

**REPORT OF THE SPECIAL SUBCOMMITTEE TO EVALUATE CONSTRUCTION OF A CAMPUS-BASED COMBINED HEAT AND POWER PLANT**

**DUKE UNIVERSITY CAMPUS SUSTAINABILITY COMMITTEE**

April 7, 2017

This report is written for the benefit of the Campus Sustainability Committee and the Duke University Board of Trustees. It reflects the findings and recommendations of the special subcommittee of the Campus Sustainability Committee to evaluate construction of a campus-based combined heat and power plant. The report is based on the subcommittee's weekly deliberations, investigation of discrete subtopics, and public comments.

**1.0 Background**

On May 9, 2016, Duke University announced its intention to pursue a partnership with Duke Energy Carolinas to build a \$55 million, 21-megawatt natural gas-fired combined heat and power (CHP) plant on the University's campus that would operate for 35 years. Duke University would contribute \$5-7 million of the plant's costs, with Duke Energy contributing the remaining \$50 million. On October 17, 2016, Duke Energy filed for a Certificate of Public Convenience and Necessity with the North Carolina Utilities Commission (NCUC or "the Commission") for regulatory approval of this proposed plant. In this filing, Duke Energy proposed that the plant be included in its rate base and proposed to operate the plant with a NOx emission level of 25 ppm. On December 1, 2016, Duke Energy requested that the North Carolina Utilities Commission suspend the procedural schedule for this plant until May. On January 18, 2017, the Commission suspended the procedural schedule with no scheduled date to resume proceedings.

The proposed CHP plant is subject to contract negotiations and the approval of the Utilities Commission. If the partnership goes forward, the basic arrangement would be for the University to purchase the thermal energy and steam produced by the plant and for Duke Energy to accept the electricity produced by the plant, making the plant part of the electricity production fleet. Duke University would also be allowed to "island" the plant to provide electricity to campus in the event of a wider grid blackout.

Because of the efficiency benefits of CHP over regular steam and power plants, as well as the option for electricity reliability, Duke University Administration proposed the plant as a means of lowering the University's greenhouse gas emissions while providing essential services to campus. The University projects a savings of \$1-2 million annually for steam production under this agreement. Subsequent statements by Duke University officials have signaled that Duke University's interest in the plant is strongly contingent on the University's ability to convert the plant to non-fossil biogas eventually and the University's ability to exit the agreement should cleaner solutions become available.

The proposal, however, has raised serious concerns within portions of the University community and public. Most fundamentally, some Duke community representatives and members of the public expressed concern that the plant is a new, long-term source of fossil fuel generation not in keeping with the University's role as a leader in climate change mitigation. The fact that the plant is sized at 21MW led to concerns that this plant would not be regulated under the Clean Air Act, as many Clean Air Act provisions only regulate plants larger than 25MW.

Opposing voices also expressed concern that the natural gas burned by this plant would also most likely come from gas produced by hydraulic fracturing. Public health concerns were also raised that Duke Energy might be permitted to operate the plant with a NOx emissions level of 25 parts per million (ppm). The rate-basing of the plant drew concerns about the equity of the agreement, as plant opponents expressed concern that ratepayers would subsidize a plant that benefits Duke University as a private entity. Finally, concerns were raised that Duke University would be setting a precedent for Duke Energy to continue to construct this style of plant.

Because Duke University announced the plan to construct the plant after the Spring 2016 semester had concluded and after most students and faculty had left campus for the summer, the news took some time to reach students and faculty. In the months following the announcement, public discourse about the potential plant increased, with many student and community groups coming out in opposition to the plant and voicing concerns about the transparency of the proposal.

In the fall semester, several public fora regarding the decision were created to facilitate public conversation about the plant. Duke University's Graduate and Professional Student Council also passed a resolution recommending increased transparency and information-sharing on the proposed plant, as well as the creation of a process to review the plant proposal before arriving at a final decision. Faculty and staff interest in the proposal also increased, with University bodies such as the Academic Council, the Facilities and Environment subcommittee of the Board of Trustees, and the Campus Sustainability Committee being asked to evaluate the merits of the proposal.

As a consequence of increased campus interest and public scrutiny, the Campus Sustainability Committee proposed that it create a special subcommittee consisting of Duke faculty, staff and students to investigate the issues regarding the plant. This subcommittee was formed specifically by choosing representatives from some of the most interested parties and groups, such as student leaders in opposition to the plant, student energy club leaders, vocal faculty and staff opponents as well as supporters of the plant and University administrators with a key interest in the plant's potential services. The composition of the subcommittee was not intended to be a democratic representation of all potential campus interests. The full list of subcommittee members is attached as Appendix A. The subcommittee was chaired by Tim Profeta, Director of the Nicholas Institute for Environmental Policy Solutions and co-Chair of the Campus Sustainability Committee. The subcommittee was given the following charge:

The CHP subcommittee will review and provide recommendations regarding the proposed CHP project including emissions methodology, economic/environmental impact, contract terms and potential alternatives. It will be up to the subcommittee and the chair to decide how explicit their recommendations and findings will be. Ultimately, these recommendations, along with others related to the Climate Action Plan update, will go to the Board in May 2017 for a final decision.

In fulfillment of its responsibilities, the subcommittee met each Friday between January 27, 2017, and April 7, 2017 to consider the complex questions involved in the CHP decision. The subcommittee also hosted a public forum to receive comments from outside stakeholders on March 27, 2017. A summary of the comments is found in Appendix D.

## **2.0 Areas of Consensus**

At a fundamental level, the subcommittee is in general agreement regarding several areas related to setting the University's priorities and goals related to its actions to address climate change, the excellence in services and operation it must maintain, and ways by which concerns related to the construction of a CHP plant could be mitigated, should it be decided that the plant should be built. The areas of consensus are summarized below.

- The Subcommittee is in strong agreement that addressing climate change and minimizing greenhouse gas emissions is and must remain an institutional priority. Furthermore, it is unanimous in its conviction that Duke University should be a leader in taking steps to mitigate greenhouse gas emissions.
- The Subcommittee agrees and appreciates that the University must maintain the high level of services needed for the campus to function with as little greenhouse gas emissions as possible. This principle is not dispositive, because of questions of what services are needed and what cost premium is acceptable to achieve lower emissions.
- In terms of the projected greenhouse gas reductions that the University could achieve through its energy investments, biogas appears to be one of the largest opportunities available to it to cut greenhouse gas emissions. Thus, the subcommittee recommends that if the University use biogas rather than fossil-derived natural gas to meet its thermal energy needs, which, in its opinion, would constitute true climate change leadership. The subcommittee believes that the University should not move forward with the plant unless it is confident that the biogas objectives described below can be met.

### **3.0 CHP Plant Evaluation**

The subcommittee found it valuable to review the CHP technology that would be put in place should the University proceed with the project, the motivation for constructing a CHP plant versus other options, and alternatives to construction of the currently proposed plant.

#### ***3.1 CHP Technology***

As the name suggests, combined heat and power technology allows for the simultaneous production of electricity and heating (or cooling) by an integrated system that is run on one fuel source. The distinctive characteristic of the CHP approach is the ability to capture heat energy produced during the generation of electricity, heat which otherwise would be lost to the atmosphere. Thus, otherwise wasted heat, such as from a unit's boiler or electricity generator, can be captured and put to use at the facility to produce steam and hot water by heating water, which would otherwise need to be heated (or cooled) from a separate or additional source of power (and fuel). By using a combined heat and power system, the efficiency of energy production increases from approximately 50% (which is what is achieved at a typical electricity generation facility) to approximately 80%.

Moreover, the fact that the fuel that powers CHP technology is being used to create electricity and heat that will be used simultaneously increases the utilization of exergy of the fuel, with exergy defined as the maximum amount of useful generated power that can be obtained from a system. By using a CHP plant, the process wastes much less exergy than just the combustion of gas for steam in the University's steam plants, as the combined generated electricity and heat is more useful than the steam alone.

#### ***3.2 Motivation for Duke University's Pursuit of a CHP Plant***

According to the Duke Administration, it chose to pursue a partnership with Duke Energy to build a CHP plant for three primary reasons. First, the University was attracted to the ability of such a plant to provide needed services to the campus. Second, the University was motivated by the cost savings it could achieve for those needed services, estimating that it would realize financial savings in the realm of \$1-2 million per year as a result of efficiency gains of a CHP plant versus other options. Third, the University was motivated by CHP technology because of the technology's ability to reduce its overall greenhouse gas emissions.

In light of the University's motivations, the subcommittee considered two main services related to the University's argument that the plant would provide needed services, including: (1) the ability to provide reliable power to most or all of the campus and hospital in the case of an extended power outage;<sup>1</sup> and (2) the ability to provide thermal energy for the campus and hospital to meet expected increases in steam and hot water demand, including the ability to defer investment in an additional hot water plant.

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<sup>1</sup> Facilities representatives project that the CHP, in conjunction with onsite generators, could provide full campus operations except in the summer, and could cover essential campus functions for the entire year.

Regarding the provision of reliable power in the case of an emergency situation, Duke Administration officials – based on historical information and increasing severity of storm events precipitated by climate change – stated that they have a high level of certainty that a campus power outage from a severe weather event is likely to occur at some point in the future and could have catastrophic effects on the campus and hospital. The CHP plant, as proposed, would allow the University to avert this risk by removing the plant from the grid and allow its use to power the University’s campus and hospital exclusively, thereby “islanding” the facility from the rest of the downed grid and providing power to the campus and hospital.

Regarding the ability to meet future steam needs, Duke Facilities and Management staff have calculated that the University will need increased steam capacity starting in 2024 and increased hot water capacity starting in 2022. Absent the construction of a CHP plant, the University estimates that an additional \$18 million to \$28 million will need to be expended on alternative infrastructure and infrastructure improvements by 2024 in order to meet those increased steam and hot water demands.

### ***3.3 Evaluation of Alternatives***

Wishing to independently evaluate the assumptions under which the University has considered a CHP plant, the subcommittee asked a group of its members (the “Alternatives Group”) to investigate the alternatives that exist to building a CHP plant as currently proposed to provide current and future electricity and steam needs of the University. The Alternatives Group evaluated several options, with a particular focus on (1) increasing building efficiency to reduce Duke’s thermal energy demand, (2) procuring fuel cells as a means to fill future backup needs or baseload demand gaps, and (3) using distributed electric steam and hot water to provide thermal energy services rather than the expanding the centralized steam production system.

The Alternatives Group determined that the use of solar power to meet the University’s steam and hot water needs via solar hot water is not currently realistic or feasible due to the financial and spatial challenges with solar. After an initial evaluation by the Facilities Management engineers, however, facilities representatives expressed concern that the alternatives would not be technically, logistically, or economically feasible or are already part of the Climate Action Plan.

The Alternatives Group also questioned the demand growth assumptions put forward by Duke Facilities and Management staff. The Alternatives Group questioned whether the backup capability of the CHP plant was necessary given the existence of diesel generators to back up hospital operations, or even allowed under the hospital’s operating regulations. From the Alternatives Group’s perspective, the backup capability is also not as dire as projected if the distributed generators are kept online and added to the capacity of the recently built central generators. Duke Administration officials on the subcommittee stood behind the demand projects.

The Alternatives Group and full subcommittee agreed that the options the Alternatives Group identified in lieu of construction of a CHP plant would cost more than the CHP proposal to achieve the same level of needed services identified by the Duke Administration, and that the cost of identified alternatives would be in addition to the \$18 to 28 million in infrastructure investments estimated by the Duke Administration to properly operate the campus absent the construction of a CHP plant. However, the subcommittee was not able to quantify the additional costs of the alternatives it identified.

The Alternatives Group noted that \$15-20 million of the \$18-28 million in new infrastructure is the result of the projected need in 2024 for a new gas boiler to produce steam; however, the Group questioned whether the need for this new generation may be able to be delayed through more aggressive energy efficiency measures and the deployment of distributed heating and steam generation. Finally, the Alternatives Group contented that other upgrades to the University's electricity and heat infrastructure that would be pursued in a non-CHP scenario would still provide reliability benefits to the University even if the University were to pursue a CHP plant in the future.

As a result, the Alternatives Group recommended that the CHP be delayed until the biogas infrastructure is more developed, which would also provide more time to evaluate the alternatives identified by the subcommittee, including time to determine the cost of such alternatives. The Group also argued that pursuing biogas before investing in the CHP plant would allow more time for the price of alternatives (identified or otherwise) to fall. Finally, delay, in the Alternatives Group's opinion, would allow the University to make greater progress in terms of developing a supply of biogas, which the Alternatives Group supported regardless of the subcommittee's or University's determination regarding the construction of a CHP plant.

### ***3.4 Environmental and Reputational Impacts***

In addition to the exploration of alternatives, other scrutiny of the plant proposal centered on the measurement and calculation of the plant's environmental impact, particularly the Administration's determination of emission reductions associated with construction of a CHP plant. The subcommittee also debated how a partnership with Duke Energy might affect the University's reputation as a climate leader, considering recent controversy over the coal ash spill clean-up and considering that some believe the Utility is not moving quickly enough to employ renewables and meet the renewable energy and energy efficiency portfolio requirements.

Specifically with respect to the calculation of the CHP plant's effect on the University's baseline emissions, a subset of subcommittee members met to consider whether the original emission reductions identified in the University's calculations were overstated because they did not account for the University's "ownership" of the electricity generation plus did not account for methane/natural gas leakage associated with the extraction and transport of the gas.

When presented with the emission calculation group's perspective, the subcommittee agreed to make the recommended changes to the emissions methodology, and recommend to the Campus Sustainability Committee to adopt those changes. By including those revisions, the subcommittee determined that the CHP plant, as proposed and assuming that it would be powered only by conventional, fossil-derived natural gas, would reduce the University's greenhouse gas emissions by approximately 10,000 metric tons carbon dioxide equivalents (~3% of campus emissions), as opposed to the 47,000-ton reduction claimed using the original methodology employed in the University's Climate Action Plan. These detailed calculations are contained in Appendix B.

Regarding the University's partnership with Duke Energy on the construction of a CHP plant, several members of the subcommittee questioned whether the University could credibly serve as a climate leader if it were to partner with a large investor-owned utility such as Duke Energy, which is one of the largest emitters of greenhouse gases in the nation (which it recognized comports with its size) and whether Duke University would be locking in fossil fuel infrastructure and demand by agreeing to a 35-year natural gas contract. Particular concerns were raised about the implications of Duke University's relationship with the utility regarding public health impacts of pollution, the potential to enable Duke Energy to continue to build this model of small, less-regulated rate-based, natural gas plants, and ratepayer impacts, considering that Duke Energy's portion of plant costs would be incorporated into the rate base. The subcommittee also considered the other side of the coin – whether the University could use the partnership to push the utility towards cleaner sources of power.

