

Sustainable aviation fuel: financing the scale-up

Civil Aviation Legal Advisors Forum

London, 26 November 2024



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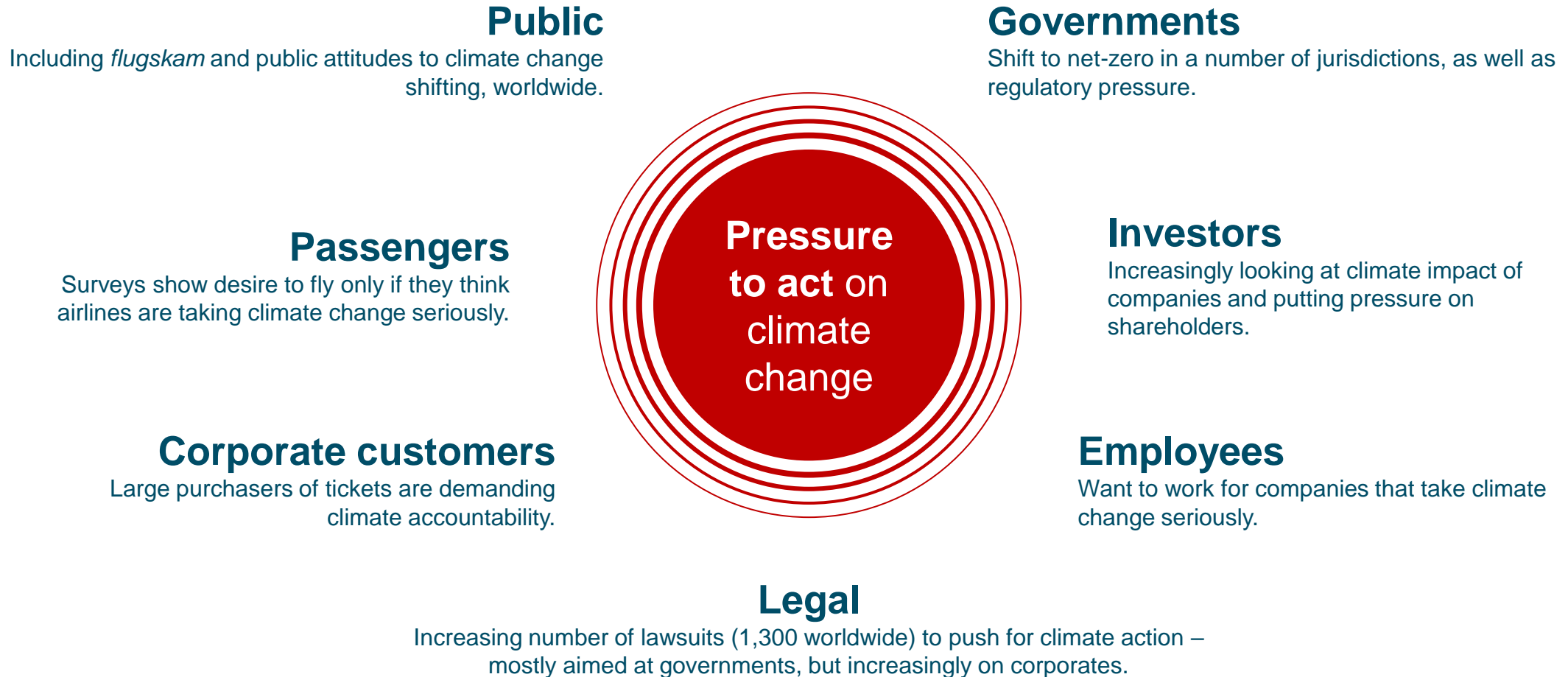


