

Presentation at Metal Bulletin International Aluminium Conference

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Bauxite and Alumina Fundamentals

Andrew Wood

Group Executive Strategy & Development

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AWAC Joint Venture (Alumina Ltd 40% interest)

BAUXITE PRODUCTION (million BDT#)

2H 2017 & 1H 2018	
Huntly & Willowdale	33.5
Juruti	5.6
MRN*	1.3
CBG*	3.3
Total	43.7

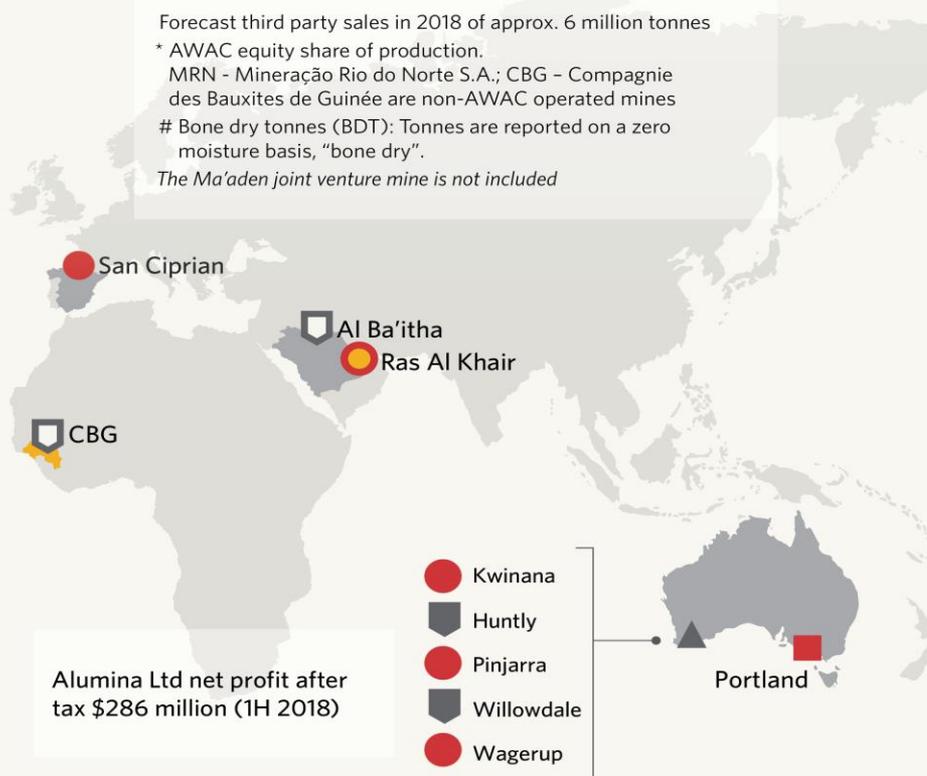
Forecast third party sales in 2018 of approx. 6 million tonnes

* AWAC equity share of production.

MRN - Mineração Rio do Norte S.A.; CBG - Compagnie des Bauxites de Guinée are non-AWAC operated mines

Bone dry tonnes (BDT): Tonnes are reported on a zero moisture basis, "bone dry".

The Ma'aden joint venture mine is not included



ALUMINA PRODUCTION (million tonnes)

2H 2017 & 1H 2018	
Pinjarra	4.5
Wagerup	2.8
Kwinana	2.1
Alumar	1.4
San Ciprian	1.6
Total	12.4

Total

12.4

Production of AWAC's operated refineries. Therefore, the Ma'aden Joint venture is not included



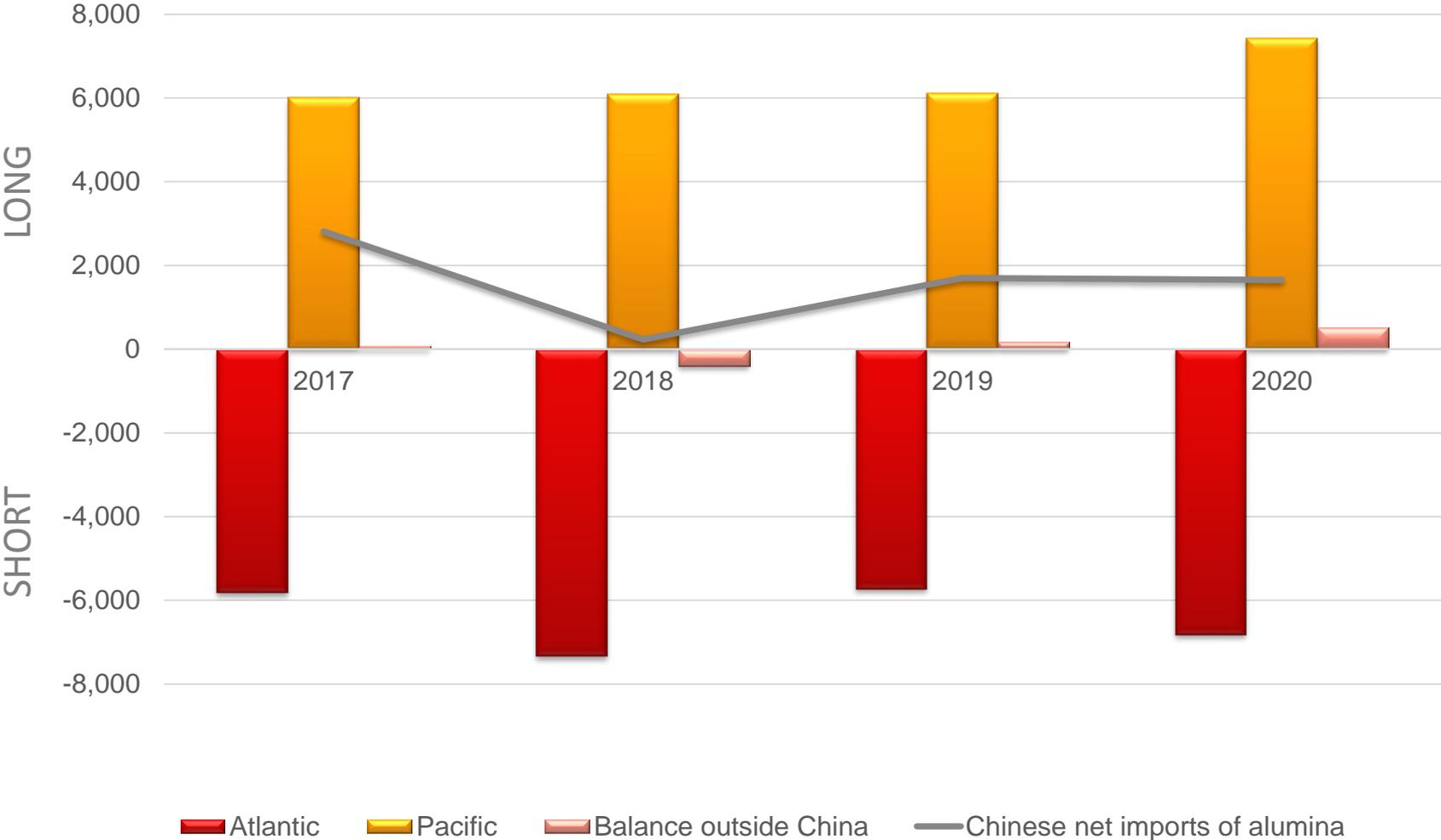
Alumina Ltd net profit after tax \$286 million (1H 2018)

