

# Vedanta Resources Plc FY2018 Interim Results and Capital Markets Day Delivering Growth and Shareholder Returns



10 November 2017

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Time	Section	Presenter	Page
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1120hrs	Zinc International	Deshnee Naidoo, CEO – Zinc International	16
1135hrs	Zinc India	Sunil Duggal, CEO - Zinc India	25
1150hrs	Zinc Q&A		34
1230hrs	Lunch		

## Oil & Gas

Sudhir Mathur – CEO, Oil & Gas



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- Contribute to 50% of India's domestic crude oil production with volumes of 500kboepd and reserves of over 3bn barrels of oil equivalent
- Operate diversified and sustainable portfolio
- Deliver long-term value to Shareholders, Governments and Local Communities

## Key Levers to deliver the vision

### ✓ **Exploration Portfolio**

Rejuvenate exploration portfolio to add contingent resources of over 700mmboe (Rajasthan Basin, Offshore blocks and participation in OALP)

### ✓ **Development Projects**

Rich set of opportunities in project portfolio ranging from enhanced oil recoveries, Tight Oil and Tight Gas to add ~100kboepd to production

### ✓ **Operations**

Maintain opex at the lower end among global peers even as we ramp-up production amidst increased field complexity and liquid handling



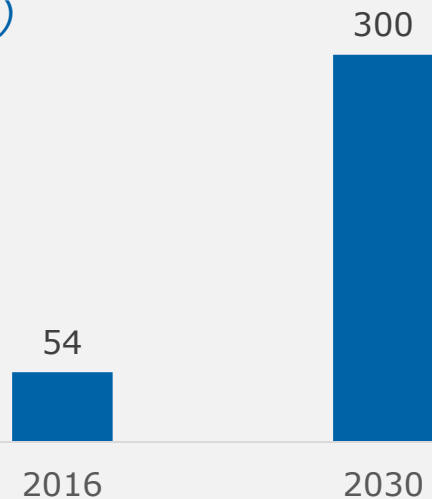
## Untapped opportunity

- Over 80bn boe of 'in place resources'
- ~50% of the sedimentary basins to be appraised
- Only 7 of 26 basins in production
- \$9bn annual Oil & Gas sector investments required through 2030

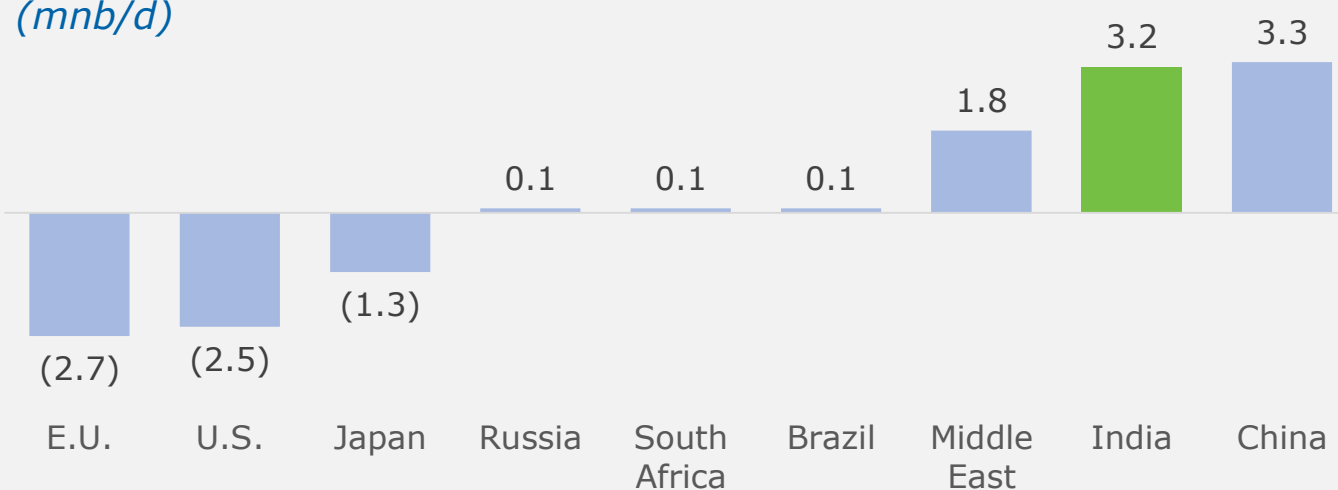
## Positive policy measures

- Hydrocarbon Exploration and Licensing Policy (HELP)
- Open Acreage Licensing Policy (OALP)
- National Data Repository
- Discovered Small Field Policy
- PSC Extension

## India Net Oil & Gas Imports (\$bn)

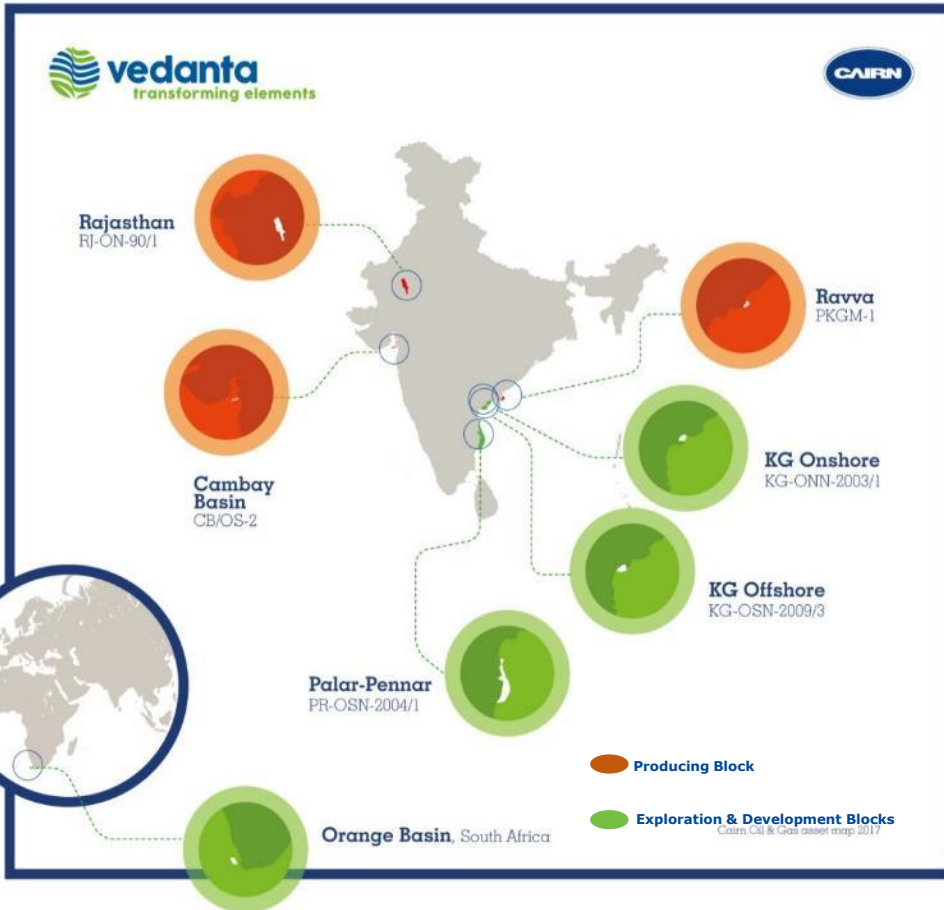


## Change in global oil demand 2015-2030 (mnb/d)



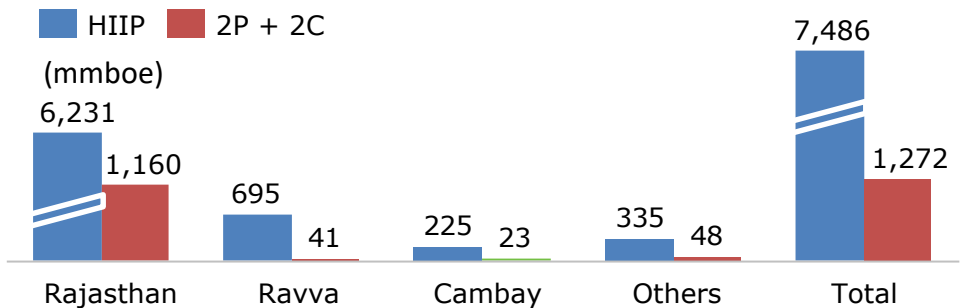
## Assets: Diverse and Prolific geological basins

- 7 blocks with net acreage of ~35,000km<sup>2</sup>
- 3 core producing blocks - 1 onshore, 2 offshore
- 51 discoveries till date (38 in Rajasthan)



## World Class Resource Base (as on Mar 17)

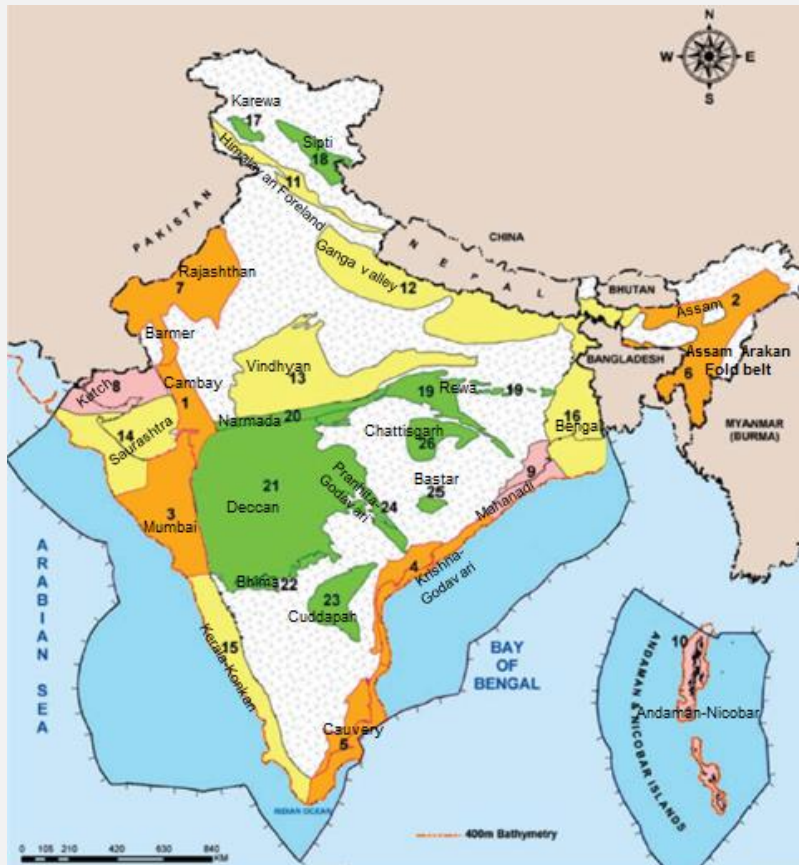
- Hydrocarbon Initially in Place of 7.5bn boe
- 2P<sup>1</sup> Reserves and 2C Resources of 1.3bn boe



## Pioneering Cutting Edge Technology in India

- World's longest continuously heated pipeline from Barmer in Rajasthan to Bhogat in Gujarat (~700kms)
- World's largest Enhance Oil Recovery (EOR) project in Mangala Field
- Successfully tested Alkaline-Surfactant-Polymer (ASP) flood process in the Mangala field
- 4D Seismic Technology for identification of Bypassed / Un-drained Oil
- Drag Reducing Agents to enhance pipeline throughput to 240kbpd
- High end hydraulic fracking technology for monetizing tight oil and tight gas formations

