City of Keene
New Hampshire

ENERGY AND CLIMATE COMMITTEE MEETING MINUTES

Wednesday, December 6, 2023 **8:00 AM** **2nd Floor Conference Room, City Hall**

Members Present:
Zach Luse, Chair
Councilor Bryan Lake
Peter Hansel
Jake Pipp
Jude Nuru
Diana Duffy
Clair Oursler
Mike Winograd, Alternate
Charles Redfern, Alternate

Staff Present:
Mari Brunner, Senior Planner

Members Not Present:
Councilor Raleigh Ormerod
Paul Roth
Lisa Maxfield, Alternate
Dr. Rowland Russell, Alternate
Kenneth Swymer, Alternate

1) Call to Order and Roll Call

Chair Luse called the meeting to order at 8:12 AM. Chair Luse invited Mr. Mike Winograd to participate as a voting member.

2) Approval of Minutes- October 24, 2023 & November 1, 2023

Chair Luse requested a motion to approve the October and November minutes. Councilor Bryan Lake moved to approve the minutes of October 24, 2023, and November 1, 2023, and received a second from Mr. Peter Hansel. With no discussion and unanimous approval, the minutes for October 24, 2023, and November 1, 2023, were approved.

3) Virtual Presentation by Audrey Schulman, Home Energy Efficiency Team (HEET)- Ms. Schulman will provide an overview of networked geothermal (networked ground source heat pumps). To learn more: https://heet.org/geo/

Chair Luse introduced Ms. Audrey Schulman from the Home Energy Efficiency Team (HEET) who joined via Zoom.

Ms. Schulman explained that they are a nonprofit climate solutions incubator. They receive money from foundations, donors as well as the government. They do not take funding from gas or geo or any other utility to maintain everyone's trust. She started off by showing images and explaining that two years ago, the local gas company came along and ripped up her street and replaced all the pipes there with new gas pipes. These pipes will last 50-100 years. They were replacing them because they were aging and leak prone. The issue with this was that they did not notify or ask anyone's permission on the street. They just did it and all the gas customers in the gas territory must pay for the new gas infrastructure. It is a one block long street and since then, two of the neighbors have gotten off gas to air source heat pumps and that is happening more and more. Heat pumps are increasingly popular. They are outselling gas furnaces now across the country, including in New England. The gas system has not gotten any less expensive in any way. Its operations and maintenance will continue to be the same because it has fixed costs, but as more customers leave, the bills for the remaining customers are going to get higher. At some point, there is going to be an inflection point where air source heat pump systems are going to become less expensive. At that point, many customers are going to get off quickly and, in the end, the only people left will be low income and renters.

The Germans call this "the last grandma problem," where they imagine one last grandma on the system paying for the entire gas territory. At that point, the gas utility will not be that safe. The system is potentially going to have problems because they will not be able to afford workers. This is not the sort of transition they want to head towards. Instead, in 2017, HEET introduced the idea of gas utilities installing networked ground source heat pumps or what they call networked geothermal.

There is different terminology for this, including thermal energy networks and community geothermal, but whatever it is called, it is a ground source. The heat pumps are in the ground and connected by a shared loop of plain water. The water is at ambient temperature with closed boreholes, so it is not pulling in more water or anything like that. They are placed shallow, only about a few hundred feet deep.

If the gas utilities installed this infrastructure instead of gas, they can amortize it in the way that they normally do over 30-50 years or even longer number of years, so that it is not much cost for any one person, and they already have the rights of way in the street and the customers to be able to do this.

This system has a variety of synergies. It is known that ground source heat pumps are extraordinarily efficient, more efficient than air source, because the ground is always the same stable temperature. Once you interconnect the boreholes and the customers, you get additional efficiencies.

She asked the group to imagine this building as an office building with all its computers running all the way through the winter. This would require more air conditioning and so it will be returning that water back into the system, but the return water will be hotter. Buildings down the street can then use that heat from the water allowing for the shed thermal energy to be reused. The second thing is that you can store thermal energy heat in the bedrock and pull it back out in the winter when you do need it. It has thermal storage with it, and this is a dirt-cheap thermal storage because it is just the ground underneath your feet.

The other outcome of the system is that it is far safer than gas because you are no longer bringing explosive gas into your home and lighting it on fire. In Massachusetts, they had the horrible experience of the Merrimack Valley gas disaster.

This is also projected to be more affordable because about 50% of the current gas bill is paying for the actual gas. With this system, there would be no more gas and the fuel cost would go away and be replaced with a very minimal amount of electricity because this is an extraordinarily efficient system. The Applied Economics Clinic projected that heating bills for networked geothermal as opposed to gas, if installed by the gas utilities, would be lower than gas.

