

CLINGENDAEL  
INTERNATIONAL  
ENERGY  
PROGRAMME

| CIEP

# Long-term Prospects for Northwest European Refining

## Asymmetric Change: A Looming Government Dilemma?



**KIVI Lecture**  
**November 8<sup>th</sup>, 2016**

# Nigeria Oil Discovery 2016: Exxon Mobil Finds Billion-Barrel Reserve In Africa

BY GREG PRICE 

ON 10/27/16 AT 1:14 PM

## Permian to Pump Oil at Record Rate as Other Shale Plays Dwindle

### MARKET INSIDER with PATTI DOMM

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## Falling oil prices could crack \$40 and get OPEC talking deal

Bottom line, the U.S. data show a world that is still oversupplied with oil.

Patti Domm | @pattidomm

18 Hours Ago



COMMODITIES | Mon Oct 31, 2016 | 7:03pm EDT

## GE to merge oil unit with Baker Hughes to create service giant

Africa

## Nigerian leader holds inconclusive talks to halt oil attacks



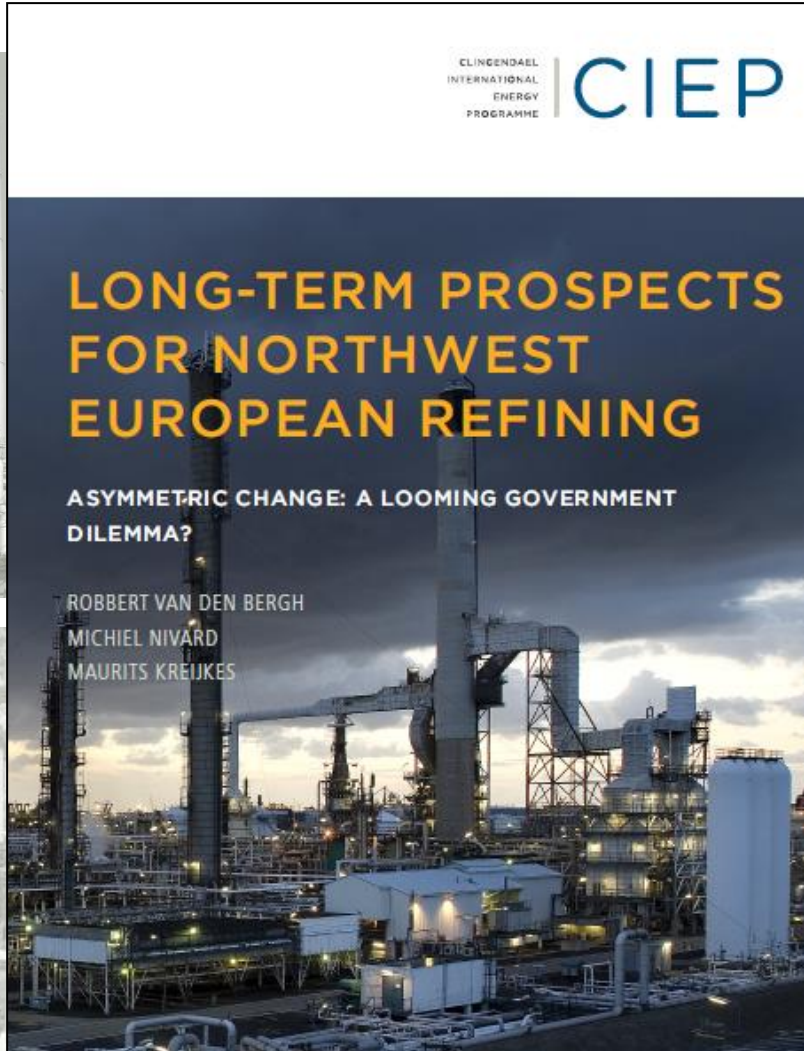




# LONG-TERM PROSPECTS FOR NORTHWEST EUROPEAN REFINING

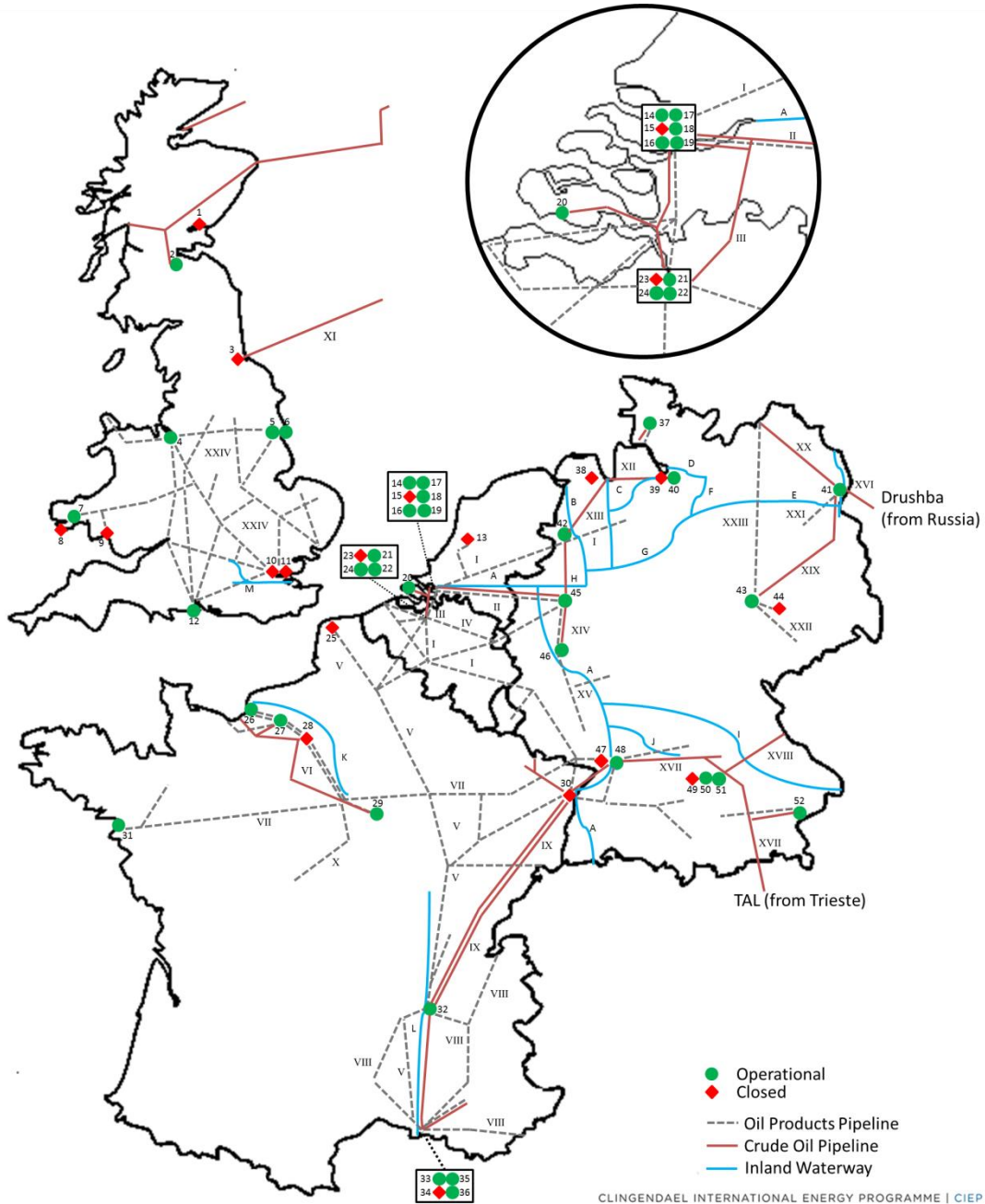
ASYMMETRIC CHANGE: A LOOMING GOVERNMENT  
DILEMMA?

