RESEARCH NOTE

SUSTAINABILITY CERTIFICATION IN BIOFUEL MARKETS

A Framework Analysis of ISCC, RED III, RINs, and Emerging Compliance Risk

April 2026

Executive Summary

The sustainability certification landscape in biofuels is undergoing a fundamental restructuring driven by European Union Renewable Energy Directive III (RED III) implementation and the documented fraud in waste-based feedstock certification. ISCC certification, which dominates the market with approximately 65-70% of voluntary scheme coverage, faces regulatory pressure following confirmed cases of fraudulent palm oil mill effluent imports worth an estimated 1.8 million tonnes in 2023. The certification framework's integrity is critical for traders, as compliance failures create supply chain risk and margin volatility across RIN (Renewable Identification Number) and LCFS (Low Carbon Fuel Standard) markets, where pricing moved 22% across H1 2025 due to policy uncertainty and certification delays.

Market Context and Current Conditions

The global biofuels certification market operates within an increasingly fragmented regulatory environment. The United States Renewable Fuel Standard (RFS) mandates obligated parties to acquire Renewable Identification Numbers (RINs) tied to verified biofuel production, creating a compliance-driven demand for certification. California's Low Carbon Fuel Standard (LCFS) operates independently, pricing carbon intensity reduction on a per-volume basis. Meanwhile, the European Union has shifted from RED II (Renewable Energy Directive 2) to RED III (2023/2413), fundamentally altering the framework for feedstock eligibility and double-counting provisions for advanced biofuels.

As of April 2026, policy uncertainty continues to create pricing volatility. United States EPA proposed renewable fuel volume obligations for 2026–2027 on June 13, 2025, with cellulosic biofuel mandates partially waived due to persistent production shortfalls. California LCFS credits averaged USD 65.58 per metric tonne in April 2025, with trading ranges spanning USD 46.50 to USD 166.00—a 257% spread reflecting structural uncertainty in carbon pricing and feedstock availability. Advanced biodiesel (D4) RINs remain under pressure due to the transition from the Biodiesel Tax Credit (BTC) to Section 45Z Production Tax Credit (PTC), which offers lower credit rates for conventional biodiesel and renewable diesel, reducing economic incentives for biodiesel blending relative to advanced alternatives.

Traders navigating this environment face three simultaneous challenges: certification scheme fragmentation, fraud-driven supply disruptions, and regulatory policy oscillation. Each creates distinct margin opportunities and hedging requirements.

The ISCC Framework and Certification Mechanics

ISCC (International Sustainability and Carbon Certification) operates as the largest voluntary sustainability certification system for biofuels globally, with accredited certifiers in Europe, Southeast Asia, South America, and Africa. The scheme functions on a chain-of-custody model, requiring each production facility, trader, and logistics operator in the supply chain to achieve and maintain certification. ISCC covers both sustainability criteria (land use, biodiversity, greenhouse gas emissions) and traceability requirements, ensuring feedstock provenance and carbon intensity calculations meet regulatory thresholds.

The certification process involves third-party audits of production facilities, mass balance documentation at each transaction point, and compliance with approved calculation methodologies for greenhouse gas savings. ISCC-certified biofuels qualify for EU RED III compliance, US RFS D4 and D5 categories, and CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) eligibility. The scheme's dominance reflects its early establishment and broad regulatory recognition, though this centralization creates systemic risk when certification integrity deteriorates.

ISCC operates through a hub-and-spoke model where certified producers supply to traders, aggregators, and end-users, each maintaining their own certification status. Documentation flows through ISCC HUB, a digital platform tracking mass balance transfers. When this system functions effectively, it provides transparent feedstock attribution and real-time compliance verification. However, the scheme's expansion into waste-based feedstocks—particularly used cooking oil (UCO) and palm oil mill effluent (POME)—exposed vulnerability to fraud at the source, as remote production points have limited regulatory oversight and verification capacity.

RED III Recognition and Framework Changes

On May 5, 2025, the European Commission formally recognized updated ISCC EU System Documents as compliant with RED III requirements, the latest iteration of the Renewable Energy Directive effective December 10, 2023. This recognition establishes the framework for biofuel sustainability and greenhouse gas (GHG) emissions savings across the European Union and mandates binding criteria for renewable fuel production and consumption through 2030.

RED III introduces several changes material to traders and producers. First, the directive establishes stricter double-counting provisions for advanced biofuels derived from waste and residues. Under RED II, biofuels from certain waste feedstocks could count twice toward renewable energy targets, creating artificial demand. RED III maintains double-counting for waste-based fuels but with more restrictive definitions and proof-of-origin requirements. Second, RED III mandates annual in-country audits of all palm oil mills (POMs) generating waste and residues certified under ISCC, effective November 2022. This ended group certification at source, forcing individual facility accreditation. Third, all ISCC EU certification bodies must complete accreditation applications by December 31, 2025, with mandatory compliance by December 31, 2026, creating a transition deadline that may temporarily constrain certification capacity.

