twelve | a world made from air

CONTRA COSTA HEALTH

Hazardous Materials Commission

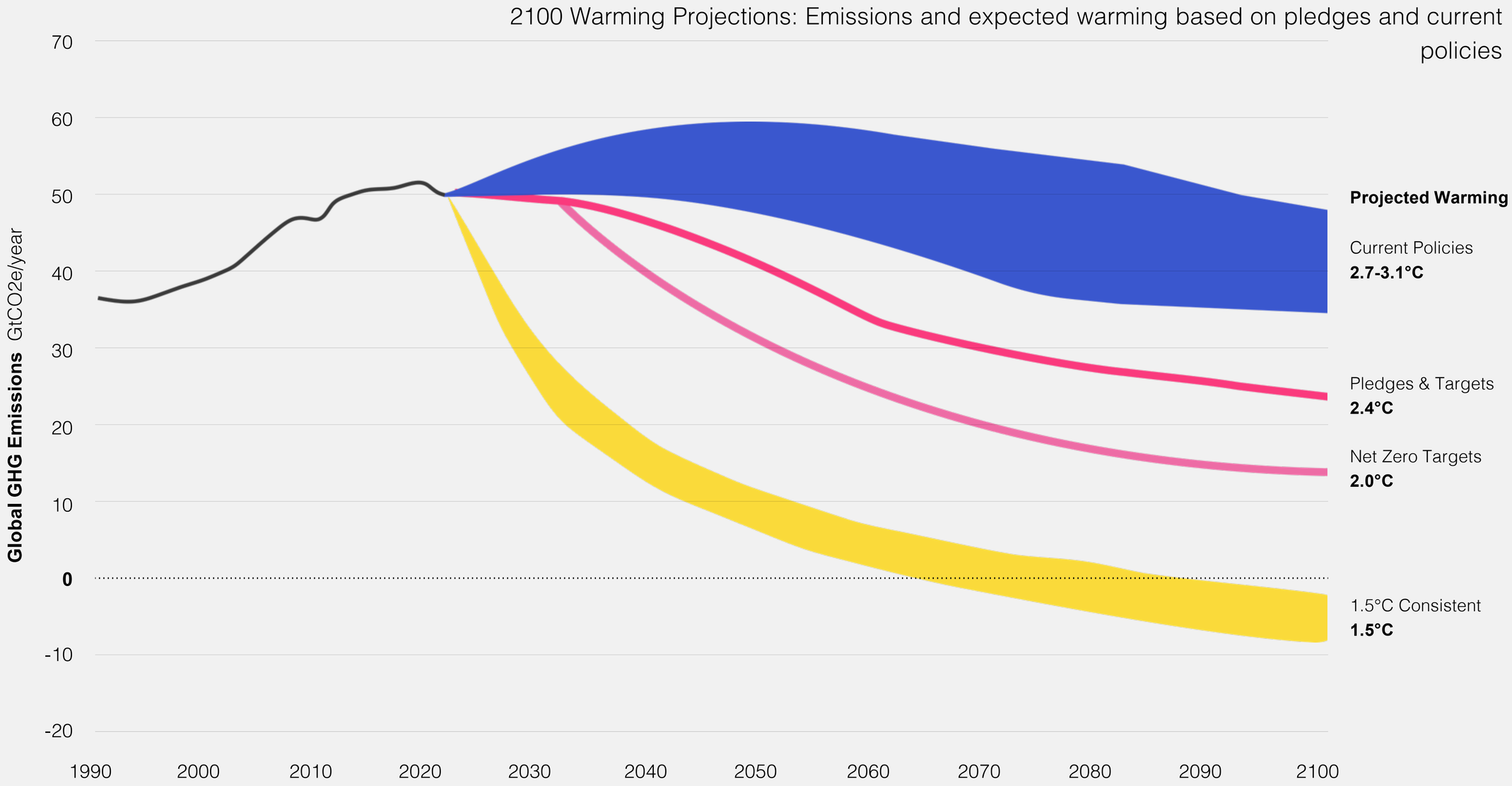
Ashwin Jadhav and Derek Phelps

June 26, 2025

we need to decarbonize aviation to meet climate goals

twelve

twelve



Source: Climate Action Tracker

we’re the carbon transformation company

e·jet®

eFuels for transportation and logistics

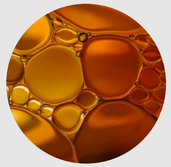
e·naphtha™

eChemicals for carbon negative feedstocks

CO2Made®

CO2Made® products from brands you love

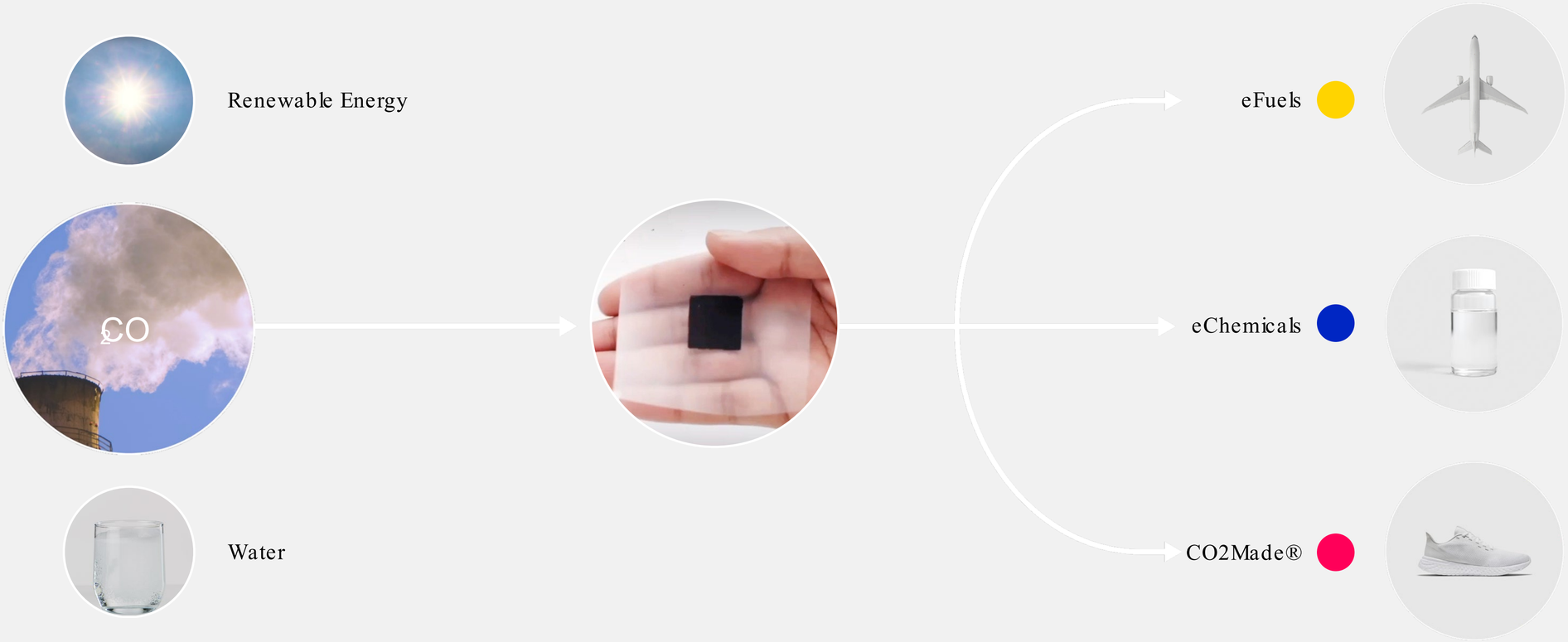
SAF landscape

				
	HEFA- The Fats Way	**Alcohol-to-jet[1] - The Corn Way**	**Gasification - The Waste Way**	**Power-to-liquid - The Air Way**
Opportunity	Safe, proven, and scaleable technology	Potential in the mid-term, however significant techno-economical uncertainty	Potential in the mid-term, however significant techno-economical uncertainty	Proof of concept 2025+, primarily where cheap, high-volume electricity is available
Technology Maturity	Mature	Commercial pilot	Commercial pilot	In development
Feedstock	Waste and residue lipids, purposely grown oil energy plants[2] Transportable with existing supply chains Potential to cover 5-10% of total jet fuel demand	Ethanol pathway High availability of cheap feedstock, but fragmented collection and distribution	Agricultural and forestry residues, municipal solid waste[5], and purposely grown cellulosic energy crops[6] High availability of cheap feedstock, but fragmented collection and distribution	CO_2 and green electricity Unlimited potential via direct air capture Point source capture is bridging the technology
% LCA GHG (Reduction vs fossil jet)	**73-84%**[3]	**85-94%**[4]	**85-94%**	**99%**[7]

1. Ethanol route; 2. Oilseed bearing trees on low-iLUC degraded land or as rotational oil cover crops; 3. Excluding all edible oil crops; 4. Excluding all edible sugars; 5. Mainly used for gas/FT; 6. As rotational cover crops; 7. Up to 100% with a fully decarbonized supply chain

