

PLACE: North Carolina Utilities Commission

DATE: Wednesday, September 14, 2022

TIME: 1:51 p.m. - 5:03 p.m.

DOCKET NO.: E-100, Sub 179

BEFORE: Chair Charlotte A. Mitchell, Presiding
Commissioner ToNola D. Brown-Bland
Commissioner Kimberly W. Duffley
Commissioner Daniel G. Clodfelter
Commissioner Jeffrey A. Hughes
Commissioner Floyd B. McKissick, Jr.
Commissioner Karen M. Kemerait

IN THE MATTER OF:

Duke Energy Progress, LLC, and
Duke Energy Carolinas, LLC,
2022 Biennial Integrated Resource Plans
and Carbon Plan

VOLUME 10

1 A P P E A R A N C E S:

2 FOR DUKE ENERGY CAROLINAS, LLC and DUKE ENERGY

3 PROGRESS, LLC:

4 Jack E. Jirak, Esq., Deputy General Counsel

5 Kendrick C. Fentress, Esq., Associate General Counsel

6 Jason A. Higginbotham, Esq., Associate General Counsel

7 Kathleen Hunter-Richard, Esq.

8 Duke Energy Corporation

9 Post Office Box 1551

10 Raleigh, North Carolina, 27602

11
12 Andrea Kells, Esq.

13 E. Brett Breitschwerdt, Esq., Partner

14 Nicholas A. Dantonio, Esq

15 McGuireWoods LLP

16 501 Fayetteville Street, Suite 500

17 Raleigh, North Carolina 27601

18
19 Vishwa B. Link, Esq., Partner

20 McGuireWoods LLP

21 Gateway Plaza

22 800, East Canal Street

23 Richmond, Virginia 23219-3916

A P P E A R A N C E S Cont'd:

Lara S. Nichols, Vice President,
State & Federal Regulatory Legal
Duke Energy Corporation
4720 Piedmont Row Drive
Charlotte, North Carolina 28210

FOR NORTH CAROLINA SUSTAINABLE ENERGY ASSOCIATION:

Taylor Jones, Esq., Regulatory Counsel
4800 Six Forks Road, Suite 300
Raleigh, North Carolina 27609

FOR SOUTHERN ALLIANCE FOR CLEAN ENERGY, NATURAL
RESOURCES DEFENSE COUNCIL, and THE SIERRA CLUB:

Gudrun Thompson, Esq., Senior Attorney
David L. Neal, Esq., Senior Attorney
Nicholas Jimenez, Esquire, Senior Attorney
Southern Environmental Law Center
200 West Rosemary Street, Suite 220
Chapel Hill, North Carolina 27516

1 A P P E A R A N C E S Cont'd:

2 CAROLINA INDUSTRIAL GROUP FOR FAIR UTILITY RATES II

3 AND III:

4 Christine D. Cress, Esq., Partner

5 Douglas E. Conant, Esq., Associates

6 Bailey & Dixon, LLP

7 434 Fayetteville Street, Suite 2500

8 Raleigh, North Carolina 27601

10 FOR CAROLINA UTILITY CUSTOMER ASSOCIATION and

11 FOR TECH CUSTOMERS:

12 Matthew B. Tynan, Esq.

13 Brooks Pierce

14 Post Office 26000

15 Greensboro, North Carolina 27420

17 Craig Schauer, Esq.

18 Brooks Pierce

19 1700 Wells Fargo Capitol Center

20 150 Fayetteville Street

21 Raleigh, North Carolina 27601

A P P E A R A N C E S Cont'd:

FOR CAROLINAS CLEAN ENERGY BUSINESS ASSOCIATION

John D. Burns, Esq., General Counsel

811 Ninth Street, Suite 120-158

Durham, North Carolina 27705

FOR BRAD ROUSE:

Brad Rouse, Pro se

Brad Rouse Consulting

3 Stegall Lane

Asheville, North Carolina 28805

FOR CLEAN POWER SUPPLIERS ASSOCIATION:

Ben Snowden, Esq., Partner

Erin Catlett, Esq., Associate

Jack Taggart, Esq., Associate

Fox Rothschild LLP

434 Fayetteville Street, Suite 2800

Raleigh, North Carolina 27601

1 A P P E A R A N C E S Cont'd:

2 FOR THE ENVIRONMENTAL WORKING GROUP:

3 Andrea C. Bonvecchio, Esq.

4 The Law Offices of F. Bryan Brice, Jr.

5 127 West Hargett Street, Suite 600

6 Raleigh, North Carolina 27601

7

8 Carolina Leary, Esquire

9 1250 I Street Northwest, Suite 1000

10 Washington, DC 20005

11

12 FOR WALMART INC.:

13 Carrie H. Grundmann, Esq., Member:

14 Spilman Thomas & Battle, PLLC

15 110 Oakwood Drive, Suite 500

16 Winston-Salem, North Carolina 27103

17

18 FOR CITY OF CHARLOTTE:

19 Karen Weatherly, Esq., Senior Assistant City Attorney

20 600 East Fourth Street

21 Charlotte, North Carolina 28202

22

23

24

1 A P P E A R A N C E S Cont'd:

2 FOR APPALACHIAN VOICES:

3 Catherine Cralle Jones, Esq.

4 The Law Offices of F. Bryan Brice, Jr.

5 127 West Hargett Street, Suite 600

6 Raleigh, North Carolina 27601

7
8 FOR REDTAILED HAWK COLLECTIVE, ROBESON COUNTY

9 COOPERATIVE FOR SUSTAINABLE DEVELOPMENT, ENVIRONMENTAL

10 JUSTICE COMMUNITY ACTION NETWORK, and DOWN EAST ASH

11 ENVIRONMENTAL AND SOCIAL JUSTICE COALITION:

12 Ethan Blumenthal, Esq.

13 ECB Holdings LLC

14 1624 Nandina Comers Alley

15 Charlotte, North Carolina 28205

16
17 FOR NC WARN and

18 FOR CHARLOTTE-MECKLENBURG NAACP:

19 Matthew D. Quinn, Esq.

20 Lewis & Roberts, PLLC

21 3700 Glenwood Avenue, Suite 410

22 Raleigh, North Carolina 27612

23

24

1 A P P E A R A N C E S Cont'd:

2 FOR BROAD RIVER ENERGY, LLC:

3 Patrick Buffkin, Esq.

4 Buffkin Law Office

5 3520 Apache Drive

6 Raleigh, North Carolina 27609

7

8 FOR KINGFISHER ENERGY HOLDINGS, LLC, and

9 FOR PERSON COUNTY, NORTH CAROLINA:

10 Patrick Buffkin, Esq.

11 Buffkin Law Office

12 3520 Apache Drive

13 Raleigh, North Carolina 27609

14

15 Kurt Olson, Esq.

16 The Law Office of Kurt J. Olson, PLLC

17 Post Office Box 10031

18 Raleigh, North Carolina 27605

19

20 FOR NORTH CAROLINA ELECTRIC MEMBERSHIP CORPORATION:

21 Tim Dodge, Esq., Regulatory Counsel

22 3400 Sumner Boulevard

23 Raleigh, North Carolina 27616

24

1 A P P E A R A N C E S Cont'd:

2 FOR THE CITY OF ASHEVILLE and COUNTY OF BUNCOMBE:

3 Jannice Ashley, Esq., Senior Assistant City Attorney

4 City Attorney's Office

5 70 Court Plaza

6 Asheville, North Carolina 28801

8 Curt Euler, Esq., Senior Attorney II

9 Buncombe County

10 200 College Street, Suite 100

11 Asheville, North Carolina 28801

13 FOR MAREC ACTION:

14 Bruce Burcat, Esq, Executive Director

15 MAREC Action

16 Post Office Box 385

17 Camden, Delaware 19934

19 Kurt J. Olson, Esq.

20 Law Office of Kurt J. Olson, PLLC

21 Post Office Box 10031

22 Raleigh, North Carolina 27605

1 A P P E A R A N C E S Cont'd:
2 FOR TOTALENERGIES RENEWABLES USA, LLC, and
3 FOR CLEAN ENERGY BUYERS ASSOCIATION:
4 Joseph W. Eason, Esq.
5 Nelson, Mullins, Riley & Scarborough LLP
6 4140 Parklake Avenue, Suite 200
7 Raleigh, North Carolina 27612
8
9 Weston Adams, Esquire
10 Nelson, Mullins, Riley & Scarborough LLP
11 1320 Main Street, Suite 1700
12 Columbia, South Carolina 29201
13
14 FOR PORK COUNCIL
15 Kurt J. Olson, Esq.
16 Law Office of Kurt J. Olson, PLLC
17 Post Office Box 10031
18 Raleigh, North Carolina 27605
19
20 FOR COUNCIL OF CHURCHES:
21 James P. Longest, Jr., Esq.
22 Duke University School of Law
23 Box 90360
24 Durham, North Carolina 27708

1 A P P E A R A N C E S Cont'd:

2 FOR AVANGRID RENEWABLES, LLC:

3 Benjamin Smith, Esq.

4 Todd S. Roessler, Esq.

5 Joseph S. Dowdy, Esq.

6 Kilpatrick Townsend & Stockton LLP

7 4208 Six Forks Road, Suite 1400

8 Raleigh, North Carolina 27609

9
10 FOR SEAN LEWIS:

11 Sean Lewis, Pro se

12 640 Firebrick Drive

13 Cary, North Carolina 27519

14
15 FOR THE USING AND CONSUMING PUBLIC, THE STATE, AND ITS
16 CITIZENS:

17 Margaret Force, Esq., Special Deputy Attorney General

18 Tirrill Moore, Esq., Assistant Attorney General

19 North Carolina Department of Justice

20 Post Office Box 629

21 Raleigh, North Carolina 27602

22

23

24

A P P E A R A N C E S Cont'd:

FOR THE USING AND CONSUMING PUBLIC:

Lucy Edmondson, Esq., Chief Counsel

Robert Josey, Esq.

Nadia L. Luhr, Esq.

Anne Keyworth, Esq.

William E.H. Creech, Esq.

William Freeman, Esq.

Public Staff - North Carolina Utilities Commission

4326 Mail Service Center

Raleigh, North Carolina 27699-4300

T A B L E O F C O N T E N T S

E X A M I N A T I O N S

MATTHEW KALEMBA, BOBBY McMURRY,	PAGE
GLEN SNIDER, MICHAEL QUINTO	
Cross Examination By Mr. Rouse.....	18
Cross Examination By Ms. Thompson.....	56
Cross Examination By Mr. Schauer.....	101
Cross Examination By Ms. Grundmann.....	138

E X H I B I T S

IDENTIFIED/ADMITTED

NC WARN Modeling Panel Cross-Examination 16/-

Exhibits 1 through 10

Tech Customers Modeling Panel Direct 115/-

Examination Exhibit-1

Tech Customers Modeling Panel Direct 115/-

Examination Exhibit-2

Tech Customers Modeling Panel Direct 118/-

Examination Exhibit-3

P R O C E E D I N G S

CHAIR MITCHELL: Mr. Rouse, still with
you Mr. Rouse.

MR. QUINN: Mr. Rouse, excuse me. Madam
Chair, I have one quick housekeeping matter. If I
ask Mr. Rouse's permission if it's okay if I
interrupt. I hope it's okay. I have been informed
that I inadvertently failed to move my exhibits
into the record at the conclusion of my
cross-examination. If the Commission believes that
this is a good time. I could do it later, but I
didn't want to miss my opportunity.

CHAIR MITCHELL: Absolutely. Are you
making a motion?

MR. QUINN: I am making a motion to move
NC WARN Modeling Panel Cross-Examination
exhibits one through 10 into the record.

MR. BREITSCHWERDT: No objection.

CHAIR MITCHELL: There being no
objection to your motion, it will be allowed. And
just for clarification, you can move the evidence
in until we adjourn. Typically we'll wait to move
in exhibits until the conclusion of the panel. So
we did it a little bit differently with the

1 previous two parties, so no harm. To the extent
2 anyone else forgets, I'll call for motions at the
3 conclusion of the examination period for this
4 panel.

5 MR. BREITSCHWERDT: Thank you.

6 (NC WARN Modeling Panel

7 Cross-Examination Exhibits one
8 through 10 were moved into the
9 record.)

10 MR. BREITSCHWERDT: Just logistical
11 housekeeping matter, we have our next panel, the
12 Carolina Utility operations panel here. From a
13 logistical standpoint just for -- we've got a
14 number of folks waiting in the wings trying to
15 figure out when to be here. Just curious how much
16 additional time Mr. Rouse estimates he might have
17 and then just planning for the rest of the day.

18 MR. ROUSE: I'm about half through.

19 CHAIR MITCHELL: All right. So we've
20 got Mr. Rouse and then we've got SACE.

21 MS. THOMPSON: And I believe I have
22 estimated about 30 minutes.

23 CHAIR MITCHELL: And 30 is a fair
24 estimate?

Page 17

1 MS. THOMPSON: I will endeavor to get
2 through, but of course it depends upon how fulsome
3 the witnesses' answers are.

4 CHAIR MITCHELL: Okay. All right. Tech
5 Customers, you're indicated for 60, is that
6 accurate?

7 MS. THOMPSON: We're going to aim for
8 45.

9 CHAIR MITCHELL: Okay. Walmart?

10 MS. GRUNDMANN: Chair, I still
11 anticipate 15. I would like to be the W in this
12 list, so just a couple questions at the end.

13 CHAIR MITCHELL: And then we've got --
14 you will not be cleaning up. Person County will be
15 clean-up. Person County, you have how much time?

16 MR. BUFFKIN: For this panel, less than
17 10 minutes.

18 CHAIR MITCHELL: And then we have got
19 Public Staff for 30.

20 MS. LUHR: It will be about 30.

21 CHAIR MITCHELL: That will take us to
22 5:00, I assume, if not beyond, right? And then
23 there's some Commission questions.

24 MR. BREITSCHWERDT: I understand.

Page 18

1 CHAIR MITCHELL: Tomorrow we will be on
2 the record at 9:00 a.m.

3 MR. BREITSCHWERDT: Thank you.

4 MR. JIRAK: Just given that there's a
5 small potential we need to flip one of our panels
6 due to availability, we'll need to evaluate that at
7 the end of the day, where we're at and then --

8 CHAIR MITCHELL: Keep us posted.

9 MR. SNOWDEN: And, Mr. Jirak, would you
10 mind, for notice purposes, tell us which panels you
11 might be flipping?

12 MR. JIRAK: The only one we -- one that
13 got flipped is Grid Edge earlier in the sequence
14 due to witness availability. Not saying that's
15 happening. We'll maybe revisit that at the end of
16 the day, if that's okay with you Chair Mitchell.

17 CHAIR MITCHELL: All right. With that
18 we will resume. Mr. Rouse, go ahead.

19 MR. ROUSE: Thank you. I didn't think I
20 was going to have to deal with unit commitment
21 discussions today.

22 CROSS EXAMINATION BY MR. ROUSE:

23 Q. I just want to follow up on our discussion
24 right at the end. And is it fair to say -- let me try

Page 19

1 to summarize the issue with -- the whole issue of unit
2 commitment, constraining what thermal generators do.

3 Is it fair to say that it leads to curtailment of
4 renewables as a problem?

5 A. (Glen Snider) I could maybe answer and then
6 let Mr. McMurry fill in. Unit commitment it's not just
7 thermal, it's how you commit a battery, whether you
8 choose to charge or discharge. You're looking at
9 forward, do I turn a unit on, do I turn it off, what
10 are its capabilities for ramp and ancillary. It's
11 beyond just ramp. It's ancillaries, your ability to
12 move up and down to follow intermittent load. But yes.
13 So your question is does unit commitment lead to
14 curtailable of renewables?

15 Q. Yes.

16 A. And I think it potentially could, but I
17 wouldn't know if it systemically does that.

18 A. (Bobby McMurry) I mean, I think it would
19 depend on where throughout the planning the rising
20 would be, but it could. But early in the '20s
21 generally we don't see curtailment of much of any
22 resource.

23 Q. Right. But what is it then about unit
24 commitment -- and bear with me -- if I have a renewable

1 resource and it's offsetting fossil fuels or some other
2 dispatchable resource and lowering cost, what is it
3 about the unit commitment setting that causes the
4 renewable to look less advantageous if it's not
5 resulting in curtailment?

6 A. This was not about renewables. The reason to
7 get a portfolio that you can, I think, use for planning
8 purpose, for regulatory purposes -- I mean, the
9 commitment is system wide. I mean, it's -- you're
10 pulling out one resource, exactly what happens to solar
11 of a no commit. You know, it can start up a 1200
12 megawatt call unit in an instant with no commitment.
13 It can shut it down instantly with no commit. I mean
14 -- it's really not just solar. It's all units, you
15 know, that's applicable to that and it impacts
16 expansion plan that is selected by EnCompass. Whether
17 it does more or less solar, I'm not going to speculate
18 on what that might do. But I just know that the plans
19 that we got out, you know, resources would appear when
20 they were not needed. We would take them out, make no
21 other change to the overall plan and it would be less
22 expensive. And so when that's happening -- in every
23 jurisdiction this was happening in a RTO, it was
24 happening in Florida, it was happening in the

Page 21

1 Carolinas. We went back to Anchor and said, you know,
2 we need some, you know, suggestions of what to try, and
3 he says I would try partial commit where partial units
4 could meet the operability requirements of the system
5 when units are selected. And when we did that the
6 resource plans -- you were not over building, you were
7 not selected resources when they were not needed and it
8 was -- it was just a plan that we thought we could use
9 to take to the next step to production cost to see what
10 the best solution is.

11 Q. So is what you're saying then that if you
12 have more accurate unit commitment --

13 A. Have any unit commitment.

14 Q. Have any, which is more accurate than none,
15 then it is a more accurate modeling of the system?

16 A. That's correct.

17 Q. Okay. But you're not saying that it
18 penalizes renewables per se in terms of forcing them to
19 be curtailed, correct?

20 A. I'm not going to answer yes or no to that
21 because I don't know the answer right now. I would
22 have to defer to some of the, you know, experts, some
23 of the -- of my group of what happens with that.

24 Q. Okay. Well, let me just ask you another

Page 22

1 hypothetical. As a vision, imagine in the future where
2 we have hundreds of gigawatts or tens of gigawatts on
3 the Duke system of battery storage, is unit commitment
4 -- I mean, obviously batteries have to be committed,
5 but my understanding of -- let me ask you this. Is it
6 your understanding that batteries are more easily
7 committed and more easily engaged than thermal
8 generators?

