Innovation in transportation fuels

Enabling deep decarbonization

molecule
BUILDING SUSTAINABLE FUTURES

Broad range of renewable feedstocks and growing

Waste animal fat from the food processing industry
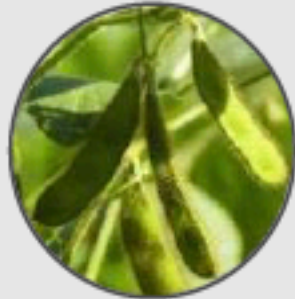
Waste fat from the fish processing industry

Vegetable oil residues (stearin, PFAD and spent bleaching earth oil)

Technical corn oil

Tall oil pitch

Soybean oil

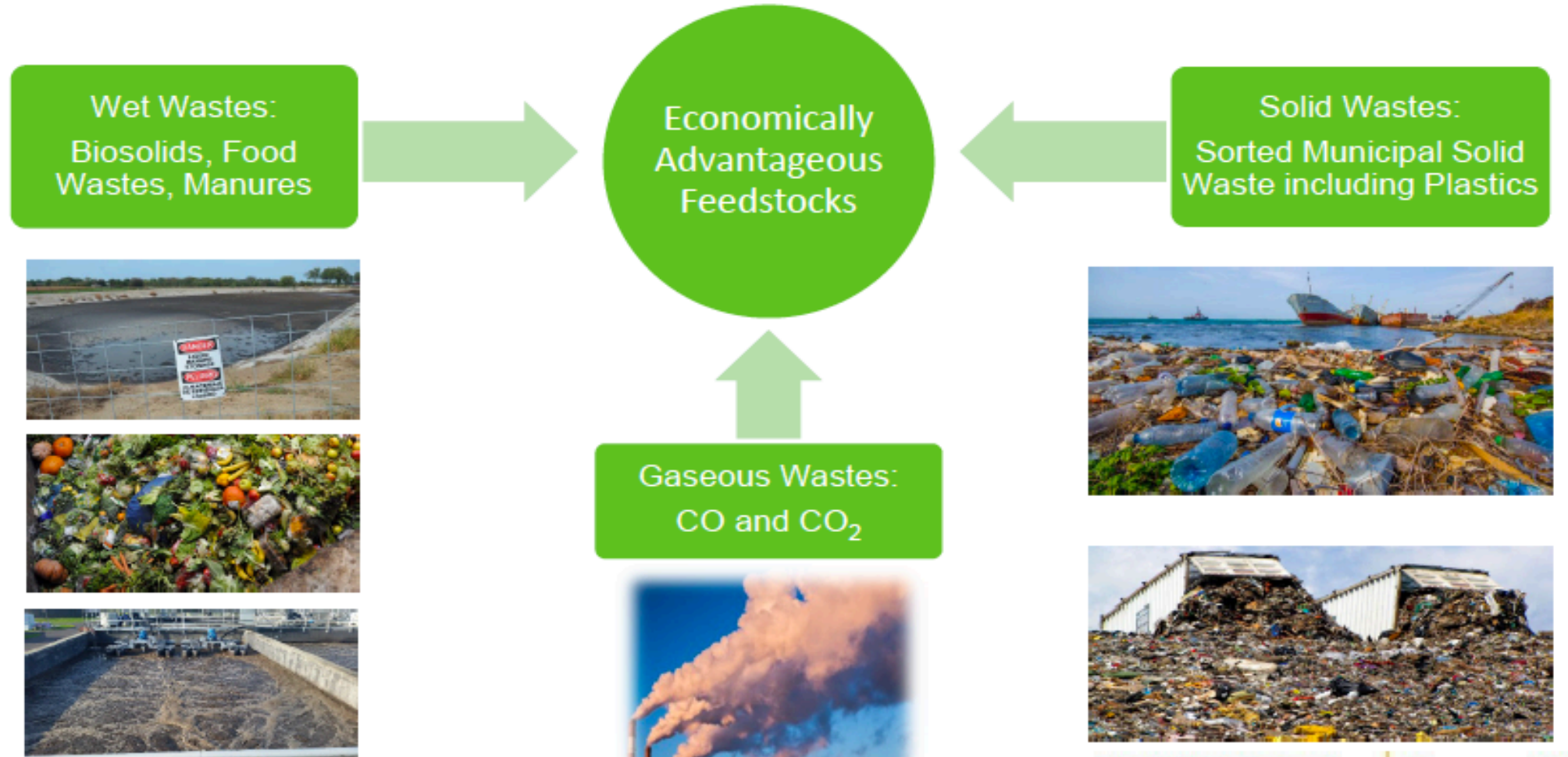Crude palm oil

Camelina oil

Jatropha oil

Rapeseed oil

Used cooking oil

We have many untapped carbon resources

Leveraging DOE's National Laboratories expertise in polymer deconstruction in biomass and applying it to distributed sources of waste carbon to make molecular building blocks for fuels, products, and energy

