LCA of Tesla Lithium-ion battery with an NCA cathode

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Tesla's Battery Supply Chain

Supplier	Material	Country	Type	Independent External Sustainability Assessment[1]	Life-Cycle Analysis (LCA) Completed[2]
Albemarle	Lithium	Australia (mine); China (refinery)	Integrated Mine Site + Refiner		
Livent	Lithium	Argentina (mine); China, USA (refinery)	Integrated Mine Site + Refiner		
Ganfeng	Lithium	China	Refiner	N/A[3]	
Yahua	Lithium	China	Refiner	N/A[3]	
Guizhou CNGR	Cobalt, Nickel	China	Refiner		
Hunan CNGR	Cobalt, Nickel	China	Refiner		
Huayou	Cobalt, Nickel	China	Refiner		
Glencore Kamoto Copper Company	Cobalt	Democratic Republic of Congo (DRC)	Mine site		
Glencore Murrin Murrin	Nickel	Australia	Integrated Mine Site + Refiner		
BHP Nickel West	Nickel	Australia	Integrated Mine Site + Refiner		
Prony Resources	Nickel	New Caledonia	Mine site		
Vale	Nickel	Canada	Integrated Mine Site + Refiner		

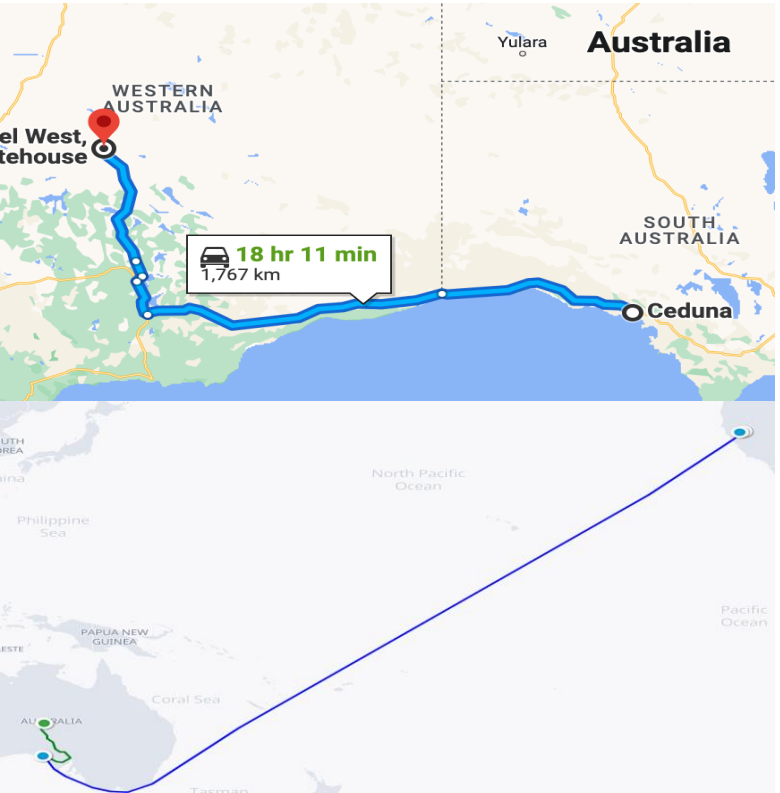
- Data pulled from Tesla's 2021 Impact Report

Legend

	Completed
	In progress / planned / commitment made
	No commitment / undisclosed

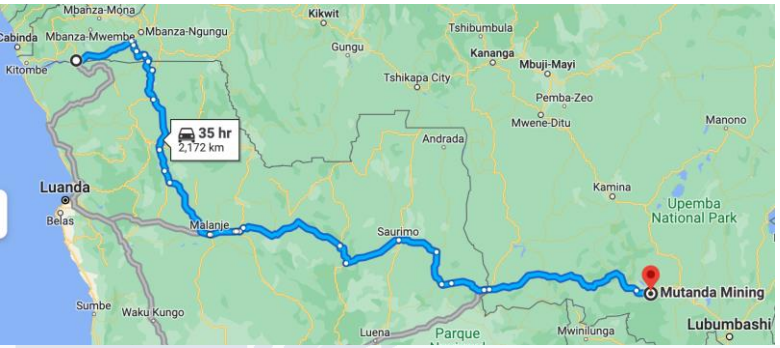
Transport - Nickel

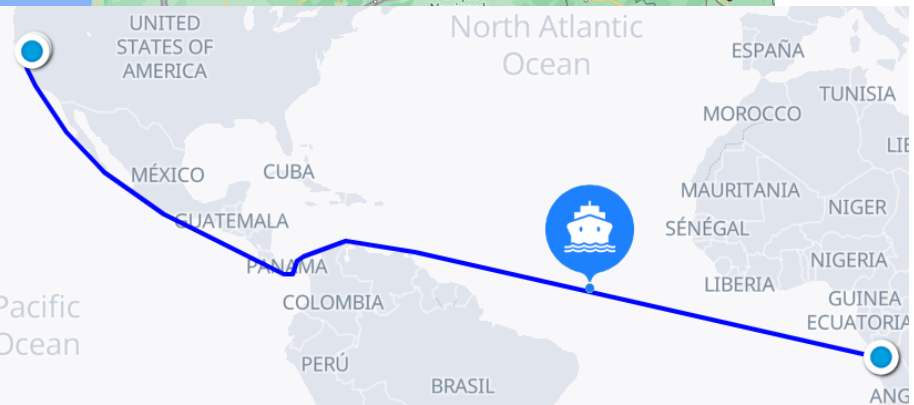
Supplier	Location	Distance	Transport	Emissions	Total Emissions
Bhp West Nickel	Extraction Mine to Thevernard Port	1767 km	Lorry	6.55 Kg CO2	24.32 Kg CO eq
	Thevernard Port to Nevada Port	14331.05 km	Sea Freight	17.52 Kg CO2	
	Nevada Port to City of Nevada	66.3 km	Lorry	0.24 Kg CO2	



