Here Comes the Sun: How mines can utilise Renewable Energy

Gold Fields, Rocky Mountain Institute and Carbon War Room
Thursday 15th September 2016
ICMM background
Supporting the transition to a low carbon economy through efficiency and low carbon technology

Introducing
• Dr Tsakani Mthombeni, Group Head of Carbon and Energy at Gold Fields
• Alastaire Dick, Operations Lead for Sunshine for Mines at the Carbon War Room
• Thomas Koch Blank, Principal at Rocky Mountain Institute
RMI-CWR: Our Joint Missions

We accelerate the adoption of business solutions that reduce carbon emissions at gigaton scale and advance the low-carbon economy.

We transform global energy use to create a clean, prosperous, and secure low-carbon future.

A GLOBAL NON-PROFIT, FOCUSED ON PROFIT
Sunshine for Mines seeks to rapidly accelerate the penetration of cost-effective renewables into the mining sector globally—reaching an **industry-wide penetration of 15% by 2025**, with adopting mines generating 35%+ of their energy from renewables.
### Five trends make for a strong business case today

<table>
<thead>
<tr>
<th>Trend</th>
<th>Description</th>
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<tbody>
<tr>
<td>High Energy-Intensity of Mining Globally</td>
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<td>Increasing Energy Security Concerns</td>
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<td>Falling Costs of Renewables; Rising Costs of Fossil Fuels</td>
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<td>Opportunity for Shared Value &amp; Community Development</td>
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<td>Firm-wide Sustainability and CSR Goals, and Shareholder Demand</td>
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## Barriers to Renewables Adoption

<table>
<thead>
<tr>
<th>Category</th>
<th>Barriers</th>
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<tbody>
<tr>
<td><strong>Lack of Information</strong></td>
<td>Lack of awareness of renewables opportunity</td>
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<td></td>
<td>Lack of data on costs vs. savings (case studies)</td>
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<td>Mining firm / Renewable developer gap</td>
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<td><strong>Lack of Demand Pull</strong></td>
<td>Mining culture, C-Suite / Site management gap</td>
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<td>Operational mindset and governance</td>
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<td>Lack of internal capacity on energy</td>
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<td><strong>Capital &amp; Risk</strong></td>
<td>Contract structure – off-takers, PPA terms, etc.</td>
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<td>Accounting and balance-sheet issues</td>
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<td>Lack of awareness of, or access to, 3rd-party finance</td>
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<td><strong>Complexity</strong></td>
<td>Mine site uniqueness and complexities</td>
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<td>Regulatory risks and uncertainties</td>
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<td>Real and perceived technical barriers</td>
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Barriers to Renewables Adoption

- To what extent do you perceive that the challenge is internal vs external?
- For how large share of your assets do you perceive that renewables is a relevant option?
- What are the primary internal challenges with increasing renewable energy generation for mines?

Internal barriers
- Concept reliability
- Life of mine uncertainty
- Opportunity awareness
- Sustainability strategy
- Internal capacity
- PPA structure
- Accounting issues

External barriers
- Lack of price points
- Lack of case history
- Firm-developer gap
- 3rd party finance
- Lack of policy support

Deal ready
No deal
Blocked by internal barriers
Blocked by external barriers
Not ready
Ready
Not ready
Background to South Deep Mine

- Grid connected (Eskom), 95% of electricity from coal
- Energy spend is 13% of operating spend (Group 21%)
- Average load 55 MW, to peak at 75 MW
- Life of Mine: +70 years
- Global Horizontal Index (GHI) of 2 061 kWh/m²
Gold Fields commitment to renewable energy

Supported by Top Management and an Enabling Environment

- Supported by Board and Group ExCo
- Strong and visible CEO Commitment
- Integrated Group Energy and Carbon Strategy
- Entrenched through our Group Energy & Carbon Policy and Guideline
- Included in Group Balanced Scorecards (Executive to Operation)

“Rising energy costs, supply constraints and carbon emission standards are some of the challenges we need to address, through, among others increased energy efficiency, use of renewable energy forms and energy storage systems”

Nick Holland, CEO, “Gold Mining Company of the Future” presentation 2015
Gold Fields commitment to renewable energy

What Gold Fields is focused on

Group BSC illustrates integrated thinking

CEO, Executive and Senior Management remuneration is linked to the deliverables
Gold Fields visible commitments to RE and EE

Strategic renewable energy and efficiency commitments

- Aiming for 20% renewable energy generation on average in all new mine developments
- Set 3-year regional carbon emission and energy efficiency targets to 2016 & revised 2020 targets
- Over US$50m in savings from energy efficiency/optimisation initiatives since Jan 2014
- Nearly 10 years of CDP submissions
- Partnership with the Rocky Mountain Institute and Carbon War Room – two NGOs focussing on carbon reductions
- Numerous recognition awards for our long term leadership in climate disclosure and performance
- ICMM initiatives we support:
  - Development of a climate viewer tool
  - Undertaking Climate Change vulnerability risk assessments at all our operations
  - Endorsed the ICMM Climate Change statement supporting Paris talks
  - Signed the Paris Pledge for Action
Gold Fields and CWR-RMI collaboration

Why did Gold Fields choose to work with CWR-RMI?

