ICIS Global Base Oil Scenarios 2019

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June 11, 2019

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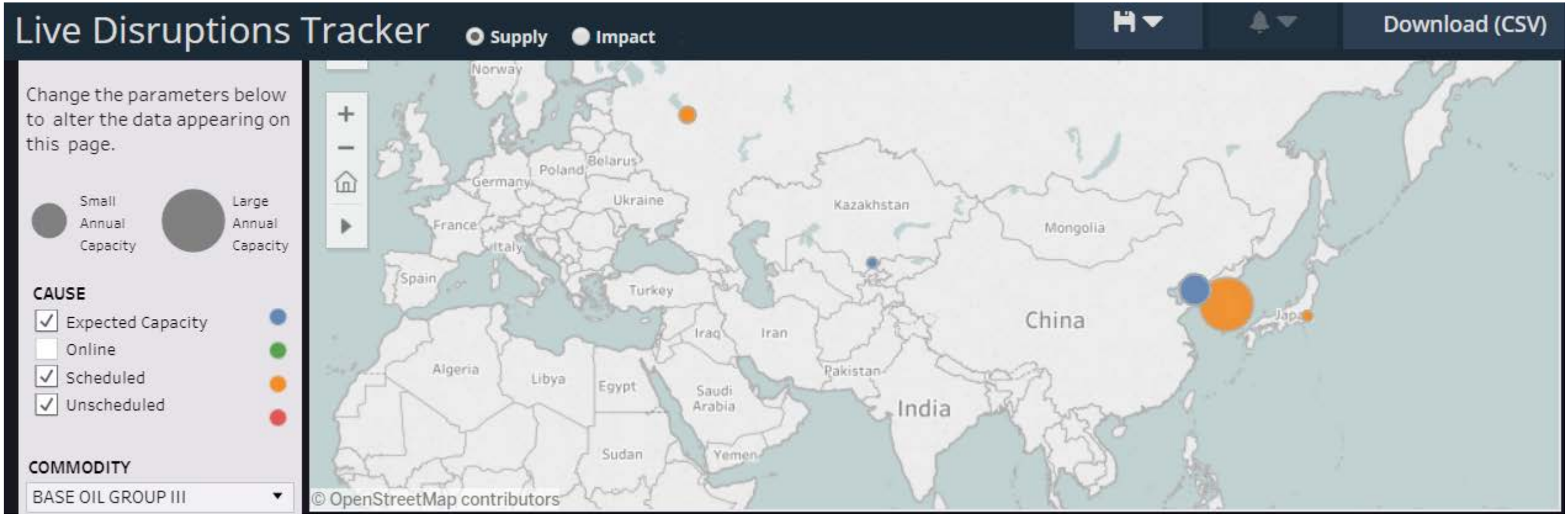
Introducing the new ICIS Outage Tracker



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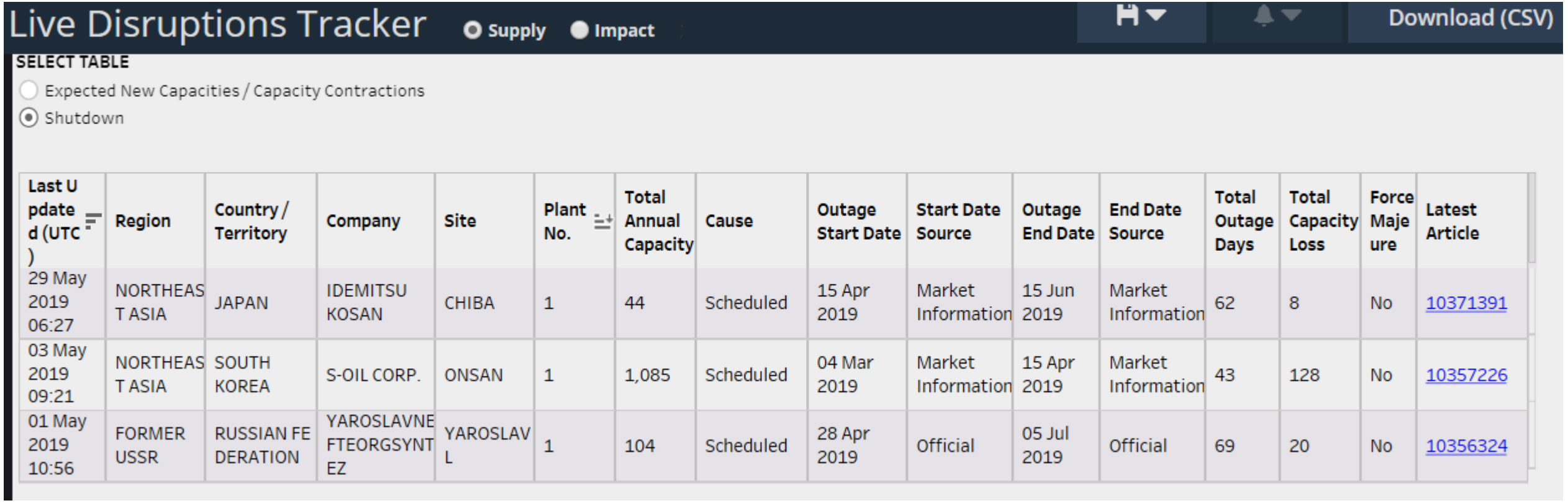


Live Disruptions Tracker ○ Supply ○ Impact Download (CSV)

SELECT TABLE

○ Expected New Capacities / Capacity Contractions

◉ Shutdown

Last Updated (UTC)	Region	Country / Territory	Company	Site	Plant No.	Total Annual Capacity	Cause	Outage Start Date	Start Date Source	Outage End Date	End Date Source	Total Outage Days	Total Capacity Loss	Force Majeure	Latest Article
29 May 2019 06:27	NORTHEAST ASIA	JAPAN	IDEMITSU KOSAN	CHIBA	1	44	Scheduled	15 Apr 2019	Market Information	15 Jun 2019	Market Information	62	8	No	10371391
03 May 2019 09:21	NORTHEAST ASIA	SOUTH KOREA	S-OIL CORP.	ONSAN	1	1,085	Scheduled	04 Mar 2019	Market Information	15 Apr 2019	Market Information	43	128	No	10357226
01 May 2019 10:56	FORMER USSR	RUSSIAN FEDERATION	YAROSLAVNEFTEORGSYNTEZ	YAROSLAVL	1	104	Scheduled	28 Apr 2019	Official	05 Jul 2019	Official	69	20	No	10356324

Agenda

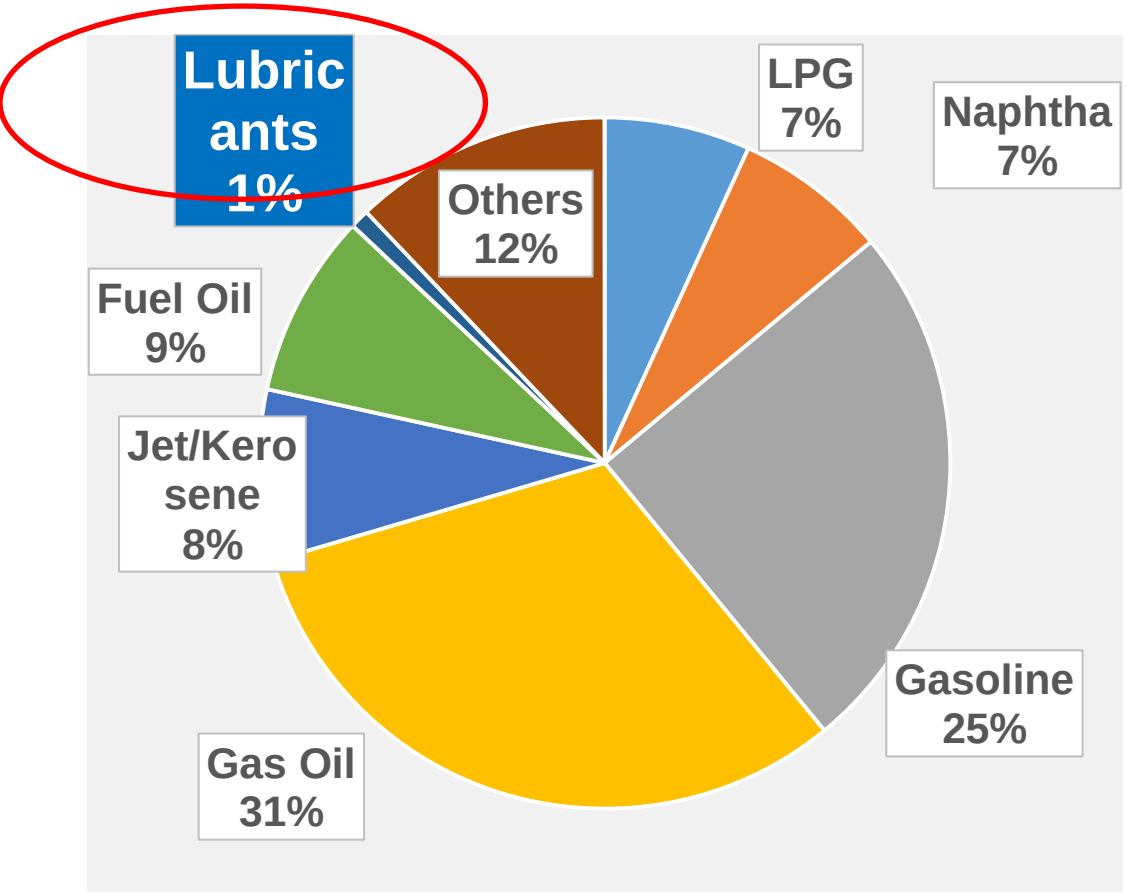
A. The Current Base Oil Landscape
    1. Demand versus Capacity
    2. Regional Dimensions
    3. Key Trade Flows

B. Potential Developments
    1. Demand Opportunities
    2. Major sensitivities
    3. New Investments
    4. Impact on Regional Balances

