

[SQUEAKING]

[RUSTLING]

[CLICKING]

PRESENTER: Thank you, everyone, for coming back after the coffee break. Our next session, our moderator is Curt Newton stepping in. The previous moderator is OK, but she won't be available for this session. And with that, I'll pass it on to Kurt.

CURT NEWTON: All right. Coming out of our first session, we now-- I think it was teed up really interesting way with the final discussion, what's going on with the human side of this, the social decision making, the motivations and such. We get into the human landscape for these networks. And we have, again, a wonderful series of three speakers, starting with Nathan Phillips. And then we'll hear from Chris Rabe, and last, Kelsey Wirth. And then, as we did with the previous session, then we'll go from the presentations into a Q&A session. So over to you, Nathan.

NATHAN PHILLIPS: All right. Thank you, Curt. And let's see. Is this the slide advancer thingy? OK. Great. All right. Well, I'm here to share with you how a mild-mannered forest ecologist ended up in a room with engineers and law experts and policy people and activists to work on the energy transition. So I'm going to give you that ecological viewpoint of this energy transition. And it started for me as this mild-mannered ecologist, who learned-- stumbled out of my lane and learned that gas leaks damaged trees.

So I study the plumbing of trees. And I wanted to know why. What's going on? This is in Newton, about three blocks away from where I live. And seeing the loss of the tree canopy was really heartbreaking as a person, but also as a scientist, what is going on? And from that moment, things started moving. I had an accidental toolkit for understanding the problem of methane leaks because I was looking at how greenhouse gases are exchanged from soils and leaves. And the same kind of equipment could be used to document where this greenhouse gas was leaking from the streets and sidewalks.

So we got funded to do a research study in the city of Boston, where we documented 3,356 gas leaks across the city. That was in 2012. And this is where, as an ecologist, I started thinking about biomimicry and thinking about the city as an ecosystem. We had a grant called Urban Metabolism at the time from the National Science Foundation. And it was the lens of using living things to think about how cities function.

And as a tree physiologist, it became clear, this gas network, this thing that's having this metabolic problem is like a tree. It's got trunks, and it's got branches and twigs. And we need to fix this problem. And that's where the idea of the transition started to come in. Can we prune the tree? Can the tree retract and a new system grow from there?

Now, things were happening at the same time, like the collapse of the gas system in the Merrimack Valley, where system-level failures were happening. And we realized in talking with folks like Zeyneb and Audrey and HEET, that to solve problems like that, we need to think bigger. We need to make the problem bigger. And coming back to the gas leaks problems on the streets and sidewalks of Boston and the greater Boston area, it became apparent to me that I needed to think bigger as an ecologist.

And when I started to see things like new trees-- this is in Roslindale-- being planted into active gas leaks and the money that was being spent and the labor and energy that was being spent to plant urban street trees in a place where we knew they were going to die. So the gas in the soil here is at about-- you can't see it, but it's like 15% in the soil. That tree was not going to live. To see things like, OK. The fix is made after the problem has wreaked havoc on the tree. So there's the empty tree pit, and there's the patch that fixed the gas leak after the fact.

So it became apparent to me that what we call infrastructure ecology is about the wires and the pipes and the streets and all of those things. But it's also about the knowledge networks and the systems and the institutions that need to communicate to actually get the problem fixed, the coordination. Just here's another example in what we call the circle of death in Newton, which is right over the Mass Pike, where you can see the new pavement here. You can see the line where the lighter gray shade becomes darker and the new pavement being cut up like two weeks after it was put down to address a gas leak. That's a 10-inch cast iron gas main there.

And so this problem, really, I couldn't avoid as an ecologist to think about how we need to bring all of the stakeholders. And we need to think about the co-located and interdependent critical infrastructure, including the trees and everything else, as an ecosystem. That's the only way we're going to solve this problem.

And so that's what inspired me so much about being here and connecting with groups like Mothers Out Front and HEET, where I was no longer being restricted to my discipline of forest ecology. I was connecting with people who were thinking in a much more inclusive and holistic manner about all of the actors and entities that need to come together. So I feel like a more holistic ecologist. This exemplifies to me the way we need to see beyond the surface and make the connections that are there under the streets and with other stakeholders.

And so what continues this work, for me, is being involved in the project in Framingham that is happening. And to come back to my profession as a tree physiologist and an ecophysiologist is really fulfilling because it's like a circle has come back around where we are now as part of this big project with so many different academic researchers and others. My part of this is to come back to look at tree health. So do these thermal networks have any effect on the tree canopy?

Sometimes in science, a nonresult is actually a really great thing to have. And after our research in two years of looking at the tree canopy where this infrastructure has gone in, we don't see any negative impact on the trees. We're going to continue to monitor the urban canopy in this area because there may be some subtle changes. If you change the thermal environment in the soil, there may be a change in when the leaves come out or when the leaves drop. And it may be species-dependent.

So lots of interesting questions, but really gratifying to know that we're not seeing any negative impact on the actual ecosystem. And just that there was a term that a famous thinker and writer and philosopher came up with, who was not an ecologist, but came up with a very important ecological term called succession. That was Henry David Thoreau in *Concord*, succession, the change in ecosystems over time.

And so it's really gratifying to be part of a project which is looking at that transition from our fossil fuel infrastructure into this new infrastructure, where we're not seeing negative impacts on the trees here. And we're likely to see a healthier tree canopy in places like the place where I saw the tree being damaged in my own city of Newton. So thank you, and I'll leave it at that. There's my friend Bob Ackley, colleague, and Margaret Hendrick. Yeah.

[APPLAUSE]