4/5/22

**INTERVIEW WITH**: Xinlei Wang and John Zhao, ABE Professor and Doctorate student, experience in geothermal systems

**CONCISE SUMMARY:**

On 4/5/22, the team interviewed Dr. Xinlei Wang and John Zhao. Professor Wang is a subject matter expert with regards to geothermal energy and has done research on other forms of renewable energy. Professor Wang explained that geothermal energy is the most efficient way to both heat and cool buildings and that despite high upfront costs it is a cheaper system to implement than traditional heating and cooling. Professor Wang explained that if the University was to switch to a geothermal system, then it would have to be done building by building and it would take a lot of planning and time. Professor Wang also told the team that geothermal and solar energy can be used together to create an energy efficient system and make it viable for the University.

**DETAILED INTERVIEW NOTES:**

**General Notes:**

* All building heating and cooling generally comes from steam from the power plant.
* Heating and cooling use the highest energy load on campus
* Energy conservation
  + ABE building 2007: 50% reduction
  + Energy auditing
* Bigger picture: we need to change our heating and cooling systems; geothermal is most energy efficient system available for heating AND cooling
  + Feasibility?
    - The technology is
    - To transfer the campus to geothermal, we must plan it out and do it slowly-- building by building. Geologists need to be involved to understand the underground.
    - We need to study energy consumption and the underground geology, physical structure of the building.
    - This process may be costly because the system needs to be designed specifically to each building (look at energy consumption, need for hot water/cold water)
    - Do we have lots of accessible underground water?
* Solar farms are generally expensive; roof solar MORE expensive; not feasible.
* How to use land most efficiently:
* Integrate agriculture and solar together to optimize land use
* Create a system model for the entire campus
* Space:
  + We need to locate them individually, while also being aware of what existing space is already occupied underground (sewage, electrical lines, tunnels, etc.)
  + It needs to be very close to the building itself (cannot be off-campus and transported in)
* How to tell if it is compatible
  + Cost
    - Costs driven by heating/cooling load, available resources, etc.
    - Generally, another party (contractor) will do the cost analysis.
  + Space
* Geothermal vs solar
  + They both need to be integrated together (i.e., solar can be used to efficiently power the heat pump); one is not “opposite” or necessarily advantageous toward the other
* Need to look at individual buildings and create individual solutions
* Feasibility of current buildings running on steam:
  + Not feasible for us to replace the load of the Abbott power plant for years and years
* Big campus buildings probably shouldn’t be built on top of pumps- because if you need to do pump repairs in the long term
* Capture CO2 to offset burning Abbott, keep part of the power plant to act as backup to match the ability of CO2 capture

LOTS of research to be done before applying geothermal to the entire campus. Geothermal takes an extremely high investment; we need sufficient land and resources to ensure that it is a good investment. It would be too risky of an investment until this criterion is being met

ECE building is a good case study

Paper that was shared: Subsurface Characterization, Monitoring, and Modeling of a Geothermal Exchange Borefield for the Campus Instructional Facility at the University of Illinois at

Urbana-Champaign