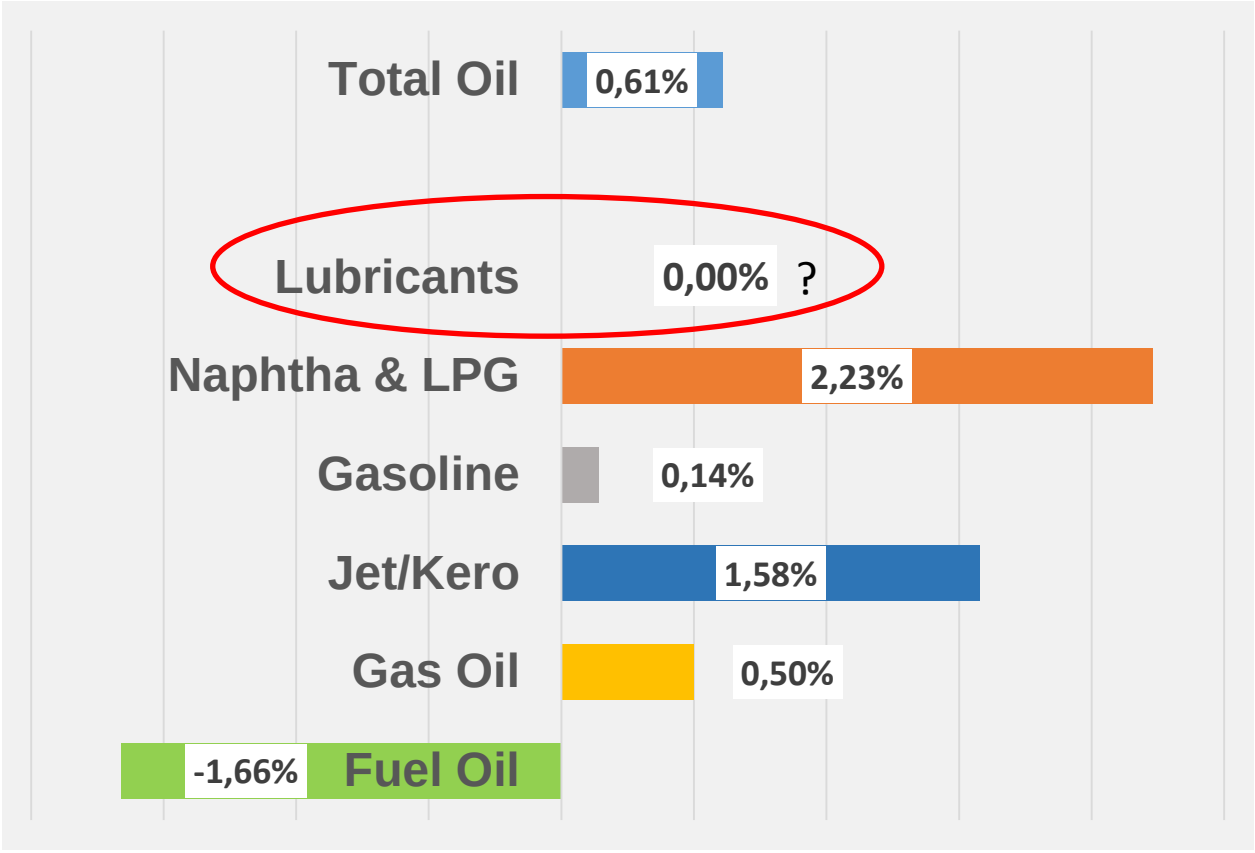
Base Oils: the current Landscape

Global Oil Demand Developments: a Refiners' perspective
We all know…Base Oil is a tiny piece…

