

# Webinar

## Pumping Up Sustainability: Embracing Heat Pumps in Commercial Real Estate

Date: September 20, 2024

00:00:00 --> 00:00:03: All right, is a little past the hour, please.

00:00:03 --> 00:00:05: Welcome to U Lies.

00:00:05 --> 00:00:10: Pumping up sustainability, embracing heat pumps in commercial real estate.

00:00:11 --> 00:00:13: My name is Kara Kokernak.

00:00:13 --> 00:00:16: I'm a senior director in the Center for Sustainability with a focus on thought leadership.

00:00:16 --> 00:00:18: And I'm really excited to moderate this panel today.

00:00:18 --> 00:00:22: Before we get in and introduce our amazing panel of great experts, I wanted to make everyone on the webinar aware, if you are not already about you allies net

00:00:24 --> 00:00:27: 0 mission priority.

00:00:27 --> 00:00:31: I find it quite interesting that some folks don't even

00:00:31 --> 00:00:35: know we have a net 0 mission priority that really

00:00:35 --> 00:00:36: focuses on decarbonizing the real estate sector and accelerating our

00:00:36 --> 00:00:40: progress to net zero.

00:00:40 --> 00:00:43: So a lot of our content and our Center for

00:00:43 --> 00:00:47: sustainability comes out about how to do that, how to

00:00:48 --> 00:00:49: make the business case for green buildings and attaining net

00:00:49 --> 00:00:52: net 0.

00:00:52 --> 00:00:55: And we do that in a very specific way.

00:00:55 --> 00:00:59: And if you have been on any type of webinar

00:00:59 --> 00:01:03: presentation with me or are you a LIE team, you

00:01:03 --> 00:01:06: have seen this graphic that we have updated it.

00:01:06 --> 00:01:08: This is how you LIE defines the journey to net

00:01:08 --> 00:01:11: zero.

00:01:12 --> 00:01:15: We define net zero or net zero building portfolio or

00:01:15 --> 00:01:19: net zero building as one that is highly efficient and

00:01:19 --> 00:01:23: fully powered by on site and off site renewable energy

00:01:23 --> 00:01:27:

00:01:27 --> 00:01:28: sources and offsets.

00:01:29 --> 00:01:32: And this journey can take us through energy efficiency, making

00:01:32 --> 00:01:35: sure your building is up to date with the latest

00:01:35 --> 00:01:39: systems, most energy efficient systems, most energy efficient building envelope.

00:01:39 --> 00:01:42: And then we move on to what can your building

00:01:42 --> 00:01:44: attained in terms of on site renewables.

00:01:44 --> 00:01:46: What type of roof space do you have?

00:01:46 --> 00:01:48: Are you utilizing geothermal?

00:01:48 --> 00:01:50: We're going to talk a little bit about that later

00:01:50 --> 00:01:51: today.

00:01:51 --> 00:01:56: And then #3 being grid interactivity, working with utilities on

00:01:56 --> 00:02:01: demand response programs and also electric your building or portfolio.

00:02:01 --> 00:02:03: We're also going to be talking about that quite a

00:02:03 --> 00:02:03: bit today.

00:02:04 --> 00:02:08: And then moving on to the remaining emissions being offset

00:02:08 --> 00:02:12: by off site renewables, wrecks or other offsets.

00:02:12 --> 00:02:15: And then at the end, I call it last but

00:02:15 --> 00:02:19: not least, but very important is making sure that owners

00:02:19 --> 00:02:22: and tenants are aligned on their ESG and sustainability and

00:02:23 --> 00:02:24: net zero goals.

00:02:24 --> 00:02:27: So both building user and building owner are moving in

00:02:27 --> 00:02:28: the same direction.

00:02:29 --> 00:02:31: And then last on that list, though sometimes we can

00:02:31 --> 00:02:32: shift it to the beginning.

00:02:32 --> 00:02:35: And I won't spend too much time on embodied carbon,

00:02:35 --> 00:02:39: but all the the carbon emissions associated with the development

00:02:39 --> 00:02:41: of a building or portfolio.

00:02:41 --> 00:02:45: So your transportation, your building materials, your construction sites.

00:02:45 --> 00:02:47: So this is what we consider our journey to net

00:02:47 --> 00:02:47: zero.

00:02:48 --> 00:02:52: Today's webinar is really focused on our recent report

00:02:52 --> 00:02:57: pumping up sustainability, myth busting heat pumps and commercial Real estate

00:02:57 --> 00:02:59: and we will drop in the chat a link to

00:02:59 --> 00:03:00: that report.

00:03:00 --> 00:03:03: I also have a link later on in the presentation.

00:03:04 --> 00:03:07: And right before I get into introducing our great panelists

00:03:07 --> 00:03:10: today, I wanted to let all the participants know that  
00:03:10 --> 00:03:12: we do have the chat open for Q&A.  
00:03:13 --> 00:03:16: There's not currently a separate Q&A box, but you're able  
00:03:16 --> 00:03:20: to chat direct questions to panelists, but I think we  
00:03:20 --> 00:03:23: would prefer you to chat those questions to everyone.  
00:03:24 --> 00:03:26: And then at the end of the session, probably about  
00:03:26 --> 00:03:29: 10 or 15 minutes to the hour, we will stop  
00:03:29 --> 00:03:29: for Q&A.  
00:03:29 --> 00:03:32: So you can add them during the conversation, we'll get  
00:03:32 --> 00:03:34: to them at the end or you can wait to  
00:03:34 --> 00:03:37: the end and we will address your comments in the  
00:03:37 --> 00:03:37: Q&A section.  
00:03:38 --> 00:03:42: So now I would love to introduce our fantastic group  
00:03:42 --> 00:03:43: of panellists.  
00:03:43 --> 00:03:45: Here you can wave and say hello.  
00:03:45 --> 00:03:47: We are all spotlight to our webinar.  
00:03:47 --> 00:03:53: Jonathan Arnold, Principal at Arnold Development, Laura  
00:03:53 --> 00:03:58: Humphrey, Senior Director  
00:03:58 --> 00:03:58: of Energy and Sustainability at L&M Development Partners  
00:03:58 --> 00:04:02: and Stet  
00:03:58 --> 00:04:02: Sanborn, VP Director of Climate Impact at Smith Group.  
00:04:04 --> 00:04:07: And really quickly, I was going to ask one of  
00:04:07 --> 00:04:12: our panelists to do a little, you know, quick explanation  
00:04:12 --> 00:04:15: of what is a heat pump and how does it  
00:04:15 --> 00:04:15: work.  
00:04:15 --> 00:04:17: But let me tell you what I was afraid of  
00:04:17 --> 00:04:20: that we'd get too deep into the technical side of  
00:04:20 --> 00:04:20: heat pumps.  
00:04:20 --> 00:04:23: And I was like, we'll hold that off a little  
00:04:23 --> 00:04:25: bit until later in the conversation.  
00:04:25 --> 00:04:27: So I just wanted to get a quick overview with  
00:04:27 --> 00:04:30: this graphic and explain for folks on the call or  
00:04:30 --> 00:04:33: folks on the webinar who don't know what a heat  
00:04:33 --> 00:04:34: pump is.  
00:04:34 --> 00:04:38: Heat pumps are a building system and it's able to  
00:04:38 --> 00:04:40: both heat and cool spaces.  
00:04:40 --> 00:04:45: Heat pumps offer electric low carbon alternatives to gas  
00:04:45 --> 00:04:47: furnaces,  
00:04:45 --> 00:04:47: boilers and air conditioning or AC units.  
00:04:48 --> 00:04:50: So they act as an all in one heating and  
00:04:50 --> 00:04:54: cooling mechanism that runs in both modes of operation.  
00:04:54 --> 00:04:57: So when the weather is warm, air source heat pumps  
00:04:57 --> 00:05:01: function as traditional air conditioning units, pumping heat out

of  
00:05:01 --> 00:05:04: a building to circulate cold air inside a building.  
00:05:04 --> 00:05:07: And when the weather is cold, they change the direction  
00:05:07 --> 00:05:10: of the refrigerant flow, drawing heat from the outside into  
00:05:10 --> 00:05:11: the building.  
00:05:11 --> 00:05:14: So yes, there is heat outside even when the temperature  
00:05:14 --> 00:05:16: is colder than colder outside than inside.  
00:05:16 --> 00:05:19: Which is a little fun fact about air temperature and  
00:05:19 --> 00:05:21: indoor air quality too.  
00:05:21 --> 00:05:24: Ground source and water source heat pumps, which we'll be  
00:05:24 --> 00:05:27: talking a little bit about today, operate the same way,  
00:05:27 --> 00:05:30: but they transfer heat from the ground or the water  
00:05:30 --> 00:05:32: regardless of the energy source.  
00:05:32 --> 00:05:35: The process does use refrigerant and a compressor to move  
00:05:35 --> 00:05:38: the heat from one location to the other.  
00:05:38 --> 00:05:41: So that's sort of your real quick heat pumps one  
00:05:41 --> 00:05:43: O 1 on what we're talking about here.  
00:05:44 --> 00:05:48: But what we really want to focus today's conversation on  
00:05:48 --> 00:05:51: is again, that report and in that report, we framed  
00:05:52 --> 00:05:55: heat pumps as busting myths that you often hear about  
00:05:55 --> 00:05:56: heat pumps.  
00:05:56 --> 00:05:59: So heat pumps have been around for decades.  
00:05:59 --> 00:06:02: Folks have used heat pumps in their building successfully.  
00:06:02 --> 00:06:04: I mean all types of buildings.  
00:06:04 --> 00:06:07: But there is there have been some myths about heat  
00:06:07 --> 00:06:10: pumps that we chose to debunk or bust.  
00:06:10 --> 00:06:14: This list here are all very detailed in the report.  
00:06:14 --> 00:06:17: So #1 being that heat pumps are not cost effective,  
00:06:18 --> 00:06:21: my utility bill will go up by switching to heat  
00:06:21 --> 00:06:24: pumps #2 Heat pumps are not a viable option for  
00:06:24 --> 00:06:26: properties in cold climates.  
00:06:26 --> 00:06:30: Not true #3 Heat pumps are not commercially proven.  
00:06:30 --> 00:06:33: They are too new #4 Heat pumps are only for  
00:06:33 --> 00:06:37: single family homes or small commercial and don't work for  
00:06:37 --> 00:06:40: mid rise, high rise or industrial properties.  
00:06:40 --> 00:06:44: We're going to show a few examples today that bust  
00:06:44 --> 00:06:48: that myth #5 Heat pumps can only be implemented in  
00:06:48 --> 00:06:54: new construction, not in retrofits or renovations #6 Electric  
heat  
00:06:54 --> 00:06:57: pumps do not heat as well as gas systems #7  
00:06:57 --> 00:07:00: that there is only one type of heat pump.  
00:07:01 --> 00:07:03: And #8 heat pumps are just too loud and take

00:07:03 --> 00:07:06: up too much space to make them an effective choice.

00:07:06 --> 00:07:08: So those are all the myths that we bust in

00:07:08 --> 00:07:08: the report.

00:07:08 --> 00:07:11: And if you want more detail on them, please read

00:07:11 --> 00:07:11: the report.

00:07:11 --> 00:07:13: Let us know if you have any questions.