Wet Wastes: Biosolids, Food Wastes, Manures

Economically Advantageous Feedstocks

Solid Wastes: Sorted Municipal Solid Waste including Plastics

Gaseous Wastes: CO and CO_2

Aviation is scaling up, but progress is slow

UNITED

UNITED

Southwest

FedEx

jetBlue

Alaska AIRLINES   American Airlines

KLM

world energy

Fulcrum BIOENERGY

RED ROCK BIOFUELS

RED ROCK BIOFUELS

SG Preston

NESTE

NESTE

1-2M gpy 2016-19
5-10M gpy 2020-21

90-180M gpy, over 10 year

3M gpy

3M gpy

~10M gpy for 10 years*

MOUs for potential future supply

Flights from Schipol (millions)

Aviation faces challenges decarbonizing

CONTRIBUTION OF MEASURES FOR REDUCING INTERNATIONAL AVIATION NET CO_2 EMISSIONS

Operational Improvements

Technology

Sustainable Alternative Fuels And Market-Based Measures

Carbon Neutral Growth From 2020

Basket Of Measures

Gap to be met By CORSIA and SAF?

International Civil Aviation Organization, 2016
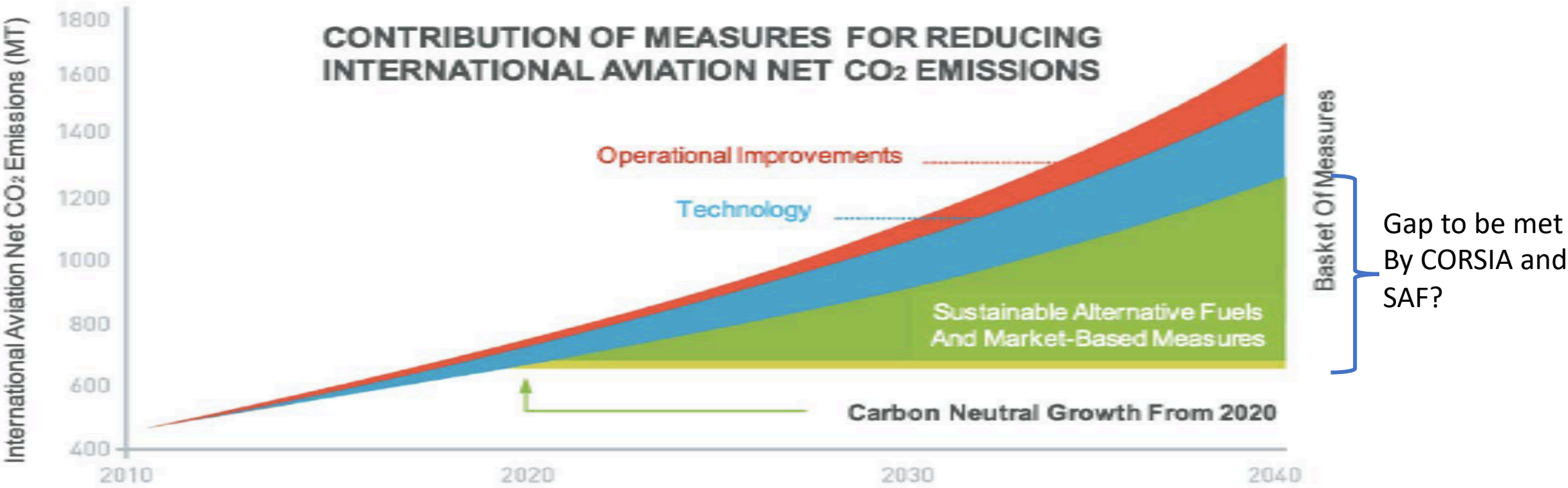
RNG, renewable diesel, hydrogen, electricity are averaging 80% to 150+% CI reductions

EER-Adjusted CI (gCO2e/MJ)

