



SUSTAINABLE AVIATION FUEL DEVELOPMENT IN KAZAKHSTAN
21ST JUNE 2024



European Bank
for Reconstruction and Development



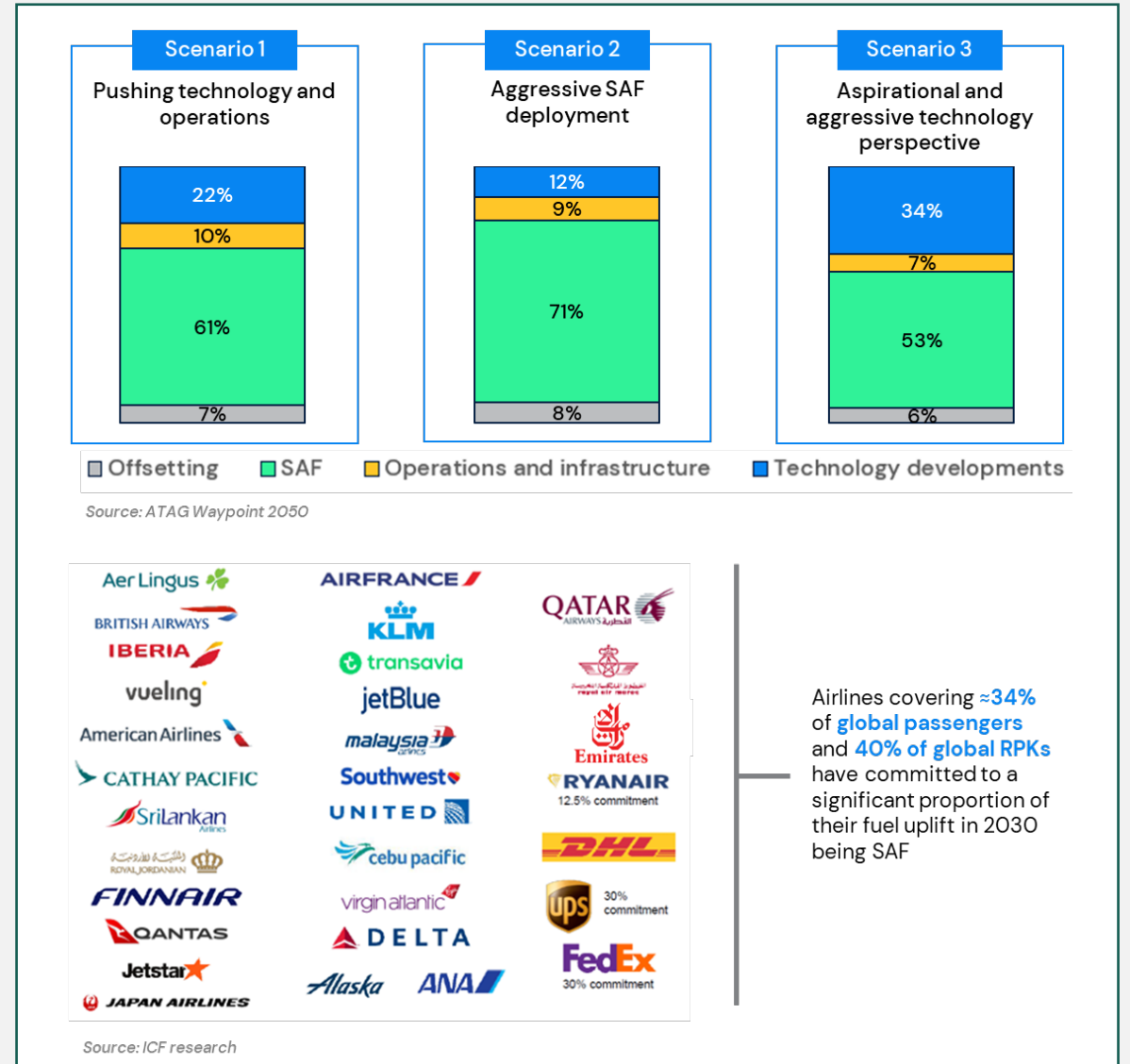
SCOPE AND STAKEHOLDERS INVOLVED

- Decarbonisation strategies:
 - Explore decarbonisation targets for the aviation sector
 - Present the global SAF landscape
 - Compare current targets in Kazakhstan with the relevant benchmarks and provide recommendations for increased ambition
- SAF market analysis
 - Demand and supply analysis
 - Feedstock availability
- SAF project definition
 - Technology overview
 - Technoeconomic assessment and pathway selection
 - Project definition
- Offtake and regulation
 - Develop a SAF offtake template
 - Suggest regulatory reforms to develop SAF



