



Market Outlook

Kathrine Fog, SVP Corporate Strategy & Analyses

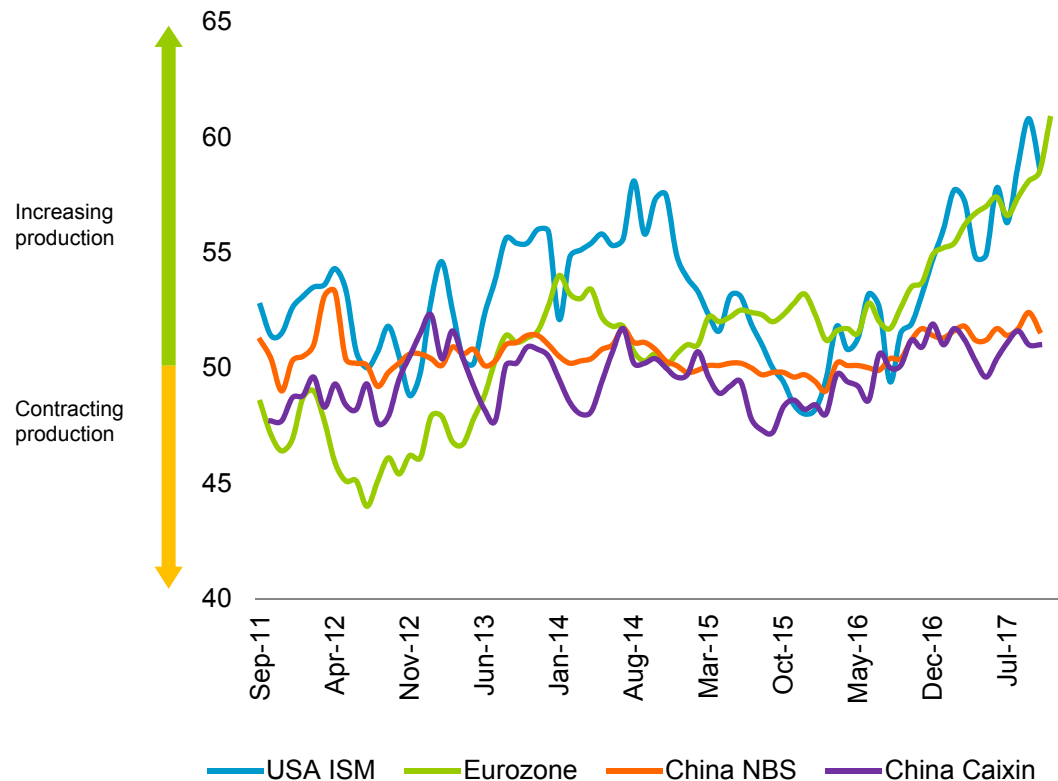
01

Macro and
downstream

Improving macro environment evident in aluminium demand

Semis demand at or above GDP in key regions

Manufacturing PMI's



Semis demand annual growth, key regions



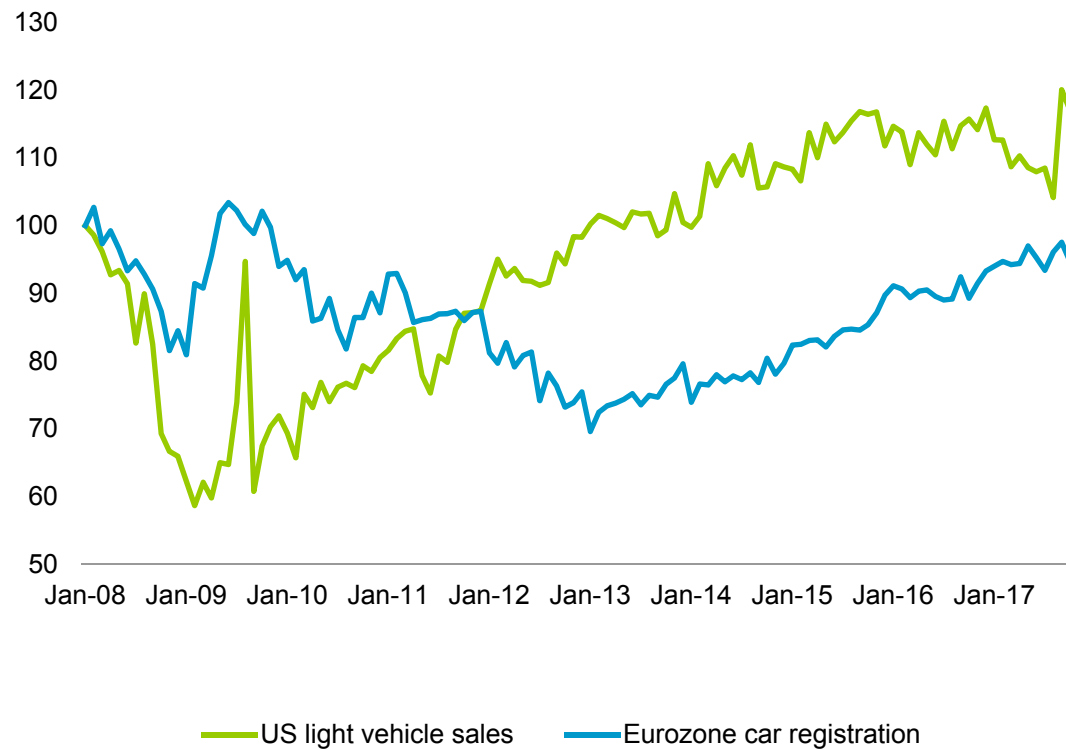
Source: Thomson Reuters, Republished under license from CRU International Ltd

Substitution trend in automotive progressing

US semis demand in automotive remains positive although car sales have overall moderated in 2017

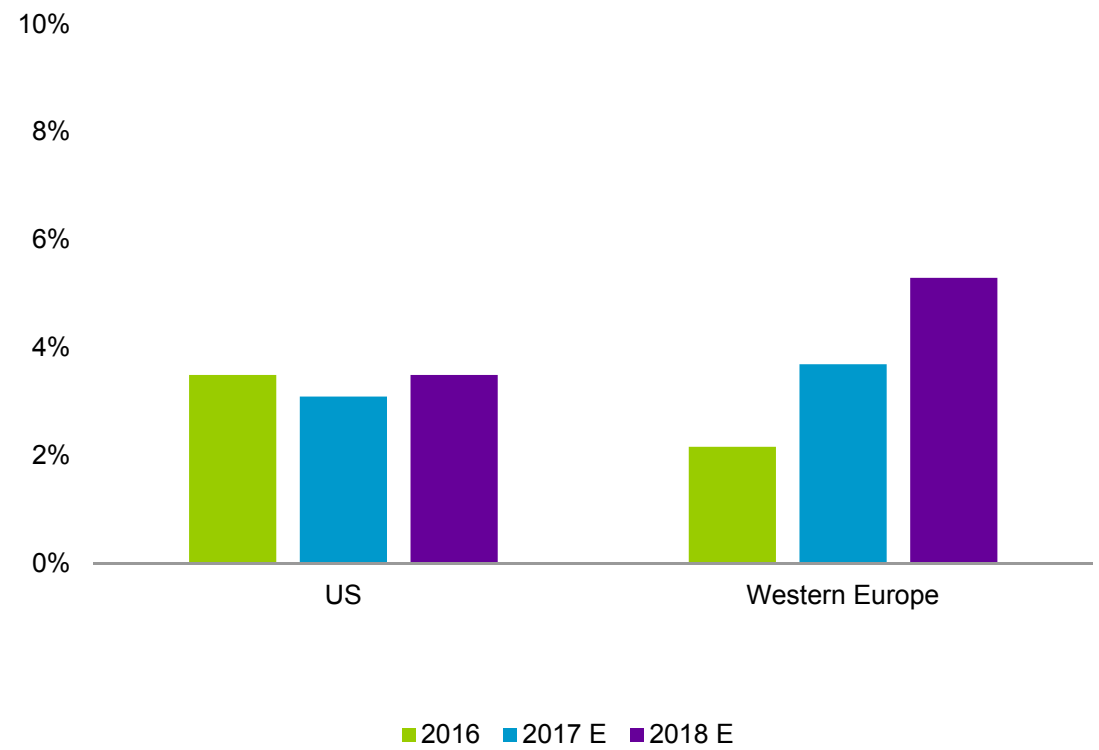
US and European automotive indicators

(Index, Jan. 2008=100)



Semis demand in transport, annual growth

(%)

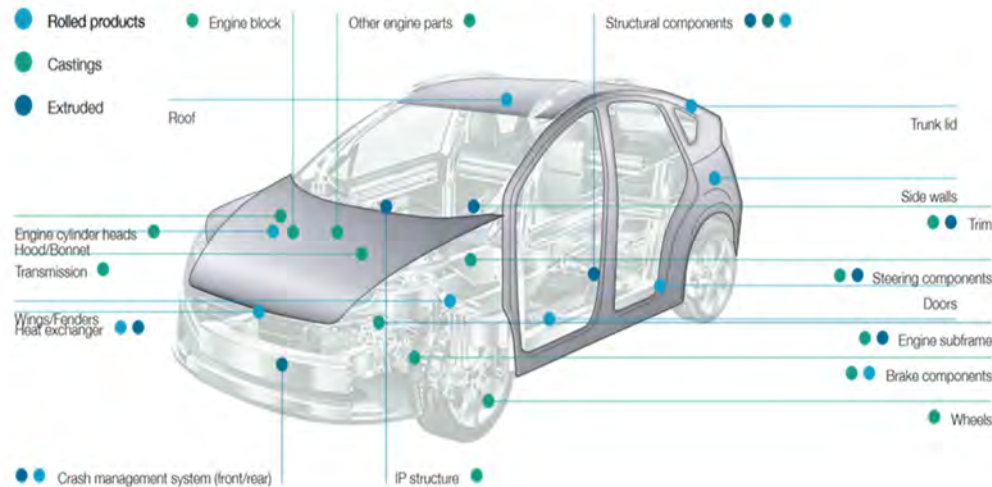


Source: Thomson Reuters, Republished under license from CRU International Ltd

Automotive demand for aluminium supporting several semis products

Car makers utilizing aluminium to reduce weight and increase fuel-efficiency

High-growth automotive segment with substantial further potential due to aluminium's superior inherent properties



Global semis demand for transport sector by product form

(Mill t)

30

25

20

15

10

5

0

2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

■ Castings ■ Extrusions ■ Other* ■ Rolled products

7 %

7 %

4 %

CAGR
2016-20

Level of
substitution

Source: Hydro analysis, Republished under license from CRU International Ltd

*Other includes e.g wire

New segments and applications supporting aluminium demand



Marine / Offshore applications



Zero-emission electrical car ferries in 100% aluminium for light-weighting



B&C, ex. Supertall buildings



Transportation, truck & trailer applications



Aluminium in solar panels



Industrial applications, ex. furnitures



Middle and high voltage cables, wire and cables for electrical applications



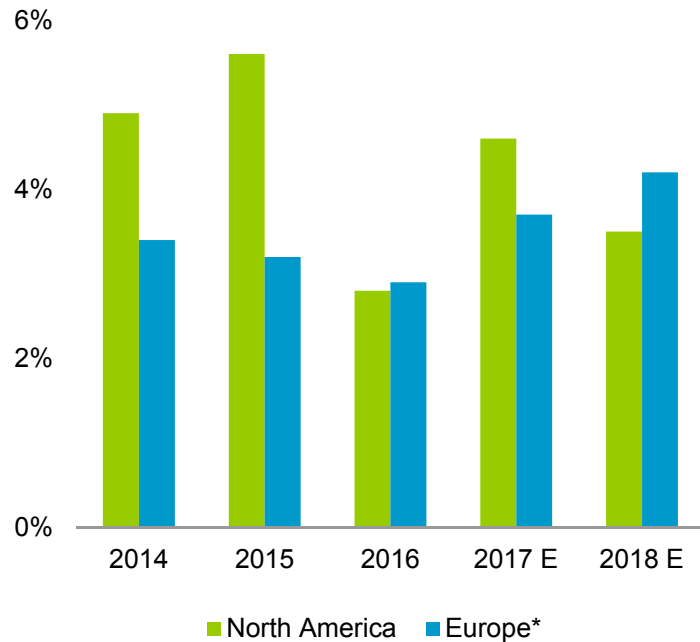
Automotive, strong drive towards EV

Rolled products demand driven by transport segment

Transport share increasing in total rolled products demand

General rolled products demand, selected regions

YoY-growth

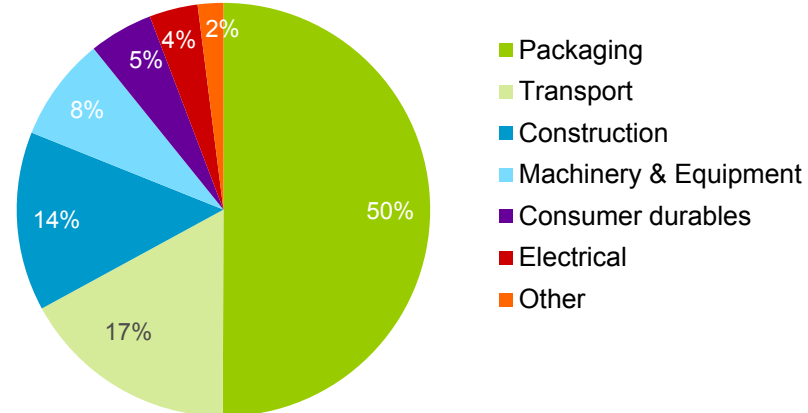


Expected market development

- Continued substitution trend in transport main demand driver
- Growth in packaging driven by can stock and foil in emerging markets

