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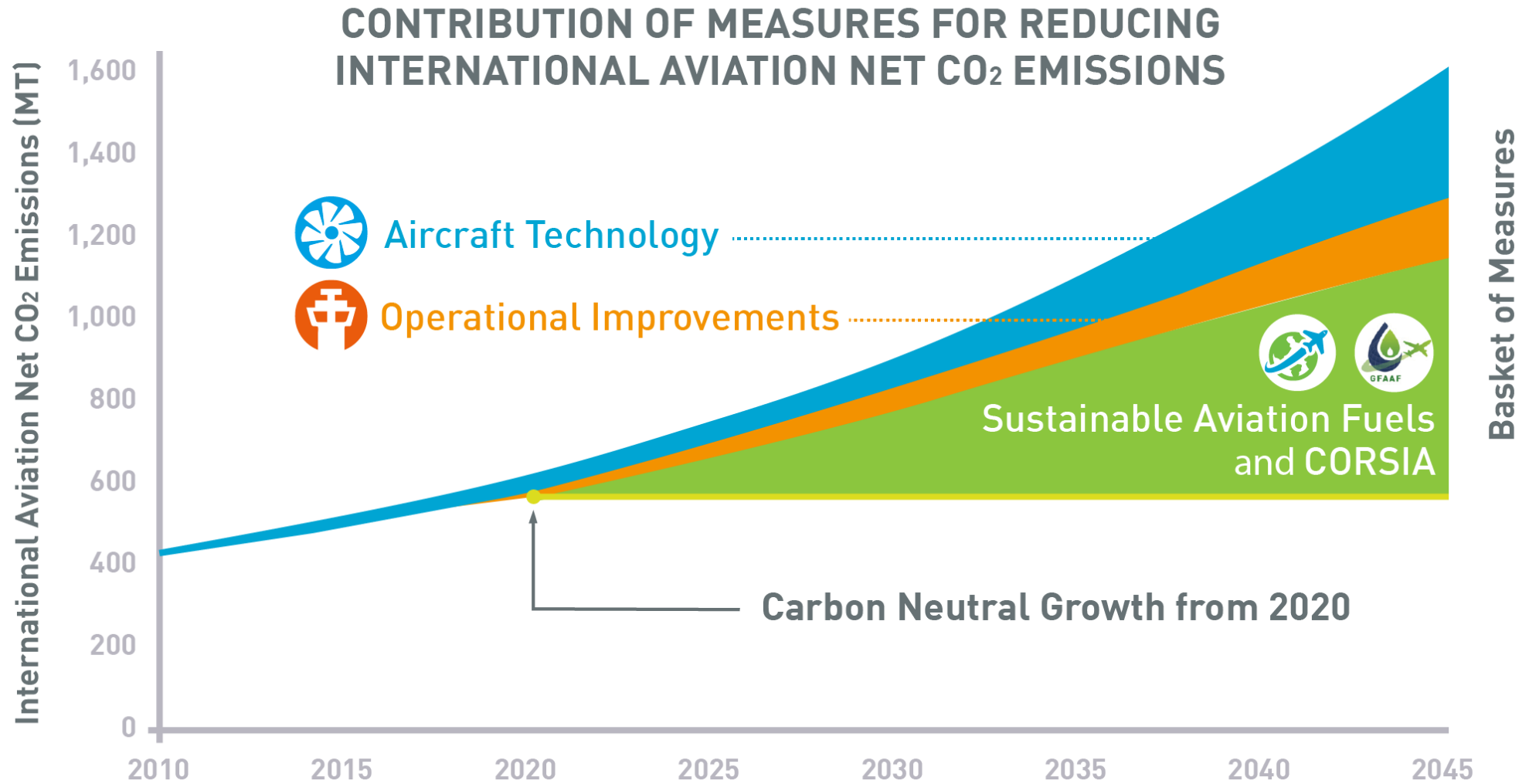
PATHWAYS TO SUSTAINABLE AVIATION

