

Unlocking the Full Value of Renewable Fuel Facilities: Powering the Future with Posh Flex Gensets

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Acknowledgements

Posh Energy would like to thank XCF Global, Inc. (XCF Global) (Nasdaq: SAFX) for its collaboration in deploying Posh Flex Gensets at XCF Global's New Rise Reno facility, as we look to demonstrate how renewable fuel producers can transform byproducts into clean power and accelerate the transition toward a more resilient, circular energy economy. XCF Global's involvement reflects a shared commitment to advancing sustainable energy innovation and unlocking new value streams within renewable fuel production.

Executive Summary

Sustainable aviation fuel (SAF) and renewable diesel (RD) are among the fastest-growing pillars of the global energy transition. Recognized as drop-in, low-carbon replacements for fossil fuels in aviation and transportation, they deliver lifecycle greenhouse gas (GHG) emissions that are substantially lower than kerosene-based Jet A and diesel. While this paper references SAF, the concepts apply equally to RD.

The next horizon is electro-synthetic aviation fuel (eSAF)—produced from carbon dioxide (CO₂), sustainably sourced hydrogen, and renewable electricity. eSAF represents the ultimate pathway to net-zero aviation fuels, effectively transforming green electricity into liquid energy. While full commercialization is still developing, ongoing innovation in SAF continues to lower carbon intensity (CI) and set the stage for eSAF adoption.

Two levers are especially critical with SAF: feedstock selection and byproduct utilization. Using waste oils and non-edible feedstocks such as used cooking oil (UCO), distillers corn oil (DCO), or animal fats dramatically reduces CI. Equally important is capturing the propane-rich byproduct of SAF production—roughly 8% of output—that is often flared or sold at low value. With the right technology, this fraction can be transformed into meaningful environmental and economic value.

That is the focus of this collaboration. Posh Energy and XCF Global are deploying the Posh Flex Genset, a flex-fuel generator system that reforms propane-rich byproduct streams into hydrogen and converts that hydrogen into renewable electricity. Posh Energy expects that

the result will be improved SAF economics, lower lifecycle CI, and a new circular model where every fraction of feedstock contributes to value creation.

Beyond SAF production itself, this integration addresses a broader challenge: the surging demand for electricity from artificial intelligence (AI) and hyperscale data centers. According to Berkeley Lab, data centers already account for 44% of U.S. electricity load growth, with AI compute clusters emerging as the single largest driver of new demand.

This white paper demonstrates how integrating Posh Flex Gensets into SAF and RD production, such as at XCF Global's New Rise Reno facility, may be able to deliver both economic and environmental benefits today, while advancing the industry's trajectory toward eSAF and fuels with near-zero—or even negative—CI.

The SAF Process and Its Byproducts

SAF is produced through the hydrotreating of triglycerides and free fatty acids. Feedstocks typically include used cooking oil (UCO), distillers corn oil (DCO), soybean oil, and non-food-grade animal fats. During hydrotreating, the triglyceride backbone is deoxygenated, producing SAF hydrocarbons and side streams.

One of the main side streams is propane, derived from the glycerin portion of triglycerides. Because it is produced at distributed facilities and often in relatively small quantities per site, it is frequently uneconomic to capture and transport. As a result, it is commonly flared, creating avoidable GHG emissions.

SAF itself has already established strong sustainability credentials. Lifecycle analyses have shown GHG emissions reductions of more than 80 percent relative to fossil diesel and kerosene, and in some cases greater than 100 percent when accounting for the avoided emissions associated with diverting waste feedstocks from alternative disposal pathways.

The propane fraction, however, is underutilized. Unlocking its value is the key to further improving the economics and sustainability of SAF production.

The Growing Electricity Challenge

The global electricity system is under profound stress. In the United States, total electricity consumption is rising more quickly after years of relative stability. The most significant driver of this increase is the rapid growth of AI compute clusters and hyperscale data centers. Over one trillion dollars is expected to be invested in new U.S. data center infrastructure by 2029, and much of that growth will be constrained by limited grid interconnection capacity.

