The path forward: Options for decarbonization in the Aviation sector (SAF)



S&P Global Platts Elizabeth Thang, Asia Managing Editor Sugar & Biofuels Elizabeth.thang@spglobal.com

Oct.27, 2021

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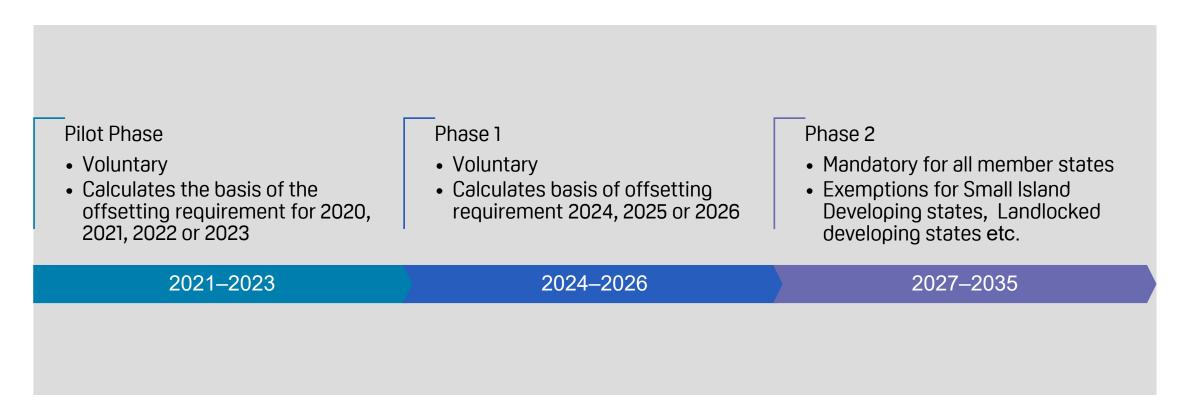
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CØRSIA



Carbon Offsetting and Reduction Scheme for International Aviation





Today's Agenda

- Platts Sustainable Aviation fuel and Renewable Diesel / Hydrotreated Vegetable Oil prices
- How do we derive the prices?
- SAF and RD/HVO historical price trends
- Challenges in the production and consumption
 How government policies are addressing these challenges
- Who is producing SAF/HVO and how much is coming online
 - New Platts prices for deep analysis

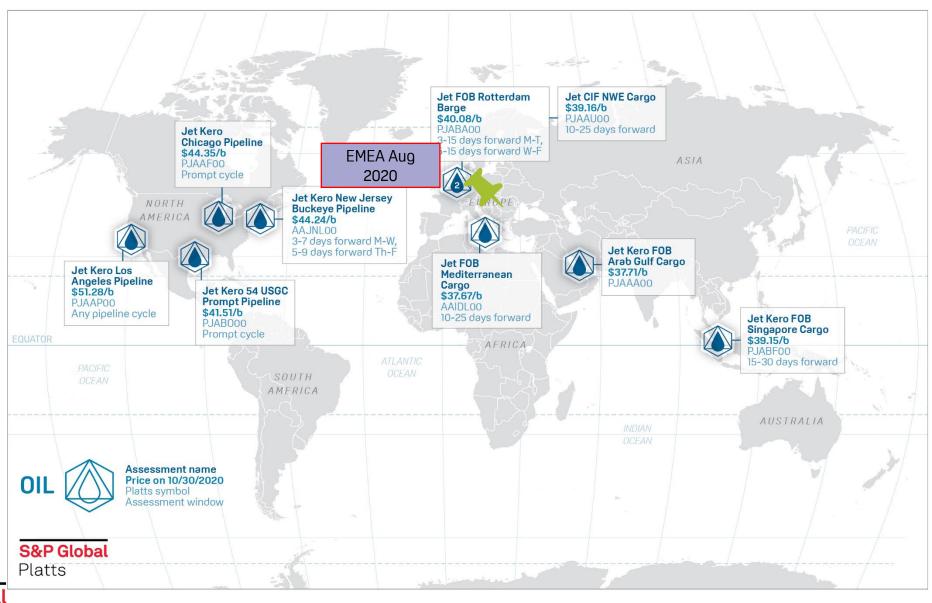
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1. Key Platts Jet Fuel Assessments & SAF prices





