2020 JISEA Virtual Meeting Presenter Profile

Travis Lowder has over a decade of experience in renewable energy, encompassing finance, policy, regulations, analysis, and project development.
The Renewable Opportunity in Mining
Travis Lowder and Tisi Igogo
JISEA Virtual Meeting
April 9, 2020
All-day workshop with over 30 industry professionals from mining companies, suppliers, trade associations and other stakeholders to discuss opportunities and barriers to incorporating more renewables into mining operations.
Drivers for Renewable Energy in Mining

Top 10 Business Risks in Mining (EY)

Circular Economy between Renewable Tech and Mining

- Renewable energy technologies depend on mining products (e.g. iron, silica, silver, lithium)
- Opportunity to create circular economies where renewables power mining operations, and mining operations provide materials for renewable tech manufacture
Costs for RE Technologies are Falling

Renewable Energy Technology % Cost Reductions since 2008


- Residential PV (-55%)
- Utility Scale PV (-71%)
- Wind (-75%)
- EV Batteries (-79%)
- LED Bulbs (-94%)
Projected Battery Storage Cost Declines

Source: NREL, 2019. *Cost Projections for Utility-Scale Battery Storage*
In 2015 there were about **600 MW** of renewable energy projects serving mine sites.

In 2020, over **5 GW** cumulative of renewable energy projects serving mining operations have either been installed or are planned.
## Mine Energy Loads and Sources

<table>
<thead>
<tr>
<th>Mining process</th>
<th>Activities and Equipment</th>
<th>Fuel Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exploration and Auxiliary Operations</strong></td>
<td><strong>Ventilation: Fan system</strong></td>
<td><strong>Electricity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Drilling: Loader trucks, diamond drills, rotary drills, percussion drills, drill boom jumbos</strong></td>
<td><strong>Electricity, Diesel, and Compressed Air</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Dewatering: Pumps</strong></td>
<td><strong>Electricity</strong></td>
</tr>
<tr>
<td><strong>Materials Handling</strong></td>
<td><strong>Digging: Hydraulic shovels, cable shovels, continuous miners, longwall mining machines, drag lines, front-end loaders</strong></td>
<td><strong>Electricity and Diesel</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Discrete transportation systems: Haul trucks, service trucks, bulldozers, pickup trucks, bulk trucks, load-haul dumps, shuttle cars, hoists</strong></td>
<td><strong>Diesel and Electricity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Continuous transportation systems: Conveyor belts, pumps, pipelines, belts</strong></td>
<td><strong>Electricity</strong></td>
</tr>
<tr>
<td><strong>Beneficiation and Processing</strong></td>
<td><strong>Comminution:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Crushing: Crushers</strong></td>
<td><strong>Electricity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Grinding: Mills</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Separations: Physical: Floating, centrifuge; and Chemical: Electrowinning</strong></td>
<td><strong>Electricity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Roasting: Furnace</strong></td>
<td><strong>Fossil Fuels</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Refining: Electrolysis and Electrowinning</strong></td>
<td><strong>Electricity and Fossil Fuels</strong></td>
</tr>
</tbody>
</table>
Every mine operation has different requirements, but in general and across sites, electricity comprises the largest energy demand.

Most of that electricity is derived from fossil fuels.
RE Applications in Mining

• Supplying onsite electrical loads
• Replacement of diesel-fired loads (electric mobility, etc.)
• Hydrogen production and storage
• Process heat
• Feedstock substitution
Barriers

- Variability of RE generation
- Conflicting business models between mine operators and RE developers
- RE expertise in the mining industry
- Land constraints
- Technology readiness and R&D gaps
Variability

Wind generation curve overlaid on mine load curve

Source: Hatch 2019
Technology LCOE as a function of renewable penetration
Source: Guilbaud 2016
Enabling Approaches

- Aligning incentives, reforming contract structures
- Capacity building
- Technology development and critical path R&D
- Supply chain certification
- Policy and regulatory measures
- Collaboration!
The Renewable Opportunity in Mining Consortium

The Renewable Opportunity in Mining Program aims to provide capacity building, technical analysis, and decision support for mining companies and related stakeholders to increase adoption of renewable energy technologies

PROGRAM ACTIVITIES

• **Best Practices:** Develop model contract structures to better align incentives between mining and RE industry
• **Technology Analysis:** Assessment of renewable technologies and integration with various mine types, regions, and processes
• **Strategy Development:** Key global regulatory, economic, societal, and societal trends affecting corporate strategy on renewables deployment

Currently seeking sponsors! Contact travis.lowder@nrel.gov for information on how to join

Photo by Dennis Schroeder, NREL 31202
Thank you!

Travis.lowder@nrel.gov
Tsisilile.igogo@nrel.gov

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of International Affairs. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.