2018 Oil Demand Profile

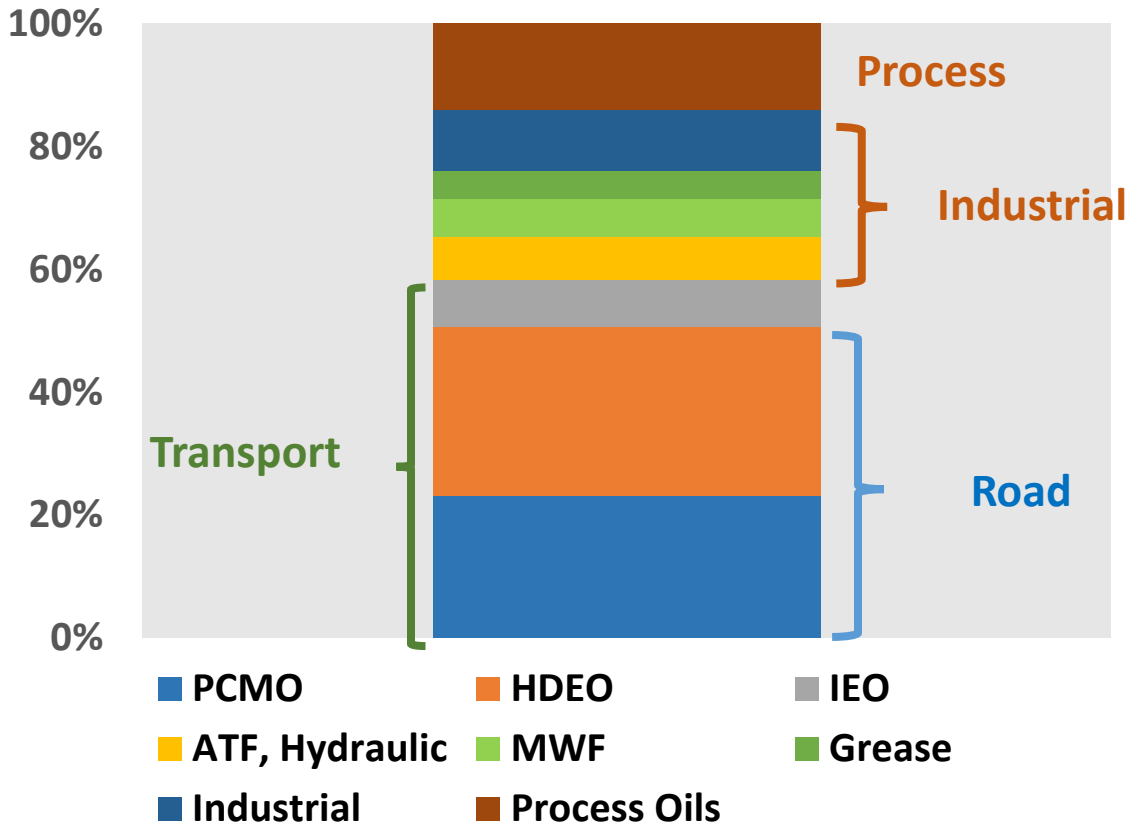


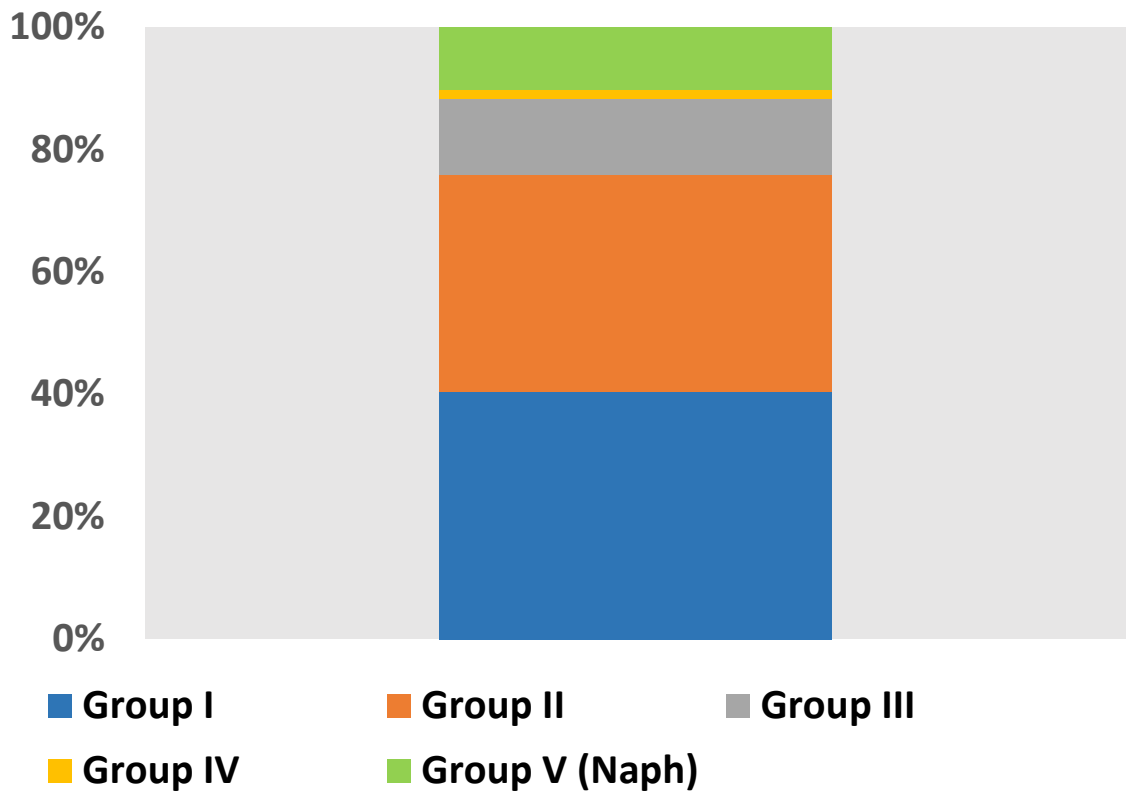
AAGR% - 2018 - 2040



Source: ICIS Supply and Demand Database

From Lubricants to Base Oils: Global 2017 Demand Profile

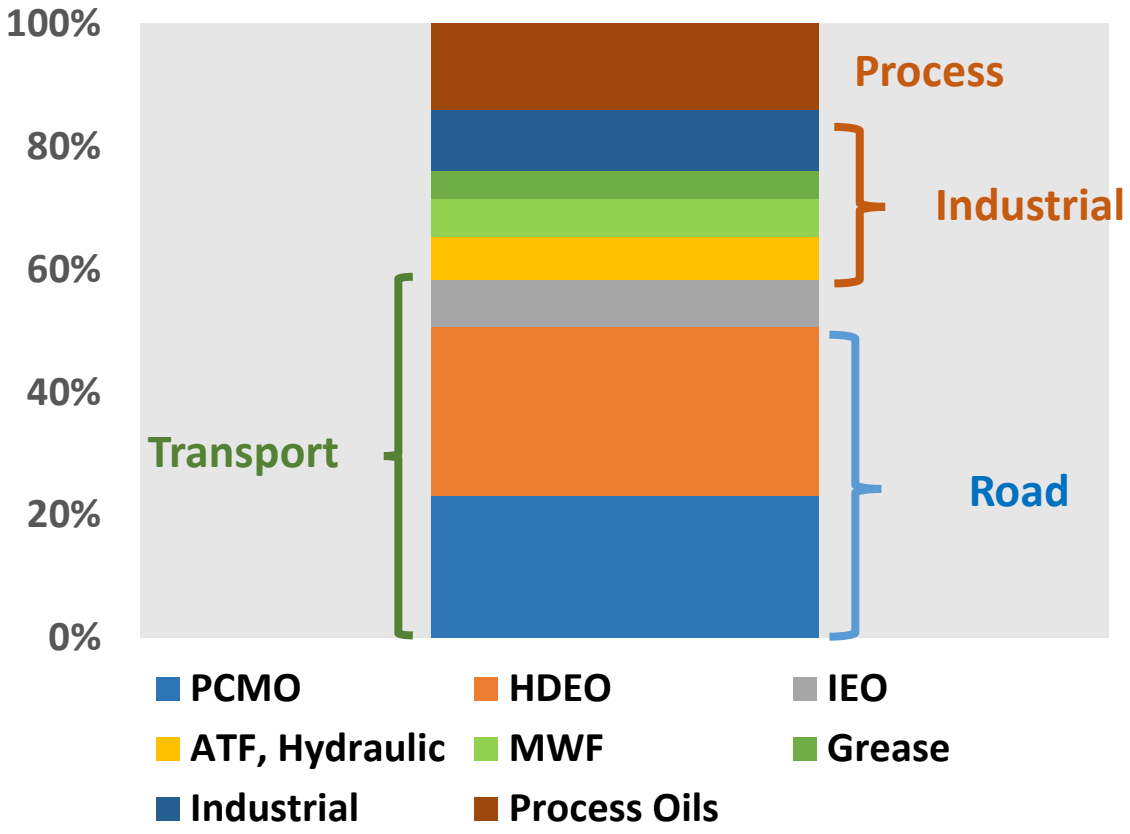


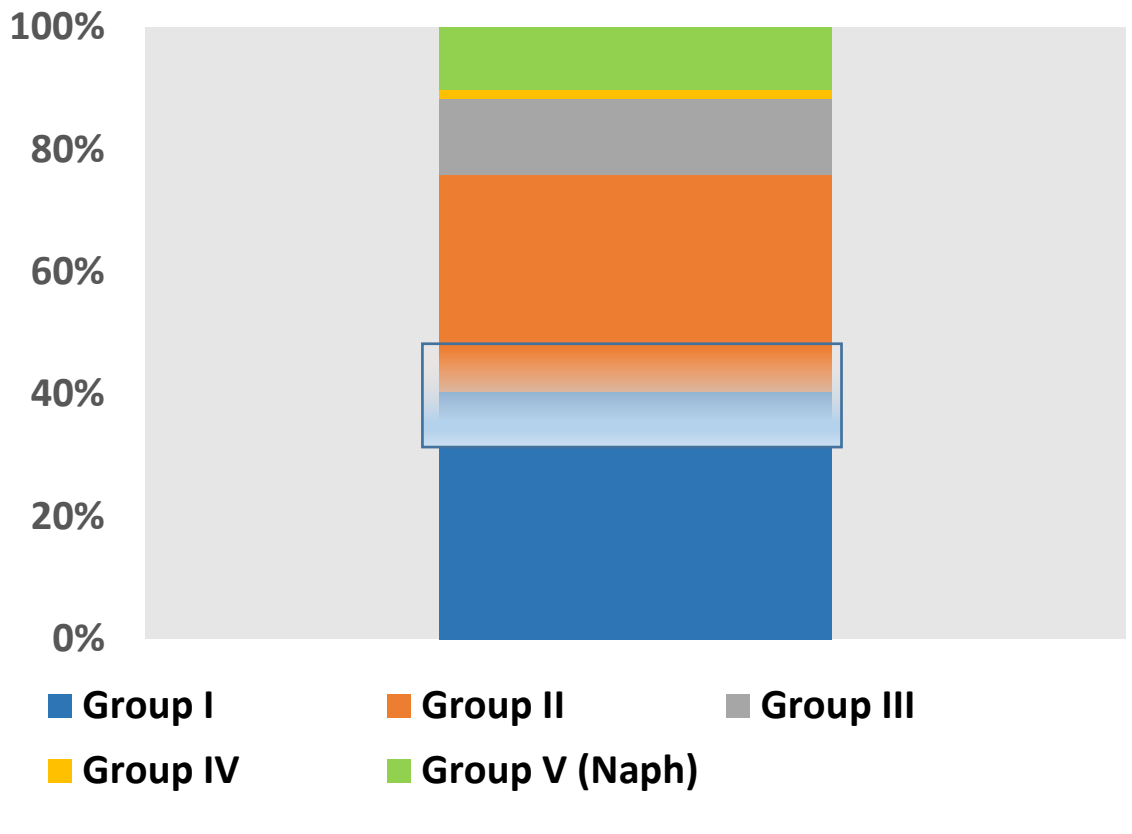


Diverse end uses, with Transportation still key driver. Group I and Group II the main Products today

Source: ICIS Supply and Demand Database and ICIS Consulting

Global Base Oil Demand Profile: 2017

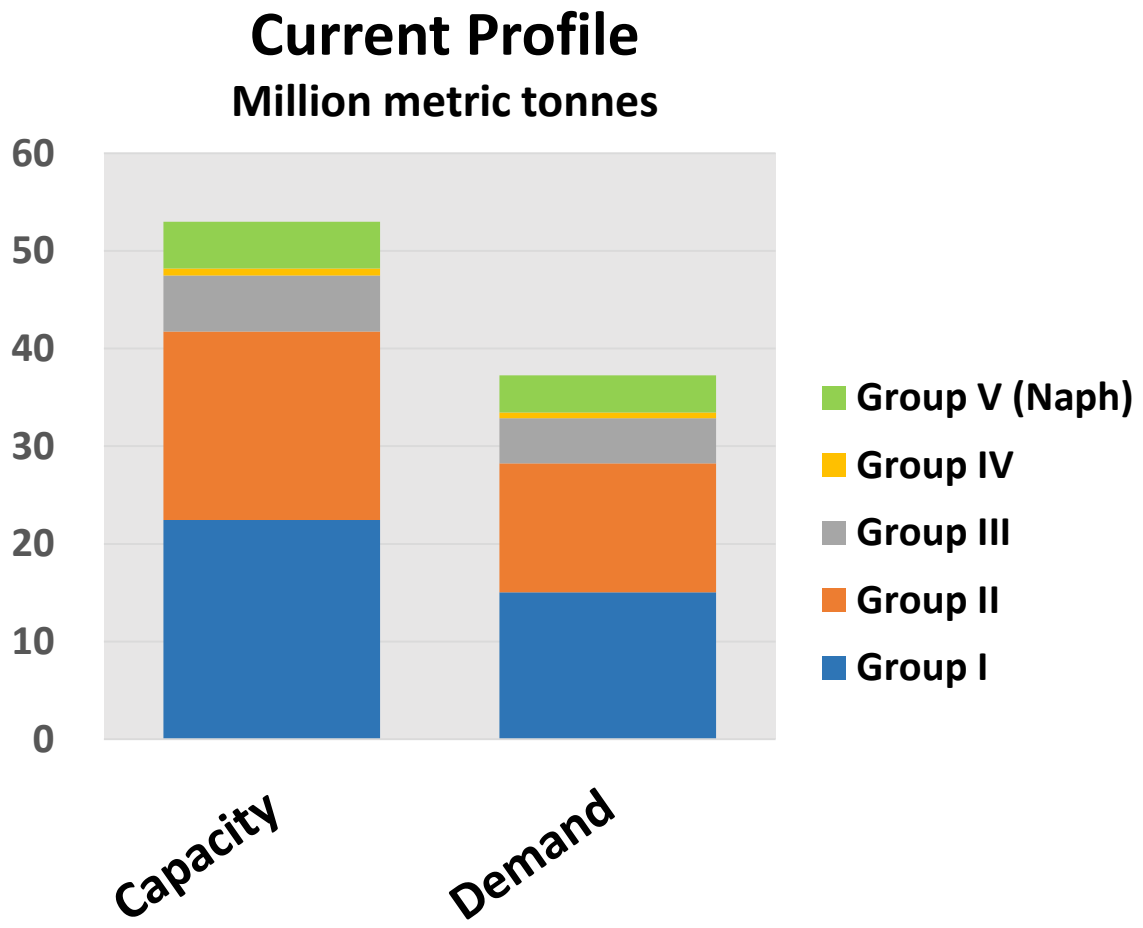


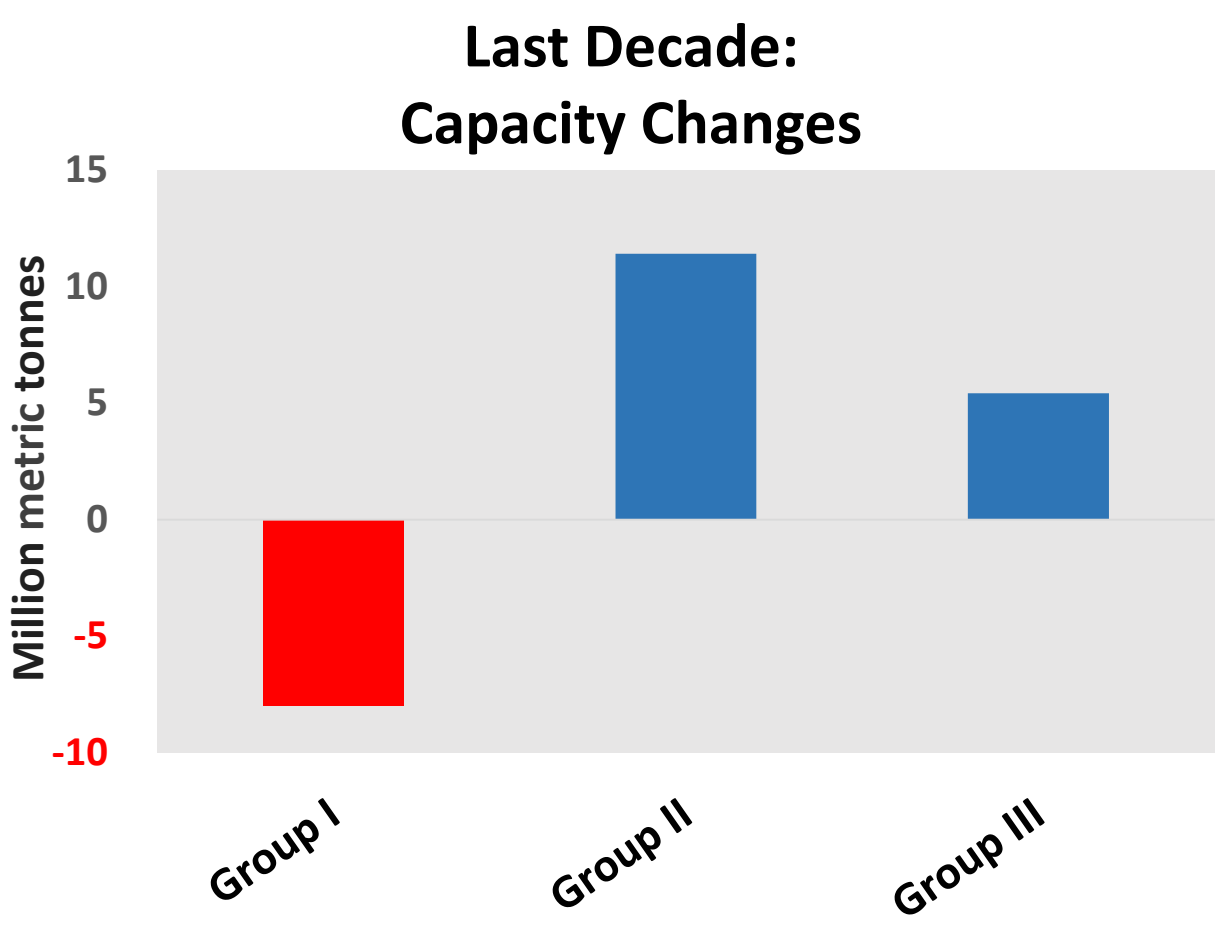


The analysis has considered the "Group I/II overlap", allocating demand to each group. A "Group II/III overlap" also requires considerations