Source: CORSIA; RED II; De Jong et al. 2017; GLOBIUM 2015; ICCT 2019; E4tech 2020; Hayward et al. 2014; ENERGINET renewables dialogue; Van Dyk et al. 2019; Umweltbundesamt 2016

carbon transformation | CO2 to products



CO2 | water | renewable energy

CO2 is captured from biogenic industrial emissions and from direct air capture, drawing down existing CO2 in the atmosphere

carbon transformation

Our carbon transformation technology, the Opus™ System, is a CO2 electrolyzer that transforms CO2, water, and renewable energy into essential carbon-based products

eProducts

eFuels for air, land, and sea; eChemicals for carbon fossil free feedstocks, and CO2Made® consumer products from brands we love

modular technology enables rapid scaling

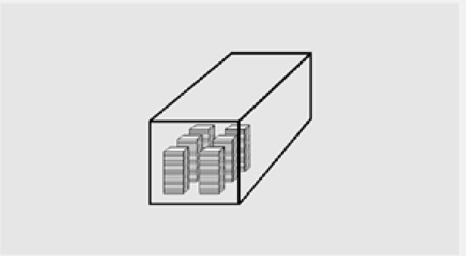
1
the shiny black leaf

Our core carbon transformation technology is the Membrane Electrode Assembly (MEA) which uses a novel CO2-reducing catalyst to electrify CO2 and water producing only oxygen and synthesis gas

2
the stack

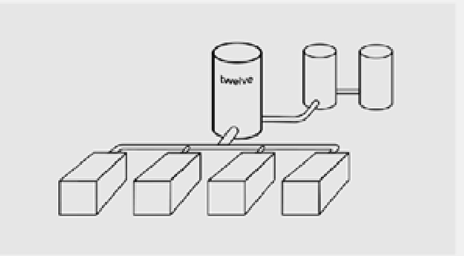
The Stack is a highly modular repeating sequence of MEAs and electrolyzer hardware to allow for controlled electrical current, CO2, and water to flow across each membrane

3
opus™



Opus is our industrial scale carbon transformation platform. It can plug into industrial systems using CO2 from point of emissions or from direct air capture

4
airplant®



AirPlant is our carbon transformation plant that can produce both E-Jet® SAF as well as E-Naphtha™