Global segment composition, rolled products

(2017)

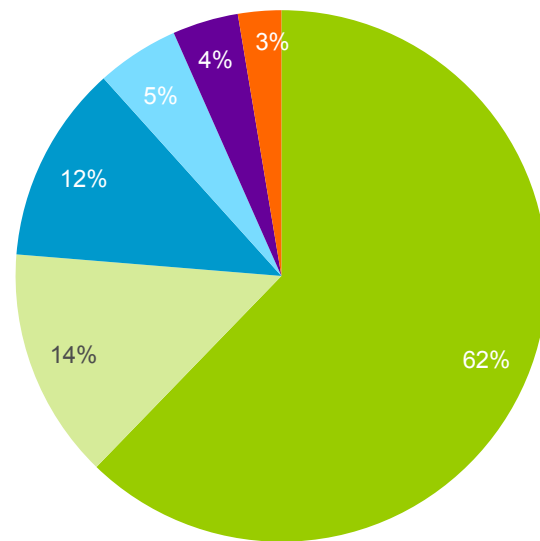


Source: Hydro Analysis, Republished under license from CRU International Ltd
*Total EU27+EFTA

Extrusion market supported by continued momentum in B&C market and improving demand in transport

Global segment composition, extrusion

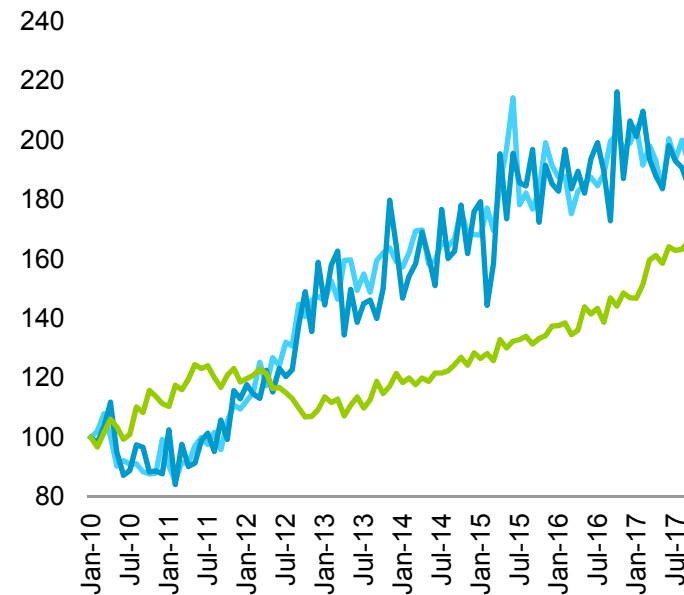
(2017)



- Construction
- Machinery & equipment
- Consumer durables
- Transport
- Electrical
- Other

Housing market indicators

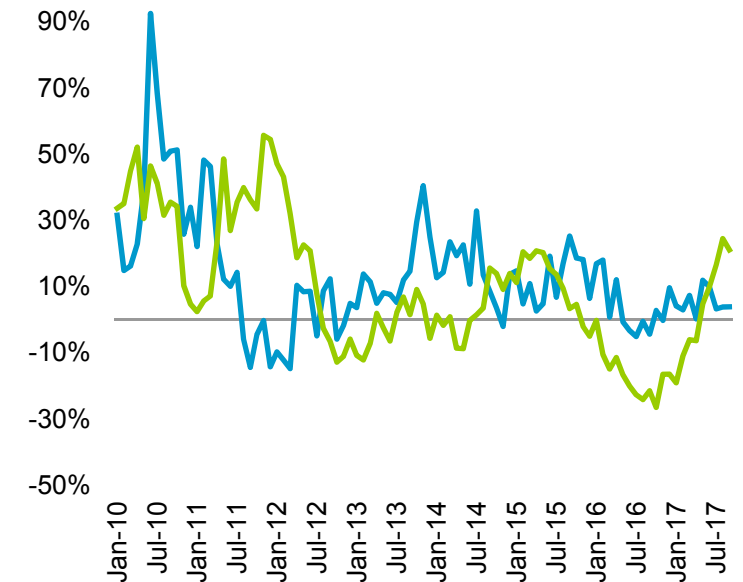
Index, Jan 2010=100



- US Building permits
- US Housing starts
- EU construction order book

US truck and trailer market

Monthly shipments, annual growth



- Light trucks
- Heavy duty trucks

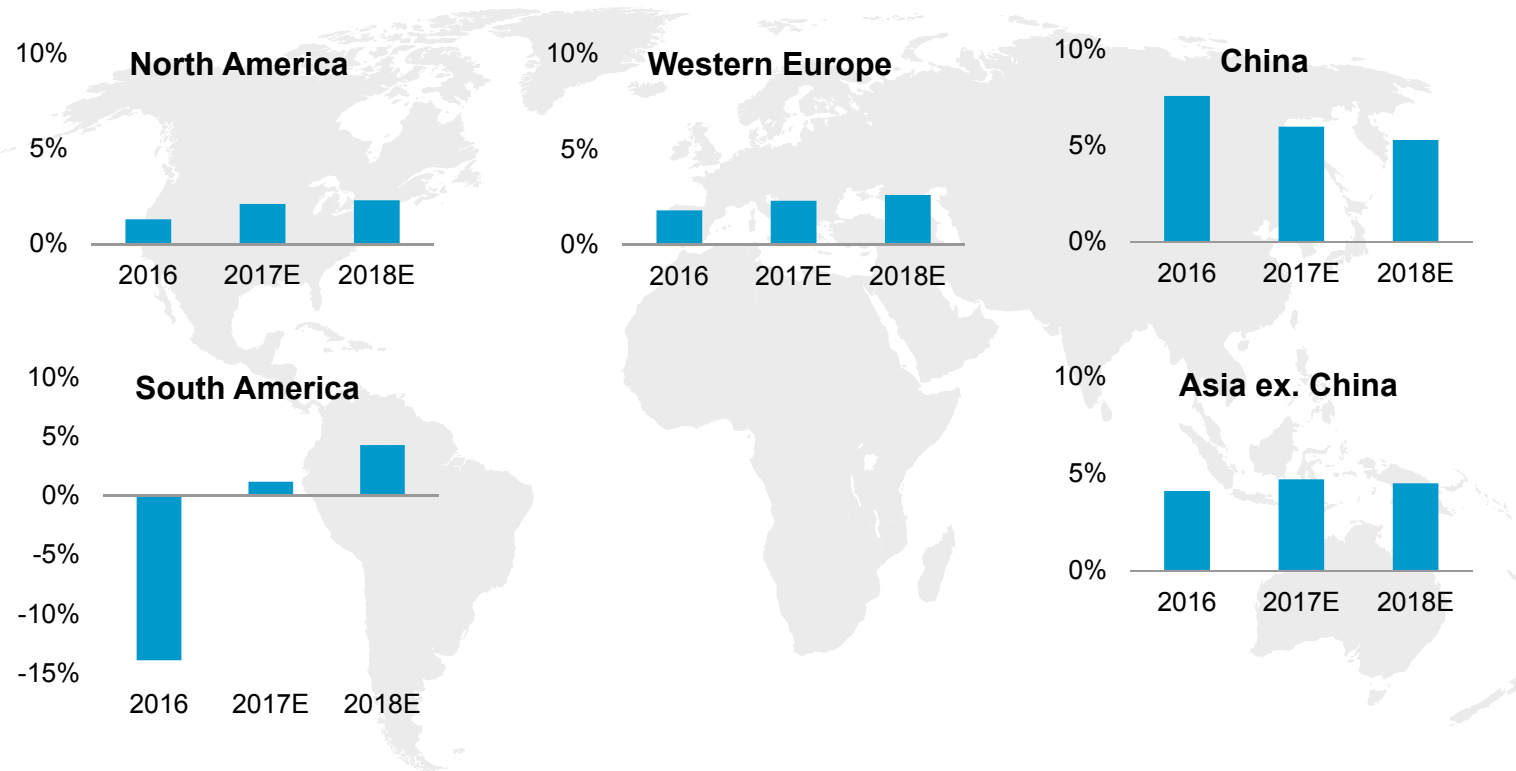
Source: Thomson Reuters, Hydro Analysis, Republished under license from CRU International Ltd

Solid extrusion demand growth in several key regions

Gradual improvement expected in Europe, Chinese demand growth estimated to moderate

Extrusion demand, selected regions

YoY-growth



Expected market development

- US housing market still sustaining positive momentum
- Construction activity in Europe continues to improve from low levels
- South America returning to positive demand growth
- Softer construction growth impacting Chinese demand

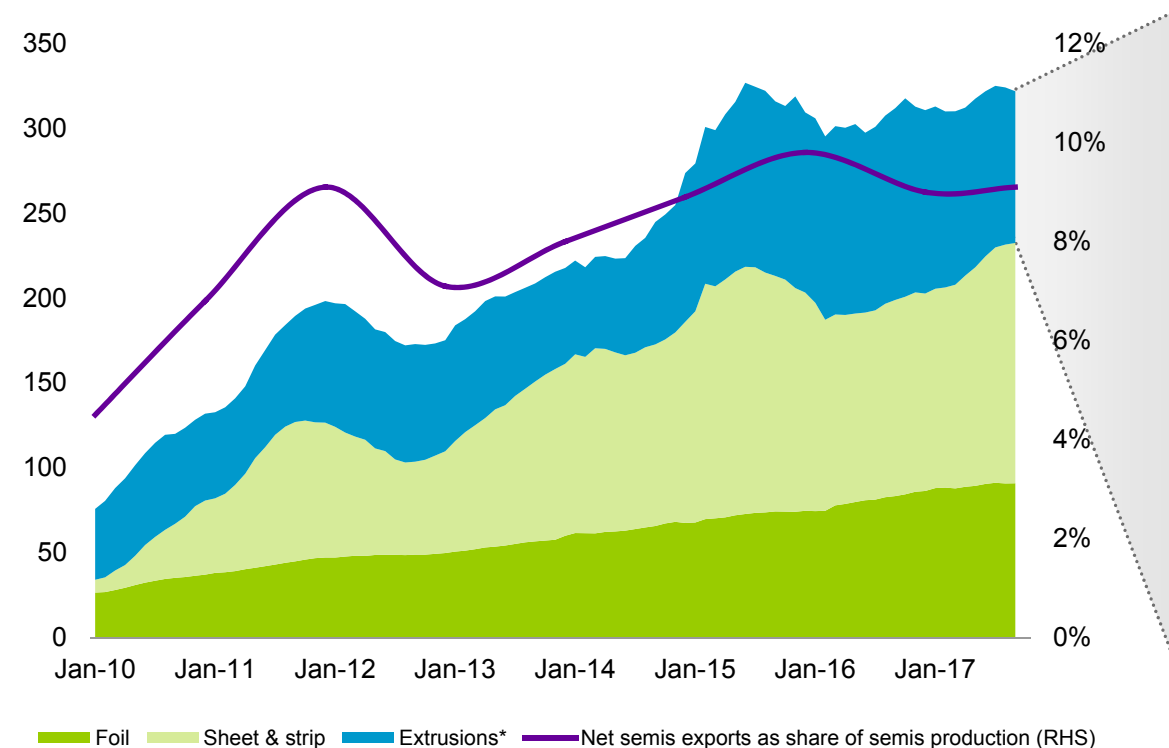
Source: Hydro Analysis, Republished under license from CRU International Ltd

Largely stable Chinese semis exports last year

Limited extrusion exports to Europe and North America, extrusion stocks transferred from Mexico to Vietnam

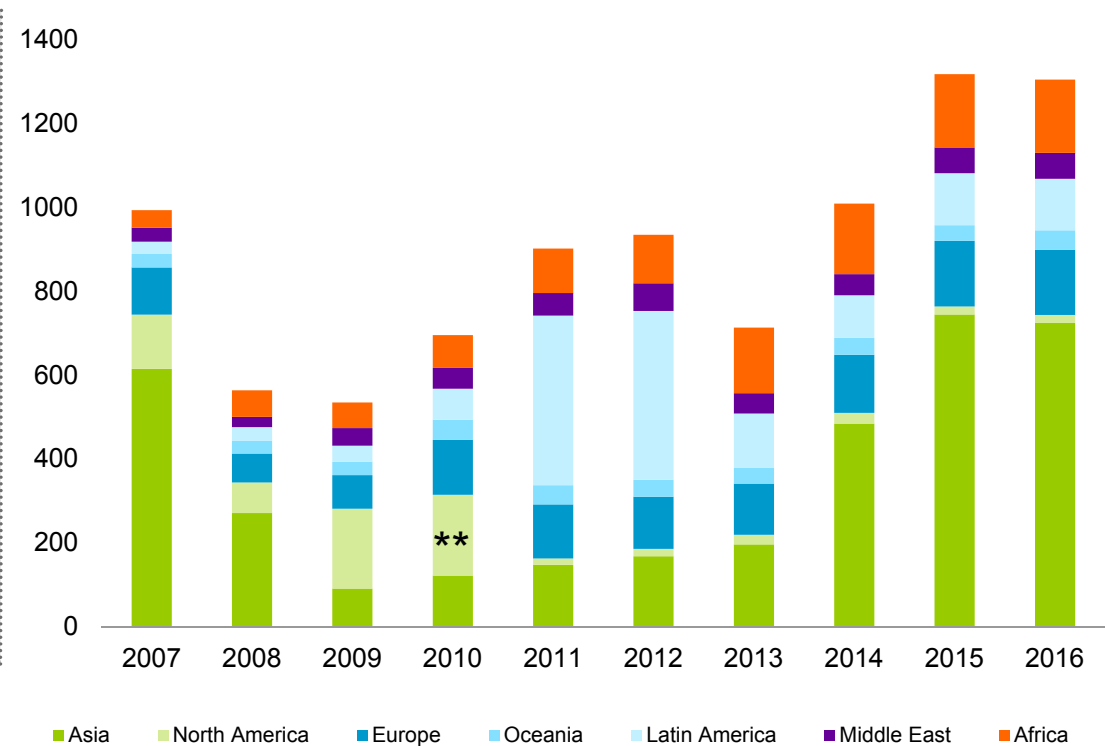
Monthly Chinese net semis exports (12-month moving average)

