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October 10, 2019

Governor Roy Cooper
North Carolina Office of the Governor
20301 Mail Service Center
Raleigh, NC 27699-0301

cc: Jeremy Tarr, Policy Advisor to Governor Cooper

Subject: Important Considerations for North Carolina's Clean Energy Plan

Dear Governor Cooper:

The DEQ and its partner agencies have done a commendable job leading a stakeholder process and translating EO80, issued by you last fall, into recommended plans and actions. The Clean Energy Plan provides a pathway to move North Carolina far along in its efforts to transition to a clean energy economy. Implementation of recommendations will be a significant challenge. However, even if everything laid out in the Plan is completed, North Carolina will still fall short in addressing climate change at the level needed, especially since it allows continued reliance on natural gas. What follows pertains to natural gas and methane and raises issues that will be critical to consider as you move forward to implement the plan.

The world's scientists, in the form of the Intergovernmental Panel on Climate Change (IPCC), tell us that we need to achieve net zero carbon dioxide emissions by 2050 in order to have a substantial chance of keeping warming to a safe level. I was a Coordinating Lead Author on the panel's Special Report that reached that conclusion.[i,ii]

However, this reduction will be much more difficult for developing nations, so advanced countries like the U.S., that have more economic and technological capacity and are responsible for a much greater contribution to historic and current emissions, need to take the lead to achieve net zero earlier, around 2040.

Unless carbon capture and sequestration technology quickly becomes very cheap (and current estimates put the cost at $2-4 trillion/year)[iii] and associated hurdles

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such as CO2 storage and pipeline siting are surmounted, there is no way new natural gas is compatible with the IPCC analysis.

As the state's chief supplier of electric power, Duke Energy, however, plans to build the equivalent of 30 large gas-burning power plants in North Carolina between now and 2034, the useful life of which would extend beyond 2050. In fact, Duke *increased* the amount of planned gas by 22% over the previous year in the latest planning update filed with the Utilities Commission on September 3.

While I was pleased to see that the Clean Energy Plan incorporates greenhouse gas reduction goals out to 2050, I am troubled that the Plan would not achieve the reductions that are necessary to avert the worst effects of climate change. Unless the Clean Energy Plan can envision a future without any new gas plants, it will not be a plan that protects North Carolina from the serious impacts of climate change as you intended when you issued EO80.

This is true even if we consider only the CO2 emissions from burning natural gas, since the IPCC's target of "net zero before 2050" does not allow for the addition of large new CO2 sources now.

Methane Venting & Leakage

And yet the effect of natural gas is even worse than that. It is composed mostly of methane, a greenhouse gas with a much stronger climate impact than carbon dioxide. Before being burned, some of the gas (methane) leaks and is intentionally vented during natural gas operations (drilling, storage, transport and distribution). Unfortunately, it is not possible to use natural gas without emitting methane. And if enough methane is released (as little as 1-3 percent in fracking, processing and transporting it), natural gas can be worse (potentially much worse) for the climate than coal.

Given that natural gas CO2 emissions *alone* make gas incompatible with the IPCC target, we should not need to quantify methane leakage, yet knowing the leak rate allows us to give a much more complete analysis of the real societal footprint of gas usage. My research in this area leads to the following conclusions:

- Methane has been the largest contributor to the worldwide failure to keep on an emissions trajectory consistent with a 2°C global warming target, causing 90% of the departure from such a trajectory that we have seen since 2000.[iv] A recent paper by Robert Howarth finds that the US fracking boom is likely an important contributor to the recent surge in atmospheric methane.[v]

- Methane is a precursor to ozone, which causes air quality issues and harms human health. When you take these costs into account (using a 3% discount rate), methane does $3,700/ton in damages compared to CO2's ~$70/ton, giving methane 50 times the societal impact of CO2. These numbers are in the process of being refined and are certain to go up as additional evidence comes in about the damaging health effects of ozone exposure. Our most recent analyses indicate that the roughly 330 million tons of methane emitted due to human activities every year (worldwide) lead to ~165,000 premature deaths around the world, including 10,000 in the US and several hundred in North Carolina.[vi]

- I calculate that, accounting for both CO2 emitted directly and upstream methane, the societal damages due to climate change and air pollution raise the true cost of electricity generated using gas from the market cost of 4.5 cents per kWh (according to the US Dept. of Energy for 2018) to 12.2 cents per kWh.[vii] That makes it more than double the cost of solar or onshore wind, based again on US DoE statistics.