Transport – Cobalt

Supplier	Location	Distance	Transport	Emissions	Total Emissions
Glencore	Democratic Republic of Congo to Matadi Port	2172km	Lorry	1.56 Kg CO2 eq	5.39 Kg CO2 eq
	Matadi Port to Nevada Port	16770.36km	Sea freight	3.76 Kg CO2 eq	
	Nevada Port to City	66.3km	Lorry	0.045 Kg CO2 eq	



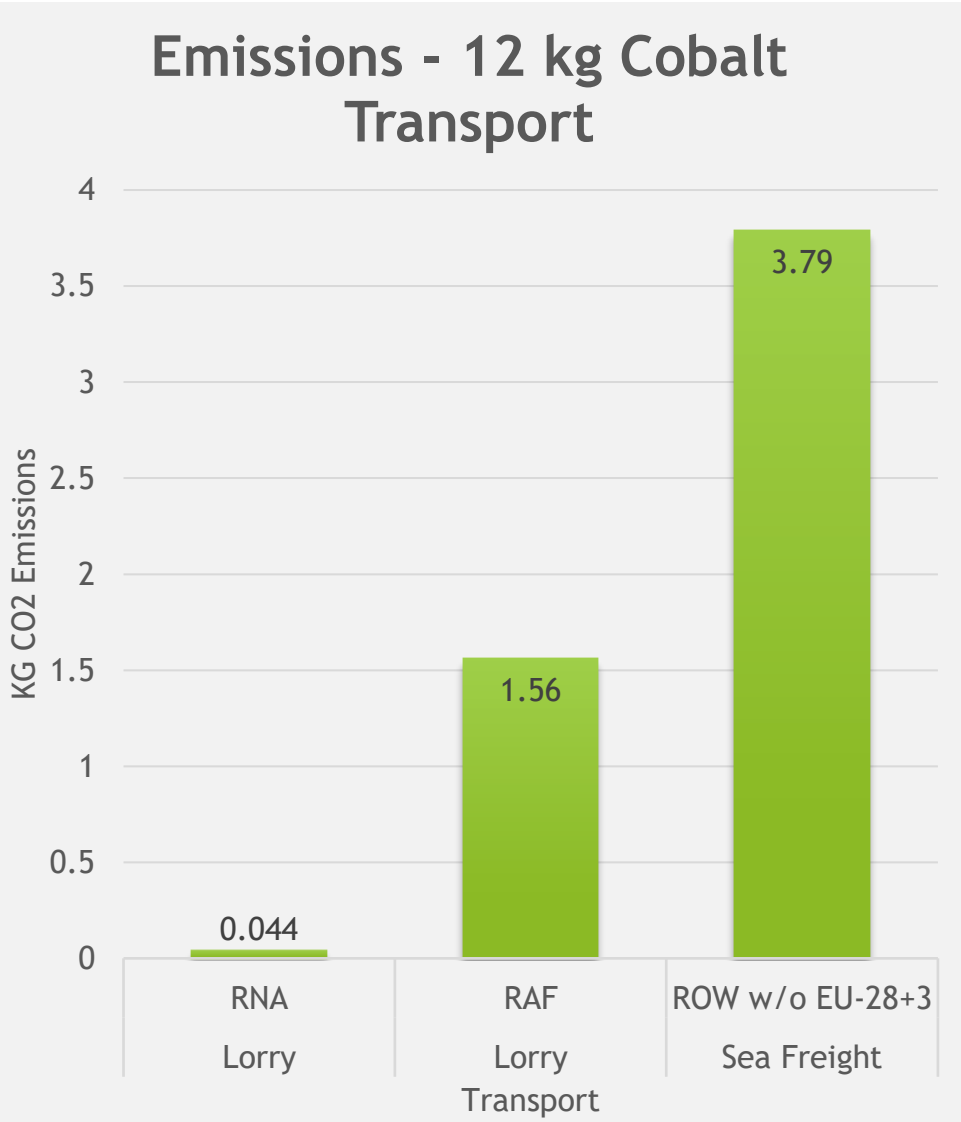


Matadi, Democratic Republic of the Congo
2.3 mi, (4.25 km)
Transit Time: an hour
Average Speed: 22 mp/h (35 km/h)

