The European refinery of the future

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Wood Mackenzie
Who we are

For the past 40 years, we have established our reputation as a trusted source of knowledge and forward-looking insight for the world's most innovative organisations.

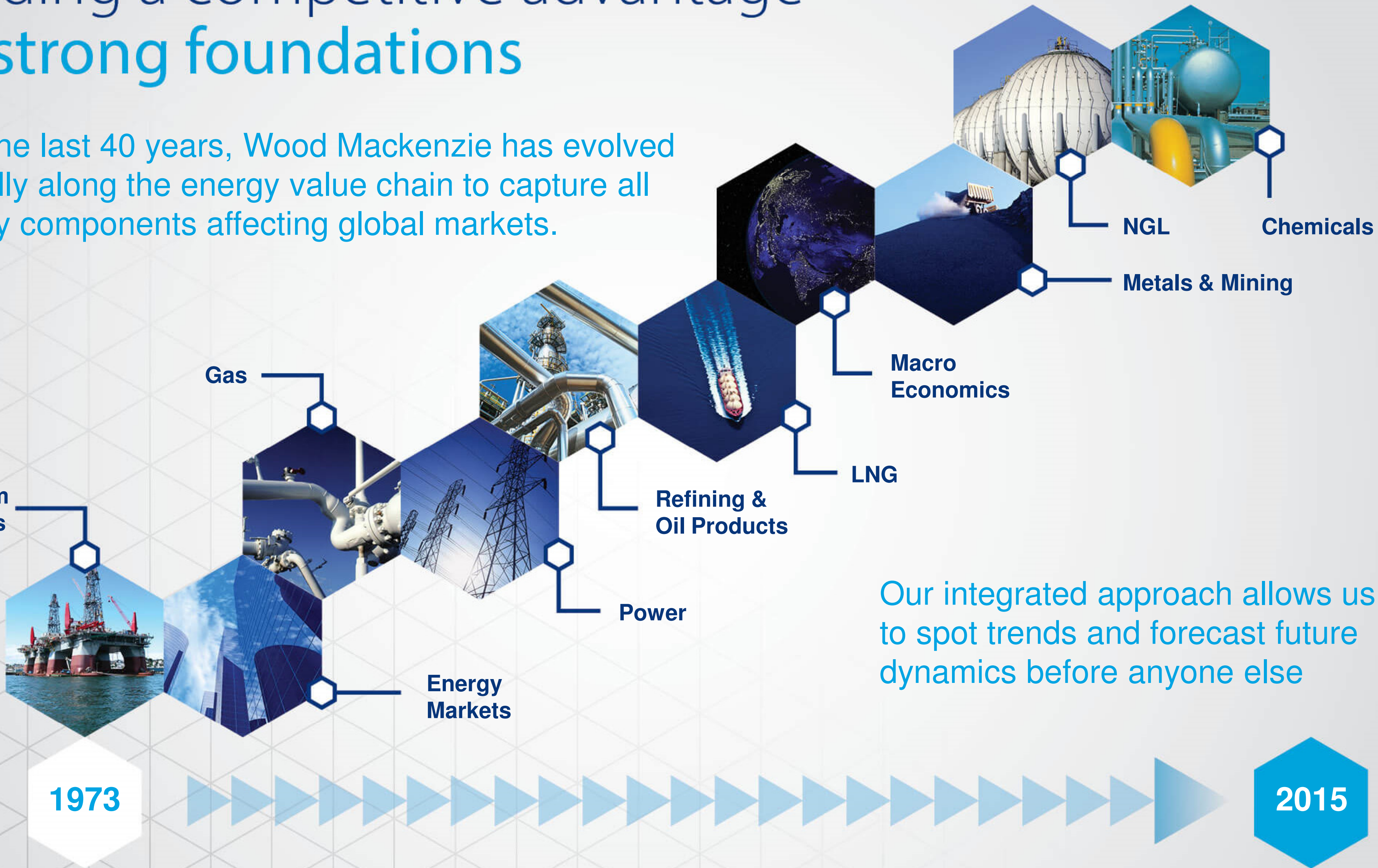
We are a global leader in commercial intelligence for the natural resources sector, empowering clients to make better strategic decisions, by arming them with objective analysis and advice on assets, companies and markets.

Our dedicated oil, gas, power, chemicals, metals and mining sector teams are located around the world, and deliver research and consulting projects based on our assessment and valuation of thousands of individual assets, companies and economic indicators such as market supply, demand and price trends.

At every stage, we apply a unique and rigorous analytical approach to provide objective analysis and advice that is valued by industries across the world. As a result, we can count the world's key energy institutions and governments among our most loyal clients.