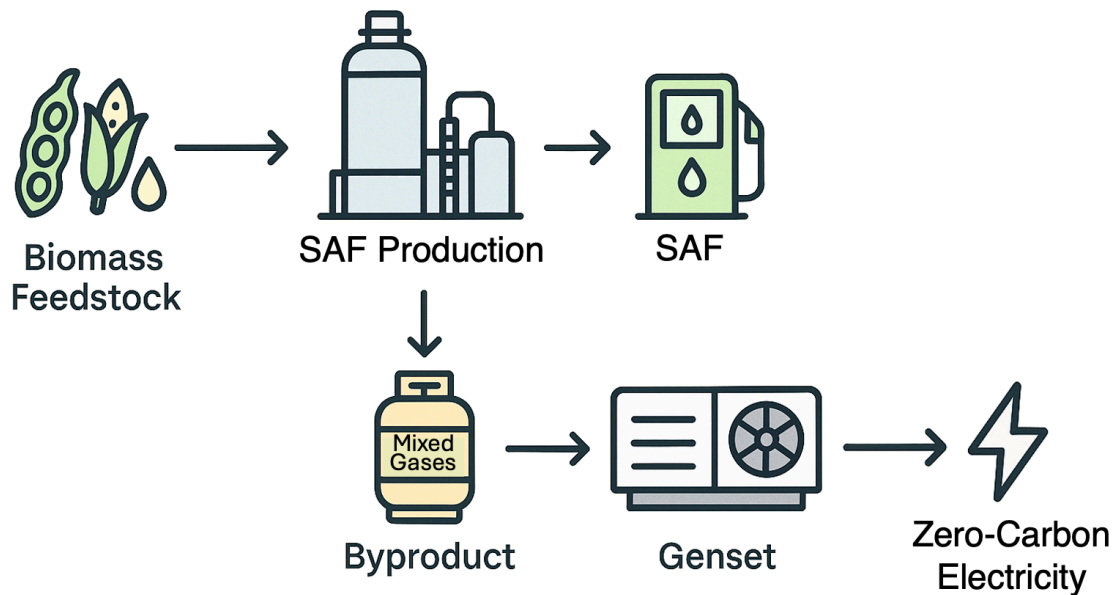
The International Energy Agency has also highlighted data centers and AI as one of the

fastest-growing sources of global electricity demand, forecasting that electricity use from data centers could double between 2022 and 2026. This growth is not just a U.S. phenomenon. European, Asian, and Middle Eastern markets are seeing similar surges in data center expansion, often located in industrial zones near SAF plants.

For SAF producers, this context creates both a challenge and an opportunity. Facilities themselves require reliable, affordable electricity for operations. At the same time, producers are in a unique position to generate on-site zero-carbon electricity that can supply nearby data centers or the grid, monetizing a waste stream while addressing one of the most pressing infrastructure challenges of the decade.

The Posh Flex Genset Solution

Figure 1 – Process flow of SAF production and byproduct utilization



Posh's Flex Genset (PFG) is a modular, high-efficiency power generation system designed to operate on unconventional and variable fuels. The genset integrates three key components:

- Proprietary reformer that converts hydrocarbons, including propane-rich streams, into hydrogen at high efficiency and low pressure.
- Water-gas shift reactor that maximizes hydrogen yield while minimizing residual carbon monoxide.
- Proton exchange membrane (PEM) fuel cell stack developed at Stanford University and validated through industrial partnerships, which silently and efficiently converts hydrogen into electricity.

The PFG is differentiated from conventional gensets in several ways. First, unlike reciprocating engines or turbines, which require standardized fuels and generate high levels of pollutants and noise, the PFG can reliably process non-standard, mixed gas streams such as those produced during SAF operations. Second, the PFG produces electricity with up to 80 percent greater efficiency per unit of fuel compared to conventional generators. Third, it operates nearly silently, emits no nitrogen oxides, sulfur oxides, or particulates, and can be configured with integrated, simplified carbon capture to achieve zero-carbon electricity, even when operating on fossil-derived fuels.

Fourth, the system is modular, with units ranging from 100 kilowatts to multi-megawatt deployments, allowing facilities to scale power production in line with their byproduct streams.

