

Clean Energy Solutions for Coffee Roasters

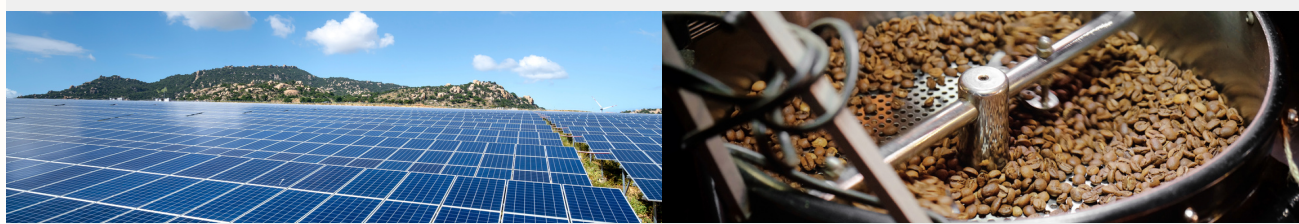
Reliable Renewable Energy for Carbon-Neutral Coffee Production and Consistent Quality

Coffee roasting accounts for approximately 30% of total energy consumption across the coffee value chain, making it a key target for achieving carbon-neutral coffee production. The process requires heating beans to 190–245°C with precise temperature control to ensure consistent flavor and quality. Therefore, reliable renewable energy solutions represent a major opportunity to enhance sustainability, maintain high product quality, and reduce production losses.

Even short power interruptions can permanently compromise a roast. Loss of drum rotation and exhaust airflow can cause uneven heating from residual heat, altering the roast profile and making the batch unsuitable for specialty-grade coffee. This can lead to significant losses of green coffee beans (up to 80% of production costs), energy, labor, production time, and customer commitments. As a result, coffee producers are increasingly investing in reliable renewable energy solutions, with **green hydrogen as a key enabler, providing uninterrupted renewable energy supply for electric roasters or serving directly as a clean fuel for hydrogen roasters.**

Examples of successful advances demonstrate the potential of renewable energy technologies to improve roasting reliability, maintain consistent coffee quality, and reduce operational emissions:

- **Electric roasting – Café William (Québec, Canada):** World's first industrial-scale fully electric roaster, powered by renewable hydroelectricity. Commercial since 2024, with 3–3.5 tonnes/hour capacity and 1 MW maximum power demand.
- **Hydrogen roasting – UCC Coffee (Japan):** First mass-production-scale hydrogen coffee roasting operation, commercial since April 2025, replacing natural gas in the burner while maintaining industrial roasting performance.





Why green hydrogen?

- 100% renewable, reliable energy: Enables coffee roasting day and night, during winter, and throughout periods of low renewable generation.
- Energy resilience: Zero-emission backup power to maintain operations during grid outages.
- Consistent roasting performance: Stable fuel cell power supports precise temperature control and repeatable roast profiles.
- Reduced fossil fuel dependence and exposure to price volatility.
- Scalable solutions from artisanal roasters to industrial facilities.
- Opportunity to produce carbon-neutral, high-quality coffee while strengthening brand value.

Decarbonization Alternatives:

Electric Roasters

- **Renewable energy:** Solar, wind, hydro, or biomass integrated with battery energy storage systems (BESS).
- **Zero-emission backup:** Hydrogen systems (electrolyzer, long-duration storage, and fuel cells) provide reliable backup power for both grid-connected and off-grid facilities.
- **Consistent coffee quality:** Electric roasters enable precise, repeatable temperature control for high-quality, sustainable roasting.
- High overall **energy efficiency**.
- Scalable from artisanal to industrial roasting.