Building a competitive advantage on **strong foundations**

Over the last 40 years, Wood Mackenzie has evolved naturally along the energy value chain to capture all the key components affecting global markets.

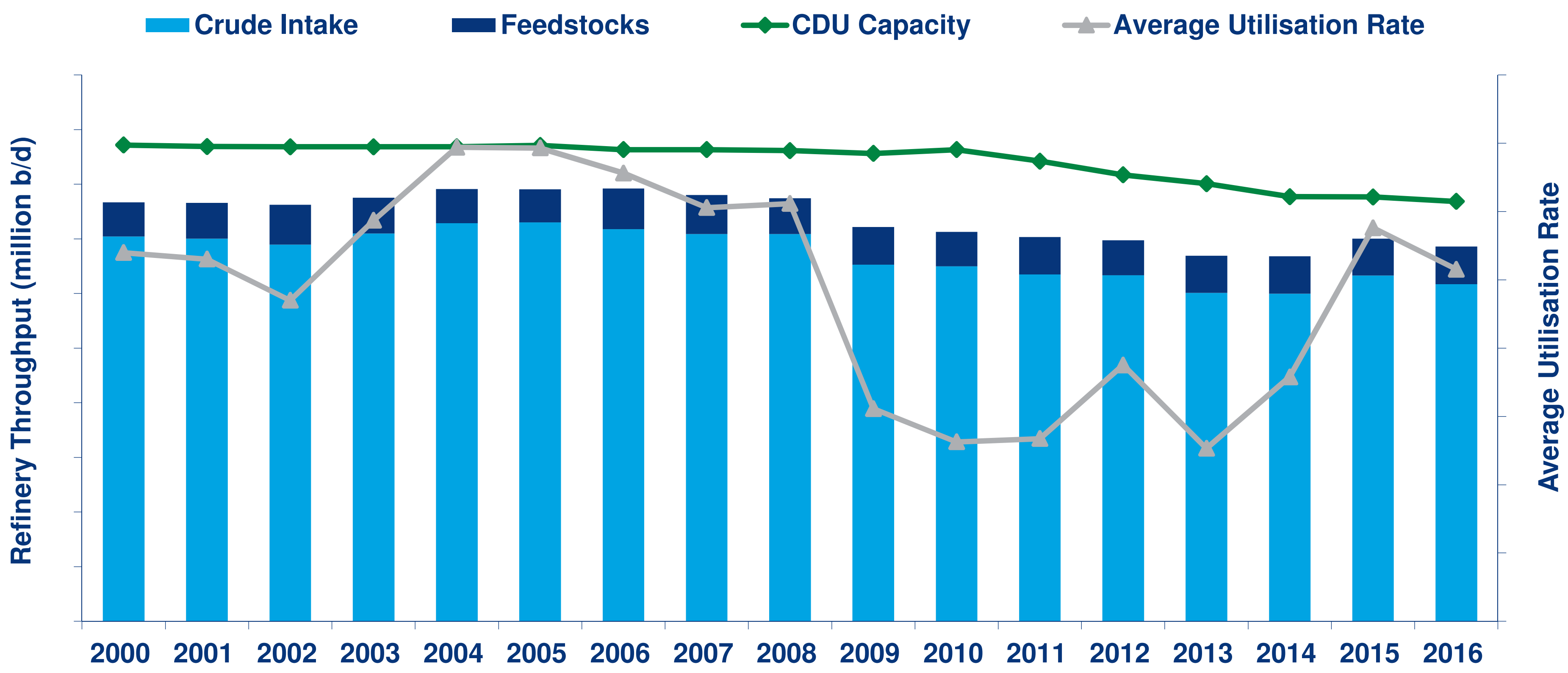


Our integrated approach allows us to spot trends and forecast future dynamics before anyone else

The European refining industry has been undergoing a period of consolidation with a 2.1 million b/d net capacity reduction since 2000