To follow that out, in Massachusetts, they had the future of gas stock. The analysts did projections of some different pathways to decarbonize the system. They found that the current way (going house to house) is going to increase the energy burden, the percentage of low-income customers and the income that is going towards energy bills, which will increase that energy burden the most. Network geothermal would increase it the least in comparison to all the others. This projection was made using some very conservative assumptions, which to her was very reassuring.

She went on to explain that if they were to merge the gas and geothermal rate bases, then they could maintain the critical ratio of customer to infrastructure even as they transition. Instead of fewer and fewer customers on the same size infrastructure, you would have the same numbers of customers and the infrastructure would just be replaced.

The other thing is in New Hampshire, as all the buildings' energy needs are moved to electricity, it is going to cause a radical increase of the electric peaks on the system during the winter. Those winter peaks could go high. Peak electricity is not only the most expensive, but also the dirtiest. The lower you bring those peaks- the faster you can move to electricity and source it from renewables with geothermal being the most efficient method. That will serve to lower those electric peaks.

She explained that if you put one unit of energy into the gas boiler, you get less than one unit of energy out because some of the energy goes up the chimney. If you put one unit of energy into an air source heat pump, you get two or three units of energy out because it is moving a naturally occurring temperature around you into or out of your building. This is known as the coefficient of energy or COP. A networked geothermal has one unit of energy put in and it moves six units

of energy from the ground into out of your building. This analysis found that the average annual COP of this system was 5.7 and during the winter it got up to 8.9. This is astonishingly high in terms of efficiency.

Just to translate that during the winter, it would work nine times better making it more efficient than a gas boiler and the emissions would also be lower.

In 2019, it was found that a building connected to networked geothermal compared to heated by gas would have 60% fewer emissions. As the country moves to a cleaner grid with a fuel mixture coming from more renewables, those emissions numbers will decrease further.

It is also more dependable because the energy is no longer coming from several states away and needing to be transported to the customer.

She explained that there is an installation in Toronto called Bursey Glen. It is in the right of way of the street so the workforce can transition because it is the exact same pipes. The only difference is the color of the stripe on the side designating what is inside of the pipe. In Massachusetts, there are two installations occurring now.

One is by Eversource and should be turned on in the spring. It has a fire station, part of a school, a few businesses, and a number of homes, including a variety of low income. National Grid is also doing an installation and should also be turned on in the Spring. She shared some photos of the installation process and explained that they frequently do spray paint markings to show where the gas previously was, which transitionally was yellow. They had to produce a new color for the geothermal and could not use blue as that is the color for water. They chose barbie pink.

There has been a variety of legislation passed across the country allowing gas utilities to head this way. In New York, they unanimously passed a law in just two months because it was pushed by the trifecta of environmentalists, utilities and unions, which is stunning.

There is also a variety of proposed legislation across the country along with a gas utility coalition composed of twenty-one gas utilities that meet regularly to look at this business alternative to try and figure out how to install and learn from each other. Her hope is that it will occur just like it has across college campuses across the country. The gas gets backed up out of the street right to the end of the street and is kept as a backup heating supply.

Colorado Mesa University has an installation and they have not turned on their gas boilers since 2012. It is over a million square feet of conditioned space and is a large installation.

She shared that Massachusetts is studying it intensely with two different national labs, MIT and a variety of others studying it to be able to make sure that they harvest as much information as possible so that they can get everybody’s trust in terms of where, when and under what conditions it works so they can scale it as quickly as possible.

There will be an open database of best practices and they will be a sort of digital twin and optimization model that will allow others to install it and have it be learning as it goes forward to make sure that they design it best each time.

The next thing that would happen is to do an iteration and begin to interconnect, allowing the system to grow over time to meet the needs. In the end, hopefully the entire gas system would be replaced, and gas would remain as a backup wherever the densest infrastructure is so that everybody knows they can get gas and can get heat even though it may never be used.

Her hope is that these sites in Massachusetts become networked geothermal and will become the kind of infrastructure that her kids and grandkids can use no matter what sort of decarbonization mandates we had, and they will be able to get safer and more affordable energy.

She thanked everyone and welcomed questions.

Chair Luse thanked her and asked if there was going to be a need for a certain number of people to sign up to move the project forward given the lift that would be required and how they planned to encourage people to make the switch.

