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PLACE: Dobbs Building, Raleigh, North Carolina

DATE: Tuesday, September 27, 2022

TIME: 1:17 p.m. - 4:54 p.m.

DOCKET NO.: E-100, Sub 179

BEFORE: Chair Charlotte A. Mitchell, Presiding

Commissioner ToNola D. Brown-Bland

Commissioner Daniel G. Clodfelter

Commissioner Kimberly W. Duffley

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: 27

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P R O C E E D I N G S

CHAIR MITCHELL: All right. Let's go back on the record, please. And I believe we're at questions on Commissioners' questions at this point.

Whereupon,

RON DIFELICE,

having previously been duly sworn, was examined and testified as follows:

MR. BURNS: Are we ready?

CHAIR MITCHELL: We are ready.

MR. BURNS: Thank you.

THE WITNESS: Before we begin, Chair, may I comment on something from previous questioning?

CHAIR MITCHELL: Well, typically, you're allowed to answer a question from counsel or from one of the Commissioners, and we've moved on now to the point at which counsel gets to ask questions on our questions. So you may have an opportunity to make the point that you need to make.

THE WITNESS: Okay. I just had found the answer to the first question I was asked.

MS. CRESS: Objection.

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MR. BURNS: It's okay. We'll take care of that later.

THE WITNESS: Okay. Thank you.

MR. BURNS: I would have to ask you about that too, and I've gone past my opportunity to do that.

CHAIR MITCHELL: All right. Hang on. So I'm just making sure no other party has questions for this witness on Commissioners' questions. So, Mr. Burns, you're up.

EXAMINATION BY MR. BURNS:

Q. Okay. Dr. DiFelice, at the end of your testimony, Commissioner Clodfelter pointed out in a question to you that EnCompass -- it was his understanding that EnCompass did not have the capability of performing the modeling.

Do you recall that question?

A. I do.

Q. And your response was, when he asked you what would you do, use different software.

Understanding that Duke was required to use EnCompass software in this procedure, do you understand whether they took any other steps outside of the EnCompass model when they were addressing issues

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related to the Carbon Plan?

A. Yes, I think there are several examples. They supplemented a large percentage of CTs for the battery storage available after the modeling results.

Q. Do you know -- and understanding you're not a modeling expert, do you know whether there could have been adjustments made to account for bidirectional charging and assumptions made for the capabilities that you've testified to?

A. I would imagine that you'd want a model that does that, and it wouldn't be too much effort to either code that into the model or artificially account for that.

Q. I believe it was Chair Mitchell who asked you whether there was solar plus storage in service elsewhere, other than under that TVA contract, and you said certainly.

Are there any examples of -- that you know of where solar plus storage is in service elsewhere and charges bidirectionally?

A. Yes. In the wholesale markets, I would say. And also, I mean, in ERCOT, for example, a lot of standalone storage is going in. Of course, that's being charged from the grid. But, in general, yes, I

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know of many projects that can both charge from the grid and from solar.

Q. There was a -- are there control units that allow that to be controlled either by the operator or by the utility?

A. Indeed. And so the answer to this -- this is probably best addressed by one of my exhibits which shows a commercially available EMS, which is energy management system, which sits on top of a BMS, a battery management system. And so the control software that's commercially available today and in operation can do a lot of the tasks that we're getting questions about quite easily.

And you can dedicate the battery to be charged in certain ways, dispatched in certain ways. You can slice off a portion of the battery for a specific application and use the rest of the battery for another application. It's fairly sophisticated these days, and there's not just one commercial vendor, there are several.

Q. There were questions from Commissioner Mitchell -- or Chair Mitchell about the provisions of the TVA contract. Is that -- I just wanted to clarify.

Is that the only example of a PPA that you're

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aware of, or are there others?

A. No, there are others.

Q. Okay. You included that as an example? Or are there other ones out there that you might rely upon if you were to design a contract?

A. Well, Georgia Power has an RFP out, and they give an example PPA that's actually a little more complicated than TVA's. But it's along the same lines. Alabama Power also has an RFP out for renewables that has a similar structure.

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

CHAIR MITCHELL: All right. With that, I believe I'll take a motion on your witness.

MR. BURNS: Yes, ma'am. At this time, CCEBA would move the six exhibits attached to Dr. DiFelice's testimony into evidence.

CHAIR MITCHELL: All right. Hearing no objection, your motion is allowed.

(DiFelice Exhibits 1 through 6 were admitted into evidence.)

CHAIR MITCHELL: Mr. DiFelice -- or Dr. DiFelice, you may step down. You are excused. Thank you very much for your testimony today.

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THE WITNESS: Thank you, Commissioners.

MR. BURNS: Chair Mitchell, there is also a very brief matter. The last time I moved for the waiver of Dr. Gonatas, his summary had not yet been filed. That was filed on Friday, and we'd ask that that be accepted into the record at the appropriate time.

CHAIR MITCHELL: All right. The testimony -- testimony summary --

MR. BURNS: Yes, ma'am.

CHAIR MITCHELL: -- of Gonatas -- witness Gonatas will be copied into the record at the appropriate time.

MR. BURNS: Thank you.

(Summary of Dinos Gonatas' direct testimony was entered in Volume 22 along with his prefiled direct testimony.)

CHAIR MITCHELL: All right. I believe we're now into Duke's rebuttal case. Duke, call your witnesses.

MR. BREITSCHWERDT: Thank you, Chair Mitchell. Duke Energy calls the Modeling and Near-Term Actions Panel back to the stand.

MS. FORCE: Chair Mitchell,

Margaret Force from the Attorney General's Office. As they move to start this panel, I wanted to ask -- make a motion. We'd like to clarify the record from yesterday. There were questions from Commissioner Clodfelter to our witness, Mr. Burgess, relating to Duke's discovery response to AGO 6-2. And there's a Duke Late-Filed Exhibit Number 4 that provides some information related to that. I think that's what the question was about. It concerns the retrofit of coal units to use gas.

MR. BREITSCHWERDT: I think that's Exhibit 2, if that's helpful.

MS. FORCE: Oh, I'm --

MR. BREITSCHWERDT: That's okay. Just clarifying the record.

MS. FORCE: AGO 6-2, and I think that the --

CHAIR MITCHELL: It's Duke Late-Filed Exhibit 2.

MS. FORCE: I believe it's late-filed -- Duke Late-Filed Exhibit Number 4. And that relates to both Marshall and Belews Creek. And not all of the -- the request, as I understood it originally from Commissioner Clodfelter for a late-filed

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exhibit, is a little different than what was provided. And our witness was not cognizant of the fact that not all of the attachments to AGO 6-2 were included in the late-filed exhibit provided by Duke.

CHAIR MITCHELL: My recollection of the record is that CIGFUR's counsel cleared that up. So the record is clear that not all of the attachments were included in the late-filed exhibit. My recollection also -- and I'll ask Commissioner Clodfelter to help me here, but Commissioner Clodfelter referred to Duke Late-Filed Exhibit 2.

And so Commissioner Clodfelter, do you have anything to add?

COMMISSIONER CLODFELTER: I'm looking at it. It's Number 2, not 4.

MS. FORCE: All right.

CHAIR MITCHELL: Can you hold it up just to make sure we're on the same page here. Is this, in fact, Duke Late-Filed Exhibit 2, counsel for Duke?

MR. BREITSCHWERDT: Correct.

MS. FORCE: Okay.

COMMISSIONER CLODFELTER: And in addition to that, it is an exhibit that contains multiple different documents. It's not just a single document.

MR. BREITSCHWERDT: And, Commissioner Clodfelter, I guess at the end of the day, is there anything else you're looking for that we haven't provided or you believe that we should have provided that we haven't? Because we want to make sure you have what you need.

COMMISSIONER CLODFELTER: Every PDF that's referenced -- and they're listed -- every PDF that's listed in the response to AGO Discovery Request 6-2. My understanding is that that's what Exhibit 2 is, that you just compiled them all, all those PDFs into a single document rather than giving them separate exhibit numbers; is that correct?

MR. BREITSCHWERDT: To the best of my knowledge, yes, sir. And I will confirm that. But that is what we intended to file as Late-Filed Exhibit 2.

COMMISSIONER CLODFELTER: For clarity of the record, it might be good if you numbered them

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2-A, 2-B, 2-C, 2-D so we could confirm that each subcomponent of that discovery request is, in fact, included in the combined exhibit.

MR. BREITSCHWERDT: That's a good suggestion. Thank you, sir.

CHAIR MITCHELL: And my recollection of Burgess -- witness Burgess' testimony is that he confirmed he recalled reviewing Duke Late-Filed Exhibit 2.

MS. FORCE: My understanding is he was referring to the other exhibit, and that's where the confusion is in the record. I'll go back and review the transcript once it's available and see, but my understanding is that he was referring to a response that Duke gave to AGO 6-2 that appears -- well, it's not included in Late-Filed Exhibit 4. I'll go back and see whether it is included in that Exhibit 2.

My point is to clarify the testimony that was given yesterday, because I don't think he was looking at the same study that Commissioner Clodfelter was referring to.

CHAIR MITCHELL: Well, the problem I have is the witness has been excused, so we -- what

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are we to do now at this point that the -- my recollection of the witness' testimony is that he was -- he was responding to Commissioner Clodfelter's question about Late-Filed Exhibit 2, and confirmed that had he had reviewed Late-Filed Exhibit 2. But let's go --

MS. FORCE: He was a little bit confused at the time, as I recall. He wasn't sure if he was talking about the same studies we were talking about. I'll go back and check again, because obviously I had in mind something different too.

CHAIR MITCHELL: Okay. Okay. Gentlemen, let's get you sworn in again.

Whereupon,

GLEN SNIDER, BOBBY MCMURRY, MICHAEL QUINTO,
AND MATTHEW KALEMBA,
having first been duly sworn, were examined
and testified as follows:

CHAIR MITCHELL: All right.

DIRECT EXAMINATION BY MR. BREITSCHWERDT:

Q. All right. Good afternoon, gentlemen.

So you are the same Modeling and Near-Term Action Panel that appeared in this proceeding on September -- starting on September 13th and then

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extending through September 15th as part of the Companies' direct case?

A. (Glen Snider) Yes, we are.

Q. Seems like a long time ago, but we're back again. So that being the case, Mr. Snider, I'm just gonna focus on you to introduce the Companies' rebuttal testimony and exhibits, and the rest of the panel will be supported by that.

So did the panel cause to be prefiled in the docket rebuttal testimony consisting of 95 pages and four exhibits?

A. Yes, we did.

Q. And on September 19th, did the Companies also prefile certain limited corrections to page 27 of your rebuttal testimony?

A. Yes, we did.

Q. And do you have any additional corrections or changes to your rebuttal testimony or exhibits at this time?

A. Yes, I have one further correction. That would be on page 78 of the rebuttal testimony. If we start at line 5 where the quote at the end of that line says, quote, no, strike the word -- strike no. Strike the entirety of line 6. Strike line 7 up to the word

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MIP. So on page 78.

MR. BURNS: May I ask the witness to repeat that?

THE WITNESS: Page 78. On line 5, we're gonna strike the word "no" at the end of the sentence, very last word in that sentence. We're gonna strike the entirety of line 6. And we're gonna strike line 7 up to the word "MIP."

CHAIR MITCHELL: I think to get everybody there, we're looking at page 77 on the testimony that we have. Does "no" begin with a quote?

THE WITNESS: Yes.

CHAIR MITCHELL: Okay. So "no" through "MIP"; is that what you said?

THE WITNESS: Up to "MIP." Leave "MIP."

CHAIR MITCHELL: Leave "MIP."

THE WITNESS: Leave "MIP." So the sentence would now read, "Reviewing the Synapse modeling files, the Companies found that the 15-year segmented solution used an MIP basis of 200, which is not precise enough for resource planning."

(Pause.)

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CHAIR MITCHELL: Okay.

THE WITNESS: I'm sorry. I might have -- I should have said 77. I apologize.

Q. And subject to those corrections, Mr. Snider, if I were to ask you the same questions today that appear in your prefiled rebuttal testimony, would your answers be the same?

A. Yes, they would.

Q. Thank you. And isn't it correct that the Companies' rebuttal testimony and exhibits include confidential information, specifically on page 57 of the prefiled rebuttal testimony, and then the rebuttal Exhibits 2 and 4 contain confidential information were filed under seal?

A. Yes, they do.

Q. And did you also prepare and cause to be filed a summary of the panel's rebuttal testimony on September 26th in Docket Sub 179-A?

A. Yes.

Q. Thank you.

MR. BREITSCHWERDT: Chair Mitchell, at this time, I'd ask that the Modeling and Near-Term Action Panel's rebuttal testimony and summary of testimony be entered into the record as if given orally from the stand.

CHAIR MITCHELL: Motion is allowed.

(Whereupon, the prefiled rebuttal testimony of Glen Snider, Bobby McMurry, Michael Quinto, and Matthew Kalemba the prefiled summary testimony of Glen Snider, Bobby McMurry, Michael Quinto, and Matthew Kalemba were copied into the record as if given orally from the stand.)

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STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-100, SUB 179

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of:	)	**REBUTTAL TESTIMONY OF**
Duke Energy Progress, LLC, and	)	**GLEN SNIDER, BOBBY**
Duke Energy Carolinas, LLC, 2022	)	**McMURRY, MICHAEL QUINTO,**
Biennial Integrated Resource Plan	)	**AND MATT KALEMBA ON**
And Carbon Plan	)	**BEHALF OF DUKE ENERGY**
	)	**CAROLINAS, LLC AND DUKE**
	)	**ENERGY PROGRESS, LLC**

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Q. MR. SNIDER, PLEASE STATE YOUR NAME, TITLE AND BUSINESS ADDRESS.

A. My name is Glen A. Snider, and my business address is 526 South Church Street, Charlotte, North Carolina, 28202. I am the Managing Director of Carolinas Integrated Resource Planning and Analytics for Duke Energy Corporation. I am providing testimony on behalf of Duke Energy Carolinas, LLC ("DEC"), Duke Energy Progress, LLC ("DEP" and together with DEC, the "Companies" or "Duke Energy") with Bobby McMurry, Michael Quinto, and Matt Kalemba as the "Modeling and Near-Term Actions Panel."

Q. ARE YOU THE SAME MODELING AND NEAR-TERM ACTIONS PANEL THAT FILED DIRECT TESTIMONY IN THIS CASE?

A. Yes.

Q. IS THE MODELING AND NEAR-TERM ACTIONS PANEL INTRODUCING ANY EXHIBITS IN SUPPORT OF YOUR REBUTTAL TESTIMONY?

A. Yes. We are sponsoring the following exhibits, which are described below.

- Modeling and Near-Term Actions Panel Rebuttal Exhibit 1 provides key graphics and figures presented in our testimony in a larger, more readable format.
- Modeling and Near-Term Actions Panel Rebuttal Exhibits 2-4 provide data request responses that are referenced throughout this testimony.

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Q. MR. SNIDER, PLEASE EXPLAIN HOW THE COMPANIES ARE APPROACHING REBUTTAL TESTIMONY IN THIS PROCEEDING.

A. Due to the significantly accelerated procedural schedule in this proceeding and the volume of testimony received by intervenors, the Companies are taking a targeted approach to focus their rebuttal testimony on more critical issues that impact the near-term action plan.

Duke Energy's direct testimony fully supported the requests for relief requested in the Companies' Verified Petition for Approval of Carbon Plan filed on May 16, 2022 ("Carbon Plan"). We also explained that it is not necessary, or likely possible, for the Commission to resolve every disputed issue related to the complex modeling assumptions or other contested aspects of this proceeding. The Companies believe that, while there are uncertainties inherent in any resource planning process, Duke Energy's proposed Carbon Plan modeling assumptions are reasonable and support the near-term action plan presented for approval in this initial Carbon Plan proceeding. Approval of the near-term action plan will create a comprehensive set of tangible actions that aggressively pursue the objectives of Session Law 2021-165 ("HB 951") in an orderly manner while providing the Commission discretion afforded to it in HB 951 to consider all available options in future Carbon Plan biennial update proceedings as the energy transition continues.

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The Companies have approached this expedited rebuttal testimony phase by focusing on whether any aspects of the Companies' requests for relief, principally including the near-term actions supported by the Carbon Plan, should be modified. The Companies also address the most significant comments and critiques of the Carbon Plan modeling and analysis presented by the Public Staff and intervenors. However, the Companies have not endeavored to undertake the unachievable task of responding in four business days to every issue presented by 28 intervenor witnesses in over 1,300 pages of pre-filed testimony and exhibits.

Q. MR. SNIDER, ON BEHALF OF THE PANEL, PLEASE BRIEFLY SUMMARIZE YOUR JOINT REBUTTAL TESTIMONY.

A. The Panel's rebuttal testimony makes the following key points:

Approach to Near-Term Actions

1. Recommends the Commission focus its efforts on approving necessary near-term actions that chart a course for achieving HB 951's longer-term CO_2 emissions reductions targets in a manner that best achieves the core objectives of the law. The Commission and the Companies will then be able to "check and adjust" in future proceedings.

2. Balancing affordability, reliability and executability are key considerations for setting the pace of energy transition. While certain parties suggest that the Commission should immediately take more aggressive action and commit to more significant development and procurements of solar and battery energy storage resources, customer groups such as CIGFUR and NCEMC, as well as the Public Staff, express support for the decisive initial steps and "check and adjust" strategy recommended by Duke Energy.

3. Risk diversification is a critical consideration in selecting near-term actions for an orderly energy transition. The Companies propose balanced investment in a diverse portfolio of resources, including approximately $5 billion in solar and solar paired with storage ("SPS")

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complemented by approximately $1 billion investment each in stand-alone storage, onshore wind, and flexible and dispatchable hydrogen-capable gas. These near-term activities are generally supported by all pathways and portfolios. In contrast, adopting certain other parties' recommended near-term actions would unduly concentrate risk by focusing on preferred resource types and policy outcomes that fail to appropriately value firm, dispatchable resources that are needed to retire coal units and progress the system-wide Carolinas energy transition.

4. Overarchingly, the Public Staff agrees that Duke Energy's supplemental modeling achieves reasonable results and finds that Supplemental Portfolio 5 validates the near-term actions presented for Commission approval. When presented on an apples-to-apples basis, there is significant alignment between the volumes of solar, battery energy storage, onshore wind, and new natural gas resources that Duke Energy and the Public Staff recommend the Commission select in this proceeding.

Carbon Free Resources Should be Selected by the Commission

5. There is substantial consensus amongst a number of parties that the volumes of solar (including solar paired with storage), battery energy storage, and onshore wind recommended by Duke Energy's near-term action plan are consistent with a "no regrets" strategy and that these resources should be "selected" by the Commission for development and procurement in the near-term.

6. The Public Staff is generally aligned with Duke Energy on solar, battery energy storage, and onshore wind and the AGO supports the Companies' proposed near-term actions with respect to these resources as part of a "no regrets" approach. In contrast, CPSA, NCSEA et al., and Tech Customers all recommend significantly greater development and procurement of solar and battery energy storage in the near-term. However, there are substantial inconsistencies between their specific recommendations for procurement and development of standalone energy storage and SPS as well as onshore wind.

7. The Companies are planning to procure significant solar paired with energy storage resources in future near-term procurement (2023-2024). While most of the 2,350 MW of solar resources procured in the near-term after 2022 will include storage, the volume of SPS needed will be based on the optimal configuration of the paired storage that can be procured at least cost and recognizing system needs.

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8. A volume adjustment mechanism similar to the 2022 Solar Procurement provides a mechanism to manage cost risk while increasing solar procurements in the near-term and would enable the Companies to procure the volume of solar modeled as needed to achieve the interim 70% target by 2030 while also lowering the risk for customers of over-procuring solar.

9. Accounting for the volume adjustment mechanism, the 2022 Solar Procurement has the potential to procure up to 1,350 MW of solar inclusive of the unawarded CPRE MW. Over-procuring solar through even larger initial procurements than planned creates increased cost risk and execution risk for the Companies and customers and is not a reasonable step.

Limited New Gas Resources Should be Selected by the Commission

10. Limited amounts of new flexible and dispatchable hydrogen-capable gas are essential to an orderly and least cost energy transition. Failing to have such flexible resources on the system as the Companies move forward with retiring 8,400 MW of coal unit capacity jeopardizes achieving the emissions reductions target, increases cost of operating the system, and increases risk of a disorderly transition. Subject to the Commission selecting limited new combined cycle ("CC") and combustion turbine ("CT") resources, the current strategy presented in the Chapter 4 execution plan remains executable.

11. The Public Staff recognizes the need for limited new CC and CT capacity as part of the near-term action plan. Numerous other parties also recognize that some limited amount of CC and/or CT capacity is needed to retire over 8,400 MW of coal generation and reliably transition the system. Only the results-oriented analysis and testimony presented by NCSEA et al., NC WARN, and EWG oppose any development of even limited, hydrogen-capable new gas resources in the near term.

12. Selecting limited amounts of new gas generation provides system flexibility, supports grid reliability, and importantly provides significant carbon reductions needed to achieve the interim 70% target called for in HB 951. Further delays in moving forward with a limited amount of hydrogen-capable natural gas resources will either present reliability challenges or delay achievement of the interim target and retirement of existing coal resources or both.

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13. In light of recent upward inflationary pressures on technology costs and the significance of the newly passed Inflation Reduction Act of 2022 ("IRA"), Duke Energy has performed preliminary modeling sensitivity analysis based on an initial review of the IRA to test the robustness of the Companies' proposed near-term actions. This modeling sensitivity continues to validate the near-term actions and supports inclusion of limited new hydrogen-capable gas resources in the near-term action plan to drive down CO_2 emissions and maintain reliability over the planning horizon.

14. In recognition of the preliminary nature of this sensitivity analysis, the Companies also agree with and support Public Staff witness Thomas' testimony that resource planning must use a consistent snapshot in time for fixing modeling inputs and assumptions, "lest the biennial IRP proceeding devolve into an endless cycle of updating assumptions and re-running the models." The Companies continue to support Commission approval of all near-term actions in this initial Carbon Plan, including limited new natural gas resources, and commit to further evaluate the impact of changing resource capital costs, tax incentives, and commodity pricing with relation to the overall economics and need for a future gas project as part of a future CPCN proceeding.

15. The Companies continue to support planning for accessing limited Appalachian Gas as the most appropriate base gas supply assumption for planning purposes. HB 951 mandates least-cost requirements to achieve compliance with the authorized carbon reduction goals. The "No App Gas" supply assumptions in SP5 and SP6 could be utilized if a "pivot" in gas supply assumptions is necessary. The Companies' analysis also presents reasonable and defendable Firm Transportation ("FT") cost assumptions and executable plans to obtain additional interstate FT fuel supply in 2022-2023 to support any new CC generation.

Long Lead Time Development Activities Supported by Modeling

16. Modeling and analysis supported by the Public Staff and other parties validates the Companies' modeling analysis showing the need for pumped storage hydro at Bad Creek II as well as the need for future SMRs.

17. While the Public Staff's preferred Supplemental Portfolio 5 does not identify the need for offshore wind until the 2040s and the Public Staff opposes immediate offshore wind development activities, the

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Companies' modeling shows relatively small overall portfolio cost increases to achieve the substantial diversity benefits of this carbon free resource. Acceleration of offshore wind into the 2030s to achieve the interim 70% target is supported by a number of Duke Energy's portfolios and would provide resource diversity and mitigate technology cost and timing risk while increasing executability of the portfolio.

Near-Term Actions Supported by Rigorous and Reasonable Modeling Analysis

18. Duke Energy continues to support the comprehensive multi-step modeling process used to develop the Carbon Plan as reasonable and appropriate. It is not reasonable to rely entirely on capacity expansion model results for economic selection of energy storage or for reliability validation. The Battery-CT Optimization step was a reasonable economic assessment in advance of the reliability validation step. The concerns expressed by witness Thomas do not address the ability of the capacity expansion model to accurately evaluate energy storage, and the sensitivities and uncertainties he references reinforce the need to validate capacity expansion model results rather than undermine this reasonable and necessary verification step.

19. The Companies approach to capacity expansion model convergence tolerance (MIP basis) and optimization segmentation appropriately balances precision and modeling complexity. Other parties modeling uses a No Commitment approach which is substantially less precise and does not fully assess real world operational conditions. The Companies look forward to continuing to work with the Public Staff and other stakeholders to further improve and refine the process in advance of the 2024 Carbon Plan update. However, the Companies strongly encourage the Commission not to prescribe specific settings for highly technical planning models in the regulatory process.

20. While the Public Staff agrees with the Companies' reliability modeling approach and subsequent resource selection needed to ensure system reliability, many interveners suggest alternative reliability actions such as additional reliance on wholesale purchases, further dependance on neighboring regions or the conversion of existing coal to 100% natural gas-burning resources. The Companies explain that these recommendations have been thoroughly considered and are not valid alternatives to ensure system reliability is maintained or improved.

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I. NEAR-TERM ACTION PLAN APPROACH

Q. PLEASE PROVIDE AN OVERVIEW OF THE NEAR-TERM DEVELOPMENT AND PROCUREMENT ACTIVITIES FOR SUPPLY-SIDE RESOURCES RECOMMENDED BY DUKE ENERGY, THE PUBLIC STAFF AND INTERVENORS.

A. Rebuttal Table 1 below shows the Companies' proposed near-term procurement volumes for each resource, as well as the modifications to those volumes suggested by the Public Staff and intervenors that proposed specific modifications.

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Rebuttal Table 1: Summary of the Companies' Proposed Near-Term Actions with Intervenors' Suggested Modifications[1]

	Solar (including SPS)	BESS Paired w/ Solar	BESS Standalone	Onshore Wind	CT	CC
Supporting deployment by:[1]	YE 2028	YE 2028	YE 2029	YE 2029	YE 2029	YE 2029
Duke Energy Proposal (MW)	**3,100**	**600**	**1,000**	**600**	**800**	**1,200**
Public Staff Proposal (MW)[2]	**2,630**	**820**	**1,130**	**600**	**800**	**1,200**
Alternative Proposals (MW)						
AGO[3]	3,100	600	1,000	600	0	0
Tech Customers[4]	3,450	1,600	2,900	1,200	400	0
CPSA[5]	4,800	1,650	*0*	*600*	*0 to 500*	*1,200*
NCSEA et al.[6]	4,000	0	4,000	600	0	0
Differences from Duke Energy Proposal						
Public Staff Proposal (MW)	**-470**	**+220**	**+130**	**0**	**0**	**0**
Alternative Proposals (MW)						
AGO	0	0	0	0	-800	-1,200
Tech Customers	+350	+1,000	+1,900	+600	-400	-1,200
CPSA	+1,700	+1,050	*-1,000*	*0*	*-800 to -300*	*0*
NCSEA et al.	+900	-600	+3,000	0	-800	-1,200

Note 1: Year End dates are selected based on the expected timeline from commencing development/procurement to project in service.
Note 2: The Public Staff recommends including 440 MW of remaining CPRE capacity in the 2022 Carbon Plan solar procurement. CPRE amounts are excluded from the numbers in this table.
Note 3: Supports the Companies' proposed solar, storage, and onshore wind volumes as a "no regrets" floor for procurement. *See* AGO Burgess Direct Testimony at 69.
Note 4: Does not make a specific Near-Term Actions Proposal. Values used are based on Tech Customers' "Preferred" portfolio. *See* Tech Customers Roumpani Direct Testimony at 5.
Note 5: CPSA does not clearly advocate for specific volumes of resources for the near-term action plan other than solar and SPS. The volumes for other resources included in Rebuttal Table 1 reflect Portfolios CPSA3 and CPSA5, which "CPSA strongly recommends. . . inform Duke's near-term execution plan." *See* CPSA Norris Direct Testimony at 29. CPSA3 and CPSA5 both include two new CCs by 2030 totaling 2,400 MW, only one of which is reflected here, consistent with the Companies' approach to developing their own near-term action proposal.
Note 6: NCSEA et al. recommend beginning procurement of 4,000 MW each of solar and storage with target in-service dates of 2025-2028. Not shown above is additional recommendation for 2,500 MW of off-system onshore wind. NCSEA et al. Fitch Direct Testimony at 50-51.

[1] Rebuttal Table 1 is also replicated in Modeling and Near-Term Actions Panel Rebuttal Exhibit 1.

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The numbers presented in Rebuttal Table 1 are adjusted to present an apples-to-apples comparison by (i) deducting the "forecasted" solar and SPS resources that are in-flight or assumed to be procured under pre-existing programs and that were not included in the Companies' Executive Summary Table 3 (approximately 1,600 MW) from the total, and (ii) presenting only resources that would be deployed through the end of 2028 (solar, SPS) or the end of 2029 (standalone storage, onshore wind, CT, and CC).

Q. MR. SNIDER, DO YOU BELIEVE THAT THERE IS A LEVEL OF GENERAL CONSENSUS AROUND MANY OF THE PROCUREMENT AND DEVELOPMENT ACTIVITIES RECOMMENDED BY THE COMPANIES AS PART OF THE NEAR-TERM ACTION PLAN?

A. Yes. From the lens of developing the near-term action plan, I believe there is general consensus in many respects. While unanimity of perspective is unachievable in a proceeding of this magnitude and with this number of intervenors, there is a substantial degree of consensus around the Companies' recommended procurement amounts of solar, batteries, and onshore wind. No parties' recommended amounts are identical but, as shown above, the Companies' recommended amounts are within the ranges recommended by other parties and, importantly, are very closely aligned with those amounts recommended by the Public Staff. The Companies acknowledge that there is not consensus around the development of new

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natural gas but that the Companies are aligned with the Public Staff on the inclusion of such resources in the near-term action plan at this time.

Q. WHAT FURTHER CONCLUSIONS CAN BE DRAWN FROM THE PARTIES' OVERALL POSITIONS?

A. Based upon the panel's review of the testimony filed by the Public Staff and other parties, there is substantial consensus that pursuing solar, battery energy storage, and onshore wind resources is consistent with a "no regrets" strategy and that these resources should be "selected" by the Commission for development and procurement in the near-term.[2] However, as explained below, there are varying perspectives on the volumes of those resources (particularly solar and storage) that should be procured or developed in the near-term (2022-2024). There are also varying perspectives regarding whether a limited amount of new dispatchable hydrogen-capable gas—specifically the 800 MW of new CT capacity and one 1,200 MW CC should be selected. This panel will focus on issues related to each of these aspects of the near-term action plan separately.

Finally, there is general consensus on the long-term need for the three long lead-time technologies (offshore wind, new nuclear, and Bad Creek II pumped storage hydro). However, intervenors raised a number of issues regarding the timing and the overall role of these resources in the Plan. This panel will briefly address modeling-related issues regarding these

[2] In all cases, subject to the obligation to obtain a CPCN (where applicable). *See* Carbon Plan Executive Summary at 24.

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long lead-time resources as they are more fully discussed in the rebuttal testimony of the Long Lead-Time Panel.

Q. RECOGNIZING THE SIGNIFICANT NUMBER OF PARTIES AND POSITIONS PRESENTED IN THIS PROCEEDING, HOW SHOULD THE COMMISSION DEVELOP THIS INITIAL CARBON PLAN?

A. First, the Companies reiterate that the Commission need not determine every contested issue presented in this proceeding and should focus its efforts on approving near-term actions that are necessary to chart a course for achieving HB 951's longer-term CO_2 emissions reductions targets in a manner that best achieves the core objectives of the law as well as the Companies' least cost Carolinas' system-wide energy transition objectives. The Commission and the Companies will then be able to "check and adjust" in future proceedings. In weighing the substantial evidence presented in this proceeding, the Companies believe that balancing the four core Carbon Plan objectives—CO_2 emissions reductions, affordability, reliability, and executability—provides a reasonable and appropriate framework for assessing the varying positions of the parties. Taken together, these core objectives establish an orderly, reliable, and executable energy transition that balances affordability in developing the least-cost plan to retire the Companies' coal units and to meet HB 951 CO_2 emissions reduction targets. The challenge before the Commission is weighing the relative aspects of these core objectives and finding an appropriate balance in determining the least-cost path to compliance.

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Q. DO SOME PARTIES TAKE DIFFERING VIEWS ON WHETHER A MORE AGGRESSIVE PACE OF EXECUTION WILL INTRODUCE AFFORDABILITY AND EXECUTABILITY CONCERNS?

A. Yes. Public Staff witness Jeff Thomas highlights that the Public Staff is concerned that the more accelerated P1 portfolio is the "most vulnerable to cost overruns related to delayed schedules and material price increases, as it relies heavily on aggressive additions of solar and storage, both of which are experiencing substantial near-term cost increases related to global inflation and supply chain issues."[3] Carolina Industrial Group for Fair Utility Rates II & III (together, "CIGFUR") witness Brad Muller takes a similar view, highlighting that a more measured pace of transition enables North Carolina to be flexible and in a position to adapt to new information or technology advancements or any number of other changed circumstances that could warrant altering the path forward in the future.[4] Witness Muller similarly highlights, from an affordability perspective, taking a less accelerated pace of transition could also "make the year-over-year rate impacts for ratepayers more manageable and ensuring that the least-cost plan is selected."[5] CIGFUR, like the Public Staff, generally supports the "check and adjust" strategy recommended by Duke Energy.

[3] Public Staff Thomas Direct Testimony at 13-14.
[4] CIGFUR Muller Direct Testimony at 16.
[5] *Id.* at 16.