### ***3.5 Potential for Renewable Biogas***

Finally, the subcommittee engaged in an extensive discussion of the possibility of powering both the CHP plants and the University's preexisting steam plants on biogas, in accordance with the goal of converting from natural gas to biogas as described in the University's Climate Action Plan. The subcommittee suggested evaluating multiple sources of biogas for the plants, but looked particularly at the possibility of capturing biogas from North Carolina swine operations to inject into the preexisting natural gas pipeline network from which the University draws its current gas supply.

The swine biogas option interested the subcommittee because it built upon the University's earlier investments in swine waste-to-energy technology at a full-scale farm in Yadkin County and economic assessments by institutions at the University of scaled collection and injection of biogas into the natural gas pipeline. As described in further detail below, subcommittee members also considered the ability to move the pork industry toward cleaner waste management systems which would greatly reduce the detrimental impacts of swine farming on neighboring communities, which include a high percentage of people of color and low-income residents.

The subcommittee also focused on the biogas option because of its potential to lead to the destruction of methane emissions currently being released by North Carolina swine waste

lagoons, rather than use fossil-based natural gas. The subcommittee recognized that methane destruction by itself brings significant climate benefits, particularly because methane is a greenhouse gas estimated by faculty experts on the subcommittee to be 34 times more powerful than carbon dioxide on a 100-year timescale, and 86 times on a 20 year timescale. (Members of the public opposed to the plant cited a multiplying GHG effect of over 80 at the public hearing, presumably referring to the 20 year values.)

The subcommittee generally agrees that if methane destruction were to be counted in terms of the greenhouse gas reduction impact – in addition to the reduction of carbon emissions associated with the replacement of natural gas that would otherwise power a CHP plant and potentially the remainder of the University’s on-campus steam fleet, the biogas procurement option far exceeds greenhouse gas reductions associated with other potential power sources. The comparative GHG reduction potential of various fuel sources and alternatives is provided in Appendix C.

### **3.6 Stakeholder Comments**

On March 27, 2017, the subcommittee held a public forum to receive comments on the proposed natural gas plant from outside stakeholders. The subcommittee also created an online form to submit comments. A full compilation of these online comments and a transcript of oral comments from the public forum can be found in Appendix D. The subcommittee received a total of 107 comments, with 72 comments opposing the plant proposal, 21 comments supporting the plant proposal, and 9 comments taking no stance on the plant proposal. The comments largely reflected the arguments both for and against the plant that are described above.

### **4.0 Subcommittee Commentary and Recommendations**

The subcommittee could not achieve consensus on all issues. While some subcommittee members consider the CHP plant to be an efficient way to provide essential services to the campus and hospital, not all members are comfortable endorsing a CHP plant as necessary or consistent with the University’s role as a climate leader. By contrast, subcommittee discussions revealed nearly unanimous agreement that, in the event that the University proceeds with the partnership to build a CHP plant, specific contractual terms must be secured to ensure that the University is providing leadership on climate mitigation. Moreover, the subcommittee appears to be unified in its interest in the potential to power the campus on biogas rather than a fossil-based fuel and was further unified in voicing its encouragement for the University’s pursuit of a biogas fuel source as expeditiously as possible.

A discussion of the areas where consensus could not be achieved and the reasoning supporting the divide in the subcommittee is provided below, after which a discussion of the subcommittee’s recommendations regarding the areas in which it did reach consensus is provided.

#### **4.1 Should Duke Pursue the CHP Plant Project?**

As mentioned above, the subcommittee could not achieve consensus on whether to pursue the CHP plant. The divide stems largely from differences of opinion regarding the urgency of the need and the belief that viable/affordable, lower carbon-emitting alternatives will emerge with time. For some subcommittee members, a persuasive case has been made that the CHP plant provides an efficient way to produce steam, hot water, and electricity for the campus and hospital, and does so in a lowest cost manner.

Other subcommittee members, however, question the urgency of investing in a CHP plant at this particular time. Those members recommend that the University instead pursue a postponement strategy to give the University time to confirm its ability to secure biogas while at the same time giving it an opportunity to more thoroughly investigate the alternatives identified by the subcommittee, as well as yet-to-be identified alternatives, to engage in more comprehensive stakeholder engagement, and to better assess the equitable distribution of costs between the University and the ratepayer.

If the University decides to delay a decision on the plant past the May Board meeting, the subcommittee recommends that the University engage in processes to secure a reliable supply of biogas, to engage the stakeholder community in the University's consideration of the CHP plant, and to create an assessment of the ratepayer issues. An update on these processes should be reported to the Campus Sustainability Committee at the beginning of the Fall 2017 semester.

#### **4.2 Suggestions of Contractual Terms**

While the subcommittee could not agree on whether it is prudent and necessary to pursue a CHP plant at this time, the subcommittee was in agreement that if the University does proceed with the CHP plant, the University's commitment to environmental stewardship must be protected through specific contractual terms. It is the subcommittee's position that the University should not enter into a contract without securing these enumerated terms from Duke Energy. Specifically, the subcommittee advises that any contract with the Utility include the following:

- A provision that the plant should be treated as would a regulated 25MW plant pursuant to the Clean Air Act, including the installation of Best Available Control Technologies (BACT) for NOx emissions that will equal or outperform the control technologies on the University's current steam plants.
- A provision that, if powered by biogas, all energy efficiency credits and renewable energy certificates must be retained by Duke University so that the University can retire them instead of allowing them to be counted toward Duke Energy's compliance with the Renewable and Energy Efficiency Portfolio Standards. In that way, any biogas obtained by the University would be additional to existing commitments, rather than replacing a current commitment of the Utility's.

- A provision allowing the University to exit the contract after 10 years at minimal cost to the University should alternative, lower-emitting technology become available. Any cost of exiting the agreement or cost of unused capital should not be passed onto ratepayers. As a means of assessing this option, the subcommittee proposes that the Campus Sustainability Committee schedule a planned review of the question after the plant has been in operation for seven years.
- A provision that Duke Energy provide all necessary support for the usage of biogas in the plant describe in Section 4.4.

In addition to these contract terms, the subcommittee recommends that Duke University request that the NCUC docket is only resumed in September 2017 and that any public hearings are scheduled for times that classes are in session, to facilitate student and faculty participation.

### **4.3 Rate-Based Plant Financing**

The subcommittee also the considered the equity question related to the extent to which ratepayers would be subsidizing the capital cost and associated ROI of the CHP plant. The subcommittee agrees that the plant would indeed be largely financed by ratepayers as a whole – with Duke University investing an additional \$5 million for the islanding capacity. In this context, it is worth noting that the equity question merits consideration despite the fact that the actual cost borne by any individual ratepayer will be very small.

Addressing the equity question is challenging because of various complicating factors. On one hand, Duke University has made clear that it places a very high value on the added resiliency offered by the plant, particularly in terms of the islanding capacity. On the other hand, one should recognize that thermal energy sales from the CHP plant to Duke University would effectively ‘finance’ a portion of the plant cost.

An added complexity in evaluating the equity issue is the difficulty in defining the counterfactual i.e. what additional capacity would be built in case the CHP plant was not built, and what the effect of that additional capacity would be on rates. An additional issue to consider is that the increased resiliency offered by the CHP plant can potentially benefit the local community as well, assuming Duke University opens its campus facilities to the local community during large-scale power outages.

Thus, while the subcommittee finds that Duke University will benefit disproportionately from the plant, there was no consensus on how to appropriately monetize this benefit to Duke University. Given the complexities noted above, this may be a value judgment that the University should explicitly make as part of the final decision making process.

#### **4.4 Duke University Investment in Biogas**

Given the scale of the biogas opportunity and its associated benefits in terms of climate mitigation and environmental and community improvements (particularly with respect to swine-waste derived sources), the subcommittee reached consensus that directed biogas should be pursued with vigor by the University. Notable to the subcommittee was the University's ongoing commitment and investments in the use of swine waste to produce renewable energy.

As a result, the subcommittee recommends that Duke University procure sufficient volumes of directed biogas in year one to render the CHP plant carbon neutral in its first year of operation, and that the plant be fully powered by directed biogas, with the goal of achievement within five years of operation, recognizing that this commitment goes beyond the University's current commitment to climate neutrality. The subcommittee recommends that the University not move forward with the plant if these biogas objectives cannot be met.

In addition to Duke University's work to develop and study the resource, numerous recent developments were considered by the subcommittee which were convincing enough for the subcommittee to agree that the prospects of such an effort are especially promising at this point in time, including support from government agencies and the pork industry itself for incentives to capture biogas, changing political winds that favor pursuit of biogas, and increased potential demand from other universities which have informally voiced their interest in partnering with Duke to purchase biogas at volumes large enough to catalyze a sufficient, reliable and economic supply.

Moreover, the subcommittee in its discussions recognized that, should a CHP plant be pursued at this time, the cost savings it is expected to achieve could offset the initial premium, or portion thereof, required to catalyze the volume of biogas necessary to meet the University's long-term needs. The subcommittee notes that there are important logistical and economic challenges that remain to be evaluated to bring the biogas to campus.

Finally, of considerable significance to the subcommittee was the opportunity pursuit of biogas provides in terms of the University's teaching and research mission. Current efforts at the University to test technologies and evaluate maximizing the energy potential of waste resources provided evidence to the subcommittee of the educational value of pursuing innovative energy and environmental projects. The Yadkin County project, for example, has advanced the science of waste management, while it has spurred interest in collaboration with other universities and institutions across the state, including with UNC Chapel Hill, NC State University and RTI.

The University should also pursue a biogas strategy to provide leadership on climate change and environmental issues at a time it is desperately needed. While events have potentially aligned to allow for the development of the biogas resources, subcommittee members believe that a significant demand signal from the University is critical to initiating the necessary

components of a biogas supply chain, a large portion of which is associated with the challenge of attracting financing required to bring the biogas to market.

In terms of scale, subcommittee members think the amount of biogas the University can buy is close to the levels required under North Carolina's renewable energy law. Because Duke Energy has continued to miss its annual targets for biogas procurement under this law, the University is in a position to increase pressure on Duke Energy to meet its biogas commitments and provide a demander of biogas willing to pay to bring the biogas market to scale. Also, the University is in a unique position via its not-for-profit status to value monetarily improvements to waste management that will benefit communities but are heretofore unvalued, thereby ensuring any arrangement to gain biogas from those sources should ensure that local pollution concerns are also addressed (as they were at the University project in Yadkin County). In fact, the subcommittee observes that the University as a purchaser is in a better position to secure this result than allowing other, less environmentally-conscious purchasers to create the market.

## **5.0 General Recommendations Regarding Future Decision Making**

While beyond the mandate of the subcommittee, members would like to stress a few additional learnings that emerged as a result of its deliberations.

- **Process for future questions.** The subcommittee would advise the University to take a different approach when discussing future major investments of this type in the future. It recommends that any investment with a significant greenhouse gas impact on Duke's operations be brought to the Campus Sustainability Committee for discussion very early in its consideration, and that the CSC engage in stakeholder dialogue, including stakeholder groups from within as well as outside the University when the investment would have significant impact on stakeholders. In the future, efforts also should be made to ensure that no major announcements occur in the summer or winter breaks when the students and some faculty are not present on campus.
- **Other emission-reducing investments.** Particularly in evaluating alternatives, the subcommittee discussed a number of other options to reduce energy usage or secure alternative energy supplies, including recommissioning of buildings that use the most energy and pursuit of solar and other renewable power. The subcommittee believes these investments should not be seen as alternatives. Rather, the subcommittee considers that these options should be pursued simultaneously and as expeditiously as possible. The subcommittee recognizes that detailed recommendations on these options are forthcoming from the Energy Subcommittee.
- **Advocacy for regulatory changes.** It is clear from its deliberations that some of the options available to Duke's peer institutions, particularly options related to sourcing renewable electric power for their campuses, is not available to Duke University because of the regulations governing North Carolina's electricity grid. The subcommittee also noted that there may be an active inquiry into energy policy in

Raleigh in the near future. It suggests that the University try to take command of its own environmental footprint by engaging in the policy process to request the legal changes needed to give the University more control over its energy options. In doing so, the University should also seek collaboration with other similarly situated institutions to further amplify its voice.

- Professor Drew Shindell presented to the subcommittee on his efforts to determine the Social Cost of Carbon (SCC) and of Methane (SCM), which are assessments of the price that would reflect the impact of greenhouse gas emissions on society. Professor Shindell estimates that using similar methodology to that used by the US Government in obtaining the SCC for carbon dioxide emissions of \$42/ton, the social cost of methane emissions is \$2200/ton (including damages driven by air quality as well as climate-related impacts). The subcommittee recommends that the University assess whether the SCC and SCM, or another price for greenhouse gas emissions, should be considered in the calculations surrounding new infrastructure investments at the University.
- More stakeholder engagement for this and other major decisions. The subcommittee recommends that the University engage in a thorough, more-engaged stakeholder process for this and other major projects undertaken on Duke's campus that may have environmental or other sensitive implications.