AWAC average alumina cash cost of production \$224/t (1H 2018): lowest quartile global cash cost curve

Global alumina market short 2018 and expected to move to balanced 2019-20



Global Alumina Balance (Thousand Tonnes)
 Deficit of 1,250 in 2018, surplus of 180 in 2019 and 420 in 2020



Source: CRU, August 2018

Current/near term supply issues: spot index price moves on fundamentals

Platts PAX FOB Australia prices

1H 2018 average price \$445/t, one month lag (low \$357/t, high \$710/t)

January - February

- Rising China domestic metal stocks pressuring domestic metal prices and outlook
- China slowing for Lunar New Year, even less import interest
- Quebec ABI smelter issues

March

- Alunorte halves output on environmental issues

May

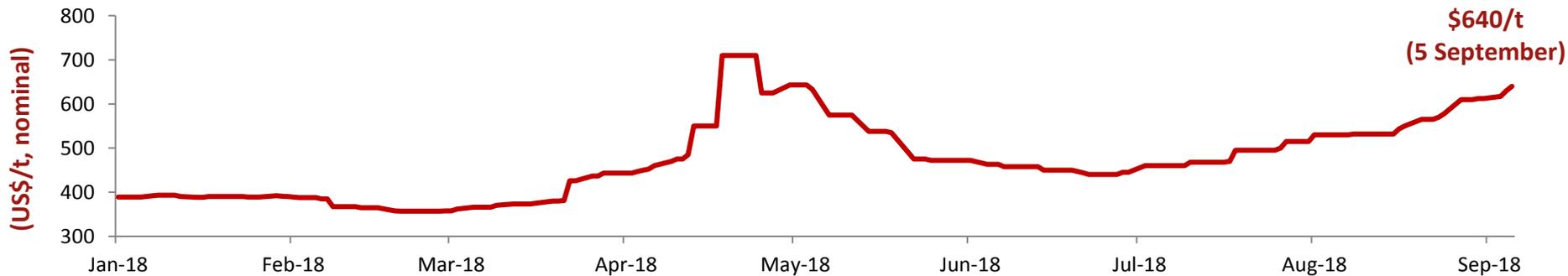
- China starts alumina exports

June

- Buyers bide their time, hope Alunorte resolution may be imminent

July

- Alpart technical issues, delays alumina shipments
- Chinese bauxite, refining cuts due to environmental audits
- Hydro, Brazilian authorities continue to spar over Alunorte
- Market participants acknowledge dispute will take time to resolve



April

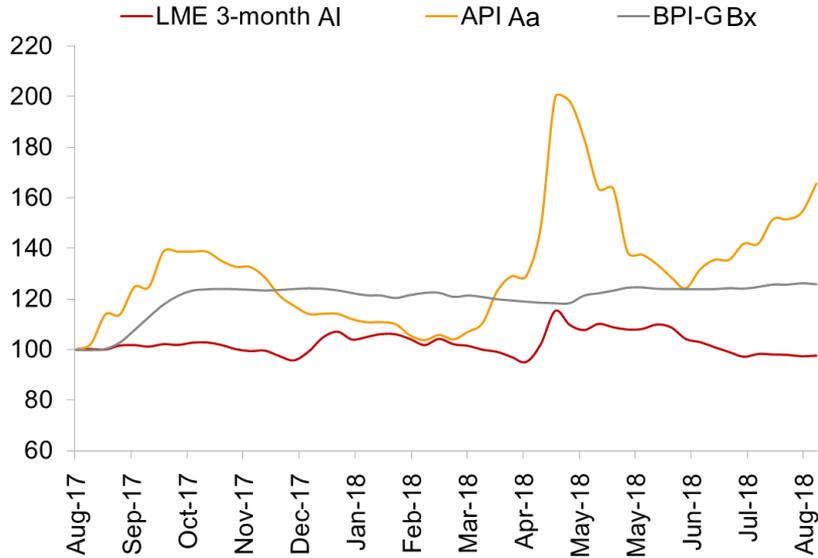
- US imposes trade sanctions on Rusal, adds to supply uncertainties
- Brazil Albras smelter halves output