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In contrast, Clean Power Suppliers Association ("CPSA"), Carolinas Clean Energy Business Association ("CCEBA"), North Carolina Sustainable Energy Association, Southern Alliance for Clean Energy, Natural Resources Defense Council, and the Sierra Club (collectively, "NCSEA et al."), and certain other intervenors advocate for a significantly more aggressive near-term procurement of solar resources and storage resources, and these intervenors believe, conversely, that the risks of execution and affordability are created by failing to procure very high volumes of these resources in the near-term. Duke Energy sees this overly-aggressive approach as fundamentally inconsistent with real-world constraints and executability considerations that the Companies identified in developing the Carbon Plan.

As highlighted in Carbon Plan Chapter 3 (Portfolios), each of the Companies' portfolios meets the core objective of CO_2 emissions reductions while seeking to balance affordability, reliability and executability considerations.

Q. AFFORDABILITY AND SELECTION OF A LEAST-COST PLAN IS A FUNDAMENTAL PART OF THE CARBON PLAN DEVELOPMENT PROCESS. DOES THE PUBLIC STAFF SUPPORT THE COMPANIES' CAPITAL COST FORECASTS AS REASONABLE AND APPROPRIATE FOR PLANNING PURPOSES?

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A. Yes. While a number of intervenors assume more aggressive cost declines for solar and battery storage than used in the Companies' Carbon Plan,[6] Public Staff witness Thomas generally finds the Companies' capital cost forecasts to be reasonable for planning purposes.[7]

Q. BASED UPON THE CAPITAL COSTS USED TO DEVELOP THE CARBON PLAN, PLEASE HIGHLIGHT THE RELATIVE INVESTMENT AMOUNTS FOR RESOURCES PROPOSED TO BE SELECTED IN DUKE ENERGY'S NEAR-TERM ACTION PLAN?

A. Rebuttal Figure 1 below shows the expected investment amount by resource type in the Companies' proposed near-term action plan. Investment amounts are presented in terms of total overnight costs for each resource type in nominal dollars.

[6] Modeling and Near-Term Actions Panel Direct Testimony at 192-194.
[7] Public Staff Thomas Direct Testimony at 53-55.

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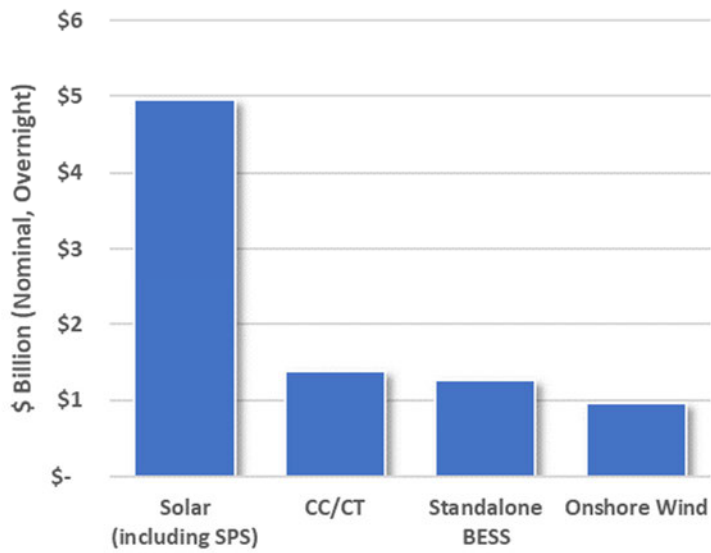
Rebuttal Figure 1: Proposed Investment by Resource Type in the Companies' Near-Term Procurement and Development Activities



As shown in Rebuttal Table 1 and in the figure above, the continued orderly energy transition requires investment in a diverse portfolio of resources, with solar playing a key role in near-term decarbonization efforts. Furthermore, it will be important to not concentrate risk too heavily in any one resource type in the course of executing the Carbon Plan.

Q. SEVERAL PARTIES HAVE POINTED OUT THAT RESOURCE COSTS ARE IN FLUX AND HAVE SUGGESTED ADDITIONAL ANALYSIS TO ASSESS THE POTENTIAL IMPACTS OF, FOR EXAMPLE, THE INFLATION REDUCTION ACT OF 2022 ("IRA"). DO THE COMPANIES AGREE WITH THIS SUGGESTION?

The Companies agree that the tax credits and other incentives in the IRA will be beneficial for customers and may offset recent upward pressures on technology costs that have occurred since the development of

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the Plan as a result of continued global supply chain constraints and domestic inflationary pressures. The IRA incentives will lower costs for solar, storage, wind, and nuclear, with potential compounding benefits if such resources can be optimally sited or meet other wage and domestic content requirements in the law. In order to provide some preliminary high-level insight into the impact of the IRA, the Companies have conducted additional sensitivity analysis discussed later in this testimony. Recognizing the limited time available to prepare this sensitivity analysis, the Companies view this analysis as preliminary in nature.

The Companies also agree with and support Public Staff witness Thomas' testimony that it is appropriate in resource planning to use a consistent snapshot in time for fixing modeling inputs and assumptions, "lest the biennial IRP proceeding devolve into an endless cycle of updating assumptions and re-running the models."[8] Importantly, the Companies must "snap a chalk line" at a specific point in time for purposes of fixing the modeling inputs and assumptions so that they can move forward with developing a plan. The modeling and analysis provided thus far in this proceeding are sufficient to support the Companies' proposed near-term actions. The Companies also agree with witness Thomas that the biennial schedule for IRP and Carbon Plan updates (as well as intervening CPCN proceedings that are required in most instances to authorize construction) as

[8] Public Staff Thomas Direct Testimony at 44.

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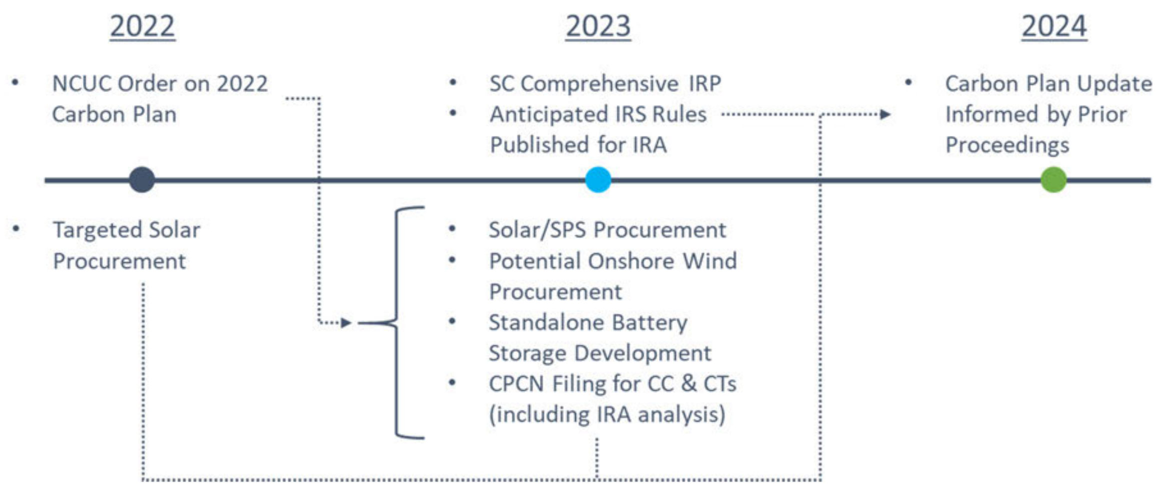
well as the development of robust portfolios and sensitivity analysis to inform recommended actions mitigate the impact of changes in assumptions over time.[9]

Rebuttal Figure 2 below illustrates the various activities and regulatory proceedings that will inform the 2024 Carbon Plan Update.

Rebuttal Figure 2: Preliminary View of Activities Informing the 2024 Carbon Plan Update



II. <u>SELECTING CARBON-FREE RESOURCES IN THE NEAR-TERM ACTION PLAN</u>

Q. PLEASE PROVIDE A HIGH-LEVEL SUMMARY OF THE TESTIMONY FILED BY THE PUBLIC STAFF AND OTHER PARTIES ON SELECTING NEW SOLAR, STORAGE, AND WIND AS PART OF THIS INITIAL CARBON PLAN.

A. It is uncontroverted that Carbon Plan near-term actions should include procurement and/or development of new solar, battery energy storage, and

[9] *Id.*

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onshore wind resources. The question before the Commission is the pace at which these resources should be pursued over the next several years. Some parties, including CIGFUR[10] and North Carolina Electric Membership Corporation ("NCEMC")[11] argue for a more measured pace of adoption, while environmental and renewable energy advocates support larger initial procurements of solar, batteries, and in some cases, onshore wind.[12]

As shown in Rebuttal Table 1 above, the Public Staff recommends relatively small modifications to the Companies' proposal, including a slightly slower pace of near-term solar procurement and a slightly more rapid pace for battery energy storage, both paired with solar and standalone.[13] Additionally, as stated in North Carolina Attorney General's Office ("AGO") witness Edward Burgess' testimony, the AGO supports the Companies' proposed near-term actions with respect to these resources as part of a "no regrets" approach.[14]

CPSA's suggested modifications to the Companies' proposed near-term actions are entirely focused on solar. CPSA advocates for 1.7 GW of additional solar procurement beyond the Companies' recommended amount and recommends that additional solar procurements beyond the 2022 Solar Procurement be comprised fully of solar paired with storage assets.[15] In

[10] CIGFUR Muller Direct Testimony at 15-17.
[11] NCEMC Fall Direct Testimony at 7-8.
[12] *See*, *e.g.*, CPSA Norris Direct Testimony at 38.
[13] Public Staff Thomas Direct Testimony at 62-63.
[14] AGO Burgess Direct Testimony at 70.
[15] CPSA Comments at 6; CPSA Norris Direct Testimony at 58.

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total, CPSA advocates for 4.8 GW of new Carbon Plan solar to be procured in 2022-2024.[16] CPSA does not address any other resource types in their suggested modifications.

NCSEA et al. also suggest substantially more rapid deployment of solar and stand-alone storage than the Companies propose. They advocate for a 30% increase to near-term solar procurement and propose about two and a half times the near-term storage procurement (both standalone and storage paired with solar) recommending 4,000 MW of procurements in their proposal relative to the 1,600 MW in the Companies' near-term development and procurement plans.[17] Highlighting the wide range of recommendations on battery energy storage, NCSEA et al.'s "Optimized" portfolio includes no pairing of solar and storage prior to 2030 but rather suggests stand-alone BESS exclusively.[18]

The Tech Customers did not specify suggested modifications to the Companies' proposed near-term actions, but their "Preferred" portfolio suggests a combined solar and SPS amount similar to Companies' proposal and, contrary to the modeling results presented by Synapse on behalf of NCSEA et al., indicates that all solar should be paired with storage. In addition, the Tech Customers appear to suggest that near-term procurement

[16] CPSA Norris Direct Testimony at 34.
[17] NCSEA et al. Fitch Direct Testimony at 50-51.
[18] *Id.*

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of onshore wind should be doubled, and standalone battery energy storage should be increased by 40% (approximately 1,400 MW).

Q. PLEASE EXPLAIN WHY THE SOLAR AND STORAGE PAIRED WITH SOLAR RESOURCES PRESENTED IN YOUR REBUTTAL TABLE 1 ARE DIFFERENT FROM THE TABLE ON PAGE 63 OF THE PUBLIC STAFF WITNESS THOMAS' TESTIMONY.

A. Witness Thomas recommends that the resources included in Supplemental Portfolio 5 (no App gas) should comprise the proposed near-term action plan, which are outlined in Table 3 (on page 63) of witness Thomas' testimony. Witness Thomas recommends the Commission select 4,250 MW of solar (which includes storage paired with solar) and 1,225 MW of battery storage paired with solar as part of the near-term procurement activities. Upon review and consultation with the Public Staff, it was determined that witness Thomas' recommendations included solar and storage resources projected to be online by (end of year) **2029**, whereas the Companies' near-term action plan includes solar and storage resources projected to be online by (end of year) **2028**. Additionally, the resources included in the Public Staff's recommendations include **both** model-selected and forecasted solar and storage paired with solar resources, whereas the Companies **only** included Carbon Plan solar and storage paired with solar resources, excluding any resources that were previously expected to come into service before enactment of HB 951.

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The forecasted solar the Public Staff included is approximately 270 MW of North Carolina Green Source Advantage ("NC GSA") Program solar, which is included from 2026-2029. The Public Staff also included in their proposal approximately 50 MW of forecasted storage paired with solar expected to come into service from 2023-2025.

Rebuttal Tables 2 and 3 below illustrate this comparison and show the small changes that the Public Staff recommends to the Companies' near-term action plan.

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Rebuttal Table 2: Near Term Action Plan Duke Energy and Public Staff Comparison – Solar (including SPS) (MW)

	Duke Energy	Public Staff
Carbon Plan Solar *(for resources online EOY 2026-2028)*	3,100	2,630
Carbon Plan Solar *(for resources online EOY 2029)*	DNI	1,350
NC GSA (2026-2029)	DNI	270
Public Staff Total Near-Term Action Plan **Including** NC GSA and 2029 Solar Resources	N/A	4,250
Total Near-Term Action Plan **Excluding** NC GSA and 2029 Solar Resources	3,100	2,630

Note: DNI = "Did Not Include"

Rebuttal Table 3: Near Term Action Plan Duke Energy and Public Staff Comparison – Storage Paired With Solar (MW)

	Duke Energy	Public Staff
Forecasted Storage Paired with Solar (2023-2025)	DNI	50
Carbon Plan Storage Paired with Solar *(for resources online EOY 2026-2028)*	600	820
Carbon Plan Storage Paired with Solar *(for resources online EOY 2029)*	DNI	360
Public Staff Total Near-Term Action Plan **Including** Forecasted and 2029 Storage Paired with Solar Resources	N/A	1,230
Total Near-Term Action Plan **Excluding** 2023-2025 and 2029 Storage paired with Solar Resources	600	820

Note: DNI = "Did Not Include"

Q. WHY DO THE COMPANIES NOT INCLUDE SOLAR AND STORAGE PAIRED WITH SOLAR RESOURCES ANTICIPATED TO COME ONLINE AFTER 2028 IN THE NEAR-TERM ACTION PLAN?

A. The Companies limited the inclusion of resources based on "near-term" procurement activity between now and 2024 that would be required to stay

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on track for meeting the interim reduction targets across any of the portfolios presented in the Carbon Plan.[19] This includes the sum of resources that would be targeted in procurements or require CPCNs between now and the 2024 Carbon Plan update. The solar capacity included in the near-term action plan is based on Definitive Interconnection System Impact Study ("DISIS") cycles with an estimated four-year lead time from interconnection request to a facility's online date, just as resources for the 2022 Solar Procurement are aligned with 2022 DISIS and are expected to come online in 2026. Likewise, solar resources aligned with the 2023 DISIS would be expected to come online in 2027 and those aligned with 2024 DISIS would be expected to come online in 2028.

Q. TO BE CLEAR, THE COMPANIES' NEAR-TERM ACTION PLAN DOES NOT INCLUDE SOLAR PROCUREMENT TARGETS THAT WOULD BE ALIGNED WITH 2025 DISIS AND ASSUMED TO COME ONLINE IN 2029?

A. That is correct. The Companies' near-term action plan does not include solar that would be aligned with the 2025 DISIS. The Companies believe a procurement that far in the future should be further informed by the outcomes of the earlier solar procurements and the 2024 Carbon Plan update. This affords the Commission the time and flexibility to wait an

[19] The Carbon Plan explains the Companies temporal approach to near-term development and procurement actions. Carbon Plan Chapter 4 (Execution Plan) at 2.

additional two years to determine procurement targets for resources expected to come online in 2029 ahead of 2030.

Q. CPSA RECOMMENDS THAT ALL PROCUREMENTS OF SOLAR AFTER 2022 SHOULD BE PAIRED WITH STORAGE.[20] HOW DOES DUKE ENERGY'S NEAR-TERM ACTION PLAN COMPARE?

A. A significant portion of future procured solar will be paired with storage, but there is no benefit to pre-determining in this hearing that all future solar must be paired with storage. The exact breakdown of standalone solar and SPS will depend on the configuration of the solar paired with storage bids in future RFPs. Because the 2022 Solar Procurement includes only standalone solar resources, the remaining solar to be procured in the near term may primarily be SPS in order to meet the storage targets in the Companies' near-term actions. For example, assuming the Commission approves the Companies' near-term action plan and directs a procurement target of 750 MW for the 2022 Procurement (not including the additional 441 MW to be procured for CPRE), then the remaining solar to be procured will be 2,350 MW (inclusive of 600 MW of storage associated with SPS resources). If all future SPS includes storage that is 25% of the solar nameplate capacity, then the Companies would need to procure 2,400 MW of SPS to reach the 600 MW paired storage target and thus no additional

[20] CPSA Norris Direct Testimony at 34.

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stand-alone solar would be required. If all future SPS includes storage that is 50% of the solar nameplate capacity, then the Companies would need to procure 1,200 MW of SPS to reach the 600 MW paired storage target. In this latter case the Companies would still need 1,150 MW of standalone solar to meet the full solar requirements of the near-term actions. As discussed by Witness Farver on the Transmission and Solar Procurement Panel, the Companies plan to procure solar and SPS resources through future procurements; however, the details and configurations of SPS targeted for procurement have yet to be determined. Accordingly, the Companies do not support CPSA's recommendation that the Commission prescriptively and preemptively dictate that all solar must include storage in the future.

Q. IS CPSA WITNESS NORRIS CORRECT THAT SELECTING DUKE ENERGY'S PROPOSED NEAR-TERM ACTIONS ON SOLAR NOW MAKES 2030 UNACHIEVABLE?[21]

A. No. As witness Norris correctly points out, a total of 5,400 MW of solar (or 5,841 MW including the 441 MW CPRE remainder) must be online by year-end 2029 to meet the P1 solar build. Under near-term actions, the Companies expect to procure 3,550 MW (inclusive of the 441 MW CPRE remainder), which leaves an additional 2,300 MW to be procured to reach P1 solar additions by 2029. However, the 2022 Solar Procurement includes

[21] CPSA Norris Direct Testimony at 24, 30-33.

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a volume adjustment mechanism that allows the targeted procurement volumes to increase by up to 20% if the weighted average of bid prices falls below the modeled price of solar. Subject to further engagement with the Public Staff and other parties and approval by the Commission, similar adjustment mechanisms may be included in future procurements that could allow for procurements above the volumes identified in the near-term action plan. The economic thresholds that trigger the volume adjustment mechanism would lower the risks of over procuring solar that the Companies identify further below. As shown in Table 4 below, the inclusion of a volumetric adjustment mechanism can enable enough solar procurement in the near-term to remain on track to meet the P1 solar volume. If, in the example below, the total procured volume through 2024 is 4,230 MW, an additional procurement of approximately 1,610 MW would be required in 2025 to reach the P1 solar additions.

Rebuttal Table 4: Example of Applying 2022 Solar Procurement Volumetric Adjustment Mechanism to Future Procurements

Procurement Year	Near Term Actions	Volumetric Adjustment	Adjusted Volume	P1 Volume
2022*	1,200	20%	1,350	1,200
2023	1,000	20%	1,260	1,050
2024	1,350	20%	1,620	1,800
Total Procured	**3,550**		**4,230**	**4,050**

*Note: 2022 Near Term Actions, Adjusted Volume, and SP1 Volume solar MW include 441 MW of CPRE shortfall. Adjusted volume for 2022 is 20% increase above the HB 951 procurement volume of 750 MW.

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It remains to be seen whether the market can deliver sufficient volumes of solar resources below the modeled cost of these resources in the Carbon Plan to fully achieve the P1 volumes by 2030. However, the Commission has broad discretion towards meeting the interim 70% target between 2030 and 2032 and can direct the Companies to procure more or less solar based on conditions at the time the Companies seek approval for future procurements. Finally, and as described elsewhere, there are numerous other considerations and aspects of an "all of the above" Carbon Plan that need to be considered to meet the carbon reduction targets while balancing the four core Carbon Plan objectives. As such, the pace of solar procurements must be viewed in the broader context of other resources and infrastructure needed in conjunction with the new solar resources to achieve the desired carbon reductions in an orderly fashion.

Q. PLEASE EXPLAIN YOUR UNDERSTANDING OF CPSA WITNESS NORRIS' POSITION REGARDING THE NEED FOR LARGER NEAR-TERM PROCUREMENTS REGARDLESS OF THE VOLUME OF SOLAR SELECTED IN THE MODEL OVER THAT TIME PERIOD?

A. Witness Norris argues that even if the Companies' modeling does not show a need for 4,800 MW prior to 2029, the Companies should move forward with procuring that volume of solar over the next few years, as opposed to procuring it in later years, closer to the year in which it is selected by the model.[22] Witness Norris argues that there is no harm to customers in this approach. While it would be financially advantageous for solar developers to secure offtake options as early as possible, it is not without risks to the Companies' customers.

Q. WHAT RISKS TO CUSTOMERS WOULD BE ASSOCIATED WITH THIS APPROACH?

A. One of the primary risks for customers is losing out on technology maturation and development by over-procuring early on. As described earlier, the Companies expect that a significant volume of the solar to be procured after 2022 will be paired with storage. Indeed, witness Norris even recommends that all future solar procurement should be solely solar paired with storage resources. Battery technology is advancing rapidly and solar paired with battery storage is not as mature as standalone solar, especially in the Carolinas. To "frontload" the procurement of developing resources in this manner would cause the Companies and their customers to miss the technologies and resource advancements that are likely to be developed over the next few years. And while standalone solar is an established technology, the last several years the Companies have seen increased deployment of higher output single axis tracking solar facilities on their systems versus the fixed tilt configurations that were previously installed. Additionally, the Companies are unaware of any bifacial solar facilities

[22] CPSA Norris Direct Testimony at 34-38.

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connected on their systems today, but, at the suggestion of stakeholders, are assuming a dramatic increase in bifacial solar panel deployment in the Carolinas beginning with the 2022 Solar Procurement.

Q. CPSA WITNESS NORRIS ARGUES THAT PROCURING THESE GREATER VOLUMES OF SOLAR EARLIER IN TIME WILL LIKELY RESULT IN COST SAVINGS FOR CUSTOMERS. DO YOU AGREE WITH THIS POSITION?[23]

A. No, I do not. I also believe other factors create cost risk for customers, as I describe below. Witness Norris states that "CPSA views the likelihood of lower versus higher future solar costs as relatively equivalent[24] His justification is based on comparing the NREL ATB moderate and conservative values and pointing out that there is equal probability between those two curves occurring. It may be true that the moderate and conservative values have equal probability, but he ignores the fact that NREL also includes an aggressive curve that also has a probability of occurring. If the full range of potential outcomes highlighted in the NREL ATB were evaluated, then that would shift probability closer to the NREL moderate case. Finally, it is noteworthy that all parties who have provided portfolios in the Carbon Plan, other than CPSA, have assumed declining costs for solar.

[23] CPSA Norris Direct Testimony at 26-27, 35-38.
[24] *Id.* at 35.

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In addition, pursuing larger initial solar procurements in the short term – significantly above the Companies' annual interconnection capability – extends the period of time between when the PPA is executed and when the facility actually begins delivering energy to customers. Extending this time period allows more time for unanticipated changes to occur and leads to increasing risk for customers that the value of the solar being delivered does not reflect the price accepted many years prior. For instance, during this longer period from PPA execution to commercial operation date, the cost to build the facility can decrease from the cost upon which the developer's bid price was established. In the instance of PPA solar, the customer would not see any decline in the price it is paying because that price is locked when the PPA is executed. If costs increase during this period, the developer may choose not to pursue the project, leading to greater risk of default as further discussed below.

Q. IS THE AMOUNT OF SOLAR CONNECTED IN ANY GIVEN YEAR FULLY THE RESPONSIBILITY OF DUKE ENERGY?

A. Duke Energy has the primary responsibility for interconnecting resources on its systems, but the Companies' procurement and generator interconnection process are not the sole drivers in ensuring timely online dates for resources. Developers and the broader marketplace must also be efficient and prepared in order to deliver on future solar growth. Factors like community acceptance, supply chain, and developer responsiveness during interconnection all factor into the pace at which solar is connected to the

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system. The Companies' recent experience is that developers highly value a stable solar development market and are more inclined to delay or terminate their interconnection and purchased power agreements due to unanticipated changes in development costs. This "attrition" as witness Norris calls it can result in needing to restudy other projects or adjust construction schedules and reprioritize work.[25]

Q. IS CPSA WITNESS NORRIS CORRECT THAT WE WILL NOT KNOW WHETHER DUKE ENERGY COULD HAVE ACHIEVED MORE SOLAR INTERCONNECTIONS IF WE LIMIT PROCUREMENT TARGETS TO THE MODELED INTERCONNECTION CONSTRAINT?[26]

A. As explained above, if bid prices are sufficiently low cost, the 2022 Solar Procurement has the potential to procure up to 1,350 MW of solar inclusive of the unawarded CPRE MW. That is nearly double the Companies' forecast of reasonably achievable solar interconnections in 2026 included in the Carbon Plan modeling. Connecting the solar resources procured through the 2022 Solar Procurement will be a significant test of the collective abilities of the Companies, the development community and the broader marketplace. Alternatively, if bid prices in the 2022 Solar Procurement are above both the 25-year avoided cost cap (for unawarded CPRE) and the Carbon Plan solar reference cost, then only the minimum

[25] *Id.* at 43.
[26] *Id.* at 20-21.

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target of 700 MW would be pursued, which may not test the full capabilities of interconnection volumes. However, in such a case where solar is unexpectedly expensive, it would not be in the best interest of customers to procure large volumes of unexpectedly costly resources anyway.

Q. HOW DO THE COMPANIES RESPOND TO CPSA WITNESS NORRIS' ASSERTION THAT THE COMPANIES' PROJECTIONS FOR SOLAR INTERCONNECTIONS ARE LOWER THAN WHAT NEIGHBORING STATES ARE CONNECTING TODAY?

A. Witness Norris notes that, when comparing the Companies' solar interconnection projections to other utilities, Duke "did not respond to CPSA's discussion of solar installation rates that are already occurring in peer states, including utility-scale solar installations in 2021 of 900 MW in Virginia and 760 MW in Georgia."[27] While comparing utility-specific levels of solar installations to state-specific levels of solar installations does not create a valid comparison, it is worth noting that since 2015 North Carolina has been a national leader in installing solar at generally comparable rates to those of other states today. As Witness Roberts explains in his testimony, this historic solar growth is why the RZEP projects are needed to achieve, and exceed, these levels of solar interconnections in the future.

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[27] CPSA Norris Direct Testimony at 19.

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Rebuttal Figure 3: North Carolina and Neighbor State Comparisons of Solar Installations Since 2012[28]

Comparing the Companies' solar interconnection assumptions to other states that have only just begun installing solar at levels North Carolina has achieved since 2015 is not a reasonable comparison. The fact that North Carolina has interconnected a tremendous volume of solar over the past

[28] State-By-State Map | SEIA (https://www.seia.org/states-map).

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seven years is a primary reason why interconnecting significantly higher levels of solar in the future is challenging.

Q. BASED ON THE TESTIMONY FILED BY THE PUBLIC STAFF AND OTHER PARTIES ADDRESSING THE NEED TO SELECT CARBON FREE SOLAR, BATTERIES AND WIND RESOURCES AS PART OF THE NEAR-TERM ACTION PLAN, PLEASE SUMMARIZE THE COMPANIES' POSITION.

A. Duke Energy continues to believe that the Companies' proposed near-term actions for carbon free resources are appropriate over the 2022 to 2024 timeframe. Additionally, the Commission has the discretion to proactively mandate higher near-term procurements to fully achieve P1 or, alternatively, to set the near-term actions as a floor and allow the Companies flexibility to adjust volumes up in future procurements in consultation with the Public Staff and stakeholders to pursue the most cost-effective portfolio of resources for customers. In any case, pre-emptively selecting the significantly higher volumes of solar and batteries recommended by CPSA and NCSEA et al. to be procured in the near-term would significantly increase execution risk and is not a reasonable step.

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III. SELECTING NEW GAS IN THE NEAR-TERM ACTION PLAN

Q. PLEASE PROVIDE A HIGH-LEVEL SUMMARY OF THE TESTIMONY FILED BY THE PUBLIC STAFF AND OTHER PARTIES ON SELECTING NEW GAS AS PART OF THIS INITIAL CARBON PLAN.

A. Perspectives vary on whether the limited amount of new dispatchable hydrogen-capable gas resources included in the Companies' near-term action plan should be selected at this time. Public Staff witness Thomas recommends approval of the Companies' proposal that two CTs (800 MW) and one CC (1,200 MW) be selected as part of this proceeding.[29] Similarly, while CPSA does not directly opine on near-term activities related to new hydrogen-capable gas, each of the CPSA portfolios modeled by the Brattle Group includes two new CCs by 2030, implicitly recognizing that new gas is a necessary part of an orderly energy transition.[30]

The AGO recognizes a potential need for new hydrogen-capable gas, and the "SP-AGO" portfolio includes a CT added in 2028. However, AGO witness Burgess recommends updating the Carbon Plan analysis to account for the impacts of the IRA prior to approval of a CPCN to construct a new gas generating facility.[31] Similarly, the Tech Customers recognize the need for new gas resources but contend that the need can largely be met by

[29] Public Staff Thomas Direct Testimony at 63.
[30] CPSA July 15 Comments Exhibit A at Slide 30-32
[31] AGO Burgess Direct Testimony at 17-18.

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contracting with existing assets,[32] an approach about which the Companies have significant misgivings as discussed below.

Finally, other parties, including NCSEA et al., NC WARN and EWG are opposed to any development of even limited, hydrogen-capable new gas resources in the near term (the NCSEA et al. "Optimized" portfolio does use 2.6 GW of hydrogen-fired CTs to help achieve carbon neutrality).[33]

Q. NCSEA ET AL. WITNESS FITCH INTRODUCES THE CONCEPT OF "PATH DEPENDENCE" TO SUGGEST THAT THERE IS INCREASED RISK OF COMMITTING TO NEW NATURAL GAS RESOURCES IN THE NEAR-TERM AS IT COULD LOCK THE COMPANIES INTO A SUB-OPTIMAL LONG-TERM PLAN.[34] PLEASE RESPOND.

A. First, the Companies agree with Witness Fitch that utilizing sensitivity analysis is a reasonable and appropriate approach to confirm that resources proposed to be selected in a least cost resource plan perform well under a range of potential resource planning futures. Indeed, the Companies did this in developing the Carbon Plan as well as in performing the supplemental modeling analysis. Both planning analyses supported the need for a limited amount of flexible and dispatchable new gas as part of the least cost plan. However, as explained in this panel's direct testimony, the Companies do

[32] Tech Customers Borgatti Direct Testimony at 6, 15.
[33] NCSEA et al. Varadarajan Direct Testimony at 9; NC WARN Powers at 29-32; EWG Makhijani Direct Testimony at 40-44.
[34] NCSEA et al. Fitch Direct Testimony at 28-30.

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not agree with NCSEA et al. that introducing unreasonable modeling assumptions such as imposing a 20-year useful life on natural gas resources or relying upon highly aggressive DSM/EE adoption forecasts and battery cost assumptions will produce reasonable results. Further, it is also important to recognize that the inaction on selecting a resource can similarly impose a form of dependence in a plan. First, the Companies agree with Witness Fitch that utilizing sensitivity analysis is a reasonable and appropriate approach to confirm that resources proposed to be selected in a least cost resource plan perform well under a range of potential resource planning futures. Indeed, the Companies did this in developing the Carbon Plan as well as in performing the supplemental modeling analysis presented in this panel's direct testimony. Both planning analyses supported the need for a limited amount of flexible and dispatchable, hydrogen-capable natural gas resources.

Q. A NUMBER OF PARTIES HIGHLIGHT THE IMPLICATIONS OF THE IRA ON RESOURCE SELECTIONS FOR THE CARBON PLAN. WHAT KIND OF PROVISIONS DOES THE IRA ALLOW FOR THAT WOULD IMPACT RESOURCE SELECTION?

A. The IRA was very recently passed by Congress and signed into law by President Biden on August 16, 2022. This bill, as many intervenors point out, provides for substantial incentives (approximately $370 billion) in climate and energy-related provisions, among other things, to counteract impacts of inflation. The IRA is very complex with a multitude of incentives

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options for supply-side resources, generally solar, wind, storage, and nuclear including potential stackable incentives based on other factors such as siting. The Companies are continuing to evaluate tax implications and applicability of this complex new law and are confirming initial interpretations of the incentives for each resource. Importantly these incentives offset the inflationary impacts to the cost of resources such as solar, wind, and storage.

All intervenors that discussed the IRA pointed to the potential benefits customers will see with increased tax incentives primarily for solar, storage and wind resources.[35] While important to understand the impacts of the enactment of the IRA, Public Staff Witness Thomas also highlights in his testimony the near-term inflationary cost impacts[36] which have, in part, triggered Congress to act on reducing these impacts,

> "costs for all resources are in a state of flux in the current environment, with global inflation and supply chain constraints causing significant price increases for many technologies particularly those dependent on imported raw materials or components."[37]

The Companies agree with Witness Thomas that global and domestic supply-chain issues have caused current technology costs to rise above those assumed at the time the Plan was prepared. Furthermore, witness Thomas goes on to explain that while technology costs are an important

[35] *See, e.g.,* CPSA Hagerty Direct Testimony at 38-39; NCSEA et al. Varadarajan Direct Testimony at 11-13; AGO Burgess Direct Testimony at 19-20.
[36] CPSA Witness Norris, at 34-37 also specifically points to China trade risks and limited experience with domestic production as potential inflationary impacts in the cost of solar specifically.
[37] Public Staff Thomas Direct Testimony at 53.