All RED II-compliant materials certified by recognized voluntary schemes until May 20, 2025 retain compliance with RED III sustainability criteria, but new production must achieve RED III standards from that date forward. This creates a transition lag during which certified inventories persist, but forward supply must meet updated criteria. The ISCC HUB system implementation by January 8, 2026 (mandatory use beginning December 22, 2025 for new and modified certificates) digitizes compliance tracking and reduces paper-based fraud opportunities, though electronic forgery poses distinct risks.

Double-Counting and Advanced Biofuel Economics

Double-counting remains a critical lever in biofuel project economics under RED III. When a biofuel from waste or residue feedstock counts twice toward a member state's renewable energy obligation, it halves the effective volume requirement for blending. This creates margin expansion for producers of waste-based biofuels relative to virgin feedstock-based alternatives. RED III's tightened definitions affect the eligible waste streams qualifying for double-counting.

Under RED III, waste-based feedstocks now require documented proof that the material would not have been produced in the absence of biofuel demand—a counterfactual that creates audit friction. Palm oil mill effluent (POME), a primary waste stream for biodiesel, must originate from mills where the POME would otherwise be disposed of or used for lower-value purposes. This heightened standard increased audit costs and reduced the universe of compliant mills, particularly in Indonesia and Malaysia where enforcement varies by region.

The double-counting mechanism directly supports biofuel project returns. Assume a waste-based biodiesel producer in Indonesia has a marginal cash cost of production at USD 480/tonne. In the EU renewable fuel market, the biodiesel blending margin (spread between renewable diesel and conventional diesel) averages 40-60 USD/tonne. Without double-counting, the project operates below cost. With double-counting, the effective "selling price" doubles on a volumetric basis, making the economics work. RED III's tightened eligibility criteria thus create structural downward pressure on waste-based feedstock supply and upside potential for biodiesel and renewable diesel pricing in markets relying on such feedstocks.

US Frameworks: RFS/RINs and California LCFS

The United States operates a bifurcated compliance system. The federal Renewable Fuel Standard (RFS) program, administered by EPA, mandates obligated parties (refiners and fuel importers) to blend renewable fuels into transportation fuel or acquire RINs (Renewable Identification Numbers) from compliant producers. Each gallon of qualifying renewable fuel generates one RIN, which trades independently of physical fuel and can be retired by obligated parties to satisfy their renewable volume obligations (RVOs). The RFS categories—D3 (cellulosic), D4 (biomass-based diesel), D5 (advanced biofuel), D6 (conventional biodiesel)—each have separate volume targets and separate trading markets.

California operates the LCFS independently, pricing biofuels on a per-gallon carbon-intensity basis rather than volumetric mandates. LCFS credits represent one metric tonne of CO2 equivalent reduced relative to a baseline. This creates a fundamentally different pricing mechanism: LCFS values depend on feedstock carbon intensity, while RINs depend on volume mandates and compliance pressure. A biodiesel producer in California can earn both D4 RINs (federal) and LCFS credits (state), creating stacked compliance value. This stacking effect historically supported biodiesel margins in California relative to the rest of the US, though policy uncertainty in 2024–2025 compressed the spread.

EPA's June 2025 proposed rule maintained 2026 renewable volume obligations at levels consistent with prior projections but partially waived the cellulosic biofuel mandate (D3) due to insufficient production. D4 (biomass-based diesel) RINs have traded in a wide range through 2025, reflecting uncertainty around Section 45Z PTC implementation rates and the biomass-based diesel RVO for 2026 and beyond. Market consensus expects continued D4 RIN price ranges of USD 0.60–1.20 per gallon through 2027, substantially lower than the USD 1.50–2.50 range observed in 2020–2022 due to lower PTC credits and reduced feedstock scarcity.

Framework	Geographic Scope	Compliance Mechanism	Pricing Basis	2026 Outlook
EU RED III	EU27 + UK	Voluntary scheme certification + national tracking	**Blending margin + feedstock premium**	Tightened waste criteria pressure economics
US RFS	United States	RIN acquisition by obligated parties	**USD 0.60–1.20/gal (D4 range)**	Policy volatility, PTC transition uncertainty
California LCFS	California only	Credit acquisition by obligated parties	**USD 46–166/MT CO2e (2025 range)**	Gradual price increase H1 2026 expected
CORSIA	International aviation	Voluntary scheme certification	**SAF premium + ISCC/RSB overhead**	Steady demand, limited supply constraint

Fraud, Waste Feedstock Verification, and Certification Challenges

Certification system integrity deteriorated materially in 2023–2024 due to documented fraud in waste-based feedstock sourcing. The EU Committee on Sustainability of Biofuels, Bioliquids and Biomass Fuels documented approximately 1.8 million tonnes of fraudulent ISCC-certified palm oil mill effluent (POME) entering the EU in 2023. This represents approximately 8–10% of total EU biofuel feedstock volumes and directly undermined the credibility of waste-based biofuel supply chains.

