Steering a Digital Transformation Journey in Mining and Metals: Approach and Recipes
Agenda

1. Vedanta: An Introduction
2. Digitalization in Mining & Metal: Gaining Speed and Traction
3. Journey So Far
4. Digital Vision and Transformation Roadmap
5. Benefits Envisaged
6. Future Landscape
7. Key Success Factors
Vedanta Resources: An Introduction

London Stock Exchange listed, globally diversified natural resource company having interest in Zinc, Lead, Silver, Copper, Iron Ore, Aluminium, Power and Oil & Gas

1. Portfolio of large, diversified, low-cost assets geared towards base metals and oil

2. Strong financial profile: Revenue of $11.5 billion, EBITDA of $3.2 billion and Free Cash Flow of $1.5 billion

3. Over 2.25 million beneficiaries of Community Development in India and Africa

4. One of the Top Companies to work for in Asia (ACES, 2016)

Foothold spans across India, Zambia, Namibia, South Africa, Liberia, Ireland and Australia
## Vedanta Resources: An Introduction (Contd..)

### Zinc Business, India

**Hindustan Zinc Ltd., India**
- **2nd largest Zinc-Lead Miner** globally with annual ore production capacity of 12+ million MT
- **4th largest Zinc-Lead Smelter** globally with **production capacity of 1+ Million MT of metal**
- **18th largest Silver producer** of the world
- **Ranked 11th globally** in Dow Jones Sustainability Index in Metals & Mining industry group

### Zinc International Business, Africa & Ireland

**Black Mountain Mine, South Africa**
- An underground operation mining Zinc, Lead, Copper and Silver with R&R of ~65 mT and ~3.1 mT of contained metal with LoM of ~5 years

**Skorpion Zinc Mine & Refinery, Namibia**
- Largest integrated zinc operations in Africa with R&R of ~26 mT, contained metal of ~2.7 mT with LoM of 4 years and refining capacity of 150 KTPA SHG Zinc

**Gamsberg Mine, South Africa**
- One of the world’s largest known Zinc deposit with R&R of ~215 mT and contained metal of ~16 mT with LoM of over 30 years

**Lisheen Mine, Ireland**
- World-class closure process underway

### Iron Ore Business, India & Liberia

**Sesa Iron Ore, India**
- **India’s largest** private sector Ore Exporter
- Capacity of ~7.8 mT with a potential to go up to ~20.5 mT
- **One of the lowest cost** Iron Ore producer in the world

**Western Cluster Ltd., Liberia**
- Wholly owned Iron assets including development rights
- Feasibility study underway for exploration and commissioning
### Copper Business, India
- **Sterlite Copper, India**
  - Custom smelter, refinery, continuous cast copper rods, sulphuric acid and phosphoric acid facility with **160 MW Coal based power plant**
  - **400 KTPA Anode and Cathode production capacity** and **expansion to 800 KTPA underway**
  - **250 KTPA CCR production capacity**
  - **Holds 36% market share** in Indian Copper Industry
  - **Sustained high utilization rate with efficient by-product management**

### Copper Business, Africa & Australia
- **Konkola Copper Mines, Zambia**
  - One of Africa’s largest integrated copper producer and one of the world’s highest grade copper mines situated in Copper Belt of Zambia
  - Sinking of **1500 deep shaft** at flagship Konkola Deep Mine Project (KDMP), first time in post-independence era of Zambia
  - State-of-the-art Copper Smelters and **concentrators with capacity of 15.5 mTPA**

- **Copper Mines of Tasmania, Australia**
  - Under Care and Maintenance at present
  - Evaluation underway to restart

### Power Business, India
- **Power Business, India**
  - One of the largest power generators in India, well poised to capitalize on India’s economic growth, power deficit and large coal resvers
  - Operates **9 GW power portfolio**
  - Includes **Captive and IPP power** generation facilities
  - Portfolio includes **coal-based power generation and renewable sources of power** like Solar and Wind
  - Exploring power opportunities in Africa
**Aluminium Business, India**

