

June 5, 2025



**NORTH
TO THE FUTURE**

Alaska Next-Gen SynFuel Refinery (ANSyR) Producing Sustainable Aviation Fuel

**Alaska Department of Transportation & Public Facilities
Deputy Commissioner Katherine Keith, PMP, PMI-ACP**



FedEx

FedEx

WORLD-CLASS TRANSPORTATION INFRASTRUCTURE

ALASKA'S COMPETITIVE EDGE



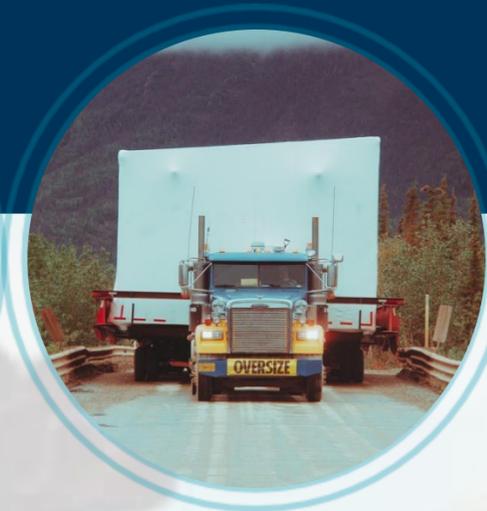
AIR

- **2** international airports
- **12,400** feet long runway to accommodate the largest cargo aircraft,
- Over **500,000** square feet of cargo handling space
- Located just **6** miles from the Port of Alaska



WATERWAYS

- **5** ports among nation's busiest
- Port of Alaska, the largest port, handles over **3.5** million tons of supplies annually
- **M-5AK**: Extends from Puget Sound to Unalaska in the Aleutian Islands
- **M-11**: Arctic Gateway Marine Route



HIGHWAYS

- **5,635** center lane miles
- **11,894** lane miles of roads/highways
- Over **\$1B** State investment in infrastructure improvements annually
- **2.5 mile** Whittier Tunnel, longest rail and vehicle tunnel in North America



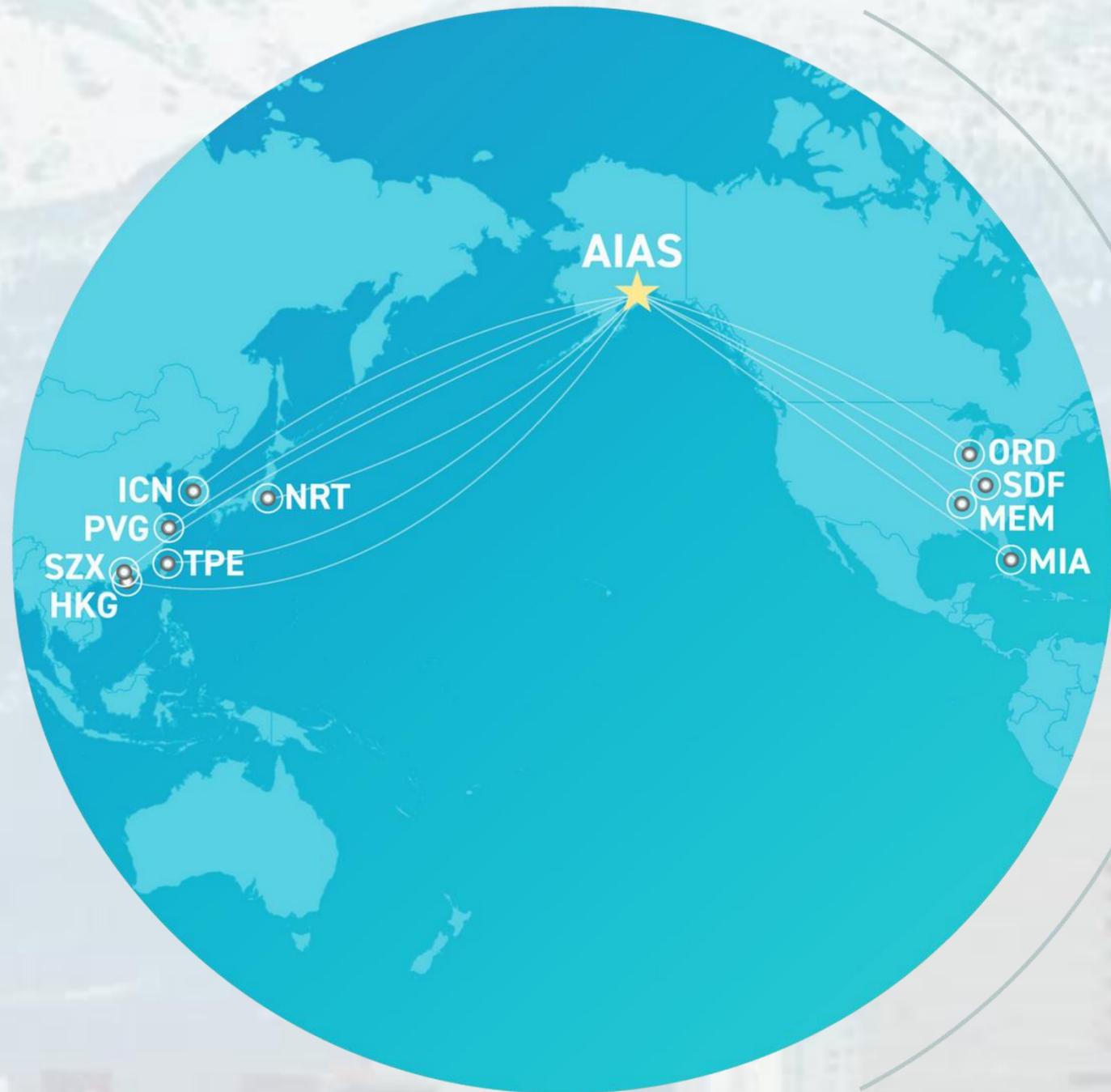
RAIL

- **470 miles**, connecting Seward to Fairbanks
- **656** total miles of track
- **737** freight railcars
- 3.5M tons freight moved annually by Alaska Railroad
- **2.8** million tons in 2020, primarily coal, gravel, and petroleum products

ALASKA CONNECTS THE PACIFIC TO THE ARCTIC THROUGH INTEGRATED AIR, SEA, AND LAND NETWORKS

ALASKA

STRATEGIC CROSSROADS FOR GLOBAL AIR CARGO



LOCATION

Anchorage's prime location, near the top of the world and between Asia and North America, makes it a critical hub for global air routes and long-haul cargo operations.

9.5 HOURS

FROM **90%**

OF THE INDUSTRIALIZED

WORLD

ALASKA'S VISION

INVESTMENT IN THE FUTURE OF COMMERCE, ENERGY, AND SUSTAINABLE GROWTH IN SOUTHCENTRAL ALASKA

Join Us in Unlocking Alaska's Potential



GLOBAL POSITION ADVANTAGE

Strategic Location: Closest U.S. gateway to Asia, the Arctic, and northern shipping routes.

Cost-Efficient Routes: Polar position shortens cargo routes and cuts fuel costs.

Logistics Hub: Top global hub for logistics with advanced infrastructure.

Key Projects: Includes major airports, ports, and the Knik Arm Bridge & Tunnel.

Investment Opportunities:

Open for business, attracting global investors.



Scan the QR code for more information

Fairbanks - 302 miles • Prudhoe Bay - 800 miles (distance from Houston, AK)

UPS BOEING 747-8F AT ANCHORAGE INTERNATIONAL AIRPORT



KNIK ARM BRIDGE

KNIK ARM TUNNEL

PORT MACKENZIE

SUSTAINABLE AVIATION FUEL REFINERY

PROPOSED INTERSTATE A5: ALASKA'S ENERGY AND FREIGHT CORRIDOR

Anchorage-to-interior Interstate as a high-capacity route uniting ports, rail, and resource regions.

Stretching 35 miles from Anchorage to the Parks Highway near Houston, the Interstate A5 corridor will unify Alaska's logistics spine - linking ports, airports, and rail to interior and Arctic infrastructure. BUILT FOR FREIGHT, ENERGY, AND SUPPLY CHAIN RESILIENCE, this all-season route connects the Pacific Ocean to the Arctic, reducing costs and accelerating access to oil fields, mining zones, and resource-rich state lands. It's a CRITICAL INVESTMENT in the long-term flow of goods, energy, and opportunity across Alaska.

PROPOSED WEST SUSITNA ACCESS

Opening Alaska's Land, Resources, and Opportunity

The West Susitna Access Project opens the door to WORLD-CLASS OUTDOOR RECREATION on over 6 million acres of State land - through a new public road that also enables responsible access for natural resource development, energy, and local economic growth.

PROPOSED SAF REFINERY: POINT MACKENZIE

The ANSyR: Alaska's Vision for Sustainable Aviation Fuel at Point MacKenzie

Alaska's Next-Gen SynFuel Refinery (ANSyR) is a proposed SAF facility at Point MacKenzie that would leverage Alaska's vast biomass resources, existing fuel infrastructure, and global cargo access to produce clean, drop-in jet fuel. Strategically located near Anchorage's international airport and backed by the state's carbon storage policies and energy expertise, ANSyR positions Alaska to LEAD IN SUSTAINABLE AVIATION while advancing a carbon-smart economy.

ALASKA INTERNATIONAL AIRPORT SYSTEM

Strategic Reach, Resilient Returns

Anchored by Anchorage and Fairbanks, Alaska's airport system offers 24/7 global access with built-in redundancy, Foreign Trade Zone benefits, and the only U.S. cabotage exemption for cargo transfers. This unique legal and logistical platform connects Asia to North America and unlocks EFFICIENT, RESILIENT SUPPLY CHAIN investment from the Pacific to the Arctic.

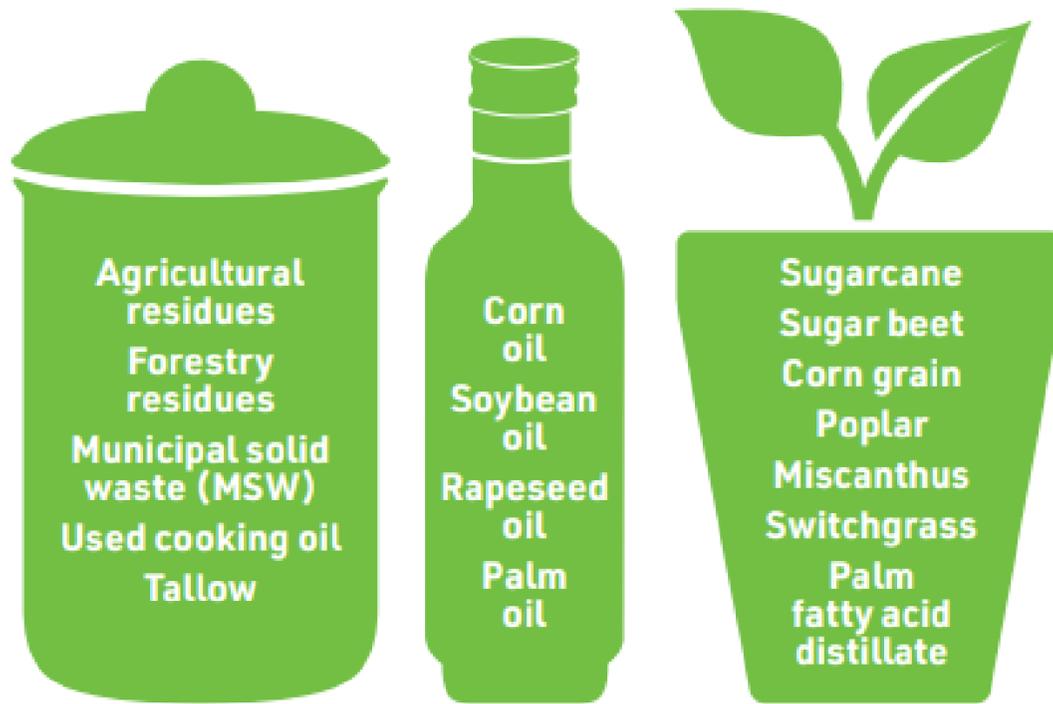
- Existing Roads
- Existing Railways
- Proposed Railways
- Petroleum Refineries
- International Airports
- Proposed Roads
- Tunnels
- Bridges
- Ports



