Energy Transitions Commission

WORLD ECONOMIC FORUM

Clean Skies for Tomorrow

MISSION POSSIBLE PARTNERSHIP

Sustainable Aviation Fuel Policy Toolkit

Brazil - ProBioQAV

November 2021

AGENDA

SAF POLICY TOOLKIT @ ETC COMISSIONERS MEETING

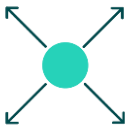
1. CST OVERVIEW
2. WHAT IS THE POLICY TOOLKIT
3. WHAT IS IN THE TOOLKIT
    - THE NEED FOR POLICY INTERVENTIONS
    - SAF STRATEGY GUIDANCE
    - POLICY FRAMEWORK TO SCALE SAF

Clean Skies for Tomorrow – Project Overview

CST is a global, cross-value-chain coalition working to facilitate the transition to net-zero flying by mid-century. In partnership with ambitious senior leadership from industry, government, and civil society, the initiative is driving a shift to zero-emissions aviation through a focus on Sustainable Aviation Fuels (SAF).

Members are collectively advancing the commercial scale of viable SAF production for broad adoption through supply, demand, policy, and financial levers.

Net-Zero Strategy



Democratize Global SAF Supply

Industry-backed Policy

Scaling demand signals

Financing the transition

ETC

CST Coalition

Steering Committee

air bp, AIRBUS, BOEING, DELTA, Deutsche Post DHL Group, Dubai Airports, Emirates, Heathrow, IAG International Airlines Group, KLM Royal Dutch Airlines, Lufthansa, NESTE, Rolls-Royce, Schiphol Group, Shell, SkyNRG, SpiceJet, UNITED

Secretariat

World Economic Forum, Energy Transitions Commission, McKinsey & Company, RMI

Knowledge Partners

pwc, Whittle Laboratory, EDF Environmental Defense Fund, European Climate Foundation, World Resources Institute

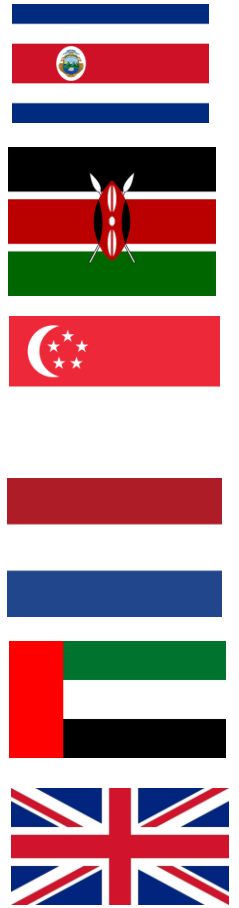
Advisory Partners

ACI Airports Council International, ATAG Air Transport Action Group, IATA, ICAO, OACI, UNFCCC

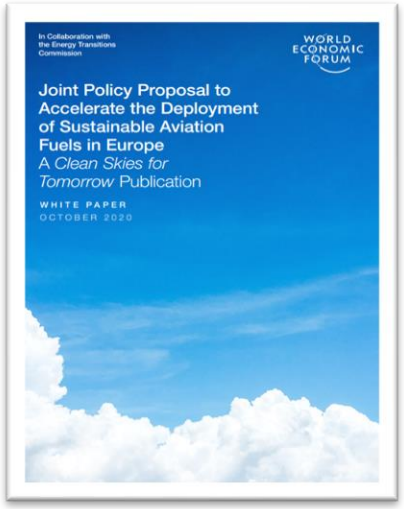
Community

salesforce, BCG, Cathay Pacific, SFO San Francisco International Airport, Changi airport group, Qantas, Groupe ADP, Alaska Airlines, Google, Port of Seattle, Dassault Falcon Jet, Etihad Airways, Fulcrum BioEnergy, easyJet, Red Rock Biofuels, Ryanair, Hong Kong International Airport, Singapore Airlines, Southwest, eni, Velocys, Microsoft, jetBlue, The Nature Conservancy, LanzaTech, BlackRock, Gulfstream, Corporación América Airports, world energy, aef Aviation Environment Federation, Caphenia

