XVIII Analyst & Investor Tour

The consolidation of Vale’s differentiation strategy

Peter Poppinga
September 6th, 2018
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“Flight to quality” is the new normal with alumina, silica and phosphorous driving market prices on top of Fe content

**Premiums and discounts**

<table>
<thead>
<tr>
<th>US$/t</th>
<th>MB 62% Fe Low Alumina</th>
<th>IOCJ</th>
<th>Lump premium (62%Fe basis)</th>
<th>MB 58% Fe LAPS</th>
<th>MB 58% Fe</th>
<th>FMG SSF</th>
</tr>
</thead>
</table>

**Silica, Alumina and Phosphorous discounts**

<table>
<thead>
<tr>
<th>US$/t</th>
<th>MB Silica (3.5-9.0%) LHS¹</th>
<th>MB Alumina (1.0-3.5%) LHS¹</th>
<th>MB Phos (0.04-0.13%) RHS¹</th>
</tr>
</thead>
</table>

¹ LHS stands for Left Hand Side axis and RHS stands for Right Hand Side axis

Source: Platts and Metal Bulletin
After investing in its competitive advantages, Vale is well positioned to benefit from two mutually reinforcing macro trends.

**Demand: Supply Side Reform**
Capacity closures for environmental and competitiveness reasons
- Higher steel prices/margins
- Higher need for productivity to achieve higher steel capacity utilization
- Higher need for higher grade fines and pellets

**Supply: Worldwide depletion of iron ore**
Alumina and phosphorous contents are increasing progressively
- China: domestic concentrates volume depletion (lower alumina and phosphorous out)
- Australia: stable volume but quality depletion (higher alumina and phosphorous in)

In a nutshell, the market needs richer ores but, on average, is getting the same Fe with higher contaminants thus, higher Fe and low-contaminant products are progressively increasing in value.

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1 Data from 45 main Chinese ports
Higher steel demand and supply restrictions led to higher steel prices, to higher need for productivity, thus higher quality ores.

**Historical rebar prices in China**

<table>
<thead>
<tr>
<th>Year</th>
<th>Price (US$/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>387</td>
</tr>
<tr>
<td>2017</td>
<td>578</td>
</tr>
<tr>
<td>2018</td>
<td>619</td>
</tr>
</tbody>
</table>

**Steel industry capacity utilization in China**

- **Actual**
- **Forecast**

Source: NBS, CRU
Investment in mining has decreased and mine depletion rate is now poised to go up

FAI¹ in ferrous mining industry in China
RMB billion

Iron ore CAPEX by major Australian players
US$ billion

~200 Mt of Chinese domestic concentrate² exited the market over the last five years

120 Mt of Australian ore need replacement in the short term and another 130 Mt until 2030

¹ FAI = Fixed Asset Investments
² Equivalent to 62% Fe content
Source: NBS, Miner’s reports and Vale
IO anchor prices are defined not only by costs but also by discounts on low grade ores in scenarios of high productivity requirements.

2024, Iron Cost (cash cost + sustaining) CFR China, 62% Fe normalized

Seaborne volume ex-pellets, including Chinese domestic supply (Mt)
Vale optimized its portfolio and quality to benefit from new market dynamics and consolidated its differentiation strategy.

Sales composition

<table>
<thead>
<tr>
<th></th>
<th>Premium products¹</th>
<th>Other products²</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>2016</td>
<td>66%</td>
<td>34%</td>
</tr>
<tr>
<td>2017</td>
<td>73%</td>
<td>27%</td>
</tr>
<tr>
<td>2018E</td>
<td>82%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Portoflio optimization

- IOCJ: market positioning and commercial initiatives concluded
- BRBF: market positioning ongoing
- SFLA: niche product launched
- Pellets: volumes increased through resumption of idle capacity

