STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH

DOCKET NO. E-100, SUB 157

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of 2018 Biennial Integrated Resource Plans and Related 2018 REPS Compliance Plans	))))	PROPOSED ORDER OF SOUTHERN ALLIANCE FOR CLEAN ENERGY, SIERRA CLUB, AND NATURAL RESOURCES DEFENSE COUNCIL

HEARD: Monday, February 4, 2019, at 7:00 p.m. in Commission Hearing Room 2115, Dobbs Building, 430 North Salisbury Street, Raleigh, North Carolina

BEFORE: Chair Charlotte A. Mitchell and Commissioners ToNola D. Brown-Bland, Lyons Gray, and Daniel G. Clodfelter.[1]

APPEARANCES:

For Duke Energy Progress, LLC, and Duke Energy Carolinas, LLC (Duke):

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For Carolina Utility Customers Association, Inc. (CUCA)

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For Carolina Industrial Groups for Fair Utility Rates I, II, and III (CIGFUR):

Warren Hicks, Bailey & Dixon, LLP, P.O. Box 1351, Raleigh, North Carolina 27602-135

For Environmental Defense Fund:

[1] Former Chairman Edward S. Finley, Jr. presided at the public hearing in this matter, which was also attended by former Commissioners Jerry C Dockham, James G. Patterson.

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For North Carolina Advanced Energy Corporation:

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For North Carolina Attorney General's Office:

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For North Carolina Clean Energy Business Alliance and Ecoplexus, Inc.:

Karen Kemerait, Smith Moore Leatherwood LLP, 434 Fayetteville Street, Suite 2800, Raleigh, North Carolina 27601

For North Carolina Sustainable Energy Association (NCSEA):

Peter Ledford, 4800 Six Forks Road, Suite 300, Raleigh, North Carolina 27609

For North Carolina Waste Awareness & Reduction Network (NC WARN):

Kristen Wills, P.O. Box 61051, Durham, North Carolina 27715

For Southern Alliance for Clean Energy (SACE), Sierra Club, and Natural Resources Defense Council (NRDC):

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For the Using and Consuming Public:

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BY THE COMMISSION:

Integrated Resource Planning (IRP) is intended to identify those electric resource options that can be obtained at least cost to the utility and its ratepayers consistent with the provision of adequate, reliable electric service. IRP considers

demand-side alternatives, including conservation, efficiency, and load management, as well as supply-side alternatives in the selection of resource options. Commission Rule R8-60 defines an overall framework within which the IRP process takes place in North Carolina. Analysis of the long-range need for future electric generating capacity pursuant to G.S. 62-110.1 is included in the Rule as a part of the IRP process.

Utilities' IRP Plans serve as the basis for decisions about whether to build or acquire new generating resources, and what resources to select. In past proceedings before this Commission, Duke has relied upon the contents of its IRP Plans to justify applications for certificates of public convenience and necessity for new generation resources. The assumptions that inform and the conclusions that are reached in IRP Plans also underpin utility calculations of avoided costs, which themselves have implications for rates paid to independent power producers and for cost-effectiveness testing of DSM/EE programs.

General Statute (G.S.) 62-110.1(c) requires the Commission to "develop, publicize, and keep current an analysis of the long-range needs" for electricity in this State. The Commission's analysis should include: (1) its estimate of the probable future growth of the use of electricity; (2) the probable needed generating reserves; (3) the extent, size, mix, and general location of generating plants; and (4) arrangements for pooling power to the extent not regulated by the Federal Energy Regulatory Commission (FERC). Further, G.S. 62-110.1 requires the Commission to consider this analysis in acting upon any petition for the issuance of a certificate for public convenience and necessity for construction of a generating facility. In addition, G.S. 62-110.1 requires the Commission to submit annually to the Governor and to the appropriate committees of the General Assembly a report of its: (1) analysis and plan; (2) progress to date in carrying out such plan; and (3) program for the ensuing year in connection with such plan. G.S. 62-15(d) requires the Public Staff to assist the Commission in making its analysis and plan pursuant to G.S. 62-110.1.

G.S. 62-2(a)(3a) declares it a policy of the State to:

> assure that resources necessary to meet future growth through the provision of adequate, reliable utility service include use of the entire spectrum of demand-side options, including but not limited to conservation, load management and efficiency programs, as additional sources of energy supply and/or energy demand reductions. To that end, to require energy planning and fixing of rates in a manner to result in the least cost mix of generation and demand-reduction measures which is achievable, including consideration of appropriate rewards to utilities for efficiency and conservation which decrease utility bills . . . .

Session Law (S.L.) 2007-397 (Senate Bill 3), signed into law on August 20, 2007, amended G.S. 62-2(a) to add subsection (a)(10) that provides that it is the policy of North Carolina "to promote the development of renewable energy and energy efficiency through the implementation of a Renewable Energy and Energy Efficiency Portfolio Standard (REPS)" that will: (1) diversify the resources used to reliably meet the energy needs of North Carolina's consumers, (2) provide greater energy security through the use of indigenous energy resources available in North Carolina, (3) encourage private investment in renewable energy and energy efficiency, and (4) provide improved air quality and other benefits to the citizens of North Carolina. To that end, Senate Bill 3 further provides that "[e]ach electric power supplier to which G.S. 62-110.1 applies shall include an assessment of demand-side management and energy efficiency in its resource plans submitted to the Commission and shall submit cost-effective demand-side management and energy efficiency options that require incentives to the Commission for approval."[2]

Senate Bill 3 also defines demand-side management (DSM) as "activities, programs, or initiatives undertaken by an electric power supplier or its customers to shift the timing of electric use from peak to nonpeak demand periods" and defines an energy efficiency (EE) measure as "an equipment, physical or program change implemented after 1 January 2007 that results in less energy being used to perform the same function."[3] Energy Efficiency measures do not include DSM.

To meet the requirements of G.S. 62-110.1 and G.S. 62-2(a)(3a), the Commission conducts an annual investigation into the electric utilities' IRPs. Commission Rule R8-60 requires that each utility, to the extent that it is responsible for procurement of any or all of its individual power supply resources,[4] furnish the Commission with a biennial report in even-numbered years that contains the specific information set out in Rule R8-60. In odd-numbered years, each of the electric utilities must file an annual report updating its most recently filed biennial report.

Further, Commission Rule R8-67(b) requires any electric power supplier subject to Rule R8-60 to file a REPS compliance plan as part of each biennial and annual report. In addition, each biennial and annual report should (1) be accompanied by a short-term action plan that discusses those specific actions currently being taken by the utility to implement the activities chosen as appropriate per the applicable biennial and annual reports, and (2) incorporate

[2] G.S. 62-133.9(c).
[3] G.S. 62-133.8(a)(2) and (4).
[4] During the 2013 Session, the General Assembly enacted S.L. 2013-187 (House Bill 223), which exempted the EMCs from the requirements of G.S. 62-110.1(c) and G.S. 62-42, effective July 1, 2013. As a result, EMCs are no longer subject to the requirements of Rule R8-60 and are no longer required to submit IRPs to the Commission for review.

information concerning the construction of transmission lines pursuant to Commission Rule R8-62(p).

Within 150 days after the filing of each utility's biennial report and within 60 days after the filing of each utility's annual report, the Public Staff or any other intervenor may file its own plan or an evaluation of, or comments on, the utilities' biennial and annual reports. Furthermore, the Public Staff or any other intervenor may identify any issue that it believes should be the subject of an evidentiary hearing. The Commission must schedule one or more hearings to receive public testimony.

