

Alternative powertrains for road vehicles

Hybrid and electric powertrains

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**Partnership for Promotion and Popularization of Electrical Mobility through
Transformation and Modernization of WB HEIs Study Programs/PELMOB**

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

Project Number: 101082860

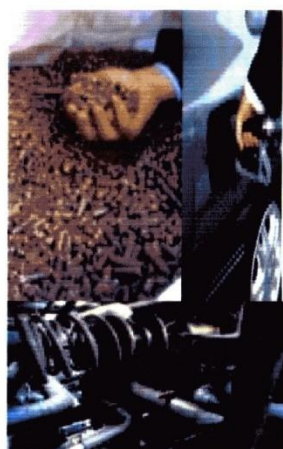
Prospects for the use of alternative fuels (EU)



Assessment

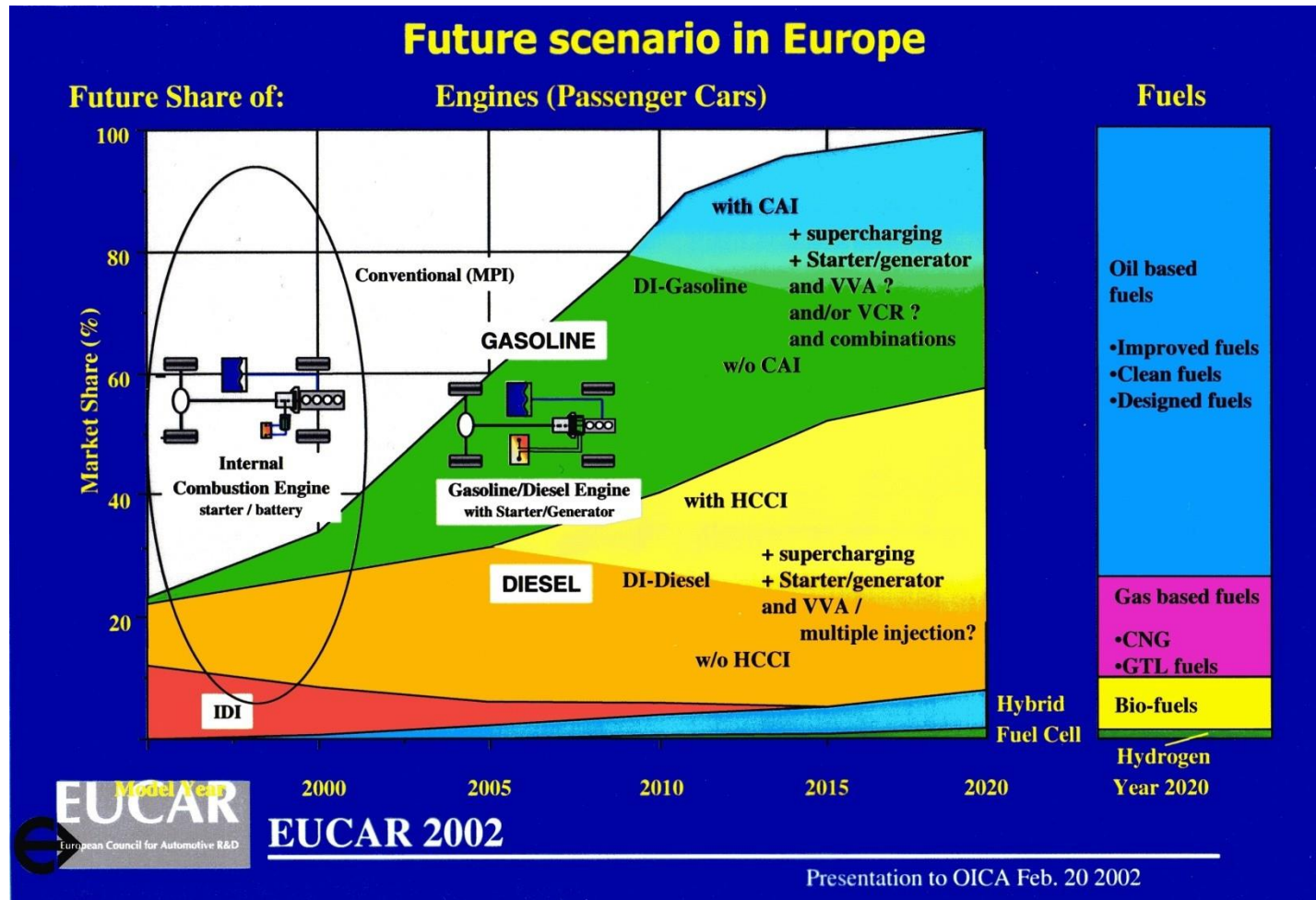
Options with potential over the next 20 years

