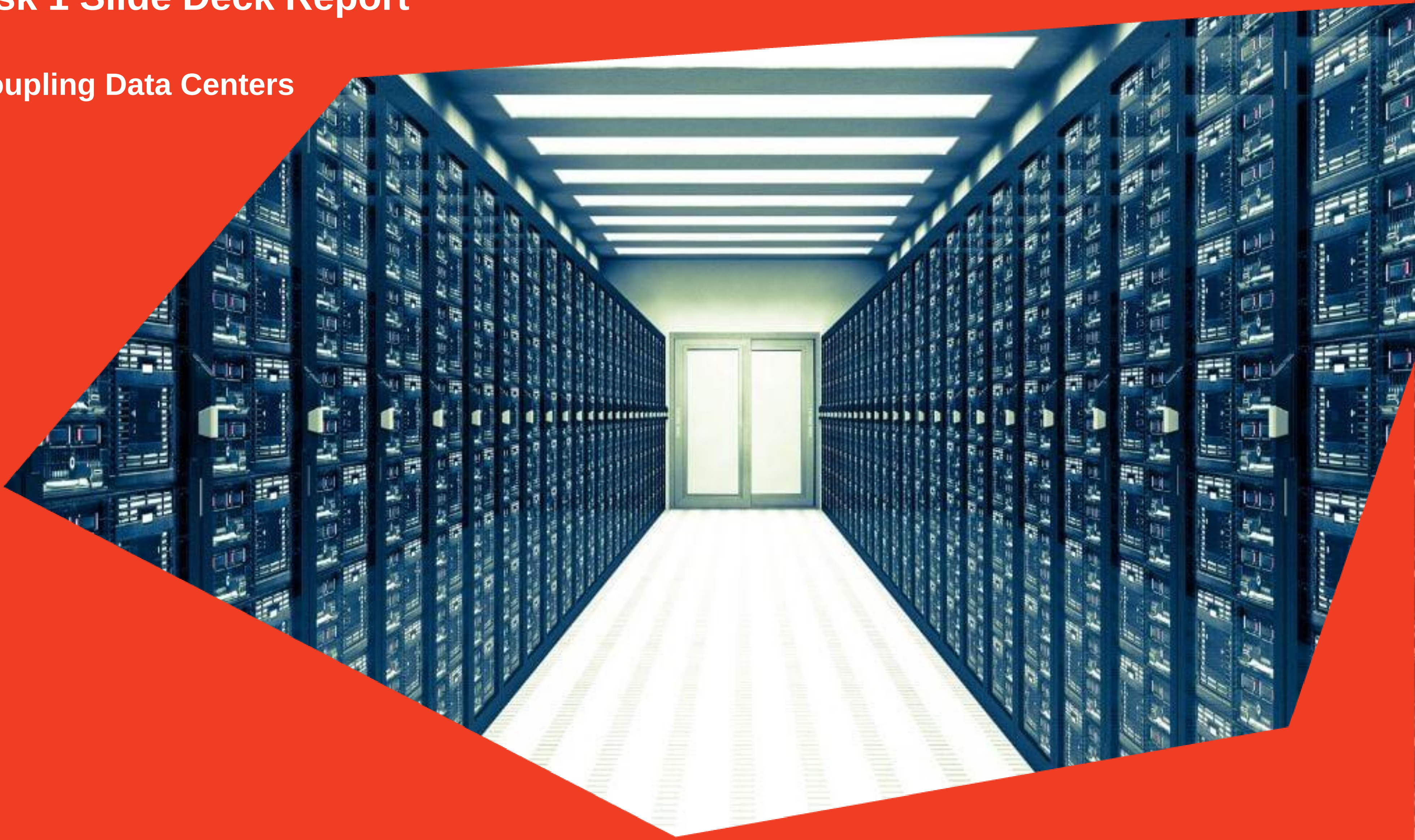
APPENDIX B – Task 1 Slide Deck Report

DATA HEAT: Sector Coupling Data Centers and District Energy

February 2026



RESHAPE STRATEGIES

ENGAGEMENT OVERVIEW

RESHAPE STRATEGIES

Reshape Strategies was engaged by three study funders to explore Sector Coupling Data centres and Thermal Energy Networks. The three funders are:

- Danish Trade Council (DTC)
- International District Energy Association (IDEA)
- New York State Energy Research and Development Agency (NYSERDA)

The work is comprised of three tasks:

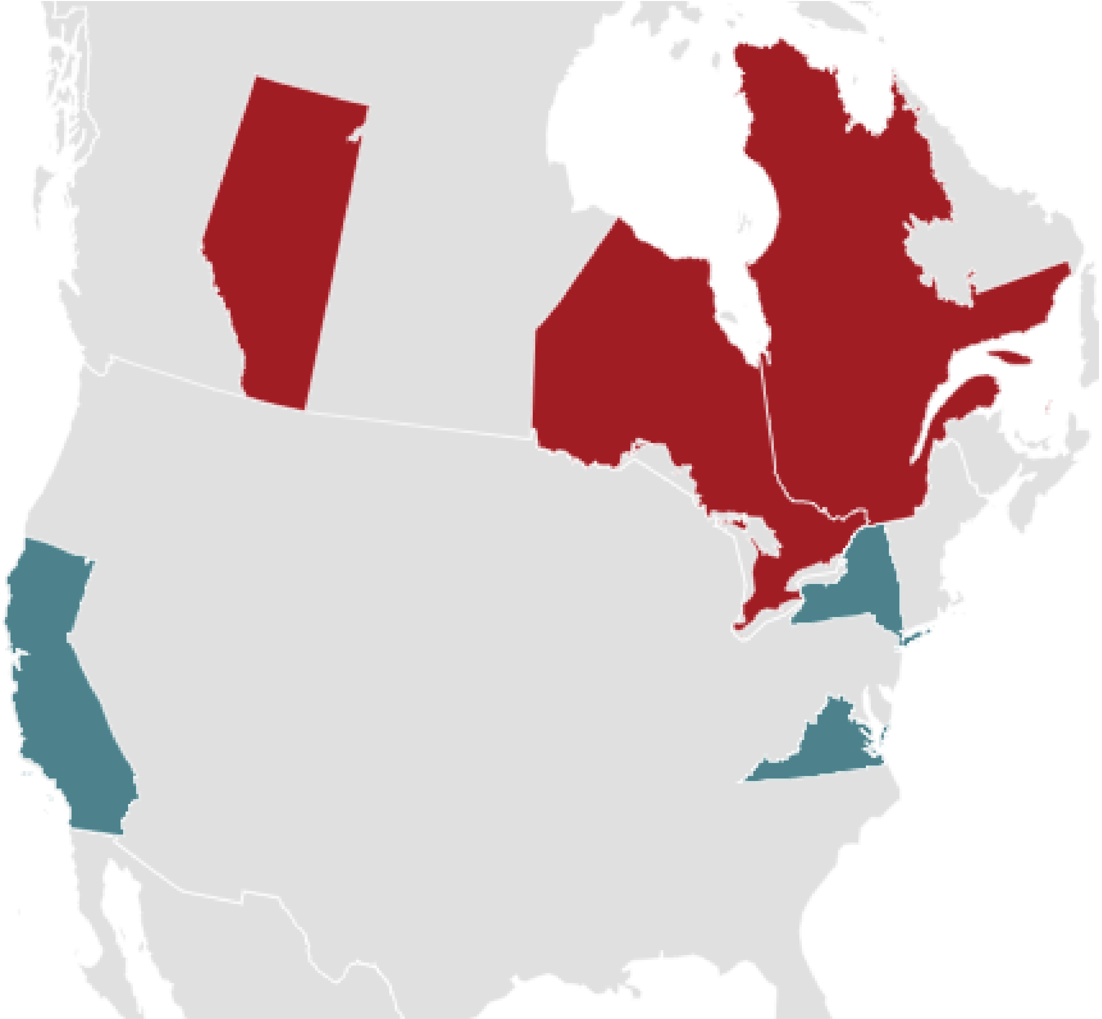
- Task 1: Research Integration Models
- Task 2: Develop a Policy Framework
- Task 3: Develop a Program Guide

This slide deck is a summary of Task 1 and it includes:

- Summary of the opportunity for 6 regions in North America
- Summary of possible technical configurations and business models
- Summary of existing TEN and Baseline policy in the six jurisdictions

The six jurisdictions selected are:

- Canada (Alberta, Ontario, and Quebec)
- US (California, New York, and Virgina)



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LIST OF ACRONYMS AND GLOSSARY OF TERMS

List of Acronyms

AB	Alberta
AI	Artificial Intelligence
CA	California
DTC	Danish Trade Council
DCHR	Data Centre Heat Re-use
GTA	Greater Toronto Area
GW	Gigawatt
HPC	High Performance Compute
IDEA	Internation District Energy Association
MDE	Markham District Energy
MW	Megawatt
MWh	Megawatt-hour
NY	New York
NYC	New York City
NYSERDA	New York State Energy Research and Development Agency
ON	Ontario
UTEN-JA	Utility Thermal Energy Networks and Jobs Act
VA	Virgina
TEN	Thermal Energy Network
QC	Quebec

Glossary of Terms

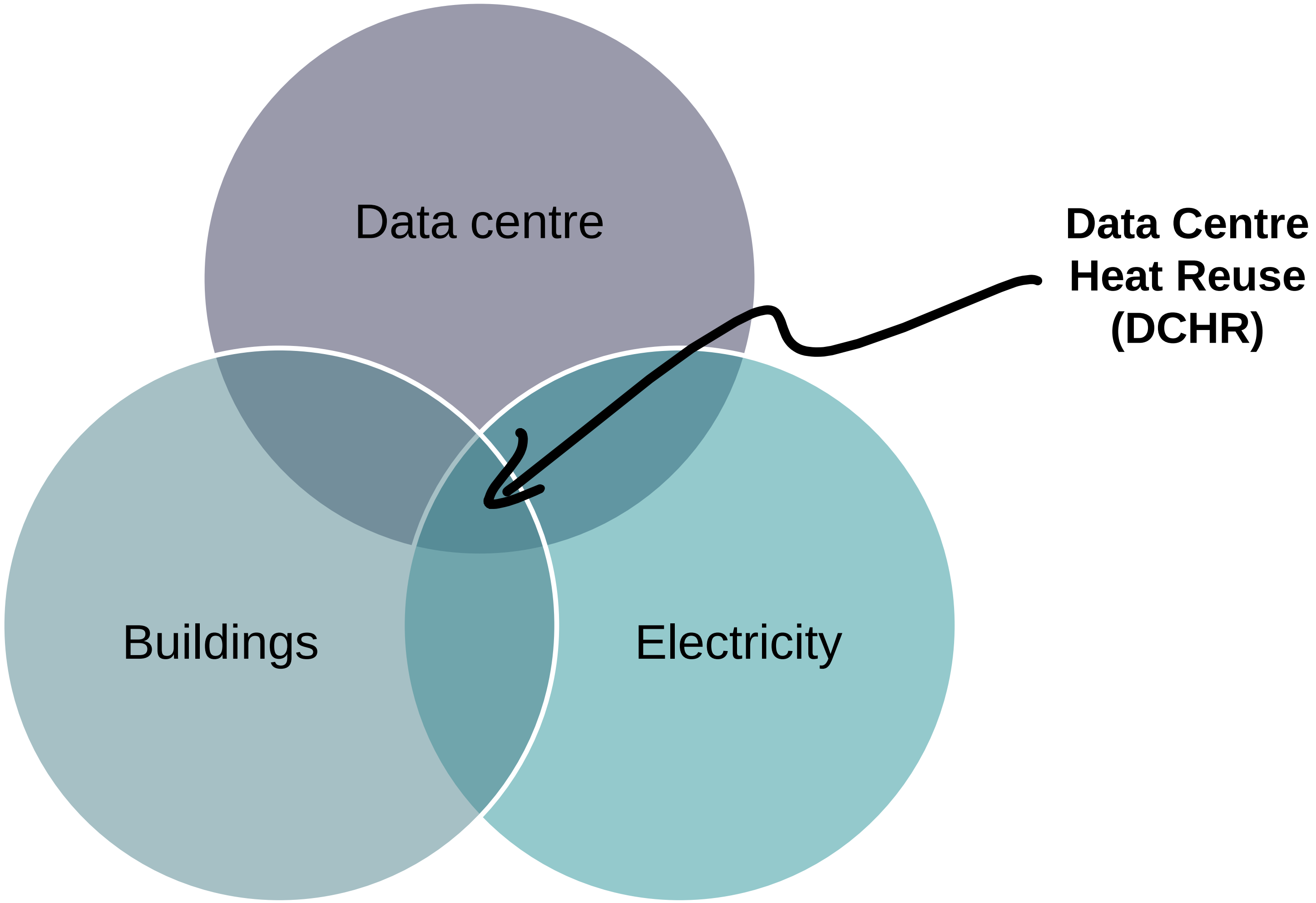
HPC	We refer to certain types of computing as HPC. This does not differentiate the nature of compute. It can be for Artificial Intelligence of bitcoin mining applications
TEN	We refer to TENs throughout the report. This is a universal term that captures all energy networks that provide heating and cooling service. Other terms include district energy, district heating, community energy, neighbourhood energy, and others.

1

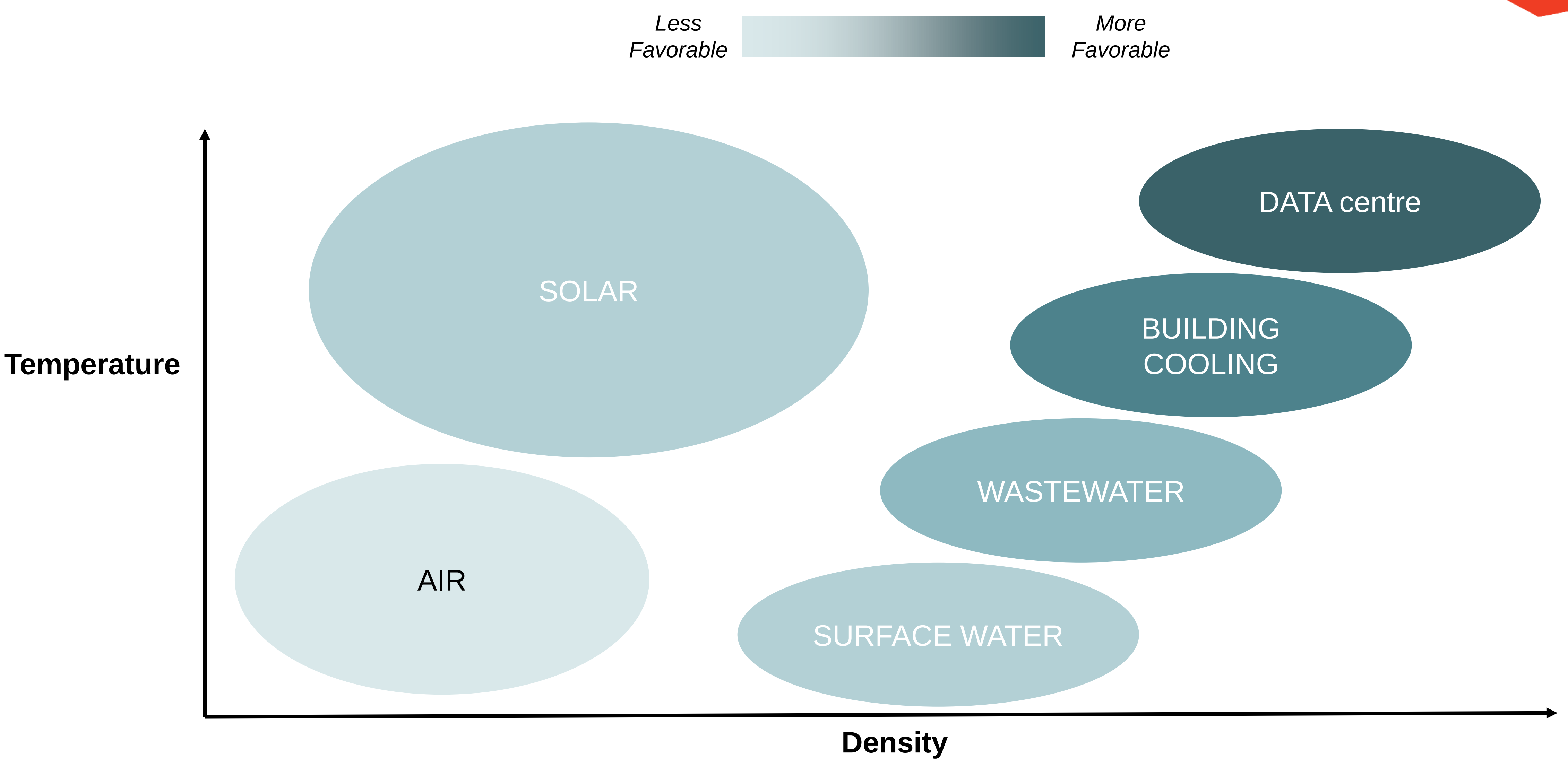
DRIVERS

A CONFLUENCE OF TRENDS

RESHAPE STRATEGIES



FAVOURABILITY OF WASTE / CLEAN HEAT SOURCES



DATA CENTRES INDUSTRY TRENDS

RESHAPE STRATEGIES

Increased Data Centre Demand

More Internet Users

For More Aspects of Life

More Intensive

Rack Densities Increasing

Need for Liquid Cooling

Closer to the Edge

AI, IoT

Driverless cars

Need to be Green

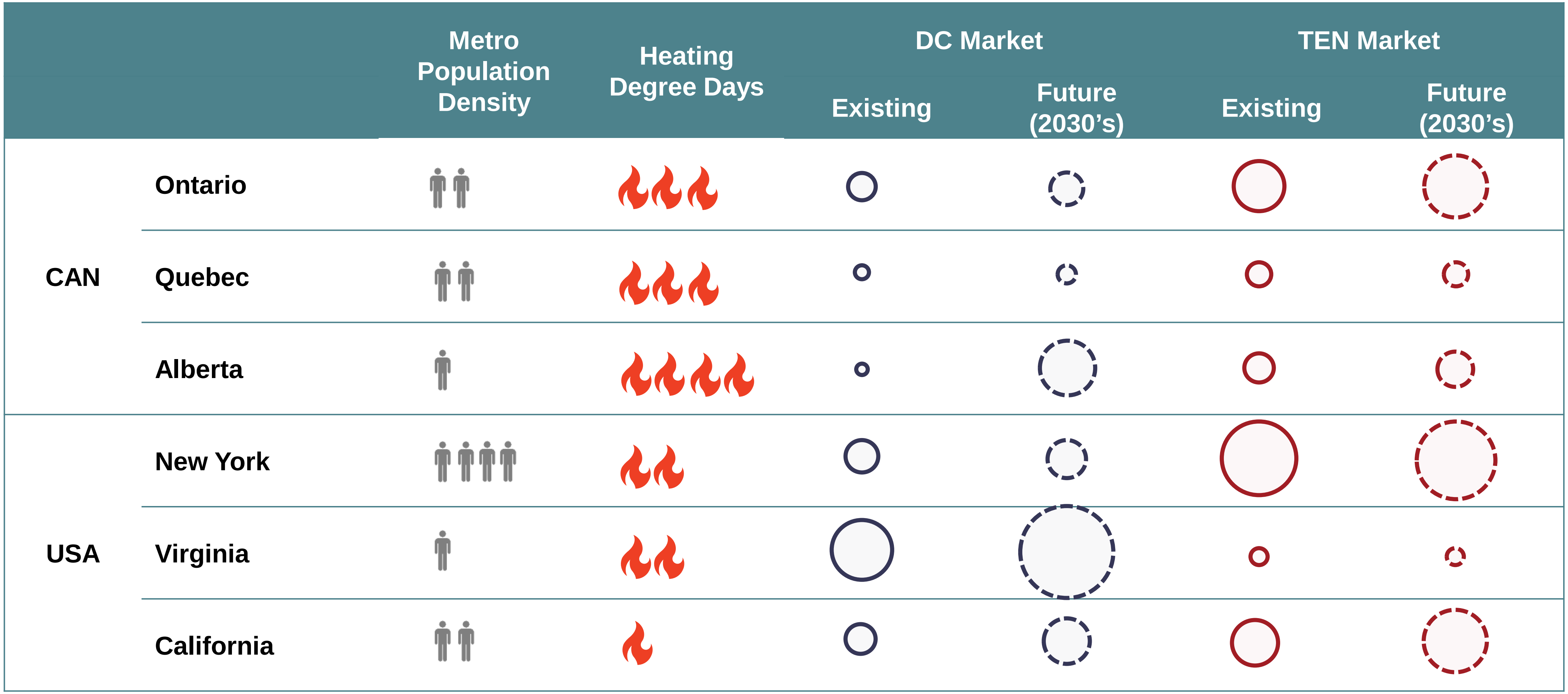
Social License to Build / Operate

Data Centre Regulations / Moratoriums

2

RESEARCH

SUMMARY OF RESEARCH



2.1

POPULATION AND CLIMATE

REGIONAL DEMOGRAPHIC AND CLIMACTIC DATA

RESHAPE STRATEGIES

Region (Subregion)	Population (2023/2024)	Population Density (per km²)	Urban/Suburban Characteristics	ASHRAE Climate Zone	Heating Degree Days (HDD, Base 18°C)	Avg. Annual Temperature (°C)
Ontario (Toronto)	6,400,000 (Greater Toronto Area)	1,020 (GTA)	Highly urban, dense downtown core, sprawling suburbs	6A (Cold, Humid)	~3,500	8.9
Quebec (Montreal)	4,000,000 (Greater Montreal)	1,100 (Greater Montreal)	Urban core with dense residential areas, suburban periphery	6A (Cold, Humid)	~4,200	6.8
Alberta (Calgary)	1,600,000 (Calgary Metro)	200 (Calgary Metro)	Urban centre with low-density suburban sprawl	7A (Very Cold, Humid)	~5,100	4.4
New York City (NYC) New York State (NYS)	8,600,000 (NYC) 20,200,000 (NYS)	11,300 (NYC) 165 (NYS)	NYC Extremely dense urban, NYS mix of urban, suburban, and rural	4A (Mixed-Humid) (NYC)	~2,600 (NYC)	12.7 (NYC)
Virginia (Northern Virginia)	2,400,000 (Northern Virginia, incl. Fairfax, Loudoun)	800 (Northern Virginia)	Mix of dense urban (Arlington) and suburban (Loudoun)	4A (Mixed-Humid)	~2,300	13.8
California (San Jose)	1,900,000 (San Jose Metro)	738 (San Jose Metro)	Urban core with extensive suburban and tech campus areas	3C (Warm-Marine)	~1,400	15.8

Notes on Data Sources and Assumptions:

- *Population: Sourced from Statistics Canada (2023 estimates for Canadian regions), U.S. Census Bureau (2023 estimates for U.S. regions).*
- *Population Density: Calculated based on metropolitan area land area from government statistics.*
- *Urban/Suburban Characteristics: Derived from regional planning documents and urban studies, emphasizing TEN feasibility (e.g., dense urban areas favor shorter pipeline networks).*
- *ASHRAE Climate Zone: Determined using ASHRAE Standard 169-2021 and regional weather station data (e.g., Toronto Pearson, Montreal Trudeau, Calgary Intl, JFK Airport, Dulles Airport, San Jose Intl).*
- *Heating Degree Days (HDD): Sourced from ASHRAE climatic design conditions (2021) and ClimateData.ca, using base 18°C for consistency.*
- *Average Annual Temperature: Based on 30-year normal from Environment Canada and NOAA weather stations.*

2.2

DATA CENTRE MARKET

DATA CENTRE DEVELOPMENT MARKET FORECAST – A BOOM DECADE AHEAD

- BloombergNEF (BNEF) forecasts US data-centre **power demand will more than double by 2035**, rising from almost 35 gigawatts in 2024 to 78 gigawatts. Actual **energy consumption growth will be even steeper, with average hourly electricity demand nearly tripling** – from 16 gigawatt-hours in 2024 to 49 gigawatt-hours by 2035.