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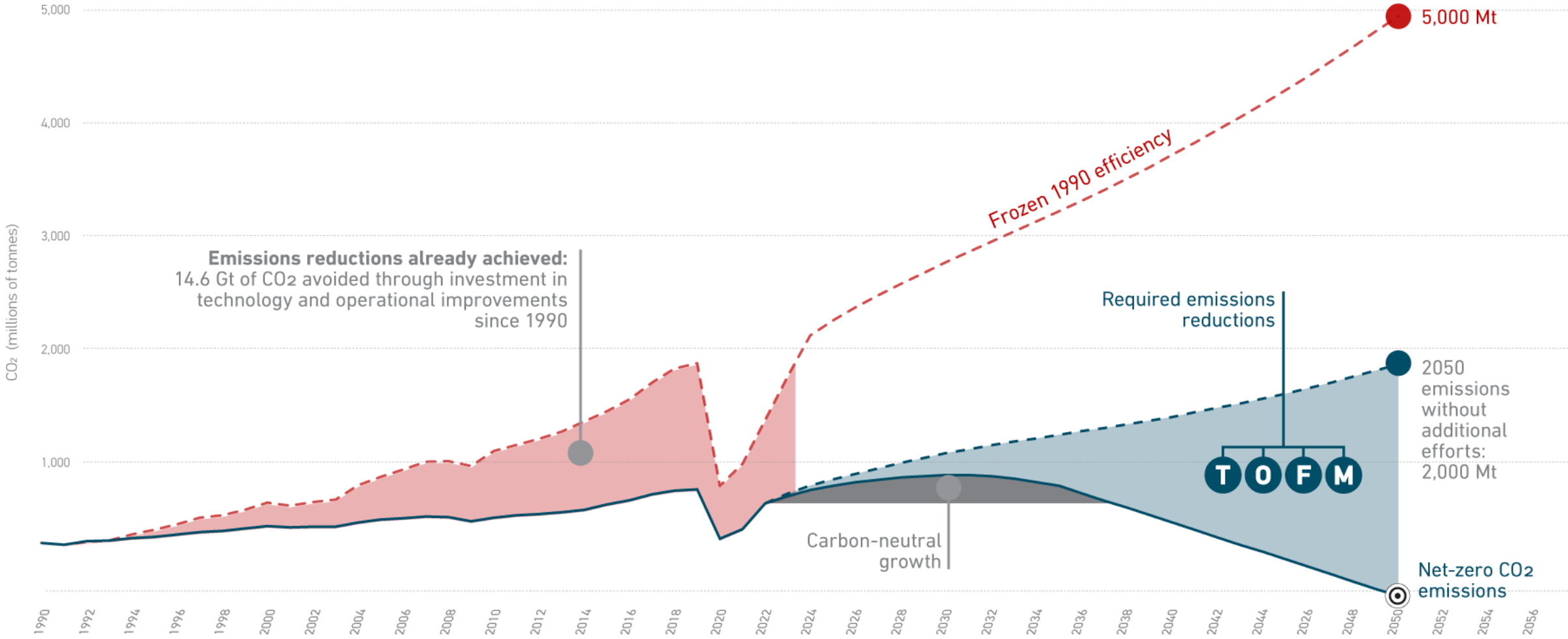
15 additional members including: AACO, A4E, AIRE, ALTA, Comac, ERA, FNAM, Genève Aéroport, IARO, ICC, ICCAIA, PATA, Paris Aéroport, ROMATSA and WTTC.



Pressure on climate impact from across stakeholder spectrum



Charting a course for 2050: net-zero globally



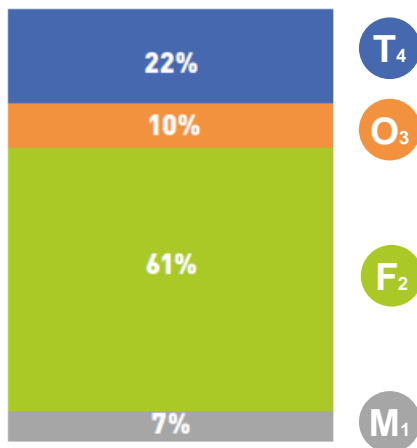
Meeting the industry goal by exploring different levers

Scenario 1

Pushing technology and operations

Industry prioritises technology and operational improvements

Emissions reduction contributions in 2050



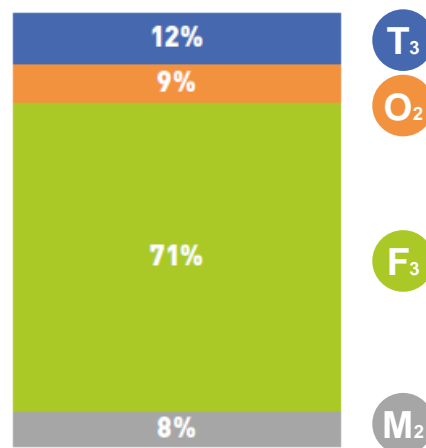
Electric and hybrid short-range (<100 seat) aircraft from 2035/2040. High-range operational improvements. 380 Mt of SAF by 2050.

