[SQUEAKING]

[RUSTLING]

[CLICKING]

PROFESSOR: Thank you for coming to the very last session. And our moderator for this session is Nick Fry.

NICK FRY: Hey, thanks, everybody. So just gather in, and we'll get into some case studies next. The first speaker is going to be Cary Smith joining us remotely. I believe we're going to have his video up.

So Cary Smith is pretty well known in the industry. He's an AEE Fellow. And he's had about 30 years in ground source and subsurface and almost another 30 years before that doing other things. Then we'll have Mark Metzner, who you heard from earlier, and Jay Egg, and Susan Murcott to follow. So if we can cue up Cary's video.

CARY SMITH: Hello. My name's Cary Smith. I hope you're enjoying the conference. Thank you for letting me present my portion of about ATL systems. My presentation will give you an overview of one-pipe ATLs.

Depending on how you classify multibuilding projects, we have between 20 and 30 ambient temperature systems operating at this time. Our first system was started in 2002, in Steamboat Springs, Colorado. Other projects include housing projects, a 40-acre heavy equipment dealer service center, a CNS truck track, 7 school campuses, and, of course, additional university campuses like Colorado Mesa University and Weber State University.

I'd like to describe what the configuration of these ATLs and stuff. First, we have a configuration that basically is a hairpin. It's two pipes going up and down the street, which connect to two connected pipes going up and down the street, which are connected primarily/secondarily to these load sink sources and buildings. The second would be the perimeter, or run around system, which basically goes around the block or around the campus.

These two loops can be-- two configurations, can be combined together to form a multidistrict multiasset system where we have a central loop that basically connects them. And then we have a submicrodistrict coming off that central loop. We could also connect directly to another central loop system. Theoretically, these are quite expandable over a large area.

Nothing's more efficient than off. An ATL uses an independently large diameter HTP. Pipe attached to that pipe are hydraulically separated independent circuits serving buildings or system assets. These assets may be, but are not limited to, really, greywater and blackwater systems, closed loop and phase change materials. That's for storage or sink source use. Solar thermal systems or PVT energy for energy addition or rejection, open loop sources or sinks. High to mid temperature geothermal resources, CHP waste, and conventional boilers and cooling towers for emergencies or peak loading.

This system uses heat pumps and diversity of loads to heat and cool. Borehole and phase change storage is diurnal for load shifting or time of day power reduction, or seasonal for heating and cooling. All sequences are bidirectional, central to building or building to Central loop.

To give you an example of the control of these systems, we have a building up here that's running between 55 and 85. If it gets out of range, what happens is it turns the central loop pump on and goes to the central loop. Of course, we started with the first thing we had. This central loop is idling. So consequently, other buildings and assets are available to this building.

Finally, if the central loop and the buildings that are on it can satisfy the load, that's diversity. Then we will go to green systems or like loop fields and PV and so forth when the temperature is under 50 or over 85. And finally, when the system gets above its set capacity and is no longer able to maintain this 50 to 85 and it has all the green assets on, we'll go to boiler cooling towers for additional energy or to reject energy, basically, under 40 degrees or over 95 degrees.

This is a picture of the front-end system of Colorado Mesa University. The central loop supplies fluids building the heat pump systems. We have about 3 and 1/2 miles of 18-inch central loop pipeline in the 5 microdistricts. We have currently 19 buildings on the system itself, and 1.3 million square feet. These five microdistricts are interconnected, and they can be operated independently or as one system.

Let me see. There are over 250 gallons of transport fluid in the system. And there are distributed assets around campus. This system uses loop fields, irrigation water, and some potable water at this time. Except for a small number of hours, we have not fired the boilers to maintain temperature in the system since 2012.

So what we've got here, we've got loop fields. This is district number 1. We've got loop fields. We've got a pumping station. This is a main pumping station for the central loop. It's sized to handle about 4,000 tons.

And so district 2 is down here. It's a set of dorms. It's mostly heating. Of course, it's isolated primary/secondary. District 3 is the Maverick Center. In the center here, we have mixing valves and so forth so that we direct and redirect the fluid throughout any of the microdistricts.

Down here, we have a classroom building dorm complex, and we have a second pumping station. These two pumping stations, by the way, when they're used together, are in a kind of a parallel series configuration. And most of the time, we only used one or two pumps to start with.

As you might be able to see, it's kind of small here, this is estimate right now. The central loop temperature is 82 degrees. And if you notice, we have none of the assets on. This is purely run on building diversity at this time. We do have, by the way, several buildings on it at the same time. So as we go through this, we're currently planning on this campus another 1.3 million square foot addition, which is going to be a sixth and probably seventh micro loop.

This is kind of a nice cartoon. What it does is tell you a little bit about-- it gives you a little broader perspective of what-- we have buildings on the loop. They can be commercial, residential, or industrial. They're cooling dominant or heating dominant. It doesn't matter. They could be balanced. It just depends.

Then on top of that, we have a system we're able to build solar PVT, do heat exchange panels and so forth. We can use air source pumps built in and made as multisource heat pumps, which basically either use air as a source or water as source, and of course ground source heat pumps.

We may have chillers on the loop. We may have wastewater heat recovery and heat and heat exchangers. Or we may have industrial waste. And of course, we have ground heat exchangers, thermal storage and water source heat exchangers. All of the system stuff can be interfaced with the electrical grid and also in PVT panels and so forth. But what we do is we operate the loop in such a way that we can shift loads or take advantage of time of day rates and so forth.

And then also on top of that, we might turn around and have another source of electricity, river run, wind, whatever have you. And finally, we can go with additions like conventional CHP, cooling towers, and of course boilers for emergency. The interesting thing is we can attach other microgrids to the loop, consider that to be opponent.

This system is emissions free and uses electrical power. And in some cases, we're starting to interface with the telecom with grid-enabled monitoring, automated sequences above the general management system, and monitoring and intelligent control, for example, mapping the flow of people back and forth across campuses, in and out of city buildings and so forth.

So that concludes my presentation. I hope you enjoyed it. And if you've got any questions, please submit them.

[APPLAUSE]