00:07:13 --> 00:07:16: But we're going to take a few of these myths

00:07:16 --> 00:07:19: and do a deep dive today with our guest panelists

00:07:19 --> 00:07:22: and talk about why this is not true and some

00:07:22 --> 00:07:25: success they've had with sharing some case studies and examples.

00:07:26 --> 00:07:30: So we're not going to hop into every single myth,

00:07:30 --> 00:07:32: but the first one we are going to talk about

00:07:33 --> 00:07:33: is myth 1.

00:07:34 --> 00:07:37: Heat pumps are not cost effective and my utility bill

00:07:37 --> 00:07:39: will go up by switching to heat pumps.

00:07:40 --> 00:07:43: So Jonathan, let's let's bust that myth and tell us

00:07:43 --> 00:07:47: about some of the work you're doing at Arnold Development

00:07:47 --> 00:07:48: Group.

00:07:48 --> 00:07:48: Sure.

00:07:50 --> 00:07:50: Thank you, Karen.

00:07:52 --> 00:07:57: So the Arnold Development Group, we've been working on reaching

00:07:57 --> 00:08:01: net zero for 22 years and we focus on transit

00:08:01 --> 00:08:06: oriented high performance buildings built now to the passive House

00:08:06 --> 00:08:09: standard with the mixed income components.

00:08:10 --> 00:08:18: Next slide project that we finished in 2020 is 276

00:08:18 --> 00:08:24: units transit oriented in Kansas City.

00:08:25 --> 00:08:29: It went on to win the NAA National Apartment Association's

00:08:29 --> 00:08:31: award for the best new construction community.

00:08:32 --> 00:08:36: One of the things that this project did was embraced

00:08:36 --> 00:08:38: envelope efficiency first and foremost.

00:08:39 --> 00:08:42: And so we've really reduced our heating and cooling loads

00:08:42 --> 00:08:46: by following the Passive House standard, which is basically super

00:08:47 --> 00:08:51: insulate your envelope, use great windows to eliminate thermal bridges.

00:08:51 --> 00:08:54: And then by doing that, you you reduce the amount

00:08:54 --> 00:08:56: of heating and cooling you need to start with to

00:08:56 --> 00:08:57: be doing.

00:08:57 --> 00:08:59: So if you look at our roofs, you can kind

00:08:59 --> 00:09:01: of see the small boxes.

00:09:01 --> 00:09:03: Those are the heat pumps that are needed to heat  
00:09:03 --> 00:09:04: the coolest building.  
00:09:04 --> 00:09:06: And one of the things that that does it frees  
00:09:06 --> 00:09:09: up a tremendous amount of roof space to do other  
00:09:09 --> 00:09:09: things.  
00:09:09 --> 00:09:11: You can see we've got rooftop gardens.  
00:09:11 --> 00:09:14: We have about 55,000 square feet of outdoor space on  
00:09:14 --> 00:09:18: the building, in part because we didn't need to fill  
00:09:18 --> 00:09:22: up our roofs with too many air conditioning units.  
00:09:22 --> 00:09:22: Next slide.  
00:09:29 --> 00:09:33: So we are huge proponents of building buildings that last  
00:09:34 --> 00:09:34: a long time.  
00:09:34 --> 00:09:38: And so we really rail against this hyper focus on  
00:09:38 --> 00:09:42: lowest first cost and really looking at the total building,  
00:09:42 --> 00:09:44: how is it going to operate?  
00:09:45 --> 00:09:47: And so we don't build out of stick.  
00:09:47 --> 00:09:50: We we've seen too many, you know, water and, and  
00:09:50 --> 00:09:51: mold issues happening.  
00:09:51 --> 00:09:55: Instead, we we build a more resilient materials, mainly  
00:09:55 --> 00:09:56: precast  
00:09:55 --> 00:09:56: concrete panels.  
00:09:57 --> 00:10:00: So instead of building really thin walls and large air  
00:10:00 --> 00:10:03: conditioners and and heaters that run all the time, our  
00:10:03 --> 00:10:04: walls are super thick.  
00:10:04 --> 00:10:07: We have tiny little heaters that barely have to run.  
00:10:07 --> 00:10:11: And so we've got tremendous energy savings in addition,  
00:10:11 --> 00:10:16: because  
00:10:11 --> 00:10:16: we're not building buildings that are combustible, our  
00:10:16 --> 00:10:19: insurance premiums  
00:10:16 --> 00:10:19: are half of what a stick built building is.  
00:10:19 --> 00:10:22: And so by we, we figured out a way to  
00:10:22 --> 00:10:25: capture both the energy savings and the insurance savings.  
00:10:25 --> 00:10:28: And then we use ITC and and IRA, all of  
00:10:29 --> 00:10:33: the incentives that are now in the Inflation Reduction Act  
00:10:33 --> 00:10:36: to help finance these projects efficiently.  
00:10:37 --> 00:10:38: Next slide.  
00:10:43 --> 00:10:47: So just a little deeper dive comparing second of Delaware  
00:10:47 --> 00:10:50: to a glass high rise building built at the same  
00:10:50 --> 00:10:53: time the same climate, you can see that there's just  
00:10:53 --> 00:10:57: an order of magnitude reduction that you can get by.  
00:10:57 --> 00:10:59: First, just focusing on envelope.  
00:11:00 --> 00:11:04: And we think that we really need to move away  
00:11:04 --> 00:11:08: from glass boxes and more to energy efficient skins.

00:11:08 --> 00:11:09: Next slide.

00:11:12 --> 00:11:16: So diving into heat pumps, specifically when it comes to

00:11:16 --> 00:11:20: the ITC, one of the things that we recently discovered

00:11:21 --> 00:11:24: and we're super excited about is the fact that when

00:11:25 --> 00:11:29: you combine a geothermal system with a heat pump system,

00:11:29 --> 00:11:33: you can actually pick up investment tax credits.

00:11:33 --> 00:11:36: And those investment tax credits are normally, we think about

00:11:36 --> 00:11:39: those for solar, only, solar, rooftop solar.

00:11:39 --> 00:11:44: Now what's happened with the Inflation Reduction Act is if

00:11:44 --> 00:11:49: you combine a heat pump with a geothermal system, you

00:11:49 --> 00:11:53: can pick up easily up to 40% ITC tax credit.

00:11:53 --> 00:11:54: And so we've got two columns here.

00:11:54 --> 00:11:55: 1 is for market rate.

00:11:56 --> 00:12:00: This is for a high rise historic adaptive reuse in

00:12:00 --> 00:12:03: a in a kind of complex site.

00:12:03 --> 00:12:06: So the first cost is going to vary a lot

00:12:06 --> 00:12:08: based on your project.

00:12:09 --> 00:12:11: You might not have \$34,000 in first cost.

00:12:11 --> 00:12:14: I just picked a project we're working on.

00:12:14 --> 00:12:17: And so don't run to the hills when you're seeing

00:12:17 --> 00:12:18: that first cost.

00:12:18 --> 00:12:20: This is very expensive project.

00:12:20 --> 00:12:22: I picked kind of a difficult one, if you will.

00:12:23 --> 00:12:26: So if we take the market rate at \$34,000 and

00:12:26 --> 00:12:29: you take the investment tax credits, you have a base

00:12:30 --> 00:12:31: tax credit, 30%.

00:12:31 --> 00:12:33: If you buy things that are built in America, you

00:12:33 --> 00:12:35: can add 10% on to that.

00:12:35 --> 00:12:36: So that's 40%.

00:12:37 --> 00:12:40: And then the 45 L tax credit, I assumed that

00:12:40 --> 00:12:43: we're not doing prevailing wage.

00:12:43 --> 00:12:46: And so that's \$1000 tax credit that you get for

00:12:46 --> 00:12:47: the project.

00:12:49 --> 00:12:53: And then there's ADOE heat pump that is state by

00:12:53 --> 00:12:57: state rebate program that for most projects that kind of

00:12:57 --> 00:13:01: fall into that \$4000 range if you were doing A4

00:13:01 --> 00:13:03: bullet double S to 8000.

00:13:04 --> 00:13:07: So you can see where when you take all of

00:13:07 --> 00:13:10: these tax credits, you can drop that \$34,000 down to

00:13:10 --> 00:13:11: 15,000.

00:13:12 --> 00:13:14: On the low to moderate income side, you get additional

00:13:14 --> 00:13:17: tax credits in the form of low income housing tax  
00:13:17 --> 00:13:17: credits.  
00:13:17 --> 00:13:21: And one of the things that the Inflation Reduction Act  
00:13:21 --> 00:13:23: did is it allowed you to use both of those  
00:13:23 --> 00:13:26: tax credits and not have to choose one or the  
00:13:26 --> 00:13:27: other.  
00:13:27 --> 00:13:31: And so for a low to moderate income project, you  
00:13:31 --> 00:13:35: can see the cost of your heat pump per unit  
00:13:35 --> 00:13:36: is \$23.  
00:13:36 --> 00:13:37: I mean, it's basically free.  
00:13:37 --> 00:13:40: And so there's no reason why a low to moderate  
00:13:41 --> 00:13:45: income project today with the tax credits that are available  
00:13:45 --> 00:13:49: should not be doing geothermal plus heat pumps next.  
00:13:50 --> 00:13:54: Just a quick note there, \$23, I mean that's busting  
00:13:54 --> 00:13:56: the meth right out of anywhere.  
00:13:56 --> 00:13:59: So I really appreciate you sharing Jonathan these these  
00:13:59 --> 00:14:00: details  
00:14:00 --> 00:14:01: and numbers.  
00:14:01 --> 00:14:01: So thank you for that.  
00:14:04 --> 00:14:06: So we're going to get into a couple more numbers.  
00:14:06 --> 00:14:10: So stepping back out now at the building scale, we've  
00:14:10 --> 00:14:15: compared conventional stick cost at \$223 a foot.  
00:14:15 --> 00:14:18: Two of our passive has concrete cost of 252.  
00:14:19 --> 00:14:22: So we're spending \$29.00 more per square foot.  
00:14:22 --> 00:14:23: OK.  
00:14:24 --> 00:14:27: But what we've also discovered is that most people, most  
00:14:28 --> 00:14:31: people won't pay more to live in a green building.  
00:14:31 --> 00:14:33: We've kind of made that as a baseline assumption, but  
00:14:33 --> 00:14:35: they don't expect to pay less.  
00:14:35 --> 00:14:38: So if someone comes into our leasing center and across  
00:14:38 --> 00:14:41: the street there's a one bedroom for \$1500 and in  
00:14:41 --> 00:14:45: our building we'll say we'll rent you that same \$1500  
00:14:45 --> 00:14:48: unit, but across the street you're paying \$200 in utilities.  
00:14:49 --> 00:14:53: Here you pay a \$1700 and we'll pay the utilities.  
00:14:53 --> 00:14:55: It's the same cost.  
00:14:55 --> 00:14:59: The tenant loves it because they have one fixed bill  
00:14:59 --> 00:15:01: and, and it's consistent.  
00:15:01 --> 00:15:03: Especially seniors and people that are on fixed income, they  
00:15:03 --> 00:15:06: absolutely love this one bill they've got to pay.  
00:15:06 --> 00:15:08: But our cost is only \$73.00.  
00:15:08 --> 00:15:11: So we get if, if you look on the bottom  
00:15:11 --> 00:15:16: kind of full horizontal table, we get \$124.00 a month



00:15:16 --> 00:15:21: in additional revenue because of this energy efficiency savings, which

00:15:22 --> 00:15:25: is \$14188 per year times 276 units is \$410,000.

