

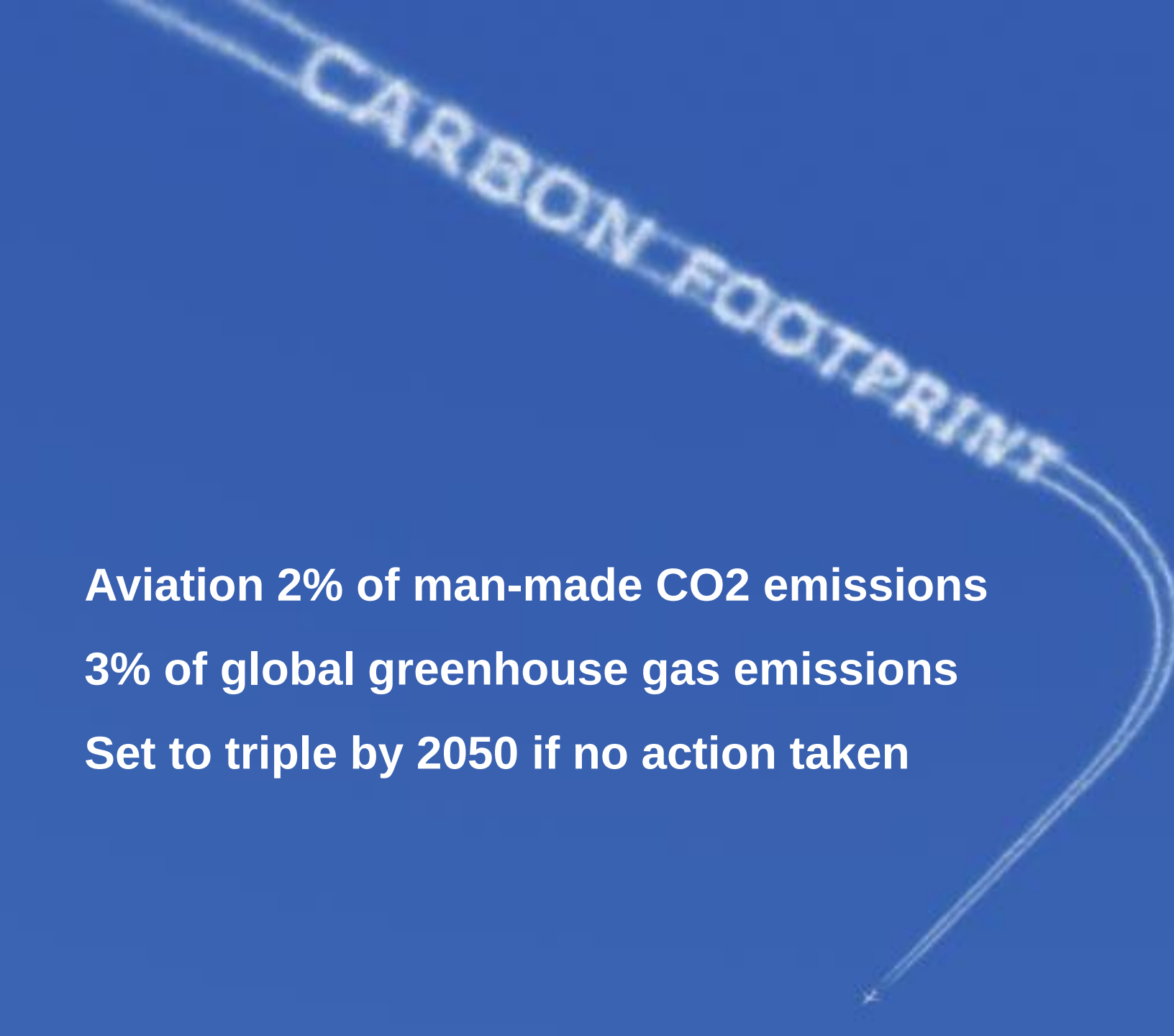


Aviation Biofuels in Brazil - Challenges and Perspective

Campos de Jordão, August 15th, 2011

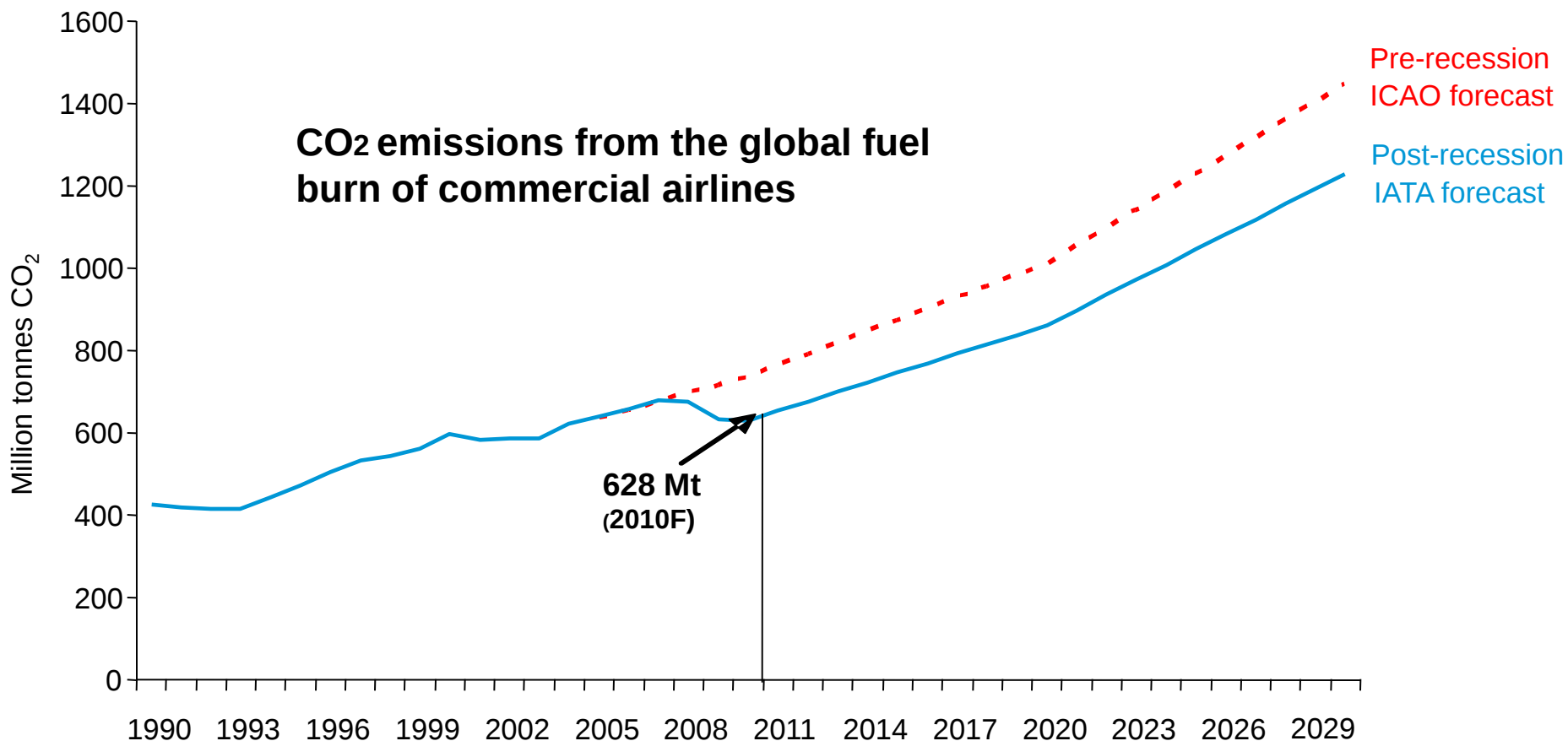
Guilherme Freire
Director, Environmental Strategies and Technologies

