

# Integrating Renewables in the Mining Sector

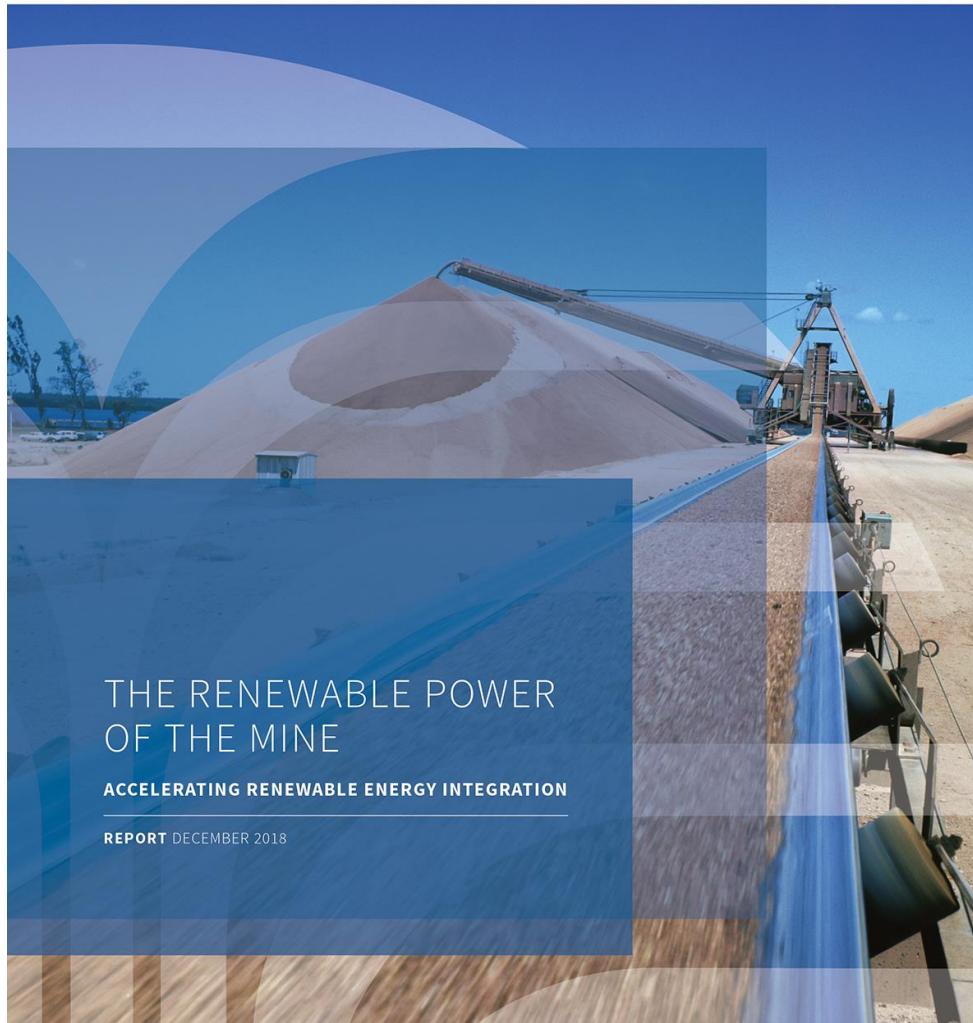
February 2019



**Columbia Center  
on Sustainable Investment**

A JOINT CENTER OF COLUMBIA LAW SCHOOL  
AND THE EARTH INSTITUTE, COLUMBIA UNIVERSITY

# Renewable energy integration: Background



Columbia Center  
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german  
cooperation  
DEUTSCHE ZUSAMMENARBEIT

ENERGYANDMINES

- ❖ Power arrangements
  - ❖ Technical
  - ❖ Expertise
  - ❖ Financing
  - ❖ Regulatory
  - ❖ Interests/incentives
- ❖ Roadblocks
- ❖ Trends/Drivers
- ❖ Methodology
  - ❖ Literature review
  - ❖ 38 Case studies
  - ❖ 53 Interviews
- ❖ Target audience
  - ❖ Host Governments
  - ❖ Mining companies
  - ❖ Independent Power Producers
  - ❖ Donors

