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September 4, 2019

Via Electronic Filing

Chief Clerk
North Carolina Utilities Commission
430 North Salisbury Street
Dobbs Building
Raleigh, NC 27603-5918

RE: Biennial Determination of Avoided Cost Rates for Electric Utility
Purchases from Qualifying Facilities - 2018
Docket No. E-100, Sub 158

Dear Chief Clerk:

Enclosed for filing in the referenced docket is the *Post-Hearing Brief of Southern Alliance for Clean Energy*. A copy of the brief in Microsoft Word will be submitted to briefs@ncuc.net. By copy of this letter, I am serving all parties of record on the service list.

Please let me know if you have any questions about this filing.

Sincerely,

/s/ Maia Hutt

MDH/lgf
Enclosures
cc: Parties of Record

TABLE OF CONTENTS

I. Introduction 1

II. Federal and State Law Supports the Development of Alternative Energy..... 5

III. Duke Energy’s Proposals in this Docket Would Hinder the Development of Renewable QF Energy in North Carolina and Undermine Legislatively-Mandated Solar Programs..... 9

IV. Duke Energy’s Proposed Solar Integration Charge and Duke Energy and the Public Staff’s Solar Integration Charge Stipulation Rely on an Inappropriate and Untested Study Methodology..... 14

V. Flaws in Astrapé’s *Solar Capacity Value Study* and 2016 RA Studies Undermine the Seasonal Capacity Weighting Assumptions in the Rate Design Stipulation..... 39

VI. The Utilities’ Proposals Regarding Battery Storage Technology Conflict with the State’s Policy of Encouraging Alternative Energy and Carbon Reduction and Violate the Plain Language of Existing PPAs 49

VII. Conclusion..... 55

PURSUANT TO North Carolina Utilities Commission (“Commission”) Rule R1-25, the Presiding Commissioner’s ruling made in open hearing on July 19, 2019, intervenor Southern Alliance for Clean Energy (“SACE”), through counsel, files this brief on certain issues in the current biennial proceeding, which concerns the 2018 avoided cost rates for Duke Energy Carolinas, LLC (“DEC”), Duke Energy Progress, LLC (“DEP”) (together “Duke Energy” or “the Companies”), and Dominion Energy North Carolina (“Dominion” or “DENC”) (collectively, “the Utilities”). This brief is focused on several key issues raised at the evidentiary hearing in this proceeding. SACE is also filing a joint proposed order with the North Carolina Sustainable Energy Association (“NCSEA”) and North Carolina Clean Energy Business Alliance (“NCCEBA”) addressing additional issues raised in the proceeding.

I. INTRODUCTION

SACE respectfully submits this brief opposing (1) Duke Energy’s proposed Solar Integration Services Charge (“SISC”), (2) Duke Energy’s proposed capacity rate design and seasonal capacity weightings, and (3) Duke Energy and Dominion’s proposed revisions to the Power Purchase Agreement (“PPA”) Terms and Conditions that would discourage the addition of battery storage to renewable energy facilities.¹

The Public Utility Regulatory Policies Act (“PURPA”) and House Bill 589 (“HB 589”) were intended to foster the development of alternative energy sources and expand the market for energy and capacity in order to benefit ratepayers.² In direct contravention

¹ This brief also opposes Duke Energy and the Public Staff’s April 18, 2019 Stipulation of Partial Settlement regarding Rate Design (“Rate Design Settlement”) and May 21, 2019 Stipulation of Partial Settlement Regarding Solar Integration Charge (“SISC Settlement”).

² See *infra* Section II.

of these goals, the Duke Energy's proposals would, if approved, undercut the development of renewable energy in the State by artificially decreasing avoided cost rates, imposing unjustified charges on solar facilities, and stifling innovation.³ In seeking to justify their anti-competitive proposals, the Utilities take up the banner of consumer protection, asking the Commission to second guess the conclusions reached by Congress, the United States Supreme Court, and the North Carolina Legislature, that promoting alternative energy development benefits ratepayers.

The Utilities have proposed in this proceeding integration charges aimed exclusively at solar power projects that will make it more expensive for solar projects to operate in the state going forward and have widespread implications for solar programs beyond PURPA standard offer contracts. Duke Energy's Solar Integration Services Charge in particular, is based on a study methodology that is too far divorced from the actual reliability standards the Companies must meet, lacks sufficient empirical testing, and has never been adopted by any Commission for the purpose of quantifying renewable integration costs.⁴ Duke Energy asks the Commission to disregard the recommendations of SACE Witness Brendan Kirby, who wrote the National Renewable Energy Laboratory ("NREL") technical report on operating reserves and variable generation,⁵ in favor of a consultant who is "not an expert" on the operation of the North American Electric

³ See *infra* Section III.

⁴ DENC's Re-Dispatch charge also raised many concerns by intervenors, but DENC took steps to address the concerns raised, with the end result of reducing their proposed charge from \$1.78/MWh to \$0.78/MWh. Tr. Vol. 5, p. 21, l. 19 – p. 22, l. 4; Tr. Vol. 5, p. 39, ll. 1-6. DENC has still failed to account for any solar benefits that would offset the charge, but the Company has at least addressed some of the concerns raised. Tr. Vol. 5, p. 208, l. 16 – p. 210, l. 6. In contrast, Duke Energy has not taken any steps to address intervenor concerns, other than to run ambiguous "post-processing" techniques exclusively for the Public Staff.

⁵ Tr. Vol. 5, p. 289 l.24 – p. 290 l.18. Witness Kirby's credentials are not in dispute. See Tr. Vol. 4, p. 208, ll. 10-20 (Duke Energy Witness Wintermantel acknowledging Witness Kirby's "great credentials").

Reliability Corporation (“NERC”) standards or the relationship between geographic diversity and solar volatility;⁶ has no power system operating experience;⁷ and admits that key assumptions in the *Ancillary Service Study* were dictated by what “Duke employees... [who] had their hands in this model” wanted rather than empirically based scientific standards.⁸ But even Duke Energy’s own data demonstrates that the Ancillary Services Study’s predictions do not reflect reality.⁹ In fact, Duke Energy’s historic data demonstrates that contrary to the Companies’ assertions, increases in solar capacity have not correlated with increased operating reserves.¹⁰ The *Ancillary Service Study* underlying the Companies’ proposed SISC is untested and unreliable, and cannot be reasonably relied upon to impose a charge on solar Qualifying Facilities (“QFs”).

Duke Energy’s proposed seasonal capacity weighting and capacity rate design are also problematic, as they devalue the capacity contributions of solar QFs. Duke Energy has chosen to mostly ignore testimony provide by SACE Witness James Wilson critiquing the Companies capacity rate design and seasonal capacity weightings, despite the Commission’s orders in other proceedings requiring that Duke Energy work towards resolving these issues.¹¹ Instead of resolving the persistent issues identified by Witness Wilson in Duke Energy’s resource adequacy studies, the Companies merely reference a Joint Report between Duke Energy and the Public Staff that fails to address many of Witness Wilson’s concerns.

⁶ Tr. Vol. 4, p. 190, ll. 10-16; Tr. Vol. 6, p. 23, ll. 6-8.

⁷ Tr. Vol. 4, p. 176, ll. 16-17.

⁸ Tr. Vol. 4, p. 181, ll. 19-22 (explaining that “the Company has chosen” not to include calculated geographic diversity benefits in its modelling”); Tr. Vol. 4, p. 207, ll. 3-4 (“The Duke employees who have years and years of experience had their hands in this model”).

⁹ See *infra* Section IV.B.2.c.

¹⁰ See *infra* Section IV.B.2.d.

¹¹ See *infra* Section V.

Finally, the Utilities paradoxically propose contract terms that will halt deployment of battery storage, even as they acknowledge the potential of storage to address the intermittency characteristics they say justifies the imposition of a solar integration charge. All parties agree that co-located solar and battery storage facilities can operate to smooth out solar intermittency and shift energy production to valuable peak demand hours.¹² Nevertheless, the Utilities propose new contract terms that would prohibit QFs from adding battery storage equipment to their facilities without forfeiting their PPAs. Worse, the Utilities attempt to retroactively, illegally alter the terms of existing QFs Power Purchase Agreements (“PPAs”) to prohibit QFs from adding battery storage. These proposals would unreasonably restrict QFs ability to take advantage of beneficial new battery storage technology, stifle the continued development of renewable energy in the State, and disadvantage ratepayers by “leaving value on the table.”¹³

In sum, the Utilities’ proposals in this docket conflict with Federal and State law, impose integration charges that will impede independent solar production based on flawed studies; discount capacity contributions by QFs; and stifle the adoption of battery storage despite widespread acknowledgement of its benefits. SACE respectfully urges the Commission to reject these proposals as described in greater detail below.

¹² See *infra* Section VI.

¹³ Tr. Vol. 6, p. 300, ll. 21-22.

II. FEDERAL AND STATE LAW SUPPORTS THE DEVELOPMENT OF ALTERNATIVE ENERGY

This proceeding is governed by federal and state law, the stated policy of which is to promote alternative, renewable energy development and increased competition to the benefit of ratepayers.

A. **PURPA Requires Encouragement of Alternative Energy Development and Fairness to Ratepayers**

Under Section 210 of PURPA, cogeneration facilities and small power producer facilities that meet certain standards can become qualifying facilities and become eligible to sell their power to electric utilities at the incremental cost of alternative electric energy, also known as avoided cost rates.¹⁴ Avoided cost rates reflect the costs a utility can avoid as a result of obtaining energy and capacity from the QF rather than buying it from a third party or generating it themselves.¹⁵ When QFs are paid at the avoided cost rates, ratepayers should be indifferent from a financial perspective as to whether their power is supplied by the utility or by a QF. In setting the “full avoided cost standard” in FERC Order 69, the FERC recognized that “[a]lthough use of the full avoided cost standard will not produce any rate savings to the utility’s customers, . . . ratepayers and the nation as a whole will benefit from the decreased reliance on scarce fossil fuels, such as oil and gas, and the more efficient use of energy.”¹⁶

¹⁴ 16 U.S.C. § 824a-3(d).

¹⁵ *Id.*

¹⁶ FERC Order 69, at 12,222 (establishing the “full avoided cost standard” and citing commenter perspectives regarding benefits broader than the avoided cost savings); Tr. Vol. 2, p. 334, ll. 20 – p. 335, l. 5.

Underlying the requirements of PURPA is the reality that monopoly utilities have historically been reluctant to purchase power from independent, alternative energy facilities.¹⁷ Indeed, “PURPA was enacted, in part, to address discrimination by electric utilities in the availability and price of power that they sell to and buy from cogeneration facilities for resale.”¹⁸ In enacting PURPA, “Congress believed that increased use of these sources of energy would reduce the demand for traditional fossil fuels, and it recognized that electric utilities had traditionally been reluctant to purchase power from, and to sell power to, the nontraditional facilities.”¹⁹

To this end, PURPA establishes a must-take obligation for utilities, paving the way for increased alternative energy development and consumer benefits by broadening the market to increase competition and shift away from fossil fuels. Courts across the country have consistently recognized PURPA’s role to encourage renewable energy development and bring new energy producers to market to compete with monopolies.²⁰ Courts and economists alike have also recognized that increased competition benefits customers by lowering prices.²¹

¹⁷ *FERC v. Mississippi*, 456 U.S. 742, 750, 102 S.Ct. 2,126, 2,132, 72 L.Ed.2d 532, 541 (1981) (“traditional utilities were reluctant to purchase power... from nontraditional facilities.”).

¹⁸ *See Indus. Cogenerators v. Fed. Energy Regulatory Comm’n*, 47 F.3d 1,231, 1,232 (D.C. Cir. 1995).

¹⁹ *Am. Paper Inst. v. Am. Elec. Power Serv. Corp.*, 461 U.S. 402, 404-05 (1983).

²⁰ *See Kamine/Besicorp Allegany L.P. v. Rochester Gas & Elec. Corp.*, 908 F. Supp. 1180, 1192 (W.D.N.Y. 1995) (recognizing “the ultimate effect of PURPA is to introduce new energy producers into the marketplace” and affirming the Federal Energy Regulatory Commission’s view that PURPA “tends to broaden the energy market as a whole” and that if “traditional utilities were successful in excluding [qualifying facilities (“QFs”)], then, the long-range effect could be to reduce competition.”) (internal citations omitted); *In re Ownership of Renewable Energy Certificates*, 389 N.J. Super. 481, 486, 913 A.2d 825, 828 (N.J. Super. Ct. App. Div. 2007) (“Congress enacted the Public Utility Regulatory Policies Act of 1978 . . . to increase competition in the production of electricity and reliance on renewable energy.”); *State ex rel. Sandel v. N.M. Pub. Util. Comm’n*, 980 P.2d 55, 58 (N.M. 1999) (“Congress introduced competition into the generation component of the electric power industry by enacting the Public Utility Regulatory Policies Act of 1978.”).

²¹ *See, e.g., Adam Smith, Wealth of Nations*, 219-20 (Amherst, New York: Prometheus Books, 1991) (“To widen the market and to narrow the competition, is always the interest of the dealers. To widen the market

Throughout this proceeding, utility witnesses have asked the Commission to second-guess the Supreme Court and Congress's conclusions, and to assume that the utilities have no bias against purchasing energy and capacity from nontraditional facilities, and no interest in setting avoided cost rates that stifle competition.^{22,23} But the will and intent of Congress, and the Supreme Court's interpretation of such remains controlling law and may not be discarded in favor of utilities' assurances that they will not seek to block competition to protect their monopoly power.

