

THEnergy

Renewables for mining

New York, April 9, 2015

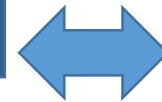
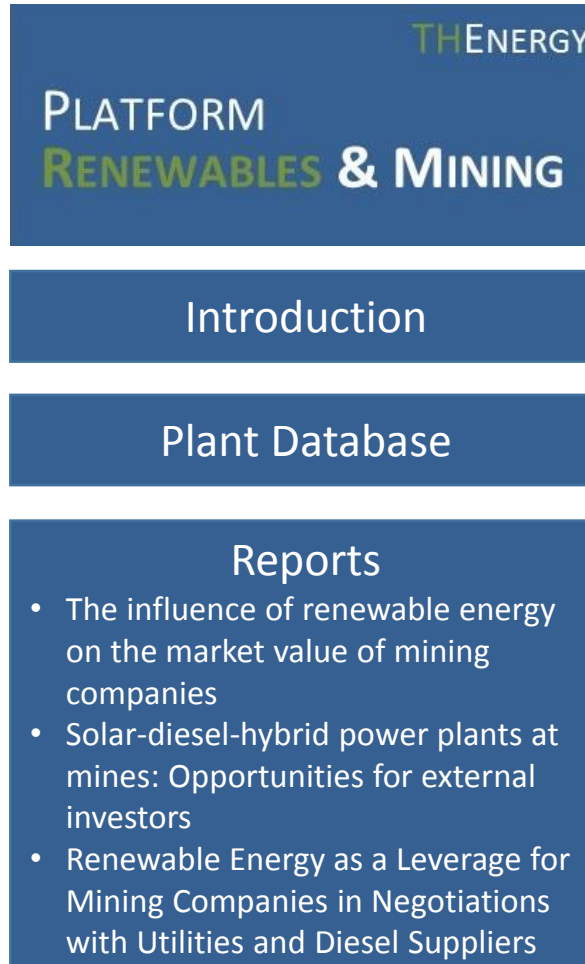
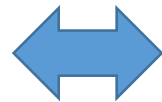
Conference „Hybrid Energy Innovations“

Dr. Thomas Hillig

The concept

Renewables

- Module price \$/Wp
- System price \$/kW
- System size MW
- CO2 avoided
- Feed-in tariff
- Tax credits
- ROCs
- Permitting process
- Changes of subsidies
- Irradiation
- Wind speed
- Anti-dumping
- Efficiencies
- Performance coefficient
- Lifetime of 20-30 years
- Warranties
- Long-term PPAs



Mining

- Renewable energy too expensive
- Security of electricity supply
- Pay-back period of 3-5 years
- Electricity around 25% of operating costs
- Energy often not considered as core competence
- Low commodity prices
- Mine operations stopped if commodity prices too low
- Cost control
- Why pay electricity beforehand?
- Short-term PPAs / leasing

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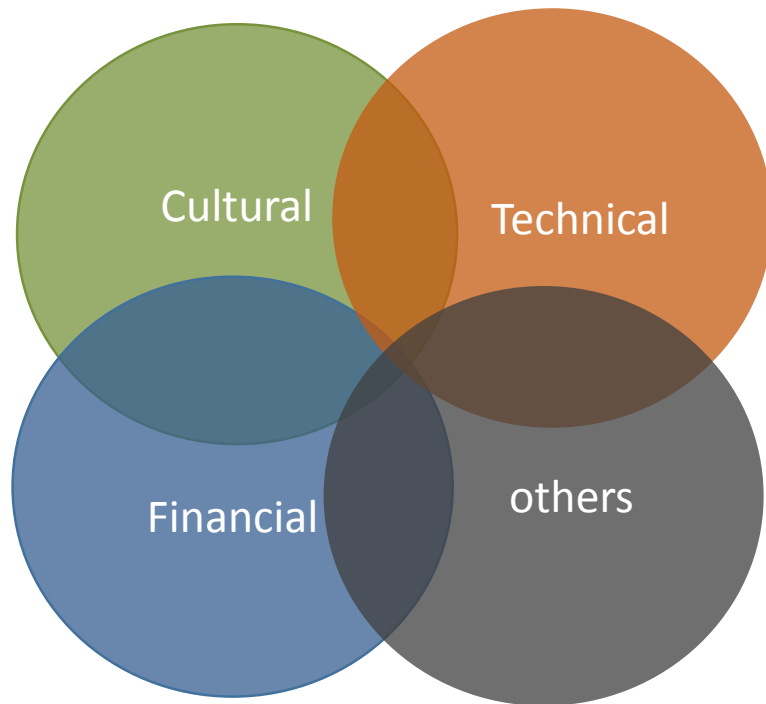
IM International mining

CREAMER MEDIA'S
MINING WEEKLY

Status-quo of wind / solar-diesel hybrid in mining

Country	Location	Year	Type	Size [MW]	Mining company
Argentina	Veladero	2008	Wind-diesel-hybrid	2.0	Barrick Gold
Chile	El Toqui	2011	Wind-hydro-diesel	1.5	Nyrstar
South Africa	North Western Bushveld	2012	Solar-diesel-hybrid	1.0	Cronimet
Canada	Lac de Gras	2012	Wind-diesel-hybrid	9.2	Diavik Diamond (Rio Tinto)
Canada	Katinniq	2014	Wind-diesel-hybrid	3.0	Glencore
TOTAL				<u>16.7</u>	

Barriers



Cultural

- Wind / solar companies considered as environmental activists & not reliable partners
- Short vs. long term thinking

Financial

- High investment costs
- Rather small size of installations for institutional investors
- Higher risk for hybrid in remote installations
- Risk due to consequences of production downtimes
- Many mining companies need capital for investing into core processes
- Country risks

Technical

- Mismatch of lifetime of mine and renewable energy plant
- Fear of over-engineering
- Missing track-record of storage and hybrid controllers
- Often an unreliable grid is main problem – standalone gensets are solution

Other

- Low oil price
- Difficult sales process incl. due diligence of mining operations for PPA
- Existing contracts for gensets / diesel

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