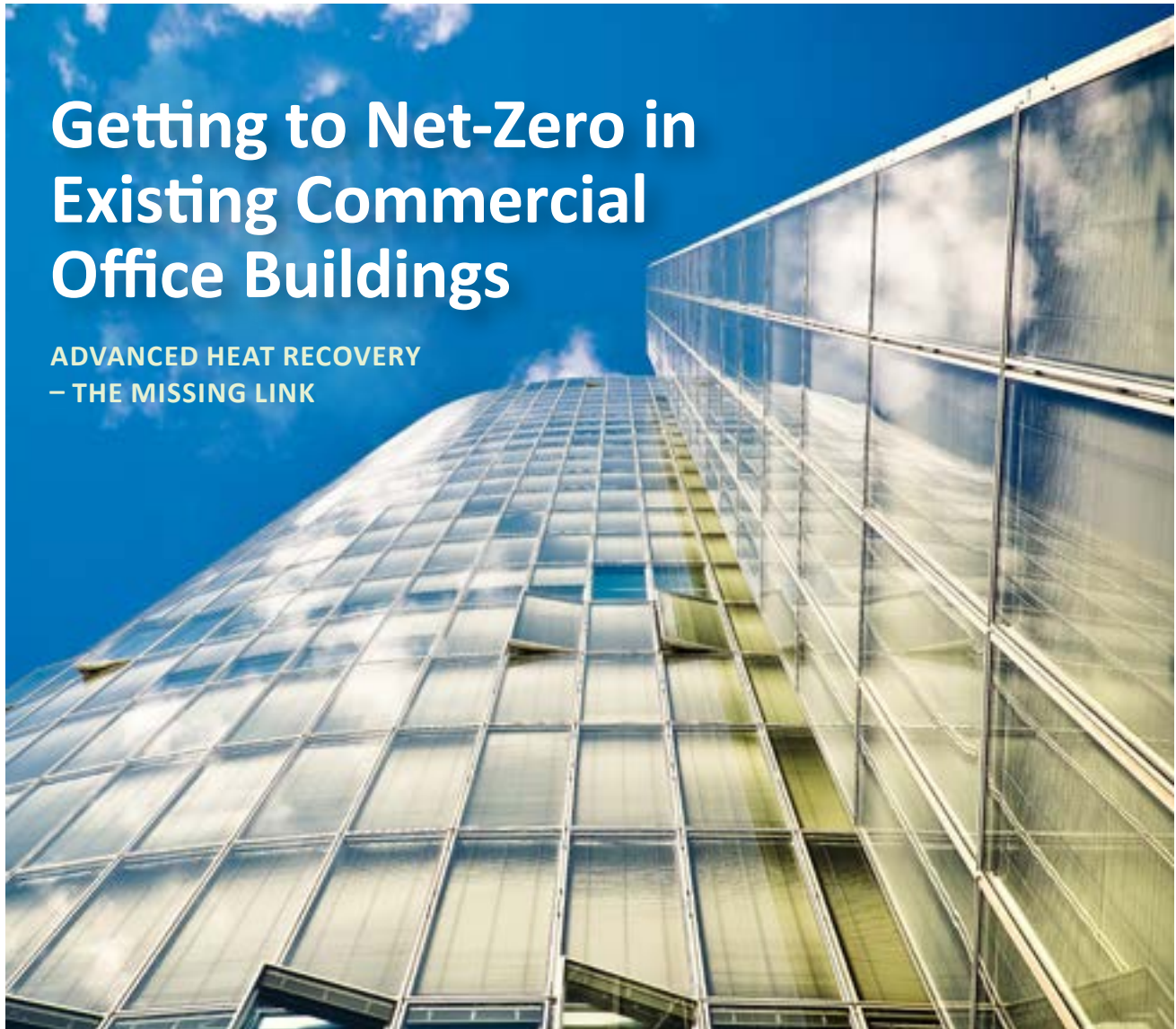


Getting to Net-Zero in Existing Commercial Office Buildings

ADVANCED HEAT RECOVERY
– THE MISSING LINK



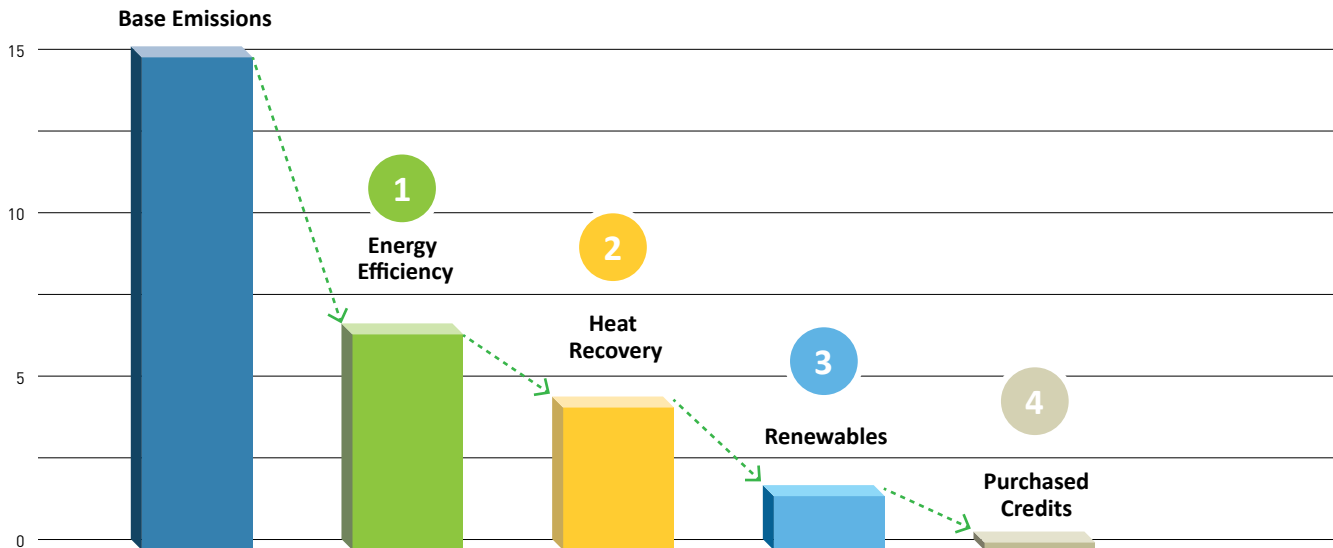
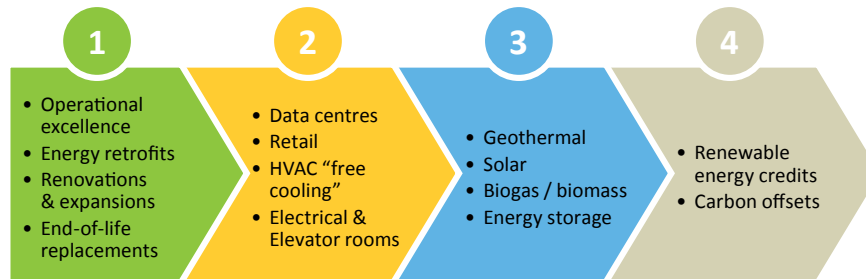
Climate change is the defining issue of our time. This enduring global crisis demands fundamental change in policies, management systems and people. The commercial office sector is leading the way.

The Climate Challenge

With the growing number of federal, provincial, state and local governments declaring climate emergencies and setting policies, targets and regulations requiring deep reductions in greenhouse gas emissions, achieving net-zero within 20-30 years is becoming a common goal. Net-zero new buildings are beginning to enter the market. Getting to net-zero with existing office buildings presents a bigger challenge.