SAF MARKET DRIVERS – AVIATION SECTOR

- Aviation industry accounts for about 3% of global greenhouse gas emissions, and this share could rise to 22% by 2050 if no decarbonisation actions are taken due to the industry growth and the decarbonisation of the other sectors.
- Among the solutions available, SAF is the most important lever for decarbonising aviation.
- Despite the collective acknowledgment of SAF's pivotal role in decarbonising the sector, production volumes are currently insufficient to represent significant levels of carbon abatement: current production is less than 0.5 Mtpa compared to a market size of ~400 Mtpa.
- Airlines covering 40% of the global revenue passenger-kilometer have voluntarily committed to at least 10% SAF by 2030.





SAF MARKET DRIVERS – REGULATION



Canada

Federal Clean Fuel Standard, mandate in British Columbia, and C-SAF roadmap.



ICAO | UN Specialised agency

2022: Established long-term goal of net-zero carbon emission by 2050, supported through CORSIA.
2023 (CAAF/3): Adopted short-term goal aiming to reduce carbon intensity by 5% by 2030.



Int. Air Transport Association

Representing 290 airlines, IATA committed for global air transportation to achieve net-zero emissions by 2050.



Finland

Target of 30% SAF by 2030, with mandate for 0.5% blend from 2020



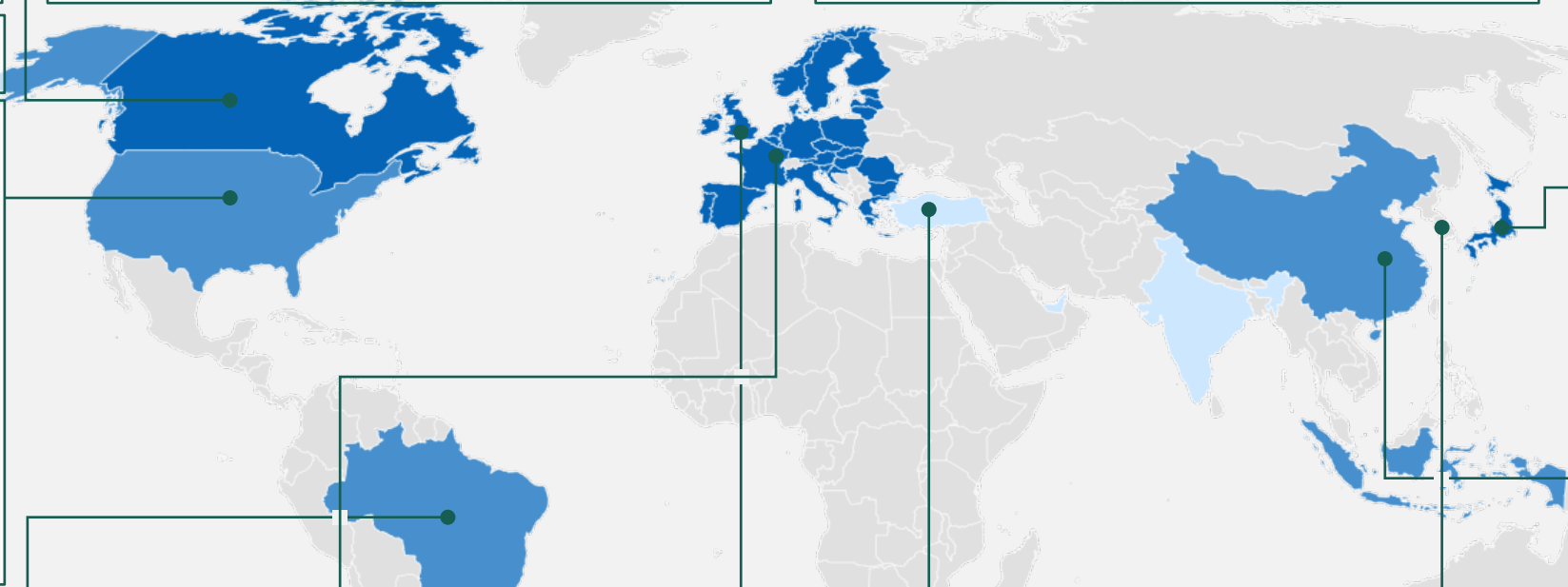
United States

- Renewable Fuel Standard (RFS)
- Blenders tax Credit (BTC)
- Clean Fuel production Credit
- CCS Credits
- Inflation Reduction Act (IRA)
- California, Oregon and Washington incentives & Clean Fuel programs