Technology Comparison for Onsite Power at SAF Facilities

Attribute	Posh Flex Genset	Diesel/NatGas Engine	Microturbine	SOFC System
Can use propane-rich variable byproduct	Yes	No or with difficulty	Medium	No
Electrical efficiency	High	Medium	Medium	High
Warm-up / dynamics	Fast	Fast	Medium	Slow
Local pollutants (NO _x /SO _x /PM)	Near-zero	High	Medium	Near-zero
Noise & vibration	Very low	High	Medium	Low
Carbon capture integration	Simplified	Challenging	Challenging	Challenging
Maintenance profile	Low	Medium-High	Medium	High (complete replacement every 3-5 years)

Benefits of Integration with SAF

The integration of Posh Flex Gensets into SAF facilities delivers multiple strategic benefits.

Highest-value use of byproducts. Rather than flaring propane or selling it into low-value markets, producers can generate renewable electricity on-site, turning a liability into an asset.

New revenue streams. In addition to SAF sales, producers can monetize zero-carbon electricity, renewable energy credits (RECs), and Section 45V Clean Hydrogen Production Tax Credits.

Enhanced 45Z and LCFS credits: When used to power on-site operations, the RECs can be retained and retired by the producer to lower the lifecycle carbon intensity of the SAF or RD produced, thereby boosting the value of Section 45z Clean Fuel Production Credits and low carbon fuel standard (LCFS) credits where available.

Grid constraint solution. On-site generation reduces reliance on congested transmission networks. It also enables SAF producers to become energy suppliers to nearby data centers, creating strategic partnerships and premium pricing opportunities.

Environmental leadership. By eliminating flaring, producing zero-carbon electricity, and further reducing lifecycle GHG intensity, producers can strengthen their leadership in sustainability and circular economy practices.

Illustrative Unit Economics of the Integrated Model

Using distillers corn oil (DCO) as the feedstock, approximately 8 pounds of DCO are required to produce one gallon of renewable diesel (RD) or sustainable aviation fuel (SAF). At a current DCO market price of \$0.48 per pound, this translates into a feedstock cost of about \$3.84 per gallon.

A. Revenue and Cost Stack

The following table illustrates the economics of SAF production when integrating Posh Flex Genset power generation and available policy incentives. The example assumes an annual production of 40 million gallons (150 million liters) of SAF.

Table 1: Illustrative Unit economics

Metric	Per gallon (US)	Per liter	Annual @ 40MMGY
SAF selling price (proxy: #1 oil)	\$2.29	\$0.61	\$91.67 M

D4 RINs (1.7 @ \$0.80)	\$1.36	\$0.36	\$54.48 M
Blender's Tax Credit (75% of \$1/gal)	\$0.75	\$0.20	\$30.03 M
45Z Clean Fuel Credit	\$0.50	\$0.13	\$20.03 M
LCFS credit	\$0.40	\$0.11	\$16.00 M
Electricity revenue (0.796 kWh/gal @ \$0.11)	\$0.09	\$0.02	\$3.52 M
45V credit (0.796 kWh/gal @ \$0.13)	\$0.10	\$0.03	\$4.15 M
Total revenue	\$5.83	\$1.55	\$219.85 M
Conversion cost	\$0.95	\$0.25	\$37.88 M
Feedstock cost	\$3.98	\$1.05	\$159.09 M
Total cost	\$4.93	\$1.30	\$196.97 M
Margin	\$0.90	\$0.24	\$22.88 M

Margin Improvement from Flex Genset: 50%: This illustrative model shows that by incorporating Flex Genset power generation, SAF producers can achieve a margin improvement of 50%.

B. Sensitivity Analysis: Margin per Gallon with Electricity + \$45V

The table below shows margin per gallon as DCO price and D4 RIN price vary. All other assumptions are held constant. The addition of electricity and \$45V credits substantially protects against negative margins when market conditions (i.e., RIN values and DCO costs) become unfavorable.