CARBON FOOTPRINT



Aviation 2% of man-made CO₂ emissions
3% of global greenhouse gas emissions
Set to triple by 2050 if no action taken

Aviation faces an emissions challenge



Source: IATA

Facing strong criticism



newstatesman
3 April 2006 £2.75

'The growth in flying will propel us into a future of melting ice caps, spreading deserts, rising sea levels and collapsing ecosystems'

MARK LYNAS
on our suicide pact with aviation

THE INDEPENDENT
Wednesday 9 January 2002
Inside the world of darts, Britain's sexiest sport

Planes, trains, and the road to ruin
Soaring rail fares are boosting the growth in domestic flights and undermining the fight against global warming

THE INDEPENDENT
NEWSPAPER OF THE YEAR
Thursday 2 November 2006
Education & careers
24-page education shop

THE ODD COUPLE
HOW MANDELA AND BOTHA MADE PEACE IN SECRET

PLANE CRAZY
Airport expansion will treble flights by 2030, flying in the face of vows to cut global warming

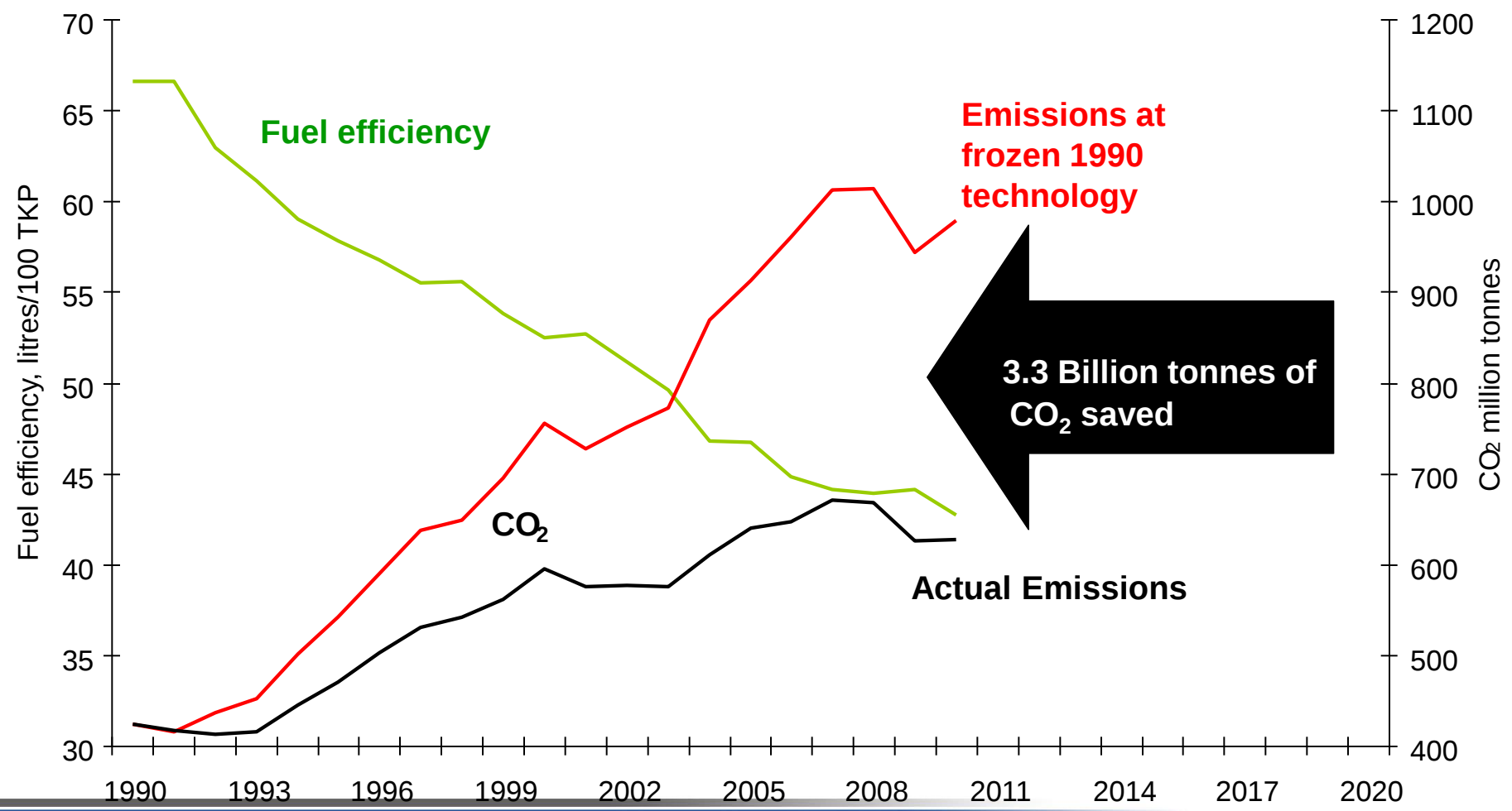
GLASGOW
City's new airport will triple capacity but...
EDINBURGH
City's new airport will triple capacity but...
BELFAST
City's new airport will triple capacity but...
LIVERPOOL
City's new airport will triple capacity but...
MANCHESTER
City's new airport will triple capacity but...
NEWCASTLE
City's new airport will triple capacity but...
LEEDS/BRADFORD
City's new airport will triple capacity but...
GLASGOW
City's new airport will triple capacity but...

he numbers
Every day, 48 flights take off from London bound for Manchester airport

• The price
Costs vary but return tickets for travel today were available last night for £171 (including tax)

