

Refinery Economics

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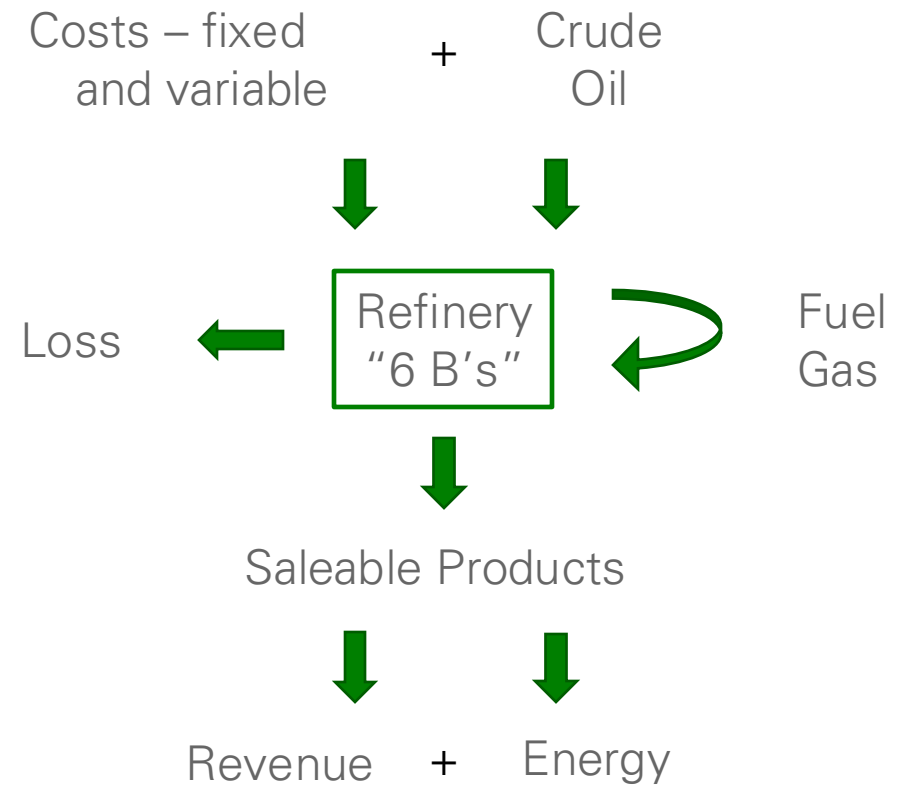
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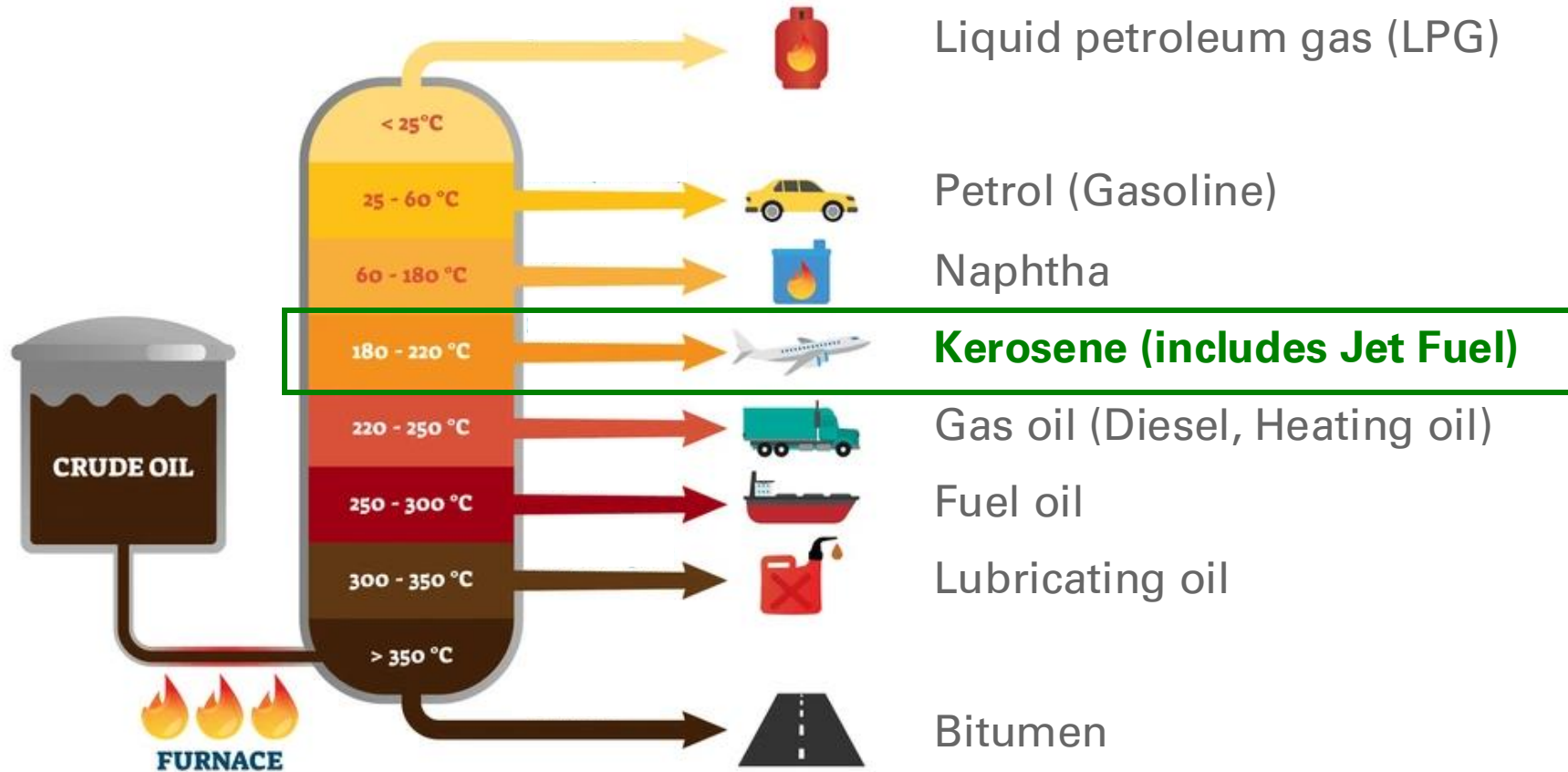
Refining