Scenario 2

Aggressive sustainable aviation fuel deployment

Industry prioritises investment in sustainable aviation fuel over technology

Emissions reduction contributions in 2050



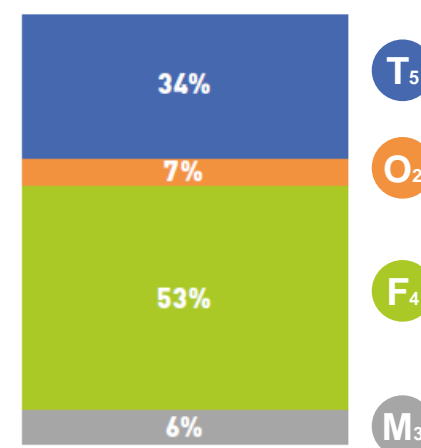
New airframe configurations such as blended wing body. Mid-range operational improvements. 445 Mt of SAF by 2050.

Scenario 3

Aspirational and aggressive technology perspective

Highly ambitious technology developments: electric and/or hydrogen for up to 200 seat aircraft before 2035

Emissions reduction contributions in 2050



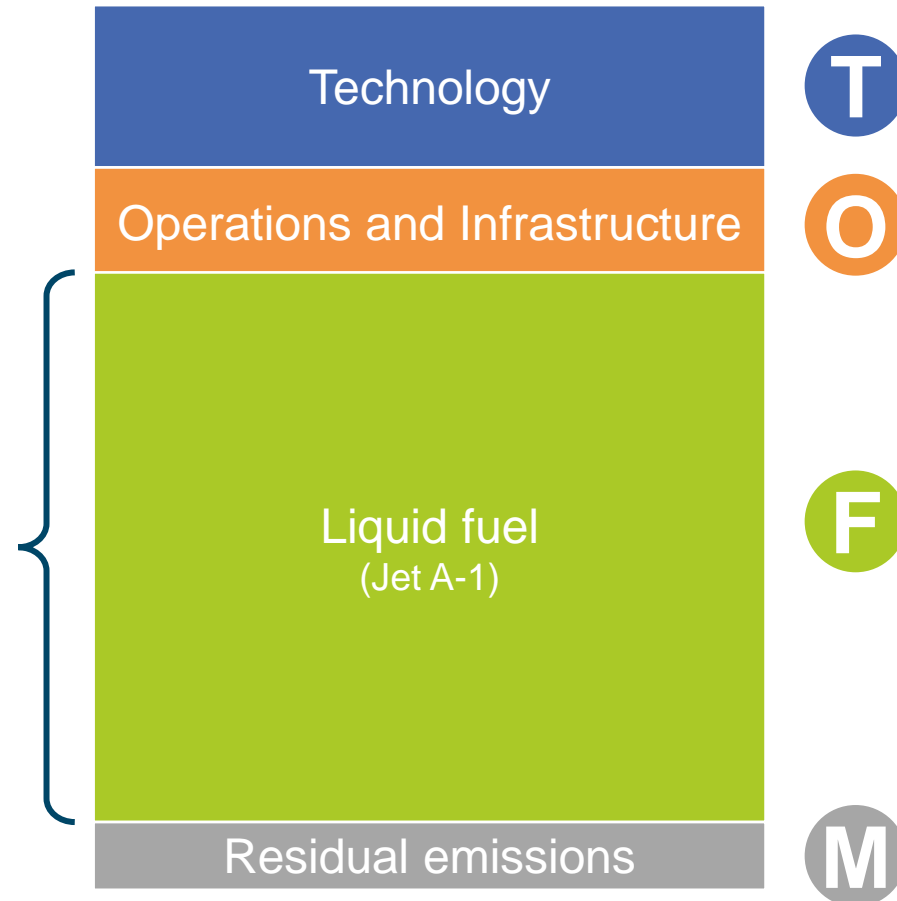
Very aggressive zero emissions aircraft (electric, hydrogen) by 2035-2040. Mid-range operational improvements. 330 Mt of SAF by 2050.