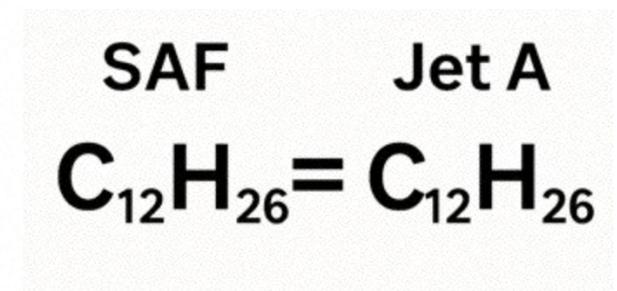
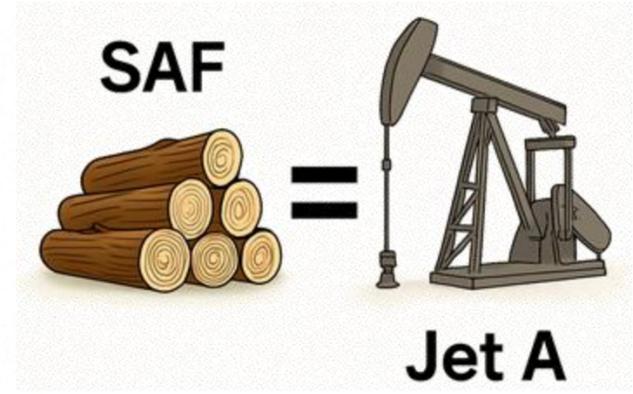
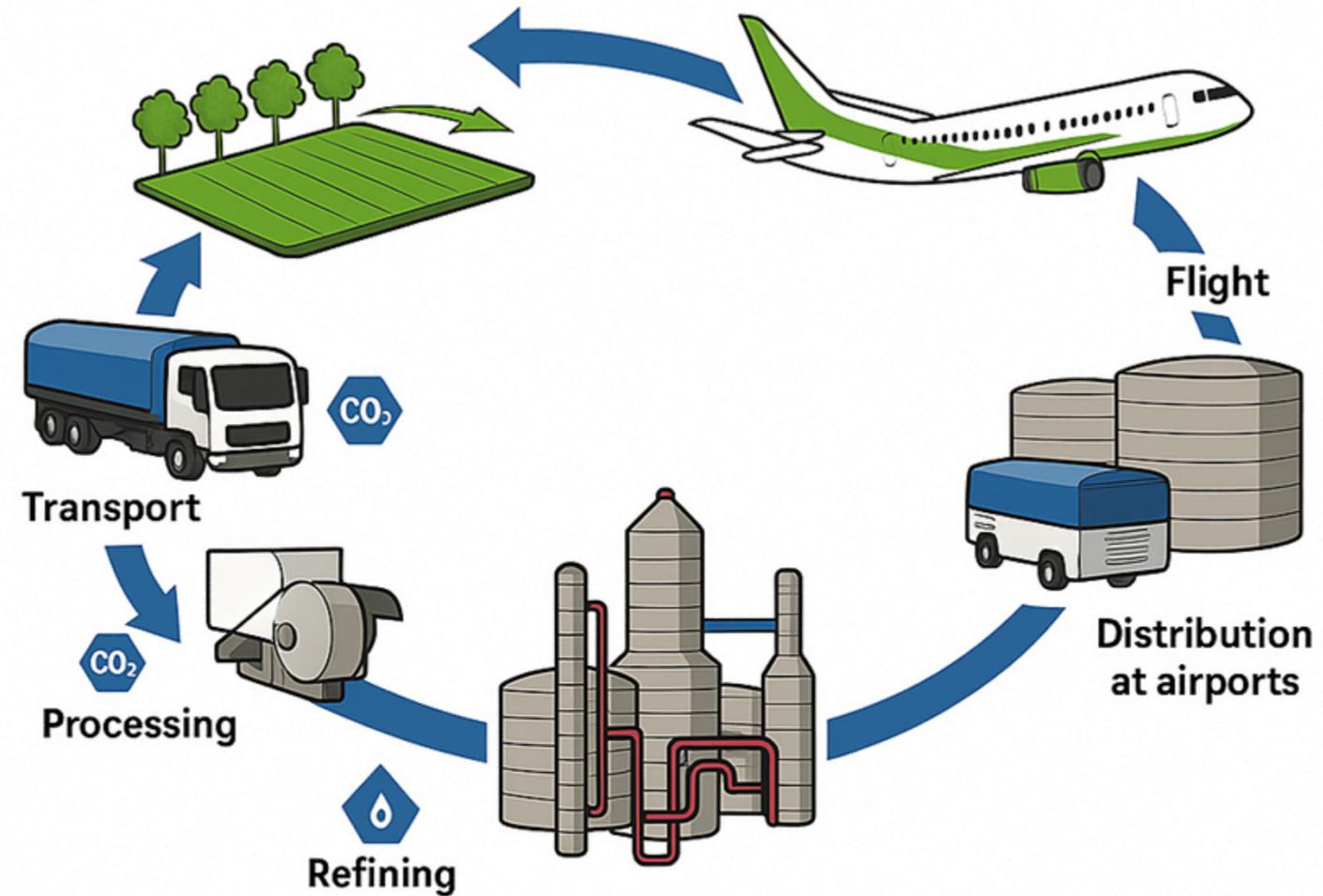
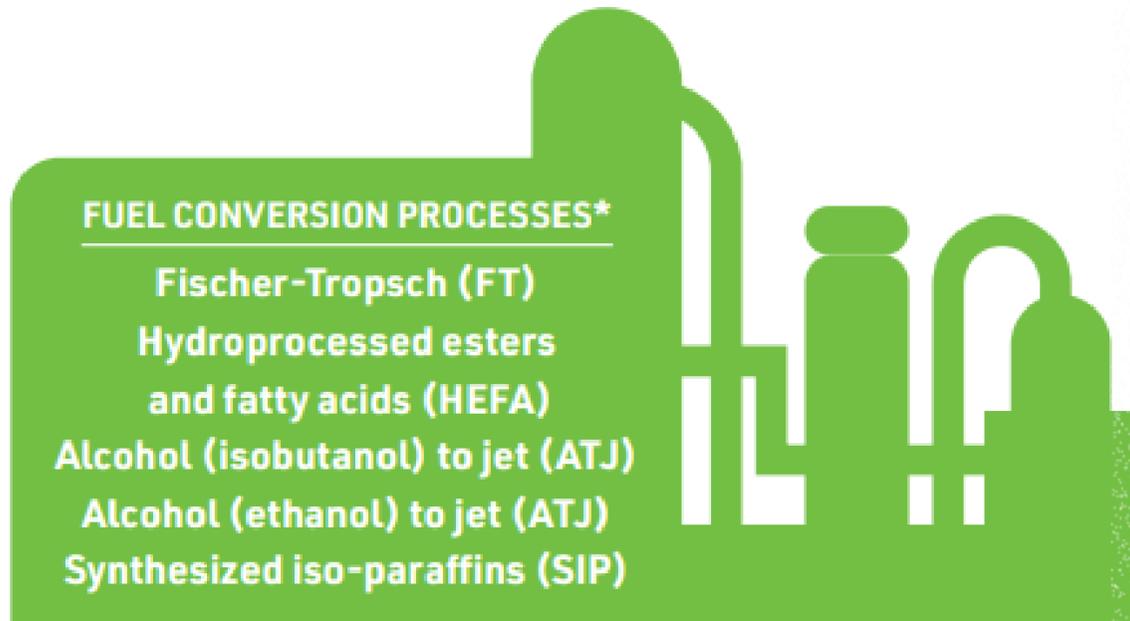
WHAT IS SUSTAINABLE AVIATION FUEL?

Sustainable Aviation Fuel (SAF) is a low-carbon alternative to conventional Jet-A. It is chemically similar to fossil jet fuel and requires no aircraft or infrastructure modifications.

FEEDSTOCKS



FUEL CONVERSION

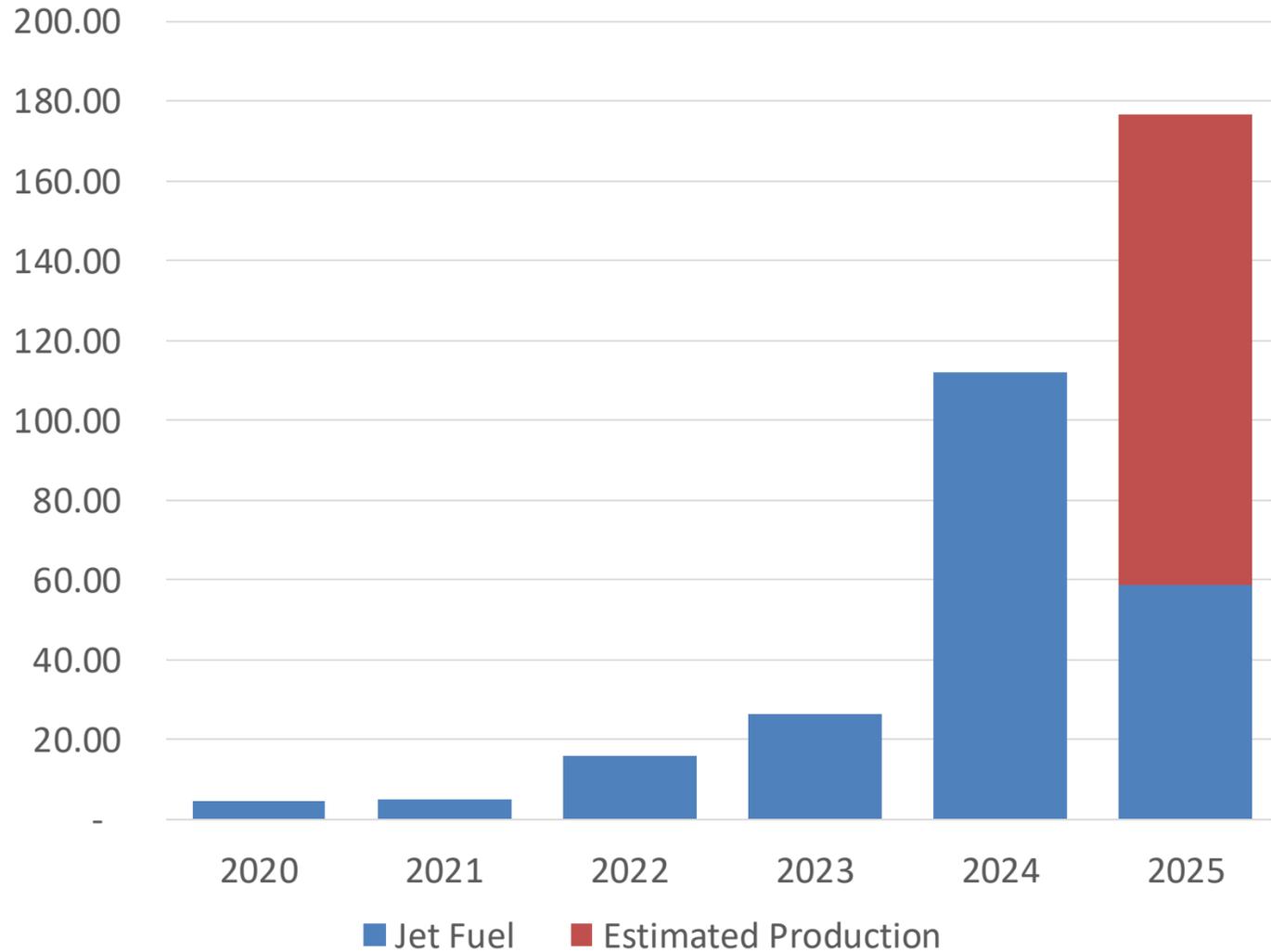


Capturing carbon from the air through biological or recycling processes and converting it into fuel.

