essentially banning incandescent light bulbs. We made an estimate of what impacts will be for every incandescent light bulb being switched over to a compact fluorescent light bulb.

MS. NICHOLS: *Thank you. Nothing further.*

COMMISSIONER CULPEPPER: All right. That will appear to conclude your testimony, gentlemen. Thank you very much. And you may stand down.

MS. NICHOLS: I would move that the exhibits --

COMMISSIONER CULPEPPER: Let me help you out here: Revised Riddle Exhibits NO. 1 and 3, Riddle Exhibit No. 2; Stevie Exhibit No. 1; Smith Exhibit No. 1. Those

will be received.

(Whereupon, Revised Riddle 1 & 3, Riddle 2; Stevie No. 1; Smith No. 1 were admitted.)

I believe that completes your case?

MS. NICHOLS: Yes.

COMMISSIONER CULPEPPER: All right. We are going to take a break for 10 minutes.

(Whereupon, off the record.)

(Whereupon, a recess was taken.)

(Whereupon, back on the record.)

COMISSIONER CULPEPPER: Let's come back to order now. We are going to begin the Interveners Direct case. We are going to start with you, Mr. Runkle.

MR. RUNKLE: At this point NC WARN would like to call to the stand John O. Blackburn.

COMISSIONER CULPEPPER: Okay. Is that Dr. Blackburn?

DR. BLACKBURN: Yes, I think it is.

DR. JOHN O. BLACKBURN; Being first duly sworn, testified as follows:

DIRECT EXAMINATION BY MR. RUNKLE:

Q Dr. Blackburn, would you give your name and address for the record, please?

A My name is John Blackburn. I live at 47 Forest at

Duke Drive, in Durham.

Q Did you prepare prefiled testimony of some 9 pages and 4 exhibits?

A Yes, I did.

Q Do you have any additions or corrections to your testimony?

A Yes. There were a couple of typos. On Page 6, Line 14, the figure should be 26 billion with respect new renewable energy instead of 24 billion.

Q That's Page 6, Line 13?

A Page 6, Line 14.

Q Okay.

A And Page 8, Line 18, you need to put the word "and" between environmental and health to read, economical, environmental and health costs.

COMISSIONER CULPEPPER: Mr. Runkle, that is Line 19 on my version.

MR. RUNKLE: I think it is. I think I was a line off when I told him where the corrections were, sir. But on Page 6, it's Line 13. And then on Page 8, it's Line 19.

A Sorry.

MR. RUNKLE: I'd like to have the exhibits 1 through 4 marked for identification purposes.

COMISSIONER CULPEPPER: They are identified as marked and filed.

(Whereupon, Blackburn Exhibits 1 through 4 were marked for identification.)

MR. RUNKLE: I also handed to the parties and to the Commission bar charts which was the different rendition of the tables to Blackburn Exhibit No. 3. We will mark that for identification purposes as Blackburn Exhibit 5.

COMISSIONER CULPEPPER: Let it be so identified.

(Whereupon, Blackburn Exhibit No. 5 was marked for identification.

Q Concerning your prefiled testimony, if I were to ask you those same questions today, would you give the same response?

A I have not changed my views.

MR. RUNKLE: At this point we would like to have Dr. Blackburn's prefiled testimony introduced into the record if asked and answered.

COMISSIONER CULPEPPER: Dr. Blackburn's prefiled testimony as amended by his revisions on the stand is admitted into evidence as if it had been given word for word orally under oath from the witness stand. And we've already marked or identified his exhibits as marked when

filed and new Blackburn Exhibit No. 5.

(Whereupon, Dr. Blackburn's prefiled testimony was copied into the record as if given orally from the stand.

STATE OF NORTH CAROLINA
UTILITIES COMMISSION
DOCKET NO. E-100, SUB 118
DOCKET NO. E-100, SUB 124

In the Matter of	)	
	)	
Investigation of Integrated Resource Planning in North Carolina - 2008	)	PREFILED TESTIMONY OF JOHN O. BLACKBURN ON BEHALF OF NCWARN
In the Matter of	)	
	)	
Investigation of Integrated Resource Planning in North Carolina - 2009	)	

Q. PLEASE STATE YOUR NAME, ADDRESS AND POSITION.

A. My name is John O. Blackburn. My address is 47 Forest at Duke Drive, Durham, North Carolina. I am Professor Emeritus of Economics, Duke University.

Q. WHAT ARE YOUR QUALIFICATIONS?

A. I hold the PhD Degree in Economics from the University of Florida. I have conducted research into energy efficiency and renewable energy over a period of twenty years. I have written two books on the subject as well as numerous articles. I have served on the Advisory Boards of the Florida Solar Energy Center and the Biomass Research Program at the University of Florida. A further summary of my qualifications is attached to this prefiled testimony as Exhibit 1.

In the past year I have prepared a report, *North Carolina's Energy Future: Data*

Shows We Can Close Power Plants Instead of Building New Ones, March 31, 2009, which was attached to NC WARN's comments in Docket E-100, Sub 118, and a supplement to that report, *North Carolina's Energy Future 2010: Phasing Out the Generation of Electricity by Coal*, February 19, 2010. Exhibits 2 and 3. Most recently I am publishing an analysis of wind and solar energy in North Carolina, "Matching Utility Load with Solar and Wind Power in North Carolina: Dealing with Intermittent Electricity Sources."

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My purpose is to address the Integrated Resources Plans (IRPs) of Progress Energy and Duke Energy filed for 2008 and 2009 in Dockets E-100, Sub 118 and Sub 124, including the revision by Duke Energy filed in January 2010.

Q. HOW WILL YOU PROCEED?

A. I will present my analysis of the IRPs and the findings in my reports and show that substantially all coal plants can be phased out in over the IRP planning horizon, even using the ambitious growth projections for both Progress Energy and Duke Energy. I will discuss the basis for my assumptions that with energy efficiency, renewable energy and customer cogeneration, coal plants can be phased out without the need for new nuclear generation. In the 2010 report, Exhibit 3, the analysis is of output to better reflect the Renewable Energy and Energy Efficiency Portfolio Standard (REPS) in Senate Bill 3. Additionally, solar energy sources have a relatively low capacity factor, although are important in meeting generation.

Q. WHY DO YOU THINK THAT THE GROWTH PROJECTIONS OF DUKE ENERGY AND PROGRESS ENERGY MAY BE OVERSTATED?

A. The expected increases in electricity demand are already lower than those typical of utilities in the 1990's and in the earlier years of this decade, but still show projected annual increases of 1.5 - 1.8% range. The forecasts are based in large part on expected population growth, with very small further increases in per-capita electricity use. Nonetheless, increases at modest rates show considerable increases when they are maintained over periods of 15-20 years. Duke Energy projects an increase in kilowatt hours generated of 43% by 2029 and Progress Energy 24% by 2024. The utilities' IRP forecasts of generation and sales in coming years are summarized in Exhibit 3 – Table 1 for Duke Energy and Table 2 for Progress Energy. Duke's figures are for the period 2010-2029, while Progress' figures are for the shorter period 2010-2024.

I believe that electricity demand is likely to grow more slowly than the two utilities project, since carrying out the construction programs in the IRP filings will necessarily raise rates to customers. I invite the Commission to review Duke Energy's recent estimate of NC retail sales in its rate increase filing, Docket E-7, Sub 909, showing ***flat sales for the 2009 - 2014 period.*** Exhibit 4. This is apparently without any effects of the present recession.

Although I believe projected demands for electricity to be overstated, I use the IRP figures as the starting point for our analysis, though I make a deduction for new wholesale sales which do not appear to be necessary or in the interests of existing customers. An example of this is the recent wholesale sales contract between Duke

Energy and the South Carolina cooperatives that requires a capacity of 1500 MW, i.e., more plants that the NC customers will to pay for.

It is important to note that if demand does not increase at the utilities' optimistic levels, the phase out of coal plants will occur even more rapidly.

Q. IN THE IRPs, WHAT NEW GENERATING PLANTS ARE PROJECTED?

A. Each utility plans to add more natural gas generation for peak, shoulder and even baseload periods. Combined cycle gas plants can be put on line faster and in smaller increments than coal or nuclear plants. Each of the utilities plans to add two large nuclear plants to their generation facilities in the planning period although operational dates for the Progress Energy's Harris and Duke Energy's Lee plants have been delayed.

What is important to note that no other coal plants are being proposed. In the IRPs and other recent filings at the Utilities Commission, each utility has announced plans to close many of its smaller coal plants. Duke Energy has listed 18 plants in the 38 - 170 MW range that it expects to close by 2020; Progress Energy has listed 12 plants that it will close or convert to natural gas.

Q. IN YOU OPINION, CAN SUBSTANTIALLY ALL OF THE COAL PLANTS BE PHASED OUT?

A. Yes, the core features of the coal phase out plan are aggressive programs to increase energy efficiency at customer locations and a renewable energy build-up to 20% of total sales, including both retail and wholesale sales in North Carolina. I also

recommend the development of substantial cogeneration (combined heat and power) facilities for commercial and industrial customers who use both heat and electricity in their facilities. Although the analysis assumes the completion of the one new coal plant still under construction by Duke Energy, Cliffside 6, it also shows that this plant is not needed and should not be built.

Q. WHAT IS THE BASIS FOR RECOMMENDING AN ENERGY EFFICIENCY GOAL OF 1.5% ANNUALLY?

A. The efficiency gain calculations in Exhibit 3, Tables 3 and 4, are based on gains of 1.5% annually, cumulated over the planning period. This is in line with many national and state studies; the most recent report from the National Academy of Sciences, affirms that, by 2030 savings of 25-31% can be accomplished. A representative from the American Council for an Energy-Efficient Economy (ACEEE), in a recent presentation to the NC Energy Policy Council, recommended a statewide efficiency standard with annual gains reaching 1.5% in 2016, rising to 2% by 2020.

These gains are reasonable as steady increases of 1% or more have been achieved in states all over the country. In North Carolina, state government buildings are now required to reduce energy consumption by 30% by 2015, a cumulative reduction of more than 2.5% annually. California utilities have worked on efficiency programs steadily since the late 1970's, and have reduced, or prevented the growth of, electricity demand at the 1.5% rate. Wisconsin is now planning annual cumulated gains of 2%, and a similar rate has been proposed in Maryland's energy planning.

Duke Energy has accepted the principle of a 1% annual gain in its Save-a-Watt

program, but starting in 2012 after a lengthy ramp up process. I think that it is time to exploit energy efficiency in earnest and do so system-wide – not because it is the law, but because it is the cheapest of all the alternatives. As indicated above, I have used an efficiency gain figure of 1.5% per year, cumulated. This level is both doable and cost-effective.

Q. WHAT IS THE BASIS FOR RECOMMENDING A RAPID DEVELOPMENT OF RENEWABLE ENERGY?

A. The amounts for new renewables – 16.7 billion kWh for Duke Energy in 2025 and 10 billion kWh for Progress Energy in 2024 – go well beyond present REPS requirement of 12.5%. Our proposed 20% goal would recognize existing renewable facilities, mostly hydroelectric, whereas the 12.5% figure does not. Meeting the 20% level would require some 24 billion kWh of new renewable generation in addition to the 5 billion kWh now generated.

The development of wind generation in NC would be necessary, as well as meeting the REPS requirement for biomass sources, along with new and small hydroelectric facilities. Falling prices for solar PV equipment make it possible to contemplate several thousand megawatts of solar installations. Large installations are now going into service at costs below $4 per watt before incentives. The key to pushing down costs even further is enlarging the market, opening opportunities for numerous installers, and creating competition, especially for residential installations.

Seventeen states now have renewable portfolio standards of 20% or more, with terminal dates of 2020 or 2025. Many of these have been raised from lower initial

targets as the utilities in those states gain experience.

Q. WHAT IS THE BASIS FOR RECOMMENDING ADDITIONAL CUSTOMER GENERATED COGENERATION?

A. North Carolina already has about 1500 MW of combined heat and power (CHP) facilities, all but one in industrial settings. These facilities, at most, contribute 7 or 8 billion kWh, around 5% of North Carolina's electricity.

The Oak Ridge National Laboratory has explored the implications of raising this figure to 20% nationally, a level which is both technically and economically feasible. There would be many benefits in addition to relatively cheap electricity, such as increased efficiency in the use of natural gas, diminished water use and reduced air pollution. Their studies show more than 3,000 MW of potential cogeneration in both North and South Carolina. Our proposal would raise this figure in North and South Carolina to about 16 -17% of power generation.

In North Carolina, there are commercial opportunities as well, of which only one relatively large unit, UNC Chapel Hill, has been developed. These facilities, at most, contribute 7 - 8 billion kWh, around 5% of North Carolina's electricity. The larger prospects are the University campuses of the State systems, and private institutions such as Wake Forest and Duke University. Clemson and Bob Jones universities in South Carolina already have these systems. CHP is also well-suited to hospitals with year-round loads for electricity, hot water and steam, which may also be used to run air-conditioning systems. Food Lion has installed CHP systems in at least five of its grocery stores.

Q. DOES THE PHASE OUT OF COAL PLANTS DEPEND ON THE CONSTRUCTION OF NEW NUCLEAR PLANTS?

A. Not at all. Our proposals amount to asking the utilities to forego further nuclear construction except for the uprates now scheduled. The power generated by new nuclear plants is not needed, and the $40 billion which might be spent on four new nuclear reactors surely has better uses.

Q. WHAT ARE THE COST CONSIDERATIONS FOR THE PHASE OUT OF COAL PLANTS?

A. Our plan to phase out coal plants entails additional costs for a much larger energy efficiency program, although the average cost of energy efficiency is approximately 4 - 5 cents per kWh saved for the aggressive program that I have proposed. We need to encourage renewable energy, and especially solar and wind, as the average costs of renewables are approximately 9 -10 cents per kWh generated, with solar photovoltaics (PV) as high as 18 cents per kWh. We need to encourage customer cogeneration as its average costs are approximately 6 - 7 cents per kWh. We are spared the 13 -18 cents per kWh costs of nuclear electricity and the avoidance of yet more nuclear waste. Without the coal plants, we will not have to bear the economic, environmental health costs of generating coal-based electricity.

The bottom line is an estimated annual savings for electricity customers in NC of $1.5 billion - $2 billion, a healthier place to live and doing our share in the fight against global warming.

Q. WHAT IS YOUR OVERALL CONCLUSION?

A. Even given the ambitious growth forecasts of Duke Energy and Progress Energy, all of their coal plants can be phased out over the planning horizon in the IRPs through energy efficiency, renewable energy and customer cogeneration.

Thank you for the opportunity to testify.

BY MR. RUNKLE:

Q Did you prepare a summary?

A Yes, I did?

Q Please proceed with that.

A Members of the Commission, I thank you for your time to appear before you. The purpose of my testimony is to address the Integrated Resource Plans of Progress Energy and Duke Energy filed for 2008 and 2009 in Docket E-100, Sub 118 and Sub 124, including the revision filed by Duke Energy in January 2010.

In my testimony and exhibits, I show that there are alternative paths to meeting the demands as forecasted in these plans, even though the utility plans may already overstate future demand. The alternative paths would permit a much more rapid reduction in coal-fired generation while not requiring the construction of costly nuclear capacity.

