

# Chemical Engineering Colloquium

April 30, 2025

Goddard Hall, Room 227

12:00 PM – 1:00 PM

**Realizing the Potential of Geothermal District Heating for Decarbonizing Energy:  
How Advances in Subsurface Science and Engineering are Changing the Game**

## Jefferson Tester

Croll Professor of Sustainable Energy Systems  
Smith School of Chemical and Biomolecular Engineering  
Cornell University

In the United States, space and water heating in residential and commercial buildings and low-temperature industrial process heat are provided primarily by the combustion of fossil fuels (natural gas, fuel oil and propane) in furnaces and boilers. For states located in the northern tier region, heating accounts for a significant fraction of their carbon footprint. Therefore, achieving carbon-neutrality will require a transformation of our heating systems. For example, in New York State, about 40% of its carbon footprint is caused by heating. Using geothermal energy in district heating systems offers an attractive option. Since 2010, Cornell has been evaluating the use of Earth Source Heat (ESH) for providing carbon-neutral heating for its campus. The basic idea of Cornell's ESH project is to circulate water through fractured regions of deep hot rock containing naturally-stored heat at sufficiently high temperatures to supply thermal energy to the campus district energy network. With the campus's high baseload winter heating demand of about 50 MW (thermal), a successful demonstration of geothermal heating at Cornell would also serve as a representative and scalable model for carbon-neutral affordable heating for many rural and urban communities across the country. In the summer of 2022, the Cornell ESH project took an important first step by drilling an exploration well, formally called the Cornell University Borehole Observatory or CUBO, to a depth of 3 km (TD = 9790.5 ft). Cornell's ongoing efforts to demonstrate ESH at scale will be discussed, including: (1) subsurface characterization, (2) reservoir design and heat extraction modeling, (3) integrating baseload geothermal district heating using ESH with bioenergy-fueled peak heating into Cornell's energy system infrastructure.



# WPI