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factor in the selection of resources in the capacity expansion model, the selection is also driven by the limited time, volume and range of resources available to integrate into the portfolio to achieve the interim target and, as a result, the discussed technology cost impacts, with respect to the selection of near-term resources, are not particularly sensitive to resource prices.[38]

Q. IS IT NECESSARY TO MODEL THE POTENTIAL COMBINED INFLATIONARY IMPACTS TO TECHNOLOGY COSTS AND THE IRA TAX INCENTIVES WITH RESPECT TO CC AND CT RESOURCES PRIOR TO SELECTION IN THE CARBON PLAN?

A. No. The Companies agree with all parties that the IRA will be beneficial for customers, lowering costs for solar, storage, wind, and nuclear, with potential compounding benefits if such resources can be optimally sited. However, as stated earlier in this rebuttal testimony, the Companies support the Public Staff testimony that the modeling provided thus far in the docket is sufficient to support proposed near-term actions.[39]

Q. RECOGNIZING THAT THOROUGH ANALYSIS OF IRA IMPACTS IS NOT NECESSARY TO SUPPORT THE COMPANIES' PROPOSED NEAR-TERM ACTIONS, PLEASE ADDRESS THE COMPANIES RECENTLY DEVELOPED PRELIMINARY MODELING ANALYSIS TO PROVIDE DIRECTIONAL GUIDANCE ON POTENTIAL EFFECTS OF THE LEGISLATION.

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[38] *Id.*, at 54-55.
[39] *Id.* at 6, 54-55, 61-62.

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A. As introduced above, the Companies conducted a preliminary modeling sensitivity analysis based on an initial review of the IRA to test the robustness of the Companies' proposed near-term actions when accounting for some level of near-term inflationary impacts in resource pricing, and the cost reducing impacts of tax incentives included in the IRA. This additional sensitivity analysis involved, first, updating technology costs for CC/CT, solar, storage, and onshore wind to account for recent inflationary pressures, and then, second, applying an estimate of applicable tax incentives allowed under the IRA to these resources. The Companies then reoptimized Supplemental Portfolio 5 (no App gas) using these updated cost and tax incentive inputs in the capacity expansion model to evaluate the initial selection of economic resources.

Q. WHAT WERE THE RESULTS OF THE PRELIMINARY MODELING ON INITIAL INTERPRETATION OF THE IRA?

A. Significant quantities of solar (standalone and SPS) and standalone battery storage continue to be selected. The capacity expansion model also continued to select CC and CT capacity by the end of 2030, generally supporting the Companies' near-term actions with respect to gas resources. Broadly speaking, this preliminary modeling of inflationary and legislative changes indicates that the IRA will likely reduce costs for customers relative to current pricing, and supports inclusion of limited new hydrogen-capable gas resources in the near-term action plan to drive down CO_2 emissions and

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maintain reliability over the planning horizon, enabling significant coal unit retirements and continuation of an orderly energy transition.

Q. IN ADDITION TO THE MODELING DESCRIBED ABOVE, DID THE COMPANIES' IRA SENSITIVITY ANALYSIS ALSO RECOGNIZE NEAR-TERM FUEL PRICE IMPACTS IN ADDITION TO THE INFLATIONARY IMPACTS AND COST REDUCING IMPACTS OF THE IRA?

A. Yes. In addition to the capturing the inflationary impacts on technology costs and initial interpretation of the tax benefits associated with the IRA using the Carbon Plan's base gas assumption, the Companies also performed the same analysis using their high gas price assumption. As pointed out by Public Staff witness Thomas,[40] while current (balance of 2022) natural gas market prices are elevated, and above the Companies' base projected 2050 natural gas price, the market projects natural gas costs will recede in the coming years as global production increases, recovering from impacts from the COVID-19 pandemic and geo-political instability impacting the cost and availability of natural gas, especially with respect to the Russian invasion of Ukraine.

While the near- and mid-term natural gas prices impact the overall cost of the system, the selection of resources utilizing natural gas up until 2050 is more significantly impacted by longer-term fundamental-based

[40] Public Staff Thomas Direct Testimony at 44.

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natural gas projections, along with other requirements of the system to reduce CO_2 emissions and maintain reliability. To further address concerns of intervenors with respect to elevated natural gas prices and the appropriate inclusion of flexible and dispatchable natural gas assets in the near-term action plan, the Companies additionally tested the preliminary IRA modeling against the Companies' high gas scenario,[41] which fully encompasses and exceeds the near-term elevated natural gas prices. Even in this preliminary IRA modeling, and in a high natural gas price scenario, with the inflationary costs of resources and responsive tax incentives, the capacity expansion model continued to select CC capacity in the near term.[42]

Q. DOES THE IRA PROVIDE FOR ANY POTENTIAL BENEFITS FOR NEW CC AND CT UNITS THAT ADDRESS CRITIQUES FROM INTERVENORS ON THE INCLUSION OF THESE RESOURCES IN THE COMPANIES NEAR-TERM ACTION PLAN?

A. Yes. Several intervenors are critical of the Companies' inclusion of hydrogen in the development of the Carbon Plan portfolios. Existing and new CC and CTs expected to operate through 2050 were assumed to be converted to 100% operations on hydrogen by 2050 to reach the Carbon Plan's absolute zero CO_2 emissions assumption at the end of the planning

[41] High natural gas price forecast is discussed in Carbon Plan Appendix E, at 40-41.
[42] The Companies originally performed high gas sensitivities in the Carbon Plan modeling confirming the selection and inclusion of CC and CT capacity. Discussion of these sensitivities are included in Carbon Plan Appendix E at 92.

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horizon. AGO Witness Burgess, specifically, points to feasibility and overall speculative nature of future hydrogen costs including cost effective production, transportation, storage, and combustion.[43] Furthermore, the Supplemental Portfolio analysis presented in this panel's direct testimony removed hydrogen as a fuel entirely from the portfolio development and simulations. As explained, this supplemental modeling analysis was developed at the request of the Public Staff, and integrated recommendations from other intervenors, including removing hydrogen fuel. While the Companies disagreed with the complete removal of hydrogen from the analysis, the continued selection of natural gas assets in these supplemental portfolios further validates the Companies near-term actions with respect to CC and CT selection, despite this extremely unlikely assumption.

Q. PLEASE REITERATE WHY THE COMPANIES SUPPORT FUTURE DEVELOPMENT OF HYDROGEN FUEL AS A REASONBLE PLANNING ASSUMPTION.

A. It is true that there are no currently active, utility-scale hydrogen facilities in use by U.S. electric utilities for power generation. However, this is expected to change, as both the Infrastructure Investment and Jobs Act

[43] AGO Burgess Direct Testimony at 46.

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(IIJA)[44] and the IRA[45] provide potential funding and significant incentives to promote near term development and scale up of the hydrogen economy. The anticipated intent of these policies is to further incentivize investments in clean hydrogen production in order to expand the supply and reduce the cost of hydrogen as the market matures. This further increases the likelihood of the Companies' original planning assumption and reduces alleged stranded cost risk associated with the limited CC and CT capacity the Companies are recommending in their near-term actions as intervenors claim.

Additionally, as stated in this panel's direct testimony[46] electric production from hydrogen is developing rapidly. For example, Mitsubishi Heavy Industry is targeting to have 100% hydrogen capable gas turbines by 2025. Even prior to these policies being enacted, other utilities, including Intermountain Power Agency, Next Era and others, have publicly stated plans to incorporate and convert to 100% hydrogen combustion of natural gas assets.

Q. DO THE RECENTLY-ENACTED IRA AND IIJA POLICIES SUPPORTING NEW HYDROGEN DEVELOPMENT FURTHER

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[44] Infrastructure Investment Jobs Act contains $8 billion for the development of at least four clean hydrogen hubs across the United States in order to further development with respect to the production, processing, delivery, storage, and end-use of clean hydrogen.
[45] The Inflation Reduction Act creates a new PTC for hydrogen production (Section 45V) starting 1/1/2023 with a 10-year term. For a taxpayer to be eligible for the hydrogen PTC, its lifecycle greenhouse gas emissions rate cannot exceed 4 kilograms of carbon dioxide equivalent (CO_2e) per kilogram of hydrogen produced.
[46] Modeling and Near-Term Actions Panel Direct Testimony at 181.

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UNDERCUT CERTAIN INTERVENORS' ASSUMPTIONS LIMITING THE USEFUL LIFE OF NEW GAS RESOURCES?

A. Yes. Synapse on behalf of NCSEA, et al., Strategen on behalf of the AGO, and Gabel and Associates on behalf of Tech Customers, assumed shortened book lives of CCs and CTs effectively increasing the cost of the resources relative to other alternatives. The provisions for clean hydrogen production in this recent legislative action further demonstrates such assumptions are unreasonable and unnecessary.

Q. DOES DUKE ENERGY AGREE WITH AGO WITNESS BURGESS[47] **THAT ANY FUTURE CPCN FOR NEW GAS SHOULD INCLUDE AN ASSESSMENT OF THE IRA'S IMPACT ON THE COMPANIES' CARBON PLAN MODELING TO CONFIRM NEW GAS REMAINS PART OF THE LEAST COST PLAN?**

A. Generally, yes. As part of the CPCN process the Companies will continue to evaluate the impact of changing resource technology costs, tax incentives, and commodity pricing with relation to the overall economics and need for the project inclusive of project specific cost estimates rather than generic cost estimates used in planning. Importantly, in addition to the updated assumptions in the CPCN the Companies also plan to file an IRP update in 2023 that will also assess changing market conditions inclusive of updated commodity price forecasts, technology cost projections based on

[47] AGO Burgess Direct Testimony at 67.

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prevailing market conditions and a more comprehensive analysis of the tax benefits attributable to the IRA. The CPCN will provide detailed updates to project costs, commodity costs and many other project specific considerations while the 2023 IRP update will assess changing market conditions from a system perspective. As discussed previously, this progression from planning dockets to execution dockets such as CPCN and procurement proceedings will inform each other and provide the Commission with opportunities to adjust the Carbon Plan over time.

Q. RECOGNIZING THAT A FUTURE CPCN FOR NEW GAS SHOULD INCLUDE ASSESSING THE IMPLICATIONS OF THE IRA ON THE COMPANIES' RESOURCE PLANS, DO THE COMPANIES AGREE WITH PUBLIC STAFF WITNESS THOMAS THAT 800 MW OF NEW GAS CTs AND 1,200 MW OF NEW GAS CCs SHOULD BE SELECTED IN THIS PROCEEDING?

A. Yes. Near-term actions to develop approximately 1,200 MW of CC and 800 MW of CT have been consistently determined to be needed by Duke Energy's modeling, including the in Supplemental Portfolio 5 (no App gas) portfolio supported and now by the preliminary IRA sensitivity. Selecting these new hydrogen-capable natural gas resources is a key component of the decisive action needed to achieve a reliable least cost plan.

There also would be significant implications of delaying the selection of these resources until after the 2024 Carbon Plan update. There is a misconception that the Companies can proceed with all other elements

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of the Carbon Plan but defer action on gas and still meet emissions reductions targets along the least cost path. To the contrary, flexible hydrogen-capable natural gas resources play an essential role in decreasing CO_2 emissions, while simultaneously providing reliable replacement capacity that enables the deployment of significant renewable resources. In the case of the new CCs, these resources are about 60% less carbon emitting per MWh basis compared to the coal they are replacing. Being the newest and most efficient resource on the system with access to the lowest cost gas on the system, these resources would offset higher carbon emissions resources over the life of the assets. As an example, delaying (or removing) a single gas CC in the plan and keeping an equivalent amount of coal online resulted in an increase of nearly 2 million tons of CO_2 on the system in the year 2030. This is roughly 2.5% of the 2005 baseline. Furthermore, peaking CTs allow for more flexibility in system operations to meet high load requirements, while providing operators the ability to turn these units on and off, reducing CO_2 emissions compared to longer required online and offline time for retiring coal, or, when needed, to run them for extended periods during high load events.

Coal retirements are predicated upon their replacement with firm, dispatchable and equally reliable capacity resources. Delaying selection of these resources could have significant impact in accelerating the retirement of coal resources. Without adequate replacement resources, including peaking CT and baseload CC resources, the Companies cannot retire coal,

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compounding the difficulty in achieving the emissions reduction targets. Additionally, if retiring coal is replaced with natural gas resources at retiring coal sites, these resources maybe able to avoid transmission investments as highlighted by AGO Witness Burgess, who notes the potential savings of citing new generation at retiring generation sites,[48] and leverage other transition savings, such as access to land, cooling water, and fuel infrastructure.

The CC and CT resources identified by the Companies in the near-term action plan are essential to achieving the emissions reduction target, while maintaining or improving reliability, and doing so along a least cost path. Failing to have such flexible resources on the system as the Companies move forward with retiring 8,400 MW of coal unit capacity jeopardizes achieving the emissions reductions target, increases cost of operating the system, and increases risk of a disorderly transition. Accordingly, the Commission should select these resources in this initial Carbon Plan as part of the near-term actions required to meet the HB 951 objectives.

Q. IS THE CHANGING UTILIZATION OF NATURAL GAS RESOURCES OVER TIME AN IMPORTANT CONSIDERATION FOR ACHIEVING CO_2 REDUCTIONS.

A. Yes. Public Staff witness Thomas highlights an important point regarding the role and carbon emission impacts of "new gas." Across all Carbon Plan

[48] AGO Witness Burgess Direct Testimony at 70.

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and Supplemental Portfolios, total system natural gas fuel consumption peaks around 2026 and steadily declines through the remainder of the planning horizon.[49] This means that the system's natural gas consumption peaks before any of the near-term CC or CTs the Companies are recommending are projected to be placed into service. These new units, with improved heat rates, can more efficiently utilize the gas being consumed further reducing CO_2 emissions and overall system natural gas consumption. Figure 5 from Witness Thomas' Testimony[50] (replicated as Rebuttal Figure 4 below) illustrates the declining natural gas consumption of the system over time across the Carbon Plan and Supplemental Portfolios.

[49] Public Staff Thomas Direct Testimony at 42.
[50] *Id.*

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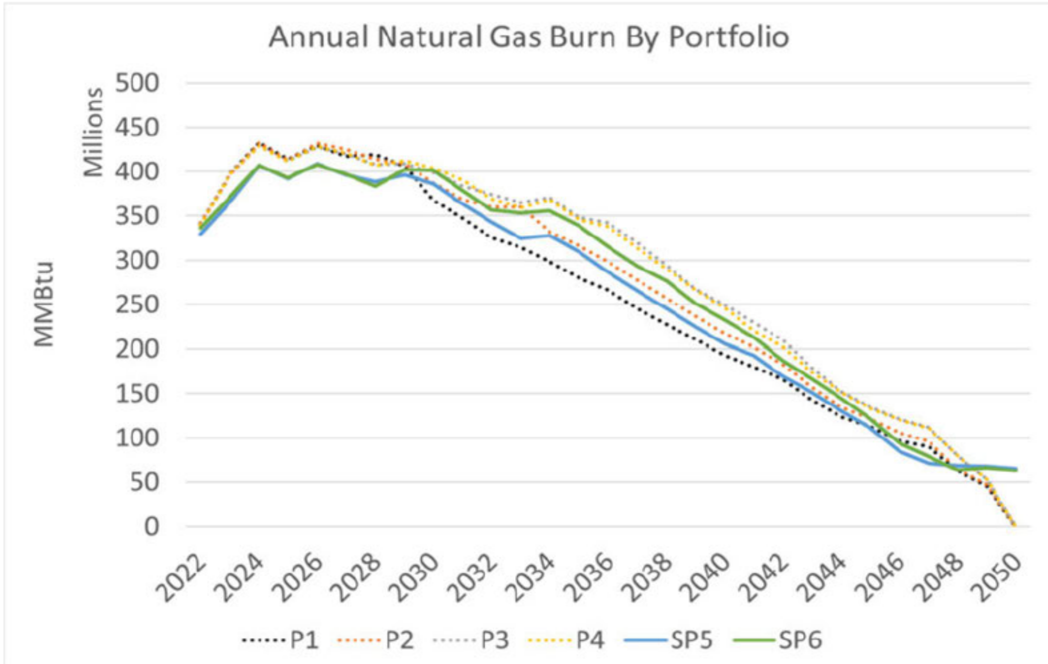
Rebuttal Figure 4: Witness Thomas Figure 5: Annual natural gas burn across Duke Energy Portfolio



Witness Thomas appropriately highlights that the role of natural gas resources will change over time especially as more variable energy resources are added to the system and new base load nuclear is integrated into the portfolio in the next decade. Due to their high degree of operational flexibility, these resources are well suited for eventual shift from base load operation to ramping resources meeting variability in load and generation from renewables. Furthermore, as Witness Thomas goes on to point out as utilization decreases overtime, this reduction helps to mitigate long run fuel price volatility risks.[51] When eventually required to operate on hydrogen, these low utilization rates will further decrease fuel supply risk, as less fuel

[51] *Id.*

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is needed to enable these units to serve a vital role in maintaining reliability and achieving a least cost path to carbon neutrality.

Q. PLEASE COMMENT ON TECH CUSTOMERS' AND AGO'S RECOMMENDATIONS RELATING TO POTENTIAL DISPATCHABLE GAS ALTERNATIVES TO PURSUING NEW GAS GENERATION.

A. Duke Energy will continue to evaluate the most prudent and least-cost options to retire the Companies' coal units and to develop the limited new gas CC and CT units that can provide the system flexibility and capacity needed to reliably meet the CO_2 emissions reductions targets on the timeline required to support and overall energy transition and achieve Carbon Plan targets consistent with HB 951 and the Companies' least cost Carolinas' system-wide energy transition objectives. However, these options must be feasible in the real world and consistent with the requirements of HB 951. Tech Customers witness Maria Roumpani's sensitivity analysis suggesting that Duke Energy can contract for additional capacity from at least one operating gas facility still requires a new CT by 2030. Her analysis also fails to address the panel's direct testimony that there is no reasonable explanation that such *additional* capacity will be available on the timeline required as the Companies retire substantial coal units and transition the fleet to meet the HB 951 targets.[52] Also as addressed in the Panel's Direct

[52] Modeling and Near-Term Actions Panel Direct Testimony at 194-195.

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Testimony, this recommendation is inconsistent with the ownership requirement under HB 951.

Similarly, AGO witness Burgess' recommendation that Companies should have modeled converting the Belews Creek station to operate exclusively on natural gas and accelerated retirement of the coal units fails to consider real-world constraints on Transco Zone 5 gas supply to the facility since it currently does not have any allocated firm interstate pipeline transportation capacity.[53] As the Companies explained in their response to AGO DR 6-2,[54] it was prudent for Duke Energy to not include Belews 100% gas conversion in the Carbon Plan analyses, since evaluations completed as recently as July 2021 showed that a 100% conversion is uneconomic for our customers and, even if justified, installation of such would take at least 4 years to complete based on our experience.

Q. PUBLIC STAFF WITNESS THOMAS' TESTIMONY REITERATES THE PUBLIC STAFF'S SUPPORT FOR THE "NO APP GAS" SUPPLY ASSUMPTION USED IN SP5 AND SP6. DO THE COMPANIES STILL MAINTAIN THEIR RECOMMENDATION OF LIMITED ACCESS TO APPALACHIAN GAS AS THE BASE NATURAL GAS SUPPLY ASSUMPTION?[55]

[53] AGO Burgess Direct Testimony at 60.

[54] Duke Energy's Confidential Response to AGO DR 6-2 is attached as Modeling and Near-Term Actions Panel Rebuttal Exhibit 2.

[55] Public Staff Thomas Direct Testimony at 46.

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A. Yes. The Companies agree that the “No App Gas” supply assumptions in SP5 and SP6 could be utilized if a “pivot” in gas supply assumptions is necessary. However, the Companies continue to support planning for accessing limited Appalachian Gas as the most reasonable and prudent base gas supply assumption. HB 951 mandates least cost requirements to achieve compliance with the authorized carbon reduction goals. Accessing Appalachian gas continues to remain viable and offers the most prudent manner to fulfill the least cost mandate and therefore should be considered reasonable as the Carbon Plan's base gas supply assumption.

As stated in the Panel’s direct testimony, the Mountain Valley Pipeline (“MVP”) is 94% complete with an estimated 20 linear miles of pipe construction remaining.[56] It is reasonable to assume that MVP will ultimately enter service.

As further evidence of the ability to obtain Appalachian gas, the Companies have entered into a definitive agreement with a third party that relies on the services of MVP. The confidential agreement provides access to firm, lower-cost, Appalachian gas supply for existing combined cycle generation that would help mitigate high levels of Transco Zone 5 cost exposure and supply risk for the Companies’ customers.

While the Carbon Plan’s base incremental natural gas supply assumption is from the Appalachia Region, the Companies understand this

[56] Modeling and Near-Term Actions Panel Direct Testimony at 178.

assumption is not fully certain given its dependence on factors outside of the Companies' control and are also prudently planning for alternate gas supply options, if determined to be needed.

Q. DO YOU AGREE WITH AGO WITNESS BURGESS' ASSESSMENT THAT THE COMPANIES MAY BE OVERSTATING THE RELIABILITY CONTRIBUTIONS OF ITS CC UNITS DUE TO A LACK OF FIRM FUEL?[57]

A. No. While witness Burgess is correct to highlight the importance of incremental interstate pipeline firm transportation to increase exposure to non-Transco Zone 5 firm fuel volumes, this should not have implications on reliability contributions. Witness Burgess states that "absent new gas pipeline capacity, Duke's CC fleet does not have access to a firm fuel supply. This deficiency in firm fuel does not only apply to new CC units being considered, but it also applies to Duke's existing fleet."[58] However, the Companies currently hold 434,560 Dth/day of Transco Firm Transportation capacity under long-term contracts that provides non-Zone 5 firm fuel supply. While this volume does not meet the natural gas needs of the entire CC fleet, this volume is greater than the peak day needs of the three gas-only combined cycles in the fleet. Additionally, the Companies contract with third parties to deliver firm fuel supply to the Companies in Zone 5. Furthermore, with the exception of the three gas-only combined

[57] AGO Burgess Direct Testimony at 41.
[58] *Id.* at 41.

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cycles, the remainder of the combined cycle fleet has diesel fuel back-up. This dual-fuel capability safeguards fuel security for when natural gas supply is not available to ensure the reliability contribution of the combined cycle units.

Q. WHEN THE COMPANIES PERFORMED THEIR ENCOMPASS MODELING, WERE THE COSTS OF SECURING INCREMENTAL FT SERVICE CORRECTLY INCLUDED AS PART OF THE COST OF NEW CC RESOURCES?

A. Yes. Witness Burgess states that "it is not obvious that the costs of this additional pipeline capacity are fully accounted for in Duke's EnCompass analysis for resource selection."[59] However, the Companies appropriately included reasonable and defendable Firm Transportation ("FT") cost assumptions in its Encompass modeling to account for the full load burn of any new gas resource. For a new CC resource, this includes both interstate and intrastate fixed costs. To ensure these generic fixed cost assumptions would be reasonable, the Companies have held confidential discussions with pipeline providers and obtained indicative cost estimates for firm transportation services. These indicative costs, along with actual contracted costs, were part of the development of the generic firm transportation assumptions used in the Carbon Plan modeling.

[59] *Id.* at 42.

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Witness Burgess references pages 25 and 26 of Strategen's filed Carbon Plan analysis that addresses natural gas transportation assumptions. Based on the Companies' Appalachian Gas interstate FT cost assumption of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**, Strategen estimates in its analysis that that this would roughly equate to **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** in additional fixed costs for each new CC addition, assuming a 70% capacity factor. Strategen states that they are "concerned that Duke's modeling process may be underestimating the significant fixed costs necessary to secure firm fuel transportation for new CC resources." However, Strategen's assumed kW-yr transportation cost value adder is actually lower than any of the Companies' modeled transportation kW-yr adders. The Companies' assumptions provided in response to Confidential Public Staff DR 3-17 are correct and appropriately account for modeling FT cost assumptions.

Furthermore, Strategen assumes a 70% capacity factor in their cost estimates. The Companies, however, assume a 100% cost allocation of the fixed charges for full load requirements to the incremental unit regardless of capacity factor. In the real world, you cannot "pick-and-choose" how much FT capacity you desire day-by-day to match capacity factors. The modeling practice applied by the Companies is inherently more conservative than a capacity factor assumption and further evidence that the Companies are not underestimating FT cost assumptions.

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In contrast to the Companies, the AGO and Strategen have not provided an alternative FT cost per Dth/d recommendation, nor do their filed materials provide any support that demonstrates FT costs are not fully accounted for. If anything, the Strategen analysis shows that the Companies' assumptions are higher cost per kW-yr than Stratgen's own estimate. Finally, it is important to note that while interstate FT costs may be significant, they also provide long-term access to lower variable gas commodity cost regions to help offset fixed FT costs.

Q. PLEASE RESPOND TO AGO WITNESS BURGESS' CLAIM THAT THE COMPANIES DID NOT ADDRESS THE FEASIBILITY OR COST OF SECURING 400,000 DEKATHERMS/DAY OF INCREMENTAL FT IN P5-P6?[60]

A. The Companies addressed incremental firm transportation from the Gulf Coast via various data requests for the "No Appalachian Gas" cases. The feasibility and cost of an incremental 400,000 dekatherms/day of Firm Transportation in P5-P6 are similar to that of the base assumptions for existing generation needs in P1-P4.

The feasibility of securing FT for the Carbon Plan's Alternate Fuel Supply Sensitivity of No Appalachian Gas Supply was addressed in the Companies' confidential response to CIGFUR DR 1-22.[61] The Companies

[60] *Id.* at 52.
[61] Duke Energy's Confidential Response to CIGFUR DR 1-22 is attached as Modeling and Near-Term Actions Panel Rebuttal Exhibit 3.

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explained that the incremental Interstate Firm Transportation for the remaining portion the Companies' existing combined cycle fleet assumes **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** The generic cost assumption of securing 400,000 dekatherms/day of Firm Transportation was detailed in confidential AGO DR 8-5 as **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**

Q. DO YOU AGREE WITH CIGFUR WITNESS GORMAN'S ASSESSMENT OF FIRM PIPELINE DELIVERY CAPACITY ASSERTING THAT "THE COMPANIES WILL NOT HAVE FIRM CAPACITY RIGHTS THAT CAN BE EXPECTED TO OPERATE DURING SYSTEM PEAKS AND THEREFORE CANNOT RELIABLY BE EXPECTED TO CONTRIBUTE TOWARD A RELIABLE SOURCE OF POWER FROM THE COMPANIES' SYSTEM"?[62]

A. No. While the Companies highlight in multiple filings the inherent uncertainties around obtaining incremental firm delivery capacity, the Companies presented reasonable and measured approaches to adding incremental gas generation and supply to ensure reliability and executability of the Carbon Plan.

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[62] CIGFUR Gorman Direct Testimony at 20.

As described in Table 4-5 of Chapter 4 of the Carbon Plan, the Companies have a near-term action of contracting for interstate firm transportation fuel supply in 2022-2023 to support any new CC generation. The Companies currently plan to proceed with this action item assuming an order on the Carbon Plan is issued selecting new gas generation, as proposed. The Companies' firm fuel supply assumptions in the Carbon Plan are reasonable for planning purposes, and they would be further detailed in any future CPCN application for new generation.

Additionally, the Companies currently utilize dual-fuel generation capacity to manage system peaks, with on-site diesel fuel at natural gas generators providing fuel security during times of limited delivered gas availability in Transco Zone 5.

Q. DO YOU AGREE WITH CUCA WITNESS O'DONNELL'S CLAIM THAT DUKE ENERGY DID NOT PROVIDE A SOLUTION TO THE PROBLEM IN ZONE 5?[63]

A. No. Although the Companies are the largest consumers of delivered natural gas in Transco Zone 5, the Companies are not solely responsible for providing "a solution" to problems in Transco Zone 5. But as outlined in the Carbon Plan, Appendix E, page 42, the Companies provide two gas supply solutions to reduce the Companies' exposure to Transco Zone 5. This will in turn reduce demand strain on the Transco Zone 5 delivered

[63] CUCA O'Donnell Direct Testimony at 11.

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marketplace, which will improve tightening regional supply and demand dynamics. These solutions are further detailed in responses to data requests, including Confidential AGO DR 8-9 which quantifies the total incremental interstate firm transportation volumes that were modeled in both Appalachian and No Appalachian gas scenarios.[64] These volumes are significant and would directly reduce the Companies procurement of Transco Zone 5 delivered gas from third parties.

The Companies do agree with CUCA witness O'Donnell that Transco Zone 5 is highly constrained and that more interstate capacity is needed into Zone 5. As stated in Carbon Plan Appendix N, among other places, the Companies believe it is imperative to obtain additional interstate natural gas capacity into the Carolinas. Obtaining this additional interstate firm transportation is required to support renewable integration, maintain cost-effective and reliable energy, and achieve lower system carbon emissions. As witness O'Donnell states, Duke Energy did recognize the issue in Transco Zone 5 when it prepared the Carbon Plan. Recognizing the issue at hand, the Companies presented reasonable and measured solutions to adding incremental gas supply to ensure reliability and executability of the Carbon Plan.

Q. BASED ON THE TESTIMONY FILED BY THE PUBLIC STAFF AND OTHER PARTIES ADDRESSING THE NEED TO SELECT

[64] Duke Energy's Confidential Response to AGO DR 8-9 is attached as Modeling and Near-Term Actions Panel Rebuttal Exhibit 4.

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NEW GAS AS PART OF THE NEAR-TERM ACTION PLAN, PLEASE SUMMARIZE THE COMPANIES' POSITION.

A. Selecting new CC (1,200 MW) and CT (800 MW) capacity as presented in the near-term action plan has been validated in the Carbon Plan modeling and is reasonable for planning purposes. Subject to the Commission selection of these new CC and CT resources, the current strategy presented in the Chapter 4 execution plan remains executable. As identified by Public Staff witness Thomas, the Commission and interested parties will have further opportunity to review any new gas generating facility in a future CPCN proceeding.[65]

Finally, as previously stated, deferral of action on the limited, hydrogen-capable gas resources included in the Companies' proposed near-term actions would delay achievement of the 70% interim target and leave the system dependent on existing coal resources for a longer period of time.

IV. APPROVING DEVELOPMENT ACTIVITIES FOR LONG LEAD-TIME RESOURCES IN THE NEAR-TERM ACTION PLAN

Q. DO THE PUBLIC STAFF AND OTHER INTERVENORS AGREE THAT THE CARBON PLAN MODELING SUPPORTS NEAR-TERM DEVELOPMENT ACTIVITIES FOR THE EXPANSION OF THE BAD CREEK PUMPED STORAGE HYDRO FACILITY AND THE NEED FOR NEW NUCLEAR IN THE 2030s?

[65] Public Staff Thomas Direct Testimony at 45.

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A. Yes. The Public Staff notes that, given the modeling results and the long development time for both Bad Creek II and SMRs, it is reasonable for the Companies to perform further near-term evaluation and initial development activities to seek initial permitting, refine the timeline of commercial operation, identify risk factors, and determine more accurate cost estimates.[66]

Q. WERE THE PUBLIC STAFF AND OTHER INTERVENORS ALSO SUPPORTIVE OF NEAR-TERM DEVELOPMENT ACTIVITIES TO SUPPORT FUTURE AVAILABILITY OFFSHORE WIND IN THE 2030s?

A. AGO Witness Burgess recommends the Commission carefully consider approving any development activities for offshore wind while recognizing offshore wind has the potential to supply significant amounts of zero carbon emitting energy and its ability to complement the generation profile of solar.[67] NCSEA et al. Witness Fitch recommends the Commission select 800 MW of offshore wind by 2030.[68] Conversely, the Public Staff relied heavily on the modeling results of the Supplemental Portfolios in developing their recommendations in their Testimony on the Carbon Plan. Because offshore wind was not economically selected by the capacity expansion model until the 2040s in the Supplemental Portfolios, Witness

[66] Public Staff Thomas Direct Testimony at 21.
[67] AGO Burgess Direct Testimony at 75.
[68] NCSEA et al. Fitch Direct Testimony at 51.

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Metz recommended the Commission deny the Companies request to begin near term resource development for offshore wind.[69] However, the Public Staff previously also highlighted in its July 15 comments the criticality of executability:

> "Execution risks will likely pose the most significant challenge to achieving the CO_2 reduction goals in Section 110.9, and should, therefore, be given substantial attention by the Commission."[70]

Later in initial comments, the Public Staff also points to Portfolio 4 as potentially the most achievable portfolio relying on a balance of resources,[71] including offshore wind. The Companies discuss in Appendix E the tradeoffs between resources diversity by including offshore wind in Portfolio 4, compared to the model's economic selection of only nuclear to meet the emission reductions targets in Portfolio 3.

> "Overall, the lowest cost portfolio is Portfolio 3, but the inclusion of offshore wind in Portfolio 4, only slightly increases the cost of the portfolio while, importantly, providing resource diversity to mitigate technology cost and timing risk."[72]

This cost impact of $0.3 Billion between Portfolio 4 and Portfolio 3,[73] relative to a portfolio PVRR of approximately $95 Billion, represents an important consideration for the Commission on the balance of executability risk with resources diversity.

[69] Public Staff Metz Direct Testimony at 24.
[70] Public Staff Initial Comments at 12.
[71] *Id.* at 19.
[72] Carbon Plan Appendix E at 82.
[73] *Id.* at 81.

