SFS Ireland
Piloting a Pathway to Net-Zero

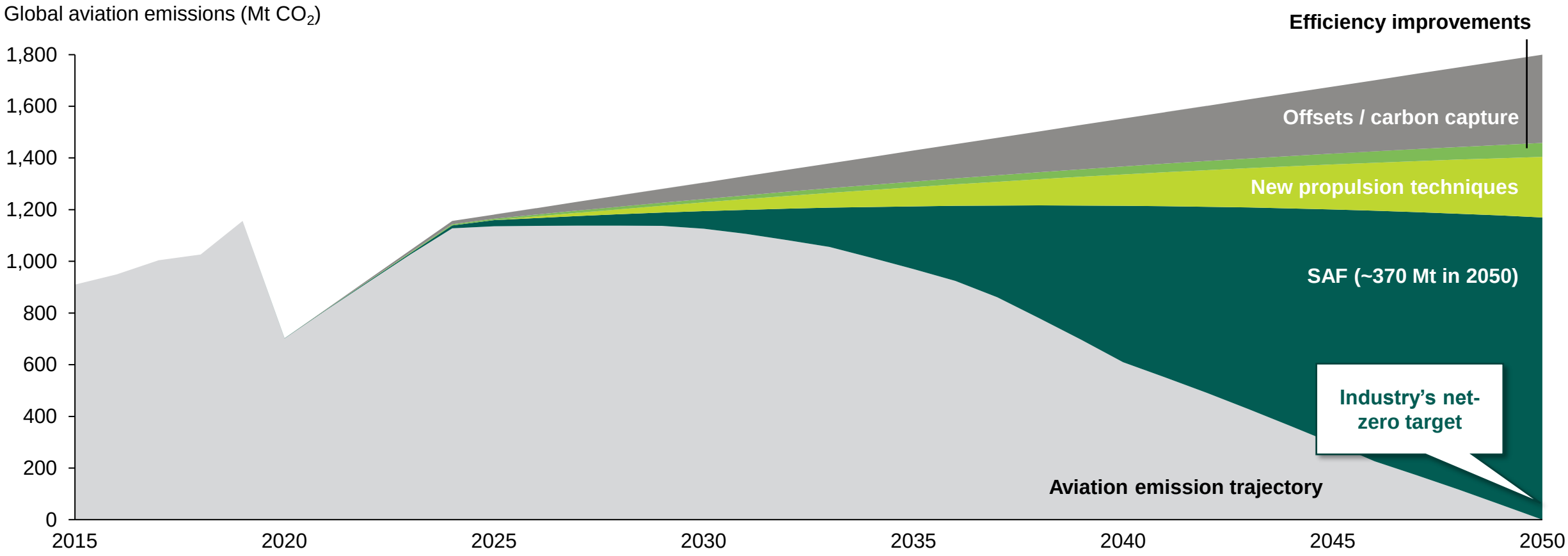
SKYNRG

IRELAND'S SUSTAINABLE AVIATION FUEL OPPORTUNITY

25 October 2023

In partnership with: AVOLON BOEING ORIX Aviation

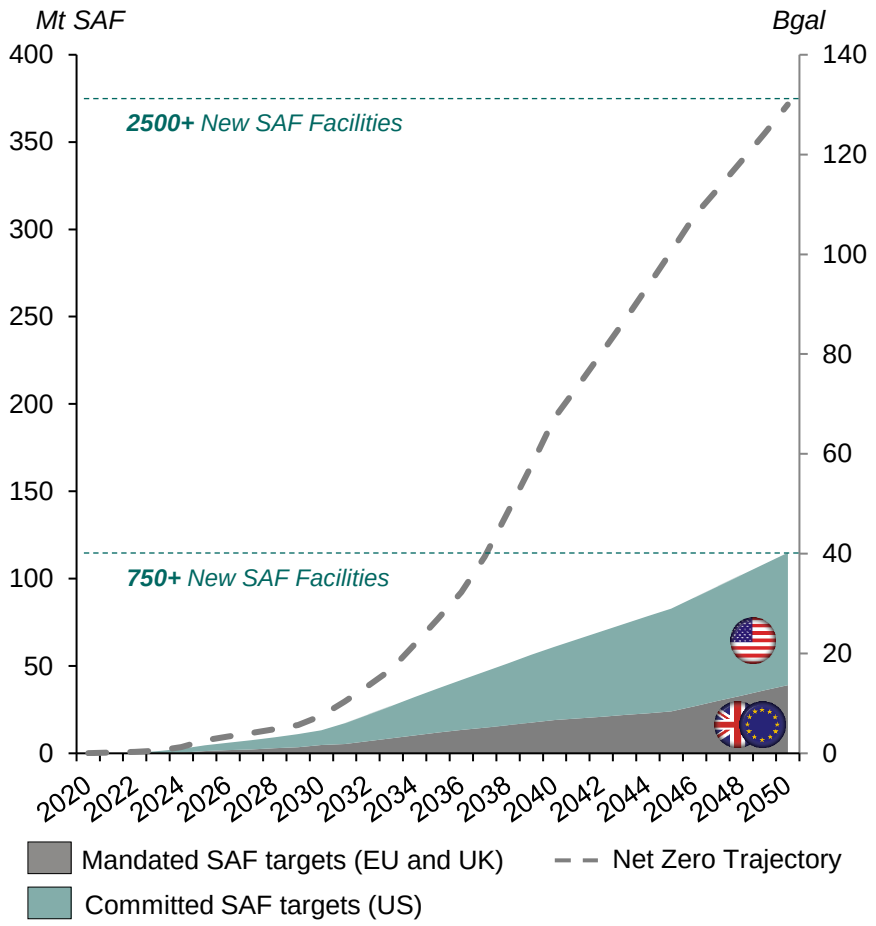
SAF IS CRUCIAL TO REACH NET-ZERO INDUSTRY TARGET BY 2050



