SYNTROPIA

ENERGY FROM THE FUTURE

# INTEGRATED SOLAR ENERGY

Corporate presentation | Hybrid PVT modules & intelligent energy systems

OCTOBER 2026 • ENGLISH EDITION

SYNTROPIA

ENERGY FROM THE FUTURE

OUR PURPOSE

# Mission

**Bringing the past and the future together to make the use of solar energy smarter.**



MORE VALUE FROM EVERY RAY

WHERE WE ARE HEADING

# Vision

## To become a market benchmark for hybrid solar (PVT) technology.

Our ambition is to move beyond conventional flat-plate solar thermal collectors and enable widespread adoption wherever both electricity and heat are required.

**ONE SOLAR SURFACE. TWO VALUABLE ENERGY OUTPUTS.**



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MARKET CONTEXT

# The challenge

Traditional photovoltaics and solar thermal collectors are marketed as separate solutions.



**24%**

**PV maximum efficiency**

As stated in the original deck

**18%**

**Typical PV operating efficiency**

As stated in the original deck

**40–80%**

**Solar thermal efficiency**

Depends on operating temperature

## ROOFTOP SPACE IS LIMITED

Separate installations compete for valuable roof space. On average, we see a combined efficiency of less than 40% when the technologies are installed separately.



OUR INNOVATION

# DuoSolis: the hybrid solar solution

DUOSOLIS
Insieme più efficienti

## Electricity + useful heat from one solar module

Syntropia developed the first version of DuoSolis, a hybrid photovoltaic-thermal (PVT) module that combines both energy conversion functions in the same panel.



DUOSOLIS | HYBRID PVT

**>600**
**kWh electricity/year**
Northern Italy

**>2,000**
**kWh useful heat/year**
Northern Italy

**>75%**
**Average total efficiency**
Up to 85% with heat pump

TECHNOLOGY

# DuoSolis | technical datasheet

Rated module outputs: 535 We electric + 1,400 Wt thermal • Total ≈1.94 kW

## THERMAL PERFORMANCE

| | |
|---|---|
| Optical efficiency $\eta_0$ | **62%** |
| Coefficient $a_1$ | **~5 W/m²K** |
| Stagnation temperature | **90°C** |
| Nominal flow rate | **150 l/h** |
| Pressure drop @ 150 l/h | **80 mbar** |
| Collector volume | **1.3 L** |
| Module weight | **50 kg** |
| Collector surface | **2.147 m²** |
| Tube fittings | **1/2" F – 3/8" F** |
| Thermal peak output | **1,400 W** |

## ELECTRICAL PERFORMANCE (STC)

| | |
|---|---|
| Peak electrical power | **535 W** |
| Current at Pmax (Imp) | **13.78 A** |
| Open-circuit voltage (Voc) | **45.91 V** |
| PV module efficiency | **22.82%** |
| Voltage at Pmax (Vmp) | **38.3 V** |
| Pmax temperature coefficient | **−0.29% / °C** |
| Short-circuit current (Isc) | **14.6 A** |
| Power tolerance | **0 / +5 W** |
| Module dimensions | **2.06 × 1.13 × 0.05 m** |
| Reference test | **1,000 W/m² · AM1.5 · 25°C** |

Thermal reference: UNI EN 12975.

THE SYNTROPIA SYSTEM

# One integrated ecosystem

Four technologies work together to produce, convert, store and intelligently manage renewable energy.



## DuoSolis

**Hybrid solar PVT module**

Simultaneous production of electricity and heat from a single solar surface.




## SyntroCore

**Multi-energy heat pump**

Heat exchange with air, PVT hydraulic loops and compact geothermal probes.



## GeoPlus

**Compact geothermal probes**

Subsurface thermal exchange and storage with a sand-based medium.