• Global leader in business solutions to reduce carbon emissions & advance a low-carbon economy
• CWR-RMI mission is aligned with our vision
• We share the goal of supporting industry-wide change
• CWR-RMI has supported our leadership aspirations and actions
• Tap into their significant experience in lowering entry barriers for renewables
• Provision of an optimised not maximised solution
• Collaborative model has been tried and tested with other companies
• Brought together a group of best in class partners to conduct analysis & provide support for renewable energy procurement
• Lessons gleaned from Gold Fields will be used to further advance and enhance renewables uptake globally
A. Portfolio-wide Energy Security Review
- Reviewed existing “Regional Security of Supply” Plans
  - South Africa
  - Ghana
  - Peru
  - Australia
- South Deep mine in South Africa identified as the highest risk and key renewables opportunity
- 5 month process

B. Techno-economic Study & Solution Design
- Analysis of site—loads, future mine needs, NPV, shared value, and firm goals
- Optimal solution:
  - 40 MW Solar PV
  - 7.5 MWh Energy Storage
  - 25-year PPA
  - Backup diesel
- 3-month process

C. Vendor Selection & PPA Advisory
- EOI sent to 75 IPPs
- RFP sent to 28
- 10 Compliant Bids were received
- Some meet utility price parity today; most trend favorably with inflation over the PPA term
- Energy storage on par with diesel
- 2-month process

D. Project Development Advisory
- Initial joint project development with South Deep
- Completion of project development handed over to South Deep
## Gold Fields Partnership – Process

### A. Energy Security Review
1. Review Regional “Security of Supply” Plans
2. Assess Energy Risks and Mitigation Options
3. Determine Key Renewable Opportunities

### B. Techno-Economic Study
1. Collect Data and Determine Baseline Scenario
2. Conduct Analysis and Determine Ideal Energy Mix
3. Evaluate and Prioritize the Business Case of Solutions

### C. Solar PV Procurement
1. Expressions Of Interest and Pre-Qualification
2. RFP and Preferred Bidder Selection
3. Client Led PPA Finalization and Project Implementation
C. Outcomes of Procurement Process

- Expression of Interest sent to some 75 players
- 28 positive responses entered Request for Proposals stage
- 10 proposals submitted
- Certain proposals claim to meet grid-price parity today & most trend favorably with inflation over the PPA term
- Energy storage technologies also appear to be on par with the current cost of diesel generation – off-grid mines can reduce diesel spend immediately
Banking a Captive PPA

Considerations to Determine Economic & Technical Feasibility

- Life of Mine
- Prevailing and Future Grid Energy Tariffs
- Geography (Land & RE Potential)
- PPA Price Expectations
- Resource intermittency ≠ unpredictability
- Load Profile Influences the PPA
- Betting on Future Grid Instability
- IFRS Accounting Issues
- Weather Profile
- Financiers Risk Appetite for Private PPAs
- Grid Integration Issues
- Force Majeure Clauses
- From a Mining EIA to Power Generation
- Social and Community Risks and Opportunities
- Cost of Storage

Green = Low risk; Yellow = Medium risk; Red = High risk
Lessons Learned and how to tackle the Barriers

**LACK OF INFORMATION**
- Create a proof point for cost effectiveness

**LACK OF DEMAND PULL**
- Use the Gold Fields case to inspire others

**CAPITAL & RISK**
- Establish a standardized process and approach

**COMPLEXITY**
- Simplify through standardization

* REIPPP: Renewable Energy Independent Power Producer Procurement
CWR-RMI aims to repeat the experience of Gold Fields with additional firms

- We will expand our suite of services, to look at opportunities not only for integrating renewables onto off-grid mine sites or sites faced with grid instability, but also for mines exploring community power or seeking new revenue streams for decommissioned sites.

**The Immediate Journey Ahead**

**Evaluate potential at the firm-level**
- Branding and publicity
- Make the business case for the mine

**Generate insights, identify key opportunities**
- Lead a facilitated procurement process.
- Recommend next steps

**Demonstrate potential with pioneering partners like Gold Fields**
- Spread operator knowledge and deal evaluation capacity
- Foster and support industry leadership

**Build, Promote, and Share Enabling Tools and Standards**
- Eliminate barriers
- Mobilise capital
- And scale
**Discussion**

- What type of initiatives would help you to overcome internal and external barriers?
- What can ICMM, Sunshine for Mines and potentially other partners do to provide support?
- How can the Sunshine for Mines program engage with more mines and build scale?

**Internal barriers**
- Reporting standards
- Standardized approaches
- Deal tracker
- SFM events
- Information sharing platform
- Case studies
- Partnerships
- Proof point for cost effectiveness

**External barriers**
- Readiness barometer
- Reporting standards

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**Not ready**

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**Ready**
Thank you

www.carbonwarroom.com

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