**Vedanta Aluminium and BALCO, India**
- Largest producer of Aluminium in India with 2.3 mTPA capacity, including Mines, Smelting, Refining and Fabrication facilities
- 40% market share in Indian Aluminium industry
- Located near to richest bauxite deposits and coal reserves
- Established infrastructure and economies of scale

**Oil & Gas Business, India**

**Cairn Energy, India**
- Operating 27% of India’s oil production, largest private sector oil producer
- Portfolio of 7 blocks, 6 in India and 1 in South Africa
- 1.3 boe gross proved and probable reserves and resources
- Strongly positioned on global oil cost curve
- Strong track record and growth pipeline in exploration and development
- Have made more than 50 hydrocarbon discoveries in last decade
Digital as a Trend: Gaining Speed and Traction

Driving Factors:

- Market Volatility
- Increased Cost Base
- Changing Global Demand

Benefits of Digitalization Adoption:

1. Real-time visualization of data
2. Derive future insights into performance, health & mineral characteristics
3. Control mineral characteristics through strategies
4. Make more timely process changes
5. Schedule dynamically across whole mine operations based on predictive alerts
6. Improved safety through people and asset tracking
7. Enhance asset health through predictive maintenance
8. Simulation and Immersive Employee Training
9. Cut cost and improve revenues, provide sustainable and disciplined growth
Journey So Far.....

Prior to 2007

- Core SAP Modules (Non-ECC Versions)
- Barcoding and Warehouse Automation
- Weighbridge Automation
- Mine Technical Systems
- Plant Technical Systems
- Core Infrastructure
- Home-grown SRM
- Home-grown HRMS

2007 to 2012

- Uniform upgrade to SAP ECC
- SAP HCM Phase 1
- SAP SRM Phase 1
- SAP MII Phase 1
- SAP GRC (Access Controls)
- SAP SOLMAN
- Newgen Shared Service
- LIMS
- SAP MDM
- Discrete EHS Systems
- Custom CRM System

2012 to 2017

- SAP SF Phase 1
- SAP Ariba Phase 1
- SAP HCM Phase 2
- SAP SRM Phase 2
- SAP MII Phase 2
- SAP VIM Phase 1
- SAP EHS
- SAP Treasury Phase 1
- SAP BIBO Phase 1
- SAP GRC (Process Controls)
- SAP Fiori Mobility
- Integrated Transport Management
Vision: To make HZL a Digital Enterprise with thrust on Innovation

**Focus Areas**

- Autonomous Operations
- Process Automation
- Analytics & Mobility
- Cloud Computing
- Collaboration
- Governance & Compliance
- Support & Operations
- Information & Cyber Security

**Business Challenge**

1. Review Ongoing Initiatives and Revisit Business Challenges
2. Develop Digital Themes & Tracks
3. Benchmark with Best in Class to develop Inventory of Digital Initiatives
4. Prioritize with business users and functions
5. Identify partners in Digital Journey & Implement selected initiatives

**Vision**

- Short Term Piloting Digital As a Project
- Medium Term Scaling Digital As a Business
- Long Term Integration Digital As a Core Value
Digital Transformation Road Map

Mine Planning & Mine/Plant Operations

- 3D Numeric Modelling for Stope and Pillar Design
- In-situ Stress Measurement
- 3D Design
- Schedule Simulation using 5D planner
- Shaft Sinking Modelling
- Integrated Mine Planning Systems
- Best in Class Equipment
- 3D scanning with laser scanner
- Virtual Reality and Simulation based Training
- Digital Mining and Asset Optimization
- Tele Remote Operations
- Electronic Shot Firing
- Centralised Control Room & Smart Laboratory
- Safety, Health & Environment Systems
- Manufacturing Integration and Intelligence
- Blend Planning & Metal Accounting

Completed / Largely Completed
Under Implementation / Pilot Phase Completed
Planned
Digital Transformation Road Map (Contd..)