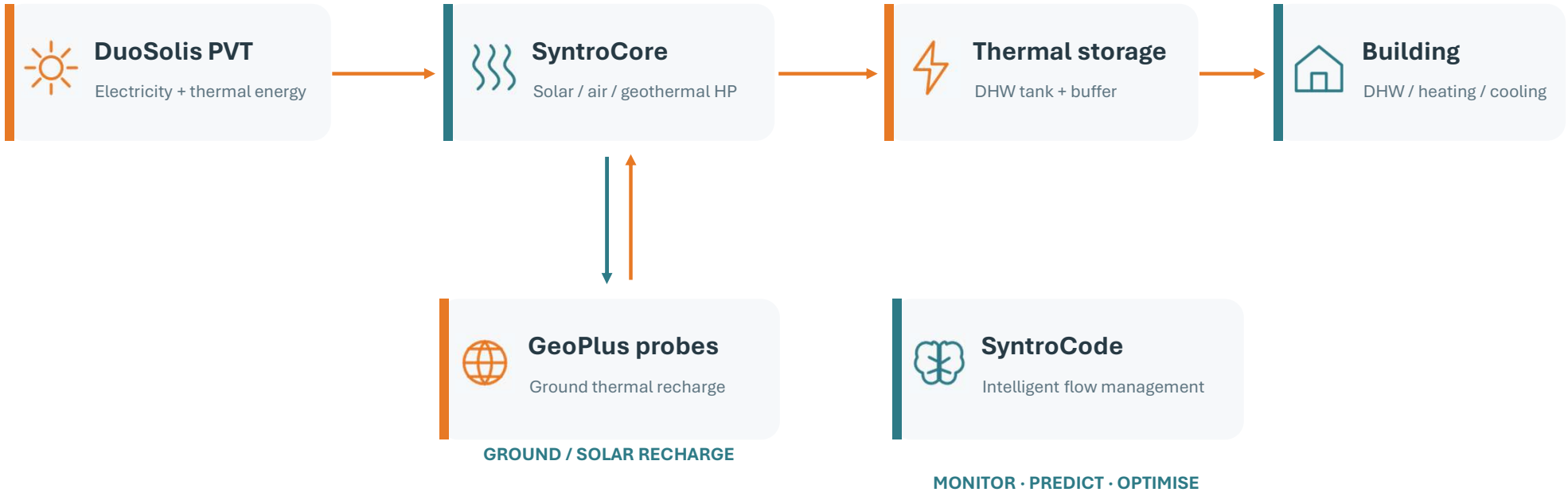

## SyntroCode

**Intelligent energy control**

Monitoring and predictive coordination of all energy flows.

INTEGRATED ENERGY FLOWS

# How the complete system works




Additional functions: low-temperature space heating · DHW integration · cooling · ground humidification · seasonal recharge

# AIR-SOURCE GEOTHERMAL CONCEPT

**BUILDING VIEW WITHOUT AN OUTDOOR HEAT-PUMP UNIT**




## INTEGRATED DESIGN

Architectural integration with PVT, compact geothermal probes and an indoor energy system.

THE SYNTROPIA SYSTEM

# An intelligent, integrated architecture

The Syntropia System turns the building and its technical plant into a dynamic energy ecosystem: producing, managing, storing and optimising all available renewable energy while reducing waste.

### DuoSolis

Hybrid PVT module that produces electricity and heat simultaneously. Captured solar energy is used or stored instead of being wasted.

### SyntroCore

The multi-energy geothermal heat pump: receives, converts and distributes heat from sun, air and ground with the goal of high seasonal efficiency.

### GeoPlus

Compact geothermal probes in a humid sand-based medium. They absorb and release ground heat, serving as a natural thermal battery.

### SyntroCode

Digital intelligence that records, analyses and optimises system performance in response to real weather conditions and user habits.

INTELLIGENT ENERGY MANAGEMENT

# Energy that adapts — and is preserved

### STORE · REUSE · RECHARGE

Solar energy captured by DuoSolis is used by SyntroCore or stored underground through GeoPlus. Surplus heat can be transferred to the buffer tank or to the ground and recovered later. Thermal and electric flows are continuously monitored and optimised.

## A system that learns

SyntroCode transforms operating data, charge/discharge cycles and user behaviour into intelligence. Its predictive controls are designed to:

- Improve control logic and prioritise energy sources
- Optimise heat-pump cycles and GeoPlus thermal charging/discharging
- Forecast building energy demand
- Maintain comfort while minimising energy use

Adaptation to the climate, the seasons and occupant needs is part of the system concept.

MARKET OPPORTUNITY

# Reference market | 2024

Hybrid PVT modules are a niche category with potential to expand as electricity and thermal demand converge.




**WORLD**

894 M PV | 15 M thermal

**38,000 PVT**




**EUROPE**

180 M PV | 1.2 M thermal

**23,000 PVT**




**ITALY***

13.6 M PV* | 0.3 M thermal*

**5,000 PVT**

PEOPLE

# Management & R&D



## Alessio Iannascoli

**FOUNDER, PRESIDENT & CTO**

Electronics engineer and entrepreneur in cleantech and IT, with experience in project management and renewable-energy engineering.



## Francesco Legrottaglie

**MECHANICAL ENGINEER · PhD**

PhD in Industrial Engineering. Expertise in mechanical design, research, automation and energy-efficiency systems.



## Dario Ravetto

**BUSINESS DEVELOPMENT**

Commercial development in Italian and international markets, strategic partnerships, institutional customers and ESCO relationships.