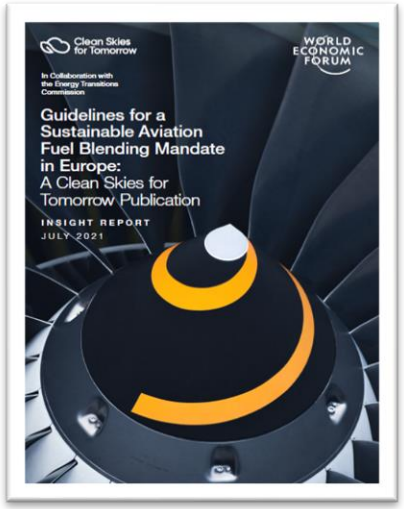
SAF Ambassador Community



CST/ETC Publications – Policy Workstream



October 2020



July 2021

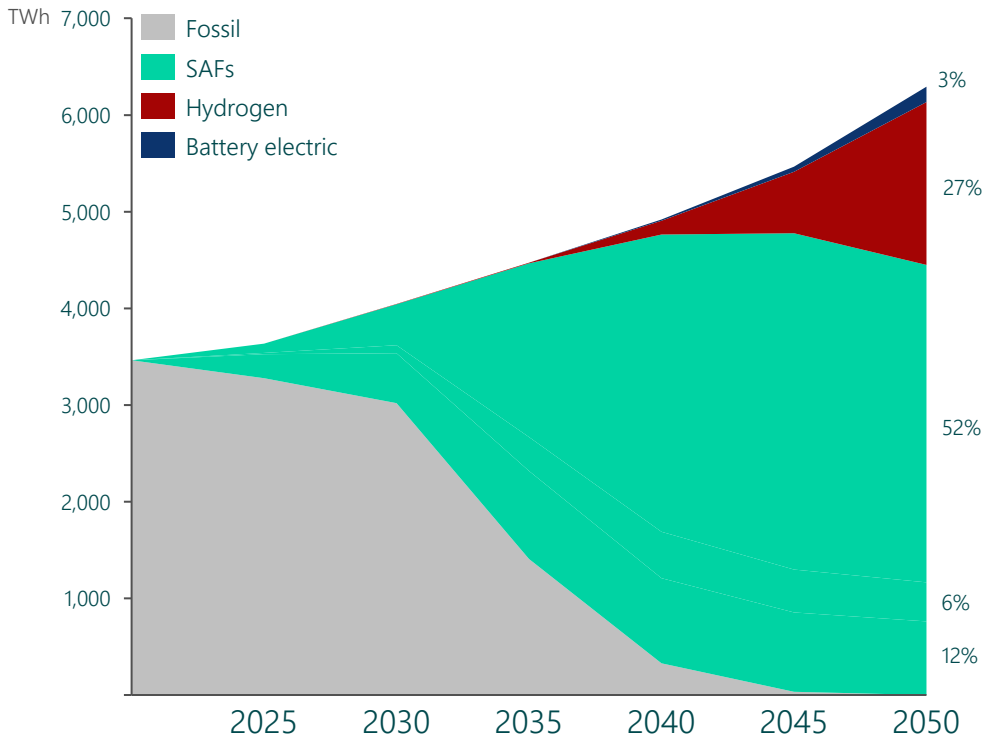
November 2021

SAF Policy Toolkit is an indicative **"menu of options" for policy-makers** worldwide to support the scaling of sustainable SAF markets across regions.

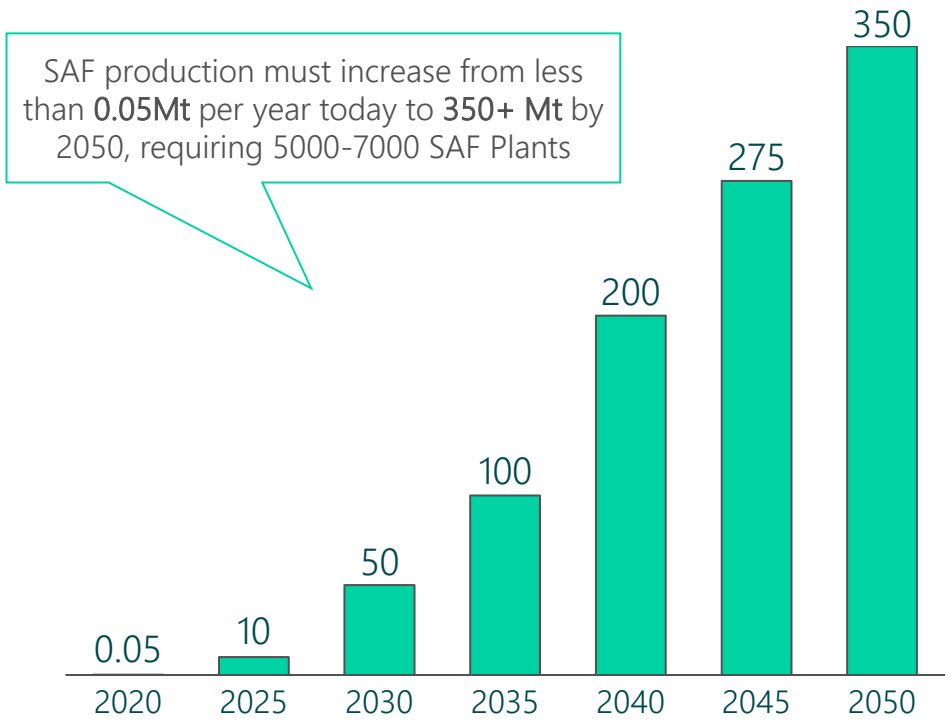
- Why SAF policy is needed
- Critical actions before pursuing specific policies
- Decision pathway for policy options available

SAFs need to account for ~70% of total jet fuel consumption in 2050 in net-zero scenarios

MPP ATS - Climate ambition pathway to net zero[1]



SAF ramp up required for net-zero alignment globally

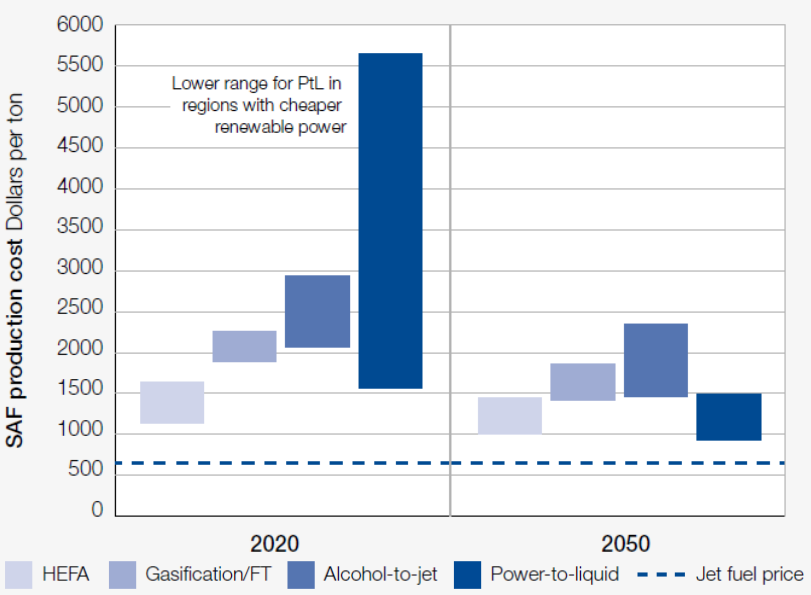


1. WORK IN PROGRESS
SOURCES: MPP AVIATION TRANSITION STRATEGY AND ATAG WAYPOINT 2050, 2021

Scaled SAF deployment is currently held back by major barriers and policy interventions will be required to unlock supply and demand at scale

