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1 My Direct Testimony discusses the Companies' recent system planning and operational  
2 experience as increasing levels of solar qualifying facility ("QF") energy is being injected into the  
3 Duke Energy Progress ("DEP") and Duke Energy Carolinas ("DEC") systems.

4 I provide the Commission background regarding how the DEP and DEC balancing  
5 authorities ("BAs") independently deploy their designated network and load-following generating  
6 assets through a Security Constrained Unit Commitment process to reliably provide firm native  
7 load service to their customers, as well as to comply with mandatory North American Electric  
8 Reliability Corporation ("NERC") Reliability Standards that enforce the provision of essential  
9 reliability services within each BA.

10 My testimony highlights for the Commission the current and growing operational  
11 challenges and reliability risks of integrating significant quantities of "non-conforming" solar  
12 energy into the BAs, including (i) managing "unscheduled" and "unconstrained" solar QF energy  
13 injections within reliability limitations of the BA's Lowest Reliability Operating Level; (ii)  
14 managing the real-time variability and intermittency of the unscheduled solar energy injections;  
15 (iii) managing the growing amounts of operationally excess energy and very steep down-ramps  
16 and up-ramps due to the non-conforming energy injections by solar facilities, particularly during  
17 the fall, winter, and spring periods; and (iv) ensuring compliance with mandatory NERC  
18 reliability standards, specifically including the BAL-001, BAL-002, and BAL-003 standards.

19 I explain the Companies' obligation to operate load-following resources at or above their  
20 "Lowest Reliability Operating Limit" or "LROL" to meet upcoming late-day and next-day system  
21 demand peaks and maintain reliable service. I demonstrate that the significant levels of QF solar  
22 energy is now causing operationally excess energy in the DEP BA during a growing number of  
23 hours on an increasing number of days during the fall, winter, and spring periods. By early 2018,  
24 DEP is projected to have over 2,200 MWs of solar facilities that will inject into the DEP BA

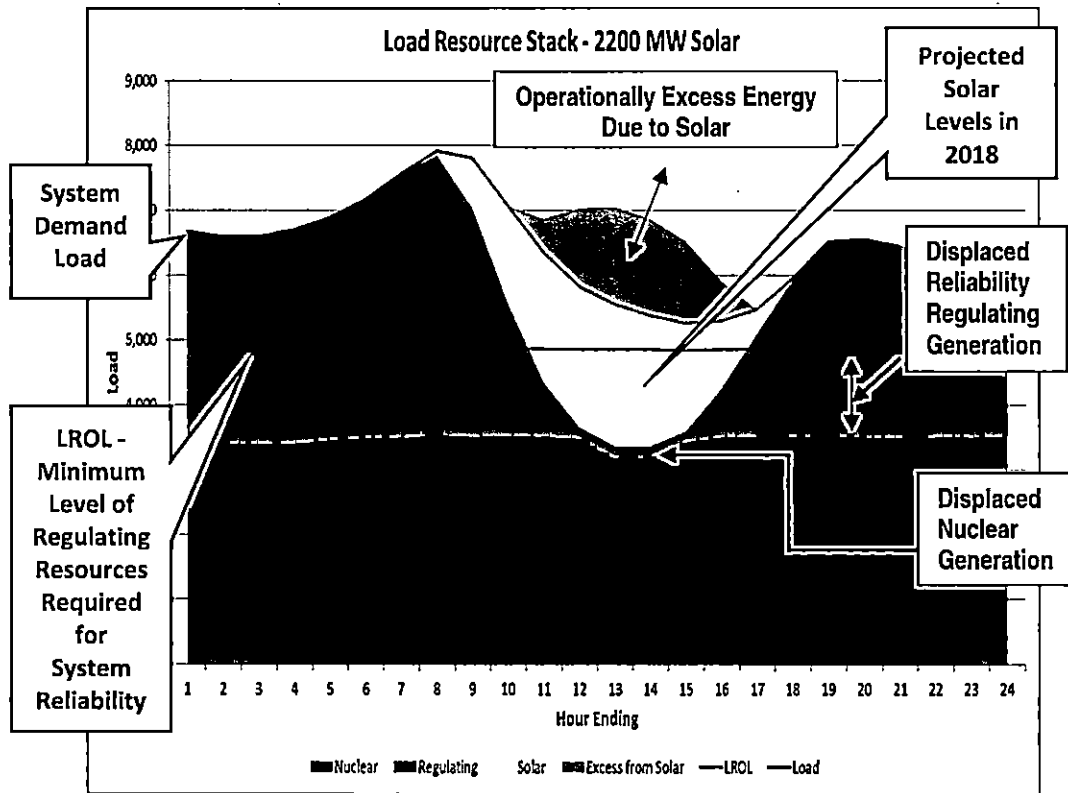
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Summary of Sam Holeman's Direct and Rebuttal Testimony  
NCUC Docket No. E-100, Sub 148