Matadi
9055.28 mi, (16770.36 km)
Transit Time: 29 days
Average Speed: 13 knots

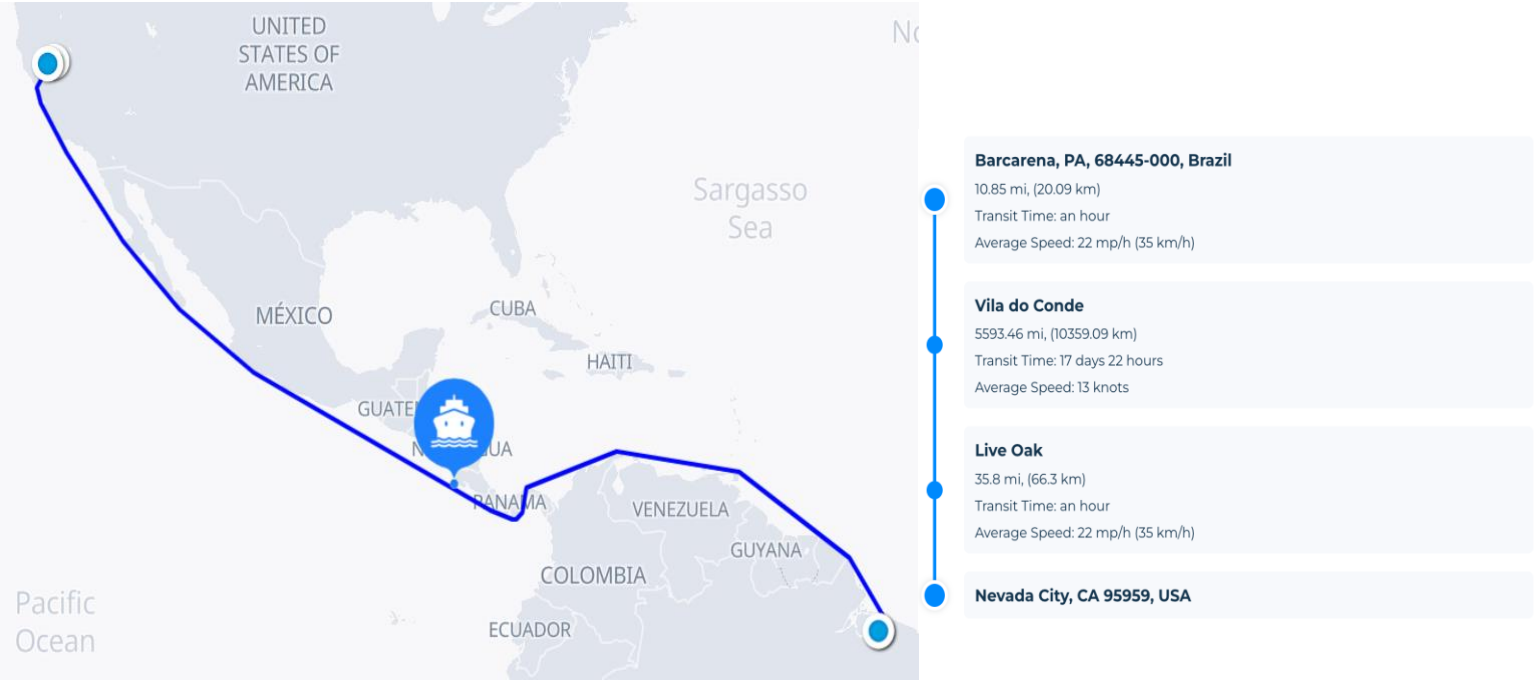
Live Oak
35.8 mi, (66.3 km)
Transit Time: an hour
Average Speed: 22 mp/h (35 km/h)