Source: ICIS Supply and Demand Database and ICIS Consulting

Global Base Oil Capacity vs Demand: ample avails



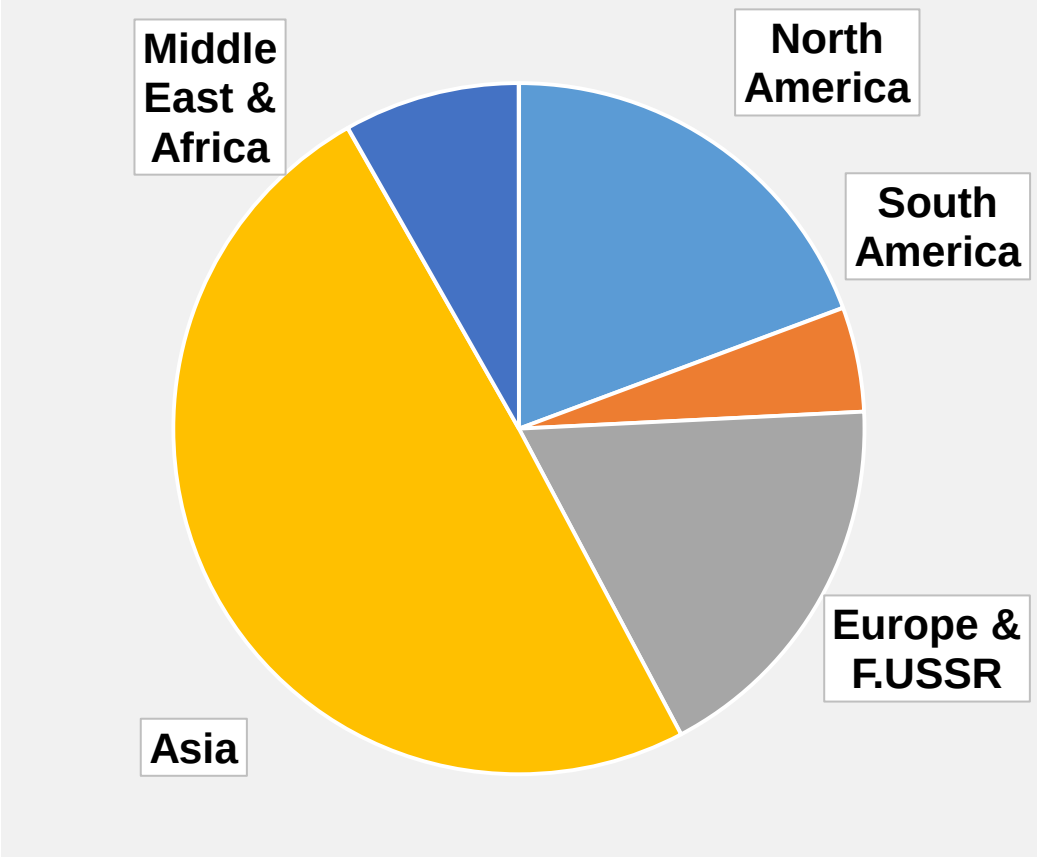


Demand driven rationalization on traditional grades, but sizeable increases taking place…

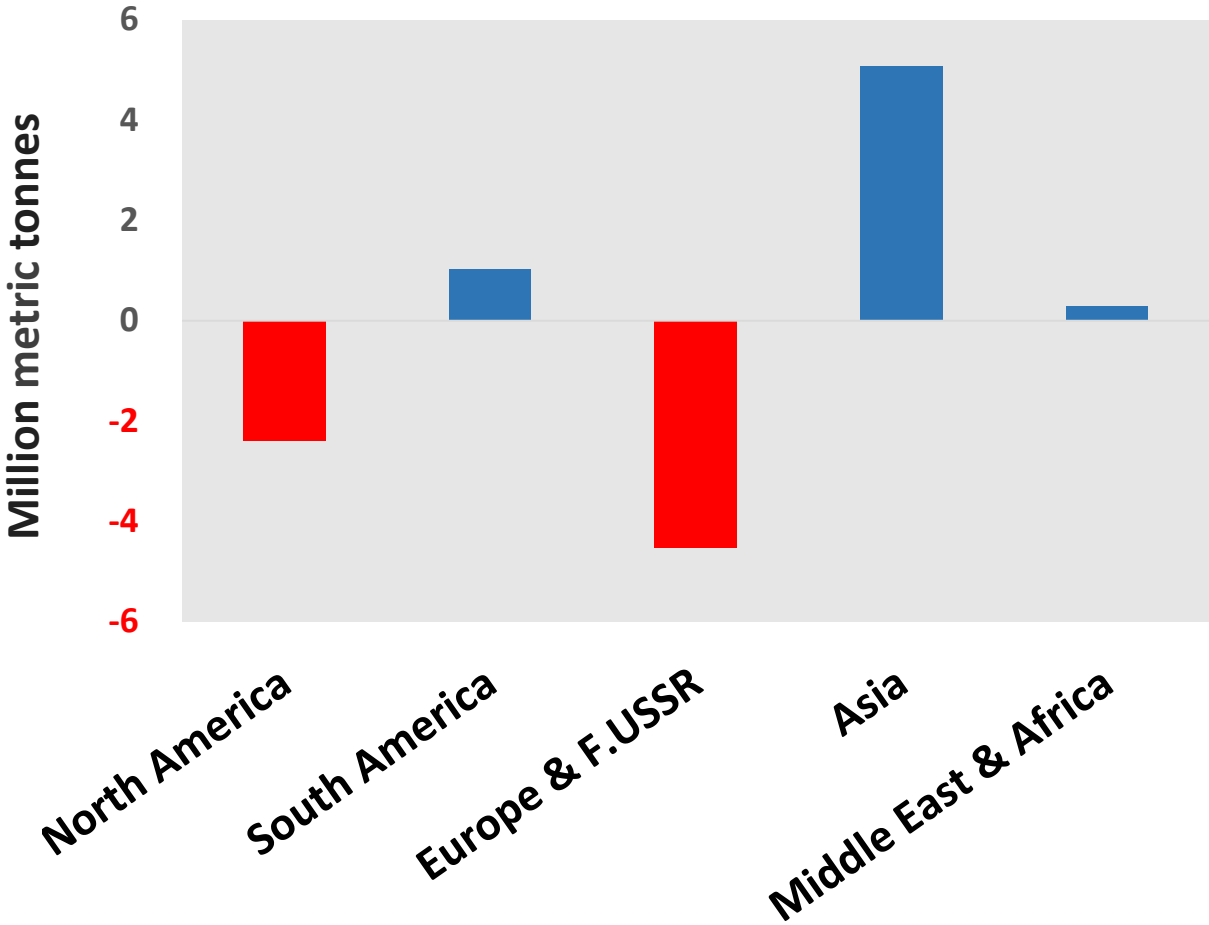
Source: ICIS Supply and Demand Database and ICIS Consulting

Recent Developments in Global Base Oil Demand: Asia Dominates

Current Demand Profile: ~ 37 MMt



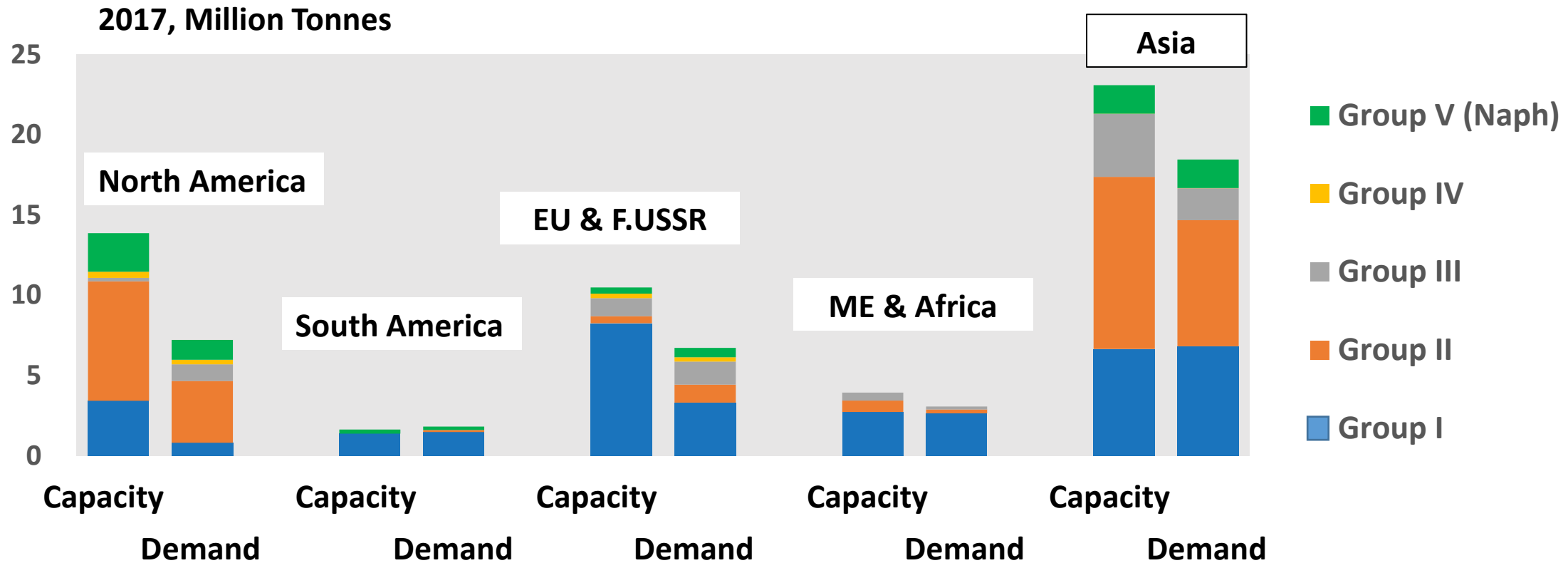
Last Decade: Incremental Demand by Region



Growth in Asian and developing economies barely compensated for loss of demand in mature markets

