

INVESTING IN AFRICA: 2019 SEMINAR SERIES

POWER PROCUREMENT IN REMOTE LOCATIONS

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INTRODUCTION

TODAY'S PRESENTERS



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WELCOME AND OVERVIEW

Topics to be covered today

Insights

- Past projects
- Challenges of the differing delivery models for remote mining operations

Grid Connected Mines

- The challenges and benefits of working with state utilities to establish grid supplied power solutions

Off-Grid Mines

- Whereby third party IPP's provide solutions that can be either thermal fuel based (diesel, HFO, gas) or hybridised with renewable forms

Connected Mine Site Generation

- Incorporating a mini grid or connection to the national grid of a mine site based power station

Technology Options and Approaches

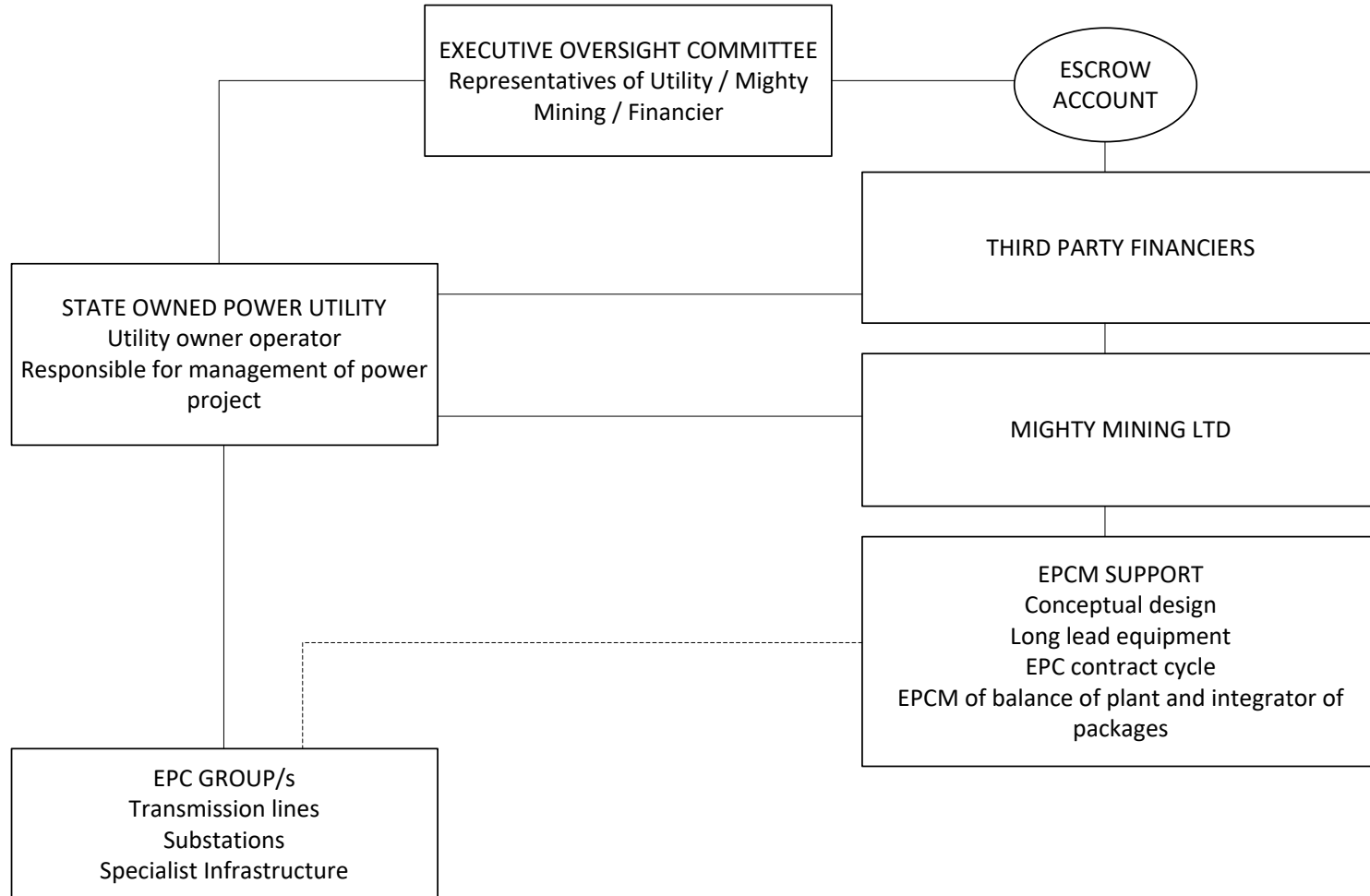
- Provide the African mining industry with a range of option for ensuring reliable and low cost power for remote mines. This seminar will focus on the delivery structures, financing, regulatory and delivery mechanisms that can be adopted to ensure the reliable and cost effective supply by third parties