¹ Premium products: pellets, Carajás, Brazilian Blend Fines (BRBF), pellet feed and Sinter Feed Low Alumina (SFLA)
² Other products: standard sinter feed (out of Tubarão, Sepetiba or Guaíba ports), lump and high silica
Vale’s Brazilian Blend Fines (BRBF) has established itself as a strong brand

**BRBF specification**

- Fe content: 62%
- silica: 5.0%
- Alumina: 1.5%
- Phosphorus: 0.07%

BRBF: a new low-alumina 62% Fe content reference being sold in more than 10 countries in Asia and representing the basis of the new MB 62% Fe Low Alumina index

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¹ Average specs of next years (wet basis)
Source: Mysteel
Sinter Feed Low Alumina (SFLA) is another premium product which was tailored to specific clients’ needs in Asia.

**SFLA production**

- **Low Al fines**
- **High grade fines**

**Blending at Tubarão Port**

**SFLA specification**

- Fe content: 64.5%
- Silica: 5.0%
- Alumina: 0.7%
- Phosphorus: 0.045%

**No investments, only minor changes in processes, no complexity**

- Lead time of 1 month from discussions to first sale
- Volume sold up to August of 12 Mt
- Average premium in 2Q18 of US$ 11.5-12.0/t

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¹ Using fines from the Southeastern System
² Average specs of next years (wet basis)
Initiatives to maximize value from Vale’s unique position in the market were delivered, with yet more to come

**Delivered initiatives**

- Increase of market capillarity and customer base
- Optimization of product portfolio
- 100% of Carajás sales contracts based on MB 65% index
- Resumption of idle pellet capacity
- Optimization of vessel fleet (trip from and to Brazil)

**Ongoing initiatives**

- Expand market capillarity and customer base
- Expose and capture the value of ores with a low alumina/silica ratio
  - Spot sales of BRBF with fixed price
  - Maximize BRBF price realization through the new Metal Bulletin Brazilian ore index
- Optimize vessel fleet distribution worldwide
- Increase the production of direct reduction pellets
Vale’s ability to adapt and position its products like no other player has boosted price realization to a new sustainable level

Vale’s average price premium¹

<table>
<thead>
<tr>
<th>Year</th>
<th>Price Realization</th>
<th>Pellets Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3.2</td>
<td>1.5</td>
</tr>
<tr>
<td>2017</td>
<td>5.4</td>
<td>1.9</td>
</tr>
<tr>
<td>2018E</td>
<td>10.0 - 10.5</td>
<td>7.0 - 7.5</td>
</tr>
</tbody>
</table>

The Differentiation Strategy is generating up to US$ 3.0 billion² in 2018

¹ Premium over the 62% Fe content reference price (includes % Fe differential to 62%, premiums and pellets adjustment)
² Excludes % Fe differential to 62% of US$ 2.5/t in 2018, US$ 2.5/t in 2017 and US$ 1.8/t in 2016
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The unique product portfolio

Rogério Carneiro
September 6th, 2018
Vale’s Ferrous Technology Center (CTF)

Main iron ore quality attributes and impacts in iron and steelmaking

The distinctiveness of Vale’s products
Vale leverages its know-how in Iron Ore and Coal into the steelmaking production chain through the CTF

**Agglomeration**
- Lumps
- BF and DR
- Sinter feed
- Pellet feed
- Coal

**Ironmaking**
- Lumps
- Blast Furnace
- Sinter
- Pellets
- Coke
- DR Reactor

**Refining**
- Converter
- Hot Metal
- Steel
- Sponge iron (DRI)

**STEELMAKING CHAIN**
- **Agglomeration**
- **Ironmaking**
- **Refining**

**NUMERICAL SIMULATION**
- Optimization of iron ore blend (linear programming)
- Neutral network sintering model
- Heat and mass balance for sintering
- Pelletizing model
- CFD models
  - Forecast of reactor internal conditions

**PHYSICAL SIMULATION**
- Pelletizing pilot plant
- Sintering pilot plant
- Cokemaking pilot plant
- DR simulation
- Characterization resources

**Lab evaluation**
- Productivity
- Fuel consumption
- Quality
Attributes to be taken into account in the steelmaking process

Main iron ore quality attributes and impacts in iron and steelmaking

- Reducibility (RI)
- Loss on ignition (LOI)
- Phosphorous (P)
- Silica (SiO$_2$)
- Alumina (Al$_2$O$_3$)
- Al$_2$O$_3$ / SiO$_2$
Higher reducibility in the blast furnace improves efficiency of Fe formation, measured by metallization degree.