Source: ICIS Supply and Demand Database and ICIS Consulting

Global Base Oil Capacity vs Demand: Regional Dimensions

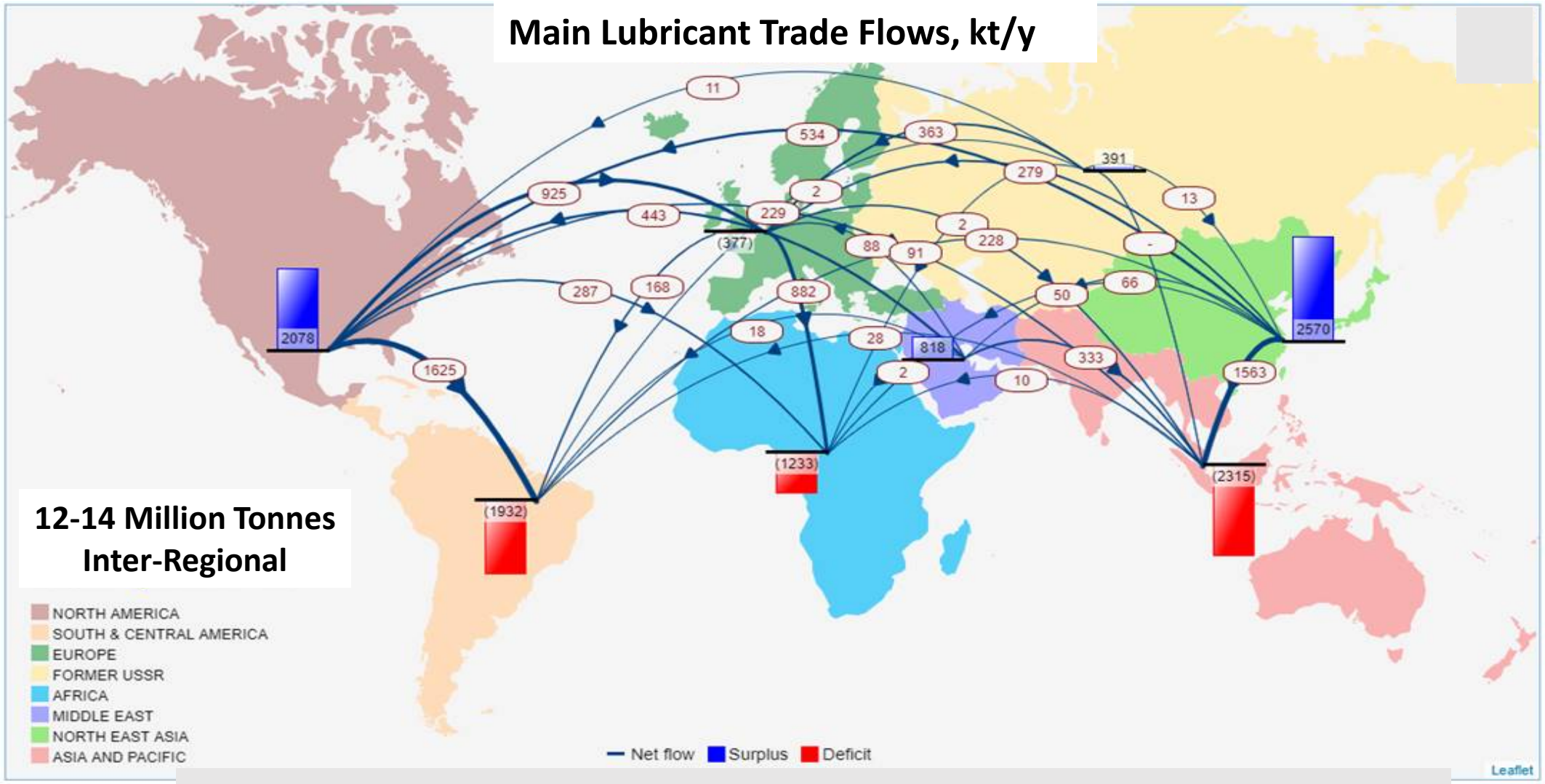


Regional Imbalances are evident for all the key Groups, generating trade flows

Note: 2017 Middle East capacity count is affected by plant closures (GTLs…), delays etc.

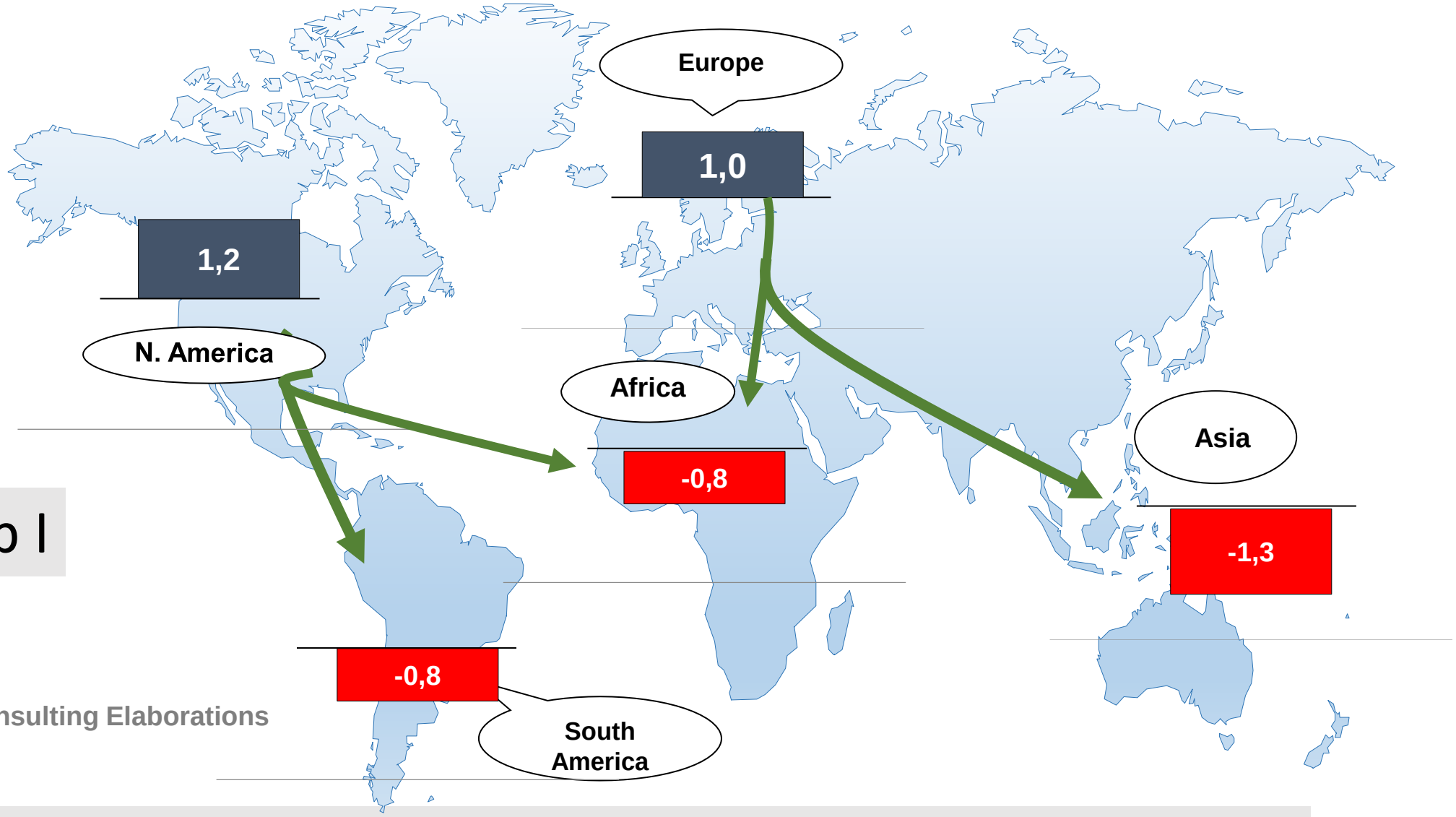
Source: ICIS Supply and Demand Database and ICIS Consulting

Regional Trade



Largely traded, with evident "Supply and Demand Centers"

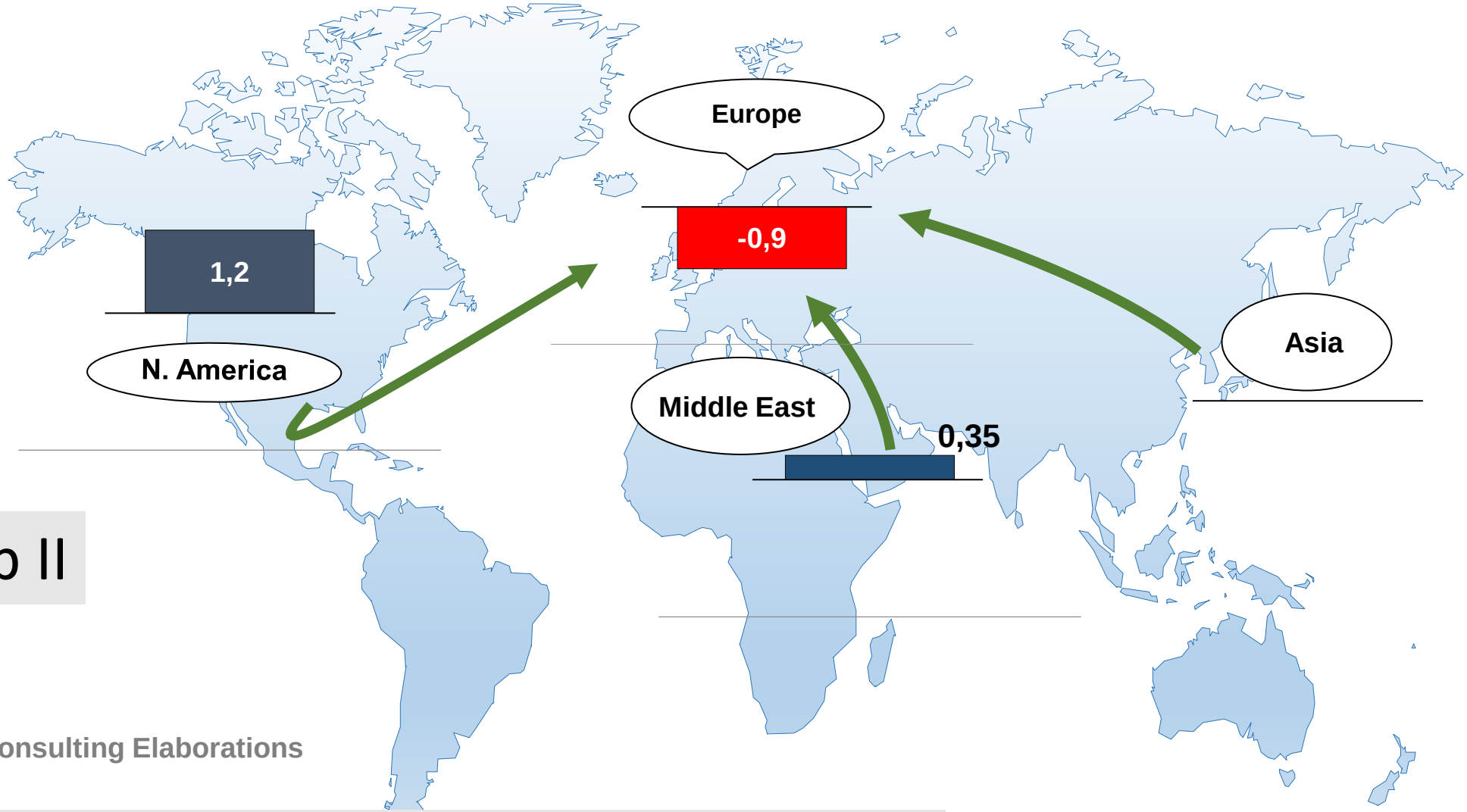
Selected Key Trade movements: 2017 (Million Tonnes)



Group I

Source: ICIS Consulting Elaborations

Selected Key Trade movements: 2017 (Million Tonnes)