The immediate need for further capacity reduction has subsided

Europe* refinery throughputs and utilisation

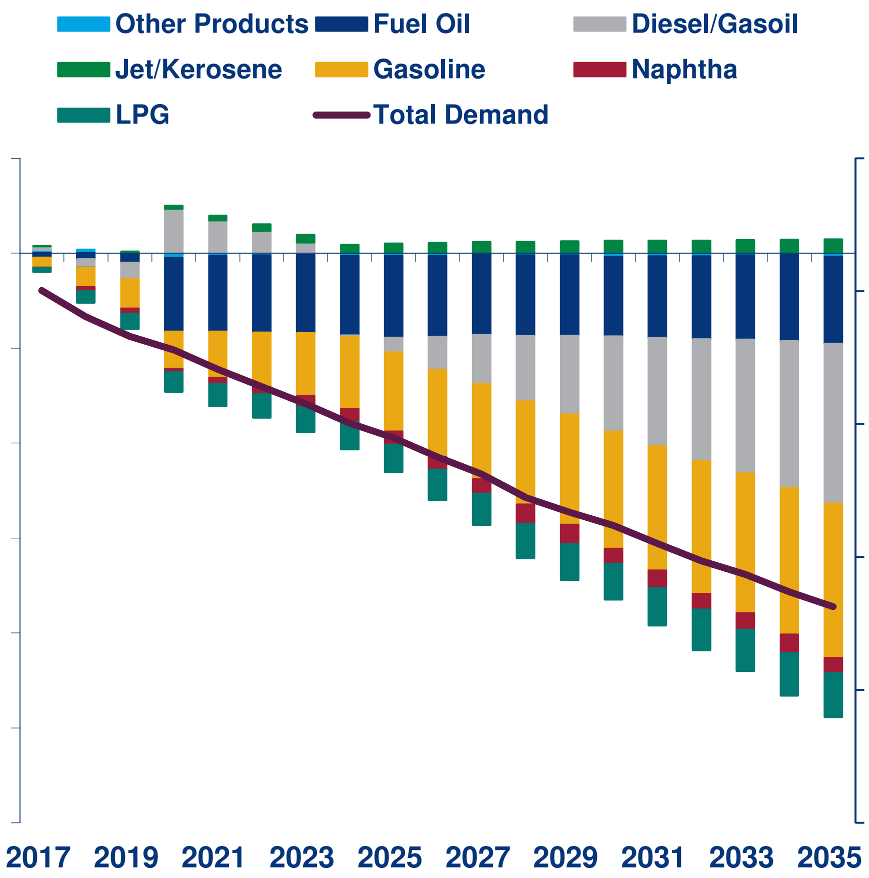


Source: Wood Mackenzie

*Europe = EU28 plus Albania, Bosnia &Herzegovina, Iceland, Macedonia, Montenegro, Norway, Serbia, Switzerland, Turkey

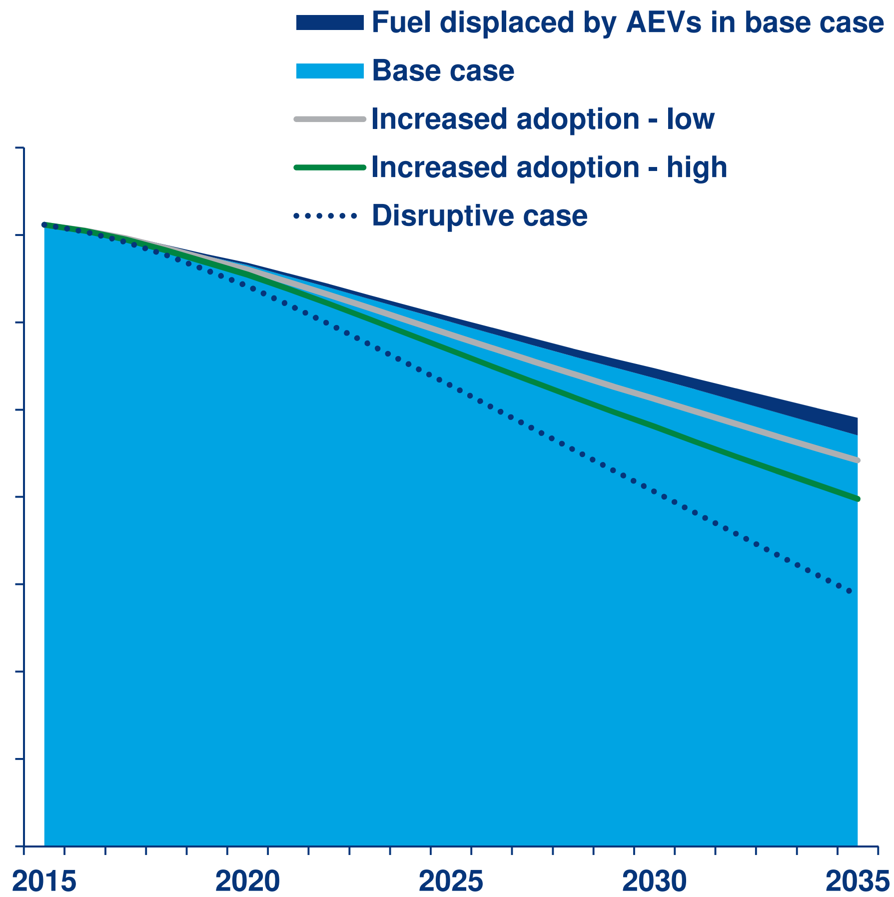
European oil demand is in decline. Downside risks to transport fuel demand are evident, but petchem feedstock demand is robust