ROBBERT VAN DEN BERGH  
MICHEL NIVARD  
MAURITS KREIJKES



# Outline

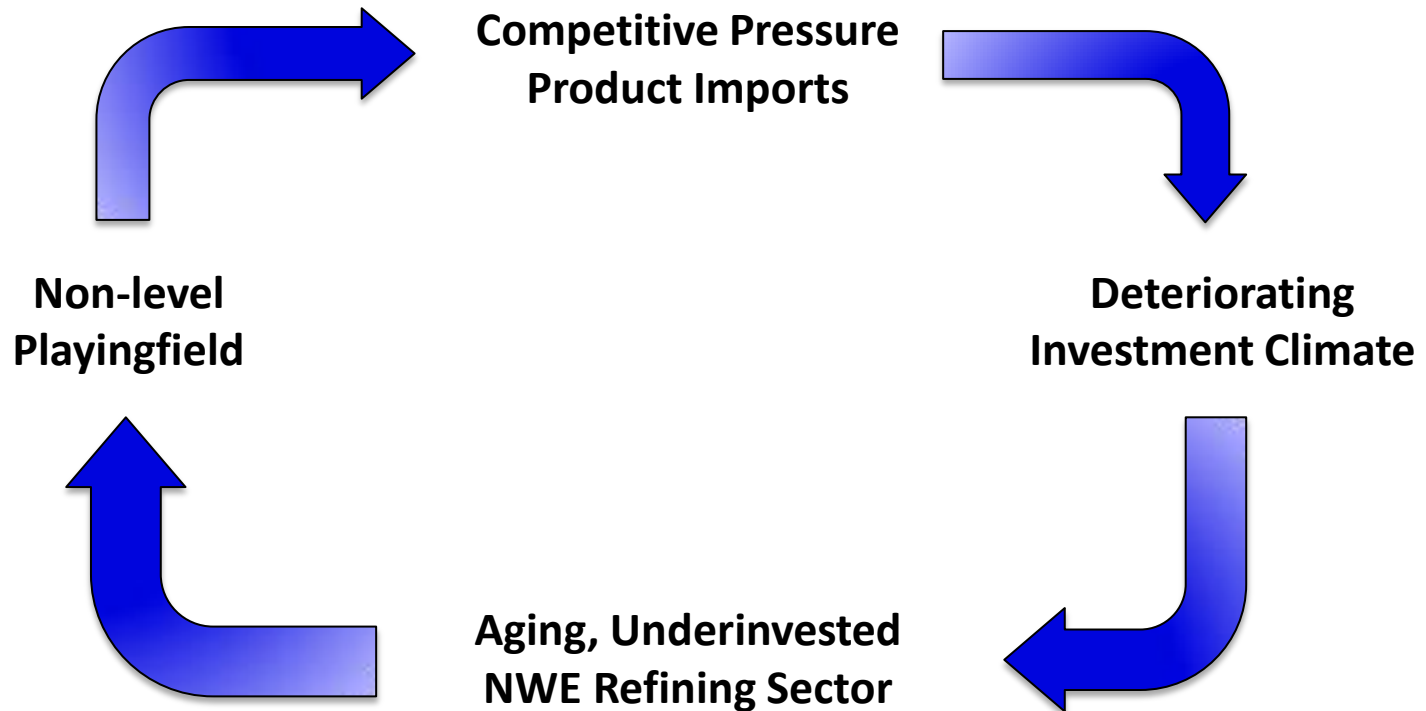
- **Introduction of the NWE Refining Study**
- **Must-Run Scenario – Last Men Standing**
- **Closure-Constrained Scenario – A New Lease of Life**
- **Implications**



# Introduction of the NWE Refining Study

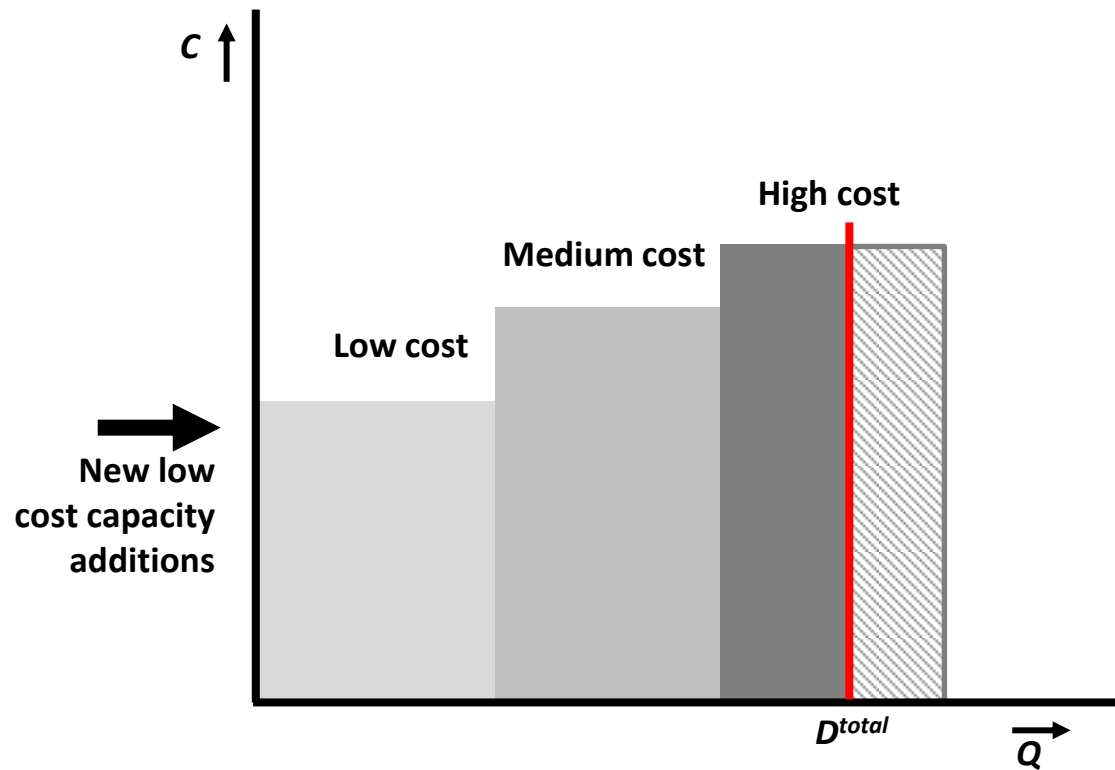
- How does the post-2025 NWE refining landscape look like?
  - Under pressure from a transition away from fossil fuels (NWE ahead of the curve)
  - Under pressure from imports (export-oriented advanced source refineries)
- What-if scenario analysis:
  - Must-run scenario (last men standing refineries + discounting barriers-to-exit)
  - Closure-constrained scenario (must-run scenario moderated by barriers-to-exit)