## Appendices

- A. Members of Combined Heat and Power Subcommittee of the Campus Sustainability Committee
- B. Updated emissions calculation and methodology for proposed CHP plant
- C. CSC Energy Subcommittee, 2017 Climate Action Plan Update, April 2017
- D. Summary and transcript of comments from March 27st, 2017 public forum and online form

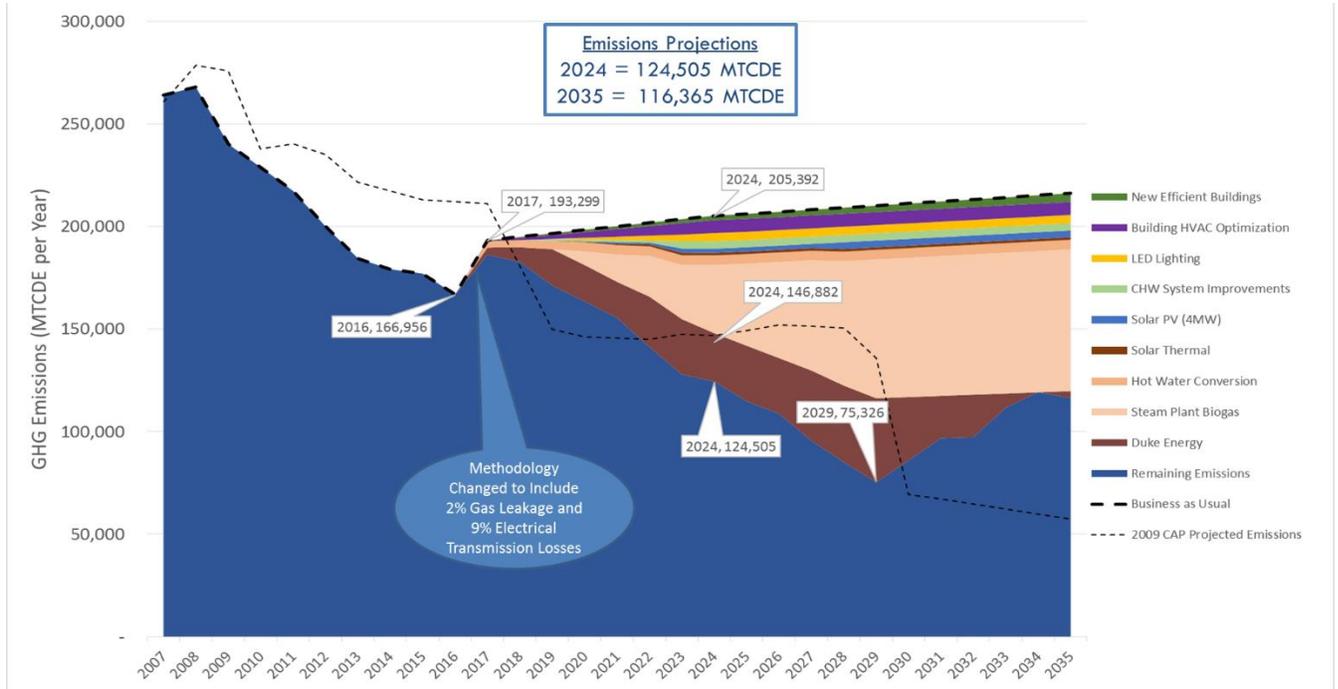
### **Appendix A: Members of CHP Subcommittee of the Campus Sustainability Committee**

| <b>CHP Subcommittee 2016-17 members</b> |  |
|---|--|
| Tim Profeta (Chair)                     | Nicholas Institute   |
|   |  |
| <b>Faculty</b>                          |  |
| Prasad Kasibhatla                       | Nicholas School of the Environment                         |
| Emily Klein                             | Nicholas School of the Environment                         |
| Henri Gavin                             | Pratt School of Engineering                                |
| Ryke Longest                            | Law School   |
| Drew Shindell                           | Nicholas School of the Environment                         |
| Tim Johnson                             | Nicholas School of the Environment                         |
| Nico Hotz                               | Pratt School of Engineering                                |
|   |  |
| <b>Staff</b>                            |  |
| Russell Thompson                        | Duke Facilities Management                                 |
| Casey Collins                           | Duke Facilities Management                                 |
| Tavey Capps                             | Sustainable Duke   |
| Kelly Garvy                             | Duke Center for Entrepreneurship and Innovation, NSOE alum |
| Sarah Adair                             | Nicholas Institute   |
| Stacy Peterson                          | Duke University Energy Initiative                          |
| Monte Brown                             | Duke University Health System                              |
| Tanja Vujic                             | Office of Executive VP                                     |
| Jason Elliott                           | Sustainable Duke   |
|   |  |
| <b>Students</b>                         |  |
| Ted Herman                              | Graduate student   |
| Alexander Klonick                       | Graduate student   |
| Claire Wang                             | Undergraduate student                                      |
| Michael Norwalk                         | Undergraduate student                                      |
| Samuel Corwin                           | Undergraduate student                                      |
| Nate Sizemore                           | Undergraduate student                                      |
| Tyler Wakefield                         | Undergraduate student                                      |

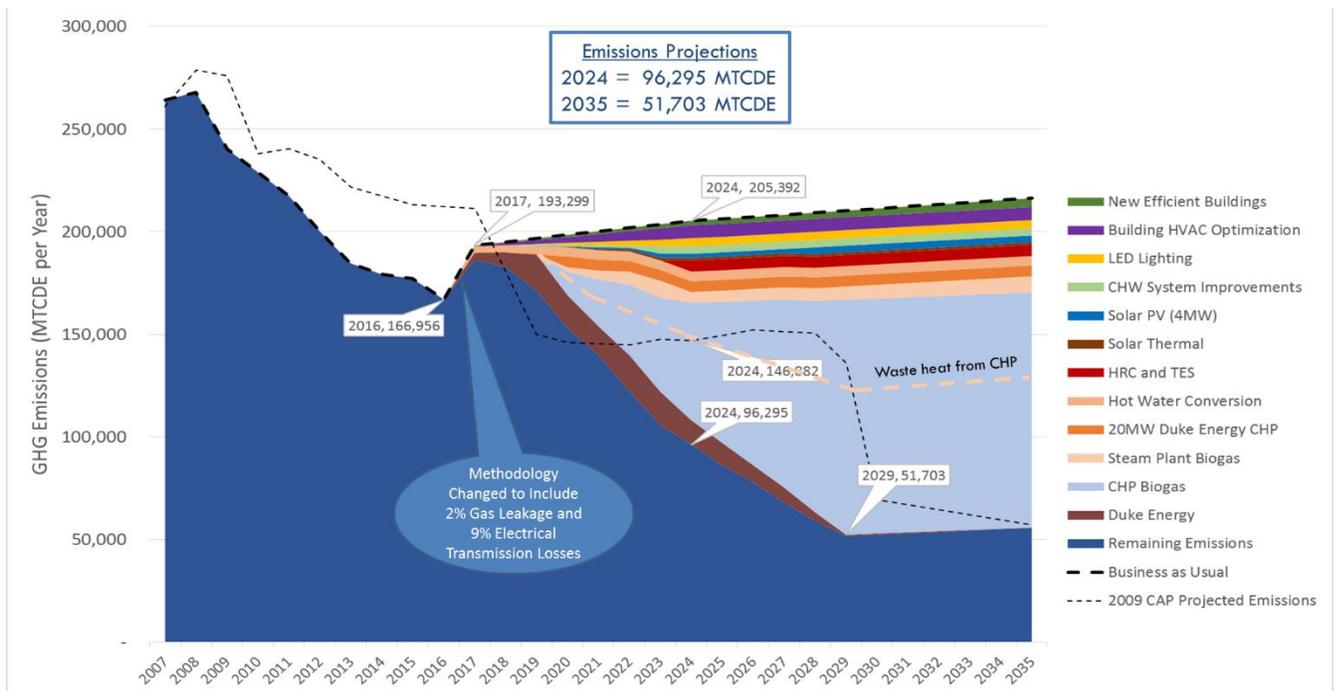


# Appendix C: CSC Energy Subcommittee, 2017 Climate Action Plan Update, April 2017

## Total GHG Emission Reductions (without CHP)



## Total GHG Emission Reductions (with CHP)



## Assumptions

- For fugitive methane emissions, Global Warming Potential (GWP) of 34 was used
- The leak rate for natural gas during production and transportation is assumed to be 2%
- Electricity transmission of losses at 9%
- Used Duke Energy provided future emissions for its fleet for purchased electricity (generated off campus)
- Assumed no major changes in regulations of utilities, either state or federal

## Summary of Potential Carbon Reduction Measures

*Note: Reduction estimates shown below are for 2024*

### Base Case:

- Buildings
  - New Efficient Buildings – 4,280 MTCDE/year reduction
    - Use campus standards and project reviews to ensure that energy use of new buildings are better than the energy efficiency code
    - Growth rate of 90,000 GSF / year with weighed average of 220 kBTU per SF
  - LED Lighting – 3,995 MTCDE/year reduction
    - Replace existing T-8 fluorescent lighting with LED's
    - Assumed 20% per year starting in 2020
    - Undetermined funding source
  - Building HVAC Optimization – 6,322 MTCDE/year reduction
    - Target total reduction of 20% from 2007 baseline, with current reductions at 13% from baseline
    - Reduce existing building HVAC energy through implementation of retro-commissioning of the most energy intensive buildings
    - Lower energy intensity buildings will rely mainly on software analytics that will be implemented to identify areas of energy waste
    - Undetermined funding source
- Utilities
  - Solar PV (4MW) – 2,044 MTCDE/year reduction
    - Install 4MW of on campus photovoltaic cells to produce carbon free electricity
    - Assumed 3 to 4 projects over 10 years starting in 2018
  - Chilled Water System Improvements – 3,576 MTCDE/year reduction
    - Install booster pumps at CHWP1, replace cooling towers at CHWP1, add additional chiller compressor VFDs, improve staging sequences
  - Solar Thermal – 1,260 MTCDE/year reduction
    - Install rooftop solar collectors to produce carbon free heating water

- Assumed installing 25% of panels over 4 years starting in 2020
- Dependent on Steam Distribution to Hot Water Conversion project
- Steam Distribution to Hot Water Conversion – 4,668 MTCDE/year reduction
  - Replace aging steam distribution with hot water distribution that is produced by a regional steam to hot water plant(s)
  - The lower-temperature heating system loses less energy compared to the traditional steam heating system
  - Various projects are underway and assume will complete by 2021
- Biogas to Offset Steam Plant Natural Gas – 69,179 MTCDE/year reduction (without CHP)
  - Purchase biogas from swine farms or other sources that currently release methane directly to the atmosphere for combustion in the existing steam boilers
  - Assume purchasing an additional 10% per year starting in 2020
- Duke Energy Scope 2 reduction – 3,414 MTCDE/year reduction
  - Duke Energy’s future plans for carbon intensity of their electricity generation assets are published through 2035
  - The carbon intensity is expected to decrease over the next decade but due to nuclear plant retirements, 2035 emissions will be similar to current levels

Additional Measures with CHP:

- Heat Recovery Chiller (HRC) – 5,447 MTCDE/year reduction
  - Install an 1,800 ton HRC at CHWP1 along with chilled water thermal energy storage (TES) and heating water buffer tanks
  - The HRC will operate to convert low-grade heat in the chilled water TES to useable heating water in the buffer tanks
  - Hydronic heat recovery from the CHP plant will supplement the recovered heat and steam produced by the CHP plant will be used for boosting the heating water supply temperature during peak loads
  - Installation to be completed by 2024
- CHP Carbon reduction – 5,258 MTCDE/year reduction
  - The carbon intensity of operating the CHP plant fueled by natural gas is less than the carbon intensity of producing an equivalent amount of heat and purchasing an equivalent amount of electricity
  - Earliest possible year plant could be operational is 2020
- Biogas to Offset CHP Electric Generation – 114,577 MTCDE/year reduction
  - Purchase biogas from swine farms or other sources that currently release methane directly to the atmosphere to fuel the CHP plant.

## Appendix D: summary and transcript of comments from March 27st, 2017 public forum and online form

### Summary of Comments

On March 27, 2017, the subcommittee held a public forum to receive comments on the proposed natural gas plant from outside stakeholders. The subcommittee also created an online form to submit comments. A full compilation of these online comments and a transcript of oral comments from the public forum can be found in Appendix C. The subcommittee received a total of 107 comments, with 72 comments opposing the plant proposal, 21 comments supporting the plant proposal, and 9 comments taking no stance on the plant proposal.

Among the comments opposing the plant, the majority expressed concern about sourcing the proposed plant with fracked gas or natural gas. Comments also included:

- Concerns about the lack of transparency during the University's decision-making process
- Concerns about the partnership with Duke Energy, which was characterized as a major polluter and barrier to renewable energy
- Equity concerns about the principle of community ratepayers financing the construction of the plant
- Concerns about the length of the contract and the University foreclosing other options due to a long-term commitment to this plant
- Concerns about the public health impacts of NO<sub>x</sub> emissions from the plant
- Concerns about the feasibility of biogas and the University's commitment to following through on its biogas commitments.
- Calls for Duke University's leadership on climate and environmental issues and appeals to Duke University's legacy of environmental scholarship
- Calls for Duke University to increase investments in renewable energy
- Calls for Duke University to more thoroughly consider alternative options of meeting campus needs.

Comments supporting the plant included:

- Support of CHP and natural gas as clean and efficient technologies and fuels
- Support of CHP and natural gas as the only feasible options of meeting campus needs
- Support of CHP as a means of providing reliable electricity and backup generation to the campus
- Support of CHP as a means of producing cost savings.

Other comments also generally supported University procurement of biogas, with many emphasizing the need for the University to definitively prove its commitments to sourcing biogas.

### Compilation of online comments

**Comment 1: Duke University student:** As a campus that champions its forward thinking, I would hate to see Duke build such a backward-minded source of energy. If we want to continue to be innovators, we need to be forward thinking in building clean energy sources. We can't claim to be a green campus if this is the type of energy sources that we continue to build. As a student, I would be extremely disappointed if Duke is to move forward in building this plant.

**Comment 2: Duke University student:** The proposed natural gas CHP plant would be detrimental and contrary to Duke's supposed progressive, forward-thinking vision and commitment to investing in the environment and sustainable technology. Especially in this political moment where the EPA and environment are under serious threat, it's the responsibility of all institutions, especially supposed leaders of innovation like Duke, to take on the sustainability agenda and protect the environment. Building this plant sets Duke back in time (to the 1970's) and is NOT a progressive, innovative, environmentally sustainable option. We can do better than this.

**Comment 3: Community member:** I am concerned that the methane released in the production and use of natural gas as a fuel will harm our environment. As a neighbor of Duke University, I am very concerned about the emissions coming from a gas-fired plant. As a rate-payer with Duke Energy, I am opposed to paying for such a plant. I suggest instead that the university use its expertise in environmental science to devise a renewable source of energy which would bring acclaim to the university and be embraced by the community.

**Comment 4: Duke University staff:** I would like to see Duke embrace renewable energy and move away from harmful older models like natural gas. Please do not proceed with building a new natural gas-fired combined heat and power plant on campus.

**Comment 5: Community member:** Natural gas is a powerful greenhouse gas. I'm concerned about both the GHG emissions and other forms of pollution that would be generated by this plant. Please make the Duke campus a model for others by investing in a clean, renewable energy solution.