B. State Law Requires Fairness to Ratepayers and Encouragement of Alternative Energy Development

It is the policy of the State of North Carolina to promote the development of alternative energy and reduce pollution from fossil fuels.²⁴ For example, the State has committed to promote the development of renewable energy and energy efficiency through the development of a Renewable Energy and Energy Efficiency Portfolio Standard ("REPS") that will: "[d]iversify the resources used to reliably meet the energy needs of consumers in the State"; "[p]rovide greater energy security through use of indigenous energy resources available within the State"; "[e]ncourage private investment

may frequently be agreeable enough to the interest of the public; but to narrow the competition must always be against it, and can serve only to enable the dealers, by raising their profits above what they naturally would be, to levy, for their own benefit, an absurd tax upon the rest of their fellow-citizens."); *State v. Atlantic Ice & Coal Co.*, 210 N.C. 742, 188 S.E. 412, 416 ("[M]onopoly denotes a combination, organization or entity so extensive and unified that its tendency is to suppress competition, to acquire a dominance in the market and to secure the power to control prices to the public harm with respect to any commodity which people are under a practical compulsion to buy); *American Moto Sales Corp. v. Peters*, 311 N.C. 311, 318, 317 S.E.2d 351, 357 (N.C. 1984) ("horizontal restraints impede competition and lead inexorably to increased prices.").

²² See e.g. Tr. Vol. 2, p. 345, l. 24 – p. 347, l. 9; Tr. Vol. 4, p. 207, ll. 4-6. It is important to note that the Companies status as the top purchaser of QF power in the nation is not indicative of Duke Energy's lack of motivation to maintain monopoly power, but of a favorable regulatory environment for QFs arising from North Carolina's historical PURPA implementation.

²³ See also *State v. Atlantic Ice & Coal Co.*, 210 N.C. 742, 748, 188 S.E. 412, 416 (N.C. 1936) ("Ruinous competition by lowering pricing has been recognized as an illegal medium of eliminating weaker competitors") (quoting Fletcher's Cyc. Corps., Vol. 1, c. 56, § 5016).

²⁴ N.C.G.S. § 62-2(a)(10).

in renewable energy and energy efficiency”; and” [p]rovide improved air quality and other benefits to energy consumers and citizens of the state.”²⁵ Reducing pollution to our air and water is even enshrined within our state Constitution: “It shall be the policy of this State to conserve and protect its lands and waters for the benefit of all its citizenry, and to this end it shall be a proper function of the State of North Carolina and its political subdivisions to... *control and limit the pollution of our air and water.*”²⁶ It is this Commission’s role to “regulate public utilities... in relation to long-term energy conservation and management... in accordance with [these] policies.”²⁷

This commitment was recently reaffirmed and strengthened by Executive Order 80, signed by Governor Cooper on October 29, 2018. Among other things, Executive Order 80 set the goal of reducing greenhouse gas emissions to 40% below 2005 levels by the year 2025.²⁸

The passage of House Bill 589, S.L. 2017-192, created a new paradigm for renewable energy acquisition in North Carolina, but did not alter the State’s underlying commitment to promote alternative energy development. In signing HB 589, Governor Cooper stated that the bill was “critical for the future of significant increases” in North Carolina’s solar industry and reiterated that “a strong renewable energy industry is good for our environment and our economy.”²⁹

²⁵ N.C.G.S. § 62-2(a)(10).

²⁶ N.C. CONST. ART. XIV, § 5 (emphasis added).

²⁷ N.C.G.S. § 62-2(b).

²⁸ N.C. Exec. Order No. 80 at p. 1 (Oct. 29, 2018).

²⁹ *Gov. Cooper Signs Law Securing Thriving Solar Industry, Shows Commitment to Wind Energy with Strong Executive Order*, N.C. Governor’s Office, (Jul 27, 2017), <https://governor.nc.gov/news/gov-cooper-signs-law-securing-thriving-solar-industry-shows-commitment-wind-energy-strong>.

HB 589 established several legislative programs intended to spur growth of the renewable energy industry in North Carolina, including the Competitive Procurement of Renewable Energy (“CPRE”), N.C.G.S. § 62-110.8, Green Source Advantage (“GSA”), N.C.G.S. § 62-159.2, and Community Solar, N.C.G.S. § 62-126.8 programs. These programs provide an alternative to—but do not replace—the State’s PURPA implementation. Full subscription of the CPRE, GSA, and Community Solar programs, along with a strong QF PURPA presence, will be necessary in order to achieve the State’s alternative energy goals and commitments.

III. DUKE ENERGY’S PROPOSALS IN THIS DOCKET WOULD HINDER THE DEVELOPMENT OF RENEWABLE QF ENERGY IN NORTH CAROLINA AND UNDERMINE LEGISLATIVELY-MANDATED SOLAR PROGRAMS

Viewed together, Duke Energy’s proposals will harm the financial viability of PURPA solar QFs and solar generators participating in HB 589 programs, in direct contravention of PURPA and HB 589’s intent. Duke Energy’s proposals also stand to further harm ratepayers by narrowing the market and eliminating competition, and by unnecessarily inflating the costs of CPRE and other HB 589 programs.

A. Duke Energy’s Proposals in this Docket will Further Degrade Opportunities for PURPA QF Development

In the Commission’s E-100 Sub 148 Order Establishing Standard Rates and Contract Terms for Qualifying Facilities (“Sub 148 Order”), it stated that “[t]he Commission will continue to monitor the amount of actual QF development and the stability of avoided cost rates to ensure that ratepayers are not exposed to undue risk of

overpayments, while at the same time providing QFs with an opportunity to obtain financing on reasonable terms.”³⁰ Since then, zero (or nearly zero) QFs have signed standard offer PPAs at the Sub-148 rates.³¹

Duke Energy’s proposals in this docket promise to impose further restrictions on QFs. Duke Energy’s Late Filed Exhibit 4 illustrates the difference in estimated annual payments for the “average” one MW solar QF under the Sub 148 rates and the rate design proposed in Duke Energy and the Public Staff’s Rate Design Stipulation in this docket.³² First, it is important to note that while the Commission requested that Duke Energy include the proposed SISC as a decrement,³³ Duke Energy has not done so, noting at the bottom of Late Filed Exhibit 4 that the comparison “does not reflect the DEC Administrative Charge (DEP Monthly Seller Charge) or the Integration Services Charge.”³⁴ The omission of the proposed SISC—\$1.10/MWh in DEC and \$2.39/MWh for DEP—from the comparison means that the annual payments QFs would receive under the currently proposed rates will be substantially lower than those predicted in Late Filed Exhibit 4. The SISC, if approved, would result in a \$2,390 payment reduction in DEC and \$5,277 payment reduction in DEP relative to the total annual payment provided in Late Filed Exhibit 4.

Even without the SISC factored in, Late Filed Exhibit 4 paints a dire picture for QFs if Duke Energy’s proposals are approved. According to Late Filed Exhibit 4, a QF

³⁰ Order Establishing Standard Rates and Contract Terms for Qualifying Facilities at p. 38, Docket No. E-100 Sub 148.

³¹ Tr. Vol. 2, p. 348, ll. 14-19. Following the hearing SACE reached out to Duke Energy to clarify whether any Standard Offer sub-148 PPAs had been signed. At this time SACE has not been provided with any updates beyond the hearing testimony.

³² Duke Energy, Late Filed Exhibit No. 4.

³³ Tr. Vol. 7, p. 153, l. 7 – p. 154, l. 9.

³⁴ Duke Energy, Late Filed Exhibit No. 4 at p. 1.

in DEC would experience a 27% decrease in total annual payment and a QF in DEP would experience a 27% decrease. With the SISC included, a QF in DEC would experience a 30% decrease in total annual payment and a QF in DEP would experience a 33% decrease.³⁵

The application of the proposed SISC in the manner detailed in the SISC Stipulation would further harm the financeability of PURPA QFs in North Carolina. The decreases to QF's annual payment discussed above do not consider the impact that the proposed "two year refresh" and SISC cap would have on the financeability of solar QFs. In the May 21, 2019 Stipulation Regarding the Proposed Solar Integration Services Charge ("SISC Stipulation"), Duke Energy and the Public Staff agreed that it was appropriate for the proposed SISC to be "refreshed" at every biennial avoided cost proceeding, so long as the new SISC did not exceed a "cap" set for each vintage. For the Sub 158 vintage, the SISC Stipulation included a cap of \$3.22 for DEC and \$6.70 for DEC—almost three times the proposed SISC for the Sub 158 Vintage.³⁶ Duke Energy Witness Snider recognized that a solar facility seeking financing as a QF or planning to bid into an HB 589 program, would have to assume the full cap would apply during the contract.³⁷

Regarding the two-year reset, the Commission disallowed a similar proposal by Duke Energy to "reset" energy prices every two years under the standard offer contract in the E-100 Sub 148 proceeding. The Commission declined to adopt the two-year reset

³⁵ Solar QFs with co-located battery storage located in DEP could potentially maintain their total annual payments, but Duke Energy's proposed terms and conditions regarding the addition of battery storage to existing QFs strongly disincentivize the addition of battery storage. *See infra* Section VI.

³⁶ SISC Stipulation, p. 9.

³⁷ Tr. Vol. 3, p. 27 1.21 – p. 28 1.20

because it would impair QFs' right to long-term fixed rates that enable financing at the outset of its obligation under PURPA.³⁸ Because the two-year refresh of the SISC would similarly impair the QF right to long-term fixed rates that enable financing at the outset of the QF obligation, the two-year reset should likewise fail for the same reasons articulated by the Commission in the Sub 148 proceeding.

Taken together, Duke Energy's proposals in this proceeding, and the terms of the SISC and Rate Design Stipulations, will unquestionably discourage QF growth in North Carolina and undermine the State's stated commitment to promoting alternative energy.

B. Avoided Cost Rates Determined in this Proceeding will have Significant Implications outside the Traditional PURPA Context

Historically, the avoided cost rates determined pursuant to the Commission's bi-annual avoided cost proceedings exclusively applied to QFs seeking to exercise their PURPA rights. This is no longer the case. In HB 589, the North Carolina Legislature included references to "avoided costs" in establishing the CPRE,³⁹ GSA,⁴⁰ and Community Solar programs,⁴¹ and the rates used in these programs are currently tied to the avoided cost rates established in this proceeding. As Commissioner Clodfelter stated at the hearing in this proceeding, "the [legislature] has now taken this concept of avoided cost and imported it into some complete non-PURPA programs."⁴² The Utilities have

³⁸ Sub 148 Order at p. 7, paragraph 10, pp. 68-70.

³⁹ N.C.G.S. § 62-110.8(b)(2) ("each public utility's procurement obligation shall be capped by the public utility's current forecast of its avoided cost calculated over the term of the power purchase agreement. The public utility's current forecast of its avoided cost shall be consistent with the Commission-approved avoided cost methodology.").

⁴⁰ N.C.G.S. § 62-159.2(e) ("The program customer shall receive a bill credit for the energy by the Commission; provided, however that the bill credit shall not exceed utility's avoided cost.").

⁴¹ N.C.G.S. § 62-126.8 ("The offering utility shall credit the subscribers to its community solar energy facility for all subscribed shares of energy generated by the facility at the avoided cost rate.")

⁴² Tr. Vol. 3, p. 142, ll. 12-19.

confirmed their perspective that the proposals in this proceeding will impact the CPRE, GSA, and Community Solar programs.⁴³

While there is broad agreement that the avoided cost rates approved by the Commission in this proceeding will impact the CPRE, GSA, and Community Solar programs, there is scant information regarding what this impact will look like and exactly how QFs and ratepayers will be affected. This problem is particularly acute in the context of Duke Energy's proposed SISC. Duke Energy and the Public Staff—despite entering into the SISC Stipulation—appear to have differing ideas regarding how the SISC will apply to these programs. For example, Duke Witness Wheeler stated that the SISC will apply to CPRE Tranche 2 if it is approved by the Commission in this proceeding.⁴⁴ But Public Staff Witness Thomas was unable to answer whether the SISC would be included in the CPRE bid cap and stated that “we don't know yet how the SISC will be implemented . . . in the CPRE.”⁴⁵ And neither Duke Energy nor the Public Staff's witnesses had a meaningful response to the concern, raised by counsel for Intervenor, that substantially reducing the CPRE bid cap by imposing the SISC would render bids at the Tranche 1 threshold unviable and potentially undermine HB 589's mandate that 2,660 MW of energy and capacity be procured over the next several years.⁴⁶

The SISC Stipulation provides for the possibility that some QFs, if operated in a fully dispatchable manner, could avoid the proposed SISC. But as Commissioner

⁴³ Tr. Vol. 2, p. 349, l. 7 – p. 350, l. 10; Vol. 2, p. 350, l. 15 – p. 351, ll. 21.

⁴⁴ Tr. Vol. 2, p. 290, ll. 18-24.