Only three options appear to have a volume potential of more than 5% fuel consumption. If **active policy** is decided to promote them, their **optimistic** development scenario is (% fuel consumption):



	Biofuel	Natural gas	Hydrogen	Total
2005	2			2
2010	6	2		8
2015	(7)	5	2	14
2020	(8)	10	5	(23)

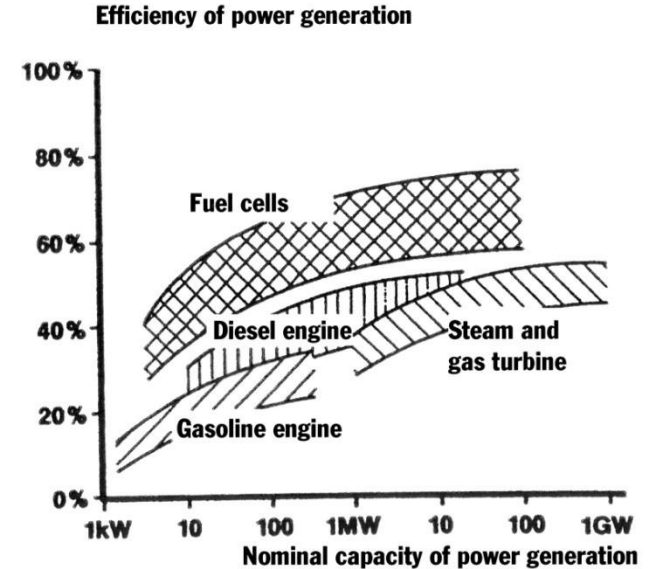
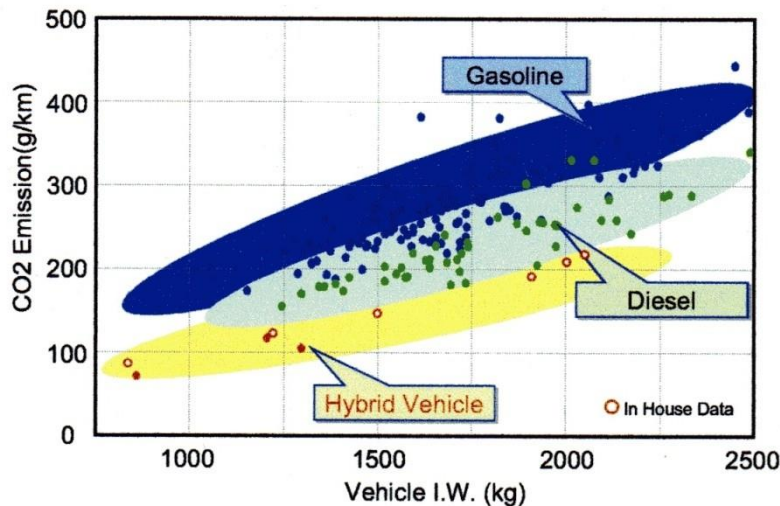
Perspectives on the application of alternative fuels and powertrains



