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OPTIMIZATION OF HYBRID ELECTRIC VEHICLE PERFORMANCE AND RANGE THROUGH BATTERY ENHANCEMENTS

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SITUATION

Due to rising fuel costs and increasing environmental awareness, there is currently an increasing trend to using hybrid electric cars instead of regular internal combustion engine (ICE) vehicles. Hybrid Electrical Vehicles (HEVs) are cost-efficient, sustainable, and fuel efficient. Widespread adoption of hybrid electric vehicles depends on whether they can match the performance and reliability of regular cars.

PROBLEMS

Hybrid electric vehicles have a number of drawbacks:

- The short life of the onboard batteries restricts the use of the electric motor.

Electric Range (BMW claims)	37 km
Electric range (consumer reports)	25-35 km

Figure 1: BMW i8 Range on Full Electric Motor [2]

- The maximum speed travelled by the car while running on the electric motor. For example the Kia Optima can reach a top speed of 64 km/h. [1]
- The excess weight of certain parts of the vehicle exert additional strain on the engines which wastes energy.

SOLUTIONS

- Early research shows that Nanowire batteries are significantly more efficient than regular lithium-ion batteries because they can store 10 times the energy stored in lithium-ion

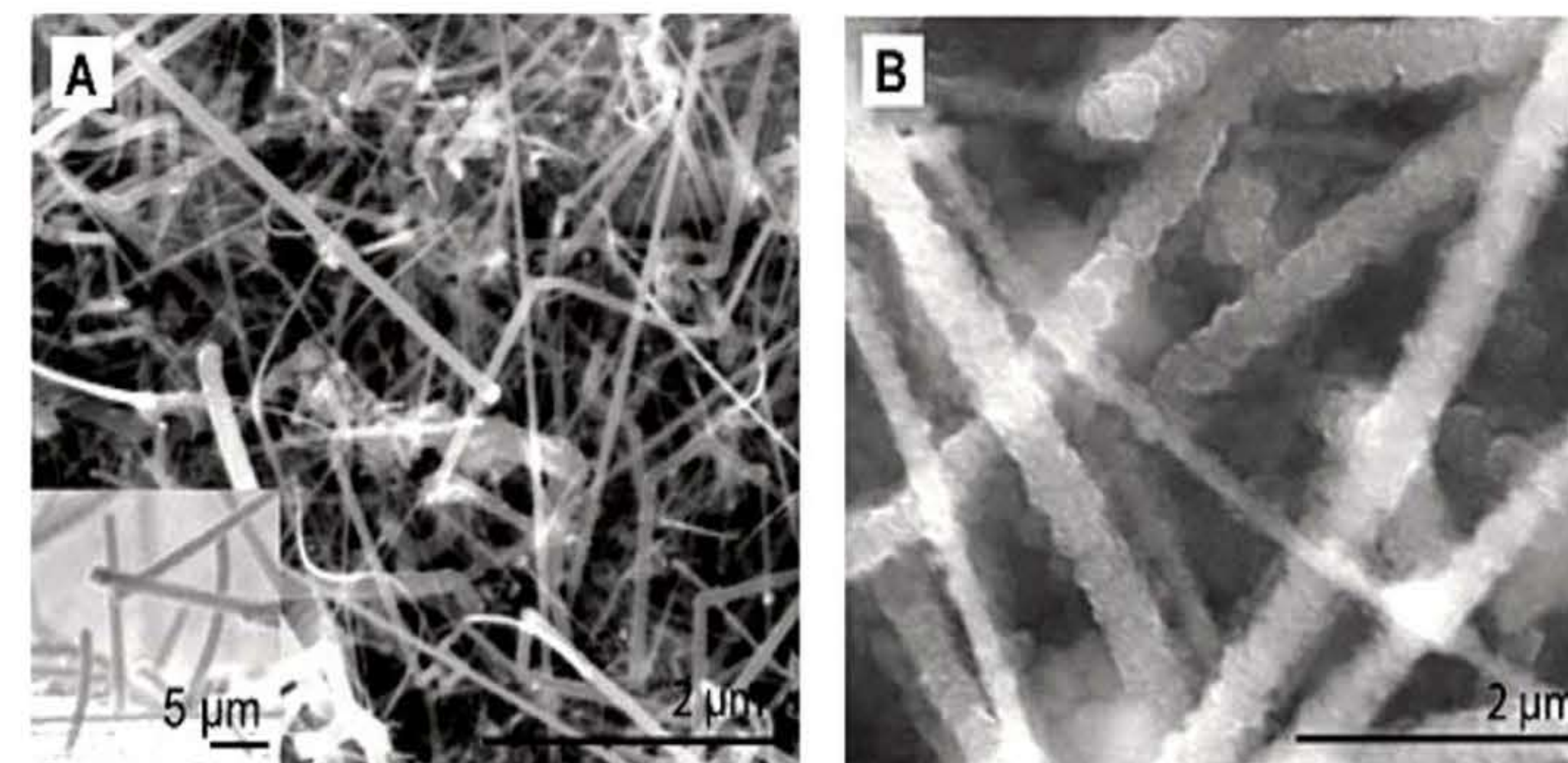


Figure 2: Nanowires before (A) and after fully charged (B). [4]