9 A. (Glen Snider) I would say they can be ramped
10 faster, brought on much faster and turned off. The
11 issue we're going to have to deal with as an industry
12 with batteries is they are energy limited, right? So
13 these models today have what we call perfect foresight.
14 You'll hear more of that in years to come, I'm sure.
15 But it means you know what's happening in the next six
16 hours. If you have a battery that can run two hours
17 the model is going to put it exactly where it needs to
18 go, that battery. In real life, if that front moves
19 through a little more, a little less slower, clouds
20 come in a little before or after, you don't have the --
21 that battery is now out, right? And so running it
22 another hour, if you had a two-hour battery, it doesn't
23 go to three. So dealing with this perfect foresight is
24 one of the issues where when we look at batteries and

1 the need to enhance our modeling, the industry as a
2 whole with energy-limited resources are saying we need
3 to enhance our modeling techniques around this perfect
4 foresight where that limited energy resource if you're
5 wrong by just a little bit, once you're out, you're out
6 and you need to recharge it. And so that's one of the
7 things, that unit commitment will commit it, but it
8 commits it assuming you know that that's going to
9 happen with actuality. The industry is evolving.
10 These modeling techniques are improving -- again, I
11 think battery is going to play an important role in the
12 Carolinas. Don't disagree with me, Mr. Rouse. But the
13 modeling techniques that were employed by the Synapse
14 team you recommended did not have unit commit on at
15 all, and that is a less accurate as Mr. McMurry stated
16 or less accurate modeling method than -- does not
17 optimize well on the resources.

18 Q. Okay. Okay. So let's turn to the gas again
19 and talk about its role as we get towards 2050. From
20 your -- and you don't need to look at the exhibit, but
21 chapter three, portfolios, page eight and the other
22 portfolio documents show a 2050 situation where -- and
23 I had to read off the chart but-- I didn't have the
24 numbers, but it looked to me like four or five percent

1 gas by the time we get to 2050, that that's -- hydrogen
2 is four or five percent of energy production at that
3 point in time, is that correct?

4 A. Yeah. I think depending on the scenario or
5 the portfolio.

6 A. (Michael Quinto) We're looking at figure
7 three-six from chapter three of the Carbon Plan. It
8 appears that about five percent of the energy mix in
9 2050 is from hydrogen.

10 Q. Okay. And the reason you have this much
11 hydrogen, as we've said, is a reliability question.
12 The system has to be reliable with resources that are
13 like the CTs or gas units that we have today, is that
14 correct?

15 A. I'll let Mr. McMurry also add in here, but
16 the Carbon Plan has identified that a limited number of
17 dispatchable resources in 2050 can significantly reduce
18 the cost of the system. These resources are not just
19 for reliability, they'll also lower cost options that
20 can be used for reliability to maintain the reliability
21 of the system long run through compliance through 2050.

22 Q. And if -- and just a hypothetical. If we had
23 unlimited storage, infinite storage, then we can build
24 a system that didn't use any of the gas or nuclear, we

1 could just build solar and wind out and it would just
2 become an energy problem and assuming if we had -- it
3 would be lovely I suppose, wouldn't it?

4 A. (Glen Snider) Again, hypotheticals, hydrogen
5 in and of itself, most people refer to it as a storage
6 technology. If that storage technology or another
7 storage technology comes in at the right cost, can be
8 cited, utilized on the grid, yes, storage of all forms
9 pumped hydro, chemical, battery, hydrogen will have a
10 significant role in the future to move renewable energy
11 into the hour it's most needed.

12 Q. Okay. And you're mentioning hydrogen, but
13 other forms of storage as well?

14 A. Hydrogen, pumped, compressed air, chemical
15 batteries, new chemistries that are on the horizon,
16 they all could potentially have a role.

17 Q. And you -- would you say you're viewing in
18 the modeling -- because you're talking about a market
19 for hydrogen. So you're talking about spending a
20 certain amount of money to buy hydrogen to run -- and I
21 assume you're talking about grain hydrogen, is that
22 correct?

23 A. That's correct.

24 Q. Okay. And grain hydrogen is one that uses

1 the process of electrolysis, converting water into its
2 constituent elements of hydrogen and oxygen?

3 A. (Michael Quinto) Clean hydrogen is hydrogen
4 that's produced -- a carbon-free resource. So that
5 could be nuclear, that could be renewables, that could
6 be wind. Most typically it's through electrolysis,
7 which uses electricity. So it needs these other
8 sources to produce the electricity to run the
9 electrolysis to create the clean hydrogen.

10 Q. So looking forward to this hydrogen economy,
11 from what you understand about hydrogen, do you think
12 that this is going to be a resource that's produced in
13 the Carolinas or produced elsewhere and imported?

14 A. (Glen Snider) That's something for the
15 market to figure out going forward. I mean, I think
16 there's a lot of discussion now at the federal level of
17 in the IIJA as to where are we going to establish these
18 hydrogen hubs. And I know the Carolinas there's a
19 consortium of end users and producers and I think Duke
20 participates in it. I'm not personally on that team.
21 But it's working on a consortium to say potentially
22 maybe the Carolinas region should be that hydrogen hub
23 and potentially get some of the IIJA funds to kick
24 start that. But it may be piped. It may be developed

1 locally. It may be a combination of both. It's my
2 understanding that that is all potential options as we
3 move over the next few decades.

4 Q. So it's one or the other? It's one or the
5 other or a mix?

6 A. It could be both.

7 Q. Or a combination. So if it's from somewhere
8 else like outside of the state, how is it going to get
9 here?

10 A. (Bobby McMurry) I mean, I'll ask Mr. Quinto.
11 He pulled it up and has the exact site, but in appendix
12 E we addressed some of the very questions that you're
13 asking. You know, we don't -- you know, the pipeline,
14 it really does not exist now to transfer hydrogen long
15 distances. We thought it was pretty interesting when
16 we were developing our plan that we had excess energy,
17 either from nuclear or from renewables near certain
18 parts of the month, every month. More in more months
19 more than others. So we did a calculation using that
20 excess energy to say what if we can make hydrogen with
21 that through electrolysis and when we did that -- I
22 mean, that was kind of part of the rationale for why we
23 said in 2035 or 2040 we could start to having small
24 percentage of our hydrogen, you know, blended with

1 natural gas, and then by '47 we could convert to
2 hydrogen is we had enough excess energy with the
3 resource plan that we brought forth. We don't know
4 what really the plan will be in 2040. This is a plan
5 with known technologies today. It looks like there was
6 enough hydrogen that could be produced to meet the
7 generation requirements of what we had.

8 Q. So I'll address this to you, Mr. McMurry.
9 You envisioned the use of that excess energy from
10 nuclear and from renewables. And there's no excess
11 energy from fossil fuels because it costs to run the
12 plants, right? The excess energy comes from
13 carbon-free, zero -- or low marginal cost resources?

14 A. I mean, fossil plants they can cycle up and
15 down -- the renewables, unless you cut it off -- you
16 can ramp it too, but that's carbon-free energy. That's
17 not being used to get to a zero carbon.

18 Q. But you -- so I guess a corollary question is
19 when you ran your -- well, you didn't include that in
20 your EnCompass modeling. So I assume you didn't give
21 a value to that energy that was curtailed, even though
22 it might possibly be used for hydrogen?

23 A. This would be energy to meet the system
24 needs. So this was as a system needs -- I mean, the

Page 29

1 system -- it's a much different system in the '40s and
2 we have a lot of nuclear and we have a lot of
3 renewables versus -- and so -- they would curtail -- we
4 saw -- we kind of did an either/or. Either let the
5 nuclear curtail or let the renewables curtail and then
6 you could determine how many megawatt hours of
7 curtailment you had or how much energy would be
8 available to make hydrogen. And there's periods of
9 time where you had more energy being produced than what
10 the system needs.

11 A. (Glen Snider) Bobby, if I could just --

12 Q. (Bobby McMurry) Just compared to today, we
13 have more gas generation. They can turn off, they can
14 turn on. You can have a fuel save associated. Go
15 ahead.

16 Q. If you could store it, that would be great,
17 but you could produce hydrogen that's a form of
18 storage?

19 A. Well, when you said an infinite amount of
20 storage, if you could store -- I don't know how many
21 batteries that would require, but that would be -- I
22 assure you, that would not be cost effective.

23 MR. BREITSCHWERDT: Chair Mitchell, if I
24 may, we're getting pretty far afield from the

1 modeling panel. Pretty extensive testimony. I
2 just want to make sure that we're progressing
3 through the line of questioning and to the extent
4 we can continue to move this forward efficiently,
5 that would be helpful.

6 MR. ROUSE: Your Honor, the role of
7 hydrogen in the future energy system is very
8 fundamental to some of the inputs for the value of
9 the gas. And so I think it's very germane that we
10 understand the role of hydrogen and some of the
11 issues that might occur from the use of hydrogen.

12 CHAIR MITCHELL: All right, Mr. Rouse,
13 let's do your best to limit your testimony to the
14 -- to limit your questions to the testimony the
15 gentlemen have provided in this proceeding and
16 remember to stick to questions, please.

17 MR. ROUSE: Okay.

18 CROSS EXAMINATION BY MR. ROUSE:

19 Q. Did you consider in your modeling treating
20 hydrogen the way that you treat batteries given that
21 hydrogen is a form of storage? In other words, where
22 you calculate and you generate the energy required to
23 power the electrolyzers that then provide the hydrogen
24 that then can be burned back into those same combustion

1 turbines that had been converted to gas or you treated
2 it differently? Is that how I understand it?

3 A. (Michael Quinto) We treated hydrogen in the
4 Carbon Plan as a fuel available as a market fuel. We
5 did not do a -- it's called power to gas where you
6 model the production of hydrogen as a storage. You
7 have to specify all sorts of inputs that, you know,
8 weren't within the scope at this time to look at how
9 much does the electrolyzers cost, what's the storage.
10 For the simplicity of the modeling we modeled a
11 hydrogen market that was produced and cost at the cost
12 to produce green hydrogen.

13 Q. Correct. But -- okay. But the fact of the
14 matter is, is it not, that that hydrogen has to use --
15 have some electricity to power the electrolyzers in
16 order to provide the hydrogen and that power, where
17 will it come from if the hydrogen is shipped into the
18 state of North Carolina from somewhere else?

19 A. (Glen Snider) So this is, I think, what Mr.
20 McMurry said. You're economically selecting to meet
21 your carbon reduction a lot of renewables, a lot of
22 nuclear. When you're in that world view you have a lot
23 of hours. You have excess green energy that get
24 curtailed. There is enough of -- calculation Mr.

1 McMurry was talking about was that -- those resources
2 that were already paid for to produce the carbon that
3 you need when they're not curtailed have excess
4 curtailment. There's enough excess curtailed energy
5 that's already economically justified from the periods
6 when they're not to produce enough carbon to get you to
7 your five percent, right? Your hydrogen. Excuse me,
8 to get to the five percent hydrogen that we had in the
9 plan. And so you point out the five percent. I think
10 we have been over this a few times. It's five percent
11 hydrogen. It could be in our ultimate portfolios with
12 Public Staff and other interveners. It could be offset
13 markets. And if neither of those come to fruition,
14 offsets or hydrogen, that five percent would need to be
15 served by something else. I think we can all stipulate
16 to that.

17 Q. Correct. But nevertheless, it is true that
18 if the hydrogen is produced in North Carolina that much
19 likely the power is going to come from the Duke system?

20 A. It would come from the Duke renewables and
21 small modular reactors and nuclear that were added that
22 would otherwise have just been curtailed. So it is
23 no-cost energy because those resources were
24 economically justified knowing that there was a

1 curtailment and for the non-curtailed portion you still
2 built it. Now you have an ability -- rather than a
3 chemical battery you can put that energy into
4 production of hydrogen, which can be stored for much
5 longer periods than a chemical battery.

6 Q. So can I just ask the assumption that you're
7 making here or ask if you have thought about this
8 assumption, which is that electrolyzers -- your
9 assumption seems to be that electrolyzers are
10 inexpensive enough that they can be allowed to cycle
11 and that they don't need to run 24/7, 365 days of the
12 year to be economically viable. Is that your
13 assumption that you're making here?

14 A. (Michael Quinto) The price of clean
15 hydrogen that we assumed does account for the capital
16 price of the electrolyzers. So for that aspect of the
17 cost of the hydrogen that's assumed in the selection of
18 the CCs and CTs on a long-run basis is factored into
19 the modeling.

20 Q. Following up on that. Did you, in that
21 calculation, use a capacity factor for the
22 electrolyzer?

23 A. I don't know what capacity factor was used.

24 A. (Bobby McMurry) The electrolyzer ran when

1 you had excess energy. I mean, the beauty behind -- I
2 thought the beauty. The reason I thought this was
3 pretty interesting is that the electrolyzers could be
4 cited at the generation source. So you could -- it's
5 just a way to say that, you know, if trans -- if
6 transporting hydrogen is 30 years away or 28 years
7 away, transporting hydrogen is not viable, we can
8 produce that fuel for RCTs or CCs and, you know, with
9 excess energy produced on the system. I don't know --
10 that was what we documented in appendix E.

11 Q. It sounds almost like perfect storage. Would
12 you agree?

13 A. No. No, I wouldn't.

14 Q. Okay. Strike that question. Is it not true
15 that there's an efficiency loss when electricity is
16 used to produce the hydrogen?

17 A. You know, as we discussed yesterday when this
18 issue was brought up with hydrogen, I think the
19 efficiency gains for the electrolyzer is currently like
20 70 percent and they're projecting over the next 10
21 years for it to get to 90 percent efficient. That was
22 part of the basis for the, you know, 1.5 dollars per
23 kilogram that we used as a basis for our hydrogen
24 price.

1 Q. And with the -- once it's in the form of
2 hydrogen and there's also an efficiency lost when it's
3 converted back into electricity. So is it not true
4 that you go and you lose -- you have an efficiency loss
5 in converting it into hydrogen and an efficiency loss
6 when you go from hydrogen back to electricity?

7 A. Yes. Every generator has --

8 A. (Glen Snider) Every storage technology, I
9 think, has an efficiency -- chemical, air, pumped, none
10 of them are a hundred percent efficient. We'll agree
11 with you.

12 Q. Compared to battery technology is that less
13 or more efficient roundtrip?

14 A. Batteries are 85 to 90. If you get to 90
15 it's about equivalent.

16 Q. That's just for the electrolyzer it sounds
17 like, not for the production.

18 A. (Bobby McMurry) The CTs are -- and it's
19 combine cycles -- in the 2047 time frame serve a very
20 different role than what a four-hour, eight-hour
21 battery is serving. These generators when you look at
22 their generation on an hourly basis, they might run for
23 several days, especially the combined cycles. Right
24 now there's not another technology that you can store

Page 36

1 that can meet that operability to the system that a gas
2 turbine can do. There may -- like I said, there's a
3 lot of things that can be developed over the next few
4 years but -- but it's a unique -- and it serves about
5 five percent. When we model it in a carbon -- to a
6 zero -- about five percent of our energy is -- you
7 know, is always -- is, you know -- when we model it
8 through our production cost it will run these units
9 about five percent of the year -- five percent of our
10 total generation is about what it equates to.

11 Q. Okay. So do you consider the possibility --
12 and again, I think it does depend on how much excess
13 energy you can have in the system and the things you're
14 mentioning, that -- or do you think it's likely that in
15 some circumstances a better solution than CTs would be
16 with the roundtrip efficiency loss of using hydrogen
17 would be to simply produce the electricity for the grid
18 and -- produce excess electricity for the grid and
19 store some or all of it in batteries which would be
20 more efficient?

21 MR. BREITSCHWERDT: Objection. Chair
22 Mitchell, I would ask for him to restate the
23 question so it's more clear.

24 CHAIR MITCHELL: Mr. Rouse, I'm going to

1 sustain the objection. Restate it. Please restate
2 your question so these gentlemen know what you're
3 asking.

4 CROSS EXAMINATION BY MR. ROUSE:

5 Q. Have you examined the alternative versus
6 using a CT powered by hydrogen of simply producing more
7 electricity instead of producing electricity to put it
8 into hydrogen to use that same electricity to serve the
9 load and then to use some of that in battery format?

10 A. (Bobby McMurry) I would answer yes. I mean,
11 this was economically selected. I mean, we went into
12 how -- you know, we made a case for how hydrogen could
13 be produced with our excess energy. What I kind of
14 cited a couple times. And then we developed a price of
15 what hydrogen would be. And, you know, expansion plan
16 economically selected a hydrogen CT versus additional
17 storage. And it starts really earlier in the '40s.
18 It's just kind of -- we observed -- I have looked at a
19 lot of model runs. You observe it. You get to about
20 2040, 2045, it really starts selecting -- it's these
21 turbine that has hydrogen and it will take the cost and
22 it's really what I think is -- you know, it's making
23 sure that -- the model is selecting resources that can
24 meet our load, the system demand in the most cost

1 effective manner. Like I said, the infinite storage,
2 we found that number of batteries, certainly, but that
3 was not selected economically.

4 A. (Michael Quinto) I will just mention the
5 capacity expansion model had the option to select more
6 storage and more renewables to offset the cost of this.
7 It opted to select, especially in that last time frame
8 of 2040, to continue to select CT on hydrogen fuel. So
9 to that point, the system -- or the capacity expansion
10 model had the option to select more storage and more
11 solar to meet that need, but instead selected the
12 hydrogen fuel CTs.

13 A. (Glen Snider) Above and beyond the 7500
14 megawatts the batteries already selected. So it just
15 becomes -- if you need batteries to run, they're
16 currently four-hour batteries. I need them to run two
17 days. I don't get one battery. I have got to do six
18 per day times two or three days. So the amount of
19 batteries becomes -- it's not one-to-one. You have got
20 to have a tremendous amount of batteries and we already
21 have, you know, a significant amount selected. So
22 you're saying that the answer should be do more
23 batteries above the -- and that's what we're just here
24 -- you know, we fundamentally say the model has

1 selected a lot of batteries, but you need to diversify
2 that. You can't rely totally on batteries. You
3 diversify with hydrogen capable CCs.

4 Q. Would it be fair to say that this whole
5 discussion and your position on this depends upon the
6 assertion that you'll have enough excess energy
7 available in some in those shoulder months to
8 economically produce hydrogen? That's what gives you
9 the price that the energy is -- that you're not
10 bringing on new capacity in order to create the
11 hydrogen?

12 A. (Glen Snider) It's a by-product of going
13 through this energy transition. You have so much
14 renewables, so much nuclear that you will have periods
15 of curtailment even with the storage you have on the
16 system. It falls out of all the model runs we have
17 done.

18 Q. Right. Okay. Trying to see if I can't skip
19 some. So let's turn to the Inflation Reduction Act and
20 your -- and I apologize, if I need to point to a
21 specific page. So let's just go to your general
22 understanding of this. But it's your testimony that
23 you can't be sure what the exact impacts of the
24 Inflation Reduction Act are because of underlying

Page 40

1 capacity constraints and that sort of thing, underlying
2 economic -- other inflation that's going on in the
3 system at the current time?