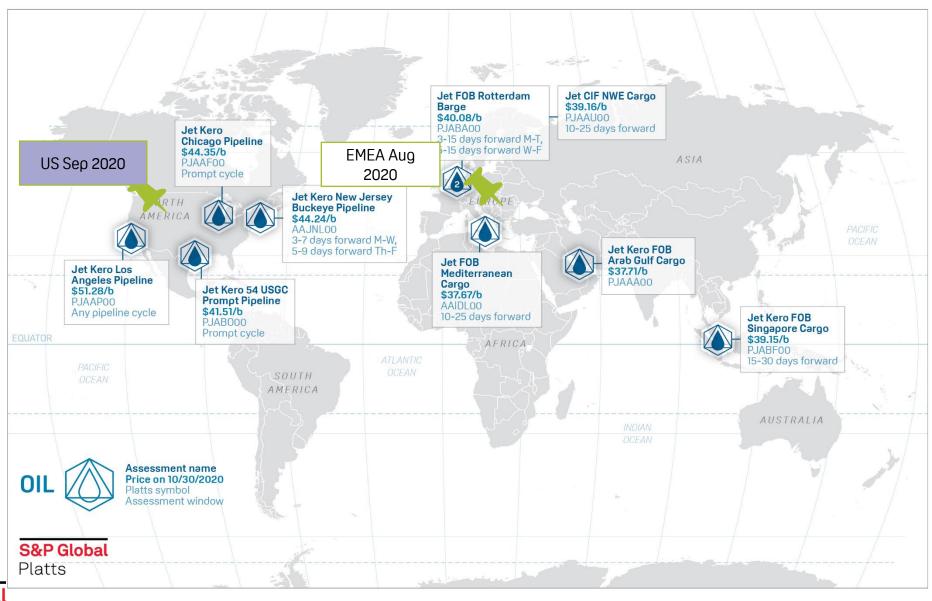
Key Platts Jet Fuel Assessments & SAF prices





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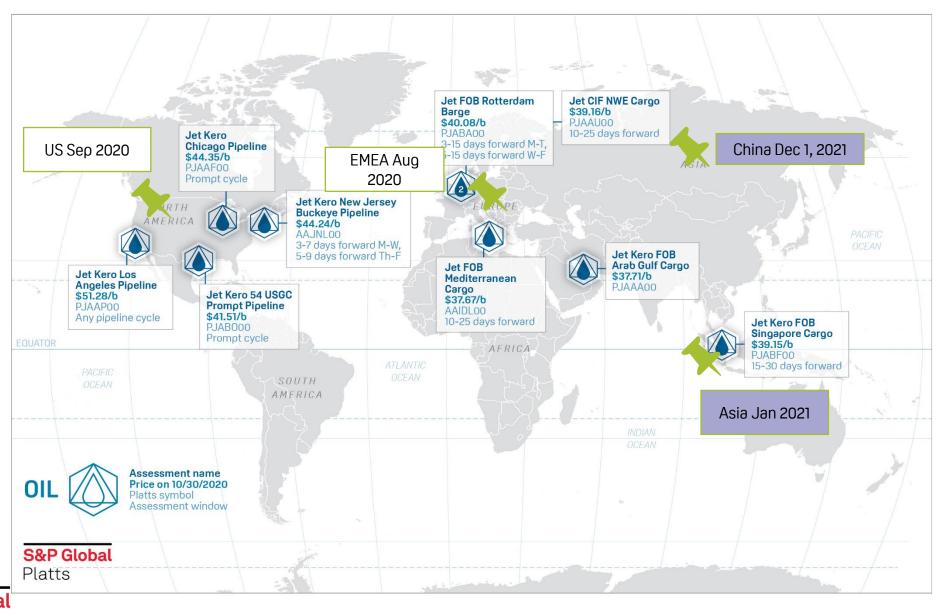
Key Platts Jet Fuel Assessments & SAF prices





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Key Platts Jet Fuel Assessments & SAF prices



What are these prices? •

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Agriculture

Platts Sustainable Aviation Fuel and Renewable Diesel prices

ASIL

in US cents/gallon.

degrees Celsius).

conversion factor of 8.071.

HVO and SAF is published on an ex-refinery

Northwest European basis in US dollar per metric ton on a daily basis.

SAF prices with and without environmental credit values

are also published in \$/mt using a 3.4 conversion factor and

SAF values reflect ASTM D7566 standard specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons, with a relative density of 776 kg/cu m (at 15

in \$/m using a 0.42 conversion factor. This implies a \$/mt to \$/b

The USWC RD prices reflect ASTM D975 standard specification with a relative density of 779 kg/cu m (at 15

S&P Global Platts Renewable Distillate published values for International Aviation program (CORSIA) aims to halve the industry's 2005 carbon emissions by 2050 by way traders and others in the oil, biofuel and renewable fuel of carbon neutral growth, SAF is one key component in markets as the demand for sustainable aviation fuel and airlines' sustainability toolboxes that can be used to meet renewable diesel grows in consumption and supply. these lower carbon goals. On August 17, 2020 Platts launched daily values of sustainable aviation fuel (SAF) and hydrotreated vegetable no spot market, we are adding critical transparency oil (HVO) in Northwest Europe. that allows market participants to compare the cost of traditional jet fuel with new SAF. HVO Ex Works Northwest Europe What is the specification for these products? SAF Ex Works Northwest Europe

This was followed on September 21, 2020, by the launch of EMEA two US West Coast SAF values.