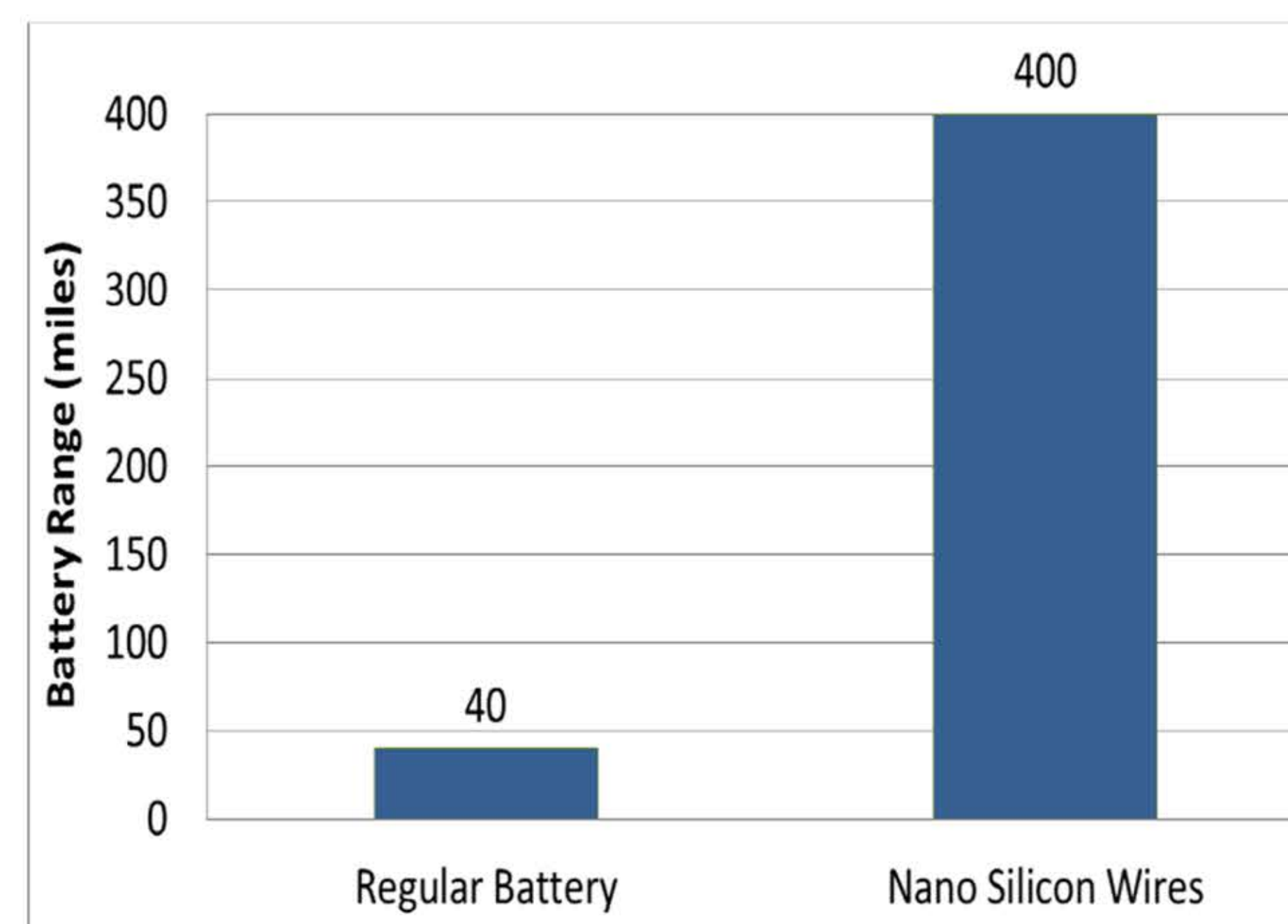


Figure 3: Battery life comparison chart

- Using a more powerful electric motor will enhance the maximum speed.
- Methods of recharging the batteries include improving the capturing of regenerative braking energy, as well as improving the capturing of lost energy from the rotational motion of the wheels.

EVALUATION

The overall evaluation for the effectiveness of the solutions presented was based on whether these changes, if implemented, would lead to a more competitive and environmentally friendly car.