SAF market expected to grow from €0.2B today to €50B in 2030, to >€500B in 2050

Source: Wall Street Research on Aerospace and Defence Data, IATA 2021

SAF MARKET IS SET TO BECOME A SIGNIFICANT INVESTMENT OPPORTUNITY DRIVEN BY POLICY AND VOLUNTARY DEMAND



Regulatory underpinning

- US targets 100% SAF use in 2050
- ReFuelEU Aviation require a 70% blend by 2050
- UK mandated 10% SAF by 2030

Voluntary market

- IATA Net Zero 2050 target pledge includes a SAF contribution of 62% by 2050
- Airlines have set voluntary SAF targets totalling at 13 Mt in 2030
- Corporates are doubling down on their voluntary SAF commitments

Should The Market Grow to Achieve Net Zero

370Mt / 123Bgal — Total SAF demand in 2050

~€1.5tr — Addressable market

€2.0tr — ESG Capex in new asset class

NB. The demand curve assumes a constant jet fuel consumption equal to 2019 volumes

INTRODUCTION | A ONE-YEAR FEASIBILITY STUDY INTO LOCAL FEEDSTOCKS WAS EXECUTED TO UNDERSTAND THE IRISH SAF VIABILITY

Study context

- Goal: investigate the potential for a commercial scale SAF facility in Ireland based on local feedstock
- Project partners: Boeing, Avolon, Orix Aviation, Sustainable Flight Solutions, SkyNRG
- Timeline: April ‘22 to January ’23

Boundary conditions SAF facility

- Timing: operational pre-2030 - meaning only ASTM-certified production pathways
- Scale: minimum 100.000 ton/year SAF production
- Sustainability: >80% GHG emissions reduction + EU mandate eligible feedstocks
- Location: Island of Ireland

EUROPEAN UNION SAF POLICY LANDSCAPE CONSISTS OF EU-ETS, RED III AND REFUELEU

Industrial Sectors	Transport Sector	Aviation Sector
EU-ETS **EU Emissions Trading System**	**RED III** **Renewable Energy Directive III**	**ReFuelEU Aviation**
A **cap-and-trade system** to **reduce GHG emissions by 62%** in 2030 vs. 2005	A **regulation** to **reach a 42.5% renewable energy share** in 2030	A regulation to reduce emissions from aviation by a **mandatory SAF uptake** of 6% in 2030, increasing to 70% in 2050