Efficiency of Fe formation vs. crystal size

Fuel consumption vs. reducibility\(^1\)

(directly correlated with metallization degree)

Direct effect on fuel consumption and productivity in the blast furnace

\(^1\) McMaster University BF Course
Loss on ignition (LOI) increases fuel consumption during sintering

Costs, productivity and emissions are affected in the sintering process
Phosphorous (P) worsens steel mechanical properties, leading to steel failures and cracking.

Costs and productivity are negatively affected in the basic oxygen furnace.

Costs vs. P content

Iron ore sintering P content (%)

Steel cost variation (US$/t)

Hot metal P content (%)

1 Area indicates different techniques for de-phosphorization
Silica ($\text{SiO}_2$) impacts operational stability/permeability, affecting sintering and blast furnace performance

**Sinter plant**

- **Brittle sinter**
  - $<4.5\%$ SiO$_2$
- **Optimum range**
  - $4.5\%$ to $6.0\%$ SiO$_2$
- **Sinter with too much slag and low reducibility**
  - $>6.0\%$ SiO$_2$

**Blast furnace**

- Silica increases slag rate, coke rate, CO2 emission and hampers productivity of the blast furnace

- Silica increases additives consumption, slag production, fuel consumption and particulates emission at the sinter plant
Alumina ($\text{Al}_2\text{O}_3$) impacts slag quality and viscosity

Impact of $\text{Al}_2\text{O}_3$ in the slag

To keep slag flowing out of the blast furnace, it is necessary to increase the thermal level, which demands more coke.

$LHS$ stands for Left Hand Side axis and $RHS$ stands for Right Hand Side axis.
Considering slag volume and quality, an optimum $\text{Al}_2\text{O}_3/\text{SiO}_2$ relation exists for ironmaking operations.

Iron ores in the highlighted area are ideal for sintering whereas other iron ores need to be blended.

1 Limit proportion between $\text{Al}_2\text{O}_3$ and $\text{SiO}_2$ percentages for an efficient sintering and blast furnace operation (Japan case)
Simulations\(^1\) realized in the CTF emphasize the superior performance of Vale’s ores in the steelmaking process.

Zero level = specs IODEX62

\(^1\) At current steel margins and coke prices
Simulations⁴ realized in the CTF demonstrate the superior performance of Vale’s ores in steelmaking

Sum of previously presented effects

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1 At current steel margins and coke prices
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Capturing the intrinsic value of Vale’s ore

Rogério Nogueira
September 6th, 2018
Iron ore is not a commodity, bringing many opportunities for Vale

- Establishing the relative economic value of high grade ores
- Capturing intrinsic value of Vale’s ore in product pricing
- Monitoring and anticipating global market trends
- Managing product portfolio actively
Iron ore is not a commodity, bringing many opportunities for Vale

- Establishing the relative economic value of high grade ores
- Capturing intrinsic value of Vale’s ore in product pricing
- Monitoring and anticipating global market trends
- Managing product portfolio actively
The cost reduction associated with the use of high grade ores is significant

Impact on hot metal costs\(^1\) (high x low grade ores\(^2\))

US$/t

- Flux and burnt lime consumption
- Coke breeze consumption
- BF metallic burden consumption

\[
\begin{align*}
\text{Slag rate} & \quad 14.6 \\
\text{RDI (Reduction degradation index)} & \quad 20.5 \\
\text{Metallic burden impact} & \quad 5.9 \\
\text{Coke consumption impact} & \quad \\
\text{Value impact on hot metal costs} & \quad 19.4
\end{align*}
\]