Europe oil demand growth forecast, million b/d



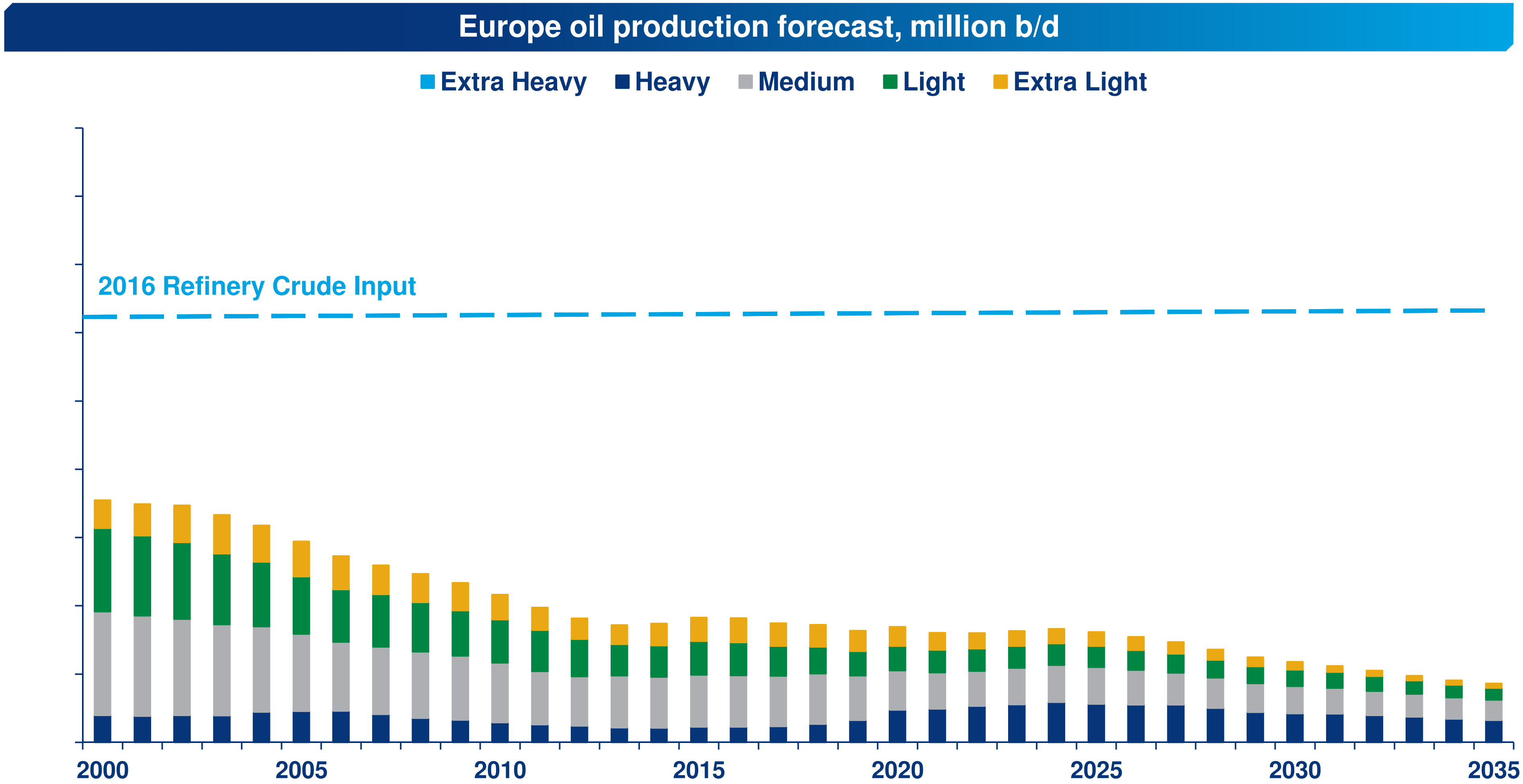
Source: Wood Mackenzie Product Markets Service

Impact of AEVs on the outlook for European passenger car fuel demand, 2015 – 2035*