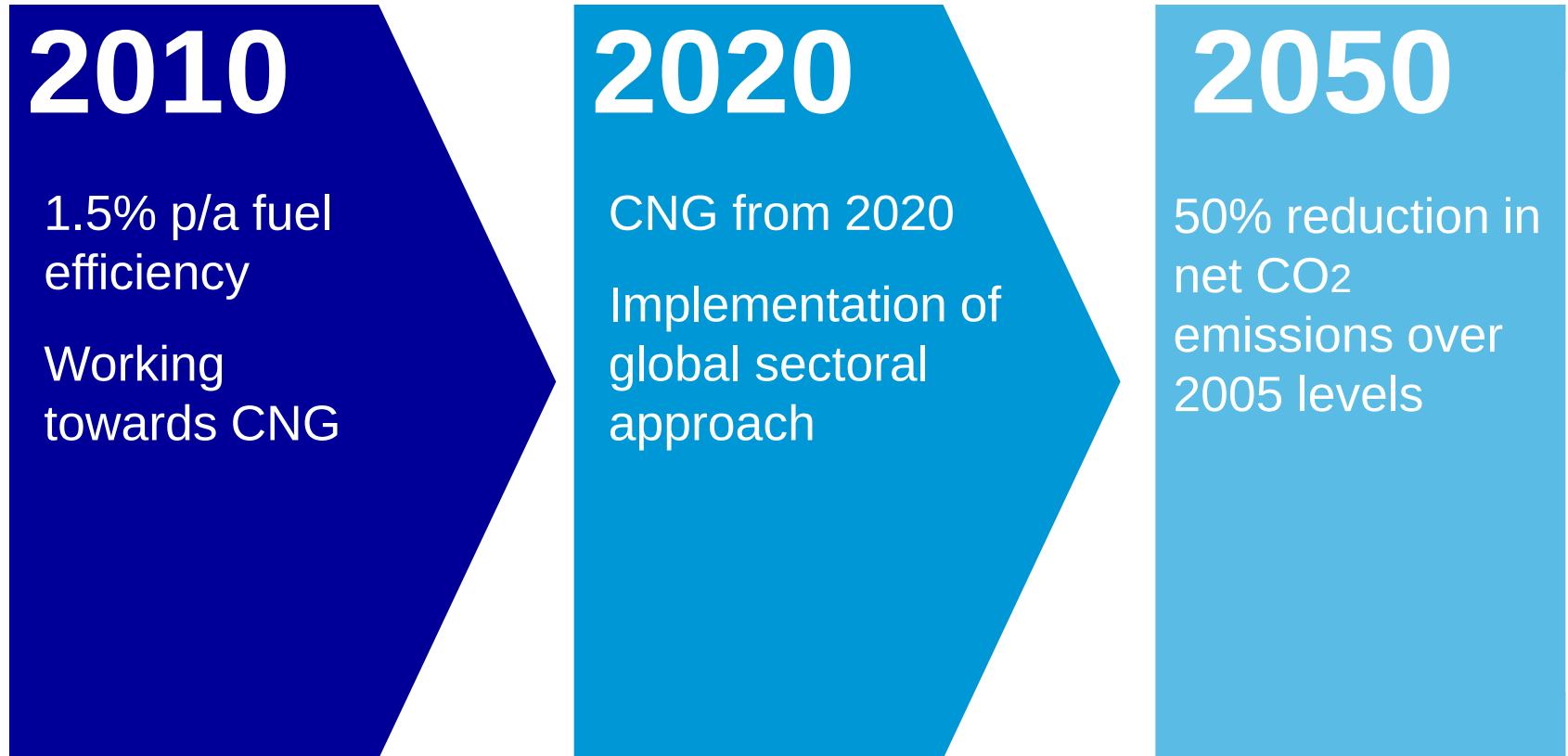
• The true cost
Each passenger's journey produces 90kg of CO₂

... but our track record is strong



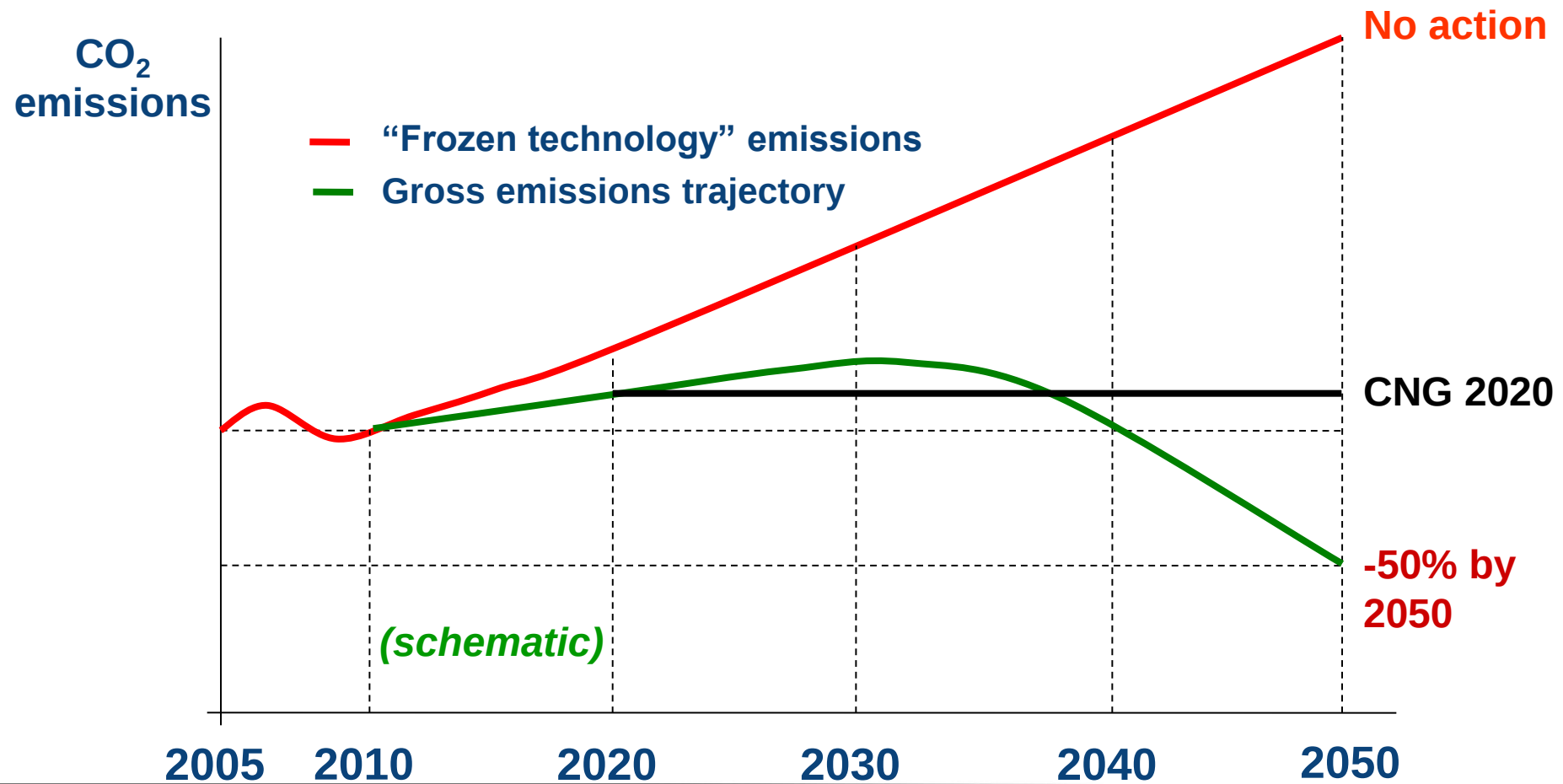


ESTAS INFORMAÇÕES SÃO PROPRIEDADE DA EMBRAER E NÃO PODEM SER UTILIZADAS OU REPRODUZIDAS SEM AUTORIZAÇÃO ESCRITA DA EMPRESA.

