



Subject: HB23-1252, “Concerning the implementation of measures to advance thermal energy service”

Date: May 1st, 2023

Dear Representatives Lieder and Kipp, and Senator Exum and the Senate Transportation and Energy Committee:

We at the Colorado Renewable Energy Society (CRES) would like to begin by thanking you for sponsoring this bill. My colleagues on the CRES Policy Committee have requested that I write this letter, since I’ve studied energy my entire career at the National Renewable Energy Laboratory (NREL) in Golden, Colorado. The major thrust of the bill appears to represent a worthwhile effort to provide new, clean energy jobs for pipe fitters and others in the natural gas industry by providing financial incentives for ground-coupled (also called “geothermal” or “geo-exchange”) heat pump systems. This is in line with efforts to reduce greenhouse gas and air pollution emissions by transitioning buildings from natural gas to electric heating. Compared to lower-cost air-source heat pumps, ground-coupled heat pumps can save electricity and reduce peak utility electric loads in the winter. In general, because of high installation costs associated with wells and trenching, ground-coupled heat pumps make more economic sense in **new** construction as compared to retrofits, so we don’t know if the incentives will be large enough to promote the latter, but time will tell.

There are several items in the bill that we have concerns and questions about as follows:

- On pages 5 and 6, it refers to “geothermal electricity generation with electrolyzers for the production of hydrogen from geothermal generation.” Economic generation of electricity from geothermal resources typically requires near-surface geothermal water or steam reservoirs at temperatures greater than about 250 degrees Fahrenheit. Colorado does not have such intense natural thermal resources. Although creating deep reservoirs via fracking (called Hot Dry Rock decades ago, but now called enhanced geothermal systems, or EGS) has been explored for many years – and is receiving new federal funding – this resource development method faces significant technical and economic hurdles.

Also, while there are some near-term uses for electrolytic hydrogen (e.g., to replace natural gas-generated hydrogen used in the production of ammonia for fertilizers), in general, it is much more efficient and economical to use electricity directly than to produce so-called green hydrogen. This is especially the case when such direct-use

electricity can be used to power high-COP heat pumps. So, we are wondering why both geothermal electricity and hydrogen production – technologies quite beside the point of your legislative intent – appear in a bill that seems focused on ground-coupled heat pump systems.

- On pg. 6, the bill refers to “the utilization of direct air capture technology.” This technology uses large fans to move large quantities of air across sorbents, which attract carbon dioxide from the air and then must be heated to release the CO₂ for geologic sequestration. As pointed out previously, the prospects for geothermal electricity production in Colorado are poor, especially when we have excellent low-cost solar and wind resources. Can we assume that this bill proposes using ground-coupled heat pumps or low-temperature hot water geothermal resources in Colorado to provide the thermal energy necessary to regenerate the sorbent? While it makes sense to use waste heat or heat from renewable sources to regenerate the sorbent, we believe there are much better uses of the electricity or the thermal energy. Furthermore, the thermal energy from Colorado’s hydrothermal resources is small compared to what would be needed for direct air capture. Furthermore, because CO₂ is a trace gas in the atmosphere (comprising only about four-hundredths of one percent (0.04%) of the air), direct air capture is prohibitively expensive. It’s important to focus instead on not emitting CO₂ in the first place. At some point if we need to remove CO₂ from the air, there are probably lower-cost ways than direct air capture to do that.

In summary, we support the major thrust of the bill to incentivize the natural gas industry to apply its underground piping expertise to ground-coupled heat pump systems, although we believe the incentives will likely have a greater impact on new projects as opposed to retrofits. However, we believe the mentions of geothermal electricity production, electrolytic production of hydrogen, and geothermal energy support of direct air capture are distractions from the main topic and are not likely to ever provide any practical environmental or economic benefits.

We offer these comments as technical advisors, and hope we are not offending the sponsors or members of pertinent Committees. At CRES, we obviously value our legislative colleagues’ attempts to move us away from our legacy dependence on fossil fuels. We are available anytime for conversations to optimize the effectiveness of those attempts.

Sincerely,

Dr. Charles (Chuck) Kutscher

For the Colorado Renewable Energy Society Policy Committee