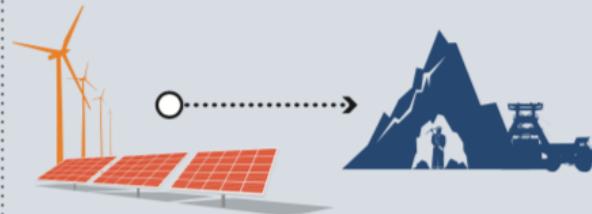


# Renewable energy sourcing arrangements

1

## SELF-GENERATION

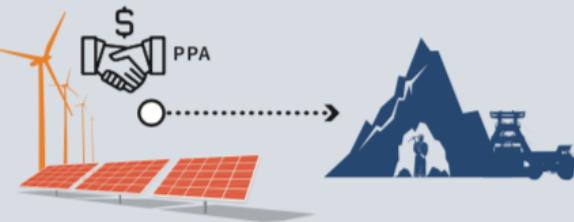
The renewable energy project is built by mining company to serve operations.



2

## POWER PURCHASE AGREEMENT

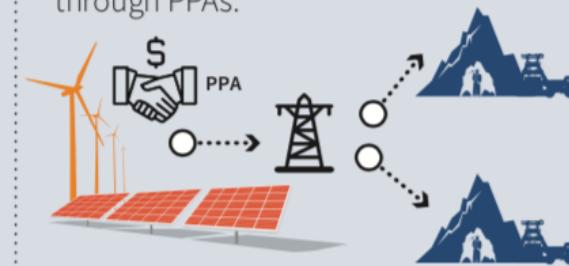
The mine contracts the energy from an independent Power Producer through a PPA.



3

## INDUSTRIAL POOLING

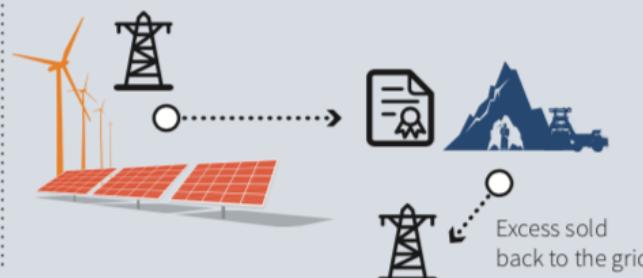
Independent Power Producer supplies to several mining companies through PPAs.



4

## ENERGY ATTRIBUTE CREDITS (EAC)

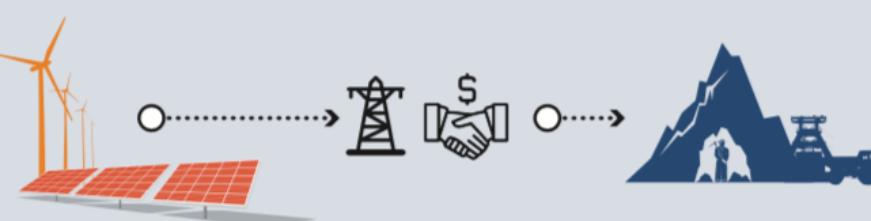
Mining company purchases credits produced by renewable energy power plants.



5

## GRID CONNECTED SOURCING GREEN ENERGY

Mining company buys green premium products or pays green tariffs to utility.



Source: CCSI (adapted from IRENA 2018).