August

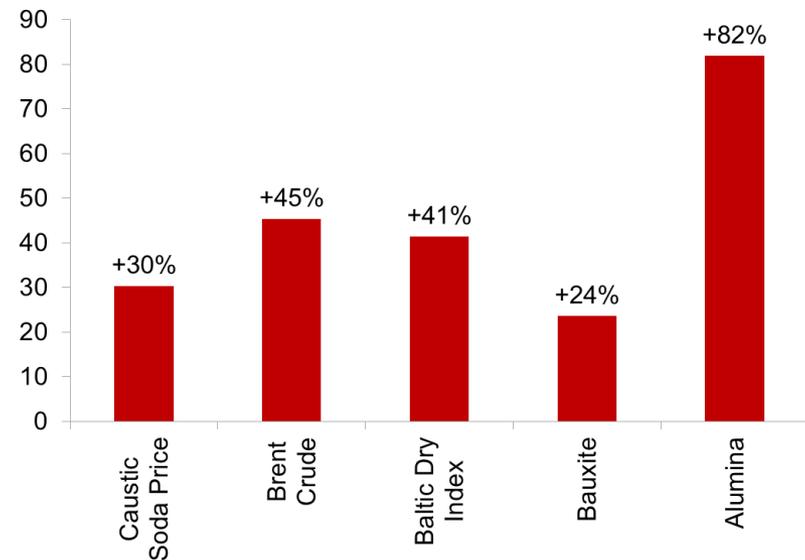
- Alcoa of Australia (AWAC) workers strike in WA
- Upward pressure from low production in Australia, Brazil, Jamaica and Vietnam
- Bauxite supply concerns, low alumina stocks, rising alumina exports support Chinese prices
- Nervousness about potential Rusal supply disruptions after October 23rd
- On-going uncertainty over Alunorte resolution

Alumina price exceeds cost push and outperforms bauxite and aluminium

Index of Bauxite, Alumina and Aluminium Prices
31 August 2017 = 100



Alumina price gain exceeds alumina cost gain
Year-on-year change, %

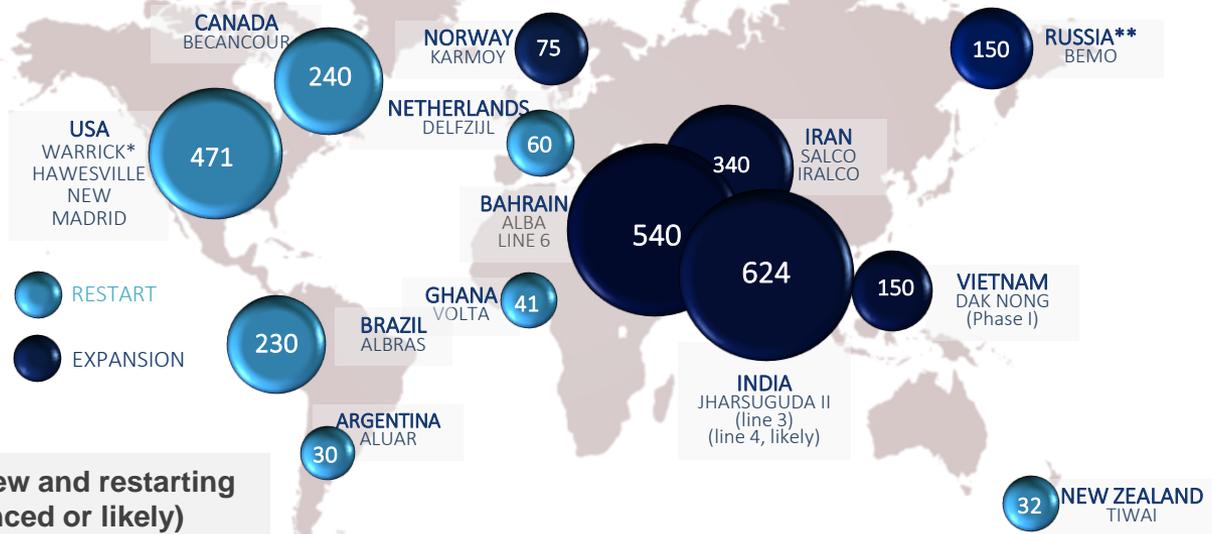


August 2017 versus August 2018

Expected ex-China smelting growth to be broadly matched by extra alumina

In 2018 and 2019, ≈ 3 million extra aluminium annual tonnes may be added (mainly expansions in Middle East, Asia)

ROW PRIMARY ALUMINUM RESTARTS/EXPANSIONS IN 2018-2019
(annualized capacity in thousand mton)



Assumed total new and restarting capacity (announced or likely) approx. 3 million tonnes