00:15:25 --> 00:15:28: If you put a cap rate of 5 1/2 on

00:15:28 --> 00:15:32: that, you have \$7.5 million of added value to the

00:15:32 --> 00:15:37: building or \$23 a foot, which is it's almost that

00:15:37 --> 00:15:39: \$29.00 in additional value.

00:15:40 --> 00:15:42: If you go up to the upper right, you've got

00:15:42 --> 00:15:44: the energy savings.

00:15:44 --> 00:15:48: But then when you look at the insurance savings that

00:15:48 --> 00:15:52: if you build a resilient non combustible building, which is

00:15:52 --> 00:15:56: another \$215,000 and you cap all of those savings at

00:15:56 --> 00:15:59: 5 1/2 percent, you are not only making up for

00:15:59 --> 00:16:02: the \$29.00 and additional dollars.

00:16:02 --> 00:16:04: You know this money that we spent on this better

00:16:04 --> 00:16:06: building, but you are having more profit.

00:16:06 --> 00:16:09: So the at the bottom, the easy math is you

00:16:09 --> 00:16:14: spend \$29.00, you get \$44.00 more in value, giving you

00:16:14 --> 00:16:15: \$15.00 more in profit.

00:16:15 --> 00:16:18: And so we really think that this is the way

00:16:18 --> 00:16:20: that we need to be thinking about how we re

00:16:20 --> 00:16:24: urbanize the country and and build going forward because it

00:16:24 --> 00:16:27: just makes both financial sense and environmental sense.

00:16:28 --> 00:16:30: I think that might be the end of my slides.

00:16:32 --> 00:16:32: It is.

00:16:32 --> 00:16:33: Thank you, Jonathan.

00:16:33 --> 00:16:37: Before we move on to myth #2, Stat or Laura,

00:16:37 --> 00:16:42: any other comments or stories to share about the cost

00:16:42 --> 00:16:47: effectiveness of heat pumps, feel free to hop.

00:16:47 --> 00:16:49: On in yeah, I would just add that the the

00:16:49 --> 00:16:52: efficiency first piece is so key and in a lot

00:16:52 --> 00:16:57: of buildings that are bumping up against an electrical service

00:16:57 --> 00:16:58: constraint.

00:16:59 --> 00:17:01: So we hear another myth that you always have to

00:17:01 --> 00:17:03: replace your electrical switch gear if you're going to do

00:17:03 --> 00:17:05: either a retrofit or upsize it like crazy for new

00:17:06 --> 00:17:06: construction.

00:17:07 --> 00:17:10: That same passive house approach, making tiny heat pumps

00:17:10 --> 00:17:12: also,

00:17:10 --> 00:17:12: you can pull that thread all the way up through

00:17:12 --> 00:17:14: your electrical infrastructure.

00:17:14 --> 00:17:17: And that's a key strategy to reducing the size of

00:17:17 --> 00:17:19: the infrastructure needed to support your project.

00:17:20 --> 00:17:22: And for folks that are bumping up against those limits

00:17:23 --> 00:17:25: on switch gear, Transformers or a feed from a utility

00:17:25 --> 00:17:28: that they're saying, oh, we can't get you power efficiency

00:17:28 --> 00:17:31: first really helps push down that peak connected load.

00:17:31 --> 00:17:33: And you might be able to avoid any of those

00:17:33 --> 00:17:34: upsizing to begin with.

00:17:34 --> 00:17:36: So it's, it's a triple win.

00:17:36 --> 00:17:39: It's tiny heat pumps, left refrigerant, but also less electrical

00:17:39 --> 00:17:42: infrastructure and less upstream things that we don't think of

00:17:42 --> 00:17:43: as our fault.

00:17:43 --> 00:17:45: You know, some big power plant needs to happen or

00:17:46 --> 00:17:47: a big growth in solar somewhere.

00:17:48 --> 00:17:49: Efficiency first.

00:17:49 --> 00:17:51: That thread is just a beautiful thread the further you

00:17:51 --> 00:17:52: pull it.

00:17:54 --> 00:17:55: Fantastic, Laura, any thoughts?

00:17:57 --> 00:18:00: Yeah, I agree with all the points made and thank

00:18:00 --> 00:18:02: you for walking us through that amazing project.

00:18:02 --> 00:18:05: And I think the only other thing to add is

00:18:05 --> 00:18:09: also consider what the alternatives would be.

00:18:09 --> 00:18:12: And a lot of times the alternatives are more expensive

00:18:12 --> 00:18:12: to operate.

00:18:12 --> 00:18:15: So if you are not on a natural or gas

00:18:15 --> 00:18:18: system or that would cost a lot to bring to

00:18:18 --> 00:18:22: your property, what are the other alternatives?

00:18:22 --> 00:18:24: Like on the East Coast, we have a lot of

00:18:24 --> 00:18:28: oil buildings and almost always it's an incredible payback to

00:18:28 --> 00:18:28: to electrify.

00:18:29 --> 00:18:31: Likewise around the country, we have a lot of buildings

00:18:31 --> 00:18:34: that have electric systems that are pretty much as as

00:18:34 --> 00:18:37: inefficient as they could be just because of that's what

00:18:37 --> 00:18:38: the technology is.

00:18:38 --> 00:18:41: And so another way to think about heat pumps just

00:18:41 --> 00:18:44: to simplify it is like it's a very energy efficient

00:18:44 --> 00:18:48: electric resistance, you know, alternative to electric

00:18:48 --> 00:18:50: resistance.

00:18:48 --> 00:18:50: It's just a really improved version of that.

00:18:50 --> 00:18:53: It's a really efficient way to do air conditioning.

00:18:53 --> 00:18:56: So if you're in a really cooling load dominated part

00:18:56 --> 00:18:59: of the country, you know, you can really simplify it

00:18:59 --> 00:19:01: like that and really just think about these heat pumps

00:19:01 --> 00:19:05: as an efficiency measure and putting aside even the electrification

00:19:05 --> 00:19:05: pieces.

00:19:07 --> 00:19:08: Fantastic.

00:19:08 --> 00:19:08: I love that.

00:19:08 --> 00:19:11: And that really speaks to, again, that efficiency thread, you

00:19:11 --> 00:19:11: know, talking about.

00:19:11 --> 00:19:14: That's your first step, making sure all your systems and

00:19:14 --> 00:19:16: your building itself is as efficient as possible.

00:19:17 --> 00:19:20: OK, let's move on to Myth 2.

00:19:20 --> 00:19:25: Heat pumps are not a viable option for properties in

00:19:25 --> 00:19:26: cold climates.

00:19:27 --> 00:19:29: So stat, I know you have some examples to share

00:19:29 --> 00:19:30: about this myth.

00:19:31 --> 00:19:31: Yeah.

00:19:31 --> 00:19:35: So I'd be happy to talk through through a bunch

00:19:35 --> 00:19:36: of options.

00:19:36 --> 00:19:39: So I think one of the myths that's overlaying a

00:19:39 --> 00:19:42: lot of these is that there's only one heat pump

00:19:42 --> 00:19:45: option, like it's either something or a heat pump.

00:19:45 --> 00:19:48: And the reality is there's 20 heat pump options.

00:19:48 --> 00:19:49: Like you can find a heat pump, they can do

00:19:49 --> 00:19:50: all sorts of things.

00:19:51 --> 00:19:53: So I wanted to go through and this is a

00:19:53 --> 00:19:56: little bit of an intersection between hard to retrofit and

00:19:56 --> 00:19:59: cold climates, the angst, but the market is changing really

00:19:59 --> 00:19:59: quickly.

00:20:00 --> 00:20:03: I would say in the last five years, we went

00:20:03 --> 00:20:06: from very almost no options in the retrofit market to

00:20:06 --> 00:20:08: now a whole host of them.

00:20:08 --> 00:20:12: And so when we see typical rooftop package units, which

00:20:12 --> 00:20:15: I'd say are most found in low rise, maybe two

00:20:15 --> 00:20:18: to four story buildings like commercial.

00:20:19 --> 00:20:21: It's a commodity product and it is as cheap as

00:20:21 --> 00:20:22: you can go.

00:20:23 --> 00:20:24: It used to be that you couldn't find a heat

00:20:24 --> 00:20:25: pump replacement for that.

00:20:26 --> 00:20:29: Not only can you now find them where it's either

00:20:29 --> 00:20:31: an all in one rooftop unit or VRF Plus do.

00:20:31 --> 00:20:34: As you know, VRF has been in the market forever.

00:20:34 --> 00:20:36: Turns out VRF has a heat pump.

00:20:36 --> 00:20:38: It uses a lot more refrigerant, but it's a heat

00:20:38 --> 00:20:38: pump.

00:20:39 --> 00:20:41: And so those options are totally on the market.

00:20:42 --> 00:20:45: The RTU or rooftop package unit, like the image in

00:20:45 --> 00:20:48: the middle upper part, those are coming on the market

00:20:48 --> 00:20:51: really quickly right now, even within the last year and

00:20:51 --> 00:20:51: a half.

00:20:52 --> 00:20:56: And there's an amazing challenge that DOE is leading right

00:20:56 --> 00:21:00: now to actually drive high efficiency cold climate retrofit

00:21:00 --> 00:21:01: RTU's

00:21:00 --> 00:21:01: into the market.

00:21:01 --> 00:21:03: And so my guess is by the middle of next

00:21:03 --> 00:21:06: year or the year after, you're going to see at

00:21:06 --> 00:21:10: least six more major manufacturers rolling out entire families

00:21:10 --> 00:21:13: of

00:21:10 --> 00:21:13: rooftop cold climate replacement heat pumps.

00:21:13 --> 00:21:15: And so the myth of, Oh my gosh, it's cold,

00:21:15 --> 00:21:17: we can't make things hot.

00:21:17 --> 00:21:21: Is is going to go out the window next?

00:21:22 --> 00:21:25: Can I just jump in there that that similarly to

00:21:26 --> 00:21:31: the RTU's, there's similar efforts happening in New York

00:21:31 --> 00:21:34: State

00:21:31 --> 00:21:34: and we think other places to do that for in

00:21:35 --> 00:21:36: unit heat pumps.

00:21:36 --> 00:21:39: So think about through the wall air conditioner.

00:21:39 --> 00:21:42: There's a lot of push, you know, especially being led

00:21:42 --> 00:21:45: by the New York City Housing Authority to find those

00:21:45 --> 00:21:48: kind of commodity products for heat pumps and they're

00:21:48 --> 00:21:49: already

00:21:48 --> 00:21:49: being implemented.

00:21:49 --> 00:21:52: So I agree, in the next one to two years

00:21:52 --> 00:21:55: there's going to be lots of other options.

00:22:01 --> 00:22:03: And then one of the things that I just wanted

00:22:03 --> 00:22:06: to highlight for when we look at cold climate is

00:22:06 --> 00:22:10: that it's also an opportunity, you know, Jonathan mentioned

00:22:10 --> 00:22:12: geothermal

00:22:10 --> 00:22:12: systems, which is essentially a heat pump that's using a

00:22:13 --> 00:22:15: more stable source than, you know, cold outside air using

00:22:15 --> 00:22:16: the ground.