Indicative overview of where CO₂ measures could be deployed

	2020	2025	2030	2035	2040	2045	2050	
Commuter » 9-50 seats » <60 minute flights » <1% of industry CO ₂	SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	~27% of CO ₂ emissions
Regional » 50-100 seats » 30-90 minute flights » ~3% of industry CO ₂	SAF	SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	Electric or hydrogen fuel cell and/or SAF	
Short-haul » 100-150 seats » 45-120 minute flights » ~24% of industry CO ₂	SAF	SAF	SAF	SAF potentially some hydrogen	Hydrogen and/or SAF	Hydrogen and/or SAF	Hydrogen and/or SAF	
Medium-haul » 100-250 seats » 60-150 minute flights » ~43% of industry CO ₂	SAF	SAF	SAF	SAF	SAF	SAF	SAF potentially some hydrogen	~73% of CO ₂
Long-haul » 250+ seats » 150 minute + flights » ~30% of industry CO ₂	SAF	SAF	SAF	SAF	SAF	SAF	SAF	

How SAF fits in to the overall decarbonisation roadmap

380Mt – 490Mt+
of SAF per year in 2050 (depending
on the lifecycle carbon and other
demand factors)



Airlines also making longer-term commitments: 5%+ SAF by 2030

5%



10%



50
airlines

RYANAIR
12.5% commitment

SAS
25% "in the 2030s"

