

PETROLEUM COKE

**MAADEN LOCALIZATION
OPPURTUNITY CARD**



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OPPORTUNITY SUMMARY

Case Summary

Regional Supply-Demand Imbalance

The GCC faces an estimated CPC supply-demand gap of ~270 kmt

Established Demand Base

Demand is largely supported by Maaden's ongoing aluminum smelting requirements.

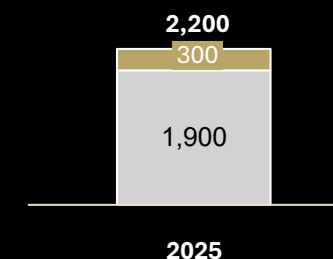
Feedstock Availability

KSA and GCC refineries produce notable volumes of anode-grade GPC

Maaden & Market Demand

GCC demand, kmt (2025)

■ Maaden Demand ■ Rest of GCC Demand



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Localization Opportunity Overview

1

Regional Supply-Demand Imbalance

The GCC faces a structural CPC deficit of ~270 kmt, which may indicate potential for additional local capacity to partially replace imports and support domestic and regional smelter demand

2

Established Demand Base

CPC is a key input for aluminum smelting (~350 kg/ton), and demand is secured by Maaden's long-term requirements plus upcoming GCC aluminum capacity expansions

3

Cost Structure Considerations

KSA and GCC refineries produce significant anode-grade GPC, which may support access to key raw materials, which represents 60–70% of production cost

4

Cost Competitiveness

Saudi Arabia offers lower energy, logistics, and labor costs, which may support competitive positioning with Chinese, Indian, and European suppliers subject to market conditions and operating assumptions

5

Strategic Relevance for KSA

Local CPC production may contribute to supply chain resilience for the aluminum industry and may align with broader industrial development and localization objectives

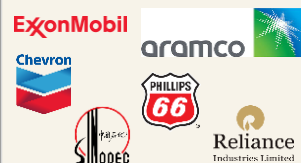
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VALUE CHAIN

Crude Oil Selection & Refining



Refiners choose **heavy crude** streams with properties suitable for coking. Crude is processed in atmospheric and vacuum distillation units to extract lighter products.



Green Petroleum Coke (GPC)



The vacuum residue is thermally cracked in the DCU, producing **green petroleum coke** plus liquid products.



GPC Handling, Screening & Storage



Green coke is crushed/screened to remove oversized material and stored before calcination. Moisture, volatile content, and metals content are monitored to ensure suitability for anode production.

Calcination



GPC is heated to ~1,200–1,350°C in rotary kilns or vertical shaft calciners to remove volatiles and increase density and electrical conductivity. This produces **calcined petroleum coke (CPC)**, the essential input for aluminium anodes.



CPC Cooling, Classification & Quality Assurance



CPC is cooled, sized, and blended to meet aluminium smelter specifications (density, sulfur <3%, metals content, reactivity).

Logistics & Distribution



CPC is shipped via bulk vessels or trucks to **anode plants** close to aluminium smelters.



Anode Production (Maaden Downstream Step)