*Reference: ASTM 7566 and ASTM 1655 - ensures the technical specifications of the fuel

U.S. SAF PRODUCTION TRENDS & CAPACITY GAPS

Sustainable Aviation Fuel
U.S. Production (Million Gallons)



Excludes SAF not registered under the RPS program or



ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

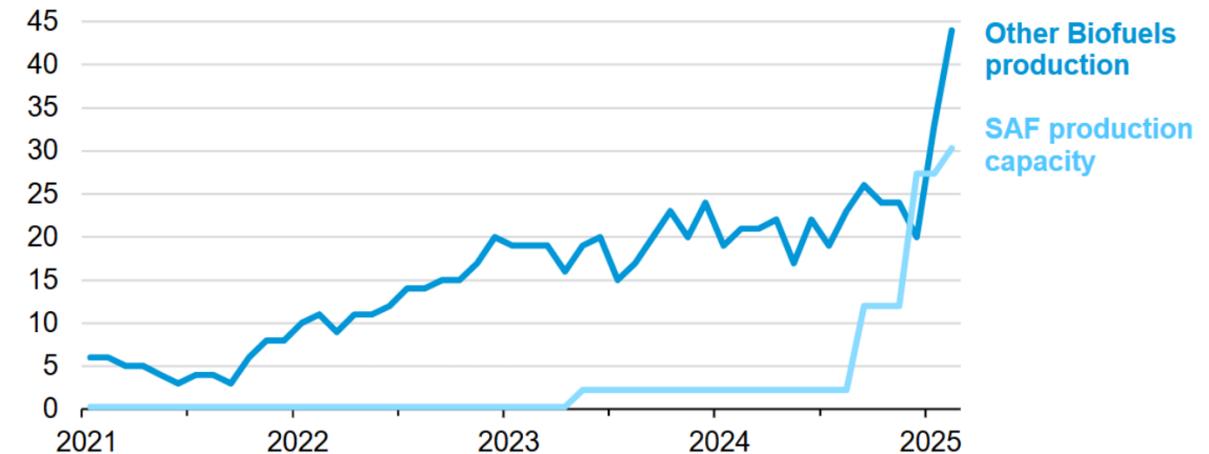
**The U.S.
produced
~93 million
gallons in
2024**



**Sustainable
Aviation Fuel**
Grand Challenge

U.S. sustainable aviation fuel production takes off as new capacity comes online

U.S. production of Other Biofuels and U.S. sustainable aviation fuel (SAF) production capacity (Jan 2021–Feb 2025)
thousand barrels per day



SAF: A Drop-In Fuel for Today's Aircraft

FUELING TOMORROW

ALASKA'S ROLE IN AVIATION ENERGY

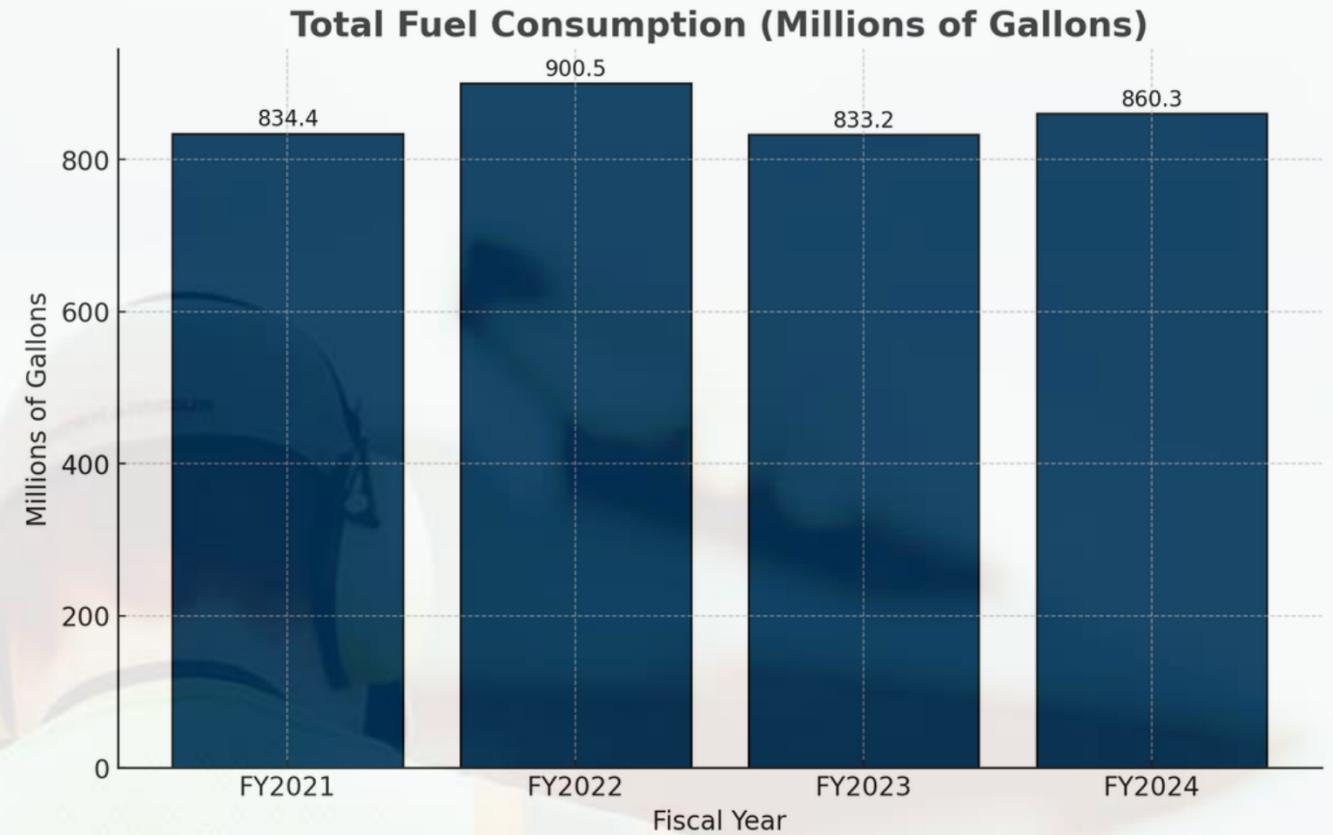


In 2022 alone, AIAS delivered an impressive **900 MILLION** gallons, showcasing Alaska's pivotal role in meeting international fuel demands.

Alaska has the industry expertise

Alaska's deep-rooted expertise in energy development, built over decades as a global leader in oil and gas production, provides a strong foundation for advancing sustainable aviation fuel (SAF) initiatives.

ALASKA HAS THE DEMAND



*Excludes jet fuel consumption from Alaska's major military bases, Eielson AFB (Fairbanks) and JBER (Anchorage), which heavily contribute to state aviation fuel demand.

Documented Air Carrier demand for SAF from FedEx, UPS, Atlas, Alaska Air, Cathay Pacific, Kalitta Air, American Airlines, Delta Airlines, United Airlines, China Airlines totals over 150 million gallons per year.

ALASKA HAS THE RESOURCES

WE'RE A RESPONSIBLE STEWARD OF
THE ENVIRONMENT

RICH IN ENERGY RESOURCES BEYOND OIL



BEETLE-KILLED FORESTS cover over **5 million acres**, posing fire and ecological risks. 2000 to 2020, **2.5 times more** acres burned than in the previous 20 years.

5-6 BILLION LBS SEAFOOD producing **1.5-2 million tons** of byproducts. Alaska produces about **60%** of the nation's commercial fisheries.



ALASKA HAS EXISTING FUELING INFRASTRUCTURE with over **140 million gallons** of fuel storage capacity at the Port of Alaska and an additional **130 million gallons** at ANC to integrate Sustainable Aviation Fuel.



By repurposing underutilized biomass for sustainable aviation fuel (SAF) production, Alaska can mitigate fire hazards, restore ecological stability, and contribute to the aviation industry's decarbonization efforts.

Marathon Petroleum Refinery, Kenai



READINESS PATH

TECHNOLOGY, STANDARDS, & CO-PRODUCTS



ASTM Certification Pathway for Alternative Jet Fuel

1. Engage Aviation Community
2. Establish Technical & Environmental Viability
 - a. Technical Evaluation (ASTM D4054)
 - b. Environmental Evaluation (GHG LCA, Sustainability)
3. Complete ASTM Testing & Submit Data
 - a. Use Clearinghouse for Testing (UDRI, SWRI)
 - b. Present to ASTM Subcommittee D02.J06
4. ASTM Review & Annex Approval
 - a. Voting & Qualification
 - b. Inclusion in ASTM D7566
5. Commercialization & Market Integration
 - a. Engage Airlines, Supply Chain
 - b. Pursue CORSIA or EPA RINs Certification

What Else Is Produced?

In addition to SAF, refineries may also produce:



