



February 27, 2017

Chief Clerk of the Commission  
NC Utilities Commission  
Raleigh, NC 27699

*Sent via email: statements@ncuc.net*

RE: Docket No. E-100, SUB 147

Dear Members of the NC Utilities Commission,

We, the 80 undersigned members of Medical Advocates for Healthy Air, a statewide network of medical and health professionals concerned about the impact of air pollution on the health of North Carolinians, are submitting this comment to express our concern with Duke Energy's Integrated Resource Plan's failure to aggressively pursue the development of clean, renewable energy sources. Restricting the amount of electricity coming from renewables to 6% and the similarly weak effort to increase energy efficiency over the next 15 years indicate a blatant disregard for economic, environmental and public health realities.

Our concern stems from the health effects caused or exacerbated by both the extraction and combustion of fossil fuels and by climate change, which is driven by the extraction and combustion of fossil fuels.

While the continued effort to shutter coal-fired power plants is a positive step, it's a mistake to replace it with methane gas. The health impacts of the hydraulic fracturing method of gas extraction are well-documented. Furthermore, the effects of climate change are already adversely impacting the health of people and communities as well as the functioning of our healthcare system across the state. Projections indicate escalating severe consequences in the health and functioning of our state unless we drastically reduce our greenhouse gas emissions. An annotated list of the research on these health impacts is appended.

Duke Energy has the responsibility and the resources to take leadership in protecting our health. While transitioning to a grid powered by clean, renewable sources is a challenge, we believe that it is a challenge that the nation's largest energy provider is up to. Any financial burden borne by the utility and ratepayers pales in comparison to the phenomenal costs to individual and social health that will occur if this transition does not take place. The health of the public must be the first priority of our government. We urge the Utilities Commission to require Duke Energy to include significant transitions to clean, renewable energy as soon as



possible in its Integrated Resource Plan.

Sincerely,



Laura Wenzel, MSW  
Manager  
Medical Advocates for Healthy Air

Attachment: Health Research Appendix

## 79 Additional signers

### Health Research Appendix

#### Methane Gas Extraction Health Impacts

The 16,000-member Pennsylvania Medical Society has called for a moratorium on new shale gas drilling and hydraulic fracturing and is urging the state to establish an independent health registry and start studying fracking's public health impacts. Their appeal follows the publication of a number of recent studies raising troubling concerns about the potential health impacts from the chemicals used in hydraulic fracturing.

In January 2017, a Yale University study reviewed list of 1000 compounds used in fracking. More than 80 percent of these chemicals lack sufficient data on cancer-causing potential. Of the 119 compounds with sufficient data, a total of 55 unique compounds were known, probable or possible human carcinogens, and a total of 20 unique compounds, including benzene, cadmium, and several polycyclic aromatic hydrocarbons, had evidence of increased risk for leukemia. The authors recommend an investigation into the relationship between hydraulic fracturing and the risk of cancer.

***Unconventional oil and gas development and risk of childhood leukemia: Assessing the evidence*** by Elise G Elliott et al. (Yale University School of Public Health) in Science of the Total Environment (2017)

Duke University scientist Christopher Kassotis has been attempting to study the impact of

chemicals used in hydraulic fracturing on growth and development, but has been stymied by the lack of transparency about the chemicals that are being used. Nevertheless, he was able to establish that 23 of 24 commonly used hydraulic fracturing chemicals can activate or inhibit the reproductive and thyroid hormones in human cells, and that the mixtures can have a synergistic and additive effect. In a study published in 2016, Kassotis exposed pregnant female mice to drinking water from water sources near fracking sites in Colorado, and examined the results in the female pups. The results echoed those from an earlier study examining the chemicals' effects on male mice: reproductive hormones and hormones were significantly affected, to the point that it could cause problems in normal growth, heart defects and the ability to reproduce. ***Adverse Reproductive and Developmental Health Outcomes Following Prenatal Exposure to a Hydraulic Fracturing Chemical Mixture in Female C57Bl/6 Mice*** Christopher D. Kassotis et al, Endocrinology (2016)