\(^1\) Cost differentials based only on transformation costs, not on acquisition costs; assuming coke cost of US$280/t (HCC CFR at Chinese mills of US$215/t, SSCC of US$125/t) and PCI of US$140/t

\(^2\) High grade ore: Fe: 65%; Low grade ore: Fe: 56.6%
Additionally, the use of high grade ores increases blast furnace productivity

Schematics of a blast furnace

Impact on productivity¹

- 25% Slag rate reduction
- 8% Volume effect
- ~20% Increase in blast furnace productivity
- 30% Slag volumetric share in BF burden
- 12% Permeability effect

¹ High grade ore: Fe: 64.5~65%; Low grade ore: Fe: 56.6%; slag rate of low grade ores @ 395 kg/t vs 292 kg/t for high grade ore. Considering 75% of sinter in metallic burden
High grade ores have a significant financial impact even in scenarios of more stringent steel margins.

**Productivity value of high vs low-grade ores**

US$/dmt of high grade iron ore

1. High grade ore: Fe: 65%; Low grade ore: Fe: 56.6%.
Leading to combined benefits of using higher x lower grade ores in every scenario of coke prices and steel margins

Relative values of high to low grade ores

<table>
<thead>
<tr>
<th>Coke Prices $/t (cost driver)</th>
<th>Steel Margins $/t (productivity driver)</th>
<th>US$/dmt of iron ore</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>230</td>
<td>50</td>
<td>13.1</td>
</tr>
<tr>
<td>280</td>
<td>100</td>
<td>16.2</td>
</tr>
<tr>
<td>330</td>
<td>150</td>
<td>19.4</td>
</tr>
</tbody>
</table>

Low demand scenarios

High demand scenarios

Assumptions

- Blast furnace capacity as the bottleneck for the calculation of productivity gains
- Based on the operation of a typical Chinese mill
- Steel mills working mostly with imported ores with restrictions in Al₂O₃
- Availability of high & low grade ores as per current supply

¹ Typical operation: 75% Sinter + 10% Australian Lump + 15% Domestic pellet, BF Slag:B2: 1.13, MgO: 9.0%, Al₂O₃: 15.5% max
Iron ore is not a commodity, bringing many opportunities for Vale

- Establishing the relative economic value of high grade ores
- Capturing intrinsic value of Vale’s ore in product pricing
- Monitoring and anticipating global market trends
- Managing product portfolio actively
There was a clear market opportunity to improve pricing of Vale’s blended product

Main market indexes and products

Products pricing the 62% Fe reference¹

<table>
<thead>
<tr>
<th>Year</th>
<th>PBF</th>
<th>NEW</th>
<th>MAC</th>
<th>Others</th>
<th>BRBF</th>
<th>Aussie share</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Q18</td>
<td>74%</td>
<td>3%</td>
<td>22%</td>
<td>77%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1Q18</td>
<td>83%</td>
<td>17%</td>
<td>5%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>78%</td>
<td>12%</td>
<td>5%</td>
<td>95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>75%</td>
<td>12%</td>
<td>12%</td>
<td>88%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>74%</td>
<td>9%</td>
<td>16%</td>
<td>84%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>79%</td>
<td>10%</td>
<td>6%</td>
<td>95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>73%</td>
<td>13%</td>
<td>11%</td>
<td>97%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>34%</td>
<td>15%</td>
<td>19%</td>
<td>33%</td>
<td>67%</td>
<td></td>
</tr>
</tbody>
</table>

¹ Only fixed-price spot sales

Source: Vale analysis and PRAs (Price Reporting Agency) data
BRBF pricing strategy improved its value perception relative to the Pilbara Blend Fines (PBF)

BRBF vs. PBF differential

US$/t

Source: Vale and PRAs (Price Reporting Agency) data
The recently launched index better captures the intrinsic value of Vale’s BRBF.