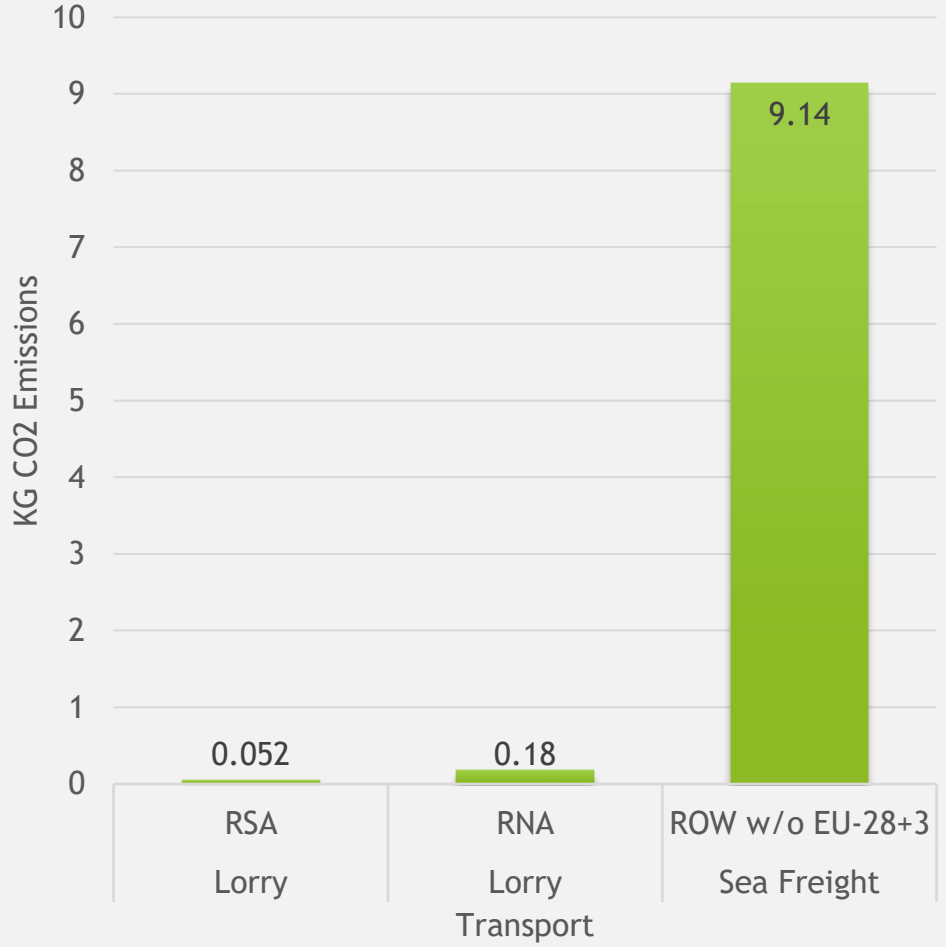
Nevada City, CA 95959, USA



Transport - Aluminium

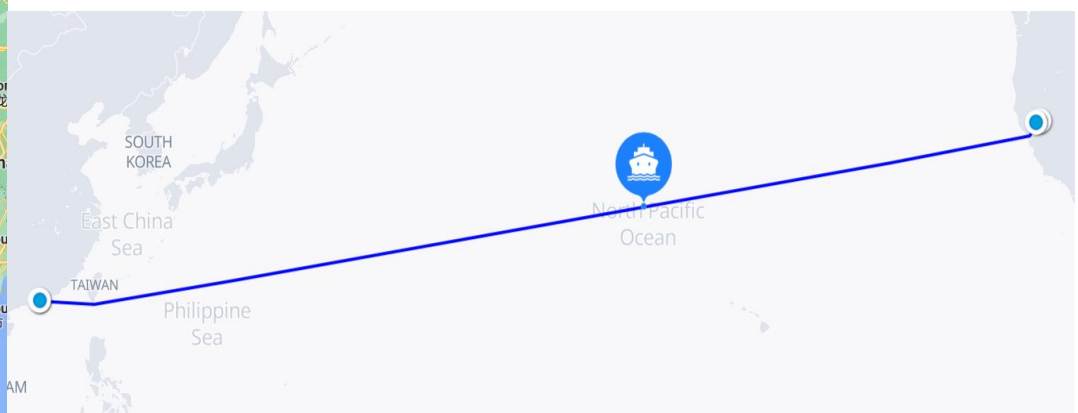
Supplier	Location	Distance	Transport	Emissions	Total Emissions
Norsk Hydro	Extraction Mine to Alunorte Port	20.9 km	Lorry	0.052 Kg CO2	9.36 KG CO2
	Alunorte Port to Nevada Port	10359.09 km	Sea freight	9.14 Kg CO2	
	Nevada Port to City of Nevada	66.3km	Lorry	0.18 Kg CO2	