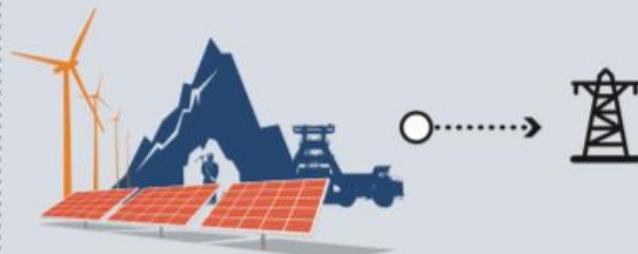


# Renewable energy sale arrangements

1

## SELLING POWER INTO GRID

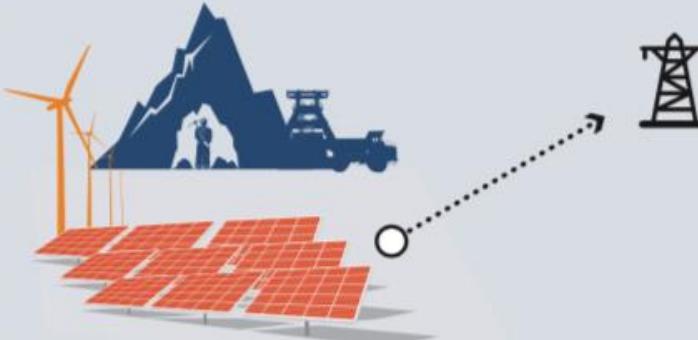
The excess capacity generated by the power plant is sold to the utility.



2

## RE POWER INSTALLATION ON MINING CONCESSION

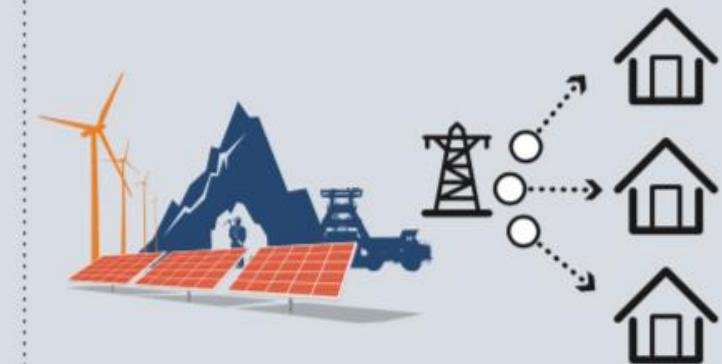
Independent renewable project is built on mining concession or rehabilitated mine site feeding into the grid.



3

## ELECTRIFYING SURROUNDING COMMUNITIES

Off-grid renewable power project serves the mine site and/or surrounding communities.



Source: CCSI.