5-Month Comparison MBOI-62 to MBOI-62-LA
US$/t

Source: Metal Bulletin
Iron ore is not a commodity, bringing many opportunities for Vale

- Establishing the relative economic value of high grade ores
- Capturing intrinsic value of Vale’s ore in product pricing
- Monitoring and anticipating global market trends
- Managing product portfolio actively
Long term trends for supply quality reaffirm the uniqueness of Vale’s iron ore products

Vale’s average Al/Si is below the seaborne average¹ and shows a decreasing trend from now to 2025

Vale’s P levels are set to decrease, while the seaborne average¹ is increasing

¹ Seaborne average excluding Vale

Source: Vale database, info is based on marketing rounds with technical consultants
Incoming supply from peers will not replace the quality of current production which is presently being depleted.

Supply profile¹ 2018 vs. 2025
Mtpy

Additions to the market

Depletion

¹ Seaborne excluding Brazil

Source: Vale database, info is based on marketing rounds with technical consultants
Iron ore is not a commodity, bringing many opportunities for Vale

- Establishing the relative economic value of high grade ores
- Capturing intrinsic value of Vale’s ore in product pricing
- Monitoring and anticipating global market trends

Managing product portfolio actively
Vale will dynamically leverage its product portfolio in order to respond to clients’ requirements and market conditions.

Profile of Vale’s iron ore products

<table>
<thead>
<tr>
<th></th>
<th>IOCJ</th>
<th>BRBF</th>
<th>SFLA</th>
<th>PFFT</th>
<th>SSFT</th>
<th>SSFG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Al</strong></td>
<td>1.8</td>
<td>1.5</td>
<td>0.9</td>
<td>0.5</td>
<td>1.0</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Si</strong></td>
<td>2.1</td>
<td>5.0</td>
<td>5.0</td>
<td>2.4</td>
<td>6.3</td>
<td>5.7</td>
</tr>
<tr>
<td><strong>Al/Si</strong></td>
<td>0.86</td>
<td>0.30</td>
<td>0.18</td>
<td>0.21</td>
<td>0.16</td>
<td>0.37</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.06</td>
<td>0.07</td>
<td>0.04</td>
<td>0.02</td>
<td>0.06</td>
<td>0.07</td>
</tr>
</tbody>
</table>

1 Average specs of the next years
2 Seaborne excluding Vale

Source: Vale database, info is based on marketing rounds with technical consultants.
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Supply chain management

Vagner Loyola
September 6th, 2018
An extensive, flexible and dynamically managed supply chain results in higher competitiveness and margin optimization.

**Extensive**

- **Distribution Centers**
  - Oman
  - Malaysia
  - China

- **Markets**
  - Europe
  - MENA

**Flexible**

- **4 Integrated Production Systems** in Brazil (mine-railroad-port)
- **22 mines**
- **13 pelletizing plants**
- **4 railroads** and **1 waterway**
- **4 loading ports** in Brazil; **1 distribution center** in Malaysia and **16 in China**;
- ~230 Mt/year of **CFR sales** – more than 60% of total

**Dynamic product portfolio**

- Pellets (Blast furnace and Direct reduction)
- Pellet feed
- IOCJ
- BRBF
- SFLA
- Standard sinter feed
- High silica fines
- Others

