

The Climate Lens – Episode 23: Homes, Buildings & the Heat Pump Solution

00:00 - 00:17

Matt Grace: Many, many times I get asked, you know, here's a shiny thing, here's a new product. Is this good? Is this sustainable? Is this going to make my building greener? And the answer depends on what you're trying to do with the building. And it also depends on what else is going on with the building.

Episode opening

00:17 - 01:28

Steve Bentley: Welcome to the podcast. My name is Steve Bentley. I'm with the Calgary Climate Hub and this is the Climate Lens on CJSW and streaming wherever you get your podcasts. In the spirit of reconciliation, we acknowledge that we live, work and play in the traditional territories of the Blackfoot Confederacy, the Siksika, Kainai, Pikani, Tsuut'ina, and the Îyâxe Nakoda Nations, the Métis Nation of Region 3, and all people who make their homes in the Treaty 7 region of Southern Alberta. We also dedicate this podcast to another group of folks that have a stake in this land that we stand on today, and that is our children, nieces and nephews, grandchildren and all future generations. I urge you to keep them in mind during this time as we face unprecedented change and start making decisions about what comes next. The opinions expressed in this podcast are those of the participants and do not necessarily reflect those of CJSW, The Calgary Climate Hub Board, or membership.

01:28 - 02:15

SB: It actually makes a lot of sense how we humans get around, and where we're going to and from make up the numbers one and two sources of climate change causing emissions. Increasingly, we'll have no choice but to dramatically mitigate these emissions as the world goes from an already disastrous one degree of global heating to 1.5 and two degrees and beyond, if we let it. The good news is the solutions exist. Matt Grace has been a sustainable buildings and communities consultant in both the UK and Canada for going on 30 years now. He was the Canada Green Building Council's Green Building Pioneer Award, recipient of 2018. He's a past Hub Board member and co-chair, is now a current board member of Alberta Ecotrust and Green Economy Calgary. He's also a good friend. Matt Grace, welcome to the Climate Lens.

02:15 - 02:16

MG: Thank very much.

02:16 - 02:28

SB: So maybe just give us a lay of the land. You know, I've set the foundation that this is a critical source of emissions to reduce. Where are we at on that? Where should we be at on that?

02:28 - 04:14

MG: Well, we're pretty dumb when we come to how we design most buildings. There are somewhere close to a couple of billion buildings already out there in the world. And various studies show that they're somewhere in the region of 40% of all of our emissions. Every study that you see there on our overall emissions impacts, the buildings, there is the biggest chunk of the pie and they do vary and it depends on how you measure it. So the problem that goes alongside that is we need more buildings. We need more places for people to live. There's a housing crisis in Calgary, as we know. So we have to build new things. We have to convert buildings. So we have to do more. But at the same time, this is a very, very significant, the

largest chunk of our emissions. But I do know that there are lots of proven routes to delivering carbon neutral, if not carbon positive. And when I when I say carbon positive, I mean this is a building that is actually sucking in, sequestering carbon rather than emitting carbon. There are lots of proven routes to that, that aren't necessarily more expensive, but perhaps they are a little bit more restrictive. So Passive House is been around for decades, started in Germany. If that's a term you're not familiar with, it is potentially slightly misleading because the word haus in German means any building, I believe. So it's come over. It's a literal translation to Passive House, and that's a very detailed, almost codified way of looking at every aspect of the building so that it can get down to net-zero.

04:14 - 04:21

SB: And the past, the passive refers to just passively taking in heat. Correct?