# DeGrussa: Off-grid, Outsourced, Solar PV



Source: Sandfire.com

Exploration

Operation

Post Closure

# Diavik: Off-grid, Owned, Wind



Source: Riotinto.com



# Kidston Mine: On-grid, Outsourced, Solar PV & Pump Storage, Feeding the Grid

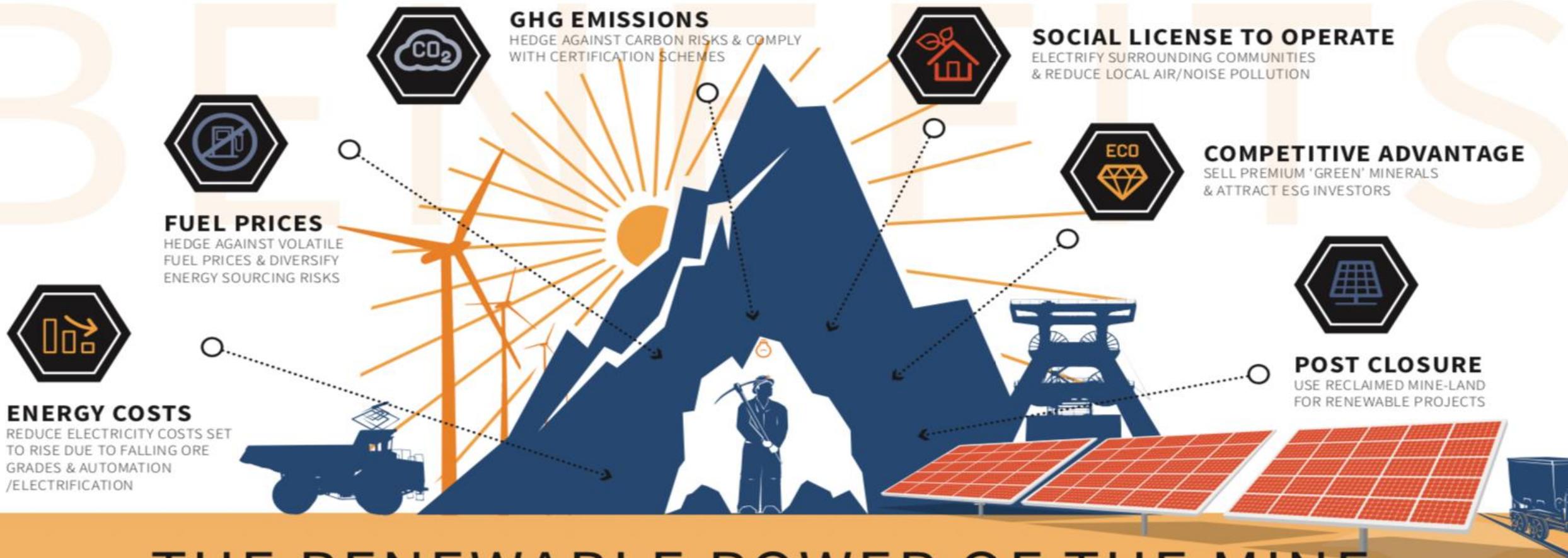


Source: [genexpower.com.au](http://genexpower.com.au)

Exploration

Operation

Post Closure



# THE RENEWABLE POWER OF THE MINE

## ACCELERATING RENEWABLE ENERGY INTEGRATION



### TECHNICAL

#### ROADBLOCKS

- Intermittency vs low tolerance for power supply disruption
- Location constraints



### EXPERTISE

#### TRENDS & DRIVERS

- Electrification & automation
- Cost competitive
- Battery storage development
- Other renewable/storage solutions
- Modular
- Blockchain



### FINANCING

- Up-front capital costs
- Cost for IPPs
- Life of mine vs long off take time
- Donor support



### REGULATORY

- Fossil fuel subsidies/tax exemptions
- National utility monopoly
- Insufficient renewable regulations
- Limited incentives or obligations
- Near tripling of renewable-specific regulations in last ten years
- Carbon pricing initiatives

