STAFF REPORT

This report was produced by staff from the Town Manager's Office, with contributions from the Town Attorney's Office

June 3, 2022

This staff report includes the following elements:

- Options to Explore
- Chapel Hill Context
- Additional Details

Options to Explore

In response to the petition and based on the information provided within this staff report, we have developed the italicized list of tentative options below for the Council to consider. If it is of interest, we can explore these further and provide additional information about the remaining questions posed for each, including any areas of research the Council may have. For this section, "heating purposes" matches the petition and refers to the use of energy for cooking, space heating, water heating, and other process heating.

Tentative Options and Questions Staff Can Explore:

1. *Require that all Town-owned new construction or significant building renovations (those where the combustion heating equipment is being replaced) use electricity and/or another clean, renewable energy source for heating purposes.*

    Questions:

    - Can we estimate as a percentage what the approximate greenhouse gas emissions reduction benefit would be for a new or typical municipal building?
    - Can we estimate as a percentage what the total cost of ownership for all-electric heating equipment would be compared to combustion heating equipment in a new or renovated Town building?
    - What impacts, if any, would this policy have on Town operations within new or existing Town buildings? For example, would this require an adjustment to our temperature set points and programming?

2. *As part of an update to the Council's Green Building Policy Framework, encourage and/or incentivize new construction or major renovations (those where the combustion heating equipment is being replaced) to use electricity and/or another clean, renewable source for heating purposes.*

    Questions:

    - What is the latest on how our electric utilities are preparing for the increase in electricity demand from heating and vehicles over time, and what changes can

ratepayers anticipate?

- For a typical household and based on ratepayer projections under the draft Duke Energy Carbon Plan, how do the annual utility costs of combustion heating compare to electric heating?

- Are there instances where an upgrade to electric space heating should be done in conjunction with other measures like weatherization and/or rooftop solar?

- What reason, if any, would a developer or builder have for not installing all-electric heating equipment?

- As part of the Council's Green Building Policy Framework update, is an incentive needed for all-electric heating in new construction and, if so, what would work best?

  Note: Through the development review process, we are now seeing mostly all-electric or electric-ready building designs for new construction. This supports our Climate Action and Response Plan goals listed in the cover memo.

3. *Require that to the greatest extent possible and practical, the Town shall establish new leases for buildings that use electricity and/or another clean, renewable energy source for heating purposes.*

   Question:

   - What are some leasing scenarios where it could be challenging for the Town to meet such a requirement and why?

Chapel Hill Context

Based on our most recent community-wide greenhouse gas emissions inventory, nearly 70% of Chapel Hill's emissions come from the energy we use in our buildings. Approximately 10% of this energy comes from natural gas, meaning that efforts to switch space heating, water heating, and cooking fuels from natural gas (or other fossil fuels) to electricity can play an important role in reducing the Town's overall emissions that contribute to climate change. We've identified building electrification as a key action category within the Town's Climate Action and Response Plan.[1]

Building electrification can come in a variety of forms. For new construction, this is about designing buildings that are only powered by electricity from the grid and/or on-site renewable energy like solar. For existing buildings that use natural gas or other fossil fuels for heating and cooking, this is known as "fuel switching" or converting HVAC equipment, stoves, and water heating appliances to all-electric options. Other fossil fuels used for heating commonly include wood, oil, kerosene, and propane.

[1] https://online.flippingbook.com/view/857144275/

Additional Details

What are some of the benefits of electrification?

We benefit from having buildings and vehicles that are exclusively powered by electricity because as the grid gets cleaner, so will the things that use electricity. Even over the last 15-20 years, utility companies have lowered the emissions from the grid by increasing the amount of energy that comes from non-fossil fuel sources like nuclear and renewables (solar, wind, hydro). Two of the main utilities in our region, Duke Energy and Dominion Energy, have both set goals of being carbon neutral by no later than 2050. As a result, the more all-electric buildings and vehicles we have in Chapel Hill, the easier it should be to meet our community-wide climate goals over time.

Additionally, while burning natural gas is cleaner than many traditional fossil fuels, its use can have both climate and public health impacts. According to the Environmental Protection Agency (EPA), 1 ton of methane has warming impacts to the earth that are 27-30 times more than 1 ton of carbon dioxide.[2] So, while utility companies are working to improve their ability to detect and manage the methane leaks associated with natural gas production and distribution, these events can and do have significant impacts on climate change. Researchers at Stanford University report that the methane emissions impacts from gas stoves (specifically unburned methane) are substantially more than what is reported by the EPA when comparing it to the combined methane emissions impacts of all residential appliances. In addition to climate impacts, the researchers also report that cooking with gas can expose people to harmful emissions which can "trigger asthma, coughing, wheezing and difficulty breathing."[3]

What is the Town's legal authority to regulate natural gas?