Research relationships referenced

ENEA

POLITECNICO MILANO 1863

UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

BUSINESS MODEL

# What we will do | core activities

### DEVELOP, PRODUCE & SELL

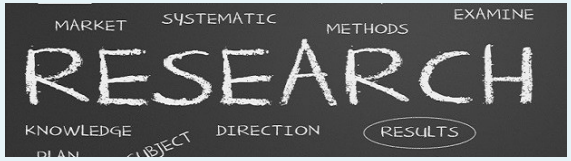
Hybrid solar modules and fully integrated systems combining heat pumps, storage and intelligent management (Syntropia System).

### NEXT-GENERATION PRODUCTS

Manufacturing of DuoSolis+ thermophotovoltaic modules, kits and related installation accessories.

### RESEARCH & DEVELOPMENT

New innovative products and solutions: multi-energy heat pumps, compact geothermal probes and predictive intelligent controls.




### TECHNOLOGY DEVELOPMENT WITH AN INTEGRATED SYSTEM PERSPECTIVE

MARKET EXECUTION

# What we will do | complementary services



## TURNKEY RENEWABLE SYSTEMS

Small and medium projects for residential and civil use, integrating the company's own technology. Typical contract size: up to 300k.



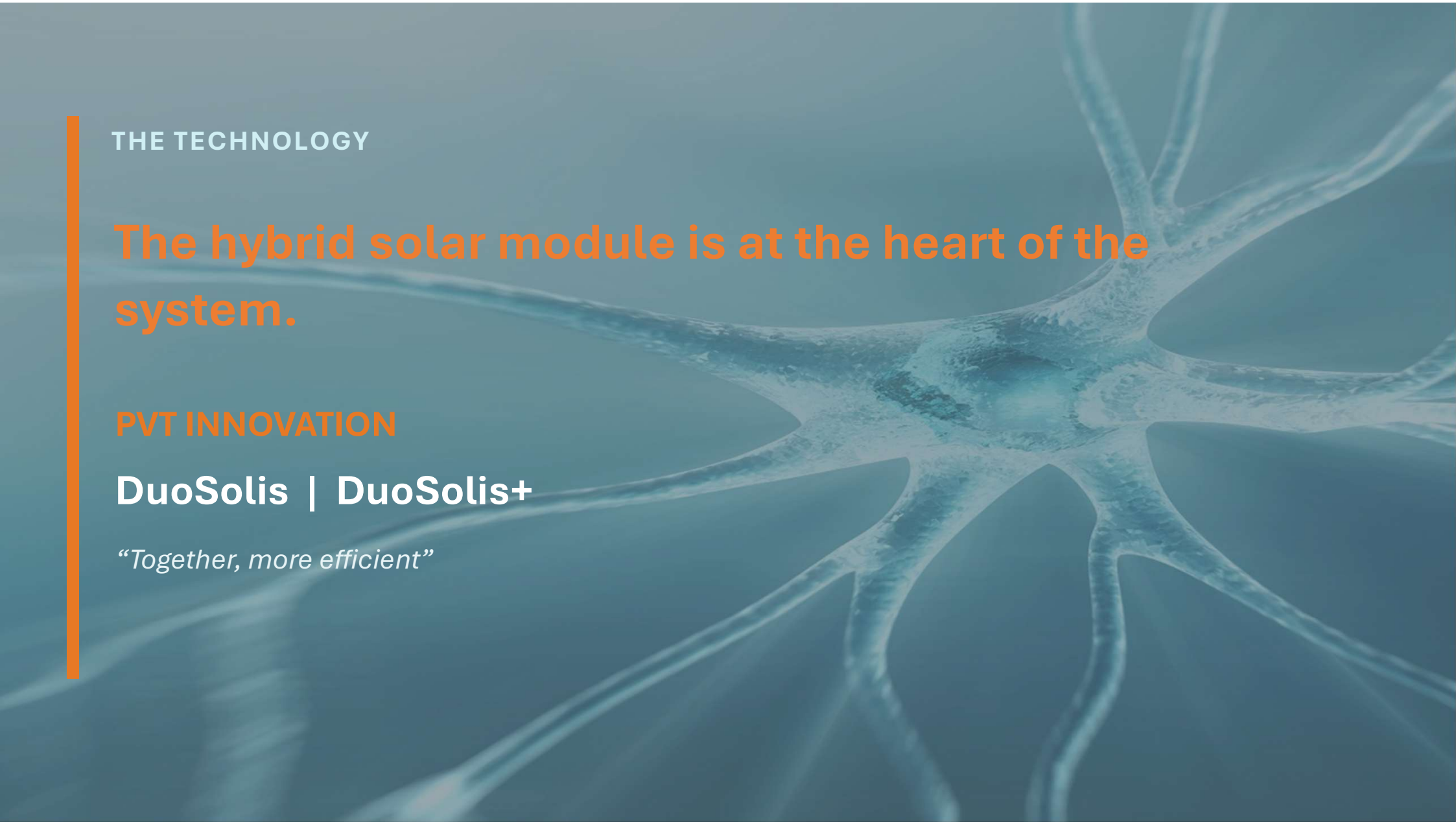
## CONSULTING & RETROFIT

Feasibility studies, building-energy upgrades and end-to-end advisory services for apartments, condominiums and single-family homes, including incentive support.