Separating fractions of usable products in crude oil



Refining and Crude oil products

Kerosene cut (from which Jet is made) sits between naphtha and gas oil



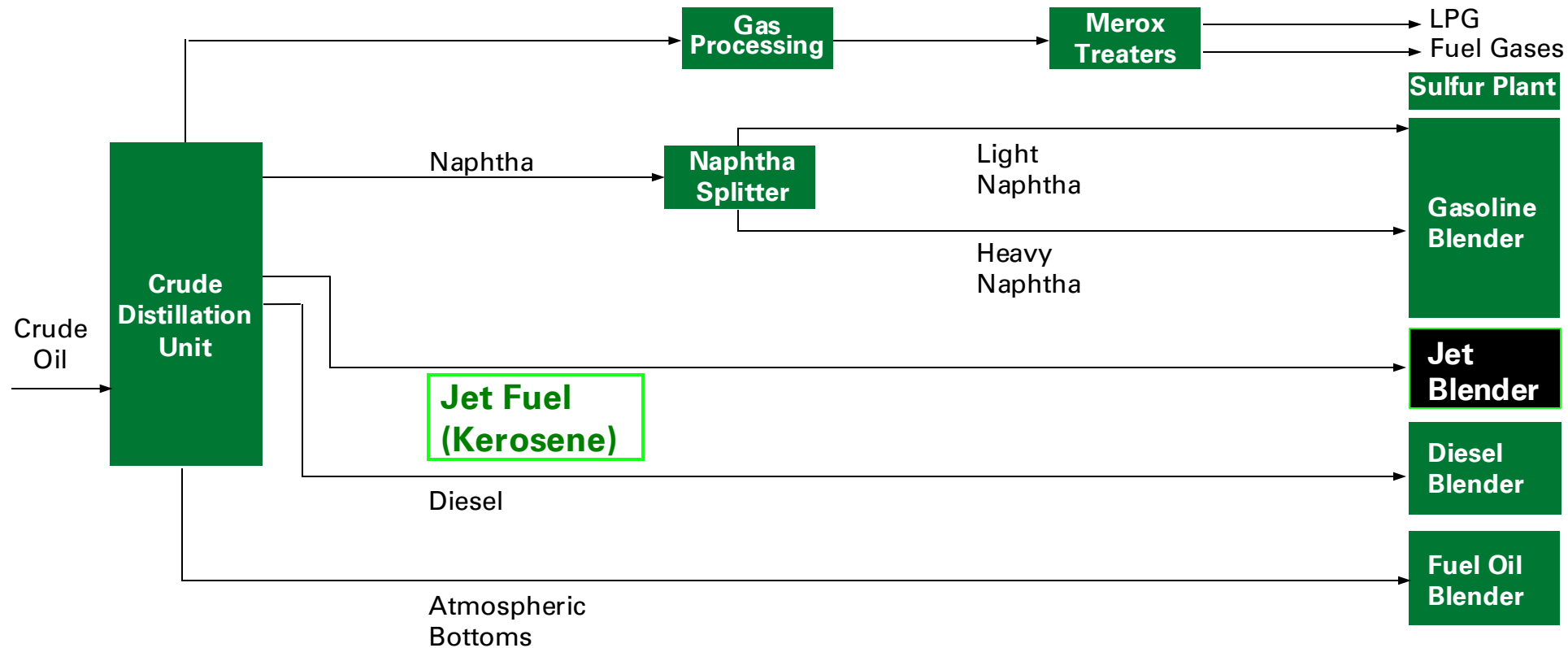
Poll #1

Jet typically represents what % of a refinery's output?

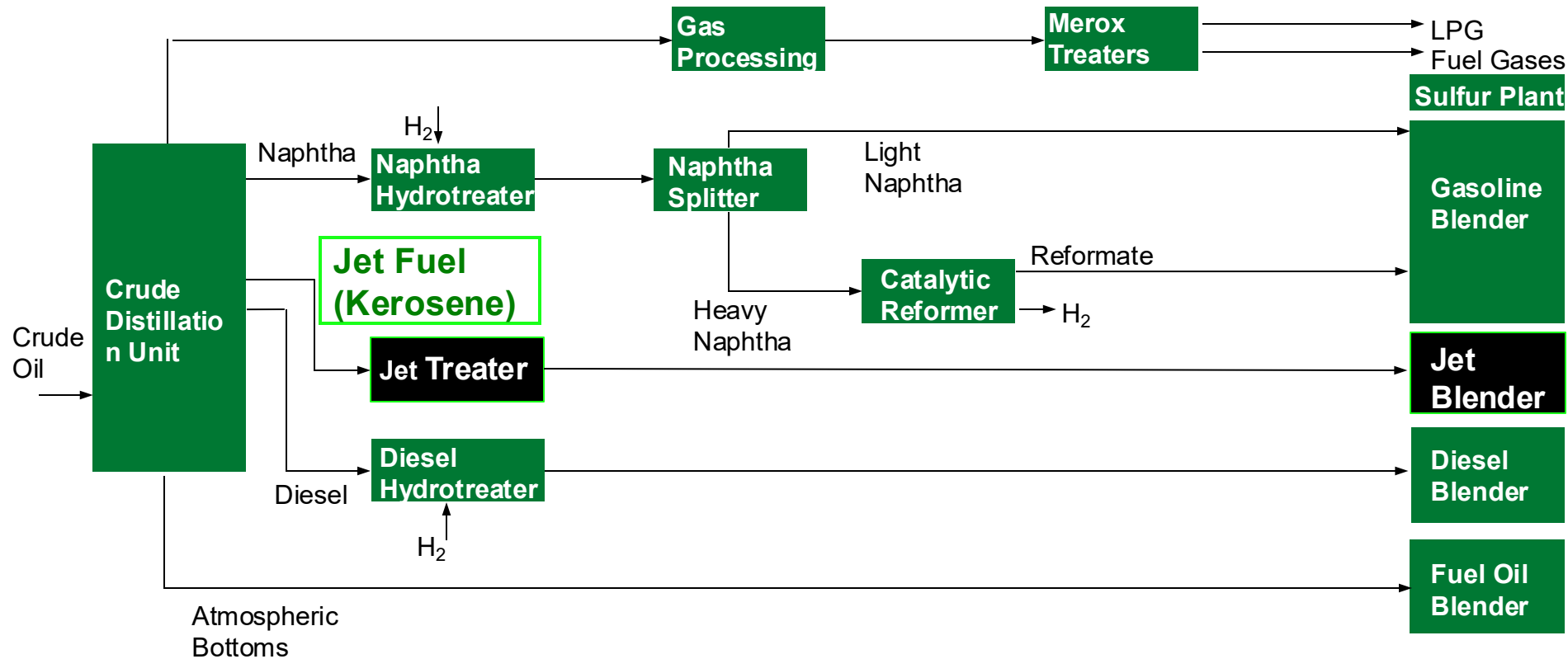
- a) 2 - 6%
- b) 9 - 13%**
- c) 22 - 26%
- d) 30 - 34%