4 CHAIR MITCHELL: Mr. Rouse, let me hear
5 from Duke's counsel.

6 MR. BREITSCHWERDT: Chair Mitchell, I'd
7 object. To the extent he's going to represent it's
8 the Panel's testimony, he should be pointing to a
9 specific page, line reference. The testimony, if
10 you're asking for -- if counsel is asking for their
11 general position or perspective beyond their
12 testimony, that's a different question.

13 CHAIR MITCHELL: I'll sustain your
14 objection. Mr. Rouse, can you point these
15 gentlemen to a specific page in their testimony to
16 which you're referring?

17 MR. ROUSE: That's not going to be
18 possible for me to do it right here, right now. I
19 certainly could. So we can just skip over that.

20 CHAIR MITCHELL: Okay.

21 CROSS EXAMINATION BY MR. ROUSE:

22 Q. Let me ask you about a couple of the
23 provisions of the Act and what your thought is. There
24 are -- there is a methane fee in the Act. Do you

1 believe that that will increase the price of natural
2 gas?

3 A. (Glen Snider) I cannot say whether it would
4 or not. I know a lot of the gas we're procuring now we
5 seek to procure working through the industry on a
6 methane reduction. So how much methane is upstream and
7 how this would impact it depends on, you know, several
8 factors. But it potentially could, but there's a big
9 push in that industry to reduce methane emissions and
10 if those -- if those are successful it may be a very de
11 minimis fee.

12 Q. Do you understand that those increases --
13 those efforts by the industry will in fact increase the
14 cost of producing natural gas which could lead to price
15 increases?

16 A. I would assume those are baked into the
17 forward curve. Everybody knows those efforts are
18 underway and the market is a pretty sophisticated
19 market. If you look at the price of the 2026/2027 gas
20 you're buying, if there was a systemic underlying
21 reason to believe it was going to be more expensive
22 there would be a free trading arbitrage there and you
23 could get really rich just buying gas today and then
24 counting on it being more expensive in the future.

1 Q. And what's your perspective on the impact of
2 the Inflation Reduction Act on the cost of solar and
3 wind in terms of what you would be facing?

4 A. It's definitely favorable. We've said that.
5 We think it's going to be really good for customers.
6 Those savings would go directly through to customers.
7 Move the ITC from 10 back to 30 percent for a 10-year
8 window, is my understanding. As witness Bowman pointed
9 out it's a several-hundred page act. It's going to
10 have to have private letter rulings. There's lots of
11 nuances still to be determined. There's lots of
12 caveats to where you place it, wages, et cetera.
13 Domestic content. But it's going to be beneficial.
14 And it's a 10-year window right now. Generally, as I
15 understand it, for projects that begin construction
16 pre-2032 we'll be able to bump up their ITC, or in the
17 case of batteries that weren't eligible now are
18 eligible for an ITC and for solar they have added a PTC
19 option. They have also eliminated normalization for
20 utility for solar. So there's several aspects to it
21 for this next decade right now. It's a decade-long
22 piece of legislation that we think are going to be
23 beneficial to -- but it is called the Inflation
24 Reduction Act and there is also inflation, which is

1 what you were alluding to earlier, page reference, that
2 has occurred since we filed the Carbon Plan. So you
3 have inflationary pressures that have increased the
4 cost of batteries, the cost of solar panels, the cost
5 of wind, the cost of gas turbines. Everything has gone
6 up with inflation. That's 101. And this will help to
7 offset that. So my only point was that it's not -- not
8 that it's not beneficial. It's the net impact. Again,
9 taking that holistic view. You can't look at the
10 Inflation Reduction Act in isolation and apply it to
11 the model inputs. You have to say where is the market
12 now for everything subject to inflation, supply
13 constraints, tariffs, international tariffs that are
14 still in existence and how does that increase prices,
15 and then how much will this Inflation Reduction Act
16 help to bring them back down over the next decade. And
17 so the big mistake would to say you simply plug in the
18 IRA into the model without also accounting for the
19 impacts that inflation have had over the last year and
20 may have going into the future. You know, it used to
21 be transitory and then it's somewhat persistent, is it
22 systemic for the next few years. All of that is going
23 to work itself out over time, but that's all I was
24 saying, Mr. Rouse, is you have to net those two against

1 each other. And we'll cover that in rebuttal. I think
2 we have alluded the fact we have done sensitivity
3 analysis on that. We'll have a robust discussion on
4 that, I'm sure, inn rebuttal so I'll try to limit my
5 comments to that for right now.

6 Q. The IRA though it won't improve the -- won't
7 reduce the inflation related to natural gas, is that
8 correct?

9 A. No, it will not provide a CAPEX benefit to
10 the capital-installed capital cost. A couple points
11 though. It does have a lot of investment dollars for
12 hydrogen, which we just had this big debate over that
13 being real or not. And so clearly when we model P5 and
14 six we took hydrogen 100 percent out. And again, it's
15 not an all or nothing, but to say zero hydrogen was a
16 pretty big stretch to say zero hydrogen when you have
17 an IRA that's very pro-hydrogen. And so no, it doesn't
18 impact the CAPEX, the capital costs. But also the
19 capital costs are not as dependent upon foreign import
20 of lithium ion, for example. So I don't have CT, you
21 know, supply chain constraints from the mining of
22 lithium ion in eastern Asia. So they all have to be --
23 again, this has to be looked at holistically, not one
24 by one. But yes, I will agree with you, that the IRA

1 does not give a tax benefit for the capital
2 construction of a gas plant.

3 Q. And with -- little bit off script here, so
4 excuse me. When you were speaking about the inflation
5 as related to gas in the earlier testimony with Mr.
6 Quinn, you talked about -- I think you just mentioned
7 it now. You talked about the forward curve related to
8 a futures market where actually the market is telling
9 us that the current inflation in gas is fleeting, is
10 not a permanent thing, is that correct?

11 A. Yeah, that is correct. I think Public Staff
12 acknowledges that as well.

13 Q. All right. There's not a forward market, is
14 there, to tell you whether the current inflation in
15 batteries or solar equipment or wind equipment is
16 fleeting or not, is there?

17 A. No, there's actually quite a bit of
18 divergence in that. I think we point out in our
19 testimony that certain interveners, actually people
20 developing solar plants in this say that it may be more
21 persistent. Their solar costs are higher than ours in
22 the plant. Not to say that we still wouldn't select
23 solar they selected in theirs. But their solar costs
24 are higher and they're higher longer and they point to

1 a potential risk that they could go up. The study
2 you're referencing starts with a much lower solar cost.
3 It's a study, so it's not sort of supported by people
4 that actually develop projects. It's based on a study
5 and it's lower and it projects it to go down. We're in
6 the middle, right? So we're lower than CPSA. We're
7 higher than Synapse and we're sort of Goldie Locks on
8 the solar, let's say. So there's uncertainty in the
9 industry and participants in the industry certainly do
10 see that there's a range of potential inflationary
11 impact.

12 Q. But you would agree that overall that the IRA
13 helps the comparison of renewables relative to gas in
14 the forecast?

15 A. Yes, on a CAPEX-to-CAPEX basis it will -- the
16 IRA itself does. If inflation for the two resources
17 are equivalent then it would net-net. But if batteries
18 went up 40 percent and CTs went up 20 and I gave a 20
19 percent benefit to the IRA for batteries but not for
20 CTs, net-net I might be in the same place.

21 Q. Right. So I'd like to -- one last question
22 on the IRA. What do you think the IRA will do for
23 electrification?

24 A. I think, you know, there is lots of

Page 47

1 incentives for EVs, for -- there's a lot of benefits in
2 the IRA that will provide benefits for electrification.
3 You know, the effect it will have, I'm sure we're going
4 to get a lot of economists that have varying opinions
5 on that. Part of it is going to be the industry's
6 ability to supply. As we all know, electric vehicles
7 have a long lead time. I currently got on the waiting
8 list for a Lightning and was told it could be three
9 years before I could get an electric truck and that's
10 before the IRA. So now more people want electric
11 trucks, and so how long is it going to take everyone to
12 get it and what's that going to do -- what's that
13 demand going to do to the price of batteries. So the
14 IRA will help from the incentive side, but it's also
15 going to push on the demand side of the equation. When
16 you have a huge demand and limited supply, Economics
17 101 says prices will go up on that and then they will
18 get offset through the tax rebate. But you have a big
19 demand push for electrification.

20 Q. And are you familiar with the impact on
21 electrification that a full decarbonization of the U.S.
22 economy would have? Have you looked at that in your
23 2050 scenario?

24 A. There's a lot of discussion on -- or in the

1 industry on the pace that that will happen and how that
2 might impact the load forecast. So yes, we understand
3 that there is electrification. It will -- as it
4 becomes more known and apparent we bake electric
5 vehicles in now. As I said, you get -- appliance
6 saturation is changing from gas to electric,
7 particularly in industrial processes and heating and
8 cooling. There are a variety of opinions as to the
9 pace at which that total sector will be able to be
10 electrified. But it will have an upward pressure on
11 demand.

12 Q. An upward pressure on demand is what you're
13 saying?

14 A. Electric demand.

15 Q. So I'm going to return just to end my
16 testimony to -- or my cross to this whole issue of -- I
17 think it related to gas and we talked about what the
18 future system would look like and what options there
19 are for ensuring reliability. And as I recall -- is it
20 true basically in the modeling that you ensure
21 reliability through three mechanisms, combustion
22 turbines using gas or hydrogen, batteries, and pumped
23 hydro?

24 A. No, that's not correct.

1 Q. What other options are there?

2 A. Wind has some positive ELCC benefits as well.
3 So we give the equivalent capacity value of wind. We
4 give -- there's a small amount. It's single digit
5 percentage, but we give a small amount of equivalent
6 capacity value to solar in that. You have SMRs that --
7 and existing nuclear plus new SMRs that will provide
8 reliability. You have battery storage, pump storage
9 that will provide. And you have gas units that can be
10 converted to hydrogen or, as we said, if the
11 marketplace 20 or 30 years from now is not evolved
12 enough in hydrogen or other storage technologies you
13 may have an offset market develop where you're --
14 again, we showed that graph many times, declining --
15 you have that limited, limited amount of fossil burn
16 that's really de minimus in the grand scheme of things
17 that is just there as a reliability. And then you have
18 an active offset market that could evolve if other
19 technologies are deemed too expensive relative to the
20 ability to offset the carbon through future offset
21 markets. And that's going to evolve over the next
22 couple of decades. Nobody knows which path the
23 industry may go two to three decades from now, but we
24 have shown the impacts of both.

1 Q. Would you say that you're modeling and that
2 one of the options -- let's just say one of the options
3 to resolving the reliability issue is in fact to build
4 more wind and solar?

5 A. Again, that would be dependent upon --
6 there's a lot of wind and solar in our plan, right?
7 And so the more you add -- as I'm sure you're aware,
8 the more you add of a given resource, the less it's
9 worth, right? So the first tranche of solar helped us
10 avoid summer capacity. It had more value than that
11 next tranche from a capacity. Now future solar is a
12 carbon-free energy but has virtually no reliability
13 assistance without storage, right, because we -- our
14 peak demand needs are no longer when the sun is
15 shining. It's in other hours. And then there's going
16 to be energy deficiency needs as well. So we have a
17 lot of wind and solar in our plan. They have a
18 declining value like any other resource. CTs, CCs have
19 declining value. And so that's the beauty of having a
20 diversified resource mix. As one starts to decline and
21 get to a point of very diminished returns, you have
22 other resources to fill in. So can you keep going
23 after diminishing returns to infinity? Yes, Mr. Rouse,
24 you could.

1 Q. And -- I'm sorry.

2 A. (Michael Quinto) I'll add to that. The
3 Commission may want to look at page -- chapter three,
4 page 23. The question of continuing to add renewable
5 resources to the system, you can see here, this is a
6 figure -- and I'll allow the Commission to turn to that
7 page. But what's being represented here is a net load
8 shape net solar. So as we continue to add renewable
9 resources that typically show up during the same time
10 of the day -- sorry, chapter three, page 23, figure
11 3-14. As you continue to add these resources you're
12 going to need flexible resources, which I think Mr.
13 Rouse was pointing to in batteries, pump storage or
14 potentially CTs. Now, CTs have the unique ability to
15 be able to run for short durations of time to help you
16 with higher penetrations of renewables to meet these
17 steep ramps as we get to higher penetrations of
18 renewables. But they also have the capability of
19 running those long durations as needed in extreme
20 weather events. So that's one of the many benefits on
21 a reliability side to a dispatchable resource, to a
22 energy-limited resource. And I think this figure here
23 presents the challenge that we're going to see with
24 more and more renewables on the system and moving

1 energy throughout time.

2 Q. Although, just a corollary to that, if you
3 had enough renewables on the system, your problem is
4 really simply how much to curtail to serve the load, is
5 that correct, for many of those hours?

6 A. Certainly. You're paying the same capital
7 price for less utilization of those resources.

8 Q. But if it's cheap enough then that still
9 might be an alternative that would be selected, is that
10 correct?

11 A. And the model has the option to do that. It
12 can continue to select resources and choose to curtail
13 them, but as cost effectiveness goes down, as Mr.
14 Snider said, the more you add to the system, the less
15 valuable they are to the system. And that's why solar
16 isn't selected every year throughout the planning and
17 more and more is added to the system. It's less cost
18 effective.

19 Q. In your testimony earlier you were talking
20 about the wind energy -- I mean, the fact that you
21 might have an energy deficit in some years and that
22 that was a problem -- or in some months and that that
23 was a problem. An energy deficit as opposed to a
24 capacity deficit. And particularly would building more

1 wind, especially in the winter, which I think is where
2 we see those energy deficits, would that be something
3 that you could do, add more wind to the mix versus
4 solar?

5 A. (Bobby McMurry) Could you refer to the page?

6 Q. I don't have that.

7 A. I think it's addressed in rebuttal. Because
8 of some of the energy deficits that we saw in the late
9 '40s we continued to investigate that, and in P5 and in
10 P6 we found that there was some outage-related issues,
11 a bug in the model that we worked on and we fixed that.
12 That's addressed in rebuttal. I just want to make sure
13 that we -- we didn't like to have periods of when
14 energy wasn't served.

15 Q. In terms of addressing this reliability
16 though, isn't one of the big problems not so much the
17 reliability -- as you get further on, not so much the
18 reliability of the units themselves, but the
19 intermittency of the load that they're having to serve?

20 A. (Glen Snider) Intermittency of the resource,
21 right?

22 Q. The intermittency of the resource and the
23 variability of the load. Yes, the intermittency of the
24 resource.

1 A. And, you know, theoretically you could add an
2 infinite amount of renewables and yes, you would be
3 reliable. The question is how much -- is that even
4 closer or reasonably economic and we're saying it's
5 not. You need storage and then even with storage you
6 need long-duration storage and then even with
7 long-duration storage you need multi-day storage.
8 Storage has diminishing returns, wind has diminishing
9 returns, solar. If there was an infinite amount for
10 free, at night when the moon is out I get a half a
11 percent or something out of my solar, I mean I could
12 build infinite solar and serve my nighttime hours. I
13 mean, I'm not trying to be too ludicrous here, but
14 where do you stop, right? You're balancing economics
15 and reliability and affordability and yes, I will agree
16 with you, Mr. Rouse, at an infinite level you could
17 have a reliable worth. We have done the modeling to
18 say what we believe the appropriate mix is.

19 Q. Okay. Another option --

20 CHAIR MITCHELL: All right. Mr. Rouse,
21 we are about an hour beyond your projected 30
22 minutes of cross-examination time for the panel.

23 MR. ROUSE: And I'm almost finished.

24 CHAIR MITCHELL: All right. I'll extend

1 you a few more questions to wrap up your
2 cross-examination of this panel so that we can keep
3 moving today. Thank you.

4 CROSS EXAMINATION BY MR. ROUSE:

5 Q. Okay. So I found one thing interesting in
6 your testimony on page 73 of your testimony. You were
7 talking about a scenario that you did --

8 A. (Bobby McMurry) Wait just a second. Get to
9 the page. Okay. I'm there.

10 Q. Sensitivity that you did where you looked at
11 lower amounts of energy efficiency programs. Is that
12 --

13 A. (Glen Snider) Yes.

14 Q. Okay. And that that affected the results
15 more in the summer than in the winter or -- let's see.
16 That the lower efficiency is -- okay. I'm going to
17 skip that question because I'm not making sense of it
18 myself.

19 MR. ROUSE: I think that ends my
20 testimony -- or my cross-examination.

21 CHAIR MITCHELL: All right. Next up,
22 SACE.

23 MS. THOMPSON: Thank you, Chair
24 Mitchell.

1 CROSS EXAMINATION BY MS. THOMPSON:

2 Q. Good afternoon, gentlemen. Gudrun Thompson,
3 representing Natural Resources Defense Council,
4 Southern Alliance for Clean Energy and the Sierra Club,
5 collectively known as SACE, et al.

6 I'm going to pick up with -- see if you
7 remember just before the lunch recess some questions
8 from Mr. Rouse about the SERVVM analysis of intervenor
9 portfolios. Do you all recall that?

10 A. (Glen Snider) Yes.

11 Q. And you recall -- well, from your testimony.
12 And you recall that the Synapse optimized portfolio
13 showed a capacity shortfall in 2035 when you ran it
14 through your SERVVM model, did it not?

15 A. Correct.

16 Q. And you'll recall yesterday -- I believe
17 y'all were here in the hearing room yesterday when Ms.
18 Bowman was testifying, were you not?

19 A. We were.

20 Q. And you'll recall that Ms. Bowman testified
21 yesterday that Duke's focus in this proceeding is
22 really on the near-term action plan and that Duke is
23 not asking the Commission to approve any of its
24 proposed portfolios that it has put forward at this

1 time, correct?

2 A. I do.

3 Q. Okay. And you've also mentioned several
4 times, I believe, the check and the adjust concept that
5 Duke is taking. Do you recall that?

6 A. I do.

7 Q. Would you agree that the Carbon Plan is an
8 iterative -- or the Carbon Planning process is an
9 iterative process. So there will be a new plan in
10 2024, correct?

11 A. Correct.

12 Q. And I believe you have even alluded to or
13 implied that the Company will be doing some IRA-related
14 modeling in 2023 for purposes of Carbon Planning, is
15 that right?

16 A. Yes.

17 Q. So here we are in 2022, and if there's a
18 projected capacity shortfall in any portfolio that is
19 before the Commission at this time, there will be time
20 to check and adjust in one of these future Carbon Plan
21 proceedings, will there not?