- 1 more energy than the BA can reliably accommodate, causing DEP to increasingly operate in a  
2 reactive mode and with very limited situational awareness.



- 3 My direct testimony explains how the generation-demand imbalance that is harmful to  
4 system frequency and the other operational risks due to the increasing levels of QF energy is  
5 challenging the DEP BA's capability to maintain compliance with NERC's BAL Standards. I  
6 explain how a potential violation of the BAL Standards could cause a system emergency on the  
7 DEP or DEC BA, resulting in unscheduled power flows, unnecessary and automatic firm load  
8 shedding, or potentially even cascading outages that could affect other BAs in the Eastern  
9 Interconnection. To mitigate these growing system reliability and operational risks, and the  
10 growing challenge of maintaining compliance with NERC's standards, the Companies have  
11 proposed a clarification to the standard offer terms and conditions to include the ability to curtail  
12 QFs during imminent violations of NERC BAL Standards to avoid these system emergencies.

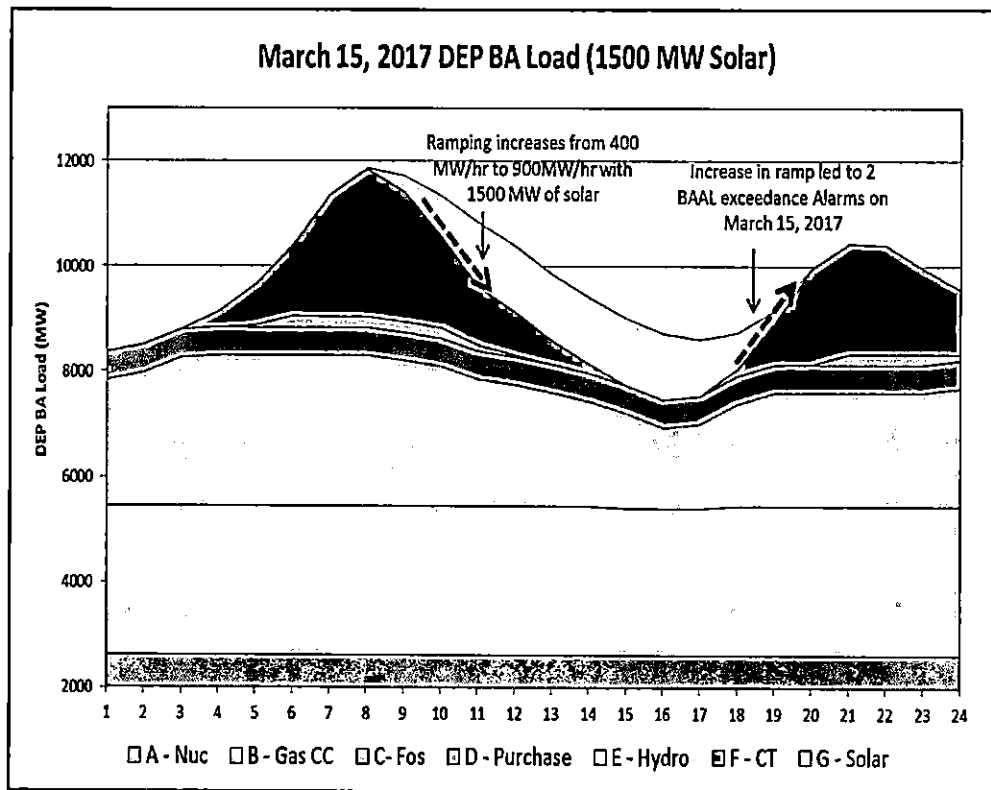
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1           My Rebuttal Testimony responds to Public Staff Witness Dustin Metz's testimony  
2 concerning system operations, safety, reliability, and regulatory compliance with regards to  
3 current and future NERC Reliability Standards. I agree with his conclusion that "[c]ontinued  
4 growth in unconstrained and non-dispatchable generation will only serve to exacerbate the current  
5 system challenges" that I addressed in my direct testimony.