This would be accomplished in our plan by much more vigorous programs of increasing energy efficiency, a more rapid development of renewable sources and the exploitation of a much larger share of combined heat and power or co-generation potentials in the service areas of the two utilities.

Our proposals are summarized in Tables 1-4 in

Exhibit 3 in my testimony. The graphs I have just distributed take the data from those tables and put them in an easier -- took the data from those tables and put them in the form of graphs which are easier to visualize.

We propose basically three things: an accelerated effort to increase energy efficiency in electricity use at a rate of 1.5 percent per year, cumulated over the planning periods. We do so because it is the least expensive way to proceed. We understand that the American Council for an Energy Efficient Economy(ACEEE)is proposing a similar path for North Carolina.

We are further proposing that renewable resources of electricity be developed to meet 20 percent of electricity demand. Seventeen states now have renewable requirements of 20 percent or more; most of these states started with lower requirements and have raised them once or twice. In my analysis I include existing hydroelectric resources in the 20 percent renewable recommendation. And I would just mention that the state requirements do exclude them in general and call for new renewables.

Utility customers which use heat, heat driven air conditioning and electricity can benefit to a much

larger extent than is now the case from CHP facilities. This technology uses the waste heat now discharged at electricity-only power plants as well as the associated cooling water and air pollution. So with these three groups of actions, their summarized on the graphs which you just received.

Let me walk you briefly through the graphs. If you'll look, first at the Progress Energy side of the page and Duke Energy is on the other side. The top graph basically make a graphical presentation of the Integrated Resource Plan of electricity to be generated. This is not capacity, but rather billions of kilowatt hours of electricity in 2010 and in the Progress case 2024, which is the end of the planning period.

The blue bar at the bottom is nuclear generation. And you see it in the company's plan that steps up considerably. With regard to the next bar, the purple, that's coal. And that shrinks considerably in the Progress plan. And the next little bar up, the light yellow one, is natural gas. And this is not capacity, but this is billion kilowatt production. That increases rather sharply in Progress' plan. And the tiny little slivers at the top are renewable energy and efficiency.

Now, if you look at the bottom of that same

page, the first bar 2010 is the same but we just made it a little narrower. And as you see, we keep the nuclear capacity at the same level it -- I'm sorry, not the capacity, but the generation. And the next bar up, coal is programmed to shrink already in Progress' plan. And this would bring it down more rapidly so that at the end of the planning period there would not be very much coal generation left, but still some left. And the natural gas figure is stepped up just as it is in Progress' IRP.

The big difference is they begin to appear when we show much larger increases in efficiency, and that's the yellow, not quite so pale, at the top of the bars. And you can see that that expands. This is the 1.5 percent per year cumulated over the planning period. And then we propose that much more renewable energy be brought on, that's the green, and the customer co-generation. So one arrives at the same gigawatt hour or billion kilowatt hour production equivalent but in a rather different fashion. And this should become imperative to close down coal generation very quickly. This is our recommendation as to how it might be done. There are many ways to do that, but here is one way.

Briefly, on the other side of the page, Duke Energy nuclear the blue. The bottom of the chart rises

rather sharply from 2010 to 2029, the end of the planning period. Coal generation, as I read the IRP, increases in billion kilowatt hours even though coal capacity is reduced quite a bit. Then Duke proposes to pursue some efficiency gains and to bring on some renewable power. This is the existing hydroelectric capacity and some new renewables. With regard to those levels, electricity generation -- what we would propose the alternative plan at the bottom chart, which would start where they are in 2010 go with the nuclear to existing facilities which is propose or is planning to do, to bring down the use of coal over the 19-year period rather sharply. But to do that in generally the same manner, efficiency cranked out a few more years than in the case for Progress Energy because this runs further out. Customer co-generation and a good deal more in the way of renewables counting in Duke's case do more than 20 percent. The new renewables would be 20 percent and this would include some credit before the hydroelectric production.

So that graphically is what we suggesting to you. In other words, doing these three things, all of which have been done successfully somewhere and are planning to be done in many other states with existing programs, one can come to a quite different result in

meeting the projected power demand. So we emphasize these plans do not rely on expensive nuclear facilities to meet electricity demand and phase out coal generation. Energy efficiency measure are already cost effective, and like renewable sources or CHP, become much more attractive economically when compared with the enormous costs of four large nuclear plants.

My analysis shows that nearly all coal plants currently operated by Duke Energy and Progress Energy can be phased out in a timely manner within the planning period and all of them in a short number of years beyond that planning period.

That concludes my remarks. I appreciate the opportunity to appear before you.

MR. RUNKLE: Dr. Blackburn is available for examination.

COMISSIONER CULPEPPER: Is there cross-examination from any of the other Interveners? Mr. Olson?

MR. OLSON: I just have a couple of questions.

CROSS-EXAMINATION BY MR. OLSON:

Q Good afternoon, Dr. Blackburn. My name is Kurt Olson, and I'm with the North Carolina Sustainable Energy Association. I'm looking at the chart for Duke Energy for

their resource plan, and I notice in the upper chart where you show what their current integrated resource plan would produce, you've got a line for purchased renewable, which is blue, I guess. And then a green area for other renewables. Can you tell me what's the difference between those two?

A The reason why there is something there which is not reflected on the chart is we had no good way of dividing Duke Energy's renewables that they themselves would construct and operate as contrasted with the renewables they would purchase from others. So we simply put the entire renewable amount in the renewable figure.

Q So does that green area, does that reflect the renewables that Duke itself would be generating?

A That's the renewable figure that comes off the IRP.

Q Were you here earlier when the panel from Duke was testifying?

A Yes.

Q Did you hear Mr. Smith's testimony in response to questions I had asked? He said that in 2013 Duke would need roughly 39 gigawatt hours in load. Did you hear that?

A Yes.

Q He said that roughly 13 gigawatt hours would come from their own generation through the PVDG program as we call it or the photovoltaic program where they put that on roof tops.

A Right, yes.

Q And then you said that 25 percent would be through RECs that are purchased out of state and that another 25 percent would be done through energy efficiency. According to my math, that's roughly 83 percent from just those three programs, all of which are Duke's programs; is that fair? I mean would you characterize it that way?

A Well, I'm not sure I understand altogether the question. But my understanding of Duke's intent was to have -- comply with the present rather modest solar set-aside in the North Carolina REPs, which would be 39 million kilowatt hours or 13 billion kilowatt hours. In one or another of those categories, I'm suggesting that we get a lot more aggressive about solar energy among other renewables and be looking out towards the end of this planning period of billions of kilowatt hours. I have to put that in the miniscule category, I guess.

Q Thank you. I think that is enough.

A Okay. I'm sorry I didn't quite answer your question. I guess if we were doing it over, we would

remove the little color that we don't actually use in the chart. But good point.

COMISSIONER CULPEPPER: Does that conclude your questions, Mr. Olson?

MR. OLSON: Yes, it does.

COMISSIONER CULPEPPER: Any other Interveners have any question? Public Staff?

CROSS-EXAMINATION BY MS. EDMONDSON:

Q On Page 8 of your testimony, Lines 10 on down you talk about, we need to encourage renewable energy. We need to encourage customer cogeneration. Who is we?

A I am speaking certainly for NC WARN. I imagine for many other green energy constituents in North Carolina. But I don't have their express consent to speak on their behalf. But I think we as people of the State of North Carolina mindful of the challenges that lie ahead with regard to energy production and energy use, we need to be more careful in our use of energy, more efficient in using it. And see to it that it comes from the most benign sources available. So that is apple pie and motherhood. I think if we took a pole, probably 99 percent of the people would say yes and 1 percent or 2 percent never understand the question.

Q You have put -- In your plan you have put a good

bit of customer cogeneration.

A Yes, that's true.

Q And you say that we need to encourage it. How would you encourage customer cogeneration?

A I think someone who is considering doing it and maybe even starting through the application process could answer that question far better than I. But from my studies in the literature and conversations with a few people, it's not easy to arrange for the connection to meet all the requirements that utilities may have. And it also depends heavily, I think, on the readily availability of natural gas which is the fuel of choice likely for cogenerators.

There are reports from different folks that are trying to arrange cogeneration that isn't quite difficult to work through the arrangements with the utilities. If the stance of utilities were that they were rewarded for seeking out cogeneration opportunities and were actively seeking them out and being as helpful as they could be to the potential cogenerators with regard to interconnection, the arrangements and standby arrangements and power purchase arrangements, there is probably a lot more out there than we now see. ACEEE I think has a list beyond mine, they see large potentials out there. And the US

Department of Energy is exploring the possibilities of getting to a 20 percent figure in the United States for cogeneration. It moved very rapidly starting in the late 70s and 1980s. And then in the 90s into this past decade it sort of stalled out. A lot of new cogeneration capacity came online, but not much has been added in the last few years.

MS. EDMONDSON: Thank you.

COMISSIONER CULPEPPER: Mr. Green, do you have any questions?

MR. GREEN: I do not. Thank you.

COMISSIONER CULPEPPER: Cross-examination from the utilities.

CROSS-EXAMINATION BY MR. ANTHONY:

Q Good afternoon, Dr. Blackburn, how are you?

A Fine.

Q Let me first ask you: The press reported recently that you've done a study about replacing all coal generation in North Carolina with renewables. Are you at all sponsoring that theory in this proceeding?

A In this proceeding, I'm suggesting that a 20 percent renewable figure in the planning period would be an appropriate goal; bearing in mind you are not required to do that. But, no, I'm not planning a 100 percent

renewable energy scenario in this hearing in this planning period.

Q What you are proposing is, I will restrict my questions to Progress Energy Carolinas, is all of our coal generation would be retired in the next 15 years?

A That looks like it's possible if you do the other three things.

Q That's what you are advocating?

A Yes.

Q Let's start with your assumptions about combined heat and power. I believe you referenced about 1500 megawatts of combined heat and power was currently present in the state?

A Yes. That is the existing amount of combined heat and power in North Carolina. Now in the tables and in any testimony, I bear in mind that Progress Energy has customers in North Carolina and South Carolina and that you operate your system, of course, as a unit. So this would be looking to cogeneration potentials in South Carolina as well in North Carolina.

Q All of those cogeneration facilities are located behind the customers meter, are they not?

A That is my understanding, yes.

Q So in order for them to be a available to assist

in meeting the overall system load, there has to be some way for the utility to dispatch them; right?

A That is not necessary at every level penetration. And that I think is a matter of which can be addressed in contracts with potential cogenerators. Basically what they are doing for you is removing the load so you don't have to serve that load. And I'm fully aware that utilities are not eager to give up customers for nothing in return. Therefore, this would require arrangements which make it more profitable for you to do enter into these arrangements than not to.

Q So the first assumption is that these customers will install the electric generating facilities necessary to capture the waste heat that you are referencing; correct?

A Or better yet, when they begin to replace equipment that now makes heat for them that they put in combined heat and power units scaled to their own requirements for electricity and heat. And they would, of course, want to have a standby arrangement with you in case their unit went down. And they might want to be able to sell to you excess power at times when it's in excess under arrangements that you would love to agree to in your contract.

Q I am trying to go baby steps here to keep my brain straight. So the first thing that has to happen is the entities, the third parties that own these generators have got to make some type of incremental investment to produce electricity?

A Yes.

Q That's number one. Now there has to be some level of control over those megawatts you might be suggesting. Not all of them have to be under the utilities' control, but some of them have to be under the utilities' control, do they not?

A Not necessarily. Utilities all over the world are learning how to integrate into their systems, wind energy, which is available when the wind blows, which is about 80 percent of the time incidentally, but it's not available all the time. And this requires some adjustments on the part of the utility. I haven't thought much about it, but I don't see off hand why that should be different for cogeneration than say wind energy. You have a lot of stuff that is dispatchable and therefore, the ability to work around the electricity which might be available from a cogenerator or wind turbine or solar cell.

Q So you are proposing that at least Progress Energy Carolinas, we're talking about 1500 megawatts of

generation that would be subject to running whenever it wants to run and the utility be expected to address that for some type of new operating procedure?

A I think it's easy to overstate that problem. The customer is getting the equipment to run according to the customer's electricity needs. And the customers that have the best cogeneration scenario are those that tend to use electricity around the clock. So that -- I don't think it's putting a huge difference in the utility's management dispatching electricity.

Q You mentioned a moment ago either standby or back stand. I don't remember the exact phrase. But you seemed to suggest there would be customers that did not want to completely rely upon their own generation to meet their needs. They would need the utility to provide back stand or standby service?

A Yes, I think a prudent operator of any kind of equipment would want to have some place to go if the equipment doesn't function. Things break down.

Q How much of that 1500 megawatts then, would the utility be expected to back stand?

A Well, you wouldn't be expected to back stand all of it at the same time because these are units scattered all over the map in sizes of I think 400 kilowatts is the

cogeneration in your Food Lion stores -- some of the Food Lion stores in your service up to 40 or 50 megawatts.

Q Dr. Blackburn, I began my non-illustrious career in the telephone world, and it was acceptable in the telephone world to size your system so that a busy signal would be received if the circuits were being used more than had been planned for.

A Right.

Q But the electricity, I don't believe, the public or Commission tolerates busy signals. Do you agree with that?

A I don't think you would last long if you had that arrangement.

Q So unless we plan to be able to back stand the entire 1500 megawatts because it is possible from a planning perspective, the entire 1500 would need back standing at the same time, then we would be providing busy signals to some of our customers, wouldn't we?

A I don't believe so. Your assumption seems to be that there are certain stances when let's say a hundred cogeneration units, a thousand cogeneration units, whatever number they are would all go off at the same time. I think that's very unlikely. The probabilities are strongly against that.

Q What percent back stands should the utility plan for?

A I think you would need to work that out based on experience. And there being now 1500 megawatts of cogeneration in North Carolina in units more on the larger size the 20, 30 megawatt facilities. Surely by now there's come experience with those cogenerators.

Q Are you familiar with the types of fuel these cogenerators use?

A I've looked over the fuel used by the existing cogenerators in North Carolina. And they kind of cover the water front. There's some that use wood or waste, some use coal, some use natural gas, a few use petroleum products. My suspicion is that new cogeneration is very likely to use natural gas.

Q But the 1500 megawatts that we have today that you're advocating be used to meet the electricity needs of the state are using, according to the information I have from the United States Department of Energy, primarily coal and oil. Is that not your understanding?

A I don't have that list with me.

Q Did you review this list before you filed your testimony?

A I did some weeks ago. And I tried to be prepared

with all kinds of information. And I regret that I don't have that one with me.

Q You do remember that coal and diesel fuel were fuels that were primarily used?

A I don't remember that's the case. But I'm prepared to be shown that it is.

Q We spoke a moment ago about the need to balance generation of electricity with the consumption.

A Right.

Q You agree with that?

A Yes.

Q It has to be done on a second-by-second or even more often basis.

A That's true.

Q Describe for us, if you would, some of these new procedures the utility is going to implement such that when we have 1500 megawatts of generations that is not under the utilities' control and is going to generate whenever it feels like generating, what are these new procedures the utility is going to use to manage that?