1. Gross Reserve and Resource estimates based on SPE guidelines as at 31st March, 2017



## India: Geology and Potential

- Only 7 of 26 basins under commercial production
  - Discovered Reserves: 28 billion boe of Ultimate Reserves
- Over 80 billion boe of 'in place resources'
- Potential in remaining 19 basins yet to be established: Recent data acquisition by DGH to fast track potential realization

## Policy Changes: Open Acreage Licensing Policy (OALP)

- Provides opportunity for acreage acquisition after a gap of 8 years
- Open areas can be accessed without waiting for a bid round: 2.7mn sq. km.
- Acreage award based on transparent competitive bidding process

## Cairn Oil & Gas: First to submit EOI's under OALP

- Dedicated team in place for evaluation of blocks under OALP with defined mandate:
  - Discover large fields in high permeability oil reservoir or tight gas reservoir
  - Develop exploration strategy with a mix of medium to low risk new plays and low risk established plays
  - Focus on quick monetization in areas closer to infrastructure
  - Prioritize areas around the prolific Barmer and KG basins
- Bids for EOI's will be submitted by 15<sup>th</sup> March, 2018 as per policy guidelines



Barmer Basin: Singular access to the prolific Basin spread over 3,000 sq. km. with established discoveries

## Rajasthan (Barmer Basin)

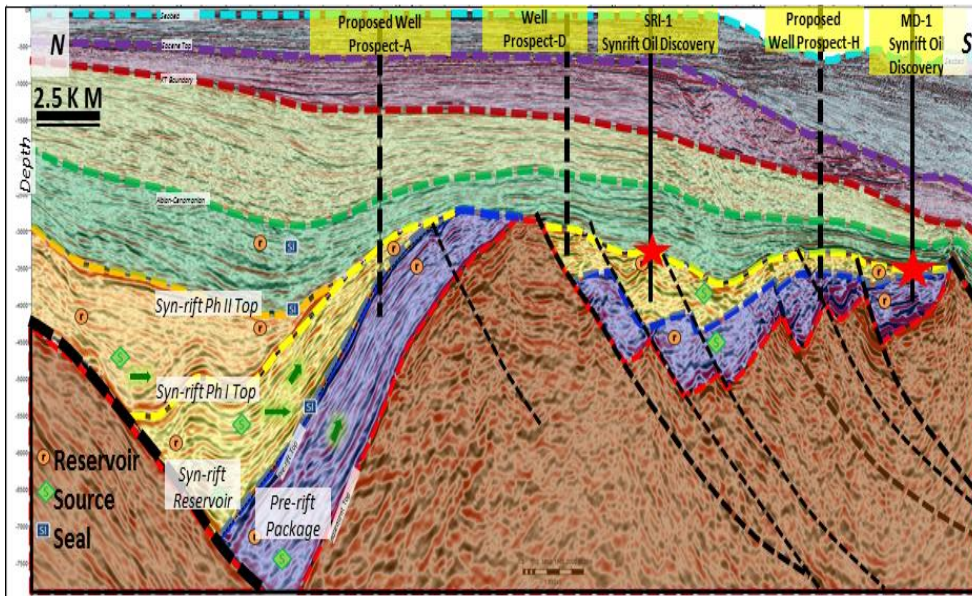
- Basin provides access to multiple play types with
  - Oil in high permeability reservoir
  - Tight Oil
  - Tight Gas
- 38 discoveries till date in 6 of the 7 plays
- G&G data including recently acquired 3D seismic and drilled wells being analysed to firm up new plays and prospects
- Global partners engaged to unravel the full potential of the block and establish 1.5bn boe of Prospective Resources
- Exploration and appraisal drilling campaign to commence from H1 CY 2018 to add 300-600mmboe of Contingent Resources



Offshore Basin: Our efforts are centred around the prolific Krishna Godavari basin

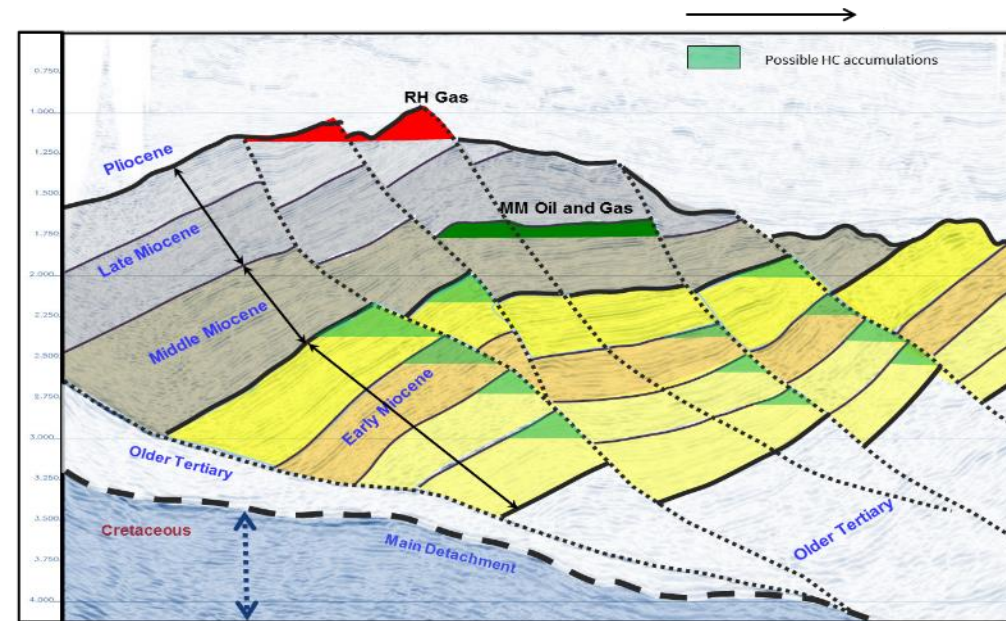
## KG-OSN-2009/3 (KG Offshore)

- Aim to establish 300mmboe of Contingent Resources
- Seismic interpretation resulted in identification of prospects and leads over different play types
- 2 well exploration drilling campaign commencing in Q4 FY18
- Exploration success to trigger appraisal drilling from Q3 FYF19



## Ravva

- Aim to establish 100 mmboe of Contingent Resources
- Prospect inventory identified in deeper prospects
- Exploratory and Appraisal drilling expected to commence in FY19



# \$1bn Capex Initiated to Deliver 300 kboepd at \$5 per boe

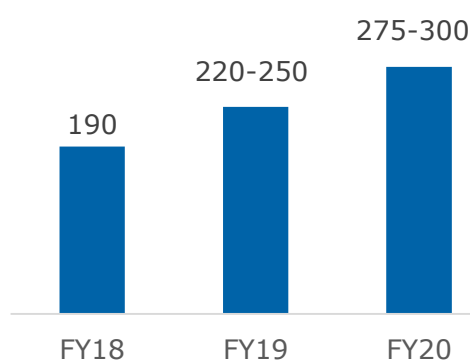
## Enhanced Execution Strategy

- Fundamental shift to 'Integrated Project Development' with in-built risk and reward mechanism to drive incremental value from project schedule and recoveries
- Engaging global partners to access cutting edge technologies to deliver economic value

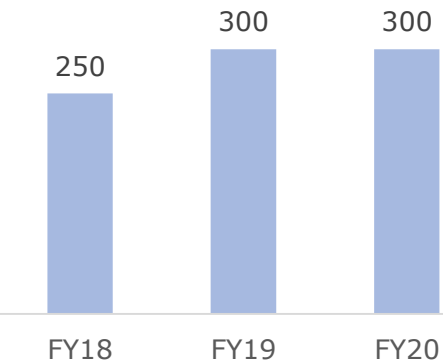
## Project Portfolio

- **Enhanced Oil Recovery:** Replicating the success of Mangala Polymer EOR in Bhagyam and Aishwariya. ASP in Mangala to further add over 100 mmbbls at \$5/bbl in due course
- **Tight Oil & Gas:** Deploying latest fracking technologies to recover Oil & Gas from tighter reservoir formations through execution of Raageshwari Deep Gas (RDG) and Aishwariya Barmer Hill (ABH)
- **Other Projects:** Infill wells around existing producers in Mangala and Cambay to accelerate near term production;  
Increasing liquid handling capacity at Mangala Processing Terminal by over 30% to handle incremental volumes

## Gross production (kboepd)



## Net capex (\$mn)



Project	Gross EUR (mboe)	Gross Capex (\$m)	Peak Production (kboepd)
<b>Enhanced Oil Recovery</b>	<b>40</b>	<b>155</b>	<b>19</b>
<b>Tight Oil &amp; Gas Projects</b>	<b>137</b>	<b>640</b>	<b>45</b>
<b>Other Projects:</b>	<b>41</b>	<b>290</b>	<b>53</b>
- Mangala Infill (60 wells)	22	140	32
- Liquid Handling Upgrade	12	120	15
- CB/OS-2 Infill (3 wells)	7	30	6
<b>Total</b>	<b>218</b>	<b>1,085</b>	<b>117</b>

**Project IRR of over 20% even at \$40/bbl per barrel Brent → Positive Free Cash Flow post capex every year**

✓ **Consistent reduction in waterflood operating cost since FY15 driven by scope optimization, process efficiencies and contract optimization**

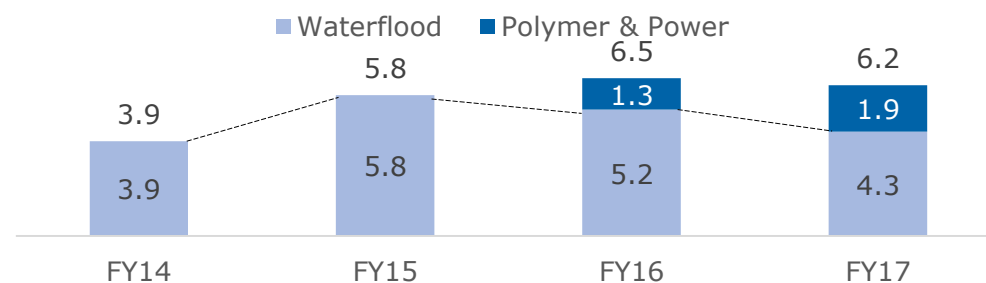
- RJ waterflood operating cost lower despite increased liquid handling (~ 1bn barrels of fluid), increased complexity and higher well count
- Savings on power costs through captive power and open access
- Reservoir optimization and production technology
- Wells and facilities management optimization