Cost Differential

SAF cost 2 to 4 times or more the price of fossil kerosene depending on the technology. Prices will come down, but not to parity



Supply Chain Investments

A whole new supply chain needs to be built up – e.g. in Europe, investments of €15 billion/year on average required until 2050

Technological Readiness

New scalable production routes (AtJ, G+FT, PtL) are still at low TRL and need to be proven at commercial scale

Level-Playing Field

Uptake of SAF despite cost differential risks of competitive distortions and carbon leakage

SOURCE: CLEAN SKIES FOR TOMORROW: SUSTAINABLE AVIATION FUEL AS A PATHWAY TO NET-ZERO AVIATION, 2021

Before implementing SAF policies, states should first develop a coherent national SAF strategy

Considerations to Inform Policy Direction:

Gather intelligence and establish a fact base

Set a vision for SAF

Create a transition pathway

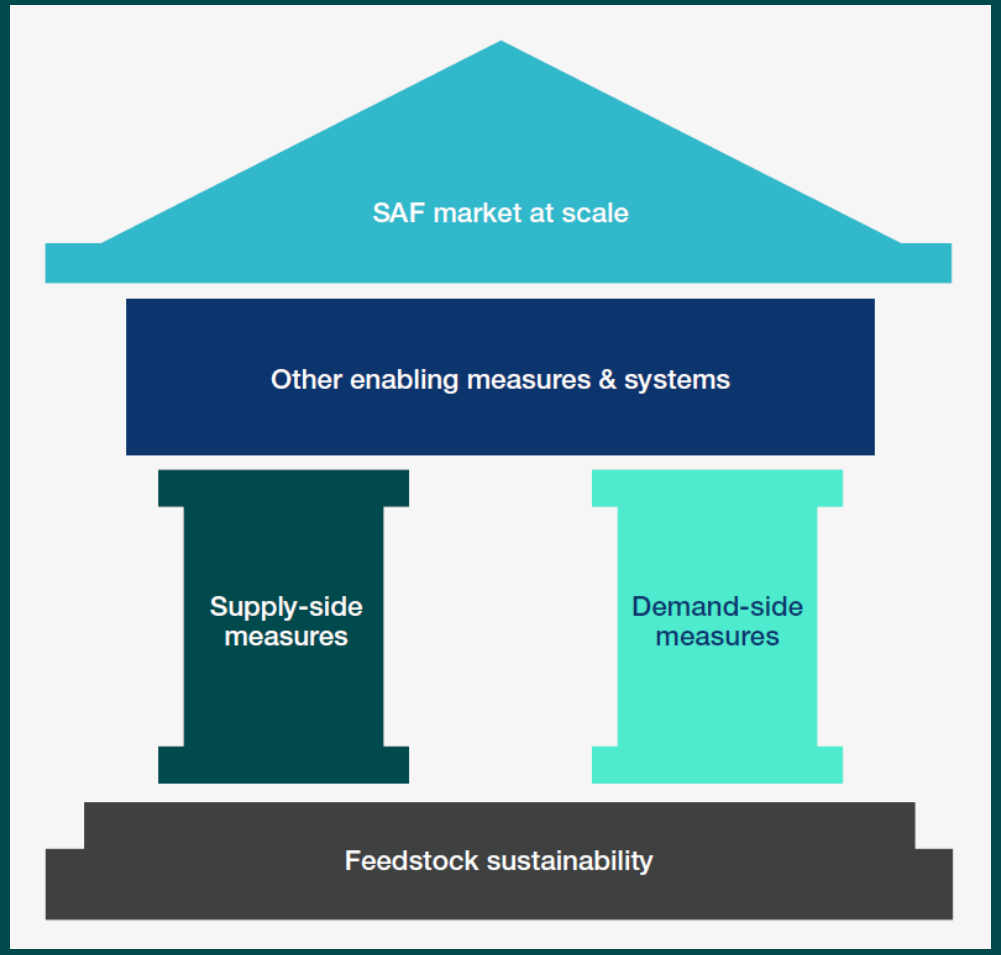
Build flexible and inclusive policy

Manage risks that may arise

Cooperate on national, regional and international level

Example of an SAF study for India - June 2021

A range of policy Supply, Demand and Enabling instruments need to be planned and implemented in a coordinated way.