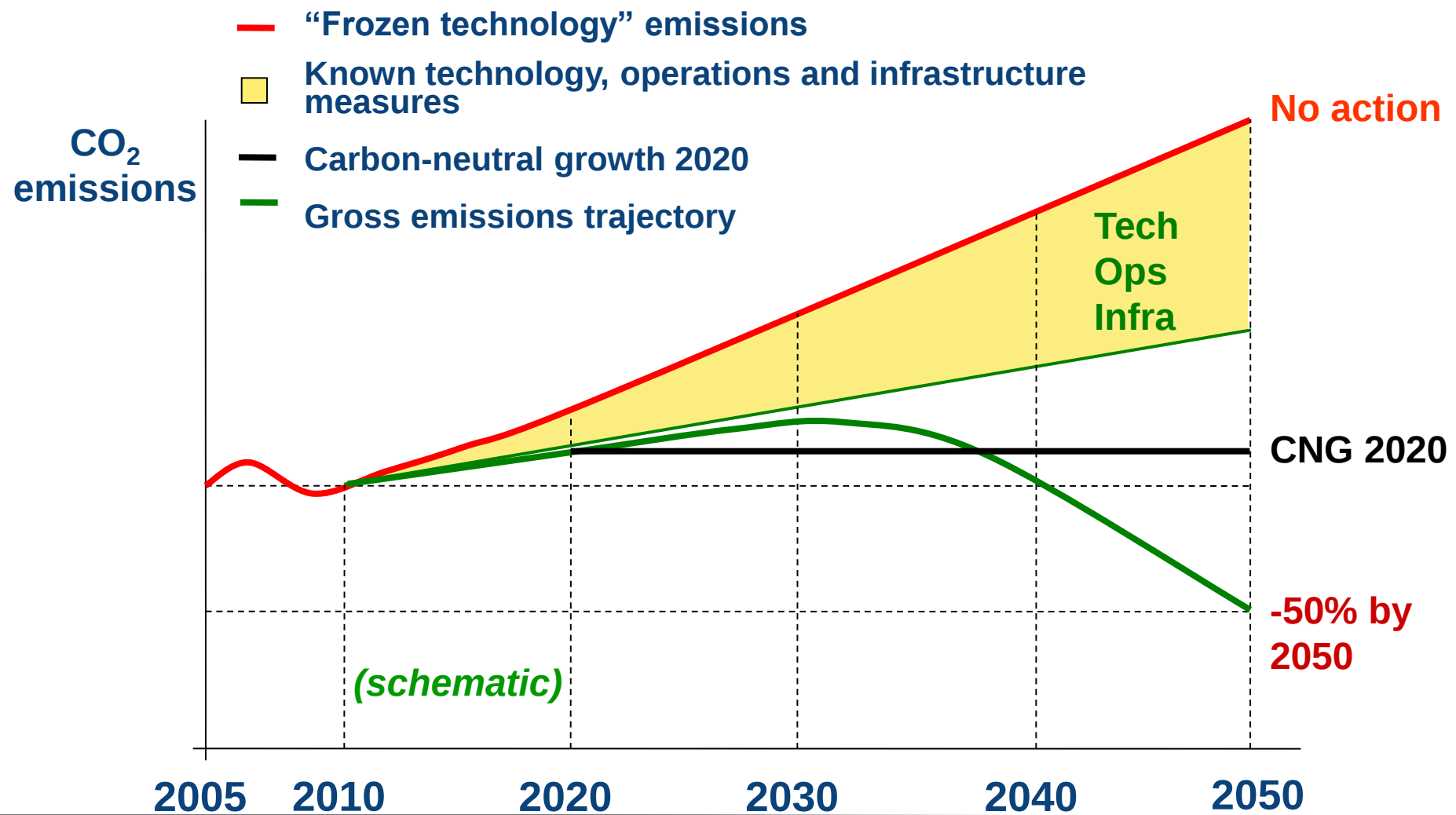


- Goals are at the global level – not States or operators
- Goals do not mean slowing down the growth of aviation

