Tompkins County Climate Protection Initiative

Minutes – Friday, September 27, 2024
Video Conference
9 am to 11 am

Attending: Sheila Out, Anne Erling, Bill Mattingly, Brian Eden, Bob Howarth, Dan Lamb, Danielle Eiseman, Dave Bradley, Evan Kurtz, Guillermo Metz, Hailley Delisle, Hilary Swartwood, Inger Aaberg, Ingrid Zabel, Irene Weiser, Janelle Bourgeois, Karim Beers, Laura Vineyard, Leon Porter, Lisa Marshall, Margaret McCasland, Marie McRae, Martha Robertson, Maura McNulty, Mike Straight, Mark Schaeffer, bethany ojalehto mays, Chris Skawski, David Kay, Alan Cole, Ray Burger, Rebecca Evans, Rosie Bostian, Roxanne Marino, Terry Carroll, Tom Hirasuna, Peter Bardaglio

Recent Findings on Methane, Blue Hydrogen and LNG – Dr. Bob Howarth
Bob Howarth is the David R. Atkinson Professor of Ecology and Environmental Biology at Cornell and he is a member of the NYS Climate Action Council. Professor Howarth discussed his recent work on LNG, methane, and blue hydrogen.

Methane

- Methane emissions have been rising rapidly since 2010
- My research suggests 33% of this increase since 2007 is due to shale gas in US – but not all researchers agree
- Methane matters – some of us, including the Intergovernmental Panel on Climate Change (IPCC), have been saying this for quite some time – IPCC position has strengthened in recent years
- Earth now is about 1.4 degrees C above pre-industrial baseline and we're moving rapidly to 1.5 to 2 degrees
- Carbon dioxide has contributed .75 degrees of warming and methane .50 degrees
- Warming from methane has contributed 33% of all warming greenhouse gases for entire time since the 1800s
- COP21 Paris Accord target: "well below 2 degrees C" – clear recognition that warming beyond 1.5 degrees C is dangerous
- Methane reductions are critical; cannot reach COP21 target with CO2 reductions alone
- We're clearly on wrong trajectory
- Carbon dioxide has long-term impact on global warming well into future – methane, in contrast, has no influence beyond 40-50 years into future
- Need to focus on a 20-year time frame when talking about methane – most people, however, use a 100-year time frame – overlooks earlier impact of methane
- 100-year time frame used by almost all governments but this severely understates damage to the climate from methane – IPCC says it's an arbitrary choice
- 20-year time frame used by States of New York, New Jersey, and Maryland (and in my lifecycle assessments)

Blue Hydrogen

- During Climate Council hearings, natural gas industry was pushing blue hydrogen as a more practical alternative to electrification and use of heat pumps – claimed it had nearly zero emissions
- Bob became interested in what its actual footprint might be
- We've been making hydrogen for over 100 years using fossil fuels – currently, 96% of hydrogen globally comes from fossil fuels
- In North America & Europe, virtually all hydrogen made from natural gas
- Natural gas is mostly methane, and this is the feed stock for hydrogen
- Under high heat & pressure, methane plus steam (water vapor) is converted to hydrogen & CO2 (steam methane reforming, or SMR).
- Natural gas also burned to provide the heat & pressure – product is called "gray hydrogen"
- "Blue hydrogen" is traditional gray hydrogen from steam methane reforming of fossil natural gas combined with carbon capture and storage
- Term first used by Air Liquide in 2015, highly promoted since 2017 by the oil & gas industry, particularly by the Hydrogen Council (a group established by BP, Shell, Total, & other oil & gas companies in 2017)
- Only two commercial blue hydrogen facilities globally (Texas & Alberta)
- Bob worked with Mark Jacobson at Stanford to analyze GHG footprint of gray and blue hydrogen – first to include methane in addition to CO2
- One of very few peer reviewed analyses assessing question of how green blue hydrogen actually is – paper published in August 2021
- Blue hydrogen turns out to have smaller footprint than gray hydrogen, but it's not zero or anything close to zero
- Methane emissions actually greater in blue hydrogen than in gray hydrogen due to use of natural gas in process of trying to capture carbon dioxide
- GHG footprint of blue hydrogen turns out to be larger than natural gas – would be better to just burn natural gas to make hydrogen
- Analysis is very conservative – need industry wouldn't like it and would be looked at very carefully
- Paper is very transparent and based on only four assumptions:
    - Emission rate for upstream, fugitive methane from using natural gas
    - Global warming potential to compare methane emissions to CO2
    - CO2 capture rate from steam methane reforming
    - CO2 capture rate from energy needed to power steam methane reforming and carbon capture
- Used best available data for estimates in our baseline analysis and performed detailed sensitivity analyses on these estimates – used value of 3.5% in estimates
- Impossible to avoid release of methane into atmosphere when producing shale gas
- Some sources of "upstream and midstream" methane emissions:
    - Releases during well drilling (in regions with past history of oil, gas, and coal)
    - Venting from storage & processing facilities
    - Unlit flares, and incomplete combustion by flares
    - Incomplete combustion by pipeline compressors
    - "Blow-downs" for pipeline maintenances