⁴⁵ Tr. Vol. 6, p. 428, ll. 18-20; p. 426, ll. 19 – p. 427, l. 4 (“how the SISC is considered in Tranche 2 of the CPRE is entirely dependent upon the decisions made by Commission and the collaboration between market participants, Utilities, and the [Independent Administrator].”). Notably, Witness Wintermantel and Mr. Carden, who calculated the SISC, are subcontractors for Accion Group, the CPRE Independent Administrator, and they should be screened from any SISC implementation in the CPRE context. *See* Tr. Vol. 4, p. 137, ll. 7-24.

⁴⁶ *See* Tr. Vol. 2, p. 383, l. 20 – p. 384, l. 7; p. 302, ll. 3-14.

Clodfelter noted at the hearing, CPRE Tranche 2 is “literally weeks away”, and Duke Energy has not yet proposed a fully dispatchable PPA.⁴⁷ As a result, this option for potentially avoiding the proposed SISC very likely will not be available for Tranche 2 participants.⁴⁸

In light of the lack of consensus and understanding regarding how Duke Energy’s proposed SISC will impact HB 589 Programs, SACE urges the Commission to reject the charge at this time. At a minimum, the SISC should not be applied to the CPRE, GSA, and the Community Solar programs unless and until its impact is more thoroughly understood and determined not to undermine HB 589’s legislative mandate.

IV. DUKE ENERGY’S PROPOSED SOLAR INTEGRATION CHARGE AND DUKE ENERGY AND THE PUBLIC STAFF’S SOLAR INTEGRATION CHARGE STIPULATION RELY ON AN INAPPROPRIATE AND UNTESTED STUDY METHODOLOGY

Duke Energy seeks to justify the imposition of the SISC based on the *Duke Energy Progress, LLC and Duke Energy Carolinas, LLC Ancillary Service Study* prepared by Astrapé Consulting (“*Ancillary Service Study*”). The *Ancillary Service Study* purports to quantify the additional load following reserves necessary in order to operate at the same level of reliability before and after the additional of solar QFs to the DEC and DEP systems. The *Ancillary Service Study* is unreliable and cannot justify the imposition of the SISC for several reasons.

First, the *Ancillary Service Study* relies on a novel methodology that applies concepts traditionally used in the utility resource adequacy planning context to predict

⁴⁷ Tr. Vol. 3, p. 154, ll. 2-9.

⁴⁸ Tr. Vol. 3, p. 157, ll. 20-23.

real-time operational reliability and quantify the cost of integrating solar. Concerns regarding the this new application of long-term planning metrics to day-to-day operational reliability are compounded by the fact that the new approach has never been approved by a state commission, peer reviewed, or subject to a Technical Review Committee (“TRC”).

Second, the *Ancillary Service Study*’s methodology fails to approximate compliance with NERC Real Power Balancing Control Performance standards and produces results that do not correspond to historical operating reserves. Specifically, the *Ancillary Service Study* fails to approximate the physical drivers of NERC compliance and relies on unreasonable, unsubstantiated assumptions regarding the scaling of intra-hour solar volatility. Furthermore, while the *Ancillary Service Study*’s accuracy has not been sufficiently empirically tested, even the limited historical data Duke Energy has made available indicates that the *Ancillary Service Study*’s predictions are not closely correlated with the amount of operating reserves needed to comply (but not overcomply) with NERC balancing requirements.

Third, the *Ancillary Service Study* fails to conform to the Commission’s past orders directing the Utilities to consider both the costs and benefits of solar QF generation. The *Ancillary Service Study* does not consider the value of potential benefits of distributed solar QF generation, and how this value might offset the costs associated with integrating intermittent solar resources.

For all these reasons, the *Ancillary Service Study* lacks credibility and accuracy, and may not be relied upon to quantify the proposed SISC.

A. The Ancillary Service Study’s Methodology has Never Received State Utility Commission Approval or been Subject to Peer Review or a TRC

1. *The Ancillary Service Study’s methodology has never been used in any jurisdiction to calculate the cost of integrating renewable energy*

The *Ancillary Service Study’s* methodology to calculate the costs of solar integration on the DEC and DEP systems has never been used to quantify the costs of solar integration for the purpose of calculating a solar integration charge in any jurisdiction. Witness Snider confused this issue by testifying at the hearing that “this model has been used before many commissions.”⁴⁹ Witness Wintermantel also testified that “the model is well vetted. It’s been calibrated in many jurisdictions.”⁵⁰ These statements were extremely misleading.

The SERVM proprietary system has been used before many commissions in the resource adequacy context.⁵¹ The LOLE metric has been used before many commissions in the resource adequacy context.⁵² Even the relatively new LOLE_{FLEX} metric has been used before two commissions—once in California for resource adequacy calculations⁵³ and twice in New Mexico as part of a Request for Proposal process and in the 2017 Public Service Company of New Mexico (“PNM”) Integrated Resource Plan (“IRP”).⁵⁴ But the methodology developed by Astrapé for this proceeding—which uses the

⁴⁹ Tr. Vol. 4, p. 15, ll. 2-3.

⁵⁰ Tr. Vol. 4, p. 205, ll. 5-8.

⁵¹ Tr. Vol. 4 p. 204, ll. 4-10.

⁵² SACE Initial Comments at p. 5, n. 11; Tr. Vol. 4, p. 62, ll.19-21.

⁵³ Tr. Vol. 4, p. 204, ll. 9-18.

⁵⁴ Tr. Vol. 4, p. 205, ll. 8-17.

LOLE_{FLEX} metric to predict the reserves necessary to comply with NERC standards as solar penetration increases and thus derive a solar integration charge—is novel and unvetted. Intervenors have been unable to find even a single instance of a utility commission approving this methodology for the purpose of deriving a solar integration charge, and Duke Energy has not put forth any evidence to the contrary.⁵⁵

Witness Wintermantel notes that comparing LOLE_{FLEX} to NERC imbalances has “never been an issue” in “most of our other jurisdictions.”⁵⁶ But this is because Astrapé has never used the LOLE_{FLEX} metric to calculate the impact of increasing solar penetration on reserve requirements for the purpose of quantifying a solar integration charge in any other jurisdiction. Witness Wintermantel repeatedly confused this issue, fixating on the history of SERVVM and the LOLE metric as a long-term reliability planning metric and stating that the model has been used in “integration-type analysis.”⁵⁷ But intervenors have been unable to find a single example of the LOLE_{FLEX} metric being used to calculate a solar integration charge. The methodology Duke Energy is asking this Commission to approve has never been used in the context of quantifying an integration charge and has never been approved by any jurisdiction for this purpose.

⁵⁵ See Tr. Vol. 4, p. 205, ll. 18 – p. 206, l. 4. (“I just want to be clear that this is not a new model. It’s been vetted...” “In other applications, as opposed to this application?” “No, no. And integration-type analysis.” “I’m sorry, my question wasn’t clear. I meant with respect to its utilization for this purpose in this proceeding.” “Okay, yeah.”).

⁵⁶ Tr. Vol. 6, p. 51, ll. 1-2.

⁵⁷ Tr. Vol. 4, p. 205, l. 24; Tr. Vol. 4, p. 204, ll. 6-8. (“[SERVVM has] been a resource adequacy and production cost model ever since Astrapé took control of it in 2005.”).

2. *The Ancillary Service Study's novel application of long-term resource adequacy metrics to day-to-day operational reliability has not been peer reviewed or subject to a TRC*

As previously noted, the SERVM model and the LOLE metric have been historically used in long-term planning and resource adequacy calculations, such as IRPs.⁵⁸ In the resource adequacy context, the SERVM model and LOLE metric have been vetted. But the *Ancillary Service Study* does not use the SERVM model and LOLE metric in this traditional context. Instead, Astrapé has taken the model and metrics that guide long-term resource adequacy and applied them to DEC and DEP's real-time operations in an effort to assess system reliability.⁵⁹ Astrapé's application of metrics used to evaluate long-term resource adequacy to assess real-time operational reliability, absent any indication that these metrics are appropriate or produce reasonable approximations of the operational reserves necessary to maintain day-to-day operational reliability, is premature and inappropriate.

Furthermore, this novel application of Astrapé's resource adequacy methodology to model the costs of solar integration has not been peer reviewed or subject to a Technical Review Committee.⁶⁰ The purpose of a TRC is to ensure that when new models are created, or old models are adapted to new situations, as is the case here, objective experts guide the development of a study to ensure that the process is unbiased and accurate.⁶¹

⁵⁸ Tr. Vol. 4, p. 62, ll.1 20-21; Tr. Vol. 4, p. 138, ll. 13-16.

⁵⁹ Tr. Vol. 4 p. 138, ll. 17-23; Tr. Vol. 4, p. 17, ll.11-13.

⁶⁰ See Tr. Vol. 4, p. 206, l. 5 – p. 207, l. 14.

⁶¹ Tr. Vol. 6, p. 114, ll. 13-23; Tr. Vol. 5, p. 285, l. 12 – p. 287, l. 9.

Duke Energy witnesses suggest that because Duke Energy employees have evaluated the Astrapé Model, peer review or a TRC is not necessary. Witness Wintermantel argued that because “Duke employees who have years and years of experience had their hands in this model”, the model has been adequately tested.⁶² Witness Snider stated that “[our] company has statistical experts internally that reviewed [the study.]”⁶³ But the purpose of peer review, and the purpose of a TRC, is to have a qualified, *independent* third party evaluate a proposed methodology. Witness Wintermantel and Witness Snider’s testimony that Duke Energy employees have been intimately involved in the creation and calibration of the *Ancillary Service Study* suggests the presence of utility bias rather than objective review.⁶⁴

The Public Staff’s review is also not an adequate substitute for independent, third-party review by subject matter experts. As acknowledged by Public Staff Witness Thomas, the Public Staff “[has] an interest as well” and would traditionally be an observer rather than an active participant in a TRC.⁶⁵ Therefore, internal review by Duke Energy of the *Ancillary Service Study*, and the review conducted by the Public Staff in the context of settlement negotiations is not an adequate substitute for peer review or a TRC.

The methodology for calculating solar integration costs which Duke Energy has asked the Commission to approve has never been approved by another utility commission, has never been peer reviewed or published in an academic journal, and has

⁶² Tr. Vol. 4, p. 207, ll. 3-4.

⁶³ Tr. Vol. 2, p. 412, ll. 6-7.

⁶⁴ Witness Wintermantel repeatedly stated that Duke Energy “doesn’t really have a reason to be biased here.” Tr. Vol. 4 p. 207, ll.5-6. *But see supra* notes 7-9.

⁶⁵ Tr. Vol. 7, p. 110, l. 20 – p. 111, l. 6; *see also* Tr. Vol. 7, p. 111, ll.4-6 (“you have to make sure that you understand the interests and the motivations of the people who are participating in the review committee.”).

not been the subject of a TRC. Therefore the model lacks credibility and cannot reasonably serve as the basis for Duke Energy's proposed SISC.

B. The *Ancillary Service Study*'s Methodology and Results are Unreliable and Flawed

The North American Electric Reliability Corporation establishes reliability standards that all parties agree are appropriate and do not impose unreasonable risks upon utilities.⁶⁶ Compliance with the NERC balancing standards is difficult to model, therefore utilities seeking to predict the level of operational reserves necessary to meet (but not substantially exceed) NERC requirements must rely on a model that approximates the physics of the NERC standards and produces predictions that strongly correlate with the operational reserves that have historically met (but not substantially exceeded) NERC requirements.⁶⁷ The *Ancillary Service Study* fails on both counts. The *Ancillary Service Study* fails to accurately approximate the drivers of compliance with NERC Real Power Balancing Control Performance standards; and the limited historical data Duke Energy has provided shows that the *Ancillary Service Study*'s predictions do not correlate with historical operating reserves. Therefore the Study is not credible and may not be reasonably relied upon to impose the SISC upon solar QFs.

1. The Ancillary Service Study's methodology fails to model the drivers of utility compliance with NERC standards

Interconnected utilities operate in compliance with NERC balancing standards, which ensure that each balancing authority conducts its day-to-day operations in a

⁶⁶ Tr. Vol. 4, p. 163, ll.6-8.

⁶⁷ This is what Commissioner Clodfelter characterized as the "objective" and "subjective" criteria.

responsible and reliable manner and does not endanger the interconnection.⁶⁸ NERC Standard BAL-001-2 Real Power Balancing Control Performance imposes two standards that govern the sub-hourly operational reliability of interconnected balancing areas.⁶⁹ The first standard, Control Performance Standard 1 (“CPS1”) evaluates the utility’s average annual contribution to interconnection frequency control performance.⁷⁰ The second standard, the Balancing Authority ACE Limit (“BAAL”) requires that the utility not operate at an imbalance that harms the interconnection’s frequency for longer than 30 consecutive clock minutes.⁷¹ As previously mentioned, it is difficult to perfectly model compliance with these standards; but the goal of any modeling exercise is to come reasonably close to approximating a physical reality. The *Ancillary Service Study* contains several methodological errors and flawed assumptions that make it completely divorced from the reality it seeks to model.

- a) The *Ancillary Service Study* assumes that load following reserves must be added for imbalance events that do not impact DEC and DEP’s conformance to NERC reliability standards

The premise of the *Ancillary Service Study* is that the DEC and DEP systems must operate at the same level of reliability before and after the addition of solar to the system.⁷² The reliability metric the Study relies on is 0.1 LOLE_{FLEX}, which allows one 5-

⁶⁸ Tr. Vol. 2, p. 361, ll. 5-7.