22 A. Yes, I think there will be time to check and
23 adjust. You may be adding -- what you invest in today
24 contributes to reliability in the future, right? And

Page 58

1 so if there's more optimal reliability mixed today, you
2 would have to add additional resources beyond maybe
3 what was optimal in that check and adjust. So I
4 believe, you know, you have to consider what your
5 investments in your near-term action plan does to
6 fundamentally support reliability and then whether you
7 believe those are adequate or, you know, will you have
8 to check and adjust. But if you find yourself in short
9 reliability yes, you would check and adjust and build
10 more resources.

11 Q. Okay. That's right. We'll talk a little bit
12 about that whole process and what goes into selecting
13 the resource mix. I'm going to shift gears and ask you
14 some questions, Mr. Quinto. You provided direction and
15 support for IRP and Carbon Plan modeling in your
16 current position, is that right?

17 A. (Michael Quinto) That's correct.

18 Q. And you did not actually perform the modeling
19 for Duke's proposed portfolios in this docket, but you
20 were involved in overseeing it?

21 A. Yes. With the direction of Glen, the
22 director of the group. I also previously ran
23 production cost and capacity expansion models in a
24 previous role.

1 Q. So you have experience running production
2 cost and capacity expansion models prior to Duke
3 starting to use EnCompass?

4 A. Yes, that's correct.

5 Q. Okay. Now, the proposal filed on May 16th
6 was the first time -- or the first plan that Duke has
7 filed with this Commission that it used EnCompass to
8 develop, correct?

9 A. (Glen Snider) That's correct. This is our
10 first filing using EnCompass.

11 Q. That's what I was trying to say. Thank you.
12 We went over this just a minute ago, but just to
13 clarify or confirm, Duke is requesting that the
14 Commission approve its proposed portfolios as
15 reasonable for planning purposes, and also to approve a
16 set of near-term actions based on those portfolios,
17 right?

18 A. Correct.

19 Q. Now, you mentioned some technical issues in
20 your testimony that interveners encountered in working
21 with the EnCompass files that Duke produced to
22 interveners. Do you recall that?

23 A. (Michael Quinto) That is in our testimony,
24 yes.

1 Q. And you mentioned that an update to a
2 different version of EnCompass that you used for
3 modeling the supplemental portfolios addressed some of
4 those issues?

5 A. That's correct.

6 Q. Modeling of the supplemental portfolios was
7 done after the parties -- the interveners and other
8 parties filed their initial comments and reports in
9 mid-July, right?

10 A. I believe that's the correct timeline, yes.

11 Q. So it was done between mid-July and August
12 19th when you all filed your direct testimony?

13 A. That sounds correct.

14 Q. Now, going back to the May/June time frame,
15 no intervening party with an EnCompass license was able
16 to take the EnCompass input files that Duke provided to
17 interveners on May 16th and produce the same outputs
18 that Duke's modeling produced, isn't that right?

19 A. That's correct. And I'll defer to Mr.
20 McMurry, I think, if you're coming down a line of
21 questioning dealing with the passing of the model
22 inputs and assumptions.

23 Q. That's fine. So, Mr. McMurry, I'll direct my
24 next question to you. So when the parties, interveners

1 and other non-Duke parties first attempted to run the
2 input files provided by Duke, the EnCompass software
3 would not complete the model runs at all and produced
4 an error message, isn't that right?

5 A. (Bobby McMurry) I don't know that it
6 produced an error message. It might not have matched
7 the model outputs that was also provided that supported
8 P1 through four. When this was brought to our
9 attention we scheduled a meeting and we shared with all
10 of the -- everybody that's -- had a technical 30-minute
11 meeting or an hour meeting with everyone that showed
12 what you would need to do to the inputs provided to
13 match our outputs of P1 through four -- to provide just
14 a little bit of context of this is running up to the
15 filing of the IRP, we found a bug in the model of which
16 it underestimated the cost of wind, solar, and
17 batteries. Only in the selection of those resources.
18 All of our economics after that was deemed correct.
19 When this was found we found a workaround to shift some
20 of the cost -- working in conjunction with Anchor
21 Power. And we found we made -- this is not
22 unparalleled. We sometimes find minor issues in a lot
23 of our filings. We'll make the corrections. We will
24 run the model to see if it has measurable impact to our

1 plans. We did that. It did not have a measurable
2 impact. I know we responded to a data request. We
3 showed the exact change in -- on P1 through four of
4 when we included the right capital cost for those
5 technologies. So when we filed our plan, we filed our
6 model with that correction already in it. And
7 within -- you know, brought to us -- so that if they
8 ran their model -- you know, when the intervene -- or
9 the people that wanted to use our input data, when they
10 ran it, it would be the correct -- it would have the
11 correct data in there and provide you results that you
12 could -- that would -- you know, with the right -- that
13 plan was developed with the right cost. I'll just
14 pause too, we have been very forthcoming through this
15 whole process, the stakeholder process, multiple
16 technical meetings with -- you know, with inputs that
17 we were providing in our model. We had a premeeting to
18 show the people it was going to -- had the ability to
19 run our models, how to have access to the data mark, I
20 think it was called, and how to log onto -- to select
21 that data. After we filed we had another meeting with
22 everybody that was going to run these models and showed
23 them exactly how to get into the site and run the
24 model. After that, like you brought up, people were

1 not able to match our outputs and we responded by
2 having another meeting with the folks and we showed
3 them how to take -- it was pretty easy change. It was
4 one change in the model and then they would have the
5 exact data set that they could match P1 through four.
6 Subsequent models you needed to add that data. Might
7 have been more words than I meant, but there's the
8 story.

9 Q. And you have anticipated -- with your
10 narrative you have anticipated a few of my questions.
11 Let me back up just a little bit. So before Duke
12 produced the EnCompass modeling files to interveners
13 around -- I think it was May 16th, you didn't conduct
14 any kind of test runs on those input files running them
15 through the model before producing them to Public Staff
16 and interveners to make sure the input files were going
17 to produce the same outputs that your own modeling
18 produced?

19 A. What was provided -- no, we did not take that
20 step.

21 Q. Okay. And then even after you addressed some
22 of the technical issues with the EnCompass files
23 through the meetings that you just described and other
24 communications back and forth, you're aware that

1 parties using EnCompass still were not able to use the
2 inputs provided by Duke to produce -- to replicate the
3 same outputs as Duke. You're aware of that, correct?

4 A. I was not aware that they could not take our
5 inputs with the correction and make the model runs to
6 have -- I know that a couple of runs -- I mean, there
7 was a whole lot of runs that was made to produce, you
8 know, P1 through four. There was one or two runs that
9 was made that was brought to our attention, the data
10 point request that we have looked at and it's pretty
11 close, but it did not match exactly our outputs. But I
12 have not heard that everyone -- that was only like two
13 data requests we received responses.

14 Q. I guess I'll ask the -- if anybody else on
15 the panel is aware that the technical issues that NCSEA
16 and SACE's consultants Synapse also encountered by
17 other consultants, including consultants Tech
18 Customers, are you aware of that? Not aware of that?
19 Are you aware that some of these same problems were
20 encountered by the Public Staff as described in some of
21 their filings?

22 A. I mean, he were forthcoming. We produced
23 these files. We set up a developmental server so that
24 we could use the exact files that was put on the -- you

1 know, that we put on the data mark and we've reproduced
2 our results. With the exception of the couple that we
3 received daily requests.

4 Q. Okay. It sounds like the panel --

5 A. You know, there might have been technical
6 issues with the model that you could work with the
7 vendor. Duke did everything they could to provide the
8 parties so that they could take our model, perform
9 their own model and with the subsequent minimum
10 reproduce our results.

11 Q. Well, I understood that the whole modeling
12 team worked very hard and has been very forthcoming
13 with information, but it sounds like you were not aware
14 that no party using EnCompass to perform alternative
15 modeling was able to replicate the modeling that Duke
16 used to developed its proposed portfolios that you're
17 asking the Commission to approve as reasonable and that
18 formed the basis of your short-term action plan?

19 A. (Glen Snider) If I could add, you know, it's
20 not like an Excel spreadsheet. This is a very complex
21 model with thousands of input. Thousands and
22 thousands. We have a lot of that discussion -- we did
23 our very best -- I mean, I have been doing this a long
24 time. We posted every model input at the time of the

Page 66

1 filing. We didn't make them ask for it in discovery.
2 We volunteered to say we'll have all of these
3 modelings -- it had to go up to a special server. You
4 couldn't just put it on the web. It was very data
5 intensive. We put it out there. We held technical
6 conferences on how to use it. There were some small
7 differences, but there was also a lot of learning
8 curves from the interveners. These are interveners
9 that have not done EnCompass molding themselves a lot.
10 They did not have the number of servers we had. So to
11 replicate that we had a team working tirelessly using
12 multiple servers and have dozens of years of
13 experience. And so when you get new modelers that
14 don't have the same resources, you can work with them
15 tremendously to get them close and maybe they couldn't
16 exactly replicate our model, but part of that is they
17 didn't have the same resources. It's not plug-in play
18 like hit go or F9. You have to be -- you know, these
19 are complex program models that -- and I'm not saying
20 -- there's some really good people and they tried
21 really hard, but they didn't have the same resources,
22 they didn't have the same server bases. So to say it
23 was the Companies', you know, lack of transparency or
24 our -- you know, if they were unable to do it, we made

Page 67

1 every effort to help train them up. I know they worked
2 -- they told us in some of -- that they were working
3 with the vendor to try and understand this model better
4 and set up the model correctly so they could repeat
5 them. But this is not a simple task of replicating
6 these results the way it might sound if you thought you
7 were just giving them an Excel spreadsheet. So Mr.
8 McMurry stated we had several meetings. We answered
9 1500 data requests on this. We had a 110-page
10 technical appendices to help explain our approach. And
11 so I think we went above and beyond. If they didn't
12 get exactly there to the last jot and tittle, I think
13 many of them were able to get pretty close to our
14 results.

15 Q. Now, wouldn't you agree though that it's
16 important to be able to validate modeling results, you
17 know, produced by any party? And I think you all did
18 some of that in sort of reanalyzing some of the
19 intervenor portfolios as well, correct?

20 A. Yeah, I think you need to have ability and I
21 thought -- as I just stated, I think -- well, maybe not
22 the exact, exact. It got very close to our results and
23 then they changed inputs to run their own models.
24 That's what we desired. We really wanted to make this

Page 68

1 not about the model, but here's the model, here's our
2 inputs. Where do you disagree with our inputs. Let's
3 bring that before the Commission. You know, some are
4 saying the lower load forecast. Some higher. I think
5 cost should be lower for renewables, higher for gas.
6 Let's focus on that and not have it on a complex
7 program modeling. So we did everything in our power
8 to make that not an issue and I think they got close.
9 They may not have got exact, but you can ask Public
10 Staff whether or not they felt they were reasonably
11 close to replicating our results. And also recognizing
12 that replicating those results meaning you need the
13 same resources, the same number of servers, the same
14 number of modelers to QA it, to check it. And so it
15 may not all be on the Companies' end that they weren't
16 able to replicate it. Some of it may be they did not
17 have adequate resources. And again, no slam at
18 anybody. Everybody was working hard in this case. But
19 this isn't a one way street to replicating results. It
20 takes both sides.

21 Q. I think you anticipated where I'm going with
22 talking a little bit about some of the disagreements
23 about inputs. I think we would spend another, you
24 know, six hours here if we got into every single one.

1 But in addition to updating the version of EnCompass
2 that you had used to develop the original portfolios
3 filed with the Commission on May 16th, for the
4 supplemental portfolios you mentioned in the testimony
5 some other changes that you made in developing those
6 supplemental portfolios, right?

7 A. (Michael Quinto) That's correct.

8 Q. Did you or did you not separately apply those
9 changes to portfolios one through four without the
10 other changed inputs that went into supplemental
11 portfolios five and six?

12 A. I had some trouble following that question.
13 Can you rephrase?

14 Q. You didn't go back and redo portfolios one
15 through four with some of those additional changes
16 other than the ones that you put into the new five and
17 six?

18 A. No. And this is a very important distinction
19 for the Commission. So the supplemental portfolios
20 that we conducted as part of the -- included with our
21 testimony, the supplemental portfolio analysis at the
22 request of Public Staff, there were a number of input
23 modeling changes, approaches to different techniques
24 that the companies didn't necessarily agree with. We

Page 70

1 thought that the inputs and assumptions that we used
2 were reasonable and appropriate for the development of
3 this plan. We underwent this supplemental portfolio
4 analysis to further validate if you changed some of
5 these inputs that interveners thought could be
6 impactful or key to the long-term planning of the
7 system and impactful to the near-term actions, would
8 those changes still result in similar near-term actions
9 as proposed by the companies. And I believe that's
10 really what the supplemental portfolio analysis was
11 endeavoring. Not saying the portfolios that we
12 presented in the original Carbon Plan were
13 inappropriate or not accurate in some way, but this
14 further validates the near-term actions that we
15 presented in the Carbon Plan.

16 Q. Are you saying the purpose of performing the
17 supplemental modeling analysis for portfolios five and
18 six, the purpose of that was to validate your near-term
19 action plan or was the purpose to work with Public
20 Staff to make some changes that they recommended and
21 then see what the results were?

22 A. (Glen Snider) If I could take a shot. I
23 think even Public Staff -- it was to test the
24 robustness. We have a request for relief for a

Page 71

1 near-term action plan that's outlined in Ms. Bowman's
2 testimony. It's outlined in the executive summary.
3 And the stresses on things like no hydrogen, on
4 changing and gas supply were done and even the Public
5 Staff, as we have discussed it, the desire for this was
6 to test the robustness of the need for those resources.
7 They're in that near-term action plan that we're asking
8 this Commission relief for. If I change these
9 assumptions, take hydrogen out, change your source of
10 gas supply, do a couple other things within the model
11 and then tell me, do I get substantially different
12 results so I can know how robust your near-term action
13 plan is. It wasn't to say that that is our preferred
14 plan or five or six, you know, like, we don't believe
15 that zero hydrogen is something we should use as a core
16 planning assumption, but as a reasonable test to test
17 the robustness of your near-term action plan we agreed
18 to take all hydrogen out. We don't agree that relying
19 on some access to Appalachian gas is a good core
20 planning assumption at this moment in time, but if you
21 wanted to test the robustness of our near-term action
22 plan, we'll pull it out and test a different source of
23 gas supply. And we -- in our endeavors with Public
24 Staff and other interveners we did supplemental

1 modeling to test that robustness and what we discovered
2 was at the outcome of that model is it did not have a
3 material impact even with some of these changes on our
4 near-term action plan. So the intent of those
5 portfolio runs were to test those assumptions and the
6 impact that they may have and that is the purpose of P5
7 and P6.

8 Q. All right. We'll come back to the schedule
9 of capacity additions produced by supplemental
10 portfolios five and six in a bit. Just continuing a
11 little bit on the supplemental portfolio results, in
12 the higher connection sensitivity, the capacity
13 expansion model selected solar up to the limit for five
14 of the first six years solar was made available to the
15 model, did it not?

16 A. (Matthew Kalembo) It did.

17 Q. I believe there was some testimony to this
18 effect yesterday, that that shows that solar was an
19 economic resource, the fact that the model selected it,
20 right?

21 A. Well, it was an economic resource if you
22 could achieve those interconnection constraints. Yes,
23 we discussed that yesterday.

24 Q. And if those interconnection constraints were

1 eased, the model would likely select more solar if that
2 limit were raised further, would it not?

3 A. If that single limit was raised further it
4 would have selected. We also didn't increase the
5 interconnection costs to be able to achieve that even
6 if we could figure out what that cost would be to be
7 able to connect 1500 in 2026 and 2027. I'm not sure we
8 would actually be able to know that today.

9 Q. Fair enough. Now, Mr. Snider, following up
10 on a response you gave to Mr. Snowden in some questions
11 yesterday, you said something to the effect that you
12 don't know where independent power producer solar
13 projects are going to be sited, where they're going to
14 be sited on the grid. Do you recall something to that
15 effect?

16 A. (Glen Snider) Yeah, something to that
17 effect.

18 Q. Now, Duke could provide solar developers with
19 more information and greater transparency to help them
20 decide where to locate whether on the transmission or
21 distribution grid to avoid congestion and provide
22 maximum benefits?

23 A. Yeah, within limits. I think there's all
24 sorts of issues, but I think we have endeavored and Mr.

Page 74

1 Roberts -- maybe a good question for Mr. Roberts. We
2 provided sort of red zones, green zones in the past
3 giving indications of where congestion is higher or
4 less and there's a balance on how much specificity you
5 can give in a moment's time. But we have given general
6 guidance on that, it's my understanding. I'm not the
7 expert so I would maybe differ a little bit of that to
8 Mr. Roberts. But I know we have produced some of that
9 guidance historically.

10 Q. All right. I'll follow up with Mr. Roberts
11 or perhaps my colleague will. Again, following up on
12 another exchange from yesterday. You, in answering
13 some questions from Mr. Burns about the way that solar
14 plus storage was modelled, and the fact that Duke had
15 done some modeling with a fixed dispatch curve,
16 essentially that was done to simplify the modeling
17 process and shorten the run times, correct?

18 A. Fair characterization at that point in time,
19 P1 through four.

20 Q. Okay. Let me ask, how much longer does it
21 take the model to solve, if that's the right word, when
22 you're modeling a dynamic dispatch versus the fix
23 dispatch curve?

24 A. (Bobby McMurry) It increased. I think I

1 mentioned three hours before is when we included the
2 partial commit. But it increased to an average runtime
3 of about nine hours. We did have several runs that
4 went 24 and one finally stopped at 48. We just let it
5 keep on running to see if it ever was going to solve,
6 but it finally did. But we -- like any modeling
7 exercise you go through, you do it more than once and
8 that was pretty much replicated. We had a couple runs
9 that went extremely long and the runtimes increased by
10 approximately a factor of three.

11 Q. Now, moving on to what you all called, I
12 think, the portfolio verification step. After the
13 capacity expansion modeling the companies performed
14 additional modeling, production cost modeling and
15 some other steps that you referred to as portfolio
16 verification, isn't that right?

17 A. (Michael Quinto) That's correct.

18 Q. And then there's a step that you all referred
19 to as the battery CT optimization step. Do you recall
20 that?

21 A. Yes.

22 Q. And that step was done before the loss of
23 load expectation or LOLE validation step where you used
24 SERVVM, is that correct?

1 A. (Glen Snider) That's correct.

2 Q. Okay. Now, in that battery CT optimization
3 step you reran the production cost model, and then
4 based on those results replaced 35 percent of the
5 battery storage that had been economically selected by
6 EnCompass with gas combustion turbines?