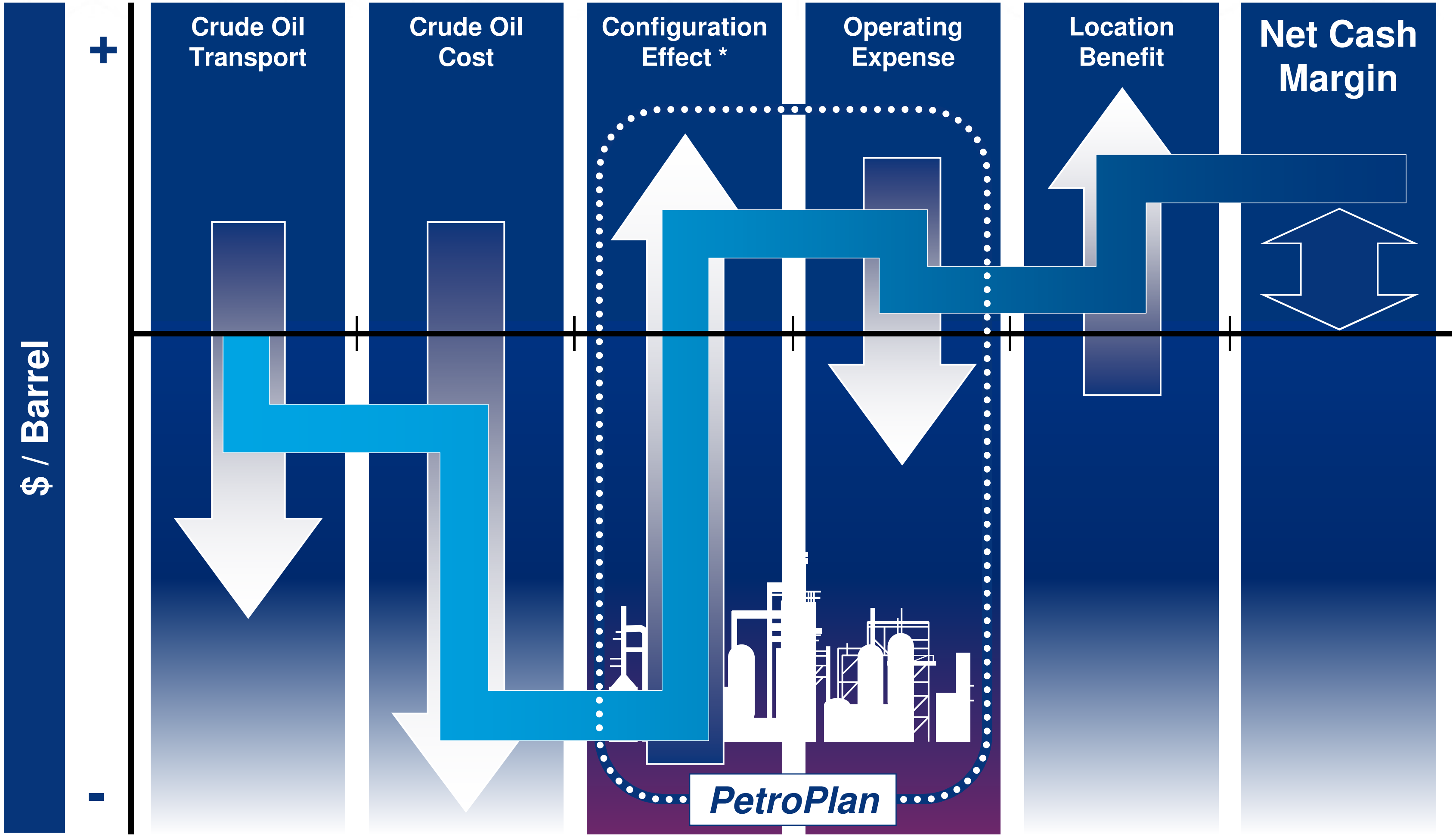
**Assumes range constraints are resolved and AEVs travel the same distance as ICE cars*

Regional crude production is in long-term decline and getting heavier



Source: Wood Mackenzie Oil Supply Tool

Successful refineries maximise value-add, while minimising feedstock and operating costs



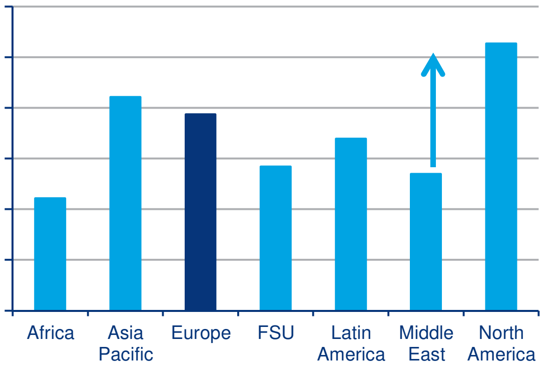
Net Cash Margin (EBITDA) = Gross Margin, *$/bbl* – Cash Operating Expenses, *$/bbl*

