I believe the *New York State Climate Action Council Draft Scoping Plan,* dated December 30, 2021, misses a major opportunity to utilize green energy and existing infrastructure, and ignores a number of practical shortcomings as well as public health implications in relation to the Plan's proposals for buildings.

The plan appears to completely miss the potential use of green hydrogen for buildings. The existing natural gas piping could be utilized to deliver a hydrogen blend. The U.S. Department of Energy Office of Scientific and Technical Information has reported that concentrations of hydrogen, 5%–15% by volume, appear to be feasible with very few modifications to existing pipeline systems or end-use appliances. (Report available at https://www.osti.gov/biblio/1068610 ).

Longer term, dedicated hydrogen infrastructure could provide clean and reliable delivery to buildings. Large scale production of green hydrogen infrastructure is already becoming a reality, with the U.S. Department of Energy providing funding for what could be the world's largest industrial green hydrogen production and storage facility. (See www.solarpowerworldonline.com/2022/04/doe-close-to-loaning-worlds-largest-green-hydrogen-plant/ )

One practical shortcoming of the plan is that is not addressed is the need to improve the reliability of the electrical grid. Ironically, the Plan notes on page 125 that extreme weather events are becoming more common and mentions power outages in relation to severe weather, but then implies that all responsibility for dealing with power failures will be on the building owners. Older neighborhoods, which often have people of low to modest incomes, tend to have less reliable electricity delivery, and more frequent power failures. Homeowners in these neighborhoods are unlikely to be able to afford elaborate backup systems or other extensive refits to their homes.

Therefore, if total electrification is to proceed, the Action Plan needs to address how New York will improve the electrical transmission system, including the "last mile" connection, especially in older neighborhoods. Reliability of electrical delivery will be extremely important with all-electric heat. If power outages are of significant length and temperatures are below freezing, water pipes in homes will eventually burst. As an example, the City of Buffalo averages 49 days a year when the temperature never rises above 32 °F and about 18 nights a year below 10 degrees (F). (See https://www.currentresults.com/Weather/New-York/Places/buffalo-temperatures-by-month-average.php for additional information.) Also of note, the lack of heat has health implications (e.g. frostbite, hypothermia) and can lead to fatalities.

The Action Plan does acknowledge that with colder climates Ground Source Heat Pump Systems (GSHPs) may have some issues providing adequate heat, and notes on page 120 that supplementary heating may be necessary: "(wood, home heating oil, propane, or gas) for peak cold conditions". However, the Action Plan proposes to entirely do away with non-electric heating. Ironically, the Plan itself acknowledges that there are problems with this approach. In general, the Plan treats the State like it is one uniform entity, much to the detriment of homeowners and other building owners in the colder parts of the State.

There are other issues with GSHPs that do not seem to be acknowledge by the Plan. Heat pumps in urban areas will need to utilize vertical shafts (as opposed to horizontal piping), as not much land is available to urban property owners. In older neighborhoods, such as those found in the City of Buffalo or in its first-ring suburbs, houses sit on lots that are not much larger than the home itself, so it is likely that vertical boreholes will be infeasible, as multiple holes are needed and they need to be spaced ten to fifteen feet apart. Additionally, as significant parts of Western New York were once under glaciers, there are numerous areas where the bedrock is near the surface. Clay and sandy soils, common in the area, may also cause issues, as these soils can shift and damage piping.

On page 129, the Plan proposes that in 2030, the State should adopt zero emission standards that prohibit gas/oil replacements (at end of useful life) of heating and cooling and hot water equipment for single-family

homes. The plan does not seem to consider the financial impact this will have on households other than Low-to-Moderate Income (LMI) households. In addition to LMIs, the increased costs, both for up-front replacement costs and on utility bills, will impact middle class homeowners, especially those on fixed incomes, e.g., retirees.

The plan can be improved. Converting the existing natural fuel gas line network to a blend of hydrogen and natural gas should be included in the plan, as well as investing in pipeline infrastructure to convert completely to hydrogen. The Plan should include the use of hybrid heating home systems (systems using both natural gas and electricity) rather than electric-only systems.

Lastly, if New York State is determined to ignore the shortcomings of going all electric, then rather than mandating mandatory replacements, incentives should be given to encourage voluntary changeovers from fossil fuels to electric heat - or at the very least, homeowners should be financially aided when being forced to replace gas/oil systems (at end of useful life) for heating, cooling and hot water equipment with electric systems.

Sincerely,

Christopher Kunsch