Thousand tonnes



Annual Chinese extrusion exports, by region

Thousand tonnes



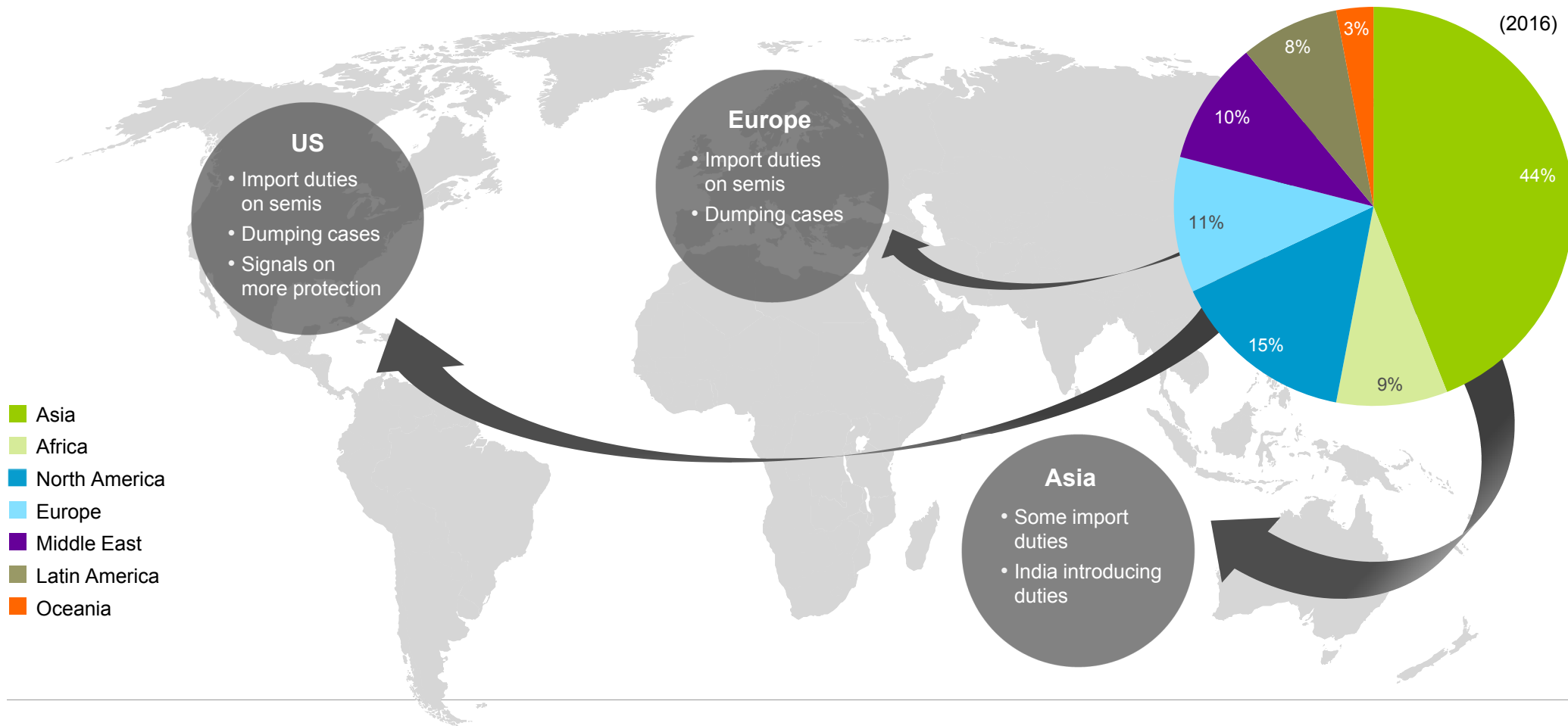
Source: CRU, Antaike, Hydro Analysis

*Mainly extrusions, but also including some smaller semis categories such as wire

**US extrusion duties imposed in 2010, impacting volumes from 2011

Trade flows partly impacted by trade measures

Chinese semis exports by destination – Asia key region



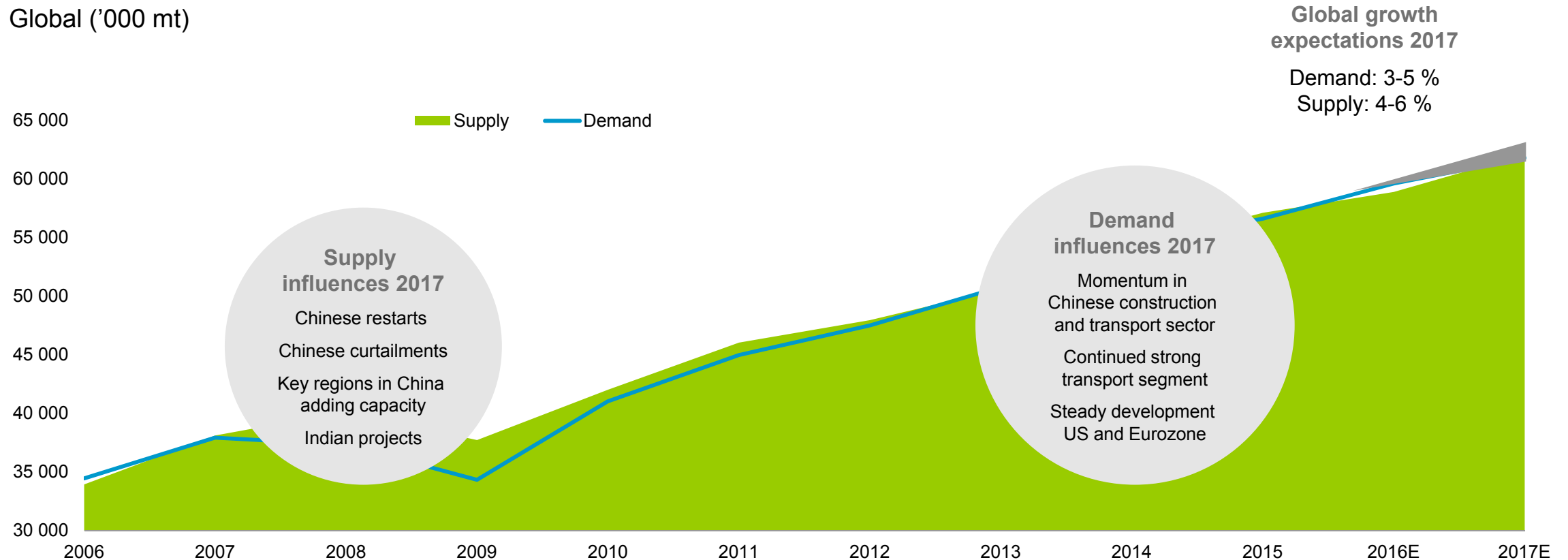
Source: Hydro Analysis, Antaike

02

Primary metal market

Recap CMD 2016: Global primary market expected to be largely balanced also in 2017

Global ('000 mt)

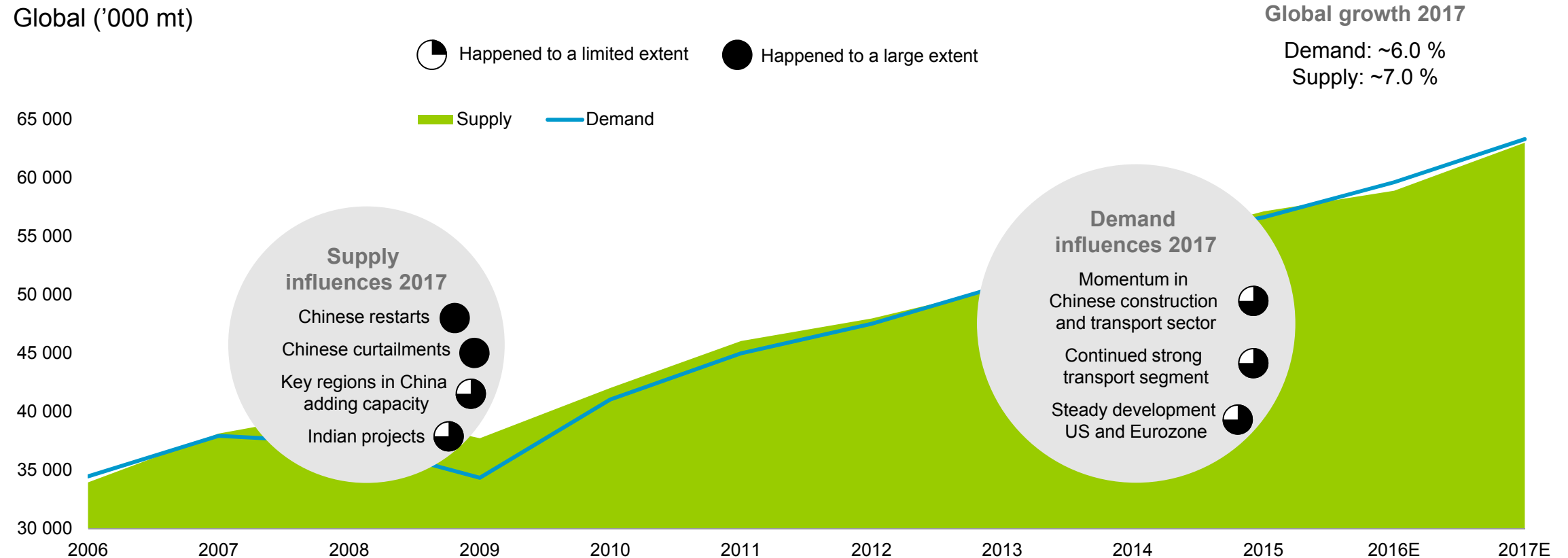


Source: CRU, Hydro Analysis

Global primary market for 2017 in small deficit

Both supply and demand higher than expected

Global ('000 mt)