04:21 - 06:50

MG: Yeah, more or less. Pretty much so. So passive, there is a design concept called passive, where you try to minimize the amount of mechanical systems that are providing your heating and your cooling. I think it might be with a translation from German. And there are two separate things. There is a there is a codified approach called Passive House, there's a Passive House Alberta here, which does great work. And if you're looking at designing anything, a new home, a new multifamily residential, a new school, a new office building, you could follow this design code and it gives you very specific targets for each element that you build with: the windows, the walls, the roof, the overall air tightness of the building. So how much air is leaking in and out? And you have to meet all these targets as you're going along. There are Passive House certified products as well. And at the end of that, you get a very efficient building, which you would then put some solar panels on and bang, you've got a net-zero building. That's the concept. But I also want to mention as other frameworks, if anybody is interested in the potential of buildings to contribute to good, go and look at the Living Building Challenge. So Living Building Challenge or the LBC, has been around for a little while now and that started out on the West Coast. And I love this concept because it challenges the status quo and it says what we need to do is have buildings that have the baseline of zero harm and zero impact, and we build from that. So normally what we do, I'm going to look at two things briefly from the Living Building Challenge. One is the human health. If you say nothing when we're building a new building or you're doing a refurbishment, there is very little in any of the building codes that looks at potentially harmful materials off gassing from your walls and anything else you put in. And the Living Building Challenge says that is not good enough. if you cannot prove that the product is healthy or at least cause zero harm, you should not include it. And the second thing it does is it looks at the carbon side of things and it says the starting point should be zero emissions.

06:50 - 07:05

SB: Yeah. Okay. And then so a carbon positive building, how would you describe one of the technologies that's going to help draw down the carbon into the buildings and utilize it?

07:05 - 09:01

MG: I love that question. So in my role, I'm a I'm a professional engineer, I'm a lead fellow. And many, many times I get asked, you know, here's a shiny thing, here's a new product. Here's something. Is this good? Is this sustainable? Is this going to make my building greener? And unfortunately, or maybe fortunately, the answer to the question is always a little bit nuanced. And the answer depends on what you're trying to do with the building. And it also depends on what else is going on with the building. So I know you are keen to talk about heat pumps and there are various types of heat pumps. There's the air source heat pumps and the ground source heat pumps. And they're they're a fairly simple technology that they're using electricity to

drive heat from either inside the building, outside or the other way around. So you can use it for heating and cooling. It very much depends what else is going on in the design. So it's very rare that one technology or one product is going to be a good climate friendly solution for every building scenario. So a heat pump, for example, if you're designing to Passive House standards, and you have the opportunity to drill into the ground and do ground source heat pumps, you're going to have a really nice, well insulated, airtight building envelope. So the walls and the roofs and the window, then that could be your only or your prime heating and cooling source. And that would work fantasticall. If we then apply that thinking to a leaky 1950s condo, it's not going to be the right fit. We have to we have to look at the building as a whole. So heat pumps are a fantastic technology and a fantastic solution. When applied in the right context.

09:01 - 10:08

SB: It seems like there's quite a lot of buzz and an interest in heat pumps. I see a lot of people talking about it. I'm wondering if, you know, like when China decided to go heavy into solar, they invested a whole lot of money into it. And now solar is cheaper. That's how technology works. And then, you know, similarly, you know, you look at transportation, one of the big solutions everybody talks about is electric cars. And it seems like that's that might be, you know, a good short to medium term fix to our transportation issues. Are heat pumps going to go through the same kind of transition? I know America has invested heavily now over the last six months into heat pumps. Now we'll see what happens politically. I don't even want to get into all that mess, but are heat pumps sort of the next solar panel or electric car as far as the way the world is going?

10:08 - 10:55

MG: That's an interesting one. Heat pumps are fairly simple. They can look exactly the same if you're applying it to your house. They look exactly the same as your business unit. Most people might not know the difference. So the they in my mind, the simplest explanation, if someone is really not that interested, is it's like your air conditioning unit, but it can go backwards. It's great technology when applied in the right context. So for you and I, Steve, we both like cycling. We probably would not get that much benefit from getting a Tour de France high performance lightweight carbon bike. It's kind of lost on us, right? We should probably both lose 10 pounds first, and then maybe another ten.

10:55 - 10:55

SB: At least.