pilot products

Mercedes-Benz

World’s first CO2Made®
car parts

Mercedes-Benz

World’s first CO2Made®
PU Foam

US Air Force

World’s first jet fuel
made from CO2

Tide

World’s first
CO2Made® formate

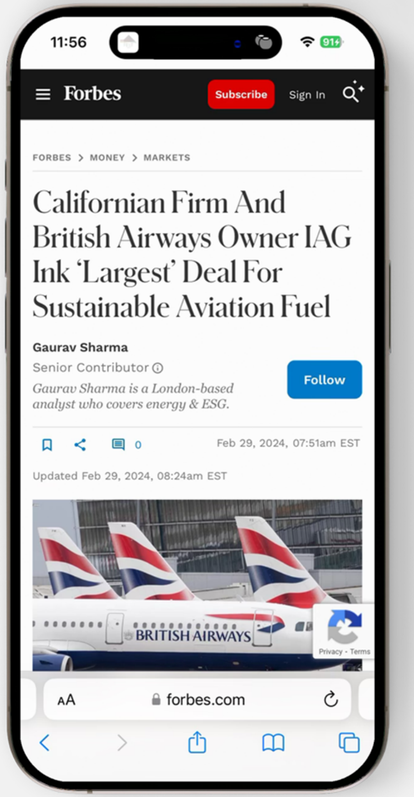
Pangaia Labs

World’s first CO2Made®
Sunglasses

an unprecedented eSAF partnership

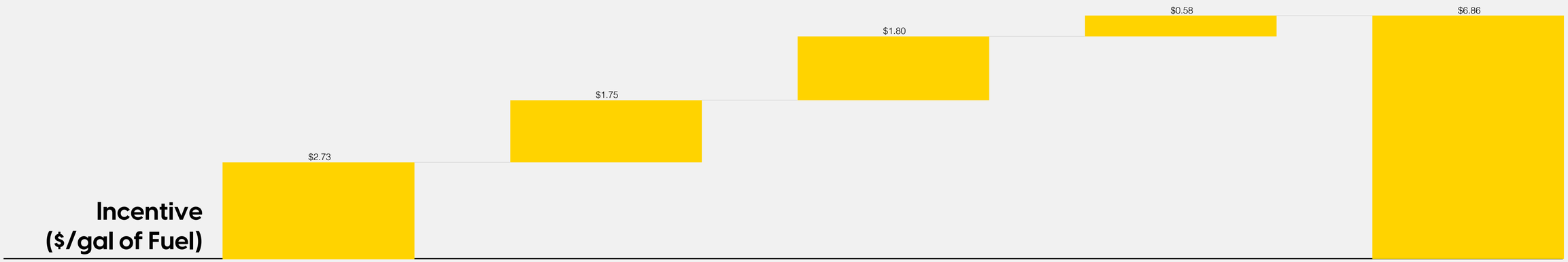
twelve x Alaska AIRLINES x Microsoft

largest eSAF deal ever



Twelve x IAG
14 Year
1 Billion Liters
Largest eSAF deal ever

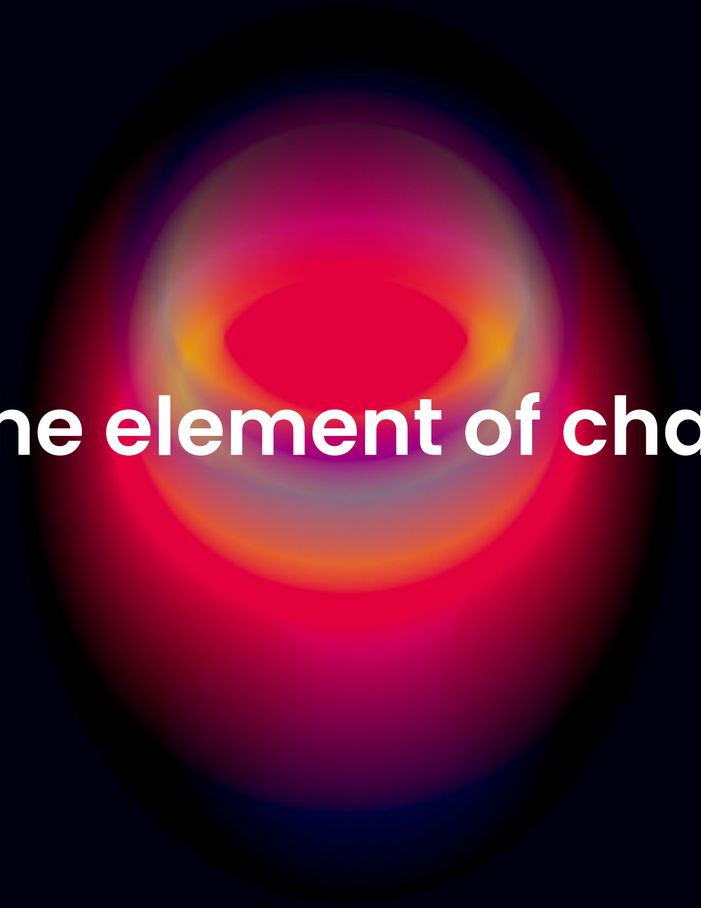
How do government incentives work?



Legislation	45V Hydrogen Production Tax Credit	45Z Clean Fuel Production Tax Credit	State-level incentives, i.e. WA	45Q
Incentive	up to $3/kg-$H_2$	Up to $1.75/gal	Up to $2/gal	$60/tonne-CO2
Conversion	0.91 kg-H2/gal	90% emissions reduction → $1.42/gal	90% emission reduction → $1.8/gal	9.58 kg CO2/gal
Expiration	2043, credits last for 10 years after COD of projects started before 2033	2027, expected to extend	n/a	2045, credits last for 12 years after COD of projects started before 2033

our investors and partners

Cumulative investments inclusive of Series C raise: $800 million



be the element of change

appendix

sustainable aviation fuel timeline

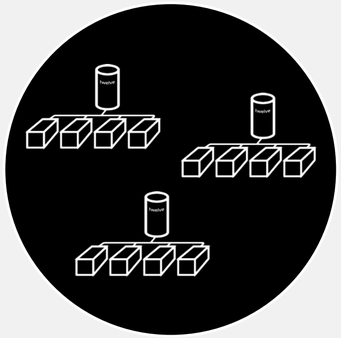
2025

Takeoff

2026/2027

Mass Production

2028+



Multiple AirPlants

delivering jet fuel made from air

production

E-Jet® is produced in Moses Lake plant

shipping

eSAF shipped via truck and JetA shipped via pipeline

blending

Fuel is blended at terminal

delivery

Fuel is shipped to Seattle-Tacoma Airport

fueling

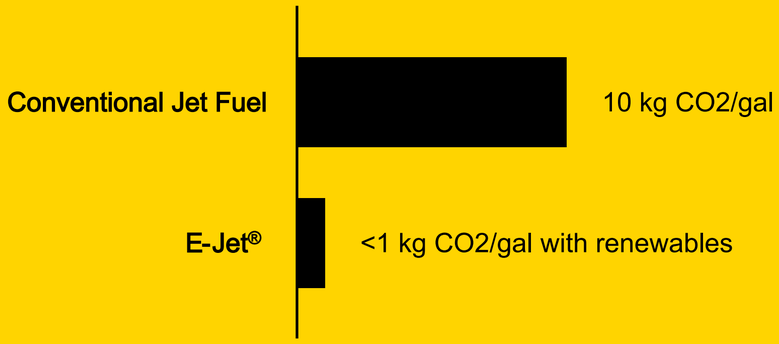
Storage, Tracking & Into-Wing Delivery

jet fuel made from air

First E-Jet customer: **US Air Force**
Fuel delivered and tested: **Summer 2021**