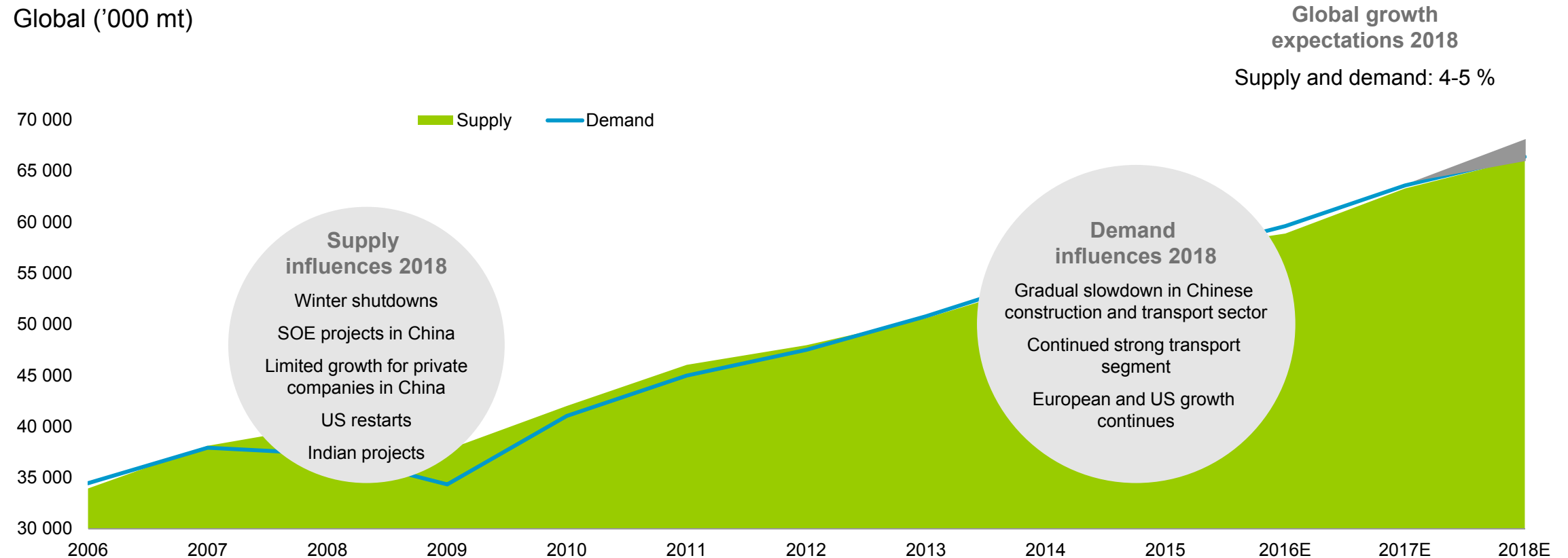


Source: CRU, Hydro Analysis

Global primary market expected to be largely balanced in 2018

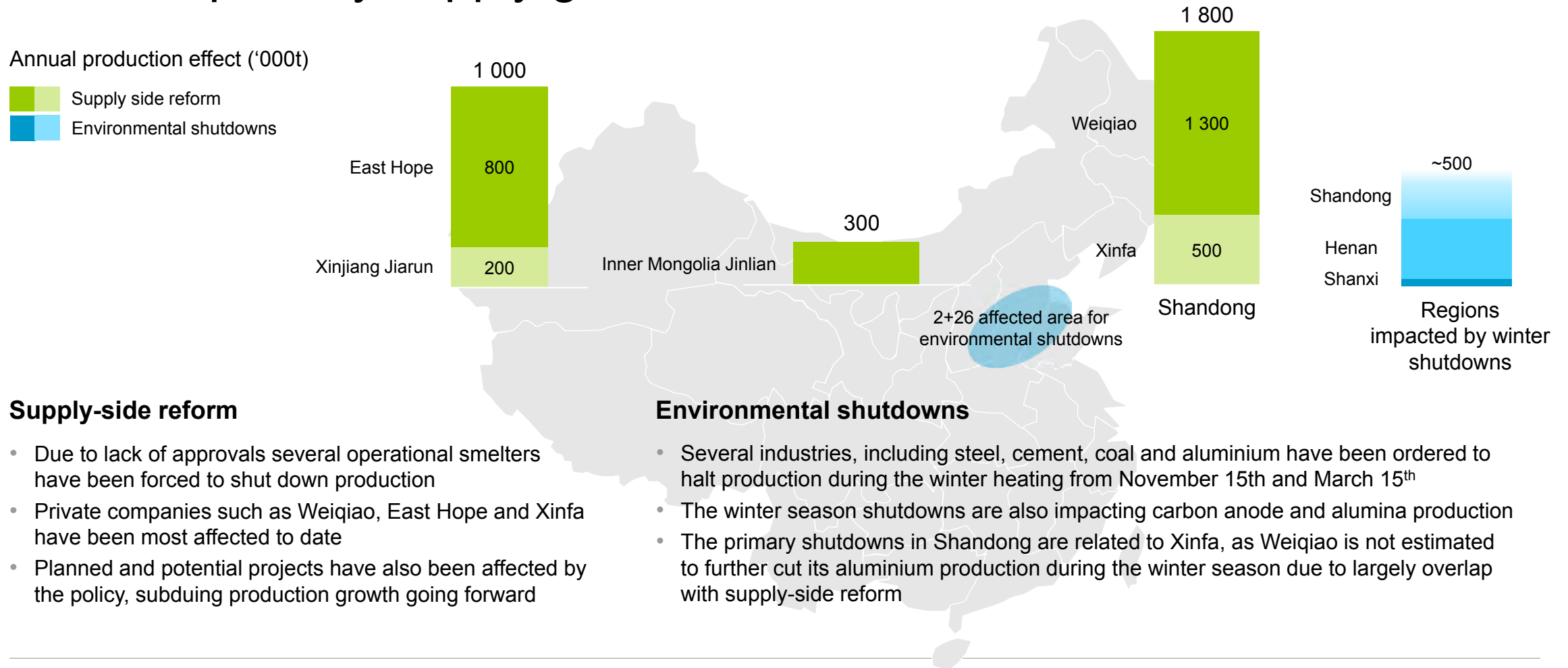
Primary supply and demand growth expected to be largely similar

Global ('000 mt)













Source: CRU, Hydro Analysis

Supply-side reform and environmental shutdowns moderating Chinese primary supply growth



Source: CRU, Hydro Analysis

Key drivers for China's aluminium expansion losing momentum

| Drivers for aluminium capacity | Past | Present | |
|------------------------------------|---|--|---|
| Demand growth |  |  | <ul style="list-style-type: none"> Continued strong growth short-term, but expected to slow longer term Export market impacted by trade restrictions |
| Lack of environmental restrictions |  |  | <ul style="list-style-type: none"> From softer to harder constraints: strong enforcement of environmental shutdowns during winter shutdown |
| Energy availability |  |  | <ul style="list-style-type: none"> Competitive advantage of coal-rich regions moderating, combined with rising coal prices Environmental issues will further challenge coal-based production |
| Access to financing |  |  | <ul style="list-style-type: none"> Tighter financial liquidity perceived as constraint for potential capacity new-builds and restarts Supply-side reform limiting new projects, especially by private players |
| Raw material access |  |  | <ul style="list-style-type: none"> Depleting domestic bauxite reserves, more dependent on imports Carbon producers also impacted by environmental shutdowns |



Supportive of capacity expansions



Moderating capacity expansions

Chinese energy market reforms impacting aluminium smelter cost

Reforms expected to even out power prices across the specter of Chinese aluminium producers

Chinese Power Market Reform: Key objectives

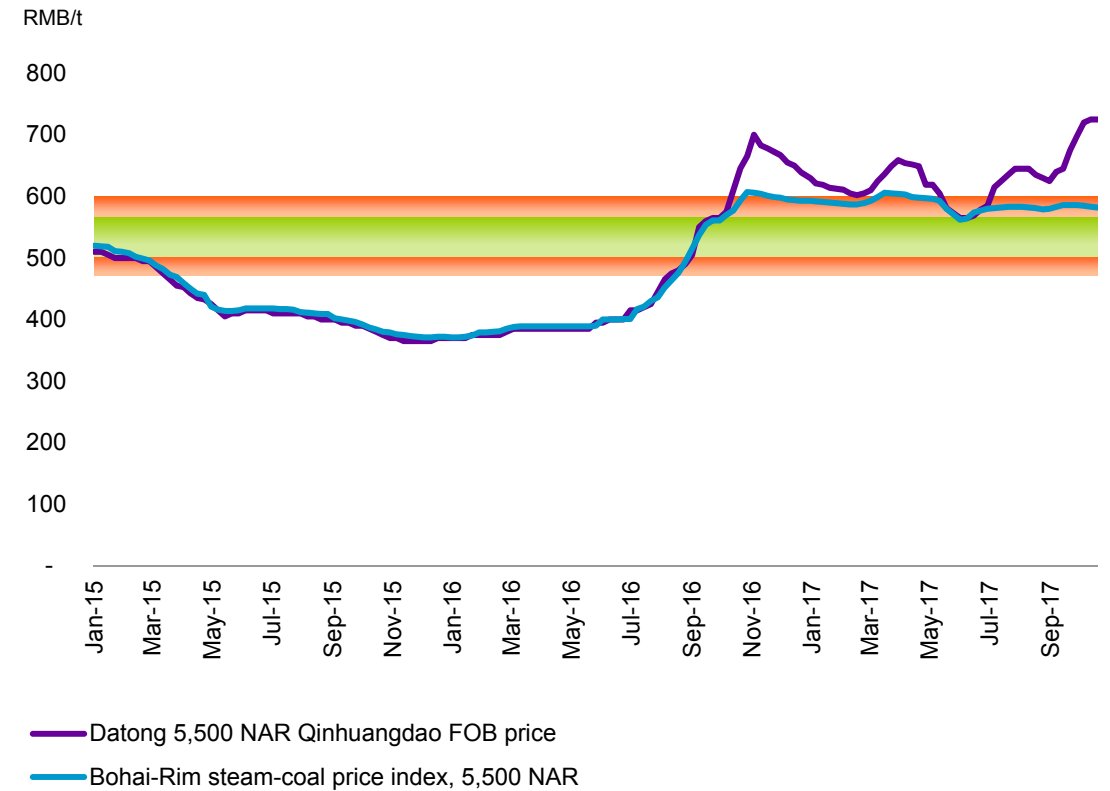
Standardize and
strengthen supervision
of captive power plants

Implement power
pricing mechanisms
reflecting market
fundamentals

Remove
cross-subsidization
and regulate T&D tariffs
at cost-plus levels

Promote direct
power purchase and
power trading

Chinese Steam Coal Price Band

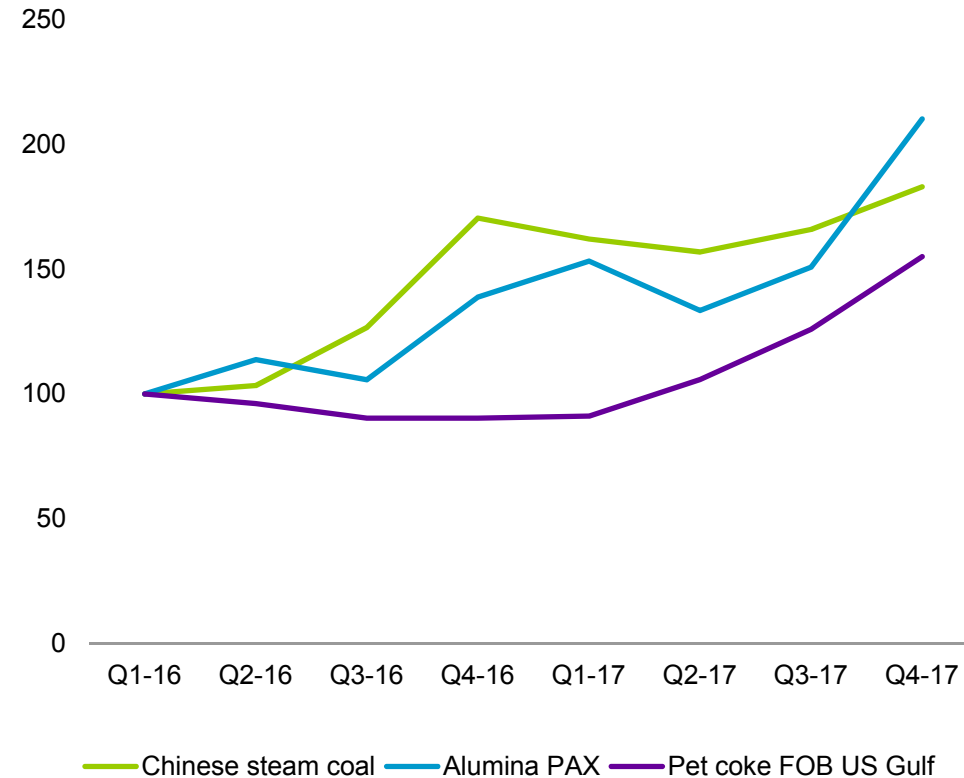


Source: IHS

Higher and steeper cost curve in 2017 compared to 2016

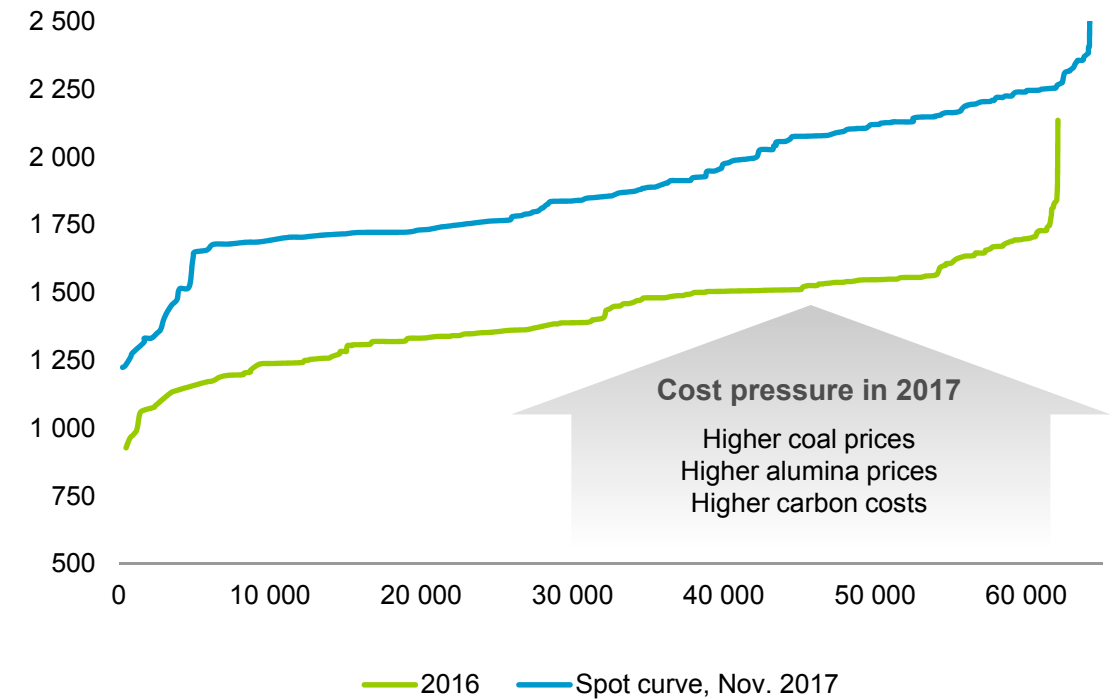
Higher end of the cost curve dominated by Chinese smelters

Index: Jan 2016 = 100



Business operating cost (BOC)