✓ **Optimizing Polymer cost and consumption**

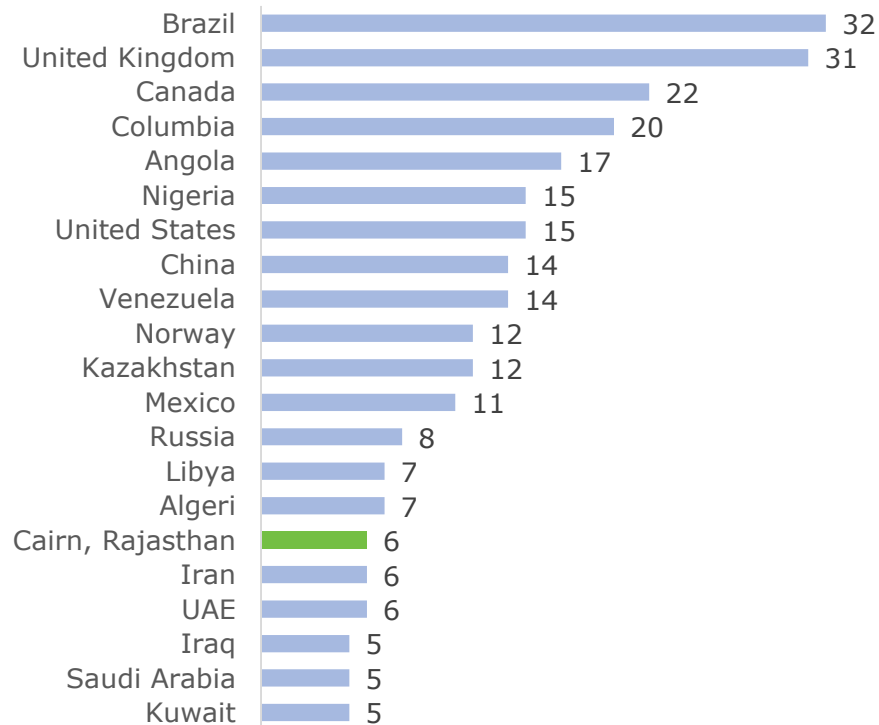
- Reduced polymer cost to \$8-9/bbl compared to initial estimates of over \$12/bbl



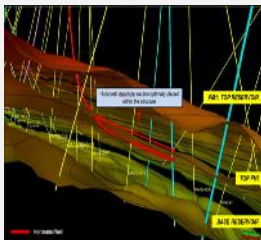
## Rajasthan costs (\$/boe)



## Global Cost Profile (\$/boe)

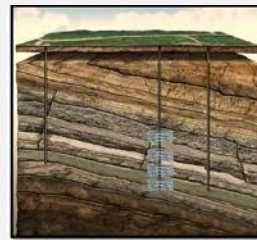


Source: For peer company Opex - Rystad Energy, Nov 2015



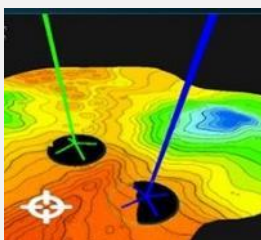
**SUB SURFACE**

- Implementation of EOR techniques
  - World's largest polymer flood in Mangala
  - Successfully tested ASP flood process in the Mangala field
- 4D Time Lapse Technology in Ravva
- Turnaround of Ravva and Cambay fields



**DRILLING OPERATIONS**

- Multi stage fracking to improve well productivity and improve EUR
- Enhanced well productivity through frac design
- Limited entry frac - multiple perforation in single stage



**DIGITAL OIL FIELD**

- Digital Oil Field – 24 hour real time monitoring



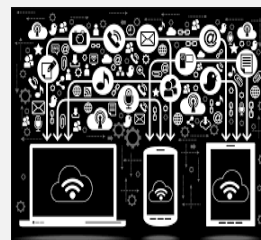
**PIPELINE**

- World's largest continuously heated pipeline (700+ Km)
- Pipeline intrusion detection system
- Using drag reducing agents to augment capacity by 30% with no additional Capex



**BIG DATA & ANALYTICS**

- Real time data analytics
- Process automation
- Collaborative ecosystem and overall integrated enterprise



**DIGITILIZATION**

- Partnerships with leading firms
- Predictive maintenance
- Sensors, wearables
- Enterprise dashboards

- **Exploration** program recommenced to add to the prospective and contingent resources with a focus on Onshore Barmer Basin, Offshore Basins and OALP rounds
- **Development Projects** execution in progress with a gross investment of \$1bn for incremental volumes of ~ 100 kboepd in the next 2-3 years
- **Operating cost** optimization to keep cost at the lower end amongst global peers amidst increased field complexity and liquid handling
- Oil & Gas business to continue generating **positive free cash flow** post capex every year



**Q & A**  
**Oil & Gas**



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## Zinc International

Deshnee Naidoo – CEO, Zinc International



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<https://www.youtube.com/watch?v=-tcsgJpTIHk&feature=youtu.be>

## Established track record...

Improved safety performance

Fundamental changes to operating philosophies

Delivered LoM extensions of all assets

Counter cyclical project investment

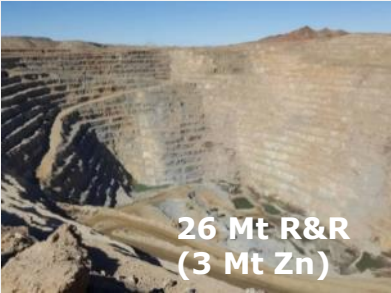
## .....Enabling key focus areas for growth



**Vision is to be the safest, socially responsible 1mtpa integrated Zn producer; in the Q1 median of the global cost curve**

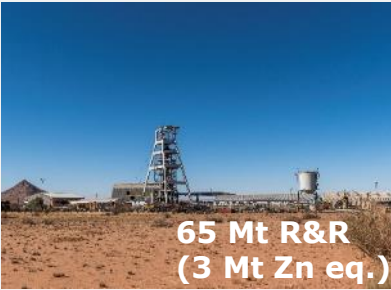
**Skorpion Zinc (100% VEDL)**

- Open pit zinc mine and refinery
- Largest integrated zinc operation in Africa
- LoM of 4 years
- Refinery capacity of 150ktpa



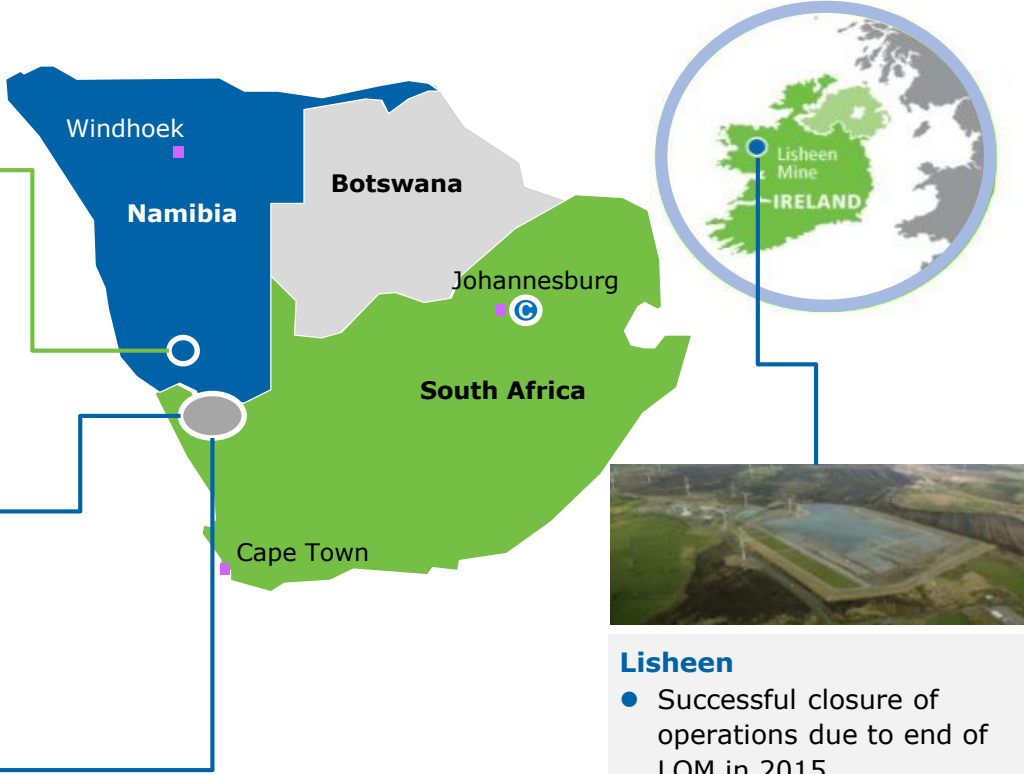
**Black Mountain Mine (74% VEDL)**

- Underground operation, mining zinc, lead, silver and copper deposit
- LoM of 4-5 years
- Plant capacity of ~100ktpa Zn eq. metal in concentrate



**Gamsberg Project**

- One of the world’s largest known Zn deposits
- Phase 1 of project in execution, \$400mn capex investment<sup>1</sup>, 250ktpa metal in concentrate
- First production by mid CY 2018



- HSE progress to ZERO
- R&R 306 Mt (22 Mt Zn eq.)
- >4,000 employees
- ~160,000 tons of Zn eq. in FY2018

**Lisheen**

- Successful closure of operations due to end of LOM in 2015
- World-class closure process underway

1. Excluding Investment During Construction

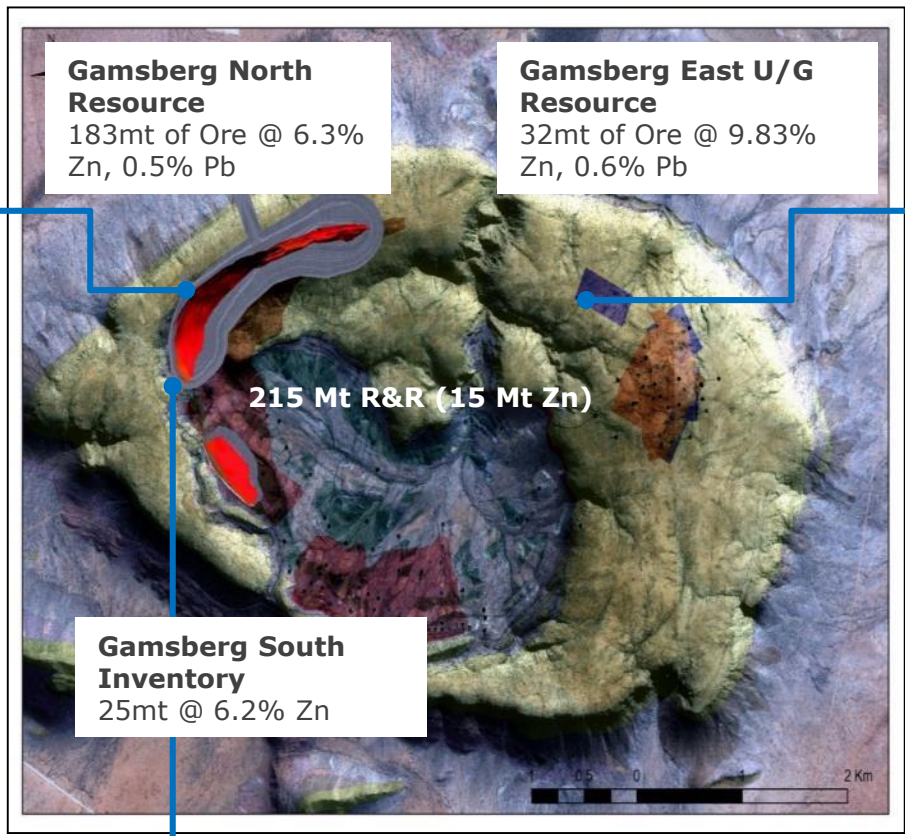


### Gamsberg Project (Phase 1)

- Current project (open-pit mine, concentrator and related infrastructure) 4mtpa ROM: **250ktpa MIC**
- **\$400mn** investment
- **First production by Mid CY 2018**, 9-12 months of ramp up to full capacity.
- COP at 1,000-1,150 \$/ton, First quartile of cost curve.
- ~2,000 jobs during peak construction, 850-900 jobs once operational
- **Phase 1 enables accelerated Phase 2 implementation**