- Blue hydrogen not much better than gray hydrogen and considerably worse than just plain natural gas
- Industry sources and social media immediately attacked paper when published – critics claimed estimate of methane emissions was too high
- But almost all of estimates they used were within range of Howarth & Jacobson paper
- Over past hundred years, hydrogen used almost entirely as chemical feedstock (oil refineries, plastics, synthetic nitrogen fertilizer), not as fuel
- Progressive energy planners have seen role for green hydrogen as fuel in future for "hard to decarbonize" sectors (air travel, steel manufacturing) -- also perhaps for storage of surplus electricity from wind and solar
- Green hydrogen made from renewable electricity and electrolysis of water
- Since 2017, blue hydrogen heavily promoted by oil & gas industry (Hydrogen Council, etc.) to include blending with natural gas in pipelines, for use to heat homes, etc.
- Beginning in 2021, industry stopped talking about blue hydrogen and came up with term "clean energy," confusing green and blue hydrogen
- Significant concerns with blending hydrogen into gas pipelines that serve homes and apartments:
    - Hydrogen is very leaky, far more than methane; hydrogen leaks contribute to global warming
    - Hydrogen makes gas pipelines more brittle, posing catastrophic risk – California Air Resources Board recently called for no more than 5% hydrogen/95% methane
    - Existing gas appliances (stoves, furnaces, water heaters) not designed for hydrogen-methane blends – would need to be replaced for blends beyond 20% hydrogen/80% methane
    - Energy density of hydrogen is far less than for methane – blending 20% hydrogen/80% methane reduces GHG emissions by only 7% (not 20%) for 100% carbon-free hydrogen.
    - Using renewable electricity to produce green hydrogen, which then heats homes very inefficient compared to using that electricity for heat pumps – for same quantity of electricity, heat pumps deliver 6 to 10 times more heat than does burning green hydrogen
    - Hydrogen is significantly more expensive than fossil natural gas, so blending any hydrogen into distribution system increases costs

<u>LNG Exports from US</u>

- Most of Bob's work recently has focused on export of LNG from US -- LNG in US made largely from fracked shale gas
- US banned export of LNG from lower 48 states until 2016 – increase in shale gas production after 2016 led to lifting of ban
- Now world's largest producer and exporter of natural gas -- most of global increase in natural gas production over past 15 years has been shale gas in US
- This increase in US shale gas production responsible for estimated one-third of total increase in atmospheric methane globally over this time period
- Methane has contributed 33% of all global warming since the 1800s