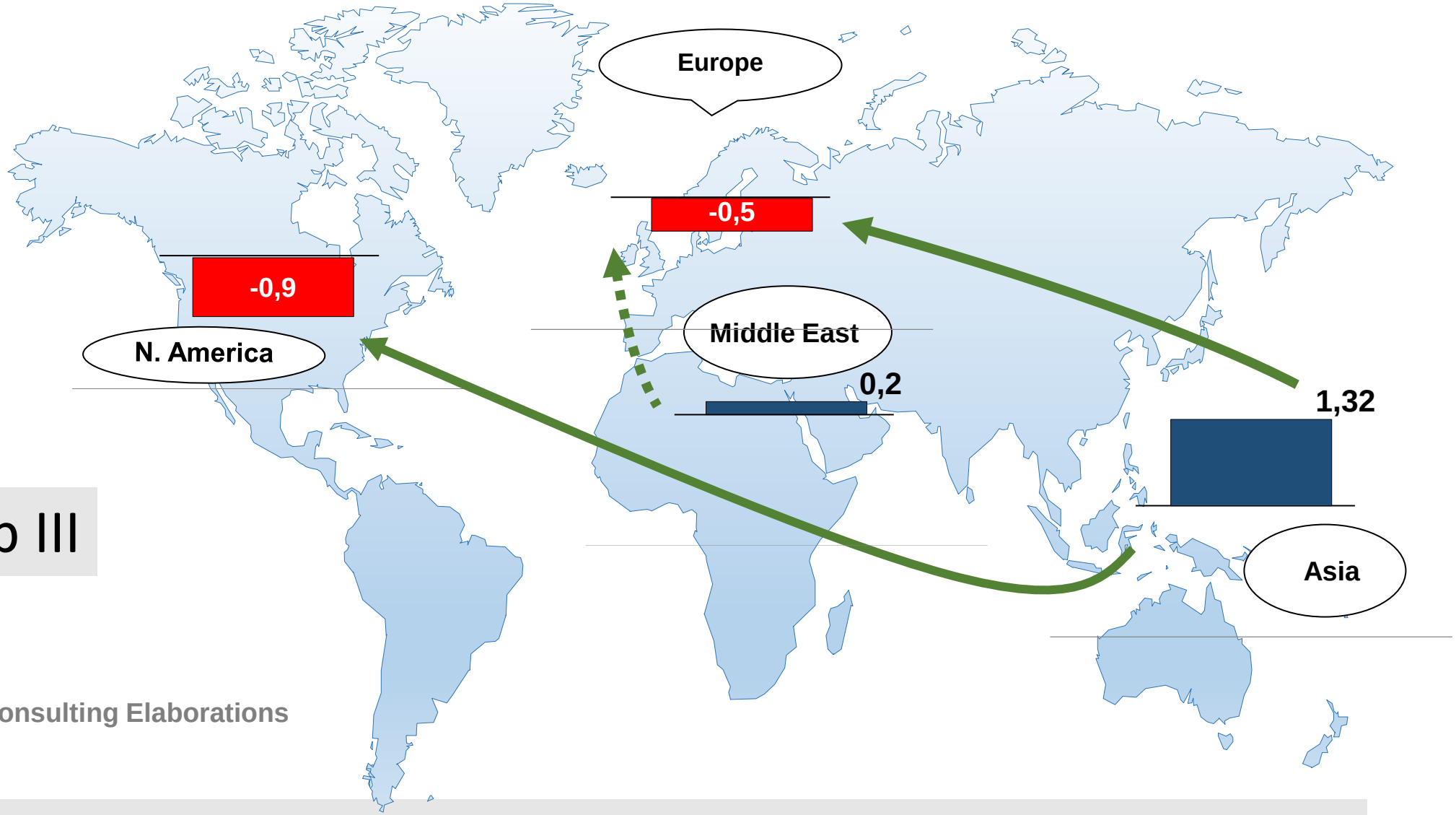
Group II

Source: ICIS Consulting Elaborations

Total Asia is balanced, but established outgoing flows from North East Asia 2017 supply ex M.East affected by plant closures, delays etc.

Net Surplus Net Deficit

Key Trade movements: 2017 (Million Tonnes)



Group III

Source: ICIS Consulting Elaborations

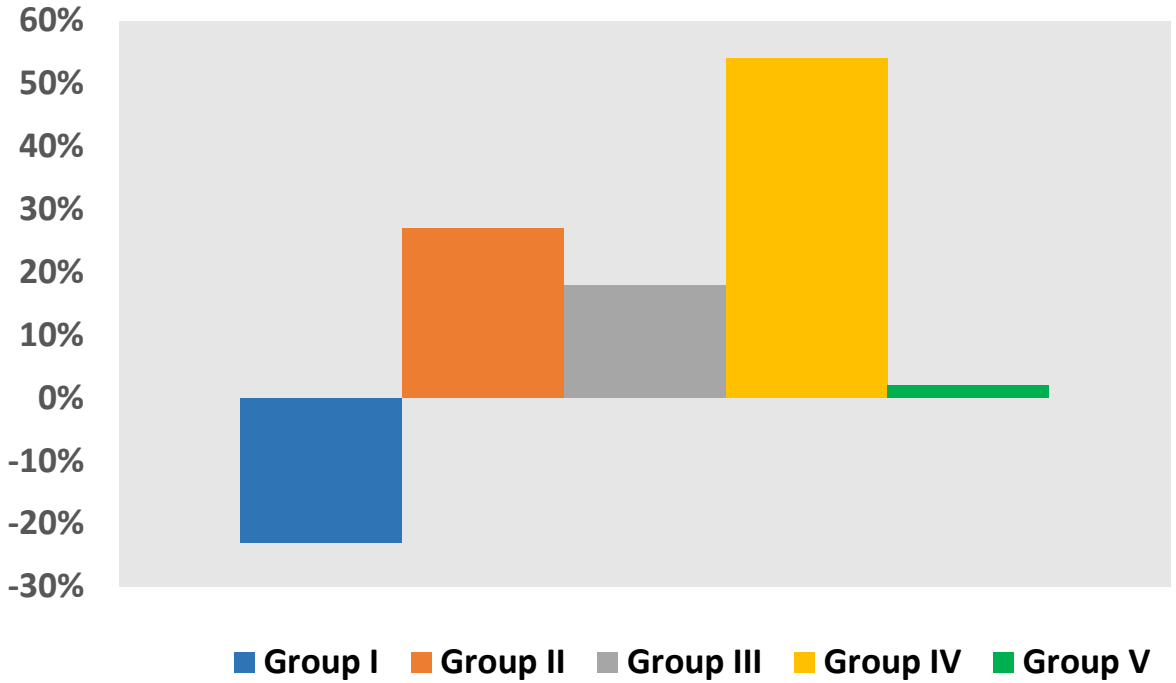
2017 supply ex Middle East affected by plant closures, delays etc.

Net Surplus Net Deficit

Base Oils: potential developments

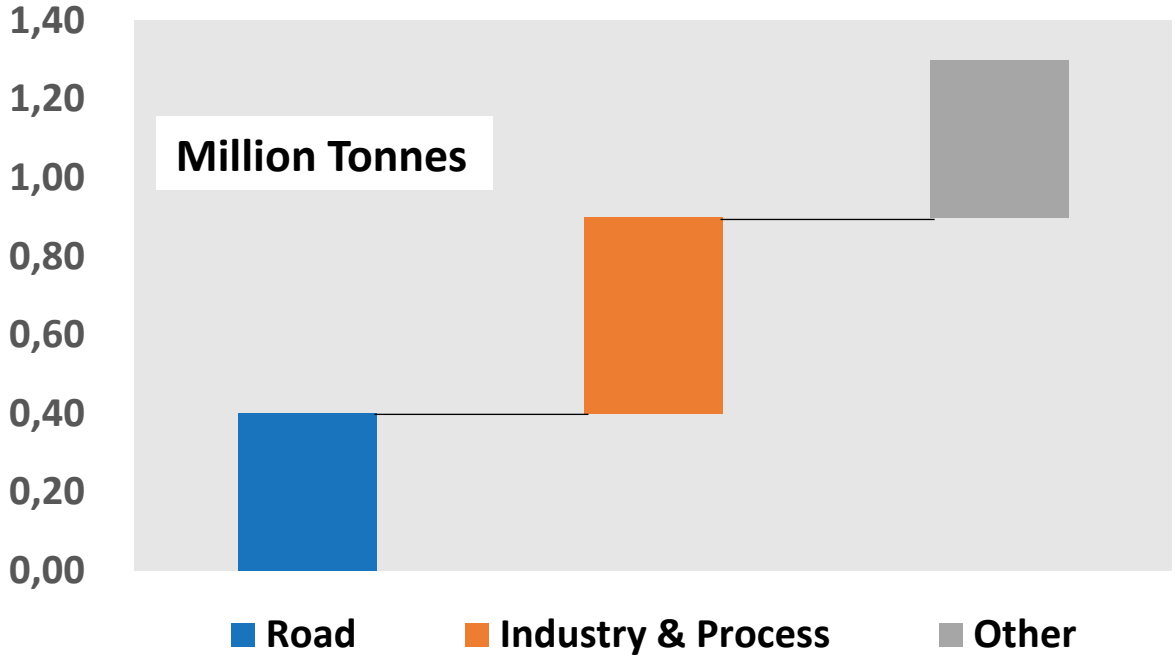
Global Base Oils Demand
Potential Developments 2017-2025

Absolute Demand Growth %



Group I affected by continuous penetration of Group II (quality requirements in selected applications). Group II also assumed as a potential economic alternative to Group III in specific segments, showing largest volume growth opportunity.

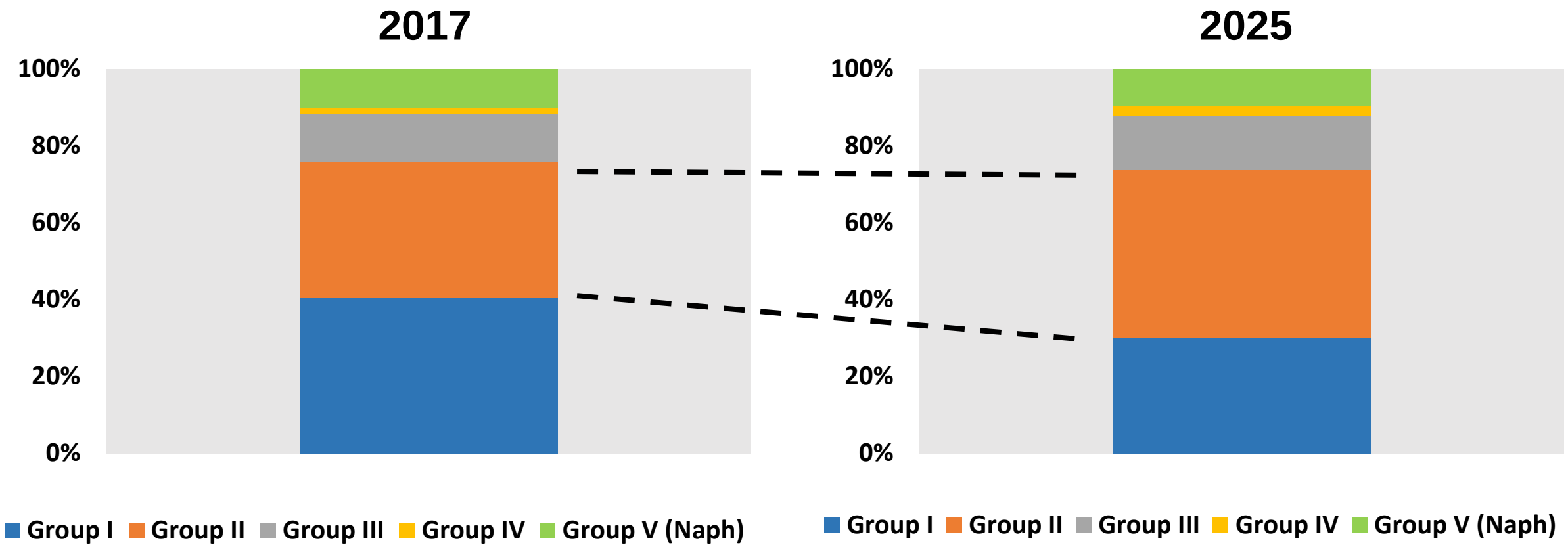
Incremental 2017-2025 Growth by Sector



Mid Term growth supported by expanding car fleet in Asia, despite increased efficiencies with use of higher grades, with additional opportunities in Aviation. Demand still supported by expanding industrial sector. Longer term overall requirements expected to gradually decline