Overview of regulatory framework for a SAF market at scale

SAF must be produced from sustainable feedstocks that significantly reduce LCA GHG emissions

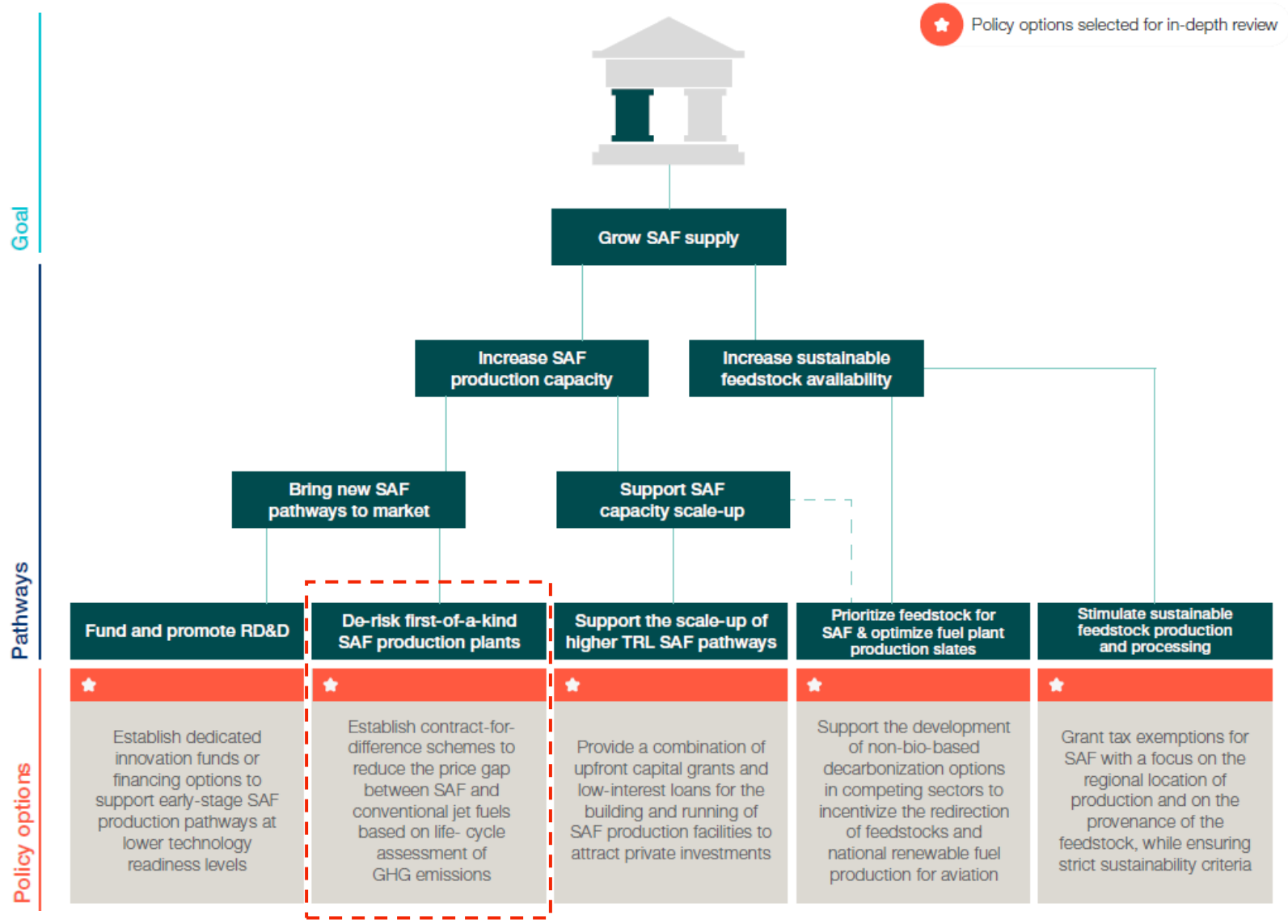
CST guiding principles are outlined as a quick-reference guide for policy-makers

Feedstock type	Feedstock category			Feedstock[vi]	Substantial GHG savings potential[vii]	Low sustainability concerns[viii]
1st gen / crop-based	Edible oil crops			Palm	✗	✗
				Soybean	✗	✗
				Other (incl. sunflower, rapeseed/canola)	✗	✗
	Edible sugars			Sugar cane	◯✓	✗
				Maize	✗	✗
				Other	✗	✗
Advanced and waste	Waste and residue lipids[ii]			Used cooking oil (industrial or private sources)	✓	✓
				Animal waste fat (tallow)	✓	◯✓
				Other (incl. tall oil, technical corn oil, fish oil, POME, PFAD)	✓	◯✓
	Purposely grown energy plants	Oil trees on degraded land		Jatropha, pongamia	✓	◯✓
		Rotational cover crops	Oil cover crops	Camelina, carinata, pennycress	✓	◯✓
			Cellulosic cover crops	Miscanthus, switchgrass, reed cannarygrass	✓	◯✓
	Agricultural residues			Rice straw	✓	✓
				Sugar cane bagasse	✓	✓
				Other (incl. corn stover, cereal residues)	✓	✓
	Forestry residues[iii]				✓	✓
	Wood-processing waste[iv]				✓	✓
	Municipal solid waste[v]				✓	✓
Recycled carbon	Reusable plastic waste				✗	✓
Non-biomass based[i]	Industrial waste gas	CO_2 from point source capture (CCS)			✓	✓
		Other (e.g. flue gas from steel production)			✓	✓
	CO_2 from direct air capture (DAC)				✓	✓

Focus of analysis ✓ Satisfied ◯✓ Potentially satisfied[ix] ✗ Not satisfied

SOURCE: CLEAN SKIES FOR TOMORROW: SUSTAINABLE AVIATION FUEL AS A PATHWAY TO NET-ZERO AVIATION, 2021

The toolkit provides a decision pathway and a range of policy options available



An in-depth review for selected policy options

De-risk first-of-a-kind SAF production plants

Establish contract-for-difference schemes to reduce the price gap between SAF and conventional jet fuels based on life- cycle assessment of GHG emissions