### Gamsberg Mega Pit (Phase 2)

- Expanded open pit by 4mtpa ROM (c.\$200 mn)
- 2nd concentrator stream of 4mtpa (c. \$150 mn)
- Additional metal production - **200ktpa MIC**



### Gamsberg U/G (Phase 3)

- New underground option for Gamsberg East 2.5mtpa
- Potential Expansion of Gamsberg North open pit to U/G
- +150ktpa MIC

### Gamsberg Extension areas (Beyond Phase 3)

- Good Potential
- Extensive drilling required to firm up potential

# Gamsberg Project Progress – Site Activities in Full Swing



North pit



Thickener pre-assembly test



Transformer installed on site



Tailings dam



Plant civil footprint



Mill shell on site



Jaw Crusher Delivered to Site

## Mining (>50% Pre-strip work complete)

- Pre-stripping volume ramped up to > 4mtpm
- Pre-stripping >35mt completed of 65mt
- First ore production – early 2018

## Plant and Infra (~55% complete)

- All long lead equipment ordered and >75% will be on site by end of 2017
- First ore feed to Plant – Mid CY 2018

## Tailings Facility & Bulk Water

- Tailing facility: 45ha of 110ha liner installed
- Water pipeline installation: 25 of 38 km installed

## Digitalisation

- Partnership model for end-to-end digitalization has been adopted

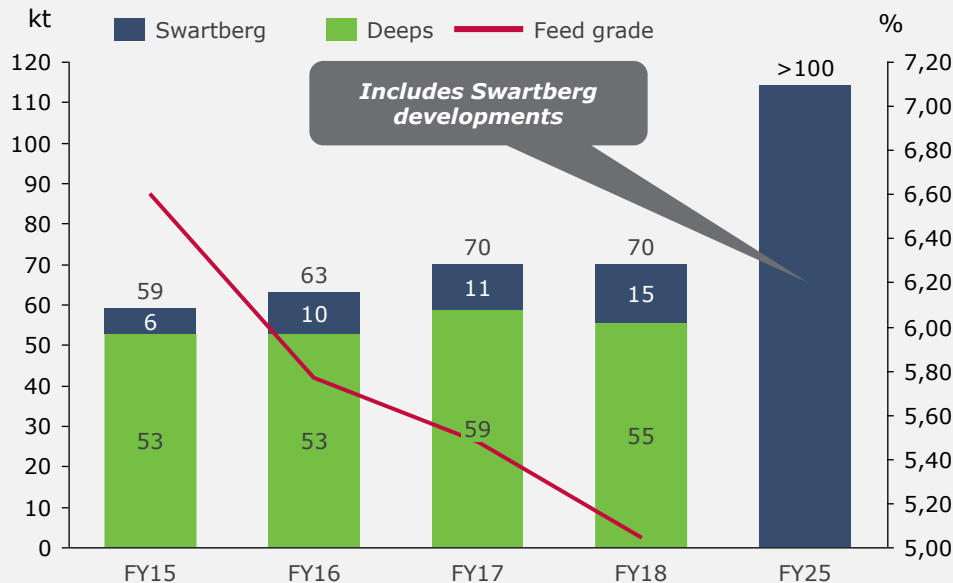
## Others

- Biodiversity - ~85,000 plants relocated (2015)
- Housing being constructed in anticipation of operational requirements
- >100 houses being constructed

**All major ordering with major commitments completed - Bulk mining, Plant & Infra and Tailings Dam  
More than 80% of the capex committed. All contractors mobilised at site. More than 1,900 employees at construction site**

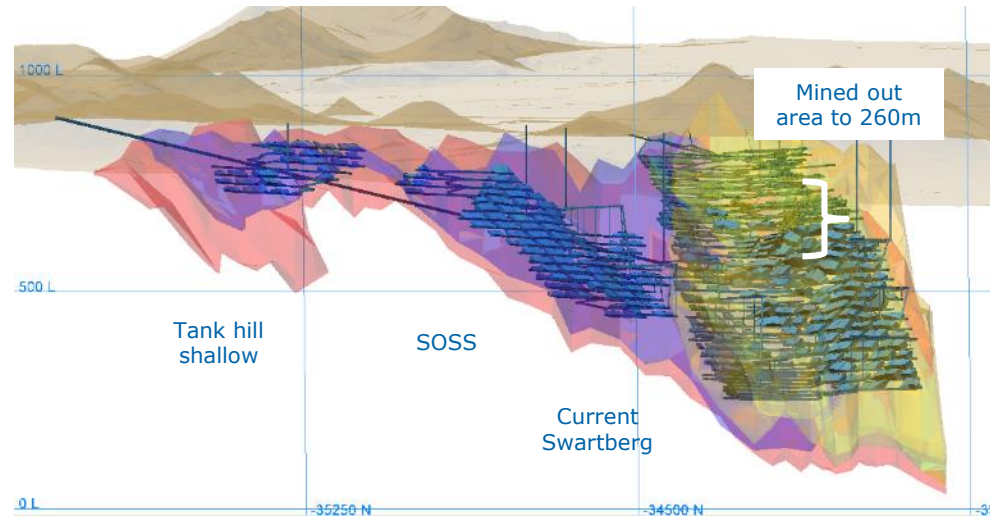
## BMM Operational Performance is Trending Positively...

### Production per year, Metal (Zn & Pb) in concentrate



- BMM continues to perform well, despite:
  - Decreasing working areas (from 10 to 5)
  - Backfill placement up by >80%
- Specific initiatives over last 2 years include:
  - Long hole mining up by >190% to 40kt
  - Milling throughput up by 11% to 1.7mtpa

## ..and can be Further Enhanced with Swartberg Phase 2



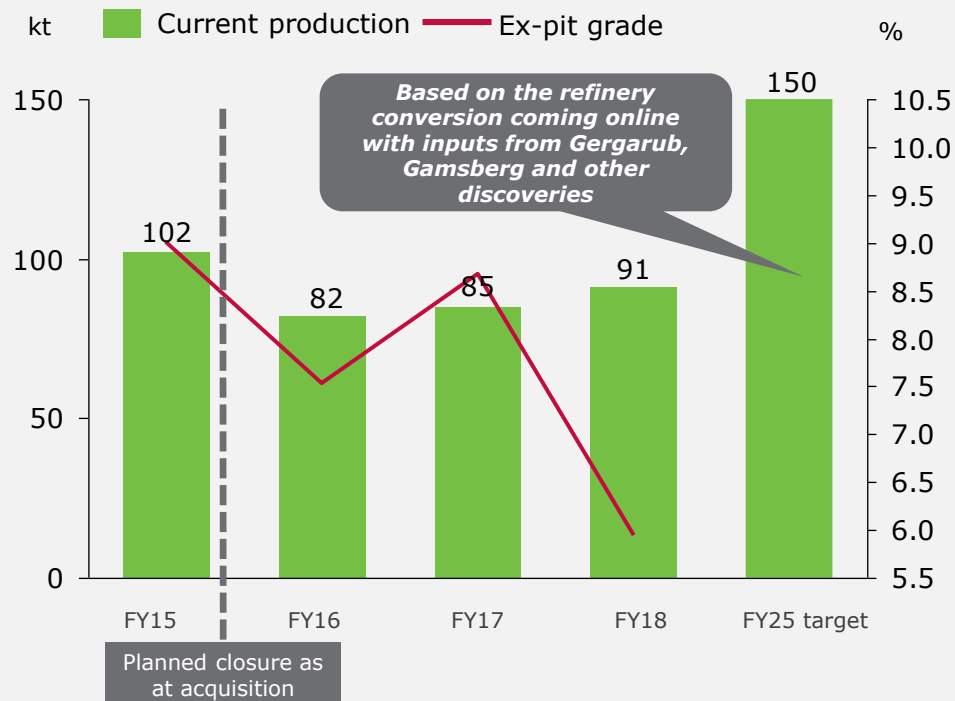
**Mining method** - Longhole open stoping with backfill  
**Mineable resource** - 26.3mt  
**Total contained metal** - 1,096kt  
**Ramp up to steady state** - 4 years  
**Steady state production** - 1.7mtpa for 13 years  
**Metal production (MIC)** - 4.3kt Cu, 47.5kt Pb, 8.3kt Zn

### Black Mountain Complex – Operational readiness

- Strong Future complex moving toward 500kt Zn eq - Gamsberg 450kt, Swartberg 75kt (primarily Pb)
- Synergy benefit on combined Black Mountain Complex (BMC) - Shared overhead structure, Commercial and Shared Infrastructure
- Combined operating model - outsourcing of Gamsberg vs owner operation on current operation. Opportunity to ensure optimal operation

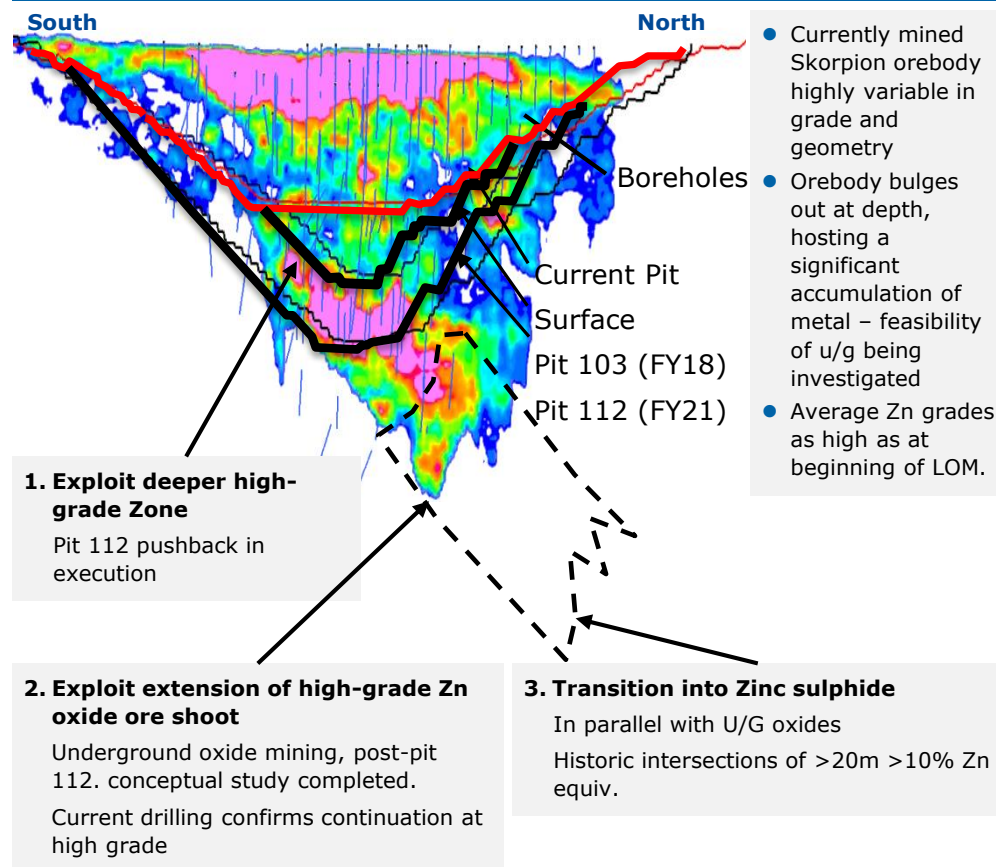
## The delivery of Pit 112 has created more certainty around SZ...

