Economic assessment of the potential for hybrid renewable power systems in the mining industry

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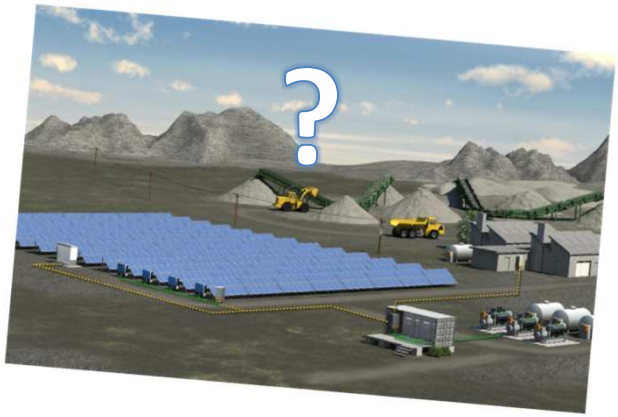

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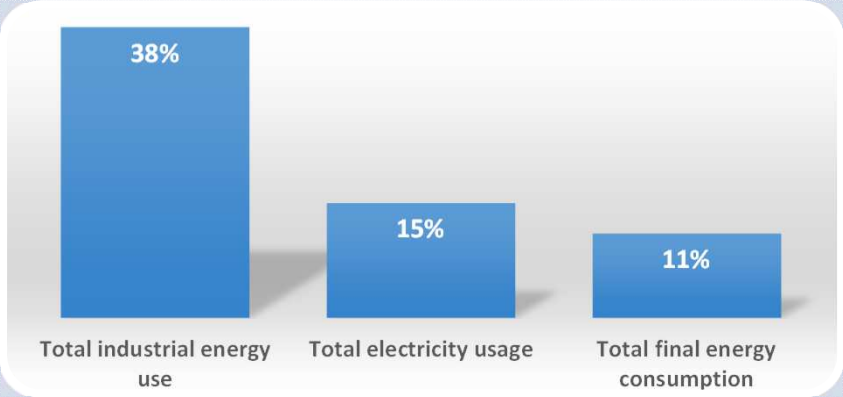
Context: the mining industry



Industry

- Relatively small in terms of the world's workforce - 30 million people are involved in large-scale mining
- The global industrial energy use is set to double by 2050 compared to 2009 standards (if no policy measures are taken) – due to lowering ore grade and increasing demand of mineral commodities

Renewable potential

- Mining plants are often located in areas with large renewable resources
- It is technically possible to power mining activities with hybrid renewable systems, combining renewable/storage and potentially diesel/grid for additional capacity
- To date, there is no scientific economic evaluation of these systems for mining settings

Mining characteristics

Technical

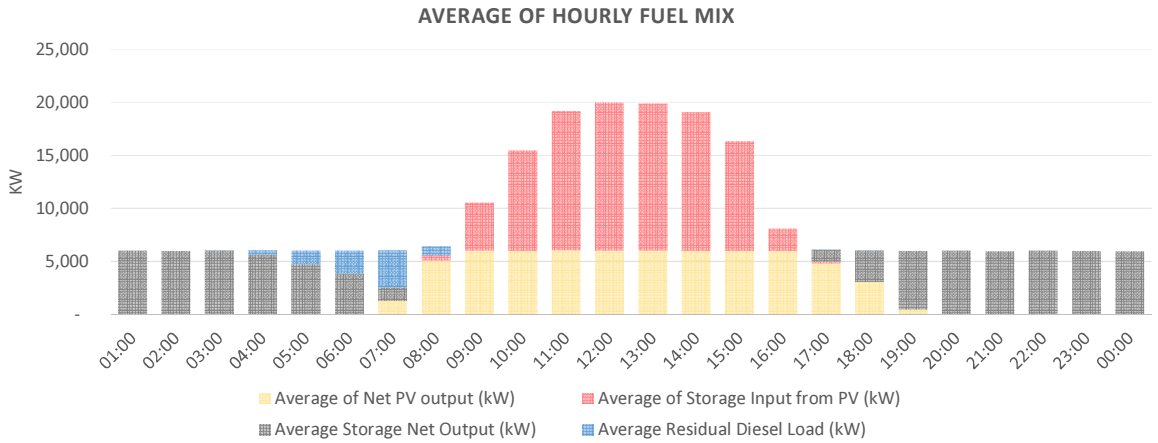
- Load curve (RQ1)
- Dispatchable mining processes (RQ1)
- Heat & electricity
- Waste heat