## LARGE EPC / ESCO PROJECTS

Engineering and delivery of renewable generation and efficiency projects above 300 kW for industry, commerce and condominium refurbishment.



THE TECHNOLOGY

# The hybrid solar module is at the heart of the system.

## PVT INNOVATION

**DuoSolis | DuoSolis+**

*“Together, more efficient”*

WHY PVT

# DuoSolis | product advantages

## STANDARD FOOTPRINT

Dimensions aligned with common mid-power PV modules (typically 480–540 We class).

## STRAIGHTFORWARD INSTALLATION

Flexible use on pitched roofs, flat roofs or façades; modular approach to system integration.

## CLEAN ARCHITECTURAL APPEARANCE

Visual impact comparable to conventional photovoltaic modules.

## MIXED PV + PVT FIELDS

Hybrid and standard PV modules can coexist in the same array thanks to compatible dimensions.

## OPERATIONAL FLEXIBILITY

The original design aims to limit issues linked to thermal oversizing or hydraulic-loop failure.

## CONSOLIDATED HARDWARE VALUE

Claimed average module cost below the sum of separate PV and thermal collector costs.

SOLAR COGENERATION

# DuoSolis | performance advantages

### TWO OUTPUTS AT ONCE

A single device simultaneously produces electrical and thermal energy from solar radiation.

### PV COOLING EFFECT

By reducing cell temperature, electric yield can increase. The original deck cites up to +30% in suitable applications, especially swimming-pool heating.

### ENHANCED HEAT COLLECTION

A closed front glazing chamber is designed to reduce front-side losses and increase useful thermal output.

### SNOW REMOVAL

Thermal activation can potentially melt snow deposited on modules.

### AERIAL GEOTHERMAL MODE

Potential to use the PVT panel as an alternative heat-exchange source, reducing the need for conventional outdoor heat-pump units.

### SOLAR COOLING

Potential applications in hot-climate markets, including the Middle East, North Africa and Southern Europe.

EFFICIENCY & COMPLIANCE

# DuoSolis | building integration advantages

## 1.4 kW

### THERMAL PEAK OUTPUT

Approximate DuoSolis module thermal power under reference conditions (AM1.5, 25°C).

## PV + HEAT

### ONE MODULE

Electrical and thermal functions are integrated in a single panel, with reduced installation complexity.

## NZEB

### LOW-ENERGY BUILDINGS

Positioned for nearly zero-energy buildings and passive-building applications.

### EU DIRECTIVE 2024/1275 · EPBD IV

The source presentation positions DuoSolis as aligned with “Solar-Ready” buildings and appropriate solar-system requirements, while thermal collection lowers the typical operating temperature of PV cells.

PROTOTYPE TESTING

# Lower temperature. More electricity.

## −0.3% to −0.4% / °C

Typical PV power-temperature sensitivity above 25°C

## +4% MORE ELECTRICAL ENERGY

In prototype tests from May to August 2019, the PVT unit averaged 4% more electricity than a PV reference of equivalent rating while heating a 200 L storage tank to 70°C daily.






THERMAL IMAGING OF PV/PVT SURFACE

PRODUCT ROADMAP

# DuoSolis+ | the next generation

## THE NEXT STEP IN PVT DESIGN

DuoSolis+ is the next-generation platform currently under development and described in the original presentation as patent-protected. The programme aims to simplify installation, improve architectural integration and optimise system performance through integrated engineering and evolved energy management.

The goal is a higher-quality, higher-performance hybrid module combining innovative materials with a distinctive design. Further technical details will be released following intellectual-property protection and product validation.



IN DEVELOPMENT

# WHY NOW?

**Solar energy must become significantly more efficient — not only in electricity generation, but also in how usable heat is produced and managed.**

### A market moving toward renewable heat and solar-ready buildings

IEA 2023 market outlook referenced in the source · Directive (EU) 2024/1275 (EPBD IV)

**ONE ROOF. TWO ENERGY STREAMS. ONE INTELLIGENT ECOSYSTEM.**



SYNTROPIA

ENERGY FROM THE FUTURE

# Every ray can do more.

Hybrid PVT technology. Multi-energy heat pumps. Intelligent controls. Integrated design.