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Statement of  
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and

**Member of the New York Climate Action Council**

by appointment of the Honorable Carl Heastie, Speaker of the Assembly

December 19, 2022

I fully support the Scoping Plan enacted today by the Climate Action Council, and I am honored and proud to have served on the Climate Action Council since its inception. I thank Speaker Carl Heastie and other members of the Assembly for this opportunity to have served. In my comments that follow, I speak as a member of the Council and as an Earth systems scientist and faculty member at Cornell University who has worked for over 40 years on issues of global change. My comments should not be construed as official positions taken by my employer, Cornell University.

Assembly Person Steven Englebright was hugely instrumental in the passage of the Climate Leadership & Community Protection Act that established the Climate Action Council. I thank him for his leadership on this, and particularly for his support of the progressive approach on greenhouse gas emissions that is a central part of the CLCPA. I originally proposed this to Assembly Person Englebright in 2016, and he enthusiastically endorsed and supported it through multiple versions of the bill that finally led to passage of the CLCPA in 2019. In this accounting for greenhouse gases, a major government for the first time ever fully endorsed the science demonstrating that methane emissions are a major contributor to global climate change and disruption. Further, in passing the CLCPA New York recognized that consumption of fossil fuels (and not simply geographic boundaries) is what matters in addressing the climate crisis. New York wisely banned the use of high-volume hydraulic fracturing (“fracking”) to develop shale gas in our State. But since the time of that ban, the use of fossil natural gas has risen faster in our State than any other in the Union. Methane emissions from this use of shale gas are high, but much of that occurs outside of our boundaries in the nearby states of Pennsylvania, West Virginia, and Ohio. Through the CLCPA, the citizens of New York are taking responsibility for these out-of-state emission caused by our use of fossil fuels, particularly for fossil natural gas. The way to reduce these emissions is to rapidly reduce our use of fracked shale gas.

The Assembly and Senate specified in the CLCPA that many of the agency heads of New York’s government be members of the Climate Actions Council, and also stated that the Council take input from a set of advisory panels. Both of these requirements led to the leadership of the State being heavily engaged and invested in the implementation of the CLCPA. And the panels brought in a large number of experts and key stakeholders who worked diligently to advise the Council on our Scoping Plan. The Plan benefitted immensely from their efforts and input, and all New Yorkers owe them our thanks.

In the well over one hundred meetings of the Council, advisory panels, and working groups since March of 2020, all viewpoints have been respectfully heard and debated. The tone set by our co-Chairs,

NYSERDA President Doreen Harris and DEC Commissioner Basil Seggos was a critical part of this. I thank them and all of the members of the Council for our sense of community through deliberations in which we often had major differences of opinion. I also thank the staff who contributed so much to the background information provided to the Council and to the drafting of our final report. A large number of individuals participated and contributed in major ways, but I want to particularly thank and acknowledge our Council Executive Director Sarah Osgood, Maureen Leddy and Jared Snyder from DEC, Carl Mas from NYSERDA, and Jessica Waldorf of DPS.

I further wish to acknowledge the incredible role that Prof. Mark Jacobson of Stanford has played in moving the entire world towards a carbon-free future, including New York State. A decade ago, Jacobson, I and others laid out a specific plan for New York (Jacobson et al. 2013). In that peer-reviewed analysis, we demonstrated that our State could rapidly move away from fossil fuels and instead be fueled completely by the power of the wind, the sun, and hydro. We further demonstrated that it could be done completely with technologies available at that time (a decade ago), that it could be cost effective, that it would be hugely beneficial for public health and energy security, and that it would stimulate a large increase in well-paying jobs. I have seen nothing in the past decade that would dissuade me from pushing for the same path forward. The economic arguments have only grown stronger, the climate crisis more severe. The fundamental arguments remain the same.

