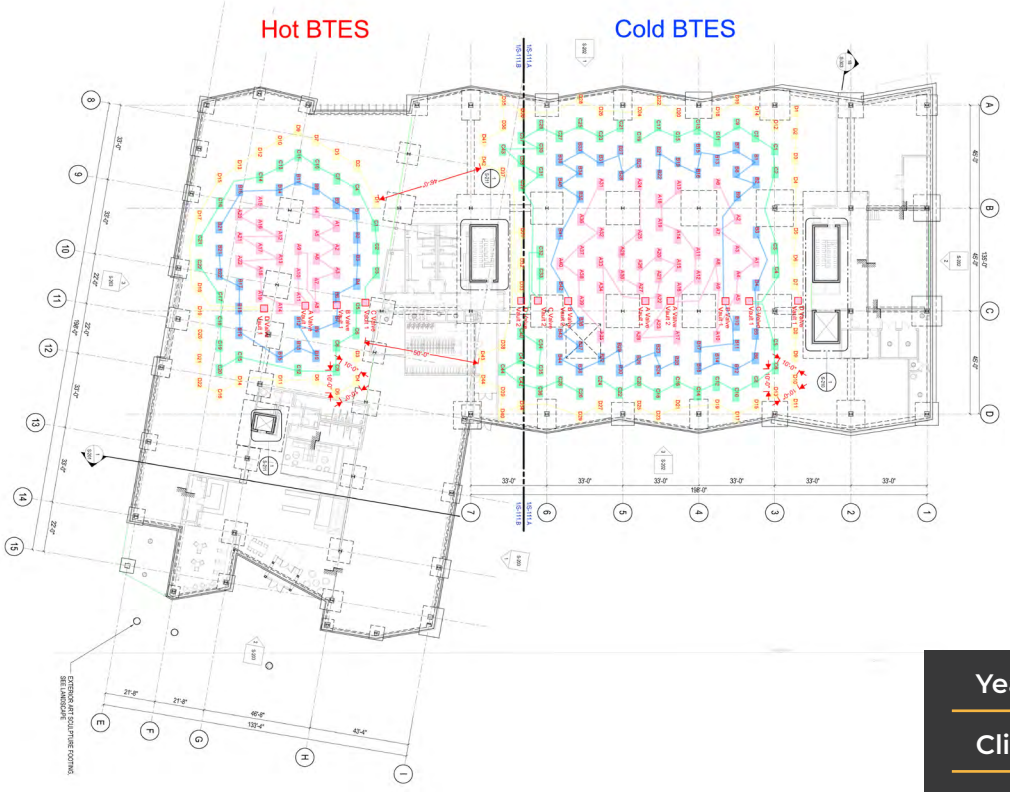
THERMAstor
SUSTAINABLE DESIGN

Colorado Laboratory

Borehole Thermal Energy Storage



Who We Are

ThermaStor Solutions Inc. (“TSS”) is a specialized engineering firm advancing geoexchange and energy storage, delivering superior building lifecycle performance while supporting ambitious environmental targets.

Our patented low-clearance drill rig enables geothermal retrofits even in constrained urban sites such as underground parking garages, unlocking decarbonization opportunities for both new construction and existing buildings. By integrating advanced hot and cold underground long-duration thermal storage (LDES) with base-building design conditions, we create unique HVAC demand management strategies that can reduce cooling-related electrical demand by up to 80% during peak hours and shift thermal production to higher-efficiency off-peak periods. This innovative approach provides a compelling financial case while ensuring grid-friendly, resilient, and scalable decarbonization solutions.

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Year	2023
Client	[classified] lab
Project Location	Boulder, Colorado
Building Size	~30,000 SQFT
Contract Size	$ 60,000 USD
Project Size	$ 1,800,000 USD
System Size	8,100 m borehole field; 528 kW water-to-water HP; 240 kW ASHP; 821 m² PVT

A high-performance cold BTES system was implemented at a confidential laboratory campus in Colorado to meet an annual heating demand of ~2,000,000 kWh. The system includes 235 boreholes (36 m deep) designed for seasonal storage, with enhanced roof-mounted photovoltaic-thermal (PVT) collectors covering 821 m². The integration of 528 kW of water-to-water heat pumps and a 240 kW air-source heat pump supports a peak heating electrical load reduction of 60%, achieving a seasonal COP of 7.95. The cold BTES field was sized larger than its hot counterpart due to lower source-sink temperature differentials on the cooling side. Additional benefits to our BTES design over the minimum code requirement included:

Case Study	Input Basis	Code Minimum	Performance	Savings	Notes
Electrical	Electricity Consumption (kWh)	1,187,288	369,520	68.9%	PV&PVT production
	Total Energy Consumption (kWh)	3,182,800	1,271,341	60.1%	HVAC-related
	Peak Demand (kWh)	1,081	**339**	**68.6%**	Eliminate grid service upgrade risk
Carbon	Grid Intensity (tCO2e/MWh)	0.447	0.447	0%	No indirect improvement assumed
	Site Emissions (tCO2e/yr)	531	0	**100%**	**Fully decarbonized**
Cost	Annual Energy Cost	$279,300	**$33,883**	**87.9%**	**Reduced OPEX**
	20 yr OPEX	$9,235,321	$1,120,374	87.9%	First cost advantage