A Are you speaking of the 1500 megawatts we have already?

Q Well, we have 1500 megawatts of back up generation right now. It's not all cogeneration, is it?

A My understanding is that there are 1500 megawatts of cogeneration in North Carolina.
Q I'm sorry, but it's not now being sold or provided to the utility for use on the electric grid?
A I think in most of those cases, there is an interconnection agreement. And probably a standby power agreement.
Q But only the excess is being sold to you utilities. It's not being used by the utility --
A That's correct. The customer -- it meets the customer's needs first. And if there's excess than the contract provides for, they sell to the utility.
Q So we're not going to move to a situation where this generation is now completely displacing, if I understood you correctly, the owner of that facility's generation so the utility doesn't have to plan to serve unless it is arranged for back stand or standby service.
A I'm suggesting that there be more cogeneration in addition to that which we now have.
Q I'm sorry. So in addition to this 1500, which not going to run all the time?
A It's going to run whatever it needs to run to meet the customer's needs. And there will be yet more of it.
Q And there will some level of back stand for that

1500?

A Yes.

Q And that you're proposing how much additional megawatts capacity of cogeneration in this state?

A In the Progress Energy case it looks like in North and South Carolina, there would be about 1800 megawatts of additional.

Q Eighteen hundred megawatts?

A Yes.

Q And have you identified the customer's entities that are going to be willing to make that investment and operate in this fashion?

A I have no access to customer-by-customer names and addresses, but I can tell you the kinds of customers classes that find that or could find it an attractive arrangement. Anybody working with blue products or paper would be a kind of industry that would have a need for heat -- processed heat and electric power. And I think some of them already co-generate with waste. Food processing as an industry requires heat -- processed heat -- and electric power. So that would be a customer class which potentially would find cogeneration attractive in some of the existing cogenerator. They're not alone in industry, that is in manufacturing. A hospital, a large

hospital particularly uses electricity and has an ongoing need for heat. Commercial enterprises that use heat and air-conditioning can avail themselves of cogeneration. The heat provides space heat in the Winter, hot water all the time. And in the Summer when the load is air conditioning, heat driven chillers. I believe this is the arrangement at the University of North Carolina, Chapel Hill, which already has 28 megawatts of cogeneration. And, of course, suggest that every other university campus of any size in the two states within your service areas is a potential cogeneration customer.

Q So what is the maximum potential additional combined heat and power capability in this state?

A ACEEE has studied this and the Department of Energy through the Oak Ridge National Laboratories and they, if I recall correctly, show that 3,000 to 8,000 additional megawatts could be available in North Carolina.

Q And your testimony is how much of that is realistically achievable.

A My testimony I'm suggesting to you that up to 1800 megawatts in North and South Carolina might be available if we play with different rules. Suppose you have large extra profits if you were successful in identifying these customers and encouraging them to install cogeneration,

I'm guessing you could find 1800 megawatts.

Q Are you aware of the amount of megawatts of base load fossil generation that Progress Energy Carolinas has?

A I have your list, yes.

Q About 3600 megawatts, isn't it?

A I've -- of fossil?

Q Of base load fossil?

A Yes.

Q So your testimony is the state as a whole has the possibility of adding 1800 megawatts of combined heat and power?

A No. I think you could do that in the Progress Service area.

Q So in Progress Energy we're going to find 1800 megawatts of additional combined heat and power to displace a portion of the 3600 megawatts of fossil we're going to shut down?

A I think it may displace base load fossil. It may displace intermediate load.

Q Have you identified -- How many actual third parties have you discussed with or identified that would make up that 1800 megawatts of incremental combined heat and power?

A I have not discussed with any potential

cogenerators. I'm relying on the work on the Department of Energy and ACEEE and a few casual conversations with people who know about that than I do.

Q Let's talk about energy efficiency for moment.

A Sure.

Q Are we in agreement that before a utility offers an energy efficiency program it must be shown to be cost effective?

A Yes.

Q And by cost effective, wouldn't you agree it that at a minimum it's got to pass a total resource cost test?

A I think I would state it in the following way: It has to be cheaper than any additional generation we plan to build.

Q TRC compares the benefit as the avoided cost to the utility?

A Yes, provided avoided cost takes into account not just the existing system, but the most costly system you're planning to add to it.

Q When you have proposed the 1.5 percent annual energy efficiency gain and you compare that to what programs can be offered that are cost effective to see whether they match up?

A I really have looked at the experience of states

that have done this for quite a long and other states that are planning to do it. And the recommendation that will be coming to North Carolina from ACEEE that you carry the efficiency efforts to 1 percent and then to 1.5 percent and then to 2 percent so that at the end of the planning period if you followed the ACEEE recommendation, you would come out about the same place that I'm recommending.

Q In doing that evaluation, did you consider differences between the states, for instance in North Carolina, what our rates and costs are compared to those or as Mr. Edge referred to the capability of our industrial customers to opt out of participating in these programs?

A Yes, I've considered that.

Q And you still believe a 1.5 percent annual decrease is realistic?

A Sure. It takes a lot of effort. And it requires -- all of our proposals require looking at efficiency that renewable energy as additional combined heat and power as the main thrust of electricity energy policy in North Carolina, that this is -- We change our mental state so that when we think about the future of electricity, this is where we go first with the added constraint that we need to be moving away from coal as

rapidly as possible. The scientists out there who are worried about climate change and global warming are not distracted by all the little stuff that's been going on, but it's captivated the public mind in the US. They see this as a serious problem and an immediate problem as one that must be addressed. Therefore, any electricity future has to have as a top goal of reducing carbon emissions, reducing the use of coal in generation. And happily that general proposition is not disputed by most of the utility managements in the United States. They are ahead of the public on that.

Q Is Vermont one of the states you are comparing North Carolina to?

A I would say Vermont is comparable in that it has had highly successful energy efficiency programs. And it is moving, indeed, quite consciously in the direction I'm talking about. I had more in mind, I guess, for long-term sustained energy efficiency at 1.5 percent a year. The experience of California which started doing this stuff late in the 70s, early in the 80s and never stopped. So that per capita electricity use in California is half what it is in the rest of the US. And it's not because Californians all switched to natural gas or oil. They use half the electricity and no more of the other stuff. Now

that is a long running high priority of effort in that state. And interestingly, Wisconsin, I think, is pushing for a 2 percent annual cumulated efficiency gain. And others like New York at talking about it. I think they're probably less well equipped than Wisconsin, which has a lot of experience already institutionalized with the utilities and with their Utilities Commission and their state government. All these constituents really have to be involved in this.

Q California's electric rates are 50 percent higher than the electric rates of North Carolina, are they not?

A They're probably maybe more than that right now. It's 8, 9 cents here and 12, 13 cents there. I think that's about right.

Q Fifteen cents there.

A Yes.

Q How about the climate? The climate of California is not comparable to North Carolina, is it?

A They may have a bigger air conditioning load and a smaller heating load, but, you know, in other respects, they're standard of living is comparable. It's pretty cold in Northern California, I'm told.

Q And the penetration of heat pumps and electric heating in North Carolina is much higher than it is in

California, isn't it?

A That is probably the case because this is something that's the -- electric heating has increased since the 1970s when a lot of people wanted to back out of oil. And heat pump penetration is fairly high, fortunately because it's a much more efficient way to heat a building than with electric direct resistance heat, which we have in Florida where I also lived for many years.

Q How many megawatts of the displaced fossil generation is going to come from renewables in your evaluation?

A For Progress Energy it would be about almost 10 billion kilowatt hours.

Q I hope my calculator goes that high. Give me one second. If my math is right that is in the neighborhood of 1200 megawatts at a 100 percent capacity factor. Does that sound right?

A It would be more megawatts than that given the large capacity factors of wind and solar.

Q I was getting there. At 100 percent we would have to triple that to make it on apples to apples energy production; right?

A In terms of capacity, it would depend on which

renewable we were talking about. For solar it would be a 20 percent capacity factor approximately. For wind probably a 30 percent capacity factor. For solar water it would be a good deal higher than 30 percent.

Q So to round it up to 1200 times 3 -- 3600 makes it 4,000 megawatts to capture all the potential renewable potential capacity we discussed?

A Pending time to think about it further, I could probably -- that's a good ballpark figure.

Q How much is solar on a dollars per megawatt hour basis? Do you know?

A For finfin(phonetic) solar installed at recent prices with the incentives and subsidies, it's probably down around 11, 12 cents kilowatt hour. Maybe lower than that.

Q On a kW basis it's about $6.5 million a megawatt, isn't it?

A No. I'm sorry the new installations that are coming in are under $4 a watt. And Souther Cal Edison has laid out an ambitious program over 4 or 5 years averaging 350 a watt.

Q So that's 4 million a megawatt?

A Yes or 3.5 million a megawatt.

Q I have to write that one down again because the

calculator doesn't go that high. If my math is right at 4,000 megawatts that's $16 billion if you use solar to meet that need.

A We're not going to meet the whole need with solar, just a part of it.

Q Okay. Wind? What else are you discussing besides wind?

A Wind -- recently installed wind plants in the Eastern part of the US, which is not the -- the plain states are where the wind is really fast and cheap -- in recently installed wind facilities in the East, they are selling power at about 6 cents a kilowatt hour. But if we take away the subsidy element there, it may be 8 cents a kilowatt hour.

Q Have you done a calculation of how many -- what it would cost to replace what is not being covered by combined heat and power and energy efficiency with that delta(sic) that's left for renewable generation to replace how much that's gonna cost upfront capital investment?

A I have done the calculations based on kilowatt hour cost.

Q What is your calculation there?

A It would average, I think, about 9 cents a kilowatt hour.

Q Well, if we agreed a moment ago if you were to use solar a hundred percent, that's $16 billion. But you're not going to use solar a hundred percent.

A No, you wouldn't want to do that.

Q So, if we rationed it down $10 billion for upfront investment?

A I have looked at a solar share of about -- solar electric share -- on the order of 5, 6,000 megawatts for the combined service areas of Duke and Progress in North and South Carolina.

Q So to be clear, for Duke and Progress Energy together for their entire system you looked at 5 or 6,000 solar megawatts?

A Yes.

Q That's upwards -- that's over $20 billion between the two of us.

A Um, 5,000 -- $5 billion -- 4 hours -- 5,000 megawatts at $4 a watt is that --

Q Well, we did 4,000 a megawatts at $4 a watt and that was $16 billion. So 5,000 is going to be $20 billion.

A Yes. Okay.

Q So we are talking $20 billion just for the renewable piece for Duke and Progress Energy Carolinas.

A Yep. But some of that is paid by customers.
Q All of it would be paid by customers.
A Yep. But bear in mind there is no fuel cost and the operation maintenance cost are small, so the kilowatt hour cost to the customer will be more than they are paying now. But also bear in mind that the customers who have these on their premises are not looking at the generation rate at the busbar cost. They are looking at the delivered cost. So if they can get it with subsidies at 11 cents a kilowatt hour or less, that is going to be cheaper for a whole lot of customers than buying utility power if the plans in the IRP are carried out.
Q What is the average life of solar panels?
A They say 25 years. But industry is hardly 25 years old. And a lot of the original stuff is still around. So it might be 30 or even 40. And to be sure, we have to have a lot of the equipment around for enough years to tell.
Q Right now the estimate is 25?
A Yes, or 30. That is for planning purposes. The solar installers would use a 25-year amortization period.
Q So every 25 years the utility is going to have to spend another $10 billion escalated for inflation; right?
A No, not the utility. It depends on whose buying

the equipment.

Q Somebody's going to have to spend another $10 billion?

A That's right. Everything wears out.

Q Twenty billion, excuse me. Another $20 billion every 25 years. Now, solar is not dispatchable either, is it?

A No.

Q Wind's not dispatchable?

A That was the point of the research you asked about earlier. And to talk about dispatch-ability, I have to go beyond the testimony filed here and point out, yes, wind is intermittent. Yes, solar is intermittent. But in the past year, I have gone through hour-by-hour wind generation for four different months of the year and hour-by-hour solar potential generation for those same four months of the year. And if you put the wind output intermittent and the solar output intermittent together for all of those hours, you come out with a stream of electricity which still fluctuates from hour to hour, but is much more nearly stable than the output of either by itself. And you can -- my research showed that you can count on that electricity for a very high percentage of North Carolina's use with having to furnish electricity

perhaps from a combustion turbine about 6 percent of the power. In other words, intermittency is a problem, but it's one that is manageable. And it does require utilities to adapt to a new situation, a new reality. That is the business model for the last 100 years doesn't work that well in this system.

Q Dr. Blackburn, your study you just referred to only looked at matching hourly loads; isn't that right?

A It looked at wind generation hour by hour through 4 different months.

Q You were only worried about matching load on an hourly basis not minute or second basis?

A That's correct. I didn't try to make this research finer than an hour by hour.

Q And your research looked at 123 days; isn't that right?

A That's correct.

Q And of the 123 days, on three of those days there were several hours each when the lights went out?

A No. There were several hours when you would need more electricity generated from the source like the combustion turbine than I allowed for when I set out to do the study. I only had 2700 megawatts of combustion turbine. Somebody's read my study. I'm impressed.

Q To be fair, the resources that you identified to deal with the intermittency were not adequate to meet load; On three of those days, there were hours in which based upon the resources you were proposing, the lights went out?

A There were 17 hours when you would need additional back up generation than the figure I started out with when I did the study. There is actually more natural gas capacity in North Carolina right now than would have been needed to meet these hours you are talking about.

Q Your study began with an immediate assumption that the energy consumption of the state would be reduced by 20 *percent through energy efficiency, didn't you?*

A Oh, yes. Efficiency is number one. That's what you always do first because it's cheaper.

Q You just assumed the 20 reduction?

A I said if you were successful at reducing energy consumption, in that case, by about 20 percent I think it was, then, yes, the remaining load could be met with a very large share of wind and solar. Much larger than I am suggesting in today's testimony, which wind and solar would be only a part of the 20 percent.

Q How many acres of land does it take for a megawatt of solar?

A You are talking roof tops, there is enough roof tops space already in the state to put the kind of capacity that I'm talking about here. So it's taking space, but not requiring additional land.

Q So we are now assuming that every roof top in the state is going to allow the installation of solar --

A No, it doesn't take all of them. It takes -- Somebody went out and counted the roof tops on residences and industrial -- commercial buildings that are not shaded oriented towards the South and found out there would be enough to do a good deal more than what I'm proposing here. That doesn't mean it will all be put on roof tops. Duke Energy, I think, is about to complete the 16 megawatt plant there in Davidson County. So some of this can be on the ground.

Q If it's put on the ground, how many acres per megawatt?

A I would have to look that number up. I don't carry it around with me.

Q Does anywhere from 5 to 10 acres sound right?

A Could be.

Q So at the 5,000 megawatts we were talking about a moment ago, we'll just use 7 for fun, that's 35,000 acres?

A No, because you're not going to put it all on the

ground.

Q We are going to assume that people will let us come put it on their roofs?

A Well, people will be beating down the doors to put on their roof tops if electricity rates go up 30 or 50 or 70 percent and solar installations become cheaper.