# Assumptions & Methodology – Negative Feedbackloop



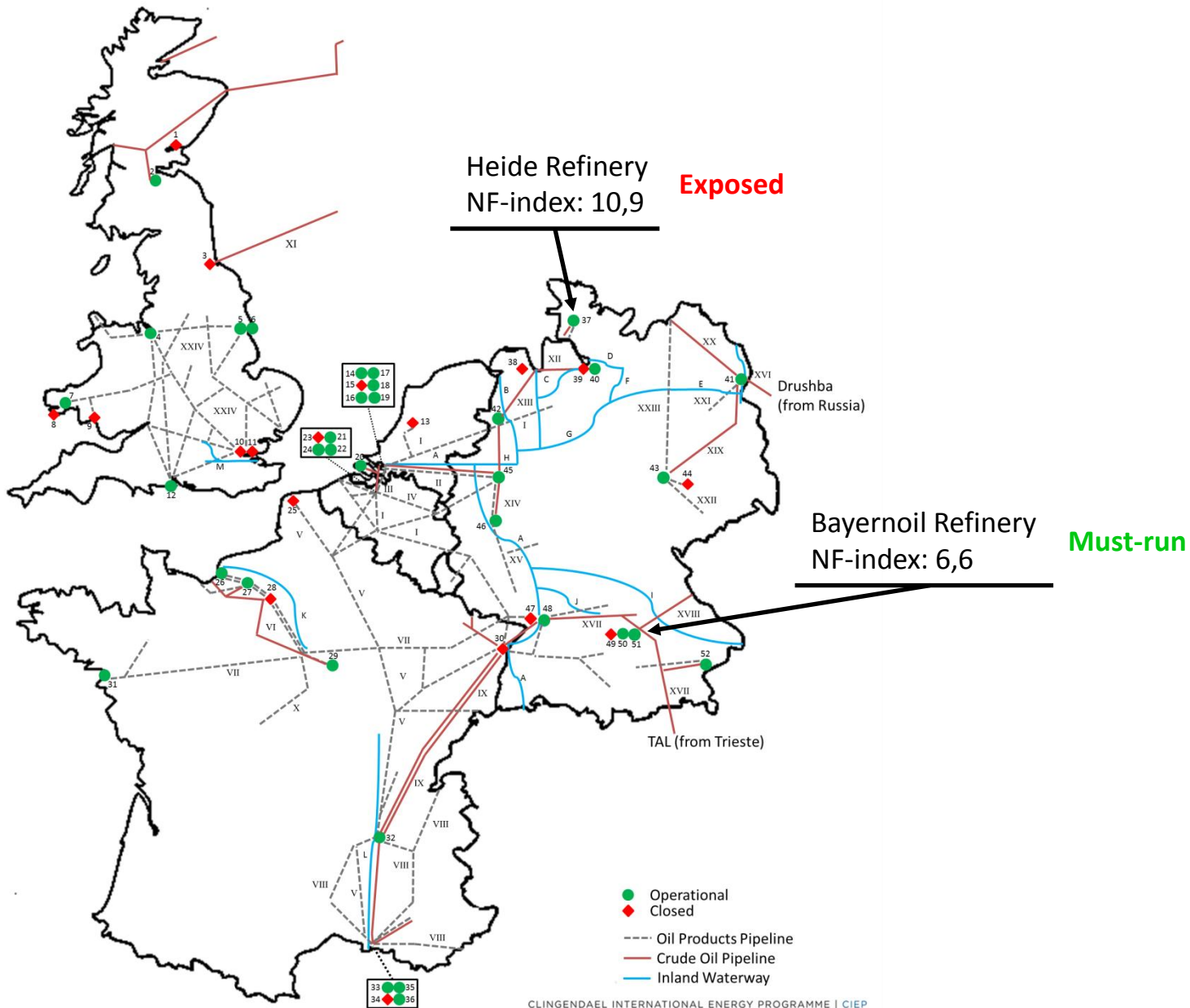


# Assumptions & Methodology – Global Refining Overcapacity



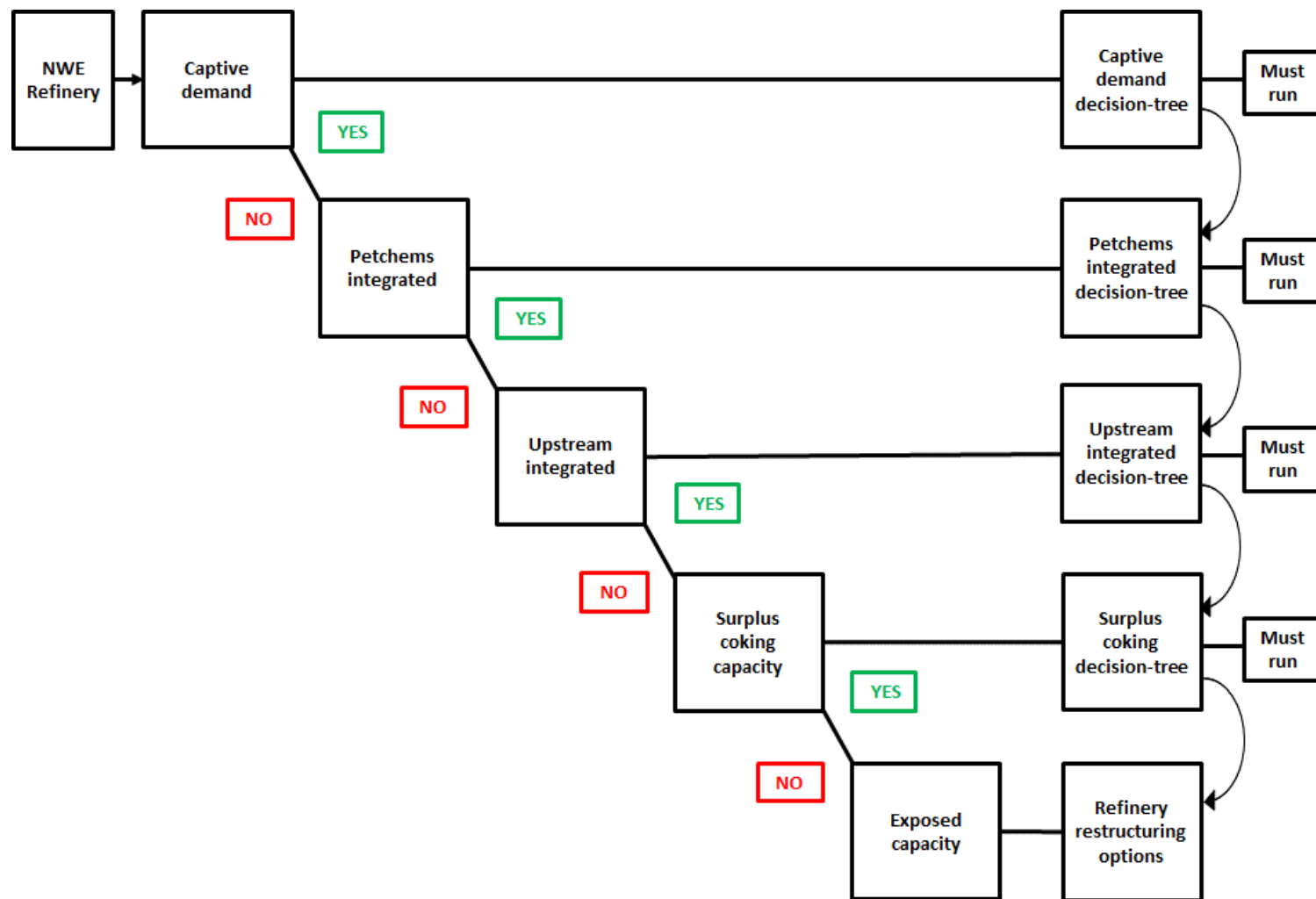
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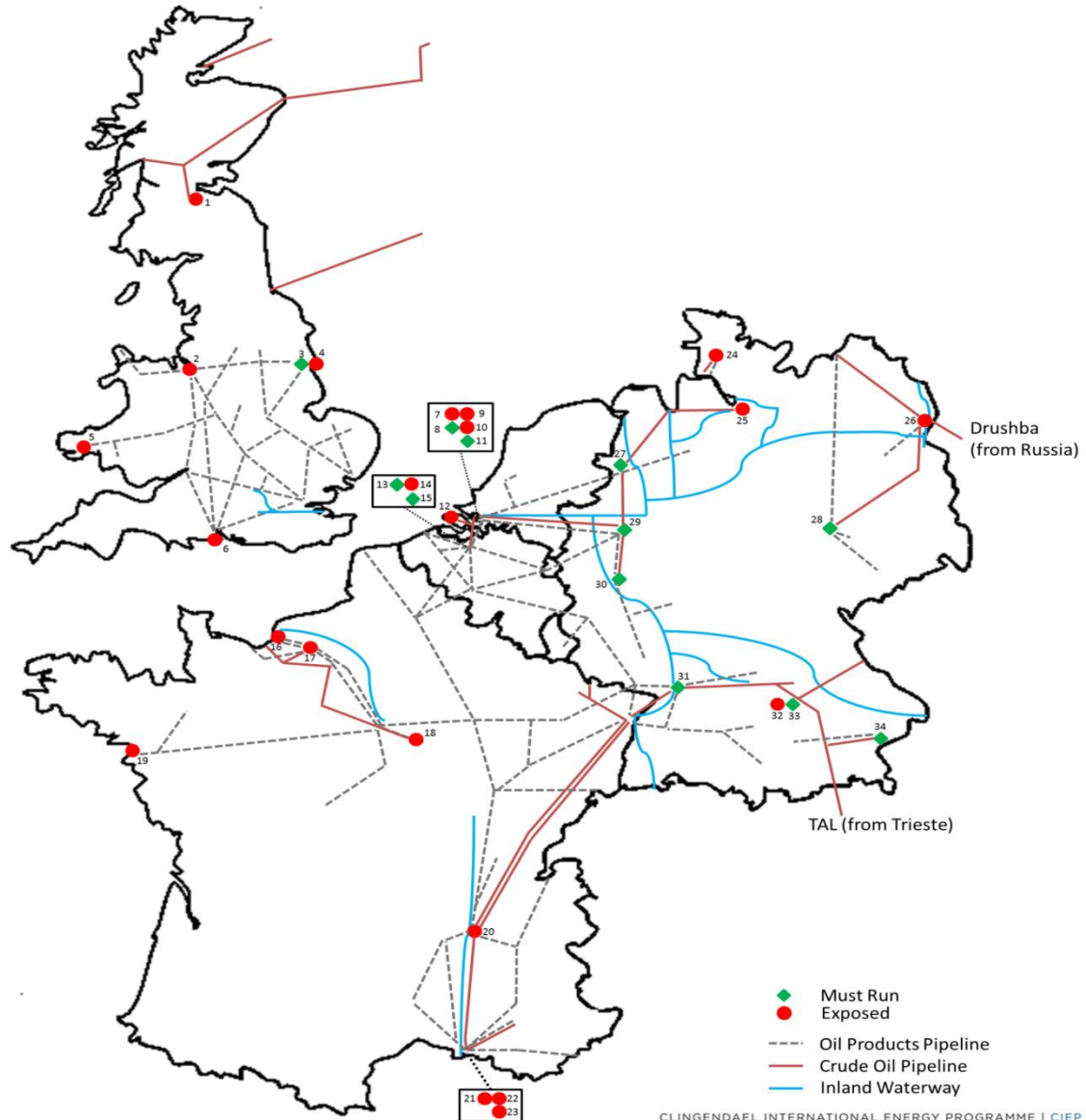
# Assumptions & Methodology – Must-Run Categories



