Dear UAB members and Mr Bielarski,

It's been a year since I attended meetings and followed along, so to start catching up, I listened to the 3/23 meeting. I am reading the IRP and the GFT documents, but since I have a ways to go, I want to make a few comments as you go into tomorrow's meeting.

First, I want to acknowledge the ongoing excellent work, questions and proposals of the UAB – I fully support Jason's 4 suggestions, and Fletcher's additions.

I also want to acknowledge and appreciate the hard work and commitment of Mr Bielarski and staff, that, as Wes stated, " contributed toward making GRU a truly outstanding utility." Too many people don't appreciate what we have, including our ace in the hole – owning the biomass plant.

As the global utility industry continues its death spiral of the old model (burn to earn), with all its rules and regs, aging infrastructure and expectations, as climate destabilization and biodiversity loss hit dangerous levels, we've reached a point where the shift to new models has to speed up, and we all see it won't be easy. The financial piece alone is daunting and requires up front capital along with different rate structures and configurations. GRU has been put in a tougher position, in my opinion, in large part to politics and decisions made in the Braddy administration years ago. Ed and staff have worked really hard to deal with that reality, and overcome so many of the hurdles, but it gets harder as we hit this section of the transition now happening at the micro to macro levels.

We must think holistically, and in context of interdependent systems
There is going to need to be a lot of education of public and commissioners –
Rate structures will need to change – the current ones lock us into a failing paradigm
Life cycle, holistic assessments in a context of climate destabilization will be necessary – we must take a systems approach as reflected in the Energy Policy
We must electrify everything we can as quickly as we can
We must develop other streams of revenue and see utilities as service and value providers -- broadband, charging stations
And lots more…. Despite the lagging regulations and narrow lens of how finance and costs have been configured.
Here are a couple of links to some articles and papers I sent in the "Before Times" regarding the transition.

2018 White Paper, Forging a Path to the Modern Grid https://www.ase.org/rdi https://www.ase.org/sites/ase.org/files/forging-a-path-to-the-modern-grid.pdf
https://www.utilitydive.com/news/rate-design-for-a-der-future-designing-rates-to-better-integrate-and-value/516786/
https://rmi.org/insight/electric-vehicles-distributed-energy-resources/
https://energynews.us/2019/10/22/in-vermont-green-mountain-power-seeks-to-expand-home-battery-storage-pilot/

Question: Is there a plan to have one or more UAB members, and, a city commissioner attend the APPA annual conference coming up? That used to happen annually, and everyone who has gone, had rave reviews about how much they learned and the ideas and people they encountered.

Given these challenging times, taking advantage of this broad body of research and ideas may be very helpful. We are members of APPA, and they work with some of the most innovative and successful public utilities such as Ft Collins, https://rmi.org/award-winning-efficiency-program-fort-collins/ *"APPA represents more than 2,000 community-owned electric utilities, serving more than 49 million people or about 15 percent of the nation's electricity consumers. Each year the*

organization grants awards to utilities that embody the spirit of APPA's DEED program—a research and demonstration program that supports innovative energy and efficiency activities. The DEED program's Energy Innovator Award recognizes utility programs that apply creative, energy-efficient techniques or technologies, provide better service to electric customers, or increase the efficiency of utility operations or resource efficiency. "We look at utilities that are going above and beyond to power their communities in efficient and responsible ways," says Tobias Sellier, director of media relations and communications at APPA. "Fort Collins definitely fit the bill. This is actually the fourth APPA award for Fort Collins, which has been involved in the association's DEED program since it began in the early 1980s."

https://www.fcgov.com/climateaction/, their EV plan as example: https://www.fcgov.com/fcmoves/ev-readiness-roadmap

This will be a very important time to take advantage of all our membership benefits – especially with the Biden Infrastructure bill that includes $100 billion for power infrastructure, tax credits for storage, EV, broadband etc— there is money for schools, housing and transportation—all related to energy efficiency, equity and justice, climate -- we need to be aware and ready to have priorities and projects ready to go when it passes. APPA has a lot of resources that may be useful.

I was dismayed to hear the continued defense of natural gas as a "clean" fuel – it is not, and the increasing body of scientific knowledge and evidence of the harm it causes, and that it does not represent a bridge to renewables, continues to accumulate. What it has going for it is that it has been so cheap—way below the cost of production with the fracking bubble.

It is imperative to make assessments on full life cycle costs. Externalizing true costs and ignoring natural resource and ecological and environmental justice realities has gotten us into this mess.

Most natural gas now is fracked gas, not conventional, so it is far more costly to extract and requires massive amounts of water , chemicals and sand—it is very volatile so the leakage of methane is far worse than with conventional.
It is an imported fuel—we are vulnerable to supply disruptions, price fluctuations and pipeline issues.
It does not contribute to our local multiplier effect to keep more money circulating in our local economy like biomass and solar do
Increasing the percentage of natural gas we use increases our vulnerability, since natural gas has become so widely used : according to the EIA, " in 2019, natural gas fueled three-fourths of Florida's net generation, and 7 of the state's 10 largest power plants by capacity and by generation are natural gas-fired.", and natural gas has become the most widely used source of electrical generation in the US since 2015. "
I understand and accept the conversion to the dual fuel unit—as long as we maintain the capacity to burn coal if necessary , but expanding natural gas lines and markets, and even offering a rebate, means that GRU is spending money to build and lock in that infrastructure, usage and demand for the long term. These may become stranded assets – there are already 30 cities that have banned new gas hookups and appliances, and a couple are even paying homeowners to replace their gas heaters and appliances with electric.