Ms. Schulman explained that Eversource offered two hours of retraining to the gas sales folks who then went out into their selected neighborhood and those salespeople had the best sales day of their lives. Every single person they spoke to who was allowed to join agreed with one exception, which was an individual who had recently replaced their HVAC and did not want to go through the process again. This system also offers cooling, which was a selling point for most since they did not have cooling installed. Customer retrofits are cheaper than installing a substation. Customer retrofits can also be paid for using loan program office funding through the Department of Energy, which offers low interest rates.

Chair Luse noted that many of the homes in our area do not have ductwork and asked if that would be an issue with the Geothermal system. Ms. Schulman said that it was not an issue and explained that for forced hot air or hot water, it would work. It would not work for steam heat in an efficient way yet. Since hot water would not be able to be converted for cooling, any customer wanting cooling would have to install mini-splits and then connect them to the system.

Councilor Lake complimented Ms. Schulman on a great presentation and asked if there were any limits to the density of the area this could be installed in and whether it would be appropriate for a downtown city core.

Ms. Schulman said a downtown city core would be more ideal in a variety of ways as it allows for more harvesting of energy per linear foot with more mixed energy use. The several types of businesses and usages will result in more load cancellation. She explained that it is better to start using it in dense urban areas. Installing this anywhere where propane or heating fuel is being used is not only easy, but smart given the prohibitive cost of propane and rising fuel oil prices.

Ed Haas (guest) asked if Ms. Schulman had any information on cost effectiveness if the system is only used for heating purposes. Ms. Schulman explained that there was a slide in her presentation from the Applied Heating Economics Clinic; that was just in reference to heating and did not include cooling. Heating would be significantly less expensive with networked geothermal.

Ms. Diana Duffy asked if anyone knew what Eversource territory this had already happened in. Ms. Schulman answered that it had happened in Framingham. Ms. Duffy then asked if anyone had an idea of how many commercial customers were on the mix of propane and air. Ms. Brunner said she doesn't have a number, but she thinks that most of the buildings in the downtown are on the piped system. However, many of the restaurants use tank propane for cooking because they found the air propane mixture is not sufficient for cooking. She explained that the default is the propane air mixture, but many commercial buildings are converting to mini-splits and solar.

Ms. Duffy said that this is the granite state and many people are not on a piped system. What is that cost? How does it work for businesses and residents that don't have a piped system?

Ms. Schulman said her understanding of the Eversource installation was that they got fuel oil customers, electric baseboard customers and gas customers all connected to the system.

Ms. Brunner noted that most of Keene does not have a pipe system underground and wondered if there would be additional cost to install in areas where there is no existing gas infrastructure.

Ms. Schulman believed it would be the same cost. Her recommendation was to do it through the gas utility company because they install it and then amortize the cost across everybody, lowering the overall cost per customer. There are a variety of ways it can be done including as a municipal power option. It is especially important to do it anywhere there is a high cooling user (like an ice rink) and a high heating user (like a greenhouse) on the same street because it creates a variety of mixed energy use.

Chair Luse asked if she had said the Framingham project was free to the customers after incentives and where that funding came from, to which she responded that it was, and the funding came from all the ratepayers.

Mr. Winograd noted that Liberty is the local utility and does pressurized propane, but his understanding was that they were changing it to something else. There will be retrofitting of everything. He asked if Liberty was part of the companies involved.

Ms. Schulman did not remember if they were in the collaborative, but she has talked to them several times. They understand the technology and while she cannot speak to whether or not they would be interested in doing it in Keene, she believed it would be worth a conversation.

Mr. Mike Metell (guest) referenced the underground materials, stating he was familiar with the plastic ones used for homes. He knows water going through pipes can be corrosive and was curious as to whether there are any special systems needed to maintain the water purity.
Ms. Schulman stated that was a great question. She continued that this is a closed loop system so the water is only filled and works like a radiator. It is cleaned beforehand, and they frequently add glycol to make sure some of the impurities do not coat the outside or inside of the pipes. It is small, under five percent of the food grade glycol that can be ingested. That maintains, as far as she understands, purity.

Chair Luse thanked Ms. Schulman for her time. She closed out saying she thought Keene was a suitable place to do it because of the system currently in place. She strongly recommended working with Liberty and thanked everyone for the opportunity to present and share her expertise and proceeded to exit the zoom call.

Chair Luse asked the group whether Liberty had been involved in the planning for the downtown infrastructure. Ms. Brunner said they had been involved in the planning. Her understanding was that all the different folks that have infrastructure in the project area have at least been made aware that the project is happening and have had some preliminary meetings. She believes that staff are currently working on a more detailed design. If they needed to do any work, they would do it when everything is dug up.