Japan

Announced 10% SAF target by 2030, some initial trial flights and production.



China

Target of c. 0.05 MT SAF in 2030, ongoing discussion to extend the ETS to aviation



Brazil

SAF facility plans, SAF mandate to reduce 1% emissions by 2027



The EU

EU ETS, Fit for 55: ReFuelEU mandate for SAF (6% by 2030, 70% by 2050)



The UK

RTFO guidance, UK ETS, Mandate for 10% SAF by 2030



Turkey

Mandate for 5% SAF by 2030 in discussion



S. Korea

Several facilities announced, plus offtake by KAL



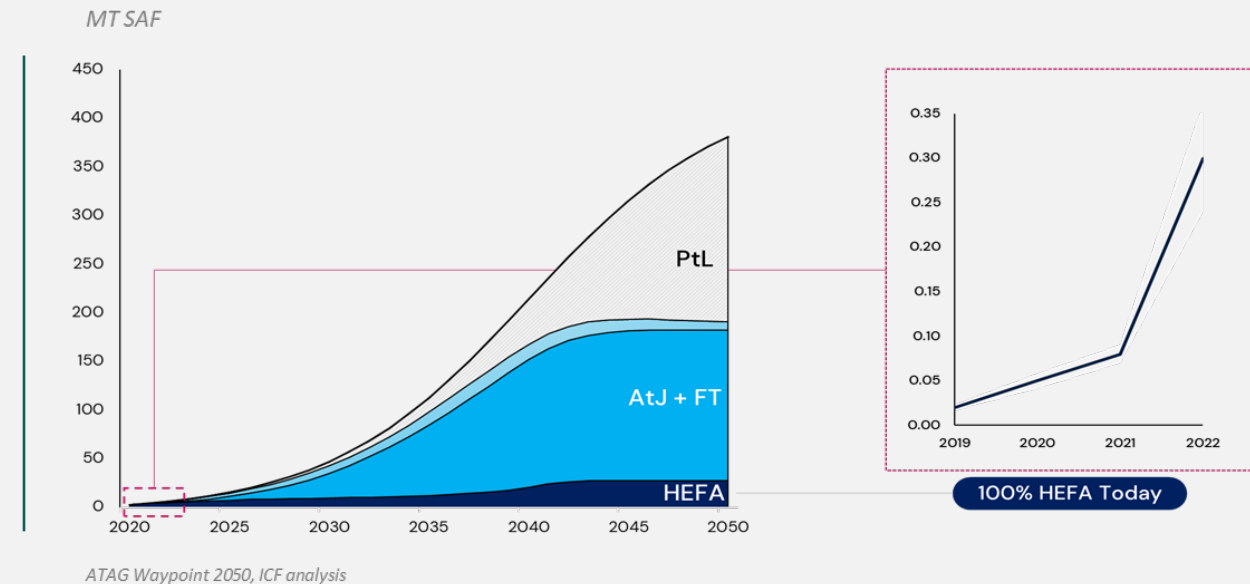
Australia

Jet Net Zero council established, first facility announced



SAF MARKET DRIVERS – FUEL PRODUCERS

- There is a significant increase in the volume of SAF production capacity expected to come online in the near term. Most of this will be produced via the HEFA pathway, although a small number of facilities using other pathways have recently started production, such as Fulcrum Sierra (FT-SPK), LanzaJet Freedom Pines (AtJ) and Velocys Immingham (FT-SPK).
- UK and EU have strict regulations for the feedstock, which only allows using waste liquid lipids (used cooking oil and animal fat category 1 and 2) for SAF production. However, ICAO's CORSIA Eligible Fuel criteria allow utilisation of crop-based feedstock for SAF production. This resulted in large scale HEFA projects across the world, including the US, which are expected to utilise soybean oil, rapeseed oil and other food and energy crops.
- It is expected that HEFA capacity will plateau in 2030s, while AtJ and FT SAF supply increasing substantially.