norwegian
28% commitment

36%
Global
passengers

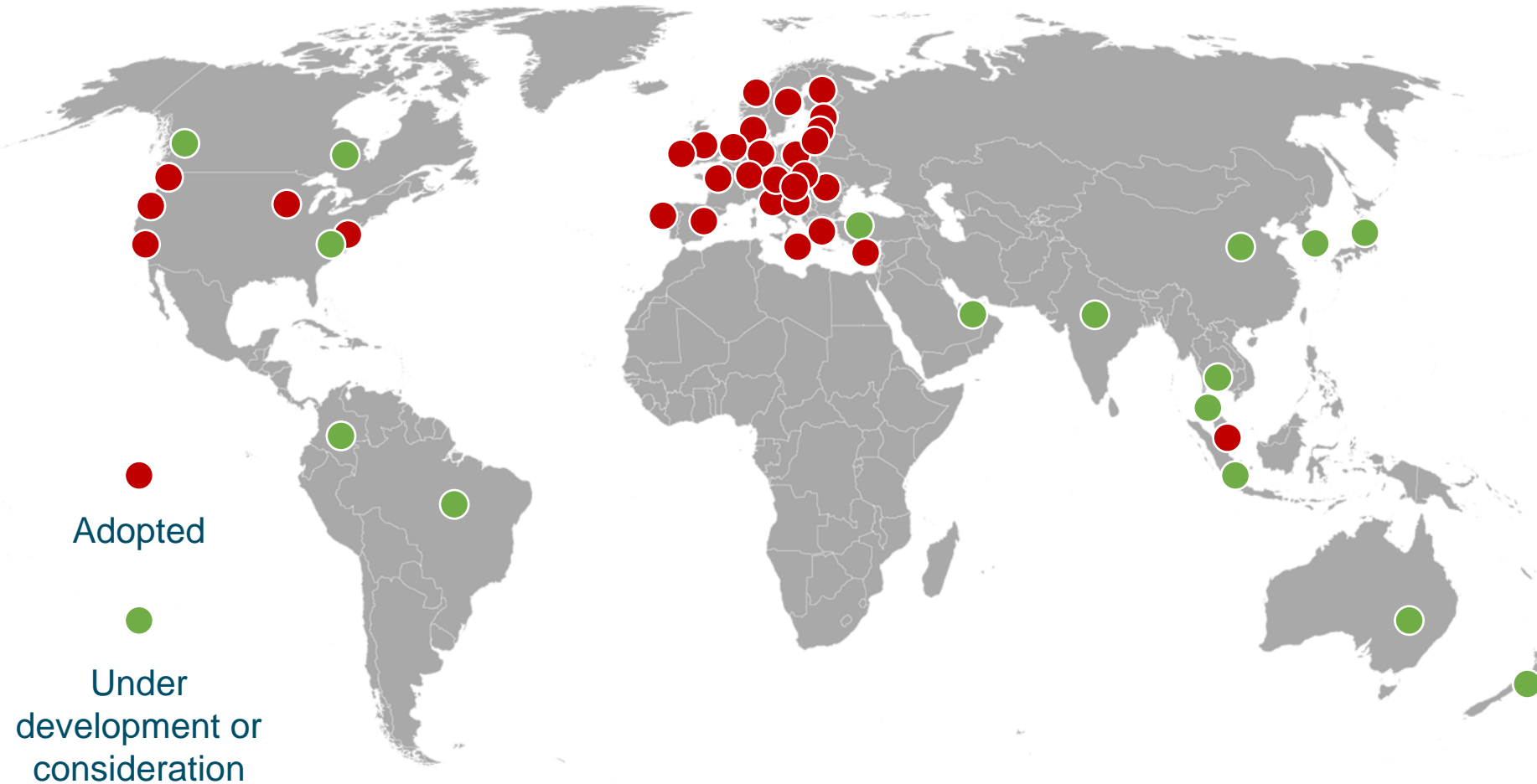
DHL
30% commitment

ups
30% commitment

41%
Global
RTKs

FedEx
30% commitment

Government policy: global picture



Around 45 countries covering over 65% of global jet fuel use are implementing or considering SAF policy options.

From those with detailed policy measures, over **20Mt of SAF** would likely be required in 2030.

Government regulations: 2030 blend policy (or equivalent)

Policy announced

	Blend	Mt SAF needed
United States	10%	9.08 Mt
European Union	6%	3.58 Mt
Norway	6% (30%*)	.06 Mt (0.3 Mt*)
UK	10%	1.2 Mt
Brazil	3%*	.145 Mt
Singapore	3-5%	.68 Mt
Japan	10%*	1.365 Mt
Canada (BC only)	10%*	.1 Mt

Policy in discussion

	Blend	Mt SAF needed
China		~3 Mt*
Türkiye	5%*	.5 Mt
UAE	1% (2031)	.5 Mt
South Korea	1%*	.076 Mt
India	5%*	.4 Mt
Indonesia	2.5%*	.1 Mt
Malaysia	1%*	.05 Mt
Thailand	1%*	.07 Mt
Total (both columns)		20.9 Mt

Mt of SAF required is an estimate based on traffic forecasts. **USA:** Grand challenge objective of 3 billion gallons in 2030. **Norway:** assume alignment with ReFuel EU, although could aim for higher (30% is current goal). **Brazil:** 3% emissions reduction requirement on domestic only, rising to 10% in 2037. **China:** Indication of 10% 2035 feasibility study (~6.5 Mt in 2035 – assume ramp-up). **UAE:** Target of 700 million litres being delivered by 2030. **Canada:** blend mandate out of British Columbia only, very rough estimation of fuel uplift proportion from Vancouver vs other major Canadian airports. **Japan:** International flights only. **India:** International flights only. **Malaysia:** 1% expected from 2027, 2030 could be higher. **Thailand:** 1% expected from 2027, 2030 could be higher. **South Korea:** 1% SAF blend mandate on international flights from 2027. **Indonesia:** 1% SAF on international flights from 2027, rising to 2.5% in 2030.

Demand-side SAF requirements



Over 40 countries with SAF blend mandates (or equivalent) in force or in progress.

~20Mt SAF



ICAO Vision from CAAF/3 of 5% carbon reduction from the use of SAF and LCAF.

~23Mt SAF
(14Mt if int'l only)