* Configuration effect is synonymous with Refinery Gross Product Worth (GPW)

Source: Wood Mackenzie Refinery Evaluation Model

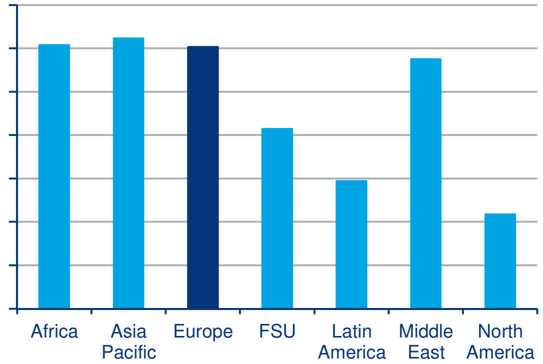
European refiners face some challenges competing with refineries in other regions

Average regional refinery complexity, 2015



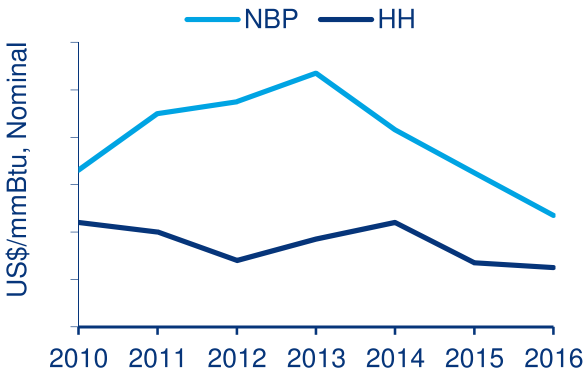
Source: Wood Mackenzie

Average regional refinery crude cost 2015, $/bbl



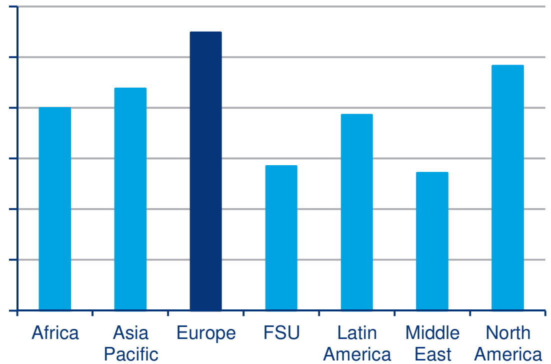
Source: Wood Mackenzie

Regional gas spot prices



Source: Argus Media, Datastream, NYMEX, Wood Mackenzie

Average regional refinery OPEX 2015, $/bbl



Source: Wood Mackenzie

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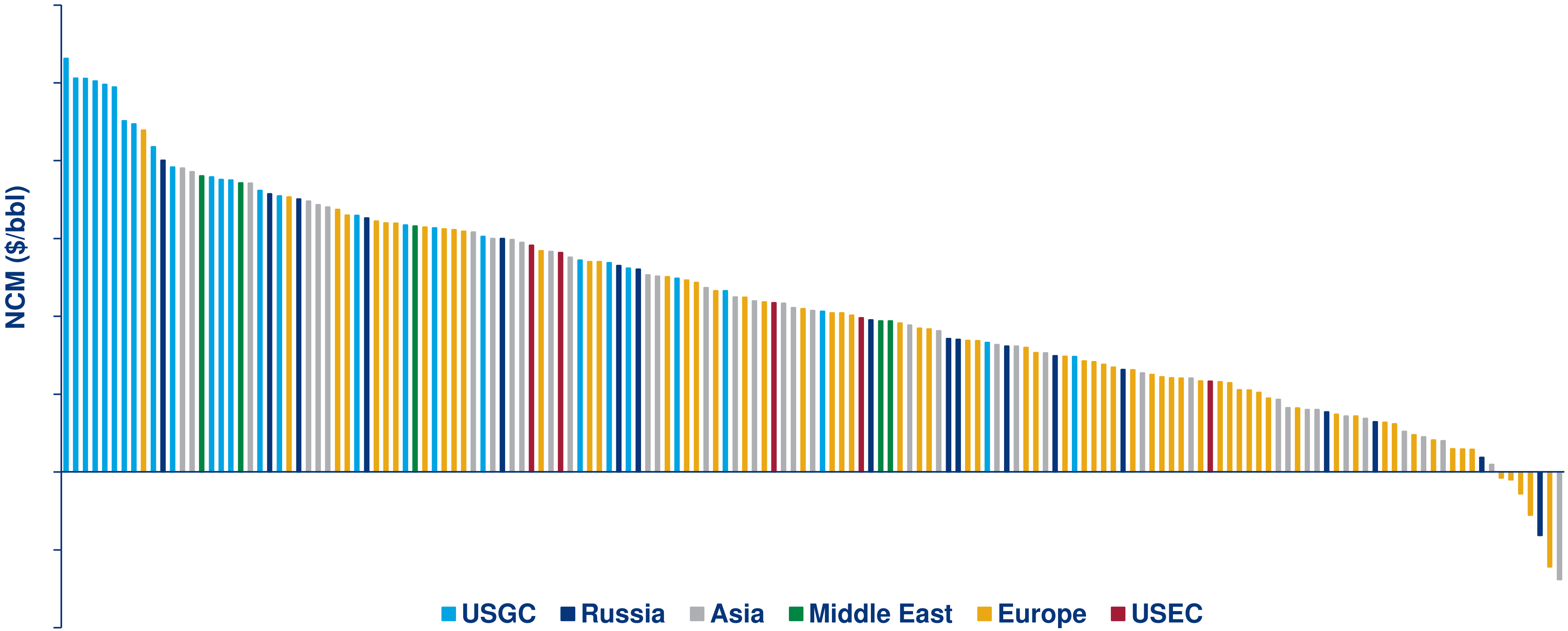
Competitive pressure from refiners in other regions will continue from existing and new build assets