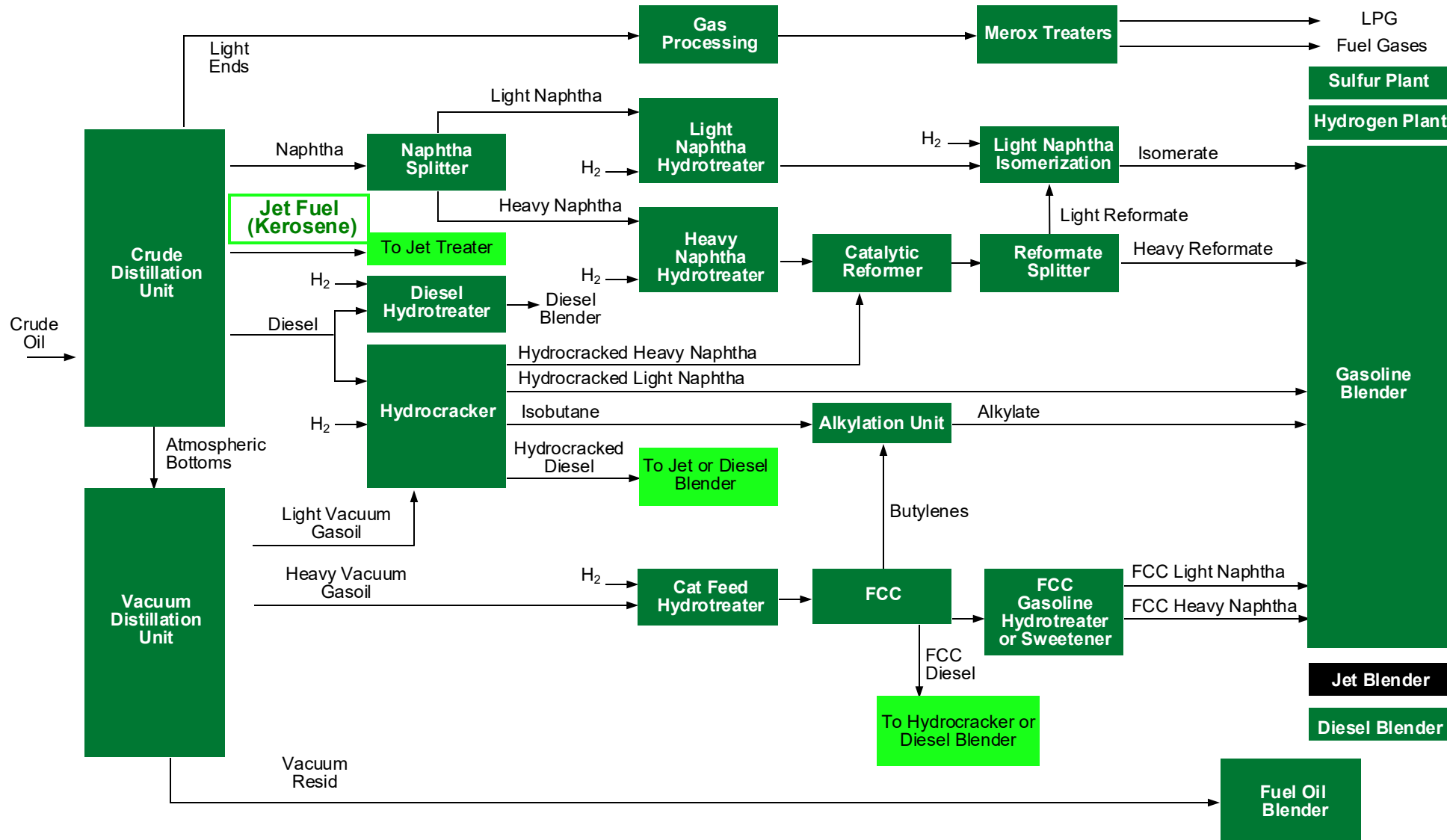
Refinery configurations – Straight Run



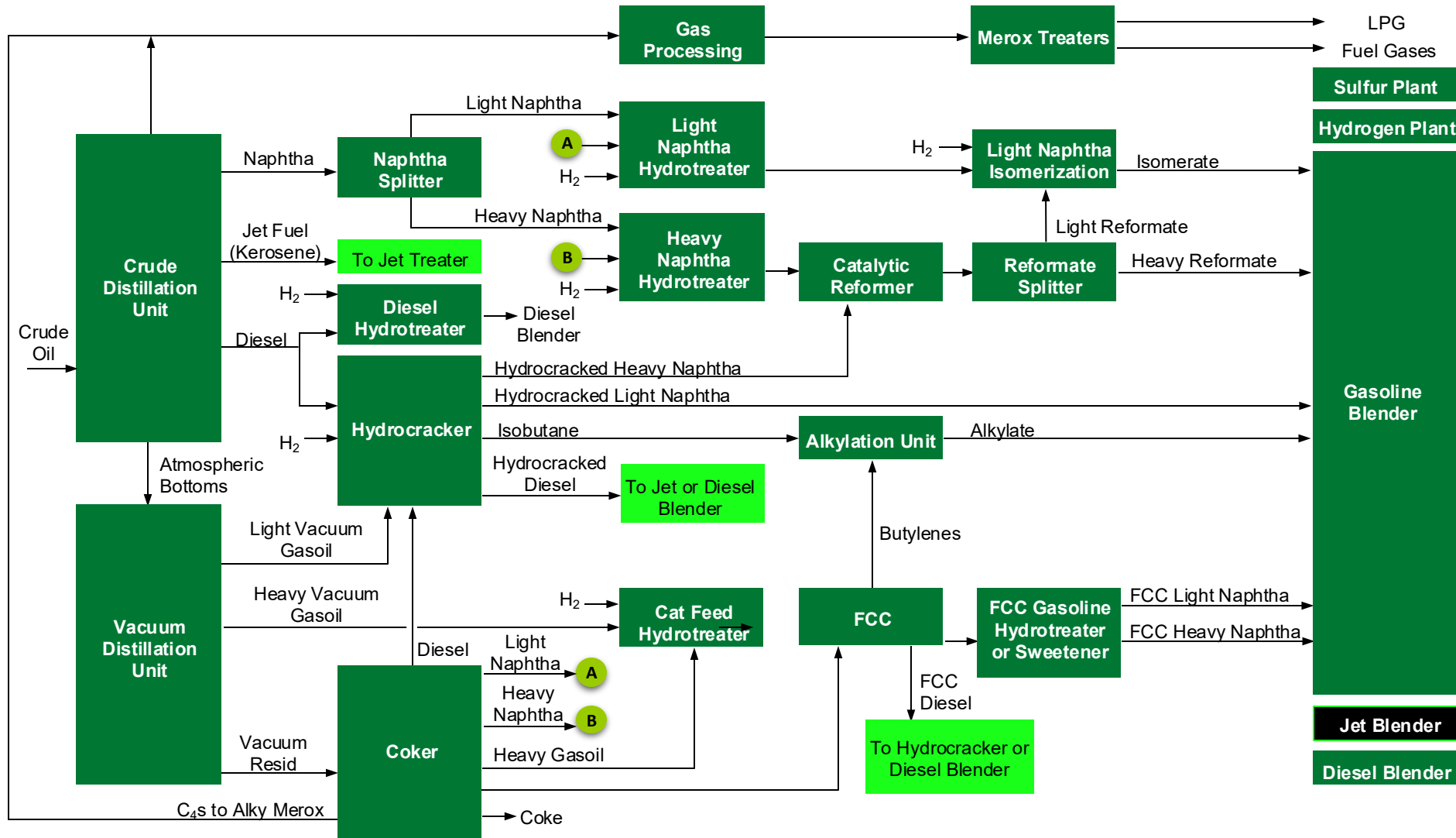
Refinery configurations – Hydroskimming



Refinery configurations – Cracking