00:22:17 --> 00:22:19: Cold climate also asks you to look for other unconventional

00:22:19 --> 00:22:21: places that you can steal heat from.

00:22:21 --> 00:22:25: So if you're in the multi family market or small

00:22:25 --> 00:22:29: commercial, like a like small commercial more on the

00:22:29 --> 00:22:32: education

00:22:29 --> 00:22:32: side, maybe like a gym or a rec center that

00:22:32 --> 00:22:34: has a lot of shower usage.

00:22:34 --> 00:22:37: Wastewater is a tremendous place to steal heat from.

00:22:37 --> 00:22:40: So in multifamily projects with all the shower usage, that's

00:22:41 --> 00:22:43: the biggest demand for heating is domestic hot water.

00:22:43 --> 00:22:45: It can be upwards of 40% of your load.

00:22:46 --> 00:22:49: There are systems now, there are sanitary water heat exchange

00:22:49 --> 00:22:51: systems or Swede systems.

00:22:51 --> 00:22:54: They literally are a heat pump that's connected to the

00:22:54 --> 00:22:55: wastewater line of your building.

00:22:56 --> 00:22:58: And so all that beautiful warm shower water that's leaving

00:22:58 --> 00:23:00: your building, it steals the heat right out of it,

00:23:00 --> 00:23:03: concentrates it and gives it back to you in domestic

00:23:03 --> 00:23:03: hot water.

00:23:04 --> 00:23:07: These systems in cold climates can be twice as efficient

00:23:07 --> 00:23:08: as an air source heat pump.

00:23:08 --> 00:23:11: So when you look at operational costs, it's super stable

00:23:11 --> 00:23:14: across the entire year because your waste from the shower

00:23:14 --> 00:23:16: is almost the same temperature year round.

00:23:17 --> 00:23:19: It gives you really consistent operating cost, very tiny heat

00:23:19 --> 00:23:22: pump because you're pulling heat from something that's

00:23:23 --> 00:23:24: already warm.

00:23:23 --> 00:23:24: So the heat pump doesn't have to be that big.

00:23:25 --> 00:23:29: So if you're space constrained, cost constrained, or utility

00:23:29 --> 00:23:32: cost constrained, a wastewater heat pump is an amazing source

00:23:32 --> 00:23:34: to especially in multifamily buildings.

00:23:35 --> 00:23:37: But it's like ideal in cold climates.

00:23:37 --> 00:23:40: If if I were doing anything north of Saint Louis,

00:23:40 --> 00:23:43: I'd say this is my go to system in multifamily

00:23:43 --> 00:23:44: for domestic hot water.

00:23:48 --> 00:23:49: Fantastic.

00:23:49 --> 00:23:51: I think we have a couple more slides, but I

00:23:51 --> 00:23:52: can move on set.

00:23:52 --> 00:23:53: Do you want to talk about these here or?

00:23:53 --> 00:23:56: Yeah, and and Jonathan touched on it a little bit,

00:23:56 --> 00:24:00: but another cold climate option that is getting a ton

00:24:00 --> 00:24:03: of attention now that you know, I was doing 20

00:24:03 --> 00:24:06: years ago in my own parents house is geothermal.

00:24:06 --> 00:24:09: And for cold climates, geothermal cannot be beat from a

00:24:09 --> 00:24:10: performance standpoint.

00:24:11 --> 00:24:14: Now with the investment tax credits supporting it from the

00:24:14 --> 00:24:16: cost first cost standpoint, it's kind of a no brainer  
00:24:16 --> 00:24:19: if you have the footprint, if you have the space,  
00:24:19 --> 00:24:20: more challenging in retrofits.  
00:24:21 --> 00:24:23: But there are a bunch of companies now that are  
00:24:23 --> 00:24:26: doing retrofit geothermal with directional bores.  
00:24:27 --> 00:24:30: So in your dense urban areas, even underneath buildings  
with  
00:24:30 --> 00:24:34: very small parking garage depths, they're actually able to do  
00:24:34 --> 00:24:36: below grade drilling operations.  
00:24:37 --> 00:24:40: In the example on the screen here, there's actually a  
00:24:40 --> 00:24:42: hospital that we're doing in a very cold climate that's  
00:24:42 --> 00:24:43: going full geothermal.  
00:24:44 --> 00:24:47: So even complex buildings, these are on the table and  
00:24:47 --> 00:24:50: the scale of these are getting much, much larger.  
00:24:50 --> 00:24:53: So it's not just your your house, you know, with  
00:24:53 --> 00:24:54: a couple three ton bores.  
00:24:54 --> 00:24:57: But now we're going up and we're seeing systems as  
00:24:57 --> 00:25:01: large as you know, 1000 tons, 5000 tons, full campuses.  
00:25:02 --> 00:25:04: So really great technology and cold climate.  
00:25:04 --> 00:25:06: And it gives you better performance in the summer as  
00:25:06 --> 00:25:07: well for cooling.  
00:25:07 --> 00:25:10: Because if you're in a mixed climate that gets really  
00:25:10 --> 00:25:13: hot during the the summer months, the ground is a  
00:25:13 --> 00:25:15: more stable source to dump heat into as well.  
00:25:15 --> 00:25:17: And so geothermal gives you a a Big Bang for  
00:25:17 --> 00:25:20: the buck both in summertime and winter time.  
00:25:22 --> 00:25:25: That's, that's a great segue that goes into our myth  
00:25:26 --> 00:25:26: #4 here.  
00:25:26 --> 00:25:29: So your example of a hospital setting this myth is  
00:25:29 --> 00:25:33: heat pumps are only for single family or small commercial  
00:25:33 --> 00:25:36: and don't work for mid rise, high rise or industrial  
00:25:36 --> 00:25:37: properties.  
00:25:37 --> 00:25:39: I mean, instead you just gave an example of a  
00:25:39 --> 00:25:42: hospital building that is disproving this myth.  
00:25:42 --> 00:25:46: Laura, you have some examples to share about Myth 4.  
00:25:46 --> 00:25:47: Please please share.  
00:25:49 --> 00:25:52: Sure and this is building on a lot of examples  
00:25:52 --> 00:25:54: already shared both sets and Jonathan's.  
00:25:55 --> 00:25:59: But L&M, you know, our favorite not, not that we  
00:25:59 --> 00:26:03: can pick our favorite heat pumps like favorite children, but  
00:26:03 --> 00:26:07: if we did it would be geothermal, don't tell air  
00:26:07 --> 00:26:08: source.

00:26:08 --> 00:26:12: And, and, and as a result, especially on new construction,  
00:26:12 --> 00:26:16: but even on retrofit, it's, it's our first, it's the  
00:26:16 --> 00:26:18: place we look to 1st.  
00:26:18 --> 00:26:21: Of course there's geology and especially where we develop  
mainly  
00:26:21 --> 00:26:24: in New York City, there's all sorts of things underground  
00:26:24 --> 00:26:26: like subways that can make it not feasible.  
00:26:27 --> 00:26:31: But but that aside, we're really leaning on this technology  
00:26:31 --> 00:26:35: because of its efficiency and its ability also to generate  
00:26:35 --> 00:26:39: hot water very efficiently within the with utilizing the same  
00:26:39 --> 00:26:40: wells.  
00:26:41 --> 00:26:44: So this is just one example of a community scale  
00:26:44 --> 00:26:47: development that we're working on, which is in East New  
00:26:47 --> 00:26:51: York and it's a redevelopment of an old hospital site.  
00:26:52 --> 00:26:56: There's some details about about this on the on the  
00:26:56 --> 00:26:58: side, but it's a 28 acre site.  
00:26:59 --> 00:27:03: It will have about over 2,000,000 square feet, mainly for  
00:27:03 --> 00:27:08: housing, over 2400 units of affordable and supportive  
housing as  
00:27:08 --> 00:27:12: well as re reinstating the the healthcare clinics that had  
00:27:13 --> 00:27:16: been there before in a new and improved space.  
00:27:16 --> 00:27:19: And all of these buildings will be on their own  
00:27:19 --> 00:27:22: geothermal system and will address all of the thermal loads  
00:27:22 --> 00:27:24: including domestic hot water.  
00:27:25 --> 00:27:27: So this This Is Us thinking big.  
00:27:27 --> 00:27:32: We have another community scale development in Queens  
that is  
00:27:32 --> 00:27:37: 32 acres similar in terms of the commercial and affordable  
00:27:37 --> 00:27:39: housing footprint.  
00:27:39 --> 00:27:42: And there we're using a district geocouple system.  
00:27:43 --> 00:27:47: So you know that that's a technology that we really,  
00:27:47 --> 00:27:51: we obviously really like and we think it really scales  
00:27:51 --> 00:27:51: very well.  
00:27:51 --> 00:27:53: But certainly the same could be true.  
00:27:53 --> 00:27:56: But air source if we'll see some examples of those  
00:27:56 --> 00:27:56: later.  
00:27:59 --> 00:28:00: Fantastic.  
00:28:02 --> 00:28:04: I have a couple of your slides in here if  
00:28:04 --> 00:28:05: you want to address this.  
00:28:05 --> 00:28:06: With Jonathan.  
00:28:06 --> 00:28:06: Any comments?  
00:28:07 --> 00:28:07: Yeah.  
00:28:07 --> 00:28:09: And this is kind of as you step into those

00:28:09 --> 00:28:11: larger scale systems, you know, we I've heard a lot  
00:28:11 --> 00:28:13: of like, oh, we don't have heat pumps that are  
00:28:13 --> 00:28:15: big for commercial buildings.  
00:28:15 --> 00:28:19: As somebody that mostly does large scale commercial  
buildings, I  
00:28:19 --> 00:28:21: can tell you that's not true that now we can  
00:28:21 --> 00:28:24: get heat pumps that scale up quite a bit.  
00:28:24 --> 00:28:28: So we have heat pumps that are typically modular and  
00:28:28 --> 00:28:30: going up to 1000 tons.  
00:28:30 --> 00:28:32: You know, that's kind of the point which you start  
00:28:32 --> 00:28:35: to switch over to heat recovery chillers and larger large  
00:28:35 --> 00:28:36: scale district systems.  
00:28:37 --> 00:28:39: But we have heat pumps now that are doing courthouses.  
00:28:39 --> 00:28:41: We have ones that are doing large commercial buildings.  
00:28:41 --> 00:28:44: We're doing, you know, large schools.  
00:28:44 --> 00:28:47: So I haven't done a project with natural gas on  
00:28:47 --> 00:28:50: it in probably 15 years and all the products that  
00:28:50 --> 00:28:52: I have available to me can hit that spot.  
00:28:53 --> 00:28:55: So I'd say the market, if you, if you think  
00:28:55 --> 00:28:59: there isn't a heat pump for that, I'd, I'd encourage  
00:28:59 --> 00:29:02: you to go to the HRI, you know, trade show,  
00:29:02 --> 00:29:03: walk the floor.  
00:29:03 --> 00:29:04: It is all heat pumps.  
00:29:04 --> 00:29:07: It is heat pumps, floor, ceiling, wall to wall.  
00:29:07 --> 00:29:09: You know, you'll take five days to walk through and  
00:29:09 --> 00:29:10: see all the heat pumps.  
00:29:11 --> 00:29:14: So the market is going is definitely pumping up with  
00:29:14 --> 00:29:16: heat pumps, so to speak.  
00:29:16 --> 00:29:19: But the scale issue I think is, is moot.  
00:29:19 --> 00:29:23: We can even see small modular heat pumps now that  
00:29:23 --> 00:29:24: are 170 ton modules.  
00:29:24 --> 00:29:26: So the scale.  
00:29:26 --> 00:29:29: The scale is there to match almost anything you're trying  
00:29:29 --> 00:29:29: to do.  
00:29:31 --> 00:29:36: Jonathan, any comments on the heat pumps are only for  
00:29:36 --> 00:29:38: single family small commercial?  
00:29:40 --> 00:29:43: Or just to reiterate that it's not been our experience.  
00:29:43 --> 00:29:46: I mean the project that I mentioned was that I  
00:29:46 --> 00:29:49: showed was 330,000 square feet of conditioned space.  
00:29:50 --> 00:29:53: We're now working on one with 650,000 square feet of  
00:29:54 --> 00:29:57: space in one building, all heat pump geothermal driven.  
00:29:58 --> 00:30:01: And the nice thing about the geothermal system is that