Chair Luse asked if she had any idea of what Liberty's plans might be for that time-period given the fact that most of their infrastructure is old and outdated.

Ms. Brunner said Liberty came to this committee with a proposal and they have also presented it to the City Council where they talked about switching over to liquid natural gas and future proofing it for hydrogen in the future. Chair Luse said he believed they said they would use the existing infrastructure for liquid natural gas.

Ms. Diana Duffy said she understood if it were the same gas, it would use the same pipes. She believed it was Bill Clark who made the presentations.

Mr. Winograd asked if the gas would be trucked in, to which Ms. Duffy said yes. He responded that seemed ridiculous. Ms. Duffy explained that it is trucked in now.

Mr. Winograd asked if it would be possible to have Liberty come back. Ms. Duffy agreed and said she would like to at least find out who their contact it. Chair Luse wanted to find out if they had plans to rip up their infrastructure when they did the downtown project.

Mr. Winograd stated that when he talked to Don Lussier, City Engineer, he had said that they were at that point now where they would be reaching out to see what everybody has for plans. He also understood that they would be doing an environmental study as well as more research because the data used is historical data.

Ed Haas, guest, asked if anybody knew anyone who had a ground source heat pump installed in the Keene or Cheshire Country area. Chair Luse said he was unaware of anyone locally but added that his sister in Iowa has one. He explained the whole neighborhood has it as it was installed when they built the development.

Mr. Winograd asked if the prison system had something. Mr. Brunner responded that the Public Works building, Keene State College and the county jail all have geothermal.

Mr. Metell said Liberty, like any other utility, is going to be looking at risk. The system that they proposed a year and a half ago was loaded with risk, but they have a high need to be here. This system seems minimal risk. He agreed with the idea to bring Liberty back and said he sees this as a win-win situation.

Mr. Winograd said he understood that Eversource did Geothermal in other areas as well as Liberty, but asked why Eversource did not do it locally here. Chair Luse explained that Eversource is only the electric utility here, but they are both the electric and gas utility in other areas and participate in geothermal in territories where they can get gas.

Mr. Charles Redfern asked if there were any incentives for Liberty to change its system on a commercial scale. Ms. Brunner said there might be federal incentives.

Dr. Nora Hanke (guest) said there might also be incentives through the rural USDA programs. She noted it was mentioned in the presentation about New Hampshire being the Granite State, but it was not addressed about whether that would play a role in the expense given the difficulty of potentially drilling into hard granite. She wondered how doing it in the NH area might vary from Framingham or the Colorado Mesa area given the geology. She would be interested to hear them address that.

Chair Luse asked Ms. Brunner if it would make more sense to talk to Don Lussier first and get his sense or see if they could have a conversation to invite Liberty back. Mr. Lake suggested discussing this with Mr. Lussier first. Ms. Brunner said staff from Public Works is aware of the whole concept but volunteered to reach out to Mr. Lussier to see what he would like to do.

4) ECC Work Group Report Outs

A) Community Solar

Mr. Jude Nuru shared that the Community Solar group met and are trying to promote community solar or solar deployment in the city and the Monadnock region. They came together to write two letters to the Monadnock Shopper News and the Keene Sentinel. Those were written to try and create awareness. They have identified the resource persons and interested businesses and in addition to that are looking into additional strategies to promote solar in the community. One other thing they have done has been to compile a list of city-owned buildings they want to vet

and see which would be suitable for onsite installation and plan to make recommendations to the city based on the gathered knowledge.

Ms. Duffy said she wanted to underscore that their committee is making sure that they are operating within their own bandwidth by not taking on too much and using the tools that can reach the most people at the least cost. She is excited to see what kind of traction the business-to-business coaching will get.

Ms. Brunner asked for copies of the letter to be able to share with the larger committee.
Dr. Hanke asked Mr. Nuru to explain what the definition of community solar is that they are using.

Chair Luse explained they are citing potential sites for community solar, but business to business was to inspire other businesses to install solar. Dr. Hanke thanked him for the clarification.
Mr. Metell suggested including the churches in the region as he knows some of them would be interested.

B) Grants, Fundraising, and Partnerships

Mr. Redfern said he had reached out and made a few attempts to bring Antioch on board with a fellowship concept. He stated it was difficult communicating with them. Ms. Brunner reached out to a contact, which helped open channels. They wanted to know what the city could do for them. He did not know if they were using that for leverage in getting the most funding for their fellowship. They talked about administrative fees that must be covered for faculty members to be working with the students. They talked about who would pay the stipend for the tuition. He felt uneasy pursuing that. He talked to Ms. Brunner about the dilemma, and she was aware of the AmeriCorps program, and he said that looks quite helpful. He had a meeting with them in the works and would be going up to Portland, ME to meet in person.