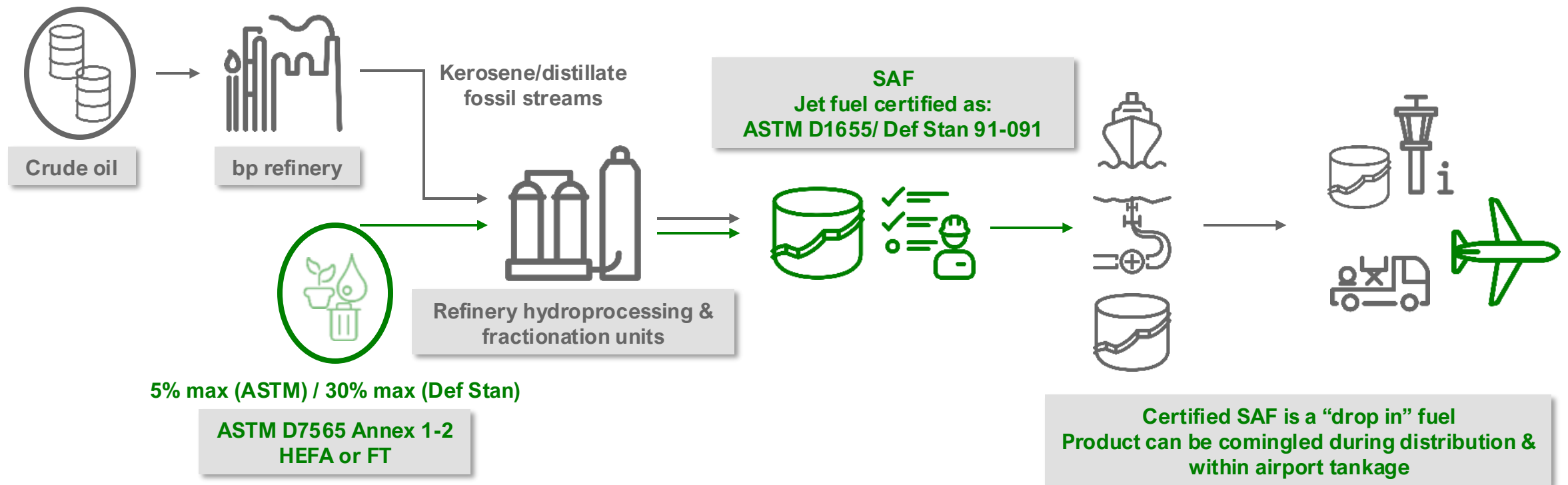


Refinery configurations – Full Upgrading



Refinery Coprocessing

Up to 30% renewable HEFA feedstock is now approved by Def Stan 91-091 (JetA1)