10:55 - 12:34

MG: And then train, and then maybe, you know, maybe that's the right technology for us. This is what I'm saying. So let's not put put something that's very, very nice technology in the wrong context. So I think if if you're going to have cooling in a residential setting, a heat pump is a great solution. They're not that much more expensive. They are widely misunderstood in the Alberta context, particularly on the single family residential, because people hear the wrong question. And I've had this experience with myself in my own home where usually someone will say to an HVAC installer, I want to put a heat pump in. And what that HVAC installer hears is I want to replace my gas furnace with a heat pump. Now, if you do not make the upgrades to how leaky your home is and how well insulated the walls are and how good your windows are, that is going to be quite expensive because the cost benefit of a heat pump of using electricity to heat your house compared to the natural gas that obviously depends on the efficiency of the heat pump unit compared to how much gas costs compared to electricity. And if we're looking at that from an emissions point of view, we can do the same thing with how much we get CO2 emissions from a kilowatt hour of gas compared with kilowatt hour electricity. So, and that ratio

is coming down all the time. Grid emissions from Alberta are dropping all the time.

12:34 - 12:34

SB: Because we got off of coal.

12:34 - 12:55

MG: So, the emissions of heat pumps is improving as we just phased out coal, which is great news. So yeah, I, I don't know if heat pumps are going to be the next PV solar because I think the technology is not following the same curve, but it's a fantastic technology in the right application.

12:55 - 14:26

SB: Like all things climate, there is a climate justice element to all this. It's easier for somebody who owns a home maybe to get a heat pump installed. It's easier for a wealthy person to own a home, to put anything they want into their house and drive whatever they like. But as far as for I'm a renter and I don't want to be an owner at any point soon. As far as the options for us, we're kind of limited. And I just want to mention an initiative by 350 Canada called Heat Pumps for All. They are calling on MPs across the country to champion a universal heat pump program overseen by a new publicly owned entity that produces, distributes and installs heat pumps in homes across the country. It's built in tenant protections. They're saying this program would save lives, cut bills and protect the planet. Do you think that is a viable step for or for, you know, folks in my position, folks who are renters, folks in apartment buildings, is that we need we need a federal boost, a full on program to get to get heat pump systems? You know, where they make sense, and increasingly I'm seeing that make sense in quite a lot of scenarios. What's your thoughts on that?

14:26 - 16:36

MG: I'm not a big fan of anything that pushes one technology single-mindedly. Because I think then we end up putting it in situations where it does not make sense. And then you also tend to get the occasional gaming of the system when you know it's never one solution fits all. So if in your your rental unit, the system needs to be replaced anyway, let's look at heat pumps. Let's see what works great. If even if you took two buildings that were absolutely identical, the sun is going to shine into the windows at different times because the location is going to be slightly different. One might be slightly closer to a railway line and just being half a block closer to a railway line or a busy street, that determines whether it's okay to open the windows or not open the windows, you may be slightly closer to the mechanical, so you might get different, different performance in terms of the noise vibration through the building. So every building is different. So it is a challenging aspect of, of equity and ethical treatment of everybody and equality. When we're saying you're a renter, you don't have control over what goes into your building, but you do have control over how you operate it. And in terms of your own energy use, you can buy a cheap meter to plug into a wall and see how much you're using. You can make sure you're not opening the window when you're running cooling, you can say, okay, it's going to be hot today. I'm going to leave my apartment. I'm going to pull the blinds down so it doesn't get too hot. So just turning things off has gone out of fashion. When I when I started off, that was the big drive, just like everyone had stickers, "Turn the lights off," and they were big campaigns to just turn things off. And the big part of anybody, whether you're an owner or a renter or you're just going through, can you turn things off? Are they not needed? It's a lot of it's really simple, but we're not we're not using many of the very, very basic things that we already have to reduce our climate footprint in buildings.

16:37 - 17:08

SB: Right back to heat pumps for just a second. Yeah. What are it seems that there's a lag perhaps on the contractor side. I keep hearing about people that that they're asking about it. And there and when they ask about it, they're being told, you know, they don't really work in cold climates or they're not really that good or is there something going on there or, you know, is that just a collection of stories I'm hearing or what are you hearing on that front?

17:08 - 17:29

MG: Well, yeah, I can I can talk about this for sure. So again, it has to be a building as a system. You can't pull you can't take a building that's designed to use with a gas furnace or even a lot of the old steam boilers and just plug in a heat pump. That's unlikely to work. There are various types of heat pumps. So you've got the air source heat pumps, which you'll see, and they look very much like an conditioning unit and they're just exchanging heat with the ambient environment. You get ground source heat pumps. They can either go deep down into the ground or you can actually get ones that go down into the ground and then a bit more horizontal.