Q Do you have solar panels on your house at this moment?

A I did in Florida. I do not now because I live at the Forest at Duke, which is a retirement center. And we are in the beginning of our energy conservation and resource concerns to look ahead to putting up both solar water heat for the swimming pool, possibly for some of the cottages. And yet further ahead solar electricity panels. But I can't do that. I don't own the roof.

Q Would you do it if you had the roof?

A Oh, yes. I would -- they would be up and running already.

Q How much would that cost you?

A I go ahead and pay the premium that it would take now because of my interest in renewable energy. But that premium gets smaller as prices come down as there's more activity. The areas with the lowest cost photovoltaic installations in the country are the areas that have been

doing it for a while, long enough to build up volume to bring many installers into the picture and to have competition between and among the installers.

Q When you had solar panels in Florida, were you disconnected from the grid?

A I'm sorry. I had only solar water on the house in Florida.

Q If you were to put solar panels on your home or here, would you disconnect from the grid?

A Oh, no.

Q Why not?

A Well, I would rather be connected to the grid because when the sun doesn't shine, I want electricity. And the grid has it. There are some installations around here which just use storage batteries. But that's wasteful. It's more efficient to connect to the grid.

MR. ANTHONY: I don't have any further questions.

COMISSIONER CULPEPPER: Cross-examination Dominion or Duke?

MR. KAYLOR: No questions.

COMISSIONER CULPEPPER: Duke?

MR. CASTLE: I just have a couple questions for you.

CROSS-EXAMINATION BY MR. CASTLE:

Q Good afternoon, Dr. Blackburn?

A Hi. I'm sorry, I don't know your name.

Q My name is Alex Castle. I represent Duke Energy Carolinas. It's nice to meet you.

A Likewise.

Q Mr. Anthony has gone through some of the cost analysis relating to your proposal here and your testimony. I just have a few other questions about other aspects of it.

A Sure.

Q Since you provided this chart, and it's also described in your testimony on an energy basis, just on a kilowatt hour --

A Yes.

Q You didn't include any consideration for capacity for reserves.

A I think -- I could make up a chart like that. I just wanted to put the emphasis for this hearing on energy. Yes. Everybody needs a reserve. Not everything runs all the time.

Q So you do acknowledge that any prudent utility would have to provide for reserves to be able to provide reliable electric service to their customers?

A You would have to have enough capacity and generation capacity that would exceed the highest load you would expect at any moment, yes.

Q Under your proposal since you didn't include reserves in what you provided so far, how would you propose to incorporate those reserves in terms of resource?

A I think that would require a good deal of study and looking at the utilities that are moving towards these levels of renewable energy, and a number of them are, to see from the utility perspective, how best to work that. My suspicion is it would turn out to be in the combustion turbine area, but you don't know that until you run through the whole plan as to how all the parts work together. And I'm not an industrial engineer, and I'm not very good on laying out the equations and optimization equations. But you folks are good at that.

Q One of the other areas I wanted to ask you about is the fact that your testimony and the exhibits don't take into consideration transmission costs and siting related to these new resources.

A Going to a plan which involves wind capacity, and I'm happy to say, Duke is taking the first step in that and you all have a wind subsidiary, so you you've got

expertise in-house. I'm glad you're doing it. In case the Commission doesn't know, and you probably do, the wind resources in North Carolina are on the coast or in the sound or in the mountains or off shore. And if you added say 1,000, 2,000 megawatts of wind capacity between the two utilities, it would be at those places and probably require new transmission because the big lines run from the big plants out to the customers and these would bring in some considerable capacity from both ends of the state.

Q So you do acknowledge with respect to wind whether it would be in the mountains or on the coast, transmission would create an additional challenge to the development of that resource?

A I think it would require additional transmission. But, you know, you guys are redoing the transmission system all the time. So, yes, the investment plan for transmission would have to allow for those lines.

Q And with the incorporation of additional intermittent resources like solar and wind into the portfolio, don't you also acknowledge that additional costs would have to be incurred to insure grid stability and voltage control?

A Those are -- grid stability and voltage control in indeed beyond my -- I think electrical engineers are very

good at that kind of thing. And what might be required in this 20 percent renewable scenario, the utilities that are there, I don't think find it that difficult. But, you know, you may have some additional requirements -- technical requirement -- in that area.

Q And Mr. Anthony referenced some of the acreage necessary to develop solar resources. But as with wind as well, there are specific land-use consideration --

A Right.

Q -- that you have to take into account with development of those resources.

A That's correct to the extent that wind farms are placed say in pastures or corn fields or whatever. It uses a fairly small percent of the area for the wind turbine base and the access road. So that whatever you were doing there, if you were raising cattle before hand, you keep doing afterwards, presumable. We certainly don't want to start cutting down forest to put up wind turbines.

Q You would acknowledge that land-use regulation and statutory restrictions would act in many cases as an impediment to development?

A It probably would. And I think this is an issue that goes beyond the utilities and the Commission alone to hold issues of state policy. That is: Is the wind

resource sufficiently valuable in a world of the future with limited carbon emissions permissible? Would it require us to rethink state policy with regard to land use in the mountains or along the coast? That's quite right.

Q So is it fair to say that this whole plan of reaching 20 percent renewables is dependent upon changes in the state's energy policy and existing statutes?

A That's right. The REPs requires only 12.5 percent of which a chunk can be efficiency and another chunk can be RECs purchased out of state. You know, this would -- what I'm suggesting to you really goes beyond the immediate hearing. It's something that the state needs to be thinking about.

Q One further question for you. I want to ask if you are aware of the press release or news statements issue by Jim Warren, the Executive Director of NC WARN wherein he indicated that he is willing to consider supporting the development of next generation nuclear power reactors?

A I've heard Mr. Warren say that. I think he is listening to the climate scientist who are so distraught by our nations not coming to grips that some of them like Mr Hansen have begun to think that nuclear power may be necessary. I think Mr. Warren, as I understand it, is

saying in view of the relationship with Dr. Hansen and some of the other climate scientists, he is ready to be open minded. But he would have to, of course, speak for himself on that. I've had those conversations.

Q Are you open minded about supporting the development of next generation nuclear power?

A I probably would have to be dragged kicking and screaming. Were it clear that we could not get there any other way, yes, of course.

MR. CASTLE: Thank you. I have no further questions.

COMISSIONER CULPEPPER: Redirect, Mr. Runkle?

MR. RUNKLE: Just a couple.

REDIRECT EXAMINATION BY MR. RUNKLE:

Q Mr. Anthony was talking to you about your recommendation of 1.5 percent for your energy efficiency. Now, is the recommendation of 1.5 percent, is that all utility controlled programs or is it energy efficiency that people outside the utilities' control may do?

A It's anything that anybody does to reduce electricity demand to a point lower than it would have been without that action. It would include, for example, the State of North Carolina's initiatives to reduce energy consumption in state buildings and on state campuses. It

would include the federal governments executive Order to reduce energy consumption in federal facilities that are everywhere including in North Carolina. It would include everything that local governments are doing in their facilities and in their schools to reduce energy consumption. All of these are going on right now. It would include further revisions of the state building code, which would bring down electricity use in building built in the future. It would include changes in federal appliance efficiency standards. Anything that contributed to the result would be included in that 1.5 percent. And I think from the list of things I just enumerated, not including dozens of other things that people are now doing, no, utilities might now have to do very much when everything else is said and done.

Q Mr. Anthony also -- you talked about the other states. Mr. Anthony asked you some questions about the rates in California and you said it was 9 cents per kilowatt. And Mr. Anthony suggested it was 15 cents per kilowatt hour in California. Do you remember those questions?

A Yes. And I've looked at those rates recently and I have trouble remembering all of those numbers.

Q So in North Carolina, if you looked at what would

happen if Progress Energy and Duke brought their nuclear plants online.

A Well, yes, rates will go up, no question about it. Let's suppose nuclear busbar cost was 11 cents per kilowatt hour then the residential rate would be 15 cents or rather the nuclear component, once it got to the residents, I doubt that we will come in at 11 cents. I think it will be more looking at the experience back in the 70s and 80s. If it were 15 cents busbar and present busbar average for the state is 5 cents, 6 cents, yes, you know, customer rates are going to go way up. I've been using residential rates, but, of course, there are commercial and industrial rates.

Q So we can save our energy now or pay California rates later?

MR. ANTHONY: Mr. Chairman, I object to this. The context of my question was Dr. Blackburn represented that California has achieved the 1.5 percent annual rate of energy savings and was saying that can be done in North Carolina. My question was in the context of the present, not what our rates may possibly be after 2020 or whenever we might build a nuclear plant.

COMISSIONER CULPEPPER: I'm going to overrule your objections. Let's wind it up here, Mr. Runkle.

Q (By Mr. Runkle) I think the point has been made. Now Mr. Anthony asked you several questions about looking at the renewable part of your recommendation. There were several assumptions in there that I got kind of confused on. It ended up looking at sort of $20 billion. Was that just for solar? Was that for solar PV or different kinds of solar?

A I think the arithmetic is if you had 5,000 megawatts of solar photovoltaic and it costs $4 a watt, you would come out with that figure.

Q Are you recommending that we we're meeting your renewable energy recommendation with just solar photovoltaic?

A No, of course not. No. That would be a part of it. It might be a quarter of it. It might be more than that. It would depend on the relative cost of solar, wind, biomass generation, solar water, additional hydroelectric and so forth.

MR. RUNKLE: I've got no further questions.

COMISSIONER CULPEPPER: Thank you very much. Questions by the Commission?

(No response.)

All right. Dr. Blackburn, it appears that will conclude your testimony today. You may stand down from

the witness chair.

DR. BLACKBURN: Thank you very much for the opportunity to speak to you.

COMISSIONER CULPEPPER: Thank you very much, sir.

Mr. Runkle, let's go ahead and deal with Blackburn Exhibit Nos. 1,2,3,4 &

MR. RUNKLE: Yes, sir. We move to have them admitted.

COMISSIONER CULPEPPER: All right. They are admitted into evidence.

(Whereupon, Blackburn Exhibit Nos. 1-5 were admitted.)

Let me remind you it's 19 minutes to 5:00. We are going to adjourn today at 5:00. We have by my calculations here three other Intervener witnesses before we get to Public Staff. And I can tell you right now we are going to take Mr. Floyd's testimony for Public Staff pretty early tomorrow morning. When we come back tomorrow morning we are coming back to reconvene at 10:00 in the morning.

That having been said, who would you like to call next?

MS. THOMPSON: Mr. Chairman, we have made Mr.

Schlissel available. He rearranged his schedule to accommodate to Mr. Anthony's preference that he be available today. He will also be here in the morning, but needs to catch a flight in the morning, late morning. I would ask, depending on the cross-examination that others have for Mr. Schlissel that if we can work him in before recess at five that would be appreciated. But if not, we would be happy to make him available tomorrow.

COMISSIONER CULPEPPER: Well, I'm ready to start working him in right now. How about that?

MS. THOMPSON: The Enviromental Defense Fund Southern Alliance for Clean Energy, Sierra Club and Southern Environmental Law Center calls Mr. David A Schlissel.

DAVID SCHLISSEL; Being first duly sworn, testified as follows:

DIRECT EXAMINATION BY MS. THOMPSON:

Q Mr. Schlissel, would you please state your name, title and business address for the record?

A My name is David A. Schlissel, S-c-h-l-i-s-s-e-l. I'm the president of Schlissel Technical Consulting, Inc, 45 Horace, H-o-r-a-c-e Road in Belmont, Massachusetts, 02478.

Q And Mr. Schlissel, did you cause to be prefiled

direct testimony in both confidential and public version in Docket E-100, Sub 124?

A Yes, I did.

Q Do you have any changes or corrections to your testimony?

A Yes. Duke witness Mr. McMurry at Page 12 of his rebuttal testimony corrected some inaccurate statements that I had in my direct testimony regarding North Carolina Statutory requirements for coal combustion, waste storage. I accept his corrections. And I thank him and the company for correcting the record.

Q Thank you. Other than those corrections, if the questions in your testimony were asked of you today on the stand, would your answers be the same?

A Yes, they would.

MS. THOMPSON: I would move that Mr. Schlissel's direct prefiled testimony, public version and confidential version under seal be copied into the record as though given orally from the stand and his exhibits be marked for identification.

COMISSIONER CULPEPPER: That motion is allowed and the witness' exhibits are identified for purposes of this proceeding as they were marked when filed. I take it his testimony is corrected to include what he has

testified to the stand, changes that rebuttal witness.

(Whereupon, David Schlissel's prefiled testimony was copied into the record as if given orally from the stand.)

(Whereupon, Schlissel Exhibits were marked for identification.)

MS. THOMPSON: We could walk through those or I could file an errata sheet if that would be acceptable.

COMISSIONER CULPEPPER: You can file an errata sheet.

Q. What are your name, position and business address?

A. My name is David A. Schlissel. I am the President of Schlissel Technical Consulting, Inc., 45 Horace Road, Belmont, MA 02478.

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

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

Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 28 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My recent clients have included the General Staff of the Arkansas Public Service Commission, the U.S. Department of Justice, the Attorney General of the State of New York, cities and towns in Connecticut, New York and Virginia, state consumer advocates, and national and local environmental organizations.

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

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

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

A. I am testifying on behalf of Environmental Defense Fund, the Sierra Club, Southern Alliance for Clean Energy and the Southern Environmental Law Center.

Q. Have you testified previously before the North Carolina Utilities Commission?

A. Yes. I have testified before the North Carolina Utilities Commission in Dockets Nos. E-2, Sub 526; E-2, Sub 537; and E-7, Sub 790.

Q. What is the purpose of your testimony?

A. I have been asked to review the 2009 Integrated Resource Plans ("IRP") submitted by Duke Energy Carolinas ("Duke") and Progress Energy Carolinas ("Progress"). I was asked to focus on the following specific issues:

- The reasonableness of carbon dioxide ("CO_2") prices used in the IRPs.
- Projected carbon emissions.
- Planned retirements of existing coal units and opportunities for additional retirements.
- Natural gas-fired generation as an alternative to existing coal.
- The potential cost of compliance with environmental requirements.

This testimony presents the results of my review.

Q. Please summarize your conclusions.

A. My conclusions are as follows:

1. Federal climate change regulation currently under consideration will require significant reductions in the nation's annual CO_2 emissions over the coming decades. Duke, however, projects that its annual CO_2

emissions will increase between 2010 and 2029 in each of the resource portfolios that it has presented in the Revised 2009 IRP in spite of its announced plan to retire approximately 1,600 to 1,700 MW of cycling coal units by 2020.

2. It is not surprising that Duke's annual CO_2 emissions are projected to increase between 2010 and 2029 because of the planned addition of the Cliffside Unit 6 baseload coal unit. The new Cliffside Unit 6, on its own, can be expected to emit approximately six million tons of CO_2 each year, or more than two million tons more CO_2 than was emitted in 2008 by all of the cycling coal units that Duke discusses retiring.