USD/t

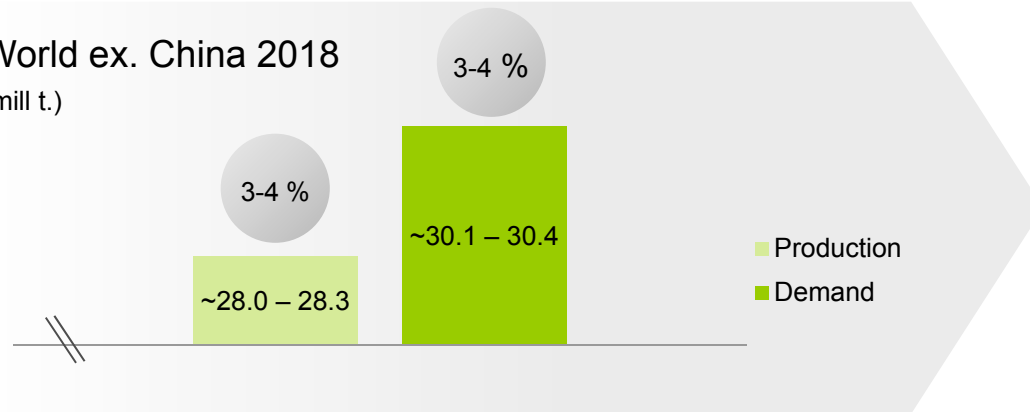


Source: Hydro analysis, IHS, Platts, Republished under license from CRU International Ltd

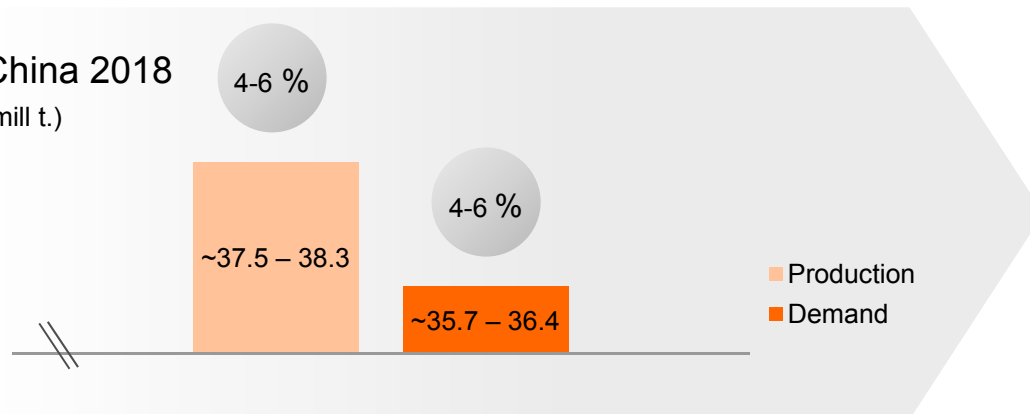
Primary aluminium market to be largely balanced in 2018

Market balances largely similar compared to 2017

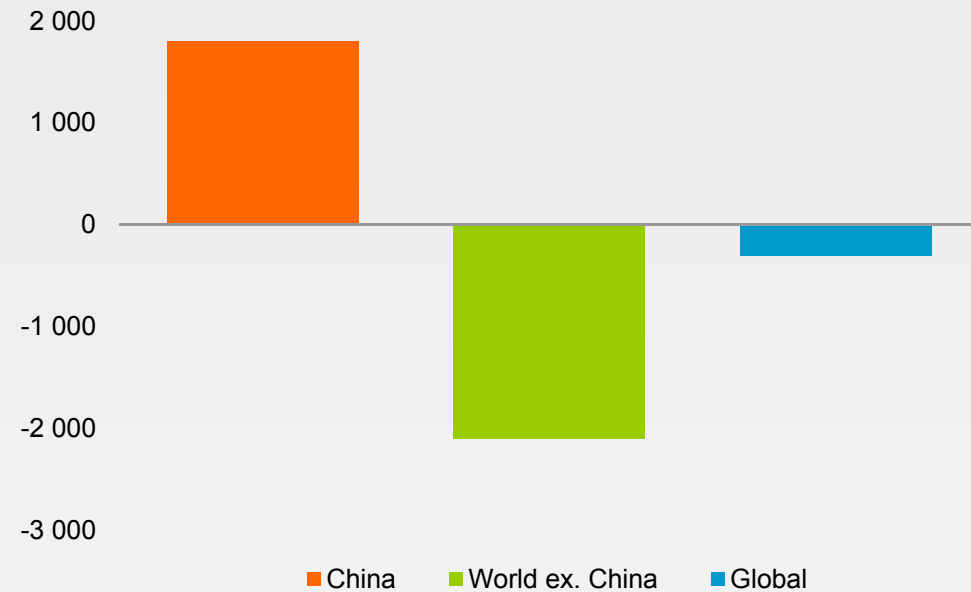
World ex. China 2018
(mill t.)



China 2018
(mill t.)



Primary market balance 2018
(‘000t)



Source: CRU, Hydro analysis

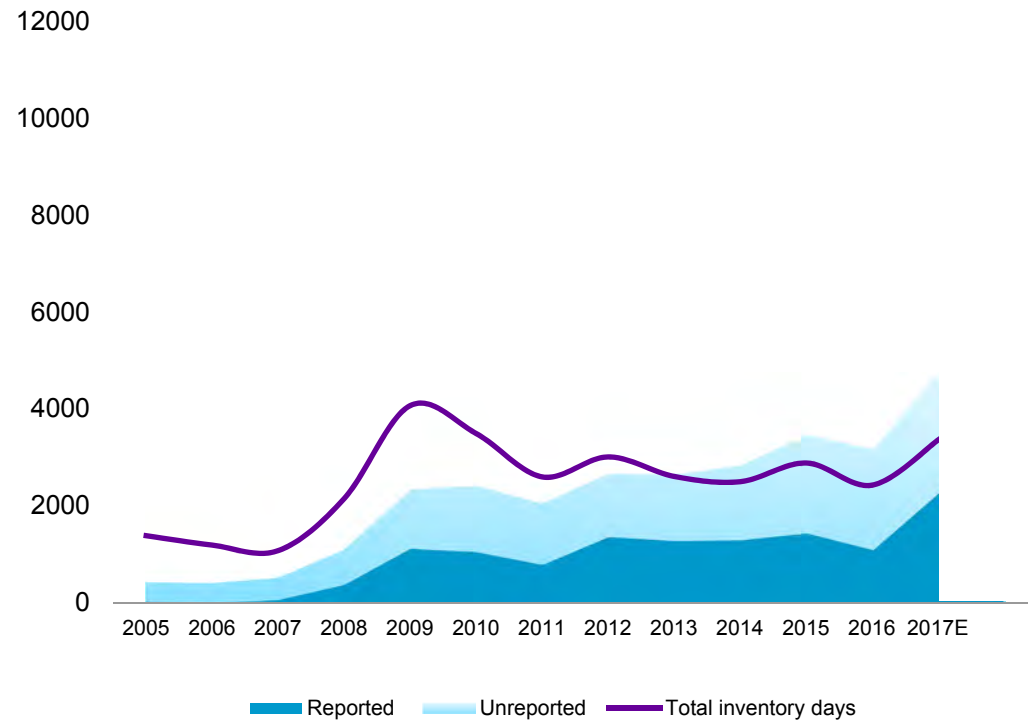
% Growth from 2017 to 2018

Stocks outside China continue to decrease, while Chinese stocks have moved higher

Chinese exports not fully filling up deficits outside China

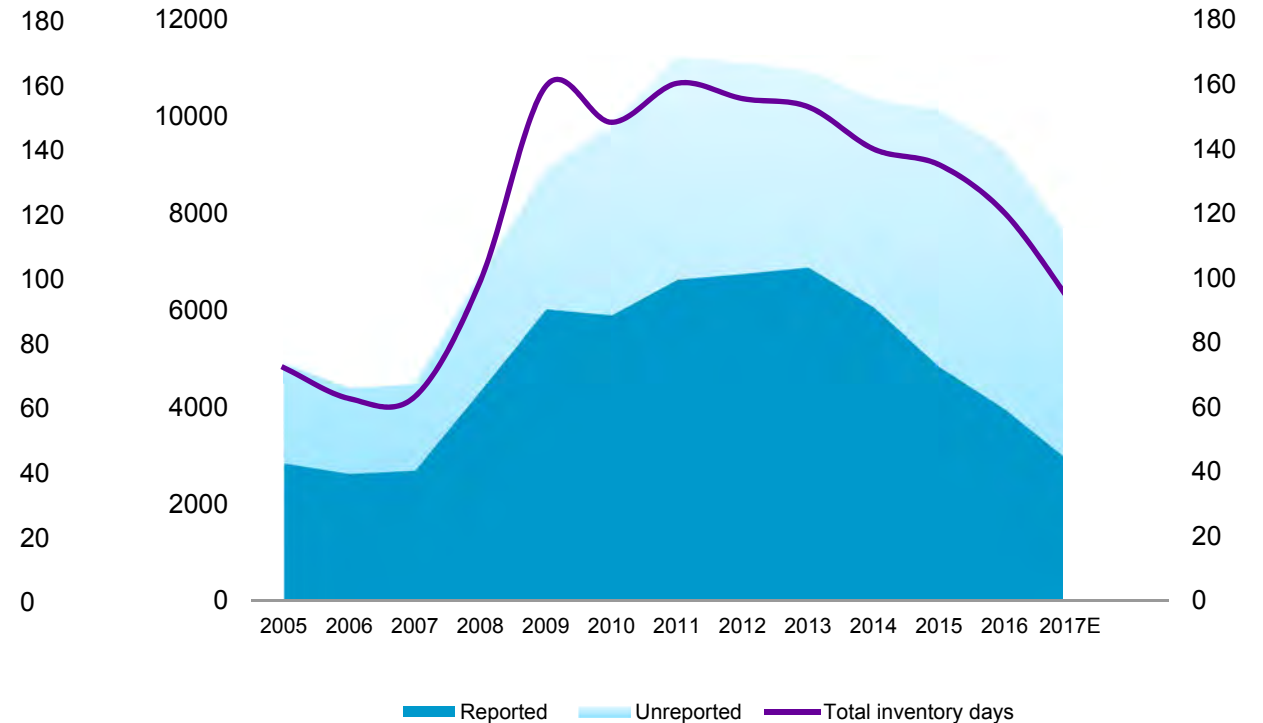
China

('000t)



World ex. China

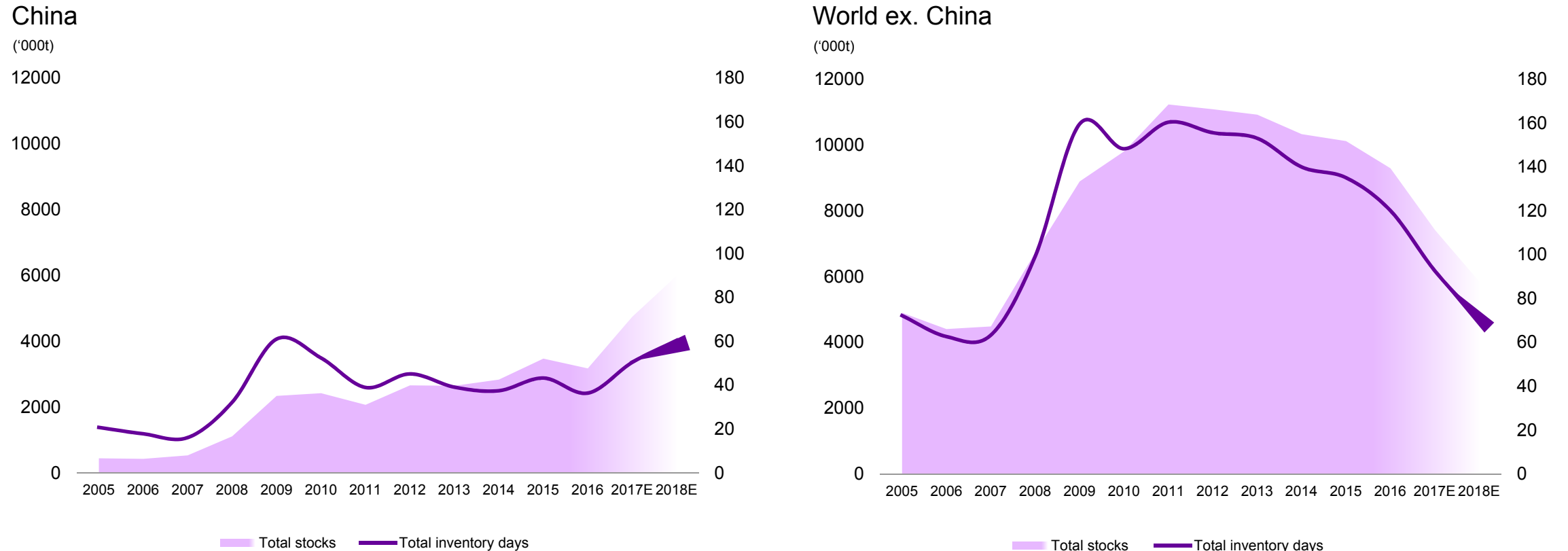
('000t)



