

## Case Study

# Alternō - ASSIST Partnership

## Sand Battery in Responding to Climate Crisis

Funded by P4G

*August 2025*



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## 1. Executive Summary

Alternō, in partnership with ASSIST and funded by P4G from April 2024 to September 2025, is developing and scaling up its sand battery technology, which stores and delivers heat, while promoting its wider adoption across industrial and agricultural sectors. This technology addresses a critical gap in the renewable energy transition—long-duration, sustainable heat storage—while reducing costs and carbon emissions for businesses.

During the P4G funding period, Alternō:

- Raised **US\$2 million** (Pre-Seed and Series A1) in follow-on investment (ADB, UntroD Capital Asia, Antler)
- Enabled the avoidance of **~35 tonnes CO<sub>2</sub> emissions**
- Partnered with PepsiCo, Mondelez, My Viet Coffee and others to launch pilots in multiple sectors, from snack production to tea and coffee drying

P4G's contribution provided catalytic funding, visibility, and network access that unlocked strategic partnerships and investor confidence—accelerating Alternō's path to commercialization and scale.

## 2. Background and problem analysis

Global greenhouse gas (GHG) emissions reached a level in 2019 that was 54% higher than in 1990, marking the steepest increase in average decadal emissions ever recorded (IPCC, 2022). This alarming trend reflects the urgent need for effective climate mitigation strategies. Renewable energy has emerged as a cornerstone of global efforts to combat climate change, yet its widespread adoption is hindered by a critical gap: energy storage.

While lithium-ion batteries currently dominate the storage landscape, they face significant limitations related to energy density, cycle life, cost, and the sustainability of raw materials (Chen & Shadike, 2025). At the same time, thermal energy demand presents a largely untapped opportunity. In 2018, heat accounted for approximately 50% of global final energy consumption

and contributed to 40% of global CO<sub>2</sub> emissions (IEA, 2019). This highlights a critical, yet often overlooked, aspect of the energy transition: the decarbonization and storage of heat.

Most energy systems ultimately aim to produce heat, with electricity often serving as a secondary intermediary. Reframing the energy question from how to generate electricity to how to deliver and store heat more efficiently opens new pathways for innovation. One such promising solution is the sand battery—a technology that stores thermal energy at high temperatures using abundant and sustainable materials. By enabling large-scale, long-duration heat storage, sand batteries offer a viable pathway to balance renewable energy supply and demand while decarbonizing industrial heat processes.



*Fig 1. Heat accounts for more than 50% energy consumption, popularly used in traditional processing methods and industrial applications*

### **3. Solution**

At Alternō, we offer an innovative sand-based thermal battery that captures, stores, and distributes heat efficiently—providing agricultural businesses with a cost-effective drying solution that can reduce energy costs by up to 50%.

The system operates in four stages:

1. **Capture:** Renewable electricity is converted into thermal energy by high-efficiency heating elements that heat sand to high temperatures.
2. **Store:** The thermal energy is stored in sand at approximately 600°C, with minimal heat loss (around 5% per day), thanks to a thick insulation layer. Temperature sensors are embedded throughout the core to monitor heat distribution in real time.
3. **Distribute:** When needed, an air blower circulates air through heat-exchange tubes embedded in the sand core. The outgoing air is heated to 100–300°C and delivered to a drying chamber for agricultural products like tea, coffee, rice, cocoa, and taro.
4. **Control:** An integrated IoT system automates temperature and humidity control to optimize drying performance.

We currently offer three product lines:

- **Alternō Standard** stores renewable electricity as thermal energy (up to 24 kWh), making it especially beneficial for off-grid locations by maximizing solar usage and reducing reliance on conventional power.
- **Alternō Hybrid** utilizes agricultural waste as a thermal input. By capturing heat from burning crop residues, we create a circular economy solution particularly suited for rice-producing regions.
- **Alternō E** (currently in R&D) is being designed to store electricity, with successful lab-scale tests already completed.

This modular, low-emission solution is especially suited for various applications including in agriculture as well as other manufacturing industries where reliable and sustainable heat is critical.



*Fig 3. Alternō Standard*



*Fig 4. Alternō Hybrid*



*Fig 5. Alternō E*

## 4. Defined methodology

Founded in 2023 by Kent Nguyen, Nam Nguyen, and Hai Ho, Alternō is an energy-tech startup driven by a mission to redefine energy storage for renewable systems. With combined expertise in engineering, entrepreneurship, and sustainable innovation, our team advanced from concept to commercial pilot within the first year.