Poll #2

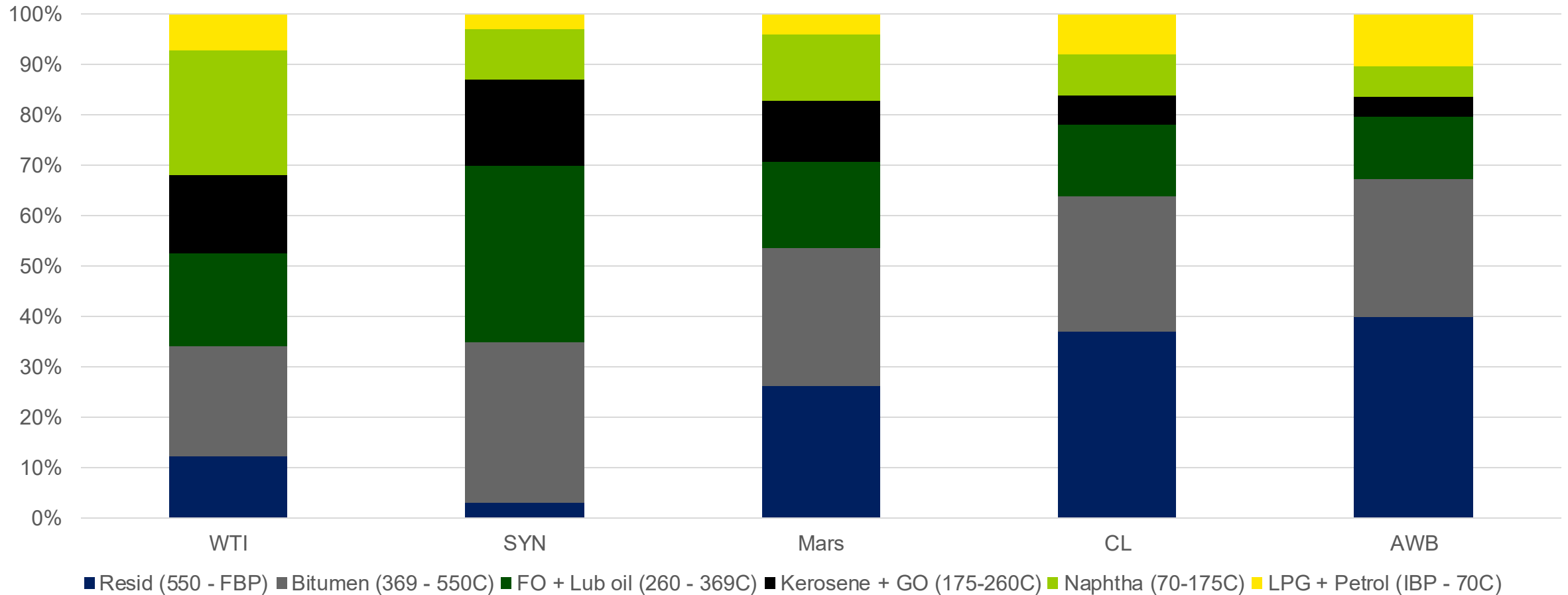
What is not one of the six “B”s of refining?

- a) Boil
- b) Break
- c) Bend
- d) Bond
- e) Bleach**
- f) Buff
- g) Blend

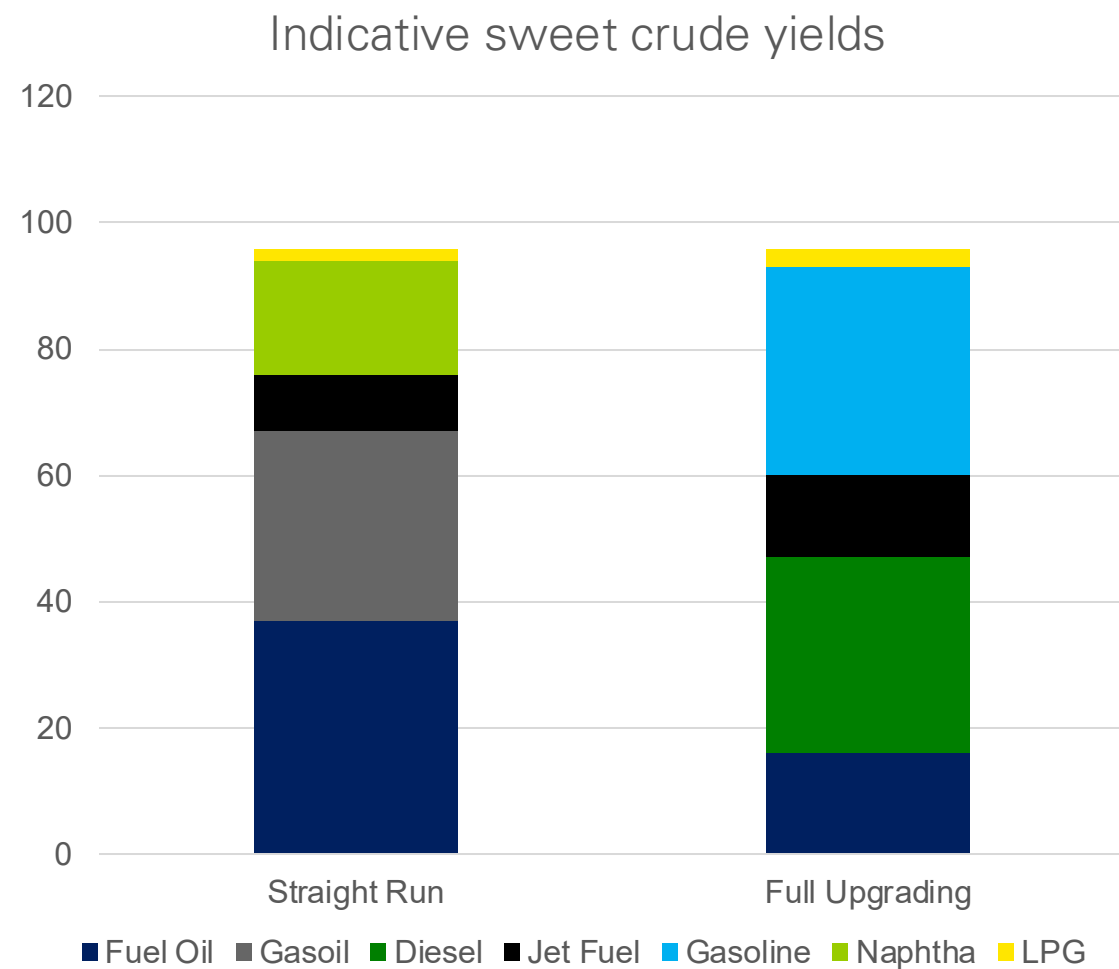


Crude yields are important

Example typical crude yields



Refinery complexity brings value



Refining Margin



Gross Margin: Gross product worth (GPW) less cost of feedstock

Net Margin: Gross margin less costs

Feedstock costs

- FOB cost
- Freight
- Insurance
- Transit losses
- Cost of working capital
- Occasional costs (e.g. handling or port costs)