Source: CRU, Hydro analysis

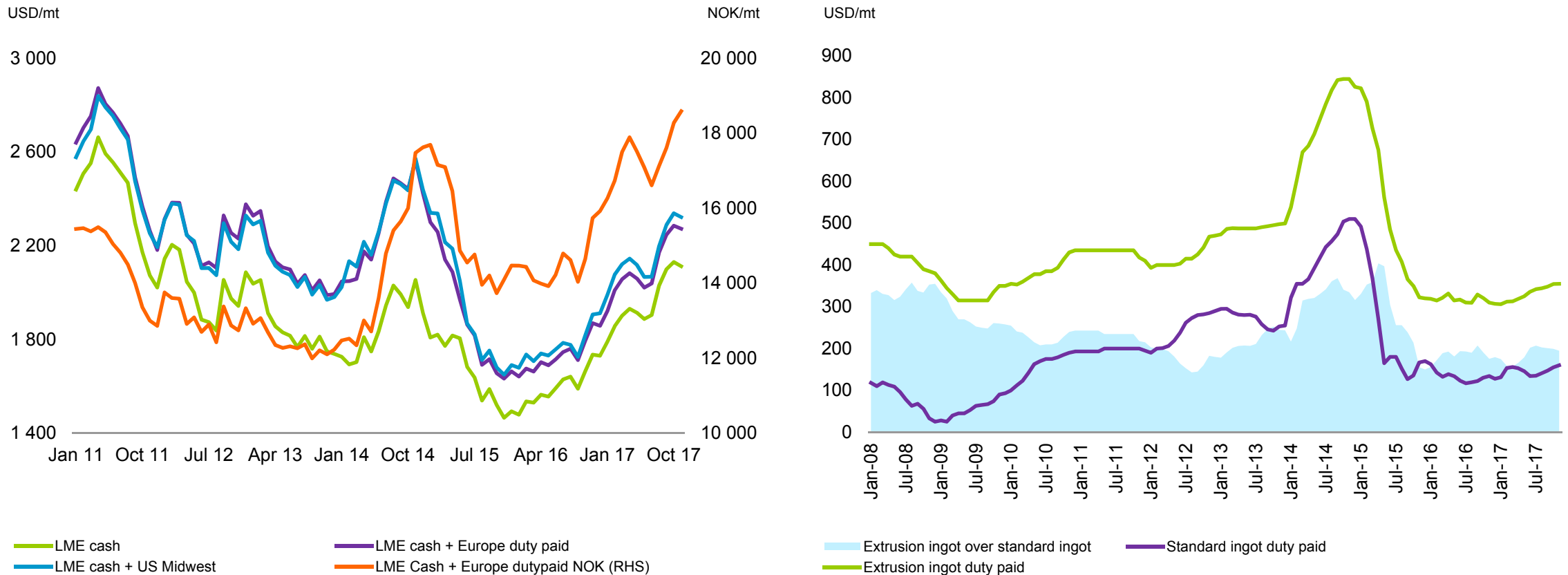
Inventory days approaching historically tight levels in world outside China in 2018

Chinese inventory days expected to increase, but not substantially



Source: CRU, Hydro analysis

All-in price level supported by higher LME and premiums in 2017, prices in NOK supported by continued weak NOK vs USD



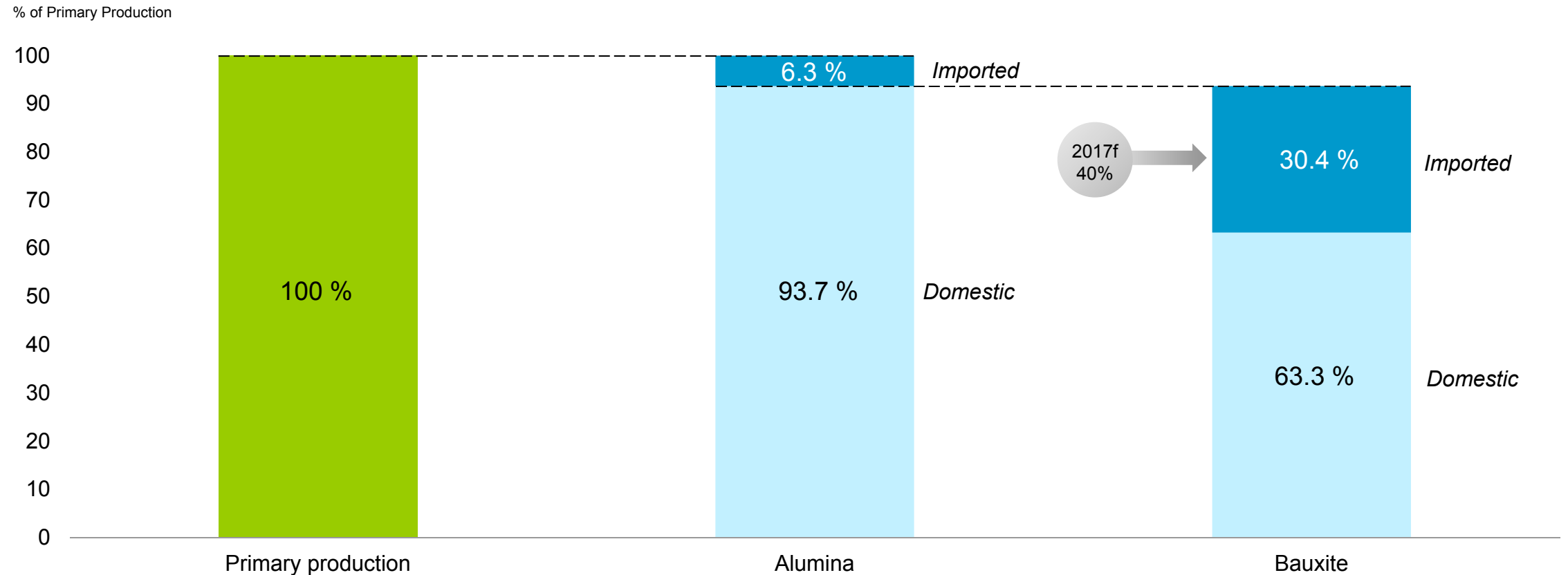
Source: Metal Bulletin, MW/MJP: Platts, Reuters Ecowin, Hydro analysis

03

Bauxite and alumina market

Chinese primary production dependent on imported resources

Around 37% based on imported raw material (average 2013-2017)

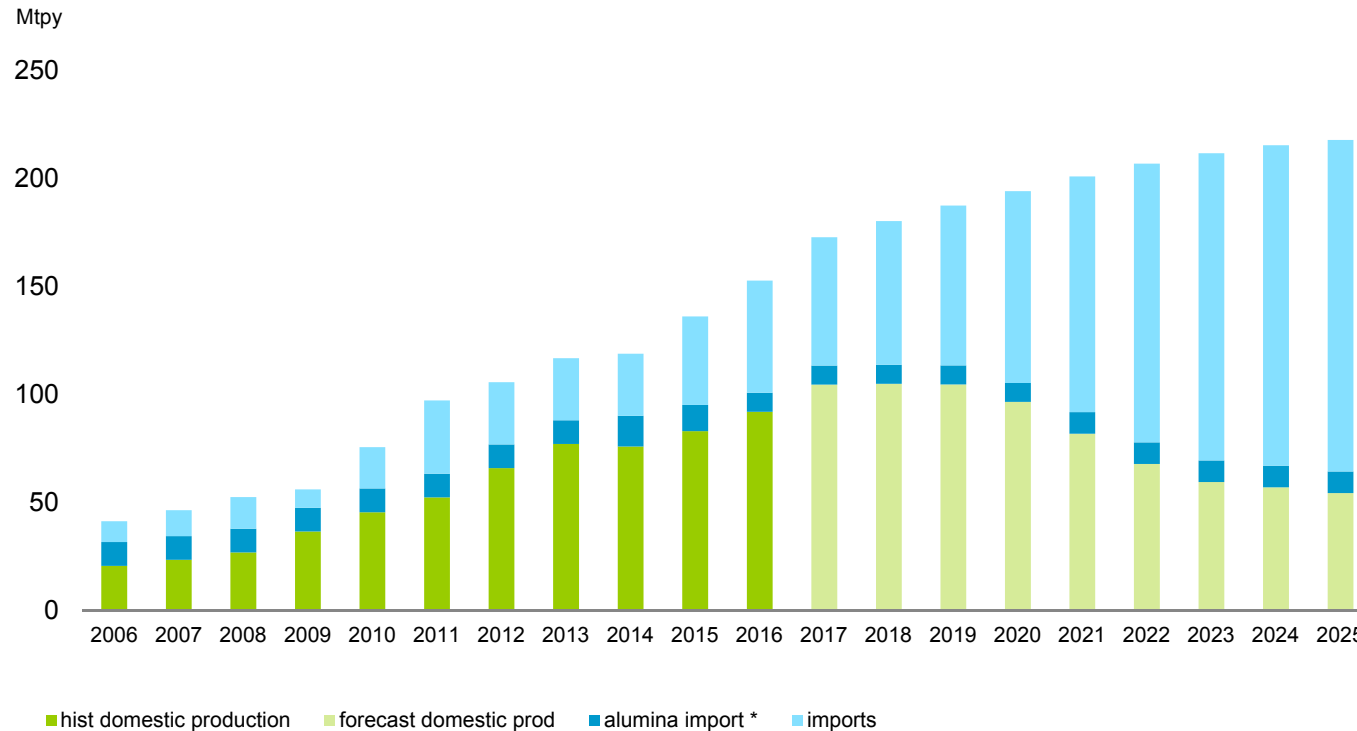


Source: CRU, China customs, 2017 forecast Hydro analysis

Bauxite production in China to decline, triggering more imports

Chinese bauxite imports set to increase

Chinese bauxite production and imports



- Depleting resources not sufficient to sustain operations in key provinces:
 - inland refineries may convert to imported bauxite or relocate to southern provinces
 - new refinery capacity in coastal region, dependent on imported bauxite
 - refinery capacity outside of China
- Bauxite (equivalent) imports could increase from ~70 Mtpy in 2017 to ~150 Mtpy in 2025

Source: CM Group (ept 2017, \$50/t cif bauxite scenario)

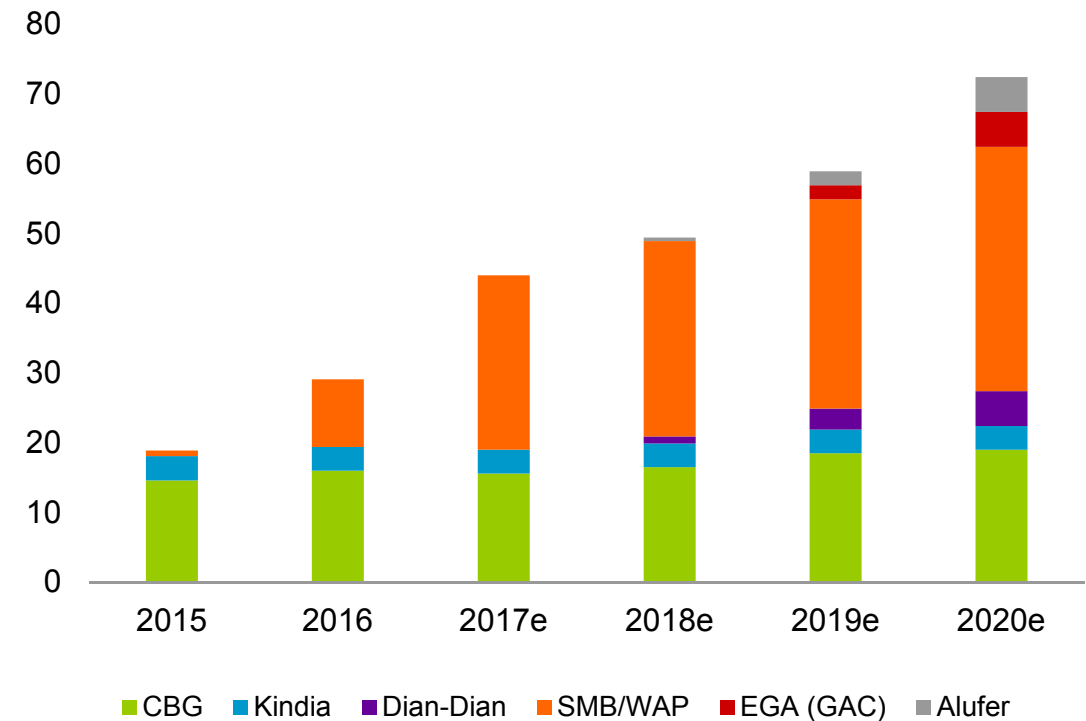
* alumina imports as bauxite equivalent

Guinea's bauxite production is rising

Projects to add 25-30 Mtpa of bauxite export capacity, resource base could support additional volumes

- Committed capacity increasing to ~70 Mtpy by 2020
- Substantial bauxite resources available
 - 20+ billion mt within 150 km of coast
 - Low reactive silica
- Chinese SOE bauxite and alumina projects more likely following USD20bn loan to Guinea
- Social instability could hamper investments
 - Higher HSE and community standards required

Guinea bauxite production (million mt)