Source: HARBOR Aluminum July 2018

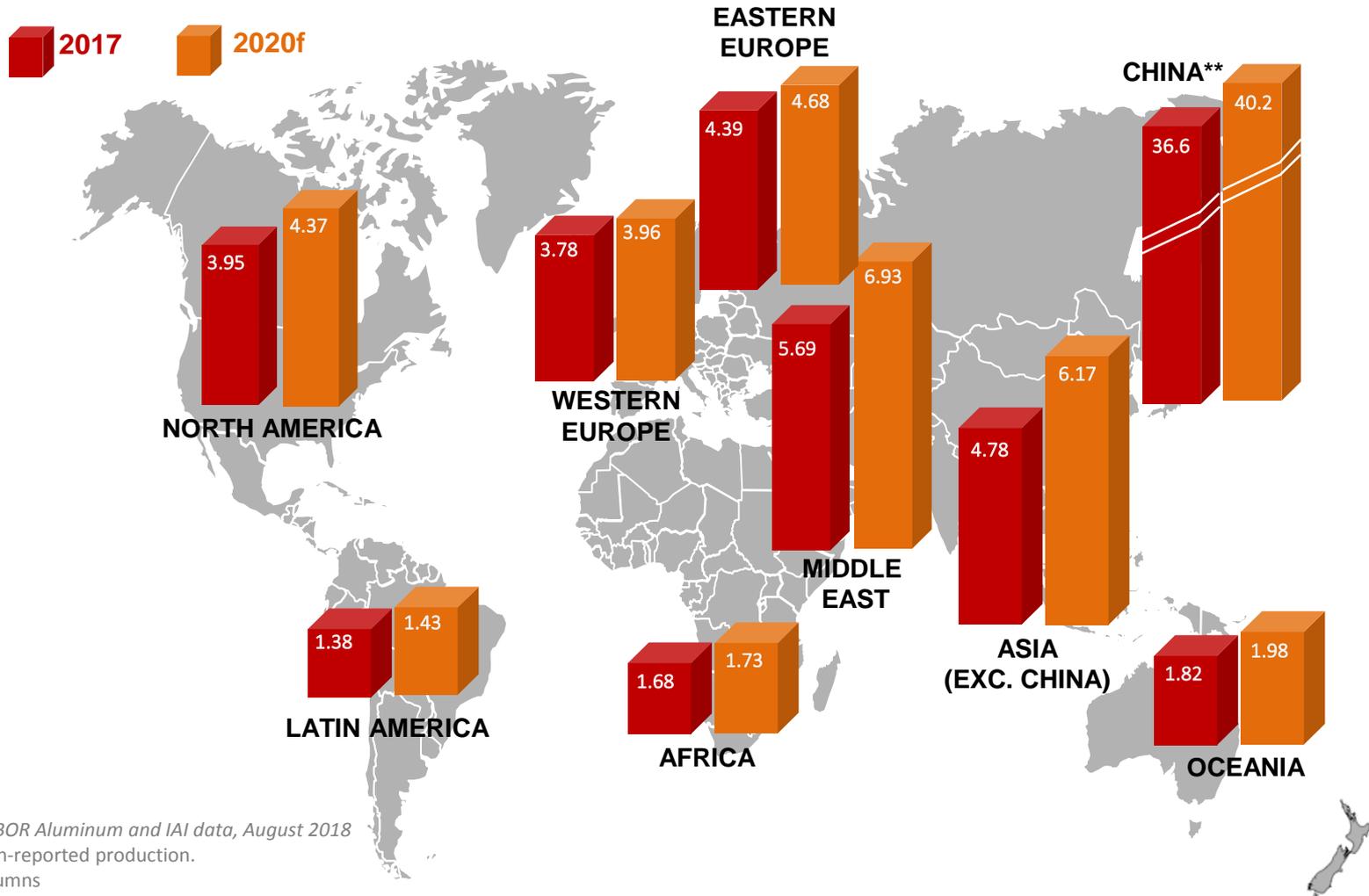
Assumes 2019 additional production from Albras once Alunorte resumes full production and from Becancour when strike is resolved

*Warrick 161-kmtpy restart began late in 2017.

**Assuming Rusal's BEMO Phase-1-Stage -II project has not been suspended, but its ramp-up will likely depend on sanctions dismissal.

Over 3 years, most smelting growth in Middle East and Asia/China

GLOBAL PRIMARY ALUMINUM PRODUCTION* BY REGION (million tonnes)



Source: HARBOR Aluminum and IAI data, August 2018

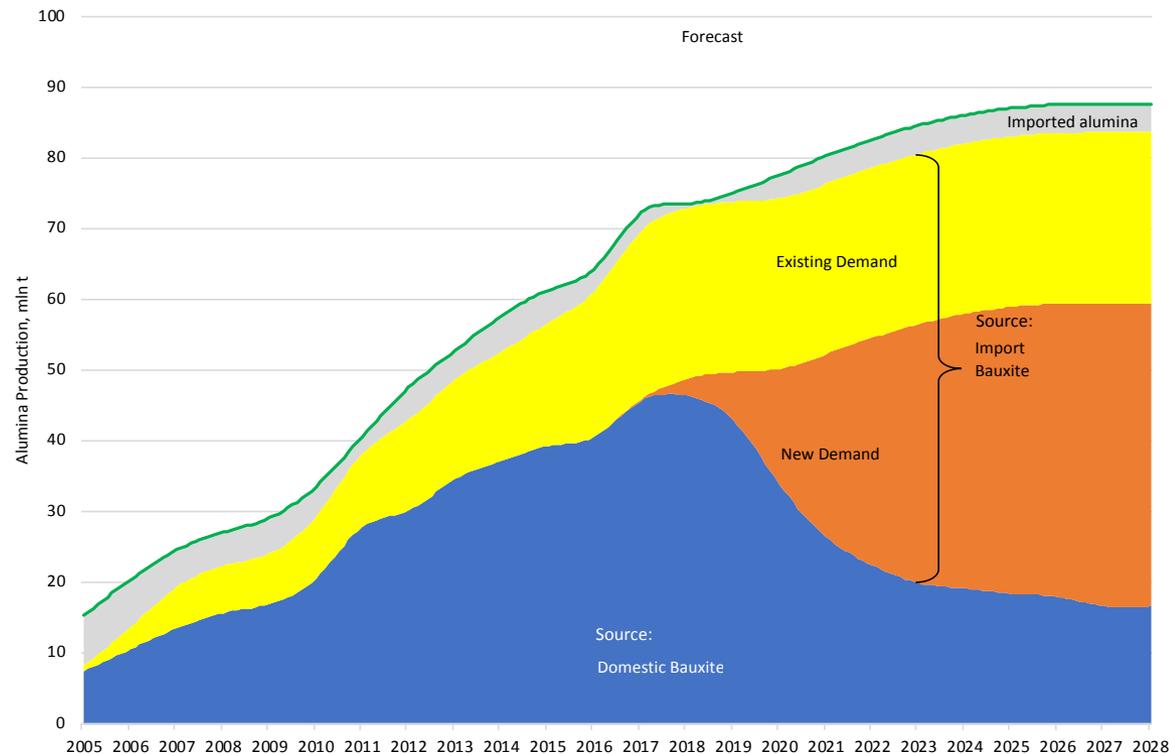
*Includes non-reported production.