Grid Connected System

- Tie into national power generation and supply system
- Typically involve upgrade of infrastructure incl: generation capacity / substations, SVC or equivalent system upgrade infrastructure
- Typically involves construction of new or extended transmission systems
- Typically financed by funding, sourced and underwritten by the mining company who is then reimbursed via tariff offset over time
- Involves power purchase agreement (PPA) based on life of mine and tied to operating license in some way



Grid Connected System

Typical Organisational Structure



Grid Connected System

Split of Responsibility

Utility (System Owner/Operator) 	Mighty Mining (and their Engineer / PCM) 
Project Management Services	Appoint Engineer & PCM
Concept Design Approval	Project Funding
Technical Standards & Specifications	Concept Design (in conjunction with Utility)
Permitting / Crop Compensation / Relocation / Way Leaves	SCADA and plant control system needs
EIA Process	Design of the required protection scheme
Letting and management of EPC contracts (detailed design, supply and construct contracts)	Power Project Oversight for integration into overall project schedule
Review and approval of all designs	
Procurement of transformers	

Grid Connected System

Grid based power supply



Benefits

- Typically lowest cost
- Lower carbon footprint than standalone diesel or HFO based island / offgrid generation
- Support the development of national and regional infrastructure
- Can positively impact local and regional communities with the installation of new power infrastructure supporting Mighty Mining's social license to operate
- Typically requires less site based infrastructure



Drawbacks / Challenges

- Poor reliability of the national power generation and supply grid requires standalone power for emergency services and sometime full capacity standby generation
- Sovereign risk related tariff hikes
- Supply of power not fully under the control of Mighty Mining
- Can negatively impact local and regional communities if load shedding is done on normal residential customers in lieu of industrial customers
- Development timetable often becomes a project critical path activity, only influenced at arms length through the power utility