00:30:01 --> 00:30:04: it's a 2 pipe system as opposed to A4 pipe  
00:30:04 --> 00:30:08: system, so that you're you have less complexity, less less  
00:30:08 --> 00:30:11: pipe to maintain, and your first cost is lower.  
00:30:13 --> 00:30:16: And does that type of system help in a retrofit  
00:30:16 --> 00:30:17: situation as well?  
00:30:17 --> 00:30:19: I mean, that is our our next myth that we're  
00:30:19 --> 00:30:22: coming up here, which is heat pumps can only be  
00:30:22 --> 00:30:25: implemented in new construction, not in retrofits.  
00:30:26 --> 00:30:28: And I know, Jonathan, you have some examples of that  
00:30:28 --> 00:30:30: that you've already shared a little bit, but maybe you  
00:30:30 --> 00:30:32: could dig a little bit deeper into this piece.  
00:30:33 --> 00:30:33: Sure.  
00:30:33 --> 00:30:38: About half of our work is historic adaptive reuse and  
00:30:38 --> 00:30:43: on our last two projects that are retrofits, we've used  
00:30:43 --> 00:30:48: solar heat pumps both, both in combination with geothermal.  
00:30:50 --> 00:30:52: Any sort of retrofit is going to be dependent on  
00:30:52 --> 00:30:56: chase availability and and there are going to be some  
00:30:56 --> 00:30:57: limiting factors.  
00:30:57 --> 00:31:01: But the myth it's just says you know, this completely  
00:31:01 --> 00:31:02: cannot work is just false.  
00:31:03 --> 00:31:04: We do it all the time.  
00:31:06 --> 00:31:07: Laura Orstet.  
00:31:13 --> 00:31:14: You're on mute step.  
00:31:15 --> 00:31:17: I just echo all of that.  
00:31:17 --> 00:31:22: We're doing retrofits in entire campuses, building stand  
alone.  
00:31:23 --> 00:31:26: It's I don't know the the game, the name of  
00:31:26 --> 00:31:28: the game is there's a heat pump for that.  
00:31:30 --> 00:31:31: You can you can do it.  
00:31:32 --> 00:31:34: I love that there's there's a heat pump for that.  
00:31:34 --> 00:31:35: Fantastic.  
00:31:37 --> 00:31:40: OK, so the the last myth that we're going to  
00:31:40 --> 00:31:43: cover really in depth before we get into some final  
00:31:43 --> 00:31:46: thoughts and some Q&A from the panelists is myth #7  
00:31:46 --> 00:31:49: there is only one type of heat pump, which set  
00:31:49 --> 00:31:52: you just busted before we even got to it, that  
00:31:52 --> 00:31:54: there's a heat pump for that.  
00:31:55 --> 00:31:57: So let's talk about that a little bit more that,  
00:31:57 --> 00:31:59: you know, there's what you know, heat pumps.  
00:31:59 --> 00:32:01: There's not just one type.  
00:32:01 --> 00:32:05: There's multiple types of heat pumps for multiple types of  
00:32:05 --> 00:32:05: situations.

00:32:05 --> 00:32:07: And Laura, I know you have a couple examples able  
00:32:07 --> 00:32:08: to share as well.  
00:32:10 --> 00:32:12: Yeah, I mean, you know, none of this is news  
00:32:12 --> 00:32:15: for everyone who's been here so far, but this is  
00:32:15 --> 00:32:18: just a couple of snapshots of three of the developments  
00:32:18 --> 00:32:19: that we've built.  
00:32:20 --> 00:32:24: I think the oldest one is Beach Green 2, which  
00:32:24 --> 00:32:28: TCO D in 2019, which is a geothermal system.  
00:32:28 --> 00:32:31: Marcus Garvey extension, which is the one kind of along  
00:32:31 --> 00:32:33: the bottom is also geothermal.  
00:32:33 --> 00:32:34: That's phase one.  
00:32:34 --> 00:32:37: Phase 2 is being built now also be geothermal.  
00:32:37 --> 00:32:42: And then we also have Sendero Verde, which is the  
00:32:42 --> 00:32:46: building on the right, which uses the RF system.  
00:32:46 --> 00:32:50: And this is, I'll try to get the credential right.  
00:32:50 --> 00:32:55: It is the largest all electric passive house multi family  
00:32:55 --> 00:32:58: building in North America or or in the US I think  
00:32:58 --> 00:33:02: Vancouver like beat us like sort of recently.  
00:33:02 --> 00:33:04: So we kind of represent them, but in the US.  
00:33:05 --> 00:33:09: So certainly lots of options that and we're having success  
00:33:09 --> 00:33:11: at at all of these sites.  
00:33:12 --> 00:33:14: And just to if you want to go to the  
00:33:14 --> 00:33:18: next slide to talk about retrofit, this is I thought  
00:33:18 --> 00:33:20: this is kind of an interesting one to share.  
00:33:21 --> 00:33:25: Most of the times when we retrofit we have residents  
00:33:25 --> 00:33:28: in place, we almost never are doing.  
00:33:28 --> 00:33:32: I wish we could do adaptive reuse or work on  
00:33:32 --> 00:33:33: vacant buildings.  
00:33:33 --> 00:33:37: We haven't had that opportunity quite yet, but this is  
00:33:37 --> 00:33:40: a great example of a building where we were taking  
00:33:40 --> 00:33:43: an old, we're taking an old steam system.  
00:33:43 --> 00:33:49: We're replacing it completely with in unit air source heat  
00:33:49 --> 00:33:49: pumps.  
00:33:49 --> 00:33:53: So we call those package terminal heat pumps or PTHPS.  
00:33:54 --> 00:33:58: And you'll seeing in this picture is kind of cool  
00:33:58 --> 00:34:01: because you can see that we did EFIS, which is  
00:34:01 --> 00:34:04: exterior insulative cladding on the outside.  
00:34:04 --> 00:34:06: So you can see on the left the old brick  
00:34:06 --> 00:34:09: and on the right with the building will look like  
00:34:09 --> 00:34:10: with the insulation.  
00:34:10 --> 00:34:12: So that efficiency first.  
00:34:13 --> 00:34:15: And you can also see in that picture the louvers

00:34:16 --> 00:34:19: on the outside of that building and that's where the  
00:34:19 --> 00:34:22: package terminal heat pumps are getting the outdoor air to  
00:34:22 --> 00:34:24: do the heat exchange with.  
00:34:25 --> 00:34:27: And this is all done with residents in place the  
00:34:27 --> 00:34:28: entire time.  
00:34:28 --> 00:34:30: No one was vacated from their units.  
00:34:31 --> 00:34:33: I can't say it was always easy or pretty, but  
00:34:33 --> 00:34:36: we did it when we're and we're currently doing it.  
00:34:36 --> 00:34:39: So we're really pushing the envelope on what's possible in  
00:34:39 --> 00:34:41: lots of different situations.  
00:34:41 --> 00:34:44: And as I noted, for folks who are interested in  
00:34:44 --> 00:34:48: this type of application, definitely look at the program called  
00:34:48 --> 00:34:51: Cleaning for All that the New York City Housing Authority  
00:34:52 --> 00:34:52: is doing.  
00:34:53 --> 00:34:56: Because they're really trying to use their buying power as  
00:34:57 --> 00:35:00: the largest public Housing Authority in the country to get  
00:35:00 --> 00:35:04: manufacturers to create products that are easier to apply in  
00:35:04 --> 00:35:06: these types of situations.  
00:35:06 --> 00:35:09: And again, you know, they're out in the market right  
00:35:09 --> 00:35:09: now.  
00:35:09 --> 00:35:11: They're being tested and used.  
00:35:11 --> 00:35:13: So there's there's a lot that's going to change with  
00:35:13 --> 00:35:15: this package trouble heat pump market.  
00:35:19 --> 00:35:21: Great, fantastic.  
00:35:21 --> 00:35:23: So we we busted a bunch of myths.  
00:35:23 --> 00:35:26: We have some more in the report before we go  
00:35:27 --> 00:35:30: to the audience Q and AI have a few questions  
00:35:30 --> 00:35:33: for you all based on our conversation here.  
00:35:33 --> 00:35:37: So it was interesting to hear on one side that  
00:35:37 --> 00:35:40: there isn't just one type of heat pump, but then  
00:35:40 --> 00:35:44: there's also seems to be a little bit of favoritism  
00:35:44 --> 00:35:47: on what works best in certain situations.  
00:35:47 --> 00:35:51: So I'd like to hear from the three of you,  
00:35:51 --> 00:35:55: what is your favorite heat pump or project or success?  
00:35:55 --> 00:35:57: And if you can't pick a favorite child, I, I  
00:35:57 --> 00:35:59: want you to just try for us today.  
00:35:59 --> 00:36:01: Like where, where, where did you, you know, implement heat  
00:36:01 --> 00:36:03: pump technology in a project?  
00:36:03 --> 00:36:05: And you said, wow, you know, a plus.  
00:36:06 --> 00:36:08: This is this is the project I want to share.  
00:36:09 --> 00:36:10: Jonathan, do you want to start?  
00:36:13 --> 00:36:15: I think the the, the most, the project I'm most