- 40+ GW of capacity currently in the interconnection queue in Northern Virginia, with PJM expecting 10 – 15 GW to come online by 2030.[1]

- In California, data centre providers have requested 3.5GW of new power from Pacific Gas & Electric (PG&E), with delivery dates through 2029. Notable requests include single customers seeking 600MW and 800MW.

Figure 1: US data center power load

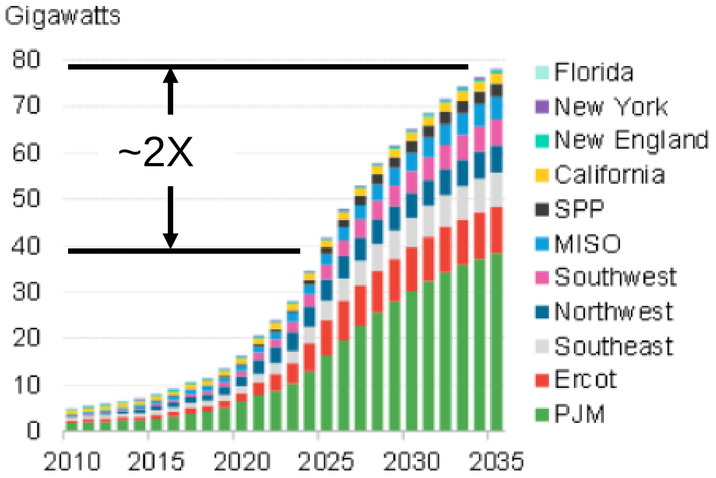
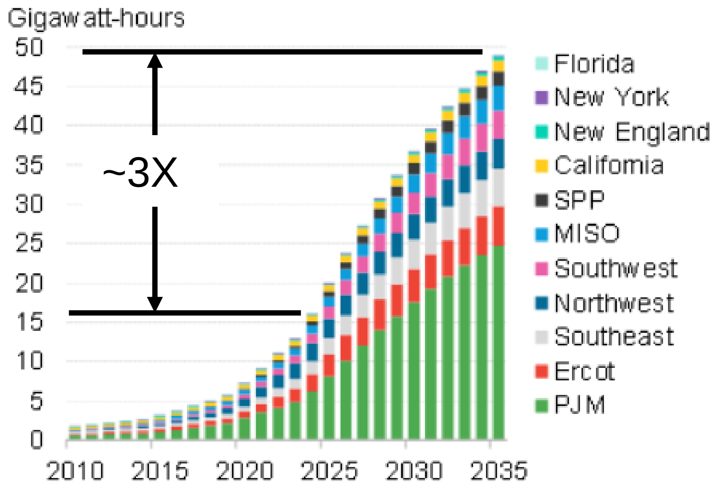


Figure 2: Average hourly US data center electricity demand



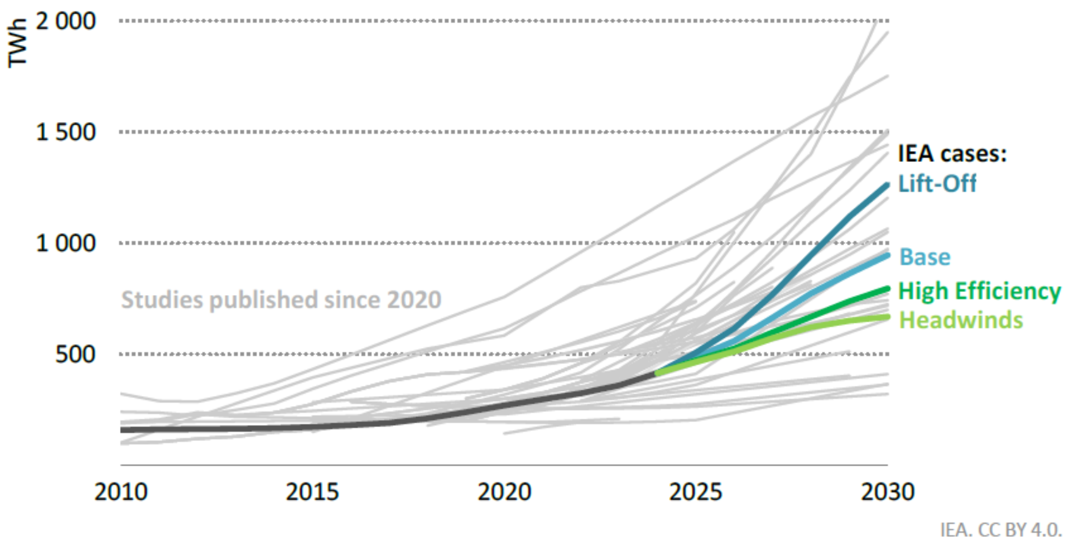
[1] Aurora Energy Research, Data centre Load Growth in PJM, June 13 2024

BloombergNEF, Power for AI: Easier Said Than Built, April 15, 2025

DATA CENTRE DEVELOPMENT MARKET FORECAST – DEGREE AND PACE OF GROWTH IS HIGHLY UNCERTAIN

There is a Sevenfold Difference Between the Highest and Lowest Projections of Energy Demand from Data centres for 2030 (all forecasts)

A ~2X difference between IEA's 'Headwinds' and 'Lift-Off' scenarios for data centre market forecast



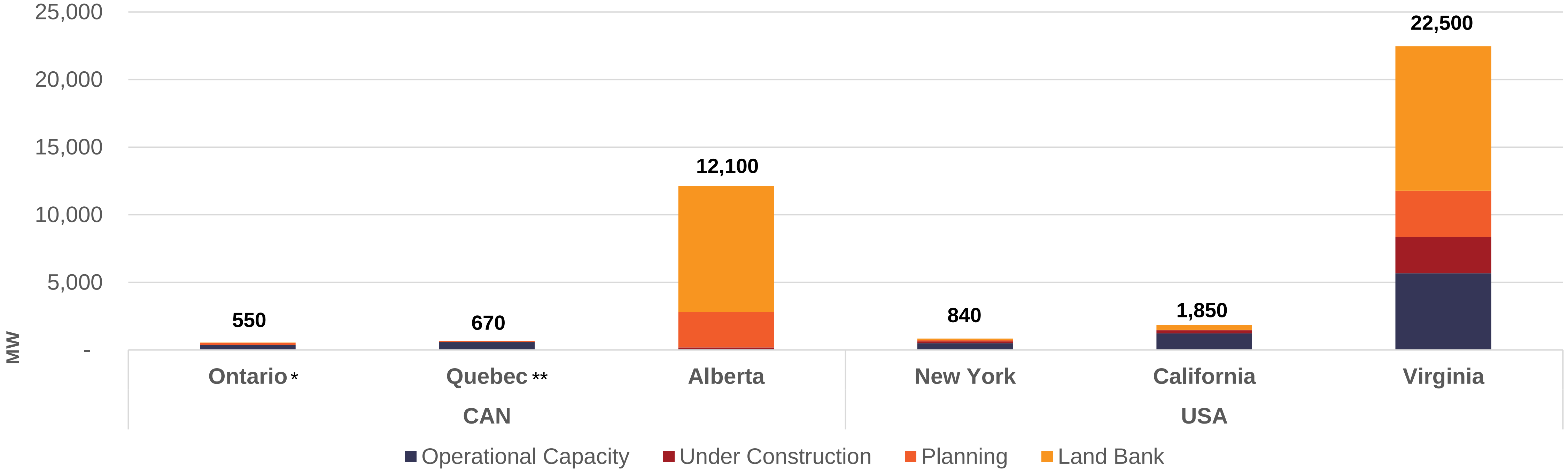
There is a sevenfold difference between the highest and lowest projection of energy demand from data centres for 2030

Notes: TWh = terawatt hour. For an explanation of the cases used in this report (Base Case, Lift-Off Case, High Efficiency Case and Headwinds Case), please see Chapter 2, section 2.1.1.

Source: IEA analysis based on Kamiya and Coroamă (2025).

IEA World Energy Outlook Special Report, Energy and AI, 2025, Third-party scenarios of data centre electricity demand compared to IEA cases, 2010-2030, pg 218

DATA CENTRE MARKET BY JURISDICTION (OPERATIONAL / UNDER CONSTRUCTION / IN PLANNING / LAND BANK)



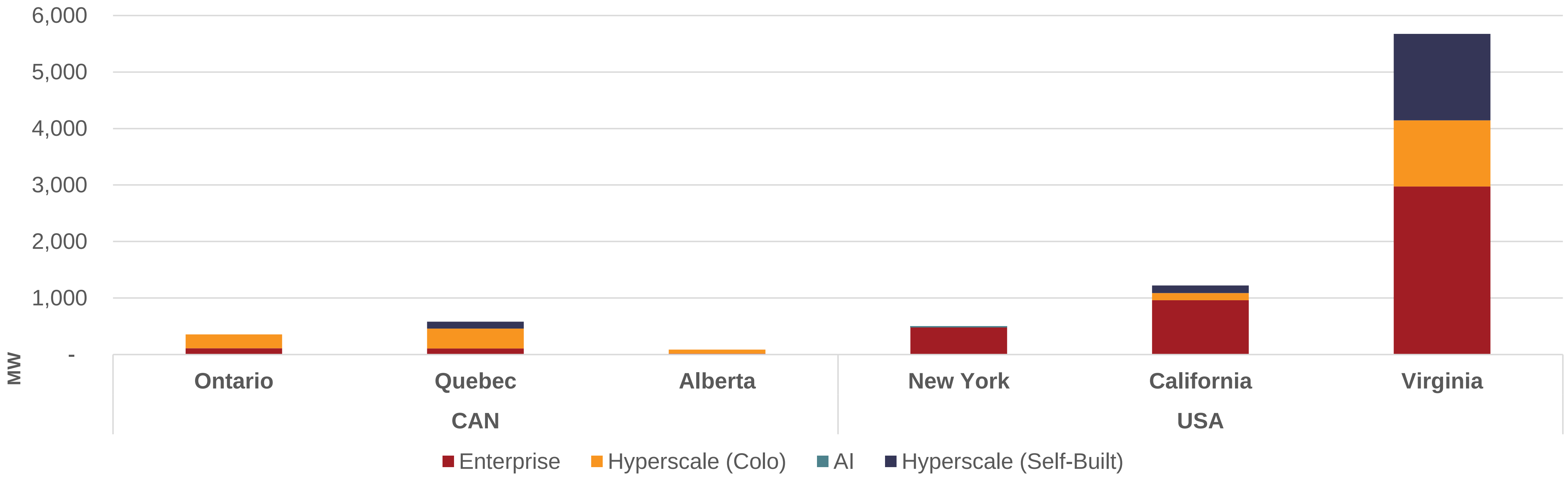
Under Construction: Data centre is under construction as of Q1 2025.

Planning: Data centre is in the planning/permitting/predevelopment phases.

Land Bank: Land is held for future data centre development and/or expansions. Often as a part of a multi-phase campus data centre development.

Data set courtesy of Structure Research. Megawatts (MW) indicate capacity of total connected IT load.
** Microsoft has three self-build data centres under development in the GTA not captured within this dataset*
*** Microsoft has secured 4 plots of land near Quebec City which it is actively developing, these are not captured within this dataset*

DATA CENTRE MARKET BY JURISDICTION AND TYPE (OPERATIONAL ONLY)



Enterprise: Data centre facility is shared between multiple tenants. Customer deployments are typically around 0.2-1MW.

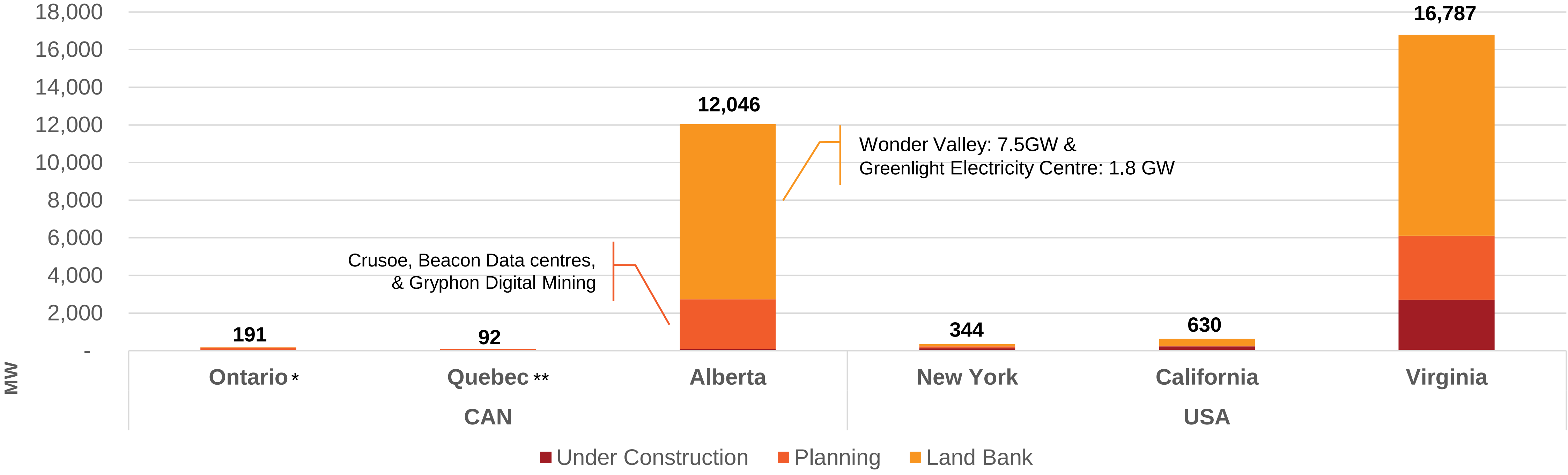
Hyperscale (Colo): Hyperscale colocation facility is leased to a handful or sometimes a single tenant who commits to larger IT capacities. Structure Research defines hyperscale colocation capacities as starting at 2MW commitments, though hyperscale deployments are increasingly moving in the 10-30MW range.

Hyperscale (Self-Built): Data centre facilities constructed, owned and operated by one of the hyperscale technology companies (e.g. Amazon, Microsoft, Meta, etc)

AI: Data centres that have a focus on AI and/or crypto deployments. Utilizes large quantities of GPUs and liquid cooling to support high density workloads.

Data set courtesy of Structure Research. Megawatts (MW) indicate capacity of total connected IT load.

DATA CENTRE DEVELOPMENT PIPELINE (TO 2035†)



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*** Microsoft has secured 4 plots of land near Quebec City which it is actively developing, these are not captured within this dataset*
† The figure captures data centre projects that are currently in the development pipeline. Actual delivery dates for implementation are highly uncertain, particularly for capacity within the 'Land Bank' category. 2035 was selected as an indicative date by which all of these projects will be delivered, however there is uncertainty as each individual project will follow a unique development timeline.

DATA CENTRE DEVELOPMENT BACKLASH

RESHAPE STRATEGIES

A New Flashpoint in Local Politics

- Once viewed as invisible infrastructure, data centres have become a visible and contentious issue in U.S. communities.
- Over the past two years, **$64 billion** in U.S. data centre projects have been **blocked or delayed**[1] due to community resistance.

Nationwide, Bipartisan Opposition

- **142 grassroots and formal groups** are actively campaigning across **24 states** to halt or restrict data centre projects.
- Opposition comes from both sides of the political aisle: Democrats often raise environmental concerns; Republicans target tax incentives and grid strain.

Key Drivers of Community Resistance

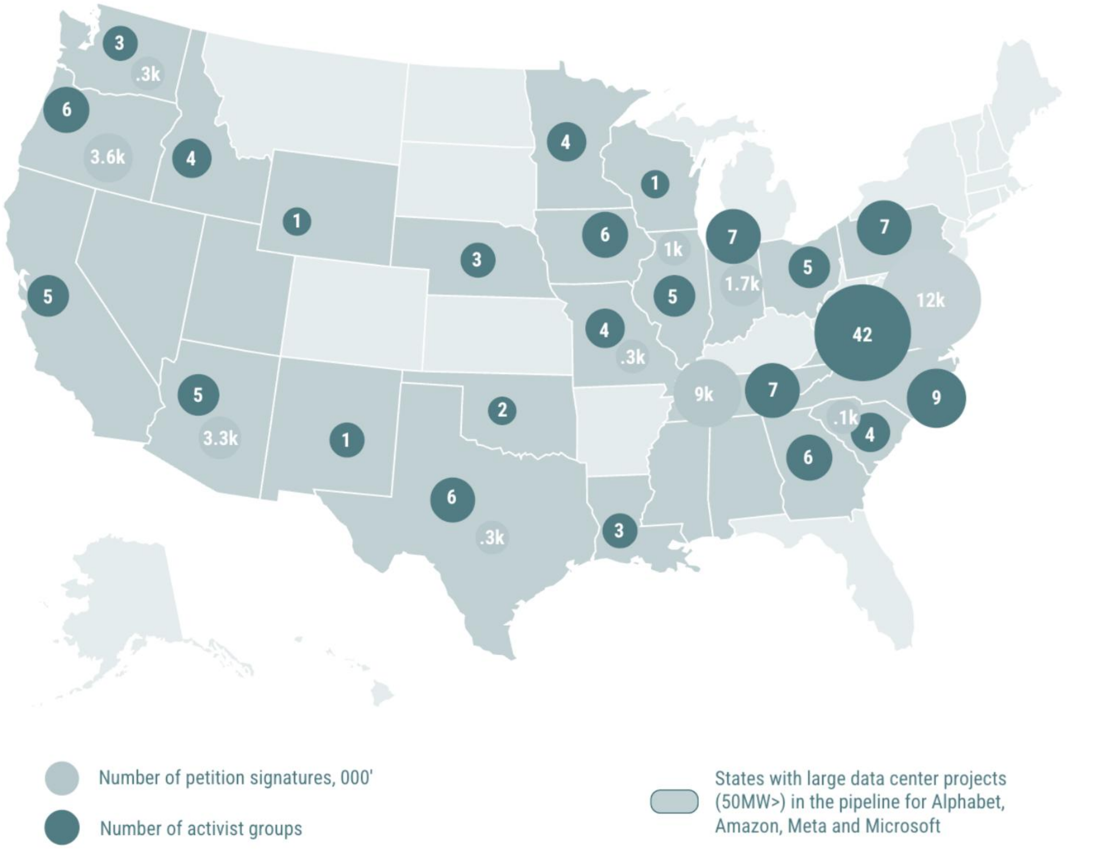
- Common concerns include:
  - Water use and power demand
  - Noise and visual impact
  - Pressure on local infrastructure
  - Loss of green space and property value concerns

Examples of Political Impact

- In Virginia and Oregon, community backlash has led to project cancellations and even the ousting of public officials who supported development.
- Warrenton, VA: Every town council member who supported Amazon's proposed data centre project lost re-election in 2024.

Emerging Trend

- Anti–data centre activism is evolving from scattered grassroots efforts into well-organized coalitions, particularly in growth hotspots like Northern Virginia.

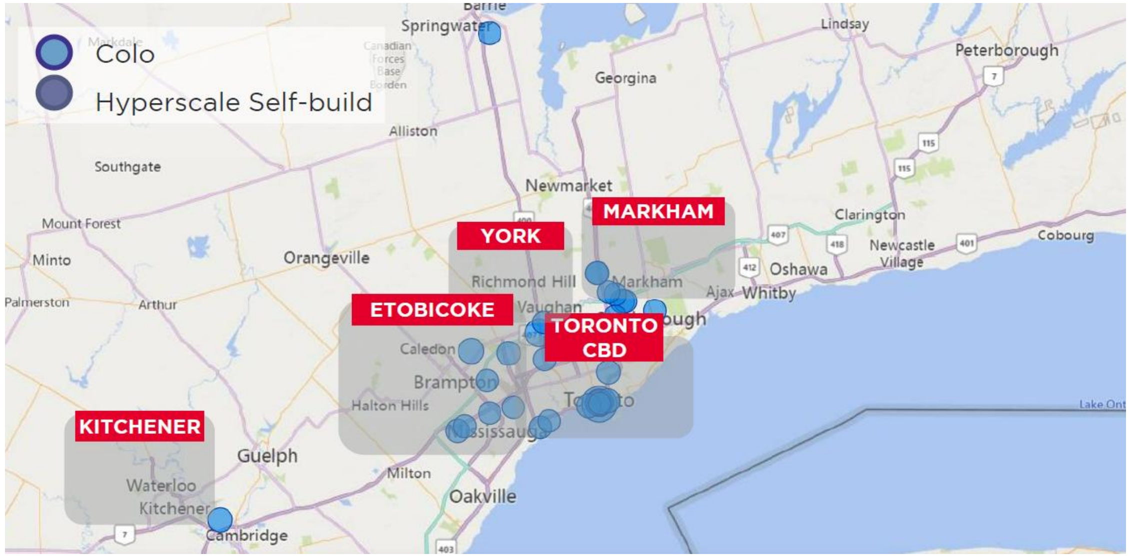


Data centre Watch Report (a project by 10a Labs), Local Opposition to Data Centre Development

[1] *$18 billion worth of data centre projects were blocked, and another $46 billion of projects were delayed over the last two years in the face of opposition from residents and activist groups.*

ONTARIO

- Healthy data centre market with consistent growth, though smaller than other major North American markets. Historically focused on colocation providers. Shift in dynamics with Microsoft's entry: 84MW data centre under construction (delivery 2026) and two more planned (First self-built data centre from a hyperscaler – may indicate more to come).
- Expected to benefit from Canadian Sovereign AI Compute Strategy: CA$2 billion investment, with CA$700 million for AI-enabled data centres.
- Refurbishment of nuclear power stations expected to be a cornerstone of generation capacity to serve growing datacentre power demand

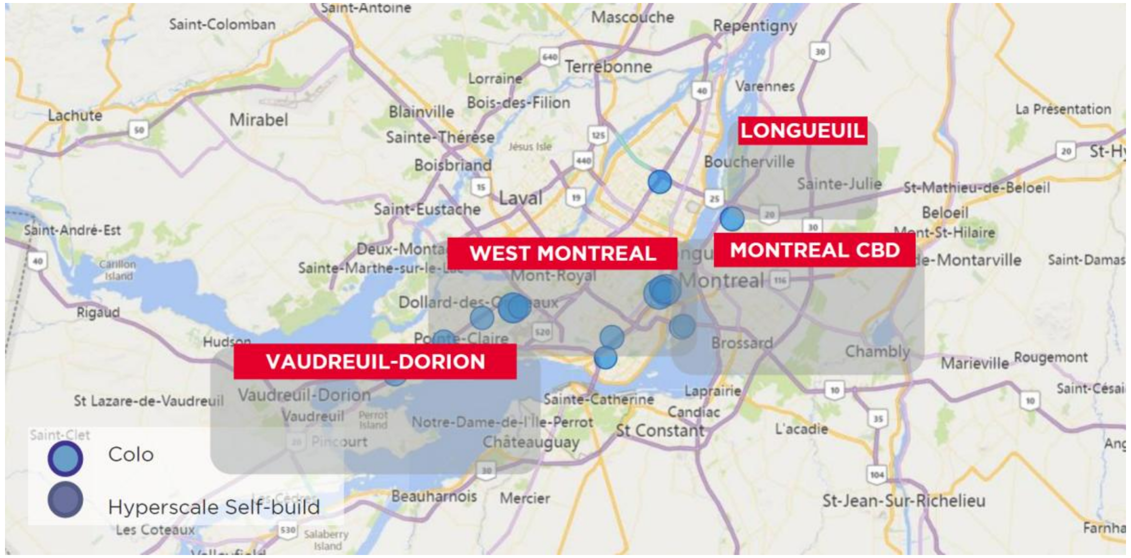


QUEBEC

- Montreal is gaining traction as a competitive data centre market in Canada, showing strong potential for growth. Benefiting from low operating costs due to abundant hydroelectric power, attractive tax incentives, and close proximity to major East Coast markets, the city offers a compelling environment for data centre development.