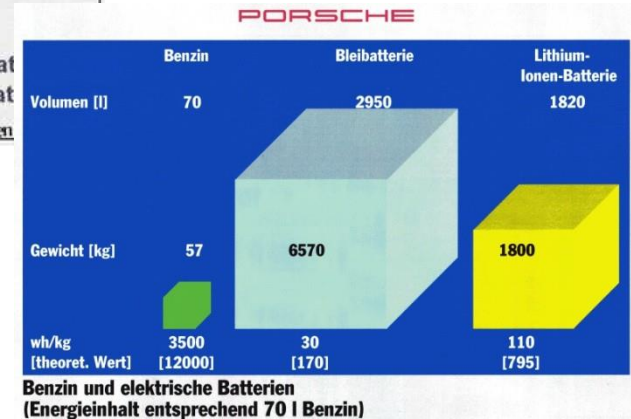
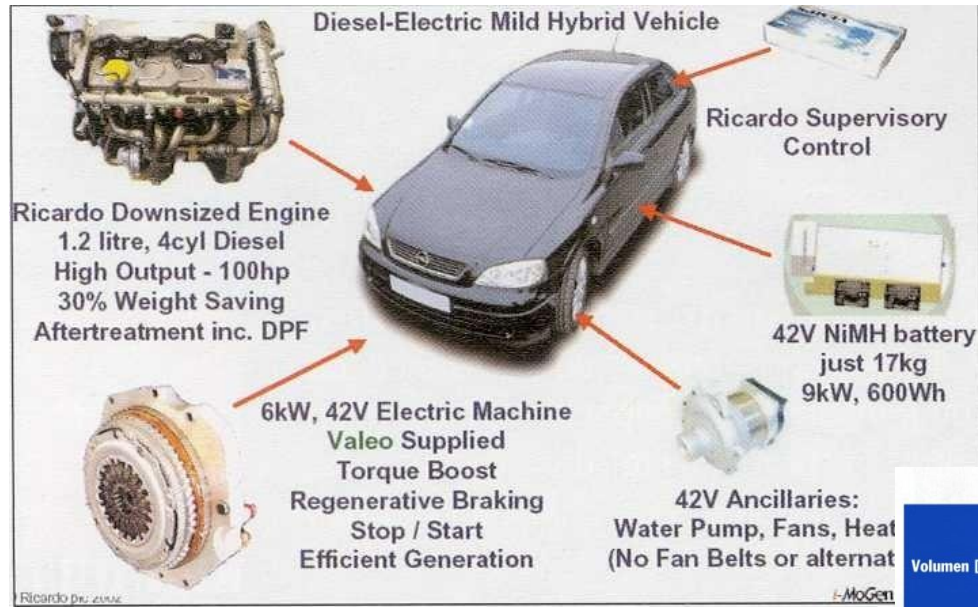
Hybrid technologies



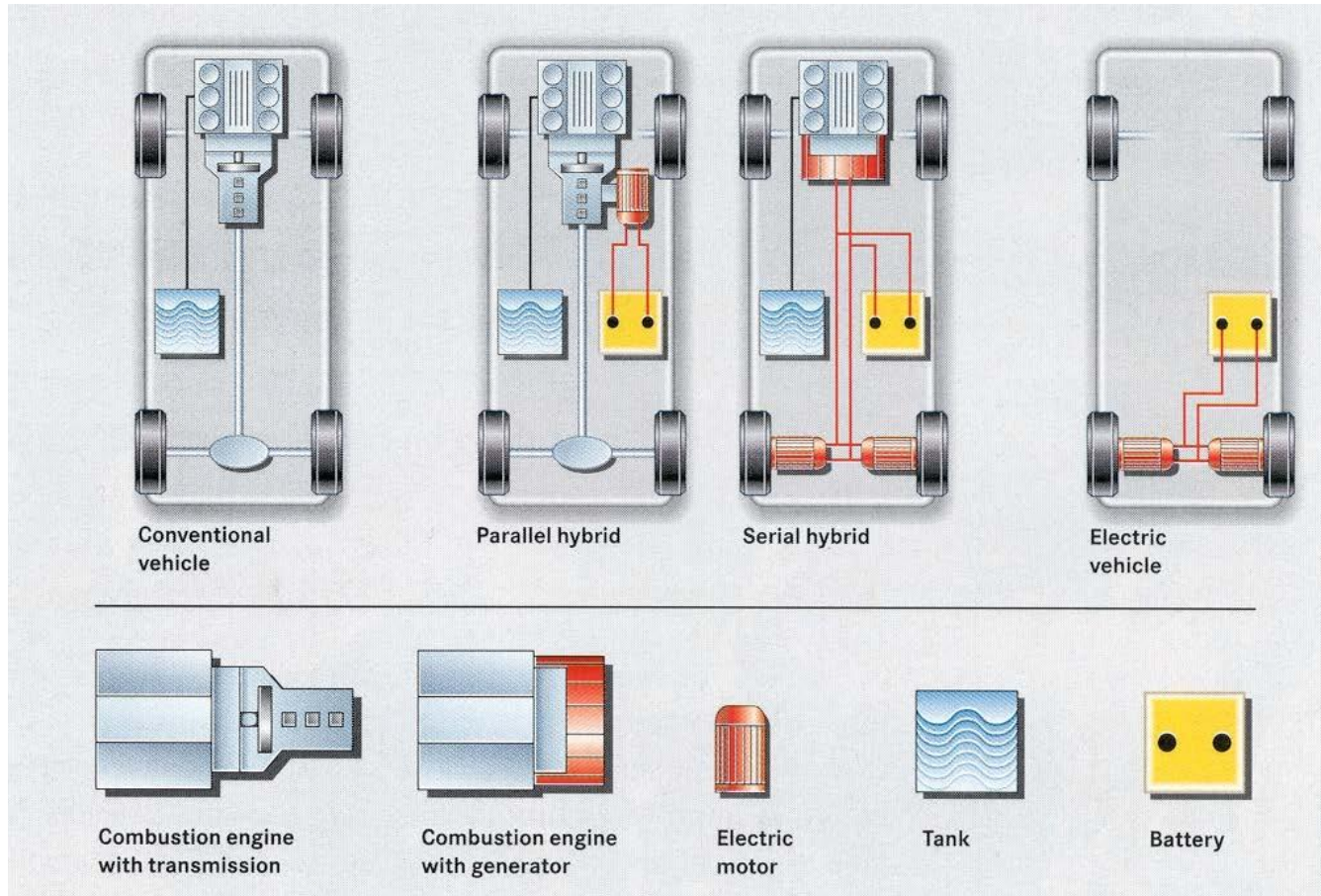
Environmental and energy advantages of hybrid technologies