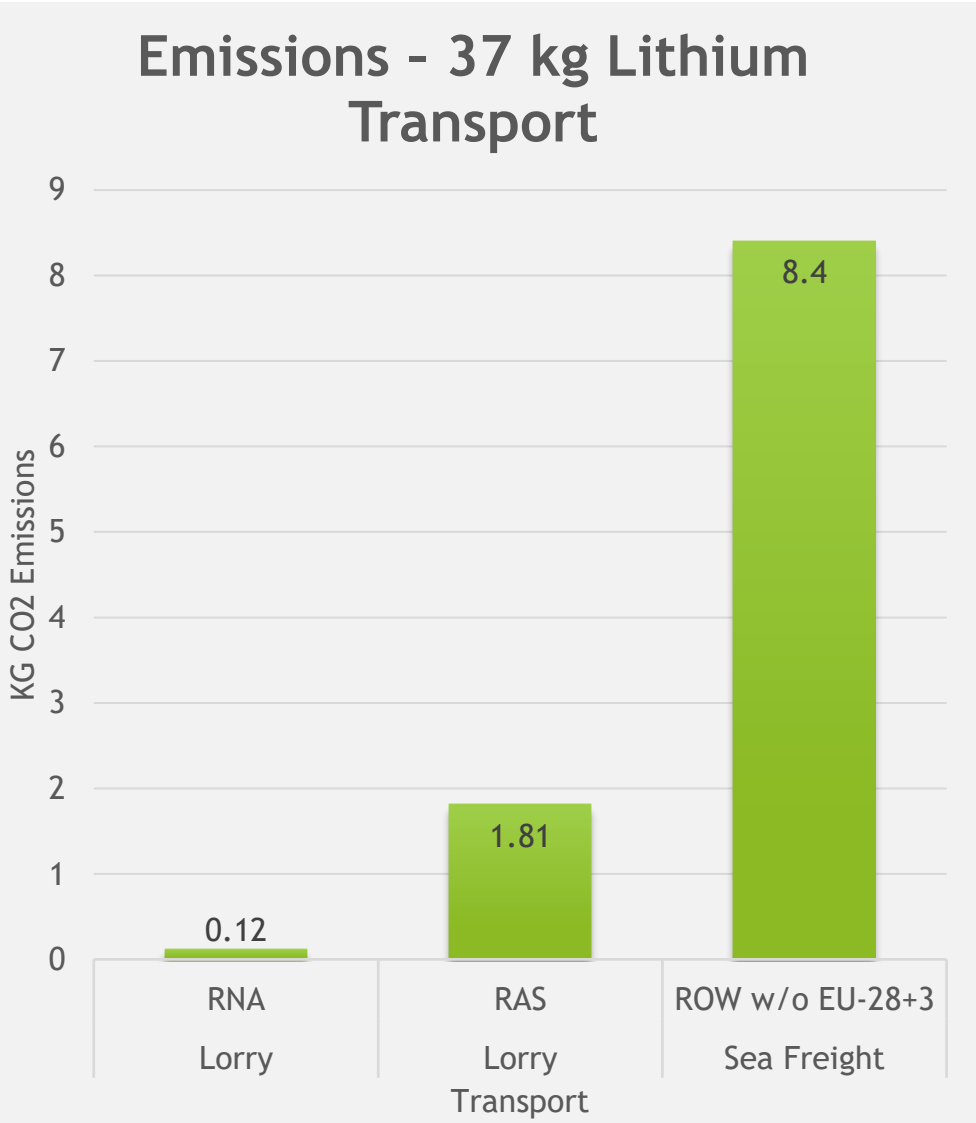




Transport – Lithium

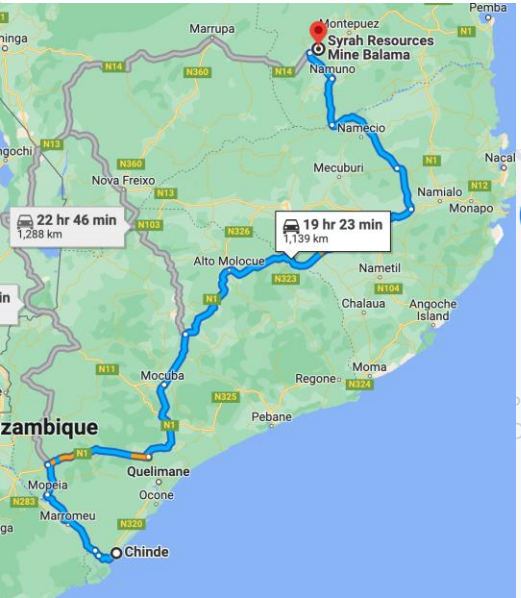
Supplier	Location	Distance	Transport	Emissions	Total Emissions
Ganfeng Lithium	Mahong Factory, Jiangxi province to Hong Kong port	850 km	Lorry	1.81 Kg CO2 eq	10.35 Kg CO2 eq
	Hong Kong port to Nevada port	11979 km	Sea Freight	8.4 Kg CO2 eq	
	Nevada Port to City of Nevada	66.3km	Lorry	0.12 Kg CO2 eq	