Renewable Diesel – for road, marine, or heavy equipment use

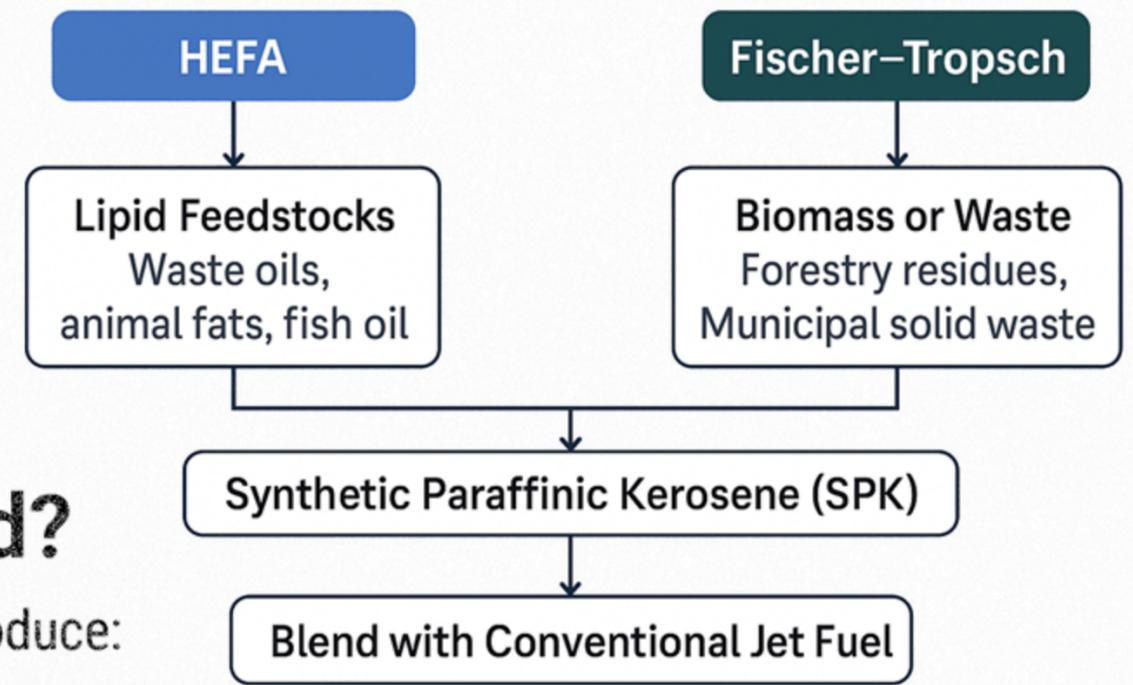


Renewable Naphtha – a blendstock or petrochemical feed



Electricity, steam, or carbon credits – depending on process design

Synfuel Production Pathways – HEFA vs. Fischer-Tropsch

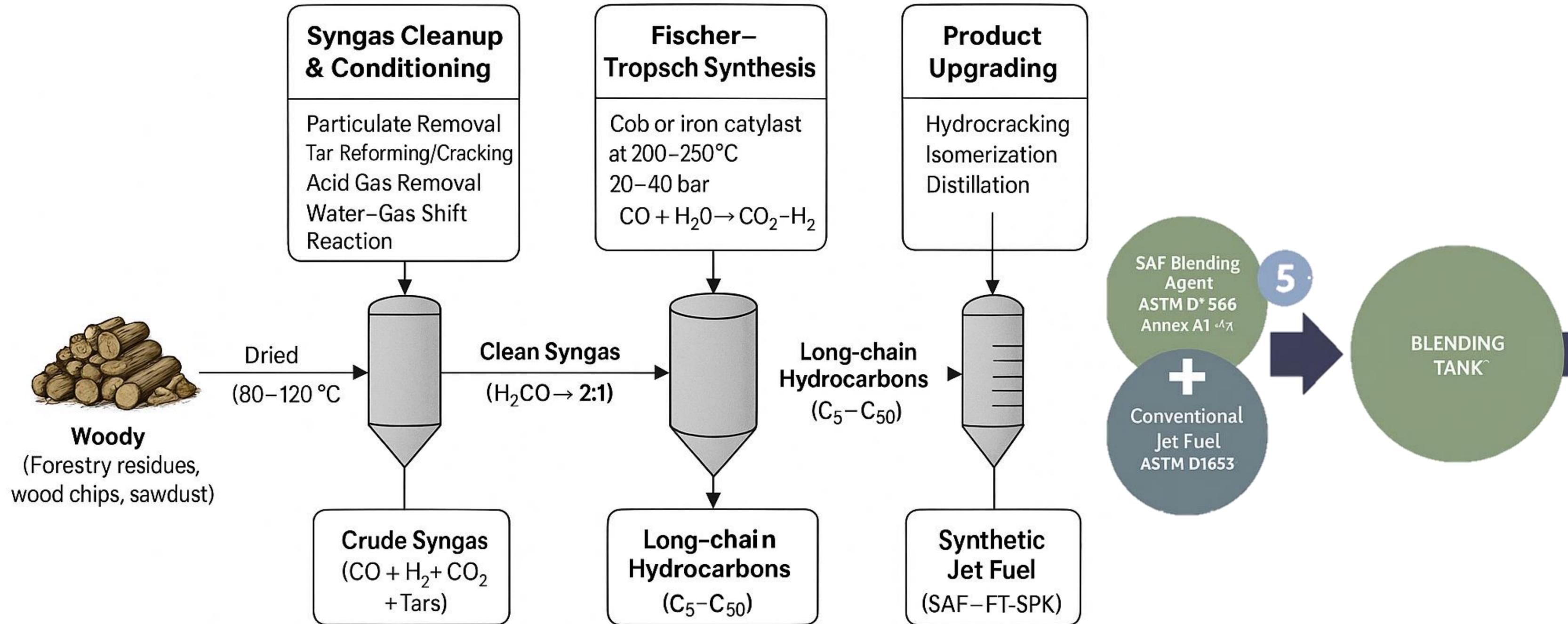


RENEWABLE DIESEL FOR AMHS

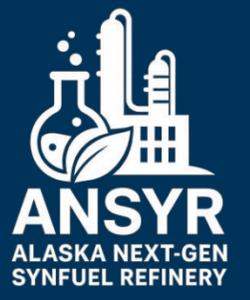


FROM FOREST TO FLIGHT

CARBON PATHWAYS IN THE FISCHER-TROPSCH PROCESS



Alaska's Biomass Landscape



Annual statewide fisheries production in 2023 was **~1.172 million tons (net weight)**, based on aggregated COAR data.

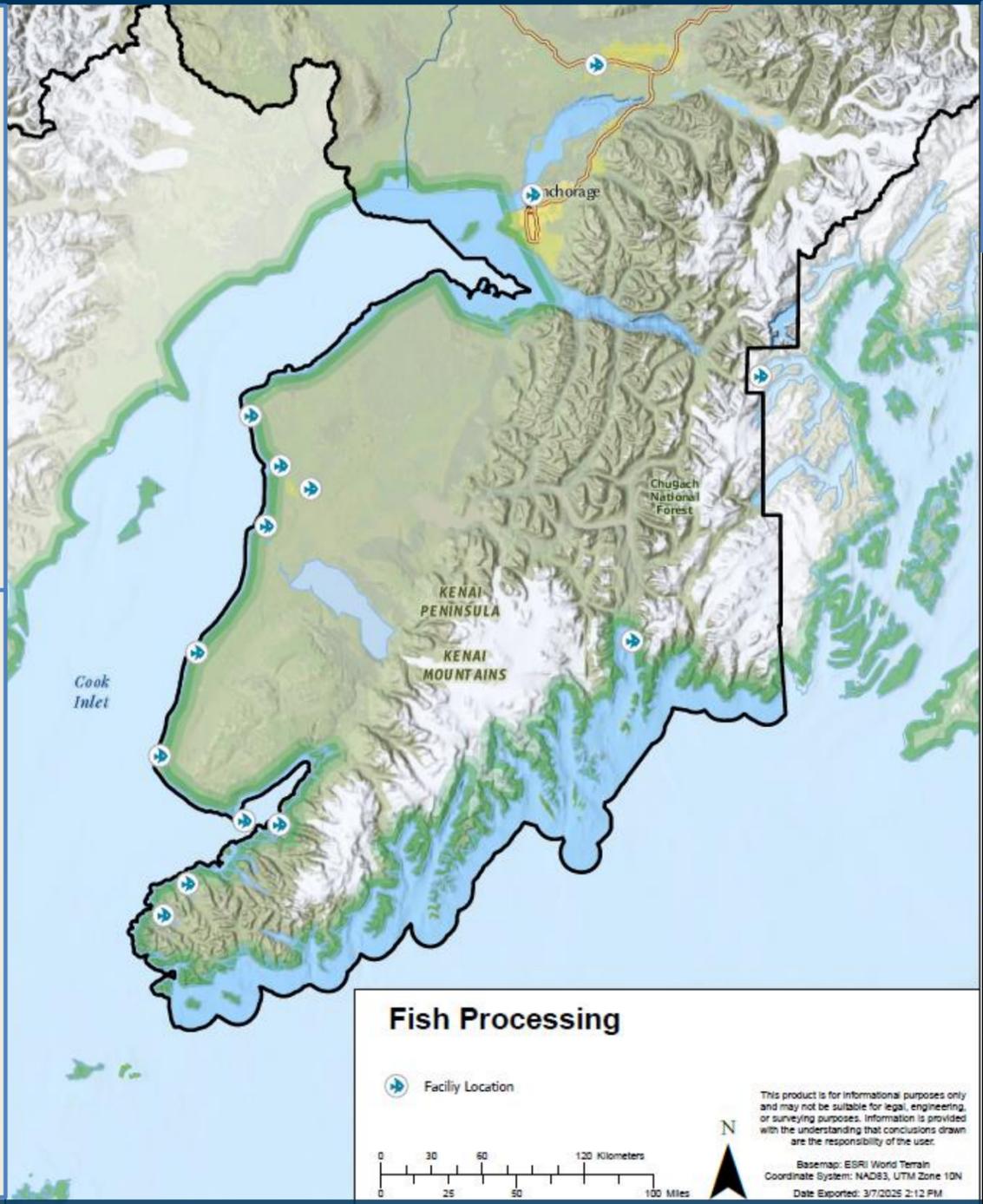
Processing concentrated in Kodiak, Dutch Harbor, Prince William Sound, Southeast Alaska, and Cook Inlet.

⚠️ COAR estimates exclude AYK and Bering Sea regions due to confidentiality thresholds.

Fish oil accounts for ~10% of total fish biomass.

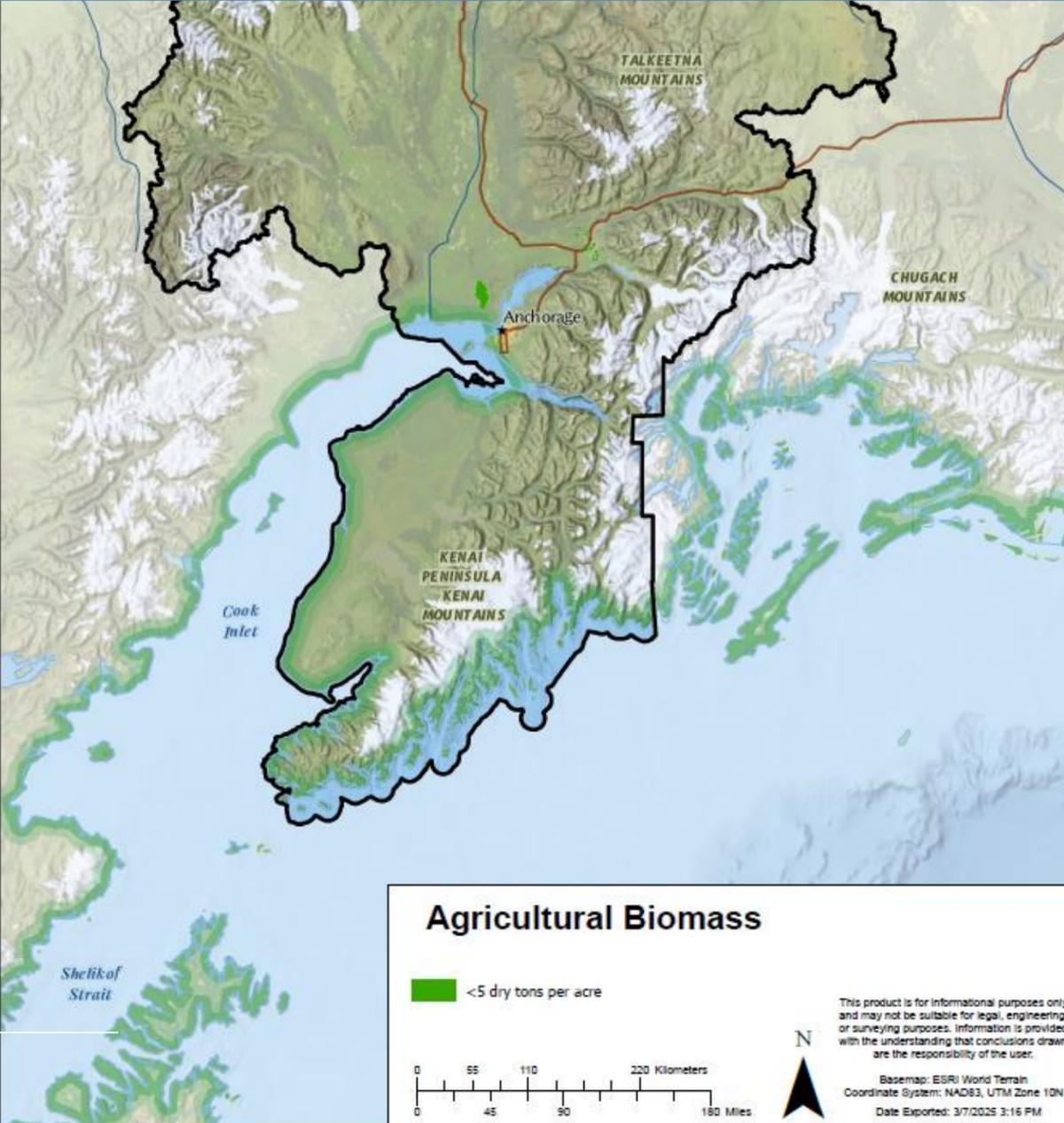
For HEFA SAF production at a scale of **215 MGY**, estimated fish oil input requirements are **~0.7–0.9 million tons/year**, assuming typical industry conversion yields.

Availability depends on species composition, lipid yield, and interannual catch variability.