2018 BIENNIAL REPORTS

This Order addresses the 2018 biennial reports (2018 IRPs) filed in Docket No. E-100, Sub 157, by Duke Energy Progress, LLC (DEP) and Duke Energy Carolinas, LLC (DEC) (collectively, Duke).

The following parties have been allowed to intervene in this docket: Carolina Industrial Group for Fair Utility Rates I, II, and III (CIGFUR); Carolina Utility Customers Association, Inc. (CUCA); Environmental Defense Fund (EDF); North Carolina Sustainable Energy Association (NCSEA); North Carolina Waste Awareness and Reduction Network (NC WARN); and, jointly, Southern Alliance for Clean Energy (SACE), Sierra Club, and the Natural Resources Defense Council (NRDC). The Public Staff's intervention is recognized pursuant to G.S. 62-15(d) and Commission Rule R1-19(e). The Attorney General's intervention is recognized pursuant to G.S. 62-20.

PROCEDURAL HISTORY

DEC and DEP filed their 2018 biennial IRP reports and REPS compliance plans on September 5, 2018.

On September 27, 2018, the Commission issued an Order Scheduling Public Hearing on 2018 IRP Plans and Related 2018 REPS Compliance Plans. That Order set the public witness hearing for 7:00 p.m. on February 4, 2019, in Raleigh.

On December 14, 2018, initial comments were filed by NCWARN. On December 17, 2018, initial comments were filed by the Environmental Defense Fund.

On January 17, 2019, NCSEA filed a motion for extension of time for the filing of initial and reply comments on the 2018 IRP Plans and Related 2018 REPS Compliance Plans to February 15, 2019, and April 16, 2019, respectively. The Commission granted this motion on January 24, 2019.

On February 4, 2019, the public witness hearing was held in Raleigh, as scheduled.

On February 7, 2019, the Public Staff filed a motion for extension of time for filing of initial and reply comments on the 2018 IRP Plans to March 7, 2019, and May 6, 2019, respectively. The Commission granted this motion on February 8, 2019.

On February 15, 2019, Environmental Defense Fund filed initial comments on the 2018 IRP Plans.

On March 7, 2019, initial comments on the 2018 IRP Plans were filed by the Public Staff, the Attorney General's Office, NCSEA, and, jointly, SACE, Sierra Club, and NRDC.

On March 12, 2019, the Public Staff filed corrections to its initial comments on the 2018 IRP Plans.

On April 29, 2019, DEC and DEP filed a motion for extension of time for filing of reply comments on the 2018 IRP Plans to May 20, 2019. The Commission granted this motion on May 1, 2019.

On May 20, 2019, DEC and DEP, the Attorney General's Office, and NC WARN filed reply comments on the 2018 IRP Plans.

On June 12, 2019, the Commission issued an order requiring Duke and the Public Staff to file proposed orders on the 2018 IRP Plans by July 12, 2019 and requesting that other parties wishing to file proposed orders do so by the same date.

On July 10, 2019, the Public Staff filed a motion for extension of time for filing of proposed orders in this proceeding to July 26, 2019. The Commission granted this motion on July 12, 2019.

PUBLIC HEARING

Pursuant to G.S. 62-110.1(c), the Commission held a public hearing in Raleigh on Monday, February 4, 2019, at 7:00 p.m., where 49 public witnesses spoke. In summary, the testimonies of the public witnesses focused on the deficiency of the Companies' renewable energy plans compared to IRPs of other utilities in other states, the urgency of the climate crisis and Duke Energy's role in it as one of the largest utilities in the world, and the need for more transparency in the IRP process and additional public hearings throughout the state. Almost every witness spoke about the Commission's crucial role in fighting climate change, within North Carolina and beyond, due to Duke Energy's size, and many of them expressed concern about the increasing

frequency of climate change-related natural disasters in North Carolina and the devastating public health and economic impacts of those events on their communities. Several witnesses commented on the economic irresponsibility of the plans laid out in the IRP, and referenced economically successful utilities and states embracing renewables at much higher rates than the Companies propose to. Additionally, many witnesses spoke out against the Atlantic Coast Pipeline, both from an economic perspective and due to the environmental justice and climate change implications inherent in pipeline siting, construction, and operation.

DISCUSSION

The Commission has reviewed the 2018 DEC and DEP IRP Plans in detail, and has carefully considered the comments of the parties, as well as the testimony of public witnesses. The crucial question before the Commission with respect to Duke's IRP Plans is whether they result in the least-cost mix of demand- and supply-side resources, as required by North Carolina law. The IRP Plans also must be considered in light of North Carolina policy goals, including Governor Roy Cooper's Executive Order 80, which puts our State on a path toward a carbon-constrained future. Based on the record in this proceeding, the Commission finds and concludes that Duke's 2018 IRP Plans fail to comply with the requirements of Chapter 62 and of this Commission's rules, and are therefore not reasonable for planning purposes. Accordingly, the Commission declines to approve the 2018 DEC and DEP IRPs, and will require the Companies to correct the deficiencies identified in the following sections of this Order.

PEAK AND ENERGY FORECASTS

Comments of SACE, Sierra Club and NRDC – Peak and Energy Forecasts

According to comments filed by SACE, NRDC and the Sierra Club, the load forecast is a major factor determining a utility's need for new resources to meet system energy and demand. Overstating load growth will result in excess capacity on the system, and excess costs borne by ratepayers. In their comments, SACE, NRDC and the Sierra Club observed that over the 15-year planning horizon, DEC forecasts an annual average growth rate of 1.0% (summer) and 0.9% (winter) with energy growth of 0.8%. DEP forecasts an annual average growth rate of 0.8% (summer) and 0.7% (winter) with energy growth of 0.5%. These intervenors retained James F. Wilson, an economist and independent consultant in the electric power and natural gas industries, to evaluate the peak load forecasts used in the 2018 IRPs.

Mr. Wilson concluded in his report that while the DEC and DEP load forecasts appear more reasonable than in the past, they should be carefully

examined.[5] Moreover, it is too soon to draw a conclusion about the Companies' winter peak load forecasts, because the instances of loads exceeding the forecasts have generally occurred under very unusual extreme cold events (such as "Polar Vortex" events). Mr. Wilson recommended that the Companies further research the drivers of sharp load spikes under extreme winter cold conditions, and develop demand response programs and other strategies for shifting load or shaving these spikes. In addition, DEC and DEP should develop a more sophisticated model of how extreme winter weather affects their loads. Mr. Wilson also recommended that the Companies further evaluate wholesale customers' contribution to system peak loads, which affect required reserve margins and capacity needs.

Public Staff's Comments – Peak and Energy Forecasts

The Public Staff emphasized that the importance of load forecast accuracy cannot be overstated, given that the purpose of the IRP is to determine the most reasonable plan of an optimal mix of resources to serve future loads at the least cost. The Public Staff found DEC's peak load and energy sales forecasts to be reasonable for planning purposes. In addition, the Public Staff found the economic, weather-related, and demographic assumptions underlying DEP's 2018 peak and energy forecasts to be reasonable. However, the Public Staff identified the unexpected growth of DEP's actual and weather normalized winter peaks as an area of concern, and pointed out that the excessive forecast errors associated with DEP's winter peak indicate that review and revision of DEP's statistical and econometric forecasting practices may be warranted.

