

Infrastructure-related emissions in energy pathways

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Evidence: The climate impact of nuclear and renewable electricity mainly consists of the emissions of constructing the power plants.

IPCC's life-cycle emission factors for electricity generation technologies

Table A.II.4 | Aggregated results of literature review of LCAs of GHG emissions from electricity generation technologies as displayed in Figure 9.8 (g CO₂eq/kWh).

Values	Bio-power	Solar		Geothermal Energy	Hydropower	Ocean Energy	Wind Energy	Nuclear Energy	Natural Gas	Oil	Coal
		PV	CSP								
Minimum	-633	5	7	6	0	2	2	1	290	510	675
25th percentile	360	29	14	20	3	6	8	8	422	722	877
50th percentile	18	46	22	45	4	8	12	16	469	840	1001
75th percentile	37	80	32	57	7	9	20	45	548	907	1130
Maximum	75	217	89	79	43	23	81	220	930	1170	1689
CCS min	-1368								65		98
CCS max	-594								245		396

Note: CCS = Carbon capture and storage, PV = Photovoltaic, CSP = Concentrating solar power.

IPCC Special report on renewable energy sources and climate change Mitigation. Annex II: Methodology. (2011)
<https://www.ipcc.ch/site/assets/uploads/2018/03/Annex-II-Methodology-1>

Impact: Emissions of electricity production infrastructure can correspond to a significant share of the life-cycle emissions of a vehicle.

Example:

For **fuel cell electric vehicles** running on **renewable electricity-based hydrogen**, the emissions of renewable electricity can correspond to **21% of the life-cycle emission of the vehicle**.

Note: Due to energy losses in hydrogen production and in the fuel cell, fuel cell EVs need 3x more energy than battery EVs.

Life-cycle emissions of passenger cars in Europe

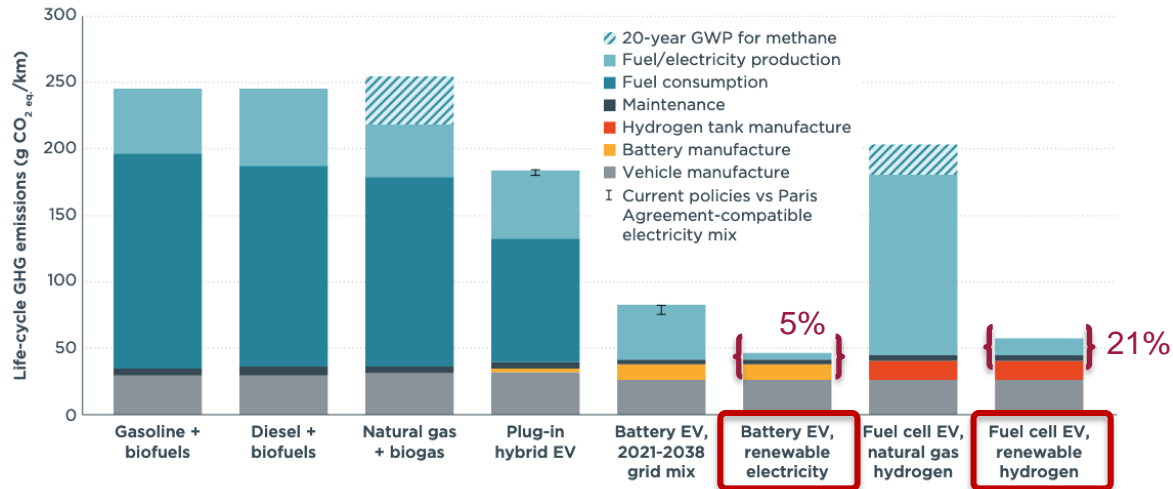


Figure 3.2. Life-cycle GHG emissions of lower medium segment gasoline, diesel, and CNG ICEVs, PHEVs, BEVs, and FCEVs registered in Europe in 2021.

Bieker (2021). A global comparison of the life-cycle GHG emissions of combustion engine and electric passenger cars. <https://theicct.org/publication/a-global-comparison-of-the-life-cycle-greenhouse-gas-emissions-of-combustion-engine-and-electric-passenger-cars/>

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Thank you!
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