Off Grid System

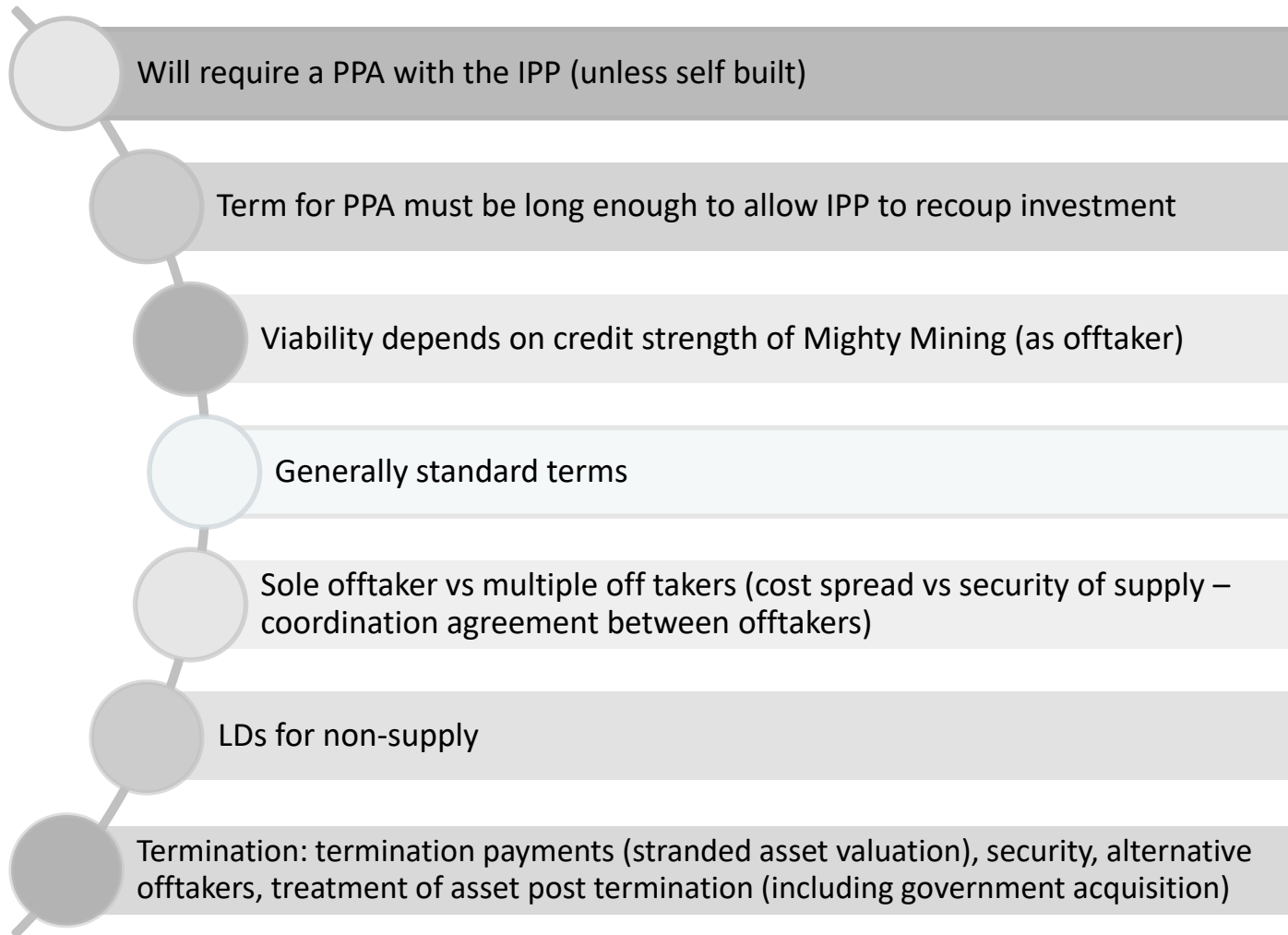
Considerations



- Grid stability and reliability
- Intensive industrial users can be first off in load-shedding
- Insufficient grid capacity
- Remote location too far from grid connection
- Increased control (including pricing and capacity) and security of supply
- Other products: Cogeneration potential (ie to utilise steam for processes), desalination
- Can be a lot smaller than utility sized plant (but aren't always – have seen between 1 – 50 MW depending on needs of project)
- No grid back up – redundancy, black start, batteries?

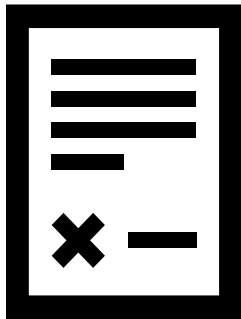
Off Grid System

The PPA



Off Grid System

Concession Agreement and Permitting



- Concession agreement between generator and government: not always required but can be a means of receiving tax concessions and transferring some political FM risk (ie government actions, change in law etc) to government so as to reduce risk to Mighty Mining
- Permitting: in some countries single offtaker generators may require generation licence (can incorporate environmental / social impact assessment which may overlap with main project – may require local investment in infrastructure – e.g. local network (see below) or energy efficiency scheme (replacing globes))