· SAF with credits, US West Coast SAE without credits. US West Coast On December 3, 2020 US coverage added Renewable Diesel SAF and RD are published on an ex-refinery, California basis

(RD) prices.

· RD with credits, US West Coast RD without credits, US West Coast

Asian SAF and HVO was launched on January 18, 2021 for mt to \$/b conversion factor. This implies a \$/ Southeast Asia.

 HVO Southeast Asia SAF Southeast Asia

What are these prices? Cost-based values reflecting the production of sustainable The RD values with and without credits are also published

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aviation fuel (SAF) and hydrotreated vegetable oil (HVO) through hydroprocessing.

These are ex-refinery prices based on calculations from S&P Global Platts Analytics based on existing Platts

RENEWABLE DISTILLATES			
		Close	Change
Northwest Europe (\$/mt) (PBF page 1013)			
HVO	HVNWD00	2061.577	-1.245
SAF	B J NWD00	2244.860	-2.579
Americas (PBF page 12)			
SAF w/ credits (¢/gəl)	ASAFK00	628.848	-1.419
SAF w/o credits (¢/gal)	ASAFL00	119.347	+5.045
RD w/ credits (¢/gal)	ARDFK00	592.967	-1.013
RD w/o credits (¢/gal)	ARDFL00	72.419	+5.244
SAF w/ credits (\$/mt)	ASAFC00	2138.083	-4.825
SAF w/o credits (\$/mt)	ASAFD00	405.780	+17.153
RD w/ credits (\$/mt)	ARDFC00	2010.158	-3.434
RD w/o credits (\$/mt)	ARDFD00	245.500	+17.777
Southeast Asia (\$/mt) (PBF page 2013)			
HVO	HVMAB00	1570.370	+39.770
SAF	ASMAA00	1702.020	+42.980
Feedstocks			
UCO CIF ARA (\$/mt)	AUCOA00	1285.00	0.00
UCO North Asia (\$/mt)	AUCOC00	1160.000	0.000
Chicago packer tallow (¢/lb)	ATALA00	58.50	0.00

- What are these prices? •
- How do the renewable distillate assessment differ from Platts oil assessments? ٠

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Platts Sustainable Aviation Fuel and Renewable Diesel prices

Agriculture

S&P Global Platts Renewable Distillate published values follow extensive consultation of producers, consumers, traders and others in the oil, biofuel and renewable fuel markets as the demand for sustainable aviation fuel and renewable diesel grows in consumption and supply.	for International Aviation program (CORSIA) aims to halve the industry's 2005 carbon emissions by 2050 by way of carbon neutral growth. SAF is one key component in airlines' sustainability toolboxes that can be used to meet these lower carbon goals.
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 SAP without credits, 03 West coast 	LISA
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	SAF values reflect ASTM D7566 standard specification
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SAF	ASMAA00	1702.020	+42.980
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- What are these prices?
- How do the renewable distillate assessment differ from Platts oil assessments?
- How are they used?

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FAQ available on Platts.com

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2. How do we assess ?