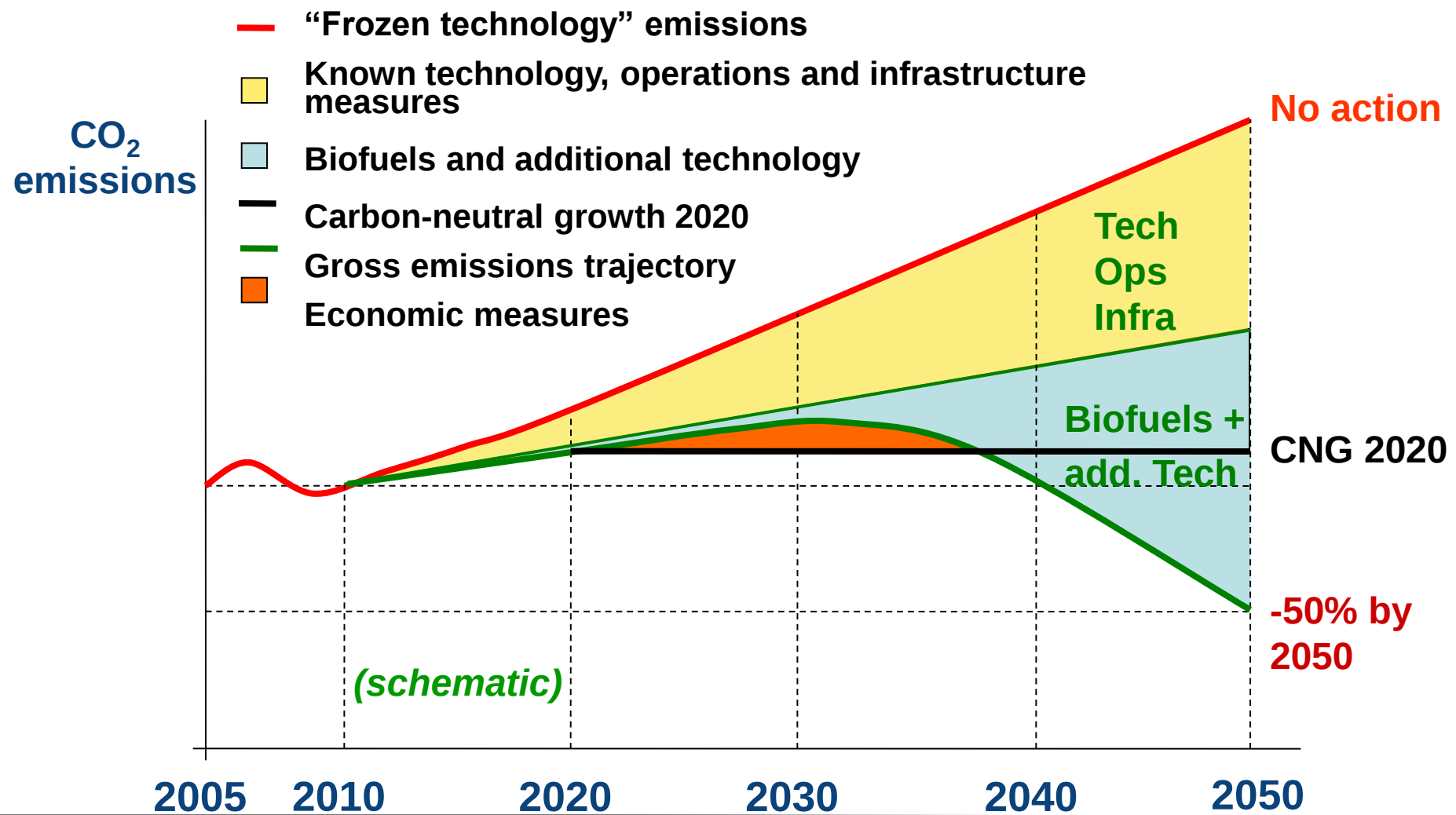
Emissions reduction roadmap



Emissions reduction roadmap



Emissions reduction roadmap



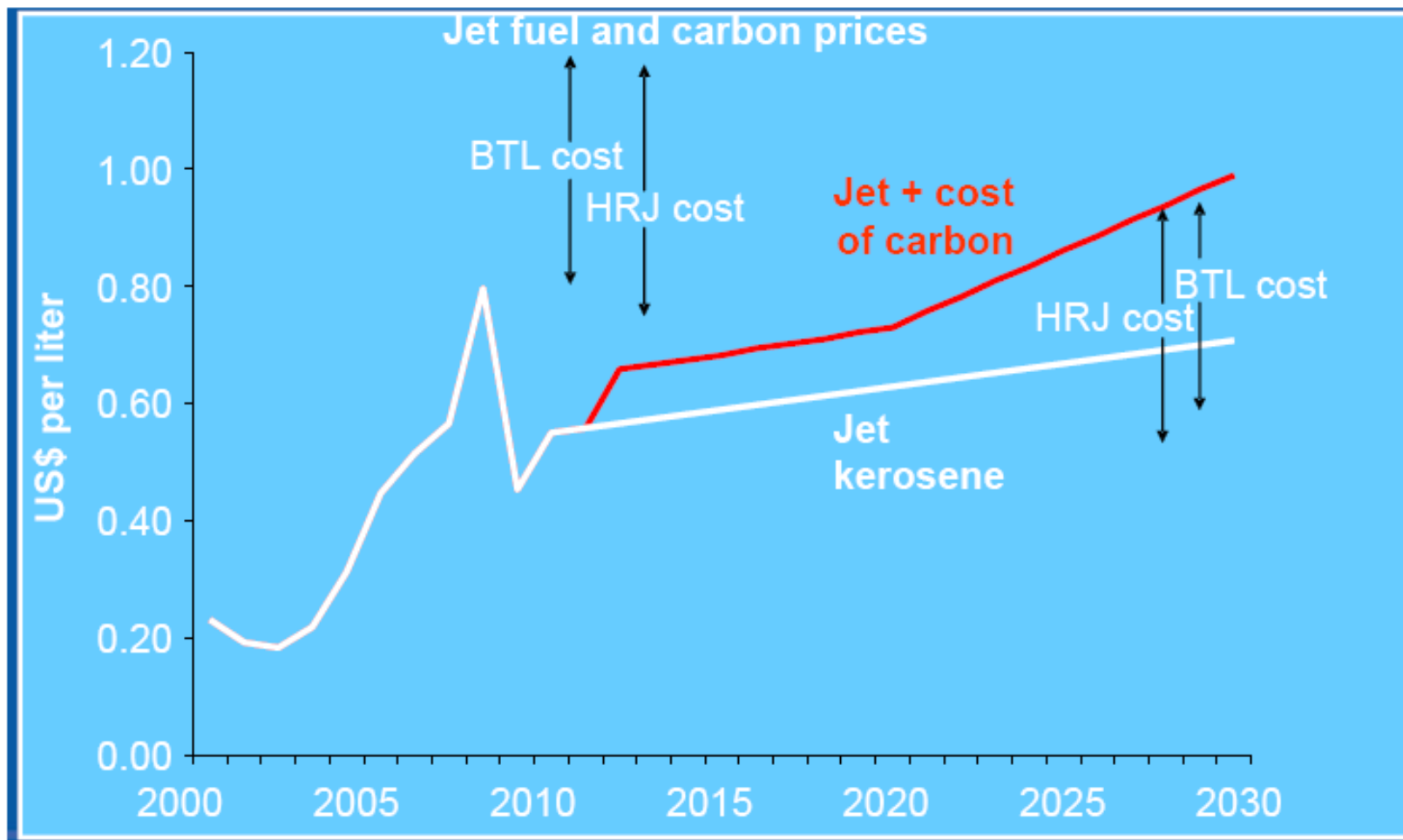
Sustainable Biofuels for aviation?

- **A long way in a few years...**
 - From 'no way' to 'dream' to reality
- **Low carbon**
 - Could reduce aviation emissions up to 80%+
- **Diversified supply**
 - Moving away from one fuel source
- **No changes in engines and airplanes**
 - Drop-in fuels

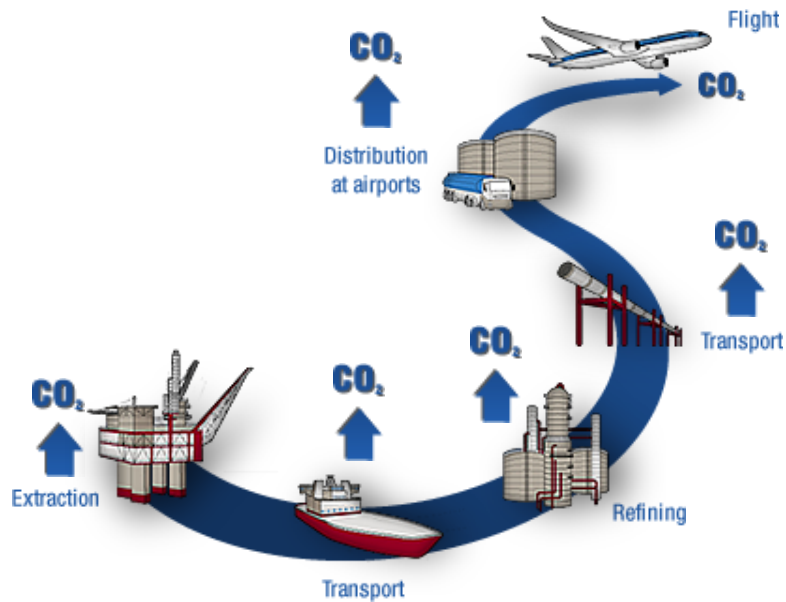


- **Drop-in**
 - Can be blended with existing jet fuel
 - No adaptation of aircraft / engines
 - No parallel infrastructure = prohibitive costs
- **Technical**
 - Low freeze point, high energy density, flash point and heat content
 - Thermal stability and good fluidity performance at low temperatures
 - Automotive bioethanol and biodiesel not suitable
- **Sustainability**
 - Globally harmonised criteria needed
- **Economic viability**
 - Bridge the cost gap with Jet A-1
 - Compare with subsidised land transport biofuels

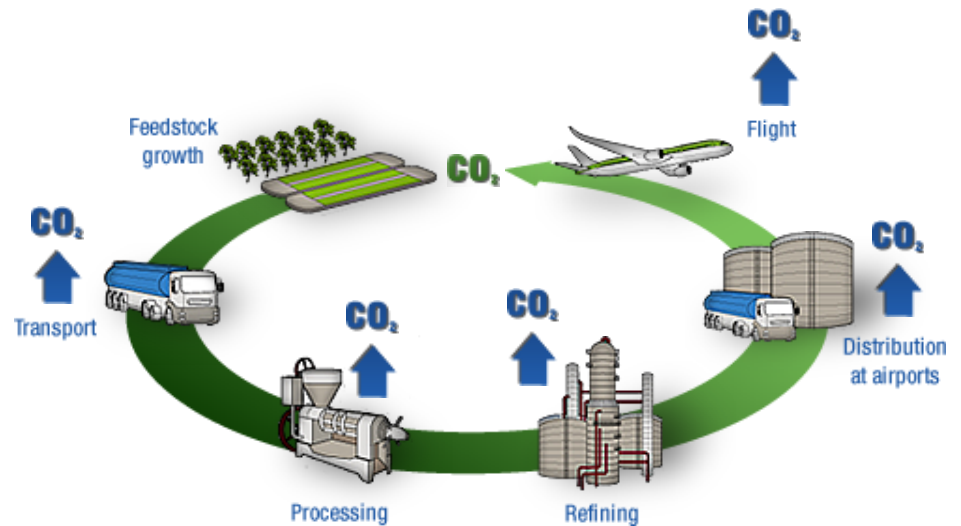
Oil and carbon price



Lifecycle Emissions



At each stage in the distribution chain, carbon dioxide is emitted through energy use by extraction, transport, etc