Michael Wolcott

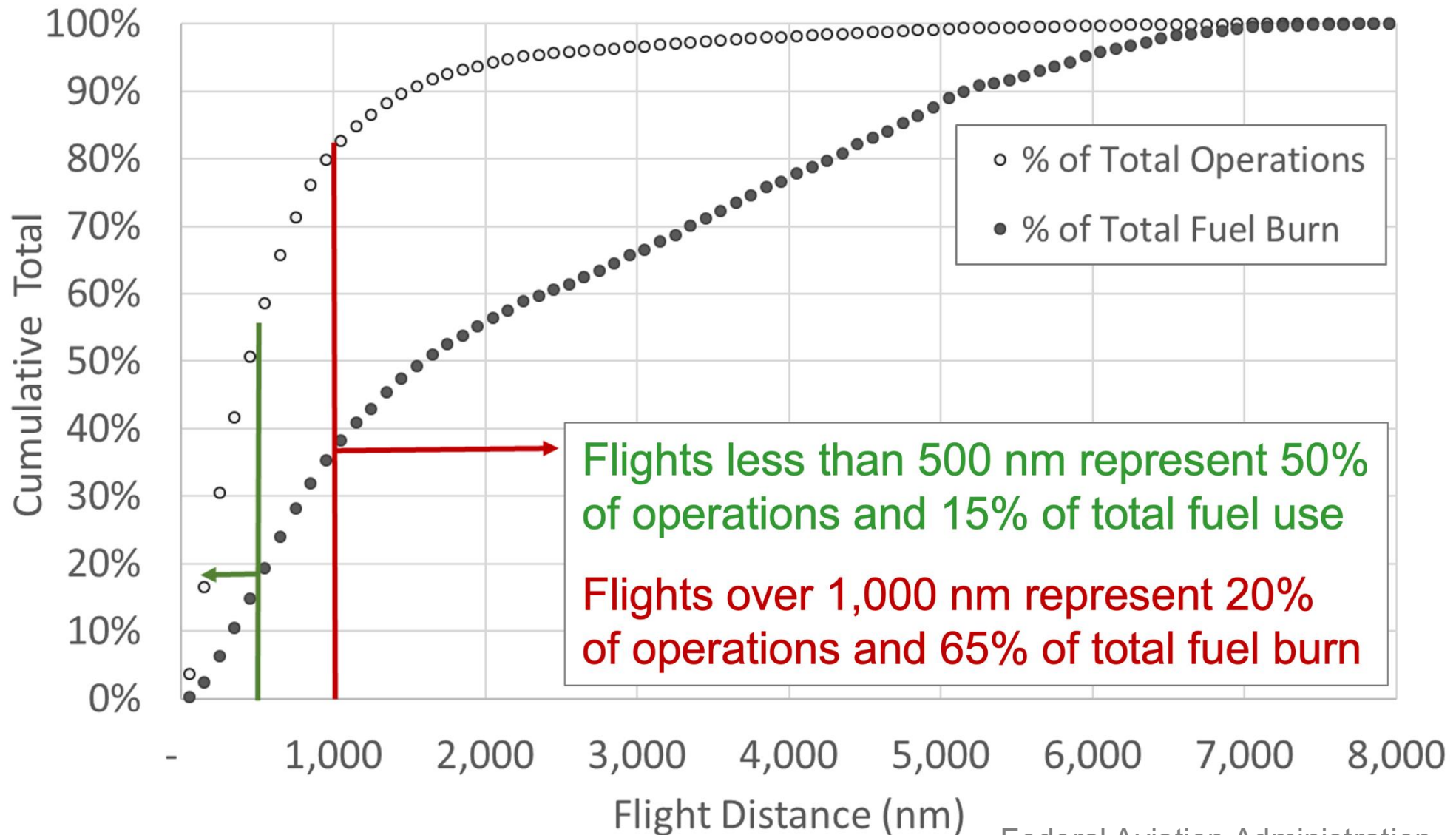
Regents Professor & Director

ASCENT – FAA Center of Excellence

January 29, 2026



Long Haul Flights are Key



Operational Improvements

- Conventional Approach
 - Improved routing options
 - Reduced taxi times,
 - Electrification of tugs, PTO, etc
- Major impacts is contrail avoidance



Persistent contrail forming regions (CFRs) are horizontally large but vertically thin

Lateral extent:



Contrail avoidance region

Contrail forming regions horizontally large
(Avg. flight distance through regions ~150km)...

Vertical extent:



Contrail avoidance region

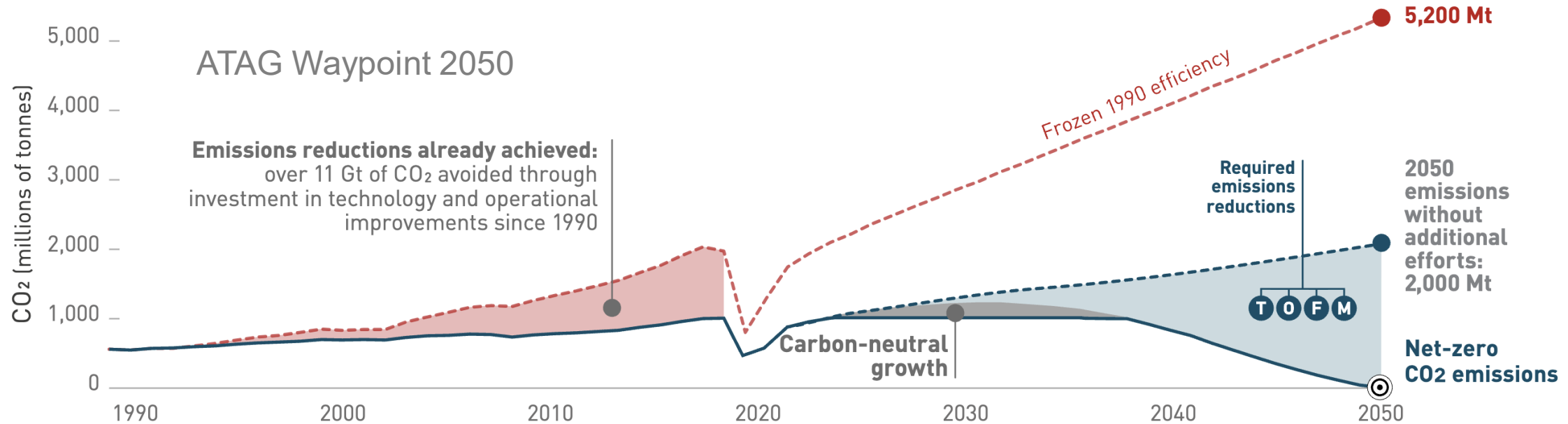
Baseline FL 350

Deviation to FL 310

... but vertically thin (1,500-3,500ft).