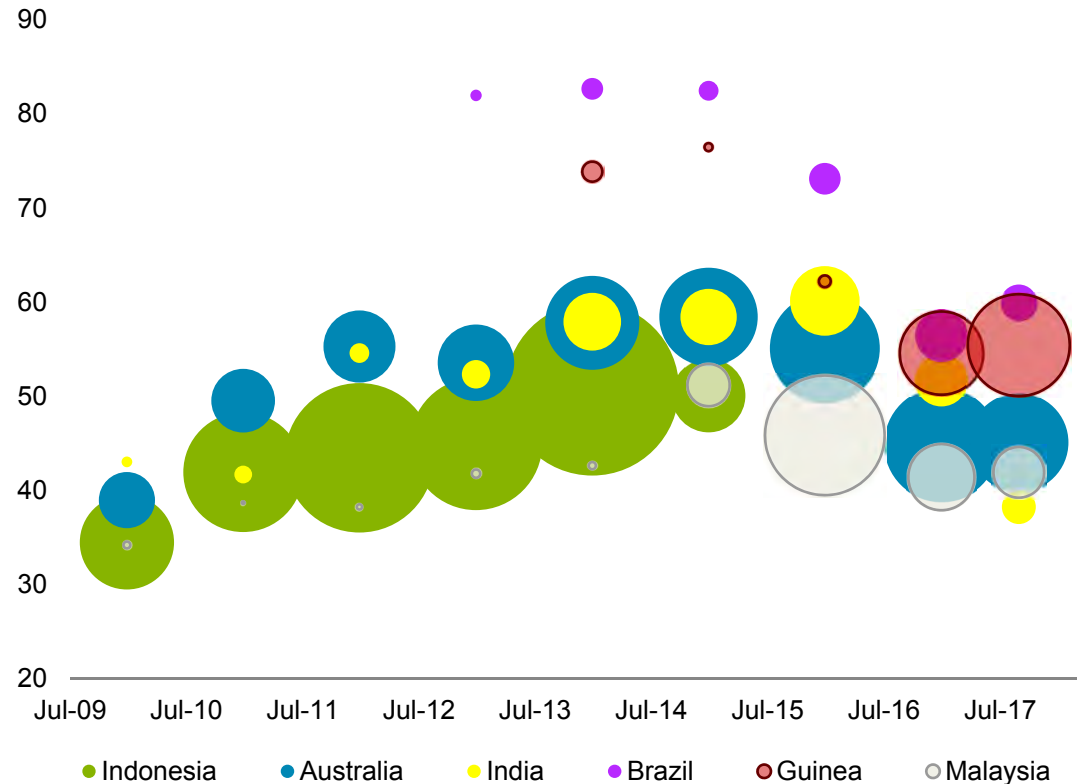


Source: CRU, Hydro analysis

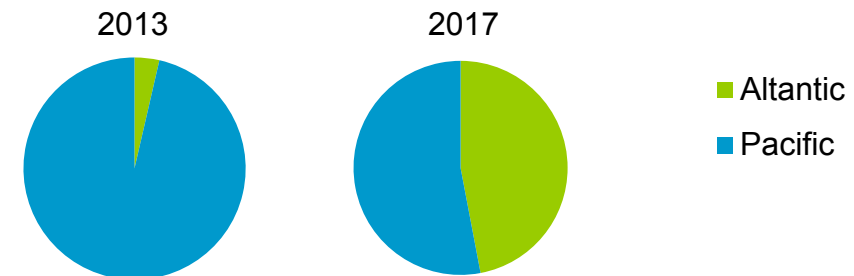
Chinese bauxite imports increasingly exposed to freight

Freight represents ~20 to 60% of the CIF price, freight rates increasing from low levels

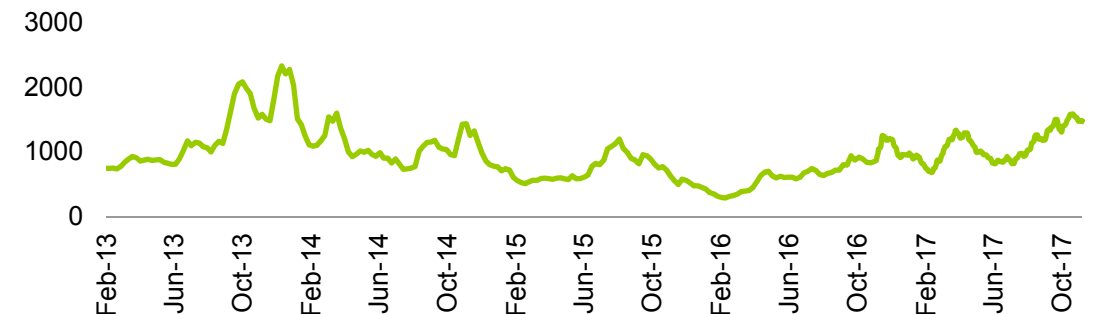
CIF China, USD/t



Origin of Chinese bauxite imports



Baltic Dry Index

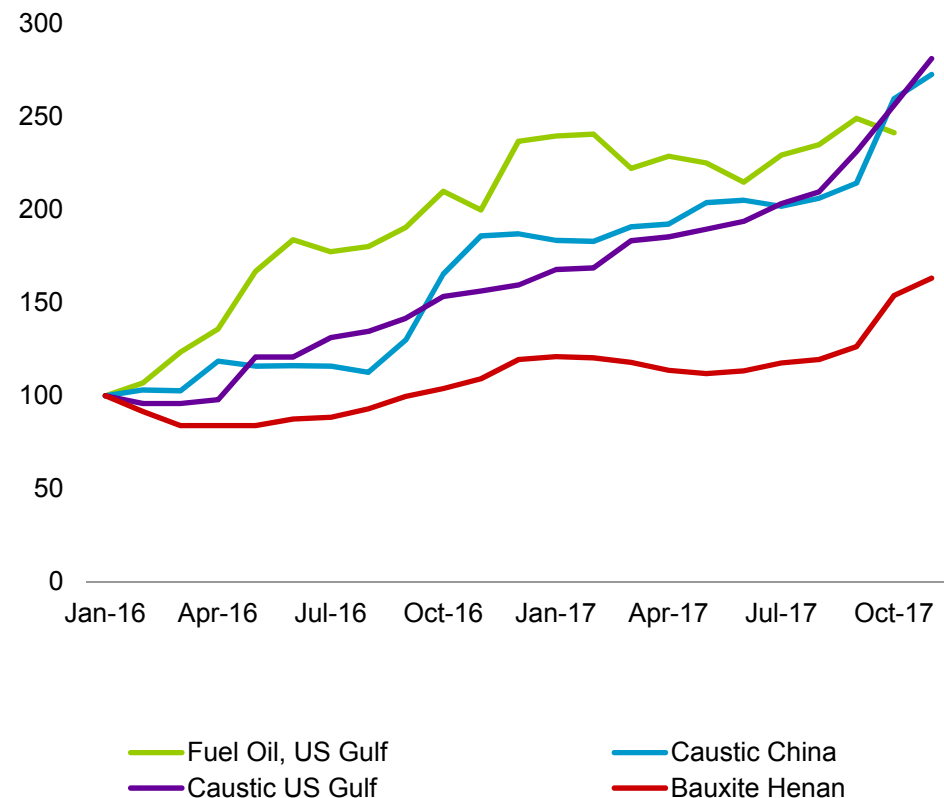


Source: China customs, Bloomberg, Hydro analysis
Note: 2017 is Jan-Sep annualized

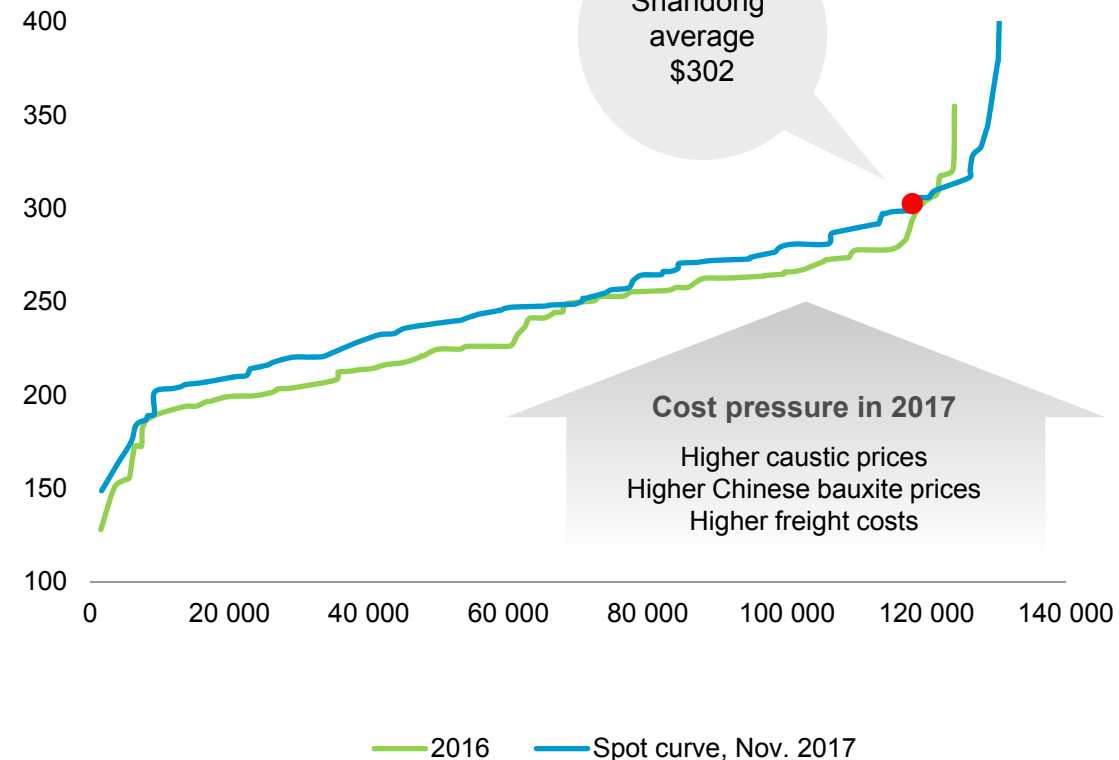
Higher alumina cost curve in 2017 compared to 2016

Higher end of the cost curve dominated by Chinese refineries

Index: Jan 2016 = 100



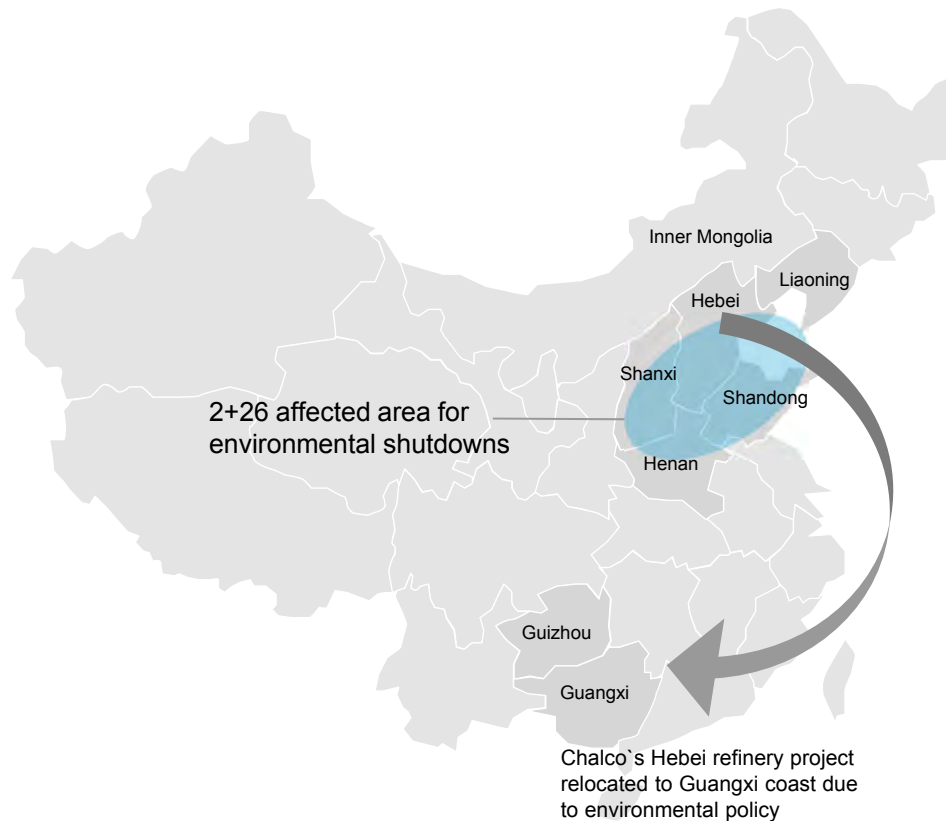
USD/t



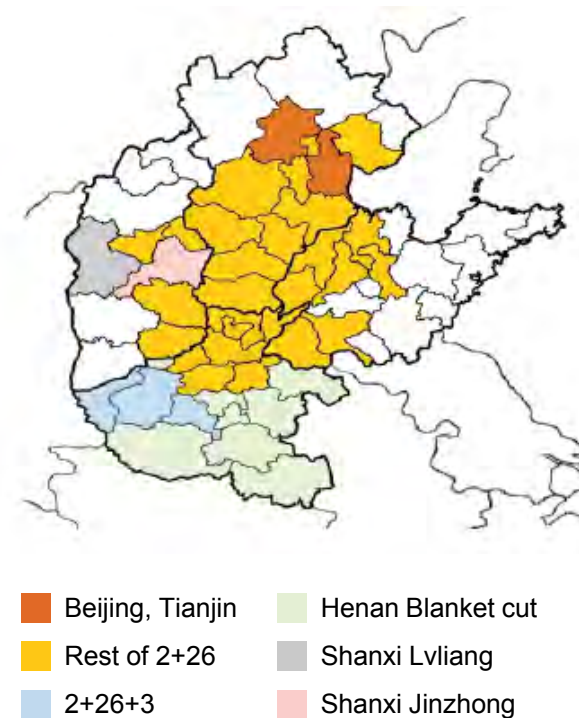
Source: Bloomberg, IHS, CM, CRU

Chinese winter shutdowns affecting alumina supply

Overall alumina impact likely to exceed smelter winter shutdowns



Current Extended Scope of 2+26 City Policy



Alumina production lost to winter cuts (annualized production effect)