# Assumptions & Methodology – Must-Run Characteristics

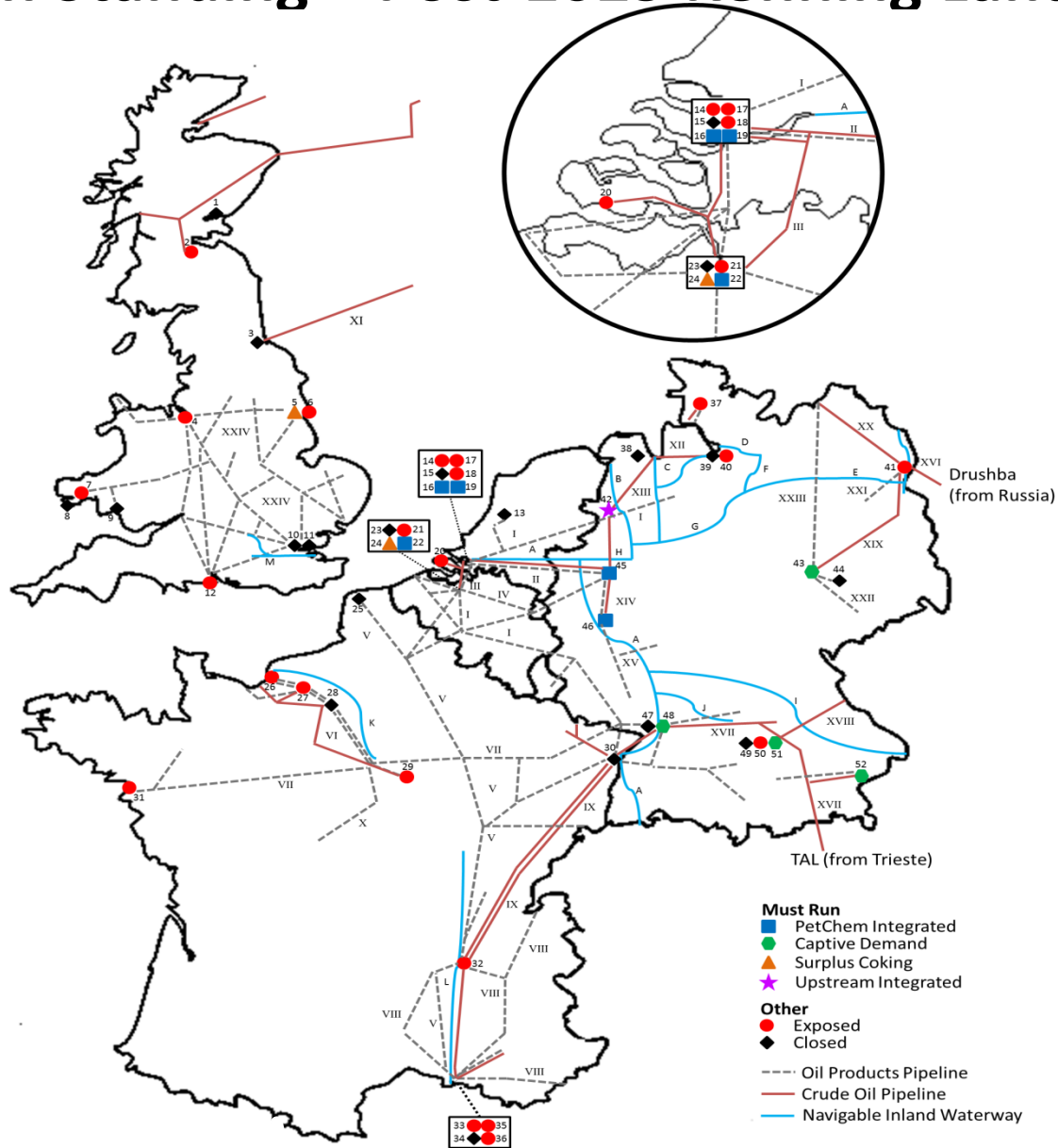
Must-run Category	Must-run Characteristic	Description
<b>Petrochemicals Integrated</b>	Direct petrochemicals integration	<ul style="list-style-type: none"> <li>The refinery has various direct pipeline connections to petrochemicals production units</li> </ul>
	World-scale steam cracker or aromatics capacity	<ul style="list-style-type: none"> <li>Steam cracker <math>\geq 1,000</math> Kt/a of ethylene capacity</li> <li>Feedstock flexibility <math>&gt; 20\%</math> (naphtha, LPG, hydrowax, gasoil)</li> </ul>
		<ul style="list-style-type: none"> <li>Aromatics plant <math>\geq 1,000</math> Kt/a</li> <li>Aggregation of Benzene + Toluene + Xylene streams</li> </ul>
	Outlet excess feedstocks	<ul style="list-style-type: none"> <li>Steam cracker feedstock flexibility requires trading outlets for excess refinery production (joint production constraint)</li> </ul>
	Petrochemicals cluster is long-term viable	<ul style="list-style-type: none"> <li>Clusters delineated at the hand of industrial gas networks</li> <li>Hydrogen pipeline networks are leading</li> </ul>
		<ul style="list-style-type: none"> <li>The cluster exhibits internal competition</li> <li>Likely to survive increased competition from US/ME clusters</li> </ul>
		<ul style="list-style-type: none"> <li>At least 2 world-scale steam crackers and aromatics plants</li> <li>Significant downstream olefins and aromatics integration</li> <li>Availability of regional ethylene and propylene pipelines</li> </ul>

