

Recent developments in electric vehicles for passenger car transport

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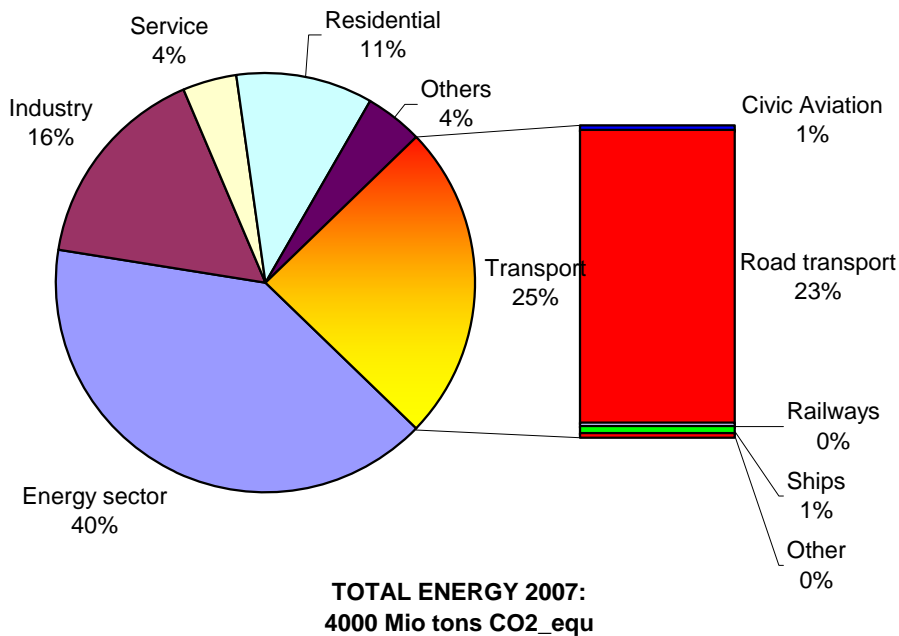
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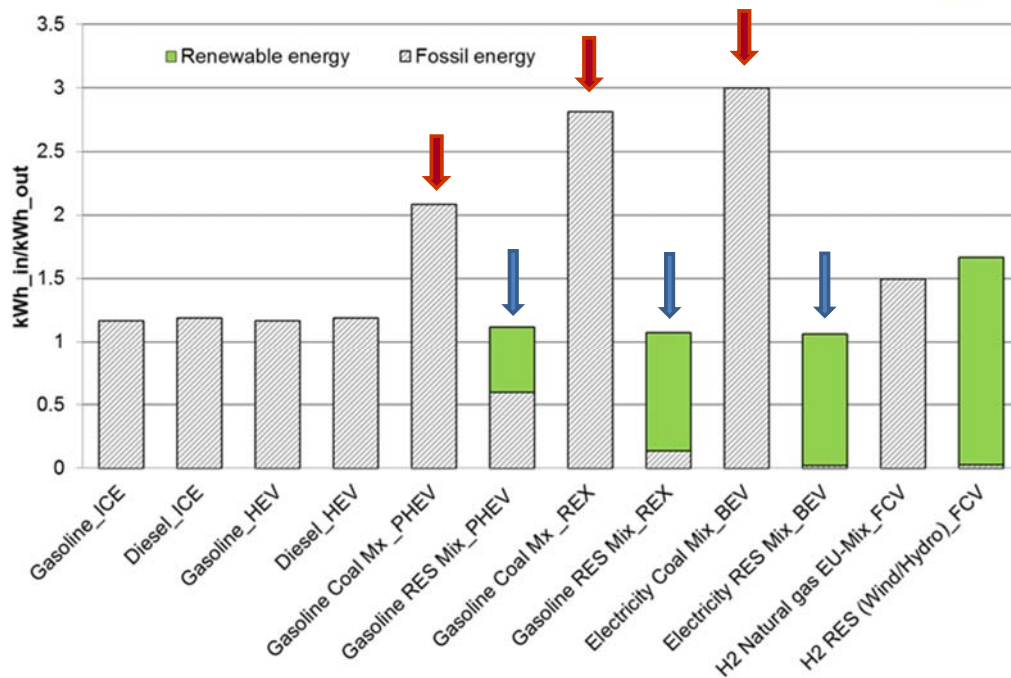
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Different types of electric vehicles:

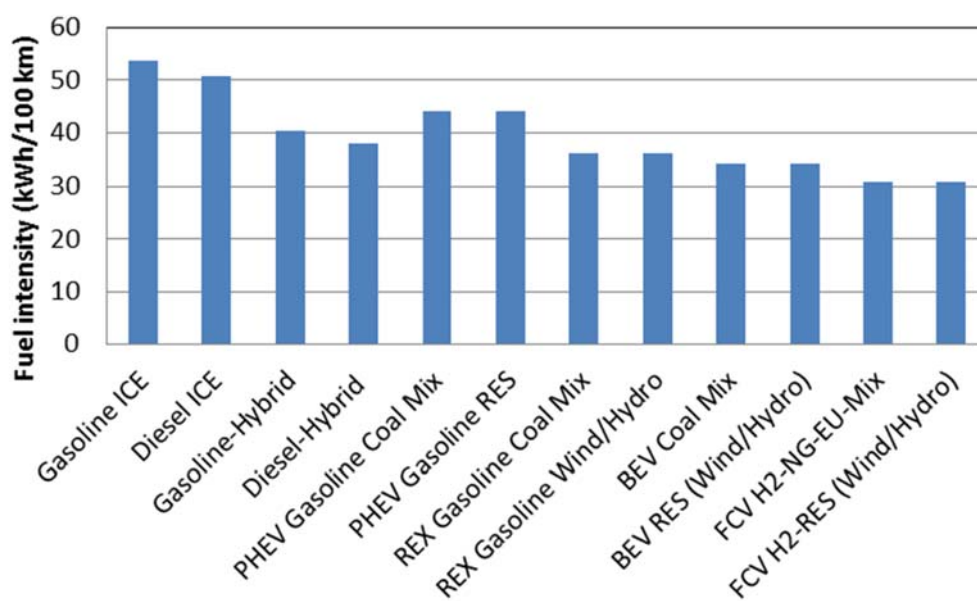
- **Full battery electric vehicles (BEV)**: these vehicles have only an electric engine
- **Hybrid electric vehicles (HEV)**: it is an ICE vehicles by an electric engine (battery is charged by regenerated energy during braking)
- **Plug-in-hybrid electric vehicles (PHEV)**: these vehicles have an ICE and an electric engine (battery can be charged externally)
- **Range extender vehicles (REX)**: these vehicles have a full size electric engine and a small ICE which can be used to charge battery. Battery can be also charged on the grid.
- **Fuel cell vehicles (FCV)**: these vehicles have a fuel cell and an electric engine. Battery is charged by energy from hydrogen.

2. Energetic performance



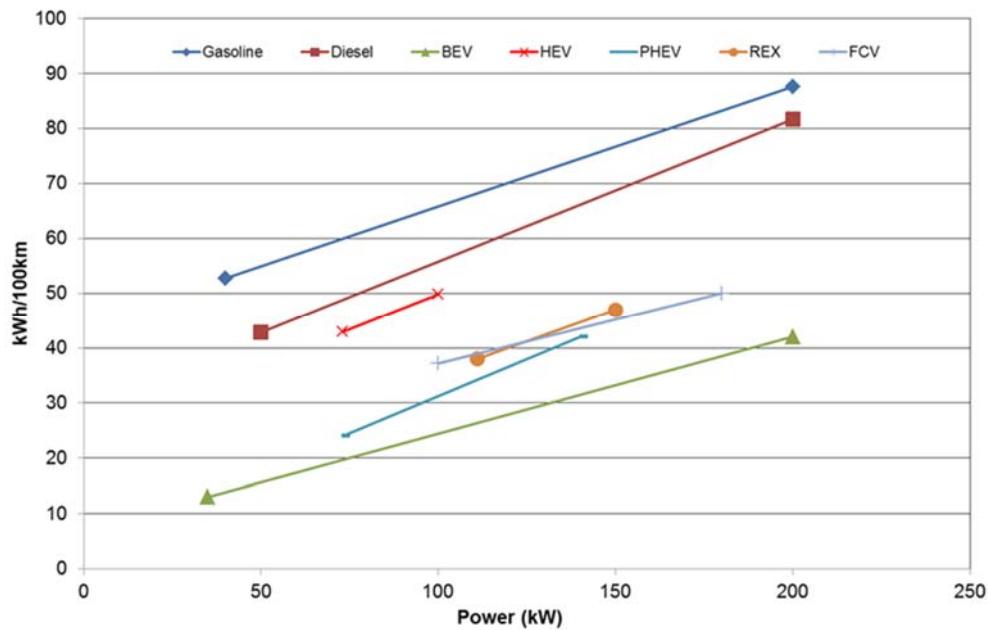
Energetic WTT-performance of various types of fuels for EVs in comparison to gasoline and diesel cars (2010)