17:48 - 20:28

MG: And they can they can be very effective. But you also can get a heat pump that is designed and optimized to use in very, very cold weather and in the in the states, in some of the cold areas of the states, they've now mandated that they have to work out. I think it's down to -30 centigrade. So the efficiency drops down as the temperature increases to go down in towards kind of -30. But there's still some heat there. But as we're getting closer down to the extreme cold temperatures, the efficiency or the coefficient of performance drops. So we're getting closer down to effectively, we might as well turn the air source heat pump off when we're getting extreme cold and just use direct electric resistance. So I think heat pumps are fantastic, but I really don't think there are a silver bullet. We need to design the building as a whole so that the heat pump has less work to do. So there are some really good technologies available, you know, some Alberta grown technologies which are quite sexy in buildings, there's a cool product, which Alberta Ecojustice put some some money in amongst others. There's a product, Calgary grown called CarbonX, a gentleman called Jason who is a plumber and he decided the plumbing industry should be able to do more for climate change. So he has developed a product that you can add to an existing building and it will it will suck out some of the carbon from the exhaust gas of the gas boiler and the product, the byproduct from that, you can make soap from it and you can make fertilizer from it. So that's grown in Calgary. There's another one called Carbon Upcycling, and they're developing a concrete technology to sequester carbon into the concrete. Another cool one I've seen is Z2S, they're doing a magnesium oxide board, which they're working out how to actually sequester into what you use instead of instead of drywall. So there are lots of exciting things out there which are not quite as interesting to look at generally because they're not as shiny and in the current press. But it's quite encouraging to see the number of products that are innovating and including a really strong element of of carbon sequestration. So they're carbon positive. They're actually bringing carbon out of the air and putting it into things that we have in our buildings.

20:28 - 21:18

SB: So, I mean, we know so much about the challenge that we face here in Canada and everywhere else. The buildings are a great big part of the challenge. What what's the big idea? How do we get across the finish line? What kind of what kind of policies are going to get us there? Like, we got to get we're trying to get to net-zero by 2050 and there's a whole lot of bad results if we don't do that. How are we going to get there? And buildings, what sorts of things are you excited about that are that really make the difference? And specifically, if there is a policy that you are interested in suggesting, you know, maybe at the federal level.

21:18 - 21:22

MG: Wow, am I able to enforce this right now?.

21:22 - 21:22

SB: Yeah, you have full power.

21:23 - 24:08

MG: I would actually be the self-appointed minister of turning things off first, and that would be my portfolio. I would actually have a team of people going around saying, "Could you turn that off?" So, jesting aside, but we need to use what we have smartly. Once we've done that, then we can have nice things and we can look at the existing building stock, which is happening now already. So Alberta Ecotrust has got some really strong initiatives there. And what we need to do is decarbonize every single existing building and that could include heat pumps, that could include solar panels, that could include renovations over many years. And the good news is that it's fairly well known and simple technology. It's fantastic for job creation. It makes the buildings more resilient to extremes of weather, which we're going to experience more. It makes them more comfortable, it makes them cheaper to run. And there's so many benefits. So we're only renewing buildings at a very low rate. It's something around 5% a year of new buildings. So we're not going to get that unless we look at all the buildings that we already have from a single family home to a duplex to an apartment building, the schools to the offices, retail, everything. And we systematically go through every building and we say, okay, how old are the windows? How old are the walls? What can we add in terms of insulation? Can we add, improve the roof. Can we put solar panels on the roofs? The heat pumps make sense. Are all the lights LED? What are the control systems? Are things on when they don't need to be? How leaky is the building? And systematically go through all the buildings that we have. So that would be my the second part of my federal portfolio. I would say every building owner needs to conduct a, have a funded decarbonization plan which includes a comfort study of the occupants, an education plan on how they fit into that, and roll that out. And that there are funding mechanisms available as well. The Canadian Infrastructure Bank has got money available for that. As I said in Alberta, Alberta Ecotrust is supporting that through this and the retrofit accelerator. So there's lots of help out there and there are lots of budding keen, budding contractors willing to help you with that that work.