- Although smaller than Toronto, Montreal is seeing steady expansion, with fewer land availability constraints than the GTA, positioning it well for continued growth. The market stands to gain from the Canadian government’s investment in AI infrastructure, much like Toronto.

- Notable expansions are already in progress, with Qscale planning to enhance its Q01 campus and Vantage set to grow its QC2 campus.



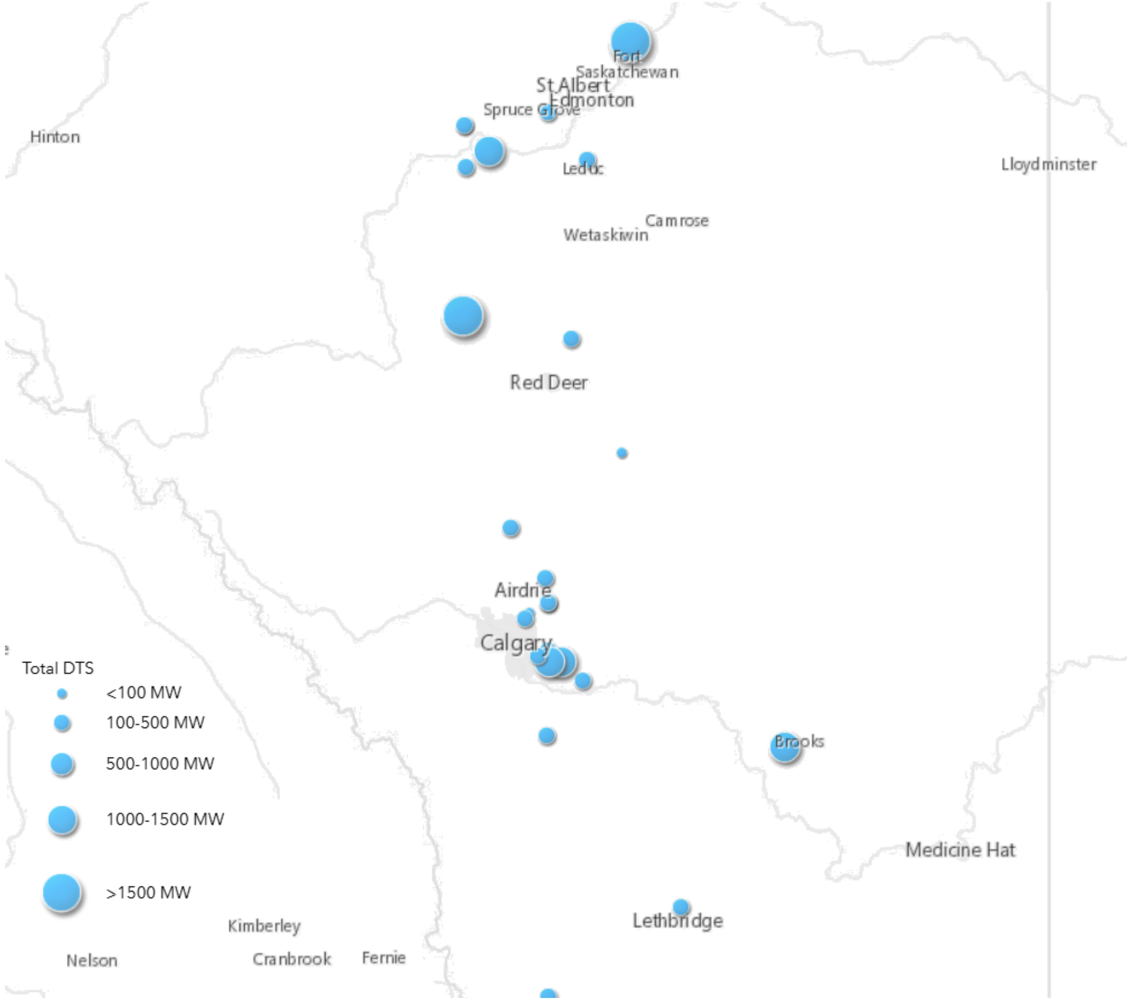
ALBERTA

RESHAPE STRATEGIES

- Massive pipeline of new projects: Over 15 major data centre proposals (totaling several gigawatts of IT power) are in the Alberta Electric System Operator queue, including Beacon Data Centres' AI hubs of up to 400 MW capacity near Calgary.

- Favourable economics and infrastructure: Alberta's competitive electricity pricing, lack of provincial sales/payroll tax, ample land, and growing tech workforce (up ~78% from 2018–2023) support the city's attractiveness for large-scale data centre investment.

- Despite strong data centre growth, there are no publicly documented projects yet using captured data centre waste heat for TENs in Calgary or Alberta—although this potential is often discussed as part of future sustainability planning



MINISTRY OF FOREIGN AFFAIRS OF DENMARK *The Trade Council*
INTERNATIONAL DISTRICT ENERGY ASSOCIATION
NEW YORK STATE | NYSERDA

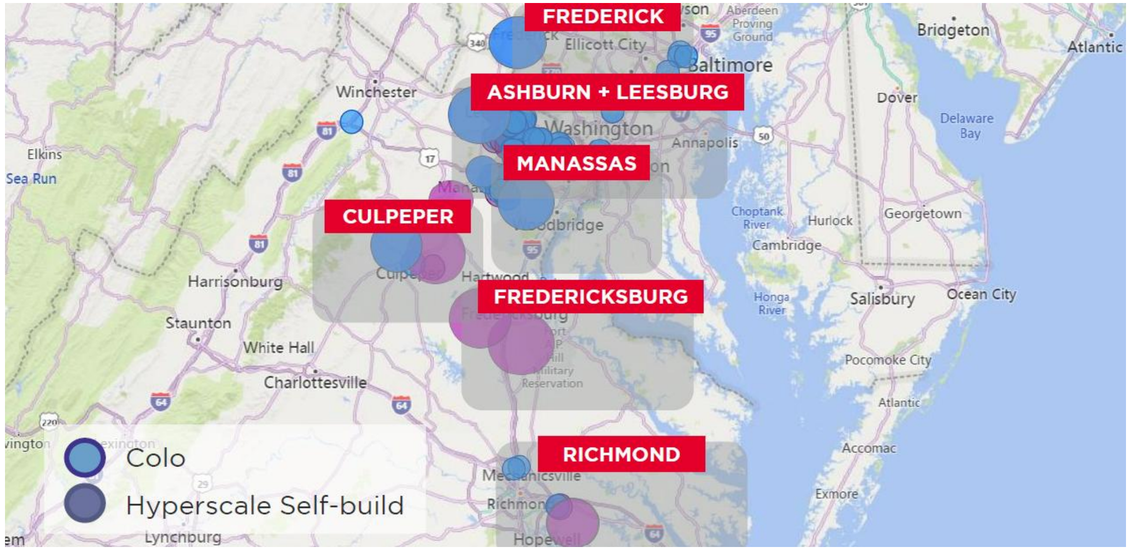
VIRGINIA

RESHAPE STRATEGIES

- Virginia remains the largest data centre market in the world, with operational capacity the 6GW mark. To put this in perspective, Virginia's operational data centre capacity is larger than the combined capacity of the next three largest data centre markets in the Americas. It also represents more than 25% of total operational capacity throughout North, Central, and South America.

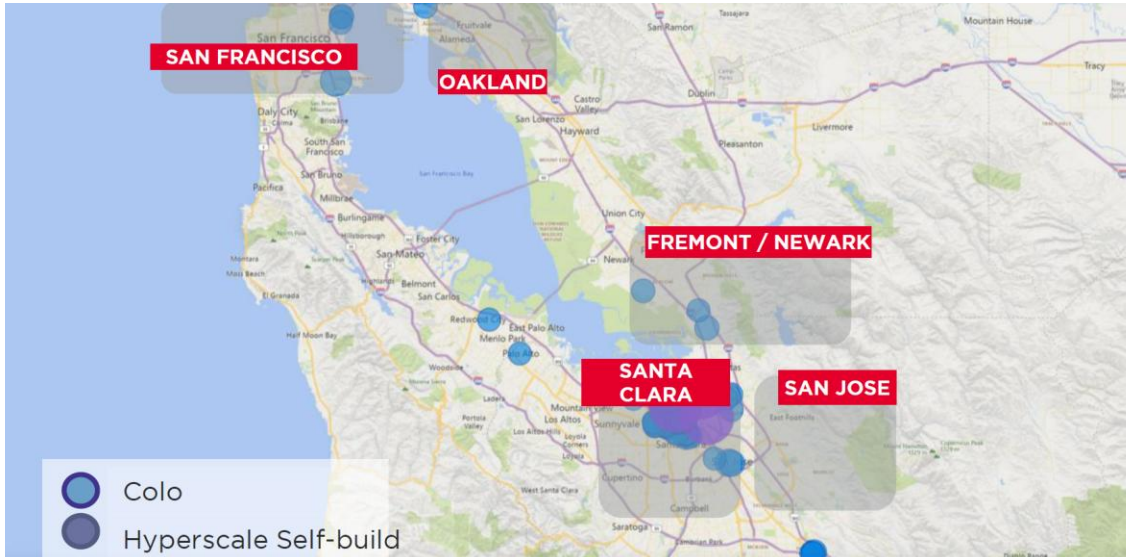
- Virginia continues to face power limitations, with Dominion Energy struggling to keep up with the rising electricity demands from existing and under-construction data centres.

- Land scarcity remains a major issue, increasing land prices and pushing transactions further from Northern Virginia's core. Despite this, established areas like Ashburn still offer available plots. Operators looking to leverage the submarket's robust data centre infrastructure are paying upwards of $4 million per acre.



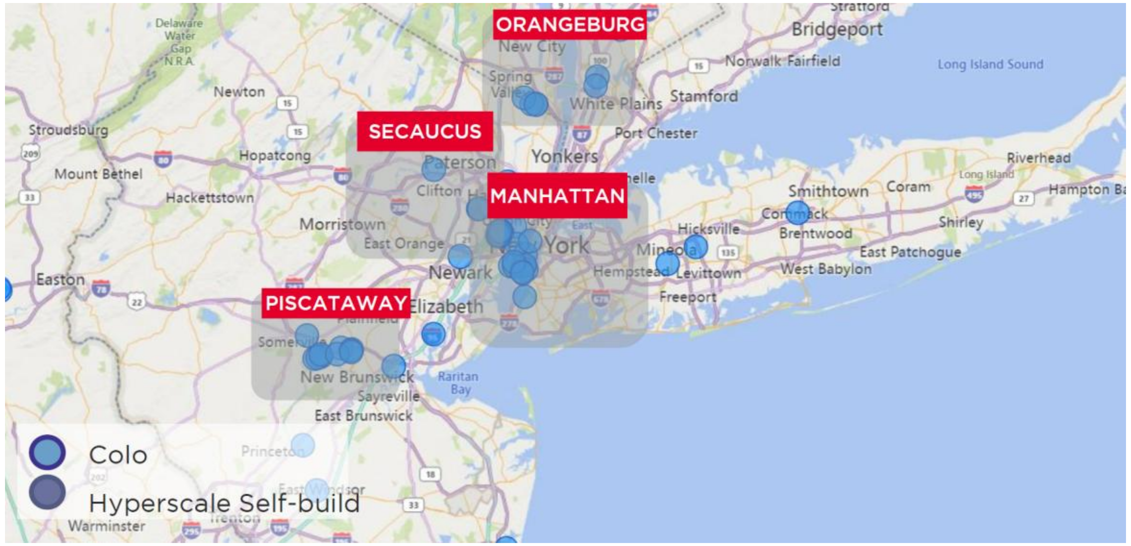
CALIFORNIA

- Modest demand for data centres with steady growth in Silicon Valley and the broader Bay Area.
- Challenges include power constraints, high land costs, and minor seismic activity risks.
- Demand is shifting to nearby markets: Reno, Portland, Eastern Oregon, and Phoenix due to local constraints.
- Data centre providers have requested 3.5GW of new power from Pacific Gas & Electric (PG&E), with delivery dates through 2029. Notable requests include single customers seeking 600MW and 800MW.
- Potential for a data centre renaissance in Silicon Valley and the Bay Area, however challenges remain with respect to rising land values and lack of immediate electricity rate relief. Competitive advantage persists in Washington, Oregon, Nevada, and Arizona due to lower development and operational costs.



NEW YORK

- Strong demand for data centre compute driven by proximity to New York City. Robust infrastructure and favorable business climate.
- Growth has slowed; under-construction pipeline at 40MW. Planned pipeline stands at 186MW.
- Over 50% of under-construction capacity from established operators expanding existing facilities. Preference for expanding current data centres over new builds.
- Significant constraints in power and land availability. Hyperscalers are shifting focus to the Midwest, where power and land issues are less severe.

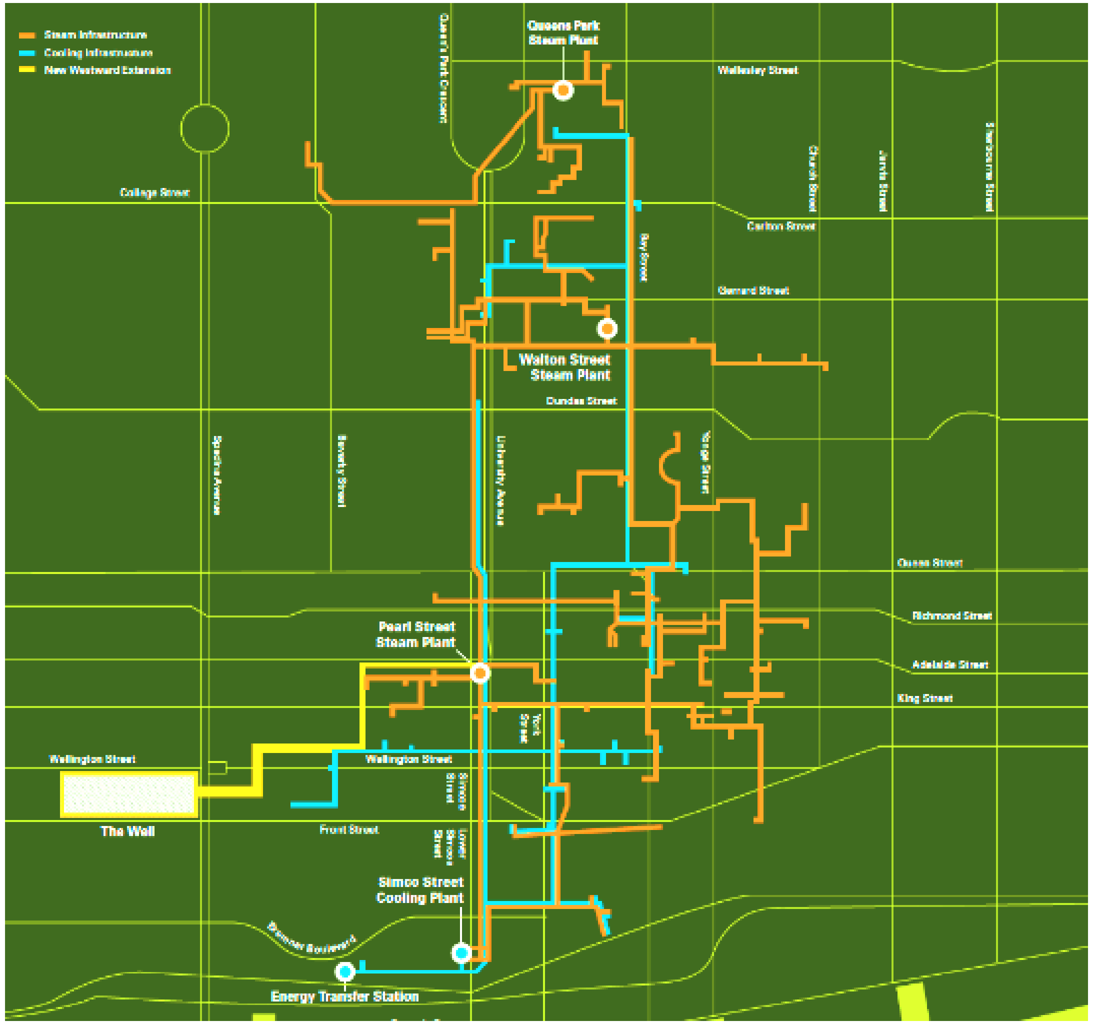


2.3

THERMAL ENERGY NETWORKS

ONTARIO

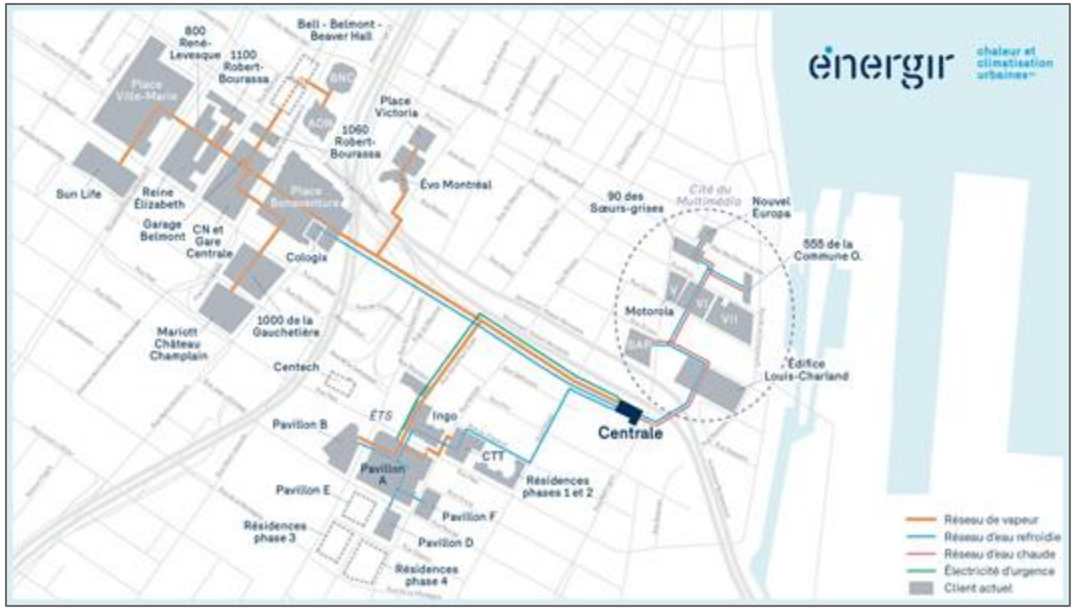
- **There are >60 TENs in the province** serving ~2,700 MW of heating load at winter peak. The systems are a mix of university and hospital campuses, and public and private TENs
- **Enwave Energy Corporation** operates the most extensive thermal networks in the Greater Toronto Area (GTA), including the Downtown Toronto district energy system, which supplies steam and hot water for heating and chilled water for cooling to over 180 buildings in the urban core. Deep Lake Water Cooling (DLWC) is a globally significant system, drawing cold water from Lake Ontario to provide low-carbon cooling. It's integrated with Enwave's downtown Toronto system and is one of the largest systems of its kind in the world.
- **Markham District Energy (MDE)** is a municipally owned utility providing thermal services to over 2 million square feet of buildings, with expansion plans tied to local growth and electrification. It primarily uses natural gas CHP, with growing integration of electric boilers and thermal storage. MDE has partnered with Equinix to harness waste heat from the TR5 data centre campus.
- **Regulatory and policy environment** is fragmented. Unlike in many European countries, Canada lacks a comprehensive federal or provincial framework supporting TENs. However, municipalities like Toronto are increasingly incorporating TENs into climate action plans and zoning bylaws, often requiring new developments to be "district energy ready."



Map of Enwave downtown Toronto district energy system. Image Credit: Enwave Energy Corp.

QUEBEC

- **CCUM (Réseau de Chauffage et de Climatisation Urbain de Montréal)**, owned by Énergir, is the city's largest thermal network. It supplies steam, hot water, and chilled water to over 1.8 million m² of downtown buildings, including universities, hospitals, and museums.
- **Hydropower-based** electricity enables low-carbon operation, with electric boilers, chillers, and heat pumps forming the backbone of CCUM's infrastructure. The low emissions intensity of Québec's grid (~1.5 gCO_2/kWh) allows for large-scale electrification of thermal supply.
- **QScale's Q01 data centre campus in Lévis** is being developed in partnership with Énergir Développement to recover and redistribute up to 96 MW of waste heat—enough to heat more than 15,000 homes.
- **Campus-scale thermal systems**, such as those at Université de Montréal, Polytechnique, and McGill, operate independently but are undergoing upgrades to improve energy efficiency and potentially interconnect. Some use geothermal and electric backup and are candidates for integration into broader networks.
- **City policy actively supports thermal networks**, especially through the Plan Climat Montréal 2020–2030 and zoning incentives in strategic growth areas (e.g., Quartier des Gares, Cité du Multimédia). These initiatives target building electrification, low-carbon thermal supply, and eventual network interconnection across districts.



