

Utility Master Plan

Leading the way to a clean energy future

Carleton's new utility system will utilize **4** forms of **renewable** energy technologies



WIND



SOLAR PHOTOVOLTAIC



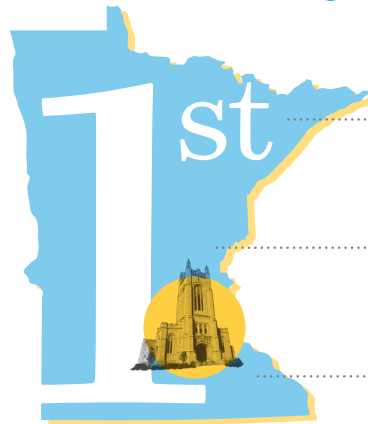
SOLAR THERMAL



GEOTHERMAL

1 of 3 campus-scale geothermal projects in the Midwest

Carleton College is the first...



college campus in Minnesota to install a **district-energy scale geothermal system**

college campus to **completely transition off steam heating**

college campus to install a **commercial-size wind turbine** (now two)

LARGEST geothermal-based district energy system in Minnesota

THE NEW UTILITY SYSTEM WILL **REDUCE ANNUAL ENERGY USE** BY

84,000,000,000 BTUs

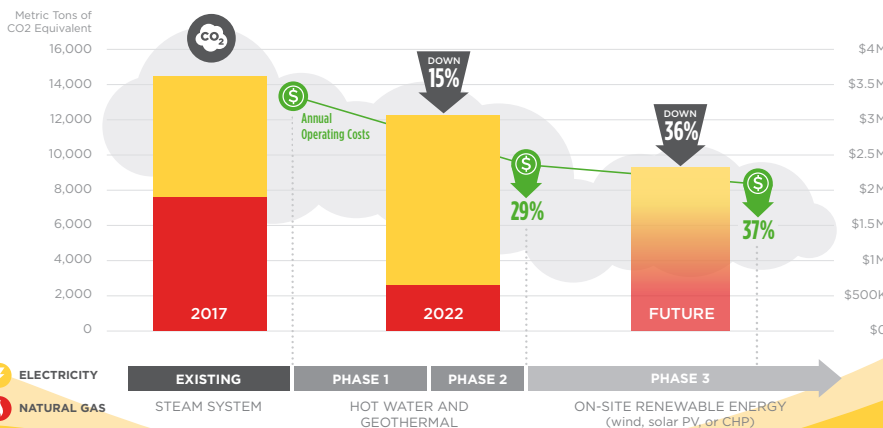
Equal to adding **6** wind turbines (15,000 MMbtu each)



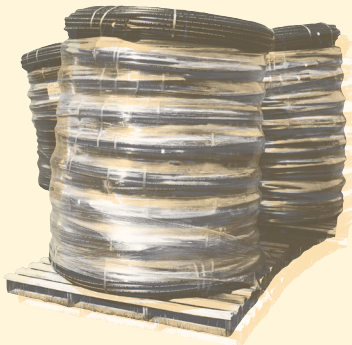
EAST ENERGY STATION
FLOOR WILL BE **32 FEET** UNDERGROUND
(Equal to height of Olin Hall)

Carleton's geothermal system was sized to optimize highest benefit for least capital cost. On our coldest day, the geothermal system will serve only 20% of Carleton's heating load, but **on an annual basis**, it will deliver **70% of our total heating and cooling energy.**

CENTRAL PLANT ANNUAL EMISSIONS & OPERATING COST REDUCTIONS



CARBON FREE BY 2050

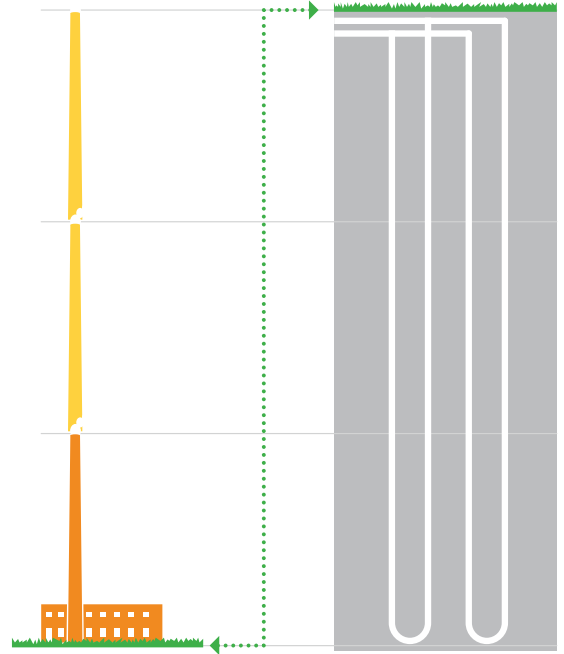


60 miles
OF GEOTHERMAL PIPING
TO BE INSTALLED UNDER
THE CARLETON CAMPUS

Each vertical well is

520
FEET DEEP

= to the **3**
height of
CARLETON
SMOKE
STACKS



ALL OF CARLETON'S STEAM DISTRIBUTION PIPING WILL BE REMOVED FROM THE TUNNELS AND REPLACED WITH **2.5 MILES OF HOT WATER PIPING**

HORIZONTAL
GEOTHERMAL WELLS

94

in **Bell Field**



100,000
total lineal feet of piping

VERTICAL
GEOTHERMAL WELLS

133

in the **Bald Spot**

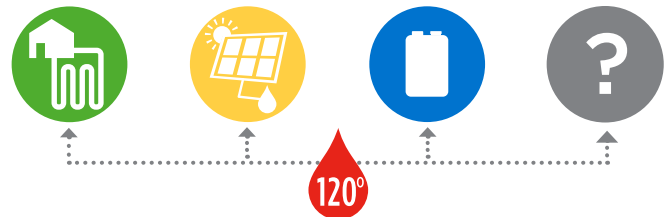


77 in the
Mini Bald Spot

220,000
total lineal feet of piping

800 TON
HEAT PUMP
CAN PRODUCE
HEATING EQUAL TO
50 RESIDENTIAL
FURNACES

THE GEOTHERMAL
WELL FIELDS WILL USE
50 MILLION
CUBIC FEET OF EARTH AS A
THERMAL BATTERY



The new 120 degree hot water heating system will be capable of connecting to many different technologies including geothermal, solar thermal, fuel cells and other emerging technologies, resulting in a more diverse and resilient energy system with reduced carbon emissions.

New heat pump will deliver **9.34X** more usable energy output at peak efficiency* than old steam boiler system.

(*simultaneous heating & cooling mode)