Pathways for SAF production

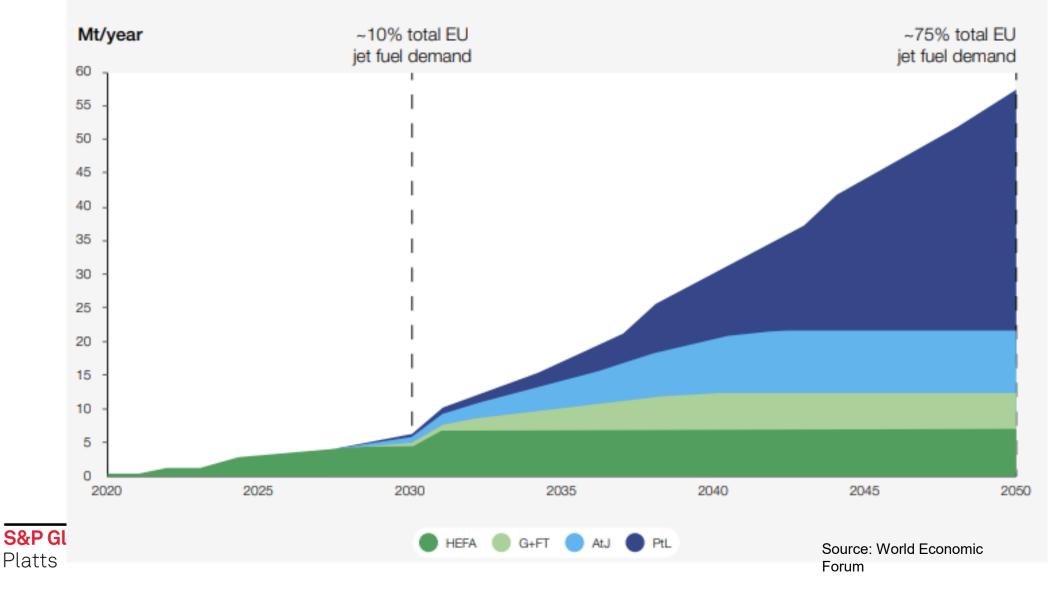
6 SAF fuels approved under ASTM D7566 with max blend levels

	Pathways Max blending v	with Jet
1	HEFA SPK -Feedstocks are UCO, Veg oil, Tallow	50%
2	Fischer-Tropsch (FT) SPK - Feedstocks solid biomass resources (e.g., wood residues)	50%
3	FT-SPK /A - variation of FT SPK	50%
4	Alcohol-to-jet - Feedstocks like iso-butanol into hydrocarbons	50%
5	HFS-SIP - Feedstocks fermented sugars (SIP), formerly known as direct-sugar-to-hydrocarbon fuel	10%
6	CHJ or Catalytic hydrothermolysis (or hydrothermal liquefaction) Feedstock - soybean oil, jatropha oil, camelina oil, carinata oil, and tung oil	50%



2. How do we assess ?

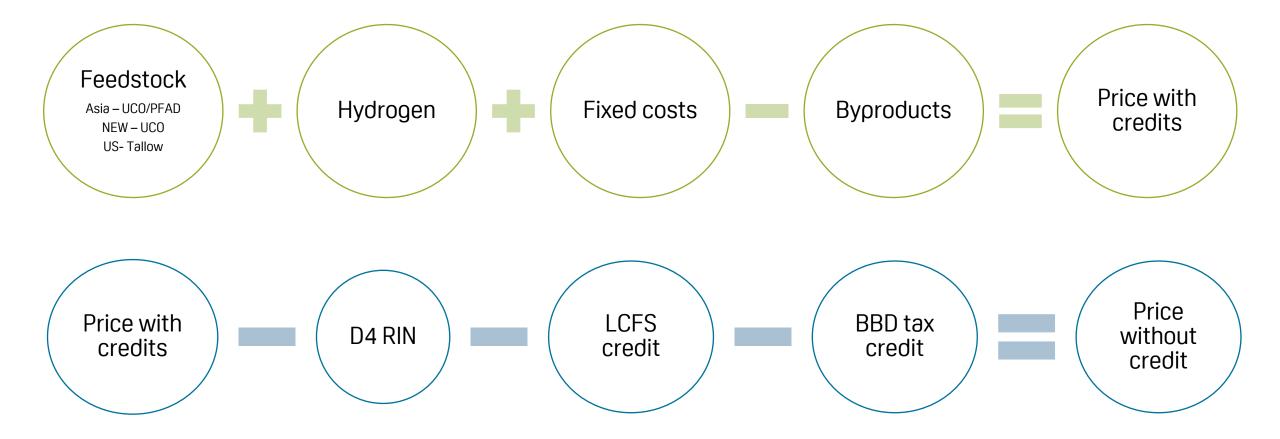
Methodology changes to account for new pathway technologies



Price calculation: Cost-based values reflecting production through hydroprocessing

