Technology and Innovation
The importance of technology

**Imperative for improved safety, efficiency and delivering full potential from operations and projects**

- Requirement for safe production
- Increasingly challenging ore bodies
- More onerous regulatory & social landscape
- Need for productivity gains
- Rising capital and operating costs
- Cash flow margins under pressure

- Engineering out risk
- Automation & mechanisation
- Research into mining innovation & robotics
- Power conservation
- Clean energy projects

**Strategic Response**

Technology a key enabler of our business
Investment in new technology vital to deliver future growth
“Fit for purpose” technology and innovation
Gold Fields technology and innovation strategy

Technology and Innovation framework integrated across the Group

- Centrally managed
- Pull and Push technologies driven in integrated and sustainable manner
- Collaboration with research groups, OEM’s and technology providers

Push-out technology
- Technology systems within Gold Fields
- Pilot for rapid deployment

Pull-in technology
- Proven technologies Gold Fields is currently assessing/piloting
- Continual scan of environment
- Define technology suite

Research & Build
- New technologies requiring investigation
- Maintain and establish new partnerships
- Use R&D and build solutions for step changes
Python Plant

Flexible solution to surface processing

Optimise Our Operations

- Unlocking gold reserves in surface resources at KDC
- Brings forward low cost gold ounces

- New technology
  - Skid mounted, mobile, versatile, compact and multiple integrated units
  - Modular set-up

- Operational flexibility
  - Designed to realise energy efficiency
  - Robust and low operating costs (R55/t vs R75/t)

- Environmental compliance
  - Smaller footprint
  - Water recovery module
  - Potential power saving (3MW vs 15MW in a conventional plant)
Compressed Air-less Shaft

Changing the paradigm – re-engineering to reduce power consumption

- Removing underground reliance on compressed air

Optimise Our Operations

Compressed air
- Current deep underground compressed air systems sub optimal
  - Consume ~20% of electricity
  - Typically less than 20% efficient

Major users profiled
- Solutions available for loading, drilling, box front cylinders and agitation
- Ventilation of refuge bays still requires a viable solution

Diagram showing pressure bar and usage of compressed air for different tasks.
Drop-in impellers and composite fans

Drawing down power consumption and operating cost

Optimise Our Operations

- Drop-in impeller - cutting edge ventilation technology
- Composite fans

Drop-in impellers use less power and improve efficiency

- Potential saving
  - Average ~8MW at KDC (already done at South Deep)
  - R40 million annual saving in 2012 terms

Composite fans (33.5kW fan provides the same airflow as a 45kW fan)

- Potential saving
  - 7MW (~600 fans being installed over the next 12 months)
  - R35 million annual saving in 2012 terms
Mill safe start system

Large mill protection and safety

- Prevents premature mechanical & electrical failure of large geared grinding mills
- Offers protection against locked charge incidents with uninterrupted production
- To be incorporated at all new projects

Optimise Our Operations

- Detects & measures torque transients during start-up
- Enables corrective action to be taken ensuring longer life of associated equipment
- Implemented at Tarkwa, order placed for Damang mills and potential roll out to most of the Group’s large geared mills
Platsol

Innovative solution for low grade poly-metallic ores

- High pressure oxidation leaching in autoclave unit
- Bringing Arctic Platinum ore body to account

- Improved overall recovery through bulk flotation and higher mass pull
  - Typical recovery improvement of ~20 percentage points to 70%
  - Improved overall revenue from basket of metals

- Yields individual products on site
  - PGM precipitate
  - Copper cathode
  - Nickel hydroxide

- Environmentally friendly process Hydromet vs Smelter

- Potential application to other poly-metallic and refractory style ores
Methane extraction at Beatrix Gold Mine

Carbon and Energy Management

Securing Our Future

- First hard rock project in the world registered under the Kyoto Protocol
- Underground and surface borehole methane extraction

- Methane captured at source underground and conveyed via a network of pipes to surface, where it is flared

- Managing carbon emissions and footprint
  - Planned to reduce 1.7Mt CO₂ for the first 7 years

- Phased approach
  - Methane flaring
  - Power generation (~4MW)

- Carbon credits derived from the project to be traded

- Stage II Methane Project (West)
Water treatment in South Africa Region

Liquid Gold Project - key to unlocking sustainable solutions

- Acid Mine Drainage – world-wide Concern
- License to Operate – water security is a key contributing factor
- Proactive – sustainable potable water solution for mine and dirty fissure water

Motivation
- Plan proactively for responsible mine closure
- Improved security of water supply
- Community involvement in related Local Economic Development

Technology selected and piloted
- Ion-Exchange, Crystalactor, selected anion and cation resins customised to our requirements

Partnerships required to ensure project sustainability beyond mining