⁶⁹ SACE Wintermantel Cross-Exhibit 1.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² Tr. Vol. 4, p. 141, ll. 16-18.

minute “event” per 10 years.⁷³ The problem with the 0.1 LOLE_{FLEX} metric is that the “event” the model is looking for—one failure of the system to follow net load given 5-minute ahead perfect foresight⁷⁴—does not actually result in a loss of load or a NERC reliability standard violation.⁷⁵

Witness Wintermantel asserts that a “violation” as measured by the *Ancillary Service Study* is “much more substantial, than, say, just a NERC balancing deviation.”⁷⁶ But pursuant to NERC reliability standards for interconnected utilities—balancing areas that are not physically islanded—the inability to follow net load during one five-minute period is not a violation at all.⁷⁷ For its modeling, Astrapé has essentially invented an additional 5-minute ramping requirement—unbeknownst to NERC—that utilities must conform to in order to operate reliably. This is particularly concerning since Witness

⁷³ Tr. Vol. 4, p. 139, ll. 12-22. To be clear, this does not necessarily produce a result that is 10,800 more stringent than the Idaho Study. On its own, the LOLE_{FLEX} metric is approximately 10,800 more stringent than the reliability metric used in the 2016 Idaho Study. However, this does not necessarily mean that the level of reliability required by the Ancillary Service Model is 10,800 more stringent than the level of reliability required by the Idaho Study. SERV’s perfect foresight allows for several 5-minute balancing deviations to occur without adding reserves, but Duke Energy has not provided data indicating how many of the 5-minute balancing deviations that do occur are flagged as “violations” relative to the total, so it is not possible to compare the Idaho Study and Ancillary Service Study methodologies directly.

⁷⁴ Tr. Vol. 4, p. 89, ll. 6-8; Tr. Vol. 7, p. 17, ll. 10-13.

⁷⁵ Tr. Vol. 6, p. 90, ll.15-20 (“[the LOLE metric is] completely inappropriate because the violation, while it does result in loss of load under resource adequacy, in this case it does not result in loss of load. . . . it doesn’t even result in a BAAL violation.”).

⁷⁶ Tr. Vol. 4, p. 139, ll.8-12.

⁷⁷ *Id.* This is the heart of Witness Kirby’s critique of the “islanding” assumption of the Ancillary Service Study. The reliability metric Astrapé has selected could only ever accurately model a physically islanded power system for whom a failure to meet a 5-minute ramping requirement would result in a blackout. Interconnected power systems, like DEC and DEP, do not need to—and in fact do not—operate in such a stringent manner in order to ensure operational reliability. It is unreasonable for the Companies’ to imposed a charge on solar QFs based on a fictional scenario where DEC and DEP do operate in this unnecessary level of stringency and pass on the costs of doing so to ratepayers.

Wintermantel is “not an expert” on the operation of NERC standards⁷⁸ and lacks power system operation experience.⁷⁹

All parties appear to be in agreement that the NERC balancing standards are sufficiently protective of system reliability.⁸⁰ Therefore Duke Energy’s reliance on a model that is driven by measurement of “violations” in response to events that do not qualify as actual NERC violations is unreasonable. The *Ancillary Service Study*’s addition of load following reserves for imbalance events that do not actually require this kind of operator response inflates the model’s reserve requirement predictions and generates an excessive solar integration charge.

b) The *Ancillary Service Study*’s assumption that solar volatility scales linearly is incorrect

Another flaw in the *Ancillary Service Study*’s methodology is the unreasonable assumption that solar volatility scales linearly. This assumption causes the Study to overestimate the amount of solar volatility at various levels of solar penetration and further inflates the Study’s estimates of the cost of solar integration.

The *Ancillary Service Study* assumes that as solar penetration increases minute-to-minute volatility will increase at the same rate. As Witness Kirby explained, this assumption is unreasonable because scientific studies have found that short-term variations of loads and variable renewable generators are typically uncorrelated among

⁷⁸ Tr. Vol. 4, p. 190, ll. 10-16.

⁷⁹ Tr. Vol. 4, p. 176, ll. 16-17. The Public Staff witness supporting the Stipulation between Duke Energy and the Public Staff regarding the proposed solar integration charge also lacks any experience as a system operator. Tr. Vol. 7, p. 17, ll. 21-22.

⁸⁰ Tr. Vol. 4, p. 163, ll. 6-8.

themselves and with each other.⁸¹ Solar plant variability tends to be uncorrelated because solar plants cannot be physically placed on top of each other, and are typically not placed side-by-side. The result is that solar facilities typically have significant geographic diversity.⁸² Witness Wintermantel, who admitted he is not an expert on this issue, inaccurately characterized this well-established scientific conclusion regarding the scaling of short-term solar variability as “a simplified formula.”⁸³

Nevertheless, Witness Wintermantel testified that Astrapé had calculated diversity benefits (a 13-17% discount) during the 2016-18 time period.⁸⁴ Witness Wintermantel testified that “the Company has chosen” to exclude observed diversity benefits because “future diversity may not materialize as expected.”⁸⁵ But as Witness Wintermantel acknowledges, uncertainty is endemic to modeling exercises.⁸⁶ Duke Energy’s decision to exclude assumptions that might change over time when doing so decreases the predicted cost of solar integration, while relying on various questionable assumptions that act to increase predictions of the cost of solar integration, is inappropriate and must be corrected.

2. *Duke Energy’s claim that the Ancillary Service Study is supported by historical data is false*

Duke’s main argument in support of the *Ancillary Service Study* and the SISC appears to be that despite the *Ancillary Service Study’s* failure to approximately model NERC compliance, the *Study* is still reliable because it produces results that are

⁸¹ Tr. Vol. 5, p. 192, ll. 1-9; Tr. Vol. 5, p. 194, l. 12 - p. 195, l. 7.

⁸² Tr. Vol. 5, p. 192, ll. 10-15.

⁸³ Tr. Vol. 6, p. 23, ll. 4-8.

⁸⁴ Tr. Vol. 4, p. 182, l. 11- p. 183, l. 3; Tr. Vol. 4, p. 199, ll. 2-4.

⁸⁵ Tr. Vol. 4, p. 181, ll. 19; Tr. Vol. 4, p. 182, ll. 17 - 20.

⁸⁶ Tr. Vol. 4, p. 197, ll. 1-10.

correlated with NERC compliance. Specifically, Witness Wintermantel testified: “when we increase operating reserves, we are going to lower NERC imbalances. When we increase operating reserves, we’re also going to lower LOLE_{FLEX}. They are correlated.”⁸⁷ This is like claiming that because high daytime temperatures increase ice cream sales, and high daytime temperatures increase air conditioner use, one can, absent any further research, use changes in amount of ice cream sold to predict air conditioning use, and then determine a segment of the population’s residential energy bills based on ice cream sales. It’s likely that there is some correlation between ice cream sales and air conditioning use because they both increase on hot days, but we know nothing about the *strength* of this correlation. In order to test the strength of the correlation and potentially justify the imposition of costs upon a segment of the population, one would compare the historical relationship between temperature, ice cream sales, and air conditioning use, and determine whether the correlation between ice cream sales and air conditioning use is sufficiently robust.

Duke Energy declined to provide the historical data that would allow for the *Ancillary Service Study*’s predictions to be directly compared to historical operating reserves. But even the insufficiently granular and extremely limited data provided by Duke Energy in Late Filed Exhibit 2 demonstrates that conformance to the *Ancillary Service Study*’s 0.1 LOLE_{FLEX} metric does not strongly correlate with historical operating reserves.⁸⁸ Moreover, the historical data provided by Duke Energy belies the

⁸⁷ Tr. Vol. 6, p. 20, ll. 15-18.

⁸⁸ See *infra* Section IV.2.b-c.

central premise of the *Ancillary Service Study*: that increasing solar penetration causes a dramatic increase in required load following reserves.⁸⁹

- a) The *Ancillary Service Study*'s methodology has not been adequately tested

A central requirement for establishing the credibility of any study methodology, especially one that is new or being applied in a novel manner, is testing against observed results. Empirically testing a new model allows for the development of a margin of error, confidence intervals, and other indicia of certainty. Duke Energy has failed to take any of these critical steps.

Witness Wintermantel was questioned extensively regarding how the *Ancillary Service Study*'s predictions compared to historical data. In response, he insisted that the Study's sole reference to historical operating reserves, in which historical operating reserves were used to "calibrate" the model to 0.1 LOLE_{FLEX} was sufficient testing.⁹⁰ But the exercise Witness Wintermantel described involves the calibration of the model and only explains how the model's base case was calculated, not whether the model's predictions are accurate.⁹¹ This calibration exercise is, as Witness Kirby explained, "necessary but not sufficient."⁹²

Witness Wintermantel's other response to questions regarding whether the model's predictions were validated was to reference sensitivity testing conducted in

⁸⁹ See *infra* Section IV.2.d.

⁹⁰ Tr. Vol. 4, p. 64, ll. 4-8; Tr. Vol. 4, p. 119, l. 24 – p. 120, l. 2.

⁹¹ Tr. Vol. 4, p. 120, l. 6 – p. 121, l. 1.

⁹² Tr. Vol. 5, p. 295, l. 9 – p. 296, l. 4.

private meetings with the Public Staff.⁹³ During the course of this testing, which was conducted privately during settlement negotiations, Astrapé used “post-processing techniques” to alter several assumptions in the *Ancillary Service Study* and concluded that doing so did not have a significant impact on the calculated integration charge.⁹⁴ But there is no information anywhere in the record before the Commission regarding the “post processing” techniques Astrapé used,⁹⁵ and Witness Wintermantel admitted that he did not actually re-run the model with different assumptions or inputs, but merely “attempt[ed] to interpolate” new assumptions into the original’s model’s outputs.⁹⁶ Therefore, there is no evidence on the record that speaks to the strength of the methodology Astrapé used to conduct sensitivity testing.⁹⁷

Furthermore, there is no evidence in the record indicating that the results of the sensitivity testing, included in Public Staff Witness’s Thomas’s Exhibit C, support Witness Wintermantel’s claim that the model produces operating reserves predictions strongly correlated to the reserves required to conform to NERC standards.⁹⁸ All the data in Exhibit C indicates is that when the $LOLE_{FLEX}$ 0.1 metric was relaxed to 0.3 and 1.0 the predicted cost of solar integration decreased. This data does not indicate anything about the accuracy of the model’s original prediction.

⁹³ Tr. Vol. 4, p. 201, ll. 9-20.

⁹⁴ Tr. Vol. 4, p. 166, l. 10 – p. 167, l. 5.

⁹⁵ Tr. Vol. 4, p. 174, l. 19 – p. 175, l. 3.

⁹⁶ Tr. Vol. 4, p. 173, l. 21 – p. 174, l. 14.

⁹⁷ Tr. Vol. 4, p. 174, l. 19 – p. 175, l. 3.

⁹⁸ See Tr. Vol. 4, p. 165, l. 10 – p. 166, l. 2.

- b) Duke Energy failed to fully comply with the Commission’s request that the *Ancillary Service Study*’s predictions for each year be compared to historical operating reserve data

Recognizing the lack of evidence supporting Witness Wintermantel’s claim that the *Ancillary Service Study*’s predictions strongly correlate with the operating reserves necessary to comply (but not substantially overcomply) with NERC balancing standards, the Commission requested that Duke Energy compare actual historic data regarding operating reserves to the *Ancillary Service Study*’s predictions of necessary operating reserves for the 2014 through the present.⁹⁹ Witness Kirby agreed that if “multiple runs” of the *Ancillary Service Study* model yielded results that conformed to historic operating reserves, this would give him more confidence in the model.¹⁰⁰

Despite having been given this opportunity to prove that the *Ancillary Service Study* model produces accurate, reliable predictions, Duke Energy declined to comply with the Commission’s full request.

First, Duke Energy failed to compare the actual historical operating reserves from each year to the *Ancillary Service Study*’s predictions for that year. Instead, Duke Energy provided the actual historic operating reserves data for the years 2015-2018 and the *Ancillary Service Study*’s 2020’s No Solar Case and 2020 Existing Plus Transition Solar Case. This is not what the Commission asked for, and not what Witness Wintermantel

⁹⁹ Tr. Vol 4, p. 223, l. 3 – p. 224, l. 2; Tr. Vol. 5, p. 291, ll. 17-23; Tr Vol. 7, p. 107, ll. 3-6; Tr. Vol 4, p. 203-204, l. 2 (prior to the Commission’s request, Astrapé had no intention of testing its model against historical performance to see how well it matches up to actual experience.).

¹⁰⁰ Tr. Vol. 5, p. 297, l. 6 – p. 299, l. 9.

testified he could provide.¹⁰¹ Duke Energy's exhibit does not actually "re-run" the model to show how accurately the model has predicted historical operating reserves. As such, Late Filed Exhibit 2 fails to provide the empirical support for the *Ancillary Service Study* that actually rerunning the model for the years 2015-2018 would.

Second, Duke Energy failed to provide the level of granularity that the Commission specifically requested,¹⁰² stating that "Duke Energy does not archive operating reserve data in the categories the Commission identified as of interest (i.e. on-line contingency reserves, regulating reserves, and on-line operating reserves.). Duke Energy does archive total contingency reserves; however, this is off-line and on-line contingency reserves summed in total."¹⁰³ This explanation is concerning, as SACE's understanding is that utilities must keep hourly records of exactly how they complied with NERC contingency reserve requirements which, prior to October of 2017, required DEP and DEC to have available explicit amounts of contingency reserves.¹⁰⁴ Those detailed audit records would have to show the exact hourly amount of spinning and non-spinning reserves that were being supplied by each generating unit each hour. Duke Energy's failure to provide this information that it is required to have on file makes it difficult if not impossible to determine whether the same categories of reserves are included in both the actual data and the modeled results.