Our approach integrates thermal engineering, materials science, and renewable energy to create the sand battery—a modular, high-temperature thermal energy storage system using abundant and sustainable materials. We applied rapid prototyping and lean startup principles to accelerate product development, supported by advanced thermal modeling and real-time monitoring tools.

A key innovation lies in our seamless integration of hardware and software. Our proprietary IoT system controls and optimizes temperature and humidity during discharge, ensuring efficient energy delivery, especially for agricultural drying applications.

Strategically, we focused on early validation and visibility. Within our first year, we secured funding from Antler and were recognized as the Grand Winner of Tech Planter Vietnam. These milestones not only validated our technical approach but also helped attract critical partners across Vietnam and around the world.

Our methodology combines deep technical capability, agile execution, and a clear mission to bridge the gap in sustainable heat storage—positioning Alternō as a scalable solution in the global transition to clean energy.



## 5. Business model

Alternō has developed a diversified business model to ensure its sand battery solutions are accessible, scalable, and adaptable to a wide range of customers across the agricultural and industrial sectors. Our approach is centered around three core revenue streams:

### 1. **Upfront Product Sales:**

We offer the Alternō Standard (US\$20,000) and the Alternō Pro Model (US\$100,000) as complete units for direct purchase. Clients who choose this model own the system and receive lifelong technical support, ensuring long-term reliability and value. This model is suitable for larger agribusinesses and factories with available capital for energy infrastructure upgrades.

### 2. **Heat-as-a-Service (HaaS):**

To lower the barrier to adoption, particularly for smallholder farmers, cooperatives, and SMEs, Alternō provides a Heat-as-a-Service model. In this approach, we retain ownership of the battery and charge customers based on the amount of heat consumed. This model eliminates the need for upfront capital investment and allows users to access clean thermal energy affordably and flexibly—enabling greater inclusivity and faster market penetration.

### 3. **Deferred Payment Plans:**

We offer flexible installment options for clients who wish to own the system but need more time to manage payments. These competitive financing terms further improve accessibility, especially for cooperatives and rural enterprises.

To enhance the user experience and support integrated renewable solutions, Alternō expanded into **solar panel sales** in 2025. This strategic addition allows customers to generate electricity onsite, creating a seamless and self-sufficient clean energy ecosystem.

Through this multi-tiered business model, Alternō ensures both commercial viability and inclusive access to sustainable heat storage solutions.



*Fig 6-7-8 Alterno Sand Battery is apply in coffee processing company in Buon Ma Thuot, Vietnam*



*Fig 9. Application of sand battery to dry tea in greenhouse*

## 6. Results

With strong financial performance and market validation, Alternō has rapidly scaled its operations. During the P4G grant period, we successfully secured US\$1 million in A1 funding led by UntroD Capital Asia and the Asian Development Bank (ADB), with continued support from Antler. This brought our total investment raised to **US\$2 million**—showcasing P4G’s critical role as a trusted funder and strategic leverage point in investor discussions.

Commercial traction has been equally strong. Alternō achieved US\$318,000 revenue in 2024 and is projected to be around US\$3M. This momentum was fueled by major wins, including being named the Grand Winner of the PepsiCo Greenhouse Accelerator and Top 2 at the Startup World Cup 2024. These recognitions opened doors to strategic partnerships with PepsiCo, Mondelez, My Viet Coffee, and other agribusinesses and cooperatives. With a growing pipeline of customers post-P4G Summit in Hanoi, we aim to reach US\$2.5–3 million in revenue in 2025.

The first commercial deployment of the Alternō Standard Sand Battery at PepsiCo’s Hung Yen factory marked a major milestone. The solution passed rigorous fire safety and quality standards and is now being considered for broader deployment across PepsiCo’s facilities in Vietnam and beyond. According to Mr. Nguyen Viet Ha, General Director of PepsiCo Food Vietnam: “The use of sand battery technology has significantly reduced our electricity consumption and carbon emissions, revolutionizing energy use at our Hung Yen facility.”