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Q. HAVE THE COMPANIES PERFORMED A SIMILAR COST SENSITIVITY ANALYSIS FOR THE SUPPLEMENTAL PORTFOLIOS TO ASSESS THE COST IMPACT OF ACCELERATING OFFSHORE WIND?

A. Yes. The Companies conducted additional sensitivities on each of the portfolios (SP5, $SP5_A$, SP6, $SP6_A$) to determine the cost impact of including and accelerating one 800 MW block of offshore wind from its economic selection in the 2040s to a 2031 in-service date available, to contribute to the achievement of the CO_2 emissions reductions target in 2032 and 2034. In each of these cases, the inclusion of offshore wind had similar impacts to the portfolio PVRR as P4 compared to P3, totaling less than $0.33 Billion PVRR impact relative to a total portfolio cost of approximately $95 Billion.

Q. WHAT DOES THIS ANALYSIS MEAN?

A. Offshore wind in the supplemental portfolio analysis, as Witness Metz points out, is not economically selected for the interim compliance but is selected in the 2040s to support achievement of net zero carbon emissions by 2050. This analysis suggests that the supplemental portfolios could support the acceleration of offshore wind to provide resource diversity and mitigate technology cost and timing risk while increasing executability of the portfolio.

Offshore wind continues to increase overall executability of achieving interim reduction targets, as pointed out by the Public Staff in their initial comments due to the inclusion of diverse portfolio of resources

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utilized to achieve the interim emission reductions target. Contrary to the witness Metz' position on behalf of the Public Staff, the Companies believe initial development activities associated with offshore wind present a prudent approach to investigating the necessary step to develop a least cost energy transition and achieving the HB 951 emissions reductions targets. Without progressing early development activities for offshore wind in the near-term, meeting the interim emissions reduction targets by 2030 would be exceedingly challenging and further jeopardizes ensuring timely achievement of the interim emissions reduction targets.

V. NEAR-TERM ACTIONS MUST BE FOUNDED ON COMPLETE AND RIGOROUS ANALYSIS

Q. SEVERAL PARTIES CONTINUE TO TAKE ISSUE WITH ADJUSTMENTS MADE TO THE INITIAL PORTFOLIO RESULTS FROM THE CAPACITY EXPANSION MODEL. HOW DO THE COMPANIES RESPOND?

A. The Companies appreciate the focus on ensuring that Duke Energy's enhanced modeling steps—which, while necessary, are admittedly not as transparent to stakeholders as the EnCompass capacity expansion modeling process—are reasonable. Overall, the Companies' multi-step modeling framework, as described in detail in Appendix E and further addressed in our direct testimony, was reasonable and appropriate for planning purposes and achieved reasonable results. To ensure the Commission has a base level

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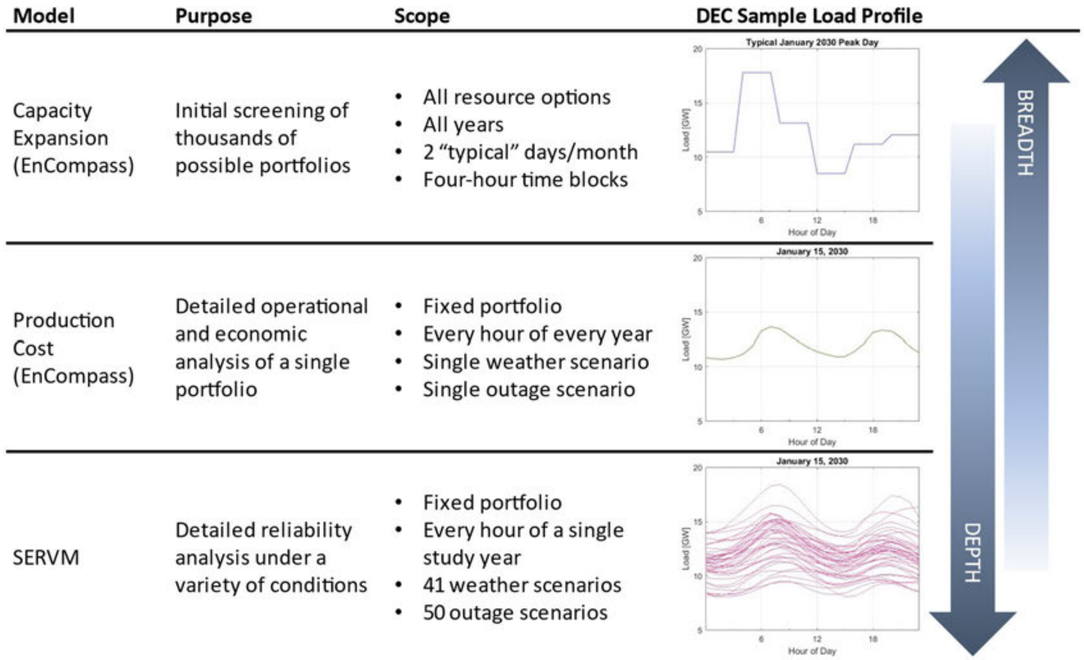
of understanding of the process, we would first like to reintroduce the multi-step process as presented in Rebuttal Figure 5 below.

Rebuttal Figure 5: Scope and Purpose of the Models Used in the Carbon Plan Analysis[74]



As Rebuttal Figure 5 shows, the Companies used the EnCompass capacity expansion model to screen resource options and develop initial Carbon Plan portfolios. The Companies then used the EnCompass production cost model to evaluate hourly portfolio operations, and then SERVM to assess whether each portfolio could be expected to maintain or improve system reliability in the future.

[74] Rebuttal Figure 5 is also replicated in Modeling and Near-Term Actions Panel Rebuttal Exhibit 1.

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Q. PLEASE ELABORATE ON THE PURPOSE OF THE ENCOMPASS CAPACITY EXPANSION MODEL AND EXPLAIN HOW THE DESIGN OF THE MODEL IS SUITED TO ITS PURPOSE.

A. The capacity expansion model is used to evaluate all resource options, including the capital and operating costs of each, the operating characteristics of each, and the costs and operating characteristics of portfolios made up of different potential combinations of these resources, to produce the least-cost resource mix that meets the objectives specified by the planner. The strength of the capacity expansion model is in its breadth as it analyzes each selectable resource to determine which should be added to the portfolio, when, and in what quantities given the characteristics of each and how the cost of each is forecasted to evolve over the planning period, in the context of changing conditions over time with regard to, among other things, commodity prices and customer load.

To achieve such broad analytical scope and still produce a solution in a reasonable amount of time, the capacity expansion model necessarily includes certain simplifications, one of which is in the temporal granularity of the analysis. As illustrated in Figure 5 above, the capacity expansion model does not optimize over every hour of every year over the planning period, but instead uses two "typical day" load shapes for each month (one shape for peak days, one for off-peak days). In the Carbon Plan analysis, each "typical day" is comprised of six, four-hour time blocks that capture the monthly peak load, the monthly minimum load, and average daily total

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energy served for the month. These necessary simplifications are the reason more detailed evaluation and verification are required using tools that are less broad in scope.

Q. WITH THAT BACKGROUND, IS IT REASONABLE TO TREAT RESOURCE ADDITIONS AND RETIREMENTS SELECTED BY THE CAPACITY EXPANSION MODEL AS FINAL FOR PLANNING PURPOSES?

A. It is not. As explained in Carbon Plan Appendix E and as we reiterated in our panel's direct testimony, the capacity expansion model provides a guide to the portfolio that could best meet the planning objectives, but subsequent verification and validation is absolutely required. There may be real-world factors that dictate adjustment to capacity expansion results, and more detailed analysis of the initial portfolio is required to assess system production costs and resource adequacy using tools designed for those purposes. The EnCompass production cost model and SERVM are two such tools.

Q. IF THE PRODUCTION COST MODEL DOES NOT ITSELF MAKE RESOURCE SELECTION DECISIONS, HOW MIGHT THAT MODEL BE USED TO INFORM ADJUSTMENTS TO CAPACITY EXPANSION MODEL RESULTS?

A. Because the production cost model evaluates unit dispatch in each hour sequentially over the full planning period (rather than against a simplified "typical day" load shape), it produces a much more accurate estimate of

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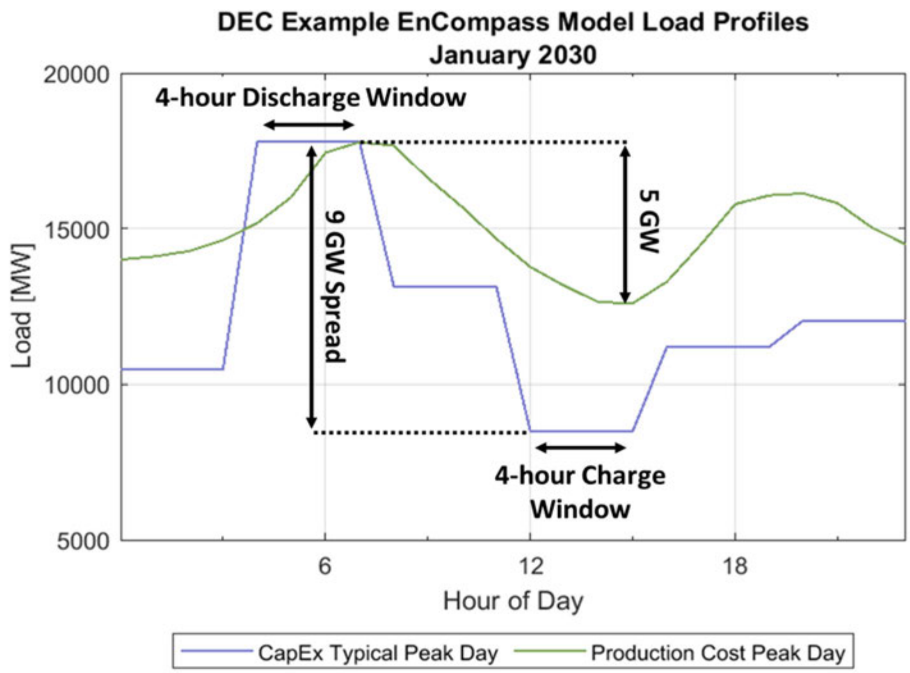
total system operating costs than the capacity expansion model is capable of. Iterative production cost model runs can be used to evaluate the impact of adjustments to the portfolio on total system operating costs. The operating cost changes, together with the associated capital cost changes, can be used to calculate the PVRR impact of the adjustment. An adjustment that lowers total PVRR can be considered an improvement to the portfolio, assuming the change does not jeopardize other planning objectives or violate any known real-world constraints.

Q. IS THIS THE PROCESS THE COMPANIES USED TO PERFORM THE BATTERY-CT OPTIMIZATION STEP?

A. Yes. As I explained in my direct testimony, the simplified "typical day" load shape used in the capacity expansion model includes both a much larger peak-valley spread than occurs in reality, and peaks and valleys with much longer duration than occurs in reality. The "typical day" load shape for January used by the capacity expansion model, and the more granular hourly load shape for a single day in January used by the production cost model are shown in Rebuttal Figure 6 below.

Rebuttal Figure 6: Comparison of Load Shapes Used in EnCompass Capacity Expansion and Production Cost Models



The use of the simplified "typical day" load shape creates a situation in which the capacity expansion model "thinks" that a four-hour battery could be fully charged at the minimum load for the month, could fully discharge to serve the peak load for the month, and that this could be repeated for *every* weekday of the month. Because the capacity expansion model has such an inaccurate and imprecise view of daily battery operations, it is essential to validate battery selection with a more granular tool.

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Q. PLEASE ADDRESS PUBLIC STAFF WITNESS THOMAS' CRITIQUES OF THE BATTERY-CT OPTIMIZATION STEP IN THE MODELING PROCESS.[75]

A. Witness Thomas' critiques of the battery-CT optimization step are centered around factors that affect resource selection in general, rather than on whether the capacity expansion model can appropriately value energy storage. If anything, the concerns expressed by Witness Thomas reinforce the need to validate capacity expansion model results rather than undermine this reasonable and necessary verification step. Battery energy storage is largely untested at the scale contemplated in the Carbon Plan analysis, and existing planning tools are still being updated and enhanced to better assess the complexities of this dynamic resource. The Companies look forward to continuing to work with the Public Staff to refine their analysis of energy storage.

Q. HOW DO THE COMPANIES RESPOND TO WITNESS THOMAS' CRITIQUE THAT THE BATTERY-CT OPTIMIZATION STEP IS POTENTIALLY REDUNDANT TO THE MORE DETAILED QUANTITATIVE LOLE VALIDATION STEP PERFORMED IN SERVM?

A. Witness Thomas finds that the LOLE Validation step appears reasonable and is consistent with the HB 951 requirements to ensure system

[75] Public Staff Thomas Direct Testimony at 16-23.

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reliability.[76] The Battery-CT Optimization step was completed in advance of the LOLE Validation step as an economic analysis to assess whether replacing a portion of model-selected batteries with CTs results in overall PVRR savings, while the LOLE Validation step is designed to ensure resource adequacy across a range of possible weather years and outage scenarios. Any CTs that are economically added in the Battery-CT Optimization step contribute to reliability in the LOLE Validation step. If the LOLE Validation step identifies a need for additional CTs above those added in prior steps to ensure reliability, these are included as well. If the LOLE Validation step does not identify a need for additional CTs, this does not undermine the inclusion of economically validated CTs in the Battery-CT Optimization step.

Q. WITNESS THOMAS ALSO CHALLENGES THE REASONABLENESS OF THE COMPANIES' USE OF AN EIGHT-YEAR OPTIMIZATION PERIOD IN PERFORMING THE ENCOMPASS MODELING AND RECOMMENDS THE COMMISSION ORDER CHANGES TO HIGHLY TECHNICAL "MIP STOP BASIS" SETTINGS WITHIN THE MODEL. HOW DOES DUKE ENERGY RESPOND?

A. The Companies maintain that the use of eight-year optimization periods is reasonable in accordance with the appropriate system operational

[76] Public Staff Thomas Direct Testimony at 24.

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conditions and convergent tolerances ("MIP Stop Basis" or "MIP basis") used in the initial development of expansion plans in the capacity expansion model in the Carbon Plan.

Q. PLEASE EXPLAIN WHAT "OPERATIONAL CONDITIONS" ARE IN THE CAPACITY EXPANSION MODEL.

A. EnCompass offers three system operational conditions that may be used in the development of an expansion plan in the capacity expansion model as described below.

- No Commitment – A simplified operational condition that ignores unit must-run requirements, ancillary reserve requirements, unit ramping capabilities, minimum time constraints governing how long a unit must be online after startup and offline after shutdown, unit start costs, etc.
- Partial Commitment – A more realistic system operational condition that recognizes whether units are online or offline, considers startup and shutdown costs, ancillary reserve requirement, etc. Partial commitment allows for partial units to be used to meet these requirements.
- Full Commitment – Similar to partial commitment but uses whole units in operational decisions.

The Companies extensively tested EnCompass in 2020 and 2021 before using this model in a regulatory filing. One of the first observations the Companies made was that when using "no commitment" in the capacity expansion model, the model solved very quickly but the results were often not logical. Often CTs and batteries were added when resources were not

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needed, resulting in unnecessarily high portfolio costs. Through extensive testing the Companies determined that using the "partial commitment" operational condition eliminated these extraneous resources and produced more logical portfolio results, but model run times more than tripled.

Q. CAN YOU FURTHER ELABORATE ON WHY A MIP BASIS IS IMPORTANT AND WHAT THE POTENTIAL IMPACTS ARE OF AN OVERLY "RELAXED" MIP BASIS?

A. Yes. The MIP basis is essentially the degree of accuracy required of the model in selecting the least cost portfolio. For example, a convergence tolerance of 200 would allow the model to "stop" trying to find a better solution once it is within 2% of the optimal solution. The PVRR of Portfolios 1-4 was approximately $100 billion so in that case using a MIP basis of 200 would allow the model to stop trying to find a better solution when it was within $2 billion (2%) of the optimal (least cost) solution. As noted previously in this testimony, the PVRR difference between Supplemental Portfolios with and without offshore wind in 2031 was only $0.3 billion. A MIP basis that allows for $2 billion of "wiggle room" around the optimal solution could result in a portfolio with very significant resource differences from the true optimal solution. The Companies typically use a convergence tolerance of 25 to 50 (equivalent to deviations of $0.25 billion to $0.5 billion from the optimal solution for a $100 billion portfolio) depending on model run times for a given analysis.

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Q. HOW DID THE COMPANIES DECIDE AN 8-YEAR SEGMENTATION OPTIMIZATION WAS APPROPRIATE FOR THE CARBON PLAN MODELING?

A. The Companies found early in the development of the Carbon Plan, which uses a CO_2 mass cap constraint to achieve the targeted emissions reductions, that the capacity expansion model would not solve using the "partial commitment" condition and imposing a reasonable convergence tolerance. Working with the EnCompass vendor, Anchor Power Solutions, the Companies found that the same run would solve if the problem was broken into smaller pieces. Using 8-year segments with a 25 MIP basis allowed the model to solve while considering the complex array of resource options available. The first segment (2023-2030) evaluated resources needed to meet a 2030 target, the most stringent CO_2 mass cap scenario. New nuclear and additional offshore wind resources were evaluated in the second eight-year segment (2031-2038) as options to meet the interim targets in P2-P6 and continue on the path toward zero CO_2 emission. The final segments could then further weigh nuclear, offshore wind, and 100% hydrogen resources for achieving the 2050 zero CO_2 emission cap.

Q. IS WITNESS THOMAS' RECOMMENDATION TO USE LONGER SEGMENTS BASED ON REASONABLE MODELING SET UP?

A. No. Witness Thomas references the Synapse modeling performed for NCSEA et al., which used a 15-year optimization period, and the Strategen modeling supporting the Tech Customers' Gabel Report, which used a

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single 28-year optimization period, as the basis for the recommendation for the Commission to direct the Companies to use an optimization period of no less than 15-years in the capacity expansion model and relax the convergence tolerance as necessary.[77] Reviewing the Synapse modeling files, the Companies found that the 15-year segmented solution used a "no commitment" operational condition, which does not reflect real world operation in the expansion plan development, and a MIP basis of 200, which is not precise enough for resource planning. The Strategen modeling, presented in the Gabel Report, did not use segmentation, optimizing resources over the entire planning horizon instead. Strategen used a more stringent MIP basis of 60, compared to the Synapse modeling, however, Strategen also used the unrealistic "no commitment" operational condition in the capacity expansion model.

Q. HOW WILL THE INCREASINGLY COMPLEX ANALYTICAL CHALLENGES ASSOCIATED WITH THE ENERGY TRANSITION INFLUENCE CAPACITY EXPANSION MODEL SETUP AND THE DEVELOPMENT OF INITIAL RESOURCE PORTFOLIOS IN THE FUTURE?

A. One example that illustrates how these challenges will arise going forward is modeling of solar paired with storage in the Companies' Supplemental Portfolio analysis. The Public Staff requested that, for the development of

[77] Public Staff Thomas Direct at 25.

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the Supplemental Portfolios, the capacity expansion model be allowed to optimize the charging and discharging of batteries paired with solar rather than using a fixed generation profile for SPS resources. This revised modeling approach increased capacity expansion model run times to in excess of 9 hours per solution, with some runs exceeding 48 hours to find a solution. This duration of run time presents an untenable result in developing IRPs and the Carbon Plan with hundreds of runs required.

As more complex modeling is undertaken, including strict emissions caps and complex fuel logic, the Companies must be careful to set up the capacity expansion model in a way that allows for reasonable processing time while ensuring reliable results. Due to the complex, technical nature of model settings in sophisticated capacity expansion and production cost models, and the continuing updates and improvements to both the models and the Companies' process, imposing prescriptive requirements in a regulatory proceeding could unnecessarily confine the Companies' efforts to address these challenges in in the future. These complexities can be discussed with the Public Staff and other interested stakeholders in advanced of the development of the 2024 Carbon Plan.

In summary, when incorporating appropriate operational conditions and a reasonable convergence tolerance, 8-year optimization segments are long enough to optimize over time periods of significant relevance to the Carbon Plan analysis and yet short enough to allow the capacity expansion model to produce results in a reasonable amount of time. The Companies

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will test longer segmentation periods as new versions of the model are implemented and will continue to engage with the Public Staff and other parties in advance of 2024, but reiterate that it would be problematic for the Commission to dictate detailed model settings.

Q. IS DUKE ENERGY PLANNING TO ADOPT THE MODELING METHODOLOGY CHANGES INCORPORATED INTO THE SUPPLEMENTAL MODELING IN FUTURE CARBON PLAN UPDATES?

A. As explained in our direct testimony, the supplemental modeling analysis performed in response to the Public Staff included both changes that the Companies agreed were reasonable for modeling and planning purposes and certain inputs and assumptions that the Companies did not find reasonable. For example, Public Staff witness Thomas highlights utilizing declining ELCC values for SPS and standalone storage as a more reasonable approach than imposing cumulative limits on these technologies in the model and supports the Companies' continuing to include additional configurations of SPS in the model.[78] As explained in the direct testimony, the Companies agreed that these were process improvements in the preforming the supplemental modeling and plan to continue to assess modeling improvements such as these and commit to engage with the Public Staff and

[78] Public Staff Thomas Direct Testimony at 30, 35.

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stakeholders in advance of the 2024 Carbon Plan update to discuss modeling process improvements that will be utilized in that proceeding.

Q. IF THE PRODUCTION COST MODEL EVALUATES PORTFOLIO PERFORMANCE ON A SEQUENTIAL, HOURLY BASIS OVER THE ENTIRE PLANNING PERIOD, WHY WOULD ANOTHER TOOL BE NEEDED TO ENSURE RESOURCE ADEQUACY?

A. The production cost model assesses only one, weather-normal, load forecast and only one forced-outage scenario. To properly assess resource adequacy, a tool like SERVM, that does deep analysis of portfolio operations across a wide range of conditions, is required.

Q. PLEASE EXPLAIN THE PURPOSE OF THE SERVM MODEL.

A. In the Carbon Plan analysis, SERVM was used to evaluate sequential, hourly system operations across 41 weather years and 50 forced-outage scenarios, for a total of 2,050 combined weather and forced-outage scenarios in each model run. Because of the complexity of this analysis, only two years were modeled in each run. As described in Carbon Plan Appendix E, SERVM provides an estimated loss of load expectation ("LOLE") for the portfolio in the modeled year, which is compared to the target LOLE threshold to confirm whether the Companies can reasonably expect that system reliability would be maintained if that portfolio were implemented.

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Q. HB 951 REQUIRES THAT THE CARBON PLAN MAINTAIN OR IMPROVE RELIABILITY. HOW DO THE COMPANIES ENSURE THAT THE CARBON PLAN SATISFIES THIS REQUIREMENT?

A. As described in this Panel's direct testimony, the Companies used a 17% winter planning reserve margin and effective load carrying capability ("ELCC") assumptions in developing the Carbon Plan portfolios based on comprehensive studies conducted by Astrapé Consulting. The reserves and capacity value assumptions provide reasonable estimates for use in the initial capacity expansion modeling. These metrics, when coupled with the reliability validation step in the modeling process, ensure the Companies' Carbon Plan portfolios maintain or improve system reliability as required for prudent resource planning and by HB 951.

Q. WERE ANY INTERVENORS SUPPORTIVE OF THE COMPANIES' RESOURCE ADEQUACY CONSTRUCT?

A. Yes. Public Staff witness Metz testified that the Public Staff does not have any concerns with the reserve margin used in development of the Carbon Plan.[79] Public Staff witness Thomas further testified that Duke Energy's ELCC studies are reasonable for planning purposes.[80] Witness Thomas also testified that the LOLE Validation step appears reasonable and is consistent with the requirements of Section 110.9 regarding system reliability.[81]

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[79] Public Staff Metz Direct Testimony at 50.
[80] Public Staff Thomas Direct Testimony at 50.
[81] Public Staff Thomas Direct Testimony at 24.

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AGO's Strategen witness Burgess testified that it is essential that reliability be evaluated comprehensively to ensure that any simplifications in models like EnCompass do not overlook any potential gaps.[82] Mr. Burgess agreed that a step similar to Duke Energy's final reliability adjustment may be necessary but also cautioned that this step can be difficult to assess.[83]

Q. WERE ANY INTERVENORS CRITICAL OF THE COMPANIES' RESOURCE ADEQUACY CONSTRUCT?

A. Yes. NCSEA et al. Synapse witness Fitch recommends that the Commission reject the Companies' LOLE Validation step claiming that it lacks a resource adequacy justification.[84] Tech Customers witness Borgatti also questions the LOLE validation step. Finally, NC WARN recommended that in calculating the planning reserve margin, the Commission should order the Companies to assume that they will meet winter peak demand with non-firm energy imports.[85]

Q. DO YOU AGREE WITH WITNESS FITCH THAT THE LOLE VALIDATION STEP LACKS ANALYTICAL RESOURCE ADEQUACY JUSTIFICATION?[86]

A. No, in fact I believe the opposite is true. The LOLE Validation step is expressly needed to ensure resource adequacy. As explained in Carbon Plan

[82] AGO Burgess Direct Testimony at 35.
[83] *Id*
[84] NCSEA et al. Fitch Direct Testimony at 17.
[85] NC WARN & CM NAACP Comments at 6.
[86] NCSEA et al. Fitch Direct Testimony at 17.

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Appendix E and in our direct testimony, the continuing transition to greater reliance on variable energy and energy limited resources makes it increasingly critical to supplement the static reserve margin requirement and resource-specific ELCC values used in the capacity expansion model with more sophisticated tools. SERVM is the state-of-the-art reliability and production cost model used to assess the carbon plan portfolios across a wide range of forced outage and weather scenarios to ensure the portfolio can maintain the industry standard one day in 10-year loss of load expectation ("LOLE"), or 0.1 LOLE.

Q. DO YOU AGREE WITH WITNESS FITCH THAT ADJUSTMENTS TO THE RELIABILITY REQUIREMENTS IN THE CAPACITY EXPANSION MODEL COULD OBVIATE THE NEED FOR SERVM?[87]

A. No. It would not make sense to rely on the capacity expansion model, a tool designed to evaluate a broad range of resources under simplified conditions, for detailed reliability assessment. Those are two completely different types of analyses. As shown in Rebuttal Figure 5 above, the capacity expansion model is the first step in the modeling process and is not a tool for evaluating reliability and does not have the capability to do the detailed portfolio analysis that is required. The capacity expansion model is simply not the

[87] *Id.* at 8.

right tool and is not capable of evaluating loss of load expectation for every hour across a wide range of forced outage and weather scenarios.

Q. DO YOU AGREE WITH WITNESS FITCH'S CLAIM THAT RELIABILITY IS MAINTAINED IN THE SYNAPSE SCENARIOS?[88]

A. No, I do not agree. Witness Fitch's claim is hinged on the Synapse scenarios meeting the reserve margin requirement and load in all hours modeled in the production cost model.[89] While this may be true, it provides a perfect illustration of why the LOLE validation step is appropriate and necessary. While a portfolio may be able to meet weather normal load in all hours of the year in a production cost model, this does not translate to meeting load in all hours under severe weather conditions which is modeled in SERVM. As noted in our direct testimony, the Companies conducted the LOLE validation step for the as-found Synapse "Optimized" portfolio and the scenario failed the reliability screen in test year 2035. Witness Fitch's claim that reliability is maintained in the Synapse scenarios is not correct as indicated by the fact that the optimized portfolio failed to meet the reliability planning criteria of no more than one reliability event in a ten-year period which has been an industry standard, and one relied upon by this Commission.

[88] Direct Testimony of Tyler Fitch, at 49.
[89] NCSEA et al. Fitch Direct Testimony at 49.

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Q. TECH CUSTOMERS WITNESS BORGATTI ASSERTS THAT THE LOLE VALIDATION STEP MAY HAVE USED RELIABILITY CRITERIA THAT DO NOT REFLECT LIKELY SYSTEM CONDITIONS WHICH COULD HAVE MATERIALLY SKEWED RESULTS OF THE ANALYSIS FOR THE GABEL/STRATEGEN PREFERRED PORTFOLIO.[90] DO YOU AGREE WITH THAT ASSERTION?

A. No. Carbon Plan Appendix E section "Portfolio LOLE and Resource Adequacy Validation", starting on Page 62, clearly lays out the modeling methodology utilized by the Companies to validate the reliability of the portfolios. In short, the Companies utilized modeling data from the 2020 Resource Adequacy Study to develop an island case LOLE target that would correspond to achieving a 0.1 LOLE on an interconnected system basis. Thus, the level of reliability benefit from neighboring utilities was held constant during the reliability validation step reflecting the same interconnected conditions as modeled in the 2020 Resource Adequacy Study. However, as noted later in our rebuttal testimony, this level of future market assistance for reliability planning purposes may be overstated due to the uncertainty in the pace of neighboring utilities' transition to variable energy and energy limited resources to achieve CO_2 reduction targets. If future studies indicate neighboring utilities have less available excess

[90] Direct Testimony of Michael Borgatti at 21.

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generation during peak periods due to the nature of their own energy transition, additional resources within the companies' control area will be required resulting in the potential need to increase the current reserve margin to maintain system reliability at current levels.

Q. WITNESS BORGATTI ALSO STATES THAT SOLAR AND STORAGE RESOURCES MAY HAVE USED A FIXED OPERATING PROFILE IN THE RELIABILITY VALIDATION MODELING WHICH WOULD DRAMATICALLY IMPACT THE RESULTS.[91] IS THIS STATEMENT ACCURATE?

A. No, it is not. The SERVM model controlled the charging and economic dispatch of the solar and storage units. There was no pre-optimized solar and storage resource profile used in the SERVM model.

Q. WHAT IS YOUR REACTION TO NC WARN'S RECOMMENDATION THAT THE COMPANIES SHOULD RELY ON NON-FIRM IMPORTS TO SATISFY THE PLANNING RESERVE MARGIN?[92]

A. As noted in this panel's direct testimony, the Companies do rely on non-firm purchases and imports for a portion of their total reserve margin requirement. The 2020 Resource Adequacy Study showed that a 17% planning reserve margin is needed to meet 0.1 LOLE which considers the diversity in neighbor loads and resources in the region and the preferential

[91] *Id.* at 23.
[92] NC WARN & CM NAACP Comments at 6.

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reliability support between DEC and DEP. The island scenario for DEC (no neighbor support) showed that a 22.5% reserve margin would be needed to meet 0.1 LOLE and DEP would require a 25.5% reserve margin with no neighbor support. In addition, DEP relies on interties to import an additional approximately 1,600 MW of firm capacity purchases. Thus, the Companies do rely to a significant degree on firm and non-firm imports to meet load and reserve margin requirements. However, the Companies are concerned that there is significant risk in overreliance on non-firm market purchases.

Q. PLEASE ELABORATE ON THE RISK IN OVERRELIANCE ON NON-FIRM MARKET PURCHASES.

A. As noted in our direct testimony, utilities around the country are continuing to retire and replace dispatchable, firm fuel supply, fossil-fuel resources with variable energy and energy limited resources such as solar, wind, and battery storage. Future market assistance for reliability planning purposes is highly speculative due to the uncertainty in the pace of neighboring utilities' transition to renewable and battery energy storage resources to achieve CO_2 reduction targets. As neighboring systems continue to retire fossil fuel resources and install solar and storage resources, neighbors' LOLE risk may shift to the winter months as it has for DEC and DEP, which could potentially lower the amount of neighbor assistance available in the future since there may be fewer capacity reserves available during winter peak periods.

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Q. CAN YOU PROVIDE A FEW EXAMPLES THAT ILLUSTRATE THE COMPANIES' CONCERNS REGARDING FUTURE LOAD AND RESOURCE DIVERSITY AND THE ABILITY TO RELY ON NON-FIRM MARKET PURCHASES FOR RELIABILITY?

A. Yes. The Companies began signaling a shift in loss of load risk from the summer period to the winter period beginning with the 2015 IRP, and adopted a 17% winter reserve margin in the 2016 IRP based on results of the 2016 Resource Adequacy Study conducted by Astrapé. The 2020 Resource Adequacy Study confirmed the appropriateness of continuing to plan for a minimum 17% winter planning reserve margin. The primary drivers for the shift in LOLE for the Companies are the high volatility of winter peak demands relative to summer peak demands, and the high penetration of solar resources which provide meaningful capacity value during summer afternoon peak demand periods but very little capacity value during early morning winter peak demand periods.

Neighboring utilities are also beginning to signal the shift in loss of load risk to the winter. For example, Dominion Energy Virginia's 2020 IRP adds substantial solar and other renewables to its system that could cause additional winter reliability stress relative to what is modeled in Astrapé's 2020 Resource Adequacy Study.[93] Dominion also noted that it will likely need to import a significant amount of energy during the winter but would

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[93] Virginia Electric and Power Company's 2020 Integrated Resource Plan at 2-8, Case No. PUR-2020-00035 (May 1, 2020) ("Dominion Energy Virginia 2020 IRP").

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need to export or store significant amounts of energy during the spring and fall.[94] Additionally, PJM now considers the DOM Zone to be a winter peaking zone where winter peaks are projected to exceed summer peaks for the forecast period.[95]

Below is an excerpt from page 2 of the publication "Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid, May 17, 2022",[96] regarding PJM loss of load risk shifting to the winter period:

> "Traditionally, resource adequacy risk in PJM has been concentrated in the summer season. In the Accelerated scenario, 95% of the load-loss risk is experienced in the summer and the remaining 5% in winter. However, electrification – in particular heating – has an asymmetrical impact, with the demand growth in winter more than doubling that in summer (summer load growth is 7%; winter 15%). Consequently, there is a pronounced shift in both the seasonal and hourly risk profiles, forcing a new seasonal split of load-loss risk of 20% summer and 80% winter."