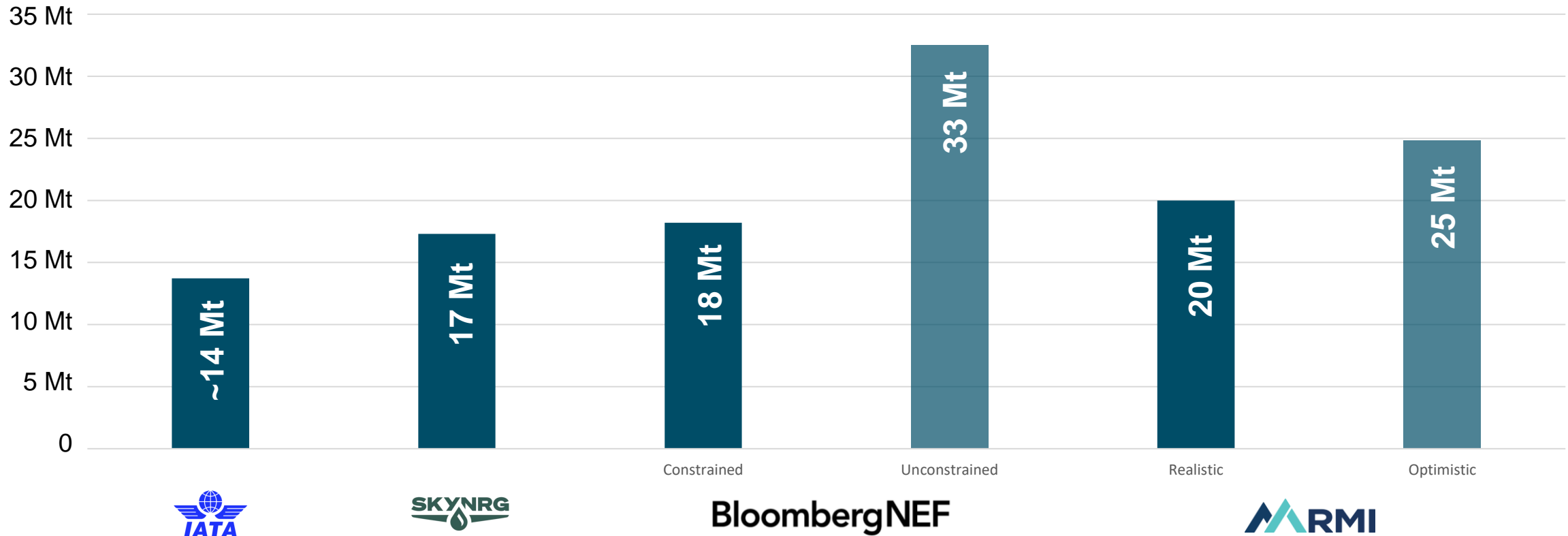


50 airline voluntary commitments of 5%-30% of their fuel uplift being SAF.

~12Mt SAF*

* SkyNRG analysis, a number of these are in addition to any blend mandate fulfilment.

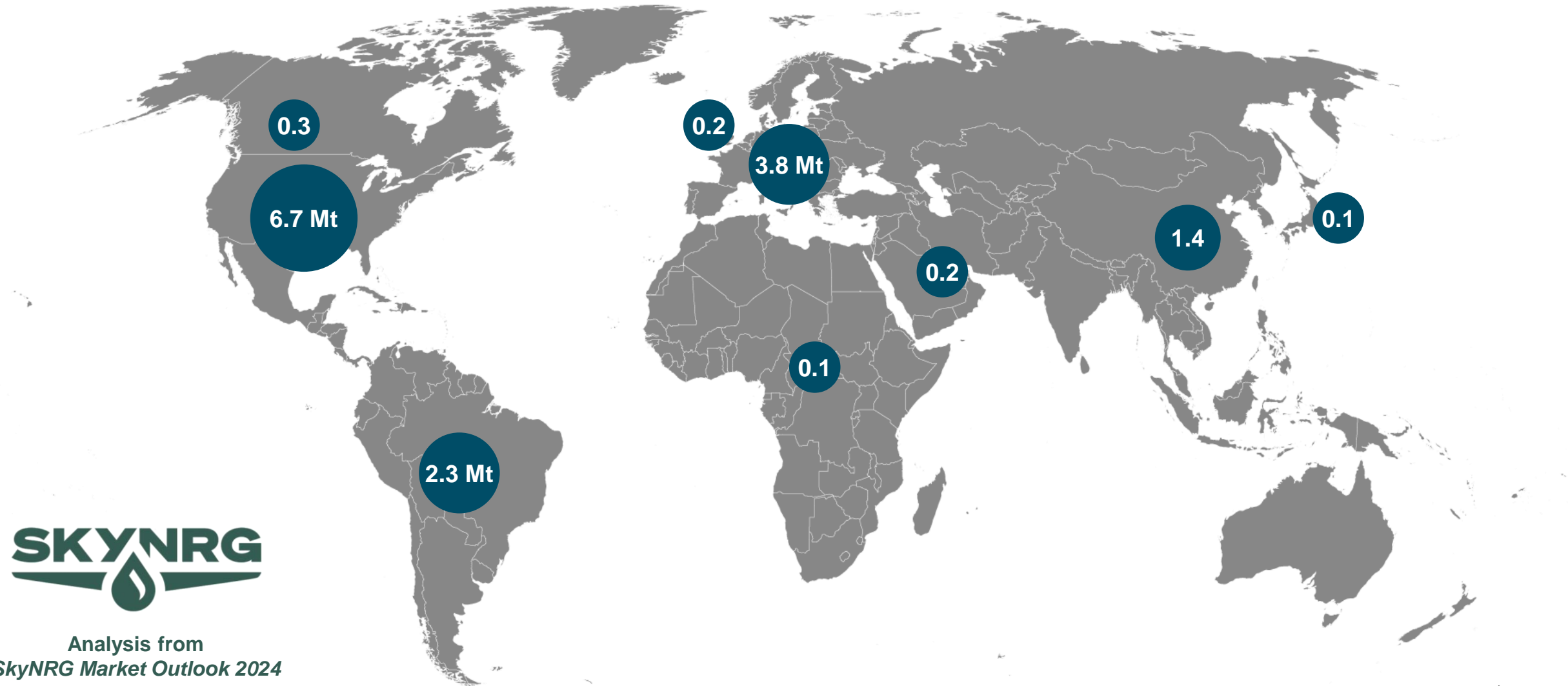
Supply-side 2030 SAF production expectations



