



# PHASE CHANGE SOLUTIONS

Building the Next Advanced Materials Eco-system  
January 2024

# PHASE CHANGE SOLUTIONS

## Innovation Journey

2010 -  
2018

### Tech feasibility & POC

- Engineering BioPCM across applications
- Fine-tuning BioPCM formulations
- Building IP moat

2019 -  
2022

### Focus, pivot to adv materials

- Focus on BioPCM & partner with OEMs
- Prioritize CCMR, Bldg EE
- Expand geographically – SEAsia and EMEA

> 2023

### Scale through partnerships

- Focus on BioPCM & partner with OEMs
- Prioritize CCMR, Bldg EE
- Expand geographically – SEAsia and EMEA
- licensing & manufacturing tech transfer for geographic expansion.

2024

# ZERO Carbon Emission Buildings

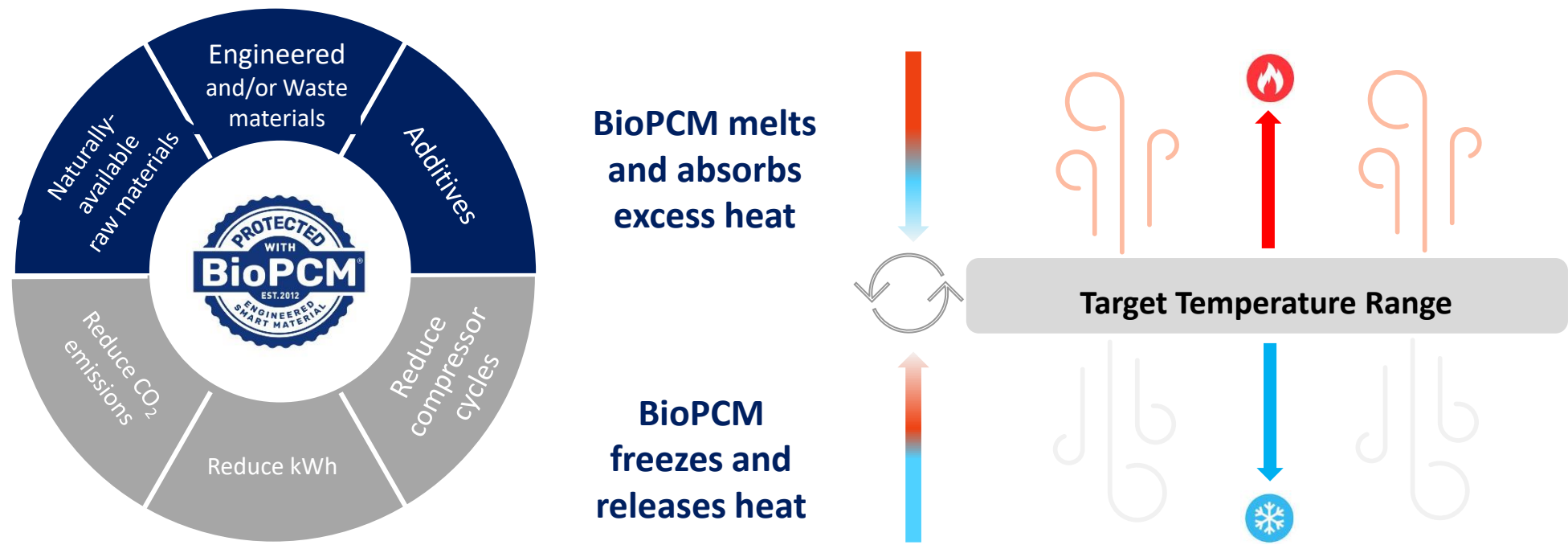


  
**PHASECHANGE**  
SOLUTIONS™

BNEF  
**pioneers**  
2020



# How does BioPCM® maintain temperature?



# Key Application Areas Focused on NetZero Energy and Zero Waste



## Energy Efficiency & Storage

37 bn | CAGR 4.5%



## Cold Chain, Refrigeration, Mobility

\$250 bn | CAGR 15%



## Telecom & Data Centers

\$50 bn | CAGR 2.5%



Heat Pumps

Wall Cladding

Integrated Ceiling Tiles

Cold Storage conditioning

Pharma shippers

**LMDS – Food & Pharma**

Grocery carts

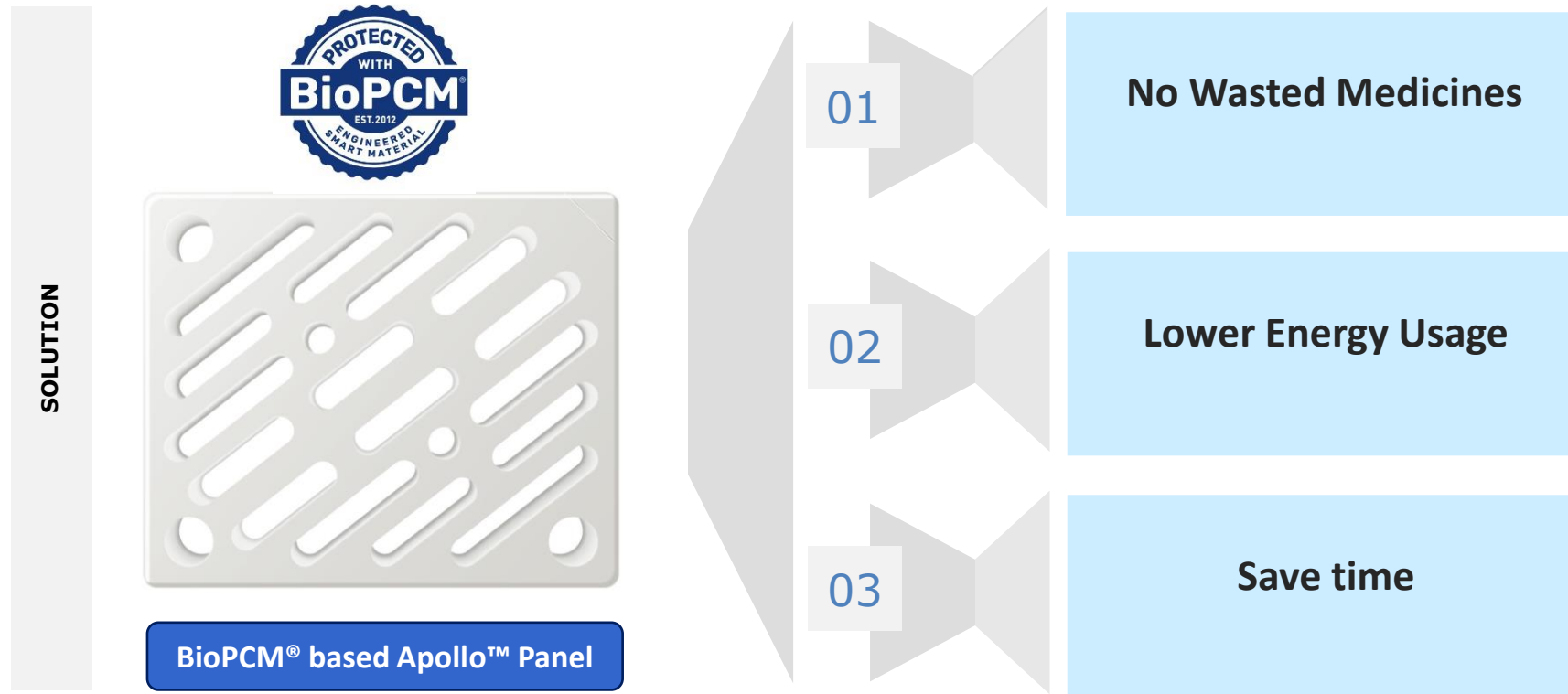
Refrigerated Trucks

Data Centers

Mobile Homes/RVs

Bldg Energy Efficiency

## REFRIGERATION



Apollo Panels address common challenges at GPs