Table 2: Illustrative Feedstock (DCO) and RIN sensitivity analysis

DCO \$/lb RIN \$/ea	\$0.70	\$0.80	\$0.90	\$1.00	\$1.10	\$1.20
\$0.40	\$1.17	\$1.34	\$1.51	\$1.68	\$1.85	\$2.02
\$0.45	\$0.77	\$0.94	\$1.11	\$1.28	\$1.45	\$1.62
\$0.50	\$0.37	\$0.54	\$0.71	\$0.88	\$1.05	\$1.22
\$0.55	-\$0.03	\$0.14	\$0.31	\$0.48	\$0.65	\$0.82
\$0.60	-\$0.43	-\$0.26	-\$0.09	\$0.08	\$0.25	\$0.42

Assumptions:

8 lb DCO/gal; RD/SAF price proxy = \$2.29/gal (#1 oil); D4 RINs = $1.7 \times$ RIN price; Blender's credit \$0.75/gal; §45Z = \$0.50/gal; LCFS = \$0.40/gal; electricity 0.796 kWh/gal $\equiv$ \$0.11/kWh; §45V = 0.796 kWh/gal $\equiv$ \$0.13/kWh; conversion cost \$0.95/gal.

Policy Incentives and Credit Stack

SAF producers benefit from one of the most robust policy frameworks in energy. D4 RINs under the Renewable Fuel Standard provide value tied to renewable identification numbers. The federal blender's tax credit provides up to one dollar per gallon, of which 75 percent is typically realizable for larger producers. California's Low Carbon Fuel Standard offers credits that vary with carbon intensity and market prices, often in the range of \$60–\$100 per ton of avoided CO₂. Section 45Z, a new clean fuel production credit, rewards fuels with carbon intensities below petroleum benchmarks, providing additional margin lift.

Electricity production through Posh Flex Gensets introduces further credits. Section 45V incentivizes clean hydrogen production, effectively monetizing the hydrogen generated in the reforming process. This credit alone can add more than ten cents per gallon of SAF equivalent margin. In addition, renewable electricity may qualify for renewable energy credits (RECs), providing yet another revenue stream.

The stack of credits is not only lucrative but also diversifying. Feedstock prices and fuel values can fluctuate dramatically, but credits tied to lifecycle performance, hydrogen, or electricity provide independent levers for profitability. Integrating the Posh Flex Genset into SAF production strengthens a producer's ability to weather commodity cycles and policy shifts.

About Credits

Eligibility for the federal 45V Hydrogen Production Tax Credit is defined under IRS Notice 2023-46 and the DOE 45VH2-GREET model, which confirm that hydrogen produced from biogenic propane and similar renewable feedstocks can qualify for Tier 1 credits. Electricity generated from such hydrogen may also be eligible for Renewable Energy Certificates (RECs) under programs like WREGIS and Green-e Energy, subject to standard fuel traceability and emissions documentation.

References:

IRS Notice 2023-46 – Clean Hydrogen Production Credit

<https://www.irs.gov/pub/irs-drop/n-23-46.pdf>

DOE 45VH2-GREET Model – Argonne National Laboratory

<https://greet.es.anl.gov/45vh2>

WREGIS Operating Rules v3.1 – Western Renewable Energy Generation Information System

<https://www.wecc.org/reliability/WREGIS%20Operating%20Rules.pdf>

Green-e Energy National Standard – Center for Resource Solutions

<https://www.green-e.org/docs/energy/Green-e%20Energy%20National%20Standard.pdf>

Case Example: XCF Global Collaboration

Posh Energy and XCF Global have signed a Letter of Intent to collaborate on deploying Posh Flex Gensets at XCF's New Rise Reno facility. The project will begin with a 100 kilowatt pilot installation to validate the performance of the technology on the facility's byproduct streams, followed by modular scale-up to 10 megawatts of capacity.

The New Rise Reno facility exemplifies the opportunity for integration. Today, propane-rich

byproduct streams are flared. With Posh's technology, these streams will be reformed into hydrogen and converted into renewable electricity, displacing fossil-based grid power, creating new revenue streams, and eliminating flaring emissions.

This collaboration demonstrates how SAF producers can move beyond fuels into electricity generation, addressing two markets simultaneously while setting a new bar for sustainability and efficiency.

Learning from Biofuel History

The history of biofuels shows that success depends on more than producing fuel. The most resilient companies have shared two traits: vertical integration and diversification.

Darling Ingredients provides a prime example of vertical integration on the feedstock side. As one of the largest renderers in the world, it controls raw material flows and has leveraged that position into joint ventures such as Diamond Green Diesel with Valero. Soybean crushers like ADM and Cargill likewise benefit from securing feedstock while participating in downstream fuel markets.

