



Fact Sheet

Western Australian Minerals sector greenhouse gas emissions and energy use

September 2022

Delivering an election commitment, the Energy Industry Development team has been established within Energy Policy WA to work with manufacturers and the mining industry to increase the uptake of locally manufactured, renewable energy options for remote mine sites.

In 2021, the Western Australian resources sector employed more than 156,000 people and delivered around \$230 billion in mineral and petroleum product sales¹.

The resources sector is a major energy consumer. This fact sheet provides an overview of the sector's greenhouse gas emissions and energy use with a focus on Western Australian minerals mining.

Greenhouse gas emissions

The Australian Government publishes emissions data in the National Inventory Report. A key data source is the National Greenhouse and Energy Reporting (NGER) Scheme. Under the NGER Scheme, corporations that meet certain energy and/or emissions thresholds must report to the Clean Energy Regulator each financial year.

The 2019-20 inventory report indicates the Western Australian resources sector (mining, minerals processing, oil and gas) is responsible for more than half of the State's greenhouse gas emissions (Table 1), excluding Land Use, Land Use Change and Forestry (LULUCF) sector emissions.

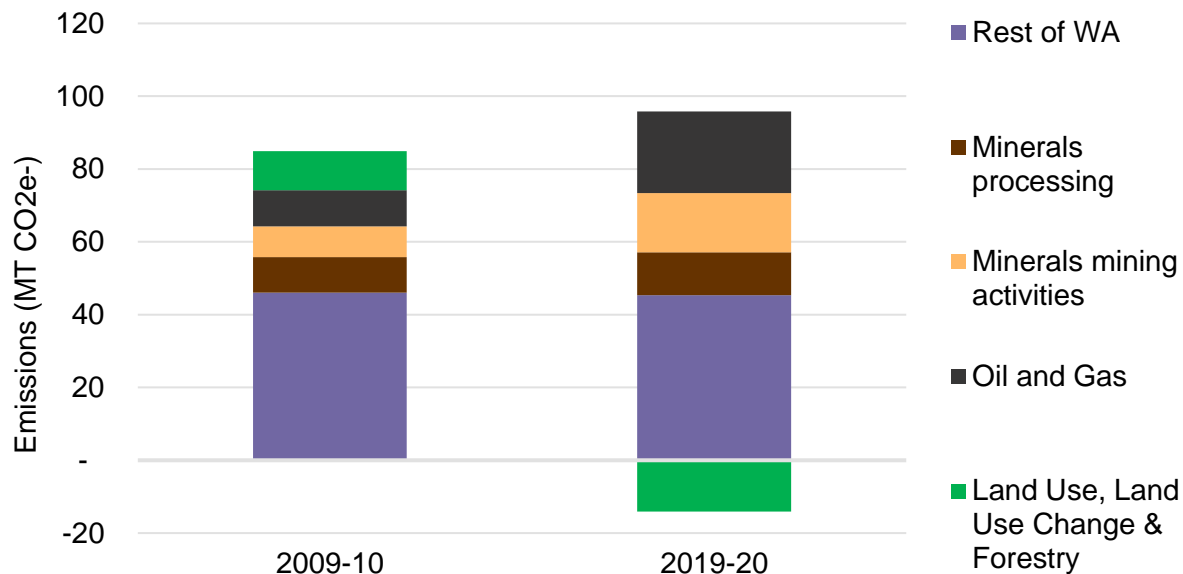
Table 1: Western Australian resource sector greenhouse gas emissions ^a

Sector	Megatonnes of CO ₂ equivalent (Mt CO ₂ e)	
	2019-20	2020-21
Minerals mining activities (including coal) ^b	16.3	16.6
Minerals processing ^c	11.7	11.3
Oil & Gas ^d	22.5	21.2
Resources Sector total	50.5	49.1
State Total (excluding LULUCF) ^e	95.8	Not yet available