**Margin optimization**
Value over volume is more than words, it is a new management model

**Process**
Maximize margins through decisions based on market conditions instead of production volume goals

**Strategic instrument**
Integrated Operations Center (COI) is a key lever for supply chain management

### COI

<table>
<thead>
<tr>
<th>Global COI</th>
<th>System COI</th>
<th>Center of Excellence (CE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DELIVERED</strong></td>
<td><strong>IN PROGRESS</strong></td>
<td><strong>DELIVERED</strong></td>
</tr>
<tr>
<td>• Improve planning across Vale through a single process/area</td>
<td>• Integrate mine to port schedules with control room monitoring</td>
<td>• Leverage the performance and capacity of main assets and processes</td>
</tr>
<tr>
<td>• Integrate and program the extended value chain (shipping, blending, marketing &amp; sales)</td>
<td>• Program mine production according to Global COI plan</td>
<td>• Develop solutions to optimize performance of the supply chain</td>
</tr>
<tr>
<td>• Optimize vessel allocation</td>
<td>• Optimize asset/mines allocation</td>
<td>• Advanced analyses to identify opportunities and improvements in processes and products</td>
</tr>
</tbody>
</table>
This new management model allows Vale to respond dynamically to developments in market demand.

Reduction of ~20Mtpy of high silica fines from 3Q17 onwards

<table>
<thead>
<tr>
<th>2017</th>
<th>Mine</th>
<th>Plant</th>
<th>Logistics in Brazil</th>
<th>Offshore</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
<td>Discussions begin on trends towards high silica discounts</td>
</tr>
<tr>
<td>2nd half of the month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>Mine production plan in 5 mines and third party purchases revisited in the Southern and Southeastern Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st half of the month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>Mining plan completely changed</td>
<td>Beneficiation schedule completely changed</td>
<td>First shipment contemplating the change</td>
<td>Offshore inventory used to adjust blend quality</td>
</tr>
<tr>
<td>2nd half of the month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
<td>First sale contemplating the change</td>
</tr>
<tr>
<td>1st half of the month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Shipping initiatives are offsetting the impact of IMO 2020

US$/t

Theoretical impact of US$ 200/t spread for replacing HSFO with Marine Diesel at the entire fleet

Combined effect of more efficient engines and competitive market conditions

Net effect of scrubbers on costs and savings from use of HSFO instead of Diesel

Freight cost 2Q18  |  Marine diesel adjustment ¹  |  Valemax G2 and Guaibamax ²  |  Scrubbers ³  |  Adjusted freight cost ⁴

17.2  |  4.0  |  2.1  |  1.9  |  17.2

¹ Based on US$ 200/t spread between marine diesel price and bunker price and 0.02 bunker factor
² Based on 100 Mt of freight capacity for 25 Valemax G2 and 47 Guaibamax and 70% CFR sales of Iron Ore fines
³ Based on 160 Mt of freight capacity with installed scrubbers, 0.015 bunker factor and US$ 0.30/t scrubber operational cost. Does not consider installation cash outflow
⁴ Considers full fleet of Valemax G2 and Guaibamax in operation and all scrubbers installed
Supply chain management captured US$ 3 billion\(^1\) until 2018 by adjusting to customer demands and market conditions

Vale’s average price premium\(^2\)

<table>
<thead>
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<th>2018E</th>
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<td>Price realization</td>
<td>3.2</td>
<td>5.4</td>
<td>10.0 – 10.5</td>
</tr>
<tr>
<td>Pellets adjustment</td>
<td>1.5</td>
<td>1.9</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Main accomplishments

- Adjustment of product portfolio by reducing high silica products
- Development of a new product with low alumina
- Adjustment of BRBF specification improving silica content and reducing product variability
- Increase in pellets production with the resumption of São Luis, Tubarão 1 and 2 plants
- Optimization of vessel fleet allocation
- Increase of RMB\(^3\) sales
- Blending in 16 different Chinese ports

---

\(^1\) Does not include % Fe differential to 62% of US$ 2.5/t in 2018, US$ 2.5/t in 2017 and US$ 1.8/t in 2016

\(^2\) Premium over the 62% Fe content reference price (includes % Fe differential to 62%, premiums and pellets adjustment)