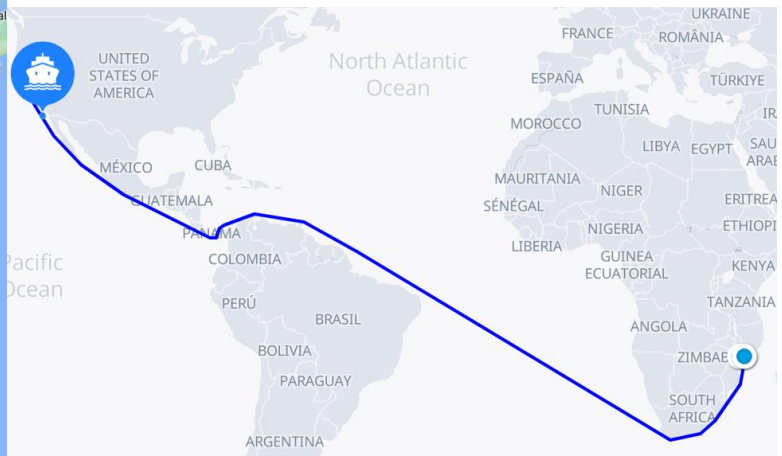


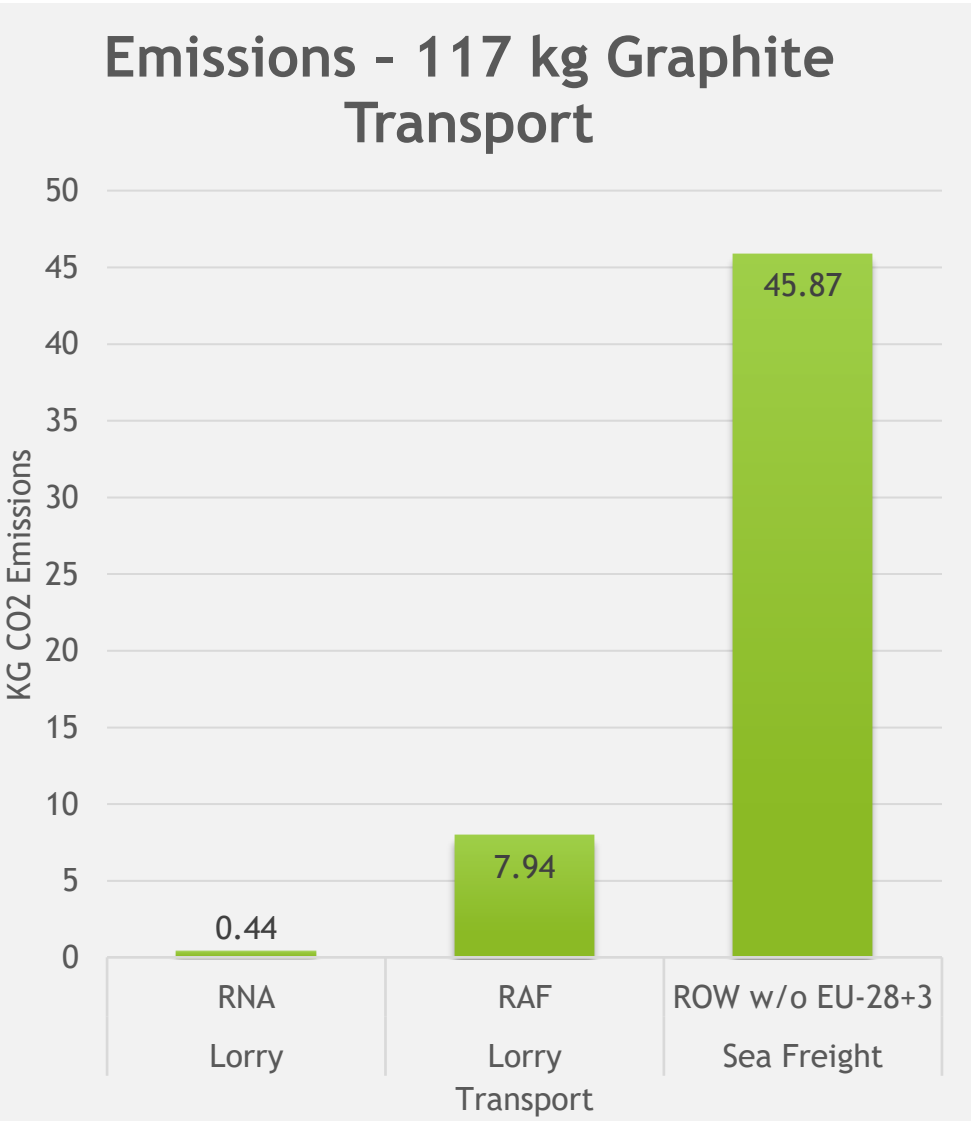


Transport – Graphite

Supplier	Location	Distance	Transport	Emissions	Total Emisisons
Syrah Resources	Cabo Delgado province to port of Chinde	1139 km	Lorry	7.94 Kg CO2	54.25 Kg CO2
	Port of Chinde to Port of Nevada	20888.84 km	Sea freight	45.87 Kg CO2	
	Port of Nevada to City of Nevada	66.3 km	Lorry	0.44 Kg CO2	