The fraud mechanism operates as follows: sellers in Southeast Asia obtain ISCC certification for POME that does not qualify under RED III waste criteria (i.e., produced specifically for biofuel use rather than a genuine mill by-product). ISCC auditors at the point of origin—often limited in technical capacity and constrained by geographic remoteness—approved documentation that did not meet RED III counterfactual standards. Fraudulent POME was sold to traders with false mass balance documentation, then exported to EU refiners who blended the material into biodiesel. The final product achieved ISCC certification at the refinery level, even though the feedstock documentation was fraudulent. By the time the fraud was detected through EU quality audits and material traceability reviews, the biodiesel had entered physical markets and RIN/LCFS markets, creating systemic compliance failures.

Market response was swift. The European Commission considered suspending ISCC recognition for waste-based biofuels for 2.5 years but ultimately opted for remedial measures rather than complete suspension. These measures included mandatory individual certification of all palm oil mills generating waste-based feedstocks (effective November 2022), increased audit frequency for waste-based producers, and enhanced documentation requirements for feedstock provenance. ISCC responded by strengthening its audit guidelines and introducing the ISCC Integrity Programme, which includes annual audits and substantiated fraud investigation protocols.

For traders and refiners, waste feedstock verification now requires heightened due diligence. Mass balance claims for POME require documented proof of mill production capacity and effluent generation rates relative to crude palm oil output. Spot audits of sourcing facilities are increasingly standard practice among compliance teams, raising transaction costs. The fraud episode also created persistent supply chain friction: some European refiners reduced reliance on POME-based biodiesel in favor of used

cooking oil (UCO) feedstock, which offers better traceability and lower fraud risk. This shift redistributed margin across feedstock types and created temporary UCO supply tightness in late 2024 and early 2025.

Competing voluntary schemes have positioned certification more stringently in response. Roundtable on Sustainable Biomaterials (RSB), a smaller but higher-standard certification scheme covering approximately 15–20% of certified biofuel volumes, maintained stricter waste feedstock criteria throughout the POME fraud period and gained market share in high-integrity supply chains serving pharmaceutical and food-grade glycerin markets. ISCC's market dominance remains intact, but the fraud episode triggered elevated certification costs (higher audit fees) and longer approval timelines (cumulative 2–3 month extensions post-detection).

Voluntary Certification Scheme Comparison

Beyond ISCC, several voluntary certification schemes operate in the biofuel market, each with distinct geographies and regulatory recognition. Roundtable on Sustainable Biomaterials (RSB) implements a comprehensive framework covering land use change, biodiversity, social criteria, and greenhouse gas emissions. RSB certification is recognized by EU RED III, US EPA for RFS purposes, and ICAO for CORSIA eligibility. RSB's stricter social criteria (particularly labor standards and community impact assessments) appeal to sustainability-focused markets but increase cost and extend certification timelines by 6–12 months relative to ISCC.

REDcert, a German-developed scheme particularly prevalent in Central European biodiesel production, focuses on traceability and GHG emissions within RED requirements. REDcert operates through a mass balance system similar to ISCC but with tighter documentation standards at source. REDcert covers approximately 10–15% of EU certified biofuel volumes and is particularly strong in German, Austrian, and Polish biodiesel refining. Its competitive advantage lies in proximity to Central European feedstock sourcing, enabling streamlined audits and faster certification cycles (typically 4–6 weeks versus ISCC's 8–12 weeks post-application).

For traders evaluating risk and cost, ISCC offers volume leverage and broad regulatory acceptance but carries fraud risk elevated by waste feedstock complexity. RSB offers premium positioning and societal value proposition but at 15–20% certification cost premium and longer timelines. REDcert offers speed and precision for European sourcing but limited extraterritorial recognition. Strategic sourcing increasingly requires managing multiple certifications simultaneously for flexibility.

> *Waste-based feedstock fraud exposed fundamental tension between certification scheme efficiency and verification rigor. Traders relying on ISCC for rapid market access now face elevated operational friction; those positioning for premium-value segments (pharmaceutical, food-grade, specialty chemicals) increasingly require RSB or dual certification to insulate supply chains from future integrity failures.*

Forward Outlook (Q2–Q4 2026 and 2027 Projection)

The near-term outlook for certification frameworks reflects three competing drivers: regulatory tightening (particularly RED III implementation completion), fraud mitigation (elevated audit costs and timelines), and geopolitical feedstock supply disruption (particularly in Southeast Asia and palm oil sourcing regions).

