Atmos future

Technical Overview (Non-Confidential)

Modular Air-Liquefaction Power • Cooling • Negative-Cost CO_2 Capture

A containerised clean-energy system delivering:

- 24/7 dispatchable power
- Integrated cooling
- Negative-cost CO_2 capture
- Waste-heat utilisation

The Problem We Solve

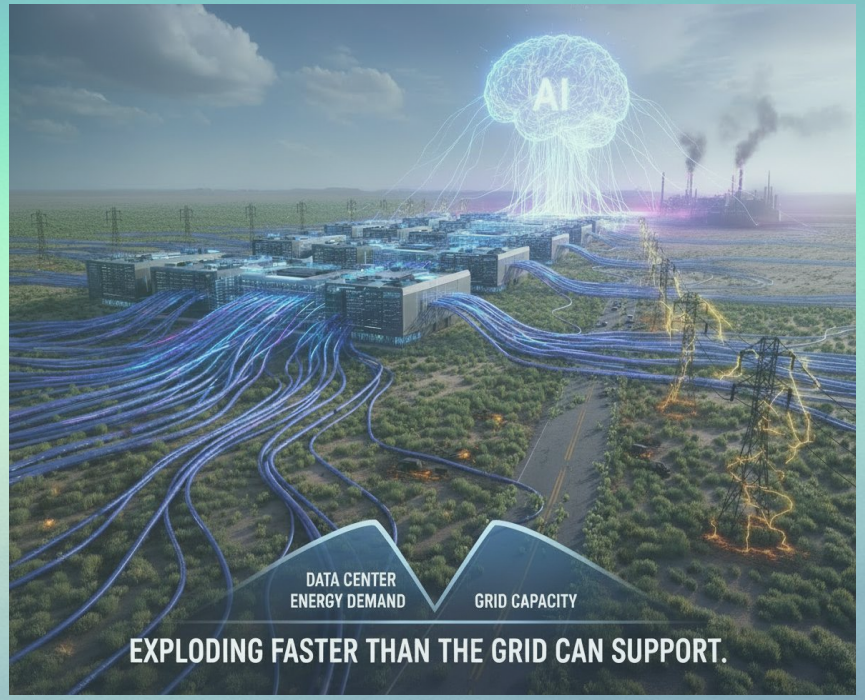
Modern industries face simultaneous challenges:

1. Rising energy costs & unreliable baseload power

2. Cooling loads consume up to 40% of data-centre energy

3. Growing CO_2 reduction mandates & carbon pricing pressures

Existing solutions like solar + storage or hydrogen are costly, land-intensive, or intermittent.

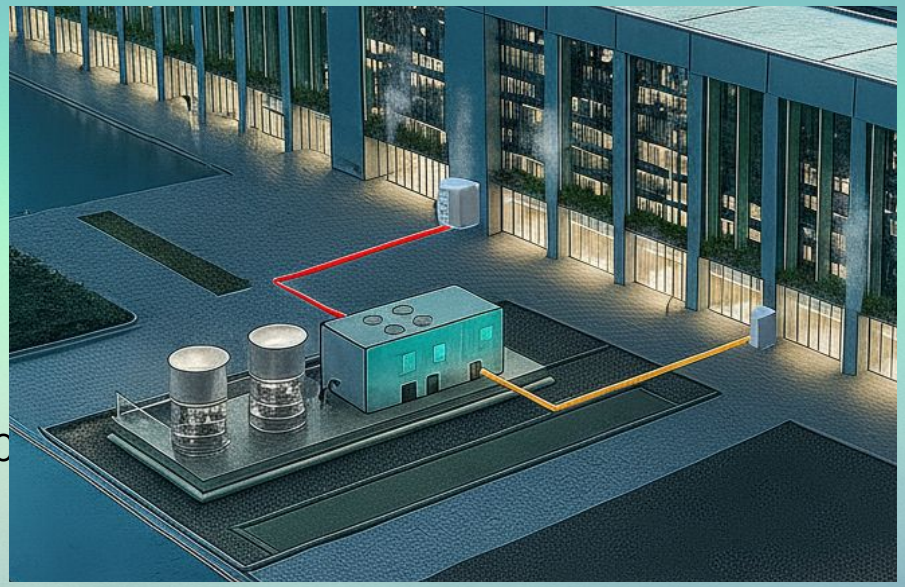


What REVFRACC Is

REVFRACC is a modular air-liquefaction and energy-recovery system that converts electricity and waste heat into:

