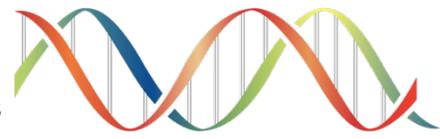




**Community BioRefineries**  
The Epitome of American Innovation



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Community BioRefineries,

## The CBR Core AI Hub: Multiple Fuel Cell Units

“Fuel cells” are devices which create electricity using a variety of fuel sources

### **Alcohol Fuel Cells**

**Powered by:** Bio-Acetone, Bio-Butanol, and Ethanol (ABE fuels)

**Type:** Low- to mid-temperature Proton Exchange Membrane (PEM) variant

**How It Works:**

**Direct Alcohol Fuel Cells (DAFCs)** use alcohols as the anode fuel, where alcohol molecules are oxidized, releasing protons and electrons. The protons pass through a membrane to combine with oxygen at the cathode, while electrons travel through a circuit to generate electricity.

- **Bio-Butanol** provides the highest energy density (36 MJ/kg), giving long, stable output.
- **Ethanol** and **Bio-Acetone** serve as complementary fuels, maintaining cell performance balance and volatility control.
- Suited for 24/7 base-load power in small AI centers and edge computing.

**Efficiency:** ~40%

**Emissions:** Water and minimal CO<sub>2</sub>

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### **Biomass-Reformed Solid Oxide Fuel Cell (SOFC)**

**Powered by:** Lignin

**Type:** High-temperature, ceramic-based fuel cell

**How It Works:**

Lignin, a complex organic polymer found in plant biomass, is thermochemically reformed into **syngas** (a mix of hydrogen, CO, and CO<sub>2</sub>). This syngas feeds the SOFC, where oxygen ions travel through a solid oxide electrolyte to oxidize the fuel, generating electricity and heat.

- **Lignin** is abundant in agricultural feed stocks and biomass, as well as forestry waste, making it an ideal circular fuel cell “feedstock”.
- High-temperature SOFCs tolerate fuel impurities and generate both electricity and usable heat (cogeneration).

**Efficiency:** ~50–60% (electrical), *up to 80% with heat recovery*

**Emissions:** Very low CO<sub>2</sub> if sourced sustainably

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### **Hydrogen Fuel Cell (PEM or SOFC-H2)**

**Powered by:** Green Hydrogen (Fermentation bi-product vs. a petro co-product)

**Type:** Proton Exchange Membrane (PEM) or Hydrogen-fed SOFC

**How It Works:**

Hydrogen fuel cells use pure H<sub>2</sub> at the anode, splitting it into protons and electrons. The protons cross a membrane to meet oxygen at the cathode, forming water, while electrons flow through a circuit to generate power.

- **Hydrogen** is produced on-site at the Community BioRefinery via electrolysis or Clostridium fermentation.
- Zero carbon emissions; ideal for mission-critical, ultra-clean AI operations.

**Efficiency:** ~50–60% (PEM), up to 65% in SOFCs

**Emissions:** Pure water vapor

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## Summary Comparison

Fuel Cell Type	Feedstock	Efficiency	Ideal Use Case	Emissions
DAFC	Bio-Acetone, Bio-Butanol, Ethanol	~40%	Base-load AI hub power	Minimal CO <sub>2</sub> + H <sub>2</sub> O
SOFC (Lignin)*	Reformed Lignin	50–60% (up to 80%)	CHP High-output/resilient power	Low CO <sub>2</sub> (from biomass)
PEM/SOFC-H <sub>2</sub>	Green Hydrogen	50–65%	Ultra-clean, precision loads	Water vapor only

\*NOTE: Recovered heat can potentially be used to create additional electricity

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## CBR Core AI Hub

While thinking about a term to describe the CBR, its fuel cells, and a focus on the Fuel Cell Electricity, I came up with *CBR Core AI Hub*. A Core AI Hub is a localized, high-efficiency power and processing unit designed to run AI workloads—like machine learning inference, data analytics, or smart city operations—without relying on a centralized grid infrastructure.

### Modular AI Data Center

- Hosts GPUs, edge servers, or micro data clusters.
- Supports AI tasks like real-time diagnostics, agriculture analytics

### On-Site Fuel Cell System

- Powered by clean fuels: ABE fuels (Acetone, Butanol, Ethanol), Lignin, and Hydrogen.
- Generates 1–2 MW of continuous power with zero or near-zero emissions.

### Biorefinery-Backed Fuel Supply

- Uses agricultural waste, dairy byproducts, or forestry residues.
- Creates a closed-loop, local energy ecosystem.

### Edge Computing Integration

- Delivers low-latency data processing near the source.
- Reduces pressure on distant, hyperscale data centers.

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## CBR Core AI Hub: Powering Tomorrow's Intelligence—Today

### What Is It?

The CBR Core AI Hub is a next-generation fuel cell energy unit engineered by the Community BioRefinery (CBR), available to meet the rising energy demands of AI data centers, edge computing, and smart infrastructure—with zero compromise on sustainability.

### Power Sources:

Fueled by a proprietary, renewable blend of:

- ABE Fuels  
*Acetone, Butanol, Ethanol* – High-efficiency bio-alcohols from sustainable biomass.
- Green Hydrogen  
Emission-free energy carrier, electrolyzed or biologically derived from CBR feedstocks.
- Lignin  
Valorized from agricultural and forestry waste, reformable into clean syngas for fuel cell conversion.

### Key Features:

- 1.92 MW Net Output
- 16,819 MWh Annually
- 24/7 Continuous Operation
- Scalable & Modular Design
- Off-Grid or Microgrid Ready

- Ultra-Low Carbon Footprint
- Perfect for 1–2 Small AI Data Centers

**Why It Matters:**

With AI projected to consume 12% of the U.S. electric grid by 2028, the CBR Core AI Hub offers a means to provide a localized, low-carbon, high-performance energy solution—one that transforms agricultural waste into intelligent power.

**CBRs built for Communities; the CBR Core AI Hub is designed for powering AI. Partner with CBR to deploy next-gen clean power hubs where they're needed most—from rural communities to tech campuses.**

For more in-depth information please see our website. [Community BioRefineries](#)