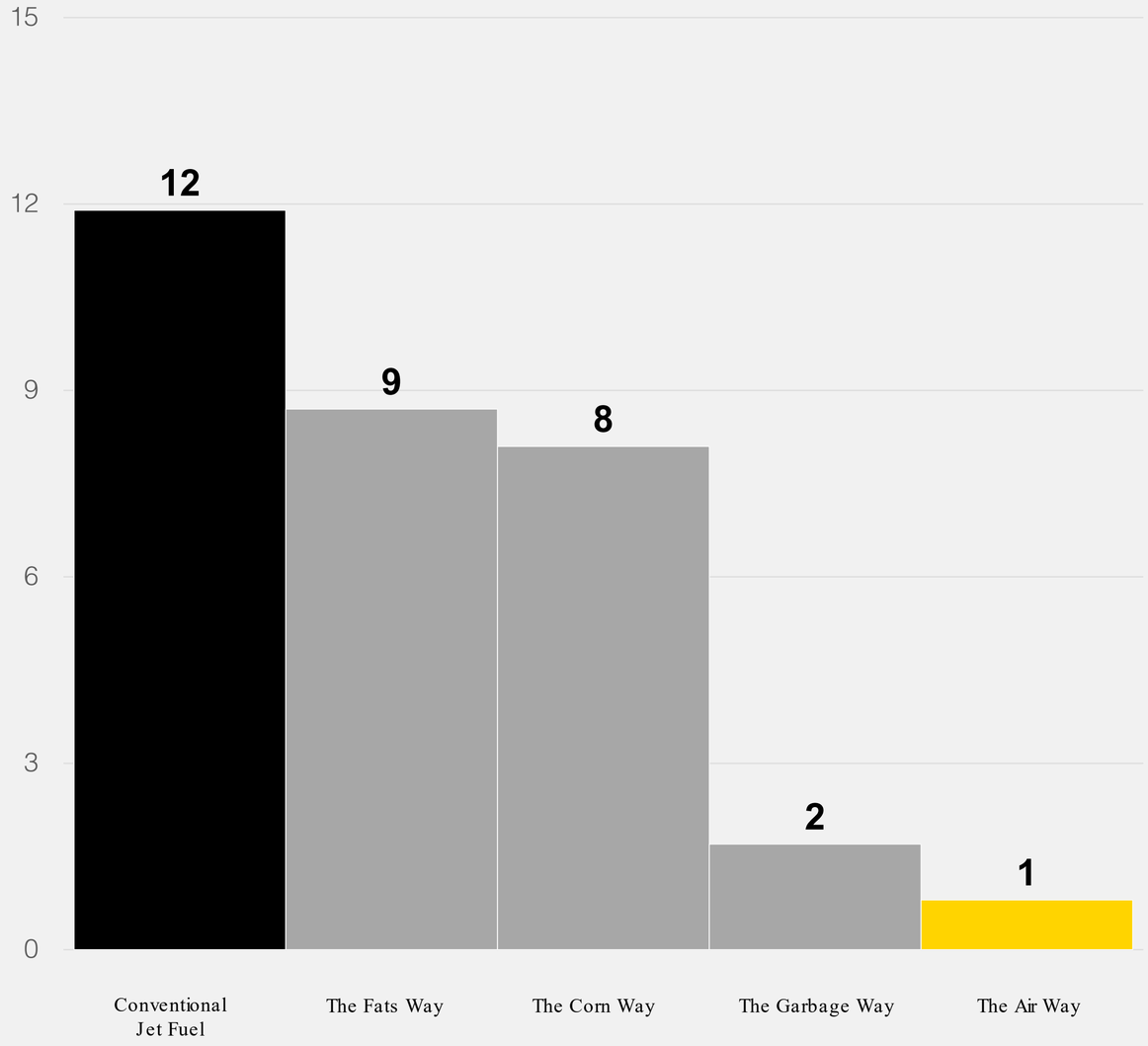
90%

Up to 90% lower emissions
than conventional jet fuel



e·jet®

making jet fuel from air significantly reduces carbon dioxide emissions