- Clean, dispatchable power
- Integrated high-capacity cooling
- Pure CO_2 output for utilisation or storage
- Grid-independent resilience

Each 40-ft containerised module delivers up to 20 MW, enabling rapid deployment and scalable clusters up to 100+ MW



How REVFRACC Works

REVFRACC uses cryogenic air-liquefaction combined with high-efficiency expansion to generate clean power.

1. Air In → Compress & Cool (Primed with a one-time liquid nitrogen (LN_2) charge during commissioning)
Ambient air is filtered, compressed and cooled until it liquefies.

No ongoing LN_2 input is required during normal operation.

2. Store → On-Demand Use
Liquid air is stored in insulated vessels until power or cooling is required.

3. Phase Change → Generate Electricity
As liquid air warms and expands, it drives a turbine to produce clean power.

4. Integrated Outputs
The cycle also provides cooling, a pure CO_2 stream, and uses waste heat to boost efficiency.

Core Innovations

Atmosfuture's technology integrates multiple high-value processes into one modular system:

- Unified liquefaction, cooling & CO_2 capture
- High-efficiency VECC expansion design (patented)
- Waste-heat-boosted cycle improving net output
- 20 MW fully modular container architecture for rapid deployment

These innovations deliver higher value per MWh than competing clean-energy systems.

Air-Liquefaction Integration | Expansion-to-Power (Proprietary) Turbine) | Waste-Heat Utilization

VECC Overview

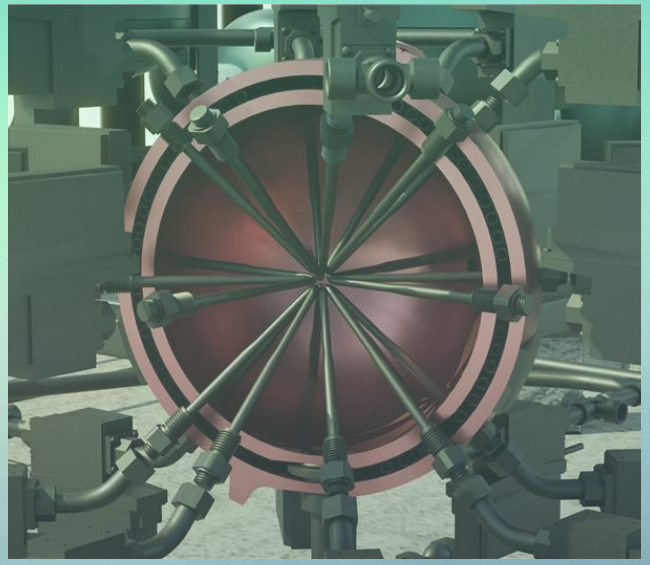
VECC (Vector Cancelling Condenser) is Atmosfuture's patented expansion technology designed to enhance the performance of the air-liquefaction cycle.

VECC enables:

- Greater usable energy extraction
- Reduced internal thermal losses
- Passive, stable 24/7 operation
- Improved overall system efficiency

Two granted patents protect the REVFRACC process and VECC architecture globally.

Designed to outperform conventional cryogenic expanders.