¹⁰¹ Tr. Vol. 6, p. 45, ll. 3 – p. 46, l. 3. ("How difficult would it be to do that for the 2016, 2017, and 2018, to . . . run your model, hold it to the 0.1 . . . LOLE FLEX result, see what reserves the model spits out, and then compare to the actuals?" "I can go pull already existing results, kind of what the operating reserves, the model, say total for '15, '17, '18. That's just kind of imbedded in the . . . results.")

¹⁰² Tr. Vol. 5, p. 291, l. 17 – p. 292, l. 8.

¹⁰³ Late Filed Exhibit No. 2 at p. 3.

¹⁰⁴ See NERC standard BAL-002-0, R3.1 – Disturbance Control Performance required: "As a minimum, the Balancing Authority or Reserve Sharing Group shall carry at least enough Contingency Reserve to cover the most severe single contingency." BAL-002-1 was in effect until BAL-002-2 became effective in October 2017. Duke should have NERC auditable records documenting compliance with BAL-002-1 that list the specific generating units and their MW spinning and non-spinning reserve capabilities that were supplying the required contingency reserves for each hour.

Third, Duke Energy failed to provide data from the year 2014, stating that the “2014 data was not readily available” and the Companies would require an additional 10-30 business days to retrieve the data.¹⁰⁵ While the Commission has not, to SACE’s knowledge, requested that Duke Energy undertake the more significant effort to review 2014 data, SACE notes that by not including the 2014 data, the Companies have eliminated one of the five data points that could be used to validate the results of the *Ancillary Service Study*. Given Duke Energy’s attempts to frame the 2015 operating reserves as an outlier,¹⁰⁶ this means that according to the Companies, there are only three reliable data points in the Late Filed Exhibit, and none of them predate 2016, when there was already a sizable amount of solar on the DEC and DEP systems.

Despite the incomplete nature of the historical data Duke Energy provided in Late Filed Exhibit 2, it is possible to reach some conclusions about the *Ancillary Service Study*’s reliability. Combining the historical operating reserve data with historical data regarding solar penetration already in the record¹⁰⁷ demonstrates that the *Ancillary Service Study*’s predictions do not reflect reality.

- c) Historical reserve data does not support Duke Energy’s claim that Astrapé’s predictions strongly correlate with the levels of reserve necessary to operate reliably

The new data the Companies provided in Late Filed Exhibit 2 is the Average Annual Actual Realized 60 Minute Ramping Capability MW for the DEC and DEP

¹⁰⁵ Late Filed Exhibit No. 2, at p. 2.

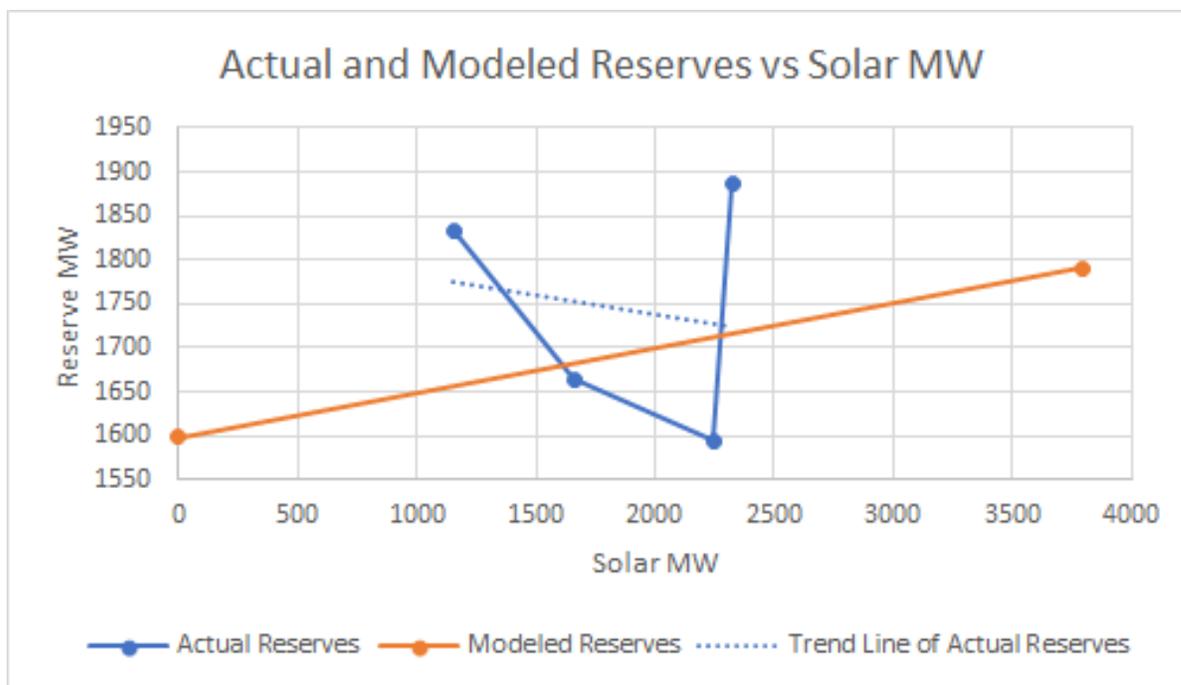
¹⁰⁶ Late Filed Exhibit No. 2, at p. 2.

¹⁰⁷ See DEC and DEP Joint Initial Statement, p. 7, Fig. 1.

systems for the years 2015, 2016, 2017, and 2018 (“actual historical reserves”).¹⁰⁸ In order to illustrate the actual historical reserves, SACE witness Witness Kirby created a figure that plots existing historical reserves against MW of solar capacity existing on the DEC and DEP systems during each of these years.¹⁰⁹ This Figure also includes the *Ancillary Service Study*’s predicted reserves against MW of solar capacity.

If we assume that the same categories of reserves are included in the actual data and in the *Ancillary Service Study*’s predictions, then the relationship between the actual data and the Study’s predictions can be depicted as follows:

Figure One: Historical Actual Reserves v. Ancillary Service Study Predictions¹¹⁰



¹⁰⁸ Late Filed Exhibit No. 2 at p.1.

¹⁰⁹ See DEC and DEP Joint Initial Statement, p. 7, Fig. 1.

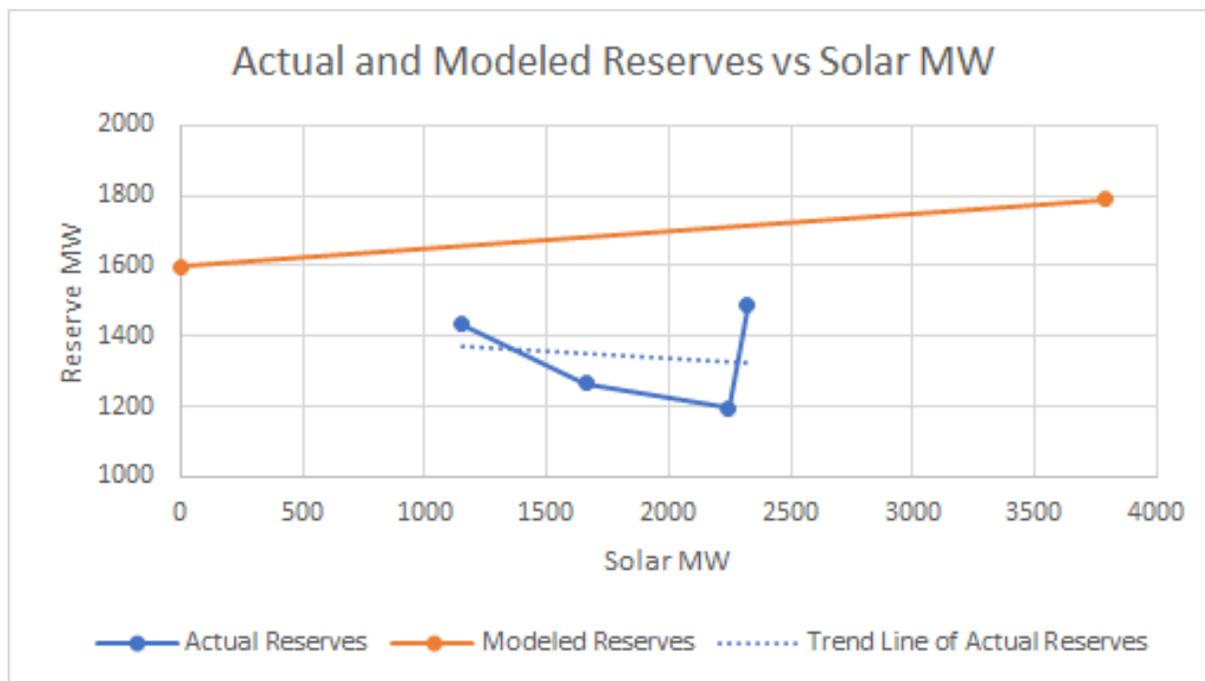
¹¹⁰ DEC and DEP Joint Initial Statement, p. 7, Fig. 1, illustrates the cumulative installed solar capacity in DEC and DEP territory for the years 2014-2018. Using this data, we can determine the Reserve MW that have historically been maintained at various levels of installed solar capacity.

This data contradicts Duke Energy's claim that the *Ancillary Service Study* accurately predicts the actual reserves at a given level of solar penetration.

However, because the Companies have failed to provide sufficiently granular data regarding the categories of reserve being provided in Late Filed Exhibit Two, it is possible that this is not an accurate comparison. Based on the text of Late Filed Exhibit 2, it is unclear if on-line spinning contingency reserves are included in both the *Ancillary Service Study's* predicted reserves and the historical actual reserves.¹¹¹ If the *Ancillary Service Study's* predicted reserves do not include contingency reserves, while the 2015-2018 Actual Operating Reserves do, Figure Two would more accurately depict the relationship between the Ancillary Service Model's predictions and actual historical reserves.

¹¹¹ Late Filed Exhibit 2, p. 3 "Duke Energy does not archive operating reserve data in the categories the Commission identifies as of interest . . . Duke Energy does archive total contingency reserves; however, this is off-line and on-line contingency reserves summer in total. DEP maintains most of its contingency reserves off-line, meaning that archived contingency reserve data would not be a good indicator for the amount of hourly on-line operating reserves."

Figure Two: Historical Actual Reserves Assuming 400 MW of Spinning Contingency Reserves v. *Ancillary Service Study* Predictions¹¹²



If Figure Two is the more accurate depiction of the relationship between historical actual reserves and the *Ancillary Service Study*'s predictions, then the Ancillary Service Model consistently over-estimates the reserves necessary to maintain reliability by a significant margin.

It is impossible to ascertain which of these comparisons is more accurate because Duke Energy has failed to follow the Commission directive to provide a sufficiently granular breakdown of reserves, listing the spinning and non-spinning contingency reserves that are not available to support solar integration, despite being obligated by NERC rules to maintain records of these categories of reserves for at least three of the

¹¹² Lacking a specific reply from Duke 400 MW, or a little less than half, of the DEC DEP contingency reserves are assumed to be spinning, which is typical for many utilities.

four historical years being analyzed.¹¹³ Regardless, Late Filed Exhibit No. 2 does not verify the *Ancillary Service Study*'s predictions and in fact demonstrates that even the incomplete historical data Duke Energy has used to attempt to justify the *Ancillary Service Study*'s conclusions reveals the Study's failure to produce realistic results.