Carbon dioxide emitted will be reabsorbed as the next generation of feedstock is grown

Source: ATAG Beginners Guide to Aviation Biofuels

Sustainability requirements



Land use



**Water and air
quality**

AVIATION BIOFUELS



Food security



Societal development



**Soil and
biodiversity**

Biomass competition among industries



Aviation



**Fine
chemistry**



Trucks



Cars



Lubrificants



Polymers

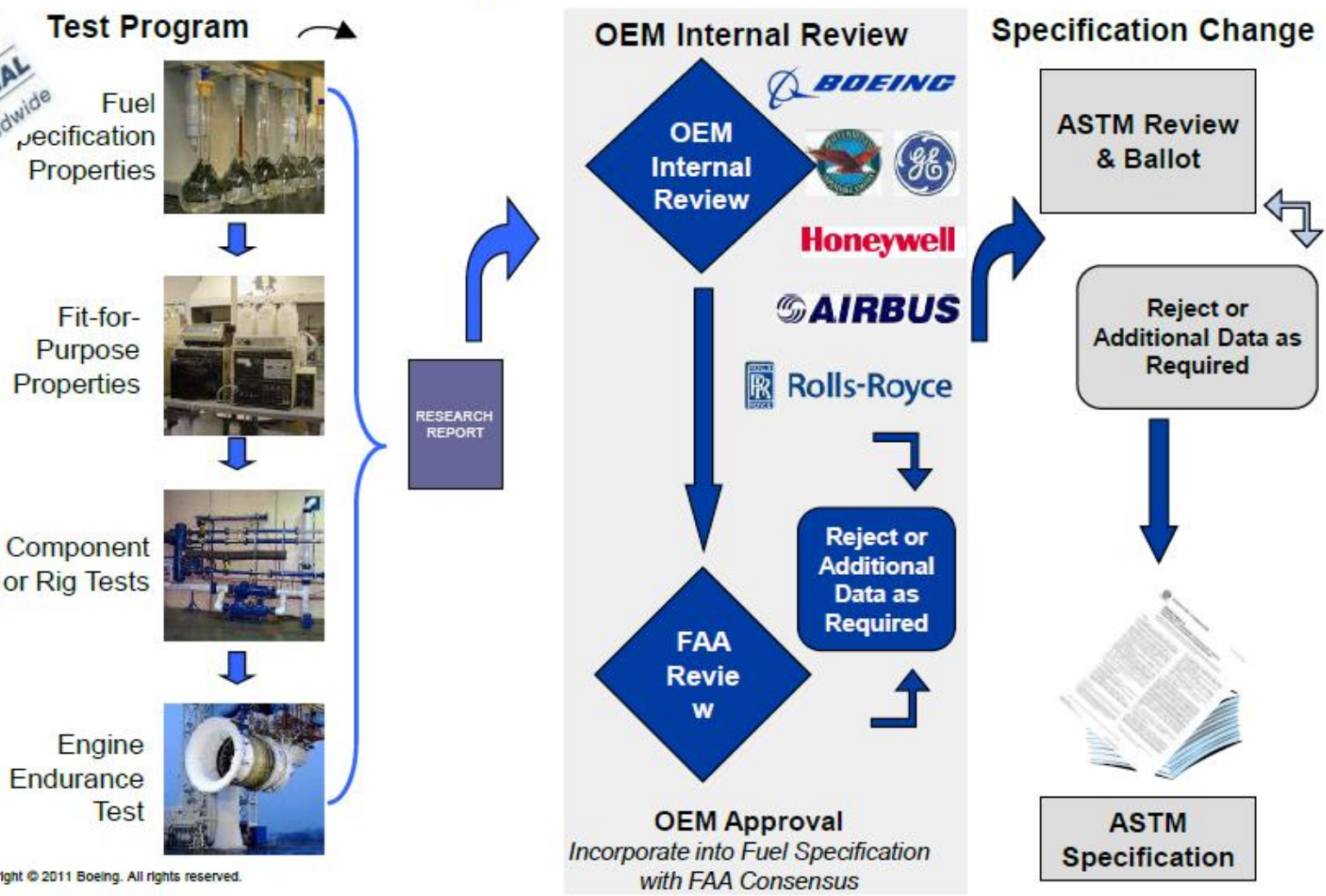
Scale up production



Biofuels Approval Process – ASTM D 4054



Standard Practice for Qualification and Approval of New Aviation Turbine Fuels and Fuels Additives



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Biofuel evaluation flights



Carrier	Aircraft	Partners	Date	Biofuel	Blend
	B747-400	Boeing, GE Aviation	23 Feb 2008	Coconut & Babassu FAME	20% one engine
AIR NEW ZEALAND	B747-400	Boeing, Rolls-Royce	30 Dec 2008	Jatropha HRJ	50% one engine
	B737-800	Boeing, GE Aviation, CFM, Honeywell UOP	7 Jan 2009	Algae and Jatropha HRJ	50% one engine
	B747-300	Boeing, Pratt & Whitney, Honeywell UOP	30 Jan 2009	Camelina, Jatropha, and Algae HRJ	50% one engine
	B747-400	GE, Honeywell UOP	23 Nov 2009	Camelina HRJ	50% one engine
	A320	Airbus, CFM	22 Nov 2010	Jatropha HRJ	50% one engine
	A320	CFM, Safran, EADS, Airbus, Honeywell, ASA	1 April 2011	Jatropha HRJ	27% one engine



HEFA - Hydroprocessed Esters and Fatty Acids

Approved
2011



Two new task forces:

- Alcohol to jet (ATJ)
- Direct Sugar to HC (DSHC)

Approval
Expected:
2013-15



HEFA - Post Approval flights

Aeromexico in first commercial biofuel transcontinental flight

03.08.2011

Categories: Engineering

Tags: Biofuels, Green

Share:  

Supply Chain Management, Energy, Green, Boeing,

Aeromexico's first commercial biofuel flight from Mexico City to Madrid yesterday (August 2nd) consisted of 70pc traditional kerosene and 30pc biofuel, made from the Jatropha Curcas oilseed plant, which is grown in several regions of the world, including Mexico, according to a statement released by Boeing.



Lufthansa

Lufthansa launches first scheduled flights using biofuel

15.07.11

Worldwide first long term test run will reduce CO2-emissions and deliver research results / Lufthansa Airbus will operate daily flights between Hamburg and Frankfurt using biosynthetic kerosene.