Below is an excerpt from page 3 of the publication "MISO Electrification Insights, April 2021"[97], regarding MISO's potential shift to winter peaking:

> "Electrification has the potential to transform MISO system-wide demand from the traditional summer peak to a winter peak. The shift is predominantly driven by the electrification of heating loads in commercial and residential buildings. As a result, the time of system risk expands to winter mornings and widens over summer afternoons. This may require MISO and MISO members to further evolve processes such

[94] Dominion Energy Virginia 2020 IRP at 6.
[95] *Id*. at 40.
[96] https://www.pjm.com/-/media/library/reports-notices/special-reports/2022/20220517-energy-transition-in-pjm-emerging-characteristics-of-a-decarbonizing-grid-white-paper-final.ashx.
[97] Electrification Insights538860.pdf (misoenergy.org).

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> as resource adequacy, resource accreditation, system planning, and outage coordination."

Georgia Power's 2022 IRP also recognizes an increase in winter reliability risks:[98]

> "Notably, the results of the most recent Reserve Margin Study continue to reflect the significant increase in winter reliability risks. These risks are associated with the following drivers: (1) the narrowing of the difference between summer and winter weather-normal peak loads; (2) higher volatility of winter peak demands relative to summer peak demands; (3) cold-weather-related unit outages; (4) the penetration of solar resources; (5) increased reliance on natural gas; and (6) market purchase availability."

TVA is a dual peaking system with similarly high demand in both winter and summer.[99] In winter, there is increased thermal and hydro generating capacity but also greater weather-driven peak variability than in the summer. TVA notes that summer peak load can vary up to 8% from weather-normal conditions while winter peak loads can vary up to 15% to 20% from weather-normal conditions,[100] which is very similar to the load variability experienced in the DEC and DEP service territories.[101] TVA notes that winter peak load variability due to weather is more unpredictable and that additional reserve margin is required to ensure reliability in winter.

[98]Georgia Power 2022 IRP, at 5-26; https://psc.ga.gov/search/facts-document/?documentId=188519
[99] TVA 2019 IRP, at 1-5; https://lpdd.org/wp-content/uploads/2020/05/tva-2019-integrated-resource-plan-volume-i-final-resource-plan.pdf.
[100] TVA 2019 IRP, Appendix D at D-3.
[101] Reference DEC and DEP 2020 Resource Adequacy Study reports included as Attachment I and II to the Carbon Plan, at 24-25.

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Thus, the reserve margins applied in the TVA 2019 IRP are 17% for the summer peak season and 25% for the winter peak season.[102]

Q. PLEASE SUMMARIZE HOW THE DUKE ENERGY AND NEIGHBORING GENERATION SYSTEM PORTFOLIOS ARE TRANSITIONING ACROSS TIME.

A. Rebuttal Table 5 below shows the resource mix in 2022 and the transition to 2035 portfolios for Duke Energy and several surrounding neighbors. Table 5 shows that firm dispatchable resources decline approximately 17% from 110,000 MW today to approximately 91,000 MW by 2035. The table also shows the significant increase in renewables and storage. Nameplate renewables increase approximately 450% from 13,000 MW to 73,000 MW and nameplate storage increases over 200% from 7,000 MW to 22,000 MW. This table demonstrates the dramatic transformation of the grid away from firm dispatchable resources with greater reliance on variable energy and energy limited resources.

[102] TVA 2019 IRP at 1-6.

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Rebuttal Table 5: Energy Transition Benchmarking to Neighboring Utilities 2022-2035

MW	Duke Energy[103]	Tennessee Valley Authority[104]	Dominion Virginia[105]	Georgia Power[106]	Dominion South Carolina[107]	Total
2022						
Renew	5,000	1,597	1,786	3,532	1,046	12,961
Storage	2,309	1,600	1,828	403	576	6,716
Firm	34,221	35,220	17,084	18,335	5,354	110,214
2035						
Renew	25,124	15,777	22,536	7,894	2,146	73,477
Storage	10,139	6,100	4,521	468	876	22,104
Firm	32.447	25,840	14,372	13,309	5,187	91,155

Q. HOW DOES DUKE ENERGY'S PLANNING RESERVE MARGIN COMPARE TO OTHER SOUTHEAST UTILITIES?

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[103] Existing Resources from Carbon Plan, Appendix D; Expansion Plans from Carbon Plan, Appendix E at 73; Supplemental Portfolio 5. Retirement Plans from Carbon Plan, Appendix E, at 49. Existing Solar Capacity from Carbon Plan, Appendix E at 24.

[104] Expansion Plan and Current Resources from TVA 2019 Integrated Resource Plan, 5d, G-13, and EIA data. Existing PPAs from 2019 Integrated Resource Plan, at 5-3, 5-4, 5-5. *See* https://www.tva.com/energy-system-of-the-future/solar for solar estimates. Wind and storage estimates from TVA 2019 Integrated Resource Plan at 9-3 and 9-4. Coal retirements from 2019 Integrated Resource Plan at 5D with acceleration from latest announcement, www reuters.com/business/energy/tennessee-valley-authority-plans-shut-coal-plants-by-2035-2021-05-03/.

[105] Existing Resources from 2021 Update to the 2020 Integrated Resource Plan, Appendix 5A. PPAs from 2021 Update to the 2020 Integrated Resource Plan, Appendix 5B. Retirements from 2021 Update to the 2020 Integrated Resource Plan, Appendix 5J. Expansion plan Alternative B from 2021 Update to the 2020 Integrated Resource Plan at 16.

[106] Coal retirements from Georgia Power 2022 Integrated Resource Plan at 1-5. Renewable Nameplate information from Georgia Power 2022 Integrated Resource Plan at A-140-A-145. The Georgia Power Solar PPAs for Double Run, Timberland, Wadley Washington County and Flint River are all delayed for a year because of supply issues: https://www.spglobal.com /marketintelligence/en/news-insights/latest-news-headlines/georgia-power-delays-970-mw-of-solar-projects-to-late-2024-70291473. Gas estimates from file - PD Capacity Expansion Plans - MGO-Base GPC. Existing Resources from file - Georgia Power Territorial Base Case Load v Existing Capacity Table – Winter.

[107] Existing resources are from Modified 2020 Integrated Resource Plan at 17. Expansion plan from Integrated Resource Plan 2021 Update at 9. CT replacement plan from Integrated Resource Plan 2021 Update at 21-22.

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Table 7 from our direct testimony is reproduced as Rebuttal Table 6 below and shows that the Companies' 17% planning reserve margin is among the lowest of southeast utilities.

Rebuttal Table 6: Utility Planning Reserve Margin Target Comparison

Utility	Planning Reserve Margin
Duke Energy Progress, LLC Duke Energy Carolinas, LLC	Winter – 17%
Georgia Power Company	Summer – 16.25% Winter – 26%
Virginia Electric & Power Company ("VEPCO")	PJM Planning Year – 15.9%
Tennessee Valley Authority ("TVA")	Summer – 17% Winter – 25%
Florida Power & Light ("FP&L")	Summer – 20% Winter – 20%
Dominion Energy South Carolina, Inc.	Summer – 14% Winter 21%
Louisville Gas & Electric ("LG&E")	Summer – 17%-24% Winter – 26%-32%

Q. PLEASE SUMMARIZE THE PRECEDING COMMENTS ON THE PLANNING RESERVE MARGIN AND CONCERNS REGARDING THE ABILITY TO RELY ON NON-FIRM MARKET PURCHASES FOR RELIABILITY.

A. In summary, the Companies' planning reserve margin is among the lowest in the southeast and the Companies rely on firm and non-firm imports to satisfy a portion of the total reserve margin requirement. The Companies

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and our neighbors are retiring firm, dispatchable resources and increasing dependence on variable energy and energy limited storage resources to meet CO_2 reduction goals. This transition, along with electrification – in particular heating – results in loss of load risk shifting more to the winter period for our neighbors as it has for Duke Energy. The Companies are concerned that to the extent historic load and resource diversification between the Companies and neighboring utilities declines, the historic reliability benefits DEC and DEP have experienced from being an interconnected system will also decline which would result in significant risk of over reliance on non-firm market purchases.

Changes in neighboring system resource portfolios and load profiles will be important considerations in future resource adequacy studies. If future studies indicate neighboring utilities have less available excess generation during peak periods due to the nature of their own energy transition, additional resources within the companies' control area will be required resulting in the potential need to increase the current reserve margin to maintain system reliability at current levels. Given the shift to greater levels of variable energy and energy limited resources, the Companies will also consider adopting the use of other reliability metrics to ensure the energy adequacy of the generation system.

Q. DID ANY OTHER INTERVENORS RESPOND TO NC WARN's REQUEST THAT THE COMPANIES BE ORDERED TO ASSUME

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THEY CAN RELY ON NON-FIRM IMPORTS TO SATISFY THE WINTER PLANNING RESERVE MARGIN?[108]

A. Yes. Public Staff witness Metz disagreed with NC WARN and stated:

> "Solely relying on non-firm energy during the winter peaks would be imprudent and potentially dangerous. Nor do I believe it would be prudent to assume that a loss of generation during a contingency event could be fully mitigated in every occurrence with non-firm resources. A function of the reserve margin is to maintain a reasonable level of system reliability. Non-firm power is just what the name implies; it is not firm, and it may or may not be available when it is needed. Even if it is available, it is subject to being curtailed at any time."[109]

NCEMC witness Fall also agreed with Duke Energy's concerns that reduced resource diversity will impact the Companies' ability to rely on market assistance for reliability purposes.[110]

VI. CONCLUSION

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.

[108] NC WARN & CM NAACP Comments at 6.
[109] Public Staff Metz Direct Testimony at 52 (emphasis added).
[110] NCEMC Fall Direct Testimony at 9.

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Duke Energy Carolinas, LLC and Duke Energy Progress, LLC
Summary of Rebuttal Testimony – Modeling & Near-Term Actions
Glen Snider, Bobby McMurry, Michael Quinto, Matt Kalemba
Carolinas Carbon Plan
Docket No. E-100, Sub 179

The Modeling and Near-Term Actions Panel's rebuttal testimony addresses the following:

Approach to Near-Term Actions

The panel recommends the Commission focus its efforts on approving necessary near-term actions that chart a course for achieving HB 951's longer-term CO_2 emissions reductions targets in a manner that best achieves the core objectives of the law. The Commission and the Companies will then be able to "check and adjust" in future proceedings.

The panel reiterates that balancing affordability, reliability and executability are key considerations for setting the pace of energy transition. While certain parties suggest that the Commission should immediately take more aggressive action and commit to more significant development and procurements of solar and battery energy storage resources, customer groups such as CIGFUR and NCEMC, as well as the Public Staff, express support for the decisive initial steps and "check and adjust" strategy recommended by Duke Energy. Rebuttal Table 1 below shows the Companies' proposed near-term procurement volumes, as well as modifications to these volumes suggested by Public Staff and intervenors.

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Rebuttal Table 1: Summary of the Companies' Proposed Near-Term Actions with Intervenors' Suggested Modifications[1]

	Solar (including SPS)	BESS Paired w/ Solar	BESS Standalone	Onshore Wind	CT	CC
Supporting deployment by:[1]	YE 2028	YE 2028	YE 2029	YE 2029	YE 2029	YE 2029
Duke Energy Proposal (MW)	**3,100**	**600**	**1,000**	**600**	**800**	**1,200**
Public Staff Proposal (MW)[2]	**2,630**	**820**	**1,130**	**600**	**800**	**1,200**
Alternative Proposals (MW)						
AGO[3]	3,100	600	1,000	600	0	0
Tech Customers[4]	3,450	1,600	2,900	1,200	400	0
CPSA[5]	4,800	1,650	*0*	*600*	*0 to 500*	*1,200*
NCSEA et al.[6]	4,000	0	4,000	600	0	0
Differences from Duke Energy Proposal						
Public Staff Proposal (MW)	**-470**	**+220**	**+130**	**0**	**0**	**0**
Alternative Proposals (MW)						
AGO	0	0	0	0	-800	-1,200
Tech Customers	+350	+1,000	+1,900	+600	-400	-1,200
CPSA	+1,700	+1,050	*-1,000*	*0*	*-800 to -300*	*0*
NCSEA et al.	+900	-600	+3,000	0	-800	-1,200

Note 1: Year End dates are selected based on the expected timeline from commencing development/procurement to project in service.
Note 2: The Public Staff recommends including 440 MW of remaining CPRE capacity in the 2022 Carbon Plan solar procurement. CPRE amounts are excluded from the numbers in this table.
Note 3: Supports the Companies' proposed solar, storage, and onshore wind volumes as a "no regrets" floor for procurement. *See* AGO Burgess Direct Testimony at 69.
Note 4: Does not make a specific Near-Term Actions Proposal. Values used are based on Tech Customers' "Preferred" portfolio. *See* Tech Customers Roumpani Direct Testimony at 5.
Note 5: CPSA does not clearly advocate for specific volumes of resources for the near-term action plan other than solar and SPS. The volumes for other resources included in Rebuttal Table 1 reflect Portfolios CPSA3 and CPSA5, which "CPSA strongly recommends. . . inform Duke's near-term execution plan." *See* CPSA Norris Direct Testimony at 29. CPSA3 and CPSA5 both include two new CCs by 2030 totaling 2,400 MW, only one of which is reflected here, consistent with the Companies' approach to developing their own near-term action proposal.
Note 6: NCSEA et al. recommend beginning procurement of 4,000 MW each of solar and storage with target in-service dates of 2025-2028. Not shown above is additional recommendation for 2,500 MW of off-system onshore wind. NCSEA et al. Fitch Direct Testimony at 50-51.

The Table shows that there is a level of general consensus around many of the procurement and development activities recommended by the Companies. The Companies are aligned with Public Staff as well as CPSA on the inclusion of limited amounts of new hydrogen-capable gas resources in the near-term action plan.

Risk diversification is a critical consideration in selecting near-term actions for an orderly energy transition. As shown in Rebuttal Figure 1 below, the Companies propose balanced investment in a diverse portfolio of resources, including approximately $5 billion in solar and solar paired with storage ("SPS") complemented by approximately

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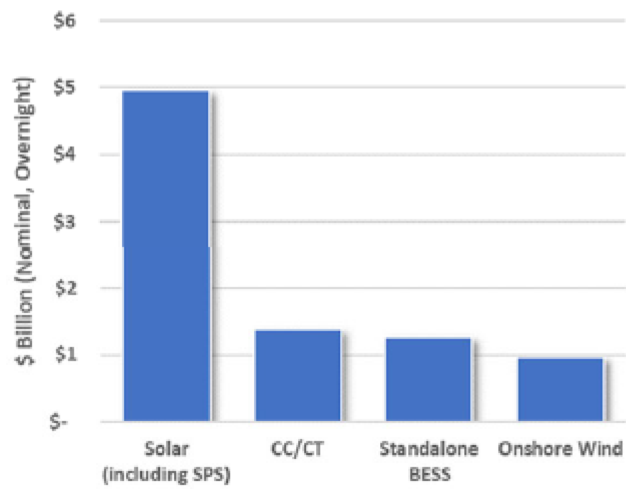
$1 billion investment each in stand-alone storage, onshore wind, and flexible and dispatchable hydrogen-capable gas.

Rebuttal Figure 1: Proposed Investment by Resource Type in the Companies' Near-Term Procurement and Development Activities



These near-term investments are generally supported by all pathways and portfolios. In contrast, adopting certain other parties' recommended near-term actions would unduly concentrate risk by focusing on preferred resource types and policy outcomes that fail to appropriately value firm, dispatchable resources that are needed to retire coal units and progress the system-wide Carolinas energy transition.

Overarchingly, the Public Staff agrees that Duke Energy's supplemental modeling achieves reasonable results and finds that Supplemental Portfolio 5 validates the near-term actions presented for Commission approval. When presented on an apples-to-apples basis, there is significant alignment between the volumes of solar, battery energy storage, onshore wind, and new natural gas resources that Duke Energy and the Public Staff recommend the Commission select in this proceeding, as shown in Rebuttal Table 1 above.

Carbon Free Resources Should be Selected by the Commission

There is substantial consensus amongst a number of parties that the volumes of solar (including solar paired with storage), battery energy storage, and onshore wind recommended by Duke Energy's near-term action plan are consistent with a "no regrets" strategy and that these resources should be "selected" by the Commission for development and procurement in the near-term.

The Public Staff is generally aligned with Duke Energy on solar, battery energy storage, and onshore wind and the AGO supports the Companies' proposed near-term actions with respect to these resources as part of a "no regrets" approach. In contrast, CPSA, NCSEA et al., and Tech Customers all recommend significantly greater development

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and procurement of solar and battery energy storage in the near-term. However, there are substantial inconsistencies between their specific recommendations for procurement and development of standalone energy storage and SPS as well as onshore wind.

The Companies are planning to procure significant solar paired with energy storage resources in future near-term procurement (2023-2024). While most of the 2,350 MW of solar resources procured in the near-term after 2022 will include storage, the volume of SPS needed will be based on the optimal configuration of the paired storage that can be procured at least cost and recognizing system needs.

A volume adjustment mechanism similar to the 2022 Solar Procurement provides a mechanism to manage cost risk while increasing solar procurements in the near-term. If solar bid prices are below the modeled cost of solar, the volume adjustment mechanism would enable the Companies to "flex up" and procure the volume of solar modeled as needed to achieve the interim 70% target by 2030 while also lowering the risk for customers of over-procuring solar.

Accounting for the volume adjustment mechanism, the 2022 Solar Procurement has the potential to procure up to 1,350 MW of solar inclusive of the unawarded CPRE MW. Over-procuring solar through even larger initial procurements than planned creates increased cost risk and execution risk for the Companies and customers and is not a reasonable step.

Limited New Gas Resources Should be Selected by the Commission

Limited amounts of new flexible and dispatchable hydrogen-capable gas are essential to an orderly and least cost energy transition. Failing to have such flexible resources on the system as the Companies move forward with retiring 8,400 MW of coal unit capacity jeopardizes achieving the emissions reductions target, increases cost of operating the system, and increases risk of a disorderly transition. Subject to the Commission selecting limited new combined cycle ("CC") and combustion turbine ("CT") resources, the current strategy presented in the Chapter 4 execution plan remains executable.

The Public Staff recognizes the need for limited new CC and CT capacity as part of the near-term action plan. Numerous other parties also recognize that some limited amount of CC and/or CT capacity is needed to retire over 8,400 MW of coal generation and reliably transition the system. Only the results-oriented analysis and testimony presented by NCSEA et al., NC WARN, and EWG oppose any development of even limited, hydrogen-capable new gas resources in the near term.

Selecting limited amounts of new gas generation provides system flexibility, supports grid reliability, and importantly provides significant carbon reductions needed to achieve the interim 70% target called for in HB 951. Further delays in moving forward with a limited amount of hydrogen-capable natural gas resources will either present

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reliability challenges or delay achievement of the interim target and retirement of existing coal resources or both.

In light of recent upward inflationary pressures on technology costs and the significance of the newly passed Inflation Reduction Act of 2022 ("IRA"), Duke Energy has performed preliminary modeling sensitivity analysis based on an initial review of the IRA to test the robustness of the Companies' proposed near-term actions. This modeling sensitivity continues to validate the near-term actions and supports inclusion of limited new hydrogen-capable gas resources in the near-term action plan to drive down CO_2 emissions and maintain reliability over the planning horizon.

In recognition of the preliminary nature of this sensitivity analysis, the Companies also agree with and support Public Staff witness Thomas' testimony that resource planning must use a consistent snapshot in time for fixing modeling inputs and assumptions, "lest the biennial IRP proceeding devolve into an endless cycle of updating assumptions and re-running the models." The Companies continue to support Commission approval of all near-term actions in this initial Carbon Plan, including limited new natural gas resources, and commit to further evaluate the impact of changing resource capital costs, tax incentives, and commodity pricing with relation to the overall economics and need for a future gas project as part of a future CPCN proceeding.

Planning for accessing limited Appalachian gas supply continues to be the most appropriate base gas supply assumption for planning purposes. HB 951 mandates least-cost requirements to achieve compliance with the authorized carbon reduction goals. The "No App Gas" supply assumptions in SP5 and SP6 could be utilized if a "pivot" in gas supply assumptions is necessary. The Companies' analysis also presents reasonable and defendable Firm Transportation ("FT") cost assumptions and executable plans to obtain additional interstate FT fuel supply in 2022-2023 to support any new CC generation.

Long Lead Time Development Activities Supported by Modeling

Modeling and analysis supported by the Public Staff and other parties validates the Companies' modeling analysis showing the need for pumped storage hydro at Bad Creek II as well as the need for future SMRs.

While the Public Staff's preferred Supplemental Portfolio 5 does not identify the need for offshore wind until the 2040s and the Public Staff opposes immediate offshore wind development activities, the Companies' modeling shows relatively small overall portfolio cost increases to achieve the substantial diversity benefits of this carbon free resource. Acceleration of offshore wind into the 2030s to achieve the interim 70% target is supported by a number of Duke Energy's portfolios and would provide resource diversity and mitigate technology cost and timing risk while increasing executability of the portfolio.

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Near-Term Actions Supported by Rigorous and Reasonable Modeling Analysis

Duke Energy continues to support the comprehensive multi-step modeling process used to develop the Carbon Plan as reasonable and appropriate. It is not reasonable to rely entirely on capacity expansion model results for economic selection of energy storage or for reliability validation. Modeling battery storage is relatively new, and the Battery-CT Optimization step was a reasonable economic assessment in advance of the reliability validation step. The concerns expressed by Public Staff witness Thomas do not address the ability of the capacity expansion model to accurately evaluate energy storage, and the sensitivities and uncertainties he references reinforce the need to validate capacity expansion model results rather than undermine this reasonable and necessary verification step.

The Companies approach to capacity expansion model convergence tolerance (MIP basis) and optimization segmentation appropriately balances precision and modeling complexity. Other parties modeling uses a No Commitment approach which is substantially less precise and does not fully assess real world operational conditions. The Companies look forward to continuing to work with the Public Staff and other stakeholders to further improve and refine the process in advance of the 2024 Carbon Plan update. However, the Companies strongly encourage the Commission not to prescribe specific settings for highly technical planning models in the regulatory process.

While the Public Staff agrees with the Companies' reliability modeling approach and subsequent resource selection needed to ensure system reliability, many interveners suggest alternative reliability actions such as additional reliance on wholesale purchases, further dependance on neighboring regions or the conversion of existing coal to 100% natural gas-burning resources. The Companies explain that these recommendations have been thoroughly considered and are not valid alternatives to ensure system reliability is maintained or improved.

This concludes the summary of the panel's rebuttal testimony.

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MR. BREITSCHWERDT: Thank you. And I would also ask that the panel's four exhibits be jointly marked for identification as -- and -- if there is no objections, and accepted into the record at the appropriate time.

CHAIR MITCHELL: All right. The exhibits to the testimony will be marked for identification as they were when they were prefiled, and move them in at the appropriate time.

(Modeling and Near-Term Actions Panel Rebuttal Exhibit 1 and Confidential Modeling and Near-Term Actions Panel Rebuttal Exhibits 2, 3, and 4 were identified as they were marked when prefiled.)

CHAIR MITCHELL: And testimony summary?

MR. BREITSCHWERDT: If I didn't mention the testimony summary, we would appreciate that be accepted as if given orally from the stand.

CHAIR MITCHELL: Copied into the record as if given orally from the stand. All right.

MR. BREITSCHWERDT: And reserving that the information filed under seal be accepted as premarked. And that being the case, then the panel

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is available for questions from the parties and the Commission. Thank you.

CHAIR MITCHELL: All right. We've got the AG's office up first.

CROSS EXAMINATION BY MS. FORCE:

Q. Good afternoon, gentlemen. Again, my name is Margaret Force with the Attorney General's Office, and I just have a few questions for you. I've tried to make them simple and run through with one point at a time, so I'll give you a chance to expand. But let me get to my next question, perhaps it will save a lot of explanation. And these concern the Modeling and Near-Term Action Plan Panel Late-Filed Exhibit 1, which is the IRA impact on the Carbon Plan.

Duke modified certain assumptions to account for the IRA's impact on the cost of wind, solar and batteries, et cetera, correct?

A. (Glen Snider) Correct.

Q. And however, in that -- they also simultaneously increase the underlying capital cost of each resource including new gas to account for recent inflationary pressure, right?

A. Yes.

Q. Okay. But not all of the IRA's provisions

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were modeled, including its effects on energy efficiency and electric vehicles or coal replacement opportunities, correct?

A. Yes. We did not attempt to remodel energy efficiency or what affect it may have. That's a much broader analysis, or on electric vehicle adoption and its related impact to battery storage cost. So none of that was modeled.

Q. And it's my understanding that it did not adjust fuel commodity prices to account for the influence of inflationary pressures driving those costs up; am I correct about that?

A. We did run a high fuel cost sensitivity. Correct me if I'm wrong, Mr. Quinto.

A. (Michael Quinto) That's correct, we did run a sensitivity which utilized the Companies' base Carbon Plan -- or the Carbon Plan's high natural gas forecast.

Q. So you modeled the price sensitivity, but that was done separately from the modeling, or was that all included?

A. The modeling was conducted off of the Supplemental Portfolio 5 using the base gas forecast. The Companies subsequently performed a sensitivity which looked at the resource selection in the

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Companies' high natural gas forecast. Similar to the analysis that was performed in the Carbon Plan, I think it's on page 92 of the Appendix E.

A. (Glen Snider) Which -- just to add to that real quickly. We stated earlier when we testified that that fully encompasses the current forward curve for natural gas and fundamentals. So it's actually higher than the current market.

Q. Okay. And when you were modeling for solar, you modeled using the production tax credit; is that correct, instead of using the investment tax credit, ITC?

A. (Michael Quinto) Yes.

Q. Isn't it true that it's traditional -- traditionally the modeling or solar would be using the investment tax credit?

A. (Glen Snider) No. That's actually one of the benefits of the new IRA, is it provides for a production tax benefit or for an investment tax credit. So there was some discussion earlier, it starts at 6 percent, I think the Public Staff lawyer had it correct. It bumps up to 30 percent if you meet wage and apprenticeship if you want to use the ITC. But it also bumps up if you meet wage and apprenticeship to a

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PTC.

In our preliminary -- and again, it is pretty quick -- but in our preliminary analysis, PTC is actually more beneficial for solar by a little bit, so we went with the more beneficial election on the PTC. But it provides the option for both, as I understand it.

Q. Okay. I don't have any other questions. Thank you.

CHAIR MITCHELL: Avangrid?

MR. SMITH: We waived our cross of this panel.

CHAIR MITCHELL: Okay. CCEBA?

MR. BURNS: Thank you. Before I start, Chair Mitchell, I have provided a copy of proposed exhibit to Mr. Breitschwerdt. The exhibit is confidential. It is Duke's response to CCEBA's Data Request 2-4. The response to that is what's confidential. I can provide a copy of the document to the Commissioners and I have copies, but hope to avoid breaking into confidential session.

So I discussed with Breitschwerdt, since I don't need to only have the document admitted and don't have questions particularly on it to this

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panel, I've asked if Duke would stipulate to the content and admission of the request and response, including the confidential attachment. And then I can file an under-seal version later today and make sure that everybody has a copy that's entitled to have a copy of the confidential part of it.

MR. BREITSCHWERDT: Duke agrees to that approach.

MR. BURNS: Would that be a problem with the panel? I mean, would you have any problem with that? I'm asking to see if that would be something that would be acceptable to you.

CHAIR MITCHELL: So you're just getting evidence in, you're not --

MR. BURNS: Yes.

CHAIR MITCHELL: -- you're not --

MR. BURNS: Yes, ma'am.

CHAIR MITCHELL: -- asking these witnesses questions?

MR. BURNS: No. And I don't want to close off the room and ask them questions. It's a very limited exhibit, it's just -- it's some cost data.

CHAIR MITCHELL: All right. I will take

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it under advisement and I will think about it, and I will give you a ruling.

MR. BURNS: Out of the blue there, sorry.

CHAIR MITCHELL: That's all right. I will -- are you -- is that the extent of your cross examination?

MR. BURNS: Oh, no, I have other questions. Just a couple of other questions.

CHAIR MITCHELL: All right. Go ahead.

MR. BURNS: Thank you.

CROSS EXAMINATION BY MR. BURNS:

Q. Would you agree, gentlemen, with witness DiFelice, that solar plus storage systems will be competitive and likely to be the more economic option as compared to standalone solar in future competitive procurements?

A. (Glen Snider) I think they'll both provide benefits. I think we've had many witnesses say it's gonna be very site specific. So I think we -- really one of the things that didn't come up in this morning's conversation with the pairing is that this concept of charging from the grid, as done in the TVA, also would need to be studied site specific, because now you need

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power flows. Instead of just leaving the facility when you have solar or solar plus storage that we modeled, you need to be able to deliver power to that region of the grid. And so that would need to be studied in a way that hasn't been studied before.

We, when we modeled this, gave solar paired with storage no incremental transmission cost when we put the storage with the solar. When you charge from the grid, you would have to study and see is that still a good assumption now that I have to have two-way power flows out of that region of the grid. So it's possible that, in some circumstances, adding that could increase cost. And so maybe there's some benefits in some situations to having standalone solar; in other situations, solar paired with storage that's charged with the grid could make more sense.

Q. On page 20 of your testimony, you basically recap the work -- I'll let you get there.

A. (Witness peruses document.)

Q. Are you there?

A. Yeah, I'm on page 20.

Q. All right. On page 20 of your testimony, you are discussing the work of NCSEA's modelers, and you state that NCSEA's optimized portfolio includes no

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pairing of solar and storage prior to 2030, but rather suggests standalone BESS exclusively.

Did you hear the testimony of Mr. Fitch yesterday?

A. I did.

Q. It's true, is it not, that in that optimized portfolio, NCSEA, for the purposes of having its work be directly comparable to that of the Companies in P1 through P4, adopted the same restrictions on dispatch of solar plus storage as were originally adopted by the Companies?

A. Yes, and they came to a different conclusion.

Q. Okay. And as you've acknowledged in your testimony and as shown in the results of the supplemental portfolios, changing those assumptions makes solar and storage a more economic resource and leads the model to favor solar plus storage over standalone, does it not?

A. In the P5 sensitivity, it did, yeah.

Q. Okay. Would you agree with me that what sets solar, solar plus storage, and wind resources apart from gas, nuclear, and coal is that there is no fuel cost, correct? One of the things that sets them apart.

A. You're spending capital instead of fuel, yes.

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Q. And there's no risk of fuel cost uncertainty or volatility with those resources, is there?

A. There is no risk. There is risk of capital, as we just heard. There's a huge amount of risk on where our capital price is going to go. But you're, again, trading capital-price risk for fuel-price risk. And I would just point out that nuclear has very low fuel price volatility relative to the other two. But yes, you're balancing taking CAPEX risk versus fuel risk.

Q. Okay. That's all the questions I have at this time. Thank you.

CHAIR MITCHELL: All right. Before -- Mr. Burns, the exhibit you've referenced -- the confidential exhibit you've referenced, is it information that's relevant to the testimonies provided by this panel?

MR. BURNS: It relates to the cost of a current battery storage, standalone battery storage project that Duke has operated or constructed in North Carolina.

CHAIR MITCHELL: Okay.

MR. BURNS: It's and a near-term resource.

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CHAIR MITCHELL: I'd ask that you pass out copies of the exhibit to the Commissioners, please.

MR. BURNS: And I'll mark it, or ask that it be marked as -- just for the purpose of identification, as CCEBA Modeling and Near-Term Panel Rebuttal Cross Exhibit 1. It is a two-page exhibit.

(Pause.)

CHAIR MITCHELL: All right. The document will be marked for identification purposes as Confidential CCEBA Modeling Panel Rebuttal Cross Examination Exhibit 1.

MR. BURNS: It's a two-page document. Thank you.

MR. BREITSCHWERDT: Chair Mitchell, could we make that Confidential Cross Examination Exhibit 1 just for clarity of the record?

CHAIR MITCHELL: Yes. So it was labeled Confidential CCEBA Modeling Panel, but you want it --

MR. BREITSCHWERDT: I'm sorry, I missed the confidential before CCEBA --

CHAIR MITCHELL: That's okay.

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MR. BREITSCHWERDT: -- but that's -- if you've already marked it that way --

CHAIR MITCHELL: Well, my recollection is this is the only confidential exhibit that's been introduced -- or that's been marked at this point. Does anyone remember another one?

MR. BREITSCHWERDT: I believe that's correct.

CHAIR MITCHELL: Okay. We can -- your convention is actually preferable, so we'll do CCEBA Modeling Panel Rebuttal Cross-Examination Confidential Exhibit 1.

(CCEBA Modeling Panel Rebuttal Cross Examination Confidential Exhibit 1 was marked for identification.)

CHAIR MITCHELL: All right.

MR. BURNS: Thank you very much.

CHAIR MITCHELL: At this point, I'd ask that the Commissioners study the exhibit, determine if they have any questions for the panel on the exhibit.

MR. BREITSCHWERDT: And, Mr. Burns, could we actually give a copy to the panelists in the instance the Commission may have questions for

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them?

MR. BURNS: Yes, absolutely. I'm sorry this is awkward, I was trying to save us trouble.

(Pause.)

