1) Gold Fields Overview

2) Challenges facing the gold industry

3) Trends impacting the gold industry of the future

4) Future operating practices and technologies

5) How Gold Fields is tackling these challenges

6) Gold Fields examples

7) Future organisational, people and governance practices

8) Conclusion
Overview of Gold Fields

<table>
<thead>
<tr>
<th>Region</th>
<th>Mines/Projects</th>
<th>Attributable Production</th>
<th>AIC</th>
<th>Net Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana Region</td>
<td>2 mines</td>
<td>644koz (32% of group)</td>
<td>US$1,020/oz</td>
<td>US$100m inflow</td>
</tr>
<tr>
<td>South Africa Region</td>
<td>1 mine</td>
<td>290koz (13% of group)</td>
<td>US$1,234/oz</td>
<td>US$12m inflow</td>
</tr>
<tr>
<td>Americas Region</td>
<td>1 mine, 1 project</td>
<td>269koz (12% of group)</td>
<td>US$762/oz</td>
<td>US$77m inflow</td>
</tr>
<tr>
<td>Australia Region</td>
<td>3 mines, 1 project</td>
<td>942koz (43% of group)</td>
<td>US$941/oz</td>
<td>US$256m inflow</td>
</tr>
</tbody>
</table>

Attributable reserves:
- West Africa: 7.0Moz
- Australia: 5.8Moz
- Americas: 1.3Moz
- South Africa: 34.1Moz

Group: FY 2016
- Attributable production: 2,146koz
- AIC: US$1,006/oz
- Mine net cash flow: US$444m
The Gold Industry has faced a number of headwinds over the past decade. Gold prices have declined by 32% since the 2011 peak (have recovered from their Dec 2015 low though).

Geological inflation\(^1\) is driving double-digit cost inflation.

Today it takes an average of 18 years from discovery to first production versus 10 years a decade ago.

The average grade of gold mined has fallen 3% p.a. since 2000.

Clashes with local communities rose 22% p.a. in the last decade.

Governments seeking greater benefits from mining operations.

Gold prices have declined by 32% since the 2011 peak (have recovered from their Dec 2015 low though).

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\(^1\) includes grade degradation, processing recoveries and tougher operating conditions.
The industry has to change the way it operates

In the future, mining will have to operate differently from today

What does the future look like?
Companies need to adapt to key technology and socio-economic trends

TECHNOLOGY TRENDS
- Artificial Intelligence, Big Data & Analytics
- Automation
- Industrial Internet of Things

Miners need to adapt to these changes to be sustainable:
Fix the basics first – integrate operations and departments (many mines operate in silos)

Digital Mining: Optimising mining assets through real-time data access and analysis across the value stream. How do we get there:

- Simple, smart, accessible systems and processes
- Ongoing, real-time feedback
- Instant access to data and information
- Absolute transparency
- Reduced bureaucracy, hierarchy
- Enabled and empowered leadership

SOCIO-ECONOMIC TRENDS
- Changing nature of work
- Flexible working
- Changing expectations of millennials

Source: NextGenOpX
A new recipe is needed for gold mining to be viable

**Different operational, governance, people and organisational metrics are needed**

- Converting outstanding *conventional* mining practices to *mechanisation & automation*
- Embracing *digital mining* and full integration of big data through advanced analytics and software technologies
- Accessing *new reserves or creating value* from previously unmined reserves by improving the economics of low grade and residual ore bodies
- Driving *disciplined capital* spending – better return for the dollar
- Developing new approach to manage *key stakeholders and entering partnerships* to ensure sustainable operations
- Embracing *energy and water efficiency* to ensure reduced environmental impact

Gold industry needs to shift from reactivity to proactively shaping the gold industry of the future
### The gold industry of the future has four focus areas

<table>
<thead>
<tr>
<th>Operating practices &amp; technology</th>
<th>Talent and leadership</th>
<th>Partnerships</th>
</tr>
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<tbody>
<tr>
<td>▪ New exploration trends</td>
<td>▪ More technical skills – strong analytics and decisions based on empirical evidence</td>
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<td>▪ Mechanised, automated and digitised operations</td>
<td>▪ High specialisation</td>
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<td>▪ Local talent development</td>
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<td>▪ Greater energy efficient operations</td>
<td>▪ New type of CEO</td>
<td></td>
</tr>
<tr>
<td>▪ Reduced environmental impact</td>
<td>▪ Governments – provide appropriate regulatory framework</td>
<td></td>
</tr>
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<td>▪ Partnerships and Shared Value with local communities</td>
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<td>▪ Stakeholders will demand commitment to socio-economic and environmental factors</td>
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### Responsibility & transparency