## REFRIGERATION

Shelves for refrigerators & freezers to maintain desired temperature control of biologics, vaccines, & pharmaceuticals.

Installed in over 3000 pharmacies

Maintains payload efficacy & avoids waste.





## Case study: ENRG Panel® in a telecom shelter

- Easy-to-install ENRG Panel® using BioPCM®, on interior walls of telecom shelters
- Installed in 9600 cell tower shelters across U.S.
- Reduced consumption by 46 million kWh

### Energy Panel® in a 20 sq. m. telecom shelter (33 panels)

Annual savings in energy consumption (kWh)	10,220 kWh
Annual cost savings per site (\$)	\$1,226
Pay back period at \$0.12/kWh	1.5 years
CO2e reduced (MT)	4 MT/site/year



# Case study: ENRG Blanket® in a gas station in Greece

Cooling Only	Heating Only
<ul style="list-style-type: none"><li>• 17% HVAC savings</li><li>• 9,055 kWh Saved</li><li>• OR 3.9MT of reduction in CO2</li><li>• €1,087 savings per year</li><li>• 3.5-year simple ROI</li></ul>	<ul style="list-style-type: none"><li>• 36% HVAC savings</li><li>• 8,558 kWh Saved</li><li>• OR 3.7MT of reduction in CO2</li><li>• €1,027 savings per year</li><li>• 3.7-year simple ROI</li></ul>



Heating and Cooling (combined)
<ul style="list-style-type: none"><li>• 23% HVAC savings</li><li>• 17,613 kWh saved</li><li>• 7.6MT of reduction in CO2</li><li>• €2,114 per Year</li><li>• 1.8 – year ROI</li></ul>





**BNEF**  
**pioneers**  
**2020**

**THANK YOU**

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