Variable costs

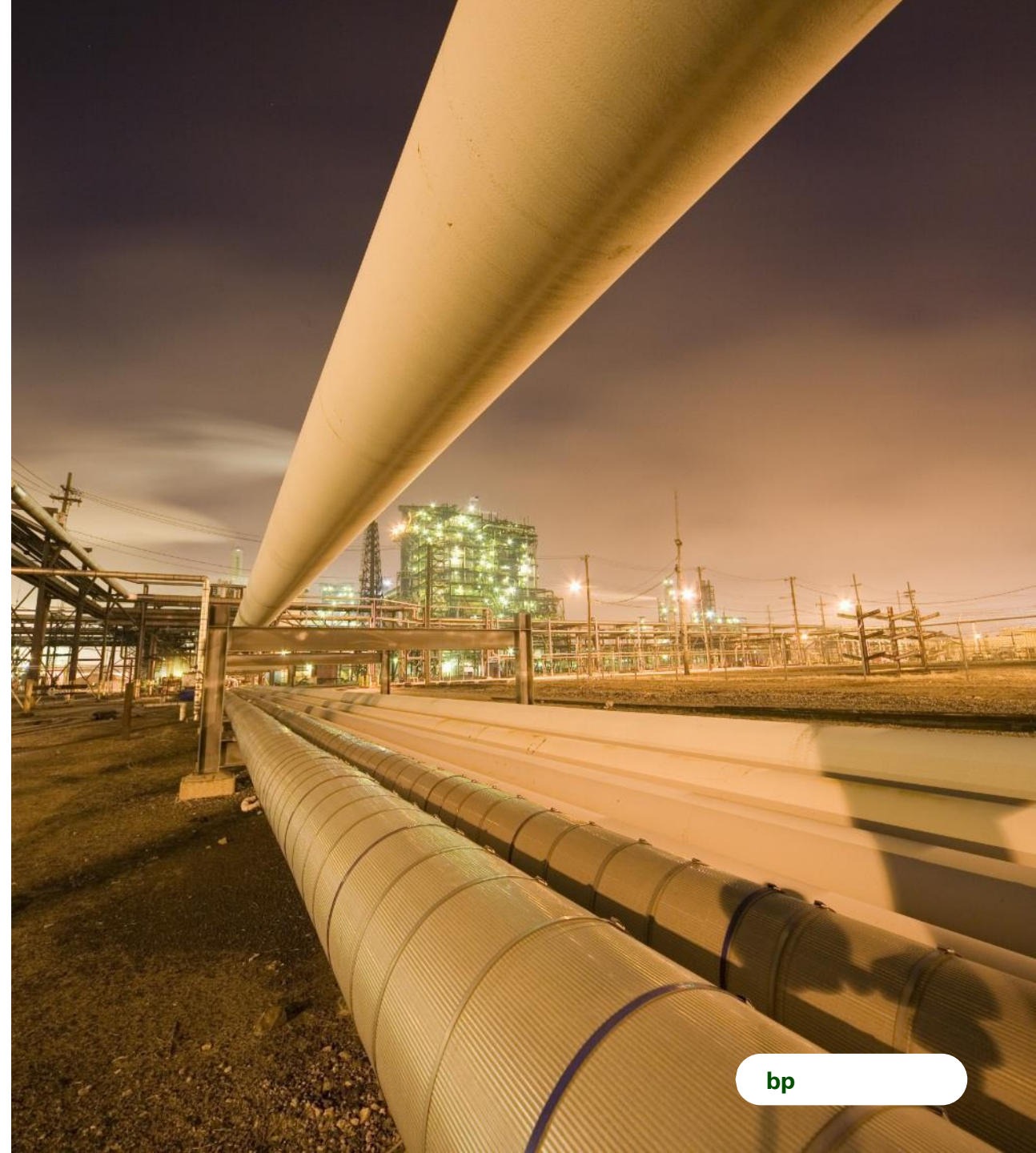
- Fuel
- Catalysts
- Additives
- Water
- Power

Fixed costs

- Wages
- Rates/rent/taxes
- Insurance
- Corporate costs
- Depreciation (non-cash)
- Carbon emission costs*

Bridging production & demand

- Changing refinery layout (expensive and slow)
- Trade barrels to meet geographical demand and remove surplus from system (Arbitrage)
- Select better suited crudes (change yield)
- Set up exchange deals (physical swaps with other counterparts)
- Build and utilise stocks against forecasted seasonality of demand



