

#### Geothermal Heat Pumps are installed inside. Air source Heat Pumps have a CU or Cooling Tower outside



## A Geothermal Energy Network involves thermal infrastructure; interconnecting pipes



#### Geothermal fundamentals





### Geothermal Systems in General

**Distributed Heat Pumps (or Central Energy Plants)** 





#### Commercial: Ground Water Sourced of <u>Class V UIC Geothermal</u> (YouTube Video)



### Understanding Earth Exchange Systems



### Aquifer Based Thermal Exchange = Class V Example





#### **Geothermal Exchange for Resorts and Campus Applications**



## NYIT Old Westbury Campus Surface Water Calculations





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### Addition of supplementary fluid exchanger (City Water; Wastewater; MTA, etc.)



#### Electrification Ready Recommendation: Supplementary geo-infrastructure exchangers at ground floor



Anticipate & provide forethought as to the Chiller Energy Plant (CEP) that will go in, designing the proper pipe and connections that will allow the building to take advantage of these [future] services; MTA, wastewater, storm water,

#### Ground Water Geothermal Exchange



# Surface Water Exchange is a Favorable Method; Used Worldwide



#### Distributed or Central Geothermal Heat Pumps



#### Distributed heat pump system

Central heat pump chiller

#### National Grid and Eversource are advocating for Geothermal Micro Grids through their respective PSCs

- To accomplish this, the Gas Leaks Allies, including HEET, worked together with legislators to create the For a Utility Transition to Using Renewable Energy legislation, or the FUTURE bill (H.2849/S.1940).
- <u>https://ma.mothersoutfront.org/m</u> <u>ass\_mof\_legislation\_team</u>
- The FUTURE bill would create a renewable thermal credit market for gas utilities, allows them to bill for BTUs, and gives them a path to evolve into renewable energy companies.



#### **Opportunities for Geothermal Exchange**



#### Surface Water Geothermal Exchange



(Reproduced courtesy of the Royal National Lifeboat Institution)

UK studied surface water thermal capacity and found that much of its heating and cooling needs can be met through Surface Water Exchange





The heat capacity given in the table is for abstraction from rivers only. These locations could also extract heat from either coastal or estuarine waterbodies.

#### Geothermal Fundamentals Applied to Small or Large









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### Surface Water Thermal Exchange





## Airport Ground-Water Coupled Thermal Energy Exchange





#### Pinellas County 911 & Police Station (2012)



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## Thermal Energy Networks share energy between structures using pipes between buildings and Geothermal Heat Pumps



## 1 kWh of Electricity = 3412 BTUs



## = 3,412 BTUs of heat (Space Heater)

# = 17,060 BTUs of heat\* (Thermal Loop Heat Pump)

• It takes 20% the kW to do the same heating with a thermal loop heat pump

\*@ 5.0 COP



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### Understanding efficiency; the ASHRAE Building in Atlanta

Using Thermal Energy form the Earth, geothermal heat pumps reduce peak electrical demand dramatically



Power Consumption at ASHRAE Bldg., Atlanta









Thermal Energy Network ModelingPenn South Campus andAdjoining Properties

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# Modeling and Inventory of Data for Heating and Cooling the NYIT Campus







The possibilities are remarkable. Thermal Energy Networks increase Public our Health and Safety & provide Energy Equity



#### We have a responsibility for <u>Health & Safety</u> of our citizens We have a responsibility to <u>Decarbonize our Communities & Buildings</u>