7 A. (Michael Quinto) Generally correct, yes.

8 Q. Now, recognizing that the exact numbers are
9 confidential, so I'm not going to ask you to say any
10 confidential numbers, how would you characterize the
11 difference in the present value of review requirements
12 for supplemental portfolios five and six before and
13 after the battery CT replacement step, if you know?

14 A. (Bobby McMurry) I mean, I don't have the
15 information in front of me at this point.

16 A. (Michael Quinto) The CTs that -- the CT
17 battery optimization step -- let me take a step back
18 and set the ground a little bit. The initial selection
19 of resources is determined in the capacity expansion
20 model. This is a screening model that uses simplified
21 load shape system operations to quickly assess a wide
22 range. We'll go into this in more depth in our
23 rebuttal testimony.

24 Q. I'm sorry, may I stop you for a moment, Mr.

1 Quinto?

2 A. Sure.

3 MS. THOMPSON: And I'll address this to
4 counsel or Chair Mitchell, whoever would prefer to
5 address this. I don't believe that the extensive
6 background narrative is necessary to answer the
7 question. This information has been filed in
8 advance and I think everybody is familiar with the
9 steps that were taken. So I had a pretty specific
10 question and I don't think the extensive background
11 is necessary to answer the question.

12 BOBBY MCMURRY: Do you have access to
13 the table you're referring to? Oh, I'm sorry.

14 CHAIR MITCHELL: Let me address
15 counsel's question. Mr. Quinto, if you can, just
16 respond to the question efficiently, but provide
17 the response that you need to answer the question.

18 MR. QUINTO: Sure.

19 MS. THOMPSON: And if you don't know the
20 answer off the top of your head, that is fine. We
21 can move on.

22 MR. BREITSCHWERDT: Chair Mitchell, if
23 she can repeat the question, please. Just to make
24 sure the record is clear.

1 CROSS EXAMINATION BY MS. CAMPBELL:

2 Q. Recognizing that the exact numbers are
3 confidential, how would you characterize the difference
4 in the present value of revenue requirements for
5 supplemental portfolios five and six before and after
6 that battery CT replacement step?

7 A. The PVRs of those portfolios after the CT
8 battery optimization are less expensive when the CTs
9 are replaced with the batteries.

10 Q. I have asked my -- my question was inartful.
11 I guess what I meant to ask was what was in the delta?
12 How would you characterize the delta and the PVR?

13 A. Yeah, I don't have those figures.

14 Q. Fair enough. Do you recall that there was a
15 delta?

16 A. (Bobby McMurry) There was. I mean -- and
17 whatever the delta is, you needed to do the production
18 cost step to determine what the value was. It showed
19 that CTs were, you know, more cost effective to the
20 customers from a total revenue requirement than a
21 battery. I mean, I pause if it would have been
22 slightly more. It wouldn't have been an automatic if
23 it was very, very close. It wouldn't have been an
24 automatic selection of one technology versus the other.

1 I mean, this is just part of planning. I mean, I was
2 thinking last night, I said I bet you -- I know I have
3 been -- I have either supported or I have been
4 responsible for about 30 IRPs, eight CPCNs. In the
5 normal course of planning any time you have similar
6 resources, especially for one that you're looking at a
7 specific need, you always do a comparative analysis
8 against the two technologies in an hourly production
9 cost model. I know we call it the CT battery change
10 out as a special step. That's a normal step. I mean,
11 if this was CTs versus CCs, if this was nuclear versus
12 combined cycle, whatever comparative technologies, if
13 you're having to make a decision on that today, you
14 would take that additional step in production cost
15 modeling. So you have -- take the example if the PVRs
16 were close. You could observe. And so that's just
17 information for the Commission to use and determine if
18 the resources -- you know, it should be approved. And
19 you can look at it from the next step or a process is
20 rate analysis. So now you have got a 1.3 or four
21 billion dollar battery project versus a five or 600
22 dollar -- million dollar combustion turbine project.
23 All right. PVRs are very similar. What is the rate
24 impact to our customers. What is the reliability to

1 the system between the two resources. It's just a
2 normal portion of planning to go to the extra step of
3 hourly production cost just to inform your decision to
4 make sure you're making the best decision for our
5 customers.

6 CHAIR MITCHELL: All right. With that,
7 Ms. Thompson, we're going to pause for our
8 afternoon break. We'll come back into the hearing
9 room and go on the record at 3:30. So let's go off
10 the record, please.

11 (A break was taken.)

12 CHAIR MITCHELL: Ms. Thompson.

13 MS. THOMPSON: Thank you, Chair
14 Mitchell. And I understand that I was not being
15 loud enough, which is not normally a problem for
16 me. Please let me know if I start to fade out.
17 Before we get started -- before I get started with
18 my questions, I would like to revisit the issue of
19 lengthy answers. I understand that the witnesses
20 are interested in providing a fulsome explanation
21 of their answers, but I am doing my best -- given
22 how long this panel has already been testifying and
23 the many, many witnesses to come in this hearing,
24 I'm doing my best to craft questions to elicit a

1 yes or no answer. To the extent the witnesses need
2 to elaborate or clarify in response to my
3 questions, they will have the opportunity to do
4 that on redirect. I would just ask -- well, I
5 guess I'm not going to prevail upon you, Chair
6 Mitchell, to instruct the witnesses in any certain
7 way, but I would ask that they try to keep their
8 answers a bit briefer.

9 MR. BREITSCHWERDT: No response. I
10 think our witnesses are doing fine and we'll take
11 that into consideration. Thank you.

12 CHAIR MITCHELL: Well, I would just
13 prevail upon everyone, witnesses and counsel, just
14 to be as efficient as you can with your time.
15 Let's make every minute that we spend in this
16 hearing room count for something. So get your
17 questions ready to go. Tighten them up.
18 Witnesses, hang in there. You have been on the
19 stand for a long time and we recognize that. So
20 just do your best to answer counsels' questions and
21 we'll go from there. Thanks.

22 MS. THOMPSON: Thank you, Chair
23 Mitchell. And thank you, counsel. And thank you
24 panelists. I know it's a long time sitting up

1 there.

2 CROSS EXAMINATION BY MS. THOMPSON:

3 Q. All right. One more question just to -- this
4 was actually where I was trying to go with the battery
5 CT optimization question. I think you read a lot more
6 into my question than was actually in there.

7 If gas prices turn out to be higher than you
8 assumed or battery storage capital costs turn out to be
9 lower that could erase the difference, the delta that
10 your modeling produced or could make the portfolio
11 with the CTs more expensive, could it not?

12 A. (Michael Quinto) That's true.

13 Q. Okay. Now, I'm going to skip some questions
14 that I had. Just a few questions around coal
15 requirements. And again, by asking a question I'm not
16 critiquing -- not implying any critique of your
17 position. Another set of out-of-model adjustments or a
18 set of out-of-model adjustments that the Company has
19 made was to the coal retirement schedule that was
20 endogenously produced by EnCompass, correct?

21 A. (Glen Snider) Correct. We did not take the
22 results straight out of EnCompass.

23 Q. Right. Now you critique Synapse's estimate
24 that changes made to the retirement dates of the Lewis

1 Creek, cliff site five and marsh one and two would cost
2 ratepayers an additional 1.4 billion. And Synapse's
3 estimate was based on a report prepared by Sargent &
4 Lundy for the U.S. Energy Information Administration.
5 Do you recall that critique?

6 A. (Michael Quinto) Yes.

7 Q. And I recognize -- recognizing that that
8 number does not factor in the cost of replacement
9 resources, you say that based on the Companies'
10 estimates, the ongoing capital expenses and fixed O&M
11 costs associated with delaying retirement of those
12 units are more like 0.4 billion. Does that sound
13 right?

14 A. That sounds correct, subject to check.

15 Q. Does that estimate factor in the cost of any
16 replacement resources?

17 A. No, it does not.

18 Q. Okay. So we're apples to apples. So 0.4
19 billion is still 400 million dollars, correct? I hope
20 that's right.

21 A. That's correct.

22 Q. And that's 400 million dollars that would be
23 borne by ratepayers, correct?

24 A. (Glen Snider) No, because -- you've quickly

1 glossed over -- you have to replace the generation. So
2 if it cost me two billion to replace a generation and
3 accelerated cost and four hundred million, then it's
4 1.6 better. I just don't want to lose the glossing
5 over.

6 Q. Fair enough. So it's a gross number?

7 A. It's one side of the ledger. So the 400
8 million is -- yes, you -- about 400 million of save
9 costs by acceleration. Not recognizing the fact that
10 you would have to accelerate the replacement
11 generation.

12 Q. Fair enough. Moving on -- and I believe this
13 was mostly Mr. Snider, but you touched -- I would like
14 to touch on some of the critiques of -- some of the
15 assumptions made by consultants for interveners as
16 outcome oriented. Do you recall that?

17 A. Yes.

18 Q. Now yesterday in his conversation with Mr.
19 Burns -- sorry. Mr. Burns in a conversation with Ms.
20 Bowman talked about the Companies' obligation to create
21 value for shareholders. Do you recall that?

22 A. I do recall.

23 Q. And you would agree that that Duke Energy
24 parent Company of the utilities has an obligation to

1 create value for shareholders?

2 A. Capital has a cost to -- yes. So when you go
3 to the capital markets they want a return.

4 Q. And to the extent that a portfolio included
5 relatively more non-solar capacity than not subject to
6 the 45/55 percent ownership split and is instead
7 utility owned and in Duke's rate base that would inure
8 to the benefit of shareholders, would it not?

9 A. So are you saying -- I'm sorry, I got lost in
10 the double negative. Say it one more time for me. I'm
11 sorry.

12 Q. Setting aside -- so solar is subject to
13 ownership split under --

14 A. Correct.

15 Q. Otherwise resources selected to meet the
16 carbon reduction requirements are to be utility owned,
17 correct?

18 A. Yes.

19 Q. So to the extent you have more of those
20 utility-owned resources, that inures to the benefit of
21 shareholders?

22 A. Not necessarily. The solar has a
23 transmission cost that we would have to build to earn
24 out. And so I could add a CT, for example, and make a

Page 86

1 lot more money maybe building the transmission for the
2 solar. So we're not -- there's no thumb on the scale
3 for capital investment. There's more than capital in
4 an energy transition than, you know, one bite of an
5 elephant at a time. But it is a lot of investment for
6 everybody, all parties involved. So no, there was no
7 potential look at that. And I'm not trying to read
8 into your question, but even what you just mentioned
9 there, more solar, even if it's owned, we have to build
10 the transmission to accommodate that. And so I
11 wouldn't say that necessarily I wouldn't make more --
12 put more in rate base in that transmission than I
13 would, you know, a CT.

14 Q. All right. Now, H951 requires that the
15 Carbon Plan be developed with stakeholder input, does
16 it not?

17 A. Yes, it does.

18 Q. And in critiquing, you're not suggesting that
19 the information and input provided by stakeholders is
20 not valuable and that the companies didn't take it into
21 account?

22 A. No, not saying that stakeholder engagement is
23 not valuable. We think it is valuable.

24 Q. And you're not suggesting that the

1 consultants retained by the various interveners lack
2 expertise in the field of energy economics?

3 A. No, I'm not.

4 Q. And Mr. Kalembe, this is for you. Based on
5 some testimony yesterday you heard Mr. Snider say that
6 it is necessary to snap a chalk line with respect to
7 price inputs in order to begin any planning exercise?

8 A. (Matthew Kalembe) Yes.

9 Q. And yesterday in response to a question from
10 Mr. Snowden, you testified that the companies basically
11 snapped a chalk with regard to some offshore wind
12 assumptions in the fall of last year. Do you recall
13 that?

14 A. I remember saying that and I think that was
15 in regards to offshore wind.

16 Q. Now, you're aware that the companies held the
17 series of stakeholder meetings for the Carbon Plan in
18 the first three months or so of this year, correct?

19 A. That's correct.

20 Q. I believe you participated in that.

21 A. Yes, I did. That's correct.

22 Q. To the extent that stakeholders provided
23 feedback during that stakeholder process on the
24 sources -- you know, what should be the appropriate

1 sources for price inputs or any other inputs and
2 assumptions, was that after the Company had already
3 snapped a chalk line on inputs and assumptions in the
4 fall of 2021?

5 A. (Glen Snider) We moved that assumption. I
6 mean, in the fall of '21 we would not have had 2029.
7 That was after the stakeholder meetings in response to
8 stakeholders. We presented a later date. I think
9 you'll remember, if I'm correct, and maybe correct me
10 if it's not your recollection, that we actually had a
11 later date in the stakeholder meeting and based on
12 feedback from stakeholders we moved to a more
13 aggressive date for offshore wind. So when we snapped
14 our chalk line for all technology costs and some of our
15 -- when we got feedback throughout that stakeholder
16 process that was one of the feedback that we received
17 where we adjusted our chalk line, erased part of the
18 chalk line and redrew it two years earlier following
19 stakeholder feedback that we could do offshore wind
20 earlier.

21 Q. Just to make sure -- just to, I guess,
22 clarify and kind of fill out the record. When did the
23 companies finalize the assumptions that we're going to
24 go into your Carbon Plan modeling and you were ready

1 to press go on EnCompass or whatever you pressed to get
2 it started?

3 A. In general, probably 80 percent of our
4 inputs, 90 percent, whatever, you know, we had our
5 production database, we have a series of database of
6 inputs that we try and keep up to date. We say snap
7 the chalk line. It's let's make sure we have the best
8 data available at that point in time. Then you begin
9 the modeling process and you say that's my set of
10 inputs. If you get stakeholder feedback that questions
11 one of those particular inputs that are germane to it
12 that you said okay, you know, based on stakeholder
13 feedback, we will reevaluate, put into the model that
14 update, we did put in an updated wind assumption after
15 all of our initial data had been determined. And so
16 that was just an example and we also -- there were
17 examples of other things that stakeholders gave us
18 feedback on that we thought were reasonable enough and
19 was not going to interrupt the process so much that we
20 couldn't accommodate the request.

21 Q. What I was asking about was when did you have
22 your assumptions and inputs finalized? When was that?

23 A. Following the stakeholder meetings.

24 Q. April-ish of this year?

1 A. Bobby, I'll turn to you if you made any
2 adjustments after April. I'm not sure.

3 A. (Bobby McMurry) I know after each
4 stakeholder meeting, I mean, and other studies we were
5 doing, we had our updates in the fall and -- I mean, we
6 were modeling from January through May 16th or May --
7 probably a week before that. But I can't state what
8 the final date was where the chalk --

9 A. (Glen Snider) Where no input was ever
10 updated.

11 A. (Bobby McMurry) Yes. No input was ever
12 updated. I would say after the last stakeholder
13 meeting we did have to make a new set of runs through
14 everything, make sure everything was clean. Start from
15 the very beginning. The overall process. And I would
16 think we did that, I mean, subject to check, please,
17 but it would probably be in early April where we
18 started making clean runs through all portfolios and
19 all the sensitivities.

20 Q. All right.

21 A. If that didn't match up to the last
22 stakeholder meeting, like I said, subject to check, of
23 when that happened.

24 Q. That's fair. Sounds about right. I'm

1 skipping a few questions in the interest of time.
2 Moving to gas prices and -- all right. So you state --
3 and actually, I'm sorry, sometimes in your testimony it
4 was hard to keep track of who was saying what.
5 Sometimes there were names in the questions and
6 sometimes there were not. One of you all said in the
7 testimony that -- and this is on page 176 -- that the
8 current natural gas market conditions largely have
9 nearer term price implications, which is well before
10 any new natural gas generation would come into service
11 in the late 2020s. Does that sound right?

12 A. (Glen Snider) Yeah. Subject to check, that
13 sounds correct.

14 Q. Do you recall also that appendix E on page 94
15 refers to the ever-present uncertainty in natural gas
16 prices?

17 A. (Michael Quinto) Subject to check, yes.

18 Q. Now, yesterday I believe there was some
19 discussion that most of the Companies' natural gas is
20 purchased as futures. Do you recall that?

21 A. (Glen Snider) I don't think I said most. I
22 just said we have a robust hedging program where we buy
23 a little bit forward and the closer in time you get,
24 the bigger the volumes.

1 Q. Apologize for the inaccuracy there. In any
2 event, the Companies' hedging -- or each Company's
3 hedging strategy has not been sufficient to insulate
4 ratepayers entirely from the recent spikes in gas
5 prices, correct?

6 A. No, it has not.

7 Q. So hedging can mitigate but it -- mitigate
8 ratepayers' exposure to the risk of fuel price spikes,
9 but it cannot eliminate their exposure entirely, right?

10 A. That's correct.

11 Q. Shifting gears to hydrogen. You discussed
12 the possibility of blending hydrogen with fossil or
13 natural gas, correct?

14 A. Correct.

15 Q. Isn't it true that existing gas pipelines
16 would need to be retrofitted in order to be able to
17 transport gas blended with some percentage of hydrogen?

18 A. (Michael Quinto) I believe the volumes that
19 we have assumed in our Carbon Plan are consistent with
20 the limits of the natural gas pipeline's ability to
21 accommodate hydrogen blending.

22 Q. Consistent with the current pipeline
23 infrastructure's ability to accommodate hydrogen
24 blending --

1 A. (Bobby McMurry) It was one percent in 2035,
2 three percent I think in 2038, and five percent in
3 2042. Based on the -- that was just the feedback we
4 got from gas buyers.

5 Q. And you used an embedded transportation cost
6 assumption in the hydrogen commodity cost assumptions,
7 correct?

8 A. (Michael Quinto) That's correct.

9 Q. Did that take into account any cost to
10 retrofit hydrogen -- pipelines in the future to be able
11 to transport larger percentages of hydrogen blended
12 with gas?

13 A. Not to my knowledge did it include additional
14 cost to retrofit gas pipelines to accommodate hydrogen
15 blending.

16 Q. And you would agree that the future supply of
17 green hydrogen carries significant uncertainty, would
18 you not?

19 A. I think there's a lot of different ways that
20 hydrogen could develop in the future.

21 Q. And given that uncertainty in the supply of
22 hydrogen and the potential need to upgrade existing
23 pipelines to transport hydrogen or some blend with
24 hydrogen, that could impact fixed and variable

1 operating costs for gas plants in the future, could it
2 not?

3 A. I'm not aware if that would impact the cost
4 to operate our plants.

5 Q. Could it impact the fuel cost?

6 A. (Glen Snider) I mean, If you're saying
7 blending one percent and paying for that one percent
8 hydrogen, could it have a slight impact on your total
9 cost of fuel? I would say that's a fair assumption.

10 A. (Michael Quinto) And it's included in our
11 gas price cost.

12 Q. Now -- let's see. Let me talk a little bit
13 about gas capital costs. I also just want to clarify
14 that when I say gas, I'm talking about what the Company
15 has referred to as natural gas.