Hay production within the analysis area (Mat-Su Valley & Kenai Peninsula) is estimated at **16,600 dry tons per year.**

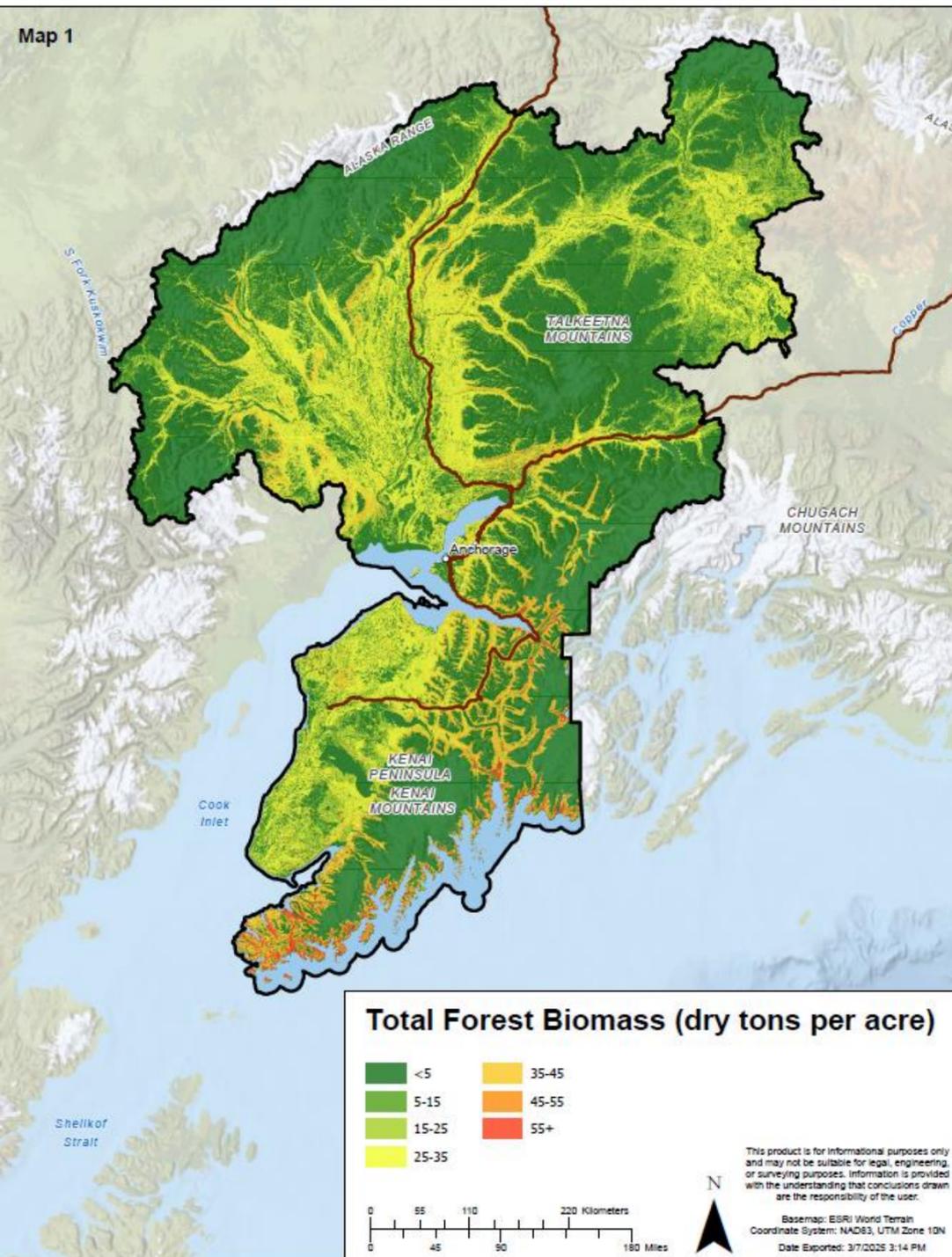
Key growing regions: Palmer and Point MacKenzie.



*DOT&PF Preliminary Biomass Inventory by Mason, Bruce & Girard and Evergreen Economics, March 2025
 COAR (Commercial Operator's Annual Report) data exclude estimates from AYK and Bering Sea regions due to confidentiality thresholds.

Alaska's Woody Biomass

Preliminary Inventory – Mat-Su Valley & Kenai Peninsula



For a target output of **230 MGY** of synfuel, approximately **4.9 million dry tons** (equivalent to **9.8 million green tons**) of woody biomass are required, assuming standard moisture content and conversion yields.

The woody biomass in this studied area alone holds enough energy to power nearly 100,000 Alaskan homes for a year — the equivalent of supplying every home in Anchorage with electricity.

Road-Accessible Woody Biomass and Growth (Dry Tons)

Biomass Type	Within ¼ Mile of Road	Within 1 Mile of Road
Standing Live Volume	16,177,000	39,982,000
Standing Dead Volume	2,578,000	6,255,000
Total Dry Tons	18,755,000	46,236,000
Annual Growth Total	231,095	571,114

*Forest biomass is primarily harvestable during winter due to wet soil conditions in Mat-Su.

1 dry ton = ~18 gigajoules = ~47 gallons Sustainable Aviation Fuel

HEFA VS. FISCHER–TROPSCH PATHWAYS



Category	Hydroprocessed Esters and Fatty Acids Synthetic Paraffinic Kerosene (HEFA-SPK) ASTM D7566 Annex A2	Fischer–Tropsch Synthetic Paraffinic Kerosene (FT-SPK) ASTM D7566 Annex A1
Tech Maturity	Commercial, deployed globally	Early-stage for biomass, mature for fossil gas-to-liquid
Primary Alaska Feedstocks	Waste oils, tallow, fish oil	Woody biomass, municipal solid waste, CO2
Best Fit for Alaska	Near-term option using seafood waste infrastructure; limited scalability	Long-term solution using forest biomass; aligned with carbon removal and forest health goals
Est. Cost per Gallon	\$6.50	\$4.30
Production Volume (MGY - millions gallon per year)	215 MGY (150 SAF, 54 diesel, 11 naphtha)	230 MGY (150 SAF, 58 diesel, 22 naphtha)
CapEx: Installed Cost	\$1.04B	\$2.8B
OpEx: Annual Operating Cost	\$1.04B/year (\$4.84/gal)	~\$534M/year (\$2.32/gal)
Feedstock Cost per gallon	Fish oil (\$4.35/gal)	Woody biomass (\$1.20/gal)

Optimizing Synfuel Yields

Target Output = 150 Million Gallons per Year (MGY) Sustainable Aviation Fuel

HEFA Pathway					
Scenario	SAF Yield	Diesel Yield	Estimated Incremental Cost (\$/gallon SAF*)	Hydrogen Use (kg per barrel of SAF)	Co-Product Impact
Baseline	60%	35%	\$3.50 – \$4.50	3.0	Balanced SAF/Diesel
High SAF	75%	20%	\$4.00 – \$5.00	4.0	Lower diesel revenue
Max SAF	80%	15%	\$4.50 – \$5.50	4.5	Minimal diesel, high SAF

Fischer-Tropsch Pathway					
Scenario	SAF Yield	Diesel Yield	Estimated Incremental Cost (\$/gallon SAF*)	Hydrogen Use (kg per barrel of SAF)	Co-Product Impact
Baseline	55%	35%	\$4.50 – \$6.00	2.5	Balanced SAF/Diesel
High SAF	70%	20%	\$5.00 – \$6.50	3.5	Reduced diesel revenue
Max SAF	75%	15%	\$5.50 – \$7.00	4.0	Minimal diesel, high SAF

Comparative Output Summary Table					
Production Pathway	SAF (MGY)	Diesel (MGY)	Naphtha (MGY)	Total Fuel (MGY)	Co-Product Share (%)
HEFA	150	54	11	215	30.2%
Fischer-Tropsch	150	58	23	231	35.1%

Suggested values based on average Minimum Selling Retail Price (MSRP)

Assumptions: Commercial-scale hydrotreatment (HEFA) and gasification–FT synthesis based on optimized catalyst ratios, thermal efficiency, and hydrogen procurement strategy. Assumes stable input feedstock costs and consistent reactor efficiency.

CARBON INTENSITY PERFORMANCE

MEETING SAF COMPLIANCE AND CORSIA STANDARDS



Target Carbon Intensity: $\leq 44 \text{ gCO}_2\text{e/MJ}^*$ (50% below baseline jet fuel CI of ~89)

Aligned with ICAO CORSIA and California LCFS thresholds

Fuel Conversion Factor, fixed value,

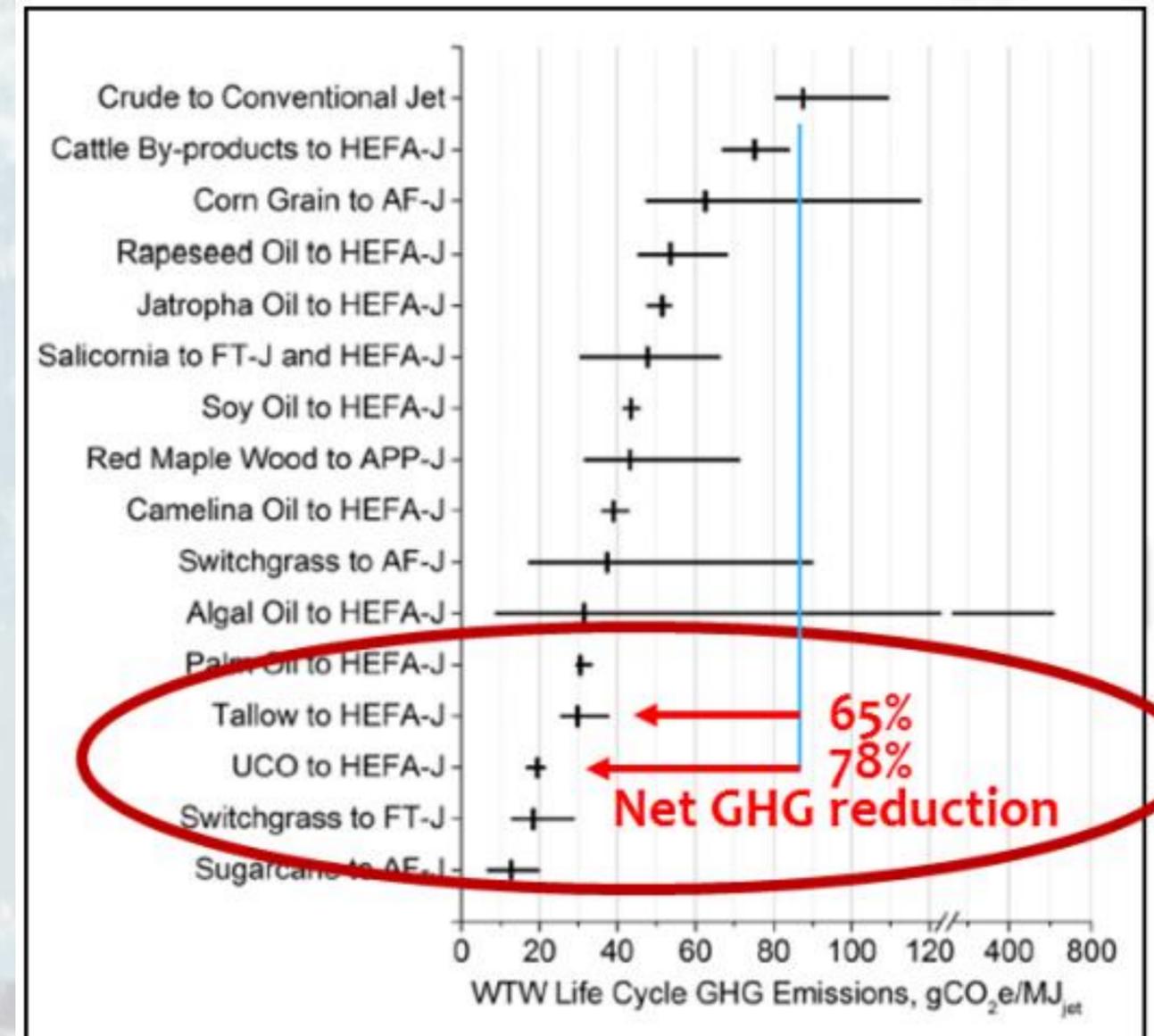
3.16 for Jet-A/ Jet-A1 or 3.10 for AvGas/ Jet B
[kg CO₂/kg fuel]

$$ER_y = FCF \times \left[\sum_f MS_{f,y} \times \left(1 - \frac{LS_f}{LC} \right) \right]$$

Total mass of CEF claimed
in the year y, by fuel type f [tonnes]

Baseline life cycle emissions,
fixed value, 89 for jet fuel or
95 for AvGas [gCO_{2e}/MJ]

Fischer–Tropsch Synfuel (231 MGY)**	Million Gallons per Year	Carbon Intensity Estimate (gCO _{2e} /MJ*)	Annual CO ₂ Avoided (metric tons)
SAF	150	~30	1.13
Renewable Diesel	48	~30	0.37
Renewable Naphtha	32	~40	0.20
TOTAL	231	30-40	1.70