European refiners will continue to invest to remain competitive

2015 refinery net cash margin, Europe and selected competitors

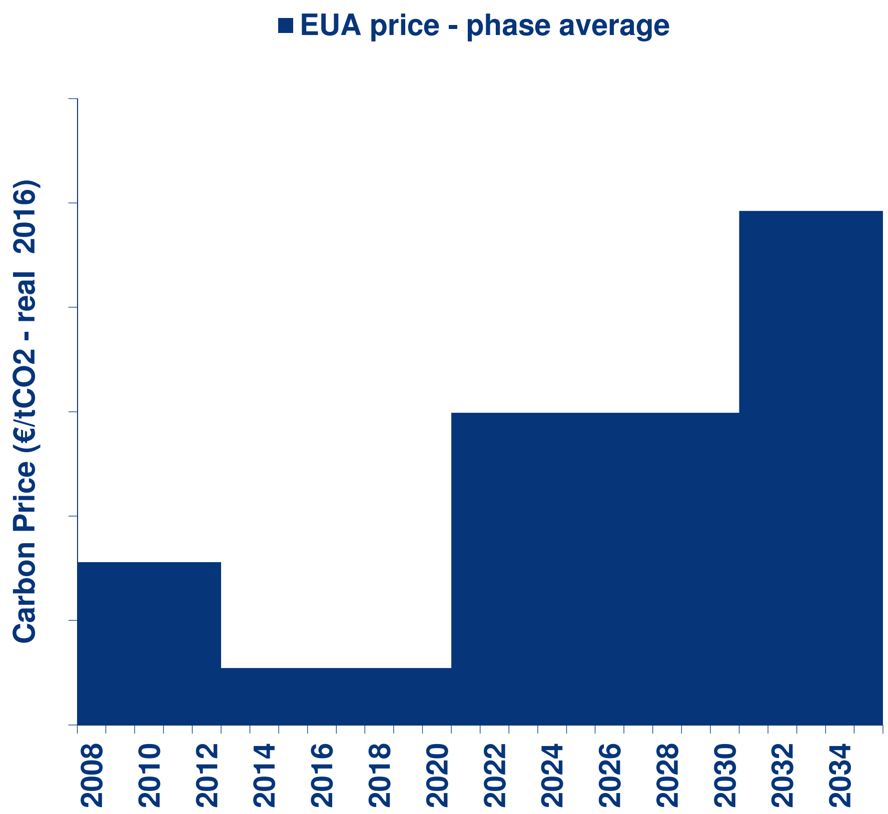


Source: Wood Mackenzie Refinery Evaluation Model

The carbon price is expected to rise under ETS IV, increasing costs for European refineries