Policy attributes

Supply

Contract for difference

Policy type
Economic

CO_2 reduction impact
High

Impact point
Fuel production

Cost profile
Variable; governments pay

Brief explanation of the policy

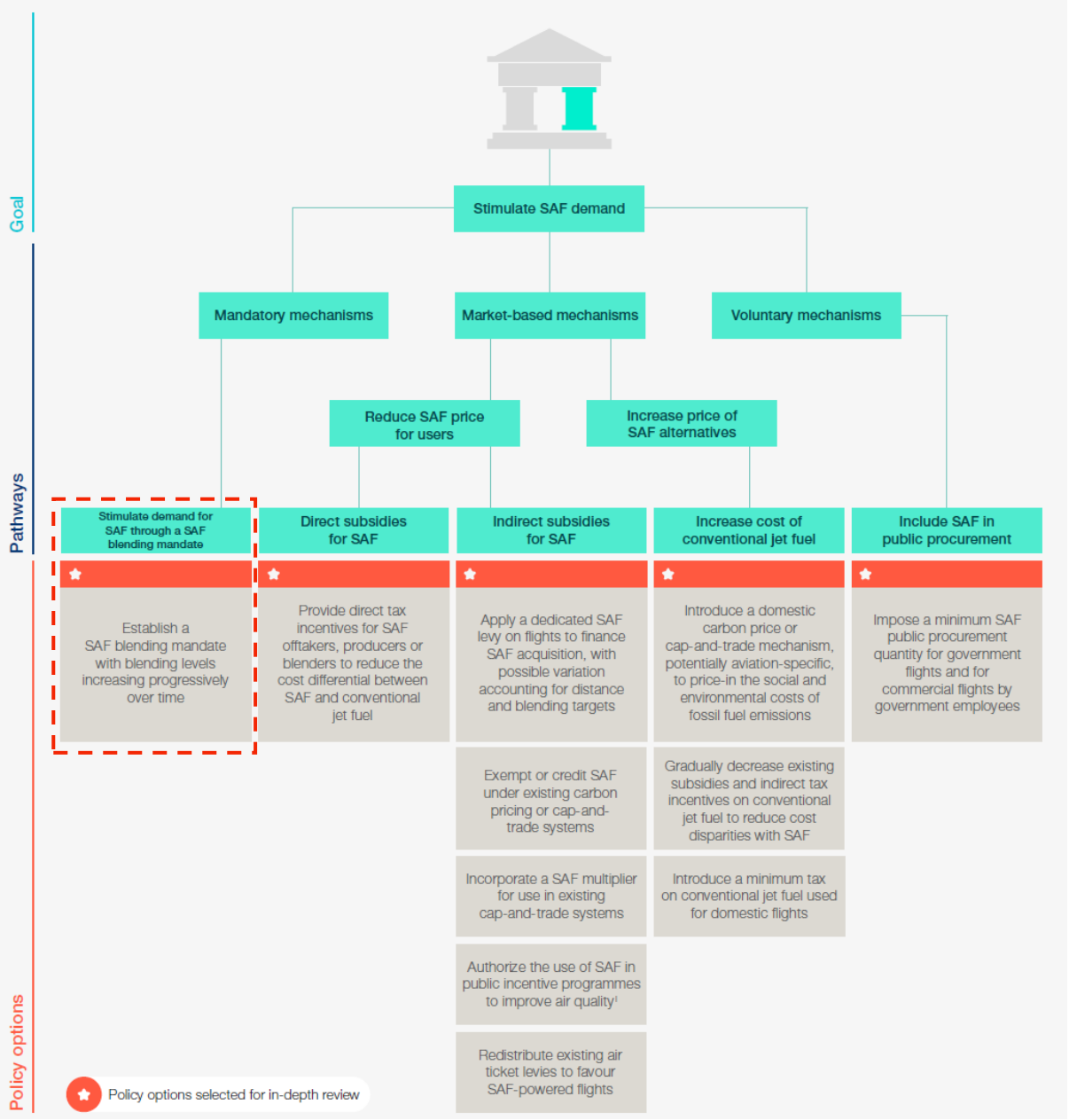
Implementation considerations

- **Policy duration**: CfD schemes need to be sufficiently long to match the necessary investment cycle.
- **Tailoring**: CfD mechanisms can be tailored to stimulate SAF production from specific pathways.
- **Funding**: funding for such programmes often comes from dedicated green levies and taxes on the general market.
- **Allocation:** CfDs should be given based on GHG savings rather than volumes.