- a) Based on data reported to the NGER Scheme. The majority of the resources sector's Scope 1 and Scope 2 emissions are reported under the NGER Scheme. Totals do not include emissions from rail freight transport, some accommodation, corporate services, water services, air transport or docks/shipping operations.
- b) Total NGER Scheme reported for minerals mining. Excludes some product transport to market.
- c) Total NGER Scheme reported for downstream mineral processing. Excludes mining and onsite beneficiation.
- d) Total NGER Scheme reported for oil and gas production.
- e) National Greenhouse Gas Accounts 2020: State and Territory Greenhouse Gas Inventories, (published May 2022). The Western Australian LULUCF sector reduced total emissions by 14.1 Mt in 2019-20.

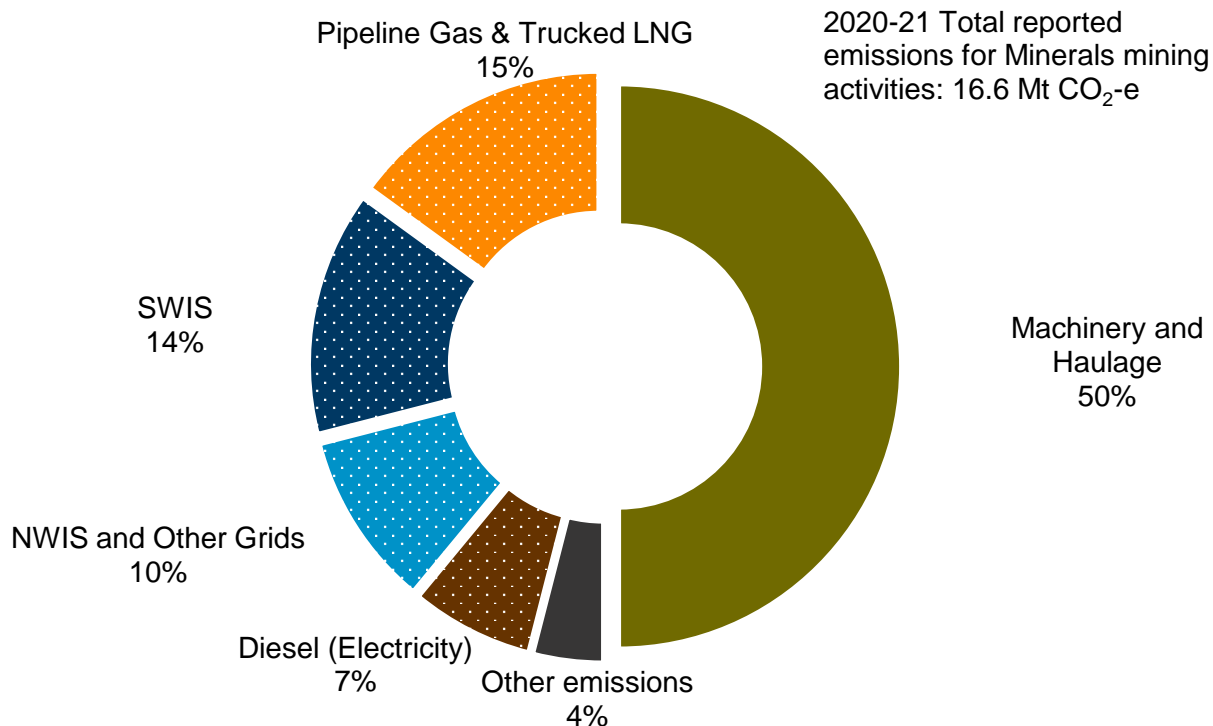
As shown in Figure 1, over the decade to 2019-20, Western Australia's greenhouse gas emissions from minerals mining activities increased by around 71 per cent, due to growth in the sector.

Figure 1: Western Australia's annual greenhouse gas emissions



As shown in Figure 2, nearly half the greenhouse gas emissions reported for minerals mining activities are from electricity generation, (dotted sections in Figure 2). Renewable generation technologies are a priority for reducing greenhouse gas emissions from mining electricity production.