16 A. (Glen Snider) I'm with you.

17 Q. Now -- actually, bear with me just a moment.
18 I might be able to eliminate some of these questions.

19 You claim that there's a 40 percent discount
20 in the cost of a gas combustion turbine if you assume a
21 four unit site versus a single unit. Do you recall
22 that?

23 A. (Michael Quinto) I mean -- I'm sorry, can you
24 point to a --

1 Q. Page 193 of your testimony. This is in
2 regard to -- discount may be the wrong word. But if
3 you assume four unit CT -- let's just turn together.

4 A. I see that.

5 A. (Glen Snider) Lines one, two and three.

6 Q. Just let me know when you're ready.

7 A. (Michael Quinto) We're there.

8 Q. Okay. So CT cost for single unit rather than
9 the four unit site are 40 percent higher based on Duke
10 Energy estimates. Do you recall that?

11 A. Yes, I see that.

12 Q. And you imply that that is a more realistic
13 assumption because Duke would build a multi-unit CT?

14 A. Yes.

15 Q. And how many megawatts at a time per plant?

16 A. For a --

17 A. (Glen Snider) You can have two units that
18 are big, that would be 800 megawatts. You could have
19 four, 200 megawatt units depending on, you know, what
20 was more appropriate when you got to the site specific.
21 But roughly -- I mean, we have ranges. We don't just
22 have 800 megawatt sites. We have some that are 800.
23 We have some that are 12. We have some that are
24 bigger. We have a range of CT sites, four, five, six.

1 Q. But the generic four-unit CT they're
2 referring to in this testimony, there's not a certain
3 amount of capacity associated with that?

4 A. I think this testimony was referring to
5 F-frame sites, which would be 800. If it was for
6 H-frames it would be more like 1600.

7 Q. So 800 to 1600. So you testified, Mr.
8 Snider, in response to a question from Mr. Quinn
9 yesterday that capacity additions can sometimes be
10 lumpy so that you have -- you're adding more capacity
11 at one time than is needed to serve load at that time.

12 A. For just peak demand. So if you added a
13 combined cycle, for example, to meet carbon reductions,
14 which is a big part of your carbon reduction, you might
15 have for a few years excess capacity.

16 Q. And you implied, I believe, that's not a
17 problem because you can sell some of that extra
18 capacity or energy produced to neighbors. I recall
19 something to that effect. Is that not -- am I not
20 recalling that correctly?

21 A. No, I don't recall that line where I'm saying
22 we're going to sell that to neighbors. I will say in
23 the optimization -- we have had this discussion in past
24 IRPs -- I think that overbuild is taken into account

Page 97

1 when you optimize it. So if you are just meeting peak
2 capacity and you're building something bigger and
3 smaller units could have fit better, that's taken into
4 account in the optimization process. And so the
5 lumpiness. And if you're overbuilt for a few years and
6 you weren't looking at carbon reductions, which up
7 until this IRP was predominantly capacity, that your
8 optimization takes that lumpiness into account and it
9 would pick something else if non-lumpy was cheaper.
10 Now you have the other benefit of carbon. So you're
11 optimizing both for peak demand, but also to meet your
12 carbon reductions and your total energy needs. So yes,
13 the economics are fully accounted for when you build a
14 bigger unit.

15 Q. Okay. So accepting that lumpiness is not
16 necessarily a bad thing when you're talking about
17 capacity additions, yesterday in response to a question
18 from Mr. Snowden you testified to the effect that it is
19 easier to adjust solar procurement downward if you over
20 procure than the reverse. Do you recall that?

21 A. Yeah. If you ignore -- I think there's an
22 important caveat. That over procurement has an
23 attendant number of risks and I won't repeat the 15
24 minutes that we talked about a risk of over

1 procurement, but subject to ignoring all of those
2 risks, yes, adjusting future procurements down is
3 easier.

4 Q. Now, that is not true -- that would not be
5 true if you overbuild gas capacity. It's not as easy
6 to adjust that downward, correct?

7 A. I think we're talking past each other, Ms.
8 Thompson. If I build two gas plants today and I
9 project two more 10 years from now, I don't have to
10 build those two 10 years from now. But if you're
11 saying if I built too many today, would it be harder to
12 back away from them then yes, I suppose it would. Why
13 we have a very limited amount of gas at this point in
14 our near term action plan.

15 Q. That is what I was asking. Thank you. Let's
16 see. Now, you also made an assumption with regard to
17 the cost of converting a gas plant to burn hydrogen.
18 That number is confidential so I'm not going to ask you
19 about it. I'm not going to ask you about the number.
20 But where did that number come from?

21 A. (Michael Quinto) It's based on engineering
22 estimates from our combustion turbine generator team.

23 Q. So those are internal numbers produced
24 internally from Duke Energy?

1 A. They rely on OEM estimates on what it would
2 take to add extra equipment to change piping manifolds,
3 that sort of thing.

4 Q. So let's take a hypothetical. Say you apply
5 for a CPCN for a new gas plant in 2023 and the
6 Commission grants that CPCN and you build a
7 gas-combined cycle plant. That would come into service
8 when, roughly?

9 A. '28 or '29, depending on the timeline.

10 Q. Okay. And if conversion -- this is still
11 with me on this hypothetical. If conversion to green
12 hydrogen turns out to be more expensive than you
13 planned then running that plant on hydrogen may turn
14 out not to be economic in the future, correct?

15 A. (Glen Snider) Yeah, it could go either way.
16 I agree. I mean, the OEMs are telling us their goals
17 -- the three major OEMS -- we talk to them all on a
18 regular basis. When I talk to that team they say most
19 of the OEMs are shooting -- have 2030 as their date
20 where out of the box your new gas turbines would be a
21 hundred percent hydrogen capable. So if they can
22 exceed those goals and get them in earlier in the year,
23 great. Earlier in the decade. So maybe there won't be
24 a conversion cost. If there is a conversion cost, I

Page 100

1 will agree with you. If there is a conversion cost and
2 if it's more expensive, it would impact your total cost
3 estimate.

4 Q. And if green hydrogen turns out not to be
5 available and sufficient quantity or at all, you might
6 have to retire that gas plant in order to achieve
7 carbon neutrality by 2050?

8 A. Again, I think -- go round and round -- if no
9 offset market comes and hydrogen doesn't come, if both
10 of those come to fruition then -- and we still feel --
11 and there's not a -- I guess I missed the third one,
12 which is reliability. There's -- if no other
13 technology comes, hydrogen doesn't come, offset market
14 doesn't come, and no other storage technology is
15 capable of meeting your reliability needs, then I think
16 there's a reliability out that says we're not going to
17 retire plants and leave the system deficient, its
18 ability to serve customers. If all of that happened,
19 yes, other technology would have to come into play that
20 don't exist today. Hydrogen would have to not come
21 into fruition and an offset market would have to not
22 develop. And if all three of those lined up in 2050,
23 28 years from now, a portion of that investment would
24 have to be retired.

Page 101

1 Q. And that was essentially my hypothetical that
2 you captured, so thank you for continuing to --

3 A. Like I said, turn enough knobs and you'll get
4 your answer.

5 Q. So in that event North Carolina does not have
6 a law that authorizes securitization for the
7 underpreciated balance of the gas plan, do we, to your
8 knowledge?

9 A. 28 years from now I don't know what laws will
10 be in place, but one is not in place today.

11 MS. THOMPSON: I believe that's all the
12 questions I have. Thank you to the Panel. Thank
13 you, Chair Mitchell.

14 CHAIR MITCHELL: All right. Tech
15 Customers.

16 MR. SCHAUER: Thank you, Chair Mitchell.
17 Craig Schauer on behalf of the Tech Customers.

18 CROSS EXAMINATION BY MR. SCHAUER:

19 Q. I would like to start with testimony that was
20 just elicited previously by Ms. Thompson. I believe
21 the panel testified that it is not aware that
22 interveners could not replicate the portfolios based on
23 the data provided, is that correct?

24 A. (Glen Snider) we weren't aware that they

1 weren't able to substantially -- to my knowledge Public
2 Staff got pretty close. Others may have struggled. As
3 we pointed out, we went to extraordinary efforts to
4 help them, but we can only do so much training.

5 Q. Right. But was the panel aware previous to
6 this afternoon that the other interveners were not able
7 to replicate the results that Duke reached with its
8 modeling?

9 A. I think we said we thought they got pretty
10 close. I think we were aware that no one had the --
11 every dot and T the same, which in a modeling exercise
12 of this magnitude, the gigabytes of data and the
13 complexity of the model is not surprising.

14 Q. And the panel also testified, and I believe
15 I'm using the term correctly, that it did its very best
16 regarding the modeling efforts. But I just want to
17 clarify that its efforts did not include taking the
18 inputs that were provided to the interveners, running
19 them again, Duke running them again to make sure that
20 they produced the outputs that were also provided to
21 interveners, is that correct?

22 A. (Bobby McMurry) Not prior to posting the
23 files. We have a developmental server which we loaded
24 our input files, we made the runs and we replicated --

Page 103

1 we didn't make every run. And it was brought to our
2 attention on a couple of times that they didn't quite
3 match. But we did replicate the base portfolios with
4 the files that was -- we took the files off the data
5 mark, put them into the developmental server, made the
6 runs and could repeat that.

7 Q. Were you able to identify why the interveners
8 were not able to replicate the model runs?

9 A. (Glen Snider) No, I think -- you know, as I
10 said, it's an extraordinarily complex modeling exercise
11 and we did the best we could to train the interveners.
12 I think they reached out to the vendor to get more
13 information themselves to try and get some of their
14 modeling techniques in line to maybe help replicate or
15 understand nuances of the model. There are a fair
16 amount of complexities in modeling the system. And so
17 they worked with the vendor. We gave them as much
18 training as we had time to do with technical
19 conferences. And like I said, I think some interveners
20 were pretty darn close and others may not have. But to
21 the degree to which they did or didn't, we did not have
22 the time to go in and further investigate the issues
23 that they may have been having.

24 Q. Is it your understanding that the public

1 staff was able to substantially replicate the modeling
2 based on the input and output files provide by Duke?

3 A. (Bobby McMurry) I would probably ask the
4 Public Staff.

5 A. (Glen Snider) Yeah, I'll leave it to them.
6 What we might say is close. I'll let the Public Staff
7 represent for themselves whether they got pretty close or
8 not.

9 Q. But as far as you know, nobody has been able
10 to replicate the modeling Duke performed based on the
11 input and output files?

12 MR. BREITSCHWERDT: Chair Mitchell, I'd
13 object. One, I think this question has been asked
14 and answered already. Two, I think we're
15 continuing to circle round and round what happened
16 four or five months ago, and Stratagem, on behalf
17 of Tech Customers, as well as numerous other
18 parties, already filed their alternative plans
19 based on presumably developing EnCompass modeling
20 based on the files Duke provided. So we keep going
21 round and round challenging whether Duke made their
22 very best efforts to provide this information, and
23 it seems like we're well beyond that. One, I think
24 the panel has answered the question sufficiently,

1 fully; and two, I think this is very well and dated
2 information.

3 CHAIR MITCHELL: Mr. Schauer, a
4 response.

5 MR. SCHAUER: Well, Chair Mitchell, it's
6 a simple yes or no question. If he can answer it,
7 I can ask one more follow-up and be done with this
8 line of inquiry.

9 CHAIR MITCHELL: Okay. I'll overrule
10 the objection. Allow one question and follow-up
11 and then we'll move on.

12 MR. SCHAUER: Thank you.

13 CROSS EXAMINATION BY MR. SCHAUER:

14 Q. As far as you know, no intervener plus the
15 Public Staff has been able to replicate the modeling
16 Duke performed based on the inputs and the outputs?

17 A. (Glen Snider) I think, as I said, they did
18 not exactly replicate them and much of that may be on
19 their side. It's not as easy as just hitting go. You
20 have to know how to configure your models, you have to
21 know how to have the model set up and run
22 appropriately, you have to have the right resources to
23 the number of servers to make it run efficiency. If
24 you don't it can bog down. So there's numerous reasons

Page 106

1 beyond just the Companies' best efforts where they may
2 have not been able to replicate results. There are
3 different versions, I think even at some point, some of
4 the interveners. So having the exact same version is
5 important to get the exact same result.

6 MR. SCHAUER: Sorry, Chair Mitchell, two
7 questions in light of that response. I apologize.

8 CROSS EXAMINATION BY MR. SCHAUER:

9 Q. So it's your testimony that the interveners
10 don't know how to use the EnCompass model?

11 A. It's my testimony that two different sets of
12 people that have the EnCompass model may not get the
13 same results if they don't use the exact same version,
14 the exact same set up, the exact same number of servers
15 that can process it. You might have had one little
16 input different. We tried to give all our inputs
17 exactly how to use them. So there's a number of
18 reasons that they may have in addition to -- and I
19 would say the interveners are -- I mean, they tried
20 their best to replicate them. It's not a knock on the
21 interveners. It's just they didn't have the same
22 resources, the same -- in some cases the exact same
23 software and you may get different results. So we
24 tried our very best to -- like I said, we have been

Page 107

1 doing this more than a dozen years, and if you had
2 asked me just a few years ago we're going to train
3 interveners on how to use the model, we're going to
4 give every input -- as part of the process it was
5 unthinkable. We have gone to extraordinary measures
6 based on history to try and give the interveners ready
7 access to every input into our model, to hold technical
8 conferences to help answer questions and to get them as
9 close as they can. If they didn't get there all the
10 way I think I just I want to make it clear, it's my
11 opinion, that it is not a hundred percent the Companies'
12 responsibility to get them to be able to replicate it.

13 Q. So, Mr. Snider, how does the Commission know
14 that portfolio one, two, three and four are valid if
15 not one but -- and not two, but three interveners were
16 not able to replicate those model numbers?

17 MR. BREITSCHWERDT: Objection. I think
18 -- sorry. Ma'am.

19 CHAIR MITCHELL: Go ahead.

20 MR. BREITSCHWERDT: That assumes facts
21 that are not in evidence. He's asked if the
22 Company was aware and it's not been established
23 that other parties -- each of whom filed an
24 alternative plan using EnCompass were able to

1 assess, validate and replicate the modeling.

2 CHAIR MITCHELL: I'm going to overrule
3 the objection -- sort of a sustain, sort of an
4 overrule. I'm going to allow you to ask the
5 question as a hypothetical so that we can move on.

6 MR. SCHAUER: Sure.

7 CROSS EXAMINATION BY MR. SCHAUER:

8 Q. So restate it as a hypothetical. How would
9 the Commission know that if not one or two but three
10 interveners could not replicate Duke's EnCompass
11 modeling that the portfolios of one, two, three, and
12 four percent of the Carbon Plan are valid?

13 A. (Glen Snider) I think the Commission in its
14 discretion understands that none of the interveners
15 replicated each others' results, right? So how can you
16 trust -- if you don't get the exact same result, then
17 how do you -- you can't be expected to get the exact,
18 exact same result. What you're verifying is that
19 modeling was done correctly within reason, that your
20 inputs are reasonable. And the fact that you can't
21 exactly replicate when you have a complex model of this
22 size and none of the interveners could replicate each
23 others' results, you would never come to a conclusion.
24 So if your standard is I need multiple people with

Page 109

1 different resources taking slightly different
2 approaches to get the exact, exact same result, you
3 will never have any ability to approve anything because
4 I don't see anybody replicating each others' results.

5 Q. All right. Moving on. On page eight of the
6 modeling panel testimony Duke states that interveners
7 used modeling assumptions that, quote, introduced bias
8 against firm dispatchable resource sites. Do you
9 recall that testimony?

10 A. What line, please? Sorry.

11 Q. Sorry, I don't have the specific line. But
12 it's page 185 and I will get the line for you in one
13 second.

14 MR. BREITSCHWERDT: Sorry, page eight or
15 page 185?

16 MR. SCHAUER: Page 185.

17 CROSS EXAMINATION BY MR. SCHAUER:

18 Q. Line 18 and 19.

19 A. Yes.

20 Q. Did you read the direct testimony of Maria
21 Roumpani submitted by the Tech Customers?

22 A. I read a summary of it awhile back, but if
23 you want to put a specific line in front of me I'm
24 happy to respond to it.

Page 110

1 Q. Well, on page five do you recall that she
2 talked about how the Tech Customers preferred
3 portfolios selected the construction of a combustion
4 turbine by the end of 2029?

5 A. I see that -- I was looking at the summary
6 now and I would agree that you did select a combustion
7 turbine by the end of '29.

8 Q. And then on page 194 of your testimony you
9 also acknowledge that the preferred portfolio also
10 selected natural gas PPAs?

11 A. Yes.

12 Q. So the Gabel report's recommendation is that
13 the Commission should, quote, reject the Companies'
14 request to pursue development and procurement
15 activities for new gas in this proceeding, isn't that
16 correct?

17 A. Yes.

18 Q. In other words, it's not a contention that
19 Duke should never build no gas, it's just that Duke
20 should wait until -- or the Commission should wait
21 until the 2024 Carbon Plan proceeding before making
22 that decision?

23 A. Yeah. Kick the can.

24 Q. Duke acknowledges that there is a risk of

Page 111

1 inadequate firm fuel supply for any new natural gas
2 plants built by Duke?

3 A. Yes.

4 Q. And on page 185 of your testimony you discuss
5 how Duke's plan to supply gas to a new gas plant is
6 based on the assumption of the completion of the
7 Mountain Valley pipeline, isn't that right?

8 A. In our primary portfolios that was our gas
9 supply region and an alternate -- in P5 and six we
10 looked at an alternate trans code down to the Henry L.
11 Gulf basin.

12 Q. Now, the Mountain Valley pipeline is expected
13 to be completed in the second half of 2023, according
14 to your testimony?

15 A. I believe that's their current public
16 position.

17 Q. So one way the Commission could mitigate the
18 fuel supply risk is to wait and see if the Mountain
19 Valley pipeline is completed in 2023, and then decide
20 as part of the 2024 Carbon Plan whether to select a new
21 natural gas plan?

22 A. I think if we move forward with a Q3 Q4 CPCN,
23 which would be second half of 2023, we're going to have
24 a pretty good indication as to whether or not at the

1 time we come forward with a CPCN that NVP is moving
2 forward or not.

3 Q. Right. But if the Commission were to wait
4 until the 2024 Carbon Plan it would have greater
5 visibility before even selecting that resource as part
6 of the plan?

7 A. I'm saying by the time we ask them to select
8 it, the time that docket concludes and they issue an
9 order yes or no on a CPCN they would have that
10 information.

11 Q. Right. But as part of the Carbon Plan
12 request in 2022 you're asking them to make that
13 decision without that information?