Colorado School of Public Health researcher Lisa McKenzie examined the associations between the proximity of the homes of pregnant women to natural gas development in a study of over 100,000 births in rural Colorado. She found that the density of gas wells within a ten-mile radius of the women's homes was associated with the prevalence of children born with heart defects. Children of mothers in the most exposed areas – those with more than 125 wells per mile -- had a 30 percent greater prevalence of heart defects than children of mothers with no wells within a 10-mile radius of their residence. Based on the work of other researchers, she suggests that the results could be attributable to maternal exposure to benzene, PAHs, solvents and air pollutants such as NOx, SOx and PM. Benzene and toluene are emitted during the "well completion" phase, when gas and water flow to the surface. Ambient benzene levels in areas with active NGD in Northeast Colorado ranged from 0.03 to 6 parts per billion by volume (ppbv) (CDPHE 2012; Gilman et al. 2013; Pétron et al. 2012). Furthermore, 24-hr average ambient air benzene levels near active well development sites in western Colorado ranged from 0.03 to 22 ppbv (McKenzie et al. 2012). The OSHA standard for benzene is 1 part of benzene vapor per million parts of air (1 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 5 ppm for any 15-minute period.

[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10043](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10043)

***Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources*** by Lisa M. McKenzie (Colorado School of Public Health) et al. in Science of the Total Environment (2012).

In a study published in the Journal of the American Medical Association, Sara Rasmussen looked at the four phases of well activity – pad preparation, drilling, hydraulic fracturing and production -- and compared them with mild, moderate and severe asthma exacerbations among 35,000 patients in a Pennsylvania asthma clinic. She found increase in all three types of asthma in patients residing within the highest quartile of well activity.

***Association Between Unconventional Natural Gas Development in the Marcellus Shale and Asthma Exacerbations*** by Sara G Rasmussen in JAMA Internal Medicine (2016)

All of these researchers admit to limitations in their studies due to inadequate information regarding the fracking activity itself. There is no federal or state mandate for the oil and gas industry to provide the information that would help establish the true health risks, or lack of risk, from hydraulic fracturing activity. In fact, in a study released last week, researchers found wide variation in state requirements for reporting spills.

***Unconventional Oil and Gas Spills: Risks, Mitigation Priorities, and State Reporting Requirements*** by [Lauren A. Patterson](#) et al. in Environmental Science and Technology (2017)

EPA has limited directly-measured air emissions data on criteria and toxic air pollutants for several important oil and gas production processes. [These] limited data, coupled with poor quality and insufficient emission factors and incomplete NEI data, hamper EPA's ability to assess air quality impacts from selected oil and gas production activities.

***EPA Needs to Improve Air Emissions Data for the Oil and Natural Gas Production Sector***, by the EPA Office of the Inspector General (2013)

[https://www.epa.gov/sites/production/files/2015-09/documents/20130220-13-p-0161\\_glance.pdf](https://www.epa.gov/sites/production/files/2015-09/documents/20130220-13-p-0161_glance.pdf)

A more detailed list of the lack of information includes the following:

First, current protocols used for assessing compliance with ambient air standards do not adequately determine the intensity, frequency or durations of the actual human exposures to the mixtures of toxic materials released regularly at hydraulic fracturing sites. At sites where it appears that health effects are produced by hydraulic fracturing, toxic emissions are often not being measured or not detected at levels deemed dangerous. The concern is that this may be an artifact of the sampling methodologies and analyses currently being used today. Given that monitoring sites are so widespread, and local hourly impacts cannot be captured, these populated areas have significant public health pollution threats that the regulatory system does not respond to or understand.

Second, the typically used periodic 24-h average measures can underestimate actual exposures by an order of magnitude. When air emission levels are highly variable, the following typically collected measurements are not relevant to individual health impacts: periodic collection of 24-h samples, tons released per year, and hourly averages per day, per week, or per year. Instead, real-time measures of patterns of exposures are needed, and these must include peak levels, durations, and components of mixtures. The NAAQS compliance monitoring criteria do not provide sufficient information to assess human health risks from acute episodes of exposures.