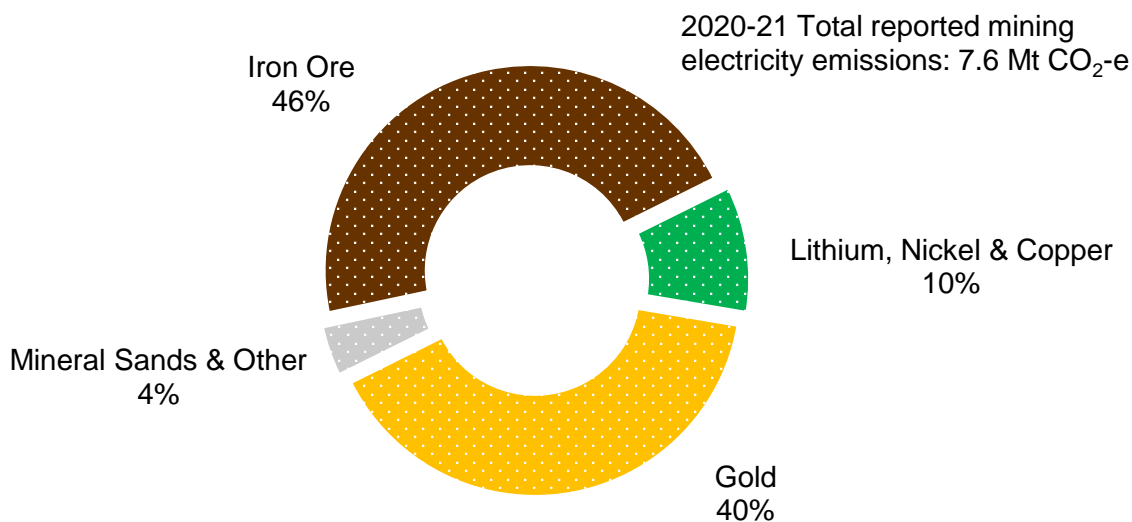
Figure 2: Sources of Western Australian minerals mining greenhouse gas emissions



Most of the remaining emissions are from fuels used in trucks and other heavy mining equipment used onsite; companies are also looking at ways to reduce these emissions.

Figure 3 is only the greenhouse gas emissions reported from electricity consumption. It shows that iron ore and gold mining account for around 86 per cent of Western Australia’s mining electricity greenhouse gas emissions.

Figure 3: Western Australian minerals mines, electricity emissions by primary mineral



Large mine sites

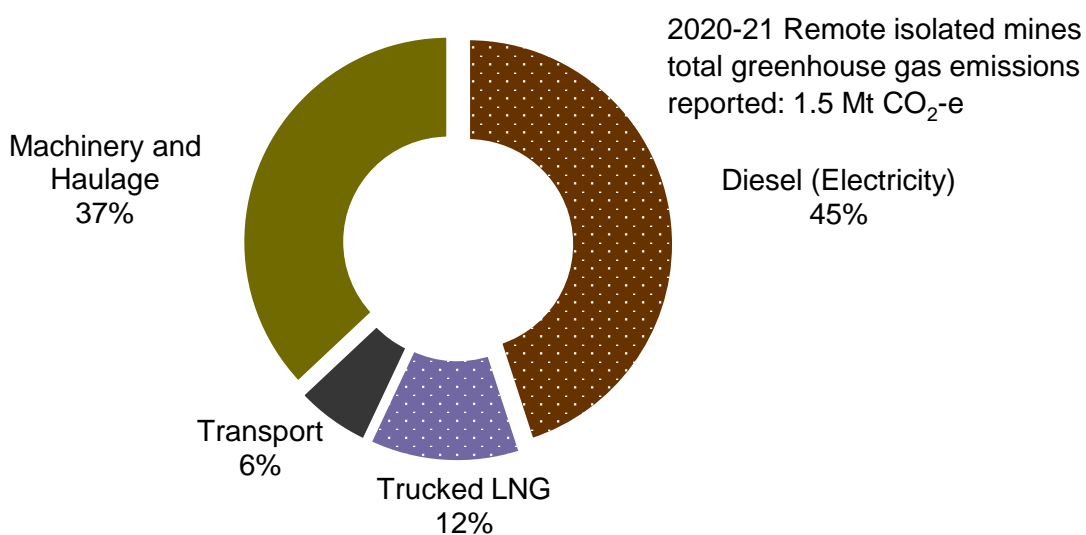
The 20 Western Australian minerals mine sites with the largest annual greenhouse gas emissions contribute around 60 per cent of the State’s minerals mining emissions. These sites are connected to main grid electricity, South West Interconnected System (SWIS) or North West Interconnected System (NWIS), or have a power station connected to a gas pipeline for electricity generation.

