Energy Aspects

SERVICE OVERVIEW

Refining Margins

The weekly refining margins service provides a snapshot of spot and forward margins for refining systems globally, drawing from our proprietary models. This new service allows subscribers to quickly evaluate market trends for the refineries by regions, and highlights challenges and opportunities for traders and optimisers. It also enables subscribers to understand the evolution of margins by refinery type and by product, as well as refiners' appetites for different crude grades.

The report provides a visualisation of the absolute and relative strength of refinery margins by product in seven key regions: Northwest Europe, the Mediterranean, Singapore, the US Gulf Coast, the US East Coast, the US Midwest and the US West Coast, accompanied by brief analytical commentary. The report is published on Mondays, while the data and charts are refreshed daily and are available online by 12:00 London time.

The key visualisations are:

- Complex refinery margins in both maximum gasoline and maximum diesel mode, for all the key regions.
- Breakdown of the recent evolution of complex margins.
- Conversion unit margins for the key regions.
- Breakdown of the evolution of conversion unit margins.
- Planned refinery maintenance.
- Technical analysis aiding identification of forward hedging and trading opportunities by comparing the value of forward margins to the cash market's historical behaviour.

Each section of the report details the margins of specific configurations (gasoline-oriented, diesel-oriented, FCC and hydrocracker) from our proprietary models, which represents the weighted average distribution of different products coming out of refineries from a specific region.

Model details

Energy Aspects' proprietary refinery margin models are based on sets of yields that aim to capture regional variations in complex refinery configurations. Gasoline configurations are based only on refineries that have FCCs. Diesel-oriented configurations are based on refineries that include hydrocrackers. The cost of crudes is given by the regional benchmark (WTI for US, Dated Brent for Europe and Dubai for Singapore) plus the weighted average of the quality differential of crudes typically flowing into the region, including their delivery costs in the case of FOB quotations.

To enable comparison between the gasoline and diesel configurations, both are modelled using the same representative regional crude slate.

Fig 1: Crude slate by region, %

	NWE	Med	Singapore	US East Coast	US Midwest	US Gulf Coast	US West Coast
Urals	29%	31%	-	-	-	-	-
BFOET	21%	-	-	-	-	-	-
CPC	-	15%	-	-	-	-	-
WTI	10%	10%	-	-	-	-	-
Basrah	15%	17%	-	-	-	-	-
Brass River	8%	9%	-	-	-	-	-
Erha	8%	9%	-	-	-	-	-
Forcados	8%	9%	-	-	-	-	-
Oman	-	-	33%	-	-	-	-
Murban	-	-	33%	-	-	-	-
Arabian Heavy	-	-	34%	-	-	-	-
Hibernia	-	-	-	50%	-	-	-
Forcados	-	-	-	50%	-	-	-
Light Lousiana Sweet	-	-	-	-	-	28%	-
Mars	-	-	-	-	-	28%	-
Midland	-	-	-	-	-	28%	-
WCS	-	-	-	-	33%	16%	33%
Bakken	-	-	-	-	33%	-	-
WTI	-	-	-	-	34%	-	-
ANS	-	-	-	-	-	-	33%
Maya	-	-	-	-	-	-	34%

Source: Energy Aspects

Spot regional product prices published by Argus Media Group are used to calculate refinery earnings.

Fig 2: Europe quotations

	NWE	Med
Propane	Propane ARA barges	Propane MED coaster
Butane	Butane ARA barges	Butane MED coaster
Naphtha	Naphtha barge FOB NWE	Naphtha FOB MED
Gasoline	Eurobob oxy barge FOB NWE	Gasoline 95 10ppm FOB MED
Jet	Jet barge FOB NWE	Jet FOB MED
Gasoil	Gasoil heating oil barge FOB Rotterdam	French heating oil FOB MED
Diesel	German diesel 10ppm barge FOB Rotterdam	French diesel 10ppm FOB MED
LS VGO	VGO 0.5% barge FOB NWE	VGO 0.5% Cif MED
HS VGO	VGO 2.0% barge FOB NWE	VGO 2.0% Cif MED
Marine fuel	Fuel oil 0.5% barge FOB NWE	Fuel oil 0.5% NWE barge
LS fuel oil	Fuel oil 1.0% barge FOB NWE	Fuel oil 1.0% FOB MED
HS fuel oil	Fuel oil 3.5% RMG barge FOB NWE	Fuel oil 3.5% FOB MED