24:08 - 24:59

SB: And then it seems like there's a lot of the climate fixes that we would like to implement here in Alberta, at the municipal level. It's kind of tough to get, you know, get to the the impactful kind of emissions on buildings we'd like to. The federal has the purse strings but also the provincial has control over things like, you know, the rules of what you build and how you build them. Is it another thing where we've got something of a provincial blockade getting in the way of us really addressing the building emissions component of our of our challenge?

24:59 - 25:52

MG: Green buildings, sustainable buildings, the carrot and the stick, the regulations, whether they're federal, municipal, provincial, those should be always be to pick up the the back end markets. That's the minimum standard. The carrot, the opportunity is for the the the owners and the developers that realize the benefits of going to net-zero, going net positive. They will have a cheaper building in the long run. If they're operating it, they will have a simpler building with less mechanical equipment in it. They'll have happier residents or occupants, and it will also be more resilient when we get when we get blackouts, when we get problems with the grid, where we get really strange weather patterns, if those buildings are designed properly and holistically, they're better all round.

25:53 - 26:10

SB: The Calgary Climate Hub has its advocacy campaign meeting coming up where we decide what things we're going to try to address over the coming year. What would you like to see as an advocacy campaign from the Calgary Climate Hub that would help on the buildings front?

26:10 - 26:53

MG: I would actually start with the tenants. I would say as a tenant, what are your rights? What are you, what are your expectations? So most people, I think they're happy to have a landlord that is reasonable and doesn't keep the rent up all the time. I think that would be a really powerful movement in Calgary, particular with the increase in rental properties. Anything where you're empowering tenants into what is a reasonable expectation of what questions you can ask and integrating that, what you can do as a tenant, simple things that you can do to influence on the space that you live in and the operation of the landlord.

26:53 - 26:59

SB: Matt Grace, thanks so much for coming on and sharing the wisdom. We'll have to keep this conversation going.

26:59 - 27:01

MG: Thank you very much. I appreciate the time. Thanks Steve.

Conclusion

27:01 - 29:16

SB: There's a few things from my interview with this month's guest that I didn't quite agree with. That's okay. We're still friends and I'm not a sustainable buildings expert. I'm a generalist, which I like to think allows me to pan back, to visit and revisit what I perceive to be the big picture. From a big picture perspective, knowing as we do, how heavy a role our buildings, our workplaces and our homes play in our overall emissions. I don't see how the governments of the world can avoid investing heavily in heat pumps for all citizens, not just some voluntary effort for the folks that can afford them. You want to tackle emissions. You have to go after the biggest targets, one of which is certainly how we heat and cool our buildings. But it's not just about bringing down our emissions or what we climate folk call mitigation. Mitigation is half our battle. Adaptation is the other half. Adaptation just means protecting our fellow humans, amongst other things, from the disastrous global heating we are already experiencing and which will get steadily, demonstrably worse in the years and decades to come until we've drawn down what needs drawing down from our atmosphere. Heat pumps, which will heat and cool buildings via electricity instead of gas or oil, are also tools of both mitigation and adaptation. One thing Canadians better have learned from the 2021 heat wave that killed 600 of our neighboring British Columbians in just a few weeks is that the status quo is not acceptable. I stand today with 350 Canada in asking my Member of Parliament for a federal government national heat pumps for all program, to protect all Canadians from when it's their turn under the heat dome. I also stand with a growing chorus of voices from across the country demanding protections for renters from life threatening heat temperatures in our homes. It will only get significantly hotter. A heat pump prevents a home from becoming an extreme heat death trap. If we care about our fellow Canadians, we'll do it, and the time is now.

Episode ending

29:16 - 29:51

SB: Well, that's about it for this episode of The Climate Lens, I thank our guests, sponsors, and volunteers that make this happen. And of course, you, the listener. Calgary Climate Hub is a volunteer-led nonprofit organization that unites a diverse group of Calgarians committed to working together to support meaningful local action on climate change. We represent a variety of communities industries, cultures and causes. We believe that a broad and diverse range of Calgarians and organizations need to be engaged of the climate crisis to develop impactful solutions that fit our unique political and economic circumstances.