Remote isolated mine sites

In Western Australia, 43 of the minerals mining operations which report to the NGER Scheme are not connected to either an electricity main grid or a gas pipeline. These ‘remote isolated’ minerals mines tend to have higher costs for fuel delivered by trucks. Typically, remote isolated mines rely on diesel and/or trucked Liquid Natural Gas (LNG) fuel for power generation. Remote isolated minerals mines contribute around 8 per cent of total mining emissions reported for Western Australia.

The emissions profile for remote isolated minerals mines (Figure 4) is different as they generally have smaller power stations with higher greenhouse gas intensity. Transport tends to be a larger portion of greenhouse gas emissions due to the increased distances of transporting product to market.

Figure 4: Western Australian remote isolated mines, greenhouse gas emissions by source



Electricity

Did you know...?

Each year in Western Australia, more megawatt hours of electricity are generated outside the South West Interconnected System than are generated within it.

Most of the 120 medium to large minerals mining operations in WA are connected to an electricity main grid or a gas pipeline. All of the power stations in the NWIS are connected to gas pipelines.

Table 2 shows the metered electricity consumption, renewables and the emissions intensity of main grids across the state.

Table 2: Western Australian electricity consumption in 2020-21 ^a

Region	Sector	Metered (TWh)	Metered renewable energy share	Estimated emissions intensity (kg CO ₂ -e/kWh)
SWIS	Minerals mining	2.6 ^b	29.33% ^c	0.68 ^d
	Total	17.6 ^e		
NWIS and Other Grids (inc. Horizon Power towns)	Minerals mining	10.0 ^f	0.84% ^g	0.52 ^h
	Total	23.2 ^g	Not Available	Not Available
Totals	Mining & Minerals Manufacturing ^h	16.8 ^g	Not Available	Not Available
	Total	43.5 ^g	14.17% ^g	

a) Based on Australian Energy Statistics, Table O (11.2), 2020-21. Includes all manufacturing and resource sector activities.

b) EPWA estimates for SWIS connected mining operations, does not include office and other offsite operations.

c) AEMO Annual Report 2020-21, Wholesale Electricity Market fuel split, does not include behind-the-meter (BTM) self-consumption.

d) Information from the National Greenhouse Accounting Factors 2021, released in August 2021

e) Australian Energy Market Operator (AEMO) Annual Report 2020-21, Total energy consumed from the grid, does not include Behind-The-Meter consumption.