### Production per year, Zn metal



- Skorpion has continued to deliver despite decreasing grades and ex-pit ore due to:
  - Extension of life from 0.5 to 4 years via the Pit 112 pushback
  - Successfully outsourced mining to Basil Read Namibia and tripled total excavation
  - Targeted plant improvement projects to increase Zn into leach

## ...With further potential at Pit 112 and the planned refinery conversion



### Refinery conversion

- Current refinery needs to be converted to process sulphide concentrates
- Techno commercial feasibility/Basic Engineering completed
- Estimated ~\$160mn Capex

**Indicative  
Consolidated Outlook**

	FY18	FY19	FY20
<b>Prod (kt)</b>	<b>150-160</b>	<b>240-260</b>	<b>410-430</b>
<b>COP (\$/t)</b>	<b>&lt;1,500</b>	<b>&lt;1,200</b>	<b>&lt;1,100</b>

**Gamsberg**

**250kt Production@  
~\$1000/t**

**Project on track and progressing as per plan**

- First production by mid CY2018 and on budget for capex target of \$400mn
- FY19 production expected to be 100kt+, with ramp-up to 250kt by FY2020
- Targeted COP of \$1,000-1,150/t, placing ZI in 1st quartile of global cost curve

**Skorpion &  
Black Mountain**

**>200kt Production**

**FY2018: Production of c.160kt @ < CoP of \$1,500/t**

- Skorpion c.90kt & Black Mountain c.70kt
- Focus on further reducing COP through operational and cost initiatives

**FY2019 & FY2020: Plan to increase production to c.200ktpa by ramping up Pit 112**

- Skorpion c.130kt & Black Mountain c.70kt

**Next phase of projects**

**Currently progressing next phase of projects within pipeline**

- Gamsberg Phase 2: 4 mtpa RoM (200 kt)
- Swartberg Phase 2: 1.7 mtpa RoM (65-70 kt)



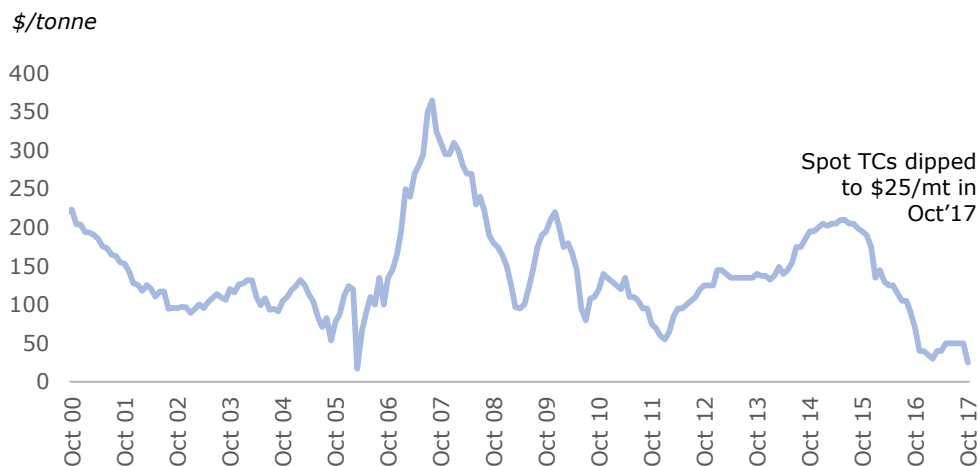
## Zinc India

Sunil Duggal – CEO, Zinc India



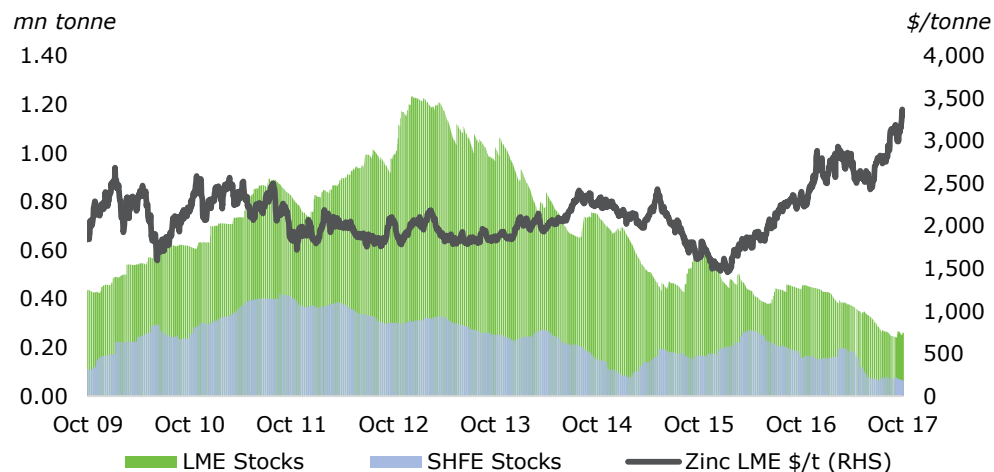
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## Supply Shortage Leading to Multi-year low spot TCs

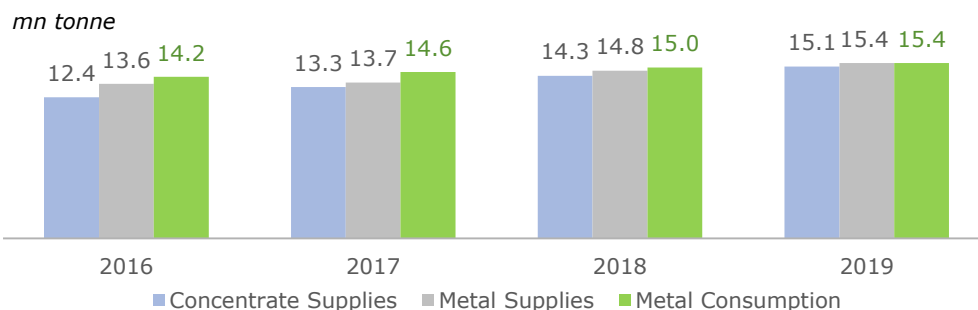


Source: Wood Mackenzie

## Declining stocks at LME & SHFE warehouses



Source: Fast markets



### Metal Inventory

Year	Metal Inventory (mn tonne)
2016	2.2
2017	1.3
2018	1.1
2019	1.1 (< 1 month)

Source: Wood Mackenzie

- **Mine to End Use:** Mine supply to metal consumption ratio continues to be under pressure
- **Market balance:** Imbalanced market; Inventories at risk, with levels at below one month
- **Demand:** Steady global demand growth of 2-3%
- **Mine Production:** Market sensitive to timing of new supplies, stable operations & reversal of production cuts
- **Smelter Production:** Falling TCs not incentivising early smelter start ups and halting new projects

**Significant increase in mine & smelter supplies required in next 5 years for stable inventory levels**

**2nd** largest zinc-lead miner globally;  
**4th** largest zinc-lead smelter globally

On track for **1.2 million tonnes** of MIC capacity by 2020;  
UG mines ramping up at 5 year CAGR of 39%

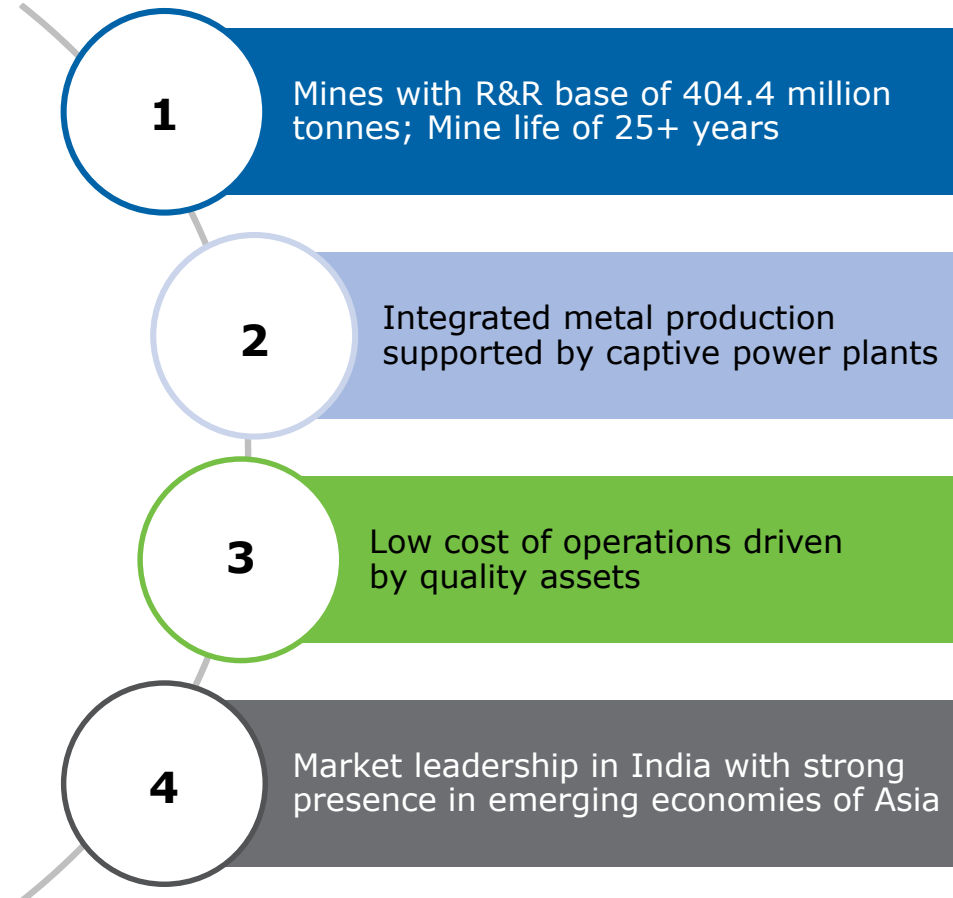
**1000 tonnes** silver production by 2021;  
Poised to be in top 5 global silver producers