- Close involvement of investors with greater transparency and access to operational data
- Knowledgeable investors will demand stringent corporate governance and adherence to world-class frameworks and standards
Operating Practices & Technology

How are we tackling these challenges at Gold Fields
Gold Fields’ Information & Technology strategy and goals

Delivering future state (>7 years)
Transformational Phase (5-7 Years)
Foundational Phase (1-2 years)

Our end goal: A fully autonomous mine, where human risks are removed, with minimal environmental impact. Looking at the exponential growth of technology, combined with growing social pressures, this will need to be in place by around 2030.
Many OEMs are pioneering automated and remote controlled equipment. Partnering with OEMs will become increasingly critical in future to harness best-of-class technologies.

Equipment currently available from OEMs:
- Open-pit autonomous trucking
- Remote controlled support equipment
- Remote controlled train transport
- Drone equipment
- Autonomous excavators

But, no fully autonomous UG solutions are currently available.

Co-operation with OEMs

Exploration
- Computer algorithm automatically detects patterns in exploration data indicative of mineralisation

Drilling
- All major OEMS offer products with various level of automation
- Other firms specialize in retrofitting existing drills for automation

Blasting
- The charging process can be automated, with the required amount of explosive being entered beforehand

Loading
- OEMs developing autonomous excavators

Hauling
- Komatsu, Caterpillar, Hitachi and others have commercial offerings of remotely operated hauling equipment

Other support equipment
- All major OEMs have developed and are developing remote solutions for support equipment like dozers, shearers, etc.

Underground equipment
- Eliminate use of diesel equipment underground
- OEMs have developed and implemented automated drilling – UG and surface

Source: Press search
Partnering with technology companies to drive operational change will become increasingly critical and common.

Gold Fields has established partnerships with...

Business Science Corporation, Amazon, NewTrax, FTP Solutions, NextGenOpX, IoT.Nxt, Trimble

...to implement technological advances...

Rugged sensors  3D vision and mapping software

...with multiple applications

Mapping and inspection  Operator safety: Advanced obstacle detection and warning  Stockpile monitoring

Geological monitoring  Enhanced tele-remote  Fleet tracking: Real time monitoring underground

...leading to...

✓ Safer operations  ✓ Increased productivity  ✓ Improved cost efficiencies

Source: Gold Fields
Current technology applications at Gold Fields – case studies
Gold Fields – What we are currently implementing (Horizon 1)

OPERATING PRACTICES & TECHNOLOGY

GFL High Level Horizon 1 I&T Themes

- Exploration Efficiency
  - Real time in hole data capture
  - Data mining of Explorations data sets

- Big Data analytics and reporting from new and existing systems

- Improved data backbones and IT platforms

- Mine automation and remote operations using existing technologies

- Collision avoidance, people tracking, solar power, carbon & fuel mgmt.

Horizon 1

Horizon 2

Horizon 3

Delivering future state (>7 years)

Transformational Phase (5-7 Years)

Foundational Phase (1-2 years)
Aerial and surface drones at Australian and Ghanaian mines have improved our exploration efforts and aerial mapping.

Different types of drone equipment

- Trimble aerial drones

- Salt lake drones: TRAMPE (Tethered Rotary Airborne Platform) and SKIMPI (Sled Kart Instrument for Magnetic Prospectivity Imaging)

- Scoping drones at Tarkwa

Gold Fields uses different drone technologies to:

- Capture high resolution aero-magnetic data particularly over salt lakes (St Ives and Granny Smith)
- Take aerial photographs of tenements (Australian mines)
- Early stage geological mapping of our tenements (Australian mines)
- Measure stockpile volumes in a short space of time (Tarkwa)

- Improve the way we capture and process data for geology, geo-technical, material movements and reconciliation
- Aerial photography of our tenements is now completed in hours – not days or weeks