CARB 2018
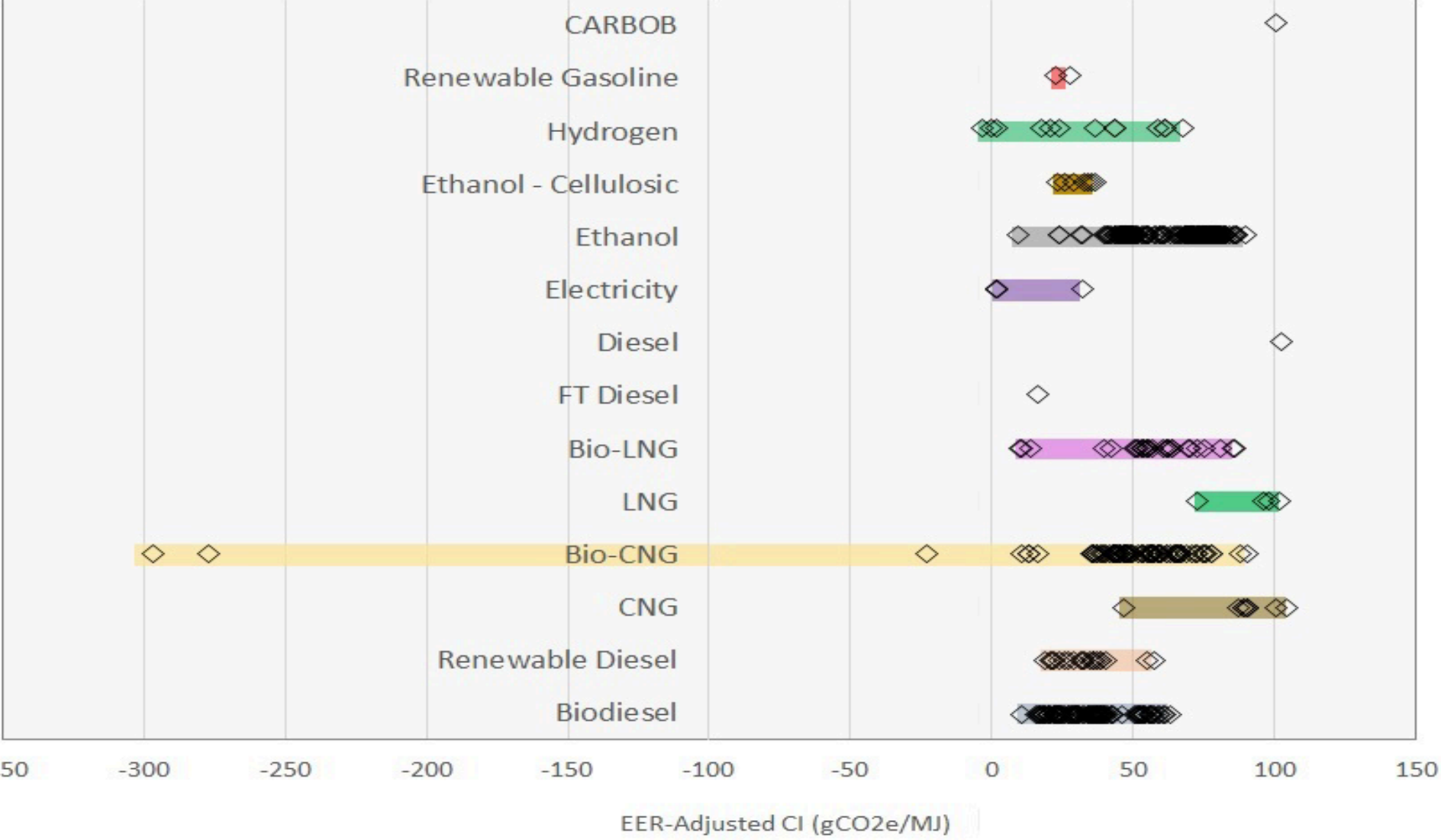
Focus on the right solution:

By asking, what is the fastest path to decarbonization?

It's not about electrons (electrification) or molecules (fuels), it's about clean electrons and molecules reducing the CI of Transportation = LCFS

Light duty transport = use clean electrons

Medium duty trucks transport (RTB) = use clean electrons or molecules

Heavy duty transport = use clean molecules

Aviation = use clean molecules

Maritime = use clean molecuels

Thank you for your attention

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