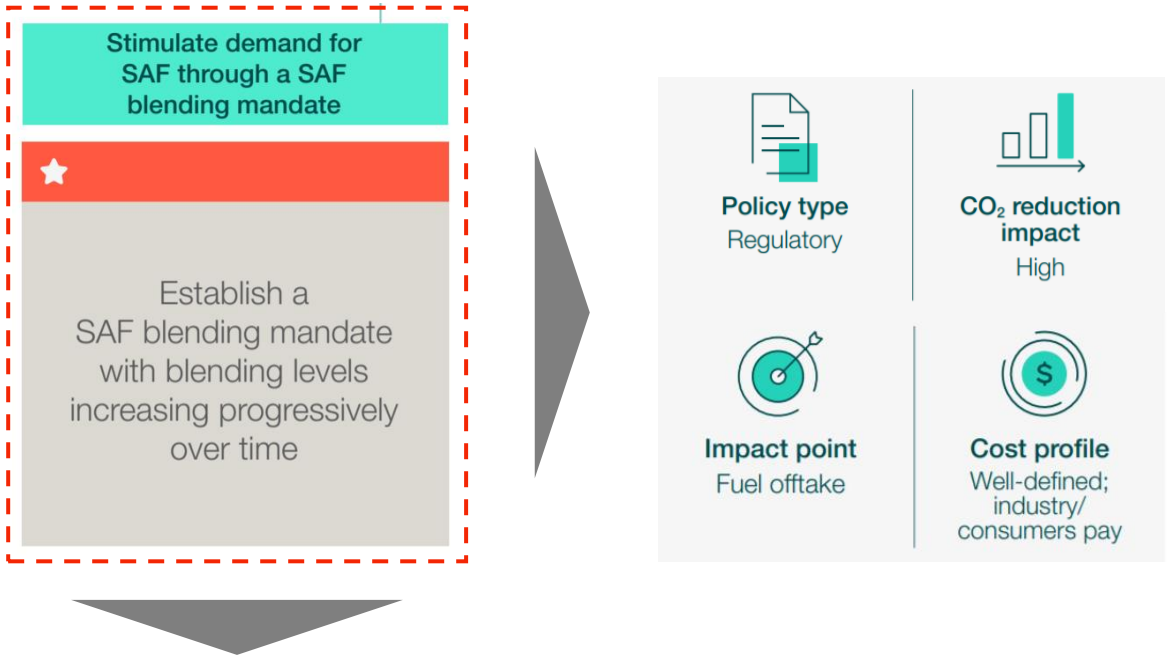
Example

- The SDE++ (stimulation of sustainable energy production and climate transition) programme in the Netherlands

DEMAND-SIDE measures & supporting policies



In-depth review of selected polices - Example



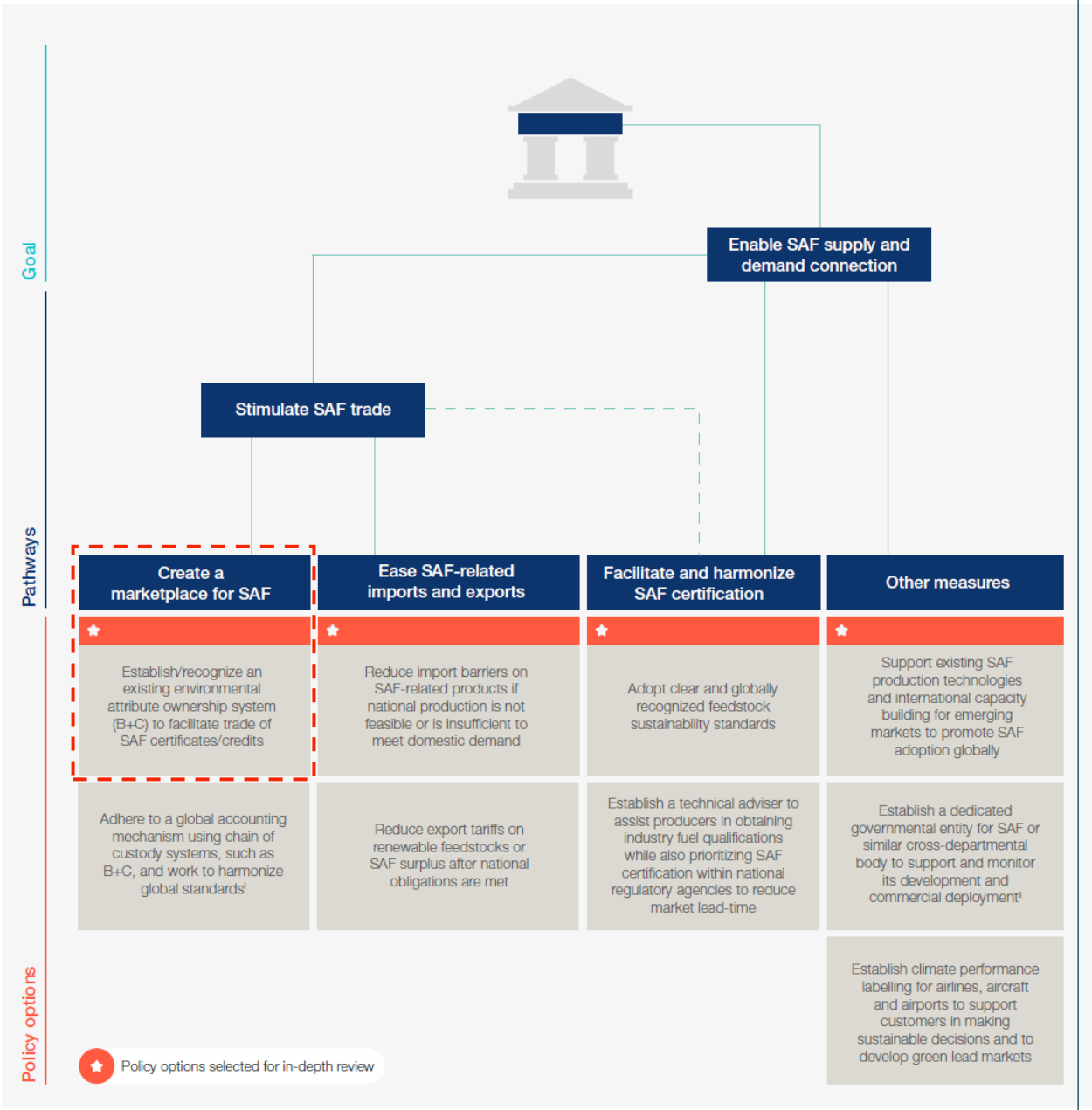
Implementation considerations

- Sub mandates
- Types of Targets
- Need for Oversight
- Market Distortions
- Implementation Mechanisms
- …