14 A. We've told them as well that we would adhere
15 to normal CPCN as we move to the execution phase and we
16 would do updated analysis that would include new gas
17 prices, the actual cost of the project, the impact on
18 fuel supply. All of that you get into a lot more
19 detail than you do at the planning phase, you get into
20 a lot of detailed project specific analytics, as you
21 all are aware on the commission in a CPCN proceeding,
22 and that would be one of the factors that would be
23 discussed in that latter half of '23 that would
24 influence -- you would have that full information,

Page 113

1 along with much more detailed cost information and
2 modeling. And so we're saying that subject to the
3 CPCN, they could -- they can make that decision at the
4 CPCN phase.

5 Q. Right. But my question was Duke is asking
6 the Commission to select that gas as part of the 2022
7 Carbon Plan proceeding?

8 A. Subject to a CPCN being filed in '23.

9 Q. Thank you. Duke stated in chapter four of
10 the Carbon Plan that the quickest it could construct a
11 new natural gas plant was five to six years?

12 A. I believe -- what page?

13 Q. Page 14. It sets forth a table. Page 14 of
14 chapter four.

15 A. And I'm just looking to verify.

16 Q. Yeah. Sure. And -- I'll wait for you to get
17 there.

18 A. Okay. I am there. I'm looking at table
19 four-five.

20 Q. That's right.

21 A. Okay.

22 Q. You would agree it says -- I mean, granted
23 it's talking about two different units, a CC and a CT.
24 But the range of time is from CPCN being granted to

1 completion five to six years.

2 A. I'm sort of doing the math. If the CPCN was
3 issued the end of '23. So I have got '24, '25, '26.
4 '27 would be four years, three if it was in the
5 beginning of the year. Four if it was in the end.
6 Three to four years for a CT and then four to five for
7 a CC.

8 Q. Exactly. You're familiar with the U.S.
9 Energy Information Administration? And the EIA
10 publishes information related to the energy industry,
11 doesn't it?

12 A. Yes. It's a broad generalized publication.

13 Q. You've read the testimony of Adrian Kimbrough
14 submitted on behalf of the Tech Customers?

15 A. Awhile back.

16 Q. Do you recall that Mr. Kimbrough -- in his
17 testimony cited the EIA's annual energy outlook 2022
18 report on page four?

19 A. Sorry.

20 Q. Subject to check?

21 A. Yeah. I'll subject to check and trust that
22 you're reading me the correct quotes from those
23 testimonies.

24 Q. Do you also by chance, subject to check,

Page 115

1 recall that Mr. Kimbrough's testimony cited a report by
2 PJM called PJM/Cone 2026/2027 report?

3 A. Subject to check, yes.

4 MR. SCHAUER: Madam Chair, I'd like to
5 distribute some exhibits.

6 CHAIR MITCHELL: Go ahead.

7 MR. SCHAUER: Madam Chair, while these
8 are being distributed, I believe they would be
9 marked as -- I'm going to try to get this right --
10 Tech Customers Modeling Panel Direct Cross
11 Exhibit-1 for the EIA exhibit and then Tech
12 Customers Modeling Panel Direct Cross Exhibit-2
13 for the PJM exhibit.

14 CHAIR MITCHELL: All right. Good work,
15 Mr. Schauer. For purposes of the record, the EIA
16 document will be marked for identification as Tech
17 Customers Modeling Panel Direct Cross-Examination
18 number one. And then the PJM Cone 2026, '27 report
19 will be marked as Tech Customers Modeling Panel
20 Direct Cross-Examination Exhibit-2.

21 (Tech Customers Modeling Panel
22 Direct Cross-Examination Exhibit-1
23 and Tech Customers Modeling Panel
24 Direct Cross-Examination Exhibit-2

Page 116

1 marked for identification)

2 CROSS EXAMINATION BY MR. SCHAUER:

3 Q. If I could direct the Panel's attention to
4 Exhibit-1. This is called the Cost and Performance
5 Characteristics of New Generating Technologies from the
6 Annual Energy Outlook '22 by the EIA. Do you see that?

7 A. Yes.

8 Q. And if you turn to the table on the second
9 page, the EIA report shows the construction lead times
10 for combustion cycle and combustion turbines. If you
11 can see for the three cc options it shows a
12 construction lead time, and I believe it's highlighted
13 in the copies you have of three years and for the
14 combustion turbine it says a construction time of two
15 years. Is that correct?

16 A. (Glen Snider) Yes, I see those.

17 Q. If you can take a look at Exhibit-2, which is
18 the PJM Cone report. I'll have to navigate you through
19 this. These are excerpts from a 94-page report that I
20 felt like nobody needed 94 pages of.

21 A. Thank you.

22 Q. If you would turn to the front of page five,
23 which is page 32 of the report, fifth page, the front
24 of it. Under the heading B3 you should see a

Page 117

1 highlighted sentence that says S&L developed monthly
2 capital drawdown schedules over the project development
3 period of 32 months for CCs.

4 A. I see that.

5 Q. In other words PJM estimated that the time to
6 construct a CC would be 32 months for purposes of this
7 study?

8 A. That is their estimate for a construction
9 period only. There's a lot more than getting a CC --

10 Q. Correct. And if you turn to the last page of
11 Exhibit-2. At the very top under the section 4B1 it
12 says S&L developed monthly capital drawdown schedules
13 over the project development period of 20 months for
14 CTs. Do you see that?

15 A. Yes.

16 Q. Okay. And so based on the estimates of EIA
17 and PJM the construction of a CT should take 20 to 24
18 months, the construction time. And the construction of
19 a CC should take 32 to 36 months, is that correct?

20 A. That's what they're saying the construction
21 period is.

22 Q. Okay. I want to show you, sorry, one more
23 exhibit that I prepared. If I may hand this one out.

24 MR. SCHAUER: Madam Chair, these were

Page 118

1 inadvertently handed out to all of the participants
2 before they were handed out to the commissioners.
3 So if we can have a moment where I can collect some
4 and make sure the commissioners and the witnesses
5 have them. We collected some, but not enough. So
6 I apologize for the confusion.

7 CHAIR MITCHELL: All right. No problem.

8 MR. SCHAUER: Madam Chair, I believe
9 this will be marked as Tech Customers Modeling
10 Panel Direct Cross Exhibit-3.

11 CHAIR MITCHELL: The document will be
12 marked for identification as Tech Customers
13 Modeling Panel Direct Cross-Examination Exhibit-3.

14 (Tech Customers Modeling Panel
15 Direct Cross-Examination Exhibit-3
16 marked for identification.)

17 CROSS EXAMINATION BY MR. SCHAUER:

18 Q. Mr. Snider, this exhibit is a visualization
19 of Duke's timeline for building a CT and a CT -- a CC
20 and CT as set forth in table 4-5, compared with the
21 timeline for the EIA and the PJM. And just to orient
22 you to --

23 A. Is this -- I'm sorry to interrupt. Is this
24 something we provided or is this something --

1 Q. No. This is a visualization I created.

2 A. You created.

3 Q. A demonstrative exhibit.

4 A. Okay. Thank you. I didn't know if you were
5 saying we provided this because I wouldn't agree with
6 that.

7 Q. You did not provide this. On the left I have
8 recreated the construction timeline Duke presents in
9 chapter four of the Carbon Plan for the construction of
10 a CT by the end of 2027 and the construction of the CC
11 by the end of 2028, which was what was discussed in
12 table 4-5. And then on the right I created the
13 construction timeline of a CT and a CC based on the
14 construction estimates provided by EIA and PJM for the
15 construction of a CT by the end of 2027 and a CC by the
16 end of 2028.

17 Based on the visualization, if Duke were able
18 to construct a CT and a CC in the amount of time that
19 the EIA and PJM estimate it should take, then Duke
20 could wait to file a CPN until 2025 and still construct
21 a CT and a CC before the dates Duke claims it needs
22 them, is that correct?

23 A. No. I'm sort of lost. Maybe you can help
24 me.

1 Q. Sure.

2 A. You're showing me three years on an exhibit
3 -- which exhibit was the EIA? And it says lead time
4 three years for a combined cycle -- three years of
5 construction, right?

6 Q. Sure.

7 A. So in your EIA you show -- on your new CC,
8 the column on the right, one year of construction. So
9 how do I get a CPCN --

10 Q. Sure.

11 A. -- and construct in a year?

12 Q. Let me better explain my exhibit. So
13 starting with Duke's timeline based on table five, it
14 said that a CPCN application would be granted in 2023
15 and then according to table 4-5 -- I'm sorry, an
16 application would be filed in 2023 -- this is for the
17 CT -- a CPCN would be granted in 2024 and construction
18 would begin sometime during 2024. And then in order to
19 have the CT completed in time by the end of 2027,
20 construction would take place at some point in 2024,
21 2025, 2026 and then through the end of 2027. Which
22 would be a timeline of either 36 to 48 months, correct?

23 A. For a CC.

24 Q. Correct. For a CT. Sorry, I misspoke. I

1 was looking at the green column.

2 A. Yeah. So I see 36 months for the CT.

3 Q. Yes.

4 A. Yes.

5 Q. Or 48, depending on whether or not the CPCN
6 was granted at the beginning of the year and Duke
7 needed all four years.

8 A. It would not be granted the beginning of the
9 year.

10 Q. Sure.

11 A. Of '23.

12 Q. Now, if a new -- for a new CC -- this again,
13 based on table four-five, a CPCN application would be
14 filed in 2023. The application according to the table,
15 in theory, assuming it's granted in 2024, in order for
16 the CC to be complete by the end of 2028, construction
17 would take place in '24, '25, '26, '27, and potentially
18 through 2028, which would be a range of 48 to 60
19 months, correct?

20 A. I don't see 60, but I guess you're going back
21 to if we had the CPCN on January 1 --

22 Q. To the end of 2028 that would in theory be
23 almost 60 --

24 A. Yeah. Which -- and we're sitting here in

1 September so -- without anything filed.

2 Q. Understood.

3 A. But yes.

4 Q. So the PJM timeline -- if I could explain
5 that.

6 A. Yeah.

7 Q. So using the assumption that a CPCN
8 application could be filed in 2025 after the 2024
9 Carbon Plan proceedings, and it would be granted at
10 some point in 2026 and using the numbers provided by
11 EIA and PJM giving Duke 20 to 24 months, the CT should
12 be able to be completed by the end of 2027, correct?

13 A. If you had a -- that's using their
14 construction -- I think where -- he's comparing
15 construction timeline, not total project. So you have
16 got permitting work to do before you turn dirt. You've
17 got to get your air permits, your water permits.
18 You've got transmission that may be your long lead time
19 to get interconnection work done. As we have seen it
20 can be the long lead time with solar. It may be
21 pipeline infrastructure that's your long lead time. So
22 if you're just focusing on turning dirt and turning
23 wrenches for the plant itself, that's a shorter
24 timeline than the total project timeline that has

1 associated infrastructure, permitting. And as we have
2 said earlier going into this proceeding, any
3 infrastructure build is taking longer these days due to
4 the protracted nature sometimes of achieving receipt of
5 all your permits, right of ways, transmission right of
6 ways, you know, to make this happen. So this
7 accelerated timeline that only looks at construction
8 and doesn't look at the associated full project
9 timeline is not really a realistic and I think, you
10 know, for point of reference for the Commission, we
11 built a number of combine cycles, a number of turbines
12 from the date the CPCN to the date -- you know, and we
13 see that expanding given the contentious nature of
14 getting all the infrastructure you need. So I would
15 not agree that you can simply say CPCN, now go start
16 building a plant. So when you adjust for that, I'm
17 more aligned with the Duke timeline as a total project
18 timeline and not taking a general industry report on
19 construction that assumes you magically get all your
20 permits and all your infrastructure on day one and just
21 start constructing. That's the difference and I stand
22 behind the Duke timeline.

23 Q. So the Commission can take judicial notice of
24 docket E-2, Sub 1006, which was the CPN application for

Page 124

1 Sutton CT. And the application was filed on April
2 2015. The CPCN was granted in August of 2015 and the
3 CT was commercially operational in July of 2017. So in
4 other words Duke managed to do it in 23 months, despite
5 all of the additional challenges you just referenced.

6 A. Yeah. You just -- you have an apples and
7 oranges comparison there. That was a brownfield site
8 with existing infrastructure that also was a one small
9 CT being added to -- so not only did you get the
10 economies of scale for that CT, that CT was a -- I
11 believe that was our -- Bobby, the black start was in
12 '16 at Sutton for the support of the nuclear plant, is
13 that correct? I don't want to say something on the
14 record wrong.

15 A. (Bobby McMurry) Subject to check.

16 A. (Glen Snider) That's all right. So if
17 memory recalls, that was not a large, you know, four
18 turbine site that you're developing. That was adding
19 to an existing CT CC site, a small CC at a brownfield
20 that had all the infrastructure already in place. So
21 that's a great example if I was just adding a little CC
22 at a brownfield site and took all the advantages of the
23 brownfield I could do it much quicker than adding a new
24 combine cycle and needing all the infrastructure to --

1 you know, to get it to -- a lot of our estimates are
2 generic -- are based on a much bigger site than what
3 he's referring to in the Sutton case.

4 Q. So the construction of a CT or a CC at a
5 brownfield site can expedite the construction process?

6 A. Yes. The brownfield site -- and, you know,
7 we hope to put our new CCs and CTs at brownfield sites.
8 But you still have infrastructure. You still have to

9 do interconnection work. For example, the CT you
10 referenced was at a gas site. If I'm doing gas at a
11 coal site, there's supporting infrastructure that's
12 needed. You may or may not need additional
13 interconnection work if your existing switch yard is
14 sufficient or not is yet to be determined. You may
15 have to build out an entirely new switch yard for a new
16 combined cycle. You may need time for the intrastate
17 pipeline construction to come into that coal site.

18 And, you know, you may have to do some preliminary land
19 work to make lay down area of what your operating the
20 coal site and operating. So there's a lot -- you still
21 have to get -- you know, go through the permitting
22 process. So there's a fair amount of work other than
23 just turning the crank. Again, that Sutton CT was a
24 small CT at an existing gas site that didn't require

1 any of that larger -- what would be needed for a much
2 larger project.

3 Q. But just to clarify, according to your
4 testimony and table four-five of chapter four of the
5 Carbon Plan, the CT and the CC that Duke wants to build
6 by 2027, 2028 would be constructed at brownfield sites,
7 according to these construction estimates?

8 A. We are striving to put them at brownfield
9 sites, yes.

10 Q. So the advantages of a brownfield site would
11 apply to the construction of these CTs and CCs?

12 A. Not in the same way it did to that Sutton
13 site. As I explained, it was a much smaller. It
14 didn't need a new switch yard. It didn't need a new
15 pipeline. It was relatively easy to permit because it
16 was such a small turbine for -- I think it was voltage
17 support for the nuclear plant and black start support.
18 It was not even of the same scope and scale as these
19 types of projects. These are much, much bigger
20 projects than the docket that you asked the Commission
21 to take judicial notice of.

22 Q. But also I asked them to be mindful of the
23 EIA and PJM estimates that they applied and published,
24 correct?

Page 127

1 A. And I reminded them to take note that it was
2 just the construction period and not the total project.

3 Q. Moving on to page 194 of your testimony. You
4 point out that the preferred portfolio selects 900
5 megawatts of CC and CT capacity from third-party gas
6 plants. Do you recall that?

7 A. I'm looking at it now.

8 A. (Michael Quinto) Do you have a line for the
9 numbers you quoted?

10 Q. 19 and 20, as well as 17.

11 A. (Glen Snider) I'm there.

12 Q. Do you see that you say that the Gabel
13 portfolio, the preferred portfolio selects 900
14 megawatts of PPAs for CT and CC power?

15 A. Yeah, additional.

16 Q. Right. And then Duke has the criticism
17 starting on line 19 of that same page that Gabel
18 presents -- or Gabel, quote, presents no justification
19 for assuming that an additional 900 megawatts of firm
20 CC and CT capacity will be available for purchase by
21 the companies on the timeline required. Do you see
22 that testimony?

23 A. I do.

24 Q. In the Gabel report at pages 30 and 31, Gabel

Page 128

1 Associates identified three third-party natural gas
2 plants with which Duke currently contracts for firm
3 capacity, correct?

4 A. They did.

5 Q. And it was Cleveland CT, Rowan CT and Rowan
6 CC, correct?

7 A. Right.

8 Q. And Gabel pointed out that Duke already has
9 existing contractual relationships for capacity from
10 these three plants, is that correct?

11 A. Yes, I think they suggest we get 900 more.

12 Q. Gabel also looked at the termination dates of
13 the various PPAs for each of those plants and use the
14 upcoming termination dates to see when Duke might be
15 able to acquire additional power from those three
16 plants.

17 A. Additional 900 above what we're currently
18 contracting for.

19 Q. But it looked at the PPAs, found the
20 available capacity and the time it was available and
21 ran that into its model, correct?

22 A. I don't know. That's what they -- when you
23 say existing PPAs, I'm sorry, I'm trying to remember in
24 their report. Are you talking about the existing PPAs

Page 129

1 that Duke has with that -- I'm trying to figure out
2 whether we're talking about incremental capacity above
3 what we're already contracting for, which is already
4 built into our plan. We assume we're going to extend
5 those contracts. The contracts -- I'm going to try and
6 say this without having to go into a confidential
7 section. Let's just say we're assuming we're going to
8 extend our existing contracts already in -- the ones we
9 think we can extend, we have built that into the carbon
10 plan. So what we're pointing out here is the
11 assumption that we can get 900 additional megawatts is
12 unsubstantiated.

13 Q. In other words, you don't believe the Gabel
14 report looked at the other capacity, the additional
15 capacity beyond what Duke already acquires from those
16 plants, looked when it would become available according
17 to the PPAs that are currently in existence, and said
18 we're going to assume that Duke can buy that additional
19 capacity as it becomes available?

20 A. Yeah. I know that's what they did do and
21 assume that. I'm saying I don't think that's a
22 reasonable assumption.

23 Q. Now, to be conservative though, Gabel
24 Associates also decided to add a five-percent premium

Page 130

1 above the current contract price with each of those
2 resources?

3 A. Yeah. Again, I think you're talking about
4 resources -- you mentioned three resources, Cleveland,
5 Rowan CT, Rowan CC. Those are by and large Southern
6 Company-owned resources. Our ability to get the
7 remainder of those -- if you see that Southern Company
8 is retiring all of its coal and relying on merchant
9 generation to retire their coal. We don't believe it's
10 substantiated to believe that Duke is going to have
11 easy access to procure more than what we're already
12 procuring, and I'm not even getting into the 951
13 ownership of taking on incremental gas under PPA versus
14 ownership. That's a separate and distinct issue. But
15 the fact of the matter is is the market in the
16 Carolinas and in the southeast for merchant generation
17 is very, very tight and getting tighter. All of these
18 assets are being subscribed back to retail load
19 obligations or wholesale load obligations and there is
20 not a large amount of excess capacity in the region
21 perhaps that there was a decade ago, and I don't
22 believe it's reasonable -- two prongs. We can have the
23 ownership discussion. That's not where I want to go.
24 We filed comments on that. It's a little bit outside

Page 131

1 my testimony. But even if we were to go past that,
2 that market is extraordinarily constrained at the
3 moment.