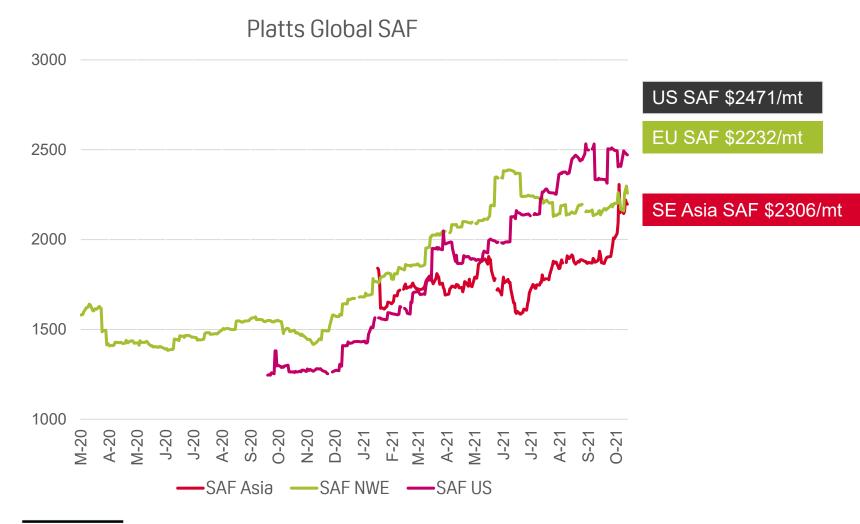


Price calculation: Cost-based values reflecting production through hydroprocessing



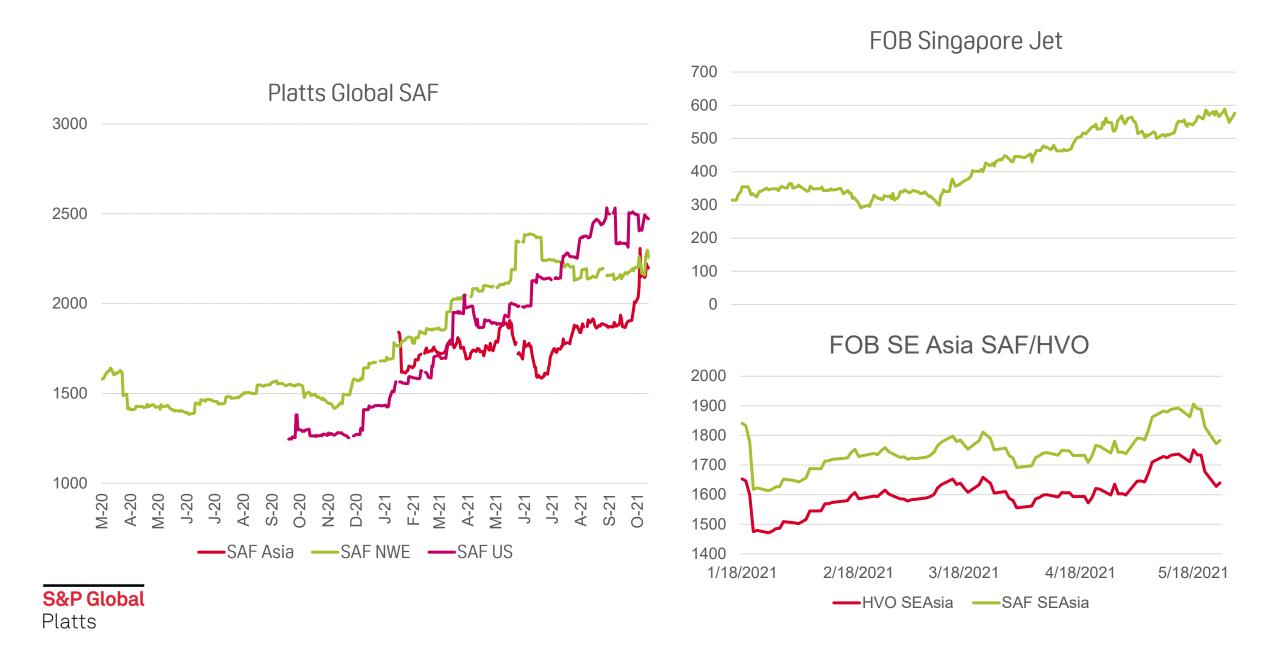


3. Platts Global SAF historical price trends





Platts Global SAF historical price trend



4. Challenges to SAF production/consumption

- High cost of production
- Lower value renewable credits (US) for SAF
- Feedstock availability
- Technology roadblocks

Argument: Higher cost of production US SAF policy Sept 2021 supportive of production

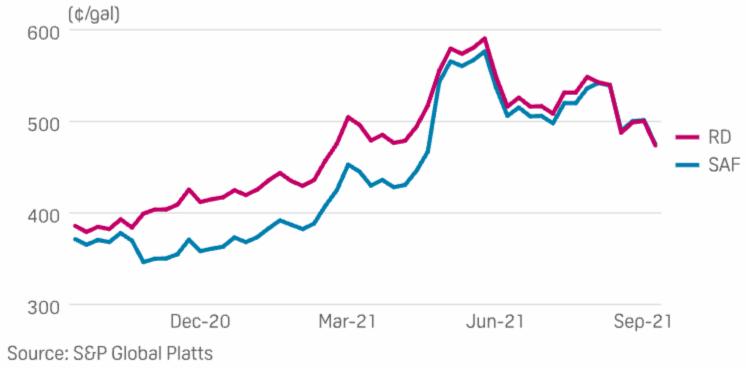
- 1. \$1.50-2.00 gal/federal tax credit proposal by Biden Administration
- 2. \$4.3 billion in funding for producers