Several estimates of 2030 production: **~17-20Mt of SAF most realistic**

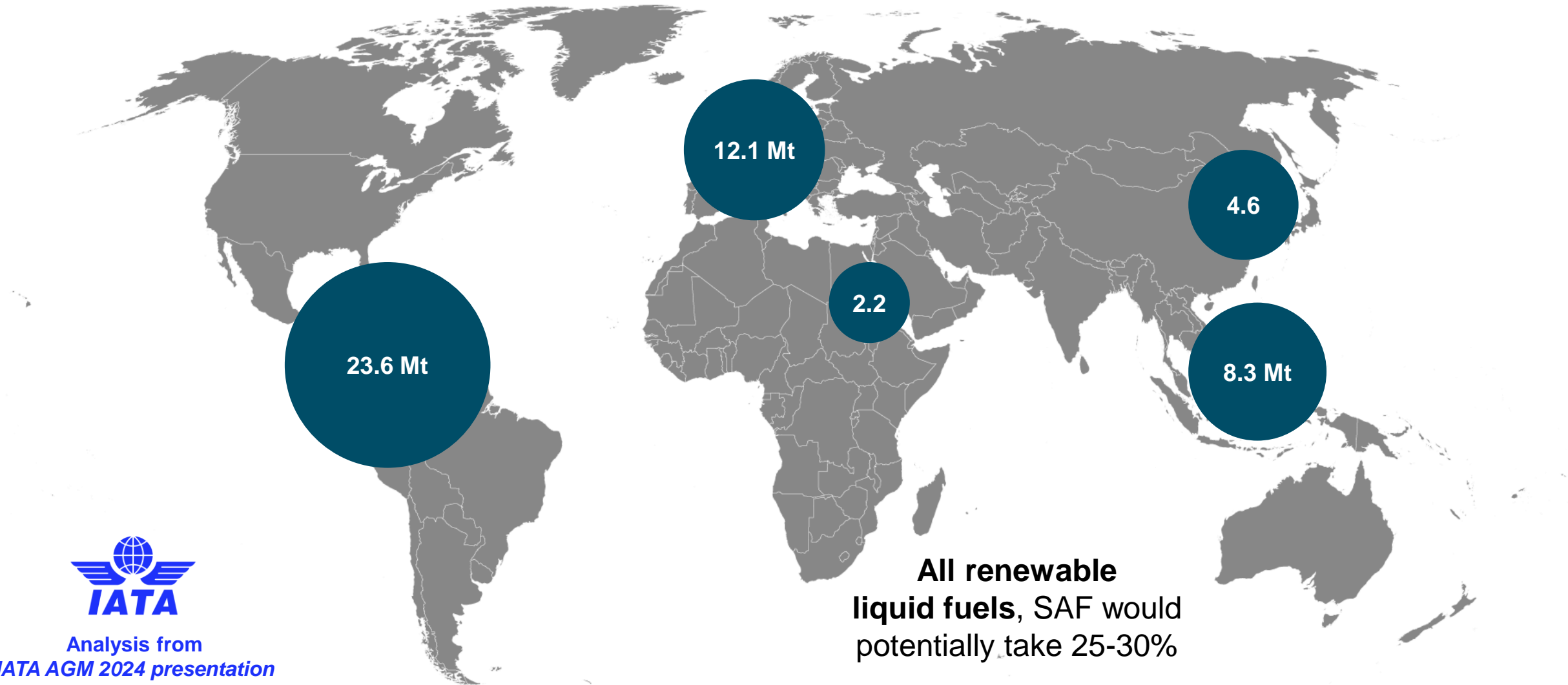
** Note that the IATA estimate shown is for 25-30% of all renewable capacity. The the BloombergNEF 'unconstrained' and RMI 'optimistic' estimates are for all announced plants – these have not weighted which plants will not make FID and therefore into production.*