SAF MARKET DRIVERS IN KAZAKHSTAN

KazMunayGas

- In 2021, KMG adopted a Development Strategy and Low-Carbon Development Programme for 2022–2031. The main targets are:
 - **15% reduction** of direct and indirect CO₂ emissions by 2031 from 2019 levels.
 - At least **10% reduction in carbon intensity** and energy intensity of production.
 - Implementation of renewable energy projects with total installed capacity of at least 300 MW.
 - 15% share of renewable energy in KMG's electricity balance.

Air Astana












- AA has developed a Low-Carbon Development Programme (LCDP) for 2023–2032. This includes:
 - Investing in fuel-efficient aircraft
 - Optimising flight routes
 - Implementing sustainable practices
 - Reducing waste and single-use plastics
 - Resource conservation, such as energy
 - AA is currently compliant with CORSIA¹.
- During 2024, the AA plans to update its LCDP and consider a commitment to **net zero by 2050**, accompanied by near-term targets for the next five years (science-based targets - SBTi).
- In line with the recent Association of Asia Pacific Airlines resolution, the Group has also set a target of achieving a collective **5% SAF blending by 2030**².

¹ Carbon Offsetting and Reduction Scheme for International Aviation (includes all international flights between signatory nations).

² Subject to SAF availability on the market.