I am pleased that North Carolina has begun to incorporate some of these costs in analyses, and in particular that the Clean Energy Plan calls on the regulators and utilities to consider the social cost of carbon, including health impacts, when calculating the relative costs of different energy resources.[viii]

The recommendations in the Clean Energy Plan are based on modeling that includes only emissions from combustion, in other words from the power plant itself. But the bulk of methane emissions from natural gas occur before the fuel reaches the power plant. I recognize that it is not straightforward to account for upstream methane in a way that is consistent with analyses of other power sources, which should then also include emissions along the supply chain that may be outside of North Carolina, and in a way that avoids double-counting with other states. However, upstream methane emissions are significant and dangerous, even if North Carolina can't neatly account

for them, and North Carolina is responsible for the emissions because it is creating the market for the gas. This should be acknowledged in implementing the Clean Energy Plan.

Economic trends alone may be enough to reverse Duke's plans for new gas in North Carolina. With the levelized cost of natural gas now running around 4-4.5 cents/kWh,[ix] the City of Los Angeles just signed a solar power purchase agreement at 1.997 cents/kWh for a facility that will also include battery storage (with electricity from the batteries priced at only 1.3 cents/kWh) and is expected to supply ~7% of the city's needs.[x] Other projects have similarly low prices for renewable energy. Recent analysis indicates that, due to a rapid decline in the cost of renewables, the cost of clean energy generation is likely to be lower than the cost of new gas plants for 90% of the proposed construction in the U.S. by the date those plants are expected to be placed into service.[xi] The same analysis shows that more than 90% of proposed new gas-fired power plants are likely to be uncompetitive by 2035. This implies that, if Duke Energy does succeed in building new gas plants, these plants are very likely to end up as stranded assets, exacerbating the already thorny problem of unrecovered debt that is preventing the utility from closing coal plants. Many other recent publications have illustrated the extreme financial and climate risks associated with new natural gas.[xii]

Recommendations

With the climate urgency we are facing, I believe that North Carolina needs a Clean Energy Plan that does more than simply trust that market forces will provide the outcome that we really need.

The Clean Energy Plan implementation process should take into account that:

- In order to meet the IPCC's 2030 and 2050 targets, ongoing economic trends and research on the impacts of methane strongly suggest that new gas plants may present an unnecessary risk to the climate and to the health of North Carolinians; and

- Regulatory impact assessments of future policies should account for methane impacts, including its social costs, life-cycle emissions of gas and other power sources, and the rapid changes in levelized cost of energy that increasingly

favor renewables plus storage over gas, and are very likely to continue to shift in that direction.

Integrated resource plans like the ones Duke Energy has put forth, dependent as they are on a buildout of power plants fueled by fracked methane gas brought to North Carolina by the proposed Atlantic Coast Pipeline and existing Transco pipeline, are inconsistent with meeting IPCC targets. In addition to causing possibly irreparable climate damage, such infrastructure is likely to saddle consumers with much greater costs than would a more rapid transition to 100% renewable energy, while also causing additional harm to already vulnerable communities.

Therefore I believe strongly that the Clean Energy Plan implementation should include:

- A permanent moratorium on new gas infrastructure in the state and

- A requirement that the investor-owned utilities account for the social cost of emissions, including in-state and upstream methane, in their Integrated Resource Plans, so that decision makers have a more accurate picture of the costs and impacts of natural gas as compared to other power generation sources.

Thank you again for your leadership on clean energy in North Carolina and the hard work that Secretary Regan, Sushma Masemore and the entire DEQ team have put forth to develop this important plan. Please let me know how I can be of assistance to you as you implement the plan and give North Carolina an energy future that truly rises to the challenges of the crisis in which we find ourselves.

Sincerely,

Drew Shindell, Distinguished Professor of Earth Sciences, Duke University

in collaboration with
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