A municipality's authority to regulate or restrict options for energy sources on non-Town-owned property, including natural gas, is uncertain at best. Without clear legislative authority to regulate the use of natural gas, local government action is vulnerable to challenge from stakeholders and could lead to further explicit restrictions of local government authority at the state-wide level.

What's "green hydrogen" and how is it connected to natural gas? [4]

Some industry experts see green hydrogen as a clean, renewable energy source that could eventually replace natural gas and other fossil fuels to compete within the residential, commercial, industrial, and transportation sectors. As part of the 2021 bipartisan infrastructure legislation, the federal government is investing more than $8 Billion into new "hydrogen hubs" that will be sited regionally throughout the country. Unlike gray hydrogen (derived from natural gas) or blue hydrogen (gray + carbon storage), green hydrogen is created by using electricity – ideally renewables – to split a water molecule using a process called electrolysis. The byproduct of burning green hydrogen is water and some predict that this form of hydrogen will be more cost competitive than blue hydrogen by 2030.[5]

While green hydrogen appears to be a promising, climate-friendly alternative, it is unclear when and to what degree it will become an established market in the United States. Currently, utilities here and

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[2] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials#:~:text=Methane%20(CH4)%20is%20estimated,uses%20a%20different%20value.).

[3] https://earth.stanford.edu/news/climate-and-health-impacts-natural-gas-stoves#gs.0xg8ll

[4] Unless otherwise referenced, the information provided in this section comes from industry experts who presented at the UNC Clean Tech Summit and the North Carolina State Energy Conference in April of 2022.

[5] https://rmi.org/clean-hydrogen-hub-offers-major-opportunity/?utm_medium=email&utm_source=spark&utm_content=spark&utm_campaign=2022_05_19&utm_term=button

abroad are testing blends of up to 20% green hydrogen within natural gas infrastructure. While these studies show promise, there are also key physical differences between green hydrogen and natural gas that raise important questions about: (1) whether existing natural gas infrastructure can be used; and (2) if it's better to focus on applications like power plants and large transportation vehicles and ships, where battery technology is currently limited. There are also some important questions about where the water would be sourced to generate green hydrogen, and some industry experts have talked about ocean water as an important area of study. In summary, while green hydrogen is likely to be a key strategy for lowering global emissions, it is not yet clear if or when it will be a viable substitute for heating purposes within residential and commercial buildings.

What are some of the challenges and emerging solutions with electrification?

In the United States, about half of all homes use natural gas for space and water heating and this represents about 15% of all natural gas consumption in this country.[6] One climate action strategy for reducing emissions in homes and multifamily buildings is to convert a natural gas furnace (or another combustion appliance) to an all-electric air source heat pump. There have been questions about the ability of all-electric heat pumps to keep indoor spaces warm enough when the temperature drops below 30-40 degrees Fahrenheit. Advances in heat pump technology within the last decade have made this equipment a more efficient[7] and effective heating (and cooling) option in colder climates, to the point where northern states like Minnesota and Maine now offer rebate incentive programs[8] and Brooklyn-based companies like BlocPower[9] have emerged in response to the climate crisis. An analysis by the Rocky Mountain Institute estimates that making the switch from combustion heating to an all-electric heat pump will reduce carbon emissions in North Carolina and all but two of the other 48 continental United States.[10] This is because electricity from the grid is now generally clean enough to where fuel switching can have both an immediate and long-term impact on emissions reduction.

While new heat pump technology has helped to address some of the concerns about all-electric space heating, it's also important to note that for some this kind of heating doesn't respond to their personal preferences as well as combustion heating. Electrification of combustion appliances also includes equipment like water heaters and stoves, where there are a range of product options, prices, and personal preferences. Regardless of the appliance type, there are a variety of factors[11] that contribute to whether or not an all-electric option would be cost-competitive or otherwise work well for a particular home or building.

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[6] https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php#:~:text=About%20half%20of%20the%20homes,residential%20sector's%20total%20energy%20consumption.

[7] https://www.energy.gov/energysaver/air-source-heat-pumps

[8] https://www.efficiencymaine.com/about-heat-pumps/

[9] https://www.blocpower.io/

[10] https://rmi.org/its-time-to-incentivize-residential-heat-pumps/

[11] https://remdb.nrel.gov/measures.php?gId=2&ctId=312&scId=4914&acId=4928