The Public Staff recommended that the Companies continue to review their winter peak equations in order to better quantify the response of customers to low temperature. In addition, the Public Staff recommended that DEC and DEP continue to review their load forecasting methodology to ensure that assumptions and inputs remain current and that appropriate models quantifying customers' response to weather, especially abnormally cold winter weather events, are employed.

Duke Energy's Reply Comments – Peak and Energy Forecasts

Duke replied to several points raised in the load forecast report of SACE, NRDC and Sierra Club consultant James Wilson. With regard to Mr. Wilson's recommendation that the Companies research the drivers of the very high loads that have occurred in each service territory under very cold weather, Duke asserted that the primary drivers of high peak demand during extreme

[5] James F. Wilson, *Review and Evaluation of the Load Forecasts for the Duke Energy Carolinas and Duke Energy Progress 2018 Integrated Resource Plans* (March 7, 2019), Attachment 3 to the Comments of SACE, NRDC and the Sierra Club.

temperatures are the predominance of electric heat pumps, and the lack of availability of natural gas as a heating source—particularly in DEP territory. Duke simply ignored Mr. Wilson's related recommendation, however, which was that the Companies should develop demand response programs and other strategies for shifting load or shaving these spikes.

Duke also expressed disagreement with several of Mr. Wilson's findings and recommendations. In reply to Mr. Wilson's recommendation that DEC and DEP develop a more sophisticated model of how extreme winter weather affects their loads, Duke noted particularly that structuring the peak model to model historical outliers would result in peak forecasts that may drastically over-or under-forecast peaks, even under normal circumstances. Responding to Mr. Wilson's assertion that winter peak load forecasts should not be driven by rare, extreme weather events, Duke asserted that attempts to model customer response to extreme weather would require broad assumptions about customers. With regard to wholesale loads, Duke responded that the Companies do not forecast certain wholesale contracts per agreement, and incorporate those forecasts into the system forecast as given.

In reply to the Public Staff's recommendations, Duke cautioned against attempting to model extreme winter peaking conditions, stating that any additional attempt to directly or intentionally model extreme peak conditions within the current IRP peak model process would increase the probability of over-forecasting peak demand.

Commission Conclusions – Peak and Energy Forecasts

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission agrees with the Public Staff regarding the importance of load forecast accuracy, and concludes that the Public Staff and intervenors have raised valid concerns regarding load forecasting, and that Duke's rebuttal of those concerns is unpersuasive. Accordingly, the Companies are directed to consider and implement the following recommendations: 1) further research the drivers of sharp load spikes under extreme winter cold conditions, and develop demand response programs and other strategies for shifting load or shaving these spikes; 2) develop a more sophisticated model of how extreme winter weather affects their loads; 3) further evaluate wholesale customers' contribution to system peak loads; 4) continue to review their winter peak equations; and 5) review their load forecasting methodology to ensure that assumptions and inputs remain current and that appropriate models quantifying customers' response to weather are employed.

RESERVE MARGINS

Comments of SACE, Sierra Club and NRDC – Reserve Margins

According to comments filed by SACE, NRDC and the Sierra Club, the planning reserve margin is a key element of an IRP because it determines how much extra capacity the utility maintains on its system to meet demand in the event of an outage or other unanticipated capacity gap. Both of the Duke 2018 IRPs use a 17% winter planning reserve margin, an increase relative to the 16% reserve margins used before the 2016 IRPs. These planning reserve margins used in developing the IRPs were, in turn, based on resource adequacy studies conducted by Astrapé Consulting in 2016 ("2016 RA Studies"). SACE, NRDC and the Sierra Club retained James F. Wilson, an economist and independent consultant in the electric power and natural gas industries, to evaluate reserve margins used in the 2018 IRPs. Mr. Wilson concluded that due to a number of flaws in the 2016 RA Studies, the DEC and DEP planning reserve margins are improperly inflated, and the 17% planning reserve margins should be rejected.

According to the SACE, NRDC and the Sierra Club summary of Mr. Wilson's findings, the 2016 RA Studies exaggerated the risk and magnitude of extreme winter peak loads, calling into question the shift by DEC and DEP to planning for "winter-peaking" systems. The RA Studies also substantially overstated the risk of very high loads under extreme cold, mainly due to a faulty approach to extrapolating the increase in load due to very low temperatures. In addition, due to the RA Studies' assumptions about demand response capacity and operating reserves applicable to winter peak conditions, the resource adequacy risk in winter was substantially overstated relative to the risk in summer and other periods of the year. Mr. Wilson also suggested that including multi-year economic load forecast uncertainty in the resource adequacy studies is not appropriate, because many short lead-time actions could and very likely would be taken if load grows faster than expected. These findings, along with corresponding recommendations for improvement, are discussed in detail in the Wilson Energy Economics report attached as Attachment 4 (the "Wilson Resource Adequacy Report").[6] Based on Mr. Wilson's analysis, SACE, NRDC and the Sierra Club commented that the use of overly high reserve margins in the IRPs means that DEC and DEP are planning to add too much new capacity on the system, which would add unnecessary costs for ratepayers.

NCSEA's Comments – Reserve Margins

The North Carolina Sustainable Energy Association (NCSEA) attached to its comments a report it commissioned from the energy consulting firm Synapse Energy Economics, Inc., entitled North Carolina's Clean Energy

[6] James F. Wilson, *Review and Evaluation of Resource Adequacy and Solar Capacity Value Issues with regard to the Duke Energy Carolinas and Duke Energy Progress 2018 Integrated Resource Plans and Avoided Cost Filing* (February 12, 2019), Attachment 4.

Future: An Alternative to Duke's Integrated Resource Plan (Synapse Report). The Clean Energy Scenario (CES) evaluated in the Synapse Report employed a 15% minimum reserve margin, based on the NERC 2018 Long Term Reliability Assessment.

Public Staff's Comments – Reserve Margins

The Public Staff commented that it continues to have concerns about the DEC and DEP reserve margins based on flaws in the 2016 Resource Adequacy studies performed by Astrapé. As summarized by the Public Staff, DEC analyzed the effects of decreasing its planning reserve margin from 17% to 16% planning reserve margin and found that it would not have any effect on future resource additions, and that loss of load expectation (LOLE) would increase slightly. DEP found that the 16% reserve margin would reduce its short-term market purchases and defer additions of gas combustion turbine capacity in 2029 and 2032 by two years each, to 2031 and 2034, respectively. At this time, with the information currently presented, the Public Staff continues to recommend a 16% reserve margin, but will work with the Companies to reach consensus within the constructs of the next resource adequacy study. The Public Staff recommends that DEC and DEP continue to evaluate the methods and assumptions in their 2016 Resource Adequacy Studies, and continue to work with the Public Staff and other stakeholders when performing future Resource Adequacy Studies.

Duke Energy's Reply Comments:

Replying to Mr. Wilson's critique of the methodology used to capture the relationship between winter load and cold temperatures in the 2016 RA Studies, Duke stated that the Companies have complied with the Commission's orders regarding those studies, and offered several reasons why they disputed Mr. Wilson's argument. With regard to SACE, NRDC and Sierra Club consultant Wilson's observations about the impact of multi-year load forecast uncertainty on resource adequacy, Duke replied that such alternatives—including demand response and energy efficiency—are not always sufficiently available or practical to satisfy a resource deficit. Relatedly, Duke disputed Mr. Wilson's recommendation to bring the Companies' winter demand response assumptions to the summer level as overly optimistic and not reasonably achievable. Duke listed several perceived obstacles that have made achieving higher levels of winter demand response challenging.