3. In order to actually reduce its annual CO_2 emissions over the coming decades, Duke will have to reduce its reliance on coal-fired generation by retiring even more coal-fired generating capacity than it has so far proposed to retire. Given that Duke already is planning to add new nuclear units to its resource mix, the alternatives for displacing additional coal units are building more natural gas-fired combined cycle units, adding more renewable resources and adding more energy efficiency than the Company now includes in its resource plans.

4. Although new natural-gas fired combined cycle units will emit some CO_2, the amounts they emit will be significantly less than a comparable amount of coal-fired capacity.

5. The Commission should not be concerned that Duke would become unreasonably dependent on natural gas if it added more natural gas-fired

combined cycle units to replace additional coal-fired generating capacity. New assessments show that there is far more natural gas available in the domestic United States than was projected even two years ago. This should enhance the value of using natural gas as a bridge fuel to a lower carbon future and should ameliorate future natural gas prices.

6. Duke and Progress should consider the potential costs of EPA regulation of coal combustion wastes in their IRP analyses.

7. The Base case CO_2 prices that Duke used in its 2009 IRP analyses were reasonable. However, given the uncertainties associated with the timing, stringency and design of federal regulation of greenhouse gas emissions, Duke should have looked at a wider range of scenarios than only ± 15 percent around that Base case set of CO_2 prices. .

8. The CO_2 prices used by Progress in its 2009 IRP analyses are compared to the range of CO_2 prices that Duke used in its 2009 IRP and to the CO_2 prices used in resource planning by Synapse Energy Economics, state commissions and other utilities.

Annual CO_2 Emissions

Q. What is the goal of the federal climate change legislation and policies that are being considered?

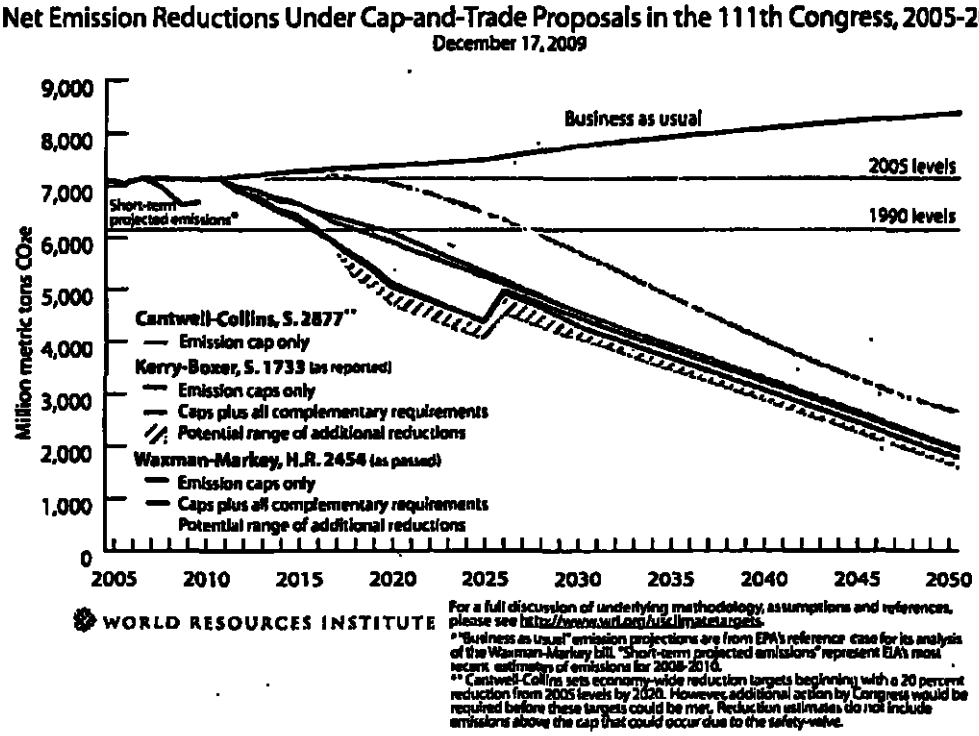
A. The general goal of most of the legislation and policies under consideration would be to reduce annual domestic U.S. CO_2 emissions by 60 percent to 80 percent from current levels by the middle of this century. It is

generally believed by climate scientists that reductions of this magnitude might enable the world to avoid the most harmful effects of global climate change.

Q. What emissions reductions would be required under the bills that have been introduced in the current 111th U.S. Congress?

A. The emissions levels that would be mandated by some of these bills are shown in Figure 1 below:

Figure 1: Comparison of Legislative Climate Change Targets in the Current 111th U.S. Congress as of December 17, 2009



It is uncertain which, if any, of the specific climate change bills that have been introduced to date in the Congress will be adopted. Nevertheless, the general trend toward carbon regulation is clear; and it would be a mistake to ignore it in long-term decisions concerning electric resources. Over time the

proposals are becoming more stringent as evidence of climate change accumulates and as the political support for serious governmental action grows.

Q. Duke Energy, the parent of Duke, is a member of the U.S. Climate Action Partnership ("USCAP"). Are the emissions targets in the proposed legislation shown in Figure 1 above consistent with the emissions reduction goals recommended by the USCAP?

A. Yes. The United States Climate Action Partnership has recommended that national CO_2 emissions be reduced by 14 percent to 20 percent from 2005 levels by 2020, by 42 percent by 2030 and by 83 percent by 2050.[1] As shown in Table 1 below, the emissions targets in the Waxman-Markey legislation that has been passed by the U.S. House of Representatives are extremely similar to the goals promoted by the USCAP.

	USCAP	Waxman-Markey
2012	97%-102% of 2005 levels	3% below 2005 levels
2020	80%-86% of 2005 levels	17% below 2005 levels
2030	58% of 2005 levels	42% below 2005 levels
2050	20% of 2005 levels	83% below 2005 levels

Table 1: USCAP and Waxman-Markey CO_2 Emission Targets

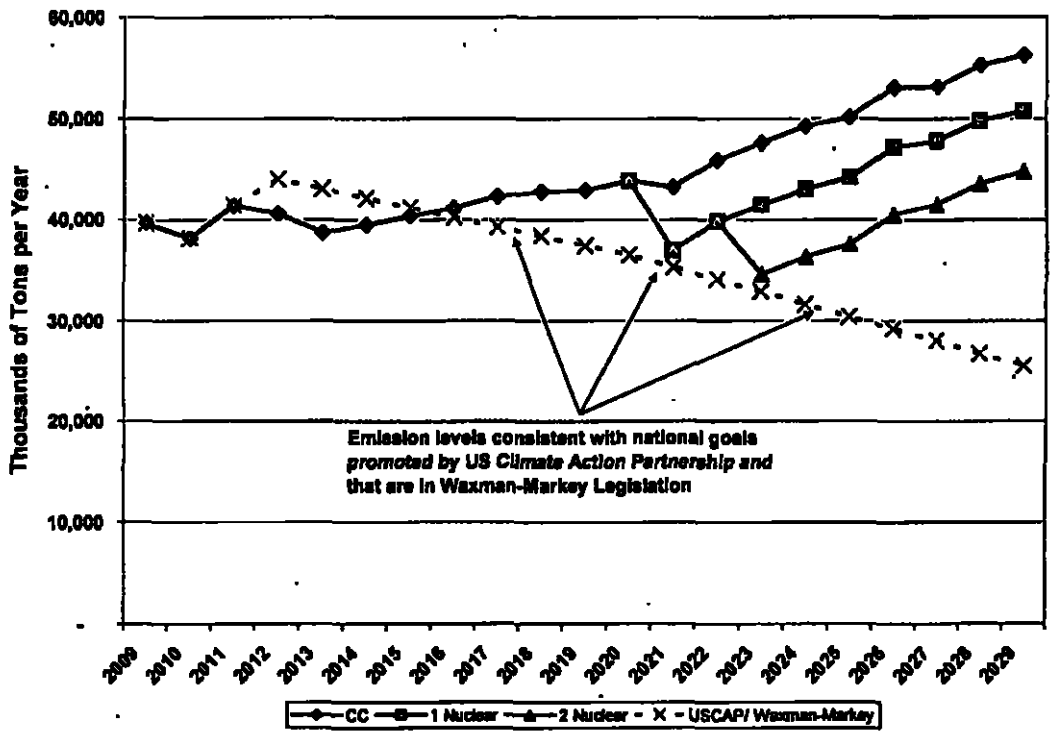
Q. What would Duke's annual CO_2 emissions be under its proposed IRP resource plan?

A. Duke discussed several modeling portfolios in its Revised 2009 IRP. These portfolios included no new nuclear units, one new nuclear unit and two new

[1] The United States Climate Action Partnership's website describes the group as follows. "USCAP is a group of businesses and leading environmental organizations that have come together to call on the federal government to quickly enact strong national legislation to require significant reductions of greenhouse gas emissions." www.us-cap.org USCAP materials refer to "the urgent need for a policy framework on climate change." www.us-cap.org.

nuclear units, respectively.[2] The annual CO_2 emissions for these resource portfolios are shown in Figure 2, below.[3]

Figure 2: Duke's Projected Future Annual CO_2 Emissions through 2030



The three solid lines in Figure 2 represent the CC (that is, no new nuclear units), the one new nuclear unit in 2021 and the two new nuclear units in 2021 and 2023 scenarios discussed by Duke in its 2009 IRP.

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[2] Duke Revised 2009 IRP, at pages 66 and 67.

[3] Figure 2 shows the annual CO_2 emissions for the resource portfolios in which there were no new nuclear units, in which one new nuclear unit was added in 2021, and in which two new nuclear units were added in 2021 and 2023. Duke also modeled scenarios in which one new nuclear unit was added in 2018 and in which two new nuclear units were added in 2018 and 2019. Duke did not provide the annual CO_2 emissions for these other portfolios. However, it can be expected that their annual CO_2 emissions would be lower in the years 2018 through 2020 than the portfolios in which new nuclear units are added in 2021 and 2023 but would be approximately if not exactly the same in subsequent years.

Consequently, Duke's own projections show that its annual CO_2 emissions would increase in each of these three scenarios by between 13 percent and 42 percent (depending on the scenario) between 2009 and 2029 at the very time that legislation under consideration in Congress would be mandating reductions in emissions. In other words, Duke's CO_2 emissions would be going in the wrong direction, i.e. up, at a time when the mandated levels of emissions were being reduced.

Indeed, Duke's CO_2 emissions would be increasing during the very same years that its parent company Duke Energy is promoting, through the U.S. Climate Action Partnership, that national CO_2 emissions be significantly reduced.

Q. Do the CO_2 emissions trajectories shown in Figure 2 reflect the coal plant retirements that Duke discusses in the Revised 2009 IRP?

A. Yes. The CO_2 emissions trajectories shown in Figure 2 reflect the approximately 1,600 to 1,700 MW of coal plant retirements discussed at pages 40-43 of its January 11, 2010 Revised 2009 IRP.[4]

Q. Is it surprising that Duke is projecting that its annual CO_2 emissions will not go down between 2010 and 2029 given that it is proposing to retire more than 1,600 MW of existing coal capacity?

A. Not really. On its own, the proposed Cliffside Unit 6 coal unit will emit approximately six million tons of CO_2 each year, or more than two million tons more CO_2 per year than the total 2008 emissions of CO_2 from all of the coal units that Duke proposes to retire. In addition, Duke also is proposing to add between 5,700 MW and 6,700 MW of gas-fired capacity to its resource mix. Natural gas-

fired units do emit CO_2 although they emit significantly less per MWh than coal-fired facilities.

Q. Is it possible that Duke will be required to actually reduce its CO_2 emissions between 2010 and 2030?

A. Yes. Duke's IRP modeling assumes that there will be legislation that will establish a cap-and-trade regime for CO_2 emissions allowances. Under a cap-and-trade scheme, Duke would not necessarily be required to reduce its emissions, but instead could purchase emissions allowances. It is possible, however, that, if Congress deadlocks on passing cap-and-trade legislation, the U.S. EPA will adopt regulations mandating actual reductions in CO_2 emissions under a command-and-control scheme. In those circumstances, Duke would have to actually reduce its CO_2 emissions rather than being able to simply purchase emissions allowances from other emitters.

Q. What actions will Duke have to take in order to reduce its annual CO_2 emissions?

A. Quite simply, Duke will have to reduce its reliance on coal-fired generation in order to significantly reduce its annual CO_2 emissions over the coming decades. To accomplish this, Duke will need to retire additional coal units beyond those already proposed for retirement. Given that the Company already is planning to include new nuclear units in its future resource mix, the alternatives for displacing additional coal units are building more natural gas-fired

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[4] Duke Response to SELC Informal Data Request No. 13.

combined cycle facilities, adding more renewable resources and adding more energy efficiency than Duke now includes in its resource plans.

Q. Does the Company have any plans for actually reducing its CO_2 emissions?

A.

[5] Exhibit DAS-2C, at slide 6.
[6] Exhibit DAS-3C, at page 16 – that is, the last slide

Q. You mentioned that one alternative for Duke to reduce its reliance on coal-fired generation is to build more natural gas-fired combined cycle facilities. Should the Commission be concerned that Duke would become unreasonably dependent on natural gas if it built more natural gas-fired combined cycle capacity to replace additional coal-fired generating capacity beyond the 1,600 MW that the Company currently is planning to retire by 2020?

A. No. First, it may not be necessary to replace coal-fired with gas-fired capacity on a MW for MW basis – in other words, some of the replacement capacity and energy may come from energy efficiency and renewable resources.

Second, Duke is projecting that gas-fired units will provide less than 0.4 percent of its needed energy from gas fired units in 2010 and only about 6 percent of its needed energy in 2029, even with the new combined cycle and combustion turbine capacity it is planning to add as part of its resource plan.[7] Thus, adding more natural gas-fired combined cycle capacity actually would help diversify Duke's current heavily coal-dependent generating mix.

Third, recent assessments suggest that there is far more natural gas available in the domestic U.S. This should enhance the value of using natural gas-fired generation as a bridge fuel to a lower carbon future and should ameliorate future natural gas prices.

In fact, the supplies of natural gas that have been identified in the past two years have been described as a structural change in the natural gas market. This structural change has two important impacts on future resource planning by companies such as Duke and Progress. First, as a result of the existing and expected supply glut, current and projected prices of natural gas have been

reduced. At the same time, the dramatically increased supplies of natural gas that are being identified should be able to accommodate any increased demands from fuel switching as a result of federal regulation of greenhouse gas emissions without causing significant increases in natural gas prices.