**One of the lowest cost** zinc producers in the world

**3rd rank** globally in the Environment category and 11th  
Overall in **Dow Jones Sustainability Index**

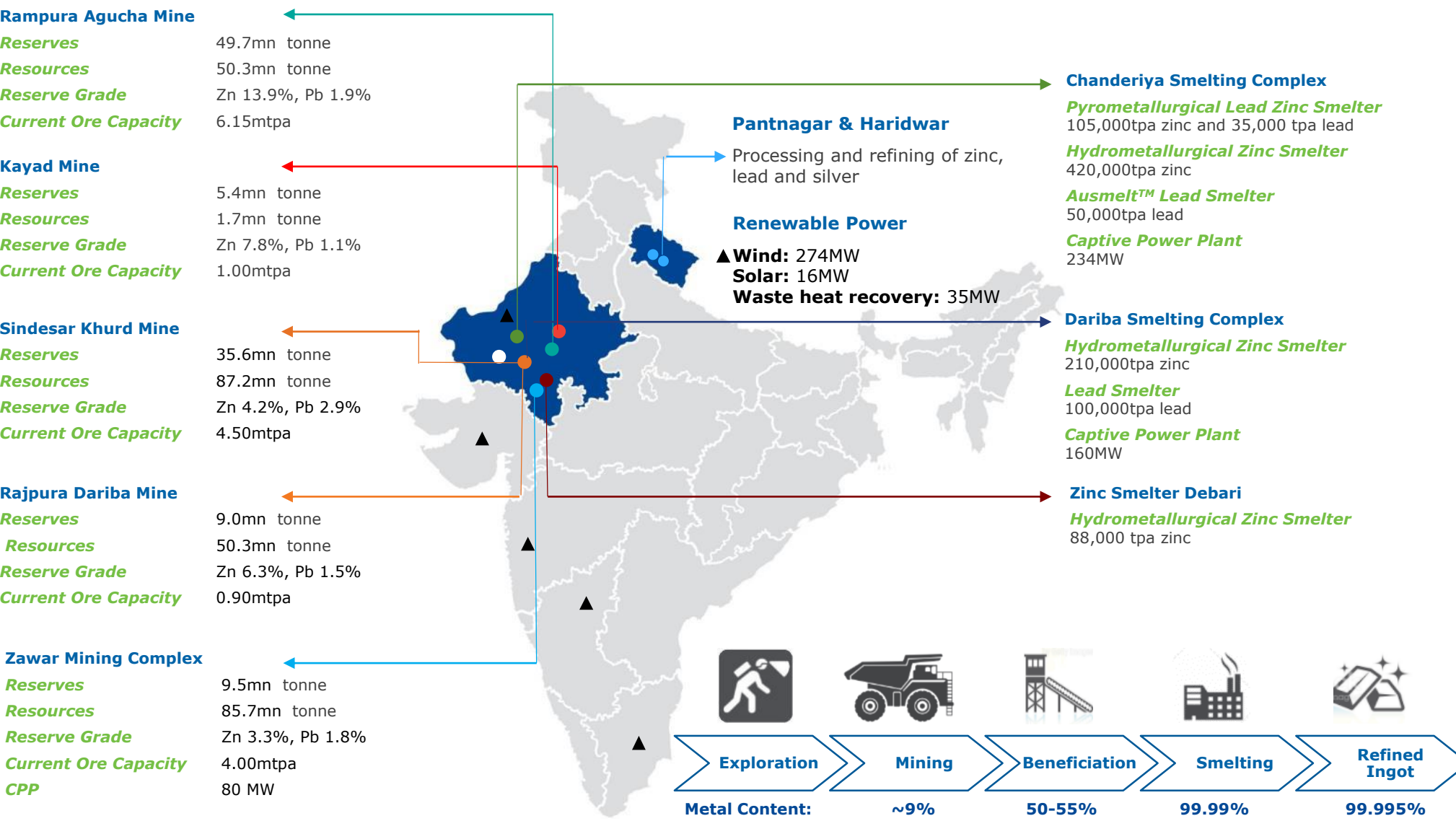
**3 mines** with **five-star** ratings by Indian Bureau of Mines

## Core Strengths



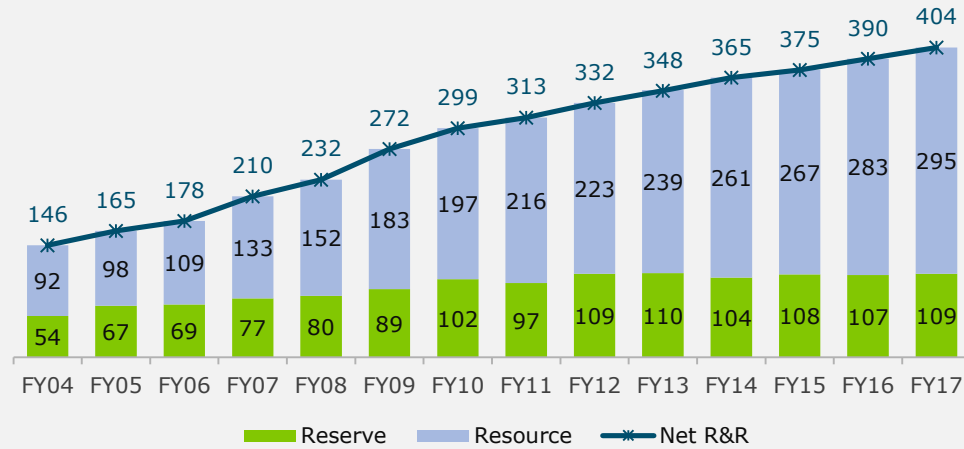
**Vision: To be the world's largest and most admired zinc-lead & silver company**

# Portfolio of Tier-1 Assets

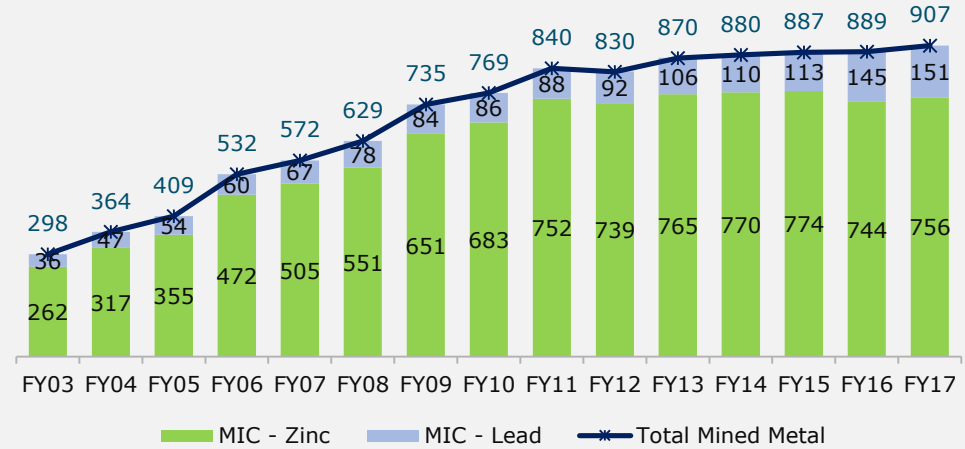


Note: Resources do not include Reserves

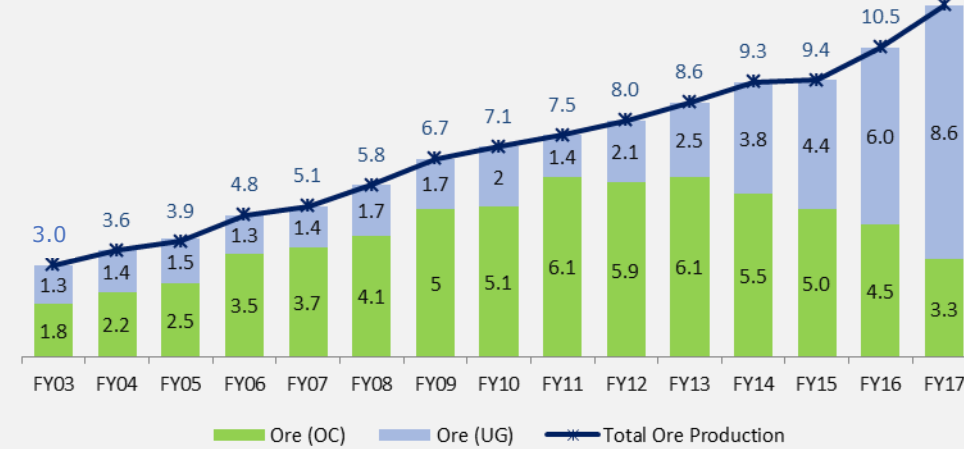
## Reserves & Resources (mn tonne) – 2.5X Growth



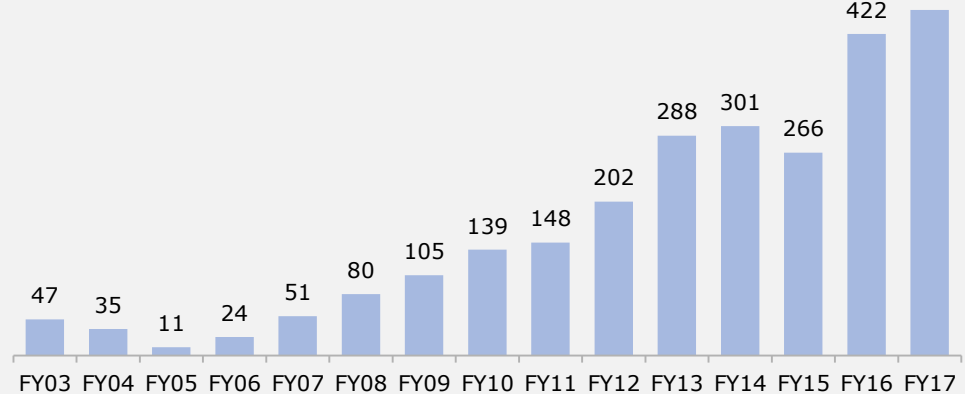
## Mined Metal ('000 tonne) – 3X Growth



## Ore Production (mn tonne) – 3.5X Growth



## Silver Metal – Integrated Saleable (tonne) – 9X Growth



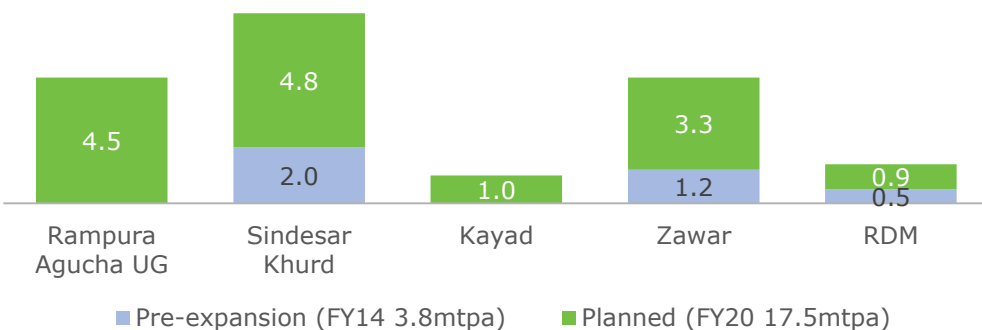
**Multi-fold growth since disinvestment by Government of India in 2002**

## Mine expansions in sync with increasing R&R

- Five major projects to increase MIC capacity to 1.2mtpa (17.5mtpa ore capacity), including RAM OC replacement
- Transition from Open Cast to UG mining
- Smelters' debottlenecking to remain fully integrated
- Six year capex of \$1.6bn ; ~\$1bn spent

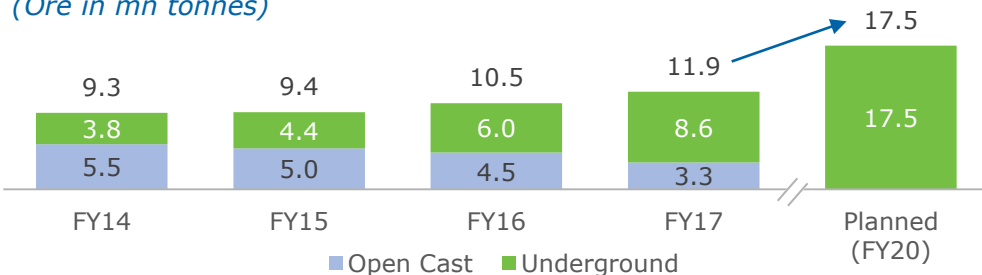
## UG Capacity Expansion – Journey to 1.2mtpa MIC