In response to the 15% reserve margin used in the Synapse Report, Duke pointed to the 2016 RA Studies, and noted that the NERC study did not take into account increasing solar penetration in the Carolinas, which Duke claims is a major driver of the increased DEC and DEP planning reserve margins.

The Companies believe that the Public Staff's load forecast uncertainty assumptions overstate the probability that actual load will be at or below the Companies' forecast levels. The Companies recommend use of a 17% winter reserve margin until such time as a new study is completed.

Commission Conclusions – Reserve Margins

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that the Public Staff and intervenors have raised legitimate concerns about the 2016 RA Studies and the use of a 17% planning reserve margin, and that Duke has failed to rebut these concerns.

In the Commission's order approving the 2016 IRPs, we allowed DEC and DEP to continue to use the 17% planning reserve margin in their 2018 IRPs, but also directed DEC and DEP to present a sensitivity analysis based on a 16% planning reserve margin. As explained in the Public Staff's comments, DEP's analysis shows that reducing the planning reserve margin to 16% would allow DEP to reduce market purchases and defer new capacity additions. In light of the flaws underlying the current 17% reserve margin, coupled with the cost-saving impact and negligible effect on reliability of a 16% reserve margin, Duke should reduce its planning reserve margin to 16%.

Further, the Companies are directed to develop strategies to address resource deficits using demand response and energy efficiency programs, particularly in the winter.

Finally, as recommended by the Public Staff, DEC and DEP shall continue to evaluate the methods and assumptions in their 2016 Resource Adequacy Studies, and continue to work with the Public Staff and other stakeholders when performing future Resource Adequacy Studies.

ECONOMICS OF CONTINUED OPERATION OF COAL UNITS

Public Hearing Testimony – Economics of Continued Operation of Coal Units

At the public hearing, public witnesses voiced concern over the continued operation of aging coal-fired power plants. North Carolina Representative Nasif Majeed noted that transitioning as quickly as possible to renewables is more cost-effective than relying on "dirty, dangerous methane gas or coal." Another commenter summarized the role of coal-fired power in Duke's 2018 IRP Plans: "Duke plans to continue running most of its coal-fired power plants. According to its plans, Duke will continue burning coal for the next 30 years, until 2048, and the plans do not even analyze whether Duke could save money for its ratepayers by retiring the coal site even sooner," and recommended that Duke "retire these coal-fired plants ahead of schedule and invest in clean solutions like energy efficiency, solar power and energy storage."

SACE, Sierra Club, and NRDC Comments – Economics of Continued Operation of Coal Units

SACE, Sierra Club, and NRDC commented that Duke's 2018 IRP Plans do not represent the least cost mix of resource options because Duke's IRP modeling did not evaluate the cost-effectiveness of coal unit retirements. Instead, Duke determines the timing and amount of coal retirements based not on economics, but based on the depreciation book life of the coal units. SACE, Sierra Club, and NRDC retained the Applied Economics Clinic (AEC), an expert consulting firm, to evaluate Duke's IRP methodology. AEC concluded that Duke did not perform a full economic comparison of existing and new resources and that Duke's hard-wiring of projected coal unit lifespans into the IRP modeling prevented a fair comparison of the economics of those units relative to competing resources.

Many of Duke's coal units have been operated at low capacity factors, and Duke plans to continue using many coal units as "peaking" plants. Based on those factors and given the high fixed costs of operating coal units, AEC concluded that continued reliance on aging coal plants is highly unlikely to be a cost-effective strategy for North Carolina ratepayers. SACE, Sierra Club, and NRDC recommended that Duke evaluate the economic and reliability implications of accelerated retirement of aging coal units compared to the continued investment in those units until the end of their depreciation book life as part of the IRP process and that the Commission review that evaluation.

NCSEA Comments – Economics of Continued Operation of Coal Units

NCSEA retained Synapse Energy Economics, Inc. (Synapse) to evaluate Duke's current operation of its generation fleet and its consideration of fleet operation in the IRP process. Synapse concluded that Duke's current operation of its fleet is not efficient and that such operation restricts the use of renewables. In addition, it concluded that Duke's IRP Plans have significant limitations and fail to adequately consider a full range of scenarios with respect to the economic dispatch of coal units and the deployment of additional renewable and distributed energy resources.

Attorney General's Office Reply Comments – Economics of Continued Operation of Coal Units

The Attorney General's Office commented that Duke's 2018 IRP Plan proposes the continued operation of numerous coal units at low capacity factors over the fifteen-year planning period even though coal units are not designed to operate infrequently and at low capacity factors and such intermittent operation may lead to higher costs than unit retirement. The Attorney General's Office retained Strategen Consulting, LLC, a consulting firm

with expertise in energy markets. Strategen reviewed the 2018 IRP Plans and recommended that the Commission direct Duke to study and report the costs of operating versus retiring coal plants on a station basis and a per unit basis and to evaluate the continued operation of coal units in modeling of least cost alternatives. The Attorney General's Office adopted that recommendation.

Duke Reply Comments – Economics of Continued Operation of Coal Units

Duke replied to SACE, Sierra Club, and NRDC's comments that the hard-wiring of coal unit retirement dates into the IRP modeling prevented a fair comparison of coal units to other resources by explaining that the retirement dates for existing coal units are projections for planning purposes and are based on retirement dates in depreciation studies that were approved in the most recent general rate cases. Duke commented that "the Companies will continue to evaluate potential accelerated retirement of their remaining North Carolina coal units and advise the Commission in future dockets."

Commission Conclusions – Economics of Continued Operation of Coal Units

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that Duke's 2018 IRP Plans fail to evaluate the cost-effectiveness of the continued operation of existing generation resources and, therefore, do not present the least cost mix of generation and demand-reduction measures. The modeling on which Duke's 2018 IRP Plans are based did not include an evaluation of the economics of existing coal units, which represent 10,410 megawatts of Duke's generation capacity. According to Duke, the retirement dates for existing coal units are based on retirement dates in depreciation studies approved in the most recent general rate cases. Those depreciation studies determined the annual depreciation accrual rates and amounts for book and ratemaking purposes based on the average service life of Duke's electric plants. However, the depreciation studies did not analyze the economics of the coal units or compare the continued operation of those units to replacement with other resources. Similarly, the unit-specific analyses regarding retirement options referenced by Duke do not constitute a fair comparison to other available resources. Therefore, the coal unit retirement dates included as projections in the 2018 IRP Plans are not reasonable for planning purposes. Accordingly, the Commission lacks the necessary information to determine whether Duke's 2018 IRP Plans would result in the least cost mix of generation and demand-reduction measures. The Commission directs Duke to reconfigure its IRP planning to include an evaluation of the economics of existing coal units.

ENERGY EFFICIENCY (EE) AND DEMAND-SIDE MANAGEMENT (DSM)

Public Hearing Testimony – Energy Efficiency and Demand-Side Management

Numerous public witnesses testified to the cost-effectiveness of renewable energy, including EE and DSM resources. According to one witness: "This draft IRP estimates [that Duke] will only have 22 percent of our energy from a combination of demand-side management, solar, and battery storage. . . . Instead, North Carolina should be investing heavily in energy efficiency and clean energy sources, including solar and on- and offshore wind."