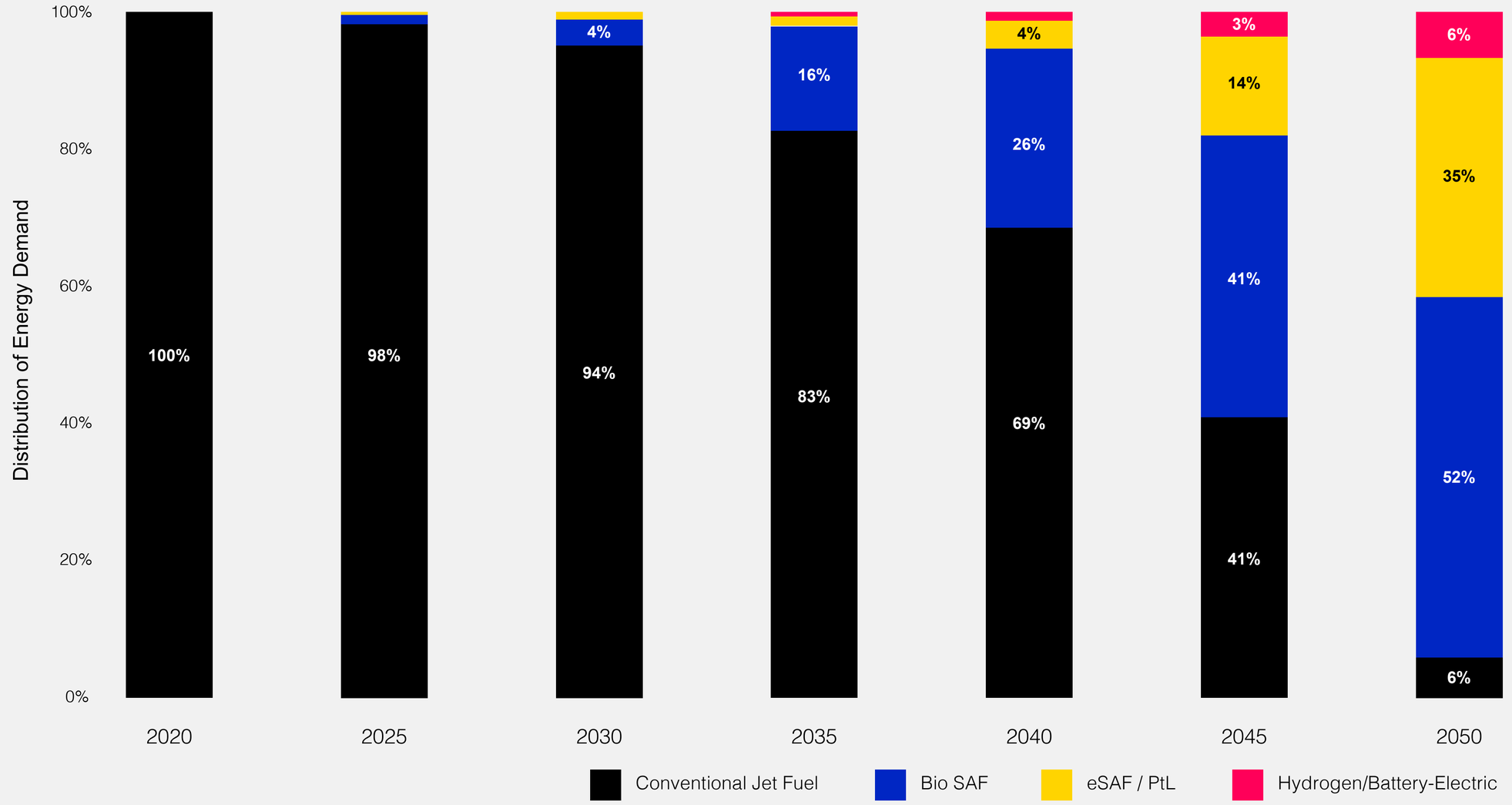


twelve

90%

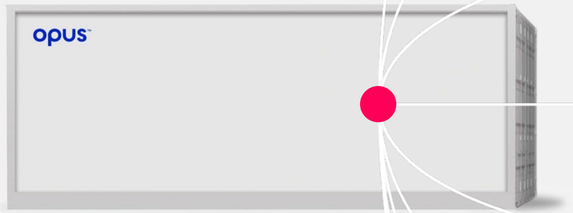
E-Jet has up to 90% lower emissions than conventional jet fuel