Performance Summary

Metric	REVFRACC Output (based on independent TEA/LCA)
Power Output	0.5–20 MW per module
Cooling Output	Equivalent to major industrial-scale chillers
CO_2 Capture	High-purity CO_2 stream, suitable for utilisation or permanent storage
Waste-Heat Utilisation	Performance uplift through integration of industrial waste heat
Operations	24/7 baseload-capable
Deployment	Indicative 6–9 month lead time (expected to reduce with scale and maturity)
Footprint	Single 40-ft container per module
Cost (per mWh)	Marginal operating cost: < £5 / MWh (indicative)

All figures are indicative, non-confidential ranges and vary by configuration and use case.

System Outputs & Value Stack

REVFRACC simultaneously produces:

🔌 **Clean Power** - Reliable, dispatchable onsite electricity.

❄️ **Integrated Cooling** - Reduces energy-intensive cooling loads for data centres and industry.

 **CO_2 Capture** - High-purity CO_2 ready for utilisation or permanent storage.

♻️ **Waste-Heat Use** - Converts low-grade heat into additional system output, improving economics.

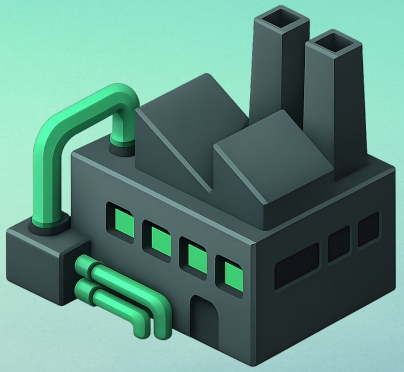
This multi-output design significantly reduces net customer cost per MWh.

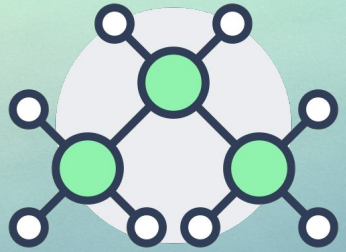
Use Cases & Industry Fit

Data Centres
– Replace chillers
– Reduce cooling electricity by up to 40%

Industrial Processes (Cement, Steel, Chemicals)
– Lower power costs
– Enable CO_2 utilisation
– Integrate waste heat recovery

Power-to-X (Methanol, DME, SAF)
– Localised pure CO_2 supply
– Improves economics of synthetic fuel pathways





Deployment Model

- Delivered as containerised, plug-and-play modular units
- Rapid installation with minimal civil works
- Integrates easily with existing power and cooling systems
- Each module provides up to 20 MW
- Expandable from single-unit pilots to multi-unit clusters
- Suitable for microgrids and decentralised operations

Unit Economics

Cost Characteristics

- Predominantly steel and copper construction
- Limited moving parts → low maintenance profile
- 80% of materials sourced from off-the-shelf industrial components
- Low marginal operating electricity requirement relative to energy output

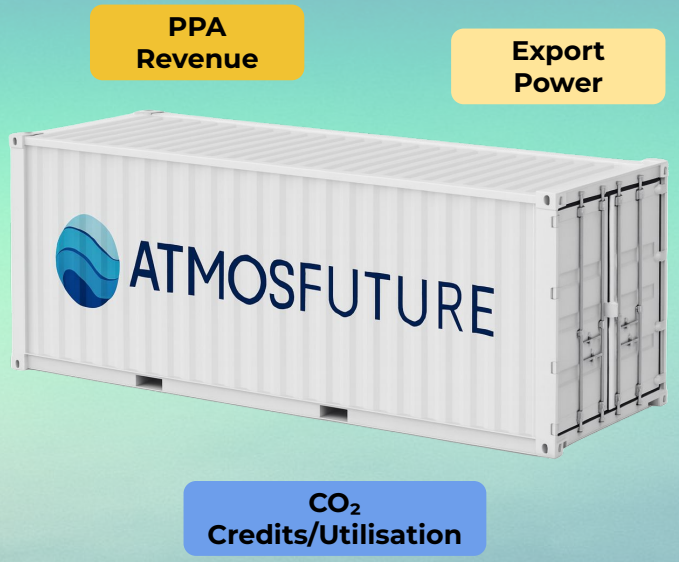
Energy & CO_2 Economics

- CO_2 capture is enabled through internal energy recovery within the cycle
- The system's expansion phase generates significantly more usable energy than the energy penalty associated with CO_2 separation
- This architecture enables **negative-cost CO_2 capture** when integrated with offtake or storage