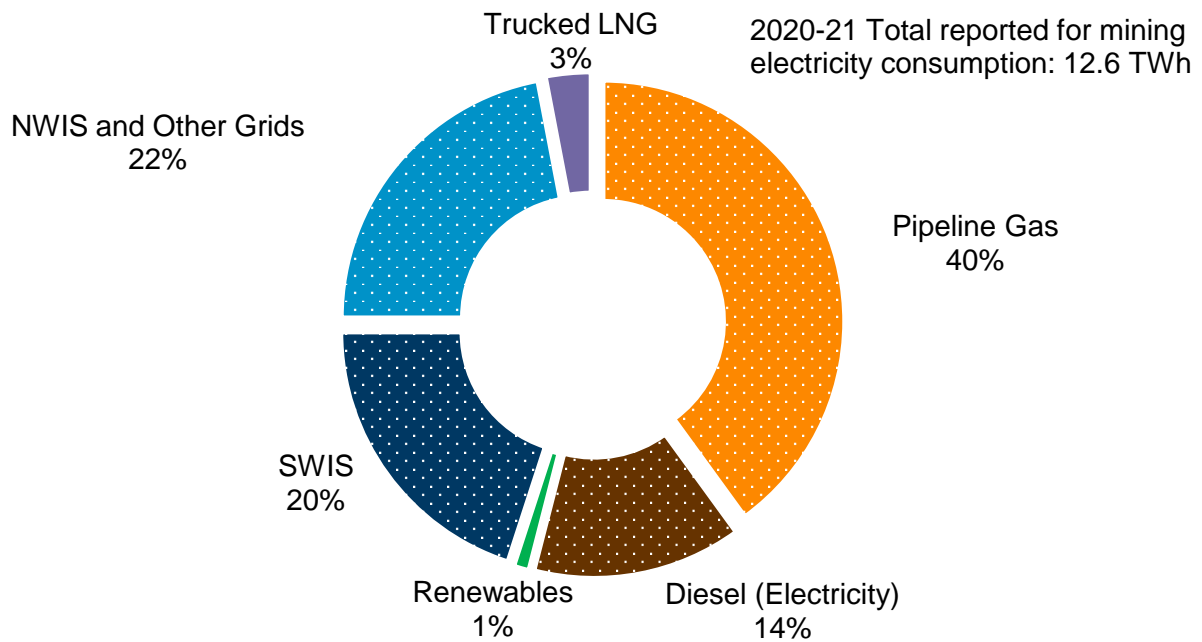
f) EPWA estimates for minerals mining outside the SWIS.

g) Based on Australian Energy Statistics, Table O (9.1), 2020-21. Includes all behind-the-meter self-consumption, estimated to be around 2.6 TWh.

h) EPWA estimates based on mining emissions and energy consumption outside the SWIS.

Figure 5 is reported electricity consumption by source and shows that electricity from main grids and onsite generation from pipeline gas are the main sources for the sector.

Figure 5: Western Australian minerals mining electricity consumption by source



Renewable generation

As of early 2022, 10 Western Australian minerals mines are achieving between 10 and 55 per cent of their annual electricity generation from renewable energy. For example, supported by funding from the Western Australian Government's Clean Energy Future Fund, the Carosue Dam mine's power generation includes a 5.3 MW solar array.

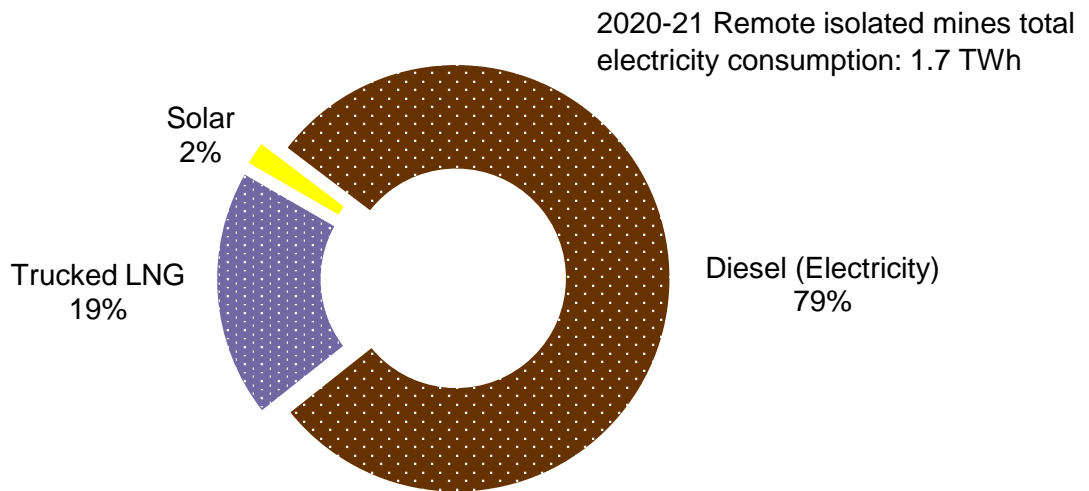
Typically, some form of storage, such as a battery energy storage system, is required to increase an isolated load's annual renewable energy contribution beyond around 10 per cent. Gold Fields' Agnew mine achieves up to 85 per cent instantaneous renewable power fraction, see the Case Study for more information. Some new mines, such as OZ Minerals West Musgrave project, are also designing power systems to achieve instantaneous renewable power fractions above 80 per cent.