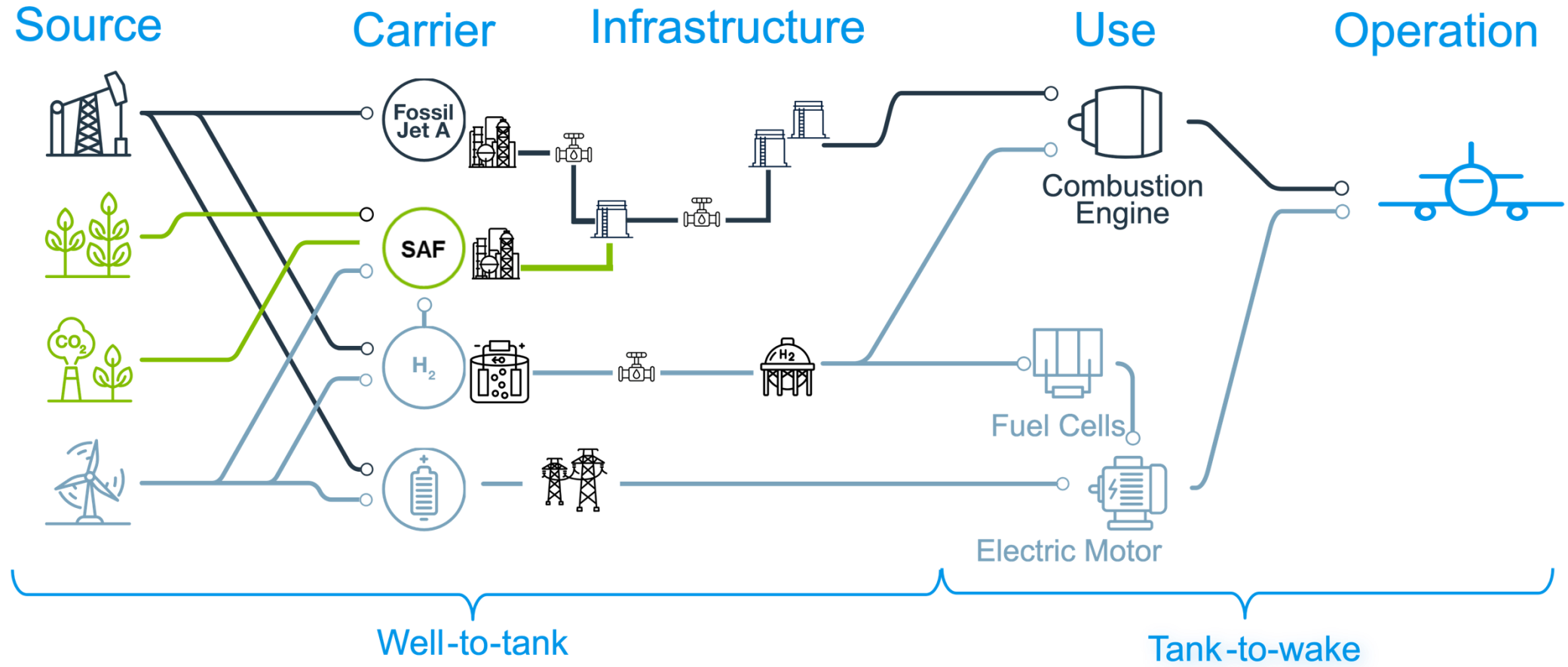
Technology Improvements



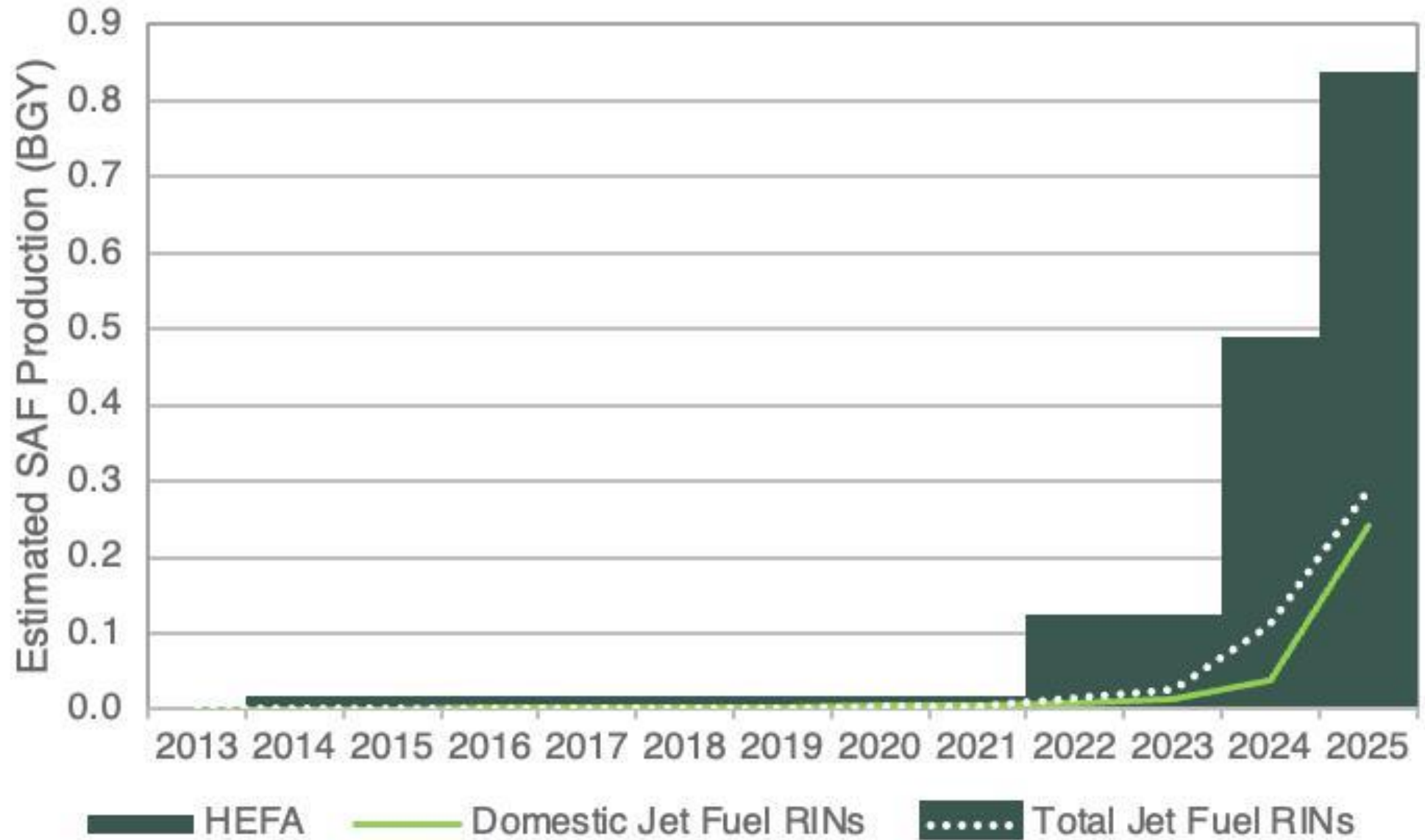
- Aircraft Efficiency has huge contributor
- Fleet renewal will continue this trend
- Major impacts may require radical advances
 - Airframe and wing design
 - Energy systems (hydrogen, electric, hybrid)



Energy System (of systems)



Potential US SAF Capacity vs Consumption





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Thank You