The structural change in the natural gas markets already has had a significant impact on utilities' resource planning. For example, in early April of last year, Entergy Louisiana informed the Louisiana Public Service Commission of its intent to defer (and perhaps cancel) a proposal to retire an existing gas-fired power plant and, in its place, to build a new coal-fired unit. Entergy explained that it no longer believes that a new coal plant would provide economic benefits for its customers due to its current expectation that future gas prices would be much lower than previously anticipated:

> Perhaps the largest change that has affected the Project economics is the sharp decline in natural gas prices, both current prices and those forecasted for the longer-term. The prices have declined in large part as a result of a structural change in the natural gas market driven largely by the increased production of domestic gas through unconventional technologies. The decline in the long-term price of natural gas has caused a shift in the economics of the Repowering Project, with the Project currently – and for the first time – projected to have a negative value over a wide range of outcomes as compared to a gas-fired (CCGT) resource.[8]

4. Recent Natural Gas Developments

> Until very recently, natural gas prices were expected to increase substantially in future years. For the decade prior to 2000, natural gas prices averaged below $3.00/mmBtu (2006$). From 2000

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[7] Revised 2009 IRP, at page 59

[8] Exhibit (DAS-4). *Report and Recommendation Concerning the Little Gypsy Unit 3 Repowering Project*, submitted by Entergy Louisiana to the Louisiana Public Service Commission, April 1, 2009, at pages 6-8.

through May 2007, prices increased to an average of about $6.00/mmBtu (2006$). This rise in prices reflected increasing natural gas demand, primarily in the power sector, and increasingly tighter supplies. The upward trend in natural gas prices continued into the summer of 2008 when Henry Hub prices reached a high of $131.32/mmBtu (nominal). The decline in natural gas prices since the summer of 2008 reflects, in part, a reduction in demand resulting from the downturn in the U.S. economy.

* * * *

However, the decline also reflects other factors, which have implications for long-term gas prices. During 2008, there occurred a seismic shift in the North American gas market. "Non-conventional gas" – so called because it involves the extraction of gas sources that previously were non-economic or technically difficult to extract – emerged as an economic source of long-term supply. While the existence of non-conventional natural gas deposits within North America was well established prior to this time, the ability to extract supplies economically in large volumes was not. **The recent success of non-conventional gas exploration techniques (e.g., fracturing, horizontal drilling) has altered the supply-side fundamentals such that there now exists an expectation of much greater supplies of economically priced natural gas in the long-run....**

* * * *

Of course, it should be noted that it is not possible to predict natural gas prices with any degree of certainty, and [Entergy Louisiana] cannot know whether gas prices may rise again. Rather, based upon the best available information today, it appears that gas prices will not reach previous levels for a sustained period of time because of the newly discovered ability to produce gas through non-traditional recovery methods...[9] [Emphasis added]

Entergy's conclusion that there has been a seismic shift in the domestic natural gas industry was confirmed in early June 2009 by the release of a report by the American Gas Association and an independent organization of natural gas experts known as the Potential Gas Committee, the authority on gas supplies.

This report concluded that the natural gas reserves in the United States are 35 percent higher than previously believed. The new estimates show "an exceptionally strong and optimistic gas supply picture for the nation," according to a summary of the report.[10]

A Wall Street Journal Market Watch article titled "U.S. Gas Fields From Bust to Boom" similarly reported that huge new gas fields have been found in Louisiana, Texas, Arkansas and Pennsylvania and cited one industry-backed study as estimating that the U.S. now has enough natural gas to satisfy nearly 100 years of current natural gas-demand.[11] It further noted that

> Just three years ago, the conventional wisdom was that U.S. natural-gas production was facing permanent decline. U.S. policymakers were resigned to the idea that the country would have to rely more on foreign imports to supply the fuel that heats half of American homes, generates one-fifth of the nation's electricity, and is a key component in plastics, chemicals and fertilizer.
>
> But new technologies and a drilling boom have helped production rise 11% in the past two years. Now there's a glut, which has driven prices down to a six-year low and prompted producers to temporarily cut back drilling and search for new demand.[12]

Finally, the American Gas Association ("AGA") has recently issued an assessment, "U.S. Natural Gas Supply: *Then There Was Abundance*," that detailed what the AGA term "the robust supply picture in the United States" and quelled

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9 Id, at pages 17, 18 and 22.
10 *Estimate Places Natural Gas Reserves 35 percent Higher*, New York Times, June 9, 2009.
11 Available at http://online.wsj.com/article/SB124104598912705 85.html.
12 Id.

any doubts about the ability of natural gas to supply the country well into the next century."[13]

Q. What are Progress' projected annual CO_2 emissions under its proposed resource plan?

A. Unfortunately, Progress has not projected future CO_2 emissions as part of its IRP analyses.[14]

Potential Regulatory Compliance Costs

Q. In addition to carbon dioxide, are there other potential regulatory compliance issues and costs that electric utilities should take into account in their resource planning?

Yes. Electric utilities should include in resource planning the costs of other new or revised air emissions requirements and the proper disposal and management of coal combustion wastes.

Q. What are coal combustion wastes?

A. Coal combustion wastes ("CCW"), also known as "coal ash" or "coal combustion products," consist of fly ash, bottom ash, boiler slag and flue gas desulfurization sludge and are typically disposed of in landfills and surface impoundments. CCW contains heavy metals such arsenic, nickel, cadmium,

[13] Exhibit DAS-6.
[14] Progress Response to SELC Data Request No. 1, Item 1-8.

chromium, lead, manganese, selenium and thallium, as well as sulfates, chlorides, boron, polyaromatic hydrocarbons, phenols, polychlorinated biphenyls, cyanide, dioxins and furans. These substances can leach into water supplies when the waste comes into contact with water.

Q. Are coal combustion wastes regulated under North Carolina law?

A. It is my understanding that there are only limited requirements for disposal of CCW under North Carolina. For instance, North Carolina law exempts CCW surface impoundments and certain new CCW landfills from solid waste regulations. N.C.G.S. § 130A-295.4. At the same time, depending on the applicable permitting regulations, a liner may not be required for CCW landfills. N.C.G.S. § 130A-295.4(b); 15A N.C.A.C. 13B .0503. Moreover, liners are not required for CCW structural fill sites. 15A NCAC 02T .1201.

For slurry ponds permitted by the N.C. Division of Water Quality, groundwater monitoring and reporting is required, unless an exemption is granted.15A NCAC 02L .0110. In fact, the N.C. Division of Water Quality recently ordered Duke and Progress to begin testing the groundwater around their ash ponds in the state for contamination with toxic metals.[15]

In addition, Senate Bill 1004, enacted during the 2009 legislative session, placed coal ash impoundments under the Dam Safety Act and subjects dams that create coal ash ponds to direct inspection by the N.C. Department of Environment

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[15] *State to require monitoring of ash ponds*, The Charlotte Observer, February 2, 2010.

and Natural Resources. Previously, electric utilities were only required to file reports with the Commission every five years.

Q. Is the EPA considering regulating coal combustion wastes?

A. Yes. EPA is currently considering proposed regulations to address coal combustion wastes.

Q. What has led to the EPA decision to consider regulating CCW?

A. A number of factors appear to have led the EPA to consider regulating CCW. First, a series of spills in late 2008 and early 2009, including the major spill of approximately one billion gallons of CCW at Tennessee Valley Authority's Kingston, TN coal plant in December 2008, drew the nation's attention to CCW storage.

At the same time, the EPA has found in a series of regulatory determinations that improper management of and disposal of combustion wastes from coal-fired power plants can and has resulted in surface water and groundwater contamination. EPA also has identified risks to human health and the environment from the disposal of CCW in landfills and surface impoundments.

For example, EPA's "Coal Combustion Waste Damage Case Assessment" dated July 9, 2007, recognized 24 proven cases of danger to human health or the environment and another 43 "potential" damage cases related to CCW. All but

one of the 24 proven damage cases involved unlined disposal units.[16] EPA recently updated this list of damage cases to include coal ash spills at Martins Creek, PA, Gambrills, PA as well as the catastrophic spill of approximately one billion gallons of coal ash at TVA's Kingston, TN plant.[17]

The EPA also has identified gaps in state regulatory programs for disposal and management of CCW.[18]

Q. What are the possible forms that EPA regulation of CCW could take?

A. The EPA is evaluating whether to regulate CCW under the federal Resource Conservation and Recovery Act ("RCRA"). EPA is considering several options including 1) regulating CCW as hazardous waste under Subtitle C of RCRA, which would include a tracking system and federally enforceable permits; 2) regulating CCW as non-hazardous waste under Subtitle D of RCRA, which would include inducements for state solid waste programs and implementation of federal minimum regulations for landfills; 3) a hybrid approach, by which CCW would be considered a solid waste if certain conditions are met, but a hazardous waste if they are not; and 4) another hybrid approach whereby wet CCWs (in surface impoundments) would be regulated as hazardous wastes and dry CCWs (in landfills) would be regulated as non-hazardous wastes.

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16 U.S. EPA, Notice of Data Availability on the Disposal of Coal Combustion Wastes in Landfills and Surface Impoundments, 72 Fed. Reg. 49714, 49718-19 (Aug. 29, 2007).

17 75 Fed. Reg. 822 (Jan. 6, 2010).

18 72 Fed. Reg. 49716.

The EPA also recently announced that it may develop regulations setting financial responsibility requirements for power plants under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA," better known as "Superfund"), citing, among other things, the "significant cleanup costs that can be generated by this industry sector."[19]

Q. When is the EPA expected to issue a proposed regulation concerned CCW?

A. It is my understanding that the EPA is expected to issue a draft of its proposed regulation on CCW in the very near future, perhaps by the date of the hearings in this proceeding.

Q. Are there any estimates of the cost of complying with the anticipated EPA regulations concerning CCW?

A. The costs associated with the EPA's anticipated regulation of coal combustion wastes are uncertain and will depend on how the EPA classifies the wastes and plant specific factors (that is, wet versus dry storage, lined versus unlined, whether stored on the surface or not). Progress has stated the following in its December 1, 2009 *Plan to Retire 550 MWs of Coal Units Without SO2Controls*, that was filed in Docket E-2, Sub 960:

> EPA is currently considering re-characterizing the nature of and *regulation of coal combustion products (bottom ash, fly ash and* related materials, hereinafter CCPs) in response to TVA's Kingston Plant ash pond impoundment failure. Speculation is focusing on EPA's regulation of CCPs as a hazardous waste. A narrow usage exclusion may be possible where the finished product of CCP is fully encapsulated. Existing uses that involve land application or unconfined uses may be prohibited. If EPA

[19] 75 Fed. Reg. 816, 822 (Jan. 6, 2010).

> characterizes CCPs as a hazardous waste or otherwise increases the regulatory requirements applicable to CCPs, the handling, storage and disposal of this material will result in significantly increased costs of operation, and more sophisticated handling equipment and disposal requirements. Classification of power plant CCP operations as activities that produce hazardous wastes as defined by the Resource Conversion and Recovery Act (RCRA) would trigger a number of additional regulatory requirements as well as potential liability associated with closure of impoundments, leachate management and site remediation. Phase out of surface impoundments is under consideration by EPA.[20]

Q. What has the electric utility industry claimed regarding the cost impact of EPA regulation of coal combustion wastes?

A. Although the industry cost estimates may be exaggerated in order to dissuade the EPA from regulating CCW as hazardous waste, they do predict significant costs. For example, an October 30, 2009 letter to the Federal Office of Management and Budget from the Utility Solid Waste Activities Group[21] warned that:

> If [coal combustion wastes] were regulated as hazardous wastes, the economic impact on the utility industry would be enormous, resulting in power plant closures, increased electricity rates for consumers, corresponding power reliability concerns, and virtually eliminating all [CCW] beneficial uses.[22]

Testimony before Congress by a representative from EPRI similarly stated that:

> A national coal combustion products regulation will alter the technology and economics of coal-fired power plants. Some owners would decide to prematurely shut down rather than incur the costs of compliance, while others would convert their ash

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20 At pages 7 and 8.

21 The Utility Solid Waste Activities Group is described as an informal consortium of 80 utility operating companies, the Edison Electric Institute and others.

22 At page 2.

handling and disposal systems and continue to operate in the post-regulation market.[23]

Q, What have been the costs of cleaning up CCW spills?

A. The cost to clean up the damage from the December 2008 release from Tennessee's Kingston plant has been estimated to range from $933 million to $1.2 billion.[24]

Q. How could Duke and Progress reflect this issue in their IRP analyses given all of the uncertainty associated with the EPA's possible regulation of coal combustion wastes?

A. The traditional way to address uncertainty in resource planning is to identify a wide range of the potential costs for key input assumptions.[25] Thus, Duke and Progress could identify ranges of the possible costs for the different ways in which the EPA may regulate coal combustion wastes (that is, hazardous or not, etc.) and then apply those ranges of costs in its IRP analyses.

Q. Have Duke and Progress properly taken the potential cost of CCW regulations into account in their IRPs?

A. No. Duke does not even discuss CCWs in its 2009 IRP. Progress mentions "consideration of coal ash as a hazardous waste" in a list of "significant challenges to deal with from a resource plan perspective," but does not appear to have reflected the potential costs in its actual planning analyses.

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23 Written Testimony of Ken Ladwig, Senior Research Manager at EPRI, before the Subcommittee on Energy and Environment of the United States House of Representatives, dated December 10, 2009.

24 "TVA Reports 2009 Fiscal Year Third Quarter Results," available at *www.tva.gov/news/releasc/julsep09/3rd_quarter.htm.*

25 For example, Duke considers ranges of potential CO_2, SO_2 and NOx allowance costs in its IRP analyses.

Q. Are there other potential regulatory compliance issues and costs that North Carolina also should be taken into account in their resource planning?

A. Yes. The already significant economic risks associated with operating coal plants will be heightened by imminent tightening of environmental regulation of pollutants produced by these plants. This year, the U.S. EPA already issued a new more demanding air quality standard for nitrogen oxides, and is scheduled to adjust standards relating to sulfur dioxide, particle pollution and ozone. EPA is also likely to issue regulations addressing interstate transport of air pollution. By 2011, EPA is scheduled to issue a federal implementation plan for regional haze, issue new source performance standards for key pollutants from electrical generating units and non-electrical generating unit boilers, and issue new standards for hazardous air pollutants, among other matters. It certainly is reasonable to expect that in most or all cases, EPA action will result in more stringent regulation of these pollutants.

Q. Do Duke and Progress adequately factor these impending air quality regulations into their IRP analyses?

A. It does not appear that Duke or Progress adequately factor into their IRP analyses the economic risks of continuing to operate existing coal-fired power plants in the face of new or more stringent air emissions requirements. Although Duke does say in its Revised 2009 IRP that it examined a range of potential SO_2 and NO_x emissions allowance prices, it does not discuss expected changes in air emissions requirements in much detail.[26] It also offers no evidence that the range

[26] Duke Revised 2009 IRP, at pages 30-34.

of SO_2 and NO_x allowance costs it considered was reasonable. Appendix F of Progress' 2009 IRP, Air Quality and Climate Change, offers a similarly brief discussion of impending changes in air emissions requirements and also fails to explain how Progress considered these expected changes in its IRP analyses.

However, Progress includes a more complete and accurate discussion of impending regulatory changes in its *Plan to Retire 550 MWs of Coal Units Without SO2 Controls* ("Retirement Plan"), which concedes that the changes are expected to result in more stringent pollution control standards. Progress' Retirement Plan also includes a fairly realistic estimation of some of the timelines involved and indicates that Progress understands that the new standards will require the utility to alter its plans accordingly. The Progress Retirement Plan is a start at a candid and more realistic discussion of how impending pollution controls will affect the cost of continue to operate existing pulverized coal plants and will also affect the cost of construction and operation of other supply-side resources. But there is no evidence that Progress has factored the regulatory issues discussed in the Retirement Plan into its 2009 IRP.

