### PHONONIC + Halton

### The Time is Now... for a New Way to Live

September 2023



### Together, we have Created the World's First Solid State, Sustainable HVAC Solution



### July 2023 was the Hottest month on Earth...Ever

PHONONIC + Halton | TTAP TECHNOLOGY

# COOLNG Next Sustainability Battleground



#### CO<sub>2</sub> Emissions Intensifying

Left unchecked, by 2050 global AC will produce 2.3bn tons of  $CO_2^3$ 

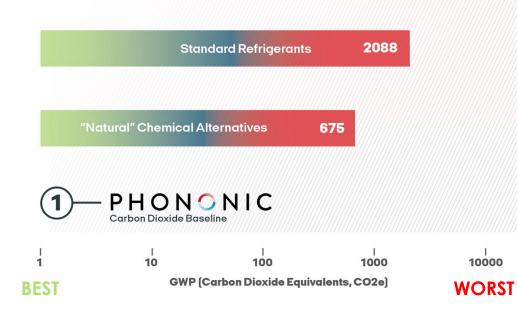
#### Refrigerant Impact is Catastrophic

Global Warming Potential 'GWP' of common refrigerants 2000X worse than CO<sub>2</sub><sup>5</sup>

appliances

## Refrigerants: Catastrophic Global Warming Contributor

#### GLOBAL WARMING POTENTIAL OF REFRIGERANTS COMPARED TO CO<sub>2</sub>





Phononic Solid State Solution Uses Only CO<sub>2</sub> & Water – Eliminating HFCs & Toxic & Flammable Refrigerants

## Refrigerants in HVAC: **Environmental Impact Demands Action**

#### CLIMATE CHANG

WORLD ECONOMIC FORUM Air conditioning is threatening our ability to tackle climate change. Here's what we need to do





#### US to Ban Refrigerants With High Global Warming Potential The EPA proposed a ban on refrigerants with high global warming potential by 2025.



Indoor Air Quality is Critical to Health and Sustainability in the Office of the Future

Technology can help buildings achieve greater IAQ without using more energy





#### The Economist

How supermarket freezers are heating the planet, and how they could change

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Grocery chains under pressure to switch from HFCs to natural refrigerants to curb climate change

Emily Chung · CBC News · Posted: Jan 29, 2023 4:00 AM EST | Last Updated: February 27









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# A Big Roadblock in the Drive to Bring Down Emissions? BUILDINGS

Commercial buildings are responsible for nearly

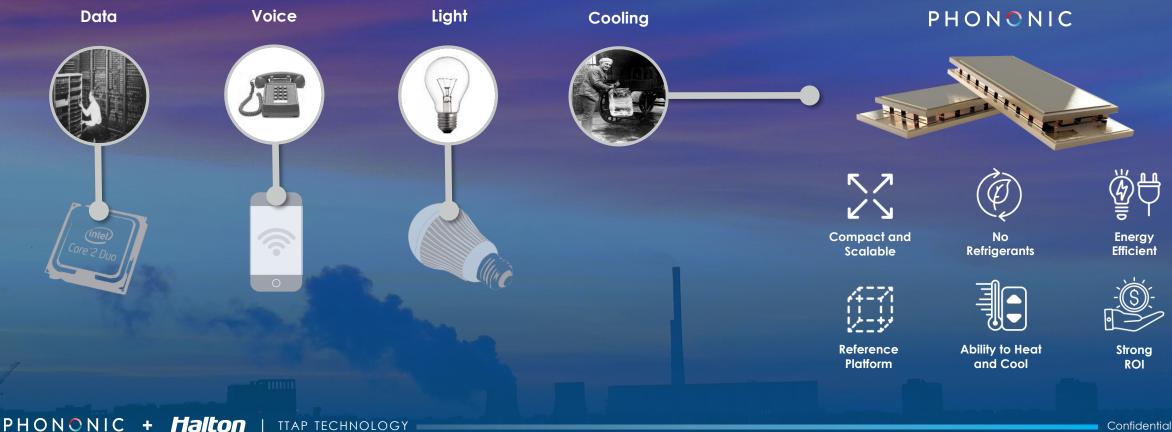
# 40% & 36%

of energy consumption

of greenhouse gas emissions

# TRANSFORMATIONAL

#### Semiconductor Innovation Legacy



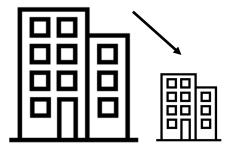
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# Halton: Rethink HVAC

Reconsider Existing Building HVAC TTAP Concept: Hybrid Integration

Thermal Module: Flexible Output Comfort & Sustainability

Building Chiller No Longer does all the Work Uses Partially Treated Fresh Air & Flexible Integration Solid State Cooling & Heating w/Flexible Scale Fresh Air w/Comfort & Lower CO<sub>2</sub>e & TCO