Source: Gold Fields, Trimble
Remote rock breaking at South Deep

South Deep has installed surface remote rock breaking equipment

A remote controlled hydraulic arm breaks the rock that has been transferred from the stopes to the ore pass system

It is too dangerous to do this manually – significant safety and productive improvements

Source: Gold Fields
St Ives has:

- Replaced semi-automated fleet management system with a Wenco Fleet Management System (started in 2016)

This project includes:

- Upgraded data communication network
- Trucks equipped with specific IDs
- Drones providing real time truck movements
- Fleet management control from a Data Warehouse to visualise and act on real-time data received
- Culture change programmes focusing on Control & Business Improvements

Outcome: Contributed towards a 17% increase in production at the mine over the past year

Source: Wenco, Gold Fields
Destress mining at South Deep

Safer, production operations

- Optimal extraction of orebody through bulk mining methods in de-stressed zone
- Replicates ~1,200m stress conditions at ~2,600m below surface
- Allows mechanised bulk mining at depth

- Preconditioning of destress ore-body by pre-drilling and fracturing the rock to prevent transfer of energy from seismic events to the rock-face
- Destress mining reduces vertical ore-body stresses by over half
- Makes use of high profile trackless equipment to minimize exposure to high field stresses
- Makes use of backfill
- Backfill reduces the attenuation of rock mass response to dynamic loading and reduces energy release rates in the proximity of the face

Source: Gold Fields
Ground penetrating radar, South Deep, South Africa

Sub-Surface Profiler (Reutech)

South Deep has:

- Replaced borehole cameras and other observational methods used to determine the effectiveness of preconditioning blasts
- South Deep now uses ground penetrating radar in the form of a Reutech Sub-Surface Profiler

Benefits:

- Fast and accurate identification of rock structures, including blast induced fracturing
- Data can be seen in real-time, reducing the turn-around time for operators to continue mining
- A reduction in face bursts since implementation; this is expected to continue

Source: Reutech
Ore sorting at Agnew, Australia

Steinert ore sorting equipment

Agnew concept phase project

- Working with Steinert to improve sorting of underground stope material
- This will sort underground stope material based on quartz content:
  - Remove diluting material with no quartz
  - Retain lower tonnage, higher grade mill feed

Example of sorted material

- 15.67g/t ore grade
- 0.12g/t waste grade

- Reduced processing costs by not processing diluting material
- Increased available capacity in the CIL plant
- Reduced underground cutoff grades through reduced processing costs
- New underground stoping areas due to reduced cutoff grades

Source: Steinert
What does the future look like?
The gold industry of the future has four focus areas:

### Operating practices & technology
- New exploration trends
- Mechanised, automated and digitized operations
- **Technical advances** through collaboration with OEMs and IT firms
- Greater **energy efficient** operations
- Reduced **environmental impact**

### Talent focus and leadership
- More technical skills – strong analytics and decisions based on empirical evidence
  - High specialisation
  - Local **talent development**
  - New type of CEO

### Partnerships
- **Governments** – contributing equity
- Partnerships and Shared Value with local communities
- Risk-Reward relationship with employees
- Strategic partnerships and JVs to share benefits and manage risks
- Stakeholders will demand **commitment** to socio-economic and environmental factors

### Responsibility & transparency
- Close involvement of investors with greater transparency and access to operational data
- Knowledgeable investors will demand **stringent corporate governance and adherence** to world-class frameworks and standards

Source: Gold Fields
The workforce will be highly skilled, specialised and trained

<table>
<thead>
<tr>
<th>Today</th>
<th>Tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Miners</strong></td>
<td><strong>Supervisors</strong></td>
</tr>
<tr>
<td>▪ Manual, non-specialised frontline work</td>
<td>▪ Most time spent with their teams</td>
</tr>
<tr>
<td>▪ Decision making information limited and not real-time</td>
<td>▪ “Wholesale” skills development for the frontline</td>
</tr>
<tr>
<td>▪ Most workers transported in</td>
<td>▪ Skilled IT specialists</td>
</tr>
<tr>
<td><strong>Miners</strong></td>
<td><strong>Supervisors</strong></td>
</tr>
<tr>
<td>▪ Automated machinery requiring specialists</td>
<td>▪ Different interpretation skills (Systems engineers, Data analysts)</td>
</tr>
<tr>
<td>▪ Mine-wide, real-time information available for decision making</td>
<td>▪ Remote monitoring and communication</td>
</tr>
</tbody>
</table>

- Mines, governments, universities & technical institutions will need to work together to develop and train the miner of the future.
- Ability to create a thriving local economy that does not rely directly on mining employment or the provision of core services to mines will be critical in developing countries.