- Bob has peer-reviewed article on GHG footprint of LNG exports from US coming out soon – doesn't usually share his work before publication in a journal
- Bill McKibben urged Bob, however, to make his findings about the climate impact of LNG exports public
- McKibben wrote about it in New Yorker and Nation – Biden administration made decision in January 2024 to pause LNG exports
- Fracked shale gas energy intensive, with significant emissions of CO2 (beyond those released when fuel is burned) from production, processing, and transport
- For LNG, considerable energy needed to liquefy and regasify, as well as for transport by tanker
- LNG and shale gas power energy needed to liquefy and regasify – LNG usually powers tankers as well
- High use of LNG and gas to power liquefaction and tankers means considerably more shale gas needed than simply gas finally delivered as LNG
- Increases upstream emissions of both CO2 and methane in US shale-gas fields
- Also more methane emissions from tankers – most modern tankers (which are far more fuel efficient, so lower CO2 emissions) emit more methane due to unburned methane in exhaust from 2-stroke and 4-stroke engines
- Most of LNG exports come from Texas and Louisiana – Pennsylvania not big exporter
- Total LNG greenhouse gas emissions are far greater than simply CO2 emitted as fuel is burned
- Longer cruises (China vs Europe) increase emissions, but type of tanker not that important – more modern fuel-efficient tankers have lower CO2 emissions but greater methane emissions
- Upstream and midstream emissions of methane and CO2 make up almost half of GHG footprint for LNG (38% for methane plus 9% for CO2) – GHG footprint of LNG 33% greater than for coal
- Right after Biden decision to pause LNG exports, Bob started to get lots of pushback – Wall St. Journal published profile of Bob – not hatchet job
- House of Representatives Committee on Science, Space, and Technology issued report criticizing his research as based on a "flawed methodology" and criticizing him as advocate without scientific rigor
- Sign-on letter from over 130 scientists, including Michael Mann, Mark Jacobson, and Sandra Steingraber, in support of Bob's LNG research sent to DOE and Treasury secretaries
- Closed-door event held just few days ago to discuss LNG with US Senators who are members of Climate Task Force and their staff, chaired by Sen. Ed Markey – several congressmen also attended – got very favorable reception

<u>Q&A</u>

- Martha Robertson: Is Biden Administration going to hold off on making final decision about LNG exports until after election and how permanent will decision be?
- Bob: Good guess that it won't make decision until after election – pause in kind of legal limbo due to federal court opinion in Louisiana
- DOE looking at both GHG emissions and economic impact of pause – one of experts who testified with Bob at US Senate event said lifting of ban on LNG exports has cost US consumers $100B in increased energy prices

- Bob anticipates that DOE will fall back on 100-year time frame for measuring methane impact – thinks it will be hard, though, to make counterargument about increased energy prices for US consumers
- Lisa Marshall: Is anyone in NY government agencies looking at how gas utilities are using ratepayer money to build infrastructure that will facilitate LNG exports and is this issue being raised elsewhere?
- Bob: Not aware of who in state government is looking at issue – hearing similar things in other parts of country, though
- Bob thinks LNG export business in US will implode of its own accord because economics are just not there
- bethany ojalehto mays: What do you think proper response should be to researchers who are receiving significant funding from the fossil fuel industry?
- Bob: If funding for research is coming from oil and gas industry, at very least we should have full disclosure – we don't do good enough job of that at any university
- Cornell not among worst – MIT, Columbia, and Stanford are probably, though
- Should make sure that we don't have institutes at universities that are simply mouthpieces for fossil fuel industry
- Dave Bradley: LNG exports set domestic price of methane – if you want to quash methane production and marketing, stop LNG exports – fracking for oil produces such vast quantity of methane that it far exceeds actual demand for it – need LNG exports to support price of methane
- Bob agrees with this line of argument
- Irene Weiser: One reason fossil fuel industry is pushing blue hydrogen is to take up slack generated by excessive methane production
- Biden administration has put in place enormous incentives for carbon capture and storage, which is associated with production of blue hydrogen
- Bob agrees and thinks blue hydrogen industry will also collapse of its own weight, like the LNG exports
- Carbon storage underground has to occur in places that are geologically capped to be safe – very few such places in US

Discussion: CLCPA and the Work Ahead – All

The last legislative session in Albany was disappointing when it came to climate and clean energy policy. In addition, Governor Hochul has indicated that the state is unlikely to achieve its goal of 70% electricity from renewable sources by 2030. Progress has been slow in other areas as well. Picking up from the conversation about Professor Howarth's research, the group discussed how we can work to push the Governor and legislature to become more aggressive on the climate and energy transition fronts.