Public Staff Comments – Energy Efficiency and Demand-Side Management

The Public Staff's review of Duke's DSM/EE forecasts and programs indicated that Duke complied with the requirements of Commission Rule R8-60 and previous Commission orders regarding the forecasting of DSM and EE program savings, as well as the presentation of data related to those savings. DEC and DEP included information about their respective DSM and EE portfolios that is similar to the information reported in the 2017 IRP updates. According to the Public Staff, DEC and DEP appropriately addressed the changes in their respective forecast of DSM and EE resources and the peak demand and energy savings from those programs.

The Public Staff commented that several factors continue to affect Duke's ability to develop and implement cost-effective EE programs. Changes to federal standards for future lighting measures will make it more difficult for a utility-sponsored EE lighting program to be cost-effective. According to the Public Staff, changes in the avoided costs also are likely to make it more difficult to attain cost-effective programs in general. Further, the Public Staff opined that with lighting being a large portion of the EE portfolios, it is not likely that the amounts of EE savings from lighting measures will continue beyond one or two more years. Other technologies such as space heating/cooling and building envelop measures will continue to face similar headwinds.

The Public Staff commented that DEP and DEC's portfolios of EE programs are not materially different from those in the 2016 IRP Plans and 2017 IRP updates. DEC and DEP have continued to merge their programs so that they mirror one another and have the same incentive structures, incentive amounts, and eligibility requirements. The Public Staff noted that the Commission has approved several requests to modify existing EE programs and to approve new programs, making DEP and DEC's programs more consistent. The Public Staff commented that in the last few DSM/EE rider proceedings, both DEC and DEP's portfolios have been shifting the source of EE savings away from lighting measures toward behavioral programs such as

My Home Energy Report. The Public Staff noted that DEC's projections for energy savings declined by 9% since the 2017 update, and that DEP's projections declined by 20%.

The Public Staff noted that DEC does not offer any residential DSM program that can be used during winter peaking events, and that DEP's EnergyWise program offers a limited DSM program for controlling water heaters and strip heat on heat pumps in its western service area. The Public Staff recommended that Duke put a renewed emphasis on designing new DSM programs to meet winter peak demands and explore the potential for new rate designs that would help customers curtail loads during winter peaking events.

The Public Staff recommended that Duke identify any changes in EE-related technologies, regulatory standards, or other drivers of future projections of EE savings regardless of the 10% threshold for which a discussion is required.

SACE, Sierra Club, and NRDC Comments – Energy Efficiency and Demand-Side Management

SACE, Sierra Club, and NRDC commented that the 2018 IRP Plans underutilize cost-effective energy efficiency and demand-side management. Duke prematurely limited the amount of energy efficiency that its IRP model could select as an available resource. SACE, Sierra Club, and NRDC commented that screening out efficiency options prior to running the resource planning models biases the analysis in favor of supply-side options. SACE, Sierra Club, and NRDC further commented that Duke's planning process does not allow energy efficiency to be easily compared with supply-side resources in a capacity expansion model. The underutilization of cost-effective energy efficiency results in a higher-cost "preferred" portfolio than necessary. SACE, Sierra Club, and NRDC recommended that EE and DSM be evaluated on a level playing field with supply-side resources by allowing the IRP planning models to "select" DSM or EE as a resource, or by modeling varying levels of efficiency without screening out a subset of efficiency potential based on flawed assumptions.

SACE, Sierra Club, and NRDC also commented that the 2018 IRP Plans assume declining savings from energy efficiency and demand-side management over the fifteen-year planning period. DEC assumes that no new demand-side management capacity will be added to help meet winter or summer peak demand or reserves after 2024, and projects decreasing reductions to peak from energy efficiency investments after 2027. DEC anticipates no additional growth in load impacts from its demand-side management programs on summer or winter peak after 2023. DEP anticipates no growth in several of its demand response programs after 2024 and practically no growth in savings from its energy efficiency EnergyWise for

Home program after 2022. SACE, Sierra Club, and NRDC noted that Duke's EE and DSM projections are at odds with Duke's statement that it "is committed to continuing to grow the amount of EE and DSM resources utilized to meet customer growth."

Attorney General's Office Reply Comments – Energy Efficiency and Demand-Side Management

The Attorney General's Office commented that demand-side resources can often be the most cost-effective option for meeting utility resource needs and managing demand is frequently cheaper than adding supply-side generation. While the Attorney General's Office noted that Duke's 2018 IRP Plans includes "a serious treatment of energy efficiency and other demand-side resources," it commented that there may be areas for further improvement in the approach Duke has taken to evaluating these options in its plan. For example, the Attorney General's Office found it unclear to what extent Duke considered cost-effective energy efficiency resources beyond the program plan that could be implemented when making its resource portfolio selection.

The Attorney General's Office recommended that energy efficiency resources be evaluated on a level playing field with other resources. Specifically, it recommended that Duke configure its IRP modeling to allow for incremental energy efficiency measures to be selected if they are more cost-effective than supply-side alternatives (rather than specifying a predetermined amount of energy efficiency resources) and to allow all cost-effective energy efficiency resources to be selected during years 2019–2027.

Duke Reply Comments – Energy Efficiency and Demand-Side Management

Duke commented that it disagreed with SACE, Sierra Club, and NRDC's characterization of the companies' statements regarding a commitment to growing EE and DSM resources as inconsistent with the projections included in the 2018 IRP Plans. Duke noted that its DSM projections are based on past experience with customer acceptance, the expectation that the amount of DSM capacity savings will reach a steady-state level, and the recognition that customer response to Duke's DSM programs has been limited. With respect to EE projections, Duke noted disagreement with intervenors' conclusion regarding EE program disinvestment, explaining that incremental annual EE savings projections are similar throughout the forecast period, but that outer year projections are offset by some programs that have reached the end of their useful life.

Commission Conclusions – Energy Efficiency and Demand-Side Management

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that Duke's evaluation of resource options, as required by Commission Rule R8-60(g), is inadequate with respect to consideration of demand-side options, including EE and DSM. The Commission agrees with SACE, Sierra Club, and NRDC that the Duke IRPs underutilize cost-effective EE and DSM and with the Attorney General's Office that Duke's IRP modeling should be reconfigured to allow for the selection of cost-effective EE measures instead of specifying a predetermined amount of EE resources. Accordingly, the Commission lacks the necessary information to determine whether Duke's 2018 IRP Plans would result in the least cost mix of generation and demand-reduction measures. The Commission directs Duke to reconfigure its IRP planning to allow for the selection of cost-effective energy efficiency and demand-side management resources.

SOLAR ENERGY

Public Hearing Testimony – Solar Energy

Many members of the public who testified at the public hearing mentioned the cost-effectiveness of solar energy. One witness pointed to North Carolina's solar potential "of 4.2 to 4.9 kilowatts per hour per meter squared." Another noted the number of Duke customers who own private solar energy systems and the waiting list for participation in Duke's Solar Rebate Program.

Public Staff Comments – Solar Energy

The Public Staff commented that Duke used a different methodology for calculating the capacity value—the percentage of nameplate capacity available for meeting summer and winter peak demand—of solar energy resources when preparing its 2018 IRP Plans than it had in its 2016 Plans and 2017 updates. Duke had previously used a coincident peak method of calculating capacity value whereby it averaged the actual solar output at typical peak load hours across several years. In 2016, DEC estimated a capacity value of 46% in the summer and 5% in the winter for solar resources, and DEP estimated a 44% summer capacity value and a 5% winter capacity value. In 2018, using a methodology developed by the Astrapé consulting firm, Duke lowered its estimates of the winter capacity value of solar. By using the Astrapé study instead of the coincident peak method, the 2018 IRP Plans project a need for additional traditional resources in 2033—138 MW more for DEC and 168 MW more for DEP.