Q. What action do you suggest the North Carolina Utilities Commission take to *address this weakness in the utilities' IRP discussion of the risks associated* with continuing to operate existing coal plants?

A. The Commission should require Duke and Progress, as well as other utilities, to submit as part of their IRP in this docket a detailed and accurate discussion of the expected new pollution control standards and a demonstration of how the utility is factoring the financial risk of these standards into its IRP. If, as it appears, any of the utilities has failed to adequately monetize the risk of

impending regulation in their IRPs, the modeling underlying the IRP should be rerun to reflect the additional cost of continuing to run existing coal plants, and of constructing and operating supply-side resources in future.

Q. Why is it important to discuss these risks now, instead of waiting until all the expected regulations are finalized?

A. Factoring in foreseeable future regulation now will result in the utility, this Commission, and the public having better information about the true costs associated with various supply side resources as well as their relative cost when compared to demand side resources. That will translate into an improved ability to provide low cost, low risk power to the citizens of North Carolina in the future.

Q. Are you aware of any state regulatory commissions that require utilities to consider compliance with current and projected future environmental regulations in their IRP process?

A. I have not conducted a thorough review of state policies on this issue, but I am aware that the Arizona Corporation Commission recently approved an amendment to the IRP rules that would require enhanced consideration of environmental impacts of power generation. The amendment reads as follows:

Adding a new subsection to IRP rules, R14-2-703, Section D.

"A plan for reducing environmental impacts related to air emissions, solid waste, and other environmental factors, and a plan for reducing water consumption. The costs for compliance with current and project future environmental regulations shall be included in the analysis of resources required by R14-2-703 (D) and (E). A load-serving entity or any interested parties may also provide, for the Commission's consideration, analyses and supporting data pertaining to environmental impacts associated with the generation or delivery of electricity, which may include monetized estimates of environmental impacts that are not included as costs for compliance. Values or factors for compliance costs, environmental impacts, or monetization of environmental impacts may be

developed and reviewed by the Commission in other proceedings or stakeholder workshops." [27]

CO_2 Prices

Q. What prices did Duke assume in its 2009 IRP for CO_2 emissions?

A. Duke assumed a Base set of CO_2 prices that begins at $24.62 per ton in 2013 and increases to $93.80 per ton in 2030.[28] Duke also assumed a High set of CO_2 prices that are 15 percent above its Base set in each year and a Low set of CO_2 prices that are 15 percent below its Base set.

Q. What was the source of the CO_2 prices that Duke used in its 2009 IRP analyses?

A. In response to a data request, Duke stated that the CO_2 prices that it used in its 2009 IRP analyses were derived from the planning model used by its consultant, ICF International.[29]

Q. Are the CO_2 prices that Duke has used in its 2009 IRP reasonable?

A. In general, yes. However, I believe that Duke should have used a wider range of scenarios than only ± 15 percent around its Base case set of CO_2 prices. It is important and prudent to consider such a wider range of possible CO_2 prices given the uncertainties associated with the timing, stringency and design of federal regulation of greenhouse gas emissions.

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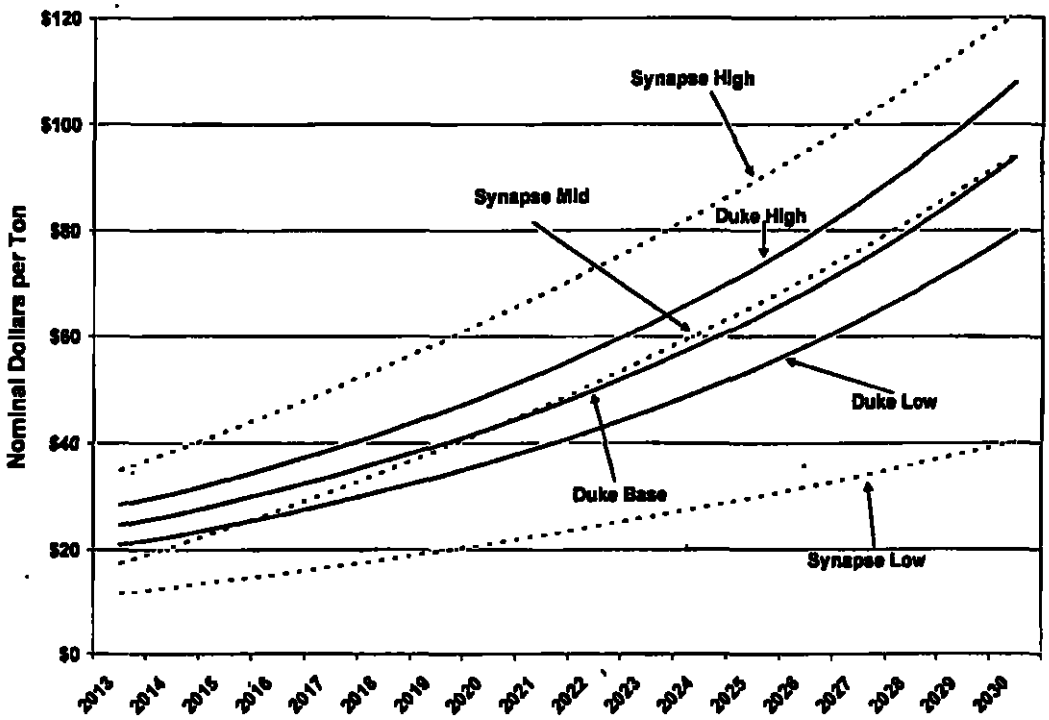
[27] Arizona State Corporation Commission website, available at http://images.edocket.azcc.gov/docketpdf/0000105829.pdf.
[28] Duke Response to SELC Informal Data Request No. 1.
[29] Duke Response to SELC Informal Data Request No. 11.

Figure 3, below, compares the annual CO_2 prices used by Duke in its 2009 IRP analyses with the CO_2 price projections that I helped developed in 2008 when I was with Synapse Energy Economics, Inc.[30]

Figure 3: Duke and Synapse CO_2 Prices in Nominal Dollars



As can be seen in Figure 3, the Duke Base and the Synapse Mid CO_2 price trajectories are very close – in fact, the Duke Base is above the Synapse Mid forecast in the early years. However, the Duke High CO_2 price forecast is significantly lower than the Synapse High forecast and the Duke Low CO_2 price forecast is significantly higher than the Synapse Low forecast. Because they

[30] The derivation of the Synapse CO_2 price forecasts is explained in Exhibit DAS-2.

encompass a wider range of possible future CO_2 prices, the Synapse forecasts allow for greater uncertainty than the Duke forecasts do.

Q. How do the CO_2 prices that Duke used in its 2009 IRP compare to other projections of future CO_2 prices?

A. Figure 4, below, compares the CO_2 emissions prices that Duke used in its 2009 IRP analyses with the current Synapse CO_2 price forecasts and the results of the independent modeling of the legislation that has been introduced in the U.S. Congress in recent years. These modeling analyses include:

- The U.S. Department of Energy's Energy Information Administration's ("EIA") assessment of the *Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007* (July 2007).[31]
- The EIA's October 2007 Supplement to the *Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007.*[32]
- The EIA's assessment of the *Energy Market and Economic Impacts of S. 1766, the Low Carbon Economy Act of 2007* (January 2008).[33]
- The EIA's assessment of the *Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007* (April 2008).[34]
- The EIA's assessment of the *Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009* (August 2009).[35]
- The U.S. Environmental Protection Agency's ("EPA")' *Analysis of the Climate Stewardship and Innovation Act of 2007 – S. 280 in 110th Congress* (July 2007).[36]
- The EPA's *Analysis of the Low Carbon Economy Act of 2007 – S. 1766 in 110th Congress* (January 2008).[37]

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31 Available at http://www.eia.doe.gov/oiaf/servicerpt/csia/pdf/sroiaf(2007)04.pdf.
32 Available at http://www.eia.doe.gov/oiaf/servicerpt/biv/pdf/s280_1007.pdf
33 Available at hup://www.eia.doe.gov/oiaf/servicerpt/lcea/pdf/sroiaf(2007)06.pdf
34 Available at http://www.eia.doe.gov/oiaf/servicerpt/s2191/pdf/sroiaf(2008)01.pdf.
35 Available at http://www.eia.doe.gov/oiaf/servicerpt/hr2454/index.html.
36 Available at http://www.epa.gov/climatechange/economics/economicanalyses.html.

- The EPA's *Analysis of the Lieberman-Warner Climate Security Act of 2008 – S. 2191 in 110th Congress* (March 2008).[38]

- The EPA's *Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress* (June 2009)[39]

- *Assessment of U.S. Cap-and-Trade Proposals* by the Joint Program at the Massachusetts Institute of Technology ("MIT") on the Science and Policy of Global Change (April 2007).[40]

- *Analysis of the Cap and Trade Features of the Lieberman-Warner Climate Security Act – S. 2191* by the Joint Program at MIT on the Science and Policy of Global Change (April 2008).[41]

- *The Lieberman-Warner America's Climate Security Act: A Preliminary Assessment of Potential Economic Impacts*, prepared by the Nicholas Institute for Environmental Policy Solutions, Duke University and RTI International (October 2007)[42]

- *U.S. Technology Choices, Costs and Opportunities under the Lieberman-Warner Climate Security Act: Assessing Compliance Pathways*, prepared by the International Resources Group for the Natural Resources Defense Council (May 2008).[43]

- *The Lieberman-Warner Climate Security Act – S. 2191, Modeling Results from the National Energy Modeling System – Preliminary Results*, Clean Air Task Force (January 2008).[44]

- *Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model*, CRA International, April 2008.[45]

- *Analysis of the Lieberman-Warner Climate Security Act (S. 2191) using the National Energy Modeling System (NEMS/ACCF/NAM)*, a report by

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37 Available at http://www.epa.gov/climatechange/economics/economicanalyses.html.
38 Available at http://www.epa.gov/climatechange/economics/economicanalyses.html.
39 Available at http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf.
40 Available at http://web.mit.edu/globalchange/www/MITJPSPGC_Rpt146.pdf.
41 Available at http://mit.edu/globalchange/www/MITJPSPGC_Rpt146_AppendixD.pdf.
42 Available at http://www.nicholas.duke.edu/institute/econsummary.pdf.
43 Available at http://docs.nrdc.org/globalwarming/glo_08051401A.pdf.
44 Available at http://lieberman.senate.gov/documents/catflwcsa.pdf.
45 Available at http://www.nma.org/pdf/040808_crai_presentation.pdf.

the American Council for Capital Formation and the National Association of Manufacturers, March 2008.[46]

In total, these modeling analyses examined more than 85 different scenarios. These scenarios reflected a wide range of assumptions concerning important inputs such as: the "business-as-usual" emissions forecasts; the reduction targets in each proposal; whether complementary policies such as aggressive investments in energy efficiency and renewable energy are implemented, independent of the emissions allowance market; the policy implementation timeline; program flexibility regarding emissions offsets (perhaps international) and allowance banking; assumptions about technological progress and the cost of alternatives; and the presence or absence of a "safety valve" price.

In Figure 4:

- S.280 refers to the McCain-Lieberman bill introduced in 2007 in the 110th U.S. Congress
- S.1766 refers to the Bingaman-Specter bill introduced in 2007 in the 110th U.S. Congress
- S. 2191 refers to the Lieberman-Warner bill introduced in 2007 in the 110th U.S. Congress
- HR. 2454 refers to the Waxman-Markey bill introduced in 2009 in the current 111th U.S. Congress

[46] Available at http://www.accf.org/pdf/NAM/fullstudy031208.pdf.

Figure 4: Levelized Duke and Synapse 2008 CO_2 Prices Compared to Results of Modeling of Proposed Federal Legislation

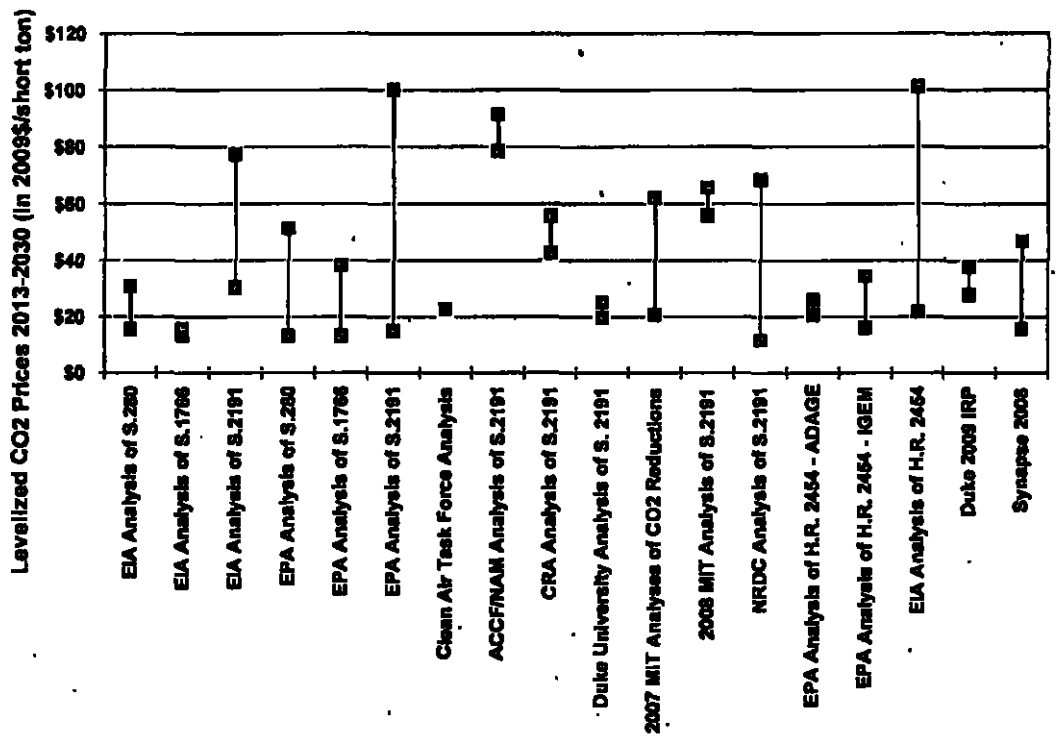

Figure 4 confirms that the range of CO_2 prices used by Duke was too narrow to reflect the potential uncertainties associated with the design and stringency of future federal regulation of greenhouse gas emissions.

Q. Does Figure 4 include the modeling of the recent Waxman-Markey bill that has been passed by the U.S. House of Representatives?

A. Yes. The third through fifth bars from the right in Figure 4 provide the ranges of levelized CO_2 prices from the recent modeling of the Waxman-Markey bill by the EIA and the EPA. However, it is not certain that whatever bill is ultimately passed by the U.S. Congress actually will reflect the terms of that legislation. This is the reason why the results of the modeling of the other legislation that has been introduced in previous U.S. Congresses remain relevant.

Q. What CO_2 prices did Progress use in its 2009 IRP analyses?

A.

Q. Are these CO_2 prices reasonable?

A. No. It is not reasonable to use a of CO_2 prices given the uncertainties associated with the timing, stringency and design of federal regulation of greenhouse gas emissions. Moreover, of CO_2 prices used by Progress in its 2009 IRP analyses is unreasonably for use as even a main or base case.