3 billon gallons/year By 2030 20% of Jet 35 billon gallons/year By 2050 100% of Jet



Argument: SAF has lower value renewable credits RD credits expire end 2022

GAP NARROWS BETWEEN SAF AND RD CREDITS

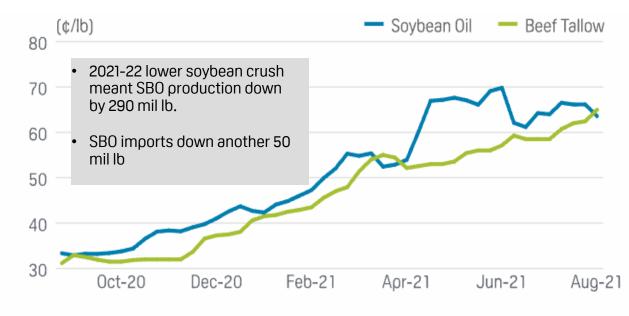


- SAF generates 1.6 D4 RINs
- RD generates <u>1.7</u> D4 RINs
- RD RIN premium over SAF rose 18% Q-o-Q

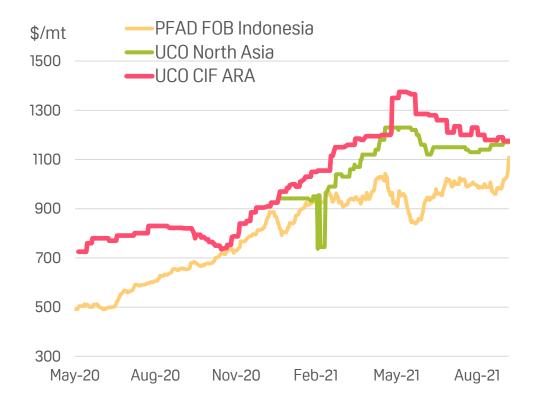
Q3 2021 =16.55 cents/RIN Q2 2021 =14.02 cents/RIN