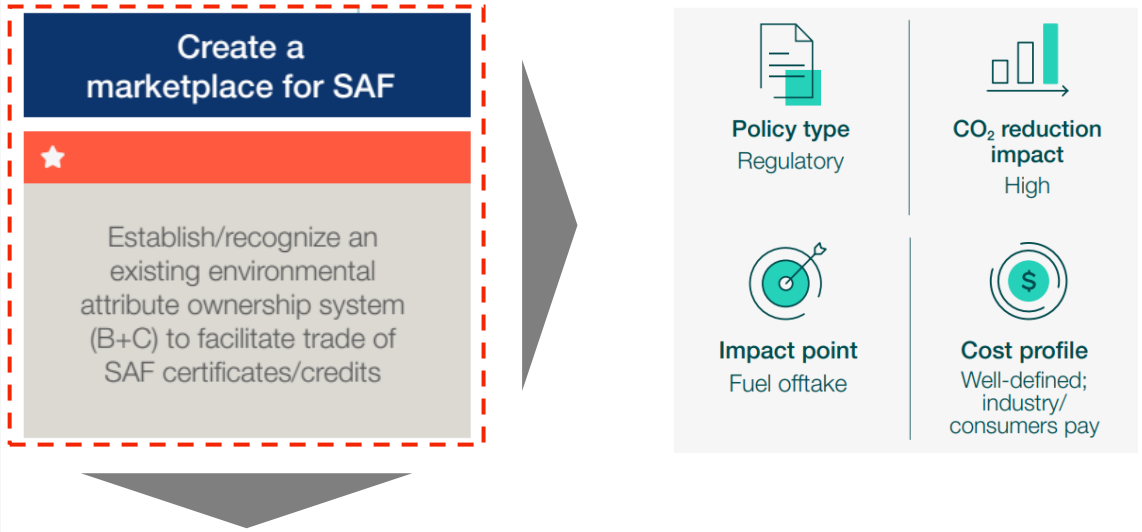
Example:

- ReFuel EU

ENABLING measures & supporting policies



In-depth review of selected polices - Example



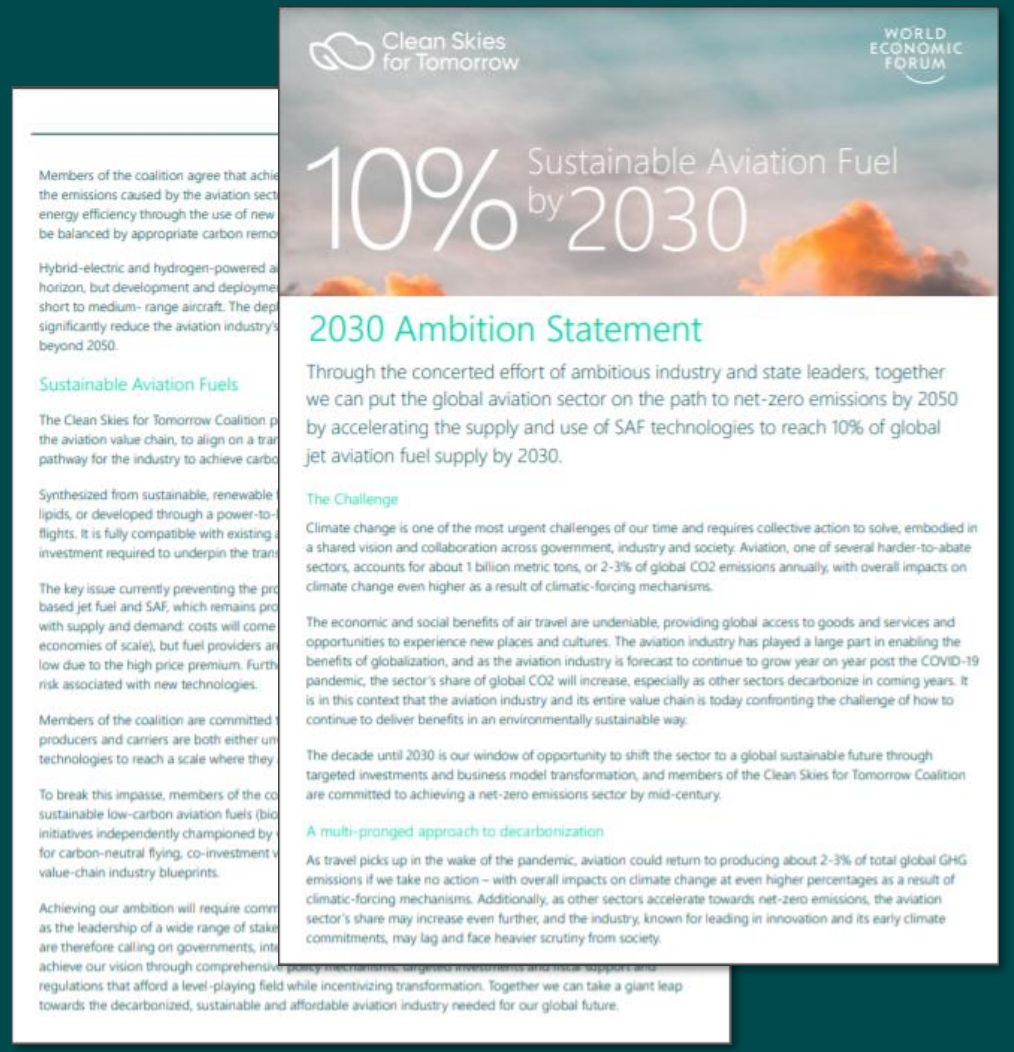
Implementation considerations

- Design of certificates
- Harmonization amongst markets
- Need for Oversight
- Costs to implement
- Reputational risks
- …

Example:

