Significant Loss of Habitability of United States Residences is Inevitable and Unavoidable in 10 to 30 Years Due to Unmitigated Natural Gas Reliance

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Abstract

On the assumption that the production of natural gas for electricity generation and direct household use must end, we perform simple calculations to discover the rate at which natural gas dependent residences must be converted away from natural gas dependence. We consider several schedules for phasing out natural gas, ranging from 10 to 30 years. Under none of these schedules is successful conversion plausible, and we conclude that many homes will lose significant elements of basic habitability. We then note how uncertainties in the economics of natural gas are likely to break unfavorably, worsening the problem. We conclude by suggesting ways our society might adapt to this foreseeable and unavoidable catastrophe.

The Residential Future of Natural Gas

The production of natural gas and its consumption for electricity generation and direct residential use must end to avoid unimaginably destructive levels of global warming.[1]

This transformation of infrastructure requires, among other things, that residences which are directly dependent on natural gas for cooking, hot water, and/or heat must be either abandoned or modified to eliminate the natural gas dependence. Some conversions are fairly trivial, though not inexpensive: replacing some appliances using existing wiring. Some conversions are both labor and money intensive such as replacing natural gas heating systems and rewiring the electricity supply to kitchens.

At what rate must these conversions take place on a national level?

[1] *Special Report on Global Warming of 1.5°C*, Intergovernmental Panel on Climate change, October 2018

Methodology and Results

Because our methodology is very simple, we present it alongside our results directly.

We assume a *natural gas retirement schedule* that could be as few as 10 years, and as many as 30, from January 1, 2020. That is, we envision the supply of natural gas being terminated between 2030 and 2050.[2]

Our analysis concerns "conversions needed per day". For this purpose, we assume a 300 day work year: 50 weeks work per year, 6 days per week.

According to the U.S. Energy Information Administration[3], there are approximately 70 million (70,000,000) residential natural gas customers in the United States. By simple division, the daily rate of conversions needed can be calculated:

natural gas termination date	conversions per day day from Jan. 1, 2020
2050	7,778
2045	9,333
2040	11,667
2035	15,556
2030	23,333

To put this in perspective, in 2019, the number of U.S. housing starts per day, assuming a 300 day work year, was only 4,300.

Worse, at present, the number of natural gas dependent residences in the United States continues to *rise*, consistent with a long-term trend.

We conclude that there is no realistic chance of completing conversions in time to successfully mitigate greenhouse gas emissions. Assuming that we do not continue to emit, destroying the habitability of our ecosystem on a massive scale, much of our housing stock will lose habitability, inevitably, and foreseeably, in the next 10 to 30 years.

The Problem is Likely Worse Than our Simple Model Shows

Our methodology assumes that housing could be converted at a steady pace. For example, in the 2050 schedule, at the start of 2049, there would remain a

[2] Our understanding is that the shorter schedules are more consistent with the urgency of the climate emergency, but the 2050 schedule is widely assumed in public policy discussions so we choose not to ignore it.

[3] https://www.eia.gov/dnav/ng/ng_cons_num_dcu_nus_a.htm

mere 7,778 homes to convert.

We believe that is likely unrealistic on the basis of a simple economic observation: The supply of natural gas to electricity generation and residences relies on an enormous, geographically dispersed, high-maintenance, labor-intensive infrastructure. As customers (commercial and residential) leave the system, the cost burden of that infrastructure is spread over fewer and fewer customers. We feel it is more likely, therefore, that as the number of customers falls, it becomes more and more likely that the natural gas supply will abruptly end because it is no longer economically possible to sustain it.

We don't dare to estimate when that abrupt cut-off may happen, but if we were to guess, for example, that it happens after 50% of customers leave, then approximately 35 million (35,000,000) homes would abruptly lose service.

What Can Policy Makers Do to Prepare?

In this section we are guided by experience and intuition only. This is not a scientific assessment. We offer two suggestions for policy makers:

1. *Alert and Educate the Public.*

   Policy makers should educate the public about the coming crisis. This may stir some property owners to act on their own, accelerating the rate of conversions even if only slightly. It may also inspire people to think of creative ways to adapt as the problem becomes more imminent.

2. *Plan for adaptation to reduced habitability.*

   At some times of year, all unconverted residences are likely to retain some degree of usefulness. Planners should explore ways to extend this partial habitability such as with temporary, minimally useful heating systems and the development of widely distributed communal facilities for cooking and bathing.

We encourage public policy makers to attempt similar calculations in other areas. For example, it is widely known that we can imagine the technology for an emissions-free transit and transport system - but how much of *that* conversion is realistically possible in the time remaining?

The IPCC famously alerted the world to the immediately urgent need for widespread transformations of social systems and relations, and deep adaptation to the constraints of the climate emergency. We believe such transformations are needed, and that simple, concrete analyses such as we've presented here are necessary to get a realistic view of what policy options remain in our context of rapidly declining capacity to manage the emergency.