Map of Energir's CCUM thermal energy network in downtown Montreal. Image Credit: Energir

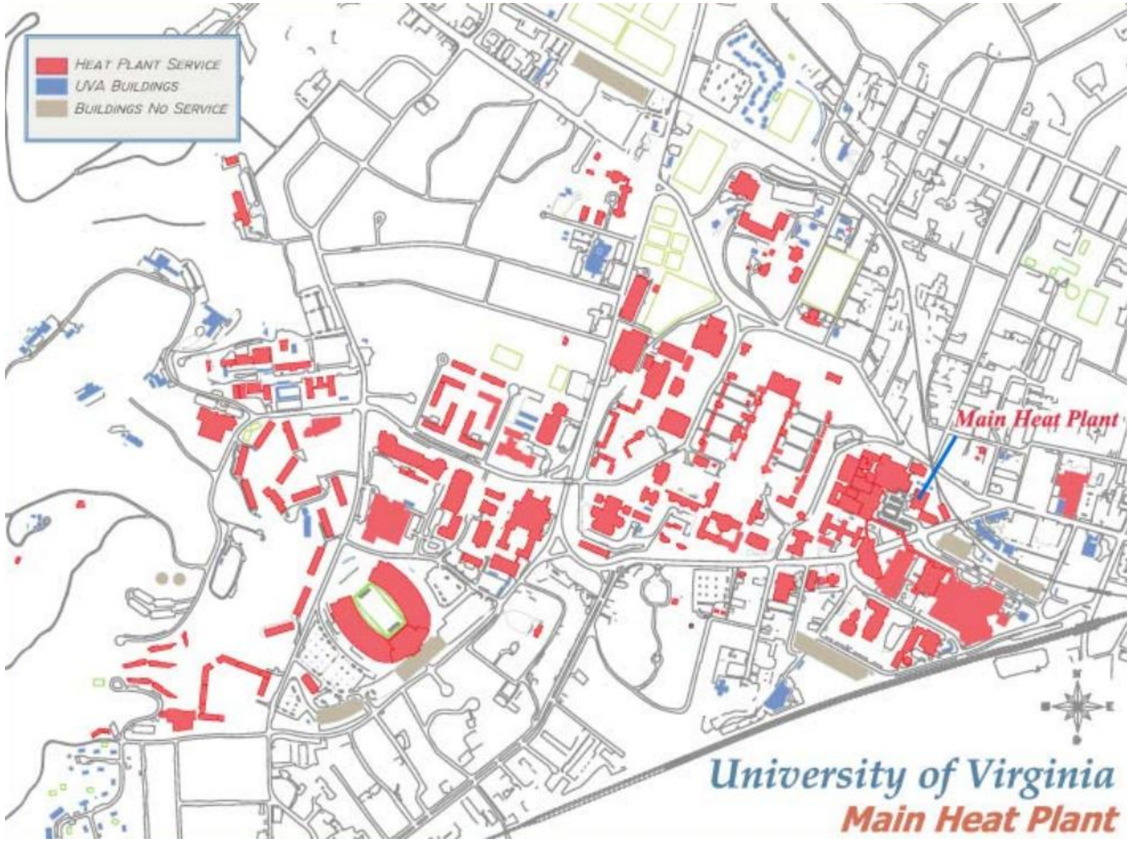
ALBERTA

- **ENMAX's Calgary Downtown District Energy System** is the largest in Alberta, providing steam and chilled water to approximately 50 buildings in the core business district, including office towers, hotels, and hospitals. It uses primarily natural gas boilers and CHP.
- **EPCOR's Edmonton District Energy System** supplies heating and cooling to over 40 buildings downtown, combining natural gas-fired boilers, electric chillers, with growing interest of waste heat recovery from nearby facilities.
- **The City of Edmonton** has developed a District Energy Strategy that aims to build on it's delivery and continued operations of the Blatchford District energy system that is based on geo-exchange.
- **Industrial and campus systems** (e.g., University of Alberta's steam system) are significant thermal energy users but often operate independently rather than integrated into larger city-wide networks.
- **Alberta's deregulated electricity market and fossil-fuel resource abundance influence system design**, resulting in less emphasis on electrification and renewable heat sources so far, but increasing interest in geothermal, waste heat from industry, and carbon capture as decarbonization pathways emerge.
- **Alberta's TEN landscape is more decentralized and industrially focused** compared to Québec or Ontario, with key networks concentrated in Calgary and Edmonton serving commercial, institutional, and mixed-use developments.

Final phase of the City of Edmonton's District Energy Strategy (published August 2022)

VIRGINIA

- Existing TEN's limited to universities (University of Virginia, Charlottesville), Hospitals (Johnston-Willis), and military bases (Quantico).
- The Northern Virginia Regional Commission is **calling for development of TENs around its vast complexes of data centre**s, however, there has been limited uptake and they are only beginning the process of a pilot project.
- **Navy Yard Annex and Military Bases (Norfolk area)** feature federally operated thermal energy systems—some undergoing modernization to support electrification and energy resilience under **DOD Energy Security Initiatives**

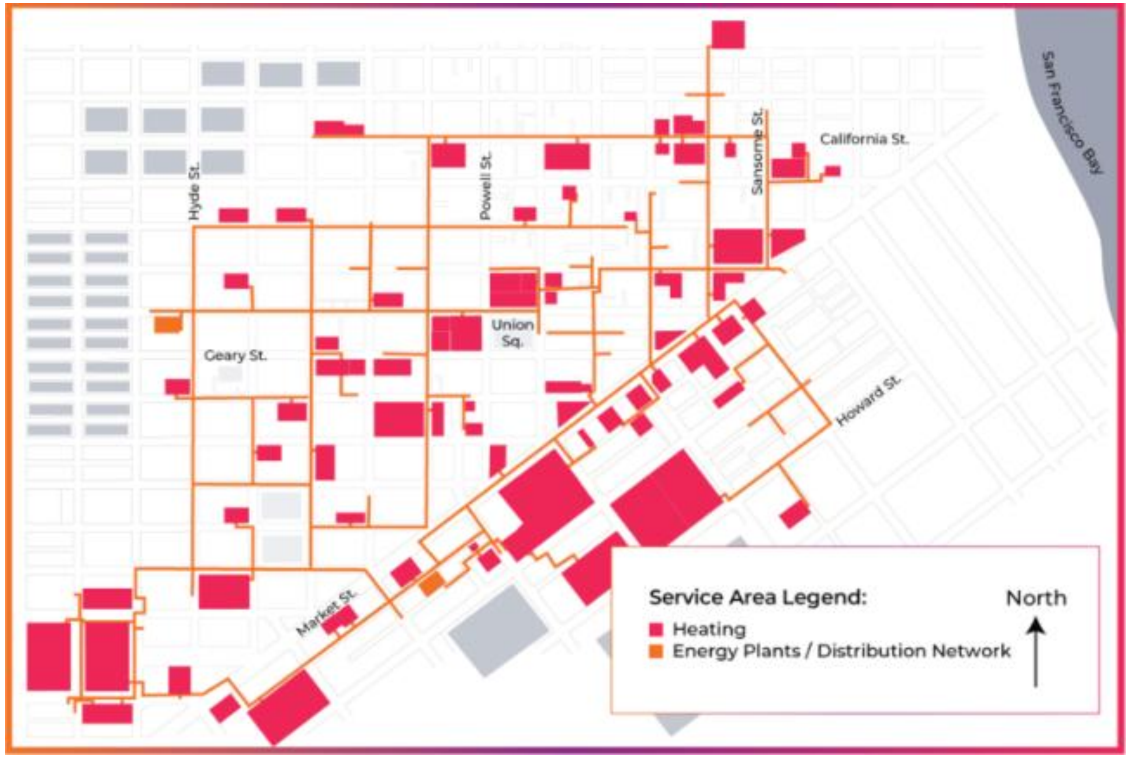


Map of University of Virginia's campus district heating system (Charlottesville). Image Credit: UoV

(NORTHERN) CALIFORNIA

RESHAPE STRATEGIES

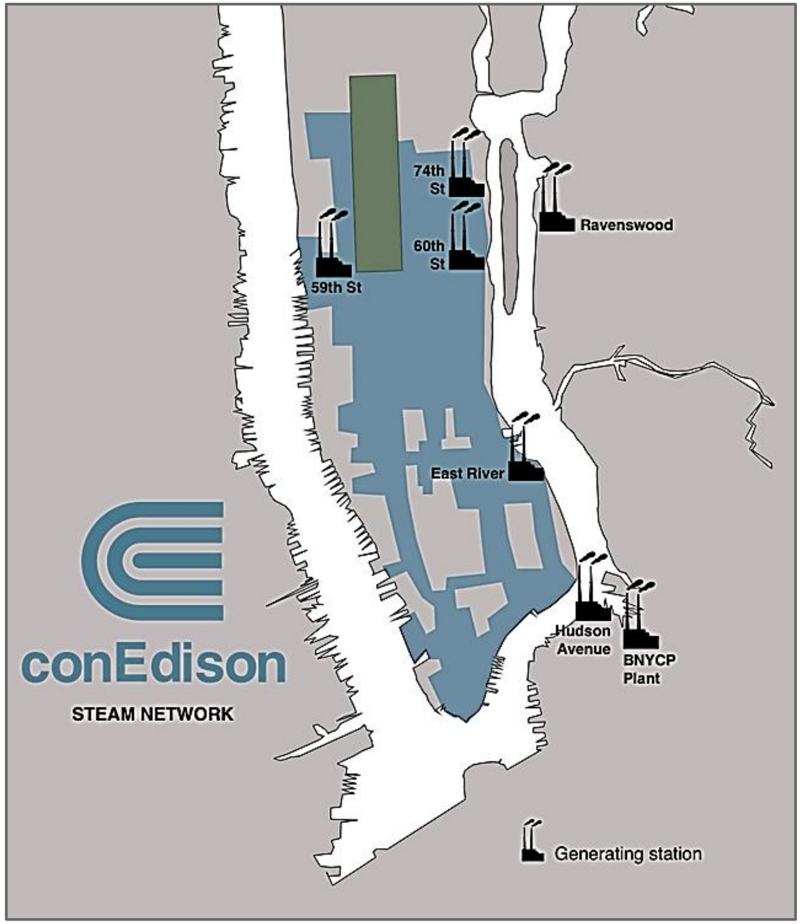
- **San Francisco District Energy (Cordia, formerly Clearway)**: Serves downtown San Francisco with steam and chilled water, sourced primarily from a natural gas CHP plant. Transition strategies toward lower-carbon thermal supply are actively being evaluated.
- **San José "Net Zero Community" project with Westbank & PG&E**: A pioneering Thermal Energy Network in development for downtown San José that integrates three new data centres + up to 4,000 residential units. Key feature: excess heat from data centres will be repurposed through Thermal Energy Network to heat and cool adjacent buildings. Construction has begun, with the first data centre expected online by late 2027(districtenergy.org).
- **Stanford Energy System Innovations (SESI)**: One of North America's advanced district thermal systems, SESI uses heat-recovery chillers, hot/chilled water loops, and thermal storage to eliminate fossil fuels on campus and reduce greenhouse gas emissions by over 60%.
- **Emerging innovation districts in Berkeley and Oakland**, and redevelopment projects on Treasure Island, are piloting micro-scale thermal networks emphasizing electric heat pumps, thermal storage, and industrial/data-centre waste heat utilization for resilience and low-carbon service.



Map of Cordia's San Francisco District Heating System. Image Credit: Cordia

NEW YORK

- **Consolidated Edison (Con Edison) operates the largest district steam system in North America**, serving over 1,700 buildings in Manhattan. The system primarily supplies steam for heating, humidification, and cooling via absorption chillers. Some parts of the steam network date back to the late 19th century. Steam systems (such as the ConEd network in NYC) are not compatible with data center heat recovery without a steam to hot water conversion of the network.
- **Campus systems at hospitals and universities** across the state exist, including several State University of New York (SUNY)campuses that are undergoing decarbonization plans
- **Public TENs** exist across the state such as in Jamestown, NY where the Board of Public Utiliites operates the system and is considering expansion and fuel switching to geo-exchange and wastewater heat recovery.
- **UTEN Pilots** are under consideration by the NYS Department of Public Service at this time of writing this report. The pilots aim to leverage a variety of low carbon resources including data center heat recovery, commercial building heat recovery, geo-exchange, and other



Map of Con Edison's Steam Network Service Image Credit: Con Ed

3

APPLICATIONS

3.1

TECHNICAL CONFIGURATIONS

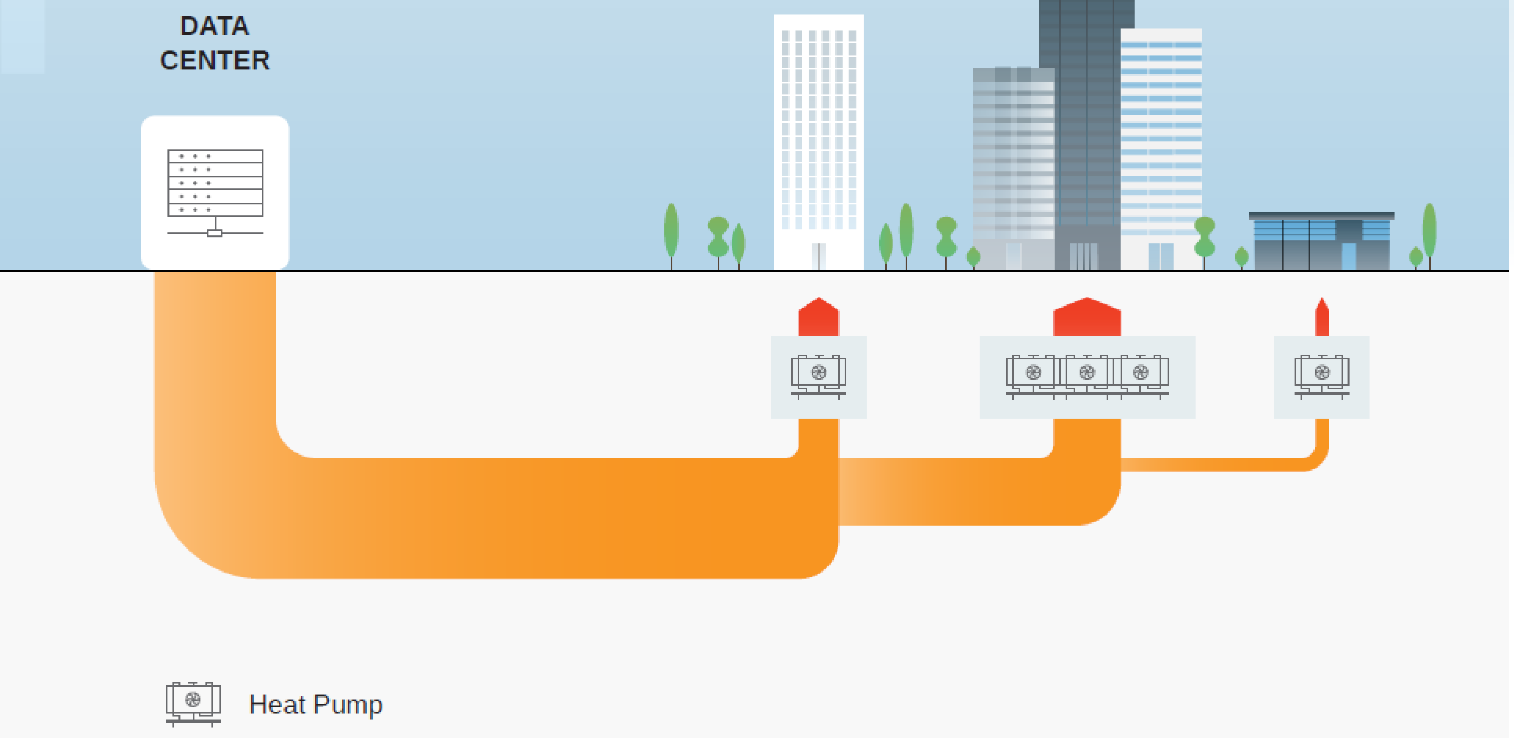
DATA CENTRE HEAT RE-USE TECHNICAL CONFIGURATIONS

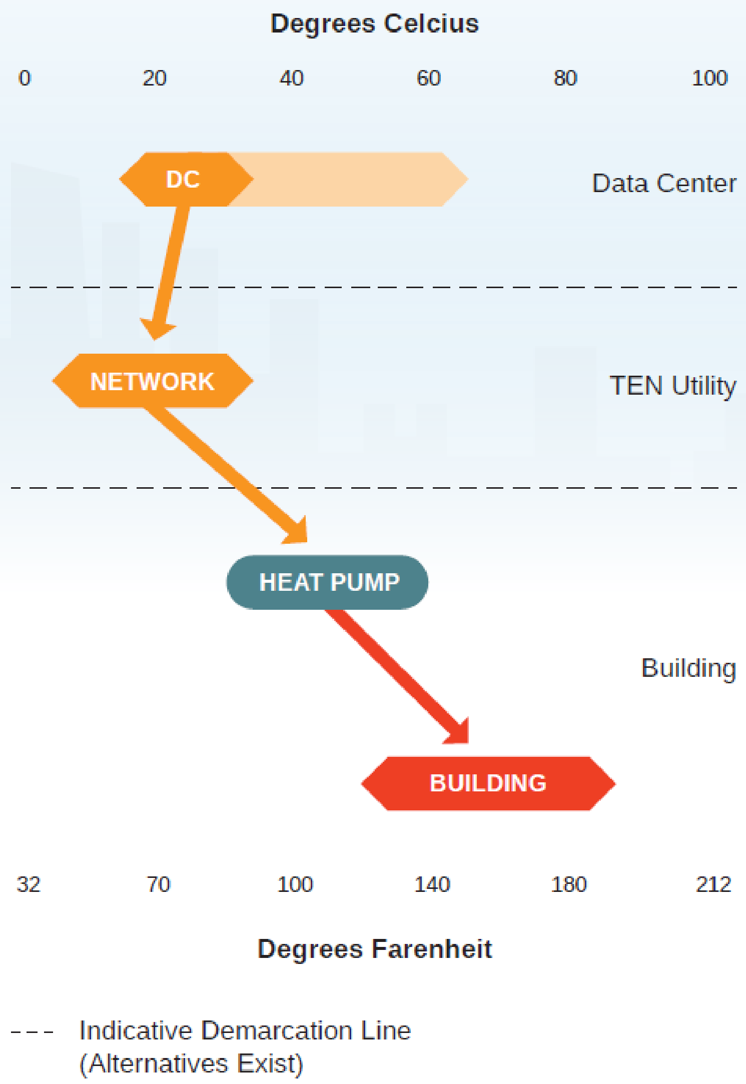
RESHAPE STRATEGIES

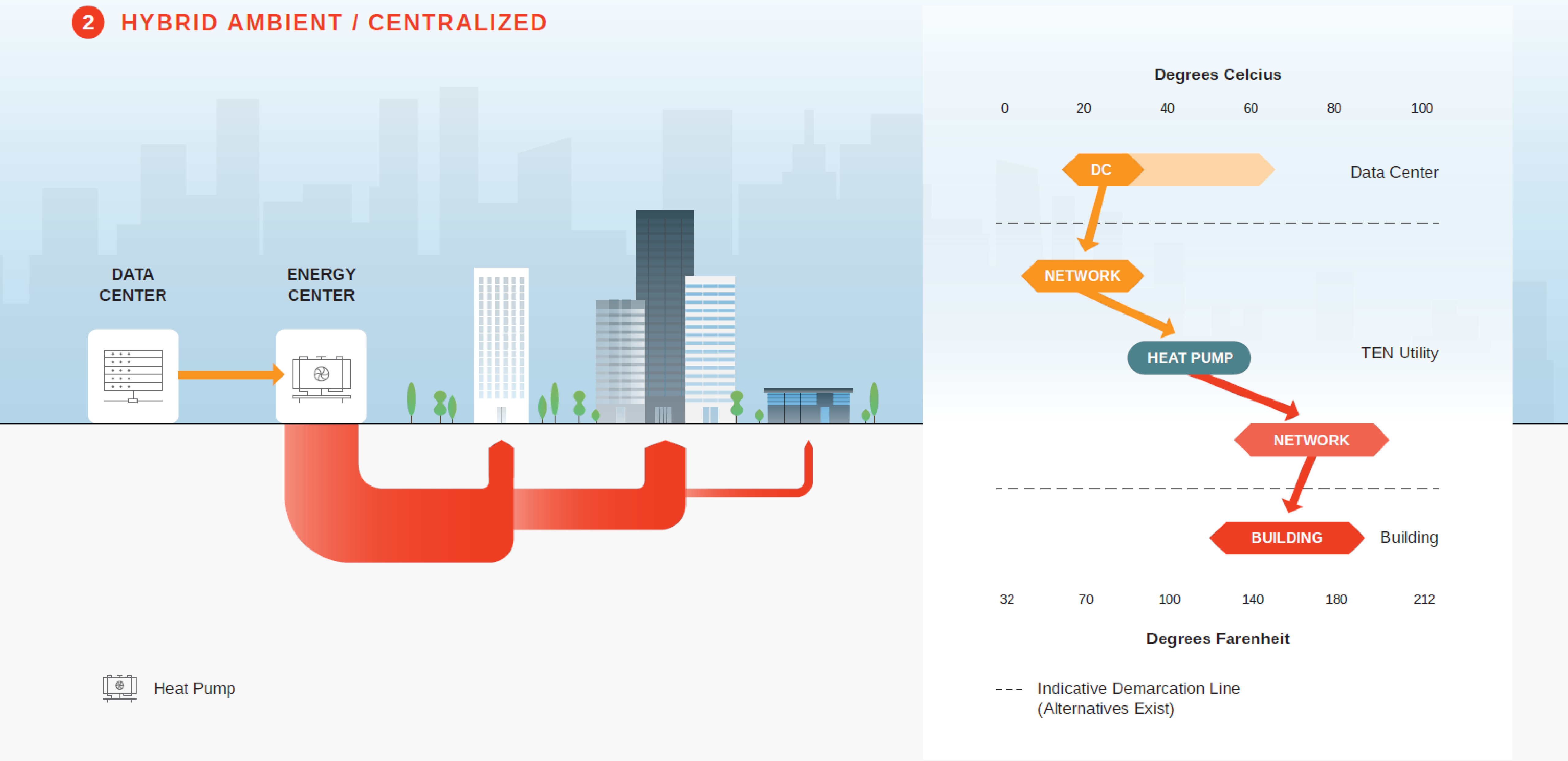
- The following slides provide a range of possible technical configurations to re-use waste heat in thermal energy networks
- This section focuses on heat re-use via TENs. However, we note that there are other applications for data centre waste heat, not covered in this report (e.g. greenhouses, aquaculture, etc). The focus of this section is heat re-use within new or existing TEN's.
- The graphics are simplified schematics for illustrative purposes. We note that thermal energy networks will typically utilize multiple heat resources (e.g. different generation technologies) and may have mixed network within one system operate at different temperature regimes. For the purpose of this section, we have illustrated a simplified scenario, and note these other considerations; multiple heat resources, multiple network or customer temperature regimes, etc.
- The tables to the right provides a summary of the data centre and TEN types that would be seen in each heat re-use configuration
- All configurations are technical possible at all scales; however, some TEN types are more prevalent at certain scales. For example fewer large city/regional ambient TENs exist.