- CST SAF Certificates for private companies

The industry is moving: CST Ambition Statement



80+
Stakeholders across the aviation value chain

22
From 22 different countries

10%
Join forces to achieve 10% SAF by 2030

1/3
Representing 1/3 of aviation's CO2 emissions

3Bn
Representing a SAF demand of 3B gallons by 2030

17
Airlines representing over 1/3 of total aviation revenue

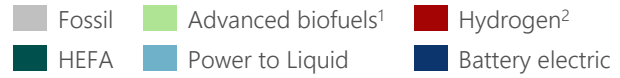
Obrigado.

carlos.agnes@systemiq.earth

QR Code to access the
SAF Policy Toolkit

Energy
Transitions
Commission

Energy carrier mix as output of the three modelled pathways

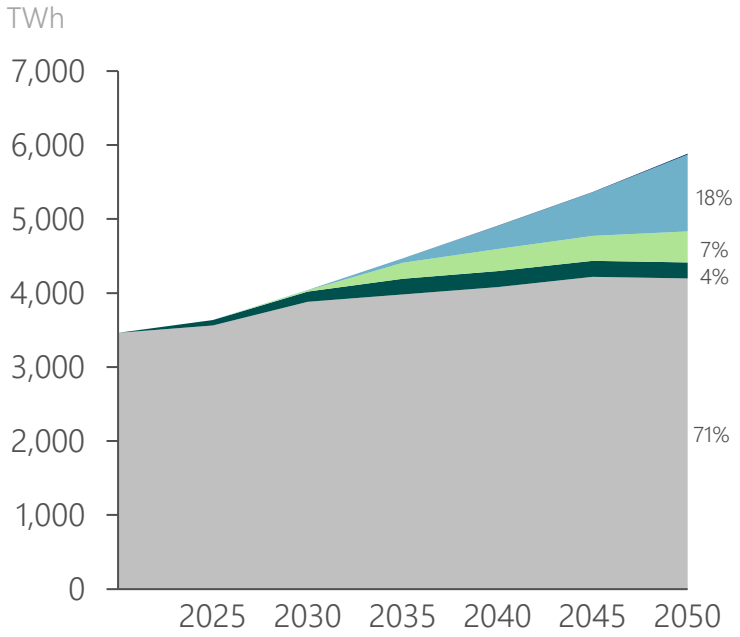


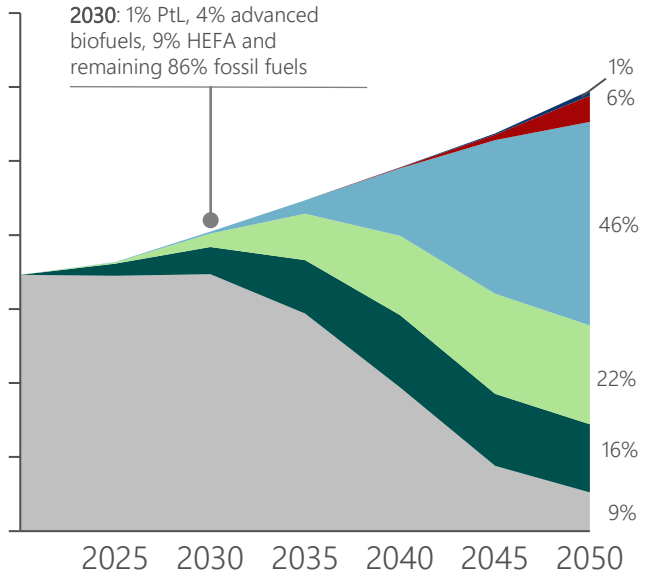
BAU pathway

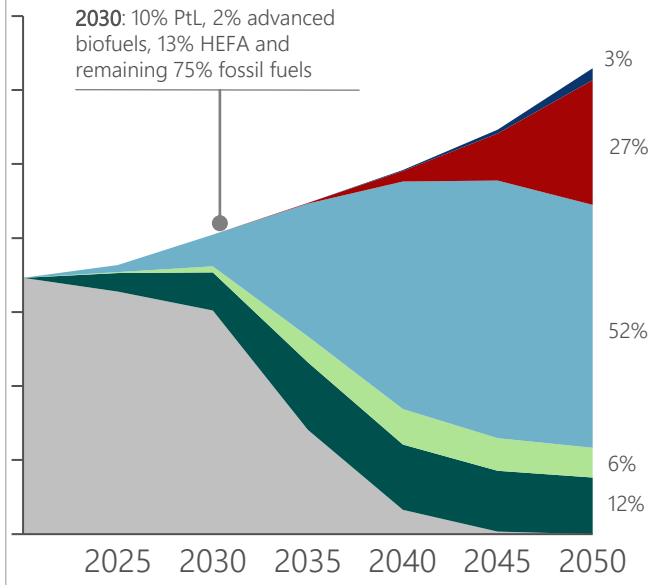
Moderate tech pathway

Climate ambition pathway

Final Energy demand







What we need to believe

- No willingness to pay additional cost for reducing carbon footprint
- Intended use of SAFs in EU and US materializes

- Willingness to pay a **green premium of 30%**
- Medium reduction in LCOE until 2050
- PtL scales in late 2030s to compete with biofuels
- **Later scaling of novel propulsion** technologies

- Willingness to pay a **green premium of 25%**
- **Significant reduction in LCOE** until 2050
- PtL scales and becomes competitive earlier
- **Earlier scaling of novel propulsion** technology

Note: Underlying demand growth follows a CAGR of 3.8%

1. Advanced biofuels are defined as non-HEFA biofuel production pathways; the cost of G-FT is taken as a proxy fuel production pathway - advanced biofuels could however include Alcohol to Jet (AtJ), pyrolysis and other advanced biofuels
2. Includes H2 fuel cell and H2 combustion