- d) Historical reserve data demonstrates that solar penetration is not a significant driver of increased reserve requirements

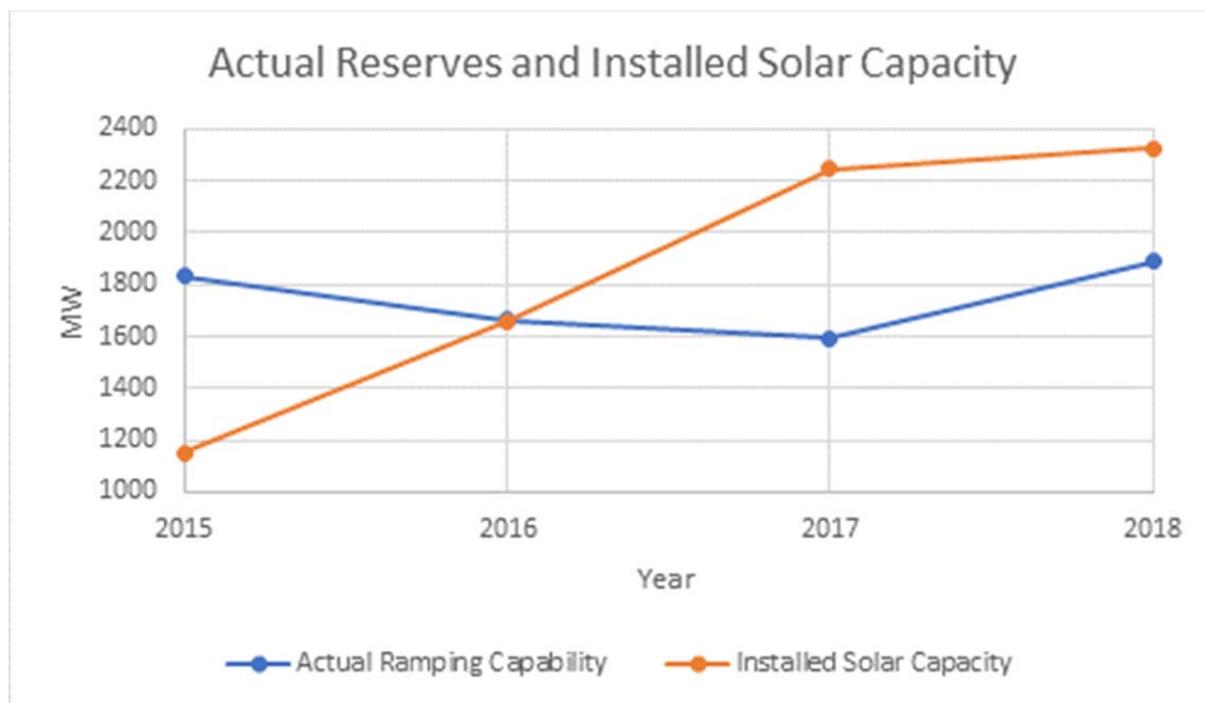
Regardless of the complications discussed in the previous section, the actual historical data provided in Late Filed Exhibit No. 2 demonstrates that actual historical reserves have not increased as solar penetration increased. As illustrated in the Figure Three, solar capacity approximately doubled between 2015 and 2018 but actual historical reserves stayed relatively stable. This data directly contradicts Duke Witness Witness Wintermantel's claim that solar leads to "exponentially increasing cost[s] of integrating incremental solar"¹¹⁴ and provides further support for Witness Kirby's assertion that Duke Energy's proposed SISC is "inflated and inaccurate."¹¹⁵

¹¹³ See *supra* note 104.

¹¹⁴ Tr. Vol. 4, p. 67, ll. 2-4; Tr. Vol. 4, p. 171, ll. 2-14.

¹¹⁵ Tr. Vol. 5, p. 215, ll. 11-13.

Figure Three: Historical Actual Reserves v. Installed Solar Capacity¹¹⁶



While Duke’s Late Filed Exhibit No. 2 is wholly inadequate to establish a robust correlation between the *Ancillary Service Study*’s predictions and actual historical reserve requirements, it does help demonstrate that Duke Energy’s primary justification for the proposed solar integration charge—that increased solar penetration has and will continue to necessitate dramatically increased operating reserves and thereby impose costs on ratepayers—is false.

C. The *Ancillary Service Study* Fails to Account for Benefits of Solar

In its Sub 140 Order the Commission recognized that “integration of solar resources into a utility’s generation mix results in both costs and benefits.”¹¹⁷ The Commission further determined that inclusion of solar integration costs and benefits in

¹¹⁶ Source: DEC and DEP Joint Initial Statement p.7, Fig. 1; DEC and DEP Late Filed Exhibit No. 2, p. 1.

¹¹⁷ *Order Setting Avoided Cost Input Parameters*, p. 60, Docket No. E-100, Sub 140 (December 31, 2014) (“Sub 140 Phase I Order”).

avoided cost calculations would only be appropriate “when both the costs and benefits have been sufficiently evaluated and reviewed by the Commission so that a reasonable level of accuracy has been attained.”¹¹⁸ As discussed above, the *Ancillary Service Study* dramatically inflates the costs associated with increased solar penetration. At the same time, the Study makes no effort to calculate the degree to which these costs are offset by the benefits of increased distributed solar QF generation.^{119 120} This one-sided evaluation of the value of solar resources does not conform with the Commission’s Sub 148 Order finding that it was “appropriate for utilities to propose schedules specific to QFs that provide intermittent non-dispatchable power, if the Utilities’ cost data demonstrated marked differences in the value of the energy and capacity provided by these QFs.”¹²¹ Instead of quantifying the “differences in value”—both costs and benefits—provided by solar QFs, the *Ancillary Service Study* focuses solely on diminutions in the value of energy and capacity provided by these QFs.

The Companies have made no effort to quantify known benefits of distributed solar generation, such as lower market prices and avoided transmission and distribution capacity costs.¹²² As NCSEA Witness Beach explained, it is widely acknowledged that the growth of zero-variable-cost renewables has led to a broad reduction in electric market prices.¹²³ In other words, contrary to the Utilities’ assertion that they are “overpaying” QFs to the detriment of ratepayers, current electric energy prices are low precisely *because* of the reliable, non-variable-cost energy provided by QFs. Witness

¹¹⁸ *Id.* at 61.

¹¹⁹ *Ancillary Service Study* at p. 3. (“This study analyzes multiple solar penetration levels and quantifies the cost of utilizing the existing fleet to reliably integrate the additional solar generation”).

¹²⁰ Dominion’s proposed Re-Dispatch charge similarly fails to consider the benefits of distributed solar generation.

¹²¹ Sub 148 Order at p. 98.

¹²² *See* Tr. Vol. 5, p. 114, l. 4 – p. 115, l. 6.

¹²³ Tr. Vol. 5, p. 114, l. 12 – p. 11, l. 3.

Beach cited numerous studies that indicated the current penetration of renewables on the DEC and DEP systems could easily account for a 4% reduction in energy market prices in the state, which would substantially offset the proposed SISC.¹²⁴ Witness Beach and Witness Ms. Glick also discussed the avoided transmission and distribution capacity costs associated with increased distributed solar.¹²⁵ Witness Beach even proposed a methodology for quantifying avoided T&D capacity costs due to increased distributed solar based on existing data evaluating the benefits of the Companies' energy efficiency programs.¹²⁶ Nevertheless, Duke Energy has made no effort to quantify these benefits.¹²⁷

Duke Energy has not quantified the “differences in value” in the energy and capacity provided by solar QFs. Instead of fairly evaluating the costs and benefits associated with integration of solar resources into the Companies' resource mix, Duke Energy has fixated on—and dramatically overstated—the costs of solar integration, while failing to even attempt to quantify the benefits. Therefore, SACE respectfully urges the Commission to reject the proposed SISC as non-compliant with the Commission's past orders directing Duke Energy to consider both the costs and benefits of increased solar penetration.

D. The Commission Should Reject the *Ancillary Service Study* and Require Duke to Conduct a New Solar Integration Study with a technical review committee

For all these reasons, the *Ancillary Service Study* cannot be relied upon to quantify a solar integration charge. SACE respectfully urges the Commission to find that

¹²⁴ *Id.*

¹²⁵ Tr. Vol. 6, p. 296, ll.16-17; NCSEA Initial Comments, Attachment 2 at pp. 21-24.

¹²⁶ NCSEA Initial Comments, Attachment 2 at pp. 21-24.

¹²⁷ Tr. Vol. 3, p. 19, ll. 7-13. Dominion Witness Petrie similarly acknowledged that Dominion had not commissioned a study to calculate avoided T&D costs. Tr. Vol. 5, p. 82, l. 17 – p. 83, l. 14.

the *Ancillary Service Study* lacks credibility, reject the proposed SISC, and reject the May 21, 2019 Stipulation of Partial Settlement Regarding Solar Integration Charge between and among DEC, DEP, and the Public Staff.

Should the Commission find that it is necessary to quantify and impose a solar integration charge in the future, SACE respectfully urges that any future study evaluating the costs of solar integration be subject to a TRC or a similar objective, qualified third-party entity that will guide the development of a solar integration study and ensure that any proposed solar integration charge is reasonable and factually supported. A TRC would be well-suited to resolve many of the contentious issues in this proceeding, including:

- whether the $LOLE_{FLEX}$ metric is an appropriate metric for real-time operational reliability;
- how to appropriately model scaling of short-term solar variability;
- whether deployment of demand-side technologies could more efficiently resolve the impacts of solar volatility on net load;
- whether it would be appropriate to consider DEC and DEP's entry in an energy imbalance market or other market structure;
- how to quantify the benefits associated with addition of solar QFs to the DEC and DEP systems (e.g. avoided transmission and distribution costs, lower market prices, deferred environmental benefits, ancillary services from solar QFs with co-located battery storage)

- whether investing in fast-start flexible resources such as batteries would more economically and efficiently mitigate Duke Energy’s concerns regarding five-minute ramping shortfalls;
- whether operational or contractual solutions could be used to remedy the impacts of low occurrence events that contribute to proportionally higher integration costs, and how these solutions could mitigate these events and reduced integration costs and charges.

V. FLAWS IN ASTRAPÉ’S SOLAR CAPACITY VALUE STUDY AND 2016 RA STUDIES UNDERMINE THE SEASONAL CAPACITY WEIGHTING ASSUMPTIONS IN THE RATE DESIGN STIPULATION

Duke Energy has proposed to revise seasonal capacity payment weightings that virtually eliminate capacity payments to solar QFs. Specifically, the Companies have proposed a 100%/0% winter/summer capacity payment weighting for DEP and a 90%/10% weighting for DEC.¹²⁸ This seasonal capacity payment weighting is also part of the Stipulation of Partial Settlement Among DEC, DEP, and the Public Staff on April 18, 2019 (hereinafter “Rate Design Stipulation”).¹²⁹ The Companies rely on the *DEC and DEP Solar Capacity Value Study* performed by Astrapé (“*Solar Capacity Value Study*”) to justify this departure from the 80% winter/20% summer seasonal weighting the Commission ordered in in the E-100 Sub 148 proceeding.¹³⁰

¹²⁸ DEC and DEP Joint Initial Statement and Exhibits at p. 29.

¹²⁹ Stipulation of Partial Settlement Among Duke Energy Carolinas, LLC, Duke Energy Progress, LLC, and the Public Staff at IV.

¹³⁰ E-100 Sub 148 Order, Ordering Paragraph 5 (“DEC and DEP should recalculate their avoided capacity rates using seasonal allocation weightings of 80% winter and 20% summer.”).

The *Solar Capacity Value Study*, which employs the same model and many of the same assumptions used in Duke Energy’s 2016 Resource Adequacy Studies (together, “the RA Studies”), has several flaws which result in inaccurate and improper avoided capacity rates that cause solar QFs to be underpaid for their capacity contributions in the summer.¹³¹ First, the RA Studies significantly overstate the risk of very high loads under extreme cold, primarily due to faulty assumptions regarding the impact of extreme cold on load.¹³² For example, the Companies assume that under extreme cold conditions DEC load will increase by 231 MW for each degree the temperature falls; Witness Wilson’s analysis showed that the historical relationship was much weaker at extreme temperatures, likely reflecting that under extreme cold temperatures customers have already turned on all of their heating resources and many public facilities, such as schools and government buildings close, reducing loads.¹³³

Second, the studies overstate winter resource adequacy risk by assuming that demand response will continue to be summer-focused even though the Companies have identified more resource adequacy risk in the winter.¹³⁴ Witness Wilson’s report demonstrates that if the Companies were to assume equal levels of demand response in winter and summer, most of the hours with load loss would be in the summer rather than winter.¹³⁵ Third, the studies improperly layer greatly overstated “economic load forecast uncertainty” on top of the weather-related load distribution.¹³⁶ Fourth, the studies use

¹³¹ SACE Initial Comments pp. 11-12; Tr. Vol. 5, p. 337, l. 13 – p. 339, l. 11.

¹³² Tr. Vol. 5, p. 337, l. 16 – p. 338, l. 2; SACE Initial Comments, Attachment B, pp. 5-13.

¹³³ SACE Initial Comments, Attachment B, at p. 7

¹³⁴ Tr. Vol. 5, p. 338, ll. 3-12.

¹³⁵ SACE Initial Comments, Attachment B, at pp. 19-20.

¹³⁶ SACE Initial Comments, Attachment B, at pp. 14-19.

inaccurate assumptions regarding operating reserves during brief load spikes on extremely cold winter morning.¹³⁷

Combined, these flaws result in the *Solar Capacity Value Study* significantly overstating winter resource adequacy risks relative to summer, and inappropriately allocating 100% and 90% of loss of load risk to winter in DEP and DEC respectively.¹³⁸ The Companies' proposed avoided capacity rate designs provided in the Rate Design stipulation, which are derived from this flawed analysis, are similarly inaccurate.¹³⁹

A. Impact of Extreme Cold on Load

The *Solar Capacity Value Study* and RA Studies rely on a flawed approach to extrapolating the relationship between temperature and load at very low temperatures that causes winter resource adequacy risk to be significantly overstated. Witness Wilson's primary critique of the studies is that the Companies' inappropriately use a linear equation to extrapolate to extremely cold temperatures, when at low temperatures, the relationship between temperature and load is much weaker than the linear extrapolation suggests.¹⁴⁰

In the 2016 IRP Order the Commission recognized Witness Wilson's report in determining that that the "DEC load forecast may be too high."¹⁴¹ The Commission also recognized the Public Staff's conclusion that the Companies' current equations may not be accurately capturing customer responses to abnormally cold conditions.¹⁴² The

¹³⁷ SACE Initial Comments, Attachment B, at pp. 6-7.

¹³⁸ Tr. Vol. 5, p. 340, ll. 1-4.

¹³⁹ Tr. Vol. 5, p. 340, ll. 5-8.

¹⁴⁰ SACE Initial Comments, Attachment B, at p. 7.