increasing demand for power-to-liquid SAF

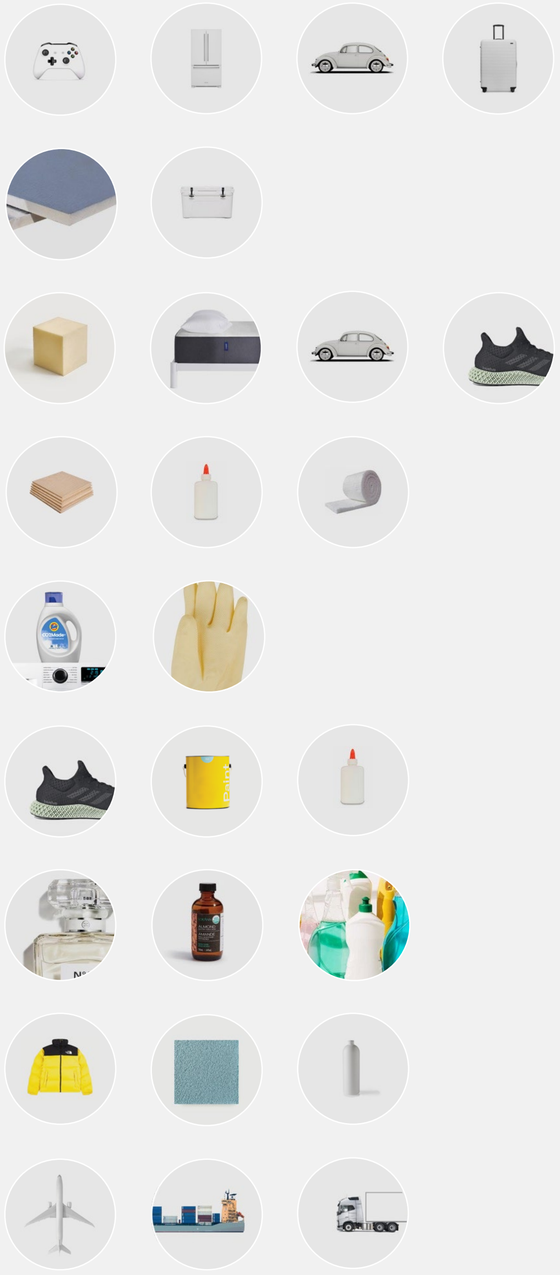


Source: IATA Sustainability and Economics

e·naphtha™



Polycarbonate	Electronics, Appliances, Automotive, Protective Shells
	Rigid PU Foam: Insulation, Food Storage
MDI, TDI, PMPPI	Flex PU Foam: Mattresses, Automotive, Footwear
Methanol (from Syngas)	Wood Laminates, Adhesives, Insulation, Plywood
Formic Acid	Detergents, Natural Latex
Acetic Acid	Footwear, Paints, Adhesives
Oxo Alcohols	Fragrances, Flavorings, Solvents
Onsite CO	Food Packaging, Nickel Treatment, R&D
Ethylene Glycols	Polyethylene Terephthalate for Fibers, Films, and Bottles
Transportation Fuels	Jet fuel, Diesel