00:36:15 --> 00:36:18: excited about if we're going to use this analogy is  
00:36:18 --> 00:36:19: in utero.  
00:36:19 --> 00:36:23: It's it's a project that we're under we're about to  
00:36:24 --> 00:36:28: start construction on and it is going to be geothermal  
00:36:28 --> 00:36:33: more than likely to district level 2 pipe system going  
00:36:33 --> 00:36:37: into a very simple heat pump system in each unit.  
00:36:37 --> 00:36:41: And the reason why I'm picking that is because if  
00:36:41 --> 00:36:45: you stick with a a standard heat pump as opposed  
00:36:45 --> 00:36:49: to a VRF, they typically are non proprietary so that  
00:36:49 --> 00:36:52: you can get anyone to work on them.  
00:36:53 --> 00:36:57: And it's the VRF systems in our experience.  
00:36:57 --> 00:37:00: Reason why that's not my favorite is it's sort of  
00:37:00 --> 00:37:01: like your car.  
00:37:01 --> 00:37:03: You used to be able to work on your own  
00:37:03 --> 00:37:03: car.  
00:37:03 --> 00:37:05: You used to be able to, you know, get in  
00:37:05 --> 00:37:06: the carburetor and clean it.  
00:37:06 --> 00:37:10: And now there's some computer that you don't have access  
00:37:10 --> 00:37:12: to and you have to bring it to one dealer.  
00:37:12 --> 00:37:17: And there could be a little bit of monopolistic tendencies  
00:37:17 --> 00:37:19: that, that show up.  
00:37:19 --> 00:37:22: So we like tried and true heat pumps, just standard  
00:37:22 --> 00:37:26: hook them up to a water source, super efficient because  
00:37:26 --> 00:37:28: we're in very hot and cold climate.  
00:37:30 --> 00:37:32: And so that, that's, that would be our pick.  
00:37:33 --> 00:37:36: And oh, and you get, you get the, all the  
00:37:36 --> 00:37:37: ITC tax credits on it.  
00:37:37 --> 00:37:40: And if you don't, if you do that, then you're  
00:37:40 --> 00:37:42: leaving a lot of money on the table.  
00:37:43 --> 00:37:44: Thank you for that reminder.  
00:37:44 --> 00:37:47: And I, I like your, your, your favorite being sort  
00:37:47 --> 00:37:50: of the tried and true easiest method so that you  
00:37:50 --> 00:37:52: know, more folks can get on board.  
00:37:52 --> 00:37:55: So that's really important when we're, we're talking about  
00:37:55 --> 00:37:58: technology  
00:37:58 --> 00:37:59: that, you know, we're, we're clearly busting myths for a  
00:37:59 --> 00:38:03: reason.  
00:38:03 --> 00:38:05: And the education piece is really important step.  
00:38:03 --> 00:38:05: Who is your favorite heat pump?  
00:38:06 --> 00:38:09: Oh man, I mean, I, I don't know if I  
00:38:09 --> 00:38:10: could name a favorite.  
00:38:10 --> 00:38:13: I have favorite for all the applications.

00:38:13 --> 00:38:17: I mean, definitely wastewater heat pumps are my, for me,  
00:38:17 --> 00:38:19: the gold standard for a multifamily.  
00:38:20 --> 00:38:23: I did a project years ago in Boulder, Co.  
00:38:24 --> 00:38:28: So cold climate, you know, high elevation cold climate, air  
00:38:28 --> 00:38:31: source heat pumps can struggle, but that wastewater heat  
pump  
00:38:31 --> 00:38:34: is just, you know, steady, really cheap hot water for  
00:38:34 --> 00:38:35: showers.  
00:38:36 --> 00:38:38: But I'll say on the other far end of the  
00:38:38 --> 00:38:42: spectrum, we have two projects on the Eastern seaboard that  
00:38:42 --> 00:38:45: are each over 1,000,000 square feet that we are doing  
00:38:46 --> 00:38:49: retrofits on high temperature water systems and buildings.  
00:38:50 --> 00:38:53: And so that market right now is kind of the  
00:38:53 --> 00:38:56: Holy Grail for CO2 heat pumps and that's next class  
00:38:56 --> 00:38:59: of CO2 heat pumps that are a little bit more  
00:38:59 --> 00:39:03: flexible on the temperatures that they work at, but they  
00:39:03 --> 00:39:07: they can become drop in replacements in that 170?? supply  
00:39:07 --> 00:39:08: water world.  
00:39:09 --> 00:39:12: So it's just really opening up options for the tough  
00:39:12 --> 00:39:13: to retrofit market.  
00:39:13 --> 00:39:16: So I'm super excited to see the growth in that  
00:39:16 --> 00:39:20: market because yeah, the city is those are the building,  
00:39:20 --> 00:39:23: the dense urban cities and cold climates.  
00:39:23 --> 00:39:25: These are the places that are quote hard and the  
00:39:25 --> 00:39:27: products are coming on the market now that that are  
00:39:27 --> 00:39:28: letting us do that.  
00:39:29 --> 00:39:29: Fantastic.  
00:39:30 --> 00:39:31: And Laura, what about you?  
00:39:31 --> 00:39:33: What is your your favorite system or favorite heat pump?  
00:39:35 --> 00:39:35: Yeah.  
00:39:35 --> 00:39:37: So again, hard to pick.  
00:39:37 --> 00:39:41: We're really enthusiastic about geothermal for all the reasons  
that  
00:39:41 --> 00:39:42: were said earlier.  
00:39:43 --> 00:39:46: But just to build on set, what might be my  
00:39:46 --> 00:39:49: favorite one in a year or two is the high  
00:39:49 --> 00:39:55: temperature, the innovations that are happening around  
circulating high temperature  
00:39:55 --> 00:39:56: of water.  
00:39:56 --> 00:39:59: And that's a lot in part because of things that  
00:39:59 --> 00:40:03: Jonathan was saying, which is that we all understand  
hydronic  
00:40:03 --> 00:40:06: lines, we all understand fan coil units.

00:40:06 --> 00:40:09: There's all these kind of basic kind of commodity parts  
00:40:10 --> 00:40:12: that we can leverage if we just change.  
00:40:12 --> 00:40:14: What's in the boiler room or what's on the roof?  
00:40:15 --> 00:40:17: And so I'm really excited about that.  
00:40:17 --> 00:40:20: Also, that allows us to reduce your refrigerant use  
dramatically  
00:40:20 --> 00:40:24: compared to running refrigerant lines through the building,  
which is  
00:40:24 --> 00:40:27: of critical importance because if a refrigerant leak could undo  
00:40:27 --> 00:40:30: any environmental benefit you might have made by putting in  
00:40:30 --> 00:40:33: the heat pumps, it's really important to monitor those.  
00:40:34 --> 00:40:37: The more packaged and I'm isolated those refrigerants are or  
00:40:37 --> 00:40:39: alternative refrigerants are used, the better.  
00:40:41 --> 00:40:42: So we're really looking at that.  
00:40:42 --> 00:40:45: And also, you know, in urban areas where we have  
00:40:45 --> 00:40:49: a lot of grid constraint, having a centralized unit that  
00:40:50 --> 00:40:54: we can control, potentially attach additional tanks to, to, to  
00:40:54 --> 00:40:58: do thermal storage and kind of protect ourselves from  
electric,  
00:40:59 --> 00:41:01: electric cost peaks and things like that.  
00:41:02 --> 00:41:03: I think they're all really promising.  
00:41:03 --> 00:41:07: It's new days, but I'm excited for that technology.  
00:41:08 --> 00:41:08: Thank you.  
00:41:08 --> 00:41:10: And I think it's great that all of your answers  
00:41:11 --> 00:41:13: really speak to the diversity and applicability of heat pumps  
00:41:13 --> 00:41:15: to so many different projects.  
00:41:15 --> 00:41:17: So there's a lot of favourites that we mentioned and  
00:41:17 --> 00:41:20: a lot of different applications with a lot of different  
00:41:20 --> 00:41:20: systems.  
00:41:21 --> 00:41:24: And that really speaks to the intention of this report  
00:41:24 --> 00:41:27: is to educate and share success stories so that folks  
00:41:27 --> 00:41:30: that are not comfortable or or still feel these myths  
00:41:30 --> 00:41:33: are are valid, can start to get comfortable with heat  
00:41:33 --> 00:41:36: pump technology and start to implement it on a wider  
00:41:36 --> 00:41:37: scale.  
00:41:37 --> 00:41:42: So with that, this is our deep dive into myth  
00:41:42 --> 00:41:44: busting heat pumps.  
00:41:45 --> 00:41:46: The QR code will take you to the report.  
00:41:46 --> 00:41:48: We also dropped it in the chat.  
00:41:48 --> 00:41:50: So please take a read.  
00:41:50 --> 00:41:52: We are going to take some Q&A right now.  
00:41:52 --> 00:41:54: The Q&A has been blowing up.  
00:41:54 --> 00:41:55: There's tons of questions there.

00:41:55 --> 00:41:59: So I'm hopeful that we'll get through most of them.

00:41:59 --> 00:42:01: We have about 15 minutes left, so I will go

00:42:01 --> 00:42:04: through them and then step Jonathan and Laura.

00:42:04 --> 00:42:07: Feel free to jump in and answer the question if

00:42:07 --> 00:42:07: you can.

00:42:08 --> 00:42:11: So the first one is from Carrie Tan.

00:42:11 --> 00:42:15: She agrees on the cost efficiency and payback and wants

00:42:15 --> 00:42:19: to know if anyone has insights on where the HVAC

00:42:19 --> 00:42:23: industry is on driving down the upfront purchase cost as

00:42:23 --> 00:42:28: the technology improves and there is more competition and

00:42:28 --> 00:42:28: or

00:42:28 --> 00:42:28: demand.

00:42:28 --> 00:42:33: And her question is specific to commercial office buildings on

00:42:33 --> 00:42:36: the West Coast, existing building stock.

00:42:39 --> 00:42:41: Well, I can jump in because I'm on the West

00:42:41 --> 00:42:42: Coast, so go West Coast, West Coast.

00:42:43 --> 00:42:46: But I will say that we're we are actually seeing

00:42:46 --> 00:42:47: prices stabilize.

00:42:47 --> 00:42:50: I'd say coming out of the pandemic just supply chain

00:42:50 --> 00:42:54: limits were causing all sorts of crazy pricing on HVAC

00:42:54 --> 00:42:57: equipment across the board and MEP equipment in general.

00:42:58 --> 00:43:00: But we're seeing prices on heat pump stabilize.

00:43:01 --> 00:43:02: They are.

00:43:02 --> 00:43:05: The heat pump market is new in terms of a

00:43:05 --> 00:43:08: commodity product for large commercial buildings.

00:43:08 --> 00:43:12: So the residential side I'd say it's a commodity product.

00:43:12 --> 00:43:13: It is out there, you can get a dime a

00:43:13 --> 00:43:14: dozen.

00:43:14 --> 00:43:18: The commercial sector for doing larger scale heat pumps I'd

00:43:18 --> 00:43:21: say is in probably year 2 of kind of that

00:43:21 --> 00:43:25: cost curve coming down and getting more to

00:43:27 --> 00:43:29: commoditization.

00:43:27 --> 00:43:29: I will say that five years ago when I was

00:43:29 --> 00:43:32: walking the show floor for HVAC equipment, you know, there

00:43:32 --> 00:43:35: was probably maybe 3 vendors that had heat pumps out

00:43:35 --> 00:43:38: and they were the, the names that you're very used

00:43:38 --> 00:43:38: to seeing.

00:43:39 --> 00:43:41: Last year when I walked the floor, every vendor, even

00:43:41 --> 00:43:44: vendors who have never made a heat pump in their

00:43:44 --> 00:43:46: life, they were bringing heat pumps to the market.

00:43:46 --> 00:43:49: So old gas boiler companies where they've made making gas

00:43:49 --> 00:43:53: boilers for 120 years, they were bringing heat pumps to

00:43:53 --> 00:43:54: the market.

00:43:54 --> 00:43:56: And so that rapid scale up of vendors that are

00:43:56 --> 00:43:59: playing the space, I think it's going to do 2

00:43:59 --> 00:44:00: things.