**Comment 6: Duke University alum:** This moment requires the University's leadership in moving away from dependence on fossil fuels into the new world of renewable energy. The topic has received and continues to receive excellent and appropriate scrutiny from broadly experienced specialists who can help with the transformation of the campus. The arguments in favor of "biogas", whatever its source, are a distraction and immaterial. The transformation of a campus is expensive but it can be made in an economically realistic way by a wealthy university that aspires to intellectual and material leadership as Duke does and must continue to do.

**Comment 7: Duke University student:** At a time of global crisis, Duke (with all its many resources and capabilities) should be leaders in sustainability on university campuses.

In light of ever increasing evidence of the severity of global warming, and more and more evidence of the greater-than-expected harms of natural gas (<https://www.purdue.edu/newsroom/releases/2017/Q1/estimates-of-emissions-from-natural-gas-fueled-plants-much-too-low,-study-finds.html>), Duke should be investing in a renewable energy future for itself. Say no to the Duke gas plant~

**Comment 8: Duke University student:** Human activities have already caused huge changes to the climate and most of the changes are irreversible. While consequences of these changes may remain uncertain, it is wise to stay conscious about any move that may further strengthen this trend of causing more severe changes. Duke University, as a community exhibiting high level of responsibility (and with maybe the best engineering school) should set an example of being cautious about the proposed natural gas CHP plant.

**Comment 9: Duke University staff:** Any new energy facility at Duke must be as sustainable as possible. It is crucial for Duke, as an institution that support intellectual inquiry including numerous researchers who work on climate science and sustainability, to demonstrate leadership in this area. Any facility that relies primarily on fossil fuels or other non-renewable energy sources would be disgrace to the university and all of those who are part of it.

**Comment 10: Duke University alum:** As an important corporate community member, a major economic driver in this part of the state, and the intellectual home of thousands of next generation's brightest minds, Duke University cannot afford to send the message that business as usual is acceptable in the face of increasing air quality and climate change concerns in a rapidly growing area like Raleigh-Durham.

This is a perfect opportunity for the University to put its money where its mouth is. Durham's climate isn't cold, and a greater part of building energy costs in this area are spent on cooling rather than heating. (I wish I could site a paper, but I'm sure folks at firms like Advanced Energy in Raleigh are best equipped to support that claim: <https://www.advancedenergy.org/>.) A better investment of that money would be to retrofit existing buildings to make them more energy efficient, which would reduce both heating AND cooling costs. As for new construction on campus, what is the level of commitment on Duke's part to achieve high-performance building standards beyond

LEED (e.g., Passive House for commercial buildings: <http://passivscience.com/our-work/commercial-office-buildings/>)?

Regarding power generation, there is a growing solar community in North Carolina that, I'm sure, would love to gain a valuable client in Duke.

The bottom line is, there are multiple ways to achieve the goal that Duke is trying to achieve, and building a combined heat and power plant isn't the best option. Clean energy investment and driving to net zero building energy should be one of the major goals of this university given all of its resources. That is a wonderful way to invest student and alumni dollars into the lives of current students and the community, as opposed to extravagant dining hall projects like West Union.

**Comment 11: Duke University student:** This gas plant reflects poorly on Duke University's role as a leader. We should not be developing this gas plant as an example of what Universities in the region should do when Duke Energy comes knocking on their doors. The investments should be going into more sustainable and environmentally friendly energy sources.

**Comment 12: Duke University faculty:** On whichever side on the aisle you sit, there are a few basic facts established by careful scientific measurements over the past few decades: the Earth is getting warmer, the concentration of carbon dioxide in the atmosphere is rising, and carbon dioxide absorbs heat radiating from the Earth's surface. The geologic record shows us strong correlations between high CO<sub>2</sub> in the atmosphere and warm epochs in the Earth's past. No amount of political rhetoric can change these observations.

Climate change is not a national, but rather a global, problem, wrought by our use of fossil fuels to power our economy. For the United States, the spirit of EPA's regulations for large power plants—the Clean Power Plan—was to curb our nation's emissions of carbon dioxide to the atmosphere, in hopes of mitigating the full extent of ongoing climate change. Other nations have other approaches, but they look to us for leadership, as one of the leading sources of CO<sub>2</sub> emissions.

For the first round of reductions in the Clean Power Plan, power plants less than 25 megawatts were exempt from regulation in an attempt to ease the burden on small-source generation. However, in North Carolina, Duke Energy has responded by abusing this loophole, proposing to build a host of new small power plants, each about 20 MW, including one in cooperation with Duke University to provide power to its campus in Durham. This new plant would be gas-fired, providing a combination of heat and power—a CHP facility.

The project is anticipated to lower the emissions of carbon dioxide that might be expected from Duke Energy's existing grid of large coal-fired power plants, but there is no provision that guarantees that any of the existing generation capacity will be retired. The University claims that CHP will increase its overall energy efficiency, by eliminating separate facilities for heat and power. With natural gas at historically low prices, the switch will save money as well—at least as long as gas prices remain low.

Natural gas is often touted as an ideal fuel to bridge the transition of society to a future world of non-fossil energy, when fossil fuels are depleted and expensive and we begin to take climate change seriously. Of course, natural gas itself is a fossil fuel, which emits carbon dioxide when it is burned. A certain fraction of the natural gas—largely methane—that is supplied to power plants inevitably leaks to the atmosphere. Current global estimates suggest the leak rate is about two percent of production. Importantly, any leak rate above about one percent of production negates most of the benefit of natural gas on mitigating climate change, because methane itself is a greenhouse gas that contributes to global warming.

With the international acceptance of the Paris Climate Accord, we are moving along a societal pathway that is free of fossil carbon emissions, avoiding the huge costs of sea level rise, reduced agricultural productivity, and

enhanced spread of infectious diseases, which are all associated with global warming. At the same time, we must not live in the dark.

Spending \$55 million on a CHP plant will implant major, long-lasting infrastructure that is certain to delay the transition of utilities to non-emitting, renewable energy sources, such as solar and wind. Across the nation, the large utilities that supply electricity to the grid have been loath to accept distributed generation, such as solar, that threatens their monopoly. Coupled with new battery technology, solar could offer an uninterrupted power source for a large university, providing an example of how the world must work in the future.

Moreover, solar technology is ready to power the Duke campus. Even without batteries, a solar array can be connected to the grid to offset the entire power demand of the Duke campus—with daytime generation on sunny days covering nighttime and cloudy day demand during those times. Solar energy is now regarded as having cost-parity with traditional forms of electricity. The construction of such a facility would provide clear “additionality” to the goal of reducing emissions of greenhouse gases. Proposals that are based on biogas do not provide such additionality; if biogas is a viable power option it will be adopted anyhow. And, all indications are that biogas will not be available immediately. Duke University would depend upon fossil natural gas for the foreseeable future.

We must separate the argument that the Duke Hospital needs an uninterrupted supply of power from the means by which Duke powers its campus. As it does now, the Hospital can continue to maintain diesel generation capacity that can “kick in” instantly should the Duke Energy grid fail us.

Those looking to institutions of higher education for leadership will look carefully at how Duke University responds to this proposal. And utilities across the nation will look carefully at Duke Energy’s strategy to duck under the threshold of regulation with separate, small power plants.

Renewable energy is the way; not skirting under the bar of EPA regulations with an array of small power plants that maintain the old ways of doing business. Setting an example for others, a solar-powered campus would light the way for bright young minds of the next generation.

**Comment 13: Duke Energy representative:** Should be noted that both UNC and NC State use CHP (or cogen) technology. NC State is expanding its system right now.

Also Princeton has a great system. <https://www.youtube.com/watch?v=xwHhbDvpdS4>

**Comment 14: Community member:** I am a community member who has lived within blocks of Duke's campus for almost 30 years. I urge you not to adopt the proposed gas-powered plant that would lock Duke University into carbon-fueled power for the life of the plant.

I look to Duke University to provide leadership in our community in response to great challenges. The dangers posed by climate change may be the biggest challenge in our lifetimes to the survival and well-being of people around the globe, and may be the biggest threat to my children and grandchildren.

In my view, the debate about whether the proposed gas-power plant will add or subtract a few percentage points in the overall carbon emissions currently emitted by Duke is beside the point. The more vital question is whether Duke University will be part of the solution, or add to the problem of climate change. If Duke will be part of the solution, then it must set an example and strive toward zero carbon emissions. It cannot achieve that by investing in the gas power plant.

Thank you very much for your consideration of these comments.

**Comment 15: Duke University student:** I am a freshman at Duke University studying Environmental Science and Policy. As a passionate environmental advocate, an important reason I came to Duke was because of its incredible environmental opportunities facilitated by its leadership in sustainability.

Initially hearing about the proposed natural gas plant, I was alarmed by Duke's pursuit of fossil fuel development given its commitment to protecting the environment. Believing we must transition away from these dangerous forms of energy because of their contribution to climate change, I signed onto the petition to oppose CHP (the proposed Combined Heat and Power Plant).

It wasn't until recently, however, that I recognized the severity of damage this plant would cause to Duke Students, Duke's reputation, and the climate, which Duke has made a commitment to protect.

CHP puts the health of students at risk. The plant's proposal would allow NOx emissions ten times greater than on typical campus CHP plants. Considering this chemical is linked with respiratory diseases such as asthma, Duke would be directly responsible for degrading its students' physical well-being. Doesn't Duke have a greater responsibility toward its students than it does toward Duke Energy?

CHP also sacrifices Duke's standing as an environmental leader. Duke offers the amazing resources such as the Nicholas School of the Environment, newly constructed Environmental Hall, the Nicholas Institute of Environmental Policy Studies, the sustainable Smart Home which I'm living in next year, the Duke Forest, the Duke Sustainability Initiative, and clubs like the Environmental Alliance and Climate Coalition which I'm involved in. Each of these projects is the culmination of years of student, faculty, and administration's leadership on making Duke an exemplary green campus. Is it really worth sacrificing all of this hard work and the legacy its created to follow through with a project which over 2,000 members of the Duke community have signed on to oppose?

I'm writing this letter on the day which President Trump devastatingly approved the Keystone Pipeline despite massive grassroots efforts to combat it and President Obama's decision to deny the permit. The utter disregard for the pipeline's effects on climate change, clean water, and human health is simply disgraceful. Unfortunately, each and every one of these criticisms accurately describes CHP. Does Duke want to employ the tactic of the Trump Administration to disregard so many of the voices of the American people for supposed short-term gain provided by a fossil fuel company?

Furthermore, what message do you think this will send across North Carolina? In a state where the legislature fails to even accept the scientific consensus behind climate change, Duke is one of the only influential institutions which can change the course of our state's environmental policy. Submitting to the pressure of Duke Energy reaffirms the climate change-denying, fossil fuel-driven agenda. If Duke approve a natural gas plant, don't you think UNC Chapel Hill, NC State, and NC Central would be more likely to do the same? Even more so, schools in rural areas such as Appalachian State or Western Carolina wouldn't feel compelled to deny a new natural gas plant. This could cause a ripple effect across the entire Southern United States; if a environmentally-focused institution in a progressive area in a swing state chooses to expand upon its fossil fuel infrastructure, then why should any institution in conservative states such as Alabama, Mississippi, or Georgia make the transition? Duke would not only be complicit in these investments, but its approval of CHP would provide them further momentum.

Now, why would approving these projects be so detrimental? First, natural gas is often obtained through fracking. By drilling deep into the ground and blasting dangerous chemicals to unlock porous rocks containing natural gas, water contamination can occur. Imagine communities no longer being able to use their sole source of water as a result of a fracking project. Fracking has also been linked to earthquakes, which is why the practice has been limited in Oklahoma since the finding. It has also been linked to asthma, heart defects, reproductive problems, and cancer.

As an environmentalist, my greatest concern is contributing to the devastating effects of climate change. When fossil fuels such as natural gas are burned, Carbon Dioxide is released into the atmosphere. As a Greenhouse Gas, CO2 traps heat rather than allowing it to escape. Consequently, the Earth's temperature increases. Global warming poses particularly drastic challenges to North Carolina. First, extreme heat in Raleigh has caused mosquito season to grow by over 30 days and has increased the average number of days above 95o by 18.6 since 1970. More than 300,000 people currently living in North Carolina are especially vulnerable to extreme heat. Second, summer

droughts are projected to get significantly worse, potentially dealing a difficult blow to the state's agricultural industry. Third, more than 4.8 million people in North Carolina, approximately half of the state's population, is now living in areas at elevated risk of wildfire. The days with wildfire potential are expected to increase by over double before 2030. Fourth, more than 450,000 people in the state are living in areas at elevated risk of inland flooding. As higher temperatures cause water to expand, the quantity of rain experienced increases. From 1950 to today, Durham's number of heavy downpours has increased by 129%. Finally, coastal flooding has drastically increased in North Carolina. In Wilmington, there have been 376 floods from 2005-2014, 82% of which are considered to be from human-driven global sea level rise. Duke could significantly reduce its contribution to these disastrous occurrences by rejecting new natural gas development on campus.

Despite all of these criticisms of CHP, some of my peers have questioned the alternative. One option that would offer significant short and long term cost savings would be to invest in energy efficiency. Technologies such as LED light bulbs, improved insulation, and EnergyStar appliances significantly reduce a building's energy usage. By retrofitting Duke's campus and incorporating these into buildings under construction, using the Smart Home as a prototype, Duke can avoid the capital intensive investment up front for the CHP and reduce its energy bill indefinitely. If additional electricity generation is necessary, Duke should fulfill its commitment set forth in the Climate Action Plan to increase renewable energy generation. Although solar panels have been placed on the rooves of the Bryan Center and Environmental Hall, these technologies should be deployed on additional buildings across campus. Duke's Energy Initiative and Bass Connections should also explore unique methods.

As a student who has learned about and experienced Duke's innovation for the environment, I am confident that the University knows rejecting CHP is not only the right thing to do, but is in the best interest of its students, reputation, and the climate. I strongly urge President Brodhead and the entire Board of Trustees to fulfill an integral part of the University's mission statement, "to contribute in diverse ways to the local community, the state, the nation and the world; and to attain and maintain a place of real leadership in all that we do" by rejecting the Natural Gas Plant once and for all.

List of References:

""North Carolina's Climate Threats."" States at Risk. Climate Central, 28 Oct. 2016. Web. 24 Mar. 2017.

""Mission Statement."" Duke University Board of Trustees. Duke University, 23 Feb. 2001. Web. 24 Mar. 2017."