Procurement Excellence
- Ariba Vendor On-boarding and Performance Mgmt.
- Ariba Auction Platform
- Ariba Contract Authoring and Monitoring
- Ariba Digital Catalogue Management
- Ariba Commercial Automation
- Ariba Supply Chain Automation (VMI,B2B)
- SAP Commodity Price Engine

Integrated Transport Management
- Driver and Vehicle Registration
- Biometric Authentication
- Transport Planning & Scheduling
- Geo-fencing & Traffic Monitoring
- Man-less weighbridges
- RFID and GPS based real-time tracking
- Auto delivery, goods receipt & invoicing

SAP HCM, Successfactors and Central Workforce Management
- Employees Profile and Digital Files Management
- Recruitment Marketing
- Recruitment and On-boarding
- Performance and Goals Management
- Succession Planning
- Biometric Authentication
- Learning Management
- Compensation Management
- Workforce Analytics

Provision of Assistance
- Customer Relationship Management & Online Metal Store
- Treasury Management
- Business Planning, Monitoring & Control
- Management Reporting

Completed / Largely Completed  Under Implementation / Pilot Phase Completed  Planned
Digital Transformation Road Map (Contd..)

- **Mine Planning**
  - S4 HANA Digital Core
  - Knowledge Management

- **Mine Operations**
  - Fiori Mobility Platform
  - Virtual & Immersive Presence

- **Plant**
  - Big Data Analytics
  - Portfolio Rationalisation

- **Transport**
  - Cyber Security, Governance, Risk Mgmt.
  - Disaster Recovery & Business Continuity

- **Market**

**Completed / Largely Completed**

**Under Implementation / Pilot Phase Completed**

**Planned**
# Benefits Envisaged in the Digital Journey

## Quantitative

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Improvement</th>
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<tbody>
<tr>
<td>1. Increase in Mine Productivity</td>
<td>~15%</td>
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<tr>
<td>2. Improved Asset Utilization</td>
<td>~10%</td>
</tr>
<tr>
<td>3. Improved Asset Availability</td>
<td>~10%</td>
</tr>
<tr>
<td>4. Reduction in Operating Cost</td>
<td>~5%</td>
</tr>
<tr>
<td>5. OEE Improvement</td>
<td>~5%</td>
</tr>
<tr>
<td>6. Reduction in procurement Cost</td>
<td>~10%</td>
</tr>
<tr>
<td>7. Reduction in PR to PO Cycle Time</td>
<td>~30%</td>
</tr>
<tr>
<td>8. Reduction in Logistic TAT</td>
<td>~20%</td>
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<tr>
<td>9. Energy Optimization</td>
<td></td>
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<tr>
<td>10. Recovery Improvements</td>
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## Qualitative

<table>
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<tbody>
<tr>
<td>1. Improved Safety, Health and Environment</td>
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<td>2. Better Decision Making with real insight into the information</td>
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<td>3. Enhanced Business Controls and Compliance</td>
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<tr>
<td>4. Better Stakeholder Collaboration – Vendors, Customers, Employees</td>
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<tr>
<td>5. Structured Talent Management</td>
</tr>
<tr>
<td>6. Reduction in Business Process Cycle Time, Improved Efficiency</td>
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Landscape in a Digital Environment

Peripheral Systems
SAP Successfactors
SAP Ariba Source-to-Pay
SAP Hybris Cloud CRM

SAP S/4 HANA Digital Core

Integration Domain (MII)
Integrated Mine Planning

SAP Fiori Mob Apps Platform / Syclo Mobility

HANA Analytics / Visualization Tools
Advanced Big data Analytical Application areas using IoT
Collision detection Energy monitoring Blend Planning
Pillferage Monitoring People Health Analysis

SAP/In Memory Real time HANA Platform) with iOT services

Digital Mining Components

Mine Technical Systems and OT Layer (Plant Automation / Sensors / HEMM / LIMS etc.)

Mine Systems HEMM devices / Fleet Sensors LIMS PLC SCADA DCS / Historian Energy Meters Environment Sensors Weighbridges Wearables

Core Infrastructure, Information Security and Compliance
End User Machines Network Data Center TP/VC FMS Cloud Computing CSA/VAPT ISO 27K DR/BCP Compliance
Key Success Factors...

1. Benchmarking and Prioritization
2. Should address a Problem Statement
3. Top Level Sponsorship, Right Organization Structure
4. Comprehensive Approach, phased deployment
5. Strategic Partnership with Solution Providers