The Public Staff noted its concern that there is a disconnect between how Duke plans to meet its peak system load and how it values the capacity

contribution of solar resources. According to the Public Staff, the Astrapé study bifurcates the treatment of solar resources and the treatment of traditional utility-owned thermal resources, thus ignoring the actual contribution of solar resources during peak hours.

The Public Staff also noted concern that, because the Astrapé study considers load uncertainty and unit outages when it calculates capacity value, the capacity value of solar is pushed down and the minimum reserve margin is pushed up, thus overstating the need for future resource additions.

The Public Staff recommended that Duke utilize the coincident peak methodology for establishing the capacity value of solar, rather than the Astrapé Solar Capacity Value Study. Specifically, Public Staff recommended that Duke use a capacity value for solar of 3% in winter and 48.5% in summer. Public Staff estimates that using capacity values established via coincident peak methodology would have the effect of delaying the need for future resource additions.

SACE, Sierra Club, and NRDC Comments – Solar Energy

Like the Public Staff, SACE, Sierra Club, and NRDC commented that Duke undervalued the capacity that solar resources provide to the DEC and DEP systems. The groups also commented that the 2018 IRP Plans under-project future solar and solar-plus-storage resources.

SACE, Sierra Club, and NRDC commented that Duke has grossly undervalued the capacity value that solar provides by relying on the Astrapé study that relies on flawed data and methodology. SACE, Sierra Club, and NRDC retained expert consulting firm Wilson Energy Economics to evaluate Duke's calculation of the capacity value of solar resources. As discussed above, the Wilson report concluded that Astrapé had overstated the winter resource adequacy risk, and that the winter/summer capacity values of solar resources on which the 2018 IRP Plans were based should be rejected.

SACE, Sierra Club, and NRDC also commented that Duke's projections fail to account for likely improvements in solar technology and are on the low end of what has been observed from projects that have been put in service in recent years. For example, DEP projects summer solar PV capacity values of 8.2 to 12.4 percent, far lower than the weighted average of 27.6 percent observed in projects installed nationally over the last ten years.

SACE, Sierra Club, and NRDC recommended that Duke reevaluate its projections for addition of new solar resources. DEP's 2018 IRP Plan projects the addition of 1,441 MW of solar over the next 15 years, with approximately 1,000 MW occurring in the next five years (a 36% increase), but with only an 11.6% increase between 2023 and 2033. DEC's 2018 IRP Plan projects the

addition of 1,314 MW of solar between 2019 and 2023, but additions of only about 90 MW per year between 2023 and 2033. Duke assumes in its IRPs that it effectively stops adding significant solar resources after it has satisfied the procurement obligations in House Bill 589. The groups noted that these projections do not reflect the recent trends in accelerated solar installations in the Carolinas nor the continuing and steep cost declines for solar. SACE, Sierra Club, and NRDC recommended that Duke reevaluate its projections for future solar installations using more realistic assessments of current and likely future cost declines and improved panel efficiencies.

SACE, Sierra Club, and NRDC also commented that the 2018 IRP Plans include only token amounts of solar-plus-storage resources and do not fairly evaluate the addition of these resources. Greater additions of grid-connected battery storage will support addition of solar and other clean energy resources on the DEC and DEP systems, as well as providing a new resource for balancing grid supply and demand, a new tool for peak shaving, and other benefits. SACE, Sierra Club, and NRDC identified examples from across the country of the steadily declining costs of solar-plus-storage projects, including prices for battery energy storage that are less costly than fossil fuel-fired generation. The groups recommended that Duke incorporate higher levels of solar-plus-storage in its long-term plans, especially given North Carolina's position as a national leader in solar development.

Attorney General's Office Reply Comments – Solar Energy

The Attorney General's Office commented that Duke's assessment may undervalue the peak load contribution from solar technologies and noted a study conducted by the National Renewable Energy Lab that found solar resources to have a higher penetration rate than Duke assumed. And, even if Duke's peak load analysis is correct, pairing additions of solar resources with energy storage offers a way to preserve their capacity value. Such pairing of solar resources with storage would eliminate the need for other capacity resources, and therefore benefit ratepayers both by increasing the value of renewable energy generation and by reducing inverter and interconnection costs. The Attorney General's Office commented that a more thorough valuation of storage technologies paired with renewable generation would help ensure a least cost resource mix, making particular note of recent and upcoming additions of solar resources in North Carolina and recommended that Duke's modeling should test a wider range of storage technologies paired with renewable energy generation.

The Attorney General's Office noted the downward trend in the cost of storage technologies as well as the increasing competitiveness of renewable resources as compared to conventional power plants. While Duke has acknowledged these trends, it does not address solar-plus-storage resource options in a systematic way as part of its 2018 IRP Plans, nor does it consider

storage in combination with solar resources as a way to expand contribution to peak hours of demand. The Attorney General's Office recommended that Duke should analyze and model costs for a broader range of solar plus storage technologies, including solar plus storage resources utilized in other states.

Duke Reply Comments – Solar Energy

Duke's reply comments raised questions about the Public Staff's methodology for calculating the capacity value of solar and noted that the companies would like to continue the ongoing dialogue with the Public Staff on such calculation. Duke commented that the companies disagree with the assessment of Attorney General's Office regarding the companies' undervaluing of the peak load contribution of solar technologies and took issue with the reliance on the National Renewable Energy Lab study given regional differences in solar output and customer usage profiles.

Duke commented that the companies acknowledge that inclusion of additional storage and solar plus storage resources in the IRPs may be warranted, but take issue with the Attorney General's Office assertion that Duke "does not thoroughly evaluate [the downward trend of storage technology costs]." Duke points to the assumptions in its 2018 IRP Plans regarding the decline in battery storage costs by 2025. Duke points to North Carolina's summer afternoon and winter morning peak conditions as factors that may limit the capacity value of batteries and batteries charged by solar resources.

Duke noted its commitment to further studying the capacity value of incremental battery storage (both grid-tied storage and solar plus storage systems) in the Carolinas at increasing penetration levels and stated that the companies expect to include the results of a capacity value of storage study as early as the companies' 2020 biennial IRP filings.

Commission Conclusions – Solar Energy

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that Duke's modeling of solar energy and capacity as presented in the 2018 IRP Plans is inadequate because the methodology utilized by Duke's consultant undervalued the capacity that solar resources provide. In addition, the Commission agrees with SACE, Sierra Club, NRDC, and the Attorney General's Office that the 2018 IRP Plans did not adequately consider solar-plus-storage. Accordingly, the Commission lacks the necessary information to determine whether Duke's 2018 IRP Plans would result in the least cost mix of generation and demand-reduction measures. The Commission directs Duke to reconfigure its IRP planning to increase the capacity value of solar resources to a reasonable level, in line with the recommendations of the Public Staff and the intervenor

comments discussed above, and to allow for the selection of cost-effective solar-plus-storage resources.