('000kt)

2500

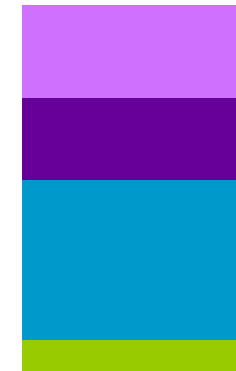
2000

1500

1000

500

0



Shanxi

Shandong - other

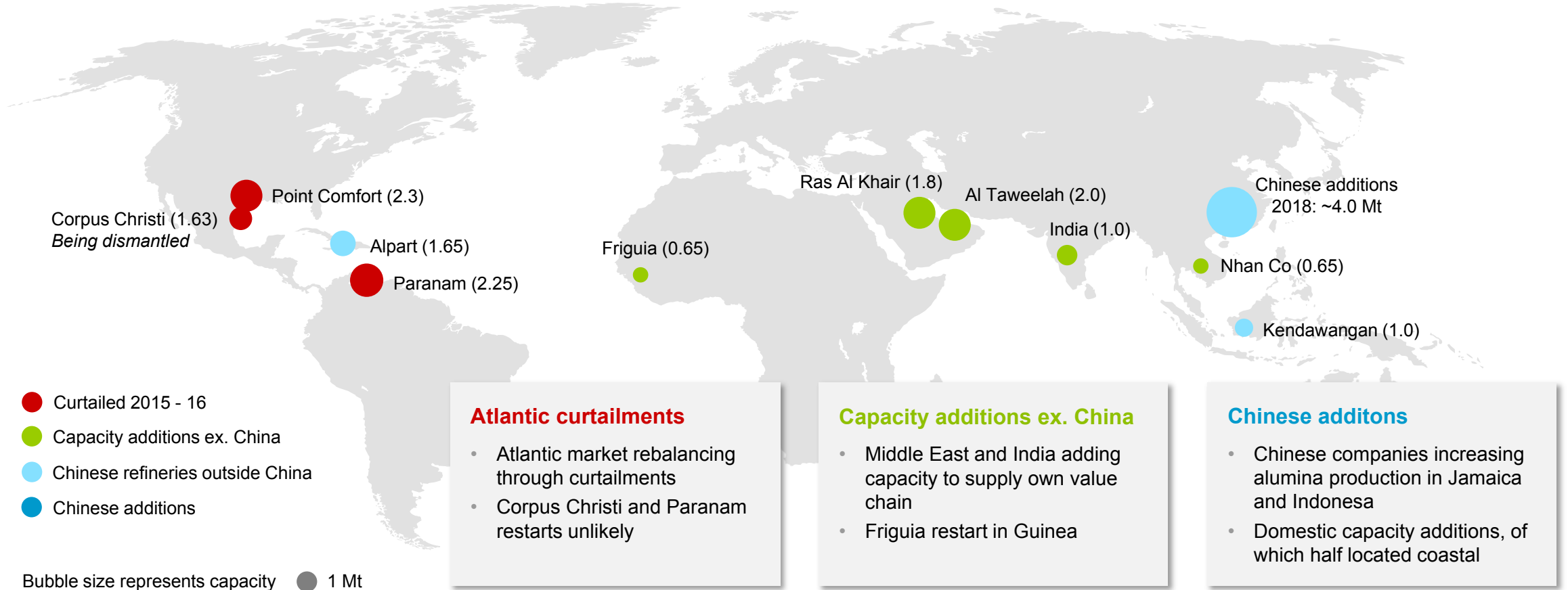
Henan

Shandong - Weiqiao

Source: CM, CRU

Alumina market balancing, Chinese additions also outside China

Limited capacity increases outside China



Source: Hydro analysis

Alumina prices rise amid policy implementation uncertainty

Market tightness, high metal prices, and increasing costs support prices

Recent alumina price drivers

Market balances

- New smelter projects ramping up in China
- Re-stocking ahead of winter
- Tighter market balance in China, less volumes available outside China

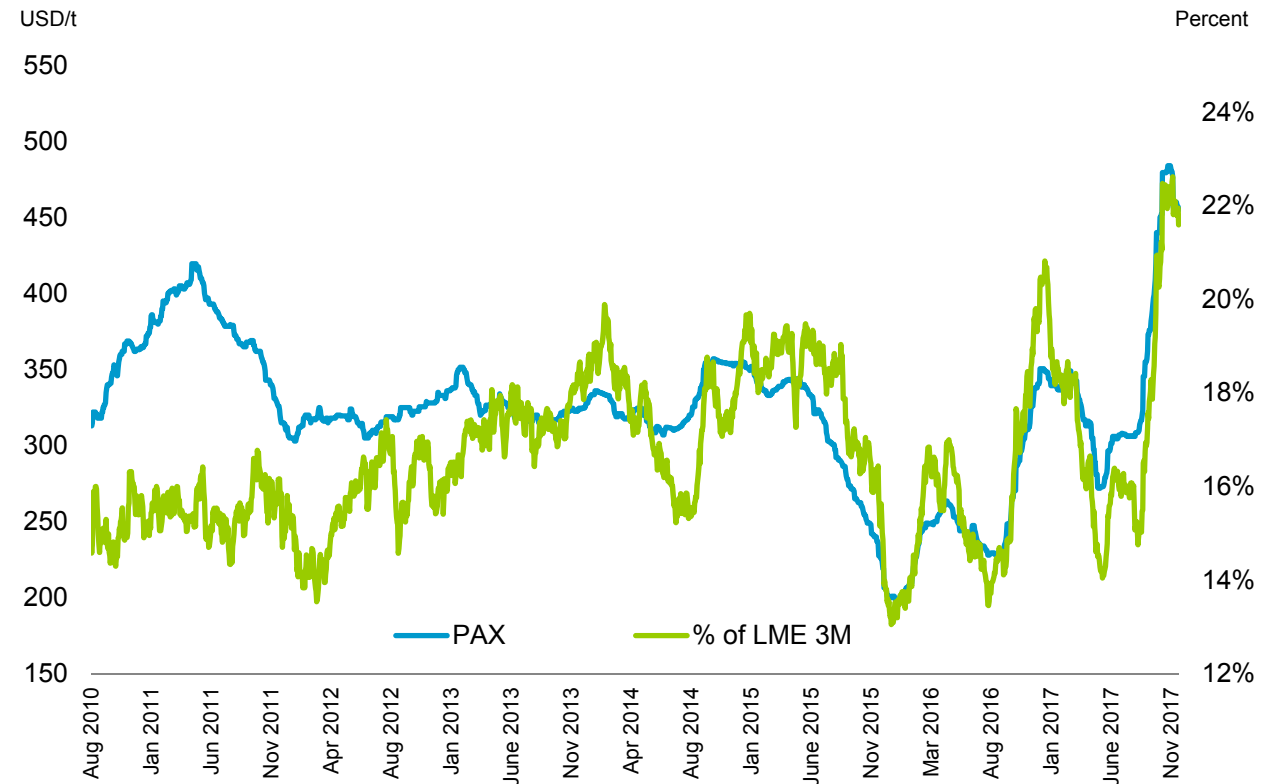
Cost inflation

- Higher caustic soda costs
- Higher transport costs in China (road & rail)
- Higher Chinese domestic bauxite prices

Other factors

- Environmental inspections, shut down of unsafe and small bauxite mines
- Uncertainty regarding upcoming winter heating season cuts

Platts alumina index (PAX, to 22 Nov 2017))



Source: Platts, Bloomberg






04

Long-term outlook and summary

Strong growth drivers across segments providing solid demand outlook

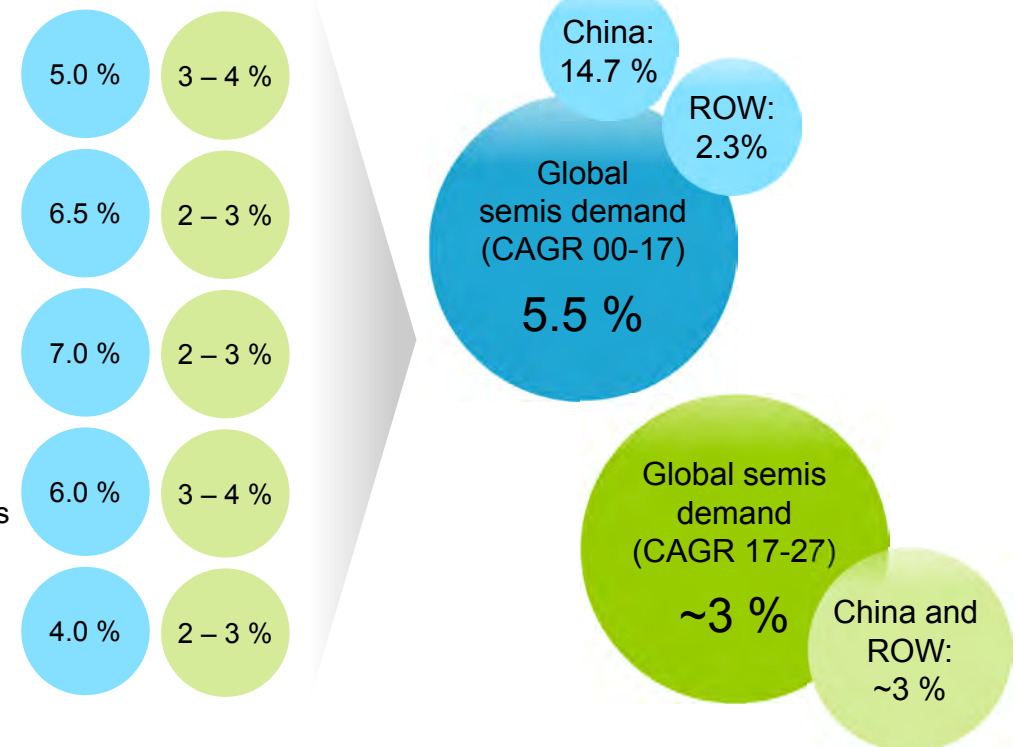
Still encouraging demand outlook from strong base – converging demand China and outside China

Strong demand drivers in key aluminium segments

| | | |
|--|----------------------------------|--|
|  | Transport | Growth in automotive vehicle production Aluminium content in cars increasing Growth in other transport modes, e.g. railway |
|  | Construction | Urbanization Housing market recovery in mature regions Energy neutral buildings |
|  | Electrical | Urbanization Copper substitution |
|  | Machinery & equipment | Improving industrial sentiment in mature regions Manufacturing activity and industrial growth in emerging countries |
|  | Packaging & foil | Urbanization Environmentally-friendly solutions |

Global semis demand per segment, CAGR

2000-17 2017-27



Source: CRU, Hydro Analysis

Growth in global semis demand creates opportunities for both primary and recycled material

Solid growth for semis, primary and recycling

CAGR 2017 – 2027

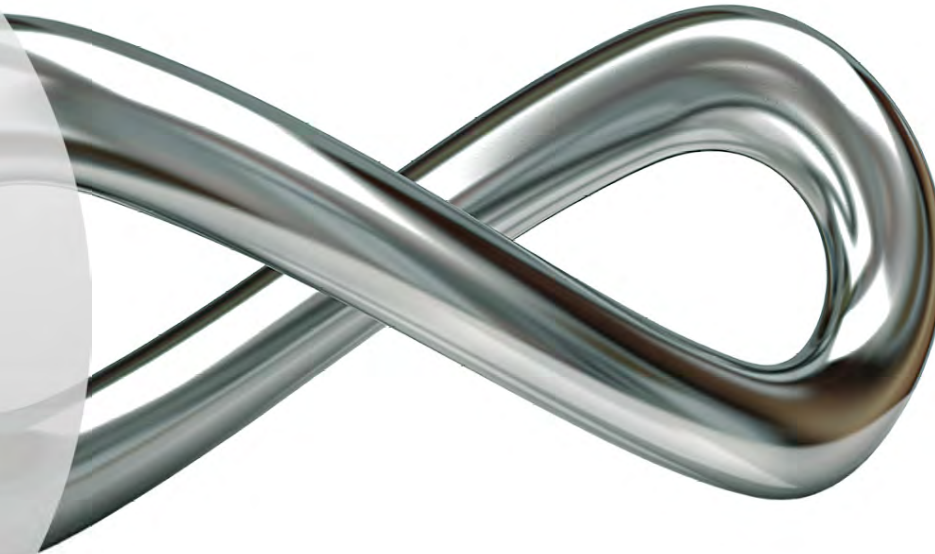


Source: CRU, Hydro Analysis

* Post-consumer and fabrication scrap

** Unallocated creep estimated at same level as unallocated disruptions

- Solid long-term demand outlook supported by strong growth drivers across segments
- Chinese primary supply moderating due to policy reform
- Global primary market largely balanced this year and next
- Cost curve pressured upwards by rising alumina and coal prices, with regional differences
- Recycling growth accelerating with increased generation of post-consumer scrap
- Chinese bauxite import dependency continues to increase
- Alumina market impacted by cost push and tighter market balances



Better Bigger Greener