Our final Scoping Plan from the Climate Action implicitly endorses the vision of the Jacobson et al. paper and is quite clear: we can meet the goals of the CLCPA and we can and will do so in way that is affordable and that will benefit all New Yorkers. Our State will be stronger as this plan is implemented, the health and well being of our citizens improved. Economic uncertainties and vulnerabilities will be reduced. Energy security will be enhanced. Our plan is also clear that the #1 priorities are to continue to move towards wind, solar, and hydro as our source of electricity; to move rapidly towards beneficial electrification as a source of heating and cooling in our homes and commercial buildings; and to move rapidly towards beneficial electrification in our personal and commercial vehicles.

Although I strongly support our final Scoping Plan, I have some disappointments. Chief among these is the decision to postpone the dates by which the State will move away from fossil fuel use for construction of new homes and commercial buildings, which are now one year later than in our draft plan passed in December 2021. For single family homes, for example, our final Scoping Plan calls for the prohibition of fossil fuels in new construction in 2025, not the 2024 specified in the draft plan. The building sector is the largest single source of greenhouse gas emissions, as I discuss further in the next paragraph below. Therefore, the greatest priority for meeting the goals of the CLCPA should be to reduce emissions from the building sector. I urge the Assembly and Senate to act to mandate that the State move away from fossil fuels more quickly than called for in the Council's Scoping Plan., using the guidance from the December 2021 draft Scoping Plan.

Exactly how important are emissions from the building sector in New York State? The Scoping Plan states this sector is the single largest emitter, accounting for 32% of the total (closely trailed by transportation at 28%). However, I believe the Plan understates the importance of the building-sector emissions for two reasons. First, methane emissions from the operations of the fossil natural gas industry in New York are included as part of the "industry" sector in the Scoping Plan, whereas they should have been included in the building and electric sectors according to the accounting specified in the CLCPA (these emissions would not occur if the fossil natural gas were not being used in our buildings and electric power plants). Making this correction, the building sector is seen to contribute 36% of all emissions, followed by 28% for transportation, 14% for electricity, 12% for waste, 6% for agriculture, and only 4% for industry. Second, the greenhouse gas inventory for the State released by the DEC in December 2021 understates methane emissions from the use of fossil natural gas, in my professional

opinion, using an emission factor of 2.49% of gas production. The preponderance of peer-reviewed literature reviewed in my recent paper suggests the factor should be 4.8% (Howarth 2022), a value that is 1.9-times greater than that used by the DEC. Correcting by this factor, I estimate that the building sector is responsible for more than 40% of all greenhouse gas emissions in New York State.

The Scoping Plan strongly calls for beneficial electrification with heat pumps as the best way forward to reduce greenhouse gas emissions from the building sector in New York. I completely agree, but I feel the Plan could have made an even stronger case by including several recent papers and reports. Further, the Plan tends to favor air-sourced heat pumps over ground-sources heat pumps. While the initial cost of the air-sourced pumps is less, they have higher energy and maintenance costs. One recent study examining heat pumps for new home construction in the context of New York State concluded that ground-sourced heat pumps are actually less expensive when these energy and maintenance costs are included (Shron et al. 2022). This was true across the State, in both the coldest and warmest regions. The study also concluded that both air-sourced and ground-sourced heat pumps are almost always less expensive than building new homes heated by fossil natural gas or propane, although air-sourced heat pumps cannot quite out compete fossil natural gas (at average prices over the past decade) in the warmest part of the State, Long Island, according to this report. However, the Long Island Power Authority (2022) has produced a brochure arguing that air-sourced pumps are cost effective for new homes over fossil natural gas on Long Island. And of course the cost of fossil natural gas has increased dramatically since these studies were produced, and may well stay high indefinitely into the future according to many energy economists. If so, anyone building a new home in 2023 or 2024 using natural gas for heating will soon wish they had instead built a fossil-fuel-free home with heat pumps. Further, these costs are from the perspective of the new home owner. I have repeatedly urged in meetings of the Climate Action Council over the past 18 months that we consider the entire energy system when considering the question of heat pumps: ground-sourced heat pumps require far less electricity during peak winter heating times, meaning that encouraging their use over air-sourced pumps lessens the need for electricity storage and for total renewable generating capacity, which could benefit consumers immensely.