Source: Gold Fields
Role of the CEO and organisational design will be different

**Shareholders**
- Manage expectations on returns
- Operational accountability
- Operational transparency

**Government**
- Facilitate private public partnerships
- Support infrastructure and social investments
- Common purpose

**Communities**
- Shared value
- Socio-economic upliftment
- Community procurement
- Community employment

**Activists**
- Drives to be more environmentally responsible
- Closer alignment and relationships with NGOs
- Greater community relations

**Portfolio of mines**
- Manage JVs with other mining companies
- Devolve operational accountability to the mines
- Industry training initiatives

**OEM and technology partners**
- Contractor mining
- Partnerships on advanced R&D and technology
- Partnerships to mutually improve business outlook

**CEO**
- Manages and engages stakeholders
- Collaborative decision-maker
- Influencer and coach
- Integrated thinker
- Portfolio manager

**Lead time information availability**

Source: Gold Fields
New partnership models in developing countries will focus on joint ownership, risk management and shared benefits.

- Contributing equity position
- Policy certainty and competitive rates
- Partners in infrastructure development

- Shift from re-active concessions to pro-active shared value

- Employees participate more in the risk and rewards of the business

- JVs with other mining companies to achieve economies of scale, diversify risks and/or address capacity constraints

- Partnerships with Universities to research new technology and train the miners of the future

Source: Gold Fields
We will need to focus on responsible and transparent operations

### Operational transparency
- Investors will require real-time operational, financial and sustainability data
- **Transparent cost and earnings reporting**

### Corporate governance
- Evolving and more stringent *corporate governance standards*
- Transparency in *dealing with governments*

### Integrated thinking
- Seeks to ensure sustainability of companies *through value creation for all stakeholders* (not only investors)
- Embed *formal management processes* that link all parts of the business (operational, financial and sustainability)

### Integrated reporting
- **Ensure greater transparency to improve trust deficit**
- Entrench adherence to reporting and sustainability frameworks

Source: Gold Fields
Mining companies will need to follow global standards of reporting since investors are demanding more transparency and clearer mandates.

### Future non-negotiables – Adherence to leading reporting frameworks. These include:

<table>
<thead>
<tr>
<th>Framework</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EITI</strong></td>
<td>Is a <strong>global standard</strong> to promote payments to government and avoid perceptions of corruptions</td>
</tr>
<tr>
<td><strong>Global Reporting Initiative</strong></td>
<td>Focuses on communicating <strong>critical sustainability issues</strong> such as climate change, human rights, governance and others</td>
</tr>
<tr>
<td><strong>UNGC (United Nations Global Compact)</strong></td>
<td><strong>UNGC aims to create a sustainable and inclusive economy</strong></td>
</tr>
<tr>
<td><strong>ICMM (International Council on Mining &amp; Metals)</strong></td>
<td>Compliance with the 10 sustainability and <strong>development principles</strong> of the ICMM</td>
</tr>
<tr>
<td><strong>Integrated Reporting Framework</strong></td>
<td><strong>Integrated reporting framework</strong> to bring greater efficiency and cohesion to reports</td>
</tr>
<tr>
<td><strong>IFRS</strong></td>
<td><strong>Set of accounting standards</strong> development by the independent Accounting Standards Board (IASB)</td>
</tr>
</tbody>
</table>

Source: Web Search, Integrated reporting framework website, EITI website
The gold industry needs to proactively shape its own future

Gold Fields has started this journey ... but significant challenges lie ahead

Continue on the **mechanisation, automation and digitisation** journey

Work with **OEMs and tech companies** to gain access to world-class technology

Partner with **other mining firms** to share risks and achieve economies of scale

Work with **educational institutions** to train hi-tech skills

Create incremental value for **employees, governments and communities**

Adopt evolving **corporate governance** and **reporting** standards