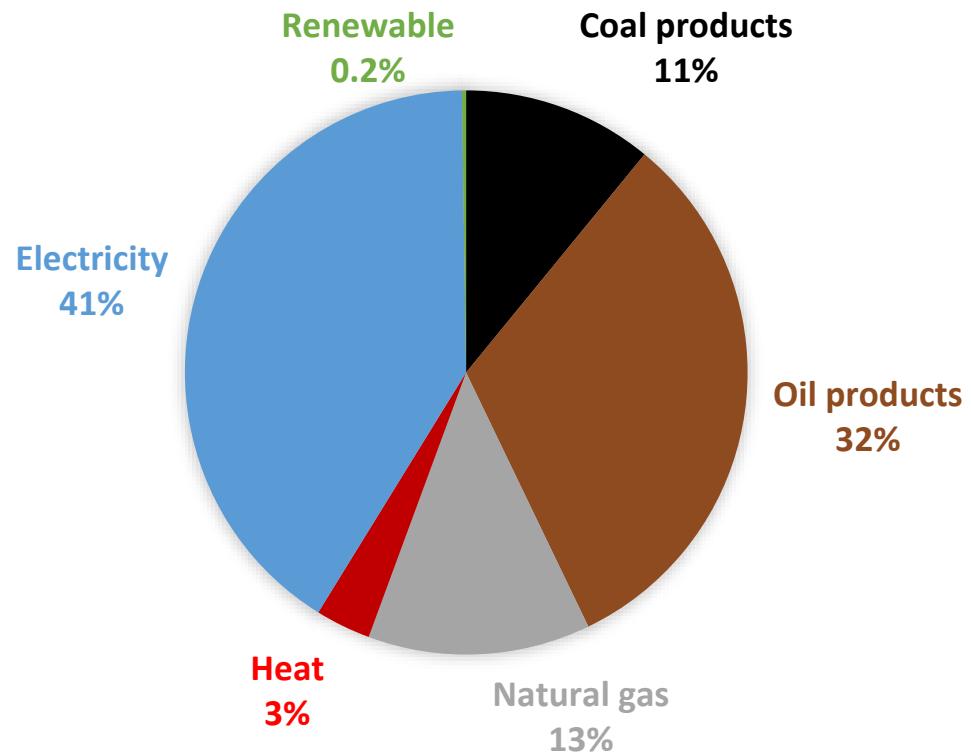


### INTERESTS

- Vested interests
- Lack of corporate operational incentives
- Institutional investors
- Consumers & government
- Affected communities
- Standards & certification

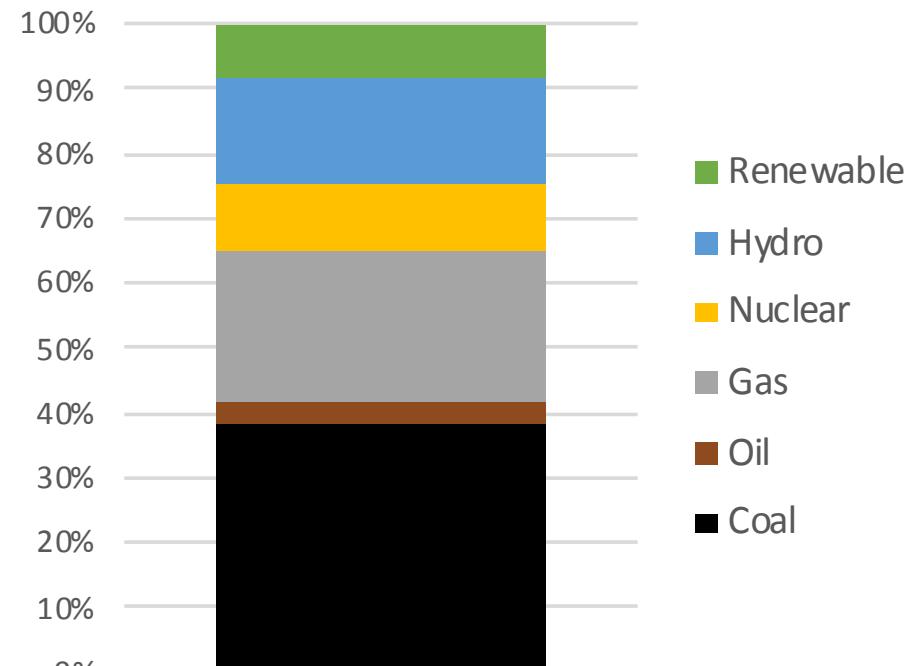
# In perspective

ENERGY DEMAND MINING IN QUARRYING (2016)



Source: IEA

ELECTRICITY GENERATION MIX (2017)



Source: BP

► 82% of energy based on fossil fuels

► Energy demand to increase by 36% by 2035

# Roadblock: Interests/incentives



- ❖ Government
  - ❖ Appealing to voters
  - ❖ Public utility
  - ❖ Beneficiaries from incumbent system
- ❖ Private sector
  - ❖ First mover problem
  - ❖ Corporate vs. operational incentives
  - ❖ Contractors
- ❖ Consumers?