00:44:00 --> 00:44:02: It's going to help with the supply chain of getting

00:44:02 --> 00:44:05: more suppliers into the market, doing the small bits and

00:44:05 --> 00:44:08: pieces, but also that competition piece.

00:44:08 --> 00:44:10: When you have more than three people that you get

00:44:10 --> 00:44:11: to go talk to, prices are going to come down.

00:44:13 --> 00:44:15: Thank you, Stet, that's great.

00:44:15 --> 00:44:19: Our next question really refers back to myth #2 that

00:44:19 --> 00:44:23: heat pumps are not viable for properties in cold climates.

00:44:23 --> 00:44:27: David Marsh wants to know how do you define said

00:44:27 --> 00:44:30: cold climate and says that where where he is, they

00:44:30 --> 00:44:33: have -30??C temperature events in the winter.

00:44:34 --> 00:44:37: And one myth that he's heard of is that heat

00:44:37 --> 00:44:40: pumps do not work well beyond -20??C.

00:44:40 --> 00:44:42: And can someone speak to that?

00:44:45 --> 00:44:45: I'll jump in.

00:44:45 --> 00:44:49: I know Laura's got experience doing retrofits and cold

00:44:49 --> 00:44:54: climates.

00:44:49 --> 00:44:54: There are, there are classes of heat pumps that trip

00:44:54 --> 00:44:57: out at you know, 20??C so or -20 Celsius, so

00:44:57 --> 00:44:59: you know, 5??F.

00:45:00 --> 00:45:03: But the and so it's depend on which heat pump

00:45:03 --> 00:45:03: you pick.

00:45:04 --> 00:45:07: So there are heat pumps that are classified as cold

00:45:07 --> 00:45:08: climate heat pumps.

00:45:09 --> 00:45:12: Those ones are typically going to include inverter driven

00:45:12 --> 00:45:14: compressors

00:45:12 --> 00:45:14: and what we call enhanced vapor injection.

00:45:14 --> 00:45:17: So those are two technologies that live inside the heat

00:45:17 --> 00:45:20: pump that actually give it an extended range as outside

00:45:20 --> 00:45:21: temperatures go down.

00:45:22 --> 00:45:24: And so those those are in terms of being widespread

00:45:24 --> 00:45:27: in the market are really within the last three to

00:45:27 --> 00:45:27: four years.

00:45:28 --> 00:45:30: A lot of the legacy information that you have are

00:45:30 --> 00:45:33: based on sort of the last generation constant speed

00:45:33 --> 00:45:36: compressor

00:45:33 --> 00:45:36: heat pumps that just couldn't, doesn't really work down there.

00:45:36 --> 00:45:39: Now capacity and efficiency does drop with outside air temp

00:45:39 --> 00:45:40: when you have an air source heat pump.



00:45:41 --> 00:45:42: So I'm not going to try to tell you that  
00:45:42 --> 00:45:43: that doesn't occur, but it does.  
00:45:44 --> 00:45:46: But the new class of heat pumps have a much  
00:45:46 --> 00:45:49: wider operational window as you go South, especially within  
the  
00:45:49 --> 00:45:50: last three years.  
00:45:52 --> 00:45:52: Great.  
00:45:52 --> 00:45:53: Thank you.  
00:45:53 --> 00:45:56: Laura, any thoughts there on on very cold climates, I  
00:45:56 --> 00:45:57: guess we could say?  
00:45:58 --> 00:45:58: Yeah.  
00:45:58 --> 00:46:00: I mean, you know, I'll just point out that, you  
00:46:01 --> 00:46:03: know, I think nationally that Maine is actually like per  
00:46:03 --> 00:46:06: capita the highest adopter of heat pumps in a residential  
00:46:06 --> 00:46:08: setting than anywhere else.  
00:46:09 --> 00:46:10: So it's too cool for me up there.  
00:46:10 --> 00:46:13: But I think maybe it's somewhere that climate sound that  
00:46:13 --> 00:46:14: you're talking about.  
00:46:14 --> 00:46:17: And similarly, I think also Montreal and and Quebec have  
00:46:17 --> 00:46:20: like very, very high rates of adoption, in part because  
00:46:21 --> 00:46:23: they have a lot of electricity generation up there.  
00:46:23 --> 00:46:26: So, so I think, yeah, just building on sets, you  
00:46:26 --> 00:46:29: can see people doing this and, and building it.  
00:46:30 --> 00:46:32: That being said, I think there's a lot of interesting  
00:46:32 --> 00:46:35: things to think about around hybrid electrification.  
00:46:35 --> 00:46:38: I don't know if anyone's totally cracked the code on  
00:46:38 --> 00:46:41: this, but at least in New York City, you know,  
00:46:41 --> 00:46:44: our, our climate is changing before our eyes like everyone's  
00:46:44 --> 00:46:45: is.  
00:46:46 --> 00:46:51: So maybe it's not exactly the same climate that the  
00:46:51 --> 00:46:56: that the questioner had, but has, but we're seeing that,  
00:46:56 --> 00:47:00: you know, our, our heating degree days that are lower  
00:47:00 --> 00:47:04: than 20?? are in a condensed part of the year.  
00:47:05 --> 00:47:09: And so we're actually considering as an industry and as  
00:47:09 --> 00:47:12: as a kind of a city where we could apply  
00:47:12 --> 00:47:15: less costly heat pumps that don't go down quite so  
00:47:15 --> 00:47:19: much and then just use an ancillary system for, you  
00:47:19 --> 00:47:22: know, the 30 days out of the year where we  
00:47:22 --> 00:47:23: have to.  
00:47:23 --> 00:47:27: And then that would also help with demand response  
potentially  
00:47:27 --> 00:47:27: as well.  
00:47:28 --> 00:47:30: So I don't know if we've all cracked the code

00:47:30 --> 00:47:33: here in New York City, but it's definitely something that  
00:47:33 --> 00:47:36: we're looking at and that can help with upfront costs.  
00:47:38 --> 00:47:40: Yeah, Kara, I had, I can't remember if I shared  
00:47:40 --> 00:47:42: a slide, but I had one that had this crazy  
00:47:42 --> 00:47:43: graph on it.  
00:47:43 --> 00:47:47: And the idea was to show that sometimes the heat  
00:47:47 --> 00:47:51: pump isn't actually a a heater, it's changing out your  
00:47:51 --> 00:47:52: air conditioner.  
00:47:54 --> 00:47:56: No, I think the next one that had like a  
00:47:56 --> 00:47:56: bunch of colors.  
00:47:59 --> 00:47:59: You passed it.  
00:48:00 --> 00:48:00: I passed it.  
00:48:03 --> 00:48:05: I've been, I think, oh, there it is, there it  
00:48:05 --> 00:48:05: is.  
00:48:05 --> 00:48:08: So this is an example of a mixed climate zone  
00:48:08 --> 00:48:11: and we always think about air conditioning and heating as  
00:48:11 --> 00:48:12: these separate things.  
00:48:12 --> 00:48:15: But when you get to buildings of scale, heat recovery  
00:48:15 --> 00:48:18: chillers are a heat pump and your waste heat that  
00:48:18 --> 00:48:21: normally you dump through a cooling tower can actually  
offset  
00:48:22 --> 00:48:23: your heating load.  
00:48:23 --> 00:48:26: And so sometimes the retrofit is actually not adding a  
00:48:26 --> 00:48:29: heating system heat pump, it's actually changing your cooling  
system  
00:48:29 --> 00:48:30: to a heat pump.  
00:48:31 --> 00:48:33: And so in a lot of buildings that are dense,  
00:48:33 --> 00:48:36: dense commercial office buildings, they may not need that  
much  
00:48:36 --> 00:48:39: supplemental heat because there's so much heat that's  
generated in  
00:48:40 --> 00:48:43: the building from computers, laptops, IT equipment, AI, you  
know,  
00:48:43 --> 00:48:46: data racks that waste heat actually can be recaptured and  
00:48:46 --> 00:48:48: used to heat the building on the facade or the  
00:48:48 --> 00:48:49: perimeter zone.  
00:48:49 --> 00:48:52: So sometimes it's changing your mindset that you can  
actually  
00:48:52 --> 00:48:55: offset, you know, upwards of 30% of your heating load  
00:48:55 --> 00:48:58: actually by just changing out your cooling chiller to something  
00:48:58 --> 00:49:00: that can recapture that heat.  
00:49:01 --> 00:49:03: So all the yellow zone here on this graph is  
00:49:03 --> 00:49:06: actually showing where waste heat from the cooling system

can  
00:49:06 --> 00:49:07: offset your heating system.  
00:49:08 --> 00:49:10: So even in the dead of winter, you can reduce  
00:49:10 --> 00:49:12: your heating demand by say 20 or 30% just from  
00:49:13 --> 00:49:15: your own waste heat, which means maybe you keep your  
00:49:15 --> 00:49:18: boiler in place because it's just there to help with  
00:49:18 --> 00:49:21: some peaks and let the waste heat offset, you know,  
00:49:21 --> 00:49:23: the emissions from 80% or so of your, of your  
00:49:23 --> 00:49:24: heating.  
00:49:24 --> 00:49:26: So it's not always about adding the heat pump.  
00:49:26 --> 00:49:29: Sometimes it's actually about switching out an AC unit into  
00:49:29 --> 00:49:31: a heat pump that can do heat recovery.  
00:49:33 --> 00:49:34: Fantastic.  
00:49:34 --> 00:49:36: The new question, the next question is going to speak  
00:49:36 --> 00:49:37: to refrigerants.  
00:49:37 --> 00:49:40: I know that there's been some chatter in the chat  
00:49:40 --> 00:49:42: about this, but I wanted the whole group to hear  
00:49:42 --> 00:49:46: Erin Swain's question about new refrigerants and design  
implications of  
00:49:46 --> 00:49:47: new refrigerants.  
00:49:47 --> 00:49:50: Specifically, will CO2 be an option for a multi family  
00:49:50 --> 00:49:51: system?  
00:49:55 --> 00:49:57: Laura, I know you mentioned something in the chat, but  
00:49:57 --> 00:49:59: if you wanted to elaborate for the rest of the  
00:49:59 --> 00:49:59: group.  
00:50:00 --> 00:50:02: I could, but I'm going to throw it to stat  
00:50:03 --> 00:50:04: because I know that CO2 refrigerant.  
00:50:06 --> 00:50:06: Yeah.  
00:50:06 --> 00:50:09: So the refrigerants were in the middle of a transition.  
00:50:09 --> 00:50:11: If you haven't run into this, you're going to.  
00:50:11 --> 00:50:15: So we were all operating in 410-A134B refrigerants.  
00:50:16 --> 00:50:19: We're slowly in this coming year transitioning to the next  
00:50:19 --> 00:50:23: classification of what we call low global warming potential  
refrigerants.  
00:50:23 --> 00:50:26: So those are coming into the market, but the question  
00:50:26 --> 00:50:28: directly of like where is it going?  
00:50:28 --> 00:50:30: We are trying to move the entire industry to natural  
00:50:30 --> 00:50:31: refrigerants.  
00:50:31 --> 00:50:34: That is the goal, ultra low GWP refrigerants that are  
00:50:34 --> 00:50:37: PFAS free, which is a very persistent chemical that can  
00:50:37 --> 00:50:38: impact our bodies.  
00:50:39 --> 00:50:40: And so that's the drive.