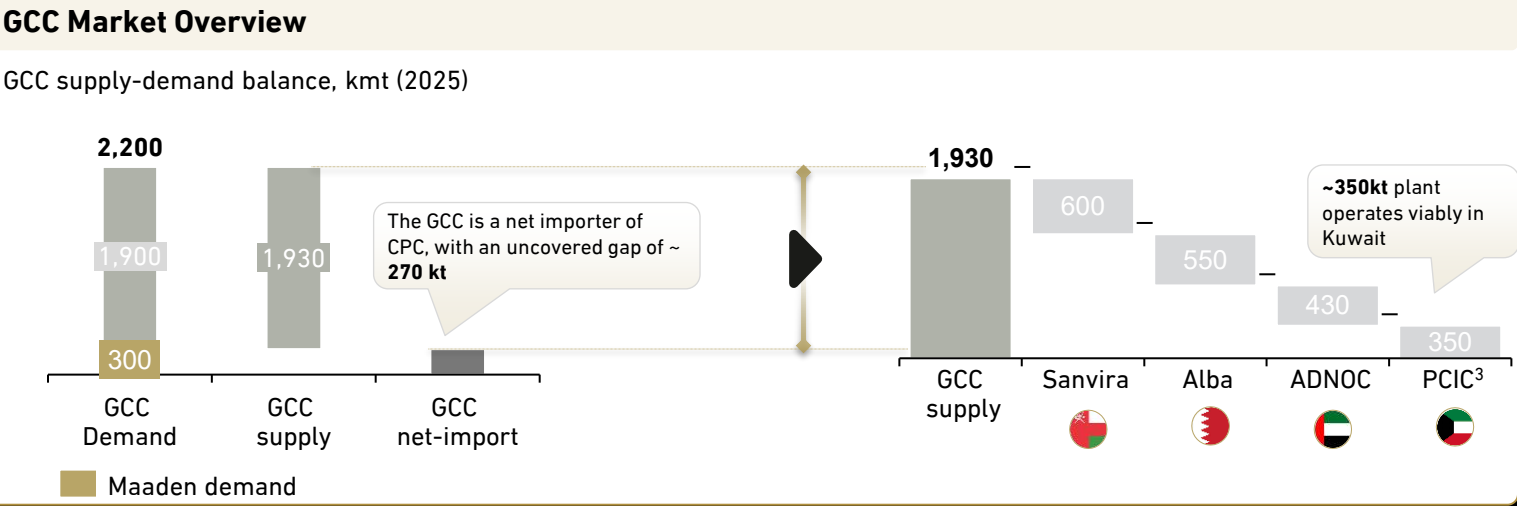
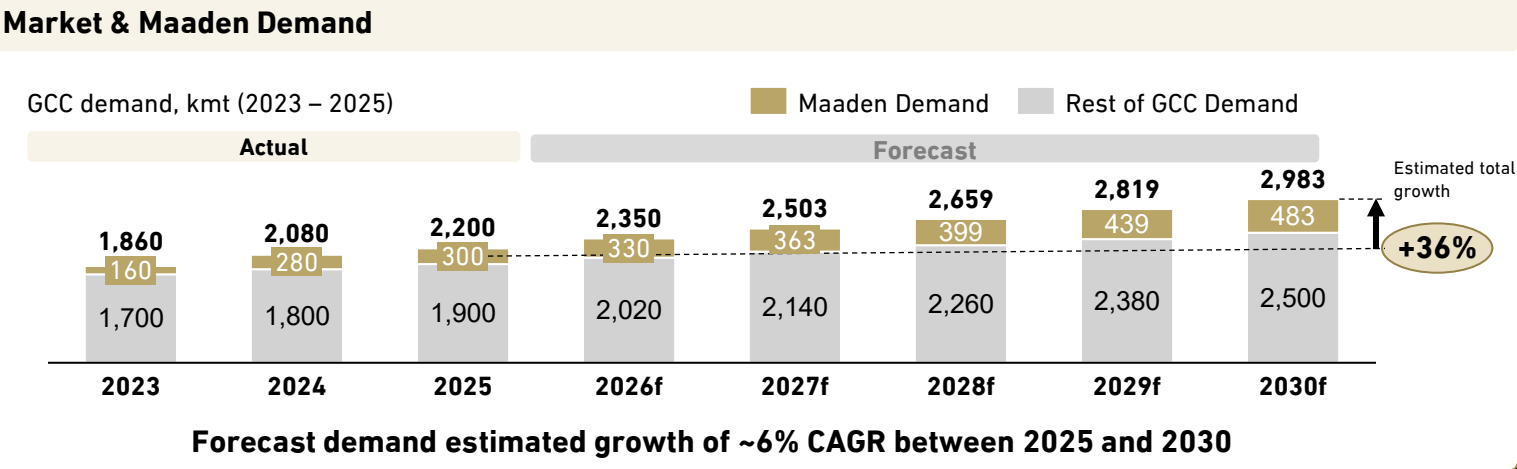


CPC and coal tar pitch are mixed, shaped, baked, and graphitized to create **carbon anodes** used in Maaden's Hall-Héroult reduction cells.



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MARKET DEMAND & SUPPLY



Market Trends & Demand Drivers

- 1 Increased aluminum production volumes, linked to smelter utilization levels and operational changes
- 2 Higher anode consumption, which may be linked to changes in Maaden's carbon operations.
- 3 Efficiency and reliability improvements which may support more consistent operation of reduction lines
- 4 Shift toward higher-quality anodes, which may result in higher volumes of premium CPC per tone of aluminum

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The KSA ecosystem comprises six main categories, supported by key enablers