**Scaled columns

Bauxite imports to increase as China depletes economic domestic supply

- China's aluminium production forecast to plateau at 43 million tpa by 2025 (30kg/capita)
- This equates to 87 million tpa of alumina consumption with a 5% allowance for non-SGA use
- By around 2028, approx. half of the extra imported bauxite will be for new alumina demand and the remainder will be for replacements of depleted or uneconomic domestic bauxite
- Also some domestic bauxite supply unavailable for environmental reasons
- CM forecast bauxite imports of 164 million t (11m t to security stockpiles) in 2023 compared with 69 million t imported in 2017 (8-9m t to stockpiles)
- Alumina imports not likely to increase significantly unless insufficient alumina capacity is approved in China – may encourage Chinese to build/buy offshore refineries – then higher alumina imports would reduce required bauxite imports

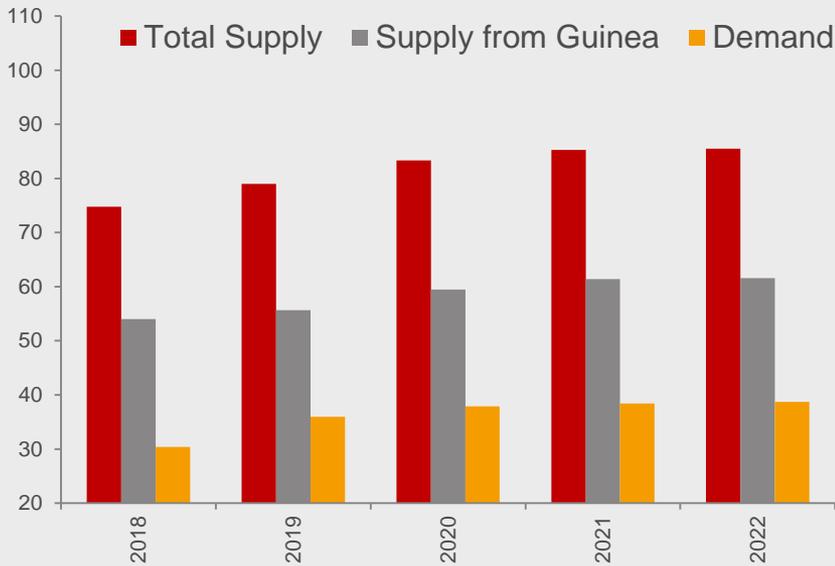
Meeting China's alumina demand growth*: will increase alumina costs



Guinea and Australia expected to continue to dominate bauxite supply to China

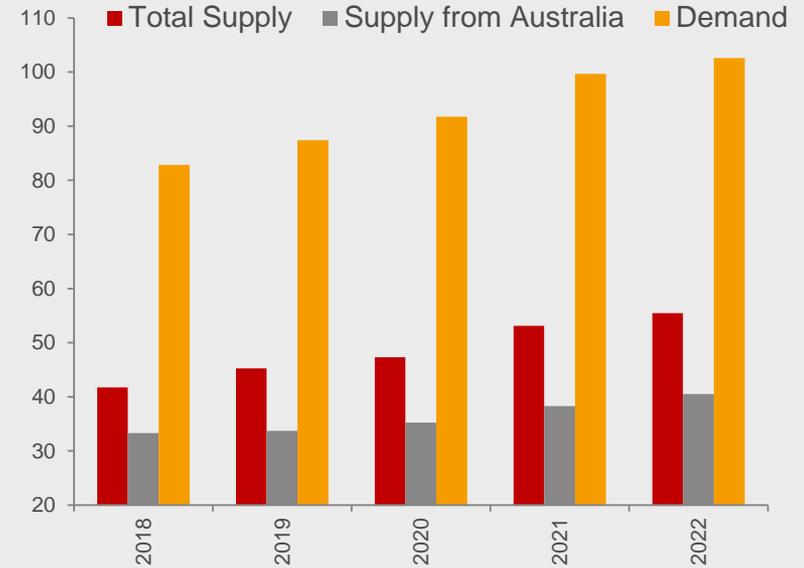
Guinea driving Atlantic third party supply