CAAFI SAF Overview Presentation

*grams of carbon dioxide equivalent per megajoule of energy

**based on the ANSVR modeled facility

EXISTING INFRASTRUCTURE IN ALASKA

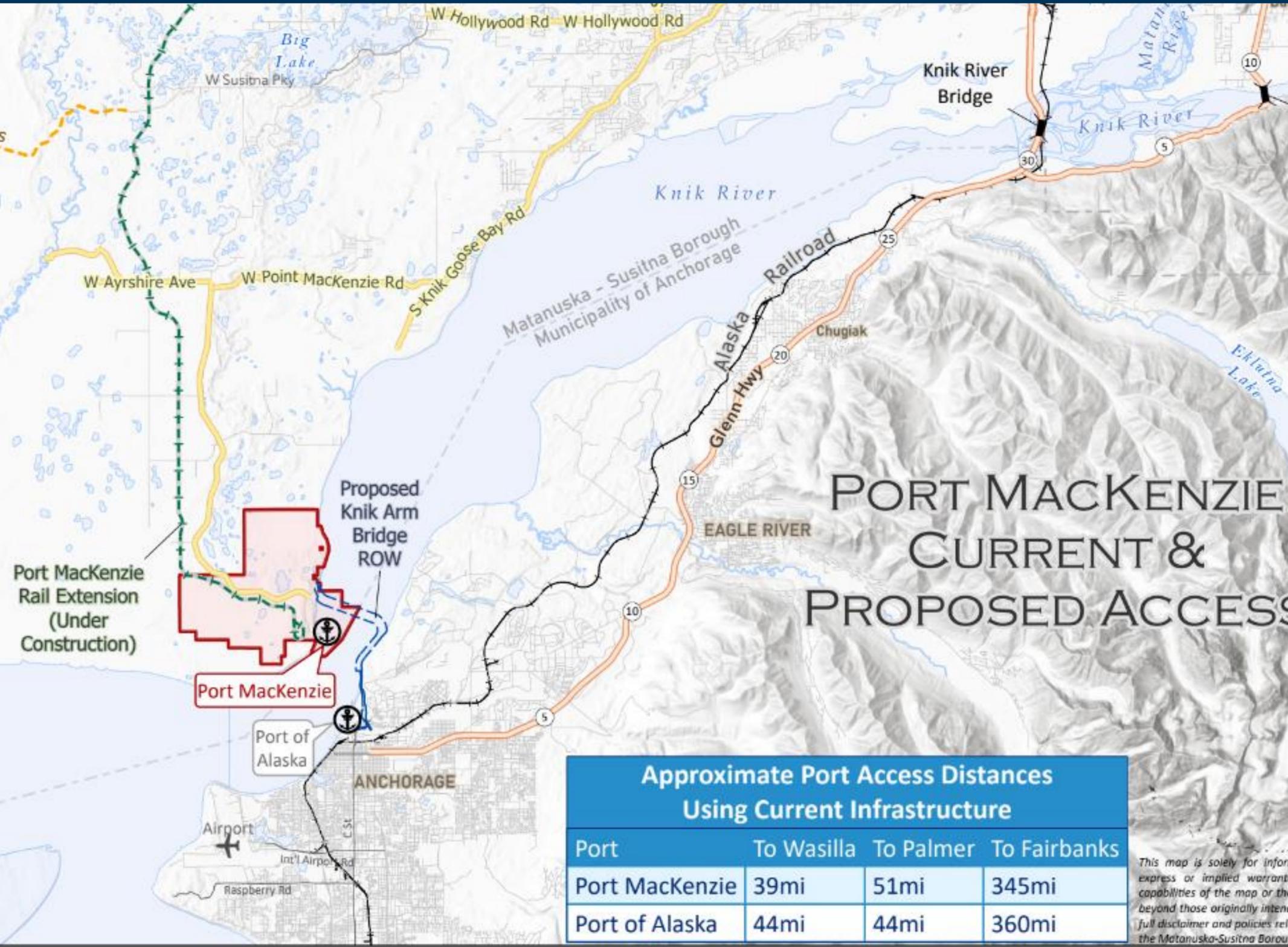


	Site	Existing Infrastructure	Readiness	Required Upgrades	Opportunities/Constraints
Refineries	Petro Star Refineries (Valdez & North Pole)	Small topping refineries (~22,000 bpd combined), limited hydrotreating-may co-process up to 5% bio-feed	✘ Minimal	Major upgrades: feedstock pretreatment, hydrogen plant, catalyst changes	⚠ Remote, limited capacity; not viable for large-scale SAF
	Marathon Kenai Refinery	Large-scale refinery: distillation, hydrotreaters, tank farm, dock, workforce, permits	✔ High	Feed pretreatment, catalyst switch, hydrogen expansion, PSA/CCS, possible dock heating	✔ Retrofit-ready; proximity to NG; reduced CAPEX
Pipeline	Port-to-Airport Pipeline (Anchorage)	~5M barrels/year throughput, trending upward	⚠ Approaching capacity	Pump upgrades or twinning by ~2030	⚠ Critical link for SAF; pressure spec & future compatibility to assess
Airports & Storage	TSAIA (Anchorage Airport)	Modern fuel farm, hydrant system, large-volume throughput	Available	Optional: fuel stratification mixers, SAF tank if segregated	✔ SAF-ready fueling system; minor additions only
	Port of Alaska (Anchorage)	Tank farms, fuel terminals, marine dock, pipeline to airport	✔ High	SAF-dedicated tanks, blending systems, minor pipeline upgrades	✔ Excellent for SAF distribution; limited local feedstock access
	Storage and Blending (Kenai & Anchorage)	Tank farms, in-line blending systems	Available	Blend controllers, SAF-dedicated tanks, certification metering	✔ Leverages existing systems; minor retrofits needed
Ports	Port MacKenzie	Accommodates Panamax-class vessels; 1,000 psf live load on the bulkhead staging pad; 200-ton crawler crane and 200,000 lb axle load capacity on the deep-draft dock	Available	No dedicated Ro-Ro ramp; Rail extension to the port not completed	✔ Excellent for refinery construction and synfuel distribution.

PORT MACKENZIE

Potential Greenfield Site

- 1,200 ft Deep Draft Dock -60' at low tide
- 375 ft Barge Dock -20' at low tide
- Open year round



PORT MACKENZIE CURRENT & PROPOSED ACCESS

Approximate Port Access Distances Using Current Infrastructure			
Port	To Wasilla	To Palmer	To Fairbanks
Port MacKenzie	39mi	51mi	345mi
Port of Alaska	44mi	44mi	360mi



Zoning Overview

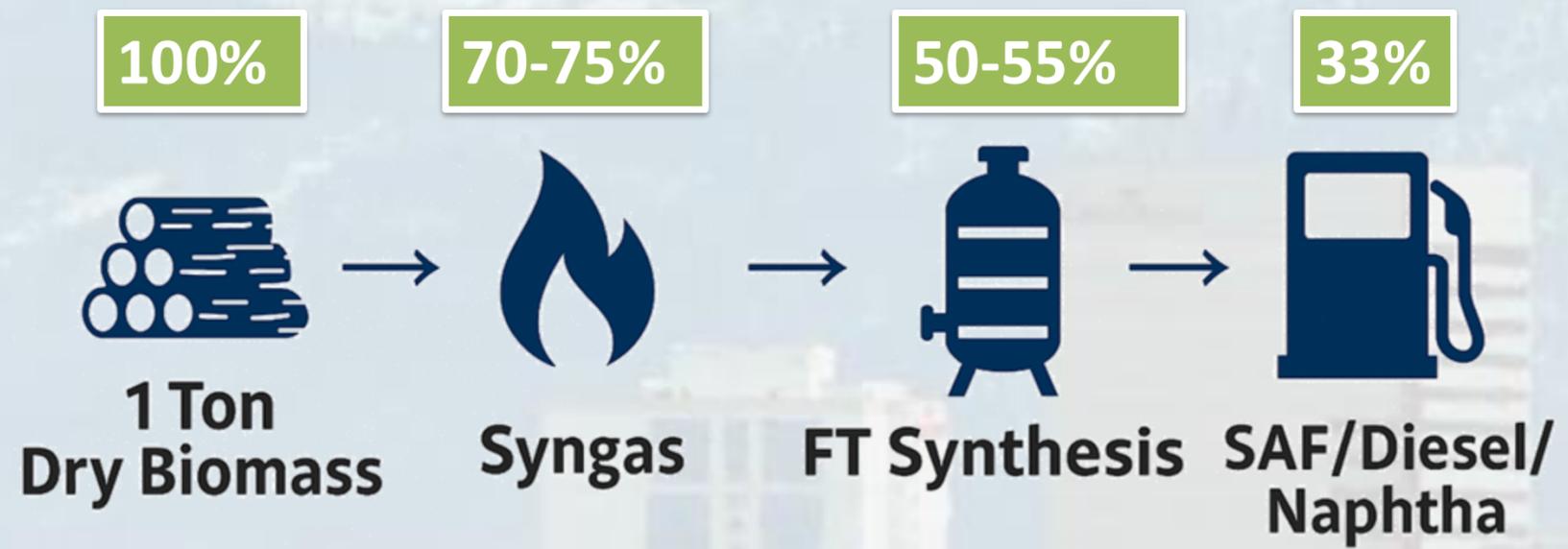
Port Industrial
District I = 3,047
acres
Port Industrial
District II = 4,836
acres

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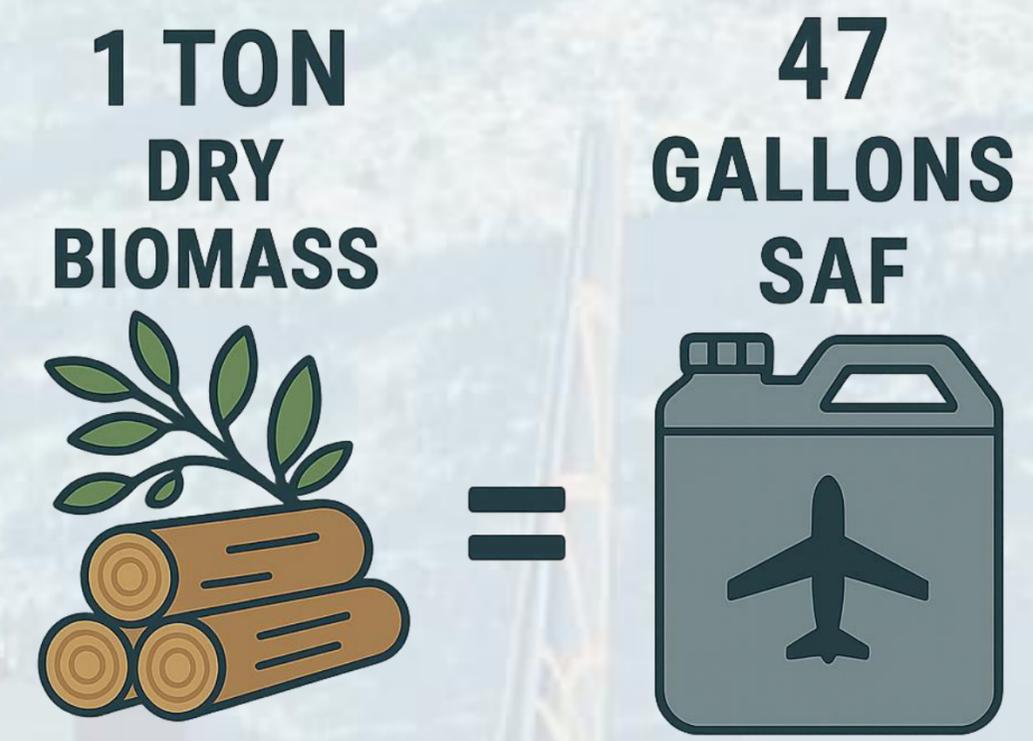


HOW MUCH JET FUEL CAN YOU MAKE FROM A TREE—OR A FISH??