- Martha Robertson kicked off this portion of the meeting by asking Bob about steps being taken by Climate Action Council members to encourage actual implementation of CLCPA
- Bob: Climate Action Council has not met since December 2022, when it approved final scoping plan
- Governor's office clearly does not want further Council engagement in planning – Bob doesn't foresee it meeting anytime soon

- But scoping plan has to be updated by law every five years – it's a two-year process since once there's a draft plan, it'll take a year to revise – so they'll have to call a meeting within next year and a half
- Of the 20 remaining on the council, 11 report to governor and two more work for fossil fuel industry – haven't figured out yet how the remaining members can be effective
- Peter: Speaker of House is one of major obstacles to further progress on climate front
- Bob: People need to figure out how to reach Heastie
- Lisa Marshall: State has just kicked off their required energy planning process earlier this month – unlike scoping plan, this plan is legally binding – Doreen Harris heads up this effort
- We need to engage with this process to ensure state moves forward – there will be hearings on this all over state next summer, along with opportunities to make comments and organize around it
- Bob agrees with Lisa but also thinks CLCPA makes scoping plan binding, at least on Public Service Commission – part of problem is PSC is understaffed and under supported politically
- PSC needs to be pushed from outside and other agencies need to do a lot more – building heat decarbonization most important thing and nobody is doing anything on it
- Lisa: Will be difficult to make progress without passing NY HEAT Act – Hochul and her staff are standing in way
- Brian Eden: Worried that energy planning process will be end run around Climate Action Council – Hochul is pushing nuclear and CAC wasn't very sympathetic to this idea
- Historically, state energy planning process has been very agency-centric -- moving away from more publicly-involved process like the scoping plan
- Peter noted that the Climate Can't Wait report card was brutal, and justifiably so – goes through point by point on how Hochul has fallen dramatically short of what needs to be done
- He shared his observation that the draft of the 2024 building energy efficiency code seemed to be supportive of the All Electric Buildings Act passed in the 2023 session of the legislature
- Also observed that it appeared Cornell is trying to do end run around the local energy code supplement
- Brian agreed, specifically regarding the $110M renovation of McGraw Hall – Cornell also prevailed on the artificial plastic turf issue
- bethany: Fight not over yet – town planning board required Cornell to show that materials being used were free of PFAS – group of Cornell faculty reaching out to discuss this issue with administration
- Irene thought unless code officer could be persuaded to step in, Cornell will likely be allowed to move ahead – appears as if Cornell and town planning board talking past each other
- Irene commended bethany and Zero Waste Ithaca for role they played in educating planning board about PFAS

- Brian pointed out, however, that none of SEQR provisions regarding life cycle analysis were taken into account – very applicant-centric process and clear planning board not interested in hearing from third party experts such as scientists
- Moving back to state level, Martha noted that fall crucial period in which agencies developed their proposed budgets
- Also need to be ready to push governor hard after upcoming election to sign Climate Change Superfund Act and to strengthen her support for climate actions that will move state towards meeting its commitments under CLCPA
- Peter suggested that NY HEAT Act particularly important piece of effort to implement Climate Action Council's scoping plan
- Reminded folks that TCCPI is member of NY Renews and Renewable Heat Now campaigns as well as Climate Can't Wait coalition
- Represents new direction for TCCPI – have become more of an advocacy organization over last couple of years
- To be effective, we need folks to be active participants in these various efforts to get legislation passed – upcoming session will be especially critical – important that we keep pressure up on governor and assembly – senate less of an issue
- Martha said she thought many of assembly members were closer to senate on many of the relevant issues – key problem is leadership of assembly, not rank and file members – also observed that governor's approval numbers not very good
- Bob noted that we are currently at 1.4 degrees C over pre-industrial baseline – we'll be consistently above 1.5 in next 2-3 years and on current trajectory we'll be breaking 2 degrees pretty consistently within ten years, plus or minus two years
- Beyond that most of models indicate we'll end up at around 3-3.5 degrees – Bob reminded people that 2 degrees would be hugely damaging
- Risk of hitting thresholds that are irreversible in climate system at 2 degrees significantly greater: fundamental changes in ocean circulation and loss of vegetation in Amazon and of boreal forests in Siberia and Canada
- Already starting to see some of these things taking place – not looking good – slowing of ocean currents, for example, hinders uptake of carbon dioxide
- Historically, ocean responsible for 25% of carbon dioxide uptake
- Bob contended that what we do in NY can have global impact – if we demonstrate here that we can move away from fossil fuel economy in ways that benefit state's citizens, it will be hugely important
- Martha observed that Bob's work has made major impact on climate action conversation – role of scientists as public advocates has been sea change and Bob has been instrumental in making that happen
- Peter said it was why it's so important that TCCPI members step up their participation in climate action over next few months