By the end of the P4G grant period, Alternō had helped clients avoid approximately **35 tonnes of CO<sub>2</sub> emissions**, reducing reliance on fossil fuels and advancing cleaner energy use. On the social front, we are working closely with the agricultural sector to empower farmers and small agri-businesses through affordable, reliable, and sustainable drying solutions. In Tân Hà Cooperative (Lâm Đồng Province), over **4,000 households managing 4,000 hectares of coffee** now benefit from stable, safe, and low-cost drying technology. In Đắk Lắk, the Eatu Cooperative’s **185 member households, covering 1,400 hectares of coffee**, have improved productivity while lowering energy expenses. Additionally, our partnership with the Rubber Research Institute is transitioning **147 hectares of rubber cultivation** to sustainable practices. Together, these efforts are cutting carbon emissions, reducing operational costs, and creating lasting economic and environmental benefits for thousands of rural families.

With continued support from P4G and the Vietnamese National Platform, Alternō is now initiating a Federation of Climate Tech Startups of Vietnam—an ecosystem effort to strengthen policy dialogue, mobilize investment, and accelerate Vietnam’s path to net zero.

## **7. Challenges and Solutions to Investment and Scale Readiness**

As a pioneering clean energy solution, the sand battery technology operates in a regulatory grey area. Currently, there are no specific policies or standardized guidelines governing its deployment. Each installation requires obtaining a fire safety permit, with procedures that vary significantly across regions and are subject to shifting local policies.

Being a first mover also brings unique market challenges. Limited public awareness and understanding of the technology have created difficulties not only in commercialization but also in securing essential services, such as insurance. However, recognition from major partners has

served as a strong market validation, allowing us to build trust with insurers and other stakeholders.

Our primary customer base lies in the agricultural sector, where the push for sustainable practices is growing. Although the Government of Vietnam has introduced supportive policies—such as Decree No. 156/2025/NĐ-CP promoting credit access for agricultural and rural development—the implementation lacks clarity and consistency. This hinders potential clients from securing the capital needed to invest in green energy technologies like ours.

More broadly, climate tech startups like Alternō face systemic barriers in navigating policy changes and accessing public funding or grants. As a single startup, influencing regulatory frameworks or securing government support is challenging. To address this, we are taking the lead in establishing a Federation of Climate Tech Startups in Vietnam. This collective initiative aims to formalize dialogue with policymakers, improve the enabling environment, and unlock financing mechanisms that support innovation and climate goals at scale.



*Fig 9-10. Alternō -ASSIST partnership successfully showcase event to introduce about the technology and its impact to combat climate change as well as to clear doubt about its safety*

## 8. Lessons learnt

Through the development and deployment of our sand battery technology, Alternō has gained valuable insights across four key areas: investment readiness, commercialization, enabling environment, and social and environmental impact.



## **Investment Readiness**

Partnership is key to building investor confidence. With funding support from P4G and strategic contracts secured with major corporations such as Mondelez and others, Alternō gained the credibility needed to unlock further capital. P4G’s recognition not only provided direct financial support but also enhanced our visibility and trust among investors—serving as a strong leverage point to secure follow-on investment. Participating in global competitions has also been a powerful tool to increase exposure and validate our innovation in the eyes of potential funders.

## **Commercialization**

As a startup, flexibility has been critical. While our initial strategy focused on targeting small businesses, we quickly realized that scaling would be more effective through strategic contracts with large corporations. This approach allowed us to achieve mass deployment across industrial facilities and, in turn, build trust with small and medium-sized enterprises. Adjusting our financial strategy—by offering diversified revenue streams such as Heat-as-a-Service, direct sales, and deferred payment options—was instrumental in accelerating early commercialization and driving revenue growth.

## **Enabling Environment**

Navigating a complex and evolving policy landscape remains a key challenge. We’ve learned that continuous engagement with government stakeholders is essential—but it requires the support of trusted intermediaries with strong networks and mechanisms for dialogue, such as the P4G National Platform. Recognizing the broader need for sector coordination, we are now spearheading the formation of a national alliance of climate tech startups in Vietnam to foster collective advocacy and a more supportive enabling environment.

## **Social and Environmental Impact**

Our commitment to impact goes beyond carbon reduction. By diversifying our product lines and advancing R&D—such as developing the Hybrid Sand Battery—we are better able to meet local needs and utilize available regional resources. These innovations help make our technology more accessible to farmers and cooperatives, broadening its impact on rural development, energy access, and climate resilience.

## 9. Recommendations

### Investment Readiness

Startups should actively participate in competitions and accelerator programs to enhance brand visibility, gain validation, and attract investor interest.

### Commercialization

Leveraging partnerships with large corporations can accelerate scale, build credibility, and open new markets—creating a solid foundation for broader adoption.