00:50:41 --> 00:50:43: You know, it takes time to transition entire industry in  
00:50:44 --> 00:50:46: that direction, but you're going to see as codes and  
00:50:46 --> 00:50:49: standards get updated, you're going to see more mono block  
00:50:49 --> 00:50:51: heat pumps that can run on propane as a heat  
00:50:52 --> 00:50:53: pump or as a refrigerant.  
00:50:53 --> 00:50:55: Very low global warming potential.  
00:50:55 --> 00:50:56: It is flammable.  
00:50:56 --> 00:50:59: So it's not for every application, but you're going to  
00:50:59 --> 00:51:02: see more options in the market for ultra low GWP  
00:51:02 --> 00:51:03: refrigerants.  
00:51:03 --> 00:51:07: CO2 is, I would say, largely going to be isolated  
00:51:07 --> 00:51:10: to domestic hot water and very high temperature systems.  
00:51:11 --> 00:51:13: It's like you're not going to be pumping CO2 around  
00:51:14 --> 00:51:17: a building a ton, but in mono block equipment, absolutely.  
00:51:17 --> 00:51:18: It's a great refrigerant.  
00:51:22 --> 00:51:23: Fantastic.  
00:51:23 --> 00:51:23: Thank you, Stet.  
00:51:24 --> 00:51:27: A quick note that someone iPhone two said that he  
00:51:27 --> 00:51:28: pumps for the wind.  
00:51:28 --> 00:51:30: So that is a great pumping question.  
00:51:32 --> 00:51:37: Let's see, there is another good question in here that  
00:51:37 --> 00:51:42: hold on one second that talks about precast concrete was  
00:51:43 --> 00:51:46: mentioned versus stick built buildings.  
00:51:46 --> 00:51:48: Concrete has gotten a bad rap due to its high  
00:51:48 --> 00:51:50: carbon emissions content.  
00:51:50 --> 00:51:54: Is green concrete or low carbon concrete?  
00:51:54 --> 00:51:58: Is there green concrete or low carbon concrete there for  
00:51:58 --> 00:52:00: use in precast panels instead?  
00:52:00 --> 00:52:03: And from what I know, yes, we have a whole  
00:52:03 --> 00:52:06: study on embodied carbon and low carbon concrete.  
00:52:06 --> 00:52:09: So there are certainly options out there in the market.  
00:52:09 --> 00:52:10: I don't know if any of the three of you  
00:52:10 --> 00:52:14: have experience with utilizing low carbon concrete in your  
00:52:14 --> 00:52:16: projects  
00:52:14 --> 00:52:16: as well and if you can speak to that question.  
00:52:19 --> 00:52:23: So our understanding that you can specify certain types of  
00:52:23 --> 00:52:29: aggregate and replacements for like our high, intense, high  
00:52:29 --> 00:52:33: carbon,  
00:52:29 --> 00:52:33: intense materials like Portland cement with fly ash to reduce  
00:52:33 --> 00:52:38: the carbon footprint of concrete by at least 50% without  
00:52:38 --> 00:52:41: really adding cost to the to the the concrete.  
00:52:41 --> 00:52:44: So it's really about the specification.  
00:52:44 --> 00:52:46: You can cut that by 50%.

00:52:46 --> 00:52:50: And then there was another question there about how do  
00:52:50 --> 00:52:53: we get the cost of concrete construction to only be  
00:52:53 --> 00:52:55: thirteen percent higher.  
00:52:55 --> 00:52:57: One of the things that we do is we eliminate  
00:52:57 --> 00:53:00: a lot of materials when you are using concrete.  
00:53:00 --> 00:53:02: So we have no flooring, Most of our ceilings are  
00:53:02 --> 00:53:03: just exposed concrete.  
00:53:04 --> 00:53:06: Our exterior walls are exposed concrete.  
00:53:06 --> 00:53:08: Our exterior is just a very simple finish on that  
00:53:08 --> 00:53:09: precast.  
00:53:09 --> 00:53:13: So when you are comparing the cost of one versus  
00:53:13 --> 00:53:15: the other, look for the deducts.  
00:53:16 --> 00:53:18: There's a lot of things to in a lot of  
00:53:18 --> 00:53:21: materials that do a lot of off gasoline that also  
00:53:21 --> 00:53:24: have really high carbon intensity that you can eliminate.  
00:53:25 --> 00:53:28: And then you have maintenance savings as well because  
00:53:28 --> 00:53:32: you  
00:53:28 --> 00:53:32: know you're not ripping out carpet and they're pretty durable  
00:53:32 --> 00:53:33: and resilient for maintenance.  
00:53:35 --> 00:53:36: Thanks, Jonathan.  
00:53:36 --> 00:53:38: And then there's a question that's a bit of a  
00:53:38 --> 00:53:41: follow up, not directly, but Esther Bobbin asks, when you're  
00:53:41 --> 00:53:44: deciding what type of heat pumps to implement in your  
00:53:44 --> 00:53:47: construction design, is the potential GHG impact  
00:53:47 --> 00:53:49: improvement part of  
00:53:47 --> 00:53:49: the decision making process?  
00:53:49 --> 00:53:52: When you compare models or brands of heat pumps, do  
00:53:52 --> 00:53:55: you use any tools to model that or compare heat  
00:53:55 --> 00:53:55: pump solutions?  
00:53:56 --> 00:54:00: And I think this goes back to an integrated design  
00:54:00 --> 00:54:00: process.  
00:54:00 --> 00:54:03: So looking at the design at the very beginning and  
00:54:03 --> 00:54:07: figuring out what makes sense for your region and your  
00:54:07 --> 00:54:09: climate zone and your particular building.  
00:54:09 --> 00:54:12: But curious to hear if any of you all have  
00:54:12 --> 00:54:16: any particular tools or applications that help you make these  
00:54:16 --> 00:54:17: decisions.  
00:54:20 --> 00:54:22: I mean, you know, if you're comparing heat pump models,  
00:54:22 --> 00:54:24: like we'll look at like a, you can put in  
00:54:24 --> 00:54:27: different things into whatever energy model you're using, like  
00:54:27 --> 00:54:29: a  
00:54:27 --> 00:54:29: treat model or whatever it is and compare.

00:54:30 --> 00:54:33: I don't know, like I've never really seen a project  
00:54:33 --> 00:54:35: change a lot once you decide what type of heat  
00:54:35 --> 00:54:36: pump you're doing.  
00:54:38 --> 00:54:42: But I will note that another factor to think about  
00:54:42 --> 00:54:44: is who's going to use it.  
00:54:46 --> 00:54:49: You know, like a lot of current heat pumps on  
00:54:49 --> 00:54:53: the market require like in the multifamily setting require a  
00:54:53 --> 00:54:56: relatively sensitive and expensive piece of equipment to be in  
00:54:56 --> 00:54:57: an apartment unit.  
00:54:58 --> 00:55:01: So I think it's thinking of thinking also through like  
00:55:01 --> 00:55:02: how is The Who is the user?  
00:55:02 --> 00:55:03: Is this a senior building?  
00:55:03 --> 00:55:04: Is it supportive housing?  
00:55:04 --> 00:55:05: Is it market rate?  
00:55:05 --> 00:55:06: Like what is it?  
00:55:06 --> 00:55:08: What are their expectations?  
00:55:08 --> 00:55:09: Where can you put the thing?  
00:55:10 --> 00:55:11: What's the maintenance like?  
00:55:11 --> 00:55:14: All of those things seem like day seven questions, but  
00:55:14 --> 00:55:17: they actually really need to be day one questions because  
00:55:17 --> 00:55:20: the whole parts of the system is going to change  
00:55:20 --> 00:55:22: a lot if you install it in a way such  
00:55:22 --> 00:55:25: that the filters can't be cleaned or that it's really  
00:55:25 --> 00:55:27: hard to clean filters like things like that, or if  
00:55:27 --> 00:55:30: it's senior housing and you have this really crazy control  
00:55:30 --> 00:55:33: panel, you know, things like that need to be thought  
00:55:33 --> 00:55:34: through.  
00:55:34 --> 00:55:36: And I think that can have more impact on the  
00:55:36 --> 00:55:39: eventual efficiency of the design than anything else.  
00:55:41 --> 00:55:43: Thank you, Laura, and thank you for bringing up the  
00:55:43 --> 00:55:47: the maintenance aspect too, because there was another  
question in  
00:55:47 --> 00:55:49: the chat focused on that asking for someone to speak  
00:55:49 --> 00:55:52: to the maintenance aspects of heat pumps and the cleaning  
00:55:52 --> 00:55:53: schedules.  
00:55:53 --> 00:55:57: And this is something that could be considered another myth  
00:55:57 --> 00:56:01: as this this person heard that heat pumps are susceptible  
00:56:02 --> 00:56:04: to mold if filters aren't cleaned monthly.  
00:56:05 --> 00:56:07: So this could be something we add on as an  
00:56:07 --> 00:56:08: addendum.  
00:56:08 --> 00:56:10: Have any of you heard of that or had that  
00:56:10 --> 00:56:11: issue on your projects?

00:56:15 --> 00:56:17: I would say that if you're running into a mold  
00:56:17 --> 00:56:20: problem on your project, it's likely not because of the  
00:56:20 --> 00:56:23: heat pump, it's likely because you have a moisture control  
00:56:23 --> 00:56:25: issue which often comes from oversized equipment.  
00:56:26 --> 00:56:29: If your if your air conditioner or heat pump is  
00:56:29 --> 00:56:32: too big for the space that it's in it it's  
00:56:32 --> 00:56:33: short cycles.  
00:56:34 --> 00:56:36: So I'm talking to the hot humid folks out there.  
00:56:36 --> 00:56:39: Short cycling equipment doesn't run long enough to help  
dehumidify  
00:56:40 --> 00:56:40: the air.  
00:56:40 --> 00:56:42: Like it'll cool the space down really quickly, but it  
00:56:42 --> 00:56:45: won't pull the moisture out, so that's likely the root  
00:56:45 --> 00:56:45: cause.  
00:56:45 --> 00:56:47: It's independent of whether you have a heat pump or  
00:56:47 --> 00:56:48: air conditioner.  
00:56:50 --> 00:56:51: Great, fantastic.  
00:56:51 --> 00:56:54: We are one minute to the hour, so I'm going  
00:56:54 --> 00:56:56: to stop the share so we can see each other  
00:56:56 --> 00:56:57: and I can.  
00:56:57 --> 00:57:00: Thank you Stet, Laura and Jonathan.  
00:57:00 --> 00:57:02: We appreciate your time today and the rest of the  
00:57:02 --> 00:57:05: ULI team and the folks that have joined us to  
00:57:05 --> 00:57:08: learn more about myth busting heat pumps.  
00:57:08 --> 00:57:10: Please read the report and let us know if you  
00:57:10 --> 00:57:11: have any questions.  
00:57:11 --> 00:57:16: This recording will be available as well as the questions  
00:57:16 --> 00:57:18: and recorded answers.  
00:57:18 --> 00:57:19: Everyone have a great Friday.  
00:57:20 --> 00:57:20: Thank you all.

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