Chair Luse asked if he had any notes or communications with Antioch that could be helpful that he could send along. Mr. Redfern offered to send it to him.

Ms. Brunner added that she was not at the meeting with Dr. Christa Daniels. She got an update from Jesse Rounds on it. Her understanding was that there may have been a misunderstanding about the available funding. Going into the meeting, Ms. Brunner let Mr. Rounds know that they had $5,000 already. She believed the message was put out to Antioch as that was all the funding they had and were putting towards it, which is likely where Christa's concerns stemmed from. To put it into context, Ms. Brunner explained that to get a fellow from UNH for two months, it costs $5,000. To get someone for an entire year, which is what they were proposing, $5,000 would not cut it. Ms. Brunner believed Christa wanted assurance before they put more time and effort into trying to figure out how it might work.

Ms. Brunner said when she and Mr. Rounds had met with Mr. Redfern, their recommendation was to focus on just gathering information on different models. She believed a great outcome for this would be for the committee to look at a few different models with one of them being a fellowship with a university. She mentioned that she spoke with Troy Moon, the Sustainability Coordinator for Portland, ME. They had two AmeriCorps volunteers placed with them. It really helped increase the amount of work his office was able to do and so she thought it might be another thing to investigate. Mr. Redfern is going to reach out to Mr. Moon to set up a meeting to learn more about it and then report back.

Prior to leaving, Ms. Beth Campbell had already started reaching out and doing phone interviews with different sustainability coordinators at different municipalities. Ms. Brunner explained there is another model where a person could be hired either part-time or full-time. She explained a fourth model that could be considered would be sharing a position with another organization. Ms. Brunner pitched to Mr. Redfern that the work group could do research into these various models and report back to the larger committee. When the committee determines which one makes the most sense, a recommendation could then be made back to the city. While it will not be done in time for this year, next year would be a suitable time to get ahead of the budget.

Chair Luse asked how much money would be needed for a yearlong fellowship. Ms. Brunner said that is something that needs to be determined. She guessed $20-30,000.

Mr. Winograd stated that he was at the meeting and believed they did not do the information gathering necessary. He felt it was a mixed-up meeting and he felt the person had a lot to offer. She is truly knowledgeable. She knows about many of the programs in place. He suggested not writing it off and believes there is a need to have a sit down one-on-one with that person.

Chair Luse responded that it was not a huge amount of money to gather and imagined that they could go to and ask local businesses or other organizations and even grant funding.

C) Education and Outreach

Chair Luse shared that Keene Energy week went well. The Energy Expo had a sparse turn out and he believed the weather was a double-edged sword. It was a beautiful day and while they had more vendors than ever before, he thought the weather also worked against them for attendance. They are looking at ways to combine efforts with the Monadnock Sustainability Hub and other groups doing similar work in the area.

D) Legislative Tracking

Councilor Lake shared that they had a short meeting. No major updates as it was mostly just planning to go into the next legislative session with an understanding of what meetings they want to track.

E) Food Security

Dr. Russell was not present so there was no update.

5) Letter Regarding NH DOT Route 101 Road Projects

Chair Luse noted that at the last meeting it was requested that a letter be drafted and brought back to the Committee for review, so he included it in the packet. He explained that he kept it tight to what they were asking for and how it ties in.

Mr. Jake Pipp said he thought both letters were very well-written. Chair Luse explained that Councilor Lake wrote the Winchester letter.

Chair Luse asked for any feedback or discussion. Mr. Winograd added that he felt they were both very good and should move forward.

Chair Luse asked if it required voting. Ms. Brunner explained that all that is needed is to authorize the Chair Luse to sign the letter and send it out.

Councilor Lake motioned to authorize Chair Luse to sign the letter and send it out and was seconded by Mr. Pipp. With no discussion and all in favor, the motion was approved.

6) Update: Lower Winchester Street Project- Letter from the ECC Chair

This letter was included for informational purposes, as it was already sent to City Council. It was not included in the packet but was sent out by e-mail by Ms. Brunner.

7) Community Power Program Update

No update.

8) New Business

No new business.

9) Next Meeting: Wednesday, January 3, 2024- 8:00AM

Five out of six members were available for that meeting. Ms. Brunner suggested keeping it on the calendar.

10) Adjournment

There being no further business, Chair Luse adjourned the meeting at approximately 9:12 AM.

Respectfully submitted by,
Amanda Trask, Minute Taker

Reviewed and edited by,
Mari Brunner, Senior Planner