Supply-side SAF expectations: 2030 production locations



Analysis from
SkyNRG Market Outlook 2024

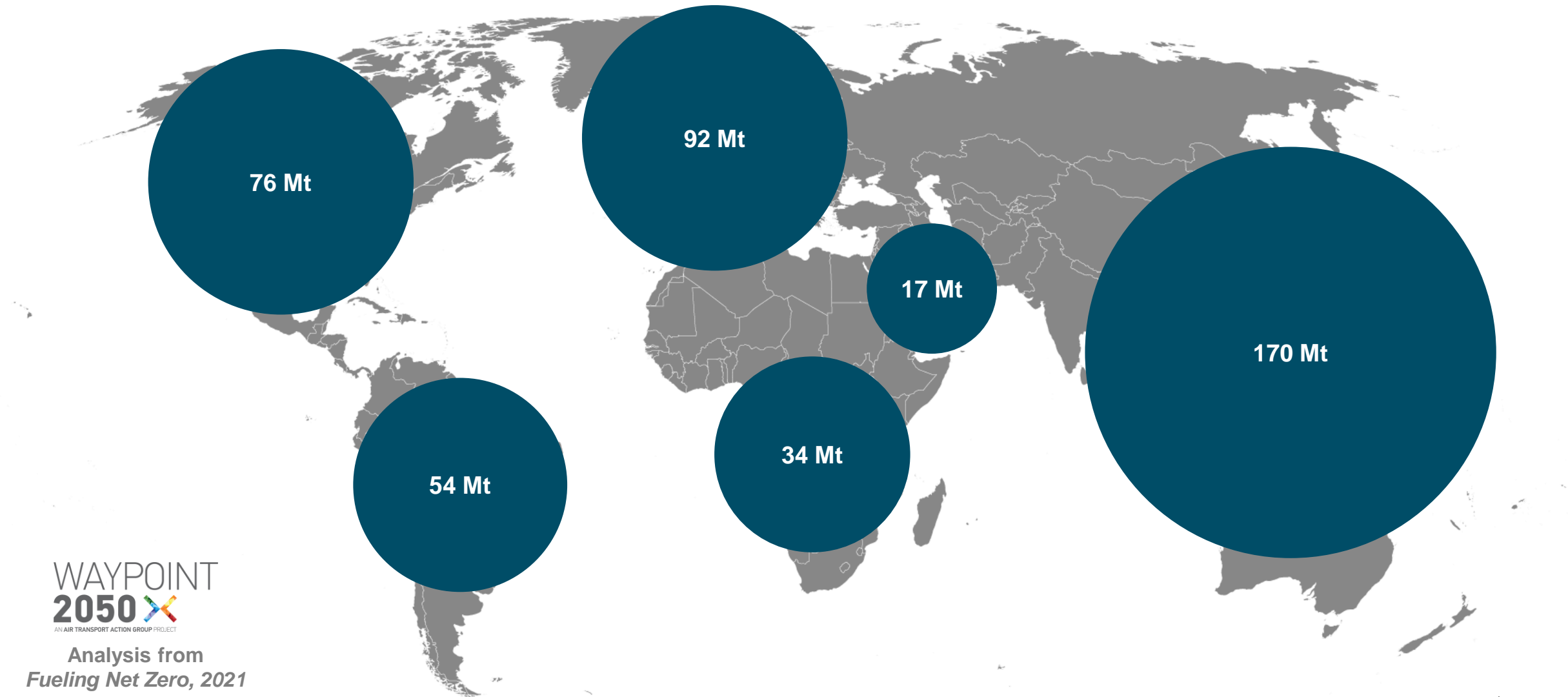
Supply-side SAF expectations: 2030 production locations



Analysis from
IATA AGM 2024 presentation

**All renewable
liquid fuels, SAF would
potentially take 25-30%**

Supply-side SAF: 2050 production need/potential



Sustainable aviation fuel: financing the scale-up

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