# Last Men Standing – Post-2025 Refining Landscape

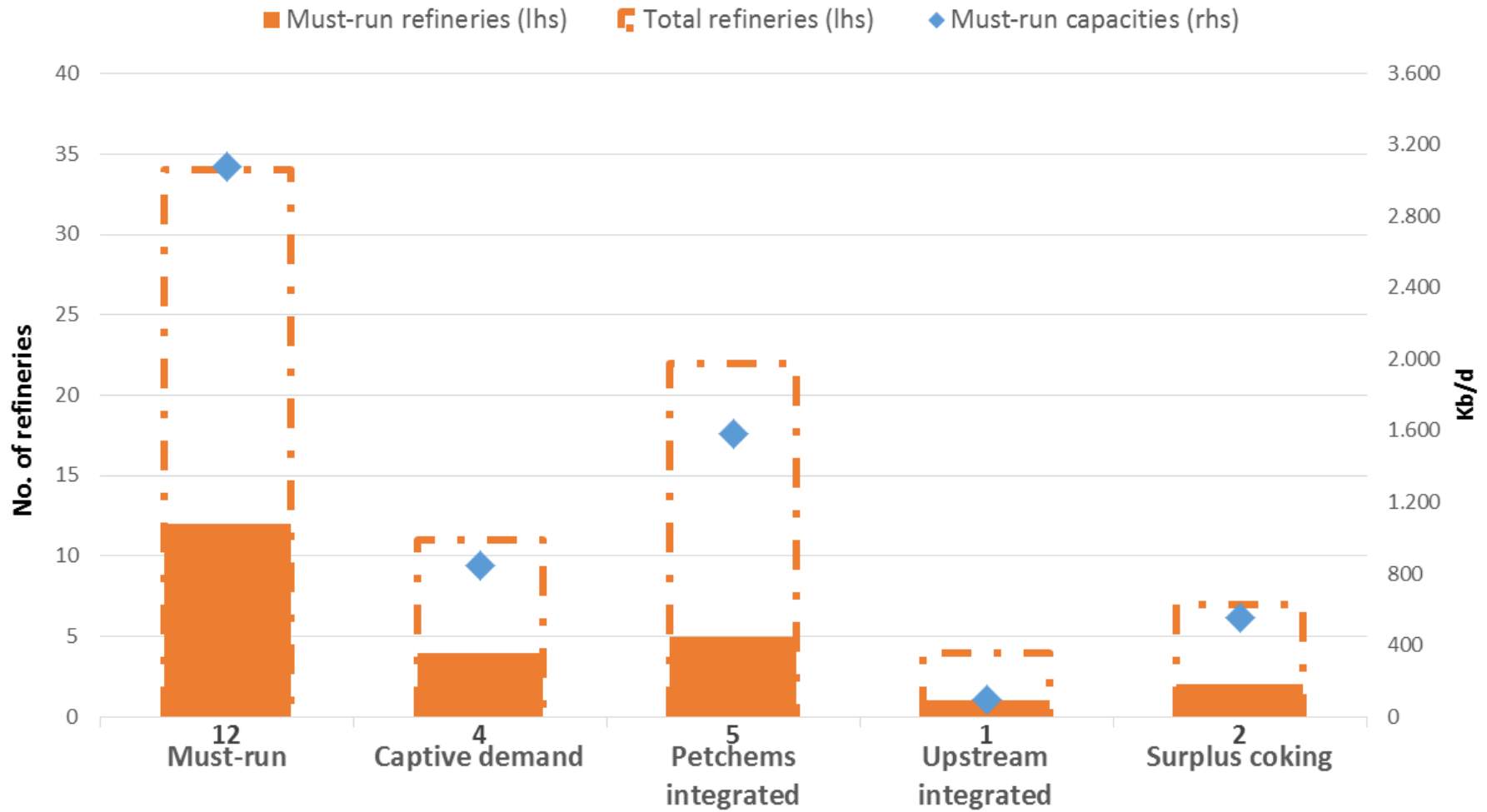




# Last Men Standing – Post-2025 Refining Landscape



# Last Men Standing – Post-2025 Refinery Landscape

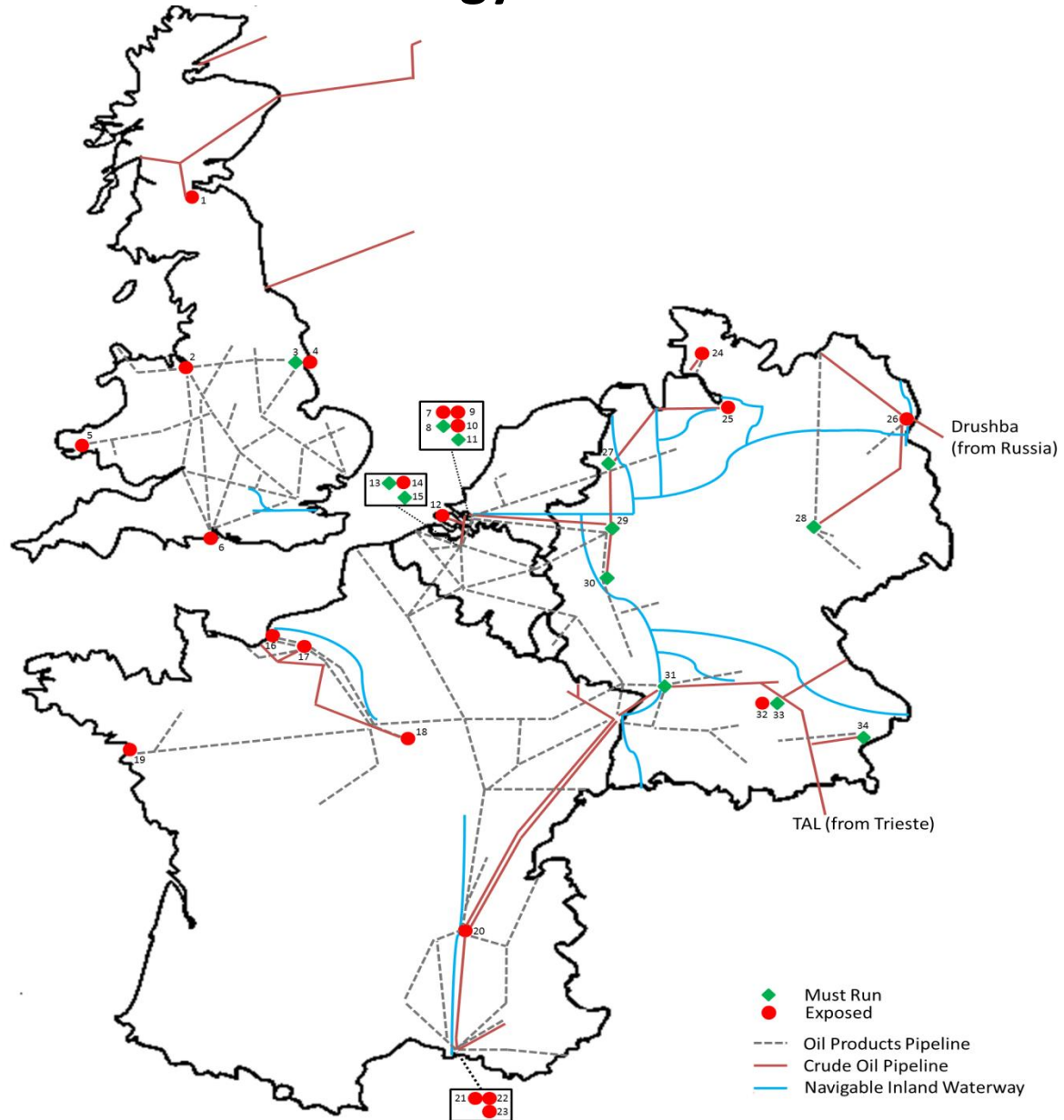


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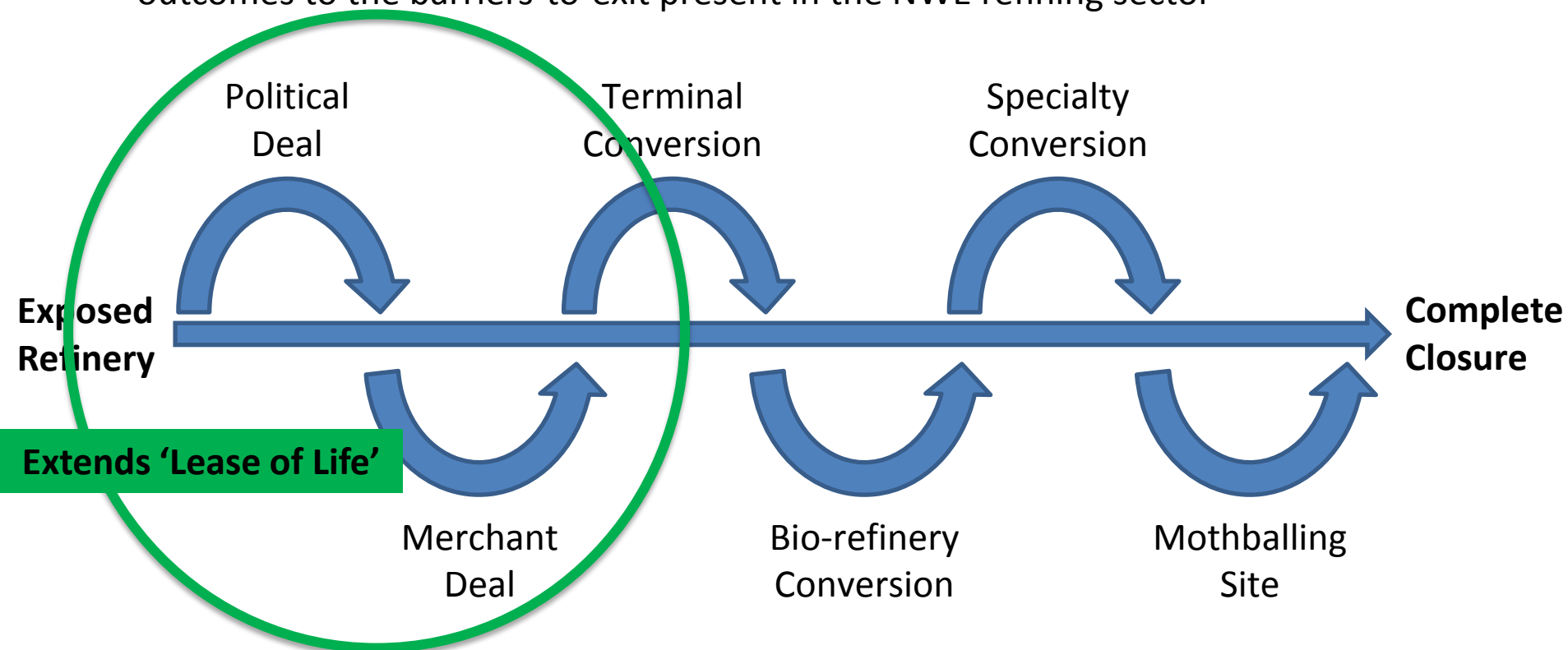