Northern Star's Carosue Dam mine's solar array. Source Nomadic Energy.

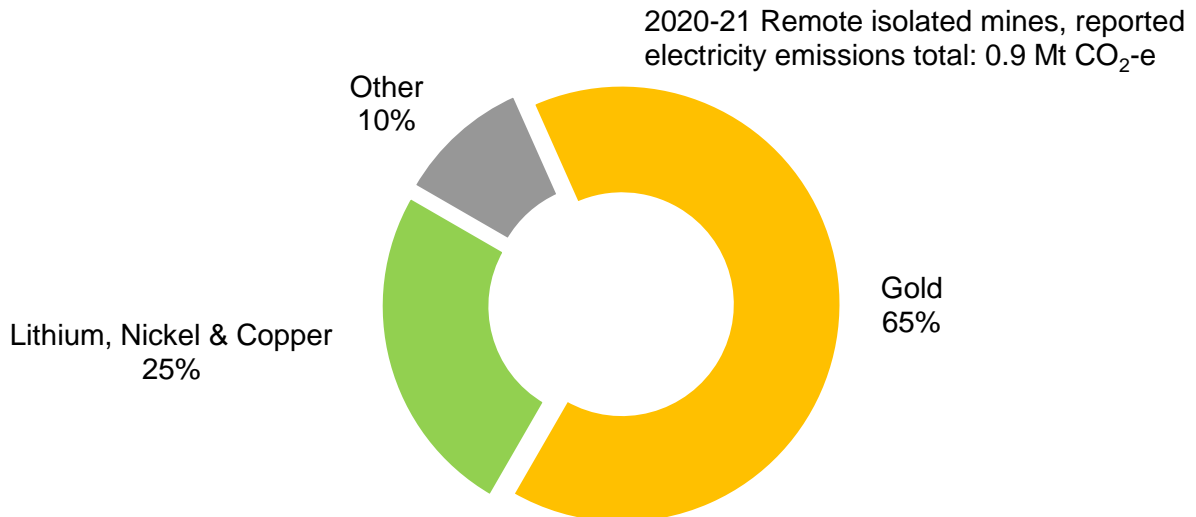
Currently, no Western Australian remote isolated minerals mines operate wind turbines or batteries, though some have solar arrays. Several remote isolated mines have announced plans to install battery systems to reduce electricity costs. Figure 6 shows electricity consumption by source for remote isolated mines.

Figure 6: Western Australian remote isolated mines, electricity consumption by source (2020-21)



The majority of greenhouse gas emissions from electricity generation for remote isolated mines are from gold mining (Figure 7). Electricity generation for battery and critical minerals operations (e.g. nickel and rare earths) are also significant for mines without access to a main grid or gas pipeline.

Figure 7: Western Australian remote isolated minerals mines, electricity emissions by mineral



NOTE: In all figures and tables, some percentages, categories and totals have been rounded to comply with Clean Energy Regulator and NGER Scheme confidentiality requirements. In this Fact Sheet, ‘isolated’ refers to sites without a connection to an electrical main grid, while ‘remote isolated’ refers to those sites without connection to a main grid or gas pipeline.