GAS-FIRED GENERATION

Public Hearing Testimony – Gas-Fired Generation

Members of the public expressed a concern about Duke's continued reliance on fossil fuels, including gas. According to one witness, "In order for North Carolina to reach the goals set forth in Executive Order 80, North Carolina will need to move away from fossil fuels such as coal and fracked gas." Others expressed concern about Duke's acknowledgement of possible future greenhouse gas legislation, but failure to mitigate compliance costs by investing in renewables rather than gas-fired generation. Representative Majeed shared the concerns of his constituents regarding the dependence on "highly dangerous fracked gas and the Atlantic Coast Pipeline as one of their primary sources for electric power generation for our state."

Public Staff Comments – Gas-Fired Generation

The Public Staff noted its concerns with the natural gas price forecasts utilized in Duke's 2018 IRP Plans and incorporated arguments raised in its comments in Docket No. E-100, Sub 158, the 2018 avoided cost proceeding. The Public Staff notes that the use of an excessively conservative natural gas price forecast for the first ten years of the planning period is unlikely to significantly alter DEC's or DEP's generation expansion plan. Nonetheless, the Public Staff recommends that the Commission require DEC and DEP to revise the natural gas fuel price forecast used in developing their generation expansion plans to use no more than five years of forward market data before appropriately transitioning to their fundamental forecast.

SACE, Sierra Club, and NRDC Comments – Gas-Fired Generation

SACE, Sierra Cub, and NRDC commented that Duke's 2018 IRP Plans rely excessively on new gas-fired generating capacity. Gas-fired generation is subject to numerous uncertainties, including fuel cost volatility, and carbon regulation. The groups noted that as more energy efficiency programs, renewable energy resources, and battery storage are added to Duke's resource mix, the need for additional gas-fired capacity is diminished.

NRDC commissioned energy consulting firm ICF to perform a power sector analysis using ICF's Integrated Planning Model (IPM®), a power sector dispatch model. SACE, Sierra Club, and NRDC commented that ICF's IPM analysis shows that greater reliance on cleaner energy sources, rather than fossil fuel generation, delivers cost savings and pollution reductions for North Carolina compared to the "business-as-usual" approach in the Duke IRPs. With

respect to gas-fired generation, ICF's "economically optimized" case, which allowed the model to optimize for a least-cost outcome, coal-fired capacity was reduced and replaced primarily with new solar; no new gas capacity was selected by the model based on economics. If North Carolina were to follow this economically optimized path, electric sector carbon emissions would fall to 41% below 2005 levels by 2025. The business-as-usual case would have a total system cost of $5.6 billion more that the economically optimized case—or, 3% higher bills for the average residential customer by 2030 and 5% higher by 2035.

Attorney General's Office Reply Comments – Gas-Fired Generation

Duke's 2018 IRP Plans propose using new supply, primarily fueled by natural gas combustion turbines, to meet energy requirements over the planning period. The Attorney General's Office commented that deficiencies in Duke's IRP modeling and analytic methods mean that this supply-side, natural-gas strategy may not be the least cost mix. The Attorney General's Office recommended three areas where further analysis is warranted: (1) Duke's modeling should test a wider range of storage technologies paired with renewable energy generation; (2) planning should take into account the costs to ratepayers from climate change caused by natural gas power generation; (3) planning should consider additional costs associated with natural gas production, including the costs of climate change.

According to the Attorney General's Office, Duke's 2018 IRP Plans do not satisfy the requirement of Commission Rule R8-60(g) that an IRP take "into account the sensitivity of its analysis to . . . risks associated with . . . fuel costs, . . . transmission and distribution costs, and costs of complying with environmental regulation," as well as taking into account other factors such as "environmental impacts." The Attorney General's Office comments that the use of solar plus storage technologies, rather than natural gas, would avoid environmental costs associated with burning fossil fuels. Natural gas power production produces significant carbon dioxide and methane emissions, which both contribute to climate change. Climate change has real costs that are ultimately borne by ratepayers—for example, the costs of responding to the extreme weather events of Hurricanes Florence and Michael and Winter Storm Diego.

The Attorney General's Office also commented that Duke's reliance on gas-fired power generation raises the potential for future anticipated costs due to government-imposed limitations on greenhouse gas emissions and that incorporating environmental considerations into resource planning is critical even if specific standards are not yet defined in environmental regulations. Indeed, there are costs associated with not addressing environmental concerns. In addition, the Attorney General's Office commented that Duke's

reliance on natural gas raises a risk that ratepayers will face unanticipated, unmodeled costs from natural gas price volatility.

Duke Reply Comments – Gas-Fired Generation

Duke commented that it disagrees with Public Staff's recommendation to revise the natural gas fuel price forecast used in developing the generation expansion plans to use no more than five years of forward market data before transitioning to the fundamental forecast. Like the Public Staff, Duke incorporated by reference the arguments it made in Docket E-100, Sub 158 regarding its reliance on 10 years of forward market data. Duke commented that using 10 years of forward market natural gas prices in the 2018 IRP Plans is appropriate for evaluating future generation needs and allows for an appropriate head-to-head comparison of long-term purchase power obligations from QFs required under PURPA.

In response to the Attorney General's Office comments, Duke commented that its 2018 IRP Plans already considered impacts and future costs from natural gas price volatility. Duke commented that it agrees with the Attorney General's Office that incorporating environmental considerations into resource planning is critical even if specific standards are not yet defined in environmental regulations. In addition, Duke commented that it supports lowering carbon emissions.

Commission Conclusions – Gas-Fired Generation

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that several parties have raised valid concerns about the potential risk of Duke's over-reliance on gas-fired generation. To some extent, these concerns will be addressed by corrections to the modeling deficiencies that we address above. In addition, the Companies should re-examine the natural gas fuel price forecast used in developing their generation expansion plans, and should take into account the costs to ratepayers from climate change caused by natural gas power generation.

EVALUATION OF RESOURCE OPTIONS

Comments of SACE, Sierra Club and NRDC – Evaluation of Resource Options

Intervenor NRDC commissioned the energy consulting firm ICF to perform an analysis of resource options. ICF used its Integrated Planning Model (IPM®) power sector dispatch model for this analysis, based on assumptions developed by NRDC from publicly available forecasts and data

sources.[7] In their comments, SACE, Sierra Club and NRDC presented results from ICF's analysis of two different scenarios: an "economically optimized" case, which allowed the model to optimize for a least-cost outcome by retiring and adding new resources, and an "IRP case," which was designed to more closely match the DEP and DEC 2018 IRPs.

According to the comments filed by SACE, Sierra Club and NRDC, ICF's IPM analysis showed that under the IRP case, which was designed to more closely match the 2018 DEP and DEC IRPs, the electric sector would depend much more heavily on natural gas, and less on solar and storage, than under the economically optimized scenario. The IRP case would also result in more carbon pollution over the next two decades. In addition, total system costs would be $5.6 billion higher than under the economically optimized case, which would translate into bills that are 3% higher by 2030, and about 5% higher by 2035, for the average residential customer.