# Assumptions & Methodology – Must-run Scenario Map



# Assumptions & Methodology – Closure Constraints Background

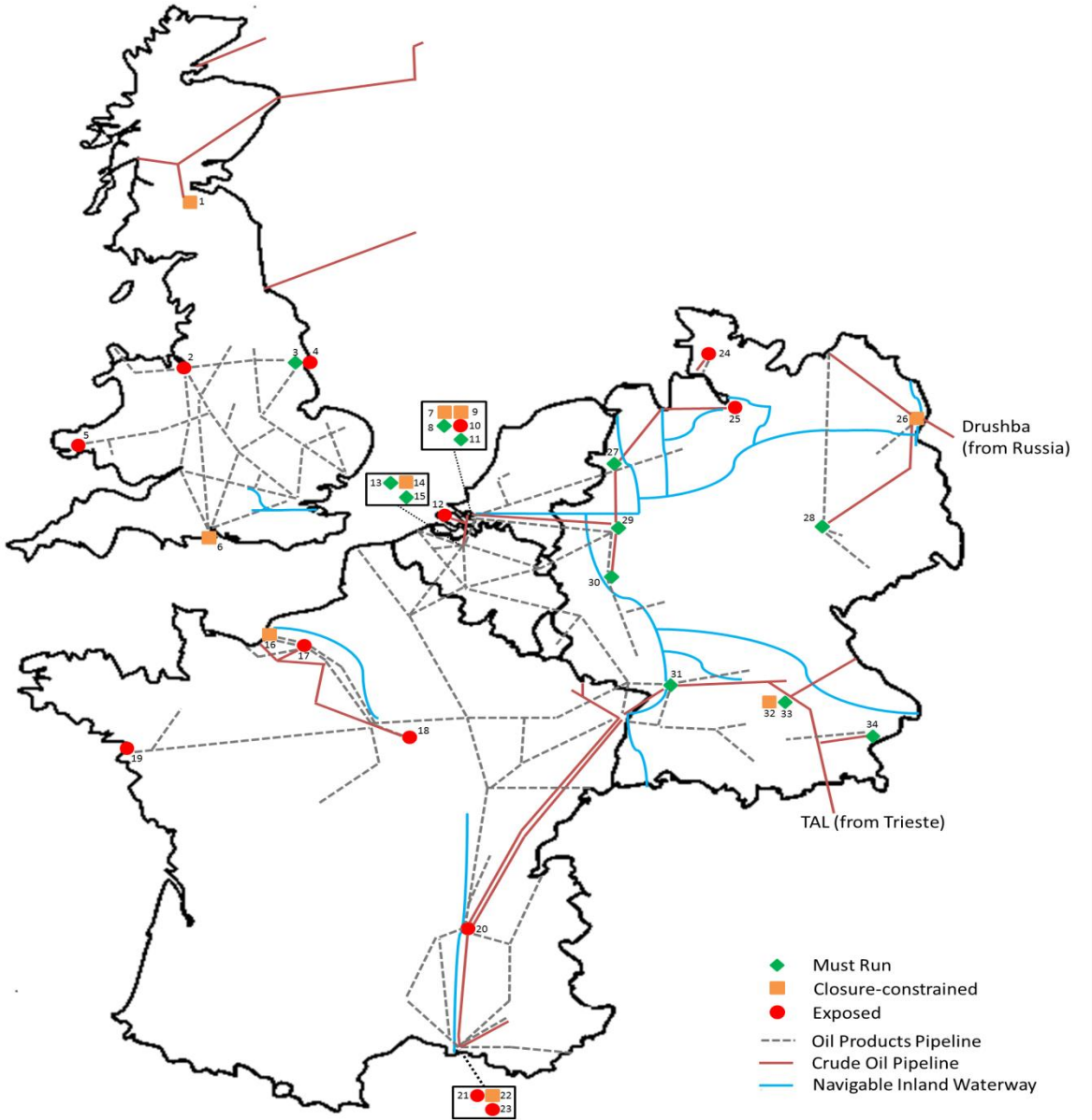
- Significant barriers-to-exit ensure that NWE refiners avoid complete refinery site closures at almost any cost
- The “closure-constrained” scenario explores the sensitivity of the “must-run” scenario outcomes to the barriers-to-exit present in the NWE refining sector