Atlantic third party bauxite supply and demand, Mt



China driving Pacific third party demand

Pacific third party bauxite supply and demand, Mt

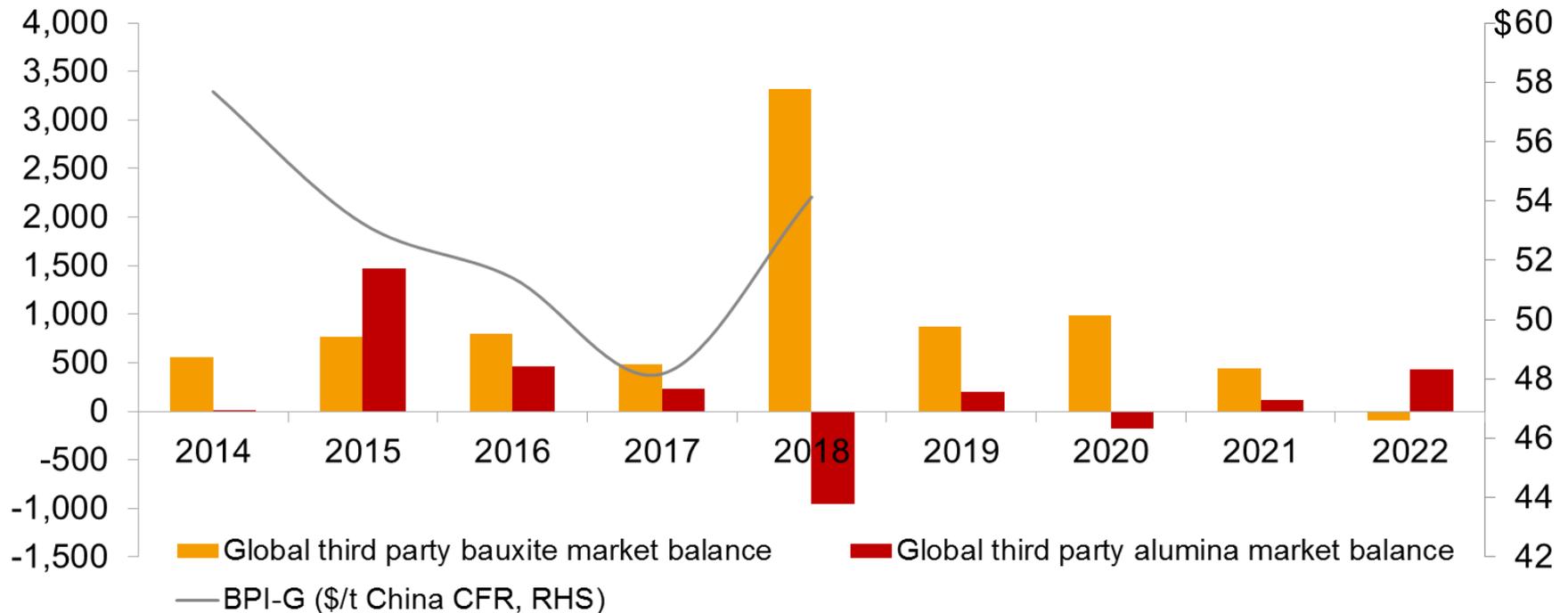


3rd party bauxite market well-supplied currently

Additional 12 million t bauxite supply in Guinea in 2018. Alunorte curtailment (despite Brazilian bauxite supply cuts) contributed to surplus in 3rd party bauxite balance. Market to tighten on higher Chinese imports.

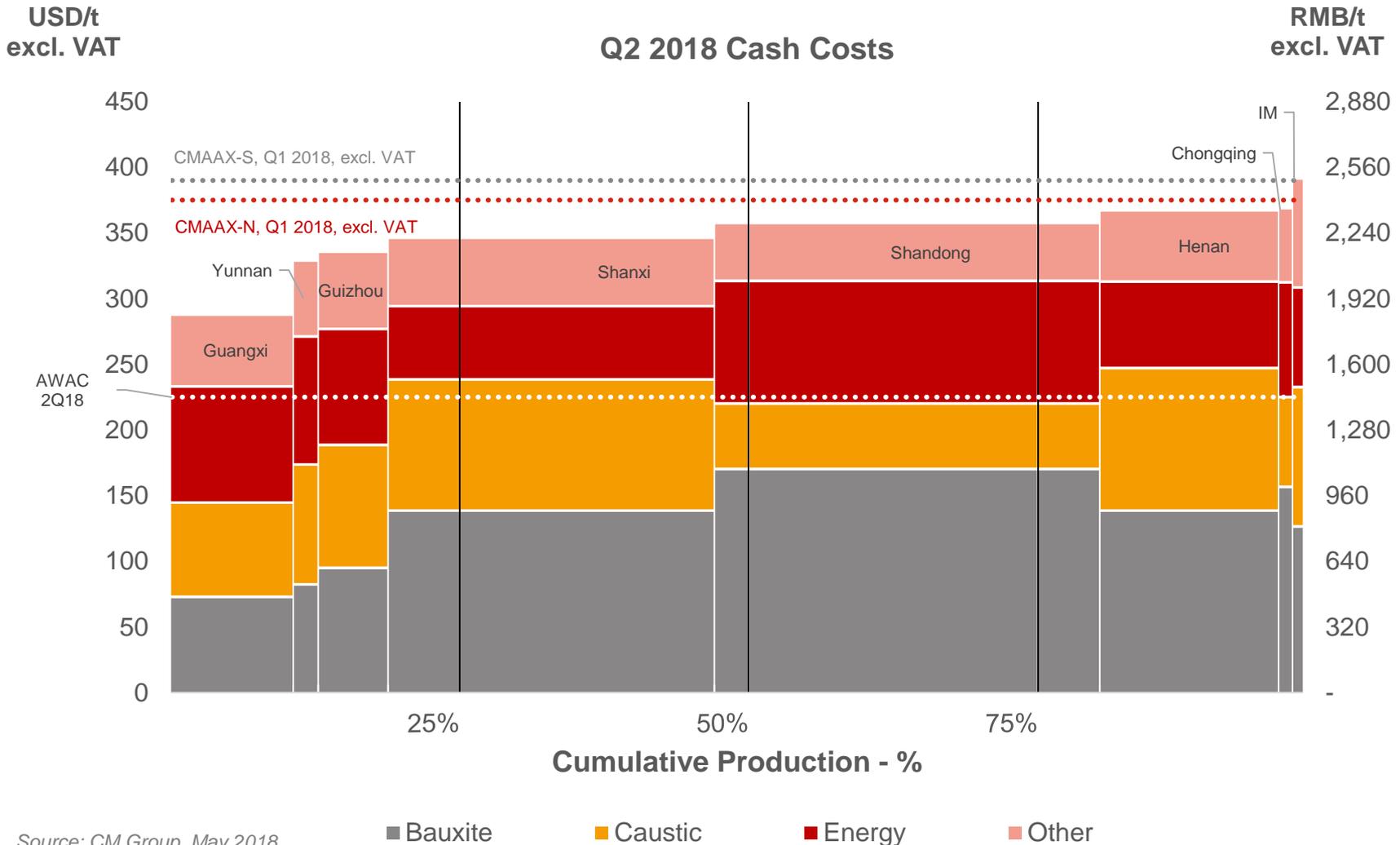
Oversupplied bauxite market in the near term