Tag	Heat Re-Use Config	Data centre Type	TEN Type
1	**Ambient**	Any	Ambient
2	**Hybrid Ambient-Centralized**	Any	Mixed (ambient and centralized heating network)
3	**Centralized**	Any	Centralized heating network
4	**Chip Heating**	High Performance Compute	Centralized heating network (with low temp buildings)
5	**In-direct**	Any	Centralized Cooling network

1 AMBIENT

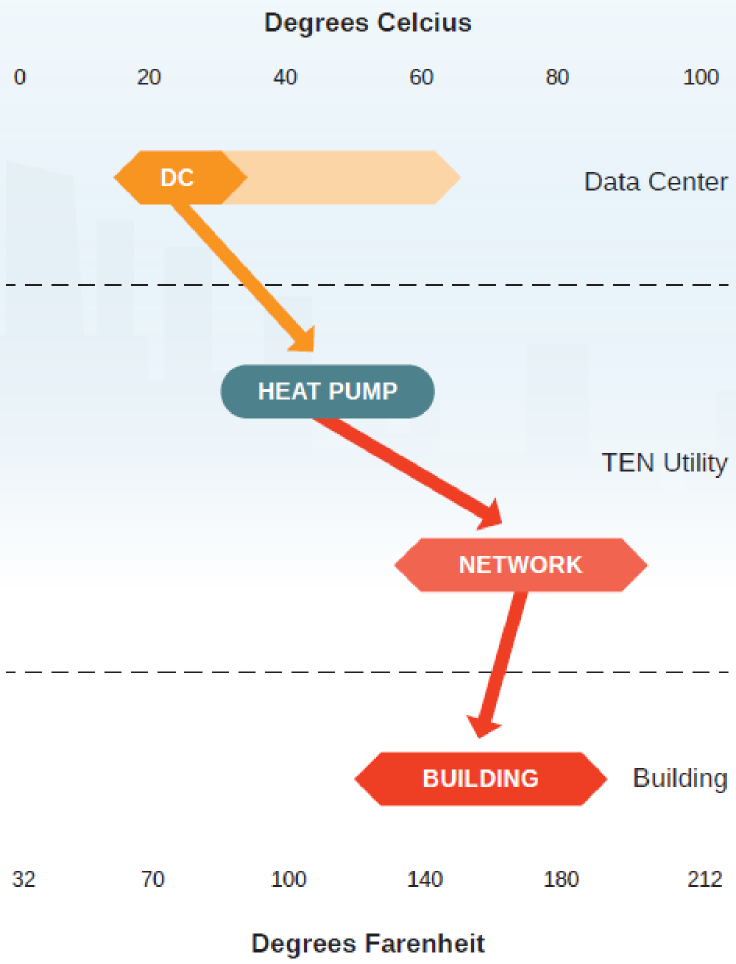

DATA
CENTER
Heat Pump


Degrees Celcius
0
20
40
60
80
100
DC
Data Center
NETWORK
TEN Utility
HEAT PUMP
Building
BUILDING
32
70
100
140
180
212
Degrees Farenheit
Indicative Demarcation Line
(Alternatives Exist)



2
HYBRID AMBIENT / CENTRALIZED
DATA CENTER
ENERGY CENTER
Heat Pump
Degrees Celcius
0
20
40
60
80
100
DC
Data Center
NETWORK
HEAT PUMP
TEN Utility
NETWORK
BUILDING
Building
32
70
100
140
180
212
Degrees Farenheit
--- Indicative Demarcation Line (Alternatives Exist)

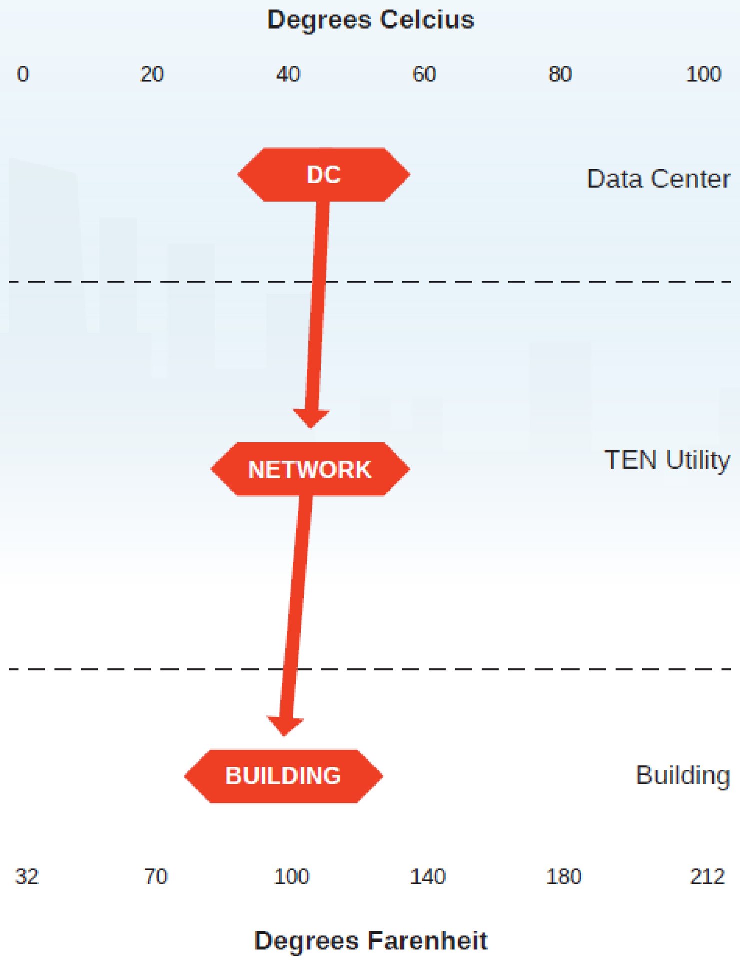
3 CENTRALIZED



Heat Pump

--- Indicative Demarcation Line
(Alternatives Exist)

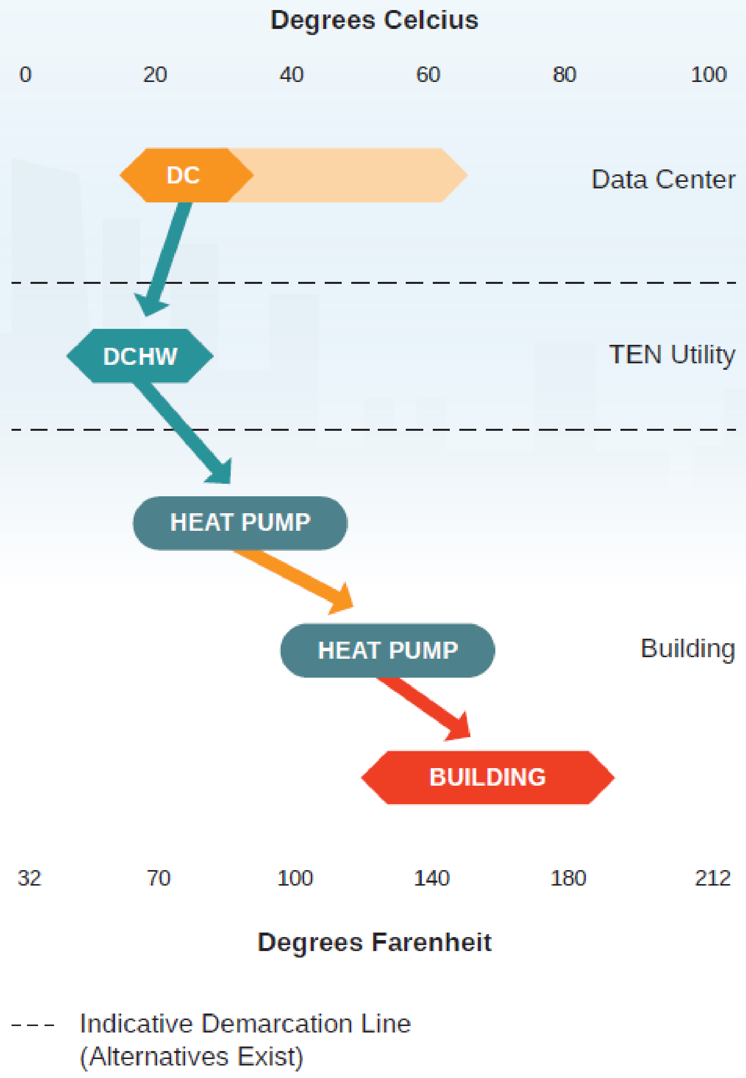
4 CHIP HEATING



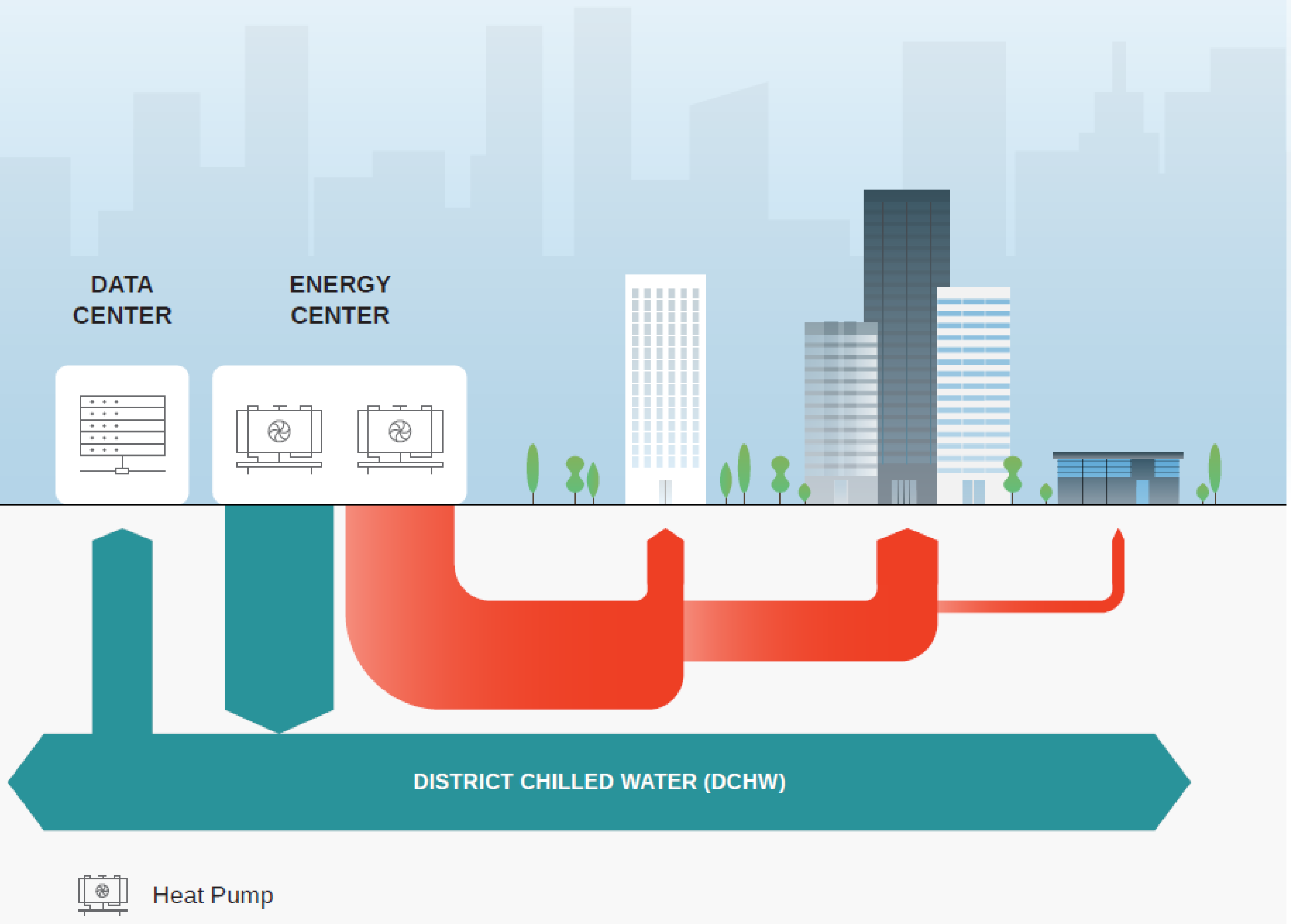
Heat Pump

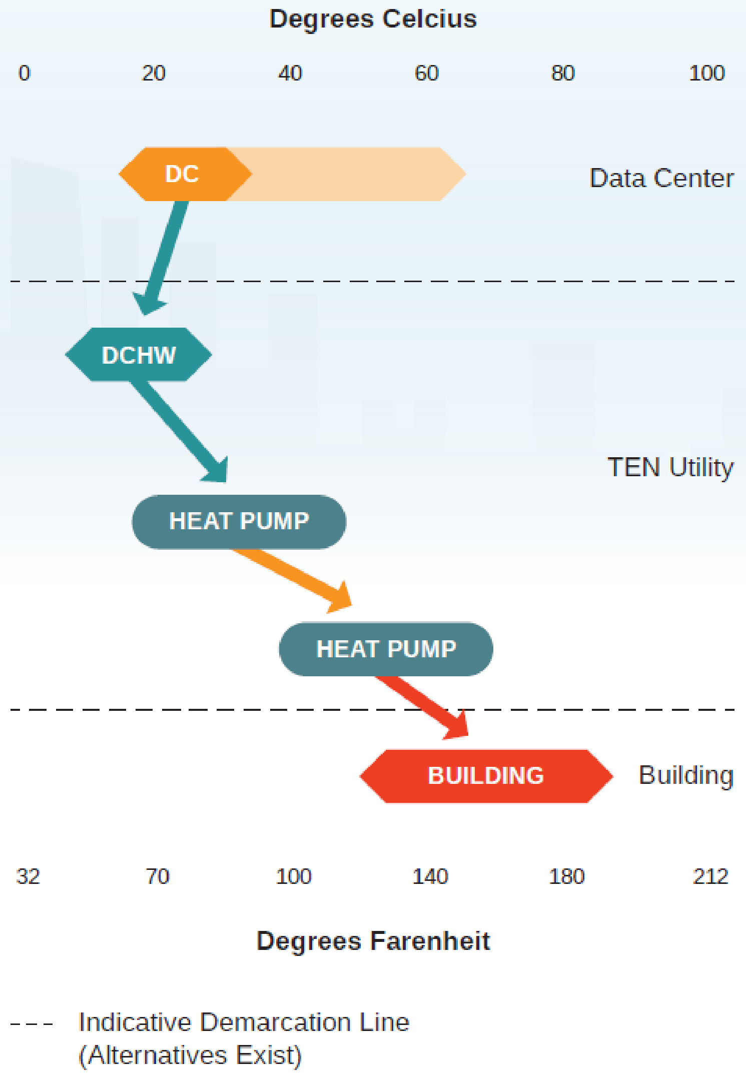
--- Indicative Demarcation Line (Alternatives Exist)

5a IN-DIRECT HEATING, DISTRIBUTED



5b IN-DIRECT HEATING, CENTRALIZED





ENHANCED UTILIZATION AND FLEXIBILITY WITH THERMAL STORAGE

Thermal storage, often in the form of large, insulated hot water tanks, can be a game-changer for a district heating system that uses waste heat from a data centre. While the data centre provides a consistent base load of heat, a thermal storage system allows for a more flexible and efficient operation, benefiting all stakeholders.

- **Decoupling Production and Demand:** The primary benefit of thermal storage is that it allows the district heating network to separate the production of heat from the demand for it. The data centre's waste heat is a continuous resource, but the end-users' demand for heat fluctuates throughout the day and with the seasons. A thermal storage system acts as a "thermal battery," storing excess heat when demand is low (e.g., at night) and discharging it when demand is high (e.g., during morning and evening peaks). This smooths out the heat load and reduces the need for expensive, less efficient peak-load boilers.

- **Increased Network Capacity and Resilience:** Thermal storage boosts the overall capacity of the system without requiring the installation of additional heat pumps or other heat-generating equipment. This can be a cost-effective way to meet growing demand. Furthermore, the stored energy provides a buffer in case of a system malfunction, power outage, or a temporary disruption to the data centre's waste heat supply, increasing the system's reliability and resilience.

- **Integration of Other Heat Sources:** The presence of a thermal storage system makes it easier to integrate other intermittent or surplus heat sources, such as solar thermal systems or excess heat from other industrial processes. This further diversifies the heat supply and reduces reliance on a single source.

- **Grid Balancing and Load Shifting:** The district heating system, with its thermal storage, can function as a form of energy storage for the power grid. When there is a surplus of electricity on the grid (e.g., from wind or solar during off-peak hours), the district heating system can use electric heat pumps to "charge" its thermal storage with heat, effectively absorbing the excess power. Conversely, during peak demand periods on the grid, the system can reduce its electricity consumption by discharging its stored heat. This helps to stabilize the grid, manage fluctuations from renewable energy sources, and reduce the need for costly grid infrastructure upgrades.

- **Increased Renewable Energy Integration:** By providing a flexible load, the thermal storage system makes it easier for the grid to accommodate a higher penetration of variable renewable energy sources. This helps accelerate the transition to a low-carbon energy system.

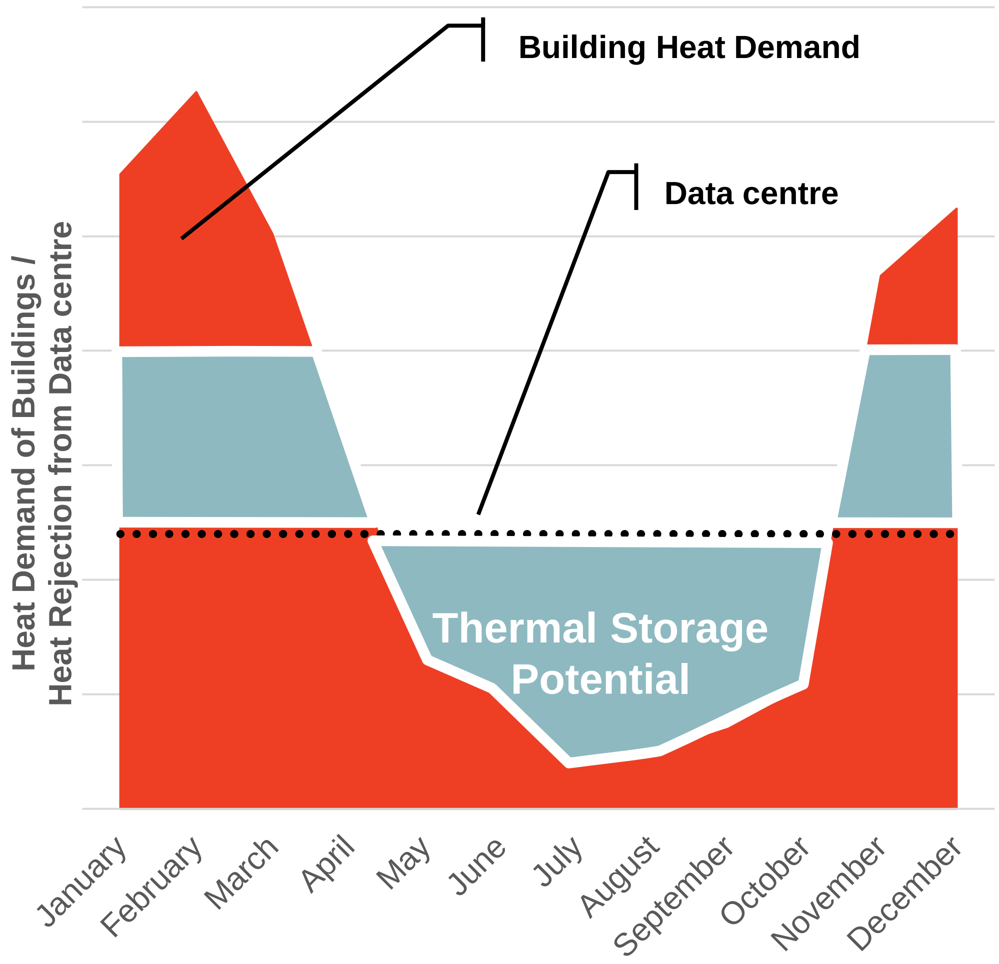
ENHANCED UTILIZATION AND FLEXIBILITY WITH THERMAL STORAGE

In some cases, the thermal resource from a data centre can be optimized with the addition of seasonal thermal storage to increase heat utilization.

In scenario's where heating demand is under served by the data centre in winter but oversubscribed in summer, a seasonal thermal storage system can balance out the system and increase the utilization of the low-carbon resource. One configuration to achieve this outcome would be to inject excess heat during the summer into a borehole field, to be extracted during the winter.

This is an optimization strategy to consider if the fundamental economics of data centre heat re-use are sound to begin with. The lifecycle cost of a seasonal storage system could be compared to an alternative low-carbon resource that would otherwise supply supplemental heating in the winter season.

Seasonal storage is one application. There are also many other potential applications of thermal storage (e.g. load balancing on a daily basis, or load shifting for demand response).