Q2–Q3 2026 Base Case (60% probability): ISCC certification processes normalize following fraud investigation closure and audit guideline updates. Certification timelines remain 10–15% longer than pre-2023 levels due to enhanced documentation requirements, but do not impose catastrophic supply delays. Waste feedstock supply continues to be constrained by RED III double-counting criteria tightening, creating blending margin support for waste-based biofuels at 45–60 USD/tonne in EU markets. US RFS policy remains volatile but D4 RIN trading ranges hold in USD 0.70–1.10/gallon range. California LCFS credits rise to USD 75–90/MT by end-Q3 as new low-carbon fuel blending comes online and carbon intensity standards tighten per 2023 amendments.

Bull Case (25% probability): Accelerated EU decarbonization policy (triggered by political shifts or climate urgency framing) creates enhanced feedstock scarcity. Advanced biofuel mandate acceleration results in tightened waste-feedstock supply, pushing double-counting premium to 80–100+ USD/tonne in EU by Q4 2026. This scenario triggers margin recovery for waste-based producers and higher renewable diesel prices, supporting D4 RIN trading above USD 1.20/gallon. California LCFS reaches USD 120–150/MT by end-2026. Certification capacity becomes a genuine constraint as audit demand exceeds certifier availability in peak sourcing regions (Indonesia, Brazil). Premium certification schemes (RSB) command 10–15% price premiums for feedstock, incentivizing suppliers to pursue dual certification despite cost.

Bear Case (15% probability): Biodiesel oversupply (driven by reduced feedstock costs or policy subsidy continuation in producing regions) floods EU markets, compressing blending margins below 30 USD/tonne. Waste-feedstock premium collapses due to abundant virgin feedstock availability. EU policy oscillation (mandate relaxation due to cost pressures) further depresses biofuel prices. D4 RINs trade at USD 0.50–0.75/gallon. California policy faces political pressure to relax LCFS requirements, capping credit prices at USD 50–60/MT. Certification becomes a compliance checkbox rather than a value lever, and pressure to consolidate schemes (ISCC absorbs REDcert/RSB) intensifies due to industry consolidation.

2027 Outlook: Medium-term certification landscape likely bifurcates between high-integrity, premium-value chains (leveraging RSB or ISCC-plus-audit standards) serving pharmaceutical, aviation, and food markets, and commodity compliance chains (ISCC baseline, minimal differentiation) serving blending mandates. The fraud episode permanently elevated cost of waste-based biofuel supply chains, likely reducing their share of total biofuel supply from 45–50% (2023) to 35–40% (2027) as refiners rotate toward virgin feedstocks or recycled carbon feedstocks with inherent traceability advantages.

Key Risks and Watch Items

Several exogenous factors warrant continuous monitoring. First, regulatory policy in the EU remains subject to revision in response to cost-of-living pressures and agricultural lobbying. A significant retreat from RED III aggressive implementation timelines would de-pressurize waste feedstock scarcity and lower biofuel blending economics, compressing feedstock premiums and RIN prices in tandem. Conversely, accelerated EU climate policy adoption (particularly transport decarbonization targets) would accelerate feedstock scarcity and certification demand. Second, geopolitical supply shocks to palm oil production (particularly in Indonesia and Malaysia due to climate events, labor disruptions, or export controls) create tail-risk scenarios where waste feedstock availability tightens faster than certification infrastructure can accommodate, triggering temporary supply disruptions and spot price spikes. Third, aviation industry expansion and CORSIA compliance pressure may redirect premium biofuels toward SAF (Sustainable Aviation Fuel) applications, compressing supply available for ground transportation blending. Fourth, emerging feedstock technologies (algae-based oils, synthetic biology pathways) may disintermediate the waste feedstock supply chains where fraud has been concentrated, though commercialization remains 3–5 years away.

Finally, certification scheme consolidation risk deserves attention. If ISCC pursues acquisition or formal partnership with smaller schemes (REDcert, UL standards), the system concentration increases, reducing redundancy and elevating systemic risk. Conversely, if regulatory pressure mounts on ISCC post-fraud episode, new scheme entry may fragment the market and increase trader friction costs navigating multiple parallel systems. Active monitoring of ISCC board dynamics, certifier auditor hiring/turnover, and audit delay metrics in major sourcing regions (Indonesia, Brazil, Ukraine) provides leading indicators of certification system stress.

Tornavia Trading Research Desk | April 2026

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