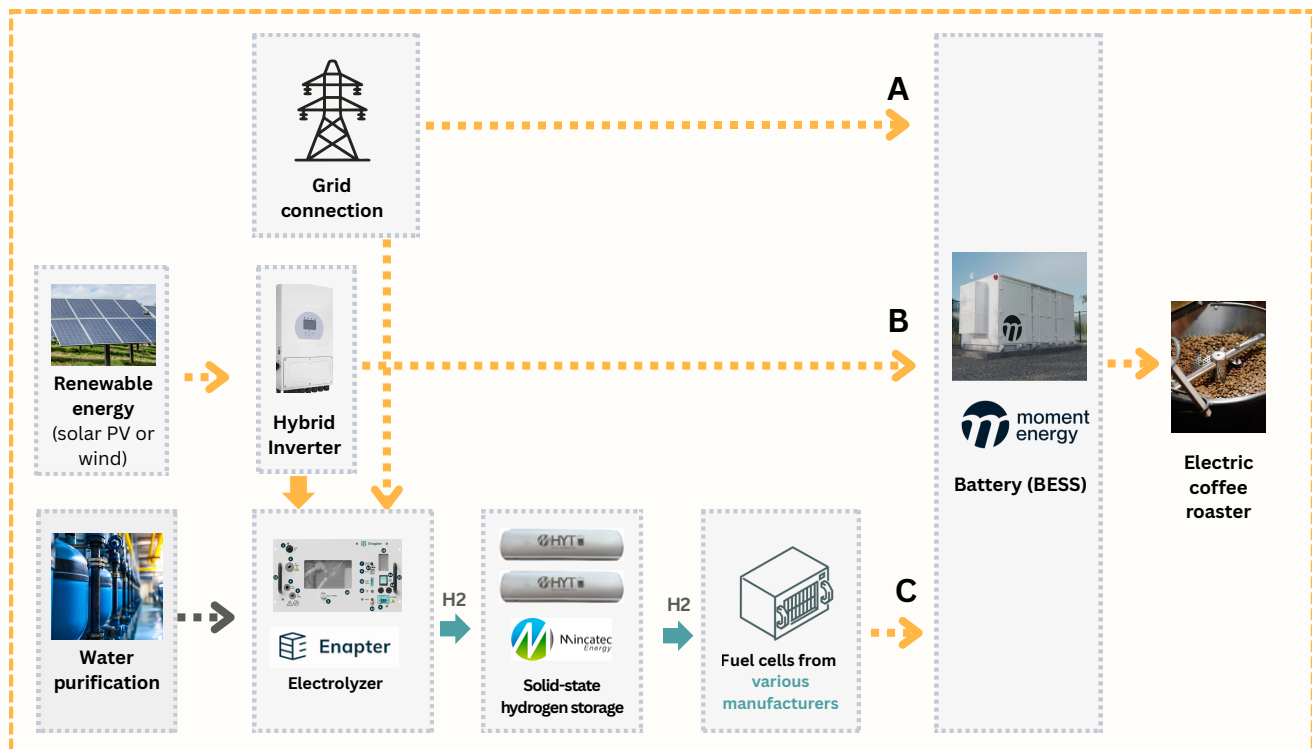
Hydrogen-Fired Roasters

- Retrofit potential for existing natural gas coffee roasters.
- Roast profiles comparable to natural gas with **consistent coffee quality**.
- Wider temperature control range, enabling **greater roasting flexibility and more diverse flavor profiles**.
- On-site hydrogen production reduces dependence on natural gas and protects against fuel price volatility.
- No CO₂, CO, SO_x, or particulate matter.

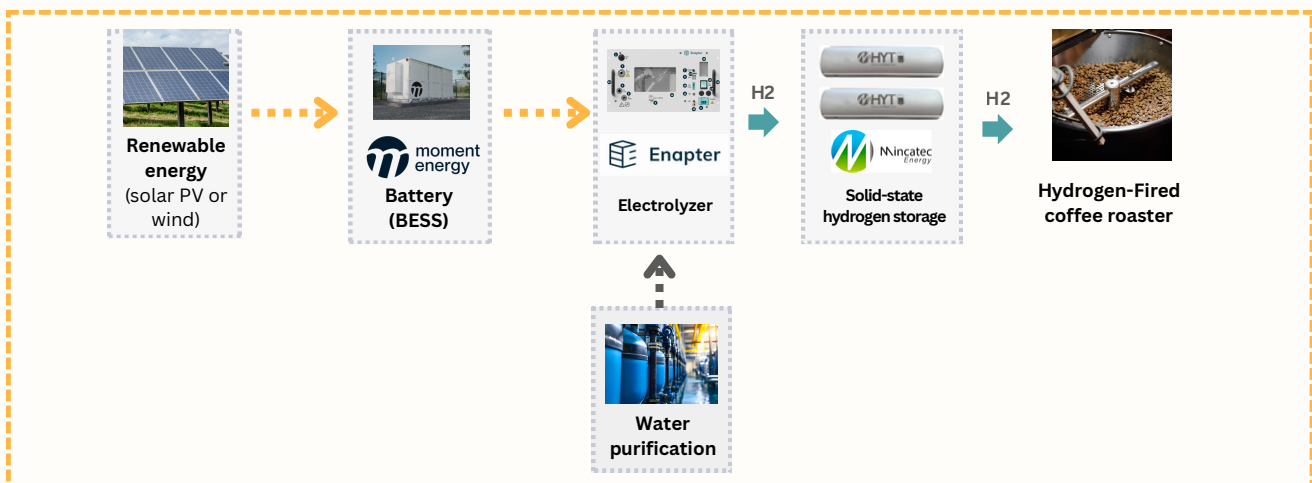
Integrated System Examples

Electric roasters powered by:

- A. Renewable grid electricity + BESS.
- B. On-site renewable energy + BESS.
- C. Optional hydrogen long-duration storage and fuel cells for continuous, reliable renewable power.



On-site green hydrogen production for hydrogen-fired roasters:





Leading Cleantech to Market

Integra Cleantech is a **commercial integrator of clean technology**. We integrate complementary solutions into **complete and cost-effective systems**, solving the hydrogen "chicken-and-egg" dilemma. Integrated solutions also have the flexibility to gradually expand capacity and scope to other applications.

We provide **complementary services across the full project lifecycle**: strategic partnership development; coordination among technology manufacturers, engineering firms (EPC), and local contractors; support with funding and grants; project execution and implementation; and post-implementation follow-up, including training delivered directly by manufacturers' specialized personnel. We work to find the correct cultural fit for your needs.

Our commercial model reduces CAPEX by enabling **direct manufacturer-to-end-user invoicing**.

Over 100 years of combined experience in clean energy, telecommunications, systems, and business development.

Sustainable, integrated energy solutions for data centers, logistics and distribution operations, ports and airports, islands and remote locations, mobile deployments, and industrial decarbonization.

Based in Vancouver with an extended team in LATAM.

Contacts:

info@integracleantech.com

Laura Guzmán • Founding Partner • laura.guzman@integracleantech.com

Alejandra Calderón • Business Development Manager •
alejandra@integracleantech.com

integracleantech.com • Vancouver, Canada