On the diversification side, ethanol producers highlight the importance of coproducts. Firms like POET derive nearly half of their revenue from animal feed in the form of distiller's grains and corn oil. These coproducts stabilize margins even when fuel prices are low.

Posh Flex Genset integration echoes both strategies. By capturing more value from their feedstock through electricity generation, renewable fuel producers achieve a form of vertical integration. By adding a new revenue stream alongside fuels, they diversify in the same way ethanol producers have long done. This alignment with proven patterns in biofuel history strengthens the case for adoption.

The Strategic Implications

The integration of Posh Flex Gensets with SAF production represents more than an incremental improvement, it redefines industry best practices by driving EBITDA growth and diversifying revenue beyond volatile feedstock and diesel values.

By aligning producers with the fastest-growing demand center in global electricity, AI and data centers, this approach expands access to new, high-value markets. In parallel, producers gain greater financial resilience through diversified income streams and stronger protection against commodity fluctuations. Sustainability performance also improves as waste is eliminated, lifecycle emissions are reduced, and zero-carbon electricity is generated. Every molecule of feedstock is optimized for maximum value creation.

Ultimately, this integration elevates SAF producers from fuel suppliers to fully integrated energy providers, positioned to play a central, and expanding role in the global transition to a low-carbon economy.

The integration of SAF production with onsite electricity generation is more than a technical improvement; it represents the beginning of a new operating model for the industry. By fully utilizing coproduct streams, producers not only diversify revenue and strengthen margins but also position themselves as integrated energy providers capable of supporting both transport fuel markets and regional power systems.

One particularly important future pathway is **carbon capture**. The Posh Flex Genset produces a clean, concentrated exhaust stream that is far easier and less costly to capture than emissions from combustion engines. The resulting CO₂ is entirely **biogenic**, originating from renewable feedstocks, which increases its value in industrial and food-grade markets.

Recent U.S. market data shows **food-grade CO₂** prices ranging from **\$400–\$700 per metric ton**, depending on region and purity (sources: *Gasworld Market Intelligence, 2024*; *IHS Markit CO₂ Market Outlook, 2024*). At the upper end of this range, \$700 per ton translates to approximately **\$280 in additional revenue per megawatt-hour (MWh)** of electricity produced by the Posh Flex Genset. When distributed across the total SAF output of an integrated facility, that equates to about **\$0.22 per gallon** of added value.

Table 3: Carbon Capture Revenue Assumptions

Parameter	Value	Notes / Source
CO ₂ market price	\$700/t	Food-grade CO ₂ (<i>Gasworld, 2024</i>)
CO ₂ yield per MWh electricity	0.40t CO ₂ /MWh	Based on reformer output
Revenue per MWh electricity	\$280/MWh	0.40 t × \$700/t
Annual SAF production	132 million gal/year	From unit-economics model
Total CO ₂ revenue	\$29M/year	103,000MWh × \$280/MWh
Added value per gallon	\$0.22/gal SAF	\$29M ÷ 132M gal

When combined with electricity sales and federal incentives such as Section 45V, carbon capture adds a third profit center to SAF operations. Facilities would no longer be simply fuel producers but multi-output energy hubs, delivering SAF, renewable electricity, and food-grade CO₂ to high-value markets.

For Posh Energy, the New Rise Reno project is the first demonstration of this integrated model. Once established, it can be replicated at other SAF facilities, setting a new benchmark for the industry—**fuels, renewable power, and carbon products delivered together at the lowest cost and carbon intensity**.

Conclusion

SAF and renewable diesel are already leading examples of decarbonization in aviation and transportation. But the full potential of these fuels lies in creating circular, integrated systems where every byproduct is utilized.

Posh Energy's collaboration with XCF Global is expected to demonstrate how Posh Flex Genset technology can turn this vision into reality. By converting propane-rich byproducts into renewable electricity, producers can improve economics, eliminate waste, green the grid, and help meet the surging electricity demand of AI and data centers.

This integration is rapidly emerging as the new standard for SAF and renewable diesel production. Through this model, renewable fuels producers establish themselves at the intersection of clean energy and digital infrastructure, delivering the lowest-cost, lowest-carbon fuels while meeting the world's growing demand for sustainable power.