Practical Pathways

Net-zero must make economic as well as environmental sense. The practical pathway to net-zero should follow a building's capital planning cycle over time. When planning renovation, equipment replacement and retrofit projects, incremental costs of low carbon design options should be considered whenever they are likely to provide lower life cycle costs. Every capital project presents an opportunity for a coherent step towards the net-zero end game.



Efficiency First

The first step is implementation of all cost-effective energy efficiency opportunities, including operations and control improvements and building system retrofits which meet required returns on investment. For jurisdictions with low-carbon electricity grids, the emphasis will be on fossil fuel efficiency. The commercial office sector has made progress since REALPAC first proposed a national energy target a decade ago. Today's good practice thermal energy targets for conventional gas-fired heating systems are:

CITY	HDD ¹ (15°C)	2018-19 ekWh/sq.ft. ²			GHG (kg/sq.ft.)
		base	heating	TOTAL	
Vancouver	1,929	0.2	3.0	3.2	0.6
Calgary	4,150	0.2	6.5	6.7	1.3
Edmonton	4,976	0.2	7.8	8.0	1.5
Saskatoon	5,218	0.2	8.2	8.4	1.5
Winnipeg	5,244	0.2	8.3	8.5	1.5
Toronto	3,175	0.2	5.0	5.2	0.9
Ottawa	4,069	0.2	6.4	6.6	1.2
Montreal	3,798	0.2	6.0	6.2	1.1
Halifax	3,499	0.2	5.5	5.7	1.0

1. HDD (15°C) is heating degree-days based on Environment Canada data for the local weather station
 2. Targets based on top-performing buildings in Enerlife's national database

Heat Recovery – The Missing Link

Most commercial office buildings generate large amounts of internal heat, not only from lights, plug loads and people but also from data centres and mechanical and electrical equipment rooms. Typically, this heat is rejected in winter through so-called air-side free cooling, or by cooling towers, air cooled condensers or district cooling systems. Reclaiming all internal heat, wherever practical, can provide a major step towards net-zero.

While every building is different, and some system configurations are more advantageous than others, in most cases reclaimed heat is collected through the building's chilled water system. Small, high-temperature heat recovery chillers extract the heat from the chilled water loop and generate heating water hot enough to meet the building's needs for much, or all of the heating season. Domestic hot water loads can be met year-round.

Analysis of several commercial office buildings in Toronto shows gas savings due to this type of heat recovery in the range of 1.7 to 4.5 ekWh/sf, amounting to displacement of between 35 and 90 percent of the energy efficient target. This level of reduction makes the remaining net-zero steps of on-site renewables and carbon offsets far more manageable. Ongoing development is expected to further increase the magnitude of the heat recovery step towards net-zero.

Making the Business Case – Carbon Taxes, Caps and Funding

In several buildings where existing plant is at end-of-life, the cost of the heat recovery chiller installation has been found to be lower than equipment replacement. In other cases, there is a cost premium. Despite the performance coefficient of the heat recovery chiller, which generates several units of heat for each input unit of electricity, utility cost savings with current rates are generally small because of the price differential between electricity and natural gas. The wild card is carbon pricing.

Emissions reduction goals of the Paris Accord are likely to drive continuing increases to the deemed or market price of carbon beyond the \$50/tonne level in Canada's current federal legislation. The corresponding rise in natural gas prices will put pressure on operating costs, while improving the business case for heat recovery chiller installations. New York City's Local Law 97 placing limits on carbon emissions, with a penalty of \$268/tonne, is due to go into effect in 2024 and may be a sign of things to come in other jurisdictions. On a more positive note, government funding is expected to help pay for projects which can deliver deep emissions reductions. Heat recovery in commercial office buildings represents a massive opportunity and contribution to corporate and national goals.

The business case for working towards net-zero buildings is grounded in risk-proofing against future carbon costs and possible regulation as well as current economics. Being prepared for future government funding and utility incentives is prudent. Demonstrating net-zero in commercial office buildings will exemplify leadership in corporate social responsibility.



Courtesy of Multistack