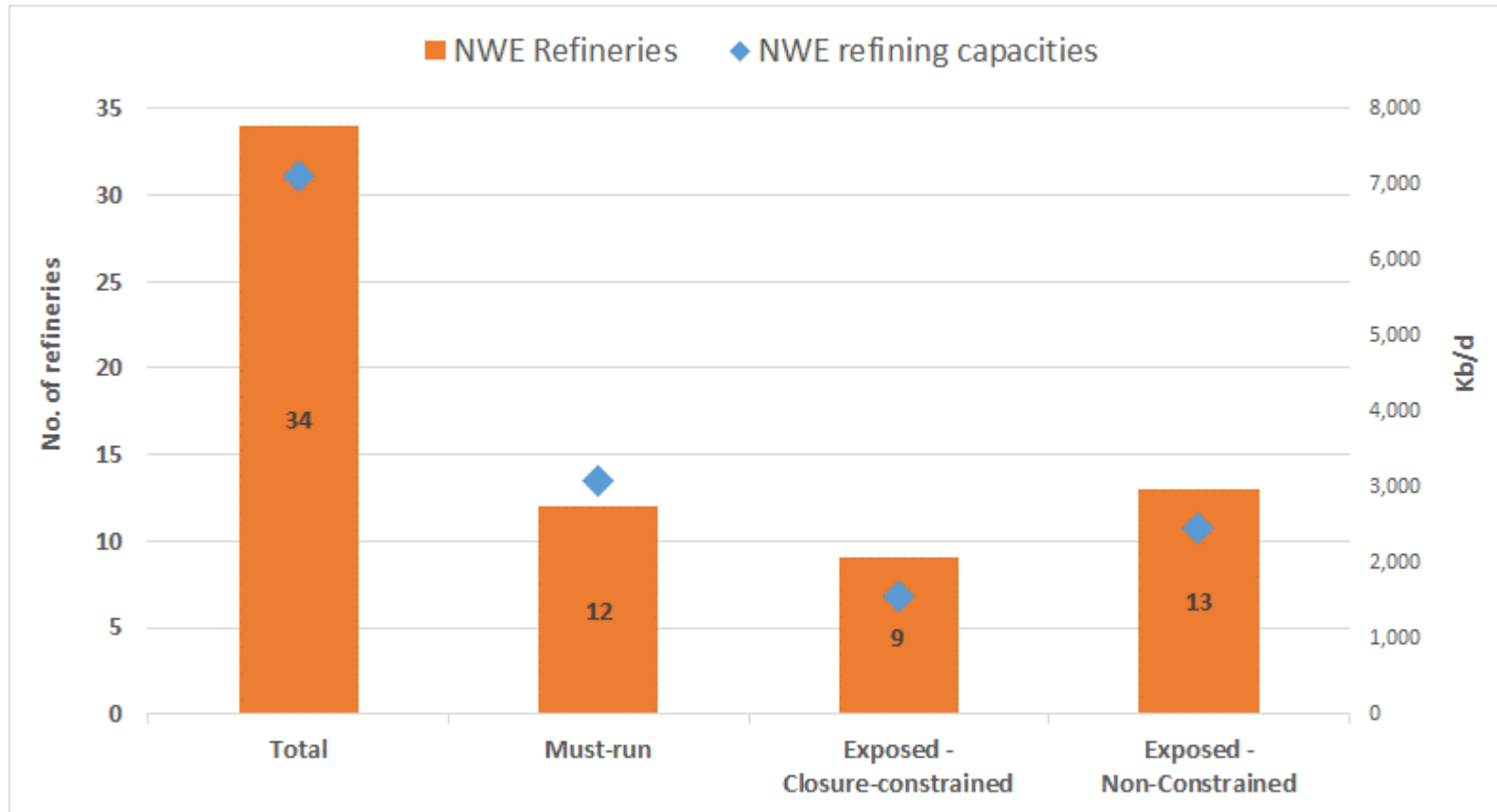
# Assumptions & Methodology – Political Deal Candidates

Closure constraint	Refinery characteristics	Description
<b>Economic footprint</b>	Strategic to economically significant cluster	<ul style="list-style-type: none"> <li>The refinery closure is likely to handicap the survival chances for an economically significant cluster</li> <li>Refinery closure is likely to have significant economic fall-out</li> </ul>
	Last remaining cluster	<ul style="list-style-type: none"> <li>Region lacks long-term competitive refining/chemical clusters</li> <li>The government is incentivised to protect the last remaining cluster</li> </ul>
<b>Security of supply</b>	Last remaining refinery	<ul style="list-style-type: none"> <li>Expected to be the last operational refinery in the country/region</li> <li>Security of supply incentivise government support</li> </ul>
	Connected to military purpose pipeline network	<ul style="list-style-type: none"> <li>The military purpose pipeline connection ensures that the refinery closure will impact a country/region's defense capabilities</li> </ul>
<b>Security of demand</b>	Majority owned by a crude long NOC	<ul style="list-style-type: none"> <li>Majority ownership by a crude long NOC suggests an important role for the refinery in securing stable crude oil demand</li> </ul>
	Direct crude pipeline connection	<ul style="list-style-type: none"> <li>A crude pipeline connection to the NOC's production assets reinforces the refinery's role in securing crude oil demand</li> </ul>

# A New Lease of Life – Post-2025 Refining Landscape



# Last Men Standing – Post-2025 Refining Landscape



- > 30% of refining capacity expected to be exposed in the long-run
- 9 out of 22 exposed refineries are closure constrained
- Operational refining capacity reduces to ~ 4.5 Mb/d

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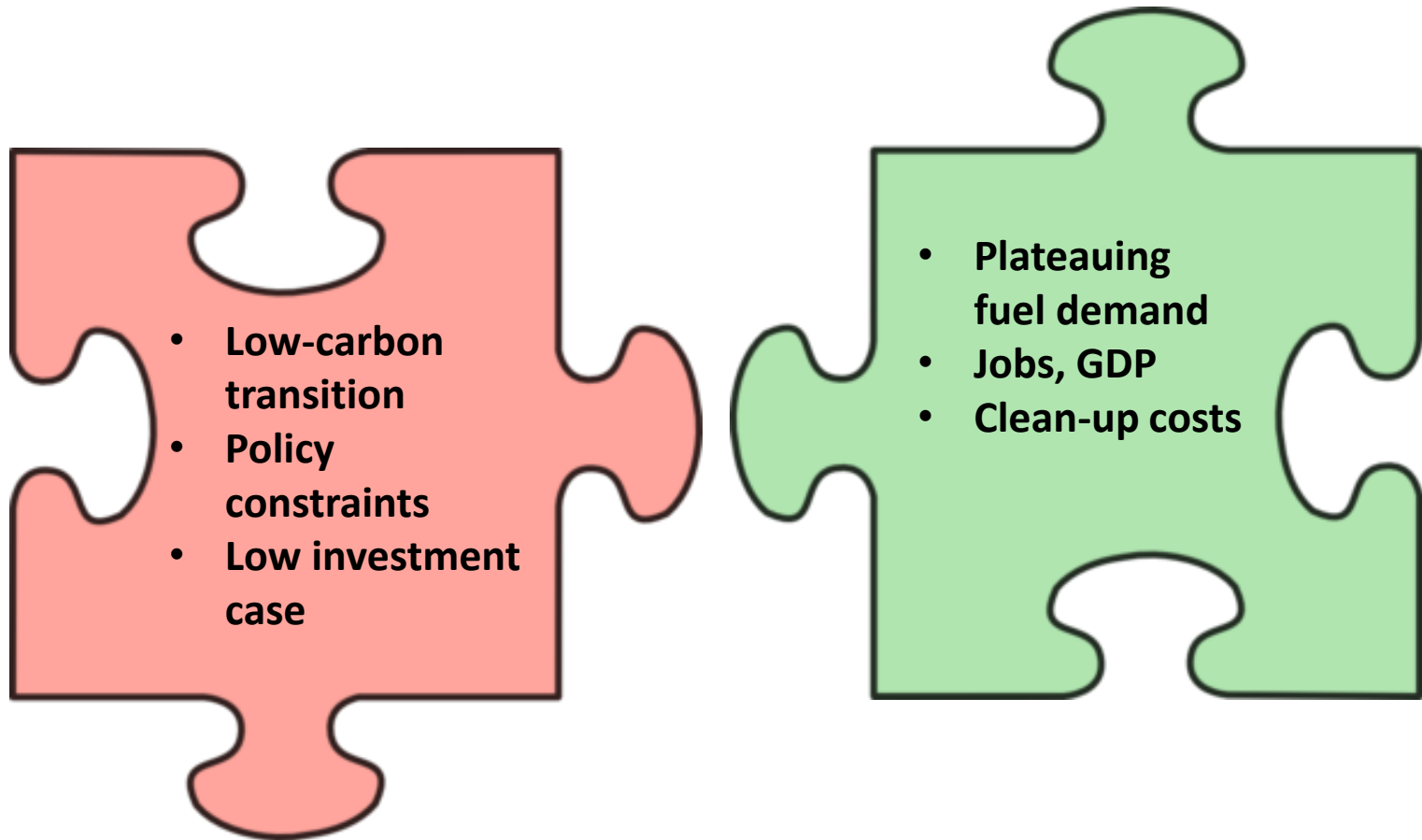


## Implications – Security of Supply

- Global refined product supply centres seem equally diverse as crude producers
  - Global supplier diversity (HHI) of 15.3 (product) and 14.6 (crude)
- Optionality of refining
- Strategic sectors (e.g. NATO, Hospitals, ...)
- Merchant refineries as ‘swing producer’?