¹⁴¹ 2016 IRP Order at p. 15.

¹⁴² *Id.*

Commission directed the Companies to work with the Public Staff to resolve these issues, but the Joint Report produced by Duke Energy and the Public Staff at the conclusion of their discussions did not address the inaccuracy of the regressions used in the RA Studies. Instead, the Joint Report merely noted that “after meeting with the Company, the Public Staff was satisfied that this approach was reasonable.”¹⁴³

Witness Wilson updated his analysis for the 2018 IRP proceeding and this proceeding, with an additional three years of data, and again determined that the majority of winter LOLE identified by the Companies is based on a highly simplified and inaccurate assumption about how loads would increase due to extreme temperatures.¹⁴⁴ These assumptions continue to overstate load under extreme cold temperatures, inflate winter risk and reserve margins, and skew the Companies’ avoided capacity weightings. The Companies failed to meaningfully engage with Witness Wilson’s critiques, merely referencing the Joint Report Duke Energy and the Public Staff submitted in response to the Commission’s 2017 IRP.¹⁴⁵ But neither the Joint Report nor the December 2017 Presentation attached to the Joint Report substantively addressed this issue.¹⁴⁶ The additional three years of data included in Witness Wilson’s analysis in this docket provide further support for the conclusion that the extrapolation greatly overstated load at the most extreme cold temperatures. There is no information on the record for this proceeding that substantively rebuts these concerns.

¹⁴³ Joint Report at p. 2.

¹⁴⁴ SACE Initial Comments, Attachment B, at p. 31.

¹⁴⁵ Duke Energy Reply Comments at p. 62.

¹⁴⁶ SACE Initial Comments, Attachment B, at p. 12.

B. Demand Response Assumptions

The *Solar Capacity Value Study* and RA Studies also overstate winter resource adequacy risk by assuming that demand response will continue to be summer-focused even though the Companies have identified more resource adequacy risk in the winter, and substantial winter demand response potential. Historically, the Companies were summer-peaking, with loss of load risk concentrated in the summer period. As a result, the Companies have designed their demand response programs to reduce demand on the hottest days of the summer, and now have roughly twice as much demand response available in summer as in winter. Since the Companies have, in recent years, identified more resource adequacy risk in winter than in summer, it is unreasonable for demand response efforts to continue to be so disproportionately geared towards reducing demand on summer days, and to neglect opportunities to reduce peak winter loads.¹⁴⁷

Further developing winter demand response could have a dramatic impact. Witness Wilson found that *if* winter demand response was brought up to the summer level, DEP and DEC would have significantly more summer hours with load loss than winter hours.¹⁴⁸ Instead of acknowledging the significant impact that additional winter demand response could have on seasonal capacity weightings, the Companies mischaracterized Witness Wilson's report as stating that "demand response winter assumptions should be brought up to the summer level," and then listed all the reasons that achieving total demand response parity between the seasons would be challenging.¹⁴⁹

SACE has not proposed a specific level of winter demand response, and has not specified

¹⁴⁷ SACE Initial Comments, Exhibit B, pp. 19-20.

¹⁴⁸ SACE Initial Comments, Exhibit B, pp. 19-20.

¹⁴⁹ Duke Energy Reply Comments at p. 63; *see also* Tr. Vol. 2, p. 133, ll. 5-8. ("the extreme amounts of DSM deployment that these intervenors anticipate to be cost effective and reasonably achievable are unsupported.")

parity between the seasons as a requirement. However, the Companies are currently not considering *any* changes to their demand response programs.¹⁵⁰ Given that the Companies' 2016 analysis shows that the technical and economic potential for residential winter demand response exceeds 2,300 for both DEC and DEP,¹⁵¹ the Companies' failure to consider any changes in their demand response programs that increase winter demand response is unreasonable.

C. Economic Load Forecast Uncertainty

The Companies' RA Studies and *Solar Capacity Value Study* greatly overstate "economic load forecast uncertainty," leading to inflated loss of load risk year-round. Witness Wilson raised this concern regarding economic load forecast uncertainty in the Companies' RA Studies in the 2016 IRP proceedings.¹⁵² In its 2016 IRP Order, the Commission expressed that it shared SACE and the Public Staff's concerns "on issues related to statistical and economic forecasting practices" and that "DEC's load forecast may be higher than reasonably justified."¹⁵³ Therefore, the Commission directed the Companies to work with the Public Staff to address these concerns.¹⁵⁴ In the 2016 IRP docket, the Public Staff and the Companies were ultimately unable to reach agreement on issues related to economic load forecast uncertainty.¹⁵⁵ In this docket, after numerous private discussions between the Companies, Astrapé, and the Public Staff, the Public Staff has accepted the Companies' economic load forecast uncertainty assumptions and

¹⁵⁰ SACE Initial Comments, Exhibit B, p. 20.

¹⁵¹ SACE Initial Comments, Exhibit B, p. 20.

¹⁵² Wilson 2017, RM Report, Docket No. E-100, Sub 147 at pp. 3-12.

¹⁵³ See *Order Accepting Integrated Resource Plans and Accepting REPS Compliance Plans* at 14, Docket No. E-100, Sub 147 (June 27, 2017).

¹⁵⁴ See *Order Accepting Integrated Resource Plans and Accepting REPS Compliance Plans* at 22-23, Docket No. E-100, Sub 147 (June 27, 2017).

¹⁵⁵ Duke Energy Reply Comments, pp. 59-66.

the proposed seasonal allocation weightings and capacity payment hour designations that result from them.¹⁵⁶

Having reached agreement with the Public Staff, the Companies have declined to directly respond to Witness Wilson's specific critiques of their load forecast uncertainty methodology. For example, the Companies do not rebut Witness Wilson's assertion that it was inappropriate to use 3-year load forecast uncertainty or that Astrapé's symmetric load forecast error distribution misrepresents the Congressional Budget Office's ("CBO") forecast errors and associated load forecast errors.¹⁵⁷ In particular, Witness Wilson testified that "the 2016 RA Studies assign almost 32% probability to under-forecast errors whose magnitude (+4% or +2%, in load forecast terms) never occurred even once in 30 years, according to the CBO data the distribution was purportedly based upon."¹⁵⁸ The Companies appear to believe that since Witness Wilson has consistently put forth the same critiques in the 2016 IRP proceeding and this proceeding, it is unnecessary to respond to them in detail.¹⁵⁹ But the Commission's 2016 IRP order required that the concerns discussed in Witness Wilson's report be acknowledged and fully addressed in future proceedings.¹⁶⁰ The Companies have failed to do so.

D. Operating Reserve Assumptions during Rare Cold-Weather Demand Spikes

The RA Studies also exaggerate winter risk through unreasonable operating reserve assumptions under winter extreme load conditions. Witness Wilson's Report

¹⁵⁶ Duke Energy Reply Comments, pp. 61.

¹⁵⁷ SACE Initial Comments, Exhibit B, pp. 17-18.

¹⁵⁸ SACE Initial Comments, Exhibit B, p. 18.

¹⁵⁹ See, e.g., Tr. Vol. 1, p. 128, l. 21 – p. 189, l. 3.

¹⁶⁰ See *Order Accepting Integrated Resource Plans and Accepting REPS Compliance Plans* at 21, Docket No. E-100, Sub 147 (June 27, 2017).

found that for both DEC and DEP, approximately 60% of annual load loss hours occurred on brief load spikes on very cold winter mornings, with the majority of these outages lasting one or two hours.¹⁶¹ During these events, system operators know that loads will soon decline and that such a substantial amount of reserve is not needed at that time, therefore the operators would very likely choose to go somewhat short on those reserves rather than call for firm load curtailment. The modeling assumption that operators would hold this large amount of resource, causing firm load curtailment, is not realistic.¹⁶² In contrast, summer peaks typically occur over multiple hours with load levels changing relatively slowly, so this adopted operating reserve assumptions is more likely reasonable for summer periods.¹⁶³ As a result of this flaw in the winter assumptions, the operating reserve assumptions used in the 2016 RA Studies, and incorporated in the *Solar Capacity Value Study* are unreasonable and further exaggerate winter risk.

E. The Commission Should Reject the Seasonal Capacity Weightings and Capacity Rates in the Rate Design Stipulation

The *Solar Capacity Value Study* and the RA Studies it relies upon are premised on the unreasonable assumptions detailed above. In the 2016 IRP proceeding, the Commission recognized the problematic nature of these assumptions and ordered the Companies to work towards resolving these issues. Two years later, Duke Energy has failed to improve its assumptions about the relationship between temperature and load at

¹⁶¹ SACE Initial Comments, Exhibit B, p. 20.

¹⁶² *Id.* pp. 20-21. In Reply Comments, Duke Energy disputes Witness Wilson's conclusions, and claims that the model commits some lower quantity of reserves. Duke Energy Reply Comments at p. 62-63. The Companies provide no citation or evidence for this claim and the 2016 Resource Adequacy Studies clearly state that the model commits to the full quantity of operating reserves in all hours. DEC Resource Adequacy Study pp. 25-26. In any case, Witness Wilson's main critique had to do with how the impact of extreme cold on load, and load forecast uncertainty, were overstated, and neither that critique nor his conclusions rest on the operating reserve assumptions.

¹⁶³ *Id.* at p. 21.

extreme temperatures, seasonal demand response, economic load uncertainty, and deployment of operating reserves during rare cold-weather demand spikes. The Commission took notice of this fact in its Order Accepting Integrated Resource Plans And Reqs Compliance Plans, Scheduling Oral Argument, and Requiring Additional Analyses in the E-100, Sub 157 proceeding (“2018 IRP Order”), in which it declined to accept “some of the underlying assumptions upon which DEC’s and DEP’s IRPs are based, the sufficiency or adequacy of the models employed, or the resource needs identified and scheduled in the IRPs beyond 2020.”¹⁶⁴ The Commission’s 2018 IRP Order also scheduled an oral argument for January 8, 2020, to further consider Witness Wilson’s concerns regarding Duke Energy’s load forecasts and reserve margins.¹⁶⁵

The seasonal capacity allocations and capacity value attributed to QFs in the avoided cost rates proposed in this proceeding rest on problematic assumptions that the Commission declined to accept in the 2018 IRP Order. Therefore, SACE respectfully urges the Commission to reject the Rate Design Stipulation entered into by Duke Energy and the Public Staff. Specifically, the Commission should reject the portion of the Rate Design Stipulation that provides “it is reasonable and appropriate for the Companies’ seasonal and hourly allocations of capacity payments to be based on the loss of load risk identified in the *Astrapé Solar Capacity Value Study*.”¹⁶⁶

Because the Commission has determined that it will review issues related to the problematic RA Studies and Solar Capacity Value Study, setting a January 2020 date for

¹⁶⁴ Order Accepting Integrated Resource Plans and REPs Compliance Plans, Scheduling Oral Argument, and Requiring Additional Analyses, August 27, 2019, Docket No. E-100, Sub 157 at p. 7.

¹⁶⁵ *Id.* at p. 89.

¹⁶⁶ Rate Design Stipulation at IV.A. SACE does not object to all aspects of the Rate Design Stipulation, and is encouraged by the development of a more granular rate design that provides appropriate price signals to QFs.

oral argument, SACE urges the Commission to disallow Duke Energy's seasonal capacity allocation proposals in the current proceeding. SACE has consistently raised concerns about the analysis and results from these studies, which underpin the seasonal weightings that Duke Energy advanced in this docket as well as the previous Sub 148 avoided cost proceeding. Considering the Commission's decision in the IRP proceeding to review the assumptions in these studies, it would be appropriate for the Commission to require DEP and DEC to temporarily revert to their previous seasonal allocations approved in the Sub 140 proceeding, which did not rely upon the flawed studies at issue in this proceeding and the 2018 IRP proceeding.¹⁶⁷

SACE further urges the Commission to instruct the Companies to study the relationship between extreme cold conditions and loads; research the drivers of sharp winter load spikes under extreme cold conditions and develop programs for mitigating these rare and brief spikes; research the potential for load forecast errors due to economic and demographic forecast error; and use the results of this research to inform the assumptions used in future resource adequacy studies.

¹⁶⁷ The Commission's Sub-140 Order approved "60%/40% weighting for summer and non-summer months for the proposed avoided capacity rates under DEC Option B and DEP Options A and B, and the 80%/20% (summer/non-summer) weighting for DEC Option A." See Order Establishing Standard Rates and Contract Terms for Qualifying Facilities, p. 31, Docket No. E-100, Sub 140 ("Sub 140 Order"). Here, it is appropriate to default to the 60%/40% seasonal capacity allocation, which encompassed the majority of contracts signed under the Sub-148, and is not tainted by the problematic 2016 RA Studies.