Type | Regulatory

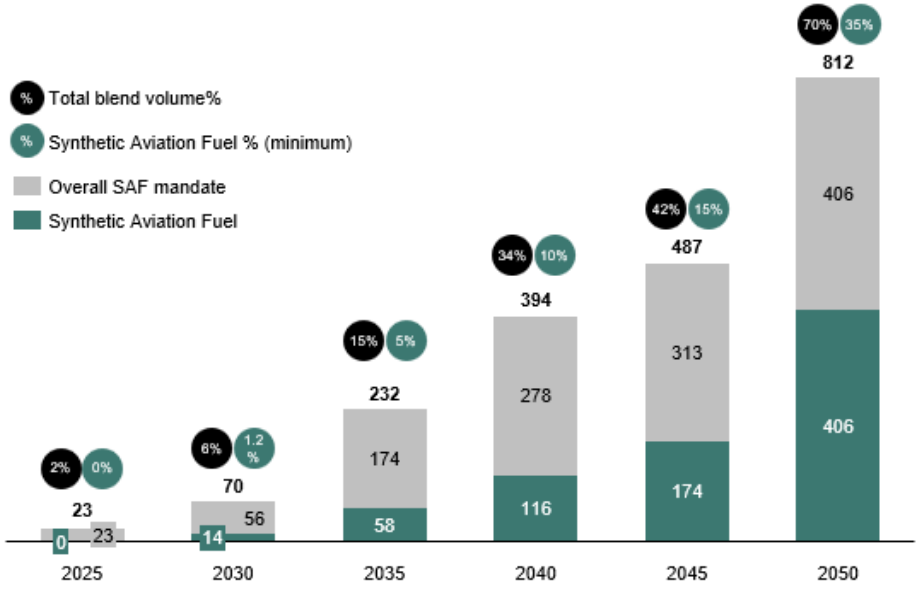
Enabler | Demand — Supply

Cost | Industry

SAF IN IRELAND | A MULTI-BILLION EURO BUSINESS IN IRELAND BUT DEVELOPMENT INITIATIVES ARE LACKING

ReFuel EU SAF mandate volumes for Ireland

In kilo tons (kt)[1]



Domestic Market opportunity

	Today	2035	2050
Mandated volume (kt)	0	~230	~800
# of SAF plants[2]	0	3	10
Economic value[3]	0	€800M	€2,550M

The Irish SAF industry could generate revenue of €2.55bn by 2050 and provide up to 1,000 high-skilled jobs

1. Based on the constant 2019 jet fuel uptake of 1.16 million ton per year;
2. ~80 kt each
3. Based on a avg. SAF value of €3,500/ton

RESULTS | PTL AND RNG SEEM MOST PROMISING WHILE SUPPORT IS STILL NEEDED TO DEVELOP THESE INDUSTRIES

	Feedstock	Availability		Challenges	Opportunities
		Today	2030+		
Oils	**Used Cooking Oil / Tallow**			• Saturated market • Usage capped by EU policies	• Commercial technology
Solid biomass	**Agri + Forestry wastes**			• Grassland dominates; limited crop residues • Fragmented feedstock and forestry products already utilized	• Energy crops promising, not yet established
	Municipal Solid Waste			• Increasing recycling rates resulting in minimal residues	• Biogenic CO_2 source from biomass fraction also an input for PtL
	Renewable Natural Gas			• Grass not SAF policy compliant (REDIII) • Competition from other industries	• Ambitious national target for RNG development
PtL	**Green hydrogen**			• Offshore floating wind is expensive source • No H_2 projects or infrastructure in development	• Large potential due to stable wind profile and scaling optionality
	Biogenic CO_2			• Biogenic CO_2: limited point sources with long lifetime • Fossil CO_2: policy doesn't allow beyond 2035	• Gas grid operator seems determined to support and connect RNG suppliers

THERE IS SIGNIFICANT FUTURE ECONOMIC SAF POTENTIAL IN IRELAND

/ INDICATIVE

Current state – SAF

Low TRL and limited technologies

↓

High risk for SAF producers

↓

Low number of SAF producers

↓

Low SAF availability

↓

No mandates in place EU wide

Current state – Ireland

- **No Irish SAF Policy** (CAP23, Roadmap, Strategy, etc)
- **Awareness is slowly building around SAF** (latest H_2 strategy mentions the potential for e-Fuels, DOT Climate Roadmap mentions alternate fuels for air transport fleet)
- **Renewable energy progress:** Policy initiatives in place to drive high levels of offshore wind power generation by 2030 will support domestic eSAF production
- **All jet fuel used in aviation is imported** to the State

Envisioned state

High TRL and several technologies

↓

Low risk for SAF producers

↓

High number of SAF producers

↓

High SAF availability and competition

↓

Strong policy through RefuelEU

The Opportunity: Energy independence; Economic opportunity; Consolidate Ireland's position as a global leader in aviation

RECOMMENDATIONS TO GROW THE IRISH SAF INDUSTRY

1. **Incentivize** (e.g. capital allowances, tax credits, pricing guarantees) to boost SAF and H_2 development for a viable PtL business case. Cross-departmental relationships are essential (DECC, DOT, DAFM) to ensure comprehensive policy framework

2. **Fund R&D** through Irish institutions and government bodies (e.g. Enterprise Ireland, Science Foundation Ireland, SEAI)

3. **Revamp planning** for SAF plants with an eye on future energy parks and circular economy growth

4. **Invest** in H_2 storage and transport, address grid congestion issues

5. **Include aviation targets** to climate action plans to enhance Ireland's position as a renewable fuel aviation hub.

6. **Collaboration between public and private sector** is critical to mobilize the required investments

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