**Comment 16: Duke University alum:** Our esteemed University owes it to everyone to be a clean energy leader, not a follower. Do not build a fossil fuel plant. Do something we can be PROUD OF

<http://thesolutionsproject.org/north-carolinas-bold-vision-for-100/>

**Comment 17: Duke University faculty:** I am against the proposal for a natural gas power plant to be built on campus by Duke Energy. We need renewable, sustainable, non-polluting energy. I advocate using more solar energy.

Duke should be a leader in this field. When our own Nicholas School of the Environment is against the proposed power plant, how could the Duke administrators even consider that option? Solar energy now!

**Comment 18: Community member:** The proposed gas fracking plant on the Duke U campus is not the best choice for energy needs. You cannot dispute the scientific evidence that fracking pollutes the surrounding air and water, and can also cause earthquakes. You have a choice to make. You can either contribute to the harmful effects of fracking, or you can stand proud and impress potential future students by choosing renewable forms of energy instead. Solar power has proven to be cost effective, and last I knew, NC ranked 4th in the nation for solar energy production. You can also turn to wind power. Or a combination of both. Imagine how impressed your potential students would be! Clean energy is always the right answer. Don't settle for fracking; there are better choices.

**Comment 19: Duke University alum:** As an alum, I would very much like to see Duke take advantage of its position of leadership in NC and around the world by moving aggressively toward powering the campus from sustainable energy sources. NC is one of the most promising places in the country for solar and wind development, and Duke could and should be on the cutting edge of innovation in this fast-growing field. The proposed natural gas plant seems a step in the wrong direction and a missed opportunity for Duke to be on the forefront of developing solutions for one of the most pressing problems we have ever faced.

**Comment 20: Community member:** I am strongly against the proposed gas plant on Duke's campus. Duke should be striving to be a clean energy leader, and a plant that emits methane--a greenhouse gas that scientists are now saying is more problematic than carbon dioxide--is not the way to do it.

**Comment 21: Community member:** Dear CSC. Please stand up to protect the campus, the surrounding neighborhoods, our city, our state, our country and the planet- reject Duke Energy's plans to build fracked gas power plants with climate-wrecking emissions on Duke's campus.

Duke University should be leading the way on environmental sustainability, not playing into the enrichment schemes of Duke Energy! Duke must join Stanford and other universities who are developing clean-energy innovations. There are better alternatives. Harness your faculty, staff, students and neighbors to devise a better plan.

The gas-fired plant proposed by Duke Energy would increase the University's greenhouse gas emissions by over 60 percent, increase local air pollution, do little to enhance reliability, continue driving the climate-destructive fracking boom, and fuel controversy for years to come. This is not acceptable.

When your grandchildren and great grandchildren ask what you did to fight the accelerating climate crisis, don't you want to be able to say that you rejected a the electric power and fossil fuel industries' reckless expansion of methane-spewing fracked gas? The time to do the right thing is now. We're counting on you. So are your grandchildren and ours.

Thank you.

**Comment 22: Duke University student:** Throughout my time at Duke, I have grown increasingly aware of the fact that we, as students, live in a bubble, completely apart from the larger Durham and Triangle community. Speaking with my peers in a variety of settings this topic comes up again and again. Accepting this gas plant is a way of accepting the status quo and this reality. Refusing to accept this plant could set us on a new path, one in which the Duke University community becomes an active, responsible force in the Triangle area, aware of its place within this larger space. I do not believe in this gas plant, because I do not believe in making Triangle residents pay for a natural gas plant, which will disproportionately benefit Duke University. Saying no to the CHP plant could be a pivotal opportunity for this incredible university to stay true to its commitment as an environmental leader, in pushing for the growth of renewable energy, but also as a responsible member of the community. If we say no to this plant, we are also saying we acknowledge our power within the Triangle and would like to utilize it, not to support Duke Energy's failure to break free from fossil fuels but as a way of challenging Duke Energy, on behalf of all Triangle community members, to do even better with renewable energy.

**Comment 23: Duke University alum:** I find it difficult to avoid the impression that the University is on very soft ground. As major investors, including students and scholars globally, move away from fossil fuels as a matter of policy, the University must recognize in thought, word and deed the end of the fossil fueled age and the advent of renewable energy in all phases of university activities. Duke University is not immune to divestment, to the perception that it is not engaged in correcting the most serious global environmental transition of our time, and not worthy of attention as a major educational resource at this critical juncture. It has in fact no real alternative to celebrating the opportunity to lead with a renovation in energy development and use on the campus. Every moment of delay increases the potential of costly intellectual, political and financial divestments.

**Comment 24: Duke University student:** I came to Duke to grow and learn as a person. I feel like these ideals should be mirrored by the university. Duke should not commit itself to being stuck in the “past” with the natural gas plant, while newer, more sustainable options for heat and energy become more viable. Furthermore, the plant is not presently a necessity. To lock ourselves into a plant that is not even necessary for 35 years is not the kind of action that I'd expect or want Duke to take as a leading research university.

**Comment 25: Duke University staff:** Although the CHP plant at Duke would mean more natural gas being burned locally, would the NET impact to the environment be MORE or LESS pollutants than if Duke Energy generated this same amount of power at their existing facilities? If less, then this certainly seems like an opportunity for a big step in the right direction.

**Comment 26: Duke University staff:** This is essential for the Duke community in the event of a major power outage. I have worked on this system for 28 years and we need this ASAP. I think in a joint effort this would be a win win for Duke University, Duke Medical Center and Duke Power.

**Comment 27: Duke University staff:** I support the construction and operation of the CHP plant on campus. I grant you that it is not a perfect energy source but it is a huge step in the right direction. Someday maybe we can replace it with solar panels on all campus rooftops but not today.

**Comment 28: Duke University staff:** The CHP plant is a no brainer. There is no other initiative we can undertake as a university that will reduce our carbon footprint on such a grand scale. Besides the positive impact to the environment, we can also provide power to critical facilities in emergency situations. I understand the desire to use renewables like solar, but it's not feasible when you consider the power and steam needs of a campus the size of Duke.

**Comment 29: Duke University staff:** This would be better alternative than coal plus a greater savings than using coal.

**Comment 30: Community member:** I not only think the prospect of the plant is a great possibility but my company has ideas to share directly with Duke University. I live in Duke Forest and have historical connections to the University as well as other connections. I own an Environmental Company in Butner, North Carolina called PRM. The company is 40 years old and formerly of Durham. We manufacture not only pollution control/ environmental remediation equipment for sites across the globe, but we have a specific focus on renewable gas to Energy projects. We have ideas that are worthy of a conversation with interested parties at Duke where the gas requirements of this plant could be claimed by Duke as 100% renewable.

**Comment 31: Duke University staff:** This would be a great opportunity for Duke University because the steam load would decrease from the steam plants. Duke Energy would sell the steam generated from the CHP plant cheaper than it currently costs Duke University to produce at the steam plants.

**Comment 32: Duke University staff:** I would like to voice my support for the CHP Plant, although this will be generated by Natural gas, I believe the impact to be minimal if any above the present way this power is generated now. Duke Energy must create the electricity to support the needs of the campus, and the present way of coal as the fuel source, to me seems to have a more negative impact on the environment. The waste energy that will be used to produce Steam that we will purchase, will mean a reduction in our own need for Natural gas to provide Steam.

**Comment 33: Duke University staff:** It appears that the CHP project is being viewed by its critics as ineffective and a scheme to shift the energy cost burden onto the NC State residents. While actual emissions reduction an energy savings amounts will vary from the proposed amounts, the current CHP plan is the best option available today. Will biogas be better? Eventually, but not today. Will solar harvesting become efficient enough to implement on campus without requiring thousands of acres of solar cells? Hopefully it will. Will the CHP reduce energy costs for

the campus? Yes. Will the CHP help provide a substantial means of power backup for the campus? Yes. Can the CHP be implemented now? Yes. There is no easy solution to the problems generated due to the increasing energy demands of the campus. Critics are not being realistic if they expect a drastic paradigm shift in current energy supply models. The campus continues to grow and the energy requirements increase as well. We need to implement a solution that is realistic instead of delaying it with ambiguity. Jim Warren of NC WARN got it right a few years ago in this article: "<http://www.ncwarn.org/wp-content/uploads/2013/02/CHP-Report-FINAL.pdf>". What changed??

**Comment 34: Duke University student:** I came to Duke to study environmental science at the Nicholas School. I knew that the school was a recognized world wide as an amazing, influential institution. Even though I knew this, I was still so surprised at the amount of opportunities there were for environmental majors. It seems to me that the natural gas plant is a direct contradiction of the Nich school. Four former deans of the school of the environment have stated that the natural gas plant is a bad idea, so why isn't our institution listening to them. By ignoring the advice of these environmental pioneers Duke is essentially saying that the Nich school is insignificant. I don't want my school to send this message.

**Comment 35: Duke University staff:** My team provided 30 years of service to Duke University building and maintaining the High Voltage Electrical System. To be able to provide the same level of service, I would like the Committee to provide my team with a Dependable, Available, Reliable, and Resilient system achieving the University's Sustainability goal. It is not an easy task, but I think the CHP is a part of the answer.

It is true, the plan is to use natural gas as fuel. We have to remember that when bio-gas will be available the CHP could use it and lower our carbon footprint. Let's have a plant that will be ready to use bio-gas when available.

We would like to take it one step further and look at the improvement that a CHP will bring for Duke University power safety and security. A catastrophic event could take out our power supply, but a CHP here on Campus could be the life line not only for Duke, but for Durham community.

We hope that Duke community will make the right decision with the safety, security, and reliability of Duke's power system as priority.

Thanks

**Comment 36: Community member:** No natural gas plant. Go solar.

**Comment 37: Duke University alum:** I share the concerns of NC WARN regarding the proposed CHP plant at Duke. I strongly urge the University to stop this plan that includes fracking and further harmful greenhouse gas emissions. I hope that Duke University would be working to support alternative non polluting energy sources such as solar and taking a leadership role in protecting our environment and its inhabitants. Please reconsider this plan and opt for clean energy options.

**Comment 38: Duke University alum:** The American Council for an Energy-Efficient Economy (ACEEE) is a Washington, D.C.-based nonprofit organization dedicated to advancing energy efficiency policies, programs, technologies, investments, and behaviors. ACEEE has written at length about combined heat and power (CHP) systems, especially in support of state policies and programs that encourage their deployment. We are writing to comment briefly on the proposal for a utility-owned CHP plant on Duke University's campus.

Our comments are intended to support the Committee's careful consideration of the energy, economic, and environmental impacts of the proposal. We also urge the Committee to take a comprehensive look at how universities across the country are using CHP as a critical strategy for meeting campus carbon reduction goals, while economically serving campus energy needs.

CHP is the most energy-efficient way of producing power, meaning it uses less fuel to produce the same amount of energy than would otherwise occur. It is different from traditional power plants because the large amount of heat generated in the process of making electricity is captured and put to use, instead of wasted. About 40 percent of a typical building's consumption is thermal energy in the form of heating, hot water, and air conditioning. In campus settings, steam from CHP systems commonly provide space heating, hot water heating, dehumidification, dining services, and other important non-electric processes. For campus energy planners tasked with achieving sustainability goals, CHP is a highly reliable, low-emitting, energy-efficient strategy for meeting thermal needs, which can be pursued as campuses maximize renewable energy options for meeting electricity needs.

Today, more than 250 colleges and universities in the US rely on CHP systems (1). As more clean energy options become available, many campuses have added renewable energy systems while also investing in CHP systems. In the last few years, Harvard, MIT, and Tufts all proceeded with CHP installations, upgrades, or expansions as a means to lower emissions, boost resiliency, and support campus research missions. According to the Harvard Gazette, their expanded CHP system, new backpressure turbines and boilers, and other efficiencies contributed to an overall reduction from campus utilities of 20,500 metric tons of carbon dioxide equivalent, equal to taking 4,300 cars off the road (2).

We understand and appreciate concerns raised about the proposed CHP system at Duke University and fully support the campus in its efforts to achieve carbon neutrality by 2024. CHP is one way to take action to significantly reduce emissions in the state of North Carolina now, while burning less natural gas to meet campus and community energy needs, because of its increased fuel efficiency. We would encourage the Committee to consider energy-efficient CHP as one of the most currently feasible pathways available today to a cleaner energy future for all North Carolinians.

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(1) "U.S. DOE Combined Heat and Power Installation Database." December 31, 2015.  
<https://doe.icfwebsiteservices.com/chpdb/>.

(2) "Cutting carbon on campus." Harvard Gazette. December 8, 2016.  
<http://news.harvard.edu/gazette/story/2016/12/harvard-achieves-greenhouse-gas-reduction-goal/>.

**Comment 39: Duke University alum and staff:** As a leading university worldwide, Duke has a responsibility to demonstrate and promote true best practices. Duke is looked to as a role model and partner for communities here on campus, in Durham, in North Carolina, and beyond. For students, the Durham community, and the world, Duke must uphold cutting-edge standards. This new plant shouldn't be part of the status quo; it should be leading the way forward. Yes, natural gas is less damaging than coal, but it still drives climate change and pollution. Yes, Duke needs reliable energy, but short-term solutions are inadequate. We have the opportunity and responsibility to go beyond those small-scale considerations and address the larger picture. Duke needs to shift to sustainable energy both to put our substantial resources to work for our community and to lead by example, showing the rest of the world how it can be done. As an alum, staff member, and part of the Durham community, I know Duke would be failing these and other communities and missing an immense opportunity in making this plant powered by natural gas.