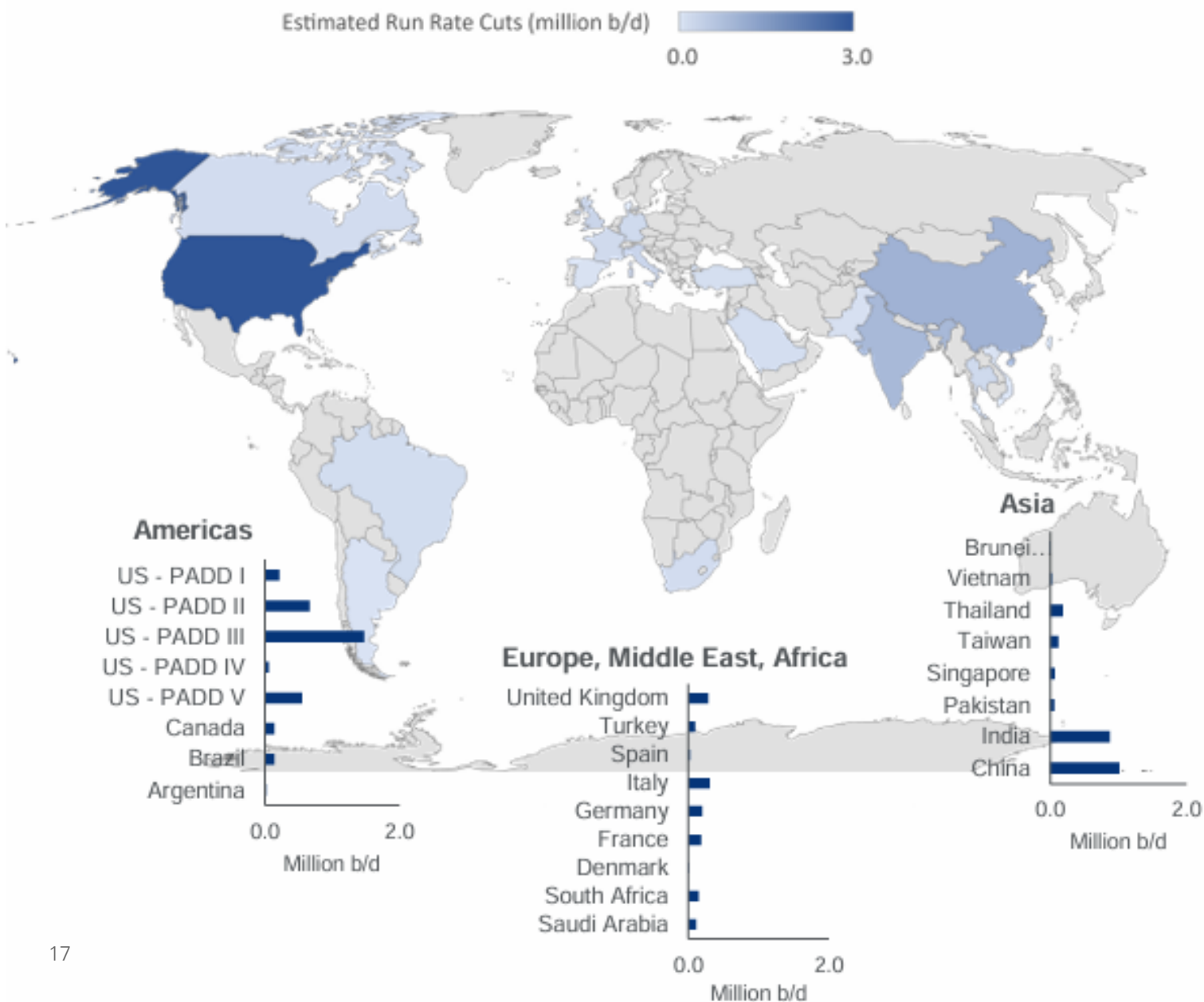
Poll #3

What is NOT relevant in crude selection to optimise refinery economics?



- a) Product yields
- b) Product quality needs (e.g. sulphur levels)
- c) Compatibility with processing units (e.g. heavy metal content)
- d) Crude oil colour intensity
- e) Market structure (contango / backwardation)