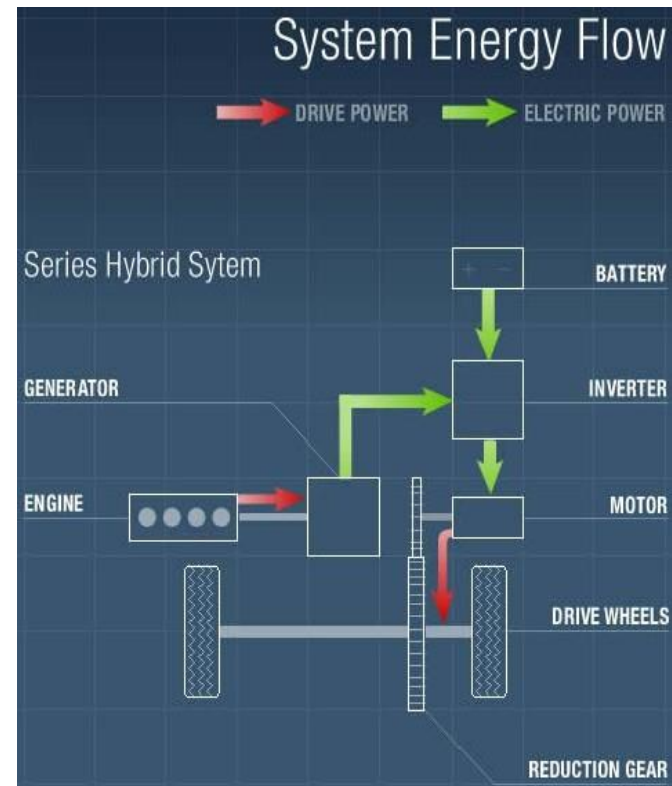
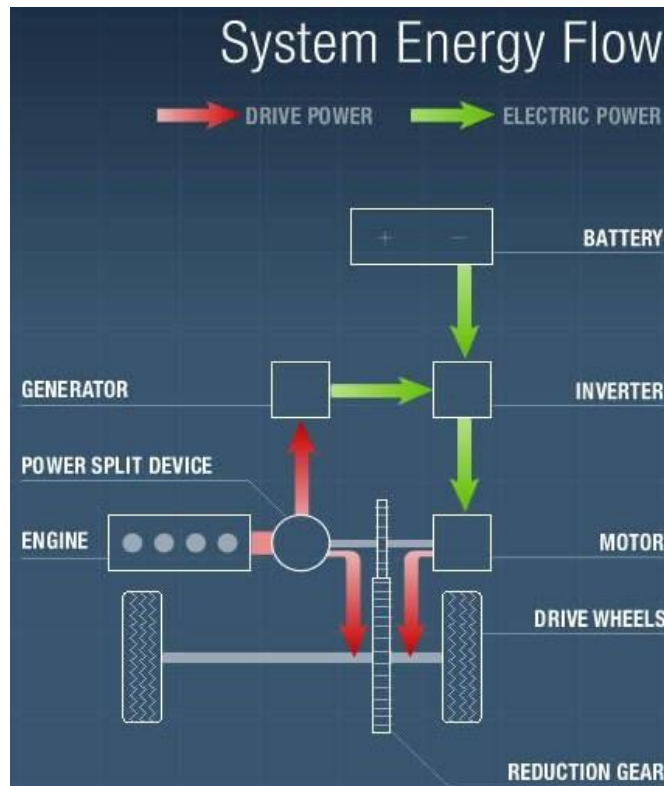
Mild hybrid vehicles