2. Energetic performance



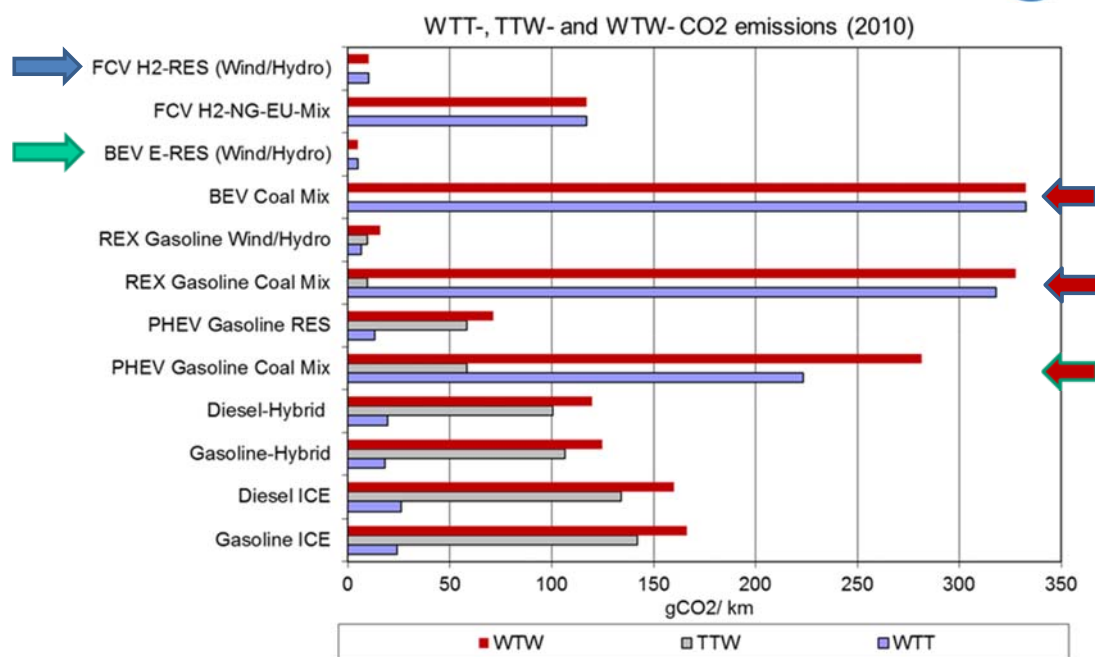
Fuel intensity per 100 km driven for various types of EV in comparison to gasoline and diesel cars (Power of car: 80 kW)

2. Energetic performance



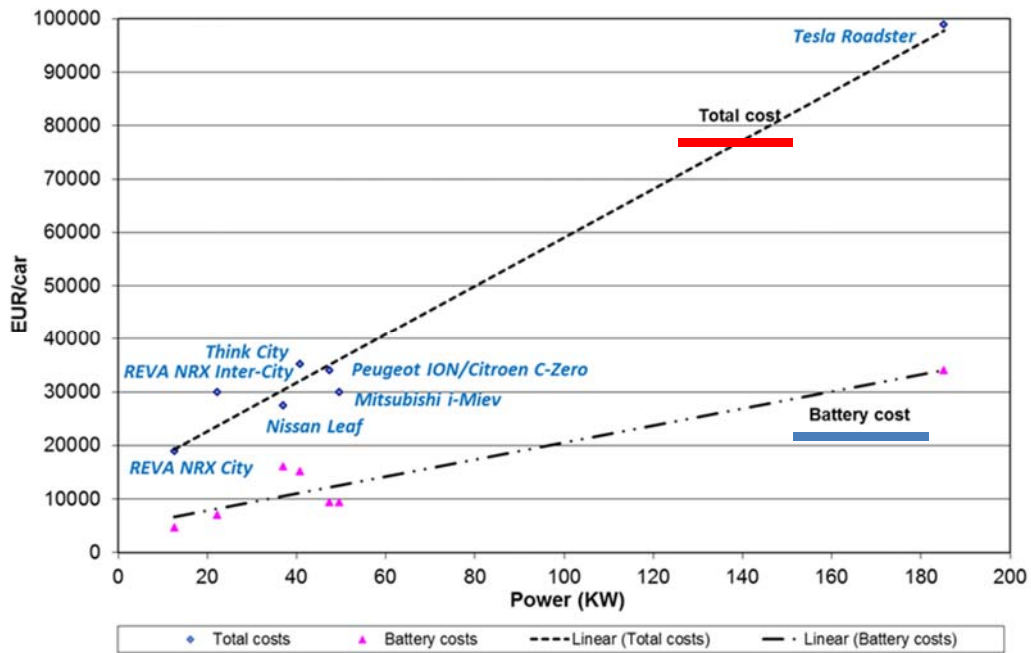
Energy use per 100 km for various types of EV in comparison to gasoline and diesel cars depending on power of car (2010 – 2012)

3. Ecological assessment



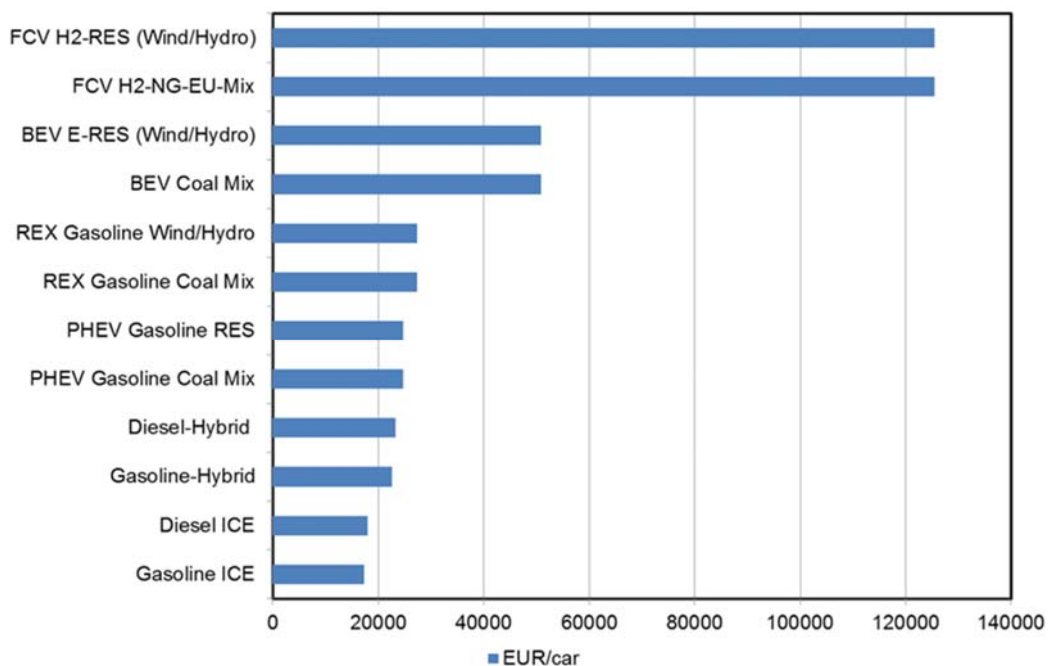
WTW-balance of CO₂-emissions per 100 km driven for various types of EV in comparison to gasoline and diesel cars (Power of car: 80 kW)

4. Economic assessment



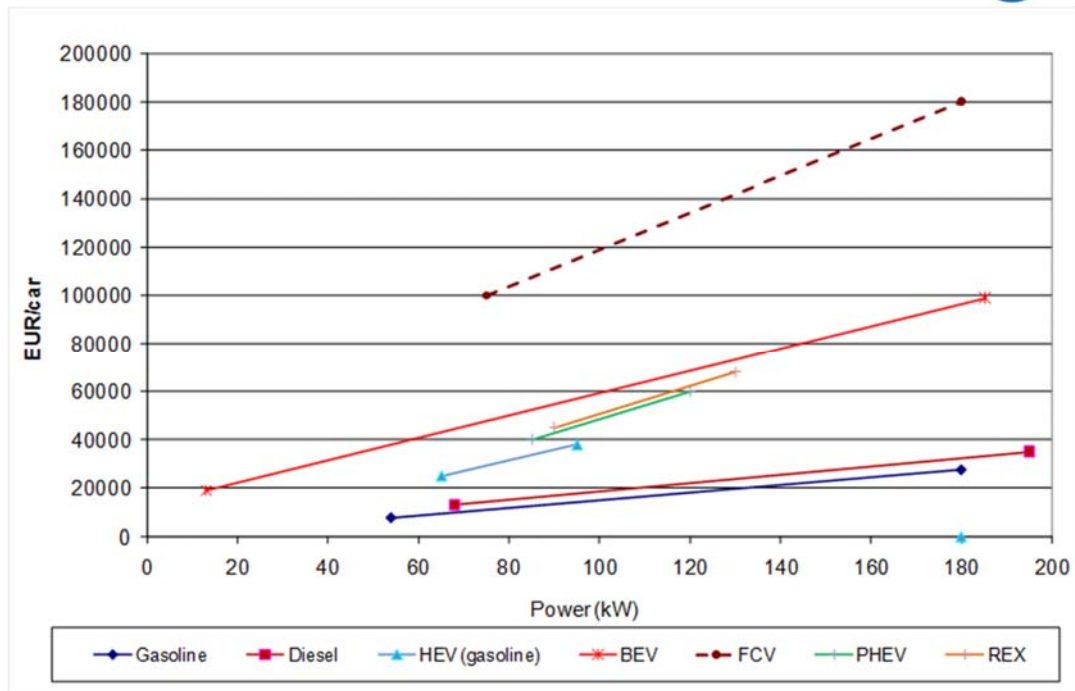
Total investment and battery costs of BEV depending on power of car in 2012

4. Economic assessment



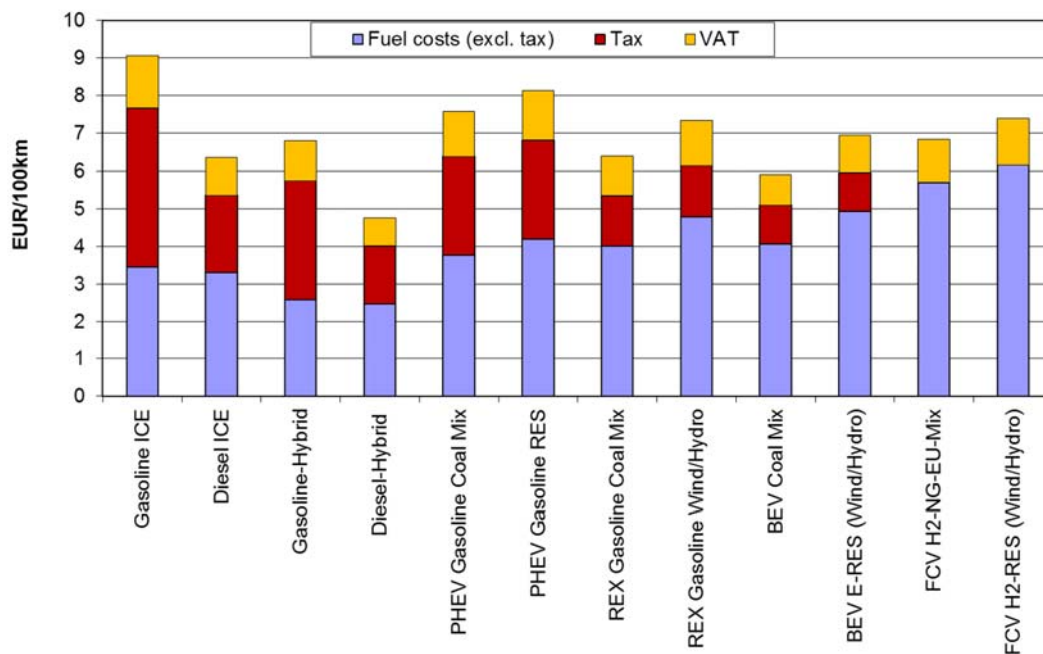
Investment costs of various types of fuels for EV in comparison to gasoline and diesel cars in 2012

4. Economic assessment



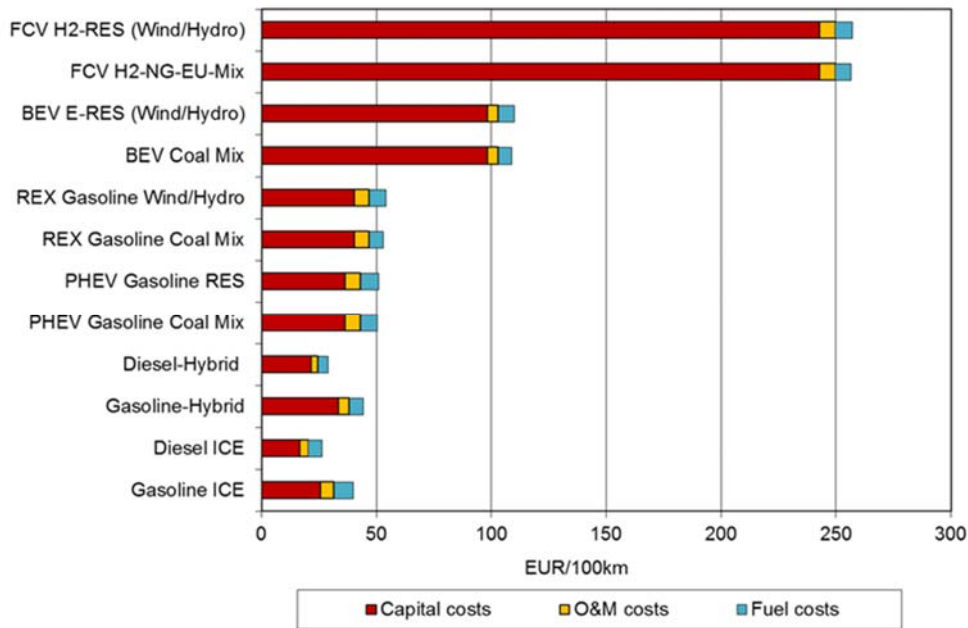
Investment costs of EV in comparison to gasoline and diesel cars depending on power of car

4. Economic assessment



Fuel costs of service mobility for various types of EV in comparison to gasoline and diesel cars (in 2010)

4. Economic assessment



Total costs of service mobility of various types of EV in comparison to gasoline and diesel cars

5. Conclusions

- The high investments cost are the major barrier for broad market breakthrough of BEV and FCV.
- For BEV also the limited driving range states a key obstacle.
- The analyzed hybrids could in principle serve as a bridging technology. However, due to their TTW emissions they cannot state a proper solution for urban areas.
- The most important perception is that also BEV and FCV are environmentally benign solution if the primary fuel source is renewable.



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