Q. How do the CO_2 prices used by Progress compare to the CO_2 prices used by Duke in its 2009 IRP analyses and to the Synapse CO_2 price forecasts?

A. As shown in Figure 5, below, the CO_2 prices used by Progress are compared to both the Duke Base CO_2 prices and the Synapse Mid CO_2 price forecast. In fact, as can be seen in Figure 5, of CO_2 prices used by Progress in its 2009 IRP analyses CO_2 prices but are than Duke's Low CO_2 prices after 2020.

Figure 5: Annual Progress, Duke and Synapse CO_2 Prices in Nominal Dollars [CONFIDENTIAL]

Figure 6, below, then compares the CO_2 prices used by Progress in its 2009 IRP analyses with the Duke and Synapse CO_2 prices and the results of the modeling of the legislative proposals that were included in Figure 2 above.

Figure 6: Levelized Progress, Duke and Synapse CO_2 Prices Compared to Results of Modeling of Proposed Federal Legislation [CONFIDENTIAL]

Q. How do the CO_2 prices that Progress used in its 2009 IRP analyses compare *to the CO_2 prices that other utilities and state regulatory commissions are* using in resource planning?

A. As Figures 5 and 6 above show, of CO_2 prices that Progress used in its 2009 IRP analyses compared to the range of CO_2 prices that Duke used in that company's 2009 IRP, as well as the CO_2 prices that Synapse Energy Economics has recommended be used in IRP and other resource planning analyses. Figure 7, below, compares the CO_2 prices that Progress has used with the CO_2 prices that some other utilities and some regulatory commissions have been using in resource planning analyses.

Figure 7: Levelized Progress Energy CO_2 Prices Compared to Prices Used by Other Utilities and State Regulatory Commissions in Resource Planning [CONFIDENTIAL]

Q. What is your recommendation concerning the CO_2 prices that Progress should use in its resource planning analyses?

A. Progress has said that it is currently evaluating numerous possible changes to its resource plan, including additional coal unit retirements, and that it anticipates making decisions on resource options prior to filing its next comprehensive IRP in 2010.[47] The Company should use CO_2 prices in these analyses and should examine a wide range of potential CO_2 prices such as the Synapse Mid, Low and High forecasts presented in Figures 3 and 5, above.

Q. Does this complete your testimony?

A. Yes.

[47] Progress 2009 IRP at page 3.

Q (By Ms. Thompson) Mr. Schlissel, have you prepared a summary of your testimony?

A Yes, I have.

Q Would you please read that summary to the Commission?

A Summary read into the record. I can skip the first paragraph since I've already given that information.

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION
DOCKET NO. E-100, SUB 124

SUMMARY OF DAVID A. SCHLISSEL TESTIMONY ON BEHALF OF ENVIRONMENTAL DEFENSE FUND, THE SIERRA CLUB, SOUTHERN ALLIANCE FOR CLEAN ENERGY AND THE SOUTHERN ENVIRONMENTAL LAW CENTER

Mr. Chairman and members of the Commission, my name is David A. Schlissel. I am President of Schlissel Technical Consulting, Inc. I am testifying today on behalf of Environmental Defense Fund, the Sierra Club, Southern Alliance for Clean Energy and the Southern Environmental Law Center.

The purpose of my testimony today is to assess the 2009 Integrated Resource Plans ("IRP") submitted by Duke Energy Carolinas ("Duke") and Progress Energy Carolinas ("Progress") in several respects. I was asked to focus on the following specific issues: The reasonableness of carbon dioxide ("CO_2") prices used in the IRPs; projected carbon emissions; planned retirements of existing coal units and opportunities for additional retirements; natural gas-fired generation as an alternative to existing coal; and the potential cost of compliance with environmental requirements.

I will summarize my conclusions.

1. Federal climate change regulations and legislation currently under consideration will require significant reductions in the nation's annual CO_2 emissions over the coming decades. Thus, it is important for the owners of fossil-fired generating facilities to develop plans for actually achieving significant reductions in their CO_2 emissions over the coming decades and not just rely on purchasing emissions credits from others. This is especially true for companies like Duke and Progress that are heavily dependent on coal-fired generation. Duke, however, projects that its annual CO_2 emissions will increase between 2010 and 2029 in each of the resource

portfolios that it has presented in the Revised 2009 IRP in spite of its announced plan to retire approximately 1,600 to 1,700 MW of cycling coal units by 2020. Progress has not even attempted to project CO_2 emissions in its IRP analysis, although it is planning to retire a number of older coal units.

2. It is not surprising that Duke's annual CO_2 emissions are projected to increase between 2010 and 2029 because of the planned addition of the Cliffside Unit 6 baseload coal unit. The new Cliffside Unit 6, on its own, can be expected to emit approximately six million tons of CO_2 each year, or more than two million tons more CO_2 than was emitted in 2008 by all of the cycling coal units that Duke discusses retiring.

3. In order to actually reduce its annual CO_2 emissions over the coming decades, Duke will have to reduce its reliance on coal-fired generation by retiring even more coal-fired generating capacity than it has so far proposed to retire. Given that Duke already is planning to add new nuclear units to its resource mix, the alternatives for displacing additional coal units are building more natural gas-fired combined cycle units, adding more renewable resources and adding more energy efficiency than the Company now includes in its resource plans.

4. Although new natural-gas fired combined cycle units will emit some CO_2, the amounts they emit will be significantly less than a comparable amount of coal-fired capacity.

5. Duke would not become unreasonably dependent on natural gas if it added more natural gas-fired combined cycle units to replace additional coal-fired generating capacity. Duke is projecting that its gas-fired units will provide less than 0.4 percent of its needed energy in 2010 and only about 6 percent in 2029. Thus, adding more natural gas-fired combined cycle capacity actually would help diversify Duke's current heavily coal-dependent generating mix. At the same time, new assessments show that there is far more natural gas available in the domestic

United States than was projected even two years ago. This should enhance the value of using natural gas as a bridge fuel to a lower carbon future and should ameliorate future natural gas prices.

6. Duke and Progress should consider the potential costs of EPA regulation of coal combustion wastes in their IRP analyses.

7. The Base case CO_2 prices that Duke used in its 2009 IRP analyses were reasonable. However, given the uncertainties associated with the timing, stringency and design of federal regulation of greenhouse gas emissions, Duke should have looked at a wider range of scenarios than only + 15 percent around that Base case set of CO_2 prices.

8. The CO_2 prices used by Progress in its 2009 IRP analyses are not reasonable compared to the range of CO_2 prices that Duke used in its 2009 IRP and to the CO_2 prices used in resource planning by Synapse Energy Economics, state commissions and other utilities. Progress has said that it is currently evaluating numerous possible changes to its resource plan, including additional coal unit retirements, and that it anticipates making decisions on resource options prior to filing its next comprehensive IRP in 2010. The Company should use a more reasonable range of CO_2 prices in these analyses.

9. Progress has taken a good first step in the direction of meeting likely federal climate change regulations or legislation by announcing the retirement of some of its existing coal-fired units. However, further retirements of coal-fired generation will be needed in the coming years and decades. Like Duke, Progress already is planning to add new nuclear units to its resource mix. Thus the alternatives for displacing additional coal units will be building more natural gas-fired combined cycle units, adding more renewable resources and adding more

energy efficiency than the Company now includes in its resource plans. These alternatives should be fully examined in the new resource analyses that Progress has said it is preparing.

MS. THOMPSON: Mr. Schlissel is available for cross-examination.

COMISSIONER CULPEPPER: Is there any cross-examination by any of the Interveners?

MR. RUNKLE: I've got one question.

CROSS-EXAMINATION BY MR. RUNKLE:

Q Ms. Schlissel, were you here earlier today when Progress Energy Witness Snider corrected his early testimony, and said that the cost for the nuclear unit that they were looking at in the IRP was 5,000 per kilowatt?

A Yes.

Q And also that the second unit would cost 3,000 per kilowatt?

A Yes.

Q Are those reasonable numbers?

A They're lower than other estimates I've seen by other utilities. If it's $5,000 a kilowatt, perhaps in 2006 that might be close. But other utilities are estimating for two units anywhere between 15 and $18 billion for the total installed cost including escalation and financing.

MR. RUNKLE: Thank you very much.

COMISSIONER CULPEPPER: Other cross-examination

questions by Interveners?

(No response.)

Cross-examination by utilities?

CROSS-EXAMINATION BY MR. ANTHONY:

Q Good afternoon. How are you?

A I'm great. How are you.

Q Picking up where you just left off, are you familiar with what SCANA is projecting its nuclear plant is going to cost?

A Yes. It's somewhere in the range of 9 to $11 billion.

Q On a kW basis, about $5,000 a kW?

A I haven't -- we're talking about two units. Eleven billion is correct. But I think the 9 to 11 is just SCANA's share of the two units. You have to check because they are co-owning with Santee Cooper. I haven't looked at the numbers and done the calculation recently, but 9 to 11 billion for two units is way below what other companies are projecting. Even your company, I think, for the plants in Florida it's higher than that.

Q We will come back to that in a moment. The SCANA facility whatever the kW cost is at SCANA is going to be the same as the kW cost at Santee Cooper, the joint owner; right?

A The construction cost is going to be the same. The financing cost will be different because Santee Cooper is a public entity and SCANA is an investor-owned utility.

Q SCANA is filing with the South Carolina Commission numbers that indicate $5,000 a kW.

A I haven't looked at the filing. I will accept that subject to check.

Q You reference the Levee Nuclear plant that Progress Energy Florida was considering. Are you aware that there's well over $3 billion in a transmission embedded in that cost estimate?

A No. I wouldn't be surprised. But I haven't looked at the estimate recently.

Q Have you reviewed Progress Energy Carolina's 2008 biennial resource plan?

A The 2008 plan, not within the last year or so.

Q Are you aware there's an entire section that discusses sensitivity analyses and CO2 low/high medium price scenarios are part of that analysis?

A No. I'm surprised to hear. I asked the company's discovery about these CO2 prices it used in its IRP analyses and I was given the one set of numbers.

Q You said it's been a year since you read our 2008

IRP?

A Yes, at least a year. The discovery I asked and I read the responses to was within the last month.

Q The entity you are appearing here on behalf of today, are they supportive of new nuclear generation?

A I don't know.

Q The higher the CO2 tax and or the higher the cost assumed for coal combustion product disposal is going make nuclear more cost effective --

A Yes. It will improve the relative economics of nuclear as it will make energy efficiency also look more economic and renewable resources.

Q Fundamentally, if I understood your testimony correctly, you're making three points: One is currently natural gas is forecasted -- currently natural gas is forecasted to be much greater availability and more applicable supply than had previously been thought?

A That's correct.

Q Two, as a result of that natural gas prices currently forecasted to be lower over the forecast horizon than had otherwise had been thought?

A That's also correct.

Q Therefore, it's a more attractive supply side resource than may have been the case several years ago.

A Correct.

Q And the utilities should consider that in picking supply-side resources?

A Yes.

Q That is one big category. The second big category is the coal combustion product issued that if the EPA elects to regulate them more strenuously all the way up to being hazardous waste, doesn't that increase the cost of fossil generation operation?

A That's correct.

Q And that should be considered when the utilities are doing their resource plans?

A Correct.

Q And the third was the activity the EPA as well as Congress to potentially regulating, legislating reductions in greenhouse gas emissions, that should be considered more strenuously in the utilities' IRP?

A Correct.

Q That's the thrust of your recommendations to this Commission?

A Yes.

MR. ANTHONY: That's all I have. Thank you.

COMISSIONER CULPEPPER: Cross-examination questions by Dominion?

MR. KAYLOR: No.

Cross-examination questions by Duke?

MS. NICHOLS: Just a couple of questions.

CROSS-EXAMINATION BY MS. NICHOLS:

Q Mr. Schlissel, I believe you appeared before this Commission back in January of 2007 in connection with the Cliffside hearing?

A Yes, I did.

Q And I want to just ask you a couple of questions about your testimony from that proceeding. In that case you were asked if you advocated as a part of your testimony that Duke adopt an all-gas future generation expansion plan. Do you recall that questions?

A No. But I've been asked a lot of questions since then.

Q In that -- Back in January of 2007 your answer was, no. Is that still your testimony?

A Right. I don't think that relying on any one fuel for the future is the way to design an electric system for the short term or for the long term.

Q And you were also asked in that proceeding if you advocate the future development of nuclear power in North Carolina, and your answer in January of 2007 was that you think it should be considered. Is that still your

opinion?

A Yes. I think the US should consider nuclear power as a possible alternative and weigh it as one of the alternatives to be considered.

Q And you've also been testifying in a number of other jurisdictions as well.

A Nice to know someone reads what I write.

Q Back in 2007 before the Ohio Power Siting Board, I believe you testified in connection with opposing an IGCC project that was being proposed --

A No, it's just a super critical --

Q Okay. I'm sorry. And in that case did you indicate that it was important to evaluate the uncertainties and risks associated with other generation alternatives?

A Absolutely. All alternatives.

Q And did you indicate that those risks included building with natural gas fired alternatives such as potential CO2 emissions costs, possible capital costs escalation and fuel price uncertainty and volatility?

A Absolutely.

Q And that would still be your testimony today?

A Absolutely.

Q And you also testified that renewable alternatives

and energy efficiency also have some uncertainties and risks?

A Right.

Q And those would include potential capital costs escalation, contract uncertainty and customer participation uncertainty?

A Right. And it's still my testimony.

Q In that case, I won't go through the other states in which you testified similarly. Thank you.

MS. NICHOLS: No further questions.

COMISSIONER CULPEPPER: Redirect?

MS. THOMPSON: No thank you. No redirect.

COMISSIONER CULPEPPER: Questions by the Commission?

(No response.)

Mr. Schlissel, looks like that will complete your testimony today.

MR. SCHLISSEL: Thank you very much.

COMISSIONER CULPEPPER: It's ten minutes after five.

MR. RUNKLE: As I offered to the Public Staff, if it's any hardship on their witness Floyd, I will waive my cross-examination. But if he's available in the morning, I would like to cross-examine him.

COMISSIONER CULPEPPER: He's going to be available tomorrow morning. So no problem about that.

MR. RUNKLE: If it's a hardship, just let me know.

COMISSIONER CULPEPPER: All right. We are going to adjourn for today. Ms. Thompson, we will handle Mr. Schlissel's exhibits tomorrow as the first item of business. But we are going to adjourn the proceedings for today and reconvene tomorrow morning in the Commission hearing room at 10:00 a.m.

MS. NICHOLS: Mr. Chairman, I would like to ask if the Duke witnesses that are not providing rebuttal testimony can be released, Mr. Smith and Mr. Riddle?

COMISSIONER CULPEPPER: Any objections?

(No response.)

Seeing none, they may be released.

MS. NICHOLS: Thank you.

Whereupon, the hearing was adjourned.

CERTIFICATE

The undersigned Court Reporter certifies that this is the transcription of notes taken by her during this proceeding and that the same is true, accurate and correct.

Sandi Mayer
Court Reporter II