Commercial Model

Atmosfuture generates revenue through:

- Energy-as-a-Service (EaaS): Power Purchase Agreements
- CO_2 output sales for utilisation (e-fuels, methanol, DME) or carbon credits
- Long-term service & maintenance contracts
  Flexible deployment via direct sale, leasing, or project-level SPVs.



Validation & Independent Review

Cranfield University — Techno-Economic Analysis (TEA), Life Cycle Assessment (LCA), and Proof-of-Concept validation

Enigmasoft — Engineering and manufacturing partner supporting REVFRACC system development

Pilot Projects:

- Scotland (TRL-5 demonstration)
- Poland (CO_2 utilisation for e-fuels)
- Tabuk (industrial deployment)

Consortium Engagement — Active participation in multiple UK and EU innovation programmes

Representative industrial pilot environment

Competitive Landscape

Technology	Limitations	REVFRACC Advantage
Grid Electricity	High cost, high CO_2	Onsite clean baseload
Solar + Battery	Intermittent, large footprint	Compact, 24/7 dispatchable
Hydrogen Systems	Expensive, low efficiency	No fuel logistics; waste-heat boosted
Traditional Cryogenic	Not integrated with CO_2 & cooling	Unified system with higher value stack

Scalability & Roadmap

Modular deployment enables rapid replication from pilot sites to multi-hundred-MW portfolios

Scalability

- Single module: 0.5–20 MW
- Multi-module: 20–100+ MW
- Designed for industrial parks, data-centre campuses, and export-power hubs

Roadmap

- **TRL-4:** PoC + TEA/LCA (Completed)
- **TRL-5:** Scotland Pilot (In progress)
- **TRL-6:** Poland Project. Pre-commercial demonstrators
- **TRL-7+:** TTabuk Project – first full commercial deployment, followed by licensing and global manufacturing scale-up

Risks & Mitigations

Risk	Mitigation
Scaling fabrication	Enigmasoft engineering partnership
Market adoption speed	Multiple funded pilots in progress
Capital intensity	Supports SPV/PPA models for customers
Technology defensibility	2 granted patents + IP strategy

Team & Technical Leadership

Vinny Patel (Co-Founder & CEO)
Proven track record scaling energy businesses to £66m; 65MW solar delivered.

Shamir Budhdeo (Co-Founder & CTO)
Inventor of REVFRACC; serial cleantech entrepreneur.

Daniel Fernandes (Head of Engineering)
Mechanical & structural systems; rapid prototyping.

Pallavi Mane (Technical Analyst)
Supply-chain and procurement optimisation.

Daryna Radionova (Financial Board Advisor)
Former Santander Exec & Industry veteran across M&A and finance.

Dr Harshul Thakur (Technical Board Advisor)
Ex-LANL Entrepreneur Fellow (carbon capture & gas separation)

Tech & Development Partners

Cranfield University
ENIGMASOFT TECHNOLOGIES
EMEC THE EUROPEAN MARINE ENERGY CENTRE LTD
University of St Andrews

Multidisciplinary team across cryogenics, thermodynamics, power systems, energy modelling, manufacturing, and commercialization.

Next Steps & Contact

Atmosfuture is now engaging:

- **Strategic investors** for TRL-6/7 scale-up
- **Pilot hosts** in data centres, industrial parks, and battery plants
- **Manufacturing partners** for multi-unit builds
- **CO_2 offtake partners** for e-fuels and industrial use

Contact:
info@atmosfuture.co.uk
www.atmosfuture.co.uk

Unlocking clean 24/7 power through supercooling and air-liquefaction.