**Comment 40: Duke University student:** Before I chose to attend Duke University, I did not realize that the institution had a separate graduate school dedicated to the environment. Now that I am on campus, I realize the significance of this graduate school. For example, in my environmental science classes, it is always particularly impactful when my professors reference research done by graduate students and faculty members from the Nicholas School. As a university that prioritizes the environment in terms of graduate education, it seems reasonable that Duke would also prioritize the environment in all other aspects. I am firmly opposed to the construction of a natural gas plant on Duke University's campus for several main reasons. First, Duke University should be a leader in sustainability and climate efforts. The Nicholas School has published a great deal of research

on the negative effects of fossil fuels on the environment and to ignore this literature by building a natural gas plant would be counterintuitive. I am proud to say that other institutions look to Duke as an influence, but that also comes with the responsibility of setting good precedents, especially with regards to energy policy. Second, the natural gas plant would increase nitrogen oxide emissions by nearly 30% at a time when we cannot afford to be increasing pollution. Third, on a justice note, it is completely unfair that Duke University would reap the benefits of the plant while community ratepayers would be the ones paying the costs on their energy bills. Many community members already have the impression that Duke students and faculty members live inside a bubble on this campus; we cannot afford to increase that image by approving a plant that would further benefit us at the cost of the surrounding area. Fourth, many advocates of the plant claim that it could eventually be powered by biogas. There is no evidence to suggest that biogas is a feasible option to power an entire campus at this time. The university has plenty of energy right now, so instead of making such claims, it should wait until it actually has the means to use biogas before building a plant based on natural gas. Finally, this plant could last for over 35 years. The state of the planet will almost surely be negatively altered in 35 years with the effects of climate change, growing populations, and depleting resources. We simply do not have the time to build plants that could increase our carbon and nitrogen oxide footprint for at least 35 more years. When I first started getting involved with environmental science at Duke, I was overjoyed and at times even overwhelmed by the sheer number of opportunities and contacts available. With all of these academic resources, we cannot ignore the facts and continue to pursue detrimental energy policies. I stand against the natural gas plant, and I urge the Campus Sustainability Committee to do the same.

**Comment 41: *Community member:*** I am not in favor of the fracked gas plant you are considering building on campus. I hoped Duke would be a leader in alternative energy, not a continued reliance on gas. I also understand that Duke Energy would have me pay for this through its rates. It's a no for me- for environmental and economic reasons.

**Comment 42: *Community member:*** I was disappointed in Duke after attending the hearing for community input on Mar 27. If Duke University wants to be a leader in new technologies that mitigate the devastating effects of climate change, how can they even suggest a new fossil fuel plant? It seems that wily Duke Energy has duped Duke into ignoring the nitrous oxide emissions, overlooking the methane leaks that are inherent in fracked gas production, and enticed them with the profits of sticking the capital expense of building the facility to everyone in North Carolina who doesn't attend Duke, ie. Duke Energy customers like me. I ask you to delay this project while you avail yourselves of the expert advice from NRDC and NC Warn to explore all renewable energy alternatives. The price of solar has come down. Solar hot water can substitute for much of your steam needs. Do not rush to damage your legacy by moving backwards.

**Comment 43: *Community member:*** While the proposed plant is an advance on the coal fired plant that it replaces, and has a carbon footprint that is considerably lower, Duke has the opportunity (and the engineering knowhow and creativity) to enable zero carbon technologies such as solar, wind and battery storage to deliver the energy needed to power the campus. Duke should use the resources of its substantial endowment to be a leader for the Triangle, North Carolina, and universities around the country in employing renewable, carbon free energy combined with continuing to reduce overall energy demand. Given that the plant will operate for at least 30 years, and very likely longer, why invest in a technology that will continue to contribute greenhouse gases to an atmosphere already overwhelmed by heat trapping gases? And with per kilowatt hour solar and wind prices dropping much faster than ever expected, why not invest in something that will pay significant dividends over the long term to the university and the environment? Please consider the future when making this decision, not just what is convenient right now.

**Comment 44: *Community member:*** A CHP plant is an efficient method of generating steam and electricity and I have been very impressed by the one on UNC's campus. I would hope that the plant is built to easily accommodate

different fuel sources and not just natural gas, and that solar and other cleaner options are carefully considered as well.

**Comment 45: Duke University alum:** I am concerned about pollution from the new power plant. Please address this issue.

**Comment 46: Community member:** Please reconsider the Duke Power plant that would use natural gas obtained by fracking.

**Comment 47: Community member:** As a Durham resident, and as a retired engineer who worked in the utility and industrial energy sectors for many years, I have reason to know that the CHP system Duke is proposing is a very efficient and relatively clean technology. Producing campus thermal energy needs with waste heat from power generation is much more efficient than generating the two forms of energy separately. Natural gas has a low carbon footprint relative to coal and using gas in a CHP system lowers its footprint per unit of usable output even further. Fugitive methane emissions throughout the production/distribution process need to be carefully controlled, and Duke and Duke Energy should put resources into assuring this is done. If at some point you can access some or all of your gas needs from biofuels, so much the better. All in all though, this is a good move, especially if you seriously work on methane emissions control, both on campus and in the upstream supply system.

**Comment 48: Community member:** There is already so much evidence that fracking is an environmental hazard, that burning any fossil fuel is an environmental hazard, and that neither are sustainable. These and the other environmental risks that the proposed plant poses demand a more sustainable and forward thinking solution to our energy needs. Please do not build this plant.

**Comment 49: Community member:** With respect to the proposed power plant operating on Fracked gas, as a Duke Power customer, I am concerned that this has not received adequate input from the community. I am not clear of the cost-effectiveness of this proposal over other alternatives. Please take more time and consideration on this before going forward. I am concerned about the use of fracked gas for this power plant and that the alternate use of methane gas has not been fully established as a feasible option. I feel this proposal needs to be more thoughtfully discussed with greater input from concerned stakeholders such as community members and the Natural Resources Defense Council. Let's pursue a win-win approach that evolves with a greater amount of community engagement and more thoughtful consideration of cost implications and environmental impacts. I ask that this proposal be tabled until there is greater opportunity for community engagement and input, and a greater examination of cost effectiveness, practicality, environmental impact, community impact and feasibility analysis.

**Comment 50: Community member:** As the former Energy Manager for a large industrial customer of Progress Energy, we seriously considered installation of CHP at our site several years ago. Done correctly, CHP potentially allows the user to significantly reduce their carbon footprint.

However the key to realizing the desired benefits from CHP is being able to utilize the waste heat generated as a by-product of the CHP (typically in the form of hot water or steam). You need be able to utilize this waste heat year round. We eventually found this was a lot easier said than done and, ultimately, this drove our decision not to install CHP.

If you haven't already done so, I urge you to bring in an independent engineering resource to look specifically at how you will utilize the CHP's waste heat, confirm feasibility and any potential additional costs.

You certainly wouldn't want to move ahead with installation of the CHP, but find out later that it's not able to deliver the expected benefits. Particularly considering that you may be living with a 20 to 30 year equipment lifespan.

Best of luck to you!

**Comment 51: Duke University student:** I am concerned that the optimum answer will not be reached due to the lack of transparency during the process and the misleading use of data (such as claiming a reduction in GHG emissions when actually those emissions had just been transferred).

The argument that this still allows Duke to meet its zero emissions goal in 2024 is wholly misleading because that target is only achievable by using carbon offsets at a scale and speed that is just not feasible, and which does not take sufficient account of other GHG pollutants such as methane.

Please open up this process and your overall sustainability planning to expert non-profits who can assist and evaluate (such as NRDC, RMI, etc.) and help come up with a fully-vetted, realistic plan. Thank you

**Comment 52: Duke University alum:** I encourage the university to pursue alternatives to natural gas to meet its energy needs.

**Comment 53: Community member:** I am deeply concerned about Duke University considering fracking. This decision seems very short sighted and harmful to the environment. What about solar power? Duke seems to be spending lots of money expanding its campus. As a center of higher learning, I find your possible fracking extremely harmful to our community. Why are you considering this option? Are you, not an educational community? This model is unsustainable and selfish.

**Comment 54: Community member:** Fracking has been shown to have serious and dangerous side effects. Apart from using millions of gallons of water on each fracking site, there are hundreds of toxic and carcinogenic chemicals used in the fracking liquid that leach into the environment and contaminate groundwater. There is also the strong suspicion that fracking induces earthquakes. Please do not support this process.

**Comment 55: Community member:** Please do not move forward without further community input. I live next to campus and have not heard about this plan until just now. Fracking on Duke campus? I thought Duke was supposed to be a leader on environmental issues. This needs further research, more public input, and more transparency. Please remember you are part of Durham and your actions affect neighborhood children. Thank you.

**Comment 56: Community member:** Duke's reputation for involvement with sustainable energy will be a laughing stock. What does the Nicolas School of Environment say about this action? What will your community face be after installing a power plant using fracked gas?

**Comment 57: Community member:** Please, Duke, do not use fracked gas at a new power plant you are building on campus- without community input. Change plans and be a leader, an example. Use sustainable energy instead.

**Comment 58: Duke University alum:** Please pioneer the use of clean energy. I just sold \$175,000 worth of Duke stock, divesting because I am disgusted by Duke Power. Our future is in clean energy, and we really need to do this now.

**Comment 59: Community member:** I implore you to NOT use fracked gas in your new gas plant. Fracking is not environmentally friendly nor sustainable. And, it is not inline with the politics and sustainable sensibilities of the greater Durham community.

**Comment 60: Duke University staff:** This would be a wonderful opportunity for Duke to show it's commitment to renewable energy (ie solar) rather than using fracked gas

**Comment 61: Community member:** Duke should NOT build a power plant with the intention of using fuel from fracking. The home of the Nicholas School of the Environment should walk the walk by opposing fracking, not encouraging it.

**Comment 62: Duke University staff, retired:** I am absolutely and categorically opposed to Duke's plan to use fracked gas at a new power plant it is building on campus. This unacceptable.

**Comment 63: Community member:** I am deeply opposed to the construction of a power plant in our community that will be powered by fracked gas. I'm upset that as a neighbor to the Duke campus that I have not heard about these plans until today, March 30th, 2017. Duke does not operate in its own private universe. It is in Durham. It is in our neighborhood. One would hope your institution would pride itself on open communication, transparency, and proactive involvement with the community in which it's located. The actions Duke has taken with the CHP plant are the opposite. Your actions are shameful. Please do not build this power plant in my family's backyard, and please make a meaningful effort to coexist with the world outside of your elite campus walls.

**Comment 64: Duke University faculty:** Please open the decision to move in the direction of using a fracked-gas power plant to a community-wide discussion. This decision could harm Duke's reputation in the area of sustainability...which is increasingly important for students, faculty and staff choosing Duke.

**Comment 65: Community member:** This vision of a gas burning plant seems so outdated. Communities, countries, businesses all over the world are moving into clean and renewable technologies. Elon Musk is developing a utility sized solar battery. There is a windmill made in France that looks like a beautiful hybrid artwork tree. There are building finishes that can collect solar. With so much new technology available, a gas burning power plant seems like a backward, primitive choice. Why not be ahead of the clean tech curve? Using the biomass from the pig farms is a poor excuse. You will still be burning gas. You will still be polluting. You will still be embracing the draconian technologies of previous centuries. You will still be offending your community, students and professors. Please don't do this. Be part of the solution to build a clean energy future with a safe planet.

**Comment 66: Community member:** I would like to PLEAD with the decisions makers at Duke to drop consideration of building a plant which would utilize fracked gas. The very process of getting it out of the ground is fraught with environmental damages. The process uses millions of gallons of water, which at the end of the day is contaminated with toxic chemicals. Surely Duke, if it has unmet energy needs, has the resources to develop a more sustainable, earth friendly plan than the one I have read about.

For the good of your neighbors, both in Durham and beyond.....for the good of your students.....for any who might look at Duke as a model, a leader for the future.....reject this idea.

**Comment 67: Community member:** Long-term fossil dependency is not a climate solution. NC has more potential for solar than most states in the country. We can be a leader, and independent, in so many other ways that are better for the community, the environment, and the future of our city. Duke has been a leader in so many ways. Continuing to pursue fossil fuels would mean Duke is leading us backwards. In addition, as a community member with no connection to Duke other than the fact that I live nearby, I am appalled that I will be paying for the subsidies a (wealthy) private institution receives. By pursuing this option, Duke continues to distance itself from the members of the community who are low-income, already disenfranchised. The fact that Duke has made this CHP plant SO difficult for the community to weigh in on only proves that Duke knows this is a terrible idea that hurts everyone but their wallet. Durham residents deserve REAL engagement, not told what they will do from a bunch of people who make decisions behind closed doors.

**Comment 68: Community member:** We do not want additional plants that depend on fossil fuels built in our community.

**Comment 69: Community member:** Please affirmatively explore alternatives and provide a cost-benefit analysis

**Comment 70: Community member:** I would prefer to see Duke University take a position of environmental leadership by opting for clean renewable energy, even if the initial cost is higher. This moral stance is worthy of Duke University and would help set the bar for others. In the long run it also makes better sense for our environment and for the sustainability of energy for the university and medical center.

**Comment 71: Duke University student:** I do not support the CHP power plant. I think Duke should be a shining example of sustainability, and I don't think this plant will do that. I think the school should look for more renewable ways to generate energy and steam on the school's campus. I believe those options exist, and if not, the great minds at Duke should be able to innovate a solution that will be more carbon neutral.

**Comment 72: Duke University student:** I encourage the University to pursue a progressive energy strategy including energy efficiency, electrification of its bus and security car fleet, and incorporating biogas over natural gas use for this new CHP plant. Given the hospital's need for steam and the campuses projected increase in electricity demand, the planned CHP plant seems like an effective way to meet both needs while also potentially lowering greenhouse gas emissions.

**Comment 73: Community member:** Am I to understand that a methane emitting and polluting fuel that is at least partly responsible for several million deaths worldwide is less expensive than non-polluting, non-death causing renewable energy? How much is a life worth in your world?

**Comment 74: Duke University student:** I encourage the committee to move forward with the CHP plant under the conditions that 1.) there is a clear plan for use of biogas in the plant. This means ensuring suppliers are on board, the university is willing to pay more for the biogas than natural gas, and this is not listed as just a "possibility." 2.) That by building the CHP plant, Duke University makes a commitment to decrease the load from the current natural gas plants on campus and will not increase these plants' capacity in the future 3.) Duke university begins investing more money in renewable sources to meet electricity demand, even if these options are not optimally economic. More than anything, Duke University needs to be part of the solution to climate change, and while I understand the economics of renewables compared to natural gas, I believe threats posed by climate change are worth investments that may not be optimally economic now in order to hedge against future climate change. Thank you.