### Enabling Environment

Engaging with existing networks and alliances provides greater leverage in policy dialogue and access to government support, especially when coordinated through trusted platforms.

### Social and Environmental Impact

A deep understanding of end-users' needs is essential. Proactively addressing pain points not only drives adoption but also maximizes the social and environmental impact of the solution.

## 10. Annex 1: Data comparison on ESG and Financial Data

| Financial Metrics   | BEFORE P4G | After P4G | Notes                                                           |
|---------------------|------------|-----------|-----------------------------------------------------------------|
| Revenue             | \$307,000  | \$609,000 | Total revenue                                                   |
| Gross Profit        | N/A        | \$149,969 | Revenue minus cost of goods sold (COGS)                         |
| EBITDA              | \$50,000   | \$221,000 | Earnings before interest, taxes, depreciation, and amortization |
| Net Income          | N/A        | -\$30,000 | Profit after all expenses and taxes                             |
| Operating Expenses  | N/A        | \$212,000 | Total expenses for operations                                   |
| Cash Flow           | N/A        | \$954,000 | Net amount of cash inflow/outflow                               |
| Number of Consumers | N/A        | 10        | Number of clients                                               |

|                                 |     |        |                                                                |
|---------------------------------|-----|--------|----------------------------------------------------------------|
| Number of Offtake Agreements    | N/A | 8      | Number of purchase agreements signed                           |
| Client Growth Ratio YoY         | N/A | 400%   | Increase of clients in the last year                           |
| Gross Margin Ratio              | N/A | 24.63% | Gross Profit / Revenue x 100                                   |
| Gross Ebitda Ratio              | N/A | 36.29% | Ebitda / Gross Profit x 100                                    |
| Debt-to-Equity Ratio            | N/A | N/A    | Describe financial leverage in the last FY                     |
| Customer Acquisition Cost (CAC) | N/A | N/A    | Cost of acquiring a new customer                               |
| Lifetime Value (LTV)            | N/A | N/A    | Total revenue expected from a customer                         |
| Investment Achieved             | 0   | \$2M   | Investment achieved through equity, debt and mixed instruments |

| ESG Metrics                                 | Before P4G Funding | After P4G Funding | Notes                                                                                                                                                                         |
|---------------------------------------------|--------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carbon Emissions (tonnes CO <sub>2</sub> e) | N/A                | ~32.35 tonnes     | Total CO <sub>2</sub> emissions from purchased electricity (Scope 2) for FY2024                                                                                               |
| People positively affected                  | 210                | ~600,265          | These are individuals directly and indirectly positively affected by climate resilience or adaptation related to the climate business commercial partner product or solution. |
| Jobs created                                | /                  | /                 | Jobs created outside of the commercial partner                                                                                                                                |
| Gender Diversity (% female employees)       | 25%                | ~32%              | Percentage of female employees                                                                                                                                                |

|                                |                         |                                                                                                                                                                                        |                                                                                                                                                                                                               |
|--------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compliance and Risk Management | Describe                | Compliance report implemented with no recorded violations. Risk registers and mitigation protocols in place. Internal audits conducted annually; third-party audit planned for FY2025. | Compliance Report (Laws and Regulations)<br>Risk practices (processes and responsibilities)<br>Risk management documentation (identification, mitigation and control)<br>Audit policies (internal - external) |
| ESG Reporting and Transparency | Describe                | Annual ESG report aligned with GRI 2021 Standards. Governance by CEO and ESG lead. ESG integrated into operational and investor reporting. Publicly shareable.                         | Frequency of ESG reporting (# reports per year),<br>Adherence to Standards (GRI, SASB, TCFD)<br>Clear governance structure<br>Integration with financial reporting                                            |
| Board Diversity                | 33% (1/ 3 board member) | 0% (3 male board members)                                                                                                                                                              | %of Women of the board members                                                                                                                                                                                |

## Reference

1. IPCC (2022) *Chapter 2: Emissions trends and drivers*. In: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press. Available at: <https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-2/> (Accessed: 2 July 2025).
2. Chen, Y. and Shadike, Z. (2025) ‘Shatter existing lifetime limit of lithium-ion battery’, *Joule*, 9(5), Article no. 101920. Available at: <https://doi.org/10.1016/j.joule.2025.101920>.
3. International Energy Agency (IEA) (2019) *Renewables 2019: Analysis and forecasts to 2024*. Paris: IEA. Available at: <https://www.iea.org/reports/renewables-2019/heat> (Accessed: 2 July 2025).