Global third party bauxite and alumina market balance, '000 tonnes

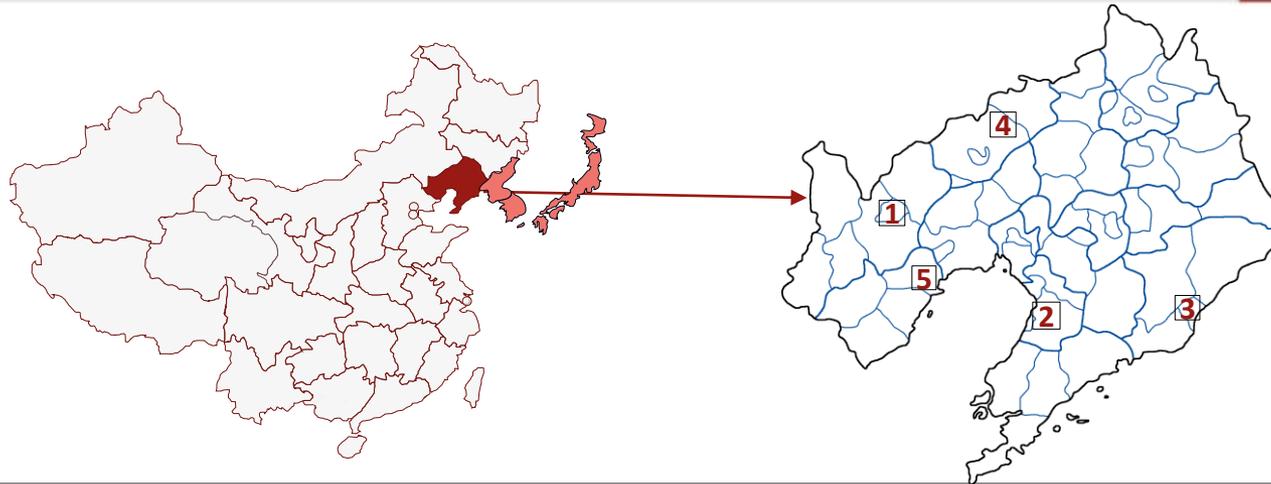


Flattening Chinese alumina cost curve due to higher bauxite costs (Q2 2018)

Alumina costs up 3% in Q2, with bauxite costs in Shanxi jumping 10% due to environmental inspections. Shanxi refineries no longer enjoy a cost advantage over Shandong coastal refineries, with higher bauxite prices and lower quality bauxite, needing more caustic



Liaoning refinery project setbacks



Company	Location	Owner	Capacity MTPY	Status	Bauxite Source
1 Jingang Aluminium	Chaoyang	SPIC & Jinzhou Port	10	Planning	Guinea, Australia
2 Dananshan Alumina	Yingkou	Bosai Group	2.5	Constructing	Ghana and others
3 Danfeng Aluminium	Dandong	Jinjiang Group	6	Planning	-
4 Fuxin Alumina Project	Fuxin	TBEA	6	Planning	Guinea and others
5 Zhongshi New Material (CGA)	Huludao	-	0.0045	Planning	-
Total			24.5		

- ❑ In early August, 5 new coastal alumina refinery projects in Liaoning province were “cancelled” with immediate effect (total 24.5m tpa capacity affected)
- ❑ Reason: environmental protection regulations prompted by local residents’ protests
- ❑ Unless projects can be relocated (e.g. to Guangxi or Inner Mongolia) or proceed with more stringent environmental requirements, China may need to import more alumina
- ❑ Since, there have been statements in support of projects from central and Liaoning authorities

“Three-Year Plan to Defend Blue Sky” 2018-2020

- **Enlarged affected area** – includes the ‘Yangtze Delta’ and ‘Fenwei Plains’ as well as the original ‘2+26 cities’ in 2017/18’s Winter cuts period.
- **Inspection and rectification targets** – 2+26 cities goal to be achieved by 2018, surrounding areas by 2019 and the rest of China by 2020
- **Key environmental targets:** Fine particles (PM2.5), industry, SO₂, coal, NOx, diesel trucks, dust

Winter cuts

- **Henan** to cut over 30% production for primary Al and alumina producers, and to cut 10% for smelters if emission is kept below certain limits during the 2018/19 winter cuts.
- **Shanxi:** a larger area is likely to be covered with more capacity targeted.
- **Shandong:** likely to cut a similar amount as in 2017/18 winter.

Others

- **Primary Al:** Strict control over new capacity
- **Coal:** By 2020 (vs 2015), 1) national coal consumption less than 58% of total energy consumption. 2) -10% in 2+26 cities. 3) -5% in Yangtze Delta, 4) negative growth in Fenwei Plains
- **Transport:** Road to rail – 1) increase railway transport to over 50% in affected area, 2) Promote New Energy Vehicles
- **Rectification of open pit mining**

Other Reforms

- **SSSR 2018:** Further supply-side structural reform with more efforts to improve economic quality, promote innovation, cut overcapacity and foster new growth drivers.
- **Points to watch:** Reform of energy-intensive captive power generation, potential control of rapid alumina capacity expansion, etc.