**Comment 75: Duke University student:** The limitations of current technology are clear, and the argument for shifting towards CHP is strong and being made by specialists. I support the comments that have already been presented about the economic and scientific cases for using natural gas to support a CHP plant as a partial step towards carbon neutrality that the university can accomplish in a reasonable amount of time. Instead of belaboring that point, I'd like to suggest that the committee invest more in its communications with the community and presentation of findings. First, firm, clear and easy-to-access statistics are needed. Second, timing is all. The community at first was surprised and distressed at being in the dark. Now, it seems that the community has done what it believes to have been its homework, and responding to their information with other information will only make them feel stupid, and put them on the defensive. The longer this trend continues, the less likely that any clear communication or traction towards collaboration will be achieved. No one likes to feel stupid. Third, many have voiced concerns about their children's health, their own health, and real value of the environment. These are tricky to quantify, but the suggestion of including an ethics specialist on the committee should be taken seriously. This can send a strong signal to the community. One particular point to consider is the question of who pays. If the community is strongly against this, is Duke willing to foot the bill? Last, I'd like the committee to really ask (and publish results from) the root question of why Duke has to expand. Is the University growing because it absolutely must, or because it wants to expand its already very large profile and power? Construction on campus has many incentives, and Duke has many resources. Confirming that these are in line is important to justifying the need for more heating power.

**Comment 76: Community member:** I support the plan for the Natural Gas Power Plant on the Duke Campus. This plant will reduce the University's carbon footprint. Please do NOT listen to the lies and B.S. from the Environmental groups. Please vote to PROCEED with the plan for the Natural Gas Power Plant. Thank you.

**Comment 77: Community member:** As a citizen of NC, I support Duke University's efforts to develop this CHP project! It is a real step in the right direction, and the pledge to source renewable biogas for the plant is one that I feel that the University is sincerely committed to.

**Comment 78: Duke University alum:** I support the Cup natural gas plant. I am a Duke alum living in Durham. I work for a non-profit research and development firm on projects to support the develop. Enter and deployment of new renewable energy technologies. I support the construction of the proposed CHP Plant on Duke's campus. The CHP Plant will provide Duke Hospital the ability to island itself for multiple days in the event of emergency. This is a service that provides value to everyone in Durham, not just those at Duke. It is a service which could not be provided by renewable energy sources such as solar or wind energy, even when combined with an energy storage system, such as Li-ion batteries. No wind turbines large enough to supply 21MW could be constructed in the middle of Durham. A 21MW PV field would take up more than 40 acres of land (based on the density of the Cestas solar farm in France, one of the most energy dense, by area, solar farms in the world). Such a large deployment is not feasible within Durham. Outsourcing the production of the power to a distant location defeats the ability to island the campus, removing value to Durham generally. CHP plants are the most energy efficient form of electricity production from fossil fuels widely used by utilities today.

I am a progressive, and I support every effort to curtail climate change. Duke University, and Duke Energy, are being admirably progressive with this proposal. I support it without reservation, and I strongly encourage the Campus Sustainably Committee to do the same.

## **Transcript of comments from March 27 Public Forum**

*Comments were directly transcribed on March 27 to the best of our ability and may have been edited for clarity. Names have been omitted to protect speakers' privacy.*

**Comment 1:** I'm a regulatory consultant of NC WARN. I live in Durham and would be affected by power plant. The stakeholder process was neither – the people who are most affected by the plant were not notified in a timely manner. All of my neighbors didn't know, and some of them work for Duke University. The process has been flawed from the start. We are in an interesting time right now with changes in electricity production and rampant increases in climate change. More and more voices are saying that methane is driving that climate change. It appears that neither Duke Energy nor the NCUC nor Duke University want to recognize that methane is 86 times more powerful of a greenhouse gas than CO2 over a 20 year time period. We're going on the wrong highway. We're building a bridge to nowhere. With a real stakeholder process, we can have experts and hear from all kinds of people such as community members and students who will be most affected by climate change over the life of the plant and we can hear from other stakeholders across the state, but we did not have a process. Without a process any decision that is made is inadequate. Having worked across the country in many states, this utilities commission have thrown out evidence from our experts who are nationally and internationally known, and doesn't want to have any interference with their ability to build more pipelines, more power plants, and more fracked gas.

**Comment 2:** I work for NC WARN and want to speak about the process. Reaching out in March for a process of just Duke University faculty, staff, and students – reaching now, March 27, is a flagrant foul. I will spare the whistle, but it's a foul to leave out community people who will be paying for this plant. When I say community people, I mean neighborhoods in Durham, people who do not work for Duke University in any kind of capacity. I know that there is a commitment to neighborhoods in Durham because of the Duke-Durham neighborhood partnership. Those folks have not been involved in the process. It's important for transparency and inclusion that those of us that who will be impacted by this gas plant are able to weigh in for public debate. There has been no recognition of those of us who will have to deal with emissions and pollution who live in the vicinity of the university and for those of us who will have to pay for this and who will have to deal with the impact of methane emissions that will exacerbate climate change. It's important for all of you to know that many of us do not trust this process – that it's March 27

and I know there's a timeline to get your draft recommendations for the public. We want to know when we will get a chance to weigh in, have public debate, and feel respected.

**Comment 3:** I'm the assistant director of the Southwest CHP Technical Partnership. We're located at the Clean Tech Center at NC State. We're funded to provide education, outreach, and technical assistance for stakeholders who want to learn more to evaluate combined heat and power. CHP systems are very efficient, extract approximately 80% of the potential energy from the fuel that they use. That efficiency means that a CHP system utilizes 30-40% less fuel to do the same amount of work and provide the same amount of energy than traditional generating capacities where you have steam generation on site and electricity generated many miles away. That efficiency translates to overall reductions in air emissions and pollution, including greenhouse gases, and also provide users with a long term, cost effective source of energy and also increase reliability and resiliency. This is particularly important during natural disasters such as ice storms and hurricanes. They can keep central campus functions, including medical centers, laboratories, and dorms, operational. They also provide a benefit to the community. Campuses with CHP systems can and have been demonstrated to be a potential center of refuge for community residents who would otherwise be without heat and hot water or any water or other life critical things that are needed. Recent events have shown the importance of having these services available. CHP can provide that. Currently, there are 263 universities around the country with CHP systems, over 80% of which are fueled by natural gas. Natural gas distribution systems typically remain operational during severe weather events, making this the fuel of choice for reliable systems. Many of these universities can be considered peers to Duke. 7 or 8 Ivy League schools have CHP. CHP is resilient and could be life-saving and is an environmentally sound technology. It allows the university to manage costs, and allows the university to be a place of refuge and reduce environmental impacts.

**Comment 4:** I'm a neighbor and an alumnus. I would like first to respond briefly to the previous speaker. No one here is against CHP plants. NC WARN has been on record supporting it. That's not the issue. I'll leave others to talk about the process. It has been secretive – I pay attention to these things and it's just blown up in the last month or two. I've also been a part of the Duke neighborhood partnership – there has been a pathway to talk to us, but they haven't used it. It feels like a pro forma process for engagement to say to the Board of Trustees that they've talked to us, but that's not true. I'm concerned that the reduction in greenhouse gases that they're talking about is because Duke Energy is going to own it now. All that's happening is that Duke University is going to relinquish ownership of greenhouse gases and I'd like the Committee to address that. I'm also concerned that Duke Energy ratepayers are going to pay for this, when it should be Duke University's nickel and dime entirely. Regarding fracked gas – we're talking about fracked gas because it's economical and driving the whole industry. By using any fracked gas, we're contributing to a global warming economy. I have concerns with the loopholes that Duke Energy is going to be using to get around the NOx limits, which are a double play for people's health. Finally, I'd like to say, why aren't we just solarizing Duke? This is a wonderful opportunity. This plant is going to operate for the next 35 years, and that's 35 years that we can use to put solar panels up and make this a truly model campus.

**Comment 5:** I'm not a neighbor but I am a stakeholder. I'm from Asheville and I've come this far because I consider this one of the most important issue of our times. I'm also a great grandfather and I lie awake at night worrying about what this planet is going to look like when my great-grandkids are my age. Shame on Duke Energy – we know that Duke Energy is not a responsible citizen in North Carolina. We all know about coal ash, we know how they treated the people of North Carolina, we know how monopoly status has allowed them to get their way in Raleigh. Also shame on Duke University for even considering entering a marriage with Duke Energy, a corrupt and polluting and climate-changing utility, the largest utility in the country, who has treated North Carolina and the need for sustainable energy in North Carolina abysmally. Why would a renowned and old university like Duke possibly even consider this? You all probably heard the Exxon Knew campaign that was started a couple years ago. Exxon knew that climate change was real in the 70s and 80s, and they lied about it. Duke Energy knows that climate change is real, they know that fracked gas is damaging communities all over the country, Duke Energy knows that methane is 86x more powerful a greenhouse gas than CO2. Duke Energy knows. Duke Energy knows.

right now that this is a fact. They say maybe the fuel can be obtained by hog waste. From what I understand, that is not a proven technology; hog waste may be significantly more expensive than fracked gas. We just don't know. To make the argument that this system is going to be good for the people of North Carolina, Durham, and the world, is shameful. So shame on Duke Energy and shame on Duke University.

**Comment 6:** I am speaking as a North Carolina native and concerned young person. A few concerns that I have is the fact that methane has not been a part of the conversation. The facts that were printed on this sheet talks about CO2 emissions but doesn't bring up methane as a conversation at all, which is where the fracked gas comes from. What is produced by fracked gas is a more powerful gas than CO2. I'm concerned about this process and if this agreement is entered into, how it might set a precedent for these types of agreements to be made by private utilities with universities for private gain, which is a scary notion. I want to echo and add my voice to all those concerns that were raised so far.

**Comment 7:** I am a climate activist. Working mostly on issues around natural gas and fracked gas, most recently looking at the Atlantic Coast Pipeline and the dangers that will bring to our residents in the Piedmont area of North Carolina. Duke University should serve as an example to other prestigious schools and lead the effort to go to 100% sustainable green energy by 2030. It's appalling that you're even considering this plant. Contrary to what many corporations would have you believe, fracked gas and natural gas is not a sustainable solution. The handout seems to be written with the express intent to deceive the public and Duke University staff and students. It refers to fugitive emissions that will reduce campus carbon emissions by 10,000 tons of CO2 per year. That might be true, but it will increase Duke University's greenhouse gas emissions overall by 61%. While reducing CO2 overall, their natural gas replacement will be contributing methane emissions instead. They're not lying, strictly speaking, but you can't say this isn't deceptive. You need to do your homework. It's very concerning that they lead with these deceptive statements. And they will then try to finalize this report in May. Duke University should instead be working with Duke Energy to partner on installing solar across campus, which can largely meet Duke University's needs. There are alternatives that would not contribute to greenhouse gas. Duke University should instead invest in this infrastructure.

**Comment 8:** I'm a resident of Duke Forest neighborhood. I'd like to say that energy policy is complicated and I know that. I know that there may be people who think this is a good idea. I personally have spent a fair amount of time trying to read about and educate on these issues. I have a scientific background. I would welcome an open debate between people who think this is a good idea and experts who think otherwise. That would give a better opportunity for us to educate ourselves and the community. From what I understand, Duke Energy is proposing a 21 MW plant with Clean Air Act emissions that only kick in at 25 MW. I'm concerned about NOx and methane. I want to say that Duke is an innovative and well-respected institution, and you have the opportunity here to set an example that will inspire students, neighbors, and peers. I urge you to invest in a campus that relies on renewable energy. If we needed a new car, we wouldn't get an oxcart, even an oxcart with newfangled instruments. Please look to renewable energy.

**Comment 9:** I'm a neighbor. I live about 6.3 miles from here along New Hope Creek. This is my neighborhood. I'm also an admirer of Duke University and its magnificent gifts, but a new gas plant produced with one of the dirtiest fuels and ditching renewables is not neighborly and it's not a gift. I am an educator, I have a niece who graduated from the Nicholas School last year. I have been a visiting scholar at the Nicholas School and I have read what their scientists have written: wise warnings about fracking. My main work now is as a writer and as a person who's working with Presbyterians for Earth Care. We have read the Pope and done a lot of thinking about what this is moving forward. I consider a fracked gas plant on campus a moral failing, a betrayal of our neighborhood. I expect a great university like Duke to lead forward and to give us real, long term solutions for sustainable energy systems to honor our economic, physical, and moral environment.

**Comment 10:** I'm also a resident of Durham. I live off of Erwin Road in a neighborhood very close to here and none of my neighbors know about this proposed plant. Tonight is the first time I've ever spoken to a decision making

body like this. I want you to consider something – that’s “legacy.” It’s a word we don’t give much attention to, and I want you to consider it tonight. A year ago, I didn’t give much consideration to power plant proposals. I’ve given a lot of consideration to Exxon and BP oil spills and numerous instances in Oklahoma due to fracking, and countless other assaults on our environment due to fossil fuels. I’ve been discouraged by our policies that encourage fossil fuels and our role in contributing to climate change. I left the role of change to the government and environmental groups. Today, none of us can be so complacent. Tomorrow, the president is sign an executive order that will undo the Obama administration’s Clean Power Plan. Just another executive order in a string of policies bent on undoing any progress that we’ve made for the last 8 years. In light of these changes, it’s no longer safe to assume that Duke Energy will shed fossil fuels in pursuit of clean energy. Both Duke Energy’s track record of environment and their current 15 year plan would lead me to believe the opposite. In light of the changing political climate in Washington DC and the administration’s all out assault on the EPA, we citizens must do all we can to ensure safe water and air for our children and their children. It may cost more in the short term, but the right thing, the better thing, often does. I come back to the word “legacy,” because the decisions we make become our legacy. My legacy is to be here to speak for the environment and clean air and water. Any decision by Duke University to build a new natural gas plant would be a stain on its legacy.

**Comment 11:** I’m a student in the renewable energy technology program in Durham Technical Community College, currently working as an electrician. I 100% agree with the sentiment of all previous speakers that climate change as well as air pollution is a very toxic issue, and in my opinion, we should have as a society begun wrestling with it decades ago. Having said that, the simple reality is, and I present this from my own technical background, that is a process that takes decades. Huge amounts of changes need to be made in our physical infrastructure as well as our legal apparatus that determines how we buy and sell electricity. Like I said, we should have started 50 years ago. I do not personally think it is realistic that 100% transition to renewable energy can happen in less than 30 years pending some kind of drastic reduction in per capita energy consumption. I also think the reality is that if Duke University does not produce energy on campus through something like a CHP system, it will have to buy energy from Duke Energy anyways, which will be produced by natural gas, coal, or nuclear, which is even worse. The integration of renewables isn’t very possible – even if we can implement renewables like solar, we would need to deal with intermittency. The options there are either batteries, which are very expensive or have their own environmental problems, or through natural gas and diesel generators. I don’t claim to know what options are the best, I simply wanted to use my background to make people who may not know about those technologies as well aware of these issues so that no one on either side can promote overly simplistic issues. I do have questions for proponents of the plant including: has the possibility of using more energy on campus or in Durham in a microgrid been considered, and what projections are there for the university’s energy demand versus capacity.