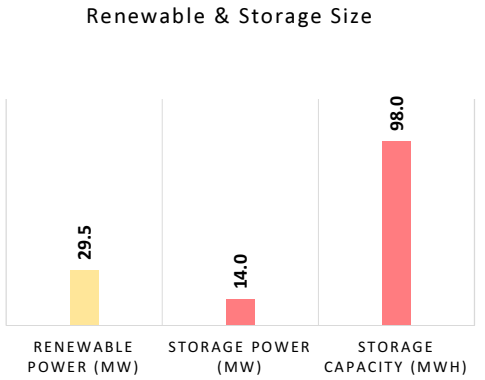
Economic

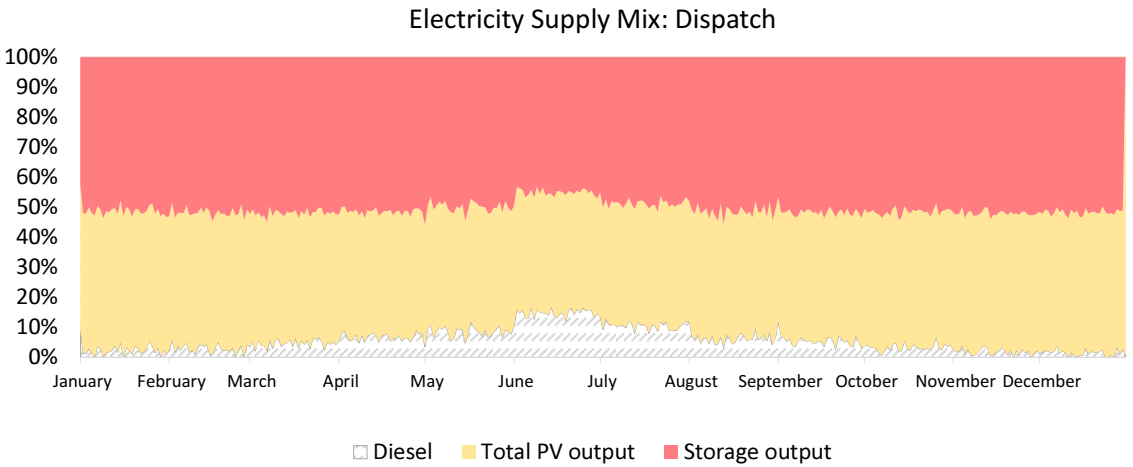
- Financing mechanisms
- Trade-offs btw. electrification and stand-alone systems (RQ 1,2,3)
- Mine lifetime (RQ1)
- Value of lost load (RQ2)
- Economies of scale (RQ1)