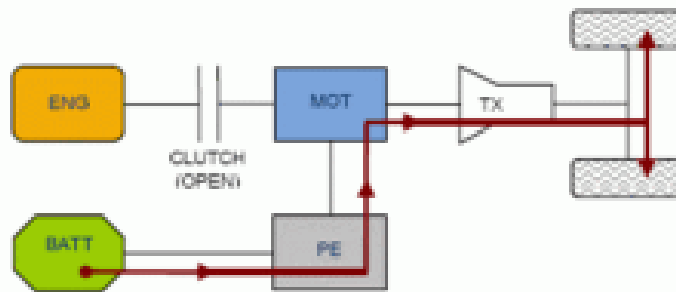
Alternative powertrains - configurations



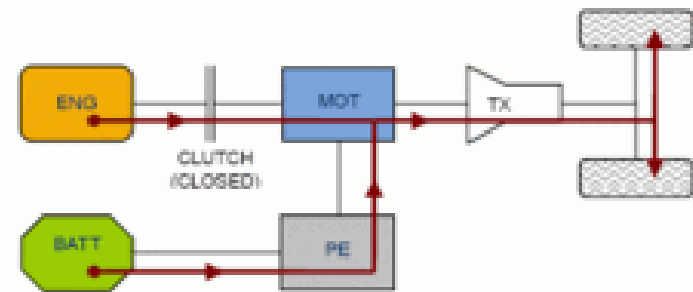
Hybrid Vehicles - Parallel and Series Hybrids



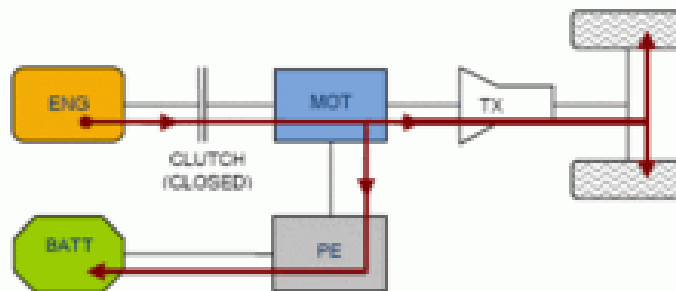
Modes of Operation of Parallel Hybrid Vehicles



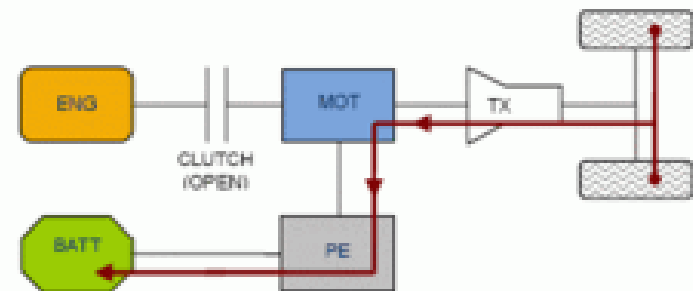
(a): electric only.



(b): hybrid / electric assist.