**VI. THE UTILITIES' PROPOSALS REGARDING BATTERY STORAGE TECHNOLOGY
CONFLICT WITH THE STATE'S POLICY OF ENCOURAGING ALTERNATIVE
ENERGY AND CARBON REDUCTION AND VIOLATE THE PLAIN LANGUAGE OF
EXISTING PPAS**

Battery storage technology has uncontroverted and enormous potential to directly address many of the concerns that Utilities have expressed regarding solar power integration to the electricity grid.¹⁶⁸ As prices for energy storage continue to decline, we have reached a critical moment for harnessing this potential and encouraging private investment in storage that will ultimately benefit ratepayers. Battery storage will enhance the utility and capability of our renewable energy portfolio, in particular to help avoid or defer future fossil-fuel based electricity generation.¹⁶⁹ Additional benefits include bulk energy time shifting, peak capacity deferral, solar clipping, flexible ramping, frequency regulation, voltage support and control, circuit upgrade or capacity deferral, transmission investment deferral, and transmission congestions relief.¹⁷⁰

Despite this enormous potential, the Utilities seek in this proceeding to completely halt private investments in battery storage by independent power producers. The Utilities' proposal to terminate any existing PPA if storage is added to the facility—*even* when the storage will not exceed the maximum AC capacity of the system—directly contradicts the State's public policy of encouraging alternative energy resources and carbon reduction. Moreover, this proposal runs contrary to the terms of existing PPAs. The Utilities' proposals should be rejected.

¹⁶⁸ See *supra* notes 172-179.

¹⁶⁹ Tr. Vol. 6, p. 279, l. 19 – p. 280, l. 6.

¹⁷⁰ Tr. Vol. 6, p. 126, l. 17 – p. 127, l. 7.

A. To Capitalize on the Many Benefits of Battery Storage, Barriers to Adoption Should be Eliminated

All parties agree that when properly deployed, battery storage provides considerable benefits.¹⁷¹ The benefits of battery storage are broadly recognized and discussed extensively in the 2018 Energy Storage Options for North Carolina Study discussed by NCSEA Witness Norris.¹⁷² SACE Witness Glick also discussed the benefits of battery storage, and the ways in which QFs can use battery-enabled smoothing and shifting to increase their value to the grid.¹⁷³ Both NCSEA and SACE witnesses explained the many ways in which battery storage adoption, and solar-plus-storage facilities in particular, will benefit ratepayers.¹⁷⁴ For example, when the utilities operate an expensive peaking resource or invest capital in a new peaking resources, the costs and any associated future risks are typically passed on to the ratepayers, but when battery storage is added to an existing QF, the ratepayer gains the peaking capacity for at most the incremental cost of the peak versus off-peak avoided cost rate.¹⁷⁵ As NCSEA Witness Witness Norris concluded, “North Carolina ratepayers will benefit if barriers are removed to the addition of battery storage.”¹⁷⁶

Duke Energy Witness Snider also acknowledged that if properly designed, installed, and operated, battery storage can eliminate the integration impacts that the

¹⁷¹ Tr. Vol. 5, p. 96, l.7 – p. 101, l. 4 (Dominion Witness Petrie discussing benefits of battery storage); Tr. Vol. 3, p. 112, ll. 4-8; Tr. Vol. 3, p. 68, ll. 4-9 (Duke Witness Snider discussing the need to incentivize battery storage adoption).

¹⁷² See Tr. Vol. 6, pp. 126, l. 6 – p. 129, l. 7.

¹⁷³ See Tr. Vol. 6, pp. 272, l. 10 – p. 274, l. 11.

¹⁷⁴ Tr. Vol. 6, p. 296, l.4 – p. 297, l. 19; Tr. Vol. 6, p. 299, l.7 – p. 301, l.9; Tr. Vol. 6, p. 129, l.13 – p. 134, l. 10.

¹⁷⁵ Tr. Vol. 6, p. 280, ll. 14-22.

¹⁷⁶ Tr. Vol. 6, p. 134, ll. 13-18.

proposed solar integration charge is intended to address (smoothing).¹⁷⁷ Witness Snider stated that adding battery storage to a solar facility allows the facility to shift production of electricity to more valuable peak times (shifting).¹⁷⁸ Witness Snider further stated that it is important to incentivize the use of battery storage, so long that it is done at the proper avoided cost rates; and that there should not be any unnecessary barriers that prevent the appropriate deployment of energy storage.¹⁷⁹

SACE agrees. Yet, despite recognizing many of the benefits of battery storage, and the importance of incentivizing the adoption of battery storage, Duke Energy's proposed Terms and Conditions will create a significant, unnecessary barrier to the adoption of battery storage going forward. Specifically, Duke Energy's proposed Terms and Conditions provide that the addition of any battery storage to an existing QF constitutes a "material alteration" that, absent the Companies' consent, constitutes a breach of the QF's existing PPA.^{180,181}

As Witness Snider admits, the proposed "material alteration" language would create a "strong disincentive" for a QF seeking to add battery storage to a facility, since it would require the QF to forfeit the higher avoided cost rates included in its PPA.¹⁸² Under the Companies' proposed Terms and Conditions, QFs would be prohibited from adapting to changing technology and maximizing their value to the grid. Duke Energy's

¹⁷⁷ Tr. Vol. 3, p. 84 ll. 11-18; Tr. Vol. 3, p. 83, ll. 16-18; Tr. Vol. 3, p. 111, ll. 9-20.

¹⁷⁸ Tr. Vol. 3, p. 110, ll. 19-24. Dominion Witness Petrie similarly discussed the value to the grid of smoothing and shifting energy output through battery storage. Tr. Vol. 5, p. 96, l. 7 – p. 101, l. 4.

¹⁷⁹ Tr. Vol. 3, p. 112, ll. 4-8; Tr. Vol. 3, p. 68, ll. 4-9.

¹⁸⁰ Tr. Vol. 2, p. 263, ll. 3-6.

¹⁸¹ Dominion has also taken the position that if a QF seeks to add battery storage to a proposed or existing facility that has established a legally enforceable obligation or executed a PPA, that QF would be required to forfeit its existing PPA and execute a new PPA in the current biennial period. Tr. Vol. 5, p. 58, ll. 16 – p. 59, l. 6. However, Dominion has not yet revised its standard offer rate schedules and contracts to reflect this position. Tr. Vol. 5, p. 63, ll. 16-23.

¹⁸² Tr. Vol. 3, p. 68, ll. 10-19.

position that any committed QF that seeks to add battery storage must terminate its PPA will have the practical effect of “wholly obstruct[ing] the addition of energy storage resources” to QFs in North Carolina,¹⁸³ and leaving value “on the table” for QFs and ratepayers alike.¹⁸⁴ The only beneficiary of Duke Energy’s restrictive battery storage proposals are the Companies’ shareholders, who will benefit from the Companies’ continued investment in expensive peaking resources in lieu of cheaper, more flexible solar plus battery storage QFs.

B. The Utilities’ Proposal to Terminate Any Existing PPA When Storage is Added Contradicts the Terms of Existing PPAs

In addition to being bad public policy, the Companies’ proposals, applied to existing PPA contracts, violate fundamental principles of contract law. Contrary to the Utilities’ claims in this proceeding, they do not have a contractual right to terminate existing QF PPAs solely because battery storage is added to a QF.

1. The Utilities’ proposals contradict the plain language of the existing PPAs

The PPAs at issue are primarily those approved in the E-100 Sub 136 and 140 proceedings.¹⁸⁵ Those contracts do not include any limitations on the addition of battery storage nor do they include any limitations regarding production profiles of the QF that may be shifted or smoothed by the addition of storage. By the plain language of the

¹⁸³ Tr. Vol. 6, p. 135, ll. 1-4.

¹⁸⁴ Tr. Vol. 6, p. 300, ll. 17-22.

¹⁸⁵ Tr. Vol. 2, p. 348, ll. 14-19. While Duke Energy has not yet confirmed, witnesses at the hearing testified that very few, or no contracts at all, had been signed under the Sub 148 PPA Terms and Conditions.

PPAs, the addition of storage does not constitute a breach of the contract warranting termination.

Additional terms in the existing PPAs support the position that storage can be added to existing QF projects. In contract law, the inclusion of one item in a contract implies the exclusion of all others.¹⁸⁶ To that end, the existing PPAs *do* include a provision that certain modifications—changes to the facility’s contract capacity, generating capacity, or estimated annual kWh energy production— could potentially trigger either breach and therefore termination, or require a new PPA.¹⁸⁷ As Commissioner Clodfelter raised at the hearing, the Companies’ overbroad definition of a “material alteration” would encompass the addition of battery storage to an existing QF that does not impact any of these contract terms.¹⁸⁸ The plain language of the contracts permits a QF to add battery storage so long as the provisions above are not breached. In particular, battery storage may be used to shift the QF’s generation profile or smooth energy output without being forced to give up its existing PPA.

Finally, even if the terms of the existing PPA contracts were unclear—which they are not—it is a longstanding rule of contract interpretation that when the plain language of a contract is unclear, the contract will be construed against the drafter, in this case, Duke Energy and Dominion Energy North Carolina.¹⁸⁹

¹⁸⁶ See *Magnum v. Raleigh Bd. of Adjustment*, 196 N.C. App. 249, 255 (2009); *In re Wright Estate v. Ball*, 204 N.C. 465, 469 (1933); *Peoples Serv. Drug Stores, Inc. v. Mayfair, N.V. (Mocora, N.V), King Inv’rs, Ltd.*, 50 N.C. App. 442 (1981).

¹⁸⁷ Sub 140 Standard Offer PPA, Terms and Conditions § (4)(a)-(c); § 1(i). It is important to note that the prohibition on a change in the “estimated annual energy production” contained in some of these documents is not the same thing as a prohibition on an exceedance of a maximum annual energy production value. None of the documents contain such a value or such a prohibition.

¹⁸⁸ Tr. Vol. 3, p. 148, l. 7 – p. 152, l. 13.

¹⁸⁹ *Root v. Allstate Ins. Col.*, 272 N.C. 580, 585 (1968).

2. *The Companies' attempt to introduce evidence external to existing contracts violates the parol evidence rule*

Duke Energy attempts to introduce evidence external to the PPA in order to support its unreasonable reading of the contract terms. But this parol evidence is not admissible to supply the terms of a fully integrated contract, such as the existing PPAs.¹⁹⁰

The PPA is a fully integrated contract. The PPA contains all of the essential terms of the agreement between Duke and a QF, including the nature and extent of services to be provided, the place where the services will be provided, the beginning and end dates, and the amount of compensation to be paid.¹⁹¹ Furthermore, the PPA and Terms and Conditions for the Purchase of Electrical Power state that the PPA consists of the PPA, the Company's Rate Schedule PP, and the Terms and Conditions.¹⁹² The parties clearly intended that these three documents—the PPA, Schedule, and Terms and Conditions—would govern all of the obligations between the parties and set forth the entire agreement. Therefore the PPA is an integrated contract and no external evidence is admissible to establish contradictory or additional terms.

Duke Energy repeatedly attempts to introduce evidence external to the contract in order to change the plain meaning of the PPA. Witness Wheeler testified in great detail about how the Companies set a levelized rate based on the expectation that the generation profile of a contracted QF will maintain stable.¹⁹³ Witness Wheeler also testified that the Companies rely on the facility information included in the terms of the Certificate of Public Convenience and Necessity (“CPCN”) which a QF must obtain in order to be

¹⁹⁰ See *Beal v. K.H. Stephenson Supply Co., Inc.*, 36 N.C. App. 505, 508 (1978).

¹⁹¹ See *Beal*, 36 N.C. App. at 508-09.

¹⁹² Terms and Conditions for the Purchase of Electrical Power, E-100 Sub 140 §1(a).

¹⁹³ Tr. Vol. 3, p. 148, l. 17 – p. 149, ll. 3.

eligible for PPA.¹⁹⁴ But neither Duke Energy’s practices regarding the setting of levelized rates nor the terms of the CPCN are included in the fully integrated PPA contract.¹⁹⁵ Nowhere in the PPA does it state that changes to the CPCN materially breach the terms of the PPA contract. In fact, the PPA does not even reference the facility information as presented in the CPCN.¹⁹⁶ Furthermore, even if the CPCN’s terms were integrated into the PPA contract—and they are not—there is no evidence that battery storage equipment even requires a CPCN.¹⁹⁷ The plain language of the PPA permits QFs to add battery storage that does not change the QF’s maximum annual energy production value. Duke Energy’s attempts to introduce external evidence to contradict the plain language of the contract are barred by the parol evidence rule. For all of the reasons enumerated above, the Commission should reject the Utilities’ efforts to prevent the addition of battery storage to QFs under existing contract terms.

VII. CONCLUSION

For the reasons described above, SACE respectfully requests that the Commission reject Duke Energy’s (1) proposed Solar Integration Charge, (2) proposed capacity rate design and seasonal weighing allocations, and (3) “material alterations” language in the proposed Terms and Conditions. SACE further urges the Commission to reject Duke Energy and the Public Staff’s April 18, 2019 Stipulation of Partial Settlement regarding Rate Design and May 21, 2019 Stipulation of Partial Settlement Regarding Solar Integration Charge.

¹⁹⁴ Tr. Vol. 4, p. 14, l. 11 – p. 15, ll. 12.

¹⁹⁵ Tr. Vol. 4, p. 41, ll. 6-22; Tr. Vol. 3, p. 148, l. 7 – p. 151, l. 14.

¹⁹⁶ Tr. Vol. 4, p. 41, ll. 6-21.

¹⁹⁷ Tr. Vol. 4, p. 44, ll. 3-9.

Respectfully submitted, this 4th day of September, 2019.

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CERTIFICATE OF SERVICE

I certify that a copy of the foregoing *Post-Hearing Brief of Southern Alliance for Clean Energy*, as filed today in Docket No. E-100, Sub 158, was served on all parties of record by electronic mail or by deposit in the U.S. Mail, first-class, postage prepaid.

This 4th day of September, 2019.

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