(Ore production capacity in mn tonnes)



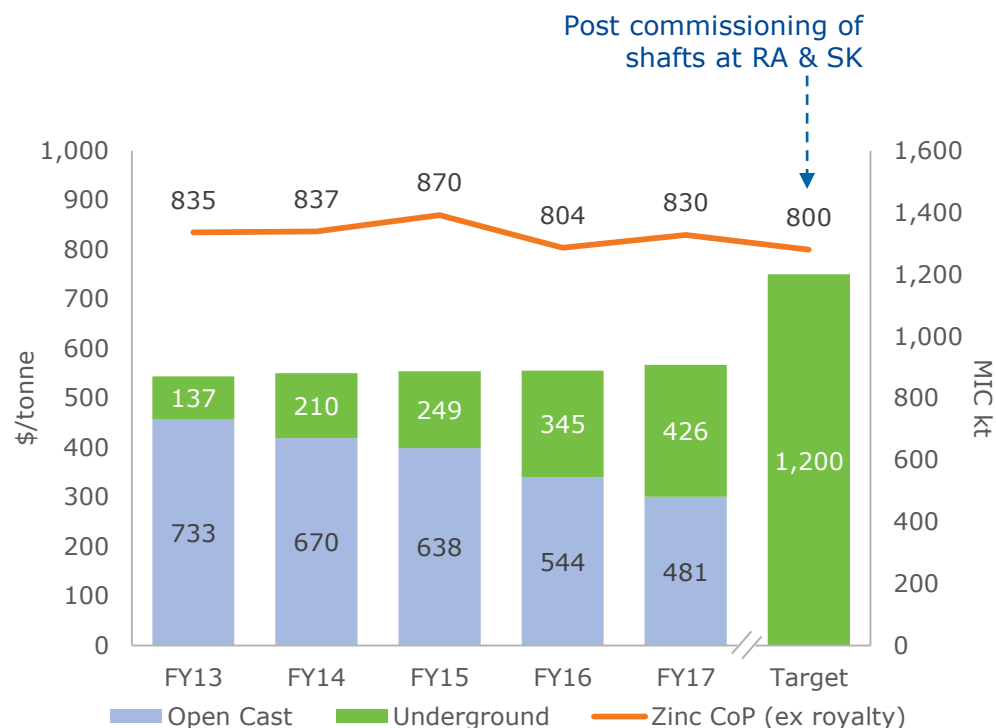
## Transition from OC to UG

(Ore in mn tonnes)

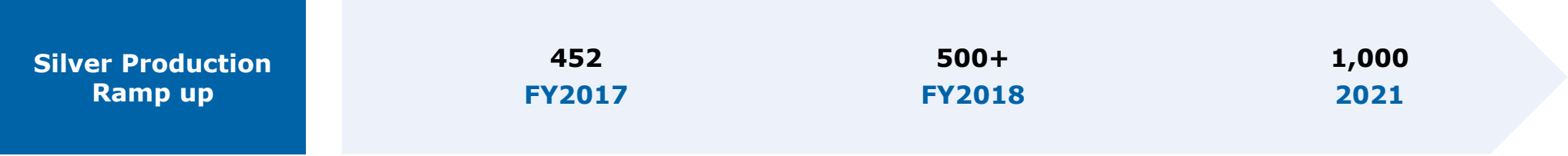


## Maintaining First Quartile of Global Cost Curve

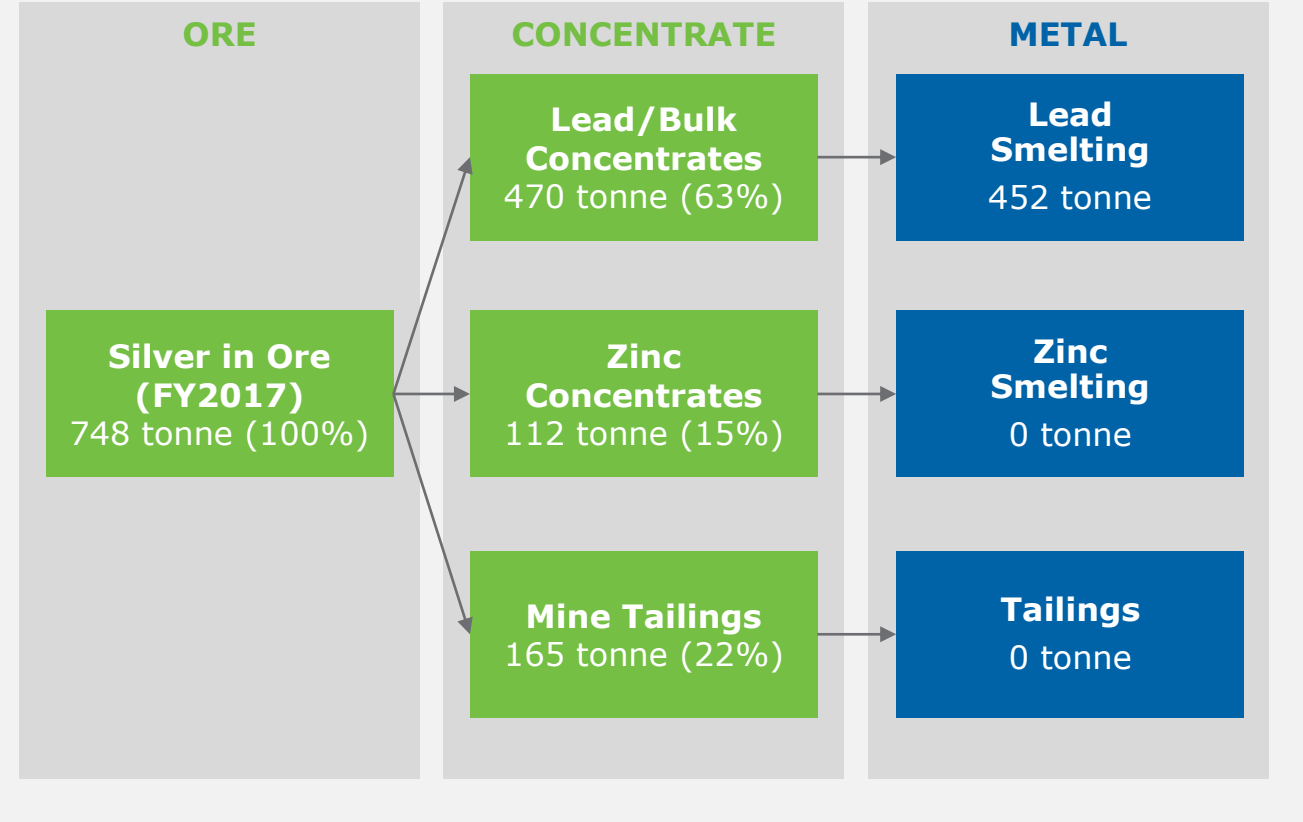
- Continue to be in first quartile of global cost curve
- CoP held firm last few years despite transitioning to UG
- Temporary spurt in FY2018 expected due to substantial increase in input commodity prices
- CoP to reduce post commissioning of shafts at RA & SK



**UG ramp up at 5 year CAGR of 39% while holding COP steady**



## Ore to Metal Recovery (FY2017)

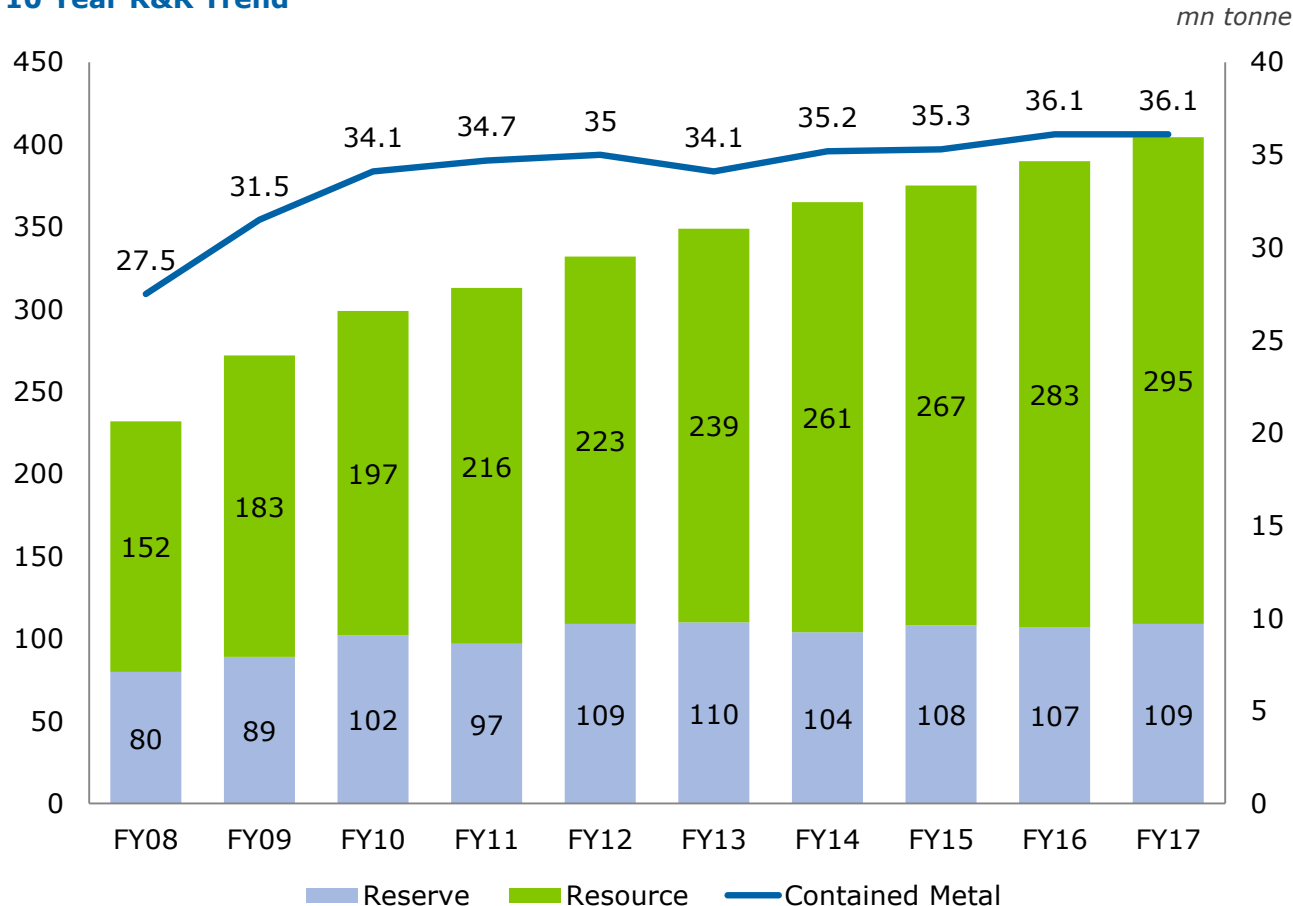


## Achieving 1,000 tonnes

- ### Key Focus Areas
- Mining (452 → 850)**
    - Focus on silver-rich deposits → ongoing
    - Achieving benchmarked recoveries
  - Zinc Smelters (0 → 100)**
    - Fuming technology → June 18 (first fumer)
    - Second/third fumer → April 20 (plan)
  - Recovery from Tailings (0 → 50)**
    - Tailings retreatment → June 18 (pilot)