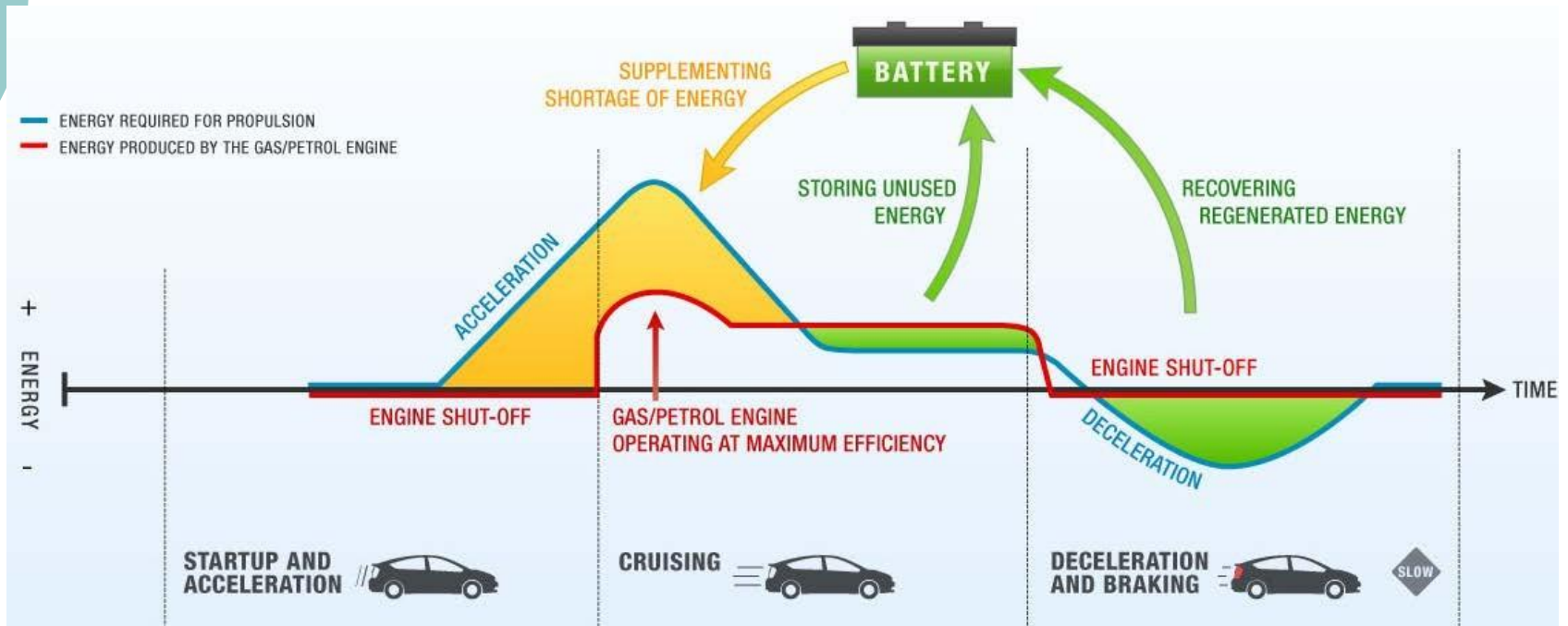


(c): battery charging.