CHAIR MITCHELL: All right. I'll take a motion from Mr. Burns at the appropriate time when the panel is prepared to step down.

MR. BREITSCHWERDT: Thank you.

CHAIR MITCHELL: All right. So next up we have CIGFUR.

MS. CRESS: Thank you, Chair Mitchell.

CROSS EXAMINATION BY MS. CRESS:

Q. Good afternoon, gentlemen. You testify on page 7 of your rebuttal testimony -- and I'll give you a second to get there.

A. (Witness peruses document.)

Q. Are you there?

A. (Glen Snider) Sorry, I'm there.

Q. Okay. Excellent. Lines 32 through 37 is where I'd like to point your attention. You testify in that paragraph, do you not, that the Companies have, quote, thoroughly considered the recommendations of certain intervenors, including the recommendation to consider conversion of existing coal to 100 percent

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natural gas-burning resources; is that correct?

A. Yes, it is.

MS. CRESS: And as much as I hate to be the person to make this request, Chair Mitchell, unfortunately the rest of my questions do pertain to confidential information. And so I would request, if it meets with the Chair's approval, that we enter confidential session at this time.

CHAIR MITCHELL: Okay. Let me check in with the -- with counsel to see who else has questions that will go into confidential information.

MR. SNOWDEN: We do not.

CHAIR MITCHELL: Okay. If any other counsel has questions that will go into confidential information, please sing out right now. All right. Well, we will go into confidential session. Let's go off the public record now. We will go into confidential session. And, Mr. McCoy, please turn off the stream.

(Due to the proprietary nature of the testimony found on pages 147 to 167, it was filed under seal.)

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(Confidential testimony ended at 2:14 p.m.)

CHAIR MITCHELL: And we will resume with the cross examination of the Modeling Panel by CIGFUR.

MS. CRESS: Nothing further, Chair Mitchell. Thank you.

CHAIR MITCHELL: Okay. All right CPSA?

CROSS EXAMINATION BY MR. SNOWDEN:

Q. Good afternoon gentlemen. Mr. Snider, I think this would be for you, but correct me if I'm wrong. You would agree, wouldn't you, that in order to achieve compliance with the 70 percent reduction by 2030, Portfolio P1 requires the addition of 5,400 megawatts of solar plus 441 megawatts of the CPRE shortfall by the end of 2029?

A. (Glen Snider) Yes.

Q. So that's 5,841 megawatts?

A. Subject to check.

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Q. Okay. I know it's late. I did the math this morning, so.

Could I have you please take a look at Rebuttal Table 4 on page 27 of the Modeling Panel's rebuttal testimony?

A. (Witness peruses document.)

COMMISSIONER CLODFELTER: I'm sorry, Mr. Snowden, what page was that?

MR. SNOWDEN: That's page 27. At the bottom of that page.

A. I am at Table 4 on the bottom of 27.

Q. Great. Thank you.

So you'd agree that the column that's labeled near-term actions represents the Companies' requested procurement targets for 2022 through 2024?

MR. BREITSCHWERDT: Mr. Snowden, I'm sorry to interrupt. Just to make sure we're clear on the record. This page 27 on the table was corrected. Just to make sure we're all working from the same document, both yourself and the witnesses.

MR. SNOWDEN: Okay. This was corrected? Okay.

MR. BREITSCHWERDT: It was. It was

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prefiled in the docket as corrected.

MR. SNOWDEN: Okay. If you will give me a minute to pull that up. Could you tell me -- apologies. Could you tell me what the nature -- do you recall what the nature of the corrections were?

MR. BREITSCHWERDT: There is a redline to numbers on line 13, and then in Rebuttal Table 4.

THE WITNESS: To help expedite maybe --

Q. Yes, please.

A. The 1,260 goes to 1,200 and --

A. (Matthew Kalemba) The 4,230 goes to 4,170.

Q. Okay. And those are in the adjusted volume category?

A. That's correct.

Q. Okay. Great. Thank you. I'm just right now looking at the near-term actions column, but thank you for clarifying that. Okay. So I don't recall whether you answered the question, I'm sorry.

You'd agree that the near-term actions represents the requested procurement targets for the Company for 2022 through 2024?

A. They do.

Q. Okay. And, Mr. Kalemba, Duke projects that

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the solar procured in those years would come online in 2026, 2027, and 2028, right?

A. So with the procurement of 1,200, it will be challenging to get it on in '26, '27, and '28, given what we believe are the realistic interconnection constraints.

Q. Okay. So no earlier than those years, then?

A. There may be some, depending on what comes out of the 2022 DISIS, that there's potential that there may be a project due, I don't know, that would come on slightly early, but generally, yes, the vast majority will come on 2026 or later.

Q. Thank you. So after these three procurement years, there would be just one more year of procurement to meet the 70 percent mandate in 2030?

A. That's correct.

Q. Okay. And the total of these numbers under the near-term actions is 3,550, right?

A. That's correct.

Q. And you'd agree that that is about 2,300 megawatts less than the 5,841 we just talked about, right?

A. Yes.

Q. So if you hit Duke's proposed procurement

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targets during the Near-Term Execution Plan, you would have to procure and interconnect at least 2,300 megawatts of additional solar in 2029 to hit that 70 percent reduction mandate, right?

A. If we were not to make volumetric -- any volumetric adjustments to these future procurements, that would be the case. However, I think we're proposing that the Commission has the opportunity, as we've discussed, to flex up.

Q. And nobody in this docket claims that Duke would be able to interconnect 2,300 megawatts of generation in 2029?

A. That's correct.

Q. Okay. So you mentioned the volumetric adjustment. So it's your contention that, if the volumes are adjusted up from the targets requested by Duke, then it might be possible to hit the volumes requested by -- projected by P1; is that right?

A. That would help keep us on line to be able to potentially hit the volumes required under P1.

Q. So the Near-Term Execution Plan that Duke has proposed only supports achieving P1 if that volume adjustment mechanism kicks in and escalates the volume of solar procured?

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A. Well, I think the -- I think it's important to note, like, the volumetric adjustment mechanism I think is really an effective potential method to both protect the customer as well as keep us on line to achieve P1. So I think there's -- we're trying to come up with an innovative solution to allow us to meet the interim target while protecting the customer against the risks that we discussed last time that we can talk more about as you wish.

Q. The volumetric -- I'm sorry, the volume adjustment mechanism will only adjust the target volume up if solar comes in cheaper than the solar reference price, right?

A. That's right. I mean, we've talked a lot about costs that are not reflected in the Carbon Plan, right? Or potentially may not be reflected in the Carbon Plan with, you know, the SLR costs or there was concerns around transmission costs not being included there. Well, we know what cost we're saying is in there for solar, and if we start to procure more solar above this Carbon Plan solar reference cost, that's just adding more costs to the plan than what we have projected.

So I think the flex allows you to procure

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more if the costs are lower than what was in the Carbon Plan.

Q. But you'd agree, wouldn't you, that the volume adjustments that are baked into the volume adjustment mechanism are not based on any modeling that was conducted by Duke, are they?

A. So for the 2022 procurement, we wanted to provide this flexibility. For the '23 and '24 procurement, I would say that they're not baked in, and we're willing to and happy to work with Public Staff and stakeholders to develop appropriate volume adjustment mechanisms. But, you know, given our concerns and the risk that we think that's out there to being able to achieve more than 1,350 megawatts per year of solar interconnections beginning in 2028, I think this allows us the flexibility to try and achieve that.

Q. Mr. Kalemba, I want to ask you, you talked about the volume -- I'm sorry, about costs exceeding the reference cost. I want to ask you a very narrow question about the instance where the solar costs are less than the reference cost.

Am I correct in my understanding that the volumetric -- or the volume adjustment mechanism only

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increases volume if the cost of solar in the procurement is less than the cost of solar that Duke relied on in modeling its portfolios?

A. That is correct, yes.

Q. So would you agree that the Near-Term Execution Plan that Duke proposed only supports the P1 portfolio if solar comes in actually cheaper than the price that Duke used for its Carbon Plan modeling?

A. Can you repeat that? I'm sorry.

Q. Sure. Sure. So you would agree, wouldn't you, that the Near-Term Execution Plan that Duke proposes only supports the P1 portfolio if, in the RFPs, solar comes in under the price that Duke projected when it did the modeling to support those portfolios?

A. I don't think that's the case. I mean, if the cost of solar is higher than we projected in the Carbon Plan, then I'm not sure that, you know, we should be trying to procure that amount to achieve that.

A. (Glen Snider) If I could just add real quick, the flex-up is 150 megawatts. So could we make up that 150 megawatts somewhere else in '23, '24, '25 procurement? Yes, we could. So the 150 flex-up is not

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determinative of your ability to meet P1 because of the '22 procurement.

Q. But you would have to adjust those procurement targets to flex up, right?

A. You would have flex-up in '23 or '24, or you could set a more aggressive '25 procurement if the market conditions warranted.

Q. Let me ask this another way. If every single bid that came in, inclusive of any network upgrade costs, came in in these procurements at exactly the solar reference cost, which is the cost that Duke used for its modeling, then the volume would not be adjusted either way; is that fair to say?

A. In this initial filing, again, subject to the discussion we had about, you know, the ability of the Commission to have the flexibility to determine that adjustment mechanism in future procurements. But in this filing, as filed, I will agree with you. I will also point out that the Commission is gonna have the ability to address this flex-up mechanism two or three times over the next coming procurements.

Q. And so if, as we just discussed in this hypothetical, solar comes in at exactly the predicted price and there's no volume adjustment, then we're not gonna hit the solar targets in P1, are we?

A. In this Carbon Plan, as filed, with no flexibility of the Commission, we would not. We would not get the solar that we envision --

Q. Okay. Thank you.

A. -- in the flex-up.

Q. Thanks. Those are all the questions I have. Thank you.

CHAIR MITCHELL: All right. CUCA?

MR. SCHAUER: CUCA has no questions.

CHAIR MITCHELL: Okay. SACE?

MS. THOMPSON: No cross examination for the panel. Thank you, Chair Mitchell.

CHAIR MITCHELL: Okay. Tech Customers?

CROSS EXAMINATION BY MR. SCHAUER:

Q. Good afternoon. Craig Schauer for the Tech Customers.

A. (Glen Snider) Good afternoon.

Q. I'd like to start on page 54 of the testimony where you discuss the Mountain Valley Pipeline.

A. I'm there.

Q. All right. The completion of MVP is important to Duke's near-term actions because Duke currently does not have sufficient firm fuel supply for

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its existing gas fleet, correct?
A. That's a bit of a compound question. So I would say is MVP important? Yes, we think that would be an important asset. Is it determinative of our Near-Term Action Plan? We've run multiple fuel supply -- I'm sure we're gonna probably get into that in Commission's questions -- and the Near-Term Action Plan was supported under all of the three different fuel supply scenarios that we examined in the multiple portfolios that we looked at.
Q. Well, to revisit, I guess, the second part of the compound question, Duke does not currently have sufficient firm fuel supply for its existing gas fleet, correct?
A. We would like to have additional firm fuel supply as a layer of price surety for our customers.
A. (Michael Quinto) And to clarify, the fuel supply as -- these are dual-fueled units, so this is a discussion of fuel supply of gas versus firm fuel supply at the sites. Many of these sites that do not have firm interstate fuel supply have on site. All of them do that do not have interstate firm fuel supply of natural gas have on site capacity of ultralow sulfur diesel, which allows those capacities to be considered

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firm in our resource planning.

Q. All right. I'll ask this a different way.

At Appendix N on page 7, does it not say, quote, the Companies' combined cycle fleet is currently deficient of interstate pipeline firm transportation capacity due to the cancellation of the Atlantic Coast pipeline?

A. (Glen Snider) Yeah. I believe we said it's deficient of what we'd like to have price surety. And Mr. Quinto explained the difference. And I think it's important for the Commission to understand the difference between price surety and physical surety. So it's deficient and exposes our customer to price uncertainty as Zone 5 becomes congested. But we do still believe we are sufficient from a reliability perspective. But as Zone 5 becomes more and more congested, you know, we are worried about price.

Q. So at page 9 of Appendix N, Duke says that less than half of its current combined cycle design capacity has firm gas supply; is that correct?

A. Yeah. It's -- again, maybe we'll cut off some Commission questions if I just answer them now. So all the combined cycles have --

MR. SCHAUER: I'm sorry, Chair Mitchell,

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can he please answer my question before he assumes the Commission questions.

CHAIR MITCHELL: He's answering your question right now. Let's see what he says and then we'll address what he says.

THE WITNESS: So firm -- when you say firm, I want to clarify what "firm" means. So firm intrastate, all of our combined cycles have firm intra. That means the LDCs, the -- you know, we have Sand Hills pipeline going out to the Wilmington area, we have Cardinal. Our combined cycles have firm intrastate within the state.

A portion of our combined cycles, we have enough interstate to unconstrained zones. So Zone 3 to 5, 4 to 5, we have about half, and that's what that line refers to, is there's only about half of the existing -- if I was at max daily burn, the combined cycles were to run full out for an entire day, about half right now is subject to Zone 5 pricing. And we can go out in a member of manners and get that Zone 5 delivered gas.

But that's the part that is -- you know, I don't know that I would have exactly called it non-firm, but it is where you do not have upstate or down -- upstream or downstream pipeline positions long term for about half of that.

So yes, I just wanted -- there's a lot of confusion around intra/inter. So firm intra. Inter, we have pipeline positions to cover about half, and half are exposed to Zone 5.

Q. So if Duke's combined cycle fleet had to run at full capacity, can Duke guarantee that it could run all of those combined cycle plants on 100 percent natural gas?

A. To my knowledge, there's never been a day where we could not have if we were willing to pay the price for Zone 5 delivered. And Zone 5 delivered goes to $20, $30, $40 an MMBtu. You make an economic decision to do something in lieu of that, and maybe running ultralow sulfur diesel becomes your economic decision.

Q. So if Duke was willing to pay the price of the market on the day the gas was needed, it's confident it could supply its entire combined cycle fleet with the necessary gas to run at full capacity?

A. As I am not the gas procurement total expert in this, but I've been sitting at my desk for a lot of years doing this, I never remember having Zone 5 say we

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just simply don't have any gas. The prices have gotten exorbitant and you look for economic alternatives.

And we have -- half of that gas is not -- and I want to make it clear, we don't go in with half of that gas exposed. So we may go in and do seasonal procurements so that some of that exposure is hedged, and only leave a fraction of that into the actual spot market. So there is times where we do have, you know, whatever portion we have exposed to Zone 5 delivered gas, we have to make an economic determination of whether or not to buy Zone 5 delivered at exorbitant price, or find another -- or as Mr. Quinto pointed out, use our fuel oil backup.

Q. Appendix N goes on to say that Duke has firm gas supply for less than a quarter of its current gas fleet's historical peak gas burn; is that correct?

A. That is correct. When you add the turbines to that equation, your gas turbines generally run at such low-capacity factors that you have -- your gas turbines have a fuel oil backup. And when it's economic, you run the gas because of the low-capacity factors, and when need be, you run the fuel oil. So when you look at it from a total CC and CT perspective, that half goes down to roughly a quarter.

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Q. Which means the other three-quarters, if they were to be fueled by natural gas, would have to buy that gas at the exorbitant price, it would be available on the market?

A. Yeah, once again, not all of that gas is spot market. So we do forward-purchase both the Henry Hub and the Zone 5. So it's not fair to say it's all exposed to Zone 5 spot prices. We talked I think the first time we were on for the few days about our hedging program. So the underlying hedges come into play. But a portion of it, a growing portion as we move to reduce our coal, is exposed to it. And that's where we're saying we would like -- we think it's good for the state to have additional firm pipe.

Q. Mr. Snider, you said a growing proportion.

Could you give us a rough estimate of what proportion that would be?

A. Yeah. I think, you know, Public Staff witness Thomas speaks to the fact that there's a little bit of a bump up when you retire goal and you put new gas on. But then as you're adding renewables, that burn keeps coming down over time so that you don't expect to have that. Annual burns are declining over time. And I think I can go to, you know, Rebuttal

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Figure 4, is that --

A. (Michael Quinto) Yeah. Page 51 of our rebuttal testimony has witness Thomas' Figure 5 from his direct testimony, which shows the changes of system natural gas consumption on our portfolios and over time.

A. (Glen Snider) (Witness peruses document.)

Q. I'm sorry. So my question was -- if I can just recall the exchange with you. I asked first if only 25 percent of your entire gas fleet was -- had firm fuel supply, the other 75 percent was exposed to exorbitant prices, and you said no, it was smaller than 75 percent, but it was growing.

And I was curious, could you give us an actual figure for the growing percentage?

A. Yeah. So again, I want to approach this. It's growing if you assume you're exposed to Zone 5 with no additional interstate pipe positions, right? And that's where we say that's why the need would be -- you can see on the figure Mr. Quinto pointed out on page 51, our total annual burns are projected to go from 350 all the way up to about 440 and then start to tail off on an annual basis.

We think that having firm -- more firm

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interstate pipeline is a good thing. We've modeled it multiple different ways. We understand the questions that have been asked about this. And so we think that your -- I just want to make sure I'm answering your question, Mr. Schauer, but it would go up without any additional pipeline before coming down. That's why we modeled the -- either our northern gas supply that we speak about in our testimony, or our southern gas supply as being important to part of our orderly energy transition.

Q. So, Mr. Snider, I think we're having a hard time communicating here. And I suspect it's my fault, because you're much more conversant in this than me.

So I'm simply asking that, if looking at Duke's historical gas peak burn, how much of that would be fueled by purchases at market prices as opposed to firm supply or forward contracts?

A. Under which pipeline assumption?

Q. Under the current status of Duke's access to firm fuel supply.

A. So it would stay the same until we add combined cycles or add firm supply. So I'm not trying to talk past you. Are we talking in today's state or are we talking in a future state?

Q. So today. So as of today, 75 percent of the gas would have to be supplied from some other means.

How much of that would be acquired at market prices?

A. A -- I cannot say exactly. When you say spot market, it depends on what our particular hedge portfolio is at any moment in time. So we put on, again, hedges that go out five years, four years, three years, two years, one year, and then we buy some in spot. When it comes to Zone 5, we have pipeline positions and then we do seasonal and other release positions, as I understand it, to hedge our exposure to Zone 5.

So those -- that exposure changes over -- you know, depending on where you're at in your hedge portfolio. And all I was trying to point out is the 25 percent was a reference to interstate firm supply only. And that would stay there until we add new pipeline position or if we added new combined cycles, then that would change.

Q. All right. So I think I understand you now.

So it's less than 75 percent would be bought at spot market prices, but you don't know what that exact percentage is?

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A. That is correct.

Q. Okay. Thank you. At page 54, Duke goes on to explain that it's optimistic that the Mountain Valley Pipeline will allow the Companies to obtain additional firm gas supply; is that correct?

A. Yes.

Q. All right. And Duke's optimism is based on the Mountain Valley Pipeline being 94 percent complete with an estimated 20 linear miles of pipe construction remaining, correct?

A. That is my understanding, yes.

Q. All right. And the testimony goes on to say that it is, therefore, reasonable to assume that MVP will ultimately enter service, correct?

A. I -- yes.

Q. All right. Does Duke's assumption about MVP's completion account for the fact that MVP construction is being challenged in five different federal lawsuits?

A. We are aware of MVP's current status.

Q. But Duke does not know when those MVP lawsuits will be resolved, does it?

A. We do not.

Q. Would you agree that we have all learned at least one thing from this Carbon Plan hearing, that legal proceedings always go slower than you want them to go?

A. Yeah. I think -- you know, I think that's true. They certainly do. It felt like it this last few weeks. But, you know, again, you're talking about a critical piece of national infrastructure that's 94 percent done. And so there's a lot of skin in the game for everybody. I get it. And there's a lot of people opposing it.

But there is also a recognition that new gas supplies are gonna be needed on a national basis as part of an orderly transition. I think it's been -- more -- it's becoming more and more evident the more articles you read, the more discussions you hear coming out of NERC and FERC and EPRI and, you know, EIA, for example, projects 100 gigawatts. We're at 400 gigawatts of gas in the country today, and they project an extra 100 coming on every decade through 2050.

Yes, they will burn less; yes, they'll probably burn hydrogen, but the EIA 2022 AEO -- you know, put that in perspective. We had a lot of discussion on the maturity of storage. Storage is -- I've heard 4 or 5, I believe the actual answer is 6.

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There is 6 gigawatts nationally, whole nation right now, of storage. There's 400 gigawatts of natural gas. 6 versus 400.

And so when we look at the industry holistically, I think MVP is recognized. And we have confidence that it is at this point in time, and if not, we'll look at alternate sources. But the nation is seeing the need for it to be part of an orderly transition, is for gas to play a role, even if it's a declining role.

Q. You're aware that this summer, on June 24, 2022, MVP asked FERC for a four-year extension to complete the pipeline's construction?

A. Yes, I'm generally aware of that.

Q. All right. So Duke does not know when the MVP lawsuits will be resolved, correct?

A. Not -- I do not know. I don't think anyone could say definitively they know when they would be resolved.

Q. And it does not know when MVP will go into service, correct?

A. It does not have an exact in-service date. I think we can go by right now they have a projected in-service date, I think, for the end of next year, if

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my memory serves me correct, on their website. But I'm just going by what they're saying publicly on their website and publicly to their investors.

Q. On Friday, James McLawhorn of the Public Staff spoke of the maxim hope is not a plan.

Your testimony makes a strong case for Duke's hope to secure more firm fuel supply for its gas fleet, but shouldn't Duke have an actual plan for more firm fuel supply before it builds more gas plants?

A. We absolutely have a plan, and it's not hope, right? It is -- there is a plan we mention in our testimony entering into. And I will not go into confidential, but having contractual positions in place should -- when MVP goes into service, and how we would get that gas into our zone. And we have that -- that is a plan. That is a contract.

We have a plan if that does not happen that you would -- coming from the north is challenging, as we've seen, so you may have to come if up from the south. And you would have to have additional projects. They're not as far along as the discussions we've got coming from the north, but there was some discussion here last week about when a company has a need -- Piedmont had a need, they went to a pipeline, they

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discussed their need, they came up with a project, they subscribed that project, and now that need is being met in the state of the North Carolina.

We would have to do something similar as an alternate to coming from the north, which we have a definitive plan in place for. And then that would be, you know, a contingency plan. And that's what was analyzed in some of the portfolios. The what if. What if this 94 percent complete pipe doesn't happen, what is your contingency -- you know, what is the contingency modeling assumption you've made? And we have that.

And then we just spoke today about the third that, you know, we could conceptualize in the event that you needed to start adding a little bit more storage at some of these sites, to look at that as another contingency, which, you know -- so we have -- we certainly, as Mr. Holeman and Mr. Roberts talked about, think about this in layers of defense. And we certainly would like to have an adequate amount of pipeline from the north. That's the cheapest most diverse fuel supply, gives us the most price and reliability risk protection.

But coming from the south is another option,

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storage is another option. So we definitively have plans and contingency options at our disposal. And as I said, I think, you know -- we can talk more about this later because I've gone on long enough. But you got to look at that risk relative to the all the other risks we're talking about in this plan. You know, we're talking about billions of dollars of investment in other technologies that all have their risks that haven't been spoken about in three weeks in this hearing. And so it's a balancing of those risks.

Q. No further questions.

CHAIR MITCHELL: All right. Walmart?

MS. GRUNDMANN: Thank you.

CROSS EXAMINATION BY MS. GRUNDMANN:

Q. Good afternoon, gentlemen. Carrie Grundmann on behalf of Walmart. Can I direct your attention to page 43 of your testimony? I want to make sure -- I know you corrected an error on one page. I'm trying to figure out if I'm missing something in a portion of testimony or if it's a purposeful omission.

Starting on line 2, you indicate that to address some concerns that intervenors had regarding elevated natural gas prices, that it appears as though you tested together your preliminary IRA modeling with

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the Companies' high natural gas scenario.

Am I understanding that to be what you're discussing there on lines 2 to 11 of page 43?

A. (Michael Quinto) Yes, that's correct.

Q. Okay. And then you go on to say at the end that, "Even in this preliminary IRA modeling and in a high natural gas price scenario, with the inflationary cost of resources and responsive tax incentives, the capacity expansion model continued to select CC capacity in the near-term."

Did I read that correctly?

A. Yes.

Q. Is it supposed to say CC and CT capacity or does it only select CC capacity under these particular scenarios?

A. Yeah. So given the compressed time frame that we had to perform this analysis, this sensitivity did only go through the capacity expansion phase. We did not go through our additional portfolio verification steps of verifying is a CT replacement of battery in this sensitivity a cost-effective option. So while the capacity expansion step did not select the CT, we did not get the opportunity to run that additional step on the sensitivity analysis to see if

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it also proved that the CTs would be selected in this sensitivity.

One thing I'll point out is, on CTs, they're a lot less dependent on natural gas pricing because they're utilized less, so the selection may be similar to previous iterations of the analysis that we've performed.

Q. But just to summarize, this analysis, the outcome of this analysis did not result in the selection of CT capacity?

A. This sensitivity of a high gas price on the IRA analysis did not, in the capacity expansion step, select CT capacity; but we did not perform additional analysis to verify if any of the batteries selected would be more economically replaced with CT capacity.

Q. Okay. And then do you have in front of you Late-Filed Exhibit Number 1?

A. I do.

Q. Let me just ask a question about it. You -- so there's this, sort of, production cost model analysis and then there's this additional economic analysis.

When I'm looking at Tables IRA 3 and 4, is there a way for me to tell, particularly with respect

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to CC and CTs, whether they were the results of the modeling at the production cost modeling step or this economic out-of-model subsequent replacement step that the Company undertook?

A. So the tables do not -- you cannot tell from the tables. I can tell you, in the Carbon Plan, we did specify how much capacity was replaced in the CT battery optimization step. For this analysis, if you look at IRA Table 4, you'll see 703 megawatts of CT capacity -- I'm sorry, this is on page --

Q. 6?

A. -- 6. Correct. Thank you. 703 megawatts of CT there was part of the CT battery economic evaluation process that's done within the production cost model to more granularly evaluate the benefits to the system.

Q. I want to come back to that in just a second.

When you go to IRA Table 3, did that occur for any of the assets under CCs and CTs listed in the DEC territory?

A. No. Those resources were selected by of the capacity expansion model.

Q. Give me one second. I'm just making a note. So going back, then, I guess I want to merge some questions that Mr. Snider answered in response to

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Mr. Schauer with the answer that you just gave regarding the 703 megawatts. The phrase I'm going to use is forced-in megawatts via the replacement step.

Mr. Snider, did you indicate a minute ago that the Company his layers of responses to deal with issues if your natural gas assumptions, whether that be MVP or something from the south, that you've kind of got layers of potential steps that you're prepared to take?

A. (Glen Snider) Yeah. I think we've been through days of testimony the last couple where we've talked about alt portfolios, primary portfolios, P5, for example. So our P1 through 4; MVP from the north, our current base case assumption. P5, the Public Staff was not meant to be some enhancement of P1 through 4. It was a stress test or a test of the robustness of the Near-Term Action Plans under P1 through 4.

So it said what if MVP isn't available and what if hydrogen is not available? So stress test, your P1 through 4 assumptions, with those and a bunch of other changes that we've all already walked through: the hurdle between energy transfers, updating on model optimization and batteries, et cetera, but we have looked at these 12 portfolios --

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Q. No, no, no, I -- absolutely -- that's --

A. -- three different gas --

Q. Yeah, yeah, no, no --

A. So yeah. All right. So that's where I'm at.

Q. I just wanted to make sure that I understood, I really was just trying to summarize what you answered four minutes ago, which was you had some layers. And I thought one of the layers that you indicated existed were batteries.

Was that one of the answers you provided to Mr. Schauer?

A. The batteries -- and when you look at the four -- there are three different gas supplies. Batteries are always an option in all three of those, right? So batteries can be picked in P1 through 6 and P1 through 6 alt. So we ran 12 different portfolios, three different looks at the gas world, transportation world, hydrogen variations, optimization. And batteries were always allowed in the capacity expansion model to be selected, and then they were always verified in a model that was more ept at looking at batteries, which is in the production cost.

Q. Thank you. Those are --

A. (Michael Quinto) If I may correct one thing.

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Mr. Snider referred to storage, on-site storage. This is storage of fuel, not battery energy storage.

A. (Glen Snider) Thank you for that clarification.

Q. Okay. Well, then -- so when he indicated storage, you're talking about storage of -- is it low sulfur diesel fuel?

A. (Michael Quinto) That's correct.

A. (Glen Snider) Yes.

Q. Carbon-emitting low sulfur diesel fuel?

A. Yeah. Or down the road, hydrogen or --

Q. We can agree to disagree on that, but those are all the questions I've got. Thank you so much, gentlemen.

CHAIR MITCHELL: Public Staff.

CROSS EXAMINATION BY MS. EDMONDSON:

Q. Good afternoon, gentlemen. Lucy Edmondson from the Public Staff. I have just a couple questions. Back to natural gas like we've been talking about.

Whose service territory is the -- whose natural gas providers service territory is the Roxboro plant located in?

A. (Glen Snider) DEP?

Q. No, the natural gas provider.

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A. PSNC.

Q. So if a new natural gas combined cycle was built at Roxboro, wouldn't PSNC build that pipeline and supply the gas?

A. That would be the likely LDC.

Q. Did you hear the Commission's discussion, they took judicial notice of a filing by Piedmont in FERC Docket Number CP 22 461?

A. I was watching online, yes.

Q. Have you ever -- have you reviewed that filing?

A. I have not reviewed the filing.

Q. Are you aware that it essentially says that Piedmont has subscribed to all of the upcoming pipeline expansion of Transco?

A. I was made aware of that project, the south side in the judicial notice, and was aware of that, yes.

Q. And are you -- do you know whether Piedmont is referencing a binding agreement to purchase the gas supply?

A. I'm sorry, I do not.

Q. All right. Turning to page 55 of your testimony, line 19, you say the Companies contract with

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third parties to deliver firm fuel supply to the Companies in Zone 5.

Would you agree that Portfolios 5 and 6 utilized a mix of Zone 4 and Zone 5 gas pricing for the existing and new CC fleet?

A. For the existing, we certainly do. For the new, it was either Zone 4 -- Zone 5 -- yeah, I think in all our 12 portfolios, you could say that we've covered all of those. So yes, if you look across all 12 portfolios.

A. (Michael Quinto) I just want to make sure I understood the question correctly. Did you say all combined cycles use a mix of Zone 4 and Zone 5?

Q. Right.

A. So that's true up until we get -- in Supplemental Portfolios 5 and 6, the base gas assumption is that we will get Gulf supply of gas from the south that's enough to cover the remaining amount of existing combined cycles that don't have firm gas supply, so that's the first portion. And then on top of that, another up to two new combined cycles' worth of gas supply.

So at that point where that project would come into service, all of the natural gas combined

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cycles on the system would be assumed to be Zone 4 gas.

Q. Okay. So I want to -- let's see. The filing you-all made on July 28th, the energy plan supplemental portfolios on page 2; do you have that in front of you?

A. (Glen Snider) Late-Filed Exhibit 1 on the IRA?

MR. BREITSCHWERDT: Ms. Edmondson, just to clarify the record, what's the date that you're referencing that the Companies made a filing?

MS. EDMONDSON: July 28th filing.

MR. BREITSCHWERDT: September 28th?

MS. EDMONDSON: No, sorry.

MR. BREITSCHWERDT: We're not to September 28th yet.

MS. EDMONDSON: Let me see. July 28th. Pull that up. Sorry.

MR. BREITSCHWERDT: If you could just -- sorry, Chair Mitchell, just make sure the witnesses know which document we're referring to. The date may not be material.

Q. Okay. So what I'm looking at is the July 28th In Re. Development of Supplemental Modeling Portfolios -- is what the cover letter filed by Mr. Jirak. And attached to it are the Supplemental

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Portfolio 5 and 6 model runs.

A. (Glen Snider) Oh.

A. (Michael Quinto) Do you have a copy of that? I think I know what you're talking about, but --

Q. Let me see if I do.

MS. EDMONDSON: I do, if I could approach.

(Pause.)

THE WITNESS: (Witness peruses document.)

Q. And turning to page 3 of that document.

A. I believe it's page 2 of the attachment.

Q. Right.

A. Yes.

Q. And under the no Appalachian fuel supply case.

A. I'm there.

Q. It's item 9.

Can you explain why the chart states that the natural gas pricing assumptions used for SP5 and SP6 use only Transco 4?

A. Yes. So the highlighted portion for number 9 is the recommendation from the Public Staff was to use the simple average of Transco Zone 4 and Zone 5 for

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combined cycles.

Upon discussion with the Public Staff in how the AMA, the asset management agreement, works between the Companies in pooling gas to supply the lowest cost gas to the most efficient use of units, it was our understanding that we would use this Transco Zone 4 price for all -- for all units based on the assumption that we would get the supply from the south that is the underlying fuel supply used in this supplemental portfolio analysis.

Q. All right. That's all I have. Thank you.

MR. BREITSCHWERDT: No redirect, Chair Mitchell.

CHAIR MITCHELL: All right. Let's take questions from Commissioners beginning with Commissioner Brown-Bland.

EXAMINATION BY COMMISSIONER BROWN-BLAND:

Q. Good afternoon. Just a couple of questions here. I know you were in the room this morning, so I wanted to ask if you had a reaction to witness Norris' testimony about the Company having lumped all the newer technologies together and not having evaluated them separately and how that impacted the outcomes from the model.