6           I describe the Essential Reliability Services that the DEP and DEC BA must provide, and  
7 the role of NERC's Reliability Standards to enforce the provision of these essential services. I  
8 also explain the upcoming NERC BAL-002-2 standard to become effective January 1, 2018,  
9 which will require the BAs to manage the DEP and DEC systems to recover the resource-demand  
10 balance within 15 minutes of a "Balancing Contingency Event."

11           In connection with the BAL-002 Standard, I discuss the growing challenges facing DEP  
12 BA operators as significant levels of non-conforming solar energy injections into the BA impose  
13 significantly steeper down-ramps and up-ramps associated with the morning and late-day system  
14 peaks. I explain that after the morning system peak, solar energy generation increases as system  
15 load naturally declines, and therefore, the BA's assets must sharply reduce their output to  
16 maintain real-time balance. I also explain that as the late-day peak approaches, solar energy  
17 generation quickly decreases just as system load naturally increases, and therefore, the BA's  
18 assets must sharply increase their output to maintain real-time balance. These steep up- and  
19 down-ramps are challenging the physical capability of the BA's assets to respond in real time to  
20 decrease and increase output.

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I also explain the purely economic role of the Joint Dispatch Agreement (“JDA”) between DEC and DEP. I discuss the limitations of the hourly, as-available, non-firm, curtailable transmission path between the DEP BA and the DEC BA. I emphasize that the “JDA” is not a tool for managing balancing, regulating, or operating reserve requirements. Further, I emphasize that non-firm transmission between two BAs is neither a prudent nor a reliable solution for managing the increasing operationally excess solar QF energy now being generated in the DEP BA.

Finally, I respond to Public Staff Witness Metz’s discussion about potential “system emergency” curtailments of QFs, particularly on the DEP system, and explain the high likelihood of operational curtailments of QFs that will be required in real time to ensure compliance with NERC Reliability Standards and to avoid the growing risks to reliable electric service on the BA as even more QFs continue to come online. I describe the Companies’ ongoing efforts to expand operating protocols for the management of system emergency curtailments of QFs and other non-

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1 QF generators on a similarly situated, non-discriminatory basis, and commit to share the  
2 protocols with the Public Staff as soon as it is completed.

3 I will conclude my summary by emphasizing for the Commission that the Companies'  
4 recent and anticipated system operations experience represent real and complex future safety,  
5 reliability, and regulatory compliance challenges due to the very high penetration levels of solar  
6 and other QFs on each BA, particularly DEP. As a system operator, I am agnostic as to the  
7 type of generation technology connected to the system, as long as I can prudently provide  
8 reliable and secure service to our customers. Under the current PURPA framework,  
9 operational challenges will intensify as the more than 2200 MWs of solar facilities  
10 connect to and inject energy into the DEP BA. My testimony supports the Companies'  
11 recommendations as a critically important initial step in evolving how solar QFs are  
12 added to the BA to enable DEP and DEC to continue to reliably serve our customers in  
13 North Carolina, and comply with NERC's Reliability Standards.

14 This concludes my summary.

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