- Biomass Intake Requirements**
- ◆ Annual Fuel Output Target: 230 million gallons/year
 - ◆ Biomass Needed (dry basis): 4.9 million metric tons/year
 - ◆ Equivalent Moisture-Adjusted Feedstocks:
 - 5.75 million metric tons @ 15% moisture content
 - 9.78 million metric tons @ 50% moisture content



Carbon and energy yield into liquid fuel is ~33%

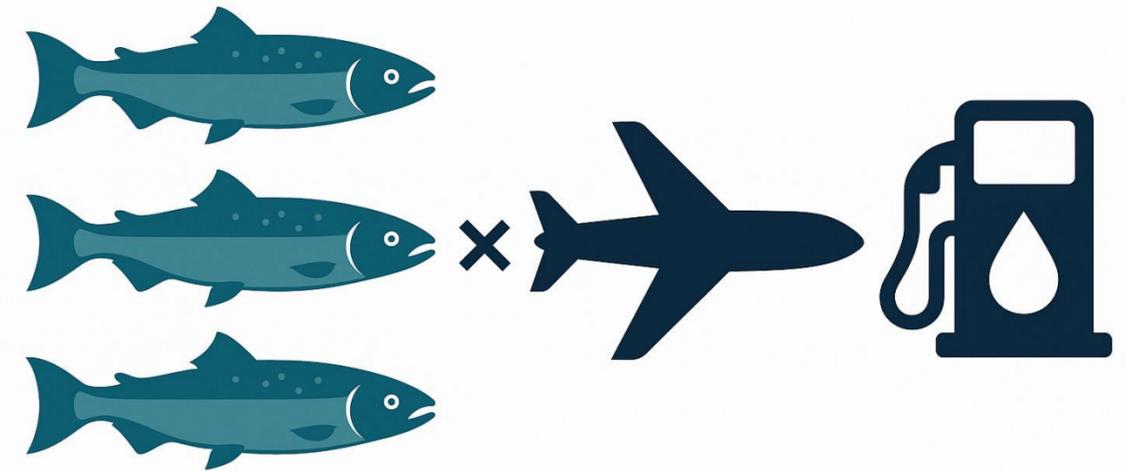


Based on HHV-converted energy yield for woody biomass (FT pathway)
 Based on facility design capacity of 230 million gallons per year and typical biomass drying yields. Assumes average moisture content per NREL TEA standards.
 Source: NREL, DOE TEA models (2024), internal engineering assumptions

FROM SALMON TO SAF: ENERGY YIELD FROM BIOMASS INPUTS

Items	Material / Input	Units/Notes
 Fish Biomass	~25 lbs per fish	Assumed 10% yield of oil
 Fish Oil (Feedstock)	1 gallon (≈3.5 kg)	Average energy content ≈ 33 MJ/kg
 Hydrogen	~0.1 kg per gallon SAF	Required for hydroprocessing: deoxygenation and saturation
 Utilities (Steam, Power)	~7.5 MJ thermal energy	Used for heating, compression, and separation processes
 Final Output	1 gallon SAF	Energy content ≈ 42.8 MJ/gal

It takes 3 salmon to make 1 gallon of sustainable aviation fuel.



Alaska Fish	Oil Yield (% by weight)	Energy Content (MJ/kg)	Typical Annual Harvest in Alaska (Metric Tons)	Oil yield (MT)	SAF Yield (Million Gallons)
Herring	10–20%	~39–41	345,000 (138,000 in by-products)	27,600	7.3
Salmon	8–12%	~39–42	468,800 (187,520 in by-products)	22,502	5.9
TOTAL				50,102 Metric Tons	13.2 MGY

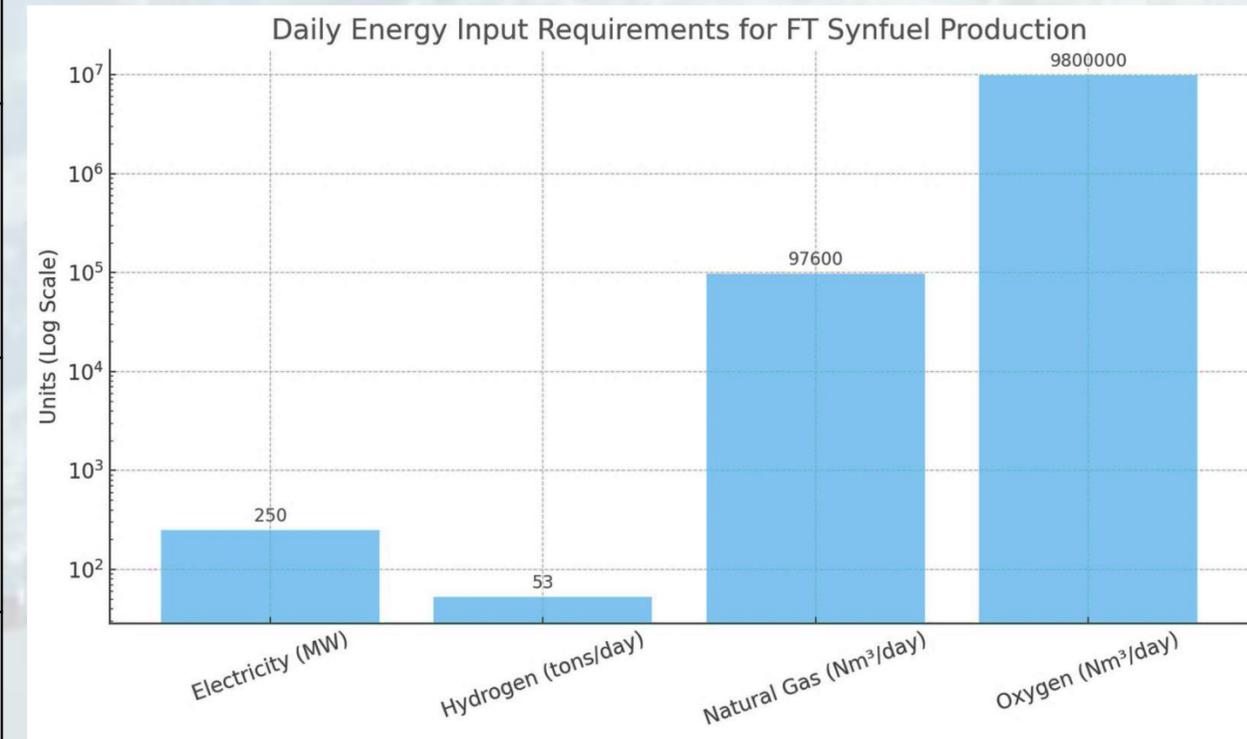
Alaska’s current fisheries byproducts could support a small-scale, synfuel refinery—potentially modular or co-located with existing rendering infrastructure—producing approximately 9% of the targeted SAF output of 150 MGY.

FISHER-TROPSCH 230 MGY REFINERY

Daily Energy & Mass Balance



Input	Daily Input Requirement	Primary Use
 Electricity	Approximately 250 MW of continuous power	Powers air separation unit, industrial compressors, and plant support systems
 Hydrogen (H ₂)	52.6 metric tons per day	Used to convert waxy synthetic fuel into jet fuel through catalytic processing
 Natural Gas	50,600 normal cubic meters per day (Steam Methane Reformer- SMR)	Provides hydrogen via steam reforming
	47,000 normal cubic meters per day (Combined Heat And Power - CHP)	Supplies fuel for power generation
 Oxygen (O ₂)	14,000 metric tons per day (approx. 9.8 million cubic meters)	Required for converting biomass into synthesis gas using high-temperature gasification



Fisher-Tropsch 230 MGY Refinery

Key Design Parameters

230 MGY total

150 MGY of sustainable aviation fuel
58 MGY of renewable diesel
22 MGY of renewable naphtha

System Area	Design Sizing & Capability
Biomass Feedstock	15,000 metric tons per day of green woody biomass (approximately 7,500 dry tons per day); 4.0 million metric tons per year total input
Feedstock Preparation	7 industrial wood chippers, 10 hammer mills, and 15 rotary biomass dryers
Gasification System	5 oxygen-blown, entrained-flow gasifier reactors (approximately 3,000 dry tons per day each)
Oxygen Supply System	14,000 metric tons per day via cryogenic air separation; power demand: 120–130 MW
Fischer–Tropsch Reactor System	5 reactor trains using slurry bubble column reactors; approximately 20,000 barrels per day of synthetic hydrocarbon liquids
Fuel Upgrading (Hydroprocessing)	Hydrocracker with 20,000 barrels per day capacity; includes isomerization to improve jet fuel and diesel properties
Hydrogen Production System	50 metric tons per day of hydrogen via steam methane reforming; includes pressure swing adsorption purification and carbon dioxide capture from reformer flue gas
Carbon Dioxide Capture and Storage	Approximately 4 million metric tons per year captured; includes drying, compression, a 20-mile pipeline, and subsea geologic injection infrastructure
Onsite Power and Steam Generation	250 MW combined heat and power system (gas turbines, heat recovery steam generator, steam turbine); approximately 100 megawatts available for export. 100 MW surplus electricity may be exportable
Water Treatment and Cooling Systems	\$15 million for process and boiler water treatment; \$15 million for cooling towers capable of rejecting approximately 230 megawatts of thermal load
Fuel Storage Capacity	Two tanks for sustainable aviation fuel (~300,000 barrels total), one tank for renewable diesel (~150,000 barrels), and one tank for renewable naphtha (~75,000–100,000 barrels), providing approximately 30 days of product storage
Product Loading and Distribution	\$15 million for marine loading dock and infrastructure; 10-mile pipeline to Port MacKenzie terminal; optional truck and rail loading systems

FISHER-TROPSCH 230 MGY REFINERY

Class Four Estimate: Total Installed Cost



Feedstock Logistics & Handling	\$83,250,000
Gasification & Syngas Production	\$609,400,000
Fischer-Tropsch Synthesis & Product Upgrading	\$492,500,000
Utility Systems (CHP, SMR, ASU)	\$649,600,000
Product Storage & Distribution	\$62,400,000
CO2 Management	\$191,200,000
Site Infrastructure	\$69,300,000
Direct Costs	\$2,157,650,000
Contingency (15%)	\$323,647,500
Preconstruction Costs (14%)	\$302,071,000
Total	\$2,783,368,500

The total installed cost of a 230 MGY Fischer-Tropsch refinery is estimated at approximately **\$2.78 billion**, based on a Class 4 level estimate (-30% to +50%).

Fisher-Tropsch 230 MGY Refinery FT 230MW Total Installed Cost



Gasification → SAF → FT synthesis → **\$2.96 billion**
In Alaska using woody biomass for feedstock

FISHER-TROPSCH 230 MGY REFINERY

Rough Order of Magnitude Annual Operating Costs (OpEx)

~\$534 million per year to operate

Cost Category	Annual Cost (\$M)	\$ per Gallon	Key Assumptions (Base Year)
Fixed	152	0.66	
Insurance & Property Tax	46	0.20	~0.5% insured value + ~1% capital PILOT tax
Labor (Ops & Maint.)	21	0.09	~180 FTE @ ~\$100k/yr fully burdened
Admin & Overhead	5	0.02	G&A ~20% of labor cost, incl. office staff, HR, accounting, admin systems
Maintenance (Routine)	60	0.26	~2% of capital in spare parts/repairs; routine inspections and contractor services
Maintenance (Turnaround)	5	0.02	Major overhauls 5-yearly (~\$25–30 MM each, amortized)
Regulatory & Compliance	7	0.03	Title V air permit, stormwater/WQ, hazardous materials tracking, CEMS maintenance, EPCRA
Misc Operations	8	0.04	Tied to financing, compliance, and digital operations
Variable	295	1.28	
Water & Utilities	2	0.01	Well water ~1.5 MGD @ \$0.50/kgal; on-site O ₂ production
Supplemental Natural Gas for CHP	4	0.01	Electricity/steam generation supplement to FT off-gas; \$11,448/day gas cost
Natural Gas for SMR	5	0.02	~50k Nm ³ /day for H ₂ production via SMR (~1.8 MMSCFD) @ \$6.90/Mcf
Feedstock	276	1.20	8.9M green tons × \$75/ton = \$667M/year; procured on wet basis
Waste Disposal	1	0.01	Minor solid/hazardous waste: spent catalyst, sorbents, filters, water treatment sludges
Chemicals & Catalysts	7	0.03	Cobalt-based FT catalyst and Pt hydrotreater catalyst (5-yr cycles); solvents, water treatment
Distribution	20	0.09	
Marine Barge (Port MacKenzie → Anchorage)	10	0.04	Cook Inlet barge ops; tug fuel, crew, mooring, terminal ops at both ends
TSAIA Jet Fuel System Integration Costs	5	0.02	Storage tank leasing, hydrant fees, safety compliance, aviation liability insurance
Storage and Blending at the Port of Alaska	5	0.02	Tank heating, maintenance, metering, throughput fee, fuel quality testing (ASTM D1655 compliance)
CCS	67	0.29	
CO ₂ Transport & Storage	67	0.29	~6.55 MtCO ₂ /year captured and injected @ \$10/ton; compression, pipeline, well monitoring
Total OpEx (Year 1)	534	2.32	All costs in constant 2025 dollars; excludes power export, excludes LCFS/45Q revenue credits.