EVOLUTION OF SUSTAINABLE DATA CENTRES

RESHAPE STRATEGIES

Legacy

- High GHG data centre
- High GHG buildings
- Poor Resource Efficiency

Recent

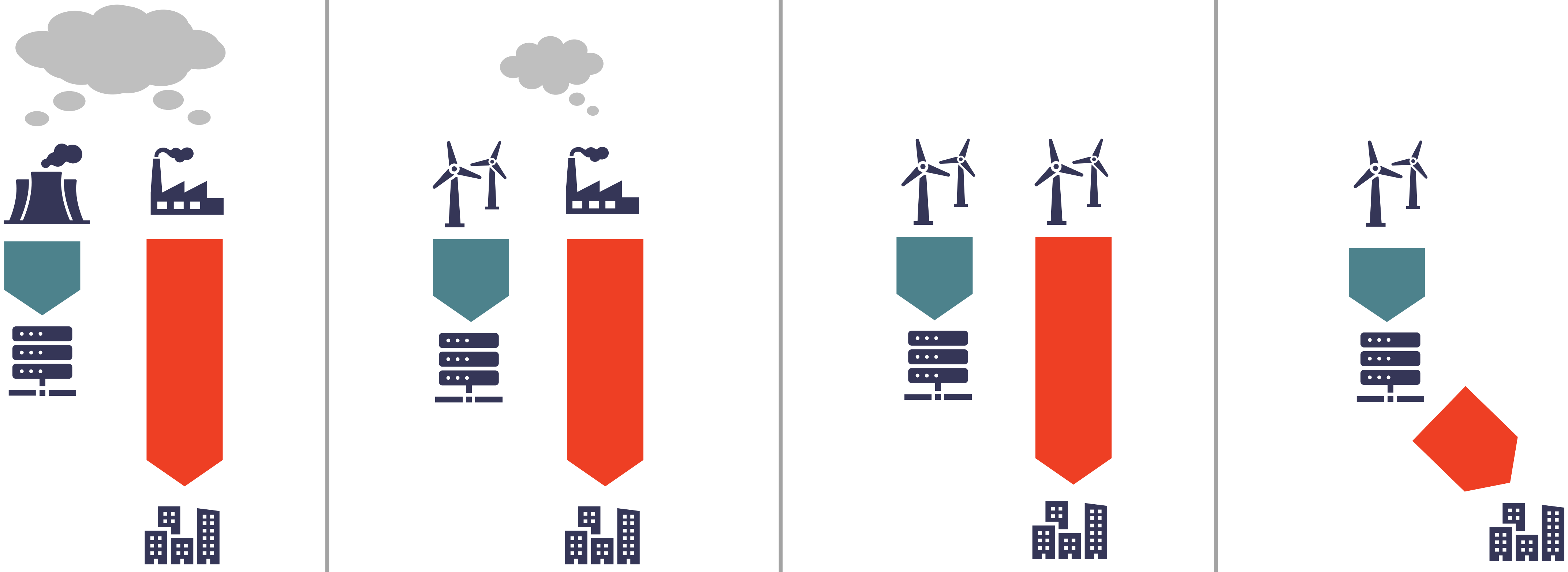
- Low GHG data centre
- High GHG buildings
- Poor Resource Efficiency

Modern

- Low GHG data centre
- Low GHG buildings
- Poor Resource Efficiency

Future

- Low GHG data centre
- Low GHG buildings
- High Resource Efficiency



3.2

BUSINESS MODELS

BUSINESS MODELS: UNDERSTANDING STAKEHOLDER INTERESTS

RESHAPE STRATEGIES

Data centre Interests
- Time to market
- Availability of power

Data centre Interests
- Tenant attraction and retention
- Enhanced environmental performance and resilience

TEN Utility Interests
- Financial return from operating utility
- Customer attraction and retention

Building Interests
- Thermal energy services
- Environmental attributes (GHG reduction)
- Low costs compliance of green building standards

Potential Complimentary Benefits (depending on configuration)
- Lower water use
- Lower power use
- Reduced CAPEX
- Future payment for waste heat*

Data centre Heat Re-use Project

* Providing access to waste heat may come with a payment from the TEN Utility to the data centre, now or in the future. It's worth noting that any payment from the TEN Utility to the Data centre will result in higher cost heating service to the building, which the project may or may not be able to absorb (at the outset). Arrangements could be made such that there is no cost for the waste heat in the near term, but that could change in the event of a potential windfall to the building in the future.

IT EQUIPMENT IS THE LION'S SHARE OF NON-LAND/BUILDING DATA CENTRE COSTS

Exhibit 3: Data center costs per megawatt
Servers are largest area of data center capex

Category	Cost/MW	% of total
Servers	25,000,000	66%
Networking	3,600,000	10%
Storage	1,200,000	3%
Subtotal IT equipment	**29,800,000**	**79%**
Uninterruptible Power Supplies (UPS)	800,000	2%
Switchgear	500,000	1%
Power distribution units (PDUs) & busway	200,000	1%
Rack PDUs	200,000	1%
Subtotal electrical equipment	**1,700,000**	**5%**
Computer room air handler (CRAH)	550,000	1%
Cooling distribution units (CDUs)	400,000	1%
Chiller (285-ton capacity)	360,000	1%
Cooling tower	90,000	0%
Subtotal thermal equipment	**1,400,000**	**4%**
Backup diesel generator	**600,000**	**2%**
Engineering fee	400,000	1%
General contractor overhead & profit	900,000	2%
Building costs	1,300,000	3%
Installation costs	1,500,000	4%
Subtotal E&C	**4,100,000**	**11%**
Grand total	**37,600,000**	**100%**

Source: BofA Global Research

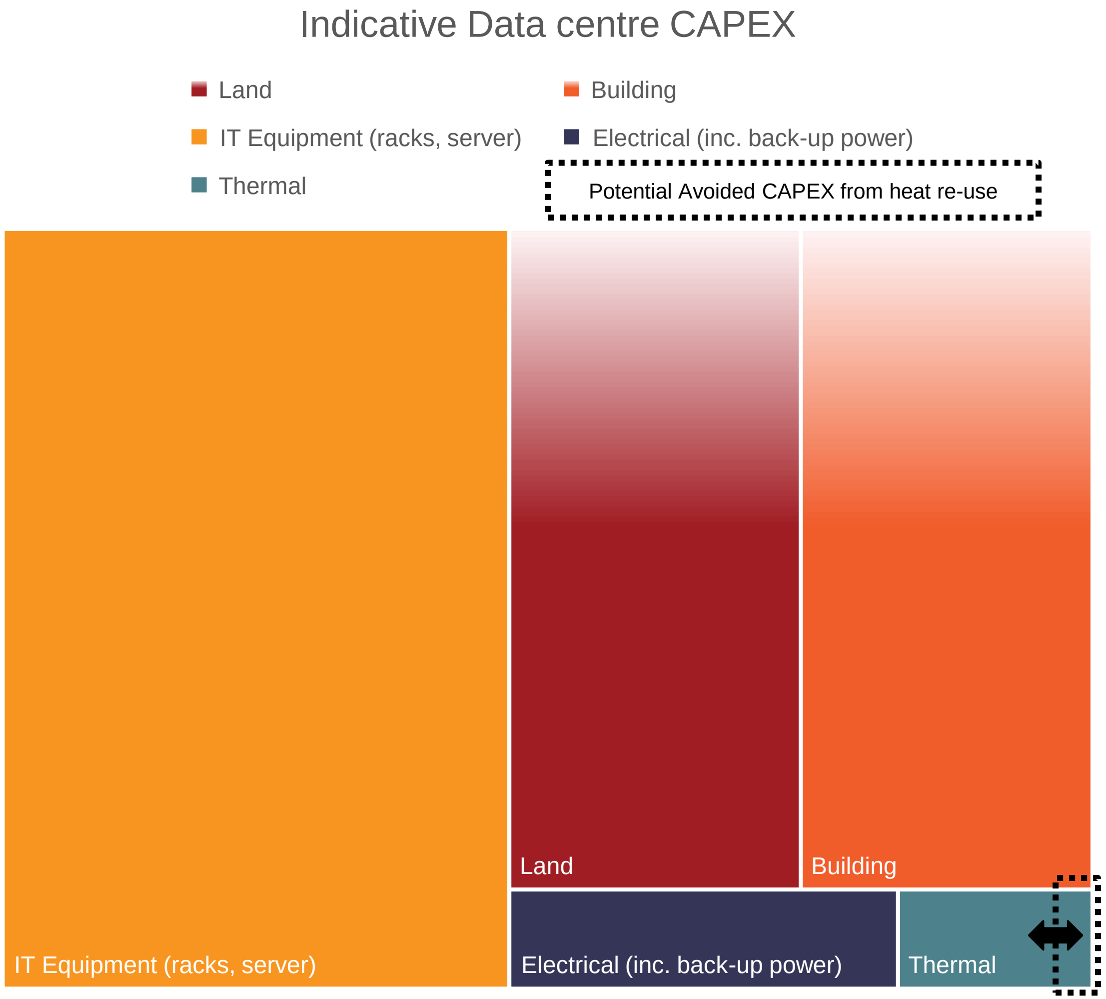
BofA GLOBAL RESEARCH

WHAT SHARE OF DATA CENTRE CAPEX CAN BE AVOIDED FROM DATA CENTRE HEAT RE-USE?

- Land and building costs for data centres:
  - Can represent a large portion of CAPEX (in some cases
  - Are highly variable (land in particular)

- Thermal equipment (chillers, cooling towers, etc.) represent a small portion of the overall cost of the data centre.
  - When IT equipment, land and building costs are included this can be less than 2-3% of overall CAPEX

- Heat re-use configurations have the potential to partially offset the CAPEX of thermal equipment due to reliability requirements of a data centre

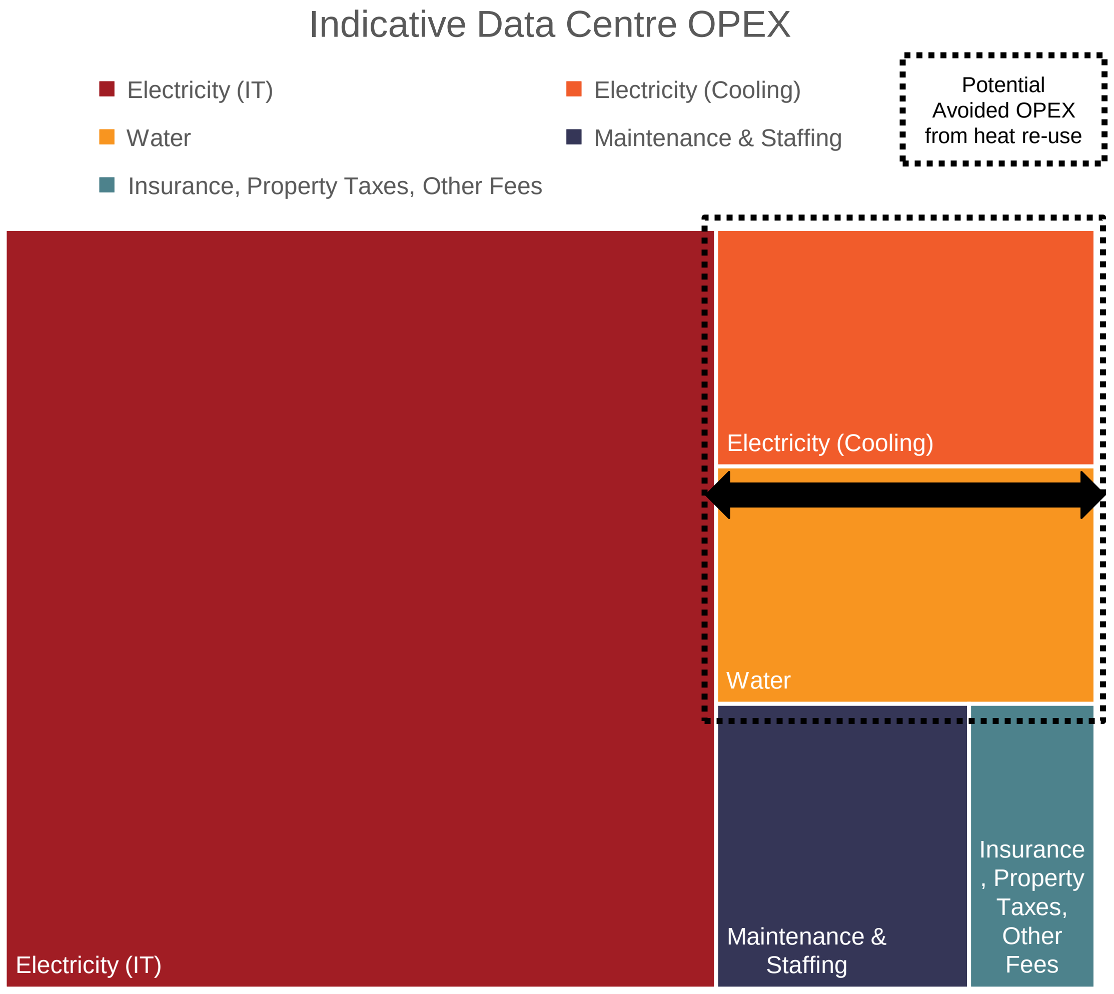


WHAT SHARE OF DATA CENTRE OPEX CAN BE AVOIDED FROM DATA CENTRE HEAT RE-USE?

- The cost to run IT equipment represent the largest share of data centre OPEX
  - Will vary by jurisdiction. Some locations have lower cost power (which is a reason why data centres might locate there)
  - It is typical that >> 50% of data centre OPEX is power to run IT load, may not change with heat re-use (though this may be possible if data electric utilities were to offer more favorable rates for data centers with heat re-use)
  - Note: OPEX costs may be split between a base building owner, and a data centre tenant. The discussion here is on an ownership neutral basis and does not differentiate between the two

- Heat re-use configurations have the potential to offset the Electrical (Cooling) and Water components of OPEX. The degree to which these costs can be avoided will vary based on how much of the heat is re-used

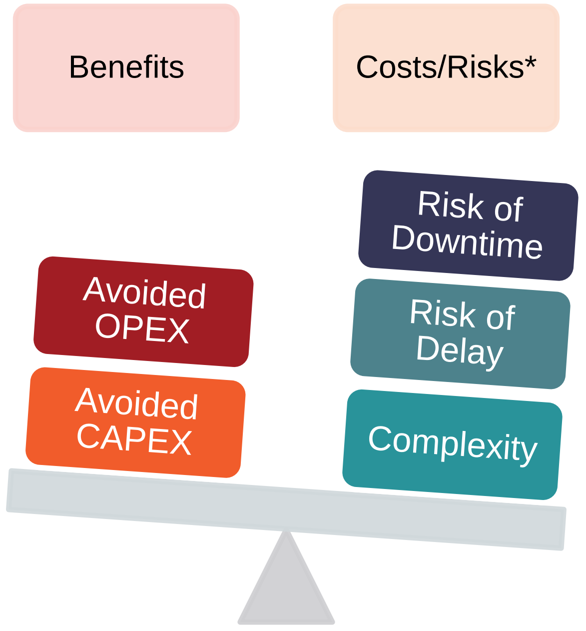
- A 2025 study on the "Assessment of the energy performance and sustainability of data centres in EU" estimate that the average heat re-use from operational projects in the EU is ~15%. At this level of heat re-use, for the indicative example to the right the OPEX savings would be in the order of <5% of annual operating costs



DATA CENTRE FINANCIAL PERSPECTIVE ON HEAT RE-USE

- Given the modest avoided capital and operating costs from data centre heat re-use, and the incremental time and effort to enable heat re-use, without regulatory requirements it is not likely that data centres to participate in a heat re-use projects on the basis of avoided costs alone.
- While the avoided capital and operating costs are non-zero, they are typically small relative to the other capital and operating costs a new data centre
- Further the priority for new data centre projects is time to market. Introducing additional complexity into the project can be perceived as a project risk
- Similarly, for operational data centers, system uptime is paramount. Interventions in these facilities to enable heat re-use can be seen as a risk to up-time
- Even though these may not be as large as perceived and/or there may be the ability to address/mitigate these risks, due to the severity of the consequence (delay in commencing operations, or system downtime) heat re-use project may not attract interest from data centre operators, even if there are financial benefits possible

Financial Perspective of Typical Data centre on Heat Re-use Projects



* Real or perceived risks

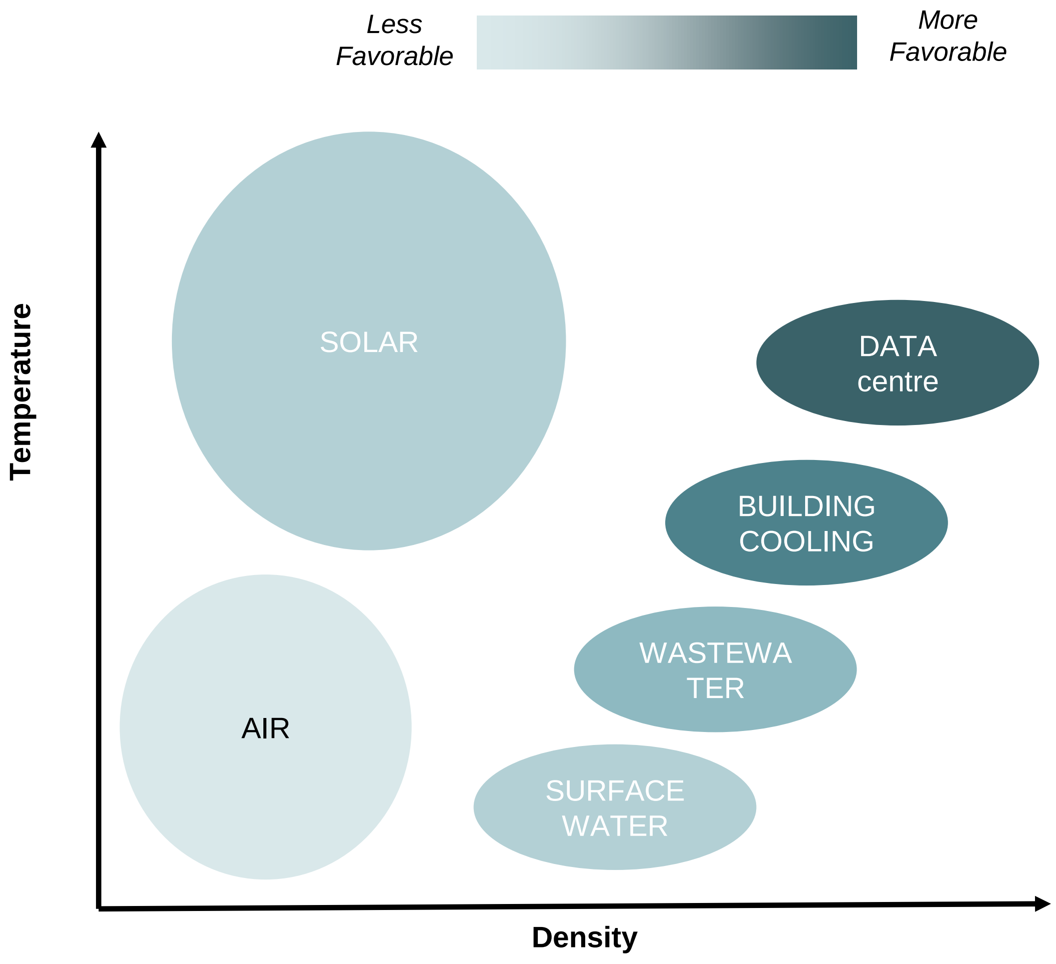
DATA CENTRE HEAT RE-USE: TEN PERSPECTIVE

RESHAPE STRATEGIES

- In contrast to the value proposition from a capital and operating costs for data centres, heat re-use can be meaningful to the business case for a TEN

- Relative to other alternatives, data centre heat re-use, **in some applications** can be:
  - Lower CAPEX compared to other low carbon technologies, especially in the cases where the capital cost for heating equipment are considered to be part of the data centre (E.g. Heat re-use configurations 3 – Centralized (with the heat pump as part of the data centre cooling system) or 4 – Chip Heating)
  - Lower OPEX compared to other low carbon technologies, given data centres can be a warm source for a heat pump allowing it to operate at higher efficiencies, or in some heat re-use configurations without a heat pump at all (E.g. heat re-use configuration 4 – Chip Heating)

- We also make the observation that certain low carbon technologies, while low cost, low electrical grid impact, and reliable can have negative public perceptions (E.g. biomass, renewable natural gas, waste heat from CHP).
  - Data centre heat re-use can be seen as a positive alternative to some of these technologies, and some stakeholders even willing to absorb higher costs for heat service from this resource
  - The same (negative connotations) can also be true. This may be the case for data centre heat re-use projects that are recovering heat from HPC that are not viewed positively (E.g. bitcoin mining)



4

POLICY REVIEW

SUMMARY OF EXISTING POLICY REVIEW

RESHAPE STRATEGIES

		Green Building Standards		TEN's Policies	Power Market Favourability	Data centre Policies	
		New Construction	Existing Buildings			Posture	Heat Re-Use
CAN	Ontario	★★★	★★	★	★★	↗	
CAN	Quebec	★★	★	★	★★★	-	★
CAN	Alberta	★			★★	↑	
USA	New York	★★★	★★★	★★	★	-	
USA	Virginia	★			★★★	↑	
USA	California	★★★	★★	★★	★	-	

4.1

GREEN BUILDING STANDARDS

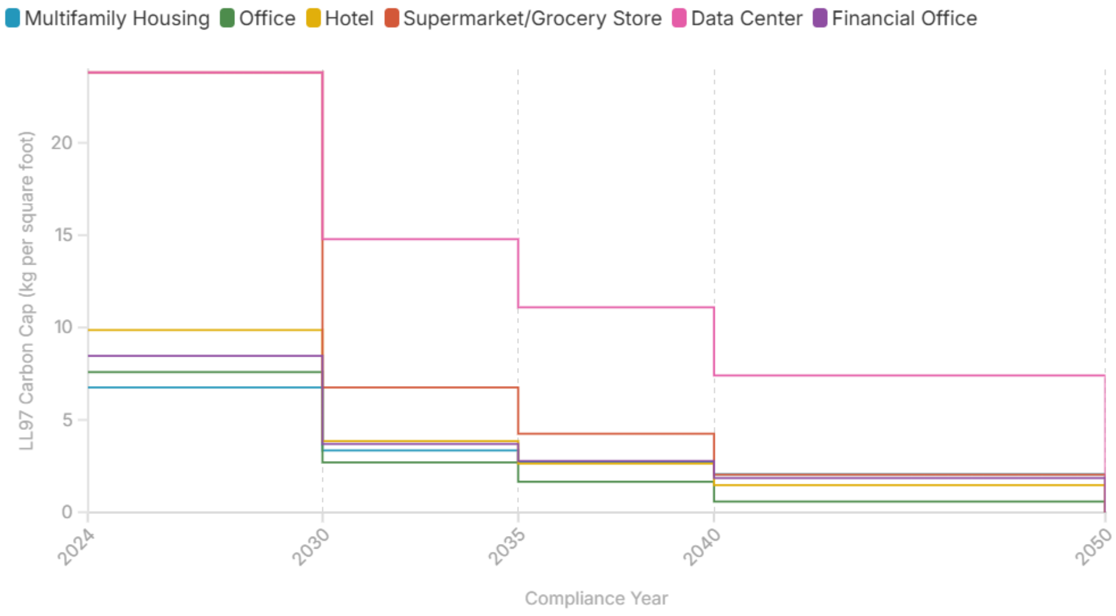
GREEN BUILDING STANDARDS: NEW CONSTRUCTION

- **Ontario (Toronto)**: Toronto Green Standard (TGS) Tier 1 mandates low-carbon heating (e.g., heat pumps); Tier 2+ targets near-zero emissions by 2030, encouraging TENs.
- **Quebec (Montreal)**: 2025 Regulation bans combustion heating, mandating electric/low-carbon systems (e.g., heat pumps, TENs).
- **Alberta (Calgary)**: Alberta Building Code (ABC) lacks heating mandates; Calgary's Climate Strategy promotes voluntary low-carbon heating.
- **New York (NYS)**: All electric building code requiring all large new construction to be all electric
- **Virginia (Northern Virginia)**: Virginia USBC has no heating-specific mandates; Fairfax encourages LEED-compliant heating (voluntary).
- **California (San Jose)**: Title 24 and San Jose Reach Code mandate all-electric heating, targeting net-zero by 2030.