Gas for Coal Rectification

- 2018: 4 million households in North China will convert to gas from coal or thermal power programs in 2018; eliminate 10 tonnes/hour or lower coal-fired boilers.

Solid Waste

- China is paying more attention to treating solid waste, with specific local policies in place already. **Red mud dams** are likely to become a focus sooner rather than later.

Total alumina cuts could be between 5.5 and 11.8 million tpa, compared with the estimated 6.9 million tpa cut last year

Source: CM Group, August 2018

Item	Status and outlook
Alumina supply	<ul style="list-style-type: none">• Some progress on resolving Alunorte and Rusal issues but timing uncertain (no impact expected beyond mid-2019)• May be some price volatility until supply issues (including the WA strike) resolved, market resettles• New/restarted alumina supply in 2019-2020 expected to broadly match smelting growth
Chinese alumina	<ul style="list-style-type: none">• Expect opportunistic exports of Chinese alumina from time to time when RoW has deficit (but at a high price)• Also expect on-going baseload alumina imports into China
Third party bauxite market	<ul style="list-style-type: none">• Expect to move from oversupply to near balance over next few years and higher Chinese alumina costs
Chinese policies	<ul style="list-style-type: none">• On-going environmental and supply-side reforms expected to slow Chinese growth and add costs

Appendix



Limited Alumina Production Response Ex-China

Curtailed Refineries	Owner	Location	Producing (M tpa)	Nameplate Capacity (M tpa)	Comment
Point Comfort	AWAC	US	0.0	2.3	Curtailed in June 2016
Alpart Alumina	JISCO	Jamaica	1.2	1.7	Acquired in curtailed state during mid 2016. Slowly ramping production. Re-started for backward integration.
Kirkvine	Winalco	Jamaica	0.0	0.6	On care and maintenance since 2009
Friguia	Rusal	Guinea	0.05	0.65	In process of restart since June 2018 (had been announced pre-sanctions). Reportedly re-start for backward integration which will take 12 months and at least \$120 million to ramp up to around 600,000 t.
Anrak	Anrak	India	0.0	1.5	Idled since 2014 (or not started)
Eurallumina – Porto Vesme	Rusal	Italy	0.0	1.1	Idled since 2010
Bauxilum	State-owned	Venezuela	0.0	2.0	Idled. Little production since 2015
TOTAL			1.25	9.85	

Limited New Alumina Growth Outside China

Country	Company	Refinery	Announced Start Up	Capacity (m tpa)	Type	Status	Bauxite Source
UAE	EGA	Al Taweelah	2018	2.000	Greenfield	Being constructed (delayed)	Guinea
Indonesia	Hongqiao	Ketapang Phase II	2018	1.000	Brownfield	Likely (in 2019)	Captive
Iran	SALCO	Persian Alumina I	2019	0.800	Greenfield	Likely	Guinea
Greece	Mytilineos	Distomon	2020	0.850	Brownfield	Confirmed	Captive

Other projects which are under consideration (and have a captive bauxite source) are:

Country	Company	Refinery	Capacity (m tpa)	Type
Laos	Yunnan Aluminum	Paksong	1.000	Greenfield
Indonesia	Inalum/Antam	West Kalimantan	2.000	Greenfield
Jamaica	JISCO	Alpart	2.000	Brownfield
Indonesia	Nanshan Group	Bintan	1.000	Greenfield
India	Vedanta	Lanjigarh	5.000	Brownfield
Guinea	SMB/Winning	Dapilon	1.000	Greenfield

Greenfield refineries ex China often take 5+ years to build. Only ones built in last 5 years are:

- Hongqiao, Well Winning Harvest Indonesia 2012 to 2016 (1m tpa)
- AWAC/Ma'aden Saudi Arabia 2010 to 2018 (1.8m tpa)
- Tan Rai, Nhan Co Vietnam 2007 to 2018 (each 650k tpa)
- EGA Al Taweelah (started in 2014, due for first alumina in 2019)

Affected Regions of 'Three Year Plan to Defend Blue Sky'

■ A. '2+26' Cities

Beijing and Tianjin (2) **Hebei (8):**
Shijiazhuang
Tangshan
Baoding

Henan (7)
Langfang
Zhengzhou
Cangzhou
Xinxiang
Hengshui
Hebi
Handan
Anyang
Xingtai

Shandong (7)
Ji'nan
Zibo

Shanxi (4)
Liaocheng
Taiyuan
Dezhou
Yangquan
Binzhou
Changzhi
Jining
Jincheng
Heze

■ B. Fenwei Plain (11 cities)

Shanxi (4):
Lvliang
Jinzhong
Linfen,
Yuncheng

Henan (2):
Sanmenxia
Luoyang

Shaanxi (5):
Xi'an
Xianyang
Baoji
Tongchuan
Weinan

■ C. Yangtze River Delta (4 provinces)

Jiangsu
Shanghai
Zhejiang
Anhui

■ D. Yangtze River Economic Belt (targeted by MIIT's three-year action plan)



Three-Stage Implementation (Jun 11 2018 to Apr 28, 2019):

Stage 1:

Review of previous results in '2+26' cities

Stage 2:

Comprehensive supervision on '2+26' and additional 11 cities in Fenwei Plain

Stage 3:

Inspection of '2+26', Fenwei Plain and Yangtze River Delta Region

- ❑ Guided by this central policy, local governments may expand the scope of policy implementation based on specific circumstances.
- ❑ *Shanxi is likely to be hit hard by the campaign, given its higher reliance on coal.*
- ❑ *Subsidies may be provided to major producers meeting certain emission standards. Exemption or relaxed regulations may apply i.e. discretionary implementation instead of a clean-cut approach.*