Under the economically optimized case, greater reliance on cleaner energy sources, rather than fossil fuel generation, will reduce system costs and pollution compared to the Duke IRPs. Under that scenario, coal capacity and generation would decline, replaced primarily by new solar. No new gas capacity was selected by the model based on economics. Renewable energy generation would more than make up for the generation reductions from other sources, without impacting total in-state generation. And under the economically optimized case, electric sector carbon emissions would fall to 41% below 2005 levels by 2025**.**

NCSEA's Comments – Evaluation of Resource Options

In its comments, NCSEA observed that the DEC and DEP 2018 IRPs Duke's IRPs ignore a least cost alternative which would allow for the utilization of distributed generation resources including specifically renewable energy. NCSEA attached to its comments a report by Synapse that NCSEA characterized as presenting a realistic clean energy future that provides both the energy and capacity to meet the needs of Duke's customers, while effectively meeting future reliability requirements as traditional generating resources are retired. NCSEA explained that the Synapse Report was prepared using the EnCompass capacity expansion and production cost model which is widely used for integrated resource planning and other forecasting and analytical purposes. The Synapse Report modeled the DEC and DEP IRPs, a Clean Energy Scenario (CES), and an Accelerated Coal Retirement Scenario. Under the CES, clean energy capacity and generation would expand dramatically, while coal and gas capacity and generation would shrink. Carbon emissions would also drop sharply. The production cost of the CES would be over $1.5 billion lower than that of the IRPs in 2033, with a significant decrease in the costs borne by ratepayers.

[7] The Commission recognizes that IPM is a national model, and not a model of the DEC and DEP systems; however, because the ICF IPM analysis focuses on the state-level results for North Carolina, it provides information that is relevant to this proceeding.

The Attorney General's Comments – Evaluation of Resource Options

Like NCSEA, SACE, NRDC and the Sierra Club, the Attorney General pointed out that Duke's failure to model energy efficiency and demand-side management alongside generating resources potentially decreases the amount of cost-effective measures selected, thereby increasing costs for ratepayers. Modeling such demand-side resources alongside supply-side resources is considered a best practice.

The Attorney General also commented that Duke's modeling of resource options should include a wider range of storage technology paired with renewable energy, consistent with industry best practice. In addition, Duke should provide a more comprehensive and transparent IRP modeling of the DEC and DEP coal fleets.

NCWARN's Comments – Evaluation of Resource Options

NCWARN commented that as other states and utilities are transitioning toward renewable energy, Duke is still relying on coal and natural gas generation, and plans to add significant gas capacity during the planning horizon. NCWARN presented as an alternative a report authored by Bill Powers, P.E. and entitled NC Clean Path 2025 (Clean Path). According to NCWARN, the Clean Path report shows that DEC and DEP can achieve 100% fossil-fuel-free energy by 2030, by taking several specific steps aimed at encouraging distributed, customer-sited renewable energy and energy efficiency.

Public Staff's Comments – Evaluation of Resource Options

The Public Staff explained that DEC and DEP use the System Optimizer and Planning and Risk models to determine the dispatch and production costs for their system, develop a set of portfolios by performing a sensitivity analysis of input variables to System Optimizer, then analyze the portfolios further under various scenarios using a capital cost model and an hourly production cost model (PROSYM).

According to the Public Staff, the modeling approach used by DEC and DEP accounts for a limited number of possible scenarios with certain futures. but does not provide the same insight that would be provided by probabilistic risk-based modeling that covers many possible futures in hundreds of iterations with variations in key input variables and assumptions, such as performed with DENC's Comprehensive Risk Analysis. Therefore, the Public Staff recommends that DEC and DEP develop analytical tools similar to those used by DENC to determine the least cost plan that provides the lowest risk to customers, while also providing operational and compliance flexibility to each utility. In particular, the Public Staff recommends that in future IRPs, DEC and DEP address similar key risk factors employed by DENC. In addition, the Public Staff recommends that in future IRPs, DEC and DEP provide an analysis of the residential annual rate impacts of each of its portfolios similar to that presented in DENC's 2016 and 2018 IRPs.

Duke Energy's Reply Comments – Evaluation of Resource Options

Duke dismissed the Synapse Report filed by NCSEA as the product of a special interest group that appears to make assumptions in their model with a predetermined outcome in mind, and that would not conform to the regulated utilities' requirement to provide reliable electric utility service at least cost over the planning period. Duke critiqued various assumptions in the Synapse Report regarding "must-run" designations of coal plants, the use of a 15% reserve margin, and the use of imports from neighboring utilities.

Similarly, Duke dismissed as "inconsequential" the ICF analysis presented by SACE, NRDC and the Sierra Club. Duke critiqued ICF's analysis based on several points, including the operation of the model with regard to retirement and addition of resources, the use of generic, publicly available cost data rather than confidential, in-house data, and the role of renewable generation.

Commission Conclusions – Evaluation of Resource Options

Based on the foregoing, the comments of the parties, and the entire record in this proceeding, the Commission concludes that the evaluations of resource options in the DEC and DEP 2018 IRPs are deficient, and as a result, the Commission cannot conclude that the Companies have complied with their obligation to submit least-cost resource plans. The comments and expert analyses presented by the Public Staff and intervenors suggest that greater reliance on clean energy resources in the IRPs would result in lower system costs for ratepayers. Notably, the Synapse CES results presented by NCSEA are directionally similar to the results of the "economically optimized" scenario analyzed by ICF and presented by SACE, NRDC and the Sierra Club. Accordingly, the Commission directs the Companies to work with the Public Staff and intervenors to develop a scenario similar to the ICF "economically optimized" case, as well as a scenario similar to the Synapse CES, model those scenarios under sensitivities similar to those used in the 2018 IRPs, and present the results of those analyses in revised 2018 IRPs. In addition, the Companies shall implement the recommendations of the Public Staff, discussed above.

CONCLUSION

The Commission has reviewed the 2018 DEC and DEP IRP Plans in detail, and has carefully considered the comments of the parties, as well as the testimony of public witnesses. Based on the record in this proceeding, the Commission finds and concludes that Duke's 2018 IRP Plans fail to comply with the requirements of Chapter 62 and of this Commission's rules, and are therefore not reasonable for planning purposes. Accordingly, the Commission will require DEC and DEP to revise their 2018 IRPs in accordance with the conclusions and directives of the Commission documented in the body of this Order, and file revised IRPs on or before November 1, 2019. Other parties to this proceeding

shall have 45 days to comment on the revised 2018 IRPs. Recognizing that the DEC and DEP 2019 IRP Update Reports are due on September 1, 2019, to facilitate compliance with this Order, the Commission will waive the requirement to file 2019 Update Reports.

IT IS, THEREFORE, ORDERED, as follows:

1. That this Order shall be, and is hereby, adopted as part of the Commission's current analysis and plan for the expansion of facilities to meet future requirements for electricity for North Carolina pursuant to G.S. 62-110.1(c).

2. That the DEC and DEP 2018 IRPs fail to comply with the requirements of Chapter 62 and of this Commission's rules, and are not reasonable for planning purposes.

3. That DEC and DEP shall revise their 2018 IRPs in accordance with the conclusions and directives of the Commission documented in the body of this Order, and file revised IRPs on or before November 1, 2019. Other parties to this proceeding shall have 45 days to comment on the revised 2018 IRPs.

4. That the requirement for DEC and DEP to file 2019 Update Reports is hereby waived.

5. That pursuant to the Regulatory Conditions imposed in the Merger Order, DEC and DEP shall continue to pursue least-cost Integrated Resource Planning and file separate IRPs until otherwise required or allowed to do so by Commission order, or until a combination of the utilities is approved by the Commission.

ISSUED BY ORDER OF THE COMMISSION.

This the ____ day of _____, 2019

CERTIFICATE OF SERVICE

I hereby certify that all parties of record have been served with the Proposed Order of Southern Alliance for Clean Energy, Sierra Club, and Natural Resources Defense Council either by electronic mail or by deposit in the U.S. Mail, postage prepaid.

This the 26th day of July, 2019.

s/ Gudrun Thompson
Gudrun Thompson