

Data Centre Microgrid Design



Who We Are

ThermaStor Solutions Inc. ("TSS") is a specialized engineering firm advancing geothermal 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	2024
Client	Major Credit Card Company
Project Location	Classified
Building Size	4.5 MW Data Centre Load
Contract Size	\$70,000 USD
System Size	3.67 GWh thermal storage capacity

ThermaStor employees (with previous firm) supported [classified] credit card company in advancing its sustainability objectives at its classified data center and office campus through a comprehensive microgrid feasibility study. The study aimed to significantly reduce reliance on grid electricity – especially during peak hours.

Our engineering team conducted a detailed assessment of the site's energy consuming systems, evaluating building energy conservation measures alongside renewable energy (solar and wind) and storage integration opportunities (long and short duration).

Peak load shifting – the key project mission – was accomplished by thermal energy storage. Above-ground chilled water, phase change material, and ice storage were found to be less effective or cost-prohibitive compared to Borehole Thermal energy storage (BTES). The cold BTES system emerged as the cornerstone of the energy strategy – designed to reduce the campus's cooling energy demand by 68% and enable seasonal shifting of renewable energy, with a storage capacity of 3.67 GWh. This approach significantly reduces curtailment and operational costs while improving overall energy resilience.

The optimized solution recommended leveraging underutilized parking lot space for solar generation – integrating both standard PV modules and PVT collectors to simultaneously generate electricity and reject heat to a seasonal cold Borehole Thermal Energy Storage (BTES) system. Existing cooling towers were leveraged in heat rejection for the BTES system, and the existing chillers waste heat made a significant contribution to the buildings heating demand.

This holistic, future-ready energy strategy offers a scalable roadmap for deep decarbonization, serving as a potential model for [classified] credit card company's global data center operations.

Lessons Learned:

When designing microgrids for mission-critical infrastructure, stakeholder alignment on operational risk tolerance is as important as technical feasibility. Early-stage engagement with facilities and IT operations teams ensured that system resilience and uptime were not compromised by aggressive decarbonization targets, ultimately shaping a solution that balanced innovation with institutional confidence.