\(^3\) Renminbi
**Supply chain management will further contribute to margins**

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Further improve sales and operations planning process</td>
<td>• Reduce demurrage costs and freight costs</td>
</tr>
<tr>
<td>• Increase productivity through synchronism / stability and optimize control center infrastructure</td>
<td>• Increase value chain productivity</td>
</tr>
<tr>
<td></td>
<td>• Reduce total infrastructure costs</td>
</tr>
<tr>
<td>• Further enhance vessel fleet, distribution and client fulfillment</td>
<td>• Reduce freight costs (ship allocation), number of voyages, and increase confidence in supply of vessels</td>
</tr>
<tr>
<td>• Improve end-to-end process / asset performance</td>
<td>• Increase assets and process productivity</td>
</tr>
<tr>
<td>• Leverage sales price realization and optimize quality management</td>
<td>• Increase price realization through optimizing the product mix given market dynamics</td>
</tr>
<tr>
<td></td>
<td>• Increase capillarity through portside sales in RMB and smaller lots</td>
</tr>
</tbody>
</table>
Premium product portfolio, flexibility and predictability boosted cash flow generation in 2018

US$ billion

Analysts' average EBITDA 2018¹
Working Capital
Interest on loans
Income tax & REFIS
Investment
Others²
Free cash flow, net of disposals
Cobalt stream
Net disposal
Free cash flow

% FCF Yield
19.9%

1 Average of 16 institutions, as of Sep 3, 2018
2 Includes derivatives and financial instruments, interest on participative stockholders debentures, dividends and interest on capital from associates and JVs and other loans, loans and advances receivable from non-controlling companies, dividends and interest on capital attributed to non-controlling interest, Samarco and others.
The nickel business will implement several initiatives to improve operational efficiency

2Q18 EBITDA Breakeven

US$/t

<table>
<thead>
<tr>
<th>COGS</th>
<th>By-product revenues</th>
<th>COGS after by-product revenues</th>
<th>Expenses and others¹</th>
<th>Premium / discounts</th>
<th>EBITDA break even 2Q18</th>
</tr>
</thead>
<tbody>
<tr>
<td>13,139</td>
<td>6,958</td>
<td>6,181</td>
<td>535</td>
<td>308</td>
<td>6,408</td>
</tr>
</tbody>
</table>

2019 EBITDA Breakeven levers

- Operational stability
- Digital transformation program
- Portfolio simplification (e.g. closure of Thompson smelter and refinery in 3Q18)
- Ramp-up of Long Harbour
- Premium product portfolio
- Sudbury optimization following single furnace transition

¹ Sales expenses, R&D, Pre-operating & stoppage and other expenses
Copper operations in Brazil will continue to be a cash cow for our Base Metals division in 2019

2Q18 EBITDA Breakeven – Salobo
US$/t

2Q18 EBITDA Breakeven – Sossego
US$/t

On a consolidated view, Salobo and Sossego’s joint EBITDA breakeven is US$ 2,404/t

¹ Sales expenses, R&D, Pre-operating & stoppage and other expenses
In the coal business, the priority was the stabilization of Moatize in 2018 to guarantee a sustainable ramp-up.

2Q18 Pro-forma C1 Cash Cost
US$/t

- Pro-forma operational costs¹: 79
- Nacala non-operational tariff²: 45
- Other costs: 4
- Cost at Nacala Port: 128
- NLC’s debt service to Vale: 12
- Pro-forma C1 cash cost 2Q18: 117

Full ramp-up pro-forma C1 Cash Cost Guidance
US$/t

- Pro-forma operational costs¹: 60-65
- Nacala non-operational tariff²: 25-30
- Other costs: 0
- Cost at Nacala Port: 85-95
- NLC’s debt service to Vale: 3 - 6
- Pro-forma C1 cash cost guidance: 82-89

¹ Includes the NLC tariff components related to fixed and variable costs and excludes royalties.
² Includes the NLC tariff components related to sustaining capex, working capital, taxes and other financial items.
In 2019, robust cash flow can be generated even considering current breakeven levels