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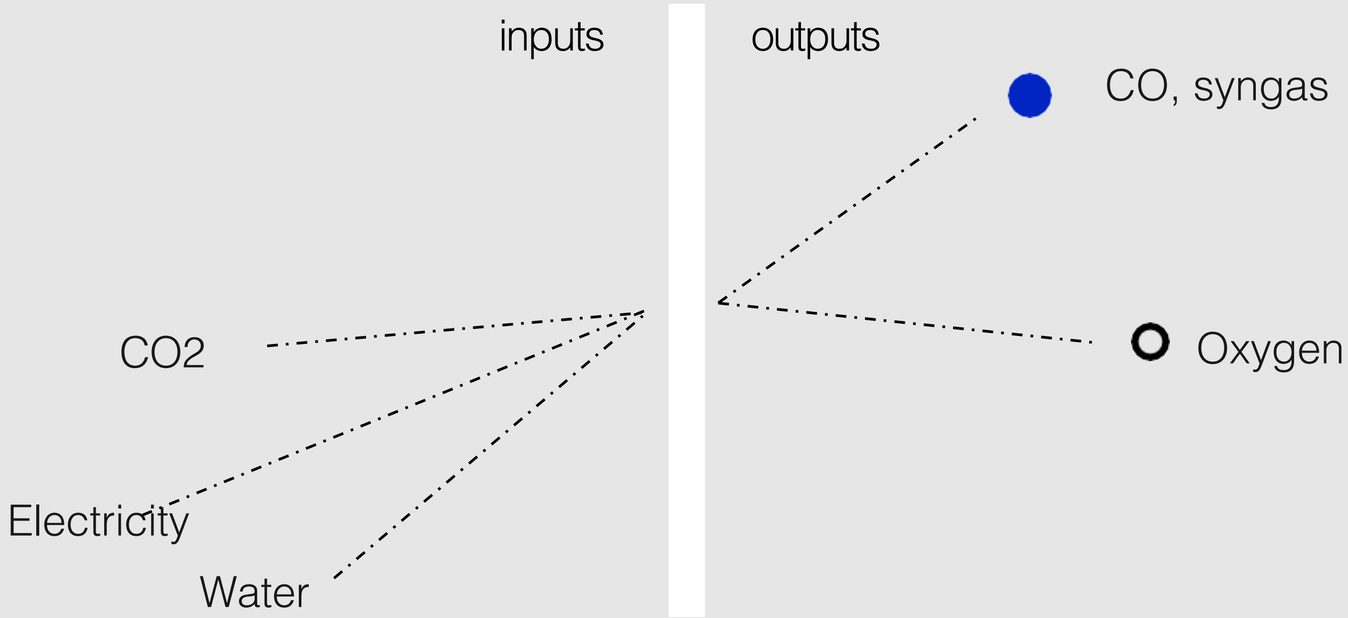
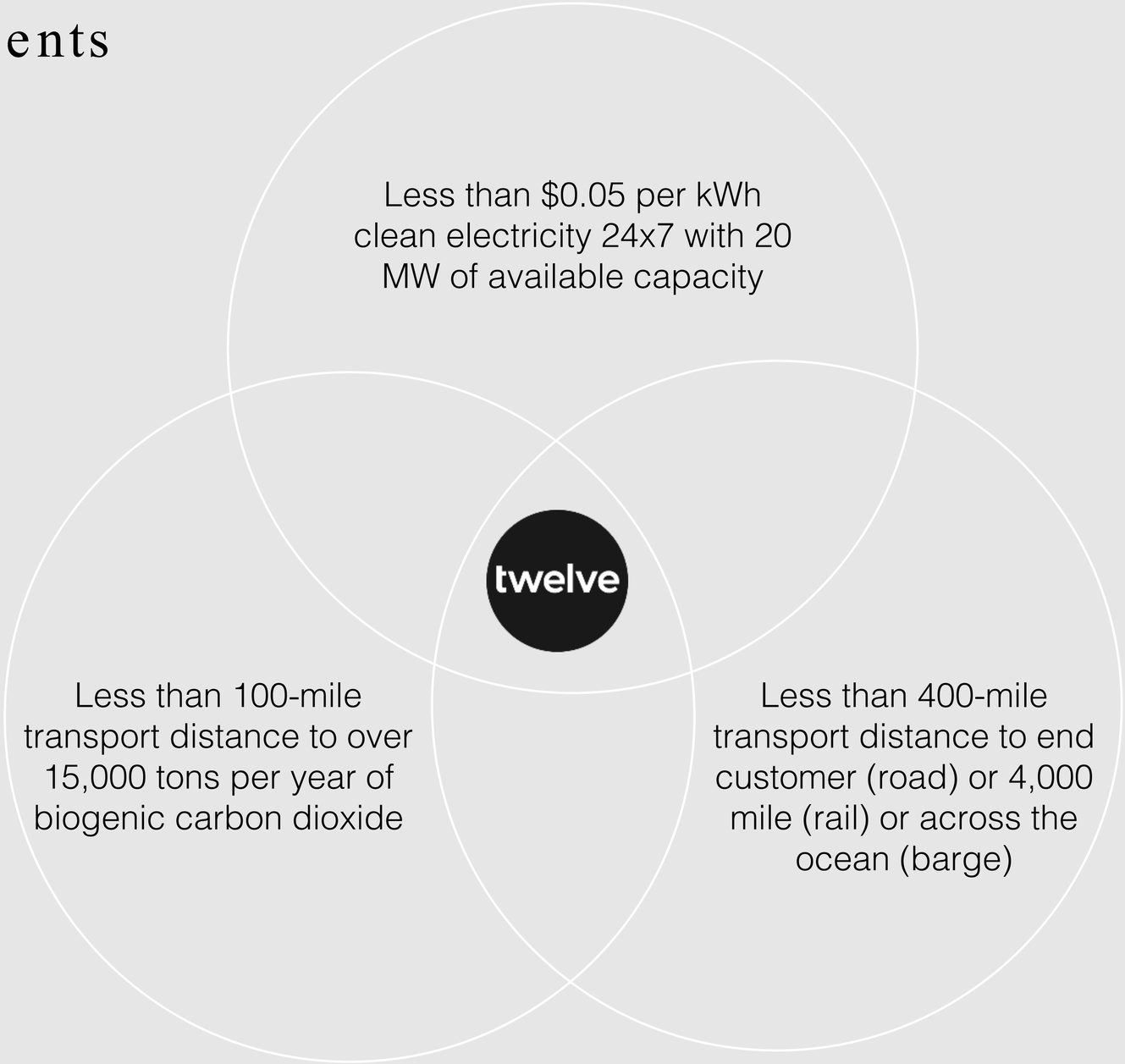
we transform CO_2 into ingredients for chemicals, materials, and fuels



process: a platform technology that enables PEM electrolyzers to make carbon-based products

Confidential

project requirements