KLM launches commercial flights Amsterdam - Paris on biofuel

AMSTELVEEN, 22 June 2011 – KLM Royal Dutch Airlines has taken another important step in aviation sustainability. In September KLM will launch more than 200 flights being operated on biokerosene between Amsterdam and Paris. "KLM has once again shown it is stimulating the development of biokerosene", according to managing director Camiel Eurlings. "In November 2009 we demonstrated that it was technically possible to fly on biokerosene. Now, a year and a half after our first demonstration flight on Camelina, a new phase has been entered around the world, that of certification. Authorisation will soon be granted to operate commercial flights on biofuel. I am especially proud to announce that KLM will take this substantial step in September".





HEFA - Hydroprocessed Esters and Fatty Acids

Approved
2011

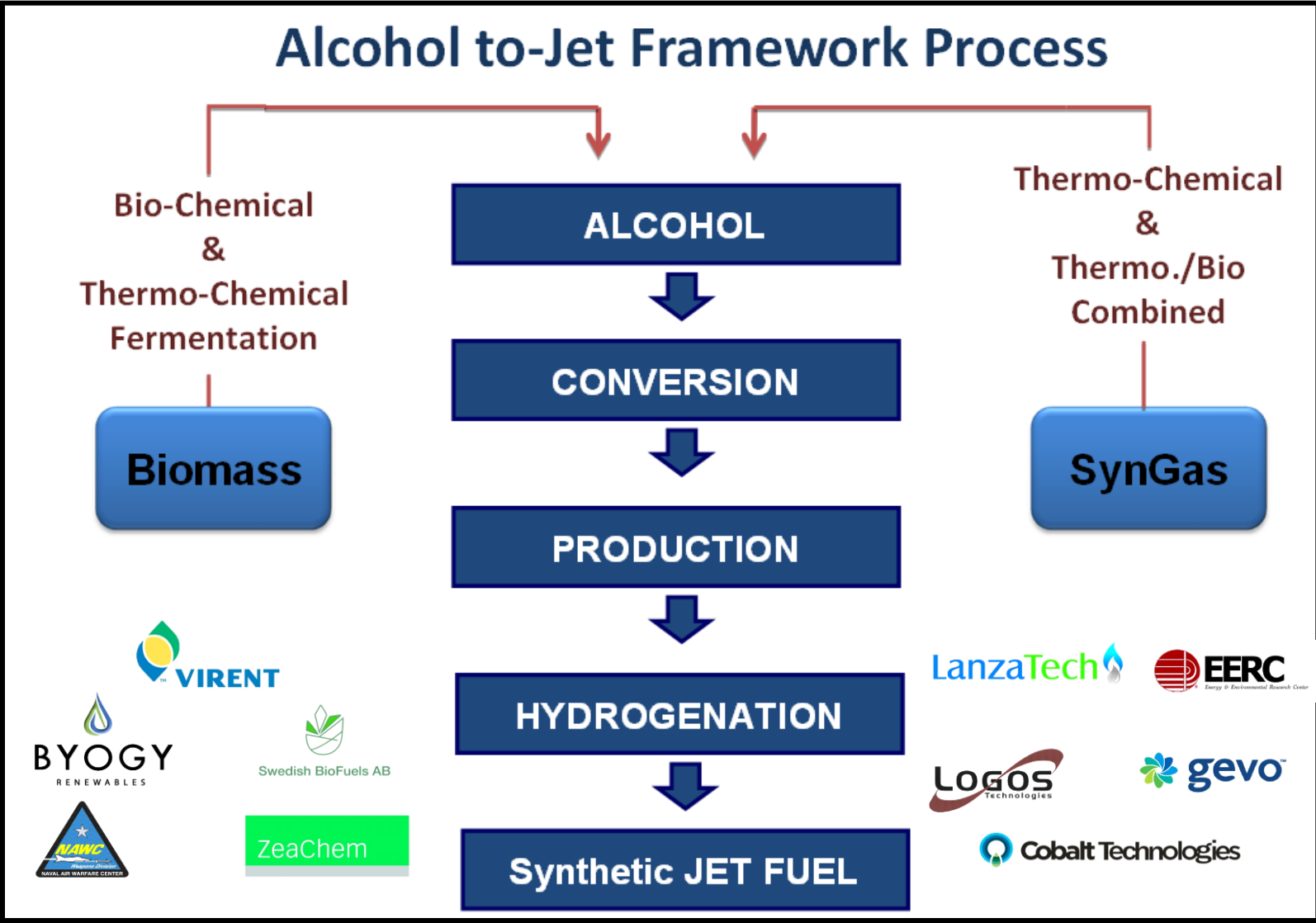


Two new task forces:

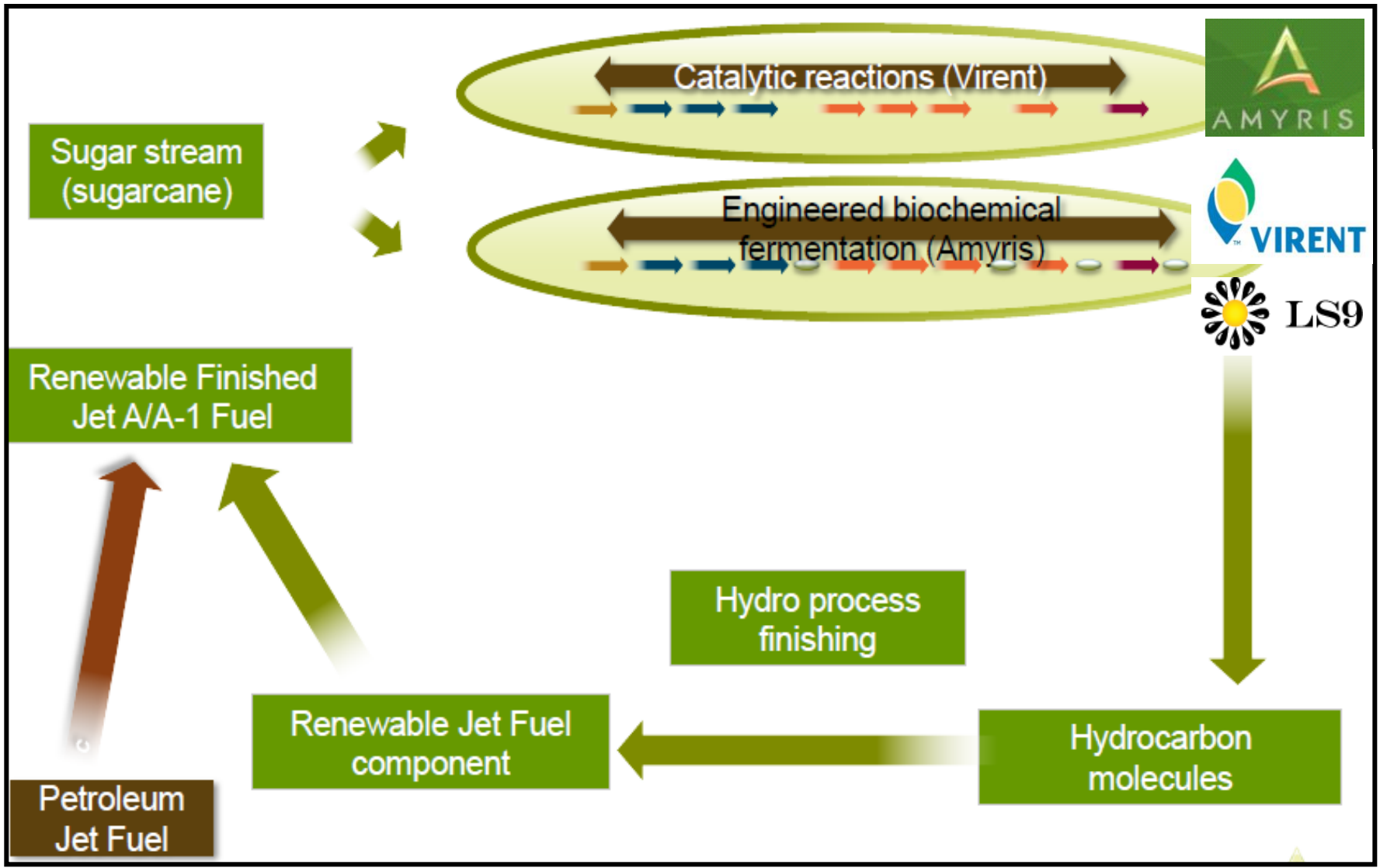
- Alcohol to Jet (ATJ)
- Direct Sugar to HC (DSHC)

