

Securing Ukraine's Energy Future: A Policy Pathway Through Biocoal Innovation and Circular Development

A Policy Perspective from Eureka Energy Corporation | 28 July 2025

As Ukraine continues to confront the existential threat posed by Russia's ongoing aggression, the country's energy infrastructure remains a persistent and deliberate target. Since February 2022, coordinated attacks on Ukraine's coal-fired power plants, transmission stations, and distribution grids have exposed the nation's strategic vulnerabilities in energy generation. The result has not only been widespread blackouts and civilian disruption but an alarming rise in economic strain caused by the growing reliance on foreign coal imports.

With over half of Ukraine's pre-war coal production and mining infrastructure compromised—particularly in the Donetsk and Luhansk regions—the country now imports a significant portion of the coal used for thermal power generation. Recent estimates indicate that **over 70% of coal used in Ukraine's coal-fired power plants is imported**, creating a heavy fiscal burden on the national budget while undermining energy sovereignty.

This dependency is unsustainable. It weakens Ukraine's resilience in the face of war, drains valuable foreign currency reserves, and delays the broader recovery and modernization of the national economy. As the international community prepares for a long-term reconstruction effort, Ukraine must now chart a new course toward energy independence—one that is not only secure and cost-effective, but also environmentally responsible.

Coal in Crisis: The National Security Implication

Coal remains a vital component of Ukraine's electricity generation portfolio, supplying reliable baseload power especially during winter months when renewable outputs decline. However, with critical mines in occupied or contested territories and a battered transportation network, domestic production has fallen drastically—from more than 80 million metric tons annually pre-2014 to under 20 million metric tons by 2023.

This shortfall has forced the Ukrainian government to procure coal from a volatile international market, often under wartime premium pricing. Imported coal now comes from geographically and politically distant suppliers, such as the United States, South Africa, and Kazakhstan—countries whose supply chains are vulnerable to geopolitical disruption or sanctions-related complications.

The longer Ukraine remains tethered to external coal sources, the more its fiscal health and national resilience erode. There is an urgent need for an indigenous fuel alternative—one that is

compatible with existing infrastructure, rapidly deployable, and capable of supporting the nation's long-term strategic objectives.

Biocoal: A Domestic Pathway to Energy Independence

Biocoal represents a high-impact opportunity to diversify Ukraine's fuel supply using local, renewable resources. Produced through the thermal conversion of organic materials in a low-oxygen environment (typically via torrefaction or pyrolysis), biocoal is a carbon-rich, energy-dense solid fuel that mimics the physical and combustion characteristics of coal.

Critically, biocoal can be **blended with coal in existing thermal power plants without significant modification**, making it an ideal transition fuel for countries with legacy coal infrastructure. Blends of **20% to 30% biocoal with traditional coal** are common globally and have been proven to significantly reduce carbon emissions, sulfur dioxide, and particulate matter.

Ukraine possesses substantial, yet underutilized, resources for biocoal production. The country's agricultural economy produces millions of tons of annual residue from crops like wheat, corn, sunflower, and rapeseed. Forestry waste—particularly from sawmills and thinning operations—adds further potential. Beyond this, Ukraine's fertile soil and geographic position make it well-suited to grow **dedicated energy crops** such as miscanthus, switchgrass, or fast-growing willow, which can be cultivated specifically for biomass energy production without competing with food systems.

In addition, municipal and organic waste streams offer another viable feedstock for conversion. By aggregating agricultural residues, forest byproducts, energy crops, and organic waste, Ukraine has the potential to develop a robust biocoal sector that contributes directly to energy production, while also resolving environmental and waste management challenges.

A Circular Economic Model for Recovery and Resilience

The vision for Ukraine's energy independence through biocoal must be understood not as an isolated solution, but as the anchor of a broader **circular economic model**—one that links energy, agriculture, forestry, and environmental protection in a closed-loop system of national renewal.

Under this model:

- **Biowaste and energy crops** serve as feedstock for the production of biocoal.
- **Biocoal is blended with traditional coal** to power existing thermal plants, displacing imported fuel.
- **Emissions from power generation** are captured through **sub-dew point (SDP) flue gas recovery systems**, reducing pollution and extracting valuable byproducts.

- **Captured materials**, such as sulfur compounds, ammonium nitrates, or condensed water, can be repurposed as **industrial feedstocks**, agricultural amendments, or inputs for other circular processes.

This approach not only enhances fuel efficiency and environmental outcomes, but creates **multiple revenue streams**, encourages **rural job creation**, and enables Ukraine to reinvest in its own infrastructure, rather than exporting wealth abroad through energy imports.

Analysts estimate that a **30% biocoal blend rate** across Ukraine’s coal-fired power fleet could **displace millions of tons of coal imports annually**, potentially saving the national government **hundreds of millions of dollars** each year. At the same time, this approach would reduce greenhouse gas emissions by 20–40%, positioning Ukraine to meet long-term EU alignment and climate compliance goals.

The Environmental Multiplier: Sub-Dew Point Flue Gas Recovery

Coal-fired power plants remain one of the most significant contributors to air pollution and greenhouse gas emissions globally. While fuel substitution via biocoal helps reduce emissions at the source, **sub-dew point (SDP) recovery technology** can further mitigate harmful emissions on the back end of the combustion cycle.

SDP systems work by cooling flue gases below their condensation point, thereby extracting latent heat and condensing pollutants—including sulfur dioxide, nitrogen oxides, and fine particulate matter—into a liquid form that can be safely managed or repurposed. This dual benefit of **heat recovery and pollutant capture** results in:

- **Increased boiler efficiency** (up to 10%)
- **Reduced air emissions** and improved air quality
- **Creation of secondary products** from emissions, such as sulfuric acid or ammonium sulfate for use in chemical and agricultural sectors

Deploying SDP systems alongside biocoal integration compounds the environmental and economic benefits of each technology. This creates a powerful, scalable framework that turns harmful emissions into valuable inputs and converts energy production from a liability into an engine of industrial innovation.

Rebuilding with Resilience, Sustainability, and Sovereignty

Ukraine stands at a critical juncture. The twin imperatives of defeating an invading force and rebuilding a modern economy require an energy strategy that is not only reliable and resilient, but also aligned with global sustainability goals and national self-reliance.

The use of **domestically produced biocoal**, coupled with **retrofitted emission recovery systems**, provides Ukraine a policy-aligned, resource-backed, and economically viable model to

reduce energy vulnerability, replace imported fuels, and launch a new industrial sector rooted in its own natural and human capital.

This is not just a technical solution—it is a national strategy for transformation.

At Eureka Energy Corporation, we view this integrated approach as a blueprint for recovery: a strategy that meets Ukraine’s immediate energy needs while laying the foundation for long-term prosperity, environmental responsibility, and energy sovereignty.

The tools exist. The feedstocks are available. The opportunity is real.

Now is the time to act.

About Eureka Energy Corporation

Eureka Energy Corporation is a U.S.-based energy development firm committed to sustainable innovation in power, fuel, and industrial systems. With a focus on integrating circular economy models and advanced technologies with an integrated energy resource focus, Eureka delivers scalable solutions to strengthen energy security, reduce emissions, and create durable economic value across global markets.

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