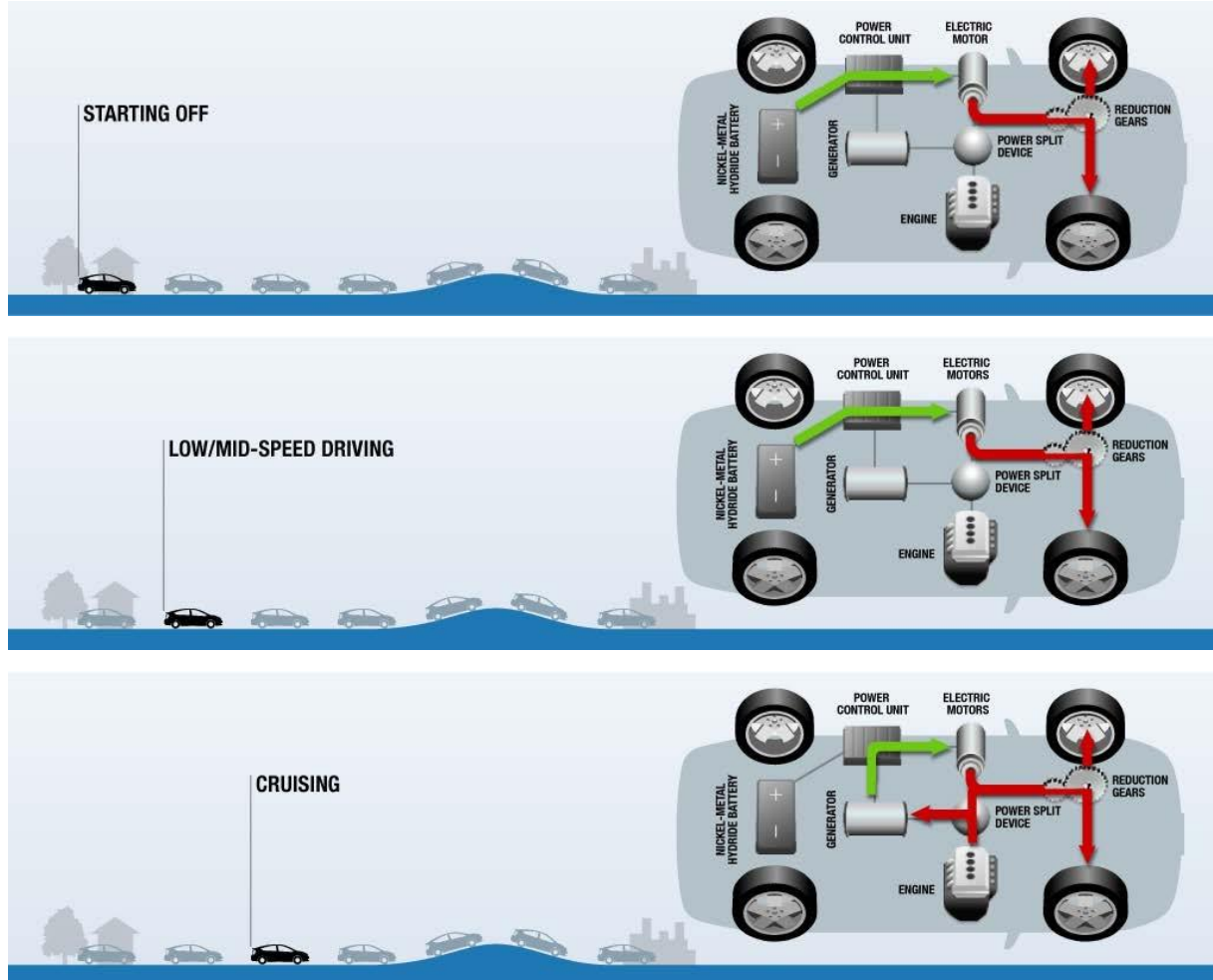


(d): regenerative braking.

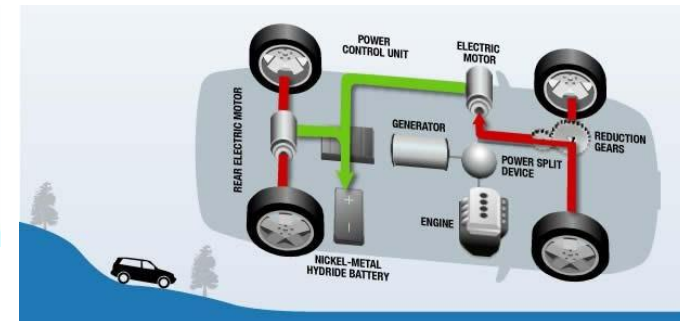
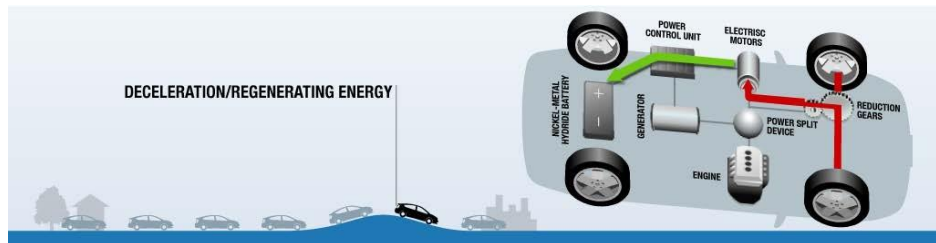
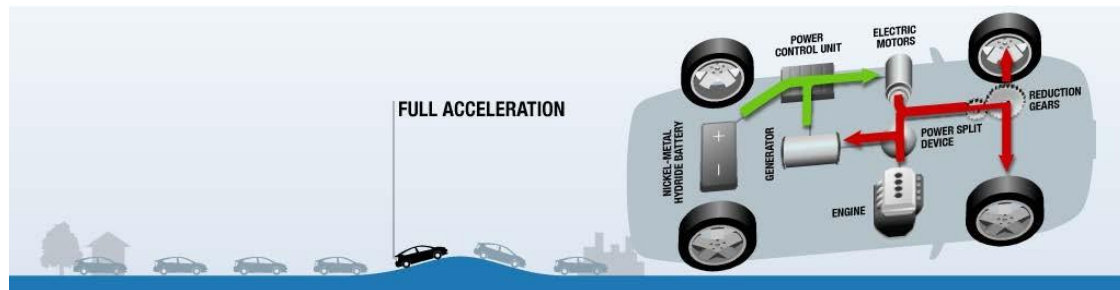
Full hybrid vehicles - operating principle