Source: Energy Aspects

Fig 3: Singapore and PADD 1 quotations

	Singapore	US East Coast
Propane	Propane (AFEI)	Propane Mont Belvieu
Butane	Butane (AFEI)	Butane Mont Belvieu
Naphtha	Naphtha FOB Singapore	Naphtha full range waterborne
Gasoline	Gasoline 92 Singapore	Gasoline reg CBOB barge NYH (33%)
	-	Gasoline reg RBOB barge NYH (67%)
Jet	Jet Singapore	Jet fuel barge FOB NYH
Gasoil	Gasoil 0.05% Singapore	Heating oil barge FOB NYH
Diesel	Gasoil 0.001% (10ppm) Singapore	Diesel ULSD barge FOB NYH
LS VGO	-	VGO 0.5% barge
HS VGO	-	VGO 2.0% barge
Marine fuel	Marine fuel cargo 0.5% Singapore	Fuel oil 0.5% NYH
LS fuel oil	-	Fuel oil 1.0% NYH
HS fuel oil	Fuel oil 380cSt 3.5% cargo Singapore	Fuel oil 3.0% NYH
RINs	-	Renewable volume obligation

Source: Energy Aspects

Fig 4: PADD 2 and PADD 3 quotations

	US Midwest	US Gulf Coast
Propane	Propane Mont Belvieu	Propane Mont Belvieu
Butane	Butane Mont Belvieu	Butane Mont Belvieu
Naphtha	Naphtha full range waterborne	Naphtha full range waterborne
Gasoline	Gasoline reg CBOB Chicago West shore (20%)	Gasoline reg CBOB FOB Colonial pipe (67%)
	Gasoline reg RBOB Chicago West shore (80%)	Gasoline reg RBOB FOB Colonial pipe (33%)
Jet	Jet fuel Chicago West shore	Jet fuel FOB Colonial pipe
Gasoil	-	Heating oil FOB Colonial pipe
Diesel	Diesel ULSD Chicago West shore	Diesel ULSD FOB Colonial pipe
LS VGO	-	VGO 0.5% barge USGC
HS VGO	-	VGO 2.0% barge USGC
Marine fuel	-	Fuel oil 0.5% FOB USGC
HS fuel oil	-	Fuel oil 3.0% FOB USGC
RINs	Renewable volume obligation	Renewable volume obligation

Source: Energy Aspects

Fig 5: PADD 5 quotations

	US West Coast
Propane	Propane Mont Belvieu
Butane	Butane Mont Belvieu
Naphtha	Naphtha full range waterborne
Gasoline	Gasoline suboctane FOB LA pipe (80%)
	Gasoline reg CARBOB FOB LA pipe (20%)
Jet	Jet fuel FOB LA pipe
Diesel	Diesel CARB ULSD FOB LA pipe
Marine fuel	Fuel oil bunker 0.5% 380cSt LA
HS fuel oil	Fuel oil bunker 380cSt LA
RINs	Renewable volume obligation
California low-carbon fuel credit	Deficit cost diesel CARB
California low-carbon fuel credit	Deficit cost gasoline CARBOB

Source: Energy Aspects

The following tables set out the ranges of the yields used in Energy Aspects models. Escalation factors and other proprietary details of the models are not disclosed.