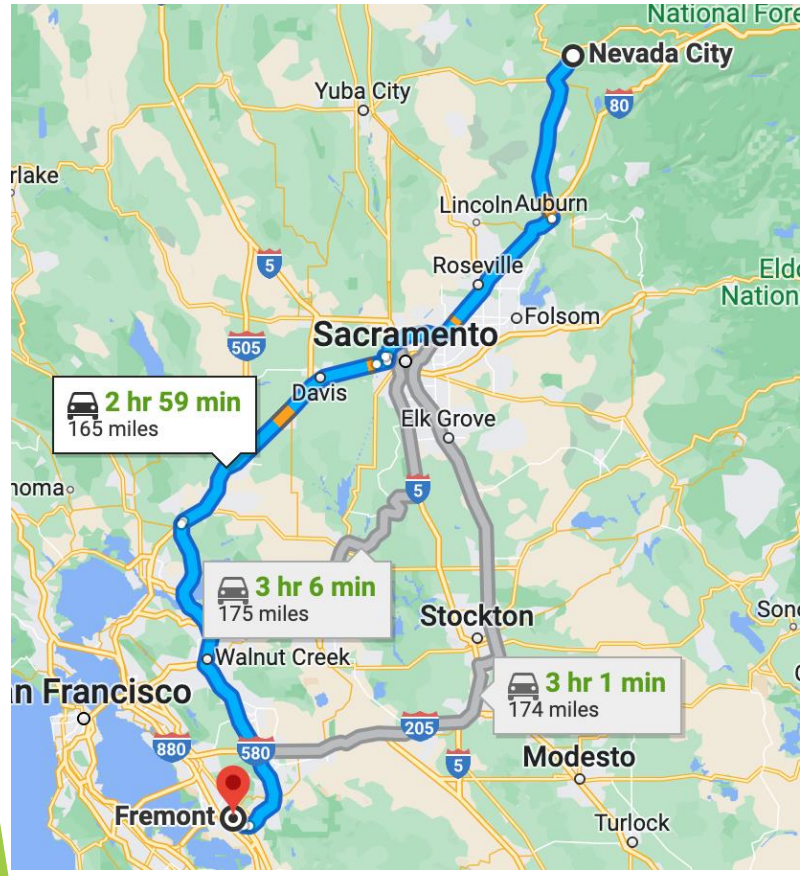




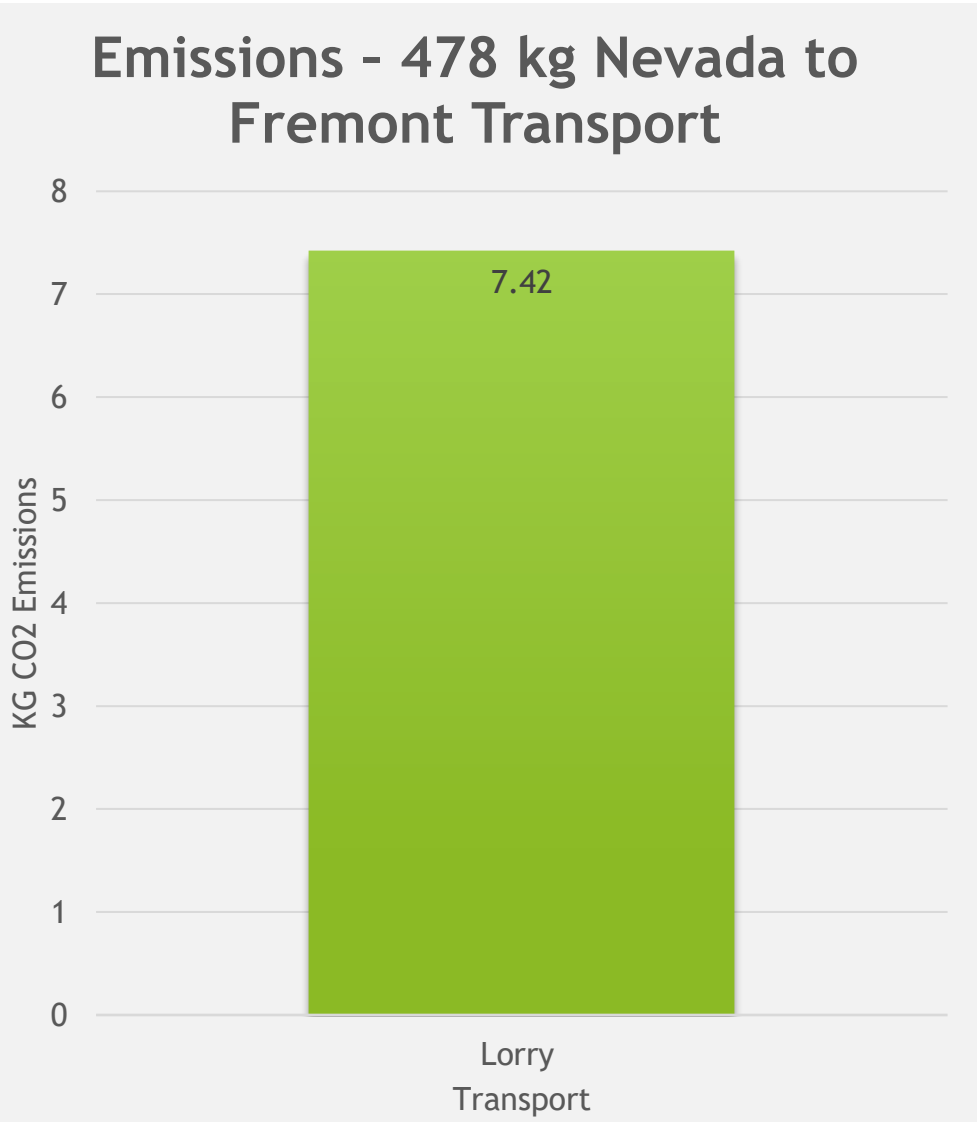


Transport of Battery Pack – Nevada to Fremont, CA

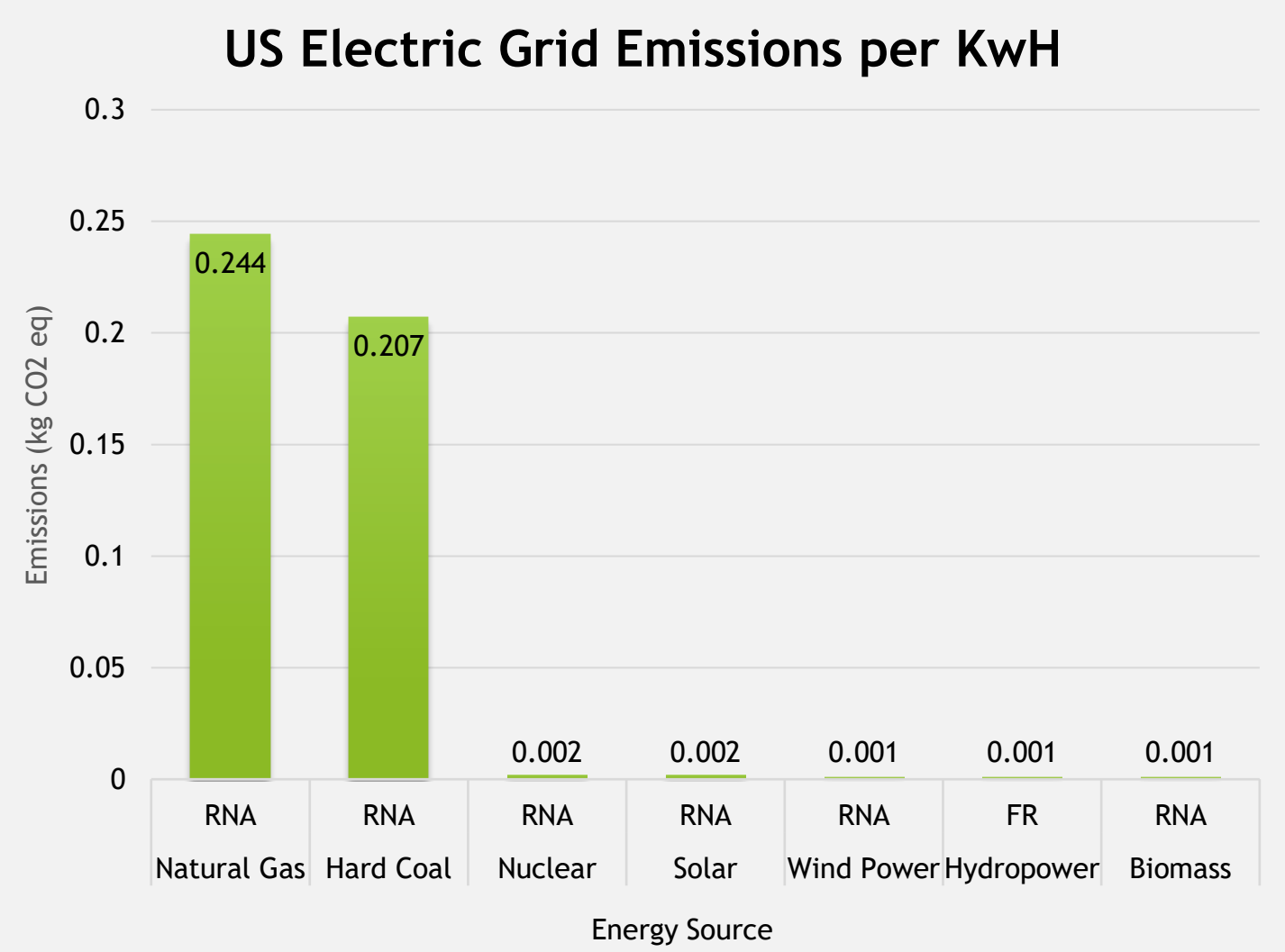
Supplier	Location	Distance	Transport	Emissions
Tesla	Nevada to Fremont, CA	275.198 km	Lorry	7.42 Kg CO2



- Total emissions:
- Nickel = 23.32 Kg CO2 eq
- Cobalt = 5.59 Kg CO2 eq
- Aluminium = 9.36 Kg CO2 eq
- Lithium = 10.35 Kg CO2 eq
- Graphite = 54.25 Kg CO2 eq
- Transportation of Battery Pack =7.42 Kg CO2 eq
- Total = 110.29 Kg CO2 eq



Use Phase



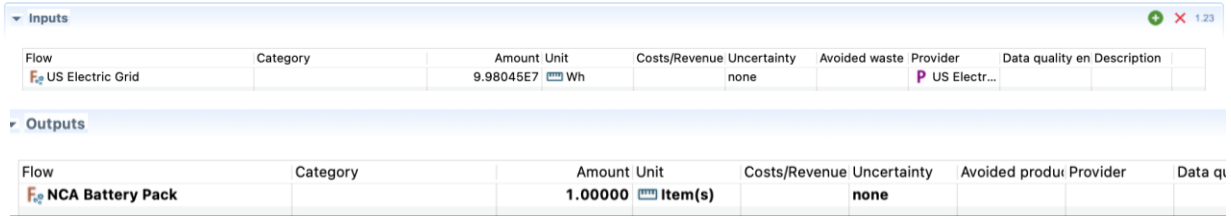
Electric Grid Mix

US Electric Grid - Energy Source	Billion KwH	Percentage of total
Biomass	53	1%
Hard Coal	828	20%
Hydro Power	262	6%
Natural Gas	1689	40%
Nuclear	772	18%
Solar	146	3%
Wind Power	435	10%

Use Phase

Breakdown

- Electricity consumption of Tesla Model 3 = 245 Wh per mile / 1.6km
- 153.125 Wh per km
- Time frame = 30 years
- Average drive in US per year = 13,500 miles = 21726.144 km
- Consumption of Battery Pack = 21726.144 x 153.124 =3,326,815.8 Wh
- For 30 years = 30 x 3,326,815.8 = 99,804,474 Wh
- Emissions = 0.46 kg x 3,326,816 = 1530 kg CO2



Contribution	Process	Amount	Unit
100.00%	Use Phase	4.55445E4	kg CO2 eq
100.00%	US Electric Grid	4.55445E4	kg CO2 eq
53.37%	Electricity from natural gas , production mix,...	2.43085E4	kg CO2 eq
45.27%	Electricity from hard coal , production mix, a...	2.06190E4	kg CO2 eq
00.53%	Electricity from nuclear , production mix, at...	239.84862	kg CO2 eq
00.37%	Electricity from photovoltaic, production mix...	166.71392	kg CO2 eq
00.16%	Electricity from wind power, production mix,...	74.88116	kg CO2 eq
00.16%	Electricity from hydro power , production mi...	72.81845	kg CO2 eq
00.14%	Electricity from biomass (solid) , production...	62.76735	kg CO2 eq

- Total emissions - 1530 Kg CO2 eq