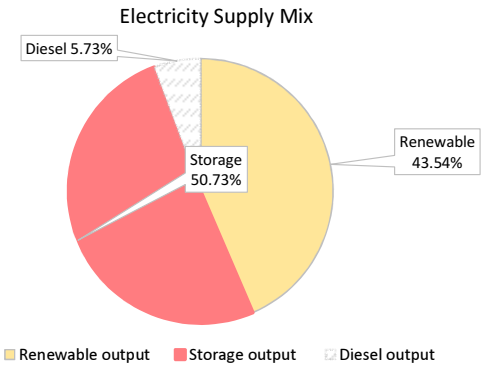
Short case study:
5 MW Chilean mine

Simulation of the power system under constraints: Maximum PV and Battery storage

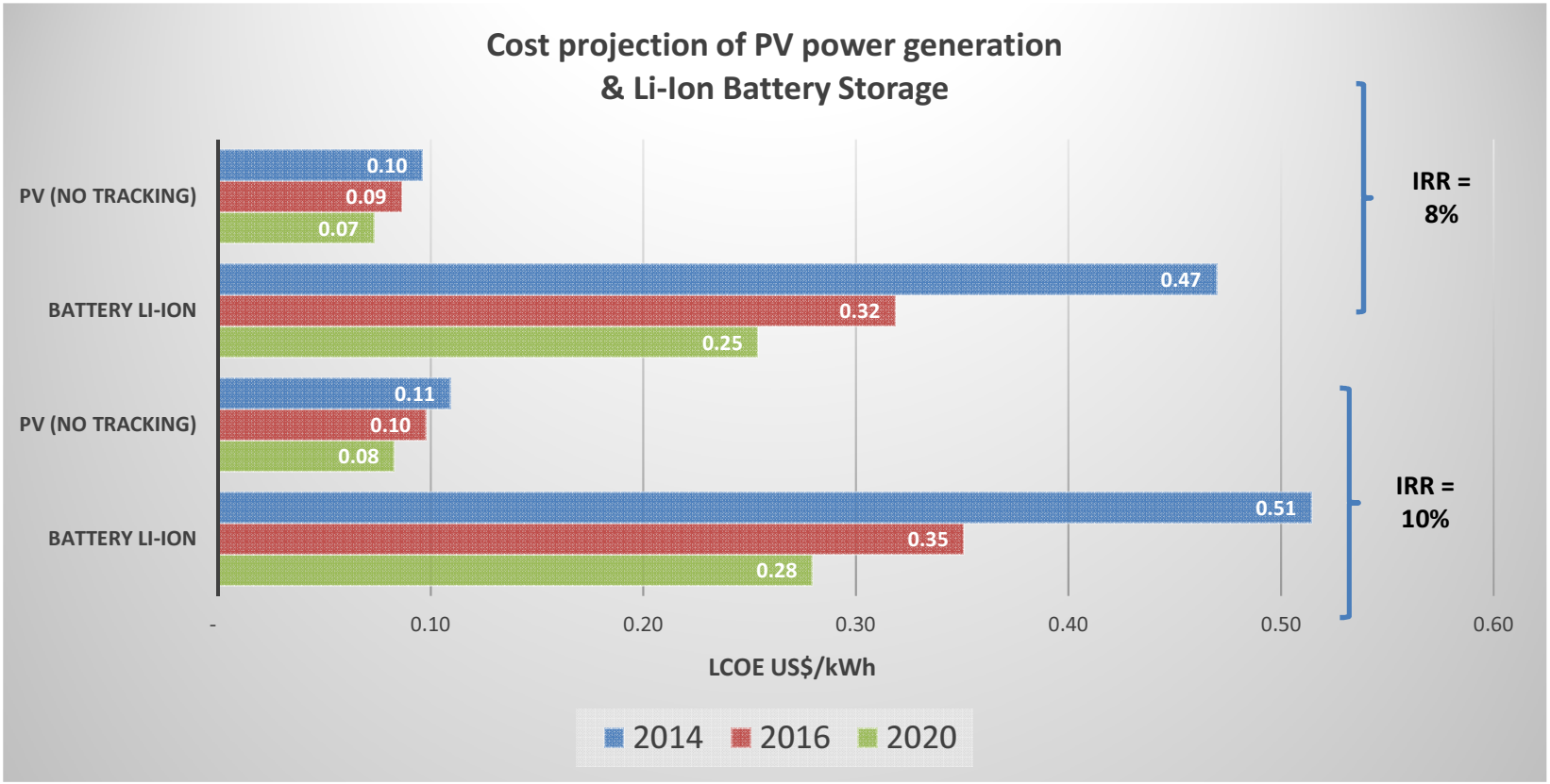




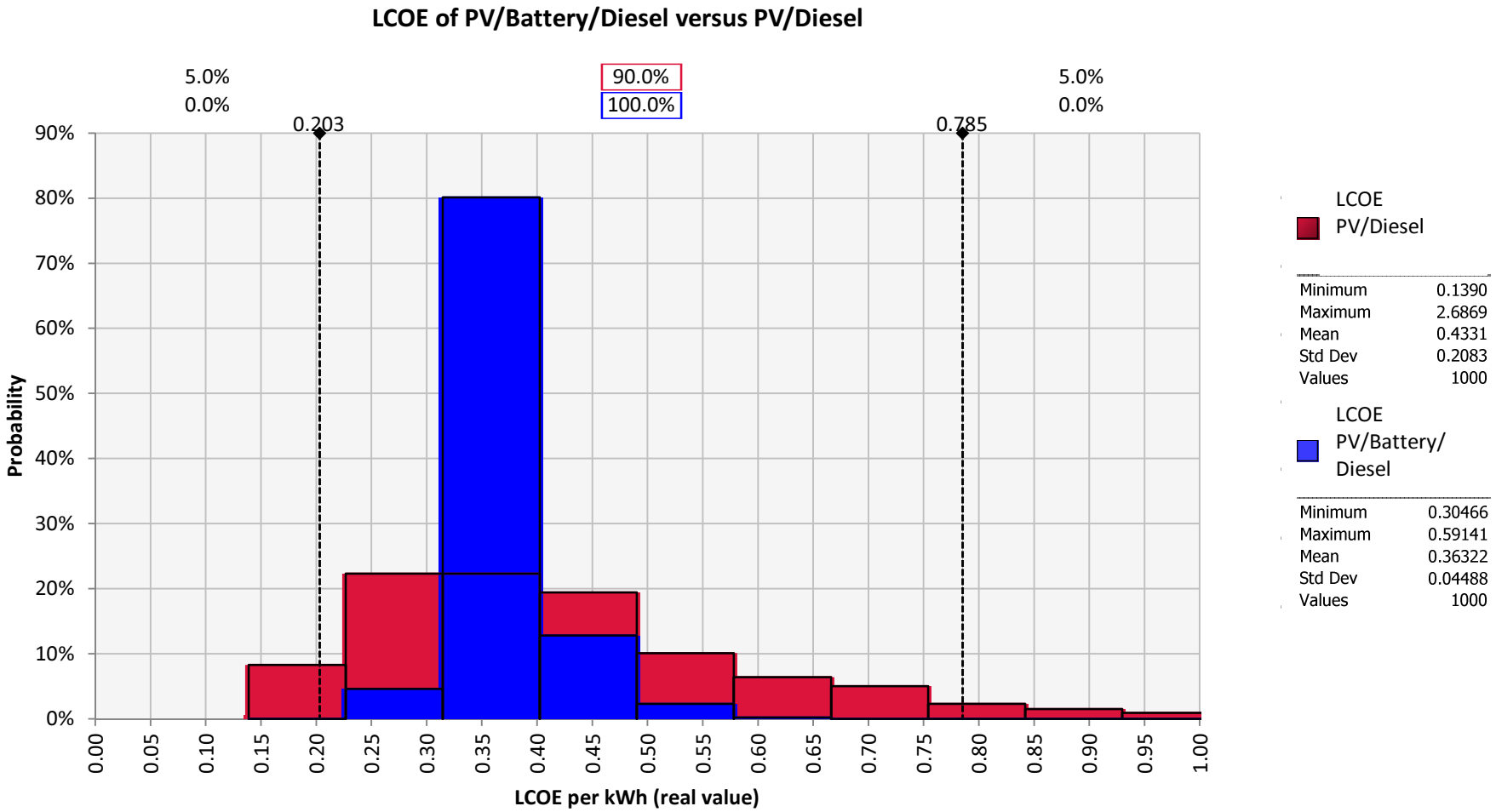




Base on the current assumptions of future costs, the LCOE of Li-Ion batteries will be reduced to 0.32-0.35 Us$/kWh in 2016 and 0.25-0.28 US$/kWh in 2020



Based on historical fuel price data, the hybrid power system with battery storage appears to be an economically justified option



Research implications

Inform mining stakeholders

Inform policy-makers

Reduce GHG