Fig 6: Gasoline-oriented complex configuration, %

	Singapore	NWE	Med	US East Coast	US Midwest	US Gulf Coast	US West Coast
Fuel and losses	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Propane	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.5 - 2.0
Butane	0.3 - 1.0	0.3 - 1.0	0.3 - 1.0	0.4 - 1.1	0.4 - 1.1	0.4 - 1.1	0.4 - 1.1
Naphtha							
Gasoline							
Jet	13.0 - 20.0	13.0 - 20.0	13.0 - 20.0	16.0 - 21.0	17.0 - 21.0	17.0 - 20.0	18.0 - 22.0
Diesel	14.0 - 18.0	14.0 - 18.0	14.0 - 18.0	16.0 - 21.0	18.0 - 23.0	18.0 - 23.0	16.0 - 20.0
LS VGO							
HS VGO							
Marine fuel oil							
LS Fuel							
HS Fuel							

Source: Energy Aspects

Fig 7: Singapore and PADD 1 quotations

	Singapore	NWE	Med	US East Coast	US Midwest	US Gulf Coast	US West Coast
Fuel and losses	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.3 - 3.3	2.3 - 3.3	2.3 - 3.3	2.3 - 3.3
Propane	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.2 - 1.6	1.4 - 1.8	1.4 - 1.8	1.4 - 1.8
Butane	0.3 - 1.0	0.3 - 1.0	0.3 - 1.0	0.3 - 0.6	0.3 - 0.6	0.3 - 0.6	0.3 - 0.6
Naphtha	7.5 - 12.0	7.5 - 12.0	7.5 - 12.0	8.0 - 12.0	9.0 - 13.0	9.0 - 13.0	9.0 - 13.0
Gasoline	19.0 - 22.0	19.0 - 22.0	19.0 - 22.0	20.0 - 24.0	22.0 - 26.0	22.0 - 26.0	22.0 - 26.0
Jet							
Gasoil							
Diesel							
HS Fuel							

Source: Energy Aspects

Breakdown of complex margins

In the breakdown sections of the Weekly margins report, the complex margins are weighted averages of the two different configurations (gasoline-oriented and diesel-oriented) in each region according to the following ratios:

Fig 8: Ratio gasoline / diesel configurations, %

	Gasoline-oriented	Diesel-oriented
Singapore	41%	59%
NWE	56%	44%
Med	53%	47%
US East Coast	87%	13%
US Midwest	78%	22%
US Gulf Coast	71%	29%
US West Coast	63%	37%

Source: Energy Aspects

The breakdown sections in the report identify the main contributors to the evolution of the margins over two relevant time periods defined in the report and shown in the tables of the Weekly margins report. The main contributors are grouped into:

- The Cif differentials of the crudes, which are part of the slate commonly processed in the region. This value also takes into account the crude's delivery costs.
- The products themselves: LPG, naphtha, gasoline, jet, gasoils, VGO and HS fuel.

Conversion unit margins

Margins for the FCC units take into account the relative strength between gasoline and gasoil prices by the use of a 'swing cut', which is the process to switch a production stream to either gasoline or gasoil. This way, we can identify whether regional FCCs should be in diesel or gasoline mode and we can then calculate their margin accordingly.

The prices of the products that are typically sold in volume (like alkylate, MTBE, gasoline components and gasoil components) are corrected using the ratio between the typical density and the standard density of the production in question.

Finally, the FCC margins are computed by also considering the downstream units, such as alkylation and MTBE units, which process the light ends produced by the FCC to boost the octane of FCC production.

Energy Aspects will not disclose yields used in the model nor the escalation factors applied. In the table below is the range of yields that was used for calculating the two conversion unit margins.

Fig 9: Conversion units yields, %

	FCC	Hydrocracker
Fuel and losses	4.7 - 6.7	0.6 - 1.0
Ethane	2.7 - 4.7	0.9 - 1.3
Propane	1.2 - 2.0	0.8 - 1.1
Propylene	5.0 - 7.0	-
Alkylate	8.0 - 10.0	-
Iso-butylene	0.8 - 1.4	-
Butane	0.5 - 0.9	2.6 - 4.6
Naphtha	-	28.0 - 31.0
Gasoline		-
Gasoil/Gasoline		-
Gasoil		-
Diesel	-	
VGO	2.0 - 6.0	
Fuel	10.0 - 11.0	-

Source: Energy Aspects