Feedstock availability Feedstock costs rise as planned projects rise

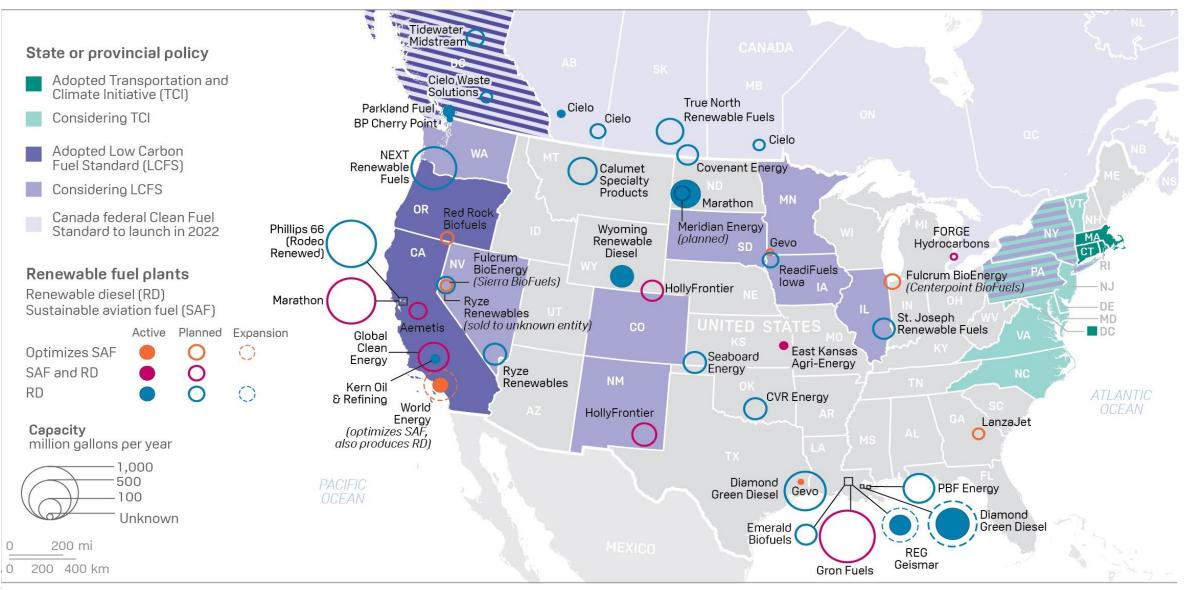


Source: S&P Global Platts





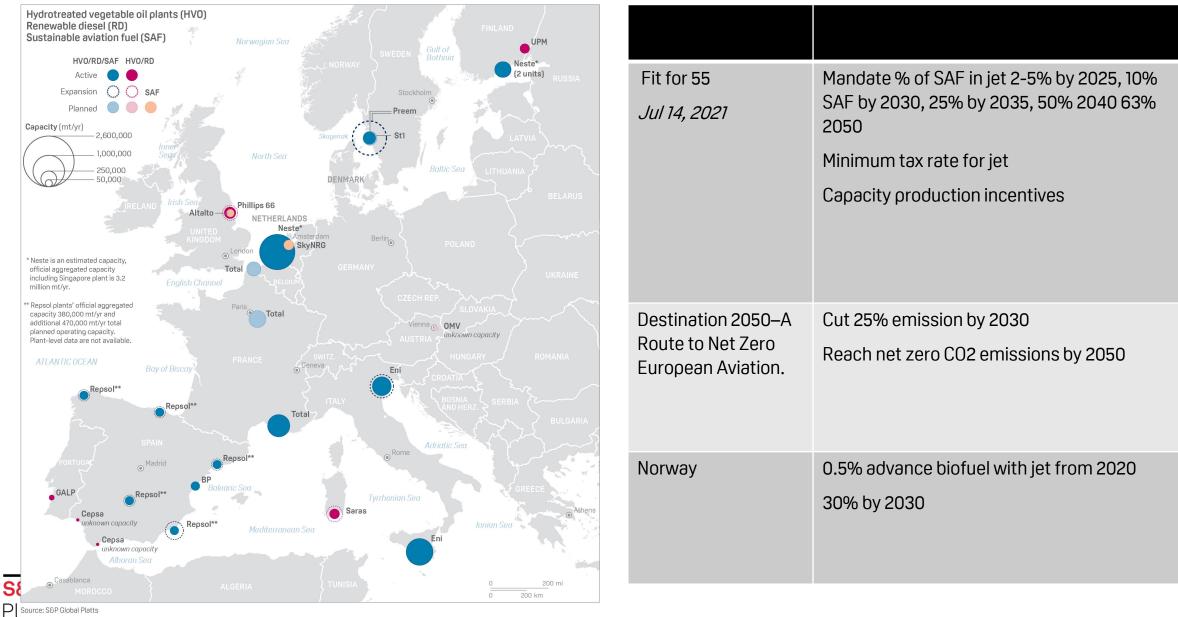
Who is producing? US SAF/HVO production current and planned



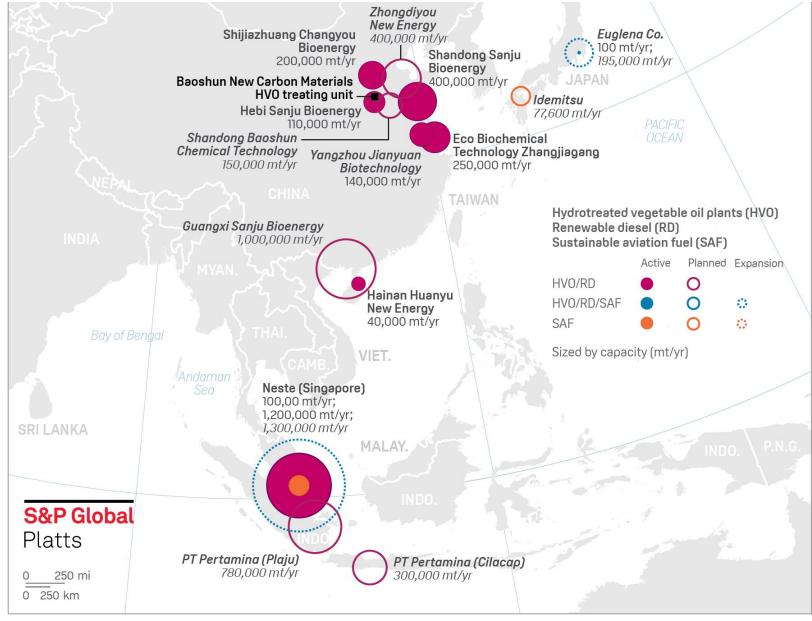
Source: S&P Global Platts; EIA

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EU SAF/HVO production current and planned