Approval
Expected:
2013-15





Direct Sugar to Hydrocarbon process (DSHC) ← EMBRAER





ALTERNATIVE FUELS

EMBRAER TECHNOLOGY DEVELOPMENT

General Overview



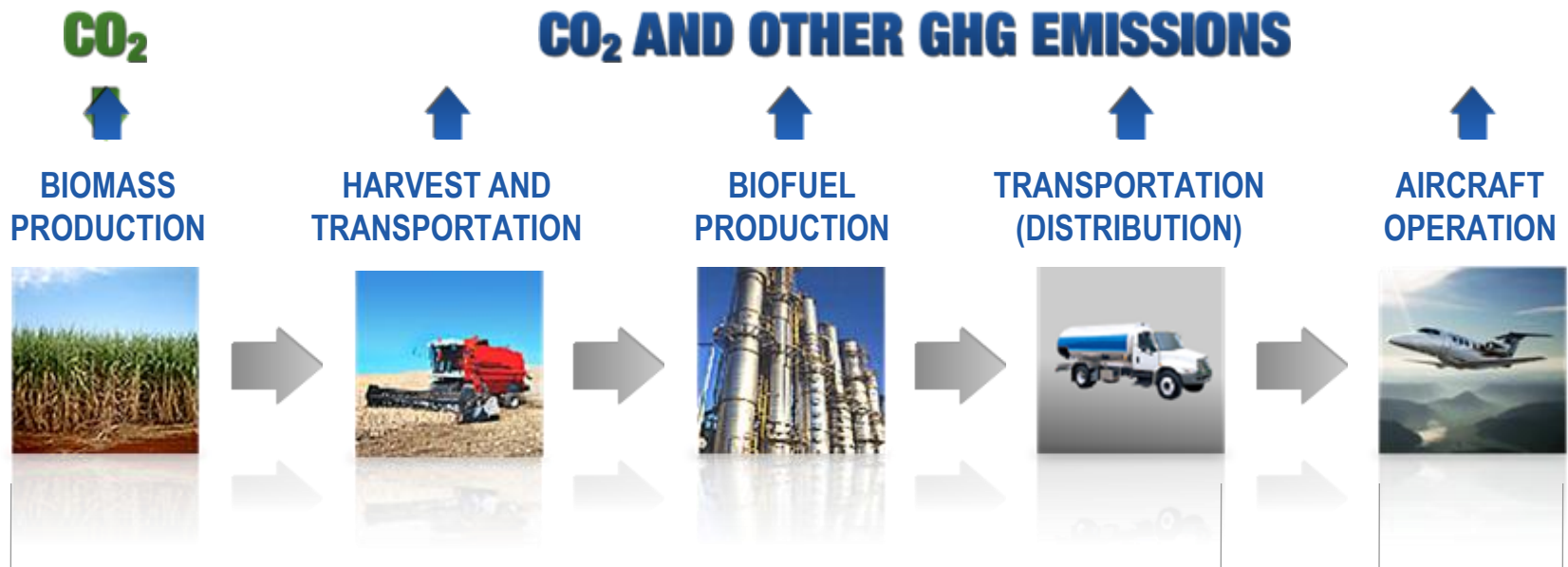
1984 – Bandeirante (FAB)
Experimental Flight - S.J.Campos e Brasília



2004 - Ipanema
Combustível: 100% etanol

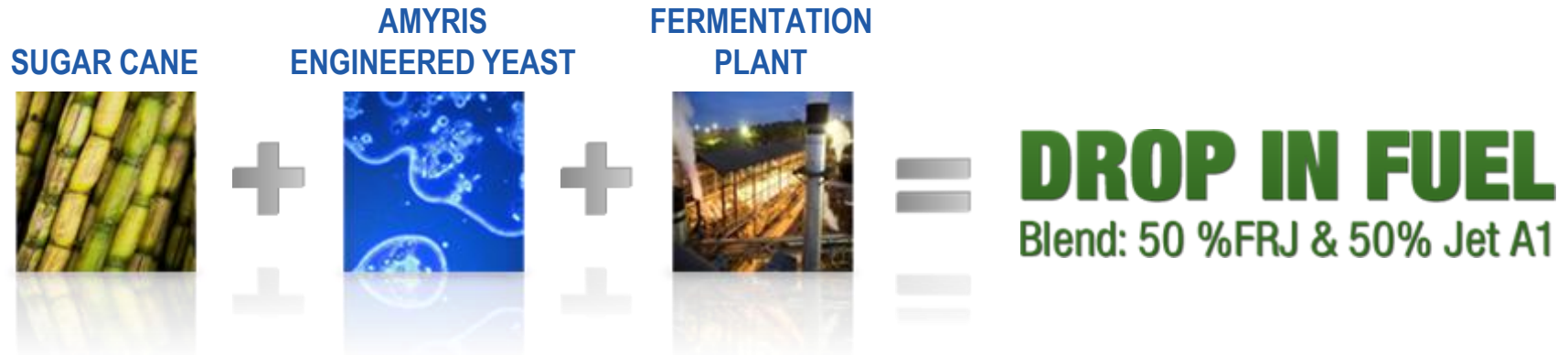


Positive CO2 life cycle



**Act as the integrator of the sustainability analysis.
(Non-Embraer Products)**

**Sustainability analysis
related to the aircraft
operation.**



- FRJ Requirements:
 - Meet the international standards
 - Sustainability → Favorable carbon life cycle
 - Meet the distribution chain requirements
 - Drop-in → up to 50% blended

Fermented Renewable Jet Fuel Evaluation





Launched in São Paulo: May, 2010

Formed by:

- Airlines
- Biofuel researchers
- Biomass producers
- Manufacturers

Objectives:

- Support aviation industry commitment to act on climate change
- Foster the development of sustainable biofuels
- Support the production scaling up



- a) Proven technical feasibility of using alternative drop-in fuels –
It works!
- b) Encourage certification of new drop-in fuels
- c) Foster the utilization of different feedstock and production processes
- d) Support harmonization of alternative aviation fuel sustainability standards
- e) Encourage governments to establish public policies



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for flight

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THANK YOU