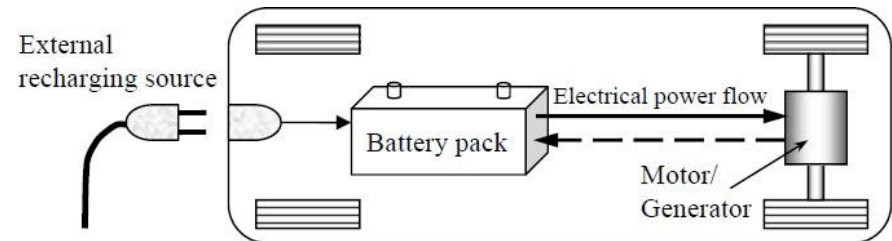
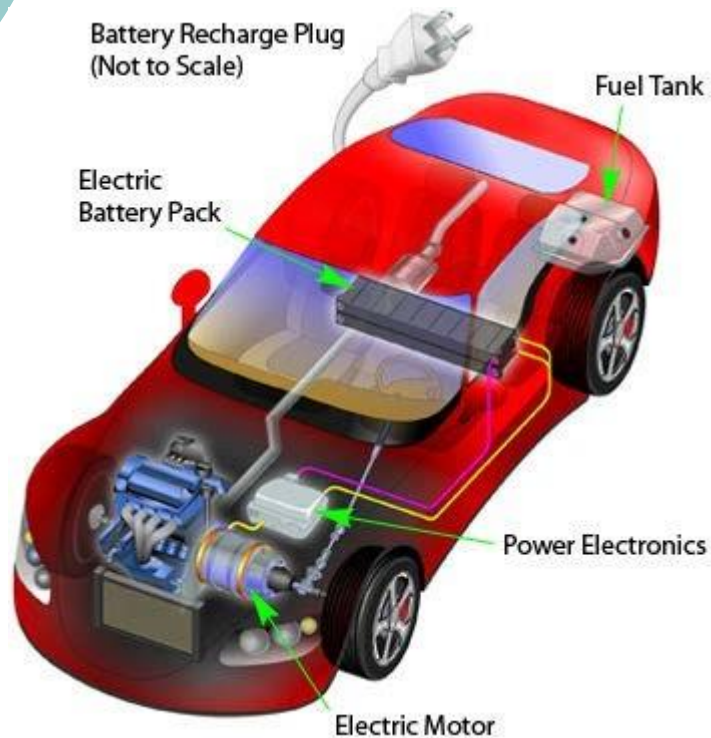
Full hybrid vehicles- modes of operation (1)



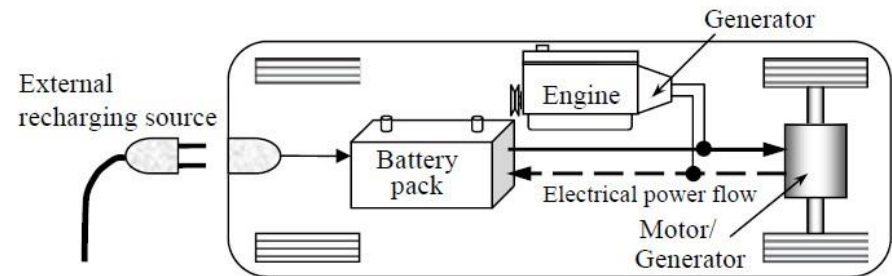
Full hybrid vehicles - modes of operation (2)



Plug-in electric hybrid



(a) Plug-in electric vehicle



(b) Electric vehicle with range extender and plug-in facility