HEFA 215 MGY REFINERY

Key Design Parameters

215 MGY Total ~10,700 barrels per day

150 MGY of sustainable aviation fuel

54 MGY of renewable diesel

11 MGY of renewable naphtha

System	Sizing / Capacity (for approximately 215 million gallons per year)
Feedstock Throughput	14,000 barrels per day of fish oil (approximately 600,000 kilograms per day)
Product Yields	150 million gallons per year of sustainable aviation fuel, 54 million gallons per year of renewable diesel, 11 million gallons per year of naphtha and liquefied petroleum gas (approximately 10,700 barrels per day total)
Hydrodeoxygenation Reactors	2 hydrodeoxygenation reactors, approximately 10–12 feet in diameter by 30–40 feet tall, approximately 100 cubic meters of catalyst in total
Isomerization Reactor	1 hydrocracking reactor, approximately 8–10 feet in diameter by 25 feet tall, approximately 30 cubic meters of catalyst
Hydrogen Production Plant (Steam Methane Reformer)	35 million standard cubic feet per day of hydrogen (approximately 88,000 kilograms per day) production, approximately 450 tonnes per day of carbon dioxide captured
Combined Heat and Power Plant	Approximately 50 megawatts (1 × 40 MW gas turbine with heat recovery steam generator and 10 MW steam turbine), approximately 400,000 pounds per hour of steam output
Carbon Dioxide Pipeline	Approximately 30 miles, 4-inch diameter, approximately 450 tons of carbon dioxide per day transported to sequestration site
Product Pipeline	Approximately 15 miles, 4-inch diameter, approximately 10,700 barrels per day of liquid fuel transported to port storage
Tank Storage	2 × 50,000-barrel feedstock tanks, 1 × 100,000-barrel sustainable aviation fuel tank, 1 × 50,000-barrel renewable diesel tank, 1 × 15,000-barrel naphtha tank, 3 × 60,000-gallon liquefied petroleum gas tanks
Utilities and Supporting Infrastructure	Sized to support the full facility, including water systems, instrument air, emergency flare system, buildings, and Arctic-specific design features

HEFA 215 MGY Refinery

Rough Order of Magnitude Installed Costs

	Total Cost
Feedstock Logistics & Handling	\$40,000,000
Gasification & Syngas Production	\$300,000,000
Fischer–Tropsch Synthesis & Product Upgrading	\$238,000,000
Utility Systems (CHP, SMR, ASU)	\$33,400,000
Product Storage & Distribution	\$98,700,000
CO2 Management	\$99,300,000
Direct Costs	\$809,400,000
Contingency (15%)	\$121,410,000
Preconstruction Costs (14%)	\$113,316,000
Total	\$1,044,126,000



Neste Singapore Refinery, located in Tuas, west of Singapore.

HEFA 215 MGY Refinery

Rough Order of Magnitude Annual Operating Costs (OPEX)



OpEx Component	Total OpEx Cost	Cost / Gallon
Fixed	\$43,700,000	\$0.19
Admin & Overhead	\$3,000,000	\$0.01
Insurance & Property Tax	\$6,000,000	\$0.03
Labor (Ops & Maint.)	\$15,000,000	\$0.07
Maintenance (Routine)	\$15,000,000	\$0.07
Maintenance (Turnaround)	\$3,000,000	\$0.01
Misc Operations	\$700,000	\$0.00
Regulatory & Compliance	\$1,000,000	\$0.00
Variable	\$974,180,000	\$4.54
Chemicals & Catalysts	\$6,000,000	\$0.03
Feedstock	\$935,000,000	\$4.35
Natural Gas for SMR	\$25,500,000	\$0.12
Waste Disposal	\$2,000,000	\$0.01
Water & Utilities	\$5,680,000	\$0.03
Opex-Transportation and Distribution	\$21,500,000	\$0.10
Storage and Blending at the Port of Alaska	\$21,500,000	\$0.10
CO₂ Transport & Storage	\$1,250,000	\$0.01
CO ₂ Transport & Storage	\$1,250,000	\$0.01
Grand Total	\$1,040,630,000	\$4.84

DELIVERED COST OF SYN FUEL

Preliminary Pre-Incentive Pricing Model



Cost Component	HEFA (\$/gal)	FT (\$/gal)	Explanation
Capital Recovery (Depreciated CapEx)	\$0.19	\$0.48	Capital recovery amortized over 25 years. Includes full EPC cost, contingency, and indirect costs.
Operating Expenses	\$4.84	\$2.32	Includes all fixed and variable O&M: feedstock, labor, maintenance, utilities, and catalysts.
Debt Service (Interest Only)	\$0.19	\$0.28	Interest-only cost from DOE loan (i.e., \$2.07B @ 6% over 30 years). Equity cost captured in Capital Recovery above.
Net Production Cost	\$5.22	\$3.08	Final estimated cost per gallon of fuel produced after accounting for financing.
Equity Return – IRR target	\$0.75	\$0.75	Includes both principal repayment + return on equity (ROE)
Optional Market Uplift	\$0.50	\$0.50	Market-driven uplift; optional depending on buyer
Total Cost to Airlines	\$6.47	\$4.33	Excludes credits (e.g., LCFS, RFS, SAF tax credits, 45Q)

WHICH PATHWAY FITS ALASKA? FT VS HEFA



Metric	HEFA Pathway Refinery	Fischer–Tropsch Pathway Refinery
Total Cost per Gallon	\$6.47	\$4.33
Production Volume	215 MGY (150 SAF, 54 diesel, 11 naphtha)	230 MGY (150 SAF, 58 diesel, 22 naphtha)
CapEx: Total Installed Cost	\$1,044,126,000	\$2,783,368,500
OpEx: Total Annual Operating Cost	\$1.04B/year (\$4.84/gal)	~\$534M/year (\$2.32/gal)
Primary Feedstock / Cost per gallon	Fish oil (\$4.35/gal)	Woody biomass (\$1.20/gal)
Conversion Technology	Hydroprocessing (HEFA)	Gasification + FT synthesis
Reactor System	2 Hydrodeoxygenation + 1 Isomerization	5 Slurry FT reactors + 1 Hydrocracker
Hydrogen Source / Demand	Steam Methane Reforming (SMR) / 88,000 kg per day	SMR + CHP integration / 50,000 kg per day
Electric Power Demand	~50 MW (mainly hydroprocessing + SMR)	250 MW (ASU, gasifier, CHP)

The Fischer–Tropsch pathway offers a **lower-cost, higher-impact, and scalable long-term SAF solution** for Alaska, supported by biomass availability and deep CO₂ reduction potential.

The **HEFA pathway** may serve as a **modular, early-phase deployment** but is constrained by high feedstock cost and volume limitations.

EXPLORING NEW FRONTIERS

ALASKA'S AVIATION OPPORTUNITIES

NEW STATE LAWS & INCENTIVES

HOUSE BILL 50

Supports underground carbon storage for SAF production.

SENATE BILL 48

Enables land leases for carbon offsets, fostering SAF feedstocks and revenue.

NEW TECHNOLOGIES

NEW OPPORTUNITIES

SAF production is projected to exceed 132 million gallons annually by 2025.

ALASKA LEADS SUSTAINABILITY WITH FAA FAST GRANT!

Developing and integrating SAF to strengthen Alaska's leadership in aviation innovation.

INVESTMENT SURGE

Global SAF investments have reached **\$17 billion** in 2023 for new facilities and technologies.

AIRLINES AND SAF INTEGRATION

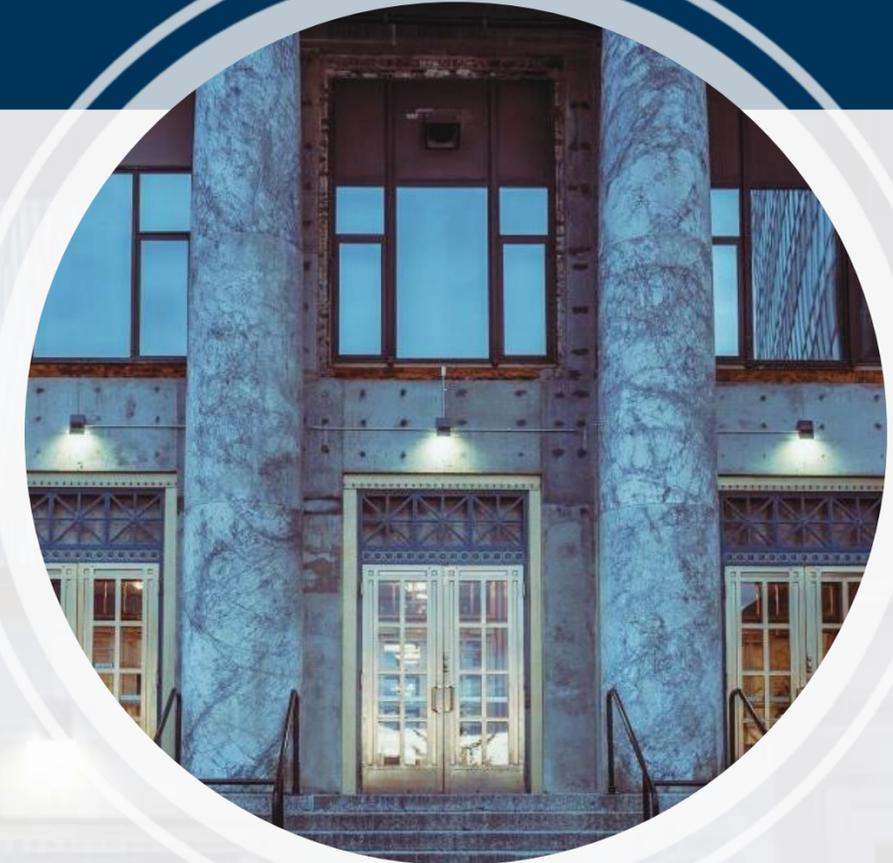
Over **50 airlines globally** have committed to SAF, with offtake agreements exceeding **20 billion gallons** for next decade.

U.S. DEPT OF ENERGY PROVIDES LOANS & TAX CREDITS TO ADVANCE SAF DEVELOPMENT

Low-Interest Loans: designed to support advanced biofuel projects, including SAF production facilities, infrastructure development, and research into new technologies.

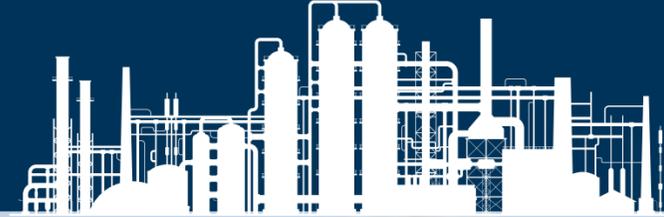
Tax Credits: Incentives are available to SAF producers, providing financial benefits for each gallon of SAF produced or for capital investments in SAF-related infrastructure.

By leveraging these financial tools, stakeholders in Alaska can enhance their competitiveness in the emerging SAF market, aligning with environmental goals while fostering economic growth in the region.



WE HAVE A PLAN

SAF IN ALASKA: PATHWAY TO 2030



Phase 1: SAF Feasibility Analysis January – July 2025

- Stakeholder Outreach: Airlines, airports, agencies
- Feasibility Studies: Feedstock, technology, logistics
- Partner Outreach: Producers, agencies, investors
- Financial Modeling: Costs, funding, partnerships

Phase 2: Preliminary Design and Pre-Application August - December 2025

- Preliminary Design: Site selection, technology, infrastructure
- Environmental Scoping: Carbon lifecycle assessment
- Regulatory Work: Permitting agencies, key requirements, DOE pre-application

Phase 3: Blending SAF Imports 2026 - 2030

- SAF Imports: Suppliers, agreements, blending logistics
- Blending Hubs: Anchorage or Fairbanks locations

Phase 4: Final Design and Permitting 2026 – 2028

- Final Design: Complete SAF facility plans
- Permitting & Funding: Secure approvals and financing
- Construction: Build facility and infrastructure

Phase 5: Staged Construction 2028 – 2030

- Construction: Suppliers, agreements, blending logistics
- 2030 Launch: SAF production begins in Alaska



AI Generated: Alaska Next Gen-Refinery at Port MacKenzie



ANSyR

ALASKA NEXT-GEN
SYNFUEL
REFINERY

ADVANCING
PARTNERSHIPS FOR
ALASKA'S FUTURE