**Comment 12:** I am the director of NC WARN. I’m glad to be here tonight. I want to be clear, this is good discussion but it’s no substitute for rigorous debate between technical experts. I don’t believe the committee has among its critics any technical experts. We’ve tried to work with the university, and I notice that there are no administration leaders here tonight, and that’s a problem. We appreciate that Russell Thompson and John Noonan met with us and our technical experts last summer and last fall to learn more about what we’re proposing. We told them from the beginning, we don’t like the expansion of fracked gas. We want to put forward our best argument and we want to hear their pushback to see where we were wrong. When we turned in our report in October, they cut us off and they simply wouldn’t respond anymore. We continued to follow up after hearing misleading statements by Duke Energy and Duke University. After a lot of pressure, Brodhead said that they would suspend the process and create a stakeholder meeting. We said great, but no one told us that a stakeholder meeting had even begun. The secrecy and transparency is a problem. The university has no immediate need for any major changes to their on-campus energy needs. Prices of battery and solar have come down even more since we published in October. There’s also a glut of electricity supply throughout Duke Energy’s territory. There is no need to keep building power plants and raising rates and stifling public debate which is Duke Energy’s legacy. We’re all part of this decision. We shouldn’t use a cold and corporate approach to this decision. I want you to sit down with our technical expert, an engineer from this university. Bill Powers will be here on May 5 at the Nasher Auditorium hosted by NC WARN and we will

invite President Brodhead and all of you to come to talk about the technical issues on this project. NC WARN is hoping very much to find a way forward with this university that avoids what is shaping up now to be a multi-year legal and street battle over this project. We want to find a way forward that takes a lead on the climate crisis. The U.S. fracking boom is the leading driver of the global climate crisis. That's in the opinion of multiple technical experts, including folks from Cornell and other places. This is not the time to be going backwards with more shale gas.

**Comment 13:** I'm a resident of Durham, about half a mile from where the plant is going in. I'm a former licenser, I gave up my engineering license when I retired. I worked 35 years with nonprofits on energy efficiency and alternative energy. I've done a lot of work in this field and I'm here to speak in support of this project. I can't speak to the process, I understand people are upset but I don't want to throw the baby out with the bathwater. I look across the portfolio of Duke Energy's power plants and they have some star performers, solar and renewables, I agree that those are the A players. You have coal fired plants, and Duke has a lot of them, a lot more coal generation here than generally across the country. Those get an F, high particulates, high NOx and high SOx. EPA has done studies around power plants and has found that there are higher cancer rates in the one mile donuts around this place. Coal is not good. Fracking has its issues; I think there needs to be a lot more studies and regulations. But go to West Virginia and look at mountaintop removal sites and see what's been done to Appalachia - the communities there that have been wiped out. I have a problem supporting continued use of coal. Gas plants are sort of in the middle of the A to F mark, and a CHP plant is well above a typical natural gas plant. If we can move more toward CHP and drop off from coal, that is a good thing. Utilities across the country are moving away from coal and toward renewables. I do not want perfect storage and solar to be the only way forward. People are dying from coal plants and I want to do anything to get off of those. A CHP plant will contribute to that.

**Comment 14:** I'm here as a community member. I live in Morehead Hill. I'm also here as a faculty member from Duke University for the past 27 years. I love Duke and I was appalled when I heard about this plant. It was only a month ago that I heard about it, and I try to keep up with these things but my neighbors and colleagues did not know about it. I have a real problem with the process and lack of transparency. I've watched Duke Energy for a long time and I do not trust Duke Energy. I have watched them stonewall any renewables in this state - while they build renewables in other states, they don't build it here because of their monopoly. I don't understand that business policy, certainly not from a human and environmental point of view. I would like to think of Duke University as a sustainability leader. That's been the image that's projected, but this power plant has not been putting us in the lead on sustainability. I encourage the university to reopen the conversation with NC WARN. I've been an NC WARN member for several years, I trust the scientific knowledge that NC WARN brings to the table, and I trust NC WARN representing the community's best interest. I urge the committee to reopen the process to regain the trust of community and campus members.

**Comment 15:** I'm a resident of Northgate Park neighborhood, which is on the other side of Duke Street and of 85. I'm a member of the neighborhood association, but I didn't know about this until NC WARN sent an email about it. I organized my precinct for the Democratic Party after the national election shocked many of us into consciousness. I'm a retired schoolteacher, I never taught science, but I can tell you what I've learned about gas extraction. Where it's being extracted, they're shattering the underground by pushing mass quantities of water that people need to drink, they're contaminating it with chemicals that they refuse to disclose because they're toxic, and it's damaging poor communities and people of color for the benefit of white people and our comfort, and that's wrong. As has been stated, the production of gas contributes to climate change, which we can see daily in the news, you can find out what's going on around the world on climate change, and you can see that we have to not contribute to climate change. We have to do what we can, whether there's regulation or not. I don't trust Duke Energy, I've been to the Utilities Commission, and I have a hard time trusting the Utilities Commission. You'll find that the room is packed with Duke Energy's lawyers to intimidate the Utilities Commission. Duke Energy contributes to people's political campaigns. They build plants they don't need, they claim predictions that their need will be greater than has actually been proven, then they charge customers to build plants that are not

necessary, and then they charge us to pay for those that are not needed, and then they pay dividends to wealthy investors. We need to be shareholders on the right side of history.

**Comment 16:** I'm a citizen of the planet. I was doing a bit of reading today and I read that 70% of the people in this country support renewable, clean energy sources. I'm looking around saying, this is Duke – we have all kinds of resources. Wealthy alumni, an incredible brain trust right here on campus, property all over the place. Isn't there a different way to go? You have a choice: you can be the past or you can be the future. You can look at dirty old ways, or you can investigate new ways. There are a lot of ways to do solar. They're talking about spray painting it, building surfaces, windows that collect solar energy. Elon Musk is working on a battery that will be utility sized. If I'm Duke Energy or Duke University, I'm getting on that because if you don't, you're going to be left behind. If you look to the future, how many more students are going to be interested in coming here? How many more staff are you going to be able to get, professors that would probably say that we're paving the way to the future? I am asking you, don't do this. There's a better way.

**Comment 17:** I'm the son of 2 Duke graduates, a Duke alum, and a proud parent of a Duke student. I work at NRDC, a national environmental group. We have been tracking this since it was announced last summer. I have a couple of important points – one is about process. For the last 7 months, what we've been told is that the reason why this is being built and why the university is most interested is the energy security benefits for the hospital. We have found out during the stakeholder process is that it seems the real reason for this is to expand the steam supply to keep up with the growth for the institution. In the utility planning timelines, there are no plans to island the system to provide backup power that in Brodhead's words are life and death for the university. The way that the dialogue has gone, we have offered our expertise to look at in detail the university's thermal and electricity needs and look at what capacity the university has to make alternative decisions in terms of investing in efficiency and renewables. At no point were any details given to us other than reports justifying the CHP plant. There's nothing proprietary about this issue and no reason to not allow experts to come in and look at the situation. CHP could be a part of the solution. 35 years ago, we'd probably recommend this. Now, you're talking about a natural gas plant that's going to exist past 2050. When we have to zero out emissions, you can't be building a natural gas plant. Duke Energy is not going to displace coal – this is going to be an add-on. The reason why this is such a precedent-setting case is, for all of the CHP plants at other universities, those universities paid for it. This precedent is for Duke Energy to bill the plant to ratepayers. We are intervening in their IRP case. We have done a detailed assessment that they're investing in a lot more natural gas, and not in efficiency as they could be. The same is true for the university. You're not looking at the whole system needs and making the investments that you should be to overall reduce steam needs of the university, come up with different ways of meeting needs. If you were to build a new way to build steam, you wouldn't build a pipeline system, you'd come up with a modern way of doing it, and that's what we'd like to you to consider now.

**Comment 18:** I'm a family doctor in Durham and a clinical associate in the Community and Family Medicine Department at Duke. I'm not speaking for Duke, I'm speaking as the father of a 31 year old daughter and a 28 year old son, both of whom went to Durham public schools. My generation has dropped the ball, and climate change is killing people right now. It's not just an issue for our grandchildren. In the Sahel region of Africa, people are dying of drought. The California farms are becoming deserts. Even if this fracked gas plant is more environmentally friendly than a coal or oil plant or some other straw man, which I actually doubt because of the issues raised about methane, the time for halfway measures is long gone. A grade of C is not good enough anymore. Duke needs to lead. I understand that we need to generate power. People here drive cars and go on airplanes, but we need a new model. Mark Jacobson, a Stanford engineer, has a plan to transition the whole world to 100% renewables with current technology. Power companies plan to make billions more dollars at the expense of 99% of the planet. Duke needs to part of the solution, not part of the problem.

**Comment 19:** I live in Durham and I went to UNC but I'm here in solidarity with the folks at Duke because there are some things that are more important. Let's take this out of the weeds and let's talk about the system. Let's not use

the people who have their water poisoned to justify creating new generation of fossil fuels at a time where we need to be moving the other way. I'm not a scientist but there are plenty of scientists here and elsewhere. Coal is not the answer, gas is not the answer. It's not just about this plant; it's about the system. It's not saying that coal is unacceptable so we're going to build gas and have earthquakes and fireballs and build pipelines that harm wetlands and native people and people of color so that they can benefit themselves and keep solar and wind out of it. Don't be complicit with Duke Energy; don't be a co-conspirator. We can move forward and we can move ahead. You heard this today - it's democracy. Almost everyone in this room came out against it. The community does not want this, and we think this is a mistake. If Duke University has any respect for life on earth, they must not do this. If they do it here, they will do it elsewhere. We have to stop this plant, the Atlantic Coast Pipeline. We must build solar and our communities. We have a choice - we can do it here, and we will stop this.

**Comment 20:** I'm a long time resident of Durham. My wife and I designed and built a passive solar house with active components. We did it not because it's the best financial choice but because it's the right thing to do. Looking at Duke, this is not a critical need. This is something that they're trying to do some planning for. When you plan ahead and make this investment, you're blocking off other options. Solar is something that you can build as you need it. They have several hundred thousand square feet of roof space, which can they develop as solar power and they can develop it out as technology improves. They can do the research and make the tough technical choices and do the research for solar and battery power and grow it out in a way that respects the environment rather than make this investment that locks them in and prevents them from spending money on alternate sources like this. I've seen other projects that have gone with solar. If Duke Energy can't or won't help with that, then perhaps Piedmont Electric or Progress Energy can step up. Duke University is supposed to be a leader. They have done some things - they've put solar on rooftops and they have done studies. But sometimes it's not just about cost per kilowatt-hour - sometimes it's about the best choice for the future. We need to make the harder decision that's the right one.

**Comment 21:** I am a member of the community of Durham. I want to talk about Duke University being a leader in climate action. When I first discovered the Nicholas School, I was absolutely inspired. One of my short term dreams is to study energy at the Nicholas School. When I learned about the plan to make Duke carbon neutral by 2024, I was incredibly impressed. I'm an organizer for climate action and I noticed that most other universities have a timeline for carbon neutrality by 2050 so I was blown away. When I heard about this plant, I was devastated. People talk about how this plant would hurt people who might want to apply to Duke University, and that's me. I think it's extremely hypocritical. I'm learning about other universities taking real leadership on climate. Just a few months ago, Colorado State University committed to going 100% renewable electricity by 2030. Last semester, the 2nd largest college in New Hampshire made a similar commitment, and so did Arizona State and other small universities across the country. I'm sick of hearing that it's not doable to power the university with renewables. We're seeing entire cities powered by renewable sources, and we're seeing entire countries. I don't want to hear that we can't power our campus and the hospital with renewables, when we see Sweden and Costa Rica powered by renewable sources.

**Comment 22:** I operate a solar plant in North Carolina. Dealing with Duke Energy - they make life extremely difficult for us to develop solar. They drag their feet, they give us incredible interconnection fees to operate their own system. They've made it very difficult. But we operate and we've operated for 3 years and it's beautiful. If we can do it - 2 farmers in Brownstone, North Carolina, Duke University can do it. Duke Energy in the last 4 years, every candidate that they have financed is a climate denier. What does that tell you? And I have one question - the biogas that we're told about from these pigs. Isn't gas fungible? If Duke doesn't buy that gas, is it just going up in the air? No. If there is a reasonable project to produce that biogas, somebody will use it. It doesn't have to be Duke University.

**Comment 23 (from Q&A):** My company is engaging in manufacturing equipment to put biogas in the pipelines now. There are alternatives out there that are not swine. Landfills also have biogas. We can't step in and do it all

overnight. We have to look at everything, minimizing and conserving everything we do have and reduce overall needs, but there are other biogas resources to consider.

**Comment 24 (from Q&A):** Rather than being transparent and fact based, I've seen you repeatedly misstate facts that the campus emissions would drop by 18% when that was actually an accounting trick. And even though people pointed that out, you repeated that statement. When I looked at the carbon neutrality goal, that's built on assumptions that aren't practical. The way that the majority of the gain is going to be achieved is through offsets and other ways to trade off emissions. When you look at the potential to do that on the scale required, you're never going to get there and you're being duplicitous and dishonest. Many of the comments tonight have not been with a concern that the university has to do something, but it's the process by which you've done and asked us to trust you when we have seen how you've gone about this problem, that's what's so wrong.

**Comment 25 (from Q&A):** It sounds like you've already made the decision and just telling us.

**Comment 26 (from Q&A):** You had at your disposal experts from across the country, and we weren't invited in. we don't need to do this now, we can wait another year and do it then.

**Comment 27 (from Q&A):** If we only need new generation in 2024, what's the rush right now?

**Comment 28 (from Q&A):** If you value the reputation of Durham, and if students have second thoughts, the optics have to be better. We can't just keep hiding things. Duke can't do that here. If you bring no other message back to your folks, this must be transparent. There have been good points here made on both sides. But it's just in this room. The optics are crucial to the benefit of Durham, the benefit of Duke, and the benefit of the kinds of people who are going to come here.

**Comment 29 (from Q&A):** We all want biogas, but we want to do it in a way that protects communities. It should be clear that the recommendations from the committee should be wait and see until we get it right. Neither of us want to do shale gas. Use some time to analyze and do technical analysis of how much solar and battery storage can do for this university. Put this thing off for a few years and do it right.