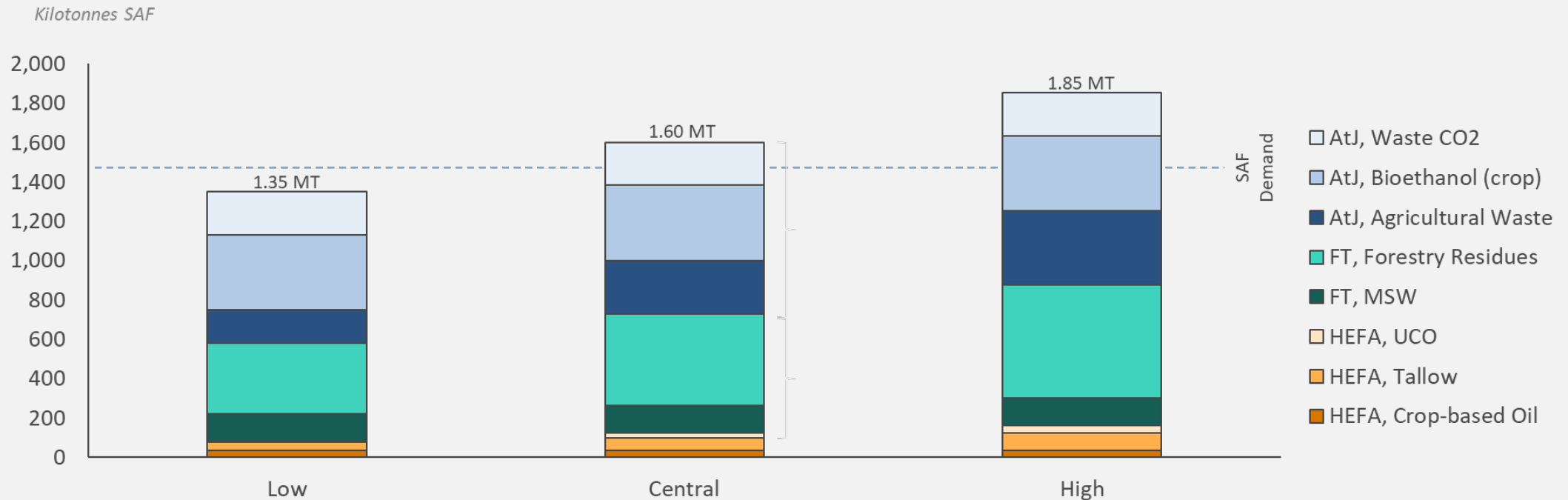
SEVERAL APPROVED ROUTES ARE AVAILABLE

Pathway	Feedstock	Max. Blending Limit
FT-SPK	Biomass (e.g. trash/rubbish, forestry residues, grasses)	 50%
HEFA-SPK	Waste lipids & fats (e.g. UCO, tallow, DCO)	 50%
HFS-SIP	Sugars to hydrocarbon (e.g. molasses, sugar beet, corn dextrose)	 10%
FT-SKA	Same feedstock as FT-SPK, but slightly different process	 50%
ATJ-SPK	Agricultural waste (e.g. forestry slash, crop straws)	 50%
CH-HK (CHJ)	Plant and animal fats, oils and greases (FOGs)	 50%
ATJ-SKA	ATJ derivative starting with the mixed alcohols	 50%
HC-HEFA-SPK	Bio-derived hydrocarbons, fatty acid esters, algae	 10%
Co-processed HEFA*	Fats, oils, and greases (FOG) co-processed with petroleum	 5%
Co-processed FT*	Fischer-Tropsch hydrocarbons co-processed with petroleum	 5%
Co-processed Biomass	Co-hydroprocessing of biomass	 5%



FEEDSTOCK AVAILABILITY DRIVES TECHNOLOGY SELECTION

- Based on the feedstock availability, it is estimated that 1.35 to 1.85 million tonnes SAF could be produced in KZ. This estimation is based on a bespoke feedstock assessment, and considers sustainability and availability for the aviation sector.
- The available feedstock would allow to achieve 65% SAF utilisation by 2050, corresponding to ~1.4 million tonnes SAF.



SAF PRODUCTION TECHNOLOGY SELECTION



							<u>Must have criteria</u>	
		SAF Yield	Consumer Proximity	Technology Readiness Level (TRL)	CAPEX	Production Cost	Feedstock Availability	ASTM-approved
HEFA	Co-processing	High	Far	High	Low	Low	Low	✓
	Stand-Alone	High	Close	High	Low	Low	Low	✓
AtJ	Co-processing	High	Far	Low	Mid	Mid	High	X
	Stand-Alone	High	Close	Mid	Mid	Mid	High	✓
	Waste CO ₂ Capture	High	Close	Low to Mid	High to Mid	High to Mid	High	✓
FT	Gasification	Low	Close	Low	High	High	High	✓

SAF PRODUCTION TECHNOLOGY SELECTION



							<u>Must have criteria</u>	
		SAF Yield	Consumer Proximity	Technology Readiness Level (TRL)	CAPEX	Production Cost	Feedstock Availability	ASTM-approved
HEFA	Co-processing	High	Far	High	Low	Low	Low	✓
	Stand-Alone	High	Close	High	Low	Low	Low	✓
AtJ	Co-processing	High	Far	Low	Mid	Mid	High	X
	Stand-Alone	High	Close	Mid	Mid	Mid	High	✓
	Waste CO ₂ Capture	High	Close	Low to Mid	High to Mid	High to Mid	High	✓
FT	Gasification	Low	Close	Low	High	High	High	✓

KAZAKHSTAN SAF DEVELOPMENT RECOMMENDATIONS



Agree on the ambition through public private collaboration

Establish a national SAF committee across the SAF value chain and use this to develop a national SAF target. Analysis showed that 4% SAF by 2030 and 65% SAF by 2050 is feasible in KZ.



Develop the regulatory framework

Policy support is key for scaling up SAF, especially at the early stages. Explore and assess potential such as incentives and/or mandates to support scaling up of SAF in KZ.



Establish Kazakhstan SAF Roadmap feedstock supply chain

KZ has the potential to produce up to 1.8 million tonnes of SAF through domestic feedstock. Invest in developing the national supply chain for collection of these feedstocks, and work towards increasing availability.



Kick-start SAF production

Focus on the first SAF facility.

Alcohol to jet seems to have potential thanks to the existing the existing bioethanol industry.



Scale up supply with new technologies

Achieving aviation decarbonisation in KZ will require 1.4 Mt SAF by 2050. This requires the penetration of advanced SAF production technologies, but at a later stage than rest of the world, enabling cost advantage.

THANK YOU



For further information please contact:

ROBERTO GONZALEZ

Principal, Energy Transition

Climate Strategy and Delivery

gonzaler@ebrd.com