## Sustained Commitment to Exploration → Strong Track Record of R&R Addition

### 10 Year R&R Trend



- R&R 404mn tonne in FY2017
- R&R estimation to the JORC standard and audited by international consultants
- Drilling 80,000+ metres pa to add new resource tonnage
- Clear exploration strategy to grow R&R
- Use of latest global technologies

**Added more than depleted every year since Vedanta's takeover;  
25+ years of mine life**



**1.5mtpa  
capacity  
under  
planning**



Shaft and decline integration  
Multi-level mining  
Digital transformation to boost productivity  
New prospects & tenements

**1.2mtpa  
capacity  
by FY2020**



25+ years of mining R&R with potential of 1.2mtpa  
Transition to underground mining progressing smoothly  
Shaft commissioning in Q3 FY2019 to give step jump  
Mill & smelter capacity to keep pace

**Outlook  
FY2018**



Mined metal: Higher than 907kt of FY2017  
Refined zinc-lead: 950kt; silver: 500+ tonne  
Project Capex of \$300-325mn  
Dollar COP (excluding royalty) likely to be \$900-\$950/t

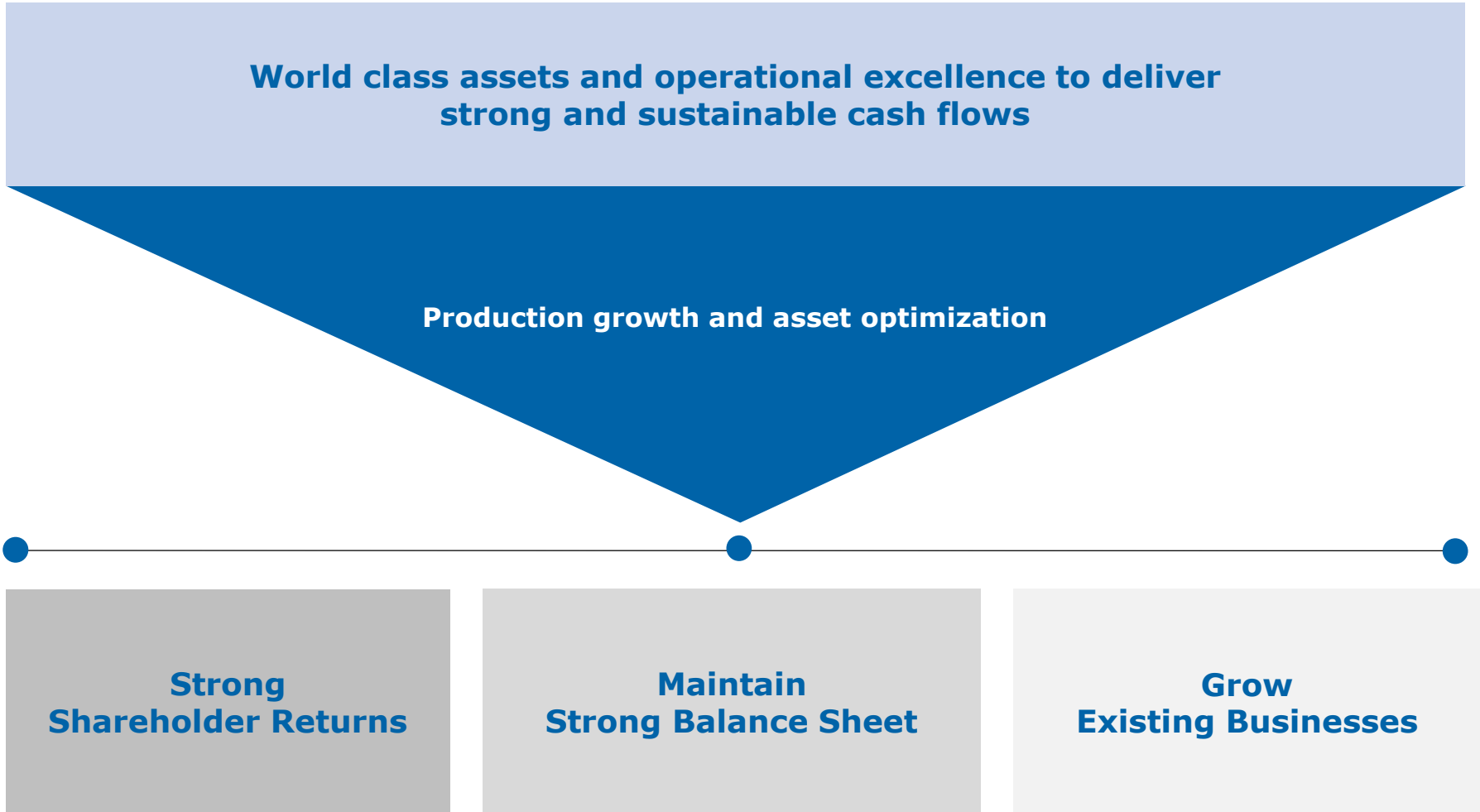
## Q & A

### Zinc



10 November 2017

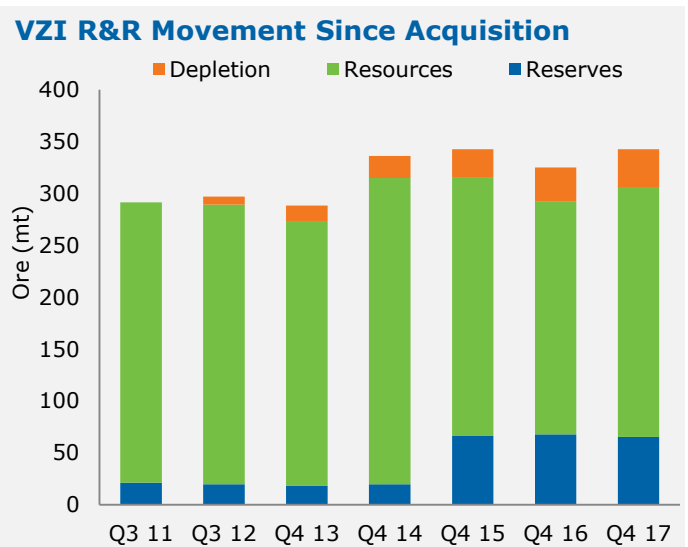
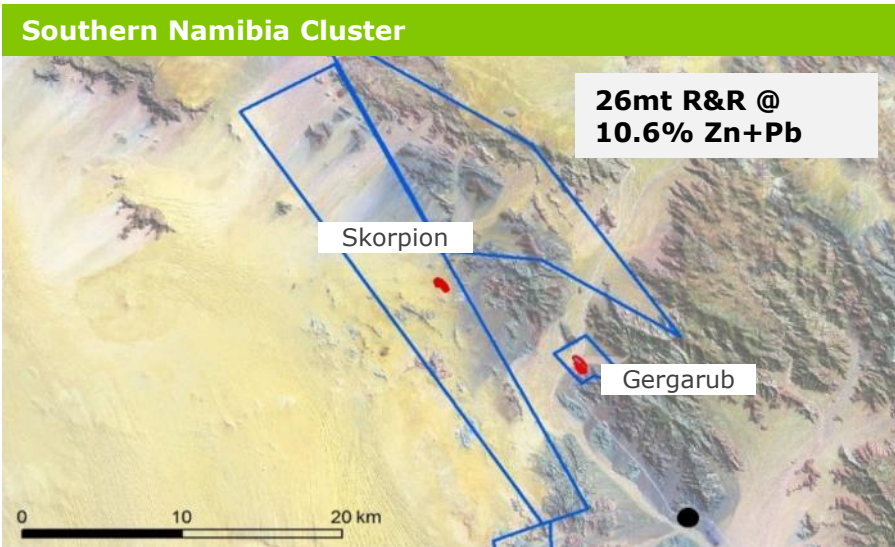




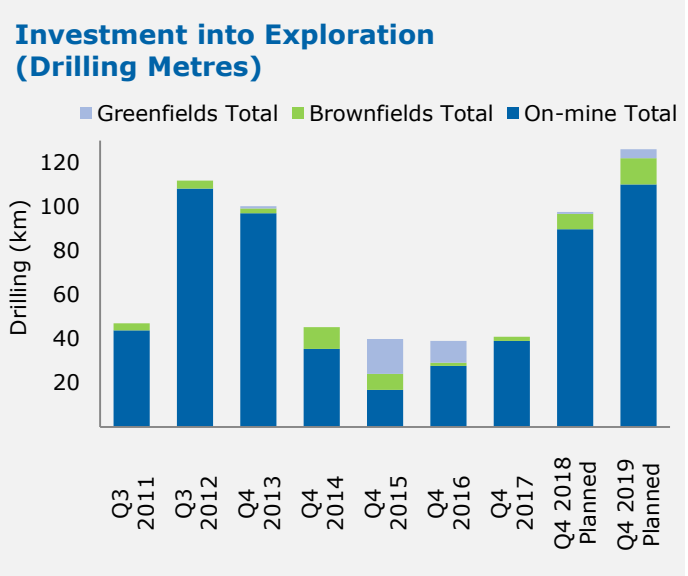
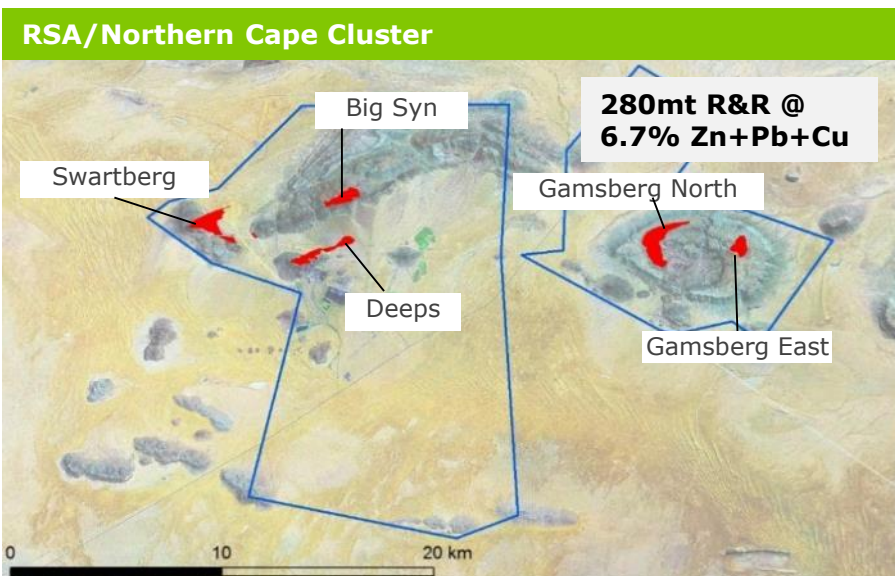
## Appendix



# Southern African Zinc Cluster: Unrivalled Opportunity for Long-Term LOM & Organic Growth



- ### High value Resource Base to enable long LOM and expansions
- Total of 21.5mt of Metal in R&R
- ### Best Zn Address in Africa
- Extensive tenement portfolio (>5,000km<sup>2</sup>)
  - Opportunity to double R&R
- ### Aggressive Exploration Programme



- R&R including depletion has increased by >15 % since acquisition to 23mt metal
- Exploration throughout downturn. Significant step-up in 2017
- Use of state of the art technology (geophysics) – high discovery rate