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A. (Glen Snider) Yeah, I don't -- first of all, we didn't -- when we lumped, we just -- that was for qualitative descriptions only. So we didn't do any special quantitative bias towards any model. We're just pointing out that battery energy storage, I probably would react by saying it is not, in my estimation -- because we all have cell phones does not mean that lithium-ion is an established, load-shifting storage technology. Again, it's not a generator. It is a load-shifting resource, a storage resource that is 6 gigawatts on the entire U.S. power grid today.

So calling that a mature technology, I think, would be a misrepresentation if you've been following the storage market and the potential for changes in chemistry and supply chain changes and shifts moving things domestically. Competition with, you know, lithium-ion with the EV market, all the expansions he spoke about were actually electric vehicle and not utility, you know, utility-scale large.

So there's a lot of dynamic changes happening in the battery market. Most of the intervenors in this case believe prices are going to fall. And I think to assume that they're gonna go up 10 years from now was -- you know, maybe that's a position he was taking.

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But I wouldn't call it mature. I think there's room for technology improvement, and I think there are -- that would probably be my reaction, is that I don't agree with his characterization of it being a mature technology.

Q. Do you disagree with him that, if you had run or looked at the technologies separately, there would have been a different outcome more favorable to solar or more favorable to storage?

A. We looked at them separately and we looked at them paired. The one -- I believe, if I'm recalling this morning's discussion correctly, the one that we did not look at was solar paired with storage that can be charged from the grid. And Commissioner Clodfelter correctly pointed out that it's a limitation of EnCompass, but it's beyond that. And I think it's really important to understand it's not just a limitation.

We would have to change other inputs, right? So the transmission cost was one I raised earlier. You would have to look at what that transmission cost would be to deliver to the grid. And so there's other differences. You know, we did give free transmission when we put -- we added the storage. And we didn't

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charge any transmission. Standalone, we actually charged transmission to in our modeling assumption as a conservative estimate, right?

There is a potential, under the IRA, that you may be able to find spots for batteries that are at retired coal sites that not only give it the IRA benefit but give it a bump-up benefit. And potentially you can find one that has both the transmission capability to charge and to discharge at that site. And so not only would you not have the adder that we put in -- I want to make it clear, we put in an adder for standalone that we didn't for paired. So that adder would go away. And you would be able to potentially get a bump-up in the way that you won't -- there was some discussion. You're not gonna be able to put solar and storage at coal sites, right? You can put storage there, might be able to put SMR. I don't want to speak for the Long Lead-Time. That's a siting issue beyond my pay grade for the Long Lead-Time folks.

But solar takes thousands and thousands of acres. And coal sites, while fairly large, developable flat land that's not the cooling lake, that's not the wetlands, that's not the ash ponds, there's a very small amount of land that would be potentially be

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viable for solar. When you look at Person County, for example, it's 3,000 megawatts of coal, that would be 24,000 to 30,000 acres of solar to get that same 3,000 megawatts. You're not gonna have 30,000 acres of developable solar land. And that assumes Person County lifts their current moratorium on large scale solar.

So this is the point I'm saying, is that standalone right now we're disadvantaging in the model relative to solar paired plus storage, and we're gonna have to be careful not to put too much weight on one P5 analysis to say that should determine all the configurations for the next three years. We should let the marketplace play out, build flexibility into our procurements that allow us to get the lowest cost storage for the customer.

Whether it's paired -- and there are some benefits to paired, I'm not disagreeing with them -- or whether it's standalone, we need to do that in a manner. And I think our Near-Term Action Plan has a nice mix of the two.

Q. Another question I have for you, and I was trying to recall the witness, but you will remember the argument anyway.

Do you agree with the double-counting issue

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that was raised with regard to the battery depth to discharge constraint that was used in the modeling?

A. (Matthew Kalemba) I frankly don't recall it being spoken about here, but I recall testimony --

Q. It's in testimony.

A. -- regarding that. So when we develop our storage costs in the Carbon Plan, we do, like, a bottoms-up type of build. So we're adding in whatever the costs are for the storage cells and all the other aspects that go into storage. But -- so when we do that, we're accounting for this depth of discharge amount that we have to overbuild the battery for.

And I think what the testimony was referring to is that other -- like NREL and other public sources, it's not -- to me, it's not clear if they're including that depth of discharge, and if they are, what -- how that impacts the prices. But we do -- we do -- when we build our battery cost for the Carbon Plan, we do a bottoms up, and so we're adding in this extra amount of battery cells that are required to keep you -- to maintain that depth of discharge.

Q. So is the testimony correct that, if it were in the initial pricing, that then your adder is a double-counting?

A. No, it's in our pricing. I don't know what the adder is. I mean, the full price that we have for the battery storage includes the depth of discharge. So I think the confusion is also that when we're doing, like, our bottoms-up building, we're building the DC battery. But when we talk about what we put to the grid, let's say it's 100-megawatt battery that we can discharge, you know, a 100-megawatt 4-hour battery, 400 megawatt hours, if we're putting 100 megawatts to the grid, that's the AC side. But that battery really needs to be 110 megawatts or so to account for that depth of discharge.

So you're actually putting out 100 megawatts, but you're -- you've got this buffer on the battery to keep you from going beyond this depth of discharge. And so it's all -- the full cost of the battery is in there.

Q. And it's not in there twice?

A. No, ma'am.

Q. Okay. And my last question concerns when a coal plant is converted to run on gas, can it be converted again to later run on hydrogen, or is it restricted because of the first conversion?

A. (Glen Snider) I'm gonna turn that over to

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Mr. McMurry or -- I'm --

A. (Bobby McMurry) Sure. And then Mike -- Mr. Quinto, feel free to chime in. But as Mr. Snider has said early, the heat rate, can you please describe the heat rate of the unit. The heat rate of Belews Creek, for example, is, you know, close to 10,000 BTUs-per-kilowatt-hour.

One thing with hydrogen, as you look forward, you know, as you plan to 2050 and hydrogen becomes more of your resource, you really want to burn hydrogen either in real small quantities at a peaking plant that has more flexibility than Belews Creek, like a CT, or if it's gonna be a little bit more, then you'd like to burn that at your remaining combined cycles.

Just from a heat -- it burns -- a CT compared to Belews Creek, from a hydrogen standpoint, you know, it's 10 percent more efficient than Belews Creek. It's a little bit. But it's designed to burn hydrogen. Now that I'm thinking about it as I speak, I don't know -- I have not seen a study to combust hydrogen in a boiler.

A. (Michael Quinto) I'm not aware of one either. I would say probably doesn't -- there is probably not a restriction on it by converting the

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first time to natural gas, there's probably not a restriction to further converting it. But again, it's using that scarce resource that have you in a most efficient way. And using it in an old coal unit is probably not the most efficient use of the energy conversions that you get.

So converting to green hydrogen or clean hydrogen and then converting again back in a gas boiler back to electricity, it's probably not the most cost-effective way to do it.

Q. Thank you.

CHAIR MITCHELL: All right. Commissioner Clodfelter? And we'll take our afternoon break at 3:15, so can you get one question in before then?

COMMISSIONER CLODFELTER: I can probably get in one.

EXAMINATION BY COMMISSIONER CLODFELTER:

Q. I'm gonna ask you a transmission question, but if -- it's probably for Mr. Roberts, but if I find out later that it was for you and you guys have been excused, I've missed the boat, so I got to ask it. You can defer it to him if you want to.

A. (Glen Snider) I'll take a swing or defer.

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Q. All right. That's great.
The -- the transmission upgrade that's necessary in order to retire Marshall 1 and 2 has not been initiated; is that correct? That project has not been initiated?
A. I'm gonna pass that to Mr. Roberts.
Q. Okay. So anything else I might ask you about that project goes to Mr. Roberts, and if he can't answer it, I don't have an answer, right?
A. That's right.
Q. All right. I've got some other questions but they will take more than a minute.
CHAIR MITCHELL: All right. We'll take our afternoon break, then we'll come back on the record at 3:30. Let's go off the record.
(At this time, a recess was taken from 3:13 p.m. to 3:31 p.m.)
CHAIR MITCHELL: All right. Let's go back on the record, please. Commissioner Clodfelter.
Q. Gentlemen, back to gas. It's not like you haven't talked about it enough already, but it's tricky, and I've just got to take you through it one more time to be sure I got it.

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So as I wrote down, you have considered in your planning, in the Carbon Plan, three different alternative supply scenarios. I wrote down three different alternative supply scenarios.

A. (Glen Snider) That is correct.

Q. Right. One of those assumes the Mountain Valley Pipeline, right?

A. Correct.

Q. That's the preferred one for the Companies?

A. Yes.

Q. I understand that Public Staff asked you to model some -- no Mountain Valley, but I want to stay, that's the Companies' preferred gas supply scenario?

A. P1 through 4 had Mountain Valley. P5 and 6 alt had Mountain Valley.

Q. All right. Got it. Okay. Now, I want to ask you a specific question on page 54 of your rebuttal testimony. And there's a paragraph beginning on line 14. "As further evidence of the ability to obtain Appalachian gas." And I think, Mr. Snider or Mr. Quinto, one of you referred to this confidential contract in one of your answers to the questions.

As I read the written testimony, that confidential agreement would supply additional firm gas

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supply for your existing combined cycle units?
A. That is correct.
Q. Is there any similar arrangement, or do you have any similar arrangement for proposed new combined cycles?
A. Yeah, I think the -- it's been explained to me again.
MR. BREITSCHWERDT: Mr. Snider, just to make sure before you answer the question that we're not in confidential session and I just want you to be cognizant --
Q. Yeah, I don't want you to tell me the -- well, you have to decide --
A. I'm gonna keep you all safe. How's that?
Q. Good. I want to stay safe.
A. We -- as I understand it, and I will not give any details, is the -- once this goes into service, then you're not looking at a brand new greenfield. That there will be expansion opportunities through, you know, increased compression, through looping. You're not looking at going back through new national forest.
And so the thought would be is, well, we're not at that point, because it's really important to say we have to have that demonstrated need, which this

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Carbon Plan would give us. That gas is a small part. And, again, I keep saying it's a limited part of our overall plan. That demonstrated need would then be the impetus to say let's go look for that expansion that's not currently at the level that the first for the existing is, to be clear. But the need has to come first, and then you could do it without going through like MVP 2, so that's not what we're looking at here.

Q. Well, without going through MV 2 -- MVP 2, what does that mean? Does that mean that MVP is sized and has sufficient transportation capacity to sell you additional firm transportation capacity for future CCs that are -- for which the need is established?

A. It's my understanding, and again subject to check, that it is expandable without new greenfield right-of-way.

Q. It would need --

A. It would need compression or additional looping on existing right-of-way, for example, that could be considered without going through the entire process that we have just spent time talking about and the risk attendant with that.

Q. You would need to first identify the need for your combined cycles, and then you would go to Mountain

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Valley Pipeline and say I'm interested in buying additional -- I've got a seller who will sell me, I've got a price established, but I need to buy some more transportation capacity from you, and that would trigger the need for an upgrade?

A. That is correct.

Q. And who would finance that upgrade?

A. The -- I think once you have an agreement in place, then the pipeline -- and again I want to be careful not to go past my expertise here, but the pipeline in the past, as I've understood it, is your agreement with the pipeline is security enough for the pipeline to move forward. If you think about past projects that have happened, your definitive agreement becomes something that they can use to then go out and obtain financing for the expansion.

Q. You would commit to the additional capacity that the additional infrastructure would enable, and they would use that as a project financing tool?

A. You would have a contractual obligation in place subject to all the normal, you know, regulatory outs and force majeures and all of that.

Q. Which, as I understand it from your testimony and the testimony that we got last week from the Public

Staff, that's essentially the model that Piedmont used with Transco on the south side reliability project; is that --

A. Yes.

Q. That is correct?

A. That is correct.

Q. So Piedmont made the commitment, Piedmont said we've got the need for the gas, we need the additional transportation capacity, we'll commit to it, and then Transco goes builds it?

A. That is correct. That's my understanding.

Q. Thank you. I've been corrected. I'm saying you go to MVP. You'd go to the owner of the Mountain Valley Pipeline, right?

A. Yeah, I want to be --

Q. Okay.

A. Yeah, you'd go to somebody.

Q. You'd go to the owner of the pipeline and the operator of the pipeline?

A. Yeah.

Q. Okay. All right. Well, I think I have to stay away from confidential, but that's information -- but -- so I'll stop on the Mountain Valley Pipeline for right now.

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But let me just, sort of, say, would you not consider that an execution risk?

A. Certainly. I mean, anytime you have to go for additional infrastructure. But the thought would be, you know, the -- that because it's an expansion project and not a new greenfield, that that execution risk would be somewhat muted in the nature of you're not -- it's not like doing a brand new pipeline, is my understanding.

Q. Okay. That's your preferred pathway --

A. Yes.

Q. -- in order to bring gas in for the new combined cycle units?

A. It's the --

Q. Got it.

A. Gives us a lot of the benefits we spoke about. Diversity of supply, lower cost, different price zones.

Q. And I think in response to a question Mr. Schauer asked you, he said if that's not available, what will you do; and you said we'll look to alternate sources. And I suppose that's the other two scenarios that you modeled, right?

A. Yes.

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Q. Those are the other two scenarios. And did I understand your testimony that, in very generic high-level terms, those two scenarios are one backhaul on the existing Transco main line from the north?

A. That is one, but it's not one that we modeled. So the --

Q. The two you modeled bringing gas from the north?

A. We -- the only one from the north was the MVP. Then we modeled from the south in two different volumes. So P1 through 4 alt, we modeled just enough for the -- coming from the south Gulf through one of the -- there are multiple pipelines and owners. But bringing gas up from the south, we modeled in our alternate portfolios enough to meet the existing CC needs. So the additional 525. And then we assumed we would put the -- we would limit the -- in P1 through 4 alt, a single combined cycle with Zone 5 exposure paired with -- because you now have the ability to put ultralow sulfur with that and Zone 5, but we've shored up the existing. So that was P1 through 4 alt. P5 was the same as the alt but --

Q. To help me --

A. No, it's good.

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Q. Stay away from P5 for a minute, and 5 and 6. I'm gonna stay 1 through 4. So walk me back again.
Your assumption was that you would buy additional Zone 4, or Zone 3 if you could get it --
A. Yes.
Q. -- gas, and bring it up from the south to give you full firm supply for your existing combined cycle fleet. And then you'd have the new CCs beyond Zone 5 pricing?
A. Zone 5 pricing with ultralow sulfur diesel as --
Q. As your back-up?
A. -- as a back-up, right.
Q. Now, under that scenario, let's call that -- I'll call that the second scenario.
Under that scenario, would you have to purchase additional -- you would have to purchase additional firm transportation capacity from Transco to bring that additional gas here, right?
A. Or potentially, again, there are, you know, other pipes coming up from the -- not in -- you'd have to go into South Carolina, potentially. I'm just saying I wouldn't pin it on exactly a specific pipe. But yes, it's fair to say that that is the assumption

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that we used in -- that we would bring it up, either 3 to 5 or 4 to 5, and for the existing at a cost.

Q. Is -- let me stay with Transco for the moment.

Is there additional firm transportation capacity available for sale to you on the existing Transco main line from the south?

A. As I understand it, it would require, much like Piedmont, that there would need to be additional projects and upgrades.

Q. So there would need to be additional infrastructure investment by Transco on the main line?

A. Yes.

Q. And I know you haven't done any project planning on this, but generically, sort of, what kind of thing would that be, additional compressor stations?

A. It may mean looping, it may mean, you know, compressors, it may mean new segments that do need. I do not know what all would be involved, as that is not my area. But we did -- we did view that infrastructure that would be needed in the modeling at a higher cost than the MVP.

Q. Would I be -- would it be fair for me to assume that the Company hasn't really taken any steps

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to execute on that plan, on that fuel supply scenario? You're still waiting on Mountain Valley Pipeline?
A. We -- I would say it's fair to say that we do not have definitive plans to the extent we do with MVP.
Q. Okay. And the same would be true for any other pipeline coming up from the south?
A. That is correct.
Q. All right. That's the second scenario. What's the third?
A. So the third was --
Q. For P1 through 4.
A. So 1 through 4, there were the two. So I just explained -- there's P1 through 4, that's MVP. P1 through 4 alt --
Q. Alt.
A. -- that was what we just spoke about.
Q. That's scenario number 2, what I've called number 2?
A. Yes.
Q. Okay. So the third scenario is really only for P5 and P6?
A. Correct. And that assumes, instead of just doing -- it was more like the MVP where you did the first from-the-south project, and then rather than

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relying on Zone 5, you did an expansion off of that project to get from the 525 all the way up to the 900.

Q. You lost me. It's probably me.

So how does that differ from scenario number 2?

A. Scenario number 2, we assume we just leaned on Zone 5, and we didn't do that. So we only allowed one combined cycle, and it was Zone 5 in scenario 2.

Q. And in scenario -- in the sensitivities 5 and 6, you assume that you'd build an even bigger upgrade to get even more firm transportation capacity out of the Transco line or --

A. And importantly, that still limited us. In no scenario did we ever consider more than two combined cycles.

Q. Okay.

A. So that was it. So in the 5, we went back to two new combined cycles.

Q. All right. In 5, then -- now I'm shifting now to 5.

A. Okay.

Q. You weren't placing any reliance on the availability of capacity, either gas or transport capacity, on the south side reliability project, were

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you?

A. We were not. We were looking at that as just an example of when you have a demonstrated need, you go to the pipe, you say have you this need, and they build the infrastructure on your behalf. And that's what happened with Piedmont. It's my understanding they did a project, they had a need. The -- you know, the resources are upgraded and Piedmont pays a fee to Transco for the upgrade. But we did not rely on that specific project.

Q. I'm gonna ask you a question now about a document that Ms. Edmondson asked you about. It's not been marked as an exhibit, and I don't have an extra copy. You have it. Mr. Quinto has it.

A. (Michael Quinto) Yes, I do.

Q. It's the -- it's the July 28, 2022, letter to the clerk from Mr. Jirak which essentially discusses the parameters of the development of the supplemental modeling portfolios requested by Public Staff. And Mr. Quinto gave you a copy of it, right?

A. (Glen Snider) I have it in front of me.

Q. Okay. On page 2, there is a series of blocks with texts in them, and number 11 is one of the parameters is to allow the model to select both J-class

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and F-class CTs and CCs and utilize retirement dates for existing CTs that match the most recent depreciation studies. And then over on the right there's a series of bullet points. And I assume that's -- those are the assumptions that you used to run that?

A. (Michael Quinto) That's correct. And they go on to page 3 as well.

Q. And they go on to page 3. The one I want to ask you about is the last bullet point at the very bottom of page 2 in the right-hand column. It's a little circle that's not colored. Got it?

A. I see it.

Q. It says, "Assume Transco expansion in 2028 securing additional firm transportation" -- that's what FT stands for?

A. Yes, sir.

Q. -- "necessary to provide firm transportation for Zone 4 gas to the existing fleet which did not already have Zone 4 gas."

That's the scenario 2 assumption?

A. That is the first part -- that is -- yes, that is the FT that's required to get to scenario 2.

Q. And then at the top of page 3, we've got two

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more sub-bullet points, I guess, is what I'd call those that discusses how you would then model the expansion project necessary to bring gas from the south to the new combined cycle units?

A. For scenario 3 for the supplemental portfolios.

Q. Got it. And here's what I want to ask is, now that I understand what I'm looking at, the term Transco expansion is a capitalized term. When I see a phrase that's capitalized, capital T, capital E, that suggests to me that it's referring to something that is more fully described and defined somewhere else. Where would I find that?

A. It's probably an error of over-capitalization. Apologies for that.

Q. That is not a reference to some other document, some study, some project report; it's not a reference to anything else?

A. No, it is not. It is generically, as Mr. Snider discussed, demonstrating a need that would be fulfilled by a pipeline helping you meet your need.

Q. And that would be a physical infrastructure upgrade by Transco that you would commit to to take the transportation capacity and use it, and that would be

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the basis on which they would proceed with the project?

A. That's correct.

Q. All right. I think that does it. Thank you.

CHAIR MITCHELL: Duffley?

EXAMINATION BY COMMISSIONER DUFFLEY:

Q. Okay. Mr. Snider, you anticipated a lot of my questions, and others have been asked. So I do have some cats and dogs out here, though.

The first is, did you hear my exchange with Mr. Ragsdale today?

A. (Glen Snider) I did.

Q. Okay. And I'd really just like to get Duke's opinion. You heard us -- heard me talking with him about coordination between NCEMC and ISOP. And I heard the redirect questions.

But I just kind of want to get a feel from Duke, are you working with them through the ISOP process to have this site into their distribution system? And what's the status of your communication with NCEMC? And are you open to this further communication with them on the benefits that they can provide to reliability?

A. No. I mean, they're an important part of this state. As he says, they're one of our largest

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wholesale customers. They serve many of our rural communities through contracts where we provide most of their bulk generation power, right? But they do have -- we meet with them from a generation side and talk about our resource plans, you know, two, three, four times a year officially, and then unofficially from time to time.

And I know they're engaged -- I'm not on the T&D side. I know they're engaged there as well. That's Mr. Ragsdale's area now. He used to be on the generation side, so I used to see him in our generation coordination planning. And they do have, you know, some designs for some Grid Edge programs. So I think there's -- you know, in the state there is learnings. What's working for you in the rural communities, what's working for us, and how do we coordinate those?

I think, you know, they take many forms that are probably beyond my level of expertise, and when you start talking about like priority, you know, emergency, that's a -- you know, what would we do in a -- prior to a -- having an organized load shed and whose role is what in providing those last, you know, resources, that's sort of maybe a Mr. Roberts question.

But in terms of them being able to utilize

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their Grid Edge, sort of, day in, day out, you know, where I think we can gain alignment is ensuring that we're both equally incented such that they're using it, you know, right now probably to lower costs for their customers. Maybe what lowers costs to their customers isn't the exact hour that lowers cost to the total grid.

So how do we, through maybe some contractual structures, do some better alignment in terms of, you know, aligning incentives, if you will, between their FERC jurisdictional wholesale contracts and our system needs. Might be something we can look at down the road. But certainly.

And then just on a more fundamental level, you know, what programs are working for you, what incentive mechanisms, what marketing mechanisms; you know, what are your customers responding to, what are they not; and then sharing that same perspective from our Grid Edge group and trying to, you know, learn. Because we're in the same region serving, you know, essentially the same customer base. So I think there's a lot of levels that we can gauge NCEMC on and we are doing that.

Q. Okay. So you are in discussions with them

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and you are working with them on these issues and learning from each other, is what I heard you testify to?

A. Yes.

Q. Okay. Thank you. Then there was something that I heard you state that I wanted to follow up and make sure I heard you correctly and then ask you a follow-up. I heard you just testify before the break, there are billions of dollars of investment that have a lot of risk attached to them that have not been spoken about in the past couple of weeks.

Did I hear you correctly?

A. You did.

Q. Okay. And -- so what are you -- can you just not -- not an hour-long colloquy, but can you just kind of give me the highlights of what you're talking about?

A. Yeah. Fair admonition. Well deserved, I might -- but the -- you know, if I just go through the opposing -- or not opposing, excuse me, the alternate portfolios that other are providing in this case, we've spent three weeks talking about gas price risk. A one-billion-dollar -- a billion-three investment, yes, it has fuel supply, yes, there's pipeline, there's commodity price risk. And we're worried about 20 years

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from now, in 2050, if hydrogen doesn't come around, if there's no offset market, I could strand a few hundred million dollars. Potentially if all those stars align perfectly and conspired against me, there's a few hundred million dollars of risk in stranded assets.

And we've had no discussion of every other intervenor's recommending between 4- and $6 billion in battery investments in the next few years. So just do $1, $1.20 a watt. You know, some people say they're gonna go up, some say they're gonna go down, with or without the IRA, it's in the multibillion dollars. And they're suggesting ranges from 3- or 4,000. Whether it's paired or standalone, it's 3- or 4- to 6,000 megawatts of batteries.

The total cost of those would be in the 4- to 6-, $7 billion range. You would lock into these technologies, in some cases where they're paired, 25-year contracts on this nascent technology. And you're gonna assume that they've been around for two years in the industry. You know, two, three years ago there wasn't 1 gigawatt on the system.

So they have been at commercial scale, small commercial scale, for two years. But we're gonna lock in to 25-year contracts for $6 billion of a nascent technology, and we've had no discussion of is there any risk in that; what happens if prices go really low, do customers see the benefit; what if they go really high, what happens then, right?

All that was just -- we had -- you know, that's my early, sort of, admonition two weeks ago is we need to take a holistic view of what risks we're asking and have a broad all-of-the-above approach that puts those risks into real buckets and spreads them out. And when you get away from gas, you're just consolidating that risk either staying into coal longer or going really heavy into batteries.

And, you know, we're talking levels of batteries that sort of rival what's in the country today, in our utility.

So I just think that has -- you know, I think Commissioner Clodfelter said I get worried about what's not being talked about; that hadn't been talked about for three weeks. But it's just been assumed that that's risk-free.

Q. Okay. Thank you. And I was not admonishing you. I really appreciate your testimony and your education. So I just wanted to not leave a wide-open door for you.

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Are there any other risks that -- wait. Before you move on, though, I did want to talk to you about that, and if you could put it in context for me. So I was just reading an article the other day about Public Service of New Mexico and how, you know, they -- they have been struggling and having some issues. And they've kept their -- they had a retirement date for their coal -- one of their coal-fired power plants. And they've had to push that out as well as they've lost reliability for the next two summers. It was indicated Public Service of New Mexico stated that there were gonna be potential load shed events. I don't think it happened this summer, but they still are under that watch for next summer.

And so that is a question for me as to how do we, as a Commission, balance -- you know, balance the cost of coming up with a plan where we're not backtracking? Or is there any value to that? Or is it -- or is that the proper way? Do we -- do we try to set ambitious goals and then backtrack or do we try to plan for not backtracking? I mean, so do you understand my question about what -- which one is more cost-effective, or is your answer gonna be it all depends?

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A. No, I think that's a fair question. It's a broad question in the -- there was some discussion earlier about, like, path dependency, right? So once you set wheels in motion, there is cost of back-pedaling. Like if you say I'm gonna have, for example, these batteries or this gas or these solar, and then they don't come to fruition, you're taking other actions, right? I'm planning to retire that coal unit so I'm letting staff go. I'm, you know, changing my maintenance schedule.

You know, you don't put as much money in a car that you're gonna retire in two years as you want if you're gonna keep it for six years. You're gonna do your oil changes and your transmission more frequently if you know you're gonna keep it for six years. So if I have to backtrack, there are costs, right?

And I think what New Mexico is seeing, we're seeing this in other areas of the country, is if you're over aggressively in saying I'm gonna be able to replace these, now you've got to stay in them. But you've taken actions that make that, you know, not costless, right? And so I do think, you know, that's what -- New Mexico is also doing the reliability step that we're doing when we're saying -- looking around

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who else is doing. That might be part of the reason is they're saying we need to do this, you know, lastly develop portfolio.

This reliability step, that's one of the utilities that we saw doing that. So I didn't realize quite why. But I do think it is important to have an orderly transition, so that's why you don't want to be overly aggressive on getting out of coal. You want to get out of coal as quickly as you possibly can, given the risk of staying in it. But you want to do it in an orderly manner and not put all your replacement resources in one basket.

So it's not all one thing replacing that coal. I'm diversifying that risk profile if I wear a little bit of risk maybe in gas. And I'm not saying riskless, certainly in our discussion. But there's risk in batteries. There's risk in solar. That's -- you know, I don't know that we have some people saying it's going up, some going down. No, technology is not advancing; yes, it is advancing.

You know, five years ago I didn't know what bifacial panel was, and all of a sudden now they're here and it's the last thing that's ever gonna happen to solar. I don't know. Maybe it is, maybe it's not.

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But -- so you've got to diversify that risk. I think we have a Near-Term Action Plan that's proved that out from a quantitative perspective, we just haven't had a lot of discussions around the non- -- what I call them, non-modelable or qualitative risks, other than gas. Spent a lot -- you know, several days talking about the risks associated with gas. And it's $1 billion out of a multibillion-dollar plan and we talk nothing about the risks of the other technologies.

And I would just say, you know, in reviewing the record, keep in mind that all of these technologies have benefits. I'm not against any technology, but they all have risks, and we shouldn't view them as they don't.

So I think the best way the Commission, you know, in looking at the orderly transition, is spacing out your coal retirements, not lumping them, and spacing out the resources that replace them and not making them lumpy as. So I'm not saying it's just nuclear or just solar and batteries that's gonna replace coal. I've got a diverse mix. If I run into a bump in the road in one of those, you know, it's -- I don't have all my eggs in that basket.

Q. And are there any other risks that you want

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to make the Commission aware of? I didn't want to shut the door too --

A. The balancing factor is staying in coal, right? So, you know, sometimes it's like, oh, let's just do nothing and wait for the -- you know, the do nothing, itself, is a risk, right? So staying in coal, you know, you have declining coal supplies, you have, you know, transportation issues, you have OEM parts, you have, you know, qualified labor, you have -- there's all sorts of risks.

So I'm not saying we should stay in coal indefinitely. So I sort of describe it to sometimes it's a little bit of a game of whack-a-mole, right? It's like, oh, I don't want to wear this risk. Well, you've just popped up -- you know, if you don't want to wear a gas risk, you've got more battery and coal risk, right? If you don't want to wear battery risk, well, then your gas or staying in coal.

So, you know, there is no risk-free, but staying in coal is not -- I'm not by any way saying that's the -- I'm just saying have an orderly exit out of coal, because it carries its own risk. But that -- part of that should be a diverse mix of resources to replace those coal while meeting your carbon objectives

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outlined in 951.

Q. Thank you. And I have a staff question for you.

The question is, so can you have coal plants that are converted to run on gas, can those later be converted to run on hydrogen?

A. (Michael Quinto) I believe that was Commissioner Brown-Bland's same question.

Q. Oh, had she already asked that? Okay. Sorry.

A. (Glen Snider) And, you know, there's a lot of we -- you know, we can -- we can look into it. One thing we weren't able to tell you is whether it's technically possible. We're not the engineers that do the boiler modifications. That's probably the piece we didn't answer. I think, from our prospective, we think hydrogen is gonna be just like natural gas. It's not gonna be abundant and cheap. It is part of a solution. And if you're gonna have a limited resource, it's probably, at least in the near-term, gonna be somewhat expensive, you want to point it towards its highest and best use.

And a third-time conversation of a 50-year-old by that point in time, you know, or

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40-year-old coal plant that's very inflexible is probably not the highest and best use of a limited amount of hydrogen. You would like that to go to these newer turbines that are designed for it and can be -- you know, use it quickly and efficiently and ramp up and ramp down and turn off so that you're wasting as little hydrogen as possible.

Q. Okay. Thank you, Mr. Snider. I don't have anything further.

CHAIR MITCHELL: Commissioner Hughes?

EXAMINATION BY COMMISSIONER HUGHES:

Q. Okay. Some in-the-weeds modeling questions for you, whoever can answer first.

A. (Glen Snider) I got some weedy guys to my right.

Q. Okay. Okay. So starting with one. I want to understand a little bit about the present value analysis that goes on. You know, and I also want to make sure I understand all the different modeling and which model is shooting out the present value. Because that's -- at the end of the day, there's a lot of focus on that number, and that's what's getting in the papers, that's what is coming to -- so -- so which model produces that? That -- I know it's not the

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reliability model, but where does that bottom line 100, 120 come out of?

A. So I'm gonna start and I'm gonna kick it to the guys in the weeds. I'm gonna try to get real high level. Each model we try and get the most important parts out of. So you start with your screening model. You have all of your capital costs that go into that. But your detailed production costs tells you how much the fuel of operating that system is going to be.

And some of those costs are better articulated outside of those models even, so like your transmission, how do you really represent your transmission, or maybe your existing coal in your retirement. So we take from those models the total cost, the fuel, the variable O&M, the fixed O&M, and the CAPEX -- capital, excuse me, and we pull it into a spreadsheet that Mr. Quinto creates. Say here's all the costs coming from the appropriate model so that you can -- and I've heard it described earlier as this behemoth. But a spreadsheet is much more traceable and, you know, hey, there's where that cost is on that line item with that formula; here's where production costs are on that. So there is a lot of transparency in a spreadsheet model that is much more difficult to

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find in one of these big linear programming models where you're saying, now, where -- which output file of those 1,000 index ones do I go to for each of these different line items.

So I disagreed earlier with somebody characterizing it as just sort of this black box spreadsheet. I think the spreadsheet actually provides a lot more clarity where you can go and see where every line item is and what every cost is. A lot more people are familiar with spreadsheets than trying to dig into the bowels of any of these various models.

So I would say that's my big picture, and I'm gonna let Mr. Quinto who develops that spreadsheet give you any more detail.

Q. And that was a great answer, but keep going if you'd like. But I -- that was what I was looking for, but --

A. (Michael Quinto) And just after you go back and listen, or after you've heard this, it might be helpful to go back and look at page 81 of Appendix E that's got some high-level discussions of how we do discount rate and what -- where different costs are coming from. But high level, as Mr. Snider discussed, the capacity expansion model weighs transmission and

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generation and simulated -- a simplified simulated system to pick the resources.

So we use those same capital costs for the generation and transmission that are consistent with the costs that are evaluated in that model. We then do the production cost, which is the detailed 8760, every hour of the year throughout the entire planning horizon, how does the model dispatch the system, and look at what the total cost of operating the system is.