# Consumers?

## Car Industry

### Green credentials

Average lifecycle for car in US midwest



#### Production emissions (kg CO<sub>2</sub> equivalent)

12,204	8,190	4,752
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#### Use emissions - 270,000km (kg CO<sub>2</sub> eq)

48,600	95,310	46,980
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#### End of life emissions (excluding battery, kg CO<sub>2</sub> eq)

311	351	159
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#### Lifecycle emissions total - 270,000km (kg CO<sub>2</sub> eq)

61,115	103,851	51,891
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#### Lifecycle emissions per km - intensity (g CO<sub>2</sub> eq/km)

226	385	192
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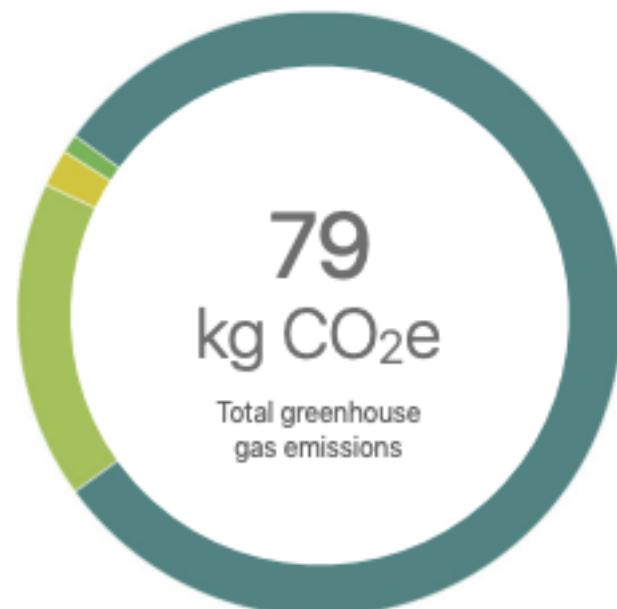
All data are based on vehicles driven in the US midwest

Source: Trancik Lab, MIT

© FT

## Electronics

### iPhone X

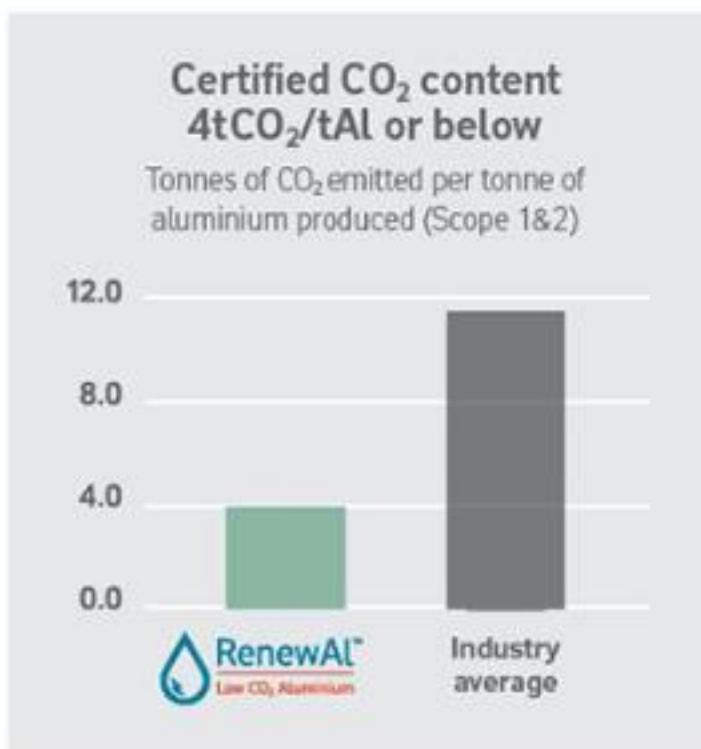


## Renewable power



85-90% of CO<sub>2</sub> emissions related to materials and suppliers (Source: Vestas)

# Low carbon minerals at a price premium?



**Customised services**

- Certification** Third-party certified CO<sub>2</sub> emissions (Scope 1&2)
- Technical expertise** Assistance in leveraging low CO<sub>2</sub> aluminium
- Traceability** Product tracked from mine to metal
- CO<sub>2</sub> reduction strategies** Support to optimise your low CO<sub>2</sub> sources
- Life cycle analysis** Contribution to specific calculation on lifecycle
- Co-branding** Unique partnerships with RenewAl™

Source: Rio Tinto



# Thank you!

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