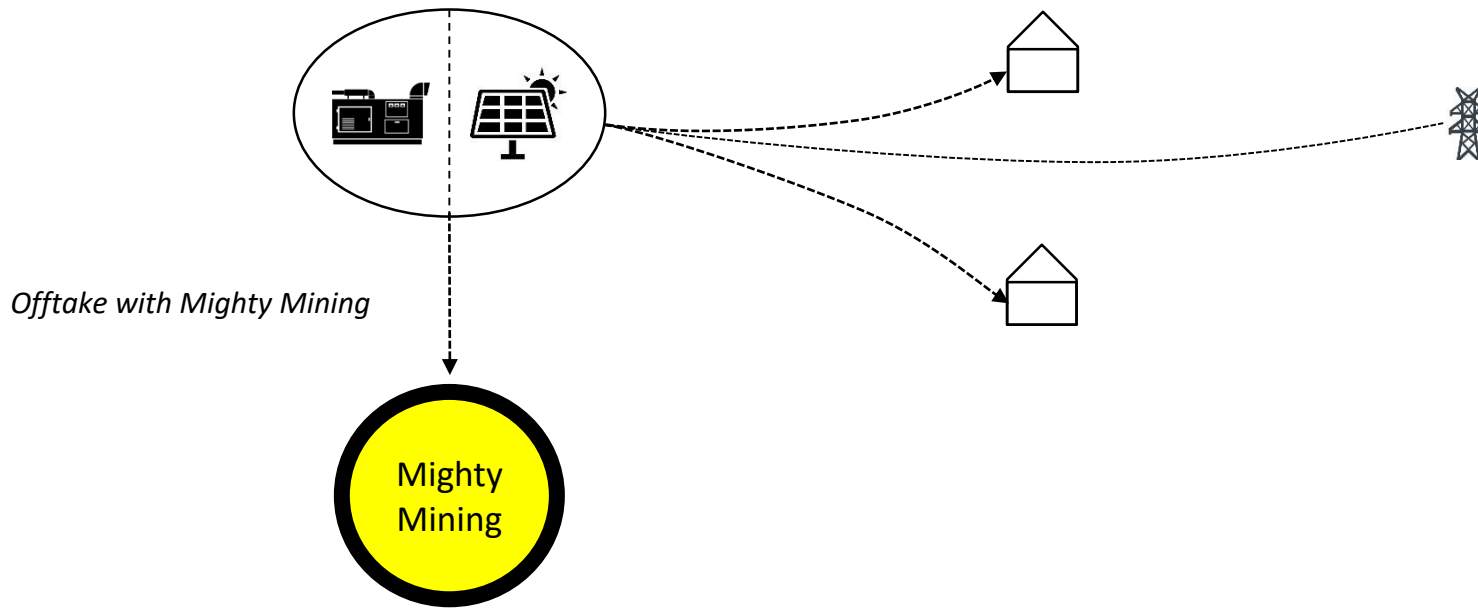
Connected Mine Site System - Marriage of offgrid and grid connected

- On site power station, tied into a local mini-grid or tied into national power generation and supply system
 - Increasingly attractive for National Governments where the generation is a hybrid of thermal and renewable generation
 - Connected mine site solutions are typically required to be a hybrid thermal/renewable solution or renewable addition to an existing thermal plant – driven by financing drivers
- Can be delivered as a combined or staged solution, with the community/grid connection being executed at a later date
- Involves construction of new or extended transmission systems to connect the mine generation to neighbouring community or grid
- Typically financed by a combination of Development Finance Institutions (DFI's) and commercial financing underwritten by the mining company and National Government
- Involves power purchase agreement (PPA) with mining company and National Government

Connected Mine Site System - Overview

The IPP provides a complete hybrid solution OR
Renewable addition to an thermal plant owned and
operated by Mighty Mining

*Offtake with National Utility
Either local Mini-grid or national grid*



Connected Mine Site System



Benefits

Benefits	Details
Extended power station offtake tenure	IPP holds offtake with the Mighty Mining and national utility delivering long term offtake underwritten by national utility offtake lowering tariff
Dual offtake reduces balance sheet impacts	IPP holds offtake with mining company and national utility. The IPP is no longer dedicated to the mining company and thus the full value of the power station is not reflected on Mighty Mining's balance sheet
Enhanced Government support	Investment that delivers power infrastructure into remote areas addresses the Government objectives and ensure strong support by the regulator and Minister
Capacity to access institutions with a lower cost of capital	Renewable projects and infrastructure development attracts DFI's and impact investment institutions that offer a lower cost of capital than what Mighty Mining can obtain
Ability to balance generation, redundancy and spinning reserve	Expanded generation and offtake allows the IPP to more effectively manage redundancy and spinning reserve across the mini grid/national grid and Mighty Mining

Connected Mine Site System



Challenges

Challenges	Details
Most jurisdictions have limited or poorly developed regulatory structures	Grid connected IPP solutions located at the mine site requires well developed IPP regulatory structures and offtake policies. Many African countries are undeveloped at this stage
Offtake timing may not align to the mine	Offtake agreements with national utilities are notoriously slow to negotiate and finalise. This presents challenges for financing and infrastructure development alignment to the development of Might Mining's assets
Delays in connection agreements	Connection to the national grid and approvals for new township connections are subject to delays that can impact completion timelines
DFI's are slow and can look to impart restrictions on the mine	DFI's and impact investment groups offer a much lower cost of capital for the IPP but have been seen to try and link the power station to the mine and impose restrictions
Performance guarantees must be executed by the IPP and National Government	The IPP and National Government must both commit to performance guarantees associated with the Mighty Mining offtake to prevent cannibalising performance as domestic demand grows

Questions?

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