[SQUEAKING]

[RUSTLING]

[CLICKING]

NICK FRY: All right. Thank you, Cary. So next up we have Mark.

MARK METZNER: Hello. I've got--

NICK FRY: Oh yeah.

MARK METZNER: I'm wired. I need that though. Good afternoon. And the last session of the day, so I'll be quick because everybody wants to get out of here, right? Pardon me?

AUDIENCE: I have a hook.

MARK METZNER: Excellent. Please use it.

I'm going to do a brief overview. This has been looked at, obviously, a number of times over the last two days. But this is a milestone project in the USA any way you look at it. Again, it's Eversource Energy, the owner of it. Single-pipe system, ambient loop, mild distribution, 37 or 38 buildings. I thought I heard an extra building somehow got attached. I'm not quite sure how that worked. That's fine.

There's commercial buildings, and there's residential buildings. So your upside there is you've got good diversity. They're all single-family homes. A district loop would not have made sense. So site selection was very important. It made sense for the residents as well as the system itself and the owner.

90 vertical and angled boreholes. So I think everyone knows that there was two configurations. Two borefields were vertical, and then there was another borefield that's kind of two borefields that are angled. So the verticals were 600 feet in depth, and the angles were 720 feet, approximately, with quad loops. Quad loops, what I mean is two U-bends in each borehole.

What I thought was very interesting, and looking at what was I going to be talking about, is you have some very interesting dynamics at play here. It's a unique coming together, if you think about it. Credit to Zeyneb, HEET, being able to pursue this over all this time, and convincing a natural gas utility that theoretically can't sell any gas. It's kind of an interesting concept when you think about it.

I thought it was just absolutely amazing because it's a successful project. And you had two really very disparate entities coming together. And what I did want to do is have a bit of an applause for Zeyneb and her team, because I don't think anyone's really recognized what they did. It was incredible.

[APPLAUSE]

When you get into some of the weeds-- and I won't go too far because I know-- How many minutes do I have left? because I was overtime last time. I'm good. All right. There's a lot that goes into it.

I mean, it's not simply a matter of sketching out a few drawings, writing up a couple paragraphs, and we're off to the races. There was over 1,200 pages of detailed design. It's the nuts and bolts, making it work. And you got to hammer out the details, otherwise you have an unsuccessful project.

So approximately 37 detailed drawings. I looked at it again, and it's actually more because there are subsets of drawings. That said, there was about 37 main ones. You go through the process once you get into construction of clarification questions and submissions and approvals. And it's not a straight path to success. There's back and forth. There's going to be-- let's be really candid. There's going to be arguments because that's the nature of the beast.

You should be doing that. No, I'm doing this. And sometimes there's not clarity in the written specification. As much as you want to do it, you can't take everything into consideration. That's kind of life.

Some of the changes-- and I was exposed to it during the process. And again, I'm not trying to beat up here on anything, and I want everyone just to realize what some of the challenges were during the process. So initially, the borefields, the three of them were all in a vertical configuration. There was a change made into the angled boreholes in one of the three bore fields.

That in and of itself causes some issues understanding, Will the angled borefield with now quad loops, as opposed to single U-bends, perform to the level required for the system to operate properly and support the building loads anticipated? So you can probably imagine there was a lot of back and forth. What's going on with these angled boreholes? We had to remodel this, remodel that. It's not simple as, OK, we're just going to start angling them out. It doesn't work that way.

Again, the single U-bend versus the quad loop, you're looking, What is the capacity? Is there an increase? And if so, what's the impact on the total system? Those have all got to be calculated.

And again, this is something that doesn't happen quickly. There's a lot of back and forth. There's a whole hierarchy of, I have a question as an engineer-- I'm not an engineer, but from an engineering firm-- over to the owner, Eversource, back down to a contractor. There's a whole system of checks and balances that's also meaning time consumption.

An interesting change that happened is the North America compliant collection vaults. Does everyone know what I mean by a collection vault, or am I talking Greek here? That's where we have a bunch of boreholes that come into a collection point, and that box, if you like-- and it's usually made from high-density polyethylene. There are concrete boxes as well. They are subterranean. They're buried. And then from there, you have a supply and return going in over to the pump house in this case.

There was a change made between the North American compliant vaults and what was put in on the angled borehole vaults, a European spec. On the face of it, you go, What's the difference? There is. You end up with different pipe sizes between a European spec, which is a DIN spec, versus a North American spec, which is, in this particular case, we use IPS, which is Iron Pipe Size.

Getting those two to marry up, sounds easy. It's not. And it ends up being a potential area of concern into the future. The other last point on changes and impact, those angled boreholes now were going under wetlands. Before they weren't. So there's a whole regulatory process that has to be adhered to, applications, approvals, et cetera.

So back to what Nickki Bruno was saying yesterday, this started-- and Zeyn, correct me if I'm wrong-- 2019 is when things really got moving.

AUDIENCE: The initial proposal was in the fall 2019 to the Department of Public Utility

MARK METZNER: Until today. So you can imagine one more step that's going to unfortunately delay things or potentially delay things. And that's the whole communication component that's vital between all parties. And is it smooth? Is it confrontational? These are all things you have to look at when you're doing a large project like this.

You've seen the picture. That's what the angled boreholes look like. It's a proven technology and makes a whole lot of sense. You're having a very small footprint up top at surface. And then those boreholes splay out and you have the separation between the boreholes, so you're not having thermal interference between them.

It allows at the surface to have less impact, if you like. You're not taking up as much room. In this particular case, the project didn't have to redo the whole parking lot and repave. They had a smaller area.

Some of the areas, and they're a little hard to see, but this is the one-- I'm just going to point, it out. And you've probably seen this picture here, as well as up there. Those are the European vaults that I was talking about. They are substantially different from a North American vault.

That's an area of concern moving forward, I'm going to pick on you, Brock. Those pipes, your best guess, is it a good idea or a bad idea? On the left. As far as--

AUDIENCE: Sounds like a trap.

MARK METZNER: [LAUGHS] Boing. In comparison to a regular vault.

AUDIENCE: Yeah. It's unconventional for what I'm used to seeing, just the way it's laid out.

MARK METZNER: Yep. OK. And that's the basic consensus. People looked at this picture and went, wow, there's some potential concerns down the road. The picture on the right is where those boreholes, where you can see them coming up here. These ones here. They're all like that. They get tied together.

The problem with air-- not problem. The issue, the concern, is if you look at the pipe on the right, you can see some of those are basically being compressed. That shouldn't be happening for a long-term reliability because ultimately, this gets backfilled, gets paved, and then you can potentially-- this is a parking lot-- have big trucks on top pushing down, pushing down. So it's an area of concern that, again, in retrospect, may have been addressed differently. That's the vault.

They're used in Europe all the time. There's nothing wrong with them. They're just not North America compliant. They have components inside, particularly PCV plastic. If anyone was here this morning, the standard in North America says you're not using PVC in these systems, subterranean.

So that's below the wetlands. It's not a huge issue so long as you get the proper approvals. The wetlands are an area of concern for everybody. And you have to make sure you're dotting Is and crossing Ts.

Again, just the quick takeaways. Communication is key. I mean, I know we've heard that repetitively. It came to the forefront. And this one in particular, when changes happened. And they were somewhat unconventional. We'll leave it at that.

That change from the single U-bend to the double U-bend, again, adds some complexity to the whole issue. And from a modeling and performance point of view, required a lot of redoing. And then the materials used are not North American compliant. Not that's the end of the world. It's just to be recognized.

And that's it. oh, good. I didn't go overtime. I'm zero minutes. Perfect.

[APPLAUSE]