Region	Green Building Standard	TEN Support	Policy Strength
Ontario (Toronto)	Low-carbon (TGS)	Emerging (ON Integrated Energy Planning)	Medium
Quebec (Montreal)	No combustion (2025)	Limited (Energir)	High
Alberta (Calgary)	Voluntary	Limited (ENMAX)	Low
New York (NYS)	All electric building code	Emerging (UTEN-JA)	High
Virginia (N. VA)	None	None	Low
California (SJ)	All-electric	Emerging (SJ TENs initative, CA gas pruning pilots)	High

GREEN BUILDING STANDARDS: EXISTING BUILDINGS

- **Ontario (Toronto)**: Developing Building Performance Standard (BPS) for large buildings (>25,000 ft²), targeting 15 $kgCO_2e/m^2$ by 2030; encourages TEN connections.
- **Quebec (Montreal)**: Regulation Respecting Energy Efficiency (2023) mandates 20% heating demand reduction by 2030; Hydro-Québec incentives for electrification.
- **Alberta (Calgary)**: Building Retrofit Program requires energy audits but no heating-specific GHG targets; limited TEN focus.
- **New York (NYC)**: Local Law 97 mandates 40% GHG reduction by 2030, incentivizing electric heating retrofits.
- **Virginia (Northern Virginia)**: No retrofit heating mandates; Dominion Energy offers HVAC incentives, no TEN focus.
- **California (San Jose)**: Building Performance Standards set GHG intensity targets (10 $kgCO_2e/m^2$ by 2030), promoting electric heating retrofits.



LL97 Property Type Emissions Limits Over Time, Urban Green Council, "What is Local Law 97?"

OFF-SITE WASTE HEAT UTILIZATION IN GREEN BUILDING STANDARDS

- **Ontario**: Toronto's Deep Emissions Reduction Plan encourages TENs (e.g., Enwave), but no waste heat mandates.
- **Quebec**: Montreal's Urban Plan supports Energir's TENs, no specific waste heat incentives. "Valorisation des rejets thermiques" (Waste Heat Recovery) initiative provides funding and support for heat-reuse.
- **Alberta**: Calgary's District Energy Strategy (ENMAX) is underdeveloped, no waste heat focus.
- **New York**: 2022 TEN law and NYSERDA pilots explicitly support waste heat reuse; Local Law 97 allows TEN offsets.
- **Virginia**: No TEN or waste heat policies; TENs absent.
- **California**: San Jose's Climate Smart Plan supports TENs, no waste heat mandates.

4.2

TENS POLICIES

NEW YORK

RESHAPE STRATEGIES

- In **2022**, New York enacted S9422, the Utility Thermal Energy Network and Jobs Act (UTENJA), enabling both gas and electric utilities to develop, own, operate, and distribute thermal energy. This law promotes job creation for transitioning gas utility workers and supports high-quality local employment in the expanding decarbonization sector.
- UTENJA stood out for bringing together a broad coalition, including environmental groups, environmental justice advocates, labor unions, consumer advocates, the building industry, and utilities. This diverse group collaborated to advance utility-scale thermal energy infrastructure while prioritizing a just transition for workers and fostering inclusivity through pre-apprenticeship programs for underrepresented communities in labor unions.
- The momentum from UTENJA continues through UpgradeNY, a coalition of unions, climate justice advocates, building industry leaders, and environmental organizations. UpgradeNY pushes for decarbonizing New York's state-owned buildings and schools using a local, unionized workforce.
- In **2023**, New York utilities proposed 13 thermal energy network (TEN) pilot projects to comply with UTENJA, though one was later withdrawn.
- By **2024**, the Department of Public Service (DPS) approved ten of these projects to advance to the engineering and design phase.
- In February **2025**, Senate Bill S4158, the NY HEAT Act, was introduced and remains under consideration.

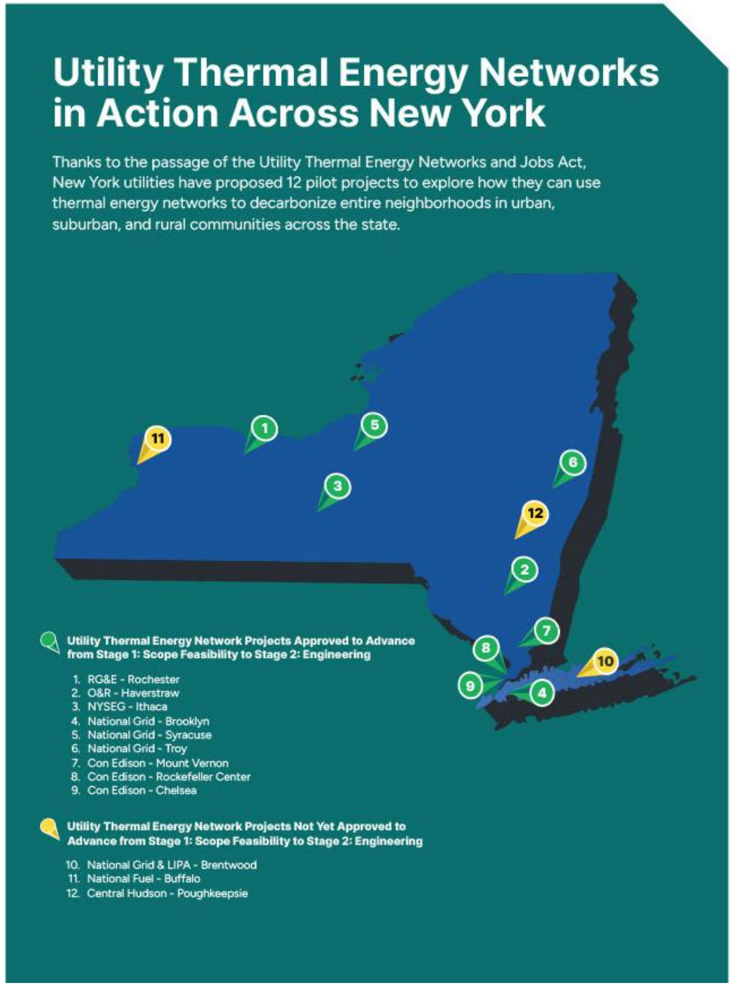


Image Source: Building Decarb Coalition

CALIFORNIA

- In 2024, California passed SB 1221, the Priority Neighborhood Decarbonization Act, authorizing gas utilities to launch up to 30 cost-effective, neighborhood-scale decarbonization pilot projects across the state as an alternative to replacing gas pipelines. These zero-emission initiatives may involve "neighborhood electrification" or thermal energy networks.
- The legislation permits the California Public Utilities Commission to adjust a utility's obligation to supply methane gas in pilot areas, provided the utility obtains consent from 67% of its customers and provides an alternative energy source that is "reasonably available to support the energy end uses" of impacted customers.
- These pilot projects focus on disadvantaged and low-income communities, incorporate tenant protections, and prioritize prevailing wages and high-road job programs to promote equitable and sustainable outcomes.

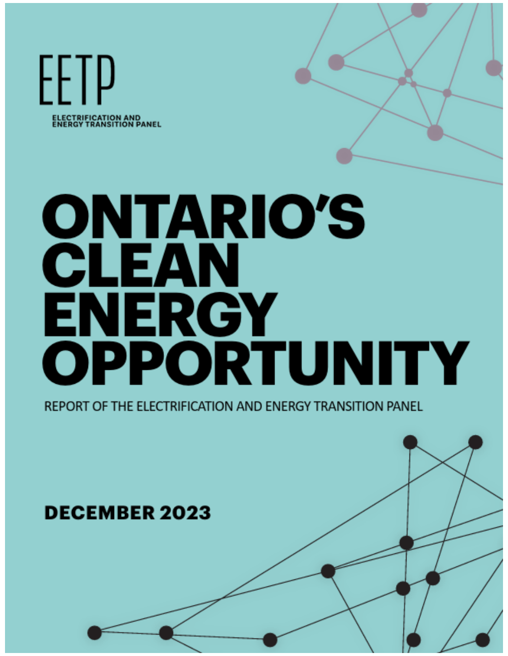
ONTARIO

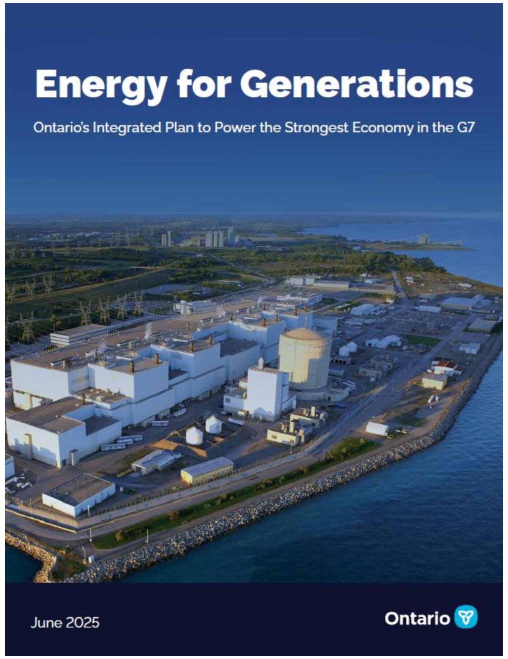
RESHAPE STRATEGIES

- In December 2023, Ontario's Electrification and Energy Transition Panel (EETP) issued its final report. Among other things, the EETP highlighted the importance of local governments in the transition to a clean energy economy, including:
  - Contributing to and taking responsibility for their local energy objectives, including the mitigation of climate change and energy affordability
  - thinking about local energy needs holistically
  - building community commitment by, among other things, developing local energy sources.

- In June 2025, the Government of Ontario released an Integrated Energy Plan (IEP), "Energy for Generations"
  - explicitly calls out district energy systems (DES aka thermal energy networks) as **a tool for supporting growth and local energy resilience**
  - includes several strategies to enhance the role of municipal governments and LDCs in energy planning

- Several initiatives underway in ON to promote TENs
  - Building Decarbonization Alliance & The Atmospheric Fund
  - Federation of Canadian Municipalities TENs Capacity Building and the Green Municipal Fund program





4.3

POWER MARKET DYNAMICS

DATA CENTRE ELECTRICITY RATES

RESHAPE STRATEGIES

Jurisdiction	ISO	Utility / Wires Owner	Large-Load (> 1 MW) Rate Class
Ontario (Toronto)	IESO	Toronto Hydro	**General Service 1,000 – 4,999 kW** (interval-metered, Hourly Ontario Energy Price + Global Adjustment; distribution & transmission charges under this class)
Alberta (Calgary)	AESO	ENMAX Power (distribution) / competitive retailer (supply)	**D410 – Large Commercial - Primary Voltage** (ENMAX Distribution Tariff for customers served at primary voltage—typical choice for data-centre loads)
Quebec (Montreal)	n/a (vertically integrated)	Hydro-Québec	**Rate M – Medium-Power (50 kW – < 5 MW)** for a 1 MW data centre; Rate L (> 5 MW) applies if load exceeds 5 MW.
New York (NYC)	NYISO	Con Edison	**Service Classification 9 (SC-9) – Large General Service** (demand > 1,000 kW; optional Standby sub-rates for on-site generation)
California (San Jose)	CAISO	PG&E (delivery) / San José Clean Energy (generation)	**Schedule E-20 / B-20 – Large General Service (≥ 1 MW)**; PG&E **Rule 30** proceeding will create a transmission-level "Data centre" tariff for > 50 kV interconnections.
Virginia (Loudoun County)	PJM	Dominion Energy	**Schedule GS-4 – Large General Service (Primary/Transmission Voltage)**—current default for hyperscale data centres; SCC docket discussions on a separate "data-centre" tariff are ongoing.

Ontario – Toronto Hydro: "Business – General Service 1,000 - 4,999 kW" class covers customers whose monthly peak demand is ≥ 1,000 kW but < 5,000 kW; data centres of this size pay wholesale Hourly Ontario Energy Price (HOEP) plus Global Adjustment and class-specific delivery charges.

Alberta – ENMAX: ENMAX's Distribution Tariff **Rate D410** (Large Commercial-Primary) is the standard wires charge for primary-voltage sites; supply is procured via contract or default RoLR. No dedicated data-centre tariff has yet been approved.

Québec – Hydro-Québec: For a 1 MW load, the applicable rate is **Rate M** (Medium-Power, 50 kW to < 5 MW). **Rate L** is reserved for ≥ 5 MW sites. Hydro-Québec currently has no data-centre-specific rate, but a "cryptographic use" Rate CB applies to blockchain/crypto loads.

New York – Con Edison: SC-9 Large General Service covers demand > 1 MW and provides multiple voltage-level options (sub-rates). PSC dockets discuss standby and resiliency modifications, but no separate data-centre class exists yet.

California – PG&E / SJCE: Large customers ≥ 1 MW take service on **Schedule E-20 (or successor B-20)**. PG&E's pending **Electric Rule 30** filing (late 2024) proposes a dedicated transmission-level tariff to expedite data-centre connections > 50 kV.

Virginia – Dominion Energy: Schedule GS-4 (Large General Service) applies to primary- and transmission-voltage customers. The Virginia SCC is reviewing proposals to shift large data-centre costs out of residential rates, but no separate tariff is yet in force.

DATA CENTRE ELECTRICITY RATES

Jurisdiction	ISO	Utility / Wires Owner	Large-Load (> 1 MW) Rate Class	Blended Effective Rate ($/MWh)	Methodology & Assumptions
Ontario (Toronto)	IESO	Toronto Hydro	General Service 1,000 – 4,999 kW	**$130 – $160**	Energy: HOEP (≈$30/MWh) + Global Adjustment (≈$50/MWh) = ≈$80/MWh. Delivery: Distribution charges (≈$45/MWh) and transmission charges (≈$20/MWh) based on Toronto Hydro's 2025 rates. IESO Power Data Low end: 95% LF, transmission-level, >5 MW. High end: 70% LF, sub-transmission, ~1 MW.
Alberta (Calgary)	AESO	ENMAX Power (distribution) / competitive retailer (supply)	D410 – Large Commercial - Primary Voltage	**$120 – $155**	Energy: Market-based (≈$60/MWh). Delivery: Distribution (≈$40/MWh) and transmission (≈$35/MWh) charges estimated from ENMAX's D410 rate. Low end: Direct connect + 90% LF. High end: 65% LF at full distribution service + higher demand charges.
Quebec (Montreal)	n/a (vertically integrated)	Hydro-Québec	Rate M – Medium-Power (50 kW – < 5 MW)	**$55 – $75**	Energy: 5.59¢/kWh (≈$55.9/MWh). Demand: $14.58/kW-month (≈$9.7/MWh). Hydro Quebec Based on Hydro-Québec Rate L/M. Low end assumes >5 MW, >90% LF. High end reflects mid-size load (~1 MW) with standard Rate M and 70–80% LF.
New York (NYC)	NYISO	Con Edison	SC-9 – Large General Service	**$200 – $250**	Energy: Market Supply Charge (≈$90/MWh). Delivery: Distribution and transmission charges (≈$130/MWh) based on Con Edison's SC-9 rates Wide spread depending on LF (65–90%) and whether connected via High Tension. Low end assumes TOU optimization and >90% LF; high end includes peak TOU, distribution access, and lower LF.
California (San Jose)	CAISO	PG&E (delivery) / San José Clean Energy (generation)	Schedule E-20 / B-20 – Large General Service (≥ 1 MW	**$230 – $270**	Energy: Generation charges (≈$100/MWh). Delivery: Distribution and transmission charges (≈$150/MWh) based on PG&E's E-20/B-20 rates. Low end assumes transmission interconnect + 90–95% LF. High end for smaller enterprise users w/ lower utilization.
Virginia (Loudoun County)	PJM	Dominion Energy	Schedule GS-4 – Large General Service (Primary/Transmission Voltage).	**$100 – $130**	Energy: Market-based (≈$50/MWh). Delivery: Distribution and transmission charges (≈$60/MWh) based on Dominion's GS-4 rates.

- Load Profile: Median estimates assume a data centre with a 1.5 MW peak demand, 1,000 kW average load
- All rates reflect blended costs including commodity (market-based rates or regulated tariffs as applicable), delivery, regulatory, and fixed charges.
- The above rates are estimates and may vary based on specific contracts, usage patterns, and utility policies.

GRID EMISSIONS AND NEAR-TERM TRAJECTORY

RESHAPE STRATEGIES

Jurisdiction	Avg Grid Emissions Factor [kg CO2e/MWh]	2030 Outlook
Ontario (Toronto)	35 (↗)	Gas use rising to meet demand; emissions projected to increase (IESO Annual Planning Outlook 2023)
Alberta (Calgary)	540 (↘)	Coal retirement and renewables ramp lead to lower emissions (AESO Net-Zero Emissions Pathways 2023)
Quebec (Montreal)	1.5 (-)	Hydro-dominant grid remains very low-carbon (Hydro-Québec Action Plan 2035 & NIR 2024)
New York (NYC)	442 (↘)	70% renewables by 2030 drives CO2 intensity down (NYISO Climate Change Impact & CLCPA Studies)
California (San Jose)	198 (↘)	SB100 targets push CAISO grid intensity lower (SB100 Joint Agency Report 2021 (CPUC, CEC, CARB))
Virginia (Loudoun County)	270 (↘)	VCEA compliance and Dominion IRP suggest steady emissions decline (Dominion 2023 IRP & VCEA Mandate)

Data centre waste heat is typically treated as zero-carbon regardless of the primary emissions from data centre power consumption. However, grid emissions are relevant in-so-far as they determine the feasibility of alternative pathways to data centre waste heat (ie. in Quebec, electrification is a low-carbon pathway for buildings, whereas in Virginia it is not today)

POWER AND PRICING REGULATIONS RELATED TO DATA CENTRES

RESHAPE STRATEGIES

- **New York (NY):**
  - NYISO and NY Public Service Commission (PSC) are evaluating impacts of large loads on grid stability and ratepayer fairness.
  - PSC's **Case 23-E-0434** proposes to classify large flexible loads (LFLs) like data centres and crypto separately to limit cost-shifting.
    → PSC Case 23-E-0434
  - NYSERDA and NYPA promote renewable procurement for hyperscalers; proposed legislation may mandate **disclosures and emissions caps**.

- **Virginia (VA):**
  - No direct legislation yet, but explosive growth (esp. in Loudoun County) has led to calls for reform of **Dominion Energy's integrated resource planning**.
  - **2023 JLARC Report** urged the legislature to explore cost allocation policies and impacts on grid congestion.
    → JLARC Report on Data centre Impacts
  - Proposals may introduce **rate classes or limits on public subsidies**; still in exploratory phase.

- **California (CA):**
  - **AB 222 (2023)** requires **data centres >20 MW** to submit reports detailing electricity source, emissions, and water usage before interconnection.
    → AB 222 – Large Load Transparency Act
  - **CEC regulations** require reporting of energy/water use for data centres ≥500 kW; may expand disclosure mandates.
    → CEC Appliance & Equipment Standards
  - CPUC planning processes now prioritize flexible loads & clean procurement to **avoid shifting grid costs to other ratepayers**.

4.4

DATA CENTRE POLICIES

EXISTING POSTURE TOWARDS DATA CENTRES

RESHAPE STRATEGIES

Jurisdiction	Dedicated DC Strategy?	Notable Public Initiatives	Incentives on Offer	Key Regulatory / Political Headwinds
Canada (Federal)	**No** Policy scattered across digital & climate files	• Data Strategy for the Federal Public Service (2023-26) • Canadian Sovereign AI Compute Strategy • Proposed **C$15 bn Green-AI Data-Centre Fund** (Dec 2024 Reuters)	• Cleantech investment tax credits (ITC) • $2bln Canadian Sovereign AI Compute Strategy • Potential Green-AI fund (not yet legislated).	• National-security screening of foreign ownership under the **Investment Canada Act** • Proposed **Digital Services Tax** on large digital-service revenues. • Uncertainty over backup-generator compliance in forthcoming **Clean Electricity Regulations**.
Alberta	**Yes** “AI Data Centre Strategy: Powering the Future of AI” (Dec 2024)	• AI Data Centre Strategy • Wonder Valley $70 bn AI-park proposal • Provincial SuperNet & rural broadband build-out	• Streamlined siting, “open for business” permitting, industrial property-tax abatements. • Low grid & behind-the-fence gas power costs; carbon-offset market.	• Indigenous consultation & Treaty-rights disputes over new sites • AESO warnings about reliability impacts from >3 GW of new DC load • High-carbon grid complicates ESG positioning.
Ontario	**No** Elements folded into digital strategy	• Building a Digital Ontario • Information & Data Assets Directive 2021 • Provincial Tier IV government DC project • Proposed Provincial Bill 5 - Protect Ontario by Unleashing our Economy Act, 2025. Large electrical interconnections must provide additional benefit to society	• Case-by-case economic-development grants; low-carbon electricity (nuclear + hydro) at competitive bulk rates.	• Severe **land & power-capacity constraints** in GTA – ENCOR Advisors on Toronto land scarcity • Complex dual privacy regime (PIPEDA + Ontario).
Quebec	No dedicated provincial DC strategy, but Hydro-Québec runs a **Data Centre Program**	• Hydro-Québec Data-Centre Program • **QScale** high-density AI campus (C$90 m provincial equity; waste-heat recovery to greenhouses)	• Preferential industrial electricity tariff (≈ 4–5 ¢/kWh) • Fast-track interconnection; grants (e.g., C$90 m to QScale)	• Municipal **property-tax assessments on IT equipment** raising costs • Potential moratoria on very-large crypto/AI loads when grid headroom tightens.