# Implications – Refining Legacy

Asymmetric Change: A Looming Government Dilemma?



**Kickstart a discussion on the future of NWE refining**

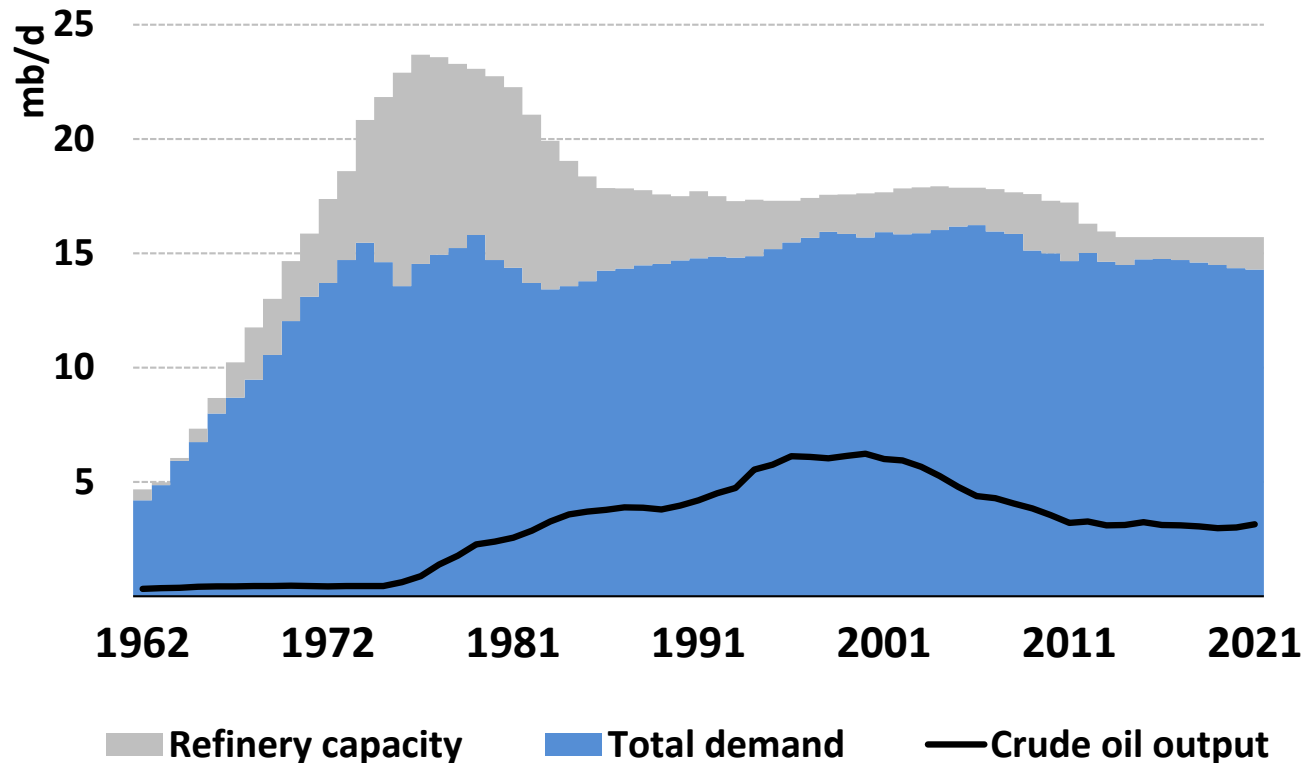
Thank you.

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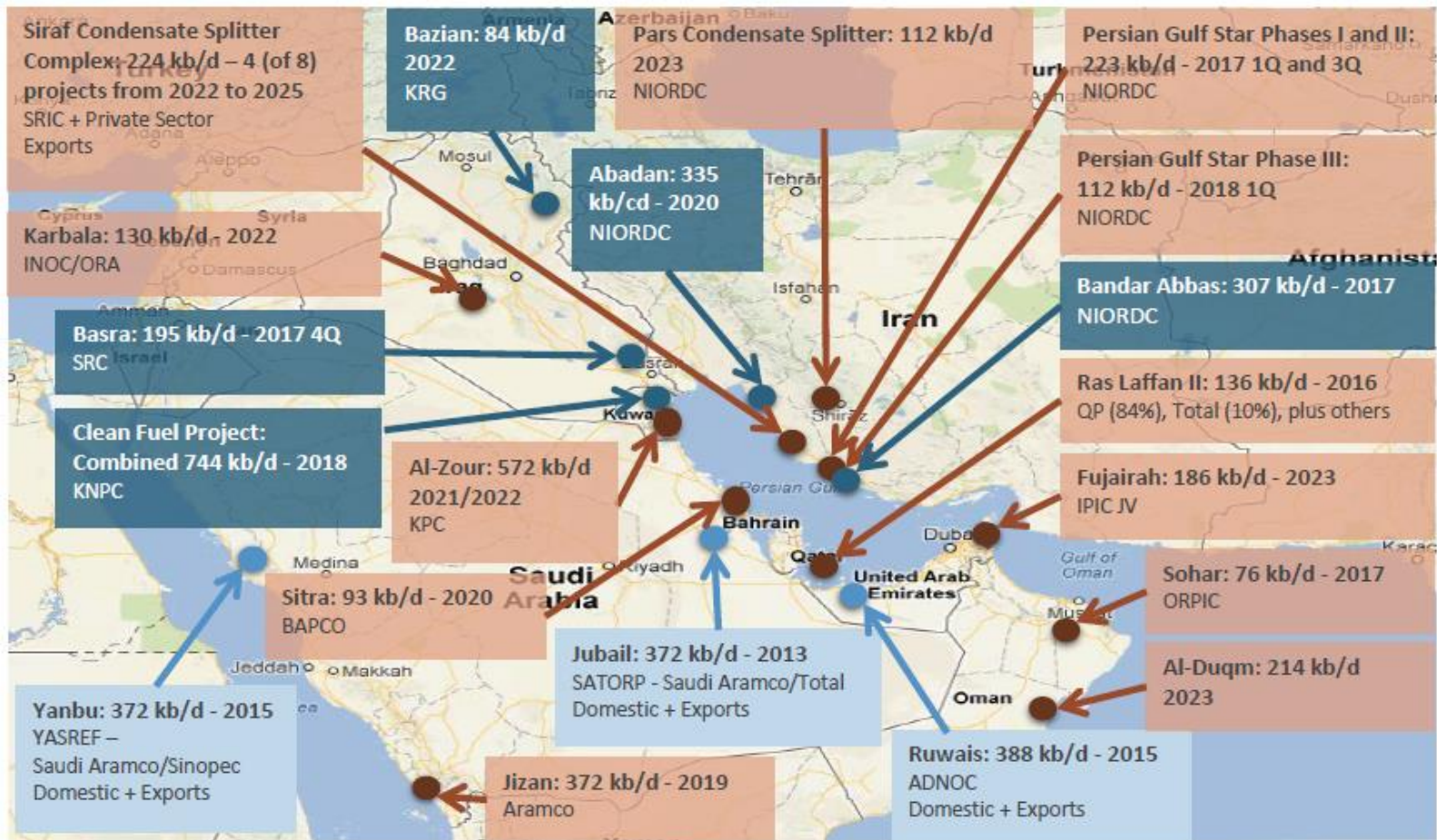
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# European refining capacity, demand and crude output



Source: IEA

# ME refinery upgrades & newbuilts



Key: Recent additions Firm and likely projects by 2025 Ongoing upgrade projects by 2025

Source: FGE, CSIS Presentation

# Assumptions & Methodology – Historical Restructuring Cases