Source: ICIS Supply and Demand Database and ICIS Consulting

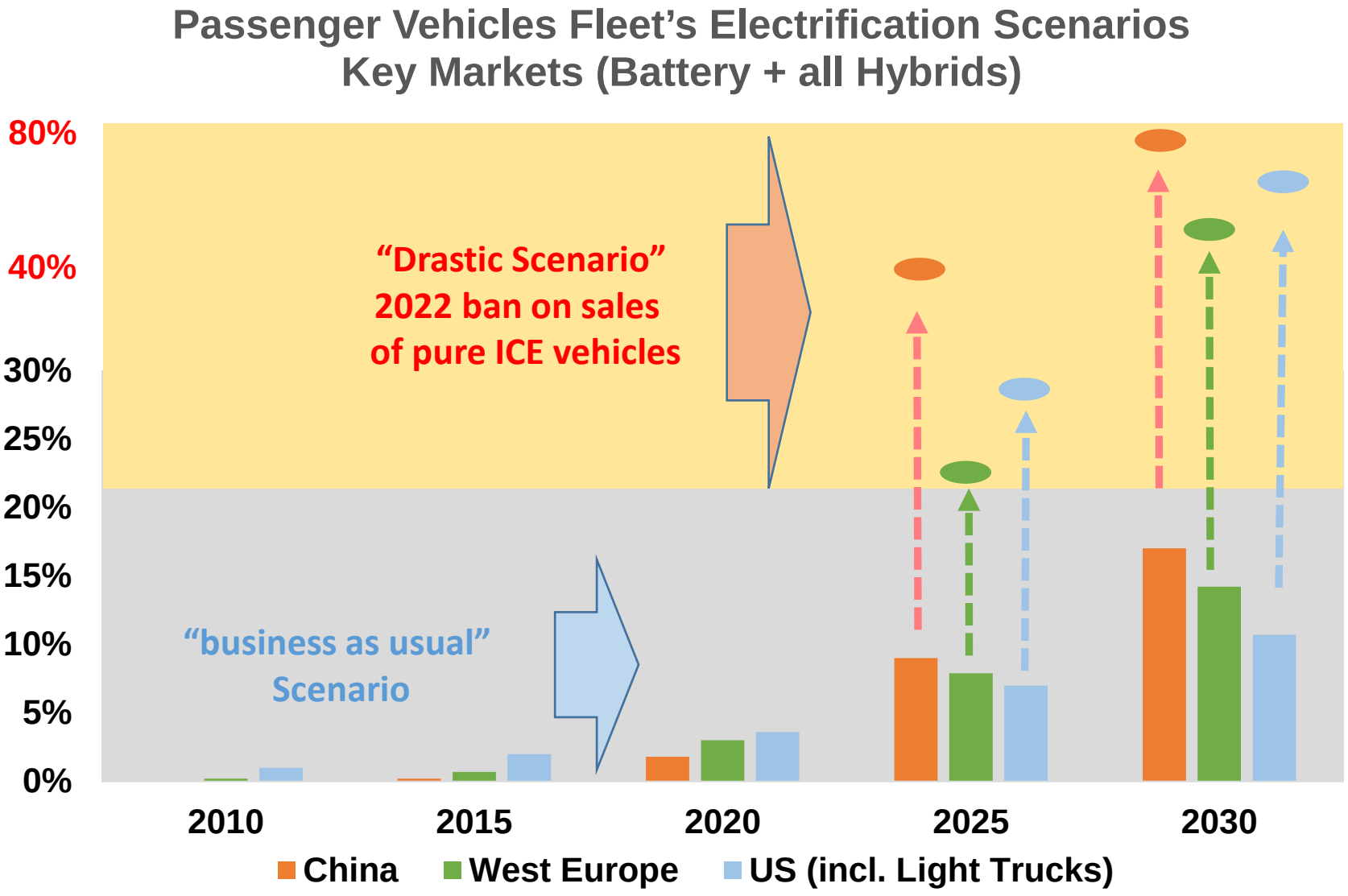
Global Base Oil Demand: 2017 versus 2025



Group II Becomes Major Grade on a global basis, but different Regional profiles will persist

Source: ICIS Supply and Demand Database and ICIS Consulting

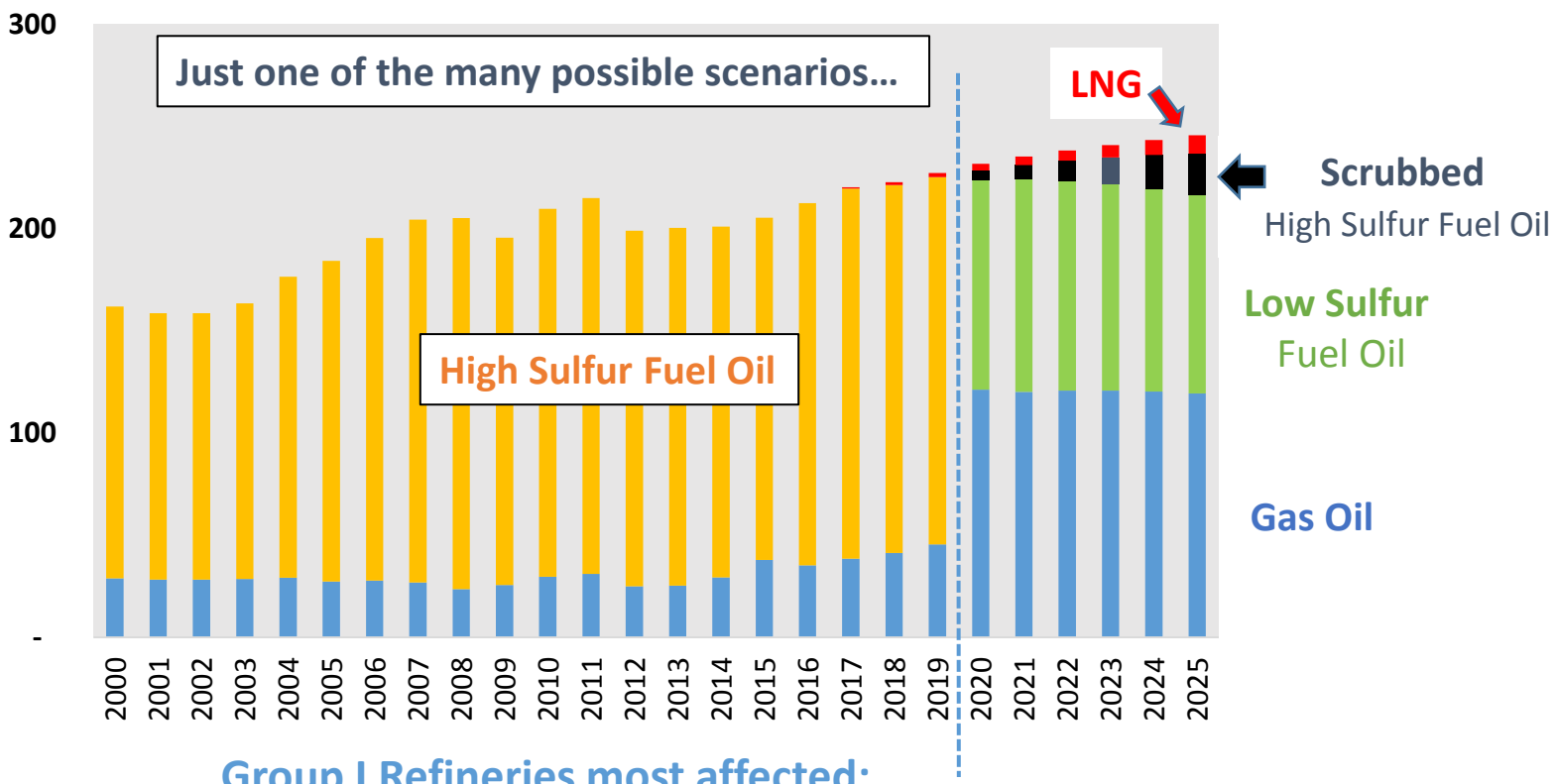
A Key **Demand Sensitivity**
EV Developments: a Base Case unlikely to impact on Base Oil Demand before 2025



- Future electrification scenarios may present huge variations in terms of ICE vehicles share on the road.
- A "business as usual" scenario would take a long time to replace conventional ICEs (hybrid would still use, albeit considerably downsized, ICEs)
- It would require a "Drastic" Scenario (i.e. assuming no pure ICE vehicles sales after 2022) to consistently bring electrification beyond 50% of the fleet by 2030
- The effect of this "Drastic" scenario would be faster in the Chinese market.

Source: various statistics with forecast and elaborations from ICIS Consulting

A key **Supply Sensitivity**
The IMO Impact is expected to be disruptive and will affect Base Oils



Group I Refineries most affected:

- Crude and VGO Feedstock likely more expensive
- Value of Fuel Oil linked co-products affected
- Lower yields of higher value Diesel
- …different refineries will have different options

