





Need for molecules in addition to green electrons

→ Fig. 1

Green molecules needed for climate neutrality by 2050?	 Industry	 Transport	 Power sector	 Buildings
No-regret	Non-energy use ¹ : <ul style="list-style-type: none"> • Feedstock: ammonia, chemicals, fertilisers • Reaction agents: DRI steel 	<ul style="list-style-type: none"> • Long-haul aviation • Maritime shipping 	<ul style="list-style-type: none"> • Renewable energy back-up, depending on wind and photovoltaic share and seasonal demand structure 	<ul style="list-style-type: none"> • Heating grids (residual heat load²)
Controversial	<ul style="list-style-type: none"> • High-temperature heat 	<ul style="list-style-type: none"> • Trucks and buses³ • Short-haul aviation and shipping • Trains⁴ • Non-road mobile machinery 	<ul style="list-style-type: none"> • Absolute size of need given other flexibility and storage options 	—
Bad idea	<ul style="list-style-type: none"> • Low-temperature heat 	<ul style="list-style-type: none"> • Cars • Light-duty vehicles • Two- and three-wheelers 	—	<ul style="list-style-type: none"> • Building-level heating

Agora Energiewende and Agora Industry (2021)

¹ Hydrogen may also be used as a reaction agent and/or feedstock in bio-refineries. ² After using renewable energy, ambient and waste heat as much as possible. Especially relevant for large, existing district heating systems with high flow temperatures. Note that according to the United Nations Framework Convention on Climate Change (UNFCCC) Common Reporting Format, district heating is classified as being part of the power sector.

³ Series production currently more advanced on electric than on hydrogen for heavy-duty vehicles and buses. Hydrogen heavy-duty to be deployed currently in time only in locations with synergies (ports, mines, industry clusters). ⁴ Depending on distance, frequency and energy supply options.