The cost burden will not be evenly distributed

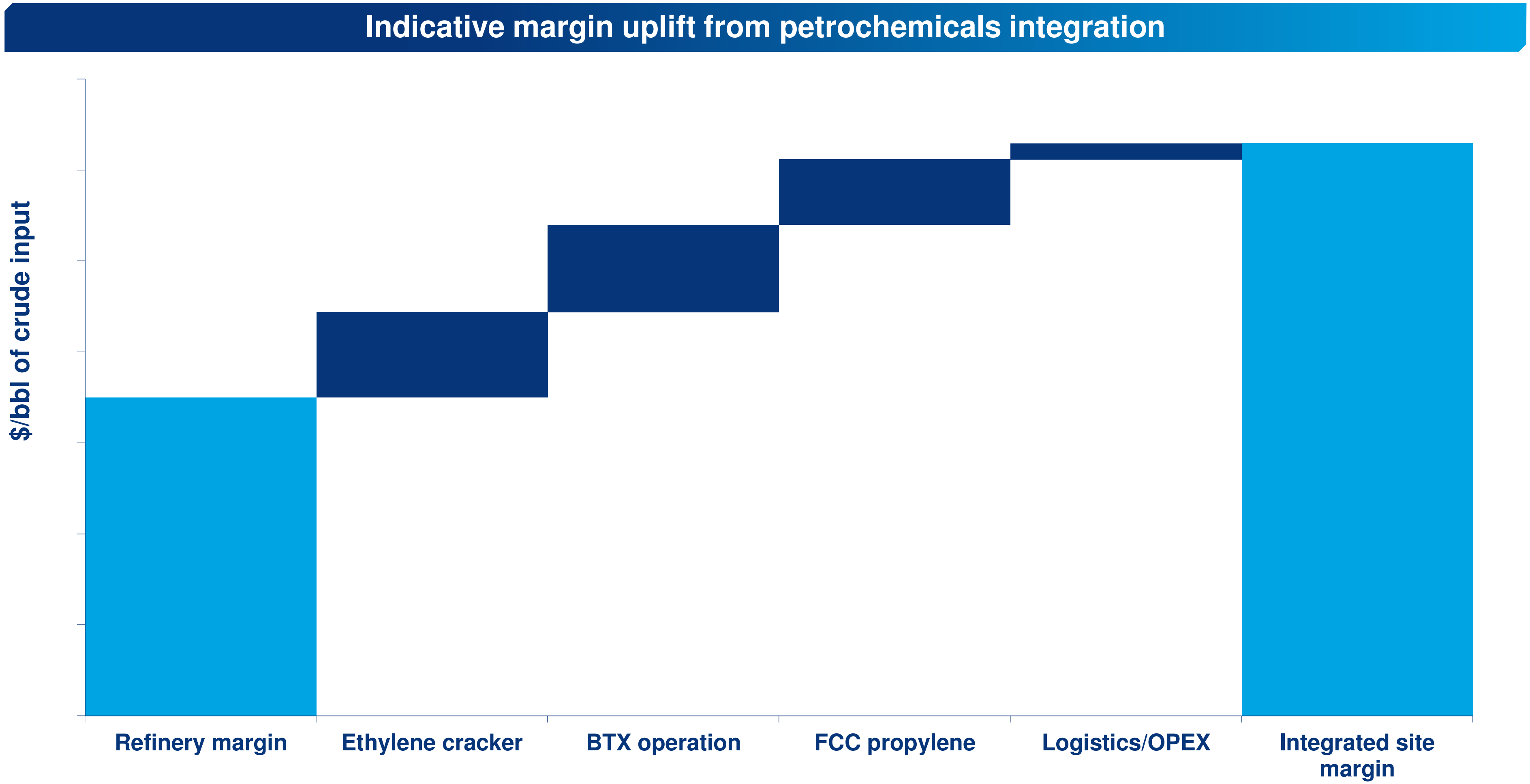
ETS carbon price forecast



Source: Thomson Datastream (actual) & Wood Mackenzie (forecast)

- Oversupply of emissions allowances to be resolved in the 2020s – Market Stability Reserve, linear supply reduction and allowance cancellation
- The tightening market coincides with rising fuel switching costs in power
- Average carbon price across Phase IV €30/tCO_2
- Proportion of allowances to be purchased (at auction) by the refining sector will rise from Phase III to Phase IV to Phase V
- Least efficient refiners faced with high carbon costs while operators in competing regions avoid similar liabilities

Petrochemicals integration can provide higher margins and increase yield flexibility



Source: Wood Mackenzie

How does a European refinery evolve to become the refinery of the future?

It becomes a highly efficient, world scale industrial complex, able to adapt to a changing market environment

Maximising value-add…

Deep conversion	Petchems integration	Specialty products	Power generation	Effective trading operations/market integration	Feedstock and yield flexibility

…and controlling costs, while ensuring compliance

Automation & digitalisation	Energy efficiency	Low emissions	Efficient logistics	High product quality, renewables

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