Carleton College Utility Master Plan

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Carleton Constructs Geothermal Well Fields

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Carleton College launched construction on a new utility master plan, beginning with the installation of two geothermal well fields this summer, in anticipation of replacing its current steam plant with a transition to a low temperature hot water system.

“By transitioning to a system that requires far less heat input, we will have the flexibility to use a much more diverse portfolio of energy sources, including renewable energy technologies of today and the future,” states **Martha Larson, manager of campus energy and sustainability**.

Carleton is the first college campus in Minnesota to have a geothermal-based district energy system, and one of only three in the entire Midwest to host a campus–scale geothermal project.

The College partnered with engineering firm MEP Associates in Rochester, Minnesota, to conduct a study over the last three years which concluded that the existing steam system would require $20 million in upgrades over the next 15-20 years, and the annual operating expenses of such a system are more than $3 million annually. The new hot water geothermal system, while requiring an outlay of approximately $38 million, will reduce annual central plant operating expenses by 35–40 percent, to around $2 million each year. This will generate around $40 million in operational savings over a 30-year period (escalated), and the project will break even in 15–20 years when compared to the cost of maintaining the current steam system.

The utility master plan — which anticipates coupling the new geothermal heating and cooling system with renewable electricity or combined heat and power — targets a 35–40 percent reduction in Carleton's annual central plant carbon emissions. This allows Carleton to reach the first interim milestone in its 2011 Climate Action Plan and advance toward its goal of zero emissions by 2050.

"Given the maintenance needs of our existing 100-year-old steam system, the goals of our Climate Action Plan, and the plans to construct a new science building at the center of campus, we recognized this as an optimal time to modernize our campus infrastructure while permanently shifting the College to a more cost effective and less carbon intense mode of operation," Larson said.

The new system will utilize geothermal wells and an 800-ton heat pump supplemented by high-efficiency condensing boilers. The geothermal drilling began in mid-June this year, with 95 horizontal wells located under Bell Field and 77 vertical wells under what is referred to as the Mini Bald Spot, located on the east side of campus by the Language and Dining Center and Myers Hall. Next summer, 133 more vertical wells will be drilled in the Bald Spot, next to Skinner Memorial Chapel in the center of campus. Each vertical well is 520-feet deep, equivalent to the height of three Carleton smoke stacks. The project as a whole will install over sixty miles of piping including the new geothermal wells and replacement of campus-wide heating distribution piping.

The geothermal wells will tie into the new east energy station, to be constructed as a sub-basement in Carleton's new science complex. The original Facilities Building will continue to house supplemental boilers and chillers. The science building project begins in earnest this fall, with a summer 2020 completion date. The East Energy Station will come online in 2019,

with Carleton's existing steam boilers set to be decommissioned in 2021. The project also includes mechanical system retrofits in some buildings to prep for lower temperature hot water. The project is being financed through bonds issued this past spring and a small amount of non-debt funds.

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