4 MR. BREITSCHWERDT: Chair Mitchell, just
5 very briefly to make sure the record is clear, when
6 Mr. Schauer said that Gabel reviewed the PPAs, can
7 we just ensure we're clear on which PPAs you're
8 referring to? Duke wouldn't have access to PPAs
9 that are not with Duke Energy. I just want to be
10 clear about which PPAs you're referring to when you
11 say your consultant reviewed the PPAs.

12 MR. SCHAUER: I have to admit that we
13 would have to refer that question to Gabel
14 Associates. But that is my understanding of the
15 research they conducted.

16 MR. BREITSCHWERDT: Okay.

17 MR. SCHAUER: And they'll be available
18 later.

19 CHAIR MITCHELL: Bring that up on
20 cross-examination.

21 MR. BREITSCHWERDT: Thank you.

22 CROSS EXAMINATION BY MR. SCHAUER:

23 Q. Mr. Snider, returning to you. Is it Duke's
24 position, is it your position that Duke will not be

Page 132

1 able to purchase that additional capacity as it becomes
2 available even if Duke is willing to pay a premium for
3 that additional capacity?

4 A. I am saying there are many market
5 participants that may have already been thinking they
6 can't assume just because an existing contract is
7 rolling off that it will not be or maybe has already
8 been, I don't have access to, right? I don't know --
9 I'm not the market expert. I say it's unreasonable,
10 it's not reasonable to assume that there is 900
11 megawatts -- as a core planning assumption today, 900
12 megawatts above what we already contract for -- just to
13 be clear, we do contract for a certain amount of gas
14 capacity that we did extend and assume we are going to
15 have access to in the Carbon Plan. But to find another
16 900 megawatts in this region we do not believe is going
17 to be reasonably accessible, notwithstanding and sort
18 of not making judgement on the filing on the ownership
19 issue.

20 Q. Thank you. Moving on to page 68 of your
21 testimony. You discuss the supplemental portfolios.

22 A. Page 68?

23 Q. Yes.

24 A. I am there.

Page 133

1 Q. And I'll give you a line in one second. You
2 start your discussion of the supplemental portfolios
3 and you say that the adjustments of the supplemental
4 portfolio would not have resulted in material
5 differences in the selection of resources in the carbon
6 plan. Do you recall that testimony?

7 A. I do.

8 Q. You acknowledge that the supplemental
9 portfolios did not select offshore wind until the
10 2040s, correct?

11 A. Yes, I agree with you.

12 Q. Then the testimony goes on to state at page
13 74, quote -- I'm sorry, it goes on to state that the
14 supplemental modeling results, quote, support Duke's
15 request for approval of near-term development
16 activities -- then I'll insert an ellipsis, for
17 offshore wind. In other words your position is that
18 the supplemental portfolios support Duke's request for
19 --

20 A. Yes. They're going to be needed and the --
21 you know, the relative benefits -- you can't pursue it
22 if you're not developing it. And we said whether
23 they're needed in the early '30 or the early '40s and
24 whether those economics change and as we said, P5 and

Page 134

1 six were done primarily as robustness tests for our
2 near-term action plan. Not to say that everything in
3 that portfolio that we exactly agreed with. And if
4 offshore wind was not -- maybe it gets select and it's
5 only a small margin of difference, that diversification
6 benefit, resource diversification benefit, may be
7 something that the Commission may want to consider.
8 That yes, it's a hundred million more than the P5 would
9 suggest. But it provides diversification. It provides
10 a different profile of resource of coming into the
11 system geography wise. So there's lots of reasons that
12 the Commission might want us to continue to keep
13 offshore wind as an option, whether it's '29, '30, '31
14 or later in the 30s. Those economics, unless they're
15 -- unless -- you know, if the Commission determines
16 that the economic selection is so out of the money that
17 they don't want any development work, that's at their
18 discretion as well. But I would say there's a lot of
19 good reasons other than not being, you know, in that
20 one particular portfolio being selected to say it's
21 still worth pursuing early development work. And I
22 will, you know, probably let you question our long lead
23 time panel that has more of those facts and figures.

24 Q. It takes approximately a decade to construct

1 an offshore wind facility, correct?

2 A. It certainly does if you don't have any
3 development work done.

4 Q. Right. So from start to finish,
5 approximately a decade?

6 A. So to keep the option more viable, you want
7 to have some development work done, yes.

8 Q. And if the supplemental model showed that
9 it's not economic for the offshore wind to be
10 operational into the 2040s that means Duke can start
11 construction or development activities in the 2030s and
12 still have it operational in time?

13 A. If your sole decision was if this was not
14 economically selected as the least cost then don't
15 begin any development work. You know, you have to
16 determine in that is that economic so egregious that we
17 should just stop everything or is that economics, you
18 know, slightly out of the money, it's not least cost in
19 this current world view but it's worth because the
20 economics were not tremendously disadvantageous to
21 offshore wind. We need to keep that option alive and
22 the -- overall when you look at the development cost as
23 a total project cost is a reasonable expenditure to
24 make to preserve the option to bring offshore wind in

1 earlier. If you never start development work then
2 you're always 10 years away, and maybe that's fine if
3 you just say it's so far under no circumstance will we
4 do it. But if it's hey, that's pretty close to being
5 least cost in the grand scheme of everything and these
6 development costs are such a small part of total
7 project cost that I'm not putting too much consumer
8 money at risk here, then that's a decision for the
9 Commission. But I think we believe it's still knowing
10 that offshore wind is a resource that over the planning
11 horizon is likely going to be needed and it could move
12 up, it could back, and that the relative economics, you
13 know, in one portfolio it's picked, in one it may not,
14 then, you know, the Commission has the discretion to
15 determine whether early development work is prudent at
16 this time.

17 Q. Mr. Snider, the statute requires least cost
18 planning, not pretty close to being least cost
19 planning, correct?

20 A. We're not asking for approval to build the
21 offshore wind. Just to be clear, we're asking for
22 approval to pursue near-term development activities. A
23 limited amount. Not asking for a CPCN or even for the
24 Commission to select that offshore wind at this time.

Page 137

1 And again, I don't want to step on the testimony of our
2 long lead time panel. So I'm trying -- in the interest
3 of time trying to keep it brief.

4 MR. SCHAUER: Madam Chair, no further
5 questions.

6 CHAIR MITCHELL: All right. Let's see.
7 Next up --

8 MR. BREITSCHWERDT: Madam Chair, I know
9 you said that exhibits would be entered into the
10 record at the end of the panel, but just while this
11 is fresh for the Commission I want to identify that
12 Mr. Schauer's Exhibit-3, which was the
13 demonstrative exhibit that he presented, this one.
14 So he was intending to demonstrate something which
15 our panel fundamentally disagreed with and disputed
16 the accuracy of the exhibit that Mr. Schauer
17 created. This is not a third-party developed
18 document. It's not been independently verified.
19 So at the appropriate time we do plan to object to
20 entering this demonstrative exhibit into the
21 record.

22 CHAIR MITCHELL: All right. Noted.

23 MS. GRUNDMANN: Chair Mitchell, I will
24 do my best to -- I will try to be done by the 5:00

1 time frame.

2 CROSS EXAMINATION BY MS. GRUNDMANN:

3 Q. Good afternoon, gentlemen. How are you?

4 A. (Glen Snider) Good afternoon.

5 Q. I want to sort of touch base on the topic
6 that we were just addressing, this demonstrative
7 exhibit from the Tech Customers. And bear with me
8 while I try to find my notes. I'm Carrie Grundmann on
9 behalf of Walmart, Inc.

10 Mr. Kalembo, were you a witness in
11 docket number E-7, Sub 1134, which was the Company
12 CPCN application for the 402 megawatt combustion
13 turbine addition in Lincoln?

14 A. (Matthew Kalembo) I was.

15 Q. And are you familiar or would the Commission
16 accept and take judicial notice that the CPCN was filed
17 for that June 17, 2017? Does that timeline sound right
18 to you?

19 A. That sounds right.

20 Q. And are you aware and familiar from a press
21 release on Duke's Website that that was connected to
22 the grid and went online in May 2020?

23 A. That sounds correct. If I can --

24 Q. Yes.

Page 139

1 A. There are multiple steps within that CT where
2 it's not actually officially -- its official online
3 date is not -- I'm quite not sure what it is now. At
4 the time and it probably still holds, I think was 2024
5 as the -- that's not to say it's not putting out power
6 today.

7 A. (Glen Snider) It's test power. It's not
8 commercially operational under the care, custody and
9 control of Duke at this point in time.

10 Q. But that's because you're using an
11 experimental technology with Siemens Energy, correct?

12 A. At an existing site. And so it was synched
13 to the grid of a conditional resource, but it is not in
14 the care, custody and control of Duke.

15 Q. But did the experimental nature of that
16 resource somehow affect and make the construction
17 easier or quicker than other types of technology would?

18 A. It made it -- to some extent we put it at
19 again an existing site and it was picked very carefully
20 because it had the infrastructure where transmission
21 upgrades were not needed, and it had adequate fuel
22 supply already there. So there was no -- it's not like
23 putting gas at a coal site where you don't have fuel
24 supply. So it had the adequate gas supply. It had the

Page 140

1 adequate transmission. And then all you were left with
2 was the construction period without the need for
3 additional transmission work or additional gas
4 infrastructure -- or significant additional gas
5 infrastructure.

6 Q. Mr. Snider, let me repeat my question so I
7 can make sure that you and I -- you're answering the
8 actual question that I'm asking you.

9 A. Got it.

10 Q. So the question had nothing to do with the
11 location or the existing transmission. It purely
12 related to the experimental nature of the Sieman's
13 Energy technology and whether or not that specific
14 technology somehow enabled you to construct more or
15 less quickly than you would with some other type of
16 technology.

17 A. And the technology being gas at a gas site is
18 all I was saying. Whether it was experimental or not,
19 you were putting gas at gas with an existing
20 transmission and existing gas. So that made it easier.

21 Q. I want to go -- I'm going to kind of jump
22 around a little bit to try and touch a number of the
23 subjects that you've touched on today. With respect to
24 offshore wind, it is the Companies' position that one of

Page 141

1 the near-term development items is to acquire the lease
2 for 155 million dollars from a Duke Energy affiliate,
3 is that correct?

4 A. I'm going to leave that for the long lead
5 time.

6 Q. But you were previously making arguments to
7 the Commission in favor of the early development work
8 just a few minutes ago in response to questions from
9 the Tech Customers, correct?

10 A. I think the Commission has a decision to make
11 to whether developing offshore wind and starting
12 development makes sense, and they can factor in many
13 factors as we're not asking for approval to construct
14 but just to begin some preliminary development.

15 Q. And my question to you is do one of those
16 preliminary development steps include acquiring a lease
17 for offshore wind?

18 A. That is my understanding, but I'm going to
19 save that, subject to check, to the long lead time
20 panel that will more fulsomely answer that question.

21 Q. Mr. Snider, I think earlier -- and I
22 apologize if I misunderstood, but I think in response
23 to some questions from Ms. Thompson you made a comment
24 with respect to gas plants about optimization and about

1 how the optimization process during modeling will help
2 select the right type of unit, is that a correct --
3 have I summarized correctly --

4 A. It's not just the optimization. At a
5 specific site you have real world conditions, right?
6 How much land do I have? What's my interconnection
7 look like? If it's a combined site, what's my water
8 availability? What's my switch yard? You have bids
9 coming in from actual EPC contractors, major equipment
10 at that point in time. So you're not using generic
11 estimates that you do in an optimization. You have
12 very specific -- and this is my point earlier about
13 dozens of different vendors and slight differences.
14 You go through a much more detailed equipment selection
15 configuration and costs at that siting and development
16 process than you do at the planning fades. And all I
17 was talking to Ms. Thompson about is that's when you
18 say can say maybe this turbine size or this turbine
19 vendor fits better at this particular site based on the
20 real-world bids we got and the real-world situation at
21 that particular site. And so we've optimized our site,
22 sometimes adding an additional turbine to take
23 advantage of the remaining transmission or water or
24 shrinking the size to fit that infrastructure that was

1 available. That will happen at that siting.

2 Q. I'm sorry, Mr. Snider, I think the record
3 will clarify obviously, it's been a little while since
4 Ms. Thompson was asking you questions, but I thought
5 the discussion was with respect to the modeling space.
6 Are you just saying you don't agree that that was the
7 context for the question?

8 A. I'm saying you'll have more discrete
9 information that you can run through the model, but
10 that the optimization I'm talking about right now and
11 I'm trying to remember if it's the same context as Ms.
12 Thompson --

13 Q. My only question is do you believe that that
14 was the context? If you don't, I'll try to reask my
15 question so that we can be talking about the same
16 thing.

17 A. I think we will be able to take real-world
18 cost and relook at it from an optimization --

19 Q. I want to talk about optimization, which is a
20 concept in the modeling space as well, correct?

21 A. Yes.

22 Q. And the optimization is -- that is something
23 that occurs to ensure that you all are developing --

24 A. Yes. And we will be able to do that based on

Page 144

1 say here it is, does it still make sense in our
2 portfolios.

3 Q. Have you had a chance to look at the Tech
4 Customers's testimony from Dr. Roumpani?

5 A. It's been a while, but please refer me and I
6 will endeavor to agree.

7 Q. Page 19 of Dr. Roumpani's testimony, lines
8 one through 12 discusses the step that the Company took
9 where it changed 35 percent of the batteries and
10 replaced it with natural gas resources. You made that
11 out-of-modeling step. You recall that, correct?

12 A. It certainly isn't an out-of-modeling.
13 That's one of the things we'd never agree with. We did
14 more detailed modeling. So you move from a screening
15 model and we did more detailed modeling to verify that
16 step. It's not out of model. It's actually in model.
17 It's in more detail model. We did make the step. I
18 disagree with the characterization it's out of
19 modeling. Mr. McMurry went through a fair amount of
20 detail to say it's standard practice, and actually if
21 you don't do that step when you go down, it's probably
22 insufficient.

23 Q. Did you go back through within the model once
24 you made that change whether or not you concede that

1 it's in or out of model and conduct a reoptimization
2 step?

3 A. The point is the optimization step is a
4 simplified screening model. You then verify that in a
5 more detailed production cost model where you have much
6 better -- so to take it back out and put it back into
7 -- that's not how the modeling works. That selection
8 process -- you don't put something in at the first
9 step, at the CAPEX screening step. That's what selects
10 it. Then you take that -- it moves you into the
11 ballpark. Gets you into a much closer zip code. And
12 so then you take things from there and you say you know
13 what, I need to look at this much more detailed,
14 especially with storage because the optimization model
15 was never built to optimize storage. That's a new
16 development in the last couple of years. It was never
17 in the architecture for these things up to this point
18 in time. That's where the industry is evolving. And
19 you say I need an 87, 60, meaning every hour of every
20 year detailed production cost model to look at the true
21 value of that storage so I can move it in realtime, not
22 on a hypothetical load shape that's not 87, 60 compared
23 to a turbine and say which one is more economic. It
24 would make no sense -- it actually -- I can't quite

Page 146

1 understand how you could even then go back and say put
2 it in the optimization. You're moving down the stream.
3 You don't go back upstream.

4 Q. Let me have you take a look at Dr. Roumpani's
5 testimony at page 19, lines one through 12.

6 A. Could you hand that to me?

7 Q. I can hand you the page from it if you'd like
8 it.

9 A. Please. I just don't have enough room on the
10 table for the several thousand pages --

11 Q. Unfortunately my dad retired from a paper
12 Company two years ago so you're not making him any
13 money.

14 A. We've made him plenty, I promise.

15 Q. That's why he got a pension when he retired
16 so we'll be thankful for that. Page 19, lines one
17 through 12. All I want to talk about is your response
18 to this criticism and if it's purely that you don't
19 think that this criticism is appropriate, I'm happy to
20 have your response to that. But the testimony says is
21 that another concern is the replacement of batteries
22 with combustion turbines, which is again done outside
23 of the model. I understand you already disagreed with
24 that. We don't have to go back through that. Because

Page 147

1 this step is done outside of the capacity expansion
2 step it encompassed it essentially bypasses the
3 selection of resources based on both their cost and
4 their potential carbon footprint as weighted by the
5 optimization under a carbon emissions reduction target.
6 Furthermore, after forcing in a high number of thermal
7 resources the composition of the remaining portfolio is
8 not again tested and might no longer be optimal.

9 The focus of my question is on that should
10 you retest to determine if it remains optimal. And is
11 your answer the same, that that's an unnecessary step?

12 A. Yeah. I don't think you need to do that
13 step.

14 Q. Thank you. I want to touch base on a topic
15 that I covered yesterday with Ms. Bowman and it relates
16 to all-in cost of the plan. Looking at the direct
17 testimony, page --

18 CHAIR MITCHELL: I'm going to pause
19 here. It's 5:00. How much longer do you
20 anticipate?

21 MS. GRUNDMANN: I would love to tell you
22 that I would be done in 10 or 15 minutes.

23 CHAIR MITCHELL: Let's break for today.
24 We'll come back. We'll start with you tomorrow

1 morning. We will be back on the record 9:00.

2 Let's go off the record.

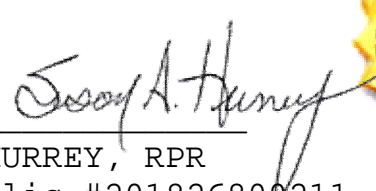
3 (The hearing was adjourned at 5:03 p.m.
4 and set to reconvene at 9:00 a.m. on
5 Thursday, September 15, 2022.)
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

CERTIFICATE OF REPORTER

STATE OF NORTH CAROLINA)
COUNTY OF ALAMANCE)

I, Susan A. Hurrey, RPR, the officer before whom the foregoing hearing was taken, do hereby certify that the witnesses whose testimony appears in the foregoing hearing were duly affirmed; that the testimony of said witness were taken by me to the best of my ability and thereafter reduced to typewriting under my direction; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this hearing was taken; and further, that I am not a relative or employee of any attorney or counsel employed by the parties thereto, nor financially or otherwise interested in the outcome of the action.

This the 20th day of September, 2022



SUSAN A. HURREY, RPR
Notary Public #201826800211