EXISTING POSTURE TOWARDS DATA CENTRES

Jurisdiction	Dedicated DC Strategy?	Notable Public Initiatives	Incentives on Offer	Key Regulatory / Political Headwinds
USA (Federal)	**Somewhat** 2025 Executive Orders & AI Action Plan	- **AI Infrastructure Push**: 2025 Executive Order directs federal agencies (DOE, DoD) to identify federal land and clean energy for data centre deployment (White House AI EO) - **DOE RFI** identifying 16 federal sites for co-located AI + clean power facilities (DOE RFI)	- Access to federal clean energy tax credits (e.g., ITC/PTC) - DOE/DoD land access via lease/partnership- Federal R&D programs (CHIPS Act, Quantum, AI) - Efficiency push via DCOI mandates	- Federal climate goals require clean energy by 2035 for new loads - No national permitting regime: regulatory burden varies by state
California	**No** No formal statewide strategy	- Pending bills: AB 1979 (mandatory energy disclosures for DCs), SB 57 (infrastructure cost allocation), and tax incentive proposals for clean DCs - Utilities (e.g., PG&E) conducting large-scale planning studies for projected 8.7 GW of new DC load by 2035 (PG&E IRP)	- Some proposed tax credits for clean-powered DCs - Local permitting support in some jurisdictions	- High retail electricity costs - Climate targets (100% clean by 2045) constrain new fossil-based load - Increasing scrutiny on water use, land impact, and public subsidies
Virginia	**No** Growth led by localities and incentives	- Local governments (Loudoun, Henrico) have implemented zoning and infrastructure rules - State debates ongoing around siting, incentives, and power use	- Statewide sales tax exemption for DC equipment over $150M investment (VA Tax Code) - Local SPAs (performance agreements) for jobs/investment - State workforce development initiatives (e.g., NOVA CC)	- Projected doubling of electricity demand by 2040 driven by DC growth - Local noise/emission/water opposition; several counties have tightened rules - Backlash over scale of tax incentives granted to hyperscale firms
New York	**No** DCs addressed through climate & energy legislation	- NYSERDA Data centre Energy Efficiency Program - Sustainable Data centres Act (S.6394) (pending): mandates clean energy targets for large DCs (33% by 2030, 100% by 2050), emissions transparency, and community benefit sharing	- Sales/use tax exemption on DC equipment (NY State Dept of Taxation) - Performance-based efficiency incentives up to $5M/project - Renewable procurement options through NYPA/LS Power	- High energy and labour costs challenge competitiveness - Pending bills may impose compliance burdens (e.g., energy reporting, renewable mandates) - Local resistance to large-scale energy and water use - Pressure to avoid passing costs to retail ratepayers

AMERICA'S AI ACTION PLAN

The "America's AI Action Plan" is a strategic roadmap developed by the White House to guide the United States toward global dominance in artificial intelligence. The plan's scope is broad, covering federal policy actions across multiple government agencies and aiming to influence both public and private sectors. Its jurisdiction is primarily federal, but it seeks to affect state-level policy by leveraging federal funding decisions. The plan will be executed through a combination of executive orders, revised federal regulations and guidelines, new initiatives, and coordinated efforts across federal departments.

The plan is structured around three core pillars:

1. **Accelerating AI Innovation**: This pillar focuses on fostering a pro-innovation environment. Key actions include removing perceived regulatory burdens on AI development, promoting open-source AI models, and updating federal procurement guidelines to ensure that government-purchased AI systems are "objective" and free from what the administration refers to as "top-down ideological bias.“
2. **Building American AI Infrastructure**: This pillar addresses the physical and digital foundation required for AI. It outlines measures to accelerate the development of critical infrastructure, including data centres, semiconductor fabs, and a modernized energy grid. The plan also includes initiatives for workforce development to support these infrastructure projects.
3. **Leading in International Diplomacy and Security**: This pillar is aimed at securing U.S. leadership on the global stage. It involves promoting the export of U.S.-made "full-stack" AI technology to allies, countering the influence of competitors like China in international forums, and strengthening export controls on advanced AI compute.

Measures to Directly Encourage or Accelerate Data centre Development

The plan places significant emphasis on accelerating physical data centre development, recognizing it as a cornerstone of U.S. AI leadership. Several direct measures are outlined to achieve this goal:

- **Streamlining Permitting and Environmental Reviews:** The administration is focused on expediting the complex and often lengthy permitting processes for data centres. This includes creating new categorical exclusions under the National Environmental Policy Act (NEPA) for data centre projects, which would exempt them from detailed environmental impact statements. It also aims to expand the use of the FAST-41 process, which provides coordinated federal review and clear timelines for major infrastructure projects.
- **Leveraging Federal Resources:** The plan directs federal agencies to identify and make suitable federal lands available for data centre development. This could include brownfield sites and even military installations, a significant policy shift aimed at bypassing state and local regulations that can slow down construction.
- **Providing Financial Incentives:** The government is directed to provide financial support for "Qualifying Projects," defined as large-scale data centres with a significant power load (e.g., over 100 megawatts) or a substantial capital investment. This support can take the form of loans, loan guarantees, grants, and tax incentives to encourage private investment in these projects.
- **Modernizing the Power Grid:** The plan acknowledges that the massive energy needs of AI data centres are a critical constraint. It calls for a multi-faceted approach to modernize the U.S. power grid, including stabilizing existing power sources, enhancing grid efficiency with new technologies, and prioritizing the development of new energy sources like enhanced geothermal and advanced nuclear.

DATA CENTRE HEAT RE-USE POLICIES

- There are **no regulations today** that directly require heat re-use from data centres in any of these jurisdictions.

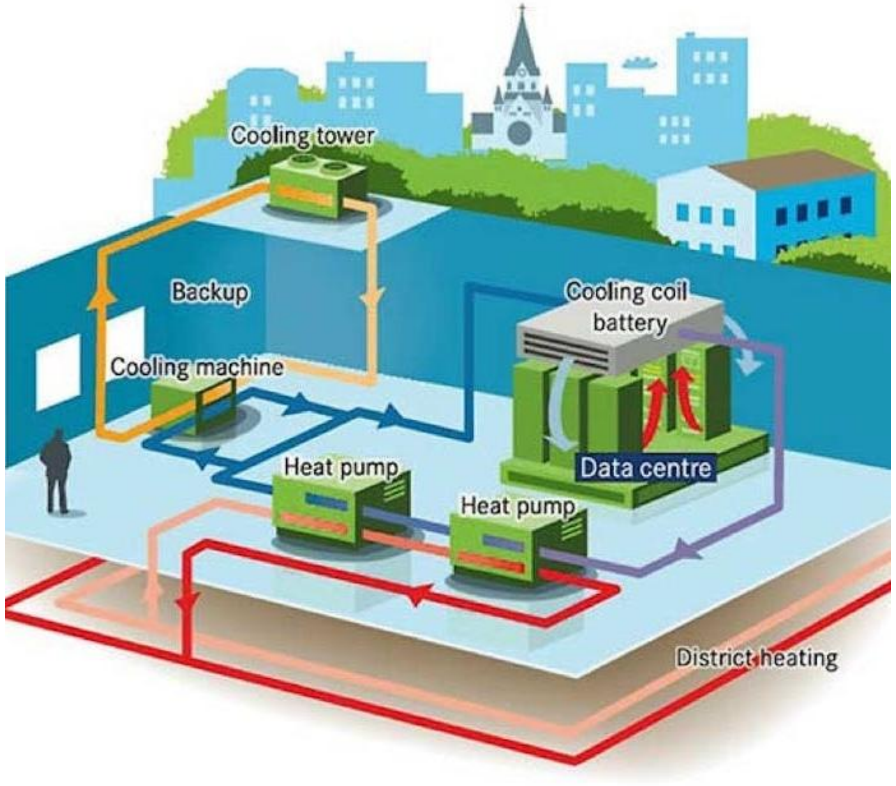


Image credit: Nortek

5

OPPORTUNITY ASSESSMENT

DEFINING THE DATA CENTRE-TENS MARKET OPPORTUNITY

The size of the Data Centre-TENs Market Opportunity can be conceptualized as the overlap between the amount of waste heat from data centres that could be practically used to serve heat load on a TEN's in a given market in the next 10 years.

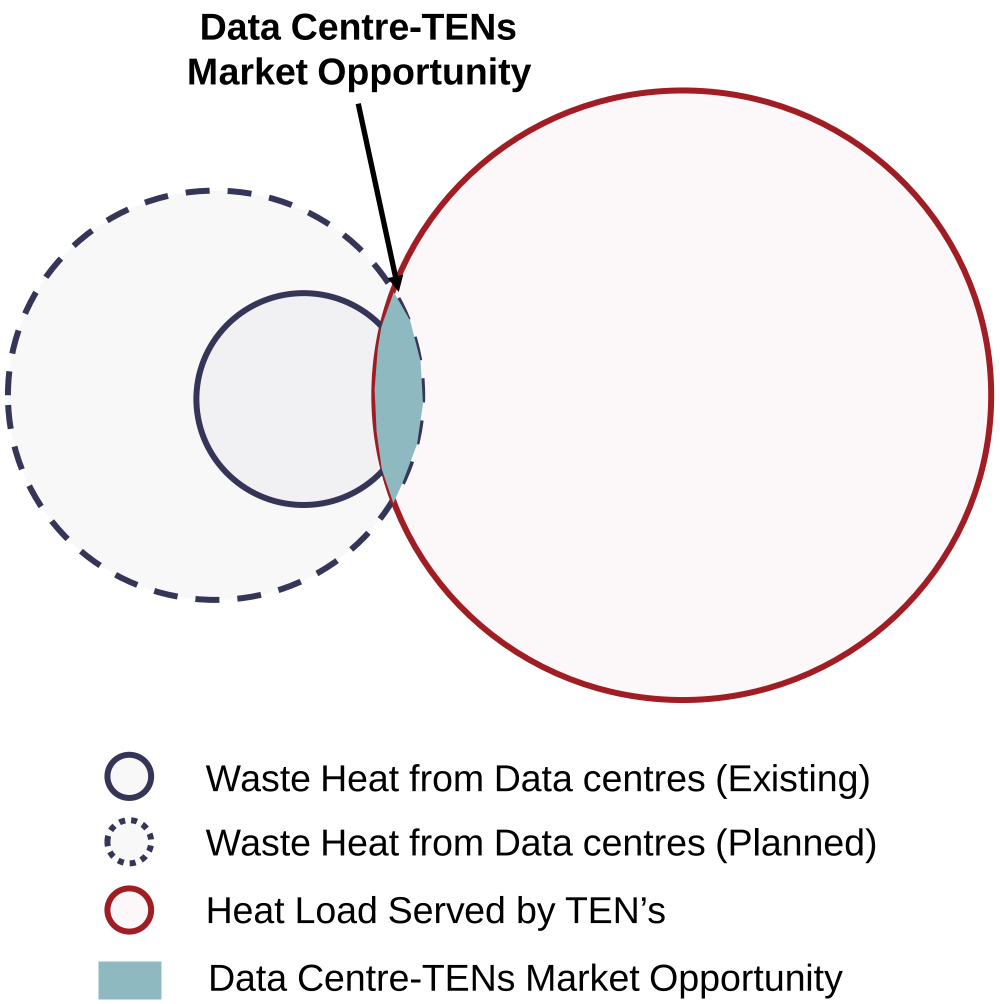
In this framework, we conceptualize data centre waste heat from both existing and future data centres. Heat load served by TENs is inclusive of both existing buildings and new buildings that will connect to existing or new TEN's.

The overlap between these two factors will be primarily determined by:

1. **Proximity**: distance between data centre and TEN (new or existing)
2. **Technical Compatibility**: cooling system type, scale and waste heat density, temperature regimes for data centre and TEN
3. **Regulatory Drivers:** carbon pricing, regulated heat re-use, incentives

This is a useful framework because it captures both the magnitude of the market opportunity (to utilize data centre heat) and can be leveraged (in subsequent sections) to discuss technical and policy interventions that can be implemented to increase the market potential.

We have provided a **comparative assessment** of the Data centre-TENs market opportunity within each jurisdiction.

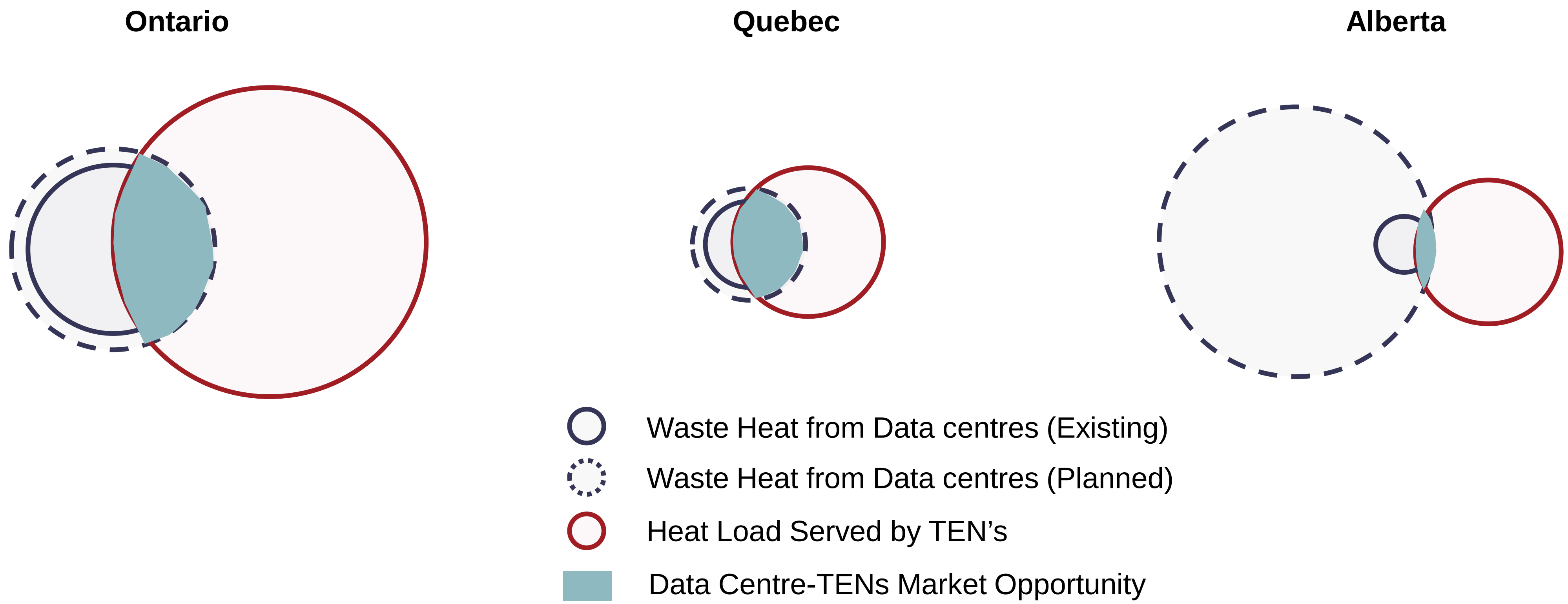


2035 DATA CENTRE-TENS MARKET OPPORTUNITY (CANADA)

RESHAPE STRATEGIES

NOT TO SCALE.

Size of overlap (market opportunity) is exaggerated in all regions to express **relative difference** across jurisdictions

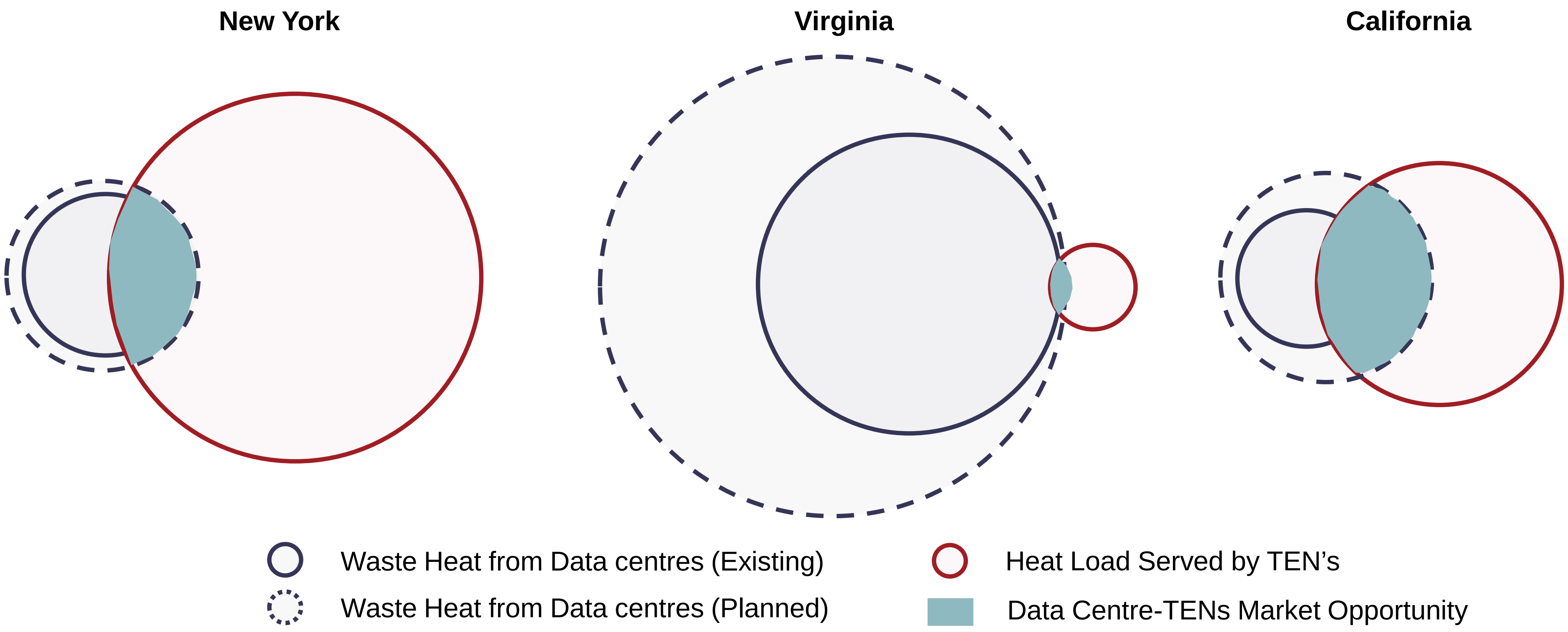


2035 DATA CENTRE-TENS MARKET OPPORTUNITY (USA)

RESHAPE STRATEGIES

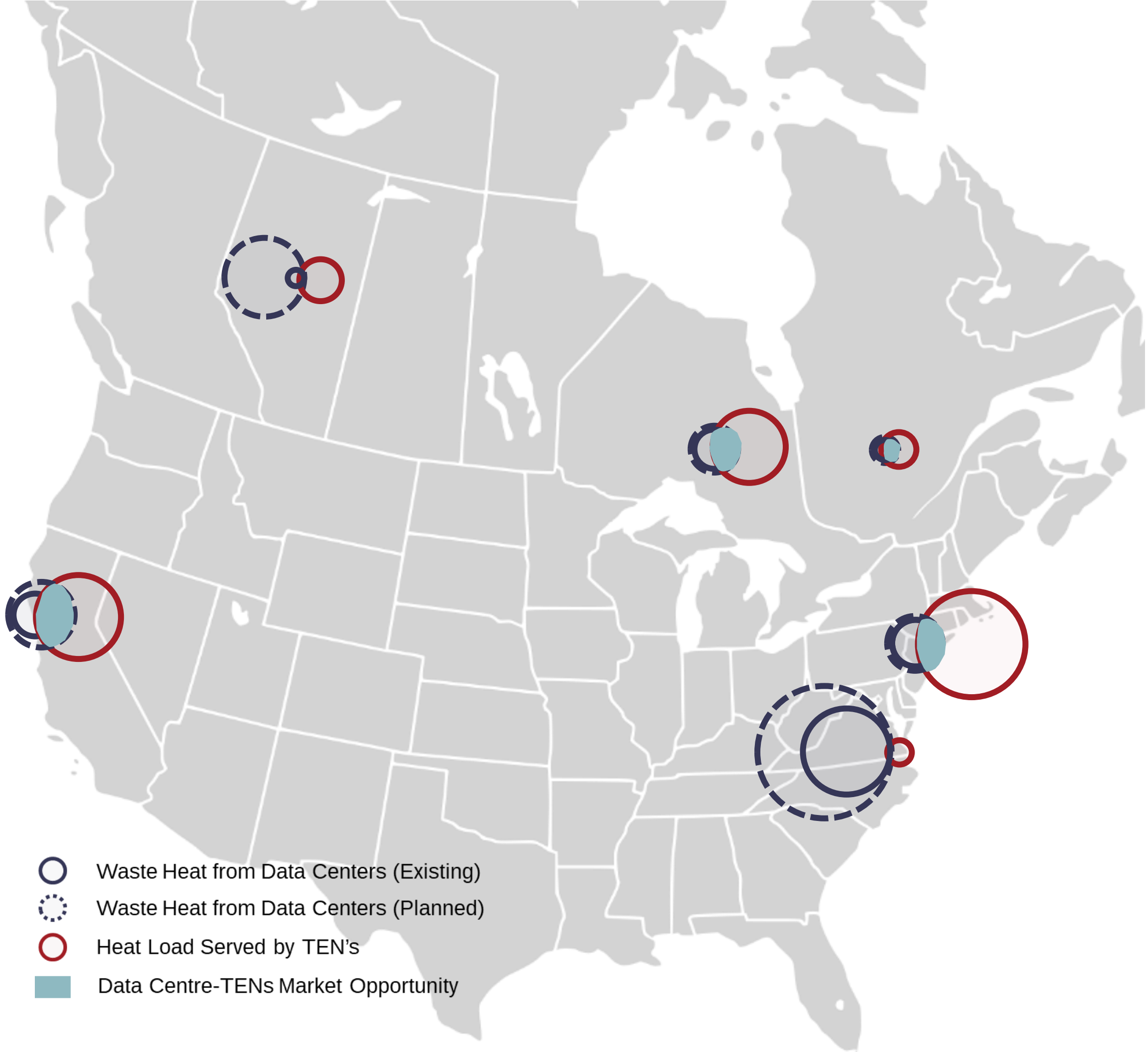
NOT TO SCALE.

Size of overlap (market opportunity) is exaggerated in all regions to express **relative difference** across jurisdictions



DATA CENTRE-TENS MARKET OPPORTUNITY ASSESSMENT (SUMMARY)

Group	Jurisdic-tion	Pros	Cons
Top Tier Market	New York	• Strong Building Decarb Policy • Emerging TENs Market	• Majority of data centres existing
	Ontario	• Established and Emerging TENs Market • Cold climate	• Majority of data centres existing
Priority Market	Quebec	• Strong Building Decarb Policy • Precedent of waste heat policy exists	• Nascent TENs market with favorable building-scale alternatives (low cost power)
	Californi a	• Large forecast of new data centres • Aggressive Building Decarb Policy	• Nascent TENs market • Limited heat demand
Tertiary Market	Alberta	• Large forecast of new data centres	• Remote siting • Limited building decarb policy
	Virgina	• Large forecast of new data centres	• Limited heat demand • Remote siting



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