

## The Sustainability of Nuclear Power and Renewables

The table below compares the sustainability of Small Modular Reactors (SMRs) with renewables.

For most issues, SMRs are seen to be more sustainable than renewables, in particular:

- SMR plant lifetime is much longer. **All currently operating solar and wind plants will have come to the end of their life and will have to be replaced before 2050.**
- SMR land area requirements are much lower.
- SMR basic materials requirements (concrete, steel, aluminium, copper) are much less on an installed capacity or tonnes per TWh basis. When you also take into account the additional cost of materials for firming and transmission for renewables, the total is very much less.

Another area of concern with renewables is mining. A recent IEA study identified copper, nickel, manganese, cobalt, chromium, molybdenum, zinc, rare earths and silicon as critical minerals. Many of these are sourced from areas where mining is not carried out in the most ethical and environmentally sustainable way and where environmental impacts and human rights are not a primary concern.

Issue	Nuclear	Renewables	
	SMRs	Large Scale Solar	Wind
Plant lifetime years	>60	<25	<30
Land area requirement	low	high	very high
Lifecycle emissions gCO <sub>2</sub> -e/kWh	12	18-50	12
Energy density	very high	low	low
Basic materials t/TWh*	1,195	2,509	5,969
Construction – concrete t/TWh*	1,058	1,216	4,466
Construction – steel t/TWh*	134	938	1,447
Construction -cost	high	low	medium low
Mining - fuel	low	zero	zero
Life waste disposal included in cost	yes	no	no
Dispatchable generation	yes	no	no
Capacity factor	95%	average 20% **	average 35% **
Direct replacement for coal	yes	no	no
Firming required	no	yes	yes
Transmission requirements	low	high	high
Additional System costs	low	high	high
Independent of weather	yes	no	no
Load following capability	yes	no	no
Provides frequency control	yes	no	no
Provides system inertia	yes	no	no
Black start capability	yes	no	no
Provide process heat for industry	yes	no	no
Visual impact	low	low	high
Noise impact	low	low	high

\* Median figures t/TWh from Dayne Eckermann June 2021.

\*\* Clean Energy Council - Clean Energy Australia report 2021