Asia SAF/HVO production current and planned



Source: S&P Global Platts Analytics

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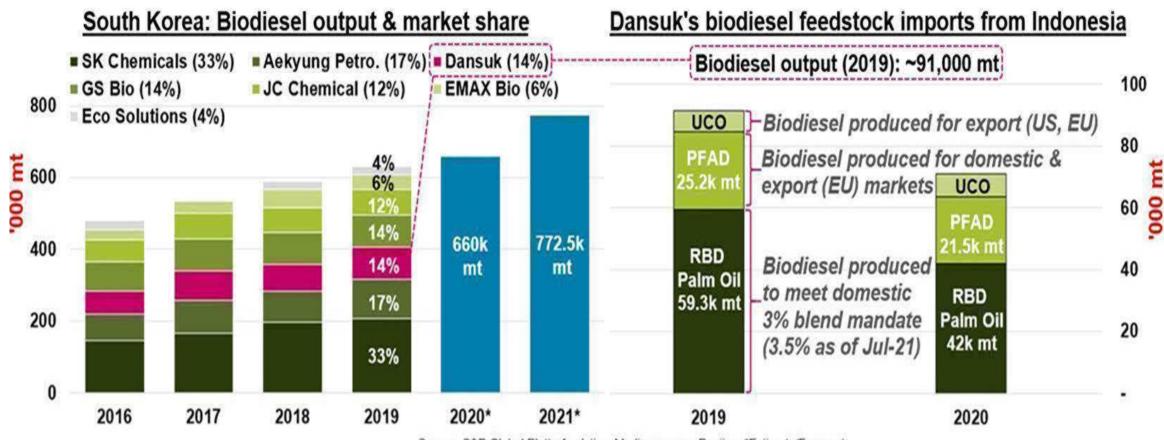


INDONESIA'S PLANNED RENEWABLE DIESEL PRODUCTION AND ESTIMATED CAPACITY

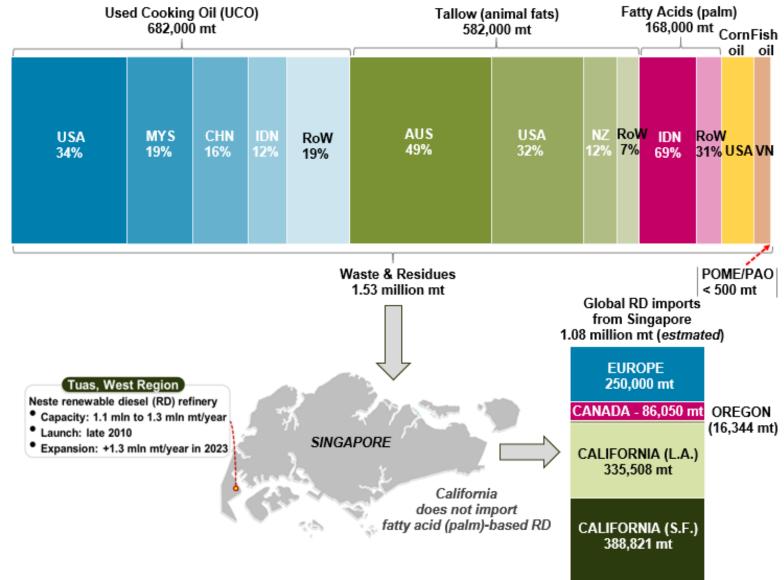
Source: S&P Global Platts Analytics

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South Korea's HVO ambitions



Source: S&P Global Platts Analytics, Media sources, Panjiva, *Estimate/Forecast



Singaporean waste/residues imports & Global RD imports from Singapore, 2020

6. New Platts prices to determine the cost to reduce carbon emissions using biofuels 36 new global prices launched Sept. 2, 2021

What is the cost to reduce carbon emissions using biofuels 36 new global prices launched Sept. 2, 2021

- Spreads and Ratios of Platts biofuels vs fossil-based fuels. – 20 assessments
 - EU ethanol-gasoline spread
 - Asia SAF-Jet
 - D4/D5 spread

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 - BD CI Value per point
 - CARB Diesel CI Value per point
 - USWC SAF CI Value per point etc



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- EU cost of reducing GHGs using biofuels under EU Renewable Energy Directive. 8 assessments
 - EU HVO GHG savings
 - EU PME GHG savings
 - EU RME GHG savings etc

Conclusions

- Platts SAF/HVO prices are global
- Prices are cost-based HEFA-SPK model with daily Platts assessments in related markets
- **3** SAF and RD/HVO historical trends shows arbitrages between regions due to feedstock prices
 - Keeping tabs on global policy that will counter the challenges of SAF production
- Tracking and engaging with the producers and buyers of SAF/HVO for spot production/consumption and targets
 - New Platts prices for deep analysis available



Thank you for your time

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