As a Council, we spent a disproportionate amount of time in debating what I believe are side issues such as renewable natural gas (RNG) and hydrogen for heating of homes. The oil & gas industry globally has pushed such ideas very heavily as a way to keep their massive fossil-gas pipelines system profitably in operation (Lowe and Cebon 2022). At the Climate Action Council, we have regularly heard suggestions that pipelines in the future can deliver hydrogen and RNG. I and others on the Council have pushed back with objective, scientifically based evidence. In the end, the Council fully rejected the use of hydrogen for heating homes, and somewhat put aside the issue of RNG saying it needed further study. I am pleased to say that RNG is not mentioned at all in the Executive Summary of the Scoping Plan, and hydrogen is mentioned only once, in this case appropriately in the context of its use with fuel cells (not combustion) in transportation (not home heating or use in pipelines).

While the Scoping Plan does not endorse the use of hydrogen for heating or in pipelines, it also does not fully explain the reasons for this decision. And in some places in the text, there is a suggestion for more research on hydrogen. In fact, there is a large amount of information that clearly demonstrates why hydrogen for delivery to homes for heating is a bad idea (Kurmayer 2021; Rosenow 2022; Pearl 2022; Prieto and Henchen 2022; Collins 2022; Lowe and Cebon 2022). There simply is no need for further research on this bad idea. Some of the major reasons for rejecting the use of hydrogen for heating for homes are outlined in the following table.

### Concerns with Blending Hydrogen into Gas Pipelines that Serve Homes & Apartments

- Hydrogen is very leaky, much more so than methane, and hydrogen leakage from pipelines will contribute to global warming.
- Only small quantities of hydrogen can be blended with fossil gas in distribution pipelines, since hydrogen makes pipelines more brittle, potentially increasing methane emissions and leading to greater catastrophic risk.
- Most existing gas appliances in homes and apartments (furnaces, cooking stoves, water heaters, dryers) are not designed to burn hydrogen-methane blends, and increasing the hydrogen content can decrease the efficiency of combustion and lead to increased air pollution, particularly of nitrogen oxides.
- Most engineering studies indicate greatly increased risk of mixing more than 20% hydrogen into fossil gas systems, and the California Air Resources Board has concluded that no more than 5% hydrogen should be blended until further study shows higher amounts are sufficiently safe.
- The energy density of hydrogen is far less than for methane, so blending 20% hydrogen into a fossil-fuel distribution pipeline reduces the combustion emissions of carbon dioxide by only 7%.
- Hydrogen is significantly more expensive than fossil gas, and so blending any hydrogen into the distribution system increases costs.
- Using renewable electricity to produce green hydrogen which is then used to heat homes and apartments diverts this electricity from more efficient uses, such as using heat pumps. For the same quantity of electricity, a heat pump can deliver 6 to 10 times more heat in a home than could burning green hydrogen.
- Inefficient uses of renewable electricity drive up costs and slow the transition from fossil fuels, since renewable electricity will remain a relatively scarce and precious commodity for the next few decades.

As with hydrogen, the Scoping Plan does not endorse any widespread use of RNG. In fact, the Plan specifies that it is generally preferable to use biogas (the unrefined mixture of methane and carbon dioxide produced in anaerobic digesters and landfills) directly and at the site of production rather than refining the biogas to produce RNG. However, the Plan does not fully explain the strong science behind this conclusion. Briefly, it takes energy to refine RNG, and this comes either from fossil natural gas with the associated greenhouse gas emissions or from using some of the biogas to power the refining (resulting in a loss of some useful energy, and a lower overall efficiency of using the energy of the biogas). Further, biogas itself can have substantial methane emissions, and the refining of biogas into RNG can substantially increase these methane emissions (Bakkaloglu et al. 2022). In a memorandum I wrote to the Alternative Fuels Working Group of the Climate Action Council in July 2022, I calculated that using the CLCPA accounting methodology and mean emissions from the Bakkaloglu et al. study, methane emissions for RNG are 156 g CO<sub>2</sub>-equivalents/MJ, or 1.7-times greater than the combined methane and carbon dioxide emissions for fossil natural gas. Unless these methane emissions can be greatly reduced, New York should clearly discourage the use of RNG.

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