Third, reference standards are set in a form that inaccurately determines health risk because they do not fully consider the potential synergistic combinations of toxic air emissions. Underlying current standards is the assumption that each toxic agent in air emission mixtures acts independently when it is inhaled or ingested into the body. The data show concurrent releases of multiple compounds. Several of these have known interactions in the body, for example VOCs and particulates. The interactions with inhalable particulates, found at 110 of the 214 sites, are of concern because the doses increase synergistically when PM combines with air toxins. Thus, the commonly used health impact is insufficient to evaluate the health impact of the mixtures because it uses average exposures and reference doses based on a single exposure to an agent.

Finally, air dispersion modeling shows that local weather conditions are strong determinates of individual exposures. Appropriate estimation of safety requires nested protocols that measure real time exposures.

Based on the analysis by David Brown published in the Review of Environmental Health, it is clear that the use of current standards is not appropriate for good pathophysiological evaluation, and consequently for good public health protection. The currently used methods of data collection also cannot provide the necessary data for determining an exposure's composition, intensity, duration, or frequency. In sum, the presence of peak emissions occurring near UNGD may lead to extreme exposures among people in close proximity to these sites. Furthermore these exposures can be exacerbated by local weather conditions and by the presence of particulate matter. Exposures are highly variable and can be difficult to monitor. Moreover, current monitoring efforts and health standards do not adequately track these events, though health reports from persons living near these sites are consistent with episodic exposure. The risk of developing chronic diseases due to exposures, especially by vulnerable populations, has yet to be determined. Revisions to health standards are necessary to protect public health in regions of UNGD. Toxicity values must be developed for shorter durations for residents in other than emergency situations. Research is also needed to evaluate the health effects of short, repeated, higher than background exposures.

***Understanding Exposure From Natural Gas Drilling Puts Current Air Standards To The Test*** by David Brown et al. (Southwest Pennsylvania Environmental Health Project) in Review of Environmental Health, 2014.

#### Climate Change Health Impacts

Methane gas is a powerful driver of climate change. In 2016, the U.S. Global Climate Change Research Program released an assessment of the health impacts of climate change on North Carolina. (Source: U.S. Global Climate Change Research Program, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*, April 2016.) This report listed the following impacts in North Carolina:

- Expect hottest days to be 4 to 5 degrees hotter. High heat days can be particularly deadly for kids playing sports outdoors, the elderly, and people with mental illness.
- Expect precipitation to increase by 5 percent, with the wettest days seeing increase of at least 10 percent more precipitation.
- Expect eastern NC to have 400 percent to 500 percent increase in the number of weeks with risks of very large wildfires. Smoke from these wildfires can impact people as far away as the Triangle.
- Changes in the climate can affect the levels of outdoor pollutants, such as particle pollution, pollen and ozone levels, and can pose additional problems for people who suffer from asthma or other respiratory illnesses, as well as from cardiovascular diseases, allergies, and mental illness.

Additional impacts include:

- More vector-borne illness: Durham has seen a 37-day increase in favorable conditions for mosquitos since 1980 (Source: Climate Central <http://www.climatecentral.org/news/more-mosquito-days-increasing-zika-risk-in-us-20553>)
- Increases in temperature coupled with increased drought can exacerbate social violence and even armed conflict. (Source: Carleton and Hsiang, Science, 2016. [https://dl.dropboxusercontent.com/u/3011470/Publications/CARLETON\\_HSIANG\\_SCIENCE\\_2016\\_W\\_SI.pdf](https://dl.dropboxusercontent.com/u/3011470/Publications/CARLETON_HSIANG_SCIENCE_2016_W_SI.pdf))
- Rising temperatures, increased air pollution and displacement from severe weather events such as fires and floods can exacerbate or precipitate mental illness. (Source: Berry, H.L., Bowen, K. & Kjellstrom, T. *Climate change and mental health: a causal pathways framework*. International Journal of Public Health. 2010 <http://link.springer.com/article/10.1007/s00038-009-0112-0>)
- People suffering from health disparities will suffer greater impacts from all these events.