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Breakeven EBITDA</th>
<th>Volume</th>
<th>Investment</th>
<th>Others</th>
<th>FCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Ore &amp; Pellets</td>
<td>62</td>
<td>28.8</td>
<td>393 Mt</td>
<td>~US$4.5 bi</td>
<td>~US$3.4 bi</td>
<td>~US$8.1 bi</td>
</tr>
<tr>
<td>Nickel</td>
<td>15,000</td>
<td>6,408</td>
<td>262 Kt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper Brazil</td>
<td>7,000</td>
<td>2,404</td>
<td>288 Kt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>165^6</td>
<td>116.8^7</td>
<td>Up to 16 Mt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

\[^1\] Analysts average, US$/t, as of Sep 3, 2018
\[^2\] US$/t as of 2Q18
\[^3\] As of Vale Day 2017
\[^4\] Considers 400 Mt iron ore production and the usual rate to transform iron ore into pellet
\[^5\] Considers working capital, financial expenses, income tax, Refis and others
\[^6\] Hard Coking Coal market reference price
\[^7\] Pro-forma C1 Cash Cost
Strong balance sheet set the basis for starting a new era of shareholder remuneration

Net Debt
US$ billion

Shareholder remuneration
US$ billion

- Buyback
- New Remuneration Policy
- Former Remuneration Policy
Rigorous capital allocation will pave the way for future growth

<table>
<thead>
<tr>
<th>Engineering, economics and funding solved</th>
</tr>
</thead>
<tbody>
<tr>
<td>São Luís, Tubarão I and II pellet plants</td>
</tr>
<tr>
<td>• Up to 13.7 Mtpy of pellet capacity</td>
</tr>
<tr>
<td>• Delivered ahead of schedule and on budget</td>
</tr>
<tr>
<td>• Cobalt stream is equivalent to 40% of the estimated VBME nominal capex of US$ 1.7 billion</td>
</tr>
<tr>
<td>• Vale remains exposed to approximately 40% of future cobalt production</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VBME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• FEL 3 to be concluded in 3Q18. Expected approval: 4Q18</td>
</tr>
<tr>
<td>• ~50 Ktpy on average for the first five years</td>
</tr>
<tr>
<td>• ~60% of the investment or US$ 600 million to be financed through the announced gold stream transaction with Wheaton Precious Minerals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Salobo III</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Oman pellet expansion</td>
</tr>
<tr>
<td>• Indonesia expansion</td>
</tr>
<tr>
<td>• Victor</td>
</tr>
<tr>
<td>• Alemão</td>
</tr>
<tr>
<td>• Onça Puma 2nd furnace</td>
</tr>
<tr>
<td>• Sudbury exploration</td>
</tr>
<tr>
<td>• Moatize Expansion</td>
</tr>
<tr>
<td>• Hu’u</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Engineering, economics and funding solved</td>
</tr>
<tr>
<td>• Study phase</td>
</tr>
<tr>
<td>• Salobo III</td>
</tr>
<tr>
<td>• Optionality</td>
</tr>
</tbody>
</table>

DELIVERED
On top of minimum dividend Vale will explore options for shareholder return in a disciplined way

**Minimum Dividend**
(30% of EBITDA - Sust.)

- Equivalent to ~50% of FCF

**Extraordinary Dividends** or **Buybacks**
- Additional return to shareholders
- Upside for share appreciation

**Growth Opportunities**
- Salobo III ~8,000 US$/ton
- 2nd Furnace Onça Puma ~11,000 US$/ton
- Oman Expansion ~ 30 US$/ton

**Bolt-on Acquisitions**
- Energy
- Southern System

**Other Liabilities Optimization**
- MBR
- Pricing of energy contracts

---

1 30% x (Adjusted EBITDA – Sustaining Investments). Approximately 50% of FCF
2 Based on average volume of the first five years (~50kt). Net of Wheaton Precious Minerals contribution of US$ 600 million