### Significant CO<sub>2</sub> Mitigation and Impact Potential Phononic + Halton TTAP Technology



## PHONONIC + Fallo

We reimagined HVAC with a landmark installation in Paris

# sustainable future

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# Phononic + Halton

#### 1<sup>st</sup> & Largest Solid State Cooling Installation

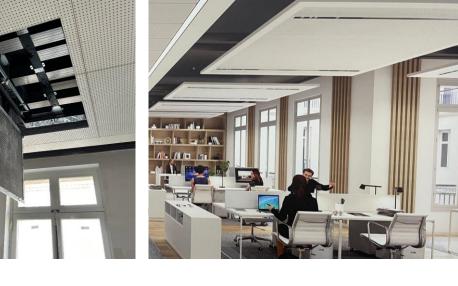


- 8,500 m<sup>2</sup> office
- 2 adjoined buildings, 5 floors each
- 100M€ /10 year lease signed



#### 'TTAP' Thermal Module

- Eliminates HFCs
- Reduces energy use
- Saves on maintenance



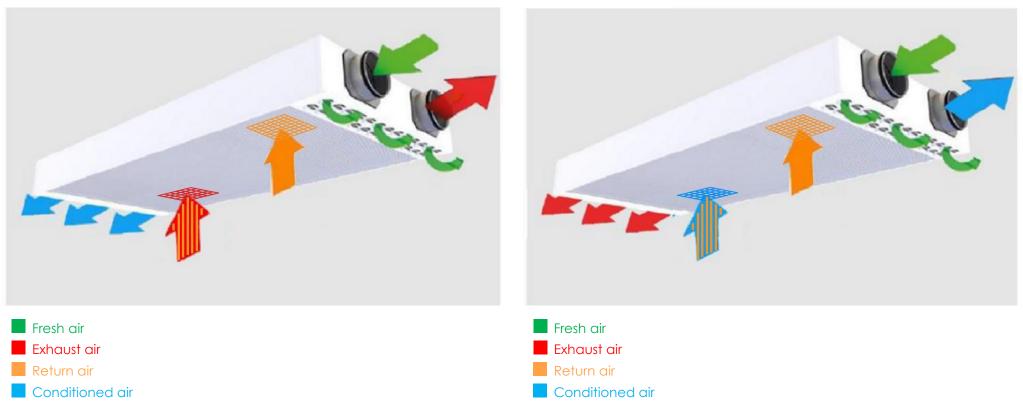
#### >150kW Installed Heating & Cooling Capacity

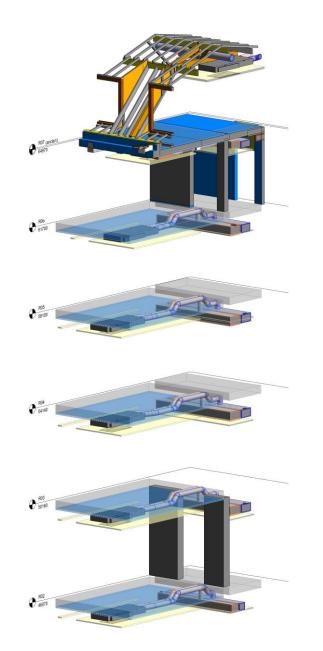
## **TTAP Platform**

#### Low Voltage & Fast Transient Response Preferred!

**HEATING MODE** 

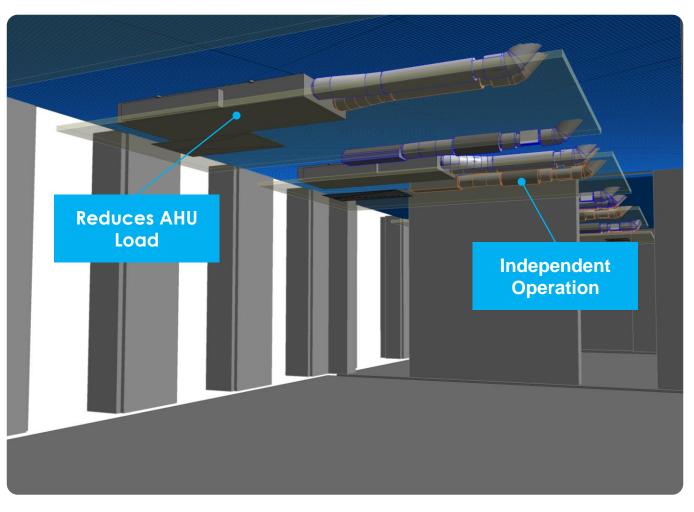
#### **COOLING MODE**





# **TTAP Platform**

#### Flexible Integration



# Superior CO<sub>2</sub>e Footprint and Total Cost of Ownership

TTAP Analysis vs. Legacy Incumbents

TTAP Production and Installation

>20% less CO<sub>2</sub>e



TTAP Operation >13% less CO<sub>2</sub>e



Total Cost of Ownership

Solid State Cooling

>100 tonnes CO<sub>2</sub>e saved

>18% savings





3<sup>rd</sup> Party Validated

# It's change that could **change the world.** And it's just beginning.

In Paris alone, there are ~350 buildings a year that could be upfitted with TTAP technology

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### TTAP – A Global Solution

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### For More Information

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### Thank you!

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