Links to some scientific papers whose findings offer evidence of increasing atmospheric methane and unconventional natural gas being the same or even worse than coal:

https://onlinelibrary.wiley.com/doi/full/10.1002/ese3.35. A bridge to nowhere: methane emissions and the greenhouse gas footprint of natural gas. Using these new, best available data and a 20-year time period for comparing the warming potential of methane to carbon dioxide, the conclusion stands that both shale gas and conventional natural gas have a larger GHG than do coal or oil, for any possible use of natural gas and particularly for the primary uses of residential and commercial heating. ***The 20-year time period is appropriate because of the urgent need to reduce methane emissions over the coming 15–35 years.***

We used a full life cycle analysis in our April 2011 paper, estimating the amount of methane emitted to the atmosphere as a percentage of the lifetime production of a gas well (normalized to the methane content of the natural gas), including venting and leakages at the well site but also during storage, processing, and delivery to customers. For conventional natural gas, we estimated a range of methane emissions from 1.7% to 6% (mean = 3.8%), and for shale gas a range of 3.6% to 7.9% (mean = 5.8%)

A recent study supported by the American Gas Foundation promoted the in-home use of natural gas over electricity for appliances (domestic hot water, cooking) because of a supposed benefit for greenhouse gas emissions **52**. The report argues that an in-home natural gas appliance will have a higher efficiency in using the fuel (up to 92%) compared to the overall efficiency of producing and using electricity ("only about 40%," according to this study). However, they did not include methane emissions in their analysis, nor did they consider the extremely high efficiencies available for some electrical appliances, such as in-home air-sourced heat pumps for domestic hot water.

Nisbit et al.: (2019): https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018GB006009 the current growth has now lasted over a decade. If growth continues at similar rates through subsequent decades, evidence presented here demonstrates that the extra climate warming impact of the methane can significantly negate or even reverse progress in climate mitigation from reducing CO_2 emissions. This will challenge efforts to meet the target of the 2015 UN Paris Agreement on Climate Change, to limit climate warming to 2 °C.

Howarth et al. (2019): https://www.biogeosciences.net/16/3033/2019/ Correcting earlier analyses for this difference, we conclude that shale-gas production in North America over the past decade may have contributed more than half of all of the increased emissions from fossil fuels globally and approximately one-third of the total increased emissions from all sources globally over the past decade. …… Methane is the second most important greenhouse gas behind carbon dioxide causing global climate change, contributing approximately 1 W m^{-2} to warming when indirect effects are included compared to 1.66 W m^{-2} for carbon dioxide (IPCC, 2013). Unlike carbon dioxide, the climate system responds quickly to changes in methane emissions, and reducing methane emissions could provide an opportunity to immediately slow the rate of global warming (Shindell et al., 2012) and perhaps meet the United Nations Framework Convention on Climate Change (UNFCCC) COP21 target of keeping the planet well below 2 °C above the pre-industrial baseline (IPCC, 2018). Methane also contributes to the formation of ground-level ozone, with large adverse consequences for human health and agriculture. Considering these effects as well as climate change,

Shindell (2015) estimated that the social cost of methane is 40 to 100 times greater than that for carbon dioxide:

We only have about a decade left to not just stop the increase of greenhouse gas emissions, but to be drawing down. Natural gas has methane and ethane that in a 20 year time frame, is 86 times worse than CO2—so our tiny remaining window of opportunity to prevent catastrophic climate destabilization is being destroyed

There is increasing awareness of natural gas impact on our health, especially on children

https://www.nationalasthma.org.au/living-with-asthma/resources/patients-carers/factsheets/gas-stoves-and-asthma-in-children
https://www.sciencetimes.com/articles/25590/20200506/gas-stoves-making-people-sicker-exposing-children-higher-risk-asthma.htm

https://www.psr.org/blog/resource/too-dirty-too-dangerous/

https://www.motherjones.com/environment/2021/02/how-the-fossil-fuel-industry-convinced-americans-to-love-gas-stoves/

https://undark.org/2020/12/02/hazards-of-gas-appliances-draw-new-scrutiny/

https://www.reuters.com/article/us-natgas-new-york-ban/new-york-city-to-ban-natural-gas-hookups-in-new-buildings-by-2030-mayor-idUSKBN29Y2T0

https://www.reuters.com/article/us-usa-climate-methane-idUSKBN2B12O4?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosgenerate&stream=top Senators Sheldon Whitehouse, Cory Booker and Brian Schatz introduced the Methane Emissions Reduction Act, which directs the Department of Treasury to assess a fee on the potent greenhouse gas beginning in 2023 - a move they say could end those emissions, help achieve climate change targets and improve air quality in communities near oil and gas facilities.

I appreciate the dedication, breadth of knowledge and talent on the UAB, and the value of your efforts to wrestle with these challenging issues in support of both GRU's vitality and future, and in providing the commission and public with the advice and information – and discussions—required to navigate these uncharted waters.

With thanks
Nancy Deren