We take some of the costs out of that model so we can more clearly see, okay, what's the variable O&M component; what is the fuel component; what is fixed -- you know, all these different components that we can see more closely, QA the system, make sure it's running correctly. And then we take that production cost out, we pair it with the EE and DSM that don't really impact the operations of the system. Those are factored in after the fact.

And then as we discussed, it was probably on our direct testimony, that some of the outputs of the production cost model have to go through another model to see how much do we continue to have to invest in our coal units over the projected lives of those assets, and how that changes from one portfolio to the next.

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So there's reasons that we utilize different outputs from different models to get the most accurate and holistic comparative analytic for cost for these portfolios. So I hope that helps.

Q. Yeah, no, that helps a lot. And you mentioned transparency. Given that that model is so important and it has so many moving parts, back to Mr. Snider, we haven't talked about that part of the model in the last three weeks. We've been talking about more the other parts of the model.

Has that part of the model been revealed in discovery and shared around, that -- you know, that big spreadsheet?

A. Yeah. You're discussing the analysis that we did to take all those costs, put them together --

Q. Yeah, the final thing. The thing that I could understand as opposed to not understanding the EnCompass model.

A. Yes, yes. The PVRR model is subject to discovery. It has been shared through discovery confidentially. It contains some confidential information in it doing the calculations. But yes, that is shared in the discovery process.

Q. And as I recall, none -- at least in this

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hearing, no one's really made a big point of debating any of the assumptions in that, quote, model as opposed to others?

A. Not that I'm aware of.

Q. Right. Well -- so when I hear that -- you know, I think Mr. Snider put it this way, is that this modeling involves a lot of trading off between capital and operating. You know, some of the big capital for the solar and then low on the operating, and some, you know, with the hydrogen may be the opposite. So in my experience that -- you know, the discount factor and the models do -- you know, those financial assumptions do matter when you're doing a lot of trading off capital versus operating.

So I just -- you know, did you do any sensitivity with -- you know, I think you used the weighted average cost of the capital for you discount factor. Did you go in and do a discount factor of five and see what -- you know, what happens when you hit return on your model?

A. I'll start. We have not done any sensitivities that look at the discount rate. We do use an after-tax weighted average cost of capital. Those costs are projected out for what we think future assets are gonna cost. Certainly there could be risk around that or changes in how that cost gets developed, but those are the best inputs at the time we have to project what future costs will be that would drive a different discount rate.

Q. Okay. Well, to my friends the attorneys, if we replaced the all the attorneys in the room with economists, we probably would have spent a lot more time and probably very -- in disagreement about the discount factor, because that is something that is heavily debated.

So we could conceivably now or in the future, no late-filed exhibits, don't worry, ask you to run some variations on that. Considering that we are -- like there's a lot of technology we don't know in the future, people could argue this whole macro economy inflation, there's been some changes since you've -- since you did your modeling. So we could ask for that.

So -- and the inflation, I think, same thing. You didn't -- you put in -- I think you got that from Moody's or from one of your --

A. We have a couple -- we have a general inflation rate that we use, and then for technology-specific resources, we project that they

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change differently. So one resource may decline in cost faster than another based off its maturing or not, or if it's already a mature technology. So we have some different inflations that are dependent on which resource or what the underlying assumption of that -- of that piece of information is.

Q. So does that give you the ability to -- like, if it's a PPA, and it's a fixed PPA, then that's free of the inflation inflater?

A. (Glen Snider) Yeah. If it's structured that way, it's flat in the model.

Q. Okay. I mean, because that has come up, I think some of the intervenors have said, you know, this say hedging. Where we fix, you know, everything else is going up, whatever it is, 2.54, what are we at now, 8?

A. That is built in, though.

Q. Yeah, it's going up. But that PPA. So in your -- that's where, in your model, the PPA, if I found that, you know, row for PPA costs, I guess for the 45 percent, that would just be flat. That would not be -- if it's a PPA that is flat?

A. I was just gonna say, I was conferring with Mr. Kalemba here. All of ours are based on capital

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costs, so we don't put in an explicit PPA cost. If we did have a PPA cost, it would -- even though it would be what we call levelized, it would have an inflation factor built in, and then it would get levelized to a flat. So the PPA, itself, would maybe -- depending on the structure. I mean, some -- I've seen commercial structures that have increasing PPAs to -- but we modeled everything based on capital -- capital cost assumptions, and not PPAs.

Q. I know there's a lot of disagreement about EnCompass, about different ways that you did things, and some of which I understood, some of which I'm still trying to understand. But one of the things that seemed to be a big deal, and you can confirm whether it is or not, is whether you use typical day versus typical week.

Did I hear that you and some of the others were that, kind of, choice in the model, and that either provided different outputs or made the model go faster or slower; do I have that right?

A. (Glen Snider) You absolutely do. And in our rebuttal, it's page 3 of Exhibit 1, we show that picture. And that's -- you know, that's pretty critical picture that we went through in direct that

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shows that the first phase capacity expansion, and I think Chair Mitchell had this question of one of the earlier intervenors, is using a capacity expansion a typical day, they have an on-peak and an off-peak day each month. So in capacity expansion, you're using that very top block.

Q. I got to find it, then, tell me again.

A. It's page 3 of Exhibit 3.

Q. Okay.

A. And so that's a typical day in capacity expansion. And I talked about, in our direct testimony, why that tends to buy us things a little bit more towards batteries. Because if you look at a battery, it doesn't provide energy, it moves it from off peak to on peak. So if that off peak to on peak is a bigger trough to peak, the battery is more valuable, right? If I had really low lows every day, every single day, and really high highs, I want a lot of batteries.

That is the simplification that gets used in capacity expansion that tends to overvalue a storage device. So we -- that portfolio verification takes you to the second row, which is in production cost. You use the full -- we used, not everybody used -- the full

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8760 that's more representative of what day in, day out looks like. And there are peaks and troughs, but they're much smaller than in capacity expansion.

So the value of the battery is not as great in production cost as it is in capacity expansion; hence, when you -- the reason we look that out and did that verification step -- this wasn't the reliability step. This was just to say, is it really as economic as we think to be investing in batteries. We know we need storage, but let's test it against a CT that can give me similar reliability and say I'm gonna lose the energy shifting with the CT. But is it worth losing it? And some amount, it did.

And so that's why we use that portfolio verification step. And we're gonna work on that. I mean, the models -- as I've said, the model's got to develop, it's got to have the bidirectional. We've got to figure out better ways in CAPEX to get the load shape more representative of what we're seeing in the production cost so that it doesn't have this inherent bias.

So that's why I'm saying you just can't take cap -- oh, Portfolio 5 in CAPEX says this, therefore just go do. You need to use the right tool, the right

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model for the right resource. And for storage, you're much better off looking at it in a production cost model than you are in a capacity expansion, because you're looking at every hour of every day for the next 28 years and saying, on a weather normal basis, how much value does is that storage provide, as opposed to CAPEX which produces a load shape that never exists in reality. And it tends to overvalue storage.

And it's an inherent issue that the simplification all -- ESSO used to have it, all the other ones, PLEXOS, all of the different softwares out there have the simplifications. And as batteries become more prevalent in the industry, they're all gonna have to figure out how to do a better job with battery optimization, battery selection, compared to what they're doing today. And that's why we do that verification step and say let's do a check on it. Let's look in this 8760 model and see that.

Q. And the problem with doing that 8760 model in the capacity part of the modeling is that we'd be here for a long time?

A. It would never solve. We would still be running, yeah. I mean, you've got to figure out -- because you're testing thousands of iterations of

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resources to see which gives you the lowest capital and operating combination, so you're looking at lots and lots, thousands and thousands of alternatives, and you can't look at 8760 when you're in that mode.

Once you have narrowed in -- again, it's my big funnel, right? That's the highest level screening model. Most the people or software geeks call that a screening model, not a definitive final model. You get a more representative portfolio that you can look at in more detail on that 8760 production cost to get a more realistic production cost value of that energy shifting that you don't get quite as good of a resolution in when you're at the first step in the capacity expansion model.

Q. And those -- whether it's typical day, typical week or 8760, that's based on, did you say 41 years of data? Or that -- you know, that is churning out and running kind of sensitivity analysis to --

A. That is our load forecasting group saying, look, over the last X number of years, you know, you can have lots of different weather patterns, but on a weather normal expected weather basis, here's what that profile would look like. Which for production cost

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modeling over 28 years is a good tool.

Q. Twenty-eight. Okay.

A. I'm just saying '22 through '50. But -- and then the last step is reliability, when you know you're not gonna have normal weather, that's where we do that last step, that SERVM model that does the stochastic analysis on the different weather years to say can I serve load under all sorts of weather conditions.

And make sure that that reserve margin, which used to do that, we didn't have to do that before because a reserve margin used to be adequate. What we've heard, you know, New Mexico, others, reserve margin is no longer, in an energy transition, an adequate metric standalone. It's a good guide, but you need to do these checks. Because when have you these high levels of limited energy storage and variable energy, you may have a combination of those that that reserve margin simply is inadequate to provide that one-day-in-10-year loss of load expectation.

So that's the final bottom step that's represented in that graph that shows the 41 different weather years. That's -- you only do that on one or two years, you don't do that on all 28 years. You say at a couple snapshots in time, 2030, 2035, if I let

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that weather pertubate in a stochastic manner and I let outages be randomly, you know, nuclear trips offline or gas or solar is offline, can I still adequately provide service and meet the one-day-in-10-year industry standard. That's that final step that that graph on the bottom represents.

We tried to put, you know, thousands of pages of modeling on one picture. So that's the danger. But that is -- that's -- that's the three big steps here is capacity expansion, which is a screening production cost weather normal, and then reliability, which looks at a statistical perturbation (phonetic spelling) of load and outages to see if you can still serve load under all weather conditions.

Q. Okay. Thank you for all that. There can be debates, I guess, about what's closer to normal with all of those different ways of cutting and slicing and dicing, and then there's also debates about what those 41 years look like, and are they -- and do they have any, you know, similarity at all to the next 28 years? Or should we throw those 41 years out and just start making stuff up, you know, that could possibly happen, terrible things that could happen in the 28 years.

So -- but what we have in this model is

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grounded on the 41 sort of on an hourly basis at the reliability. That's the final -- that's your sort of --

A. When we bring --

Q. -- stamp of approval at the end?

A. Commissioner Clodfelter asked earlier if we would do another resource adequacy study, and we said it's likely we're gonna need one in '24. Everything you just spoke about will be a significant amount of testimony on whether we should throw out those years or not. And there's various opinions on that. So everything you said is exactly right, but it's sort of, you know, gonna be -- you had that same discussion in the past resource adequacy studies and in the avoided costs when we had the solar integration service study, those type of issues came to bear, you may remember. So we will address those. Hopefully not in a late-filed exhibit.

Q. Not in late-filed, and preferably not even in this hearing. We have enough things that we're disagreeing with. So I appreciate that. No further questions.

CHAIR MITCHELL: Commissioner McKissick?

EXAMINATION BY COMMISSIONER McKISSICK:

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Q. I want to first state that you -- as a panel, you've answered basically all the questions that were in the back of my mind going into this session. So I want to thank you for the excellent job that you've done in articulating responses to a variety of questions. Particularly ones dealing with batteries and gas and things of that sort.

The one thing that I wonder about substantially when we contemplate what direction we move in with the Carbon Plan is how realistic these deadlines are. Our projected deadlines for specific types of projects. I think, with solar, you know, we have an established track record about how long projects would typically take and how long it's gonna take to come online. You know, we talk about CTs, CCs, we have some idea.

But I guess the thing I don't know, when you sit here and work your models, when you're talking about something like small modular reactors, or you're talking about offshore wind or even onshore wind, how much you build in the potential for delay. Or for more -- or taking into account factors that could influence when that power will become available. And when I say that, I mean, we know when it comes small

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modular reactors, there's a lot of unknowns there that are gonna potentially impact when that's available to us if we go down that path. And we know they're regulatory as well as technology-wise, notwithstanding what GE and Hitachi are doing.

So, I mean, I do get concerned about the timelines, because I know that, notwithstanding offshore wind being an established technology, what's gonna happen when we have people protesting it because they don't want to see the turbines? Or we end up with litigation? Or we talk about onshore wind and we end up with a moratorium that could impact the entire eastern part of our state? Or we start talking about transmissions to get the power from the coast down there, you know, to inland from New Bern to where that power is needed, there are gonna be people protesting transmission lines. Or we go out and build out everything in the red zone, and then when there's a proliferation of solar, you end up with moratoriums like Person County.

So how much are you actually thinking about the potential for delay? And is that even a factor at all, because it's too difficult to anticipate? And it may be that there's an answer that's related to one of

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those technologies that's not applicable to others. So can you help me out with that?

A. (Glen Snider) No, it's certainly -- you know, when we talk about execution risk -- and again, shining a spotlight on that in this Carbon Plan in a brighter way than we ever have in any past IRP, right? You know, what are the actual risks and benefits associated with execution? I think you just did a great job of articulating that there is not a resource in this plan that may not get some amount of pushback at some -- whether it's the transmission, the land, the, you know, nuclear, the offshore wind, you know, site.

And so, you know, I do think we put in -- you know, these timelines are expanding a little bit compared to what they used to be. So we have expanded them. And if you look at -- I think we had some exchange when we were in here on direct of, hey, you can just put a CT in in two to three years and a CC in three to four. Well, in a perfect world with, you know, no opposition whatsoever, that might used to have been the case years ago.

But we have acknowledged that these are taking longer. We build in, sort of, an execution

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expected date. You know, on the financial side, we put in contingency. What you're talking about is almost like a time contingency. Do I need to build a year in for litigation or protests? And certainly, you know, that's a risk with all. And I appreciate the fact that you've pointed out it's not -- it's easy to pick one, hey, look at what's happened to this, you know, wind project, or look what's happened to this gas project and then protesting that permit or -- but you can -- I can point them out across all the way you just did.

So again, sort of back to Commissioner Duffley's question of, you know, this is why you wouldn't want to have your whole Carbon Plan built on one or two technologies, because if those delays would then magnify because you're betting all your carbon reduction and your fuel reductions on that one technology. So, you know, diversification is the best I think we can do on that, starting with our Grid Edge stuff, and really pushing hard on that. And I know there's been a lost discussion on that.

And then diversifying your supply side so that those risks that you just articulated very well aren't -- aren't magnified by just going into one of them. So that's -- we have expanded them, there is --

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some of them are still aggressive, and no doubt in my mind that there is some aggressiveness on these, whether it's solar interconnection or SMR timelines or wind timelines.

But I really appreciate the way you asked the question, which is don't let yourself get too hung up on one technology, because you're just gonna trade that risk off. If you say I'm not gonna do you it because of that risk, you're just choosing to transfer that risk to other technologies. And so I think the model showed it from a quantitative, and I've said this a couple times, but from a qualitative, I think you get the same benefits that the quantitative model set. You're diversifying those types of risks that are very difficult to put into a production cost model.

A. (Bobby McMurry) Just to add to it. I mean, you're thinking exactly what we were thinking when we were developing the plan. I mean, that's the reason you have P1, 2030, P2, 2032, P3 and 4 in '34. You know, we'll push to try to get things, you know, completed earlier, but there's risk across the board on every technology. And that's the reason we provided you a suite of options to get there. It wasn't like we were trying to pick one over another. We just tried to

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identify many of the risks that you just brought up. So that -- I don't know --

A. (Glen Snider) That's a good point. Thank you, Bobby.

Q. Yeah, I mean, it certainly speaks to the value of optionality, and I -- the more I study these materials, I understand the potential merit in that approach. You say you've expanded the timelines out on some of these projects.

When you expanded the timelines, did you also take those factors in consideration as related to cost?

A. Yeah. Each of the technologies have, sort of, a spend curve in it, it says here's how much is getting expended year by year over that timeline that leads up to its install cost inclusive of AFUDC. And then we do put some contingency, as I said earlier, or the people that provide that have a contingency cost in there that recognizes some time, some materials, you know, that you're gonna need a contingency in a project. And when we bring a CPCN, you often look at, you know, do we have adequate contingency in our CPCN. So we do -- we do look at the cost sort of year by year, and then how much contingency we may need on those costs.

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Q. And I really appreciate the depth that goes into the exhaustive work that you do when you're modeling, because it's a really awesome task that -- when you're undertaking it and looking at all these variables.

As we look forward to 2024, I mean, one of the things I heard a lot about from intervenors was the way that the modeling was done. There was a lot of assumptions that were made by Duke, or limitations that were put on the model, and that they -- you know, when it comes to EnCompass. But that there was a need to share greater information along the way.

And in my mind, one thing that needs to be done along the way are more technical conferences, to be completely candid. Because there's a lot more that can come out in technical conferences than what we can do in these hearings which are more litigious, in a way, rather than informational.

So what improvements can you see, moving forward going toward 2024, that can address the concerns I've heard from intervenors during the course of this hearing?

A. Yeah. No, I think that's a fair question. And, you know, again, I think the intervenors

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recognize, we recognize the timeline was very compressed for everybody. This has been -- you know, from the time the legislation passed to having tens of thousands of pages before this Commission, there was tremendous work by all the intervenors, I applaud them, there was good participation in our broad meetings as well as some of our technical meetings. So hopefully having -- and I heard a couple other witnesses say this, having a little bit more time.

But then balancing the fact that as we sat here today, the technical experts didn't agree, right? So some people say costs are going up, some say they're going down. Some say they're gonna perform like this, some say they're gonna perform like that. So we can meet all day long and we're not gonna get alignment, it's just the -- you know, I've been doing this a long, long time. You are not gonna get ten parties in the room to agree on all these critical inputs. But we can have, you know, a series -- I don't disagree with you that having some more technical meetings, understanding each other's perspectives and perhaps the range of prices.

You know, it's frustrating for me, for example, to come in and relitigate CT and CC costs 10

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years in a row. I mean, we've had hours before this Commission, for example, on, you know, no, you -- that's a misrepresentation of a CT to use an LM6000, that's not what's not in your Carbon Plan. We had in it in the avoided cost, we had it in the last IRP, and we get the same 30 pages of testimony, you know, that we have to then spend our time and resources, the intervenors spend theirs.

It would be nice to litigate some of these once and then have a much more narrow range. Not to say there's no uncertainty. Same thing for a lot of these inputs. If we can start honing in and not relitigating in every proceeding the same issues, and perhaps, you know, some more technical conferences, but perhaps, you know, at some point the Commission says, you know, let's stick within this range unless there's compelling evidence to go outside of it. Because I think I've relitigated what a generic CT cost is and these same issues for 10 years.

And we get a decision out of the Commission says, you know, we have these finding of facts and, you know, we agree with you here, we disagree with you here, economies of scope, economies of scale, use a four-unit, and then it's like we start from square one

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again when we go into the next proceeding, and we start all over. That probably can -- you know, we can expedite that by both having some -- less litigious but then say, hey, we've been down this path, why don't we agree to make that a much narrower range.

Same thing for battery cost or same thing for solar cost and, you know, maybe find some of these issues where we can find some common ground on will help have a little bit more time. Some more technical conferences is certainly beneficial.

So I think there are some things we can do, and we're committed to work with the Public Staff and stakeholders. Again, in balance, we've got probably -- as much as I hate to say it, but going into next year you've got even more dockets, because you're gonna have procurements and CPCNs and execution dockets and MYRPs and, you know -- so it's the same people, the same resources, and it would be nice if we just had 365 days to sit and meet and try and find alignment. But when we're in six different dockets, we're gonna have to not think that we can just have too many stakeholder meetings while we're simultaneously adjudicating multiple dockets.

So finding that balance, you know, we're committed to do, we're committed to stakeholder engagement, and we just need to find that and find that balance. But I think I'm with the other intervenors that said given a little bit more time and a few more meetings and, you know, I think we went to unprecedented lengths to give a lot of data. We've had some learnings in this that will apply to the next one.

You know, if -- a couple more meetings on modeling up front to explain some of the parameters to make sure we're all on the same version and we're all looking at the data and testing it together. You know, there are things we can do on the modeling process that we've learned on this one, so maybe that helps as well.

So I'm hopeful that we can start to hone in on some of these with a little bit more time and learnings would be my answer.

Q. Sure. And I appreciate that. I mean, I think that's the type of attitude you really have to have moving into 2024. Because I'm seeing this as just, you know, really a first step in us going down this pathway that we're gonna continue doing as a Commission. Not necessarily this group of Commissioners, but the Commission doing for quite some time to come every two years.

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A. Not the same witness either for many years to come, that's why we're bringing up our younger guys.

Q. And I hope that, you know, going into the next cycle, yeah, I think the -- what you articulated in terms of, kind of, an overall aspirational commitment of inclusiveness would be excellent. And I think the extent to which, you know, the limitations in the model before it, you know, it's shared so that people can duplicate it and see how close they get to the same outcomes, whatever assumptions there are, before people find it's just not working would be extraordinarily helpful.

So that's the only thing I would share observation-wise. But I appreciate all the information you've shared this afternoon and in the preceding time that you came before us. It's been very insightful. Thank you.

A. Thank you, Commissioner.

CHAIR MITCHELL: All right. Commissioner Kemerait?

MS. KEMERAIT: No.

CHAIR MITCHELL: Okay. Commissioner Clodfelter?

EXAMINATION BY COMMISSIONER CLODFELTER:

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Q. Mr. Snider, you're gonna hate me for this but I got one more gas question. I'm sorry. I didn't get them all done and that's my fault, I apologize. On pages 57, 58 and 59 of your rebuttal testimony, there is some -- I'm not gonna ask you to go into the confidential portions, I'm gonna ask you something about the information.

You've got some confidential data in there about the assumptions you used about firm transportation cost assumptions in your modeling.

The question I want to ask is, when you develop those assumptions about the cost of firm transportation, either on Mountain Valley Pipeline or from Transco South or other southern pipelines, did those cost assumptions take into account the fact that the pipeline owner would be trying to recoup from you the cost of the upgrades that they would have to finance in order to deliver that firm transportation capacity to you?

A. Yes, they did.

Q. They did. So I can look at this number on this page and know you've tried to take into account what the -- what did you use as a source for estimating the costs of those projects?

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A. So with -- again, without going into confidential, we are in -- in our normal course of business, we work with the pipelines and get rough estimates of, hey, at this level of need, what are we looking at, what's involved, and what are our options. And so our -- this is something that's ongoing between us, we are, you know, in a related industry. Their product is one that we need to convert to electricity.

So we meet with them, not me personally, on a fairly regular basis. And our procurement team gives us prices that they believe are reflective of what those entities would need for a return on and over a long-term agreement.

Q. These numbers reflect some back-of-the-envelope information that you got from the pipeline owners?

A. And depending on where you're at in those discussions, some are more or less back of the envelope.

Q. Got it. Thank you.

CHAIR MITCHELL: Any additional questions for the panel?

(No response.)

EXAMINATION BY CHAIR MITCHELL:

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Q. Mr. Snider, just a couple. Or really panel.
Do you -- when do the Companies anticipate filing CPCN for the next gas-fired asset? Have you gotten that far?
A. (Glen Snider) Yeah. I think, you know, we're looking in all likelihood -- we talked a little bit about in the execution plan. I don't know if we give a month. But it's end of Q3, maybe Q4 of next year.
Q. '23?
A. Yes.
Q. Okay. Do SP5 and SP6 support the near-term actions that the Company is proposing?
A. We believe they do.
Q. Okay. So 1 through 4 plus 5 and 6?
A. If you -- especially if you look at them in totality, right? So maybe it's not the exact megawatt or the exact year, but if you look at the totality and view 5 and 6 as stress tests on 1 through 4, we believe that we've had a limited number of resources in our Near-Term Action Plan that we say are generally consistent with all of our portfolios. So, you know, while I may not match one portfolio to the exact year or the exact megawatt, the balance of all 12, looking

at it from various perspectives, we think this is a set of no-regrets actions that are supported by extensive analysis inclusive of the supplemental IRA analysis that we did.

So we think, between the 12 portfolios and then the IRA analysis as a quick check, and again, understanding you're gonna get a lot more information in '23, it's not -- you know -- but we believe our Near-Term Action Plan has been validated through just, you know, pretty much an exhaustive set of analysis that we've been doing pretty much nonstop since this started.

Q. Okay. Okay. The Company has proposed and discussed -- the Companies have proposed conversion of gas-fired assets to hydrogen-fired, you know, if and when that market materializes.

If it doesn't materialize, what's the plan -- you've answered this, I just want to make sure my recollection is correct, but what's the plan for those assets beyond 2050?

A. Sure.

Q. The gas-fired assets that still remain in service.

A. So first of all, I think hydrogen is probably

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not a -- we've, sort of, characterized it as a yes or a no. It's probably somewhere in the middle, like how much and how viable and how extensive, right? It's probably not, you know what, 20 years from now nobody has any hydrogen, or hydrogen is really cheap and it's widely available for all gas plants. So I will -- I want to answer your question, but I want to say, you know, we sort of characterize this as a no-go or go, and it's probably something in the middle.

But if hydrogen for whatever reason becomes completely uneconomic or never develops, we've talked about really three or even four outcomes, right? So first of all, an offset market, while non-existent today, is certainly -- it's industry recognized that that last 5 or 10 percent is extraordinarily expensive with today's technologies.

Anything we're talking about in this plan, you know, if you assume hydrogen doesn't become, or some other long-duration storage doesn't become viable, that offsets markets may need to fill that void for that last little bit, we're talking -- you know, we're not talking huge amounts. We're talking that last 5 -- in 951's case, that last 5 percent.

So you could burn a limited amount as a

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reliability resource under an offset market. You could potentially -- again, we haven't -- we didn't put it in because there's no current geology that we see. But, you know, I think Commissioner Clodfelter brought up, you know, 30 years from now is sequestration. There's gonna be a lot of people trying to crack that solution. Is there a limited amount of sequestration in 20 to 30 years?

And again, may not be for all of it. Can I sequester just a limited amount of it? And then, ultimately, if something doesn't come to fruition, we're not gonna let the grid go dark. I mean, there is a reliability out under every piece of legislation that's ever been passed. I think preserving reliability is paramount, right?

So 951 allows -- if some other technology, whether it's hydrogen, offset market, sequestration, long-duration storage, if something doesn't come to fruition, you have the right to run that on a limited basis for reliability. And then if all of those levers, you know, move against you, there is the potential that you could have to stop operating.

So if all four of those knobs get turned and along some iron battery that's pennies on the dollar

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comes to fruition and you can use that, then potentially there's in the hundreds of millions of risk, which I just asked this Commission to put in context with the billions and billions of investment and other technologies and not let it be painted as the primary risk in this docket. It is probably not even making the top five.

So, you know, we've let it be painted as the number 1, and I'm saying if you actually looked at it holistically, it's on the list, but don't let it be painted as number 1 the way it's been for three weeks. So that's where I'm at.

Q. What is number 1, in your opinion?

A. I think number 1 is, if you were to go no gas and go concentrated I want 6-, $7 billion worth of storage in the next few years, you're gonna wear a lot more risk than you're gonna wear by building a limited amount of hydrogen-capable gas. There's no getting around that. Twenty-five-year contracts on emergent technologies that don't have any operating experience for 20 years and chemistries are gonna stay perfect, you know, that's just unlikely, right?

And whether they go up or down, you're wearing risk. And so that's -- you know, but we're not

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proposing that, and I don't think many of the intervenors really -- if you step and say in the near term what should we do over the next few procurements, does it really make sense to go concentrated.

Staying in coal. If I stay in coal and don't do something to get out of coal, if I don't have it, that in and of itself, given the supply constraints that we're seeing on fuel supply and the lack of OEM -- you know, OEM manufacturers, skilled labor, that's gonna dwindle over the next decade, right? So staying in coal is not an option.

So I do think, you know, the number 1 risk depends on where we try and -- where we try and consolidate. And if we consolidate everything into just a handful of resources, then that's gonna be your number 1 risk.

Q. Okay. The CAPEX, to the extent there is one, difference between a hydrogen-capable gas asset versus one that wouldn't be, is there a way for you-all to determine that at this point?

A. I'm gonna let Mr. Quinto --

Q. Does my question make sense?

A. The OEMs have given us quotes on this and where they think we're gonna be over time. But in

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terms of CAPEX differences for hydrogen, did you want to --

A. (Michael Quinto) Yeah, I'll say a couple things, and Mr. McMurry can add. Right now, all of the main OEMs are moving towards the direction of making their CTs, combustion turbines, whether they're simple cycle or combined cycle, hydrogen capable. They understand that that's a recognition in the industry that that's gonna be important for the viability of their assets long term. That's being factored into the price that they're, you know, projecting out into the future.

The cost that we've assumed, you know, may be on the scale of 30 to 50 percent when put into service, but by 2030, that could be 100 percent. Now, the cost that we've factored in look at conversion costs, but late in the period. So that would be plenty of time to continue to see how is the best way to retrofit these assets going forward to make them 100 percent hydrogen capable, or to not do those conversions.

Q. Okay. So your percentages were percentage-run hydrogen?

A. That's correct.

Q. Okay. Okay. So you said early on you're

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looking at 30; is that right, 30 to 50?
A. Yeah. I'm not a combustion turbine expert, but I believe the existing fleet, some of the units can even run up to 30 percent today. The ones that we have on the system.
Q. Okay. I assume the newest -- those are units you-all have in service today?
A. Yes.
Q. Okay. Okay. Let's see. You-all have been in the room for a couple of days now, and I assume you've have been listening or you've been briefed about the testimony that's been given in this hearing room over the past couple of weeks.
Are there -- are there -- do you want to provide a response, Mr. Snider, to any of the questions that I have asked of any witness in this proceeding, and answers that I've been given, just in response to answers that I've been given? Just kind of opening it up to you to respond to any questions I've asked of any other witness.
A. (Glen Snider) Yeah. You know, I think, you know, a lot of the witnesses, we've covered a lot of water here this afternoon and I've addressed probably 89, 90 percent of what I've heard. And I think, in

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fairness, a lot -- the witnesses put in a lot of effort, they come from a different perspective, so I'm not -- I appreciate the effort they've put in. We've learned from our engagements with them.

So it's just different perspectives, I think, on, you know, when you highlight some of the -- like I said, some of the risks on -- you know, the one thing I would say most witnesses are saying is you just take the capacity expansion model, and when you're not -- when you don't have Mr. Holeman and Mr. Roberts sitting around you every day or, you know, watching the load on the screen every day, it can become a little bit academic in nature. Like, hey, this model is the answer, right? Like I just put things in P5 or in CAPEX, and if P5 says this, this is what we do.

And, you know, so a lot of the witnesses answered from sort of that, you know, academic perspective. I do modeling, I've done modeling for 10 years. You know, we're doing modeling but we're sitting amongst the people responsible for operating the system. So as Mr. Holeman always tells me, you know, please try your best to model the system as we operate it so that when you deliver us a plan, I can operate the plan you deliver.

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And so some of those realities, you know, we paint as, you know, out-of-model adjustments, or Duke has its thumb on the scale. And, you know, as I've told this Commission in our direct, this case is the first time ever it's so obvious that we don't have our thumb on the scale. I wish there was cheap long-duration storage and I didn't have to build a new gas plant.

I will -- you know, if I was out just saying maximize revenues, I'll make more in battery -- as a Company in battery and solar and transmission than a gas plant. I am not trying to build a gas plant for profits for the Company. This is for Mr. Holeman and Mr. Roberts saying give me a diverse set of resources that diversify risk so that I can orderly work through this energy transition.

And, you know, I think the one thing that I probably disagree with all the witnesses were they say we somehow had our thumb on the model or we've done things out of model. We tried to use the best tools that were available, whether it was a model, whether it was an input to the model, to reflect the realities that we face day in, day out, and use the best tools to evaluate those analytically.

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So some of the questions you asked intervenors, you know, when they characterize us as doing things with a bit of a thumb on the scale or a profit motive, I can promise you the engineers that sit here and run these models don't have an ounce of that in them. They are really trying to take what Mr. Holeman and Mr. Roberts said and say, how do I specify these models in a way that, to the best of our ability, you know, tries to capture how the system is gonna run.

And so all that said, I appreciate the input of the intervenors, appreciate them participating, the effort they put into it. We did take a lot of their input. We didn't even talk a lot about that in the proceeding, but some of the inputs throughout the stakeholder processes, how we specified certain technologies, like bifacial with the tracking, you know, trying to middle ground on interconnection even though we're not there, probably not as far apart as may be painted out in this.

So there was a lot of good back and forth that I applaud the intervenors on. But that's probably my biggest one that I'd end with.

Q. All right. Well, thank you for that

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response.

CHAIR MITCHELL: All right. Any additional questions? All right. Let me see who has questions on Commissioners' questions. I'm hoping we can get this panel out of here today. Raise your hands up high so I can see.

MR. SNOWDEN: If you do or do not?

CHAIR MITCHELL: If you do.

MR. SNOWDEN: Okay.

CHAIR MITCHELL: All right. Well, we are not gonna get out of here today. So we will end it for today. Let's go off the record. We will be back on the record at 9:00.

(The hearing was adjourned at 4:54 p.m. and set to reconvene at 9:00 a.m. on Wednesday, September 28, 2022.)

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CERTIFICATE OF REPORTER

STATE OF NORTH CAROLINA)
COUNTY OF WAKE)

I, Joann Bunze, RPR, the officer before whom the foregoing hearing was conducted, do hereby certify that any witnesses whose testimony may appear in the foregoing hearing were duly sworn; that the foregoing proceedings were taken by me to the best of my ability and thereafter reduced to typewritten format 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 1st day of October, 2022.

JOANN BUNZE, RPR

Notary Public #200707300112

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