But higher cost freight rates will be there for everyone…

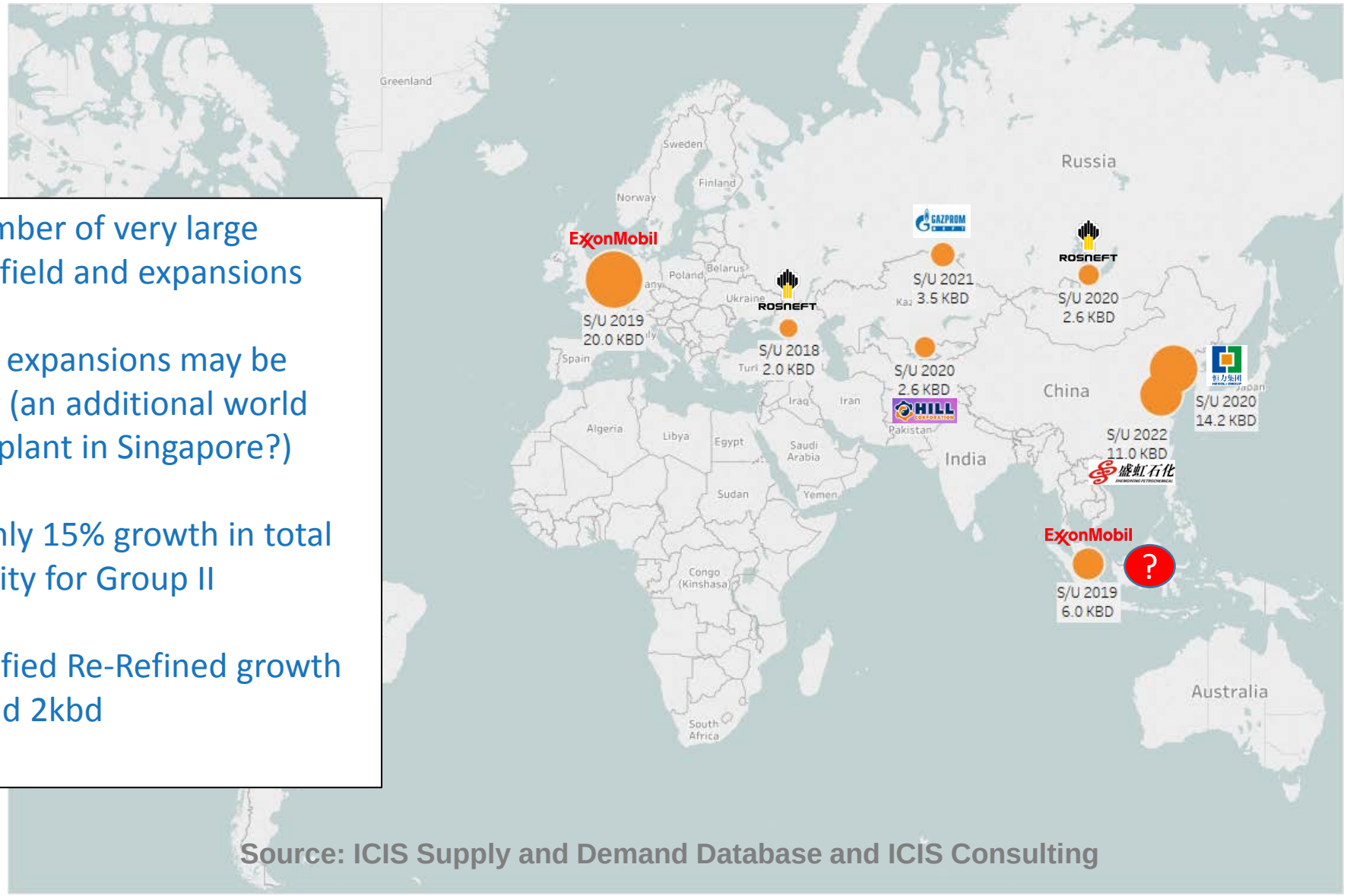
The short story…

- **IMO 2020** rules focus on reducing SOx emissions from global shipping. They will require reducing global sulphur content in Fuel Oil for ships to a max 0.5% by Jan 1, 2020. Ships may also meet the SOx emissions requirements by using exhaust gas cleaning systems or **"scrubbers".**
- "Straight run" production of **low sulfur fuel oil** is very limited, and production by "blending lower sulfur streams" not enough. VGO type of material likely to be in greater demand for bunkers, and lower sulfur/lighter crude more valuable.
- The shift away from High Sulfur Fuel Oil will require a major increase in demand for **Gas Oil** bunkers and call for the need of "cracking more fuel oil". Lower sulphur gas oil (diesel) will be relatively more valuable. Heavier/higher sulphur crude to be valued relatively lower. "Deep Cracking" refineries, with large desulfurization capability will be economically advantaged.
- By 2025, contribution from **LNG** and from **"Scrubbers"** will still be limited. LNG based fleet needs time to develop, and Scrubbers additions not always a fit.

Source: ICIS Supply and Demand Database & ICIS Consulting

New Group II Capacity

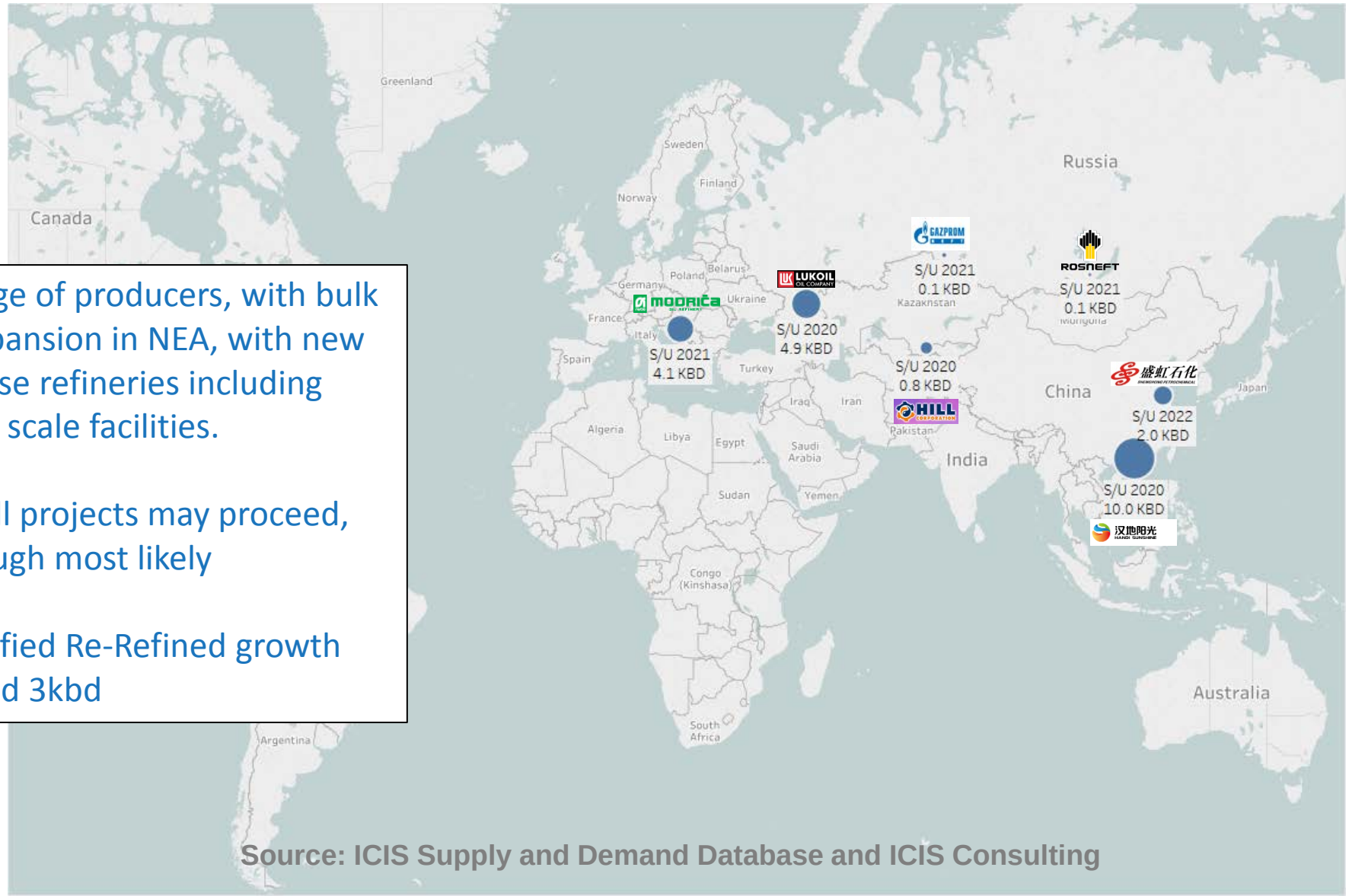
- A Number of very large greenfield and expansions
- Some expansions may be larger (an additional world scale plant in Singapore?)
- Roughly 15% growth in total capacity for Group II
- Identified Re-Refined growth around 2kbd



Source: ICIS Supply and Demand Database and ICIS Consulting

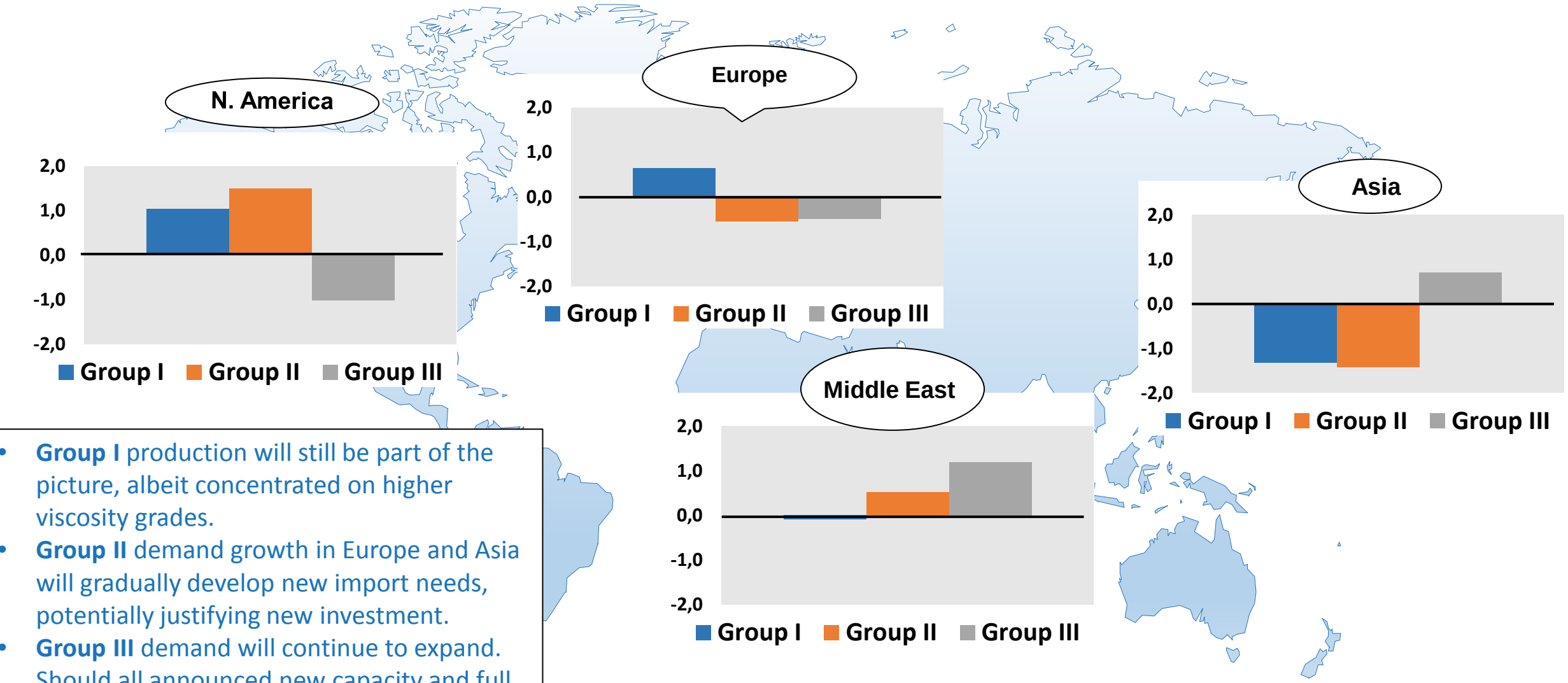
New Group III Capacity

- A range of producers, with bulk of expansion in NEA, with new Chinese refineries including world scale facilities.
- Not all projects may proceed, although most likely
- Identified Re-Refined growth around 3kbd



Source: ICIS Supply and Demand Database and ICIS Consulting

Key Potential Balances: 2025 (Million Tonnes)



- **Group I** production will still be part of the picture, albeit concentrated on higher viscosity grades.
- **Group II** demand growth in Europe and Asia will gradually develop new import needs, potentially justifying new investment.
- **Group III** demand will continue to expand. Should all announced new capacity and full Middle East capabilities take place, new requirements could be mostly satisfied

Source: ICIS Supply and Demand Database and ICIS Consulting

Conclusions

Conclusions

Base Oil Demand is expected to show moderate growth ‘till 2025, but efficiency trends are expected to flatten or possibly even decrease demand longer term

- Asia will dominate future incremental demand, while mature markets will trend lower. In the key road sector, efficiency will be a major factor. The pace of “electrification” remains uncertain, and unlikely to affect Base Oil demand by 2025. But ignoring its potential could be a mistake…

- Group I decline is expected to continue, with Group II to become the dominant grade. New Group II capacity should be rapidly filled, while more rationalization will be necessary for Group I. The path for Higher Quality/Group will continue, increasing demand for Group III. Potential new investment, however, needs to be carefully evaluated. New trade developments may develop, with imbalances still expected to prevail around specific groups.

- The IMO 2020 will affect Group I refineries more than other Groups. This may call for a more “concentrated production” of the higher viscosity grades: “lighter streams” may have to look at the fuel pool. Overall, long haul Base Oil exporter will be affected by higher freight costs.

Presentation by:

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Any Questions?

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