Global refineries cut runs by 7 million b/d year-on-year



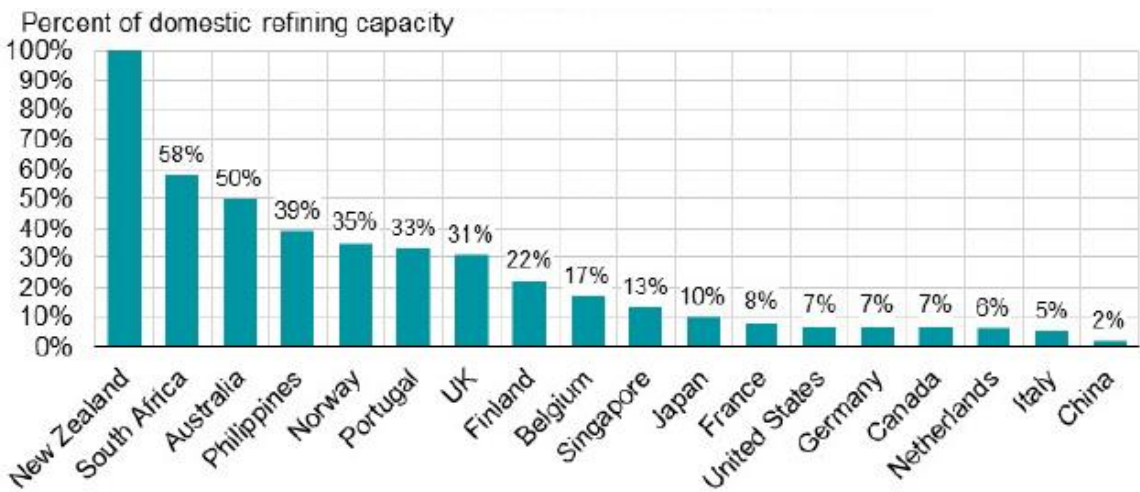
April 2020:
Refinery economic
run-cuts

Global refining capacity changes 2019-22

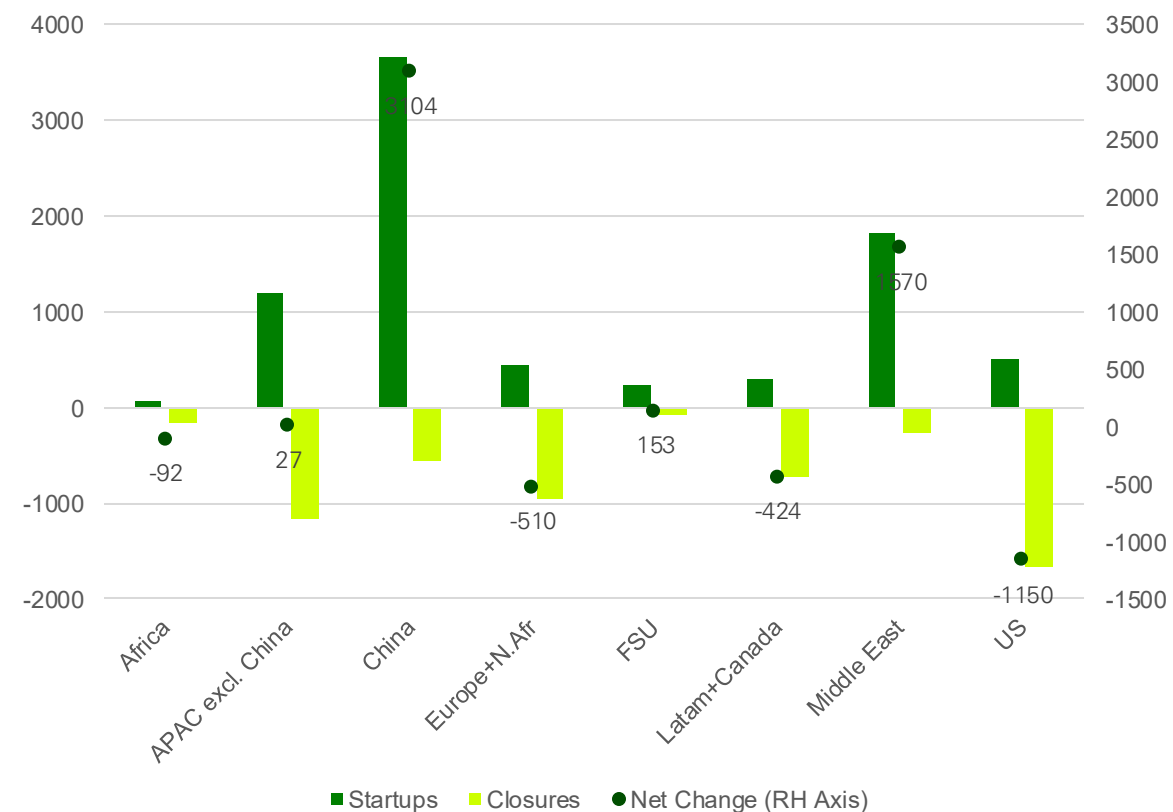


Poor margins, uncompetitiveness and prohibitive cost to repair damaged refineries shifted refinery outputs more to the East

Percent of Domestic Refining Capacity Closed Since January 2020



²Refinery Capacity Change by Region 2019-22

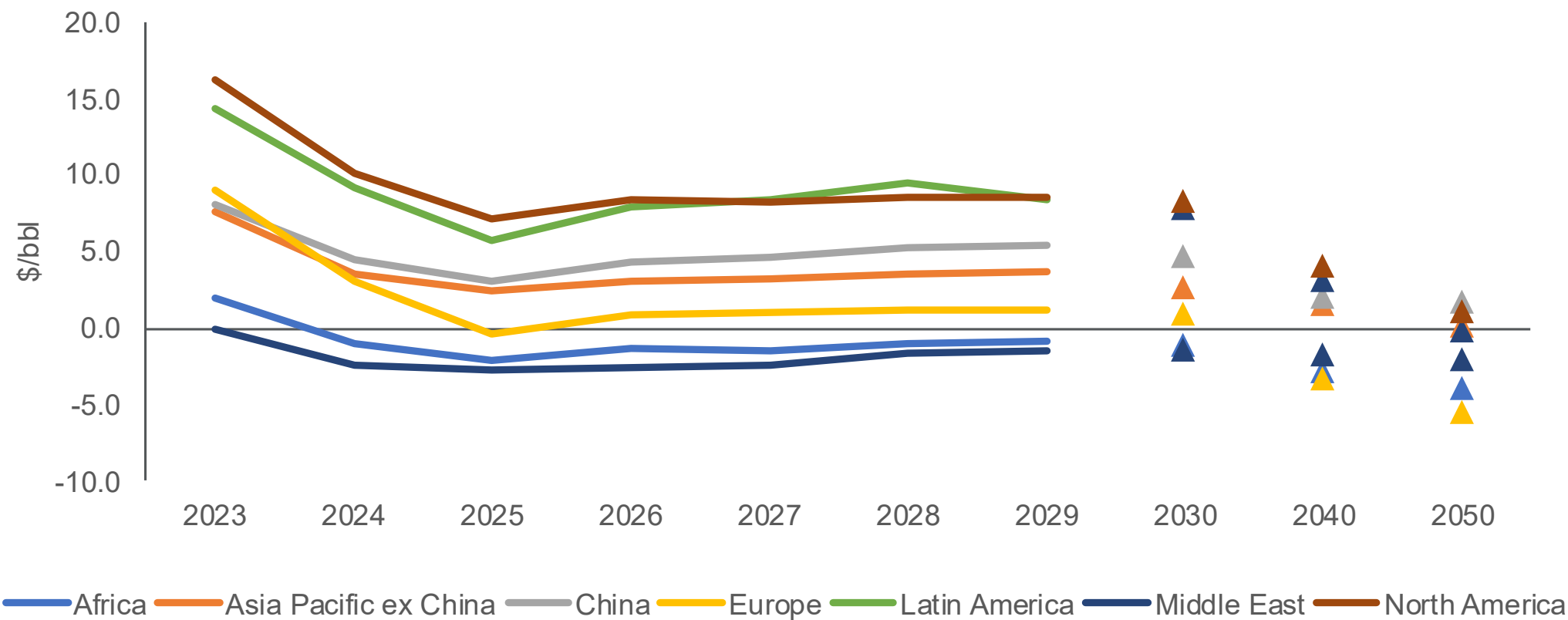


Refinery margin outlook

Wood Mackenzie sees long-term margins being challenged



Regional Weighted Average - NCM



Source: Wood Mackenzie

14 February 2025

NCM = Net Cash Margin

Key Messages



1. Refining is a complex and capital-intensive business
2. Refinery economics are driven by multiple factors including refinery complexity, cost and quality of feedstocks, total value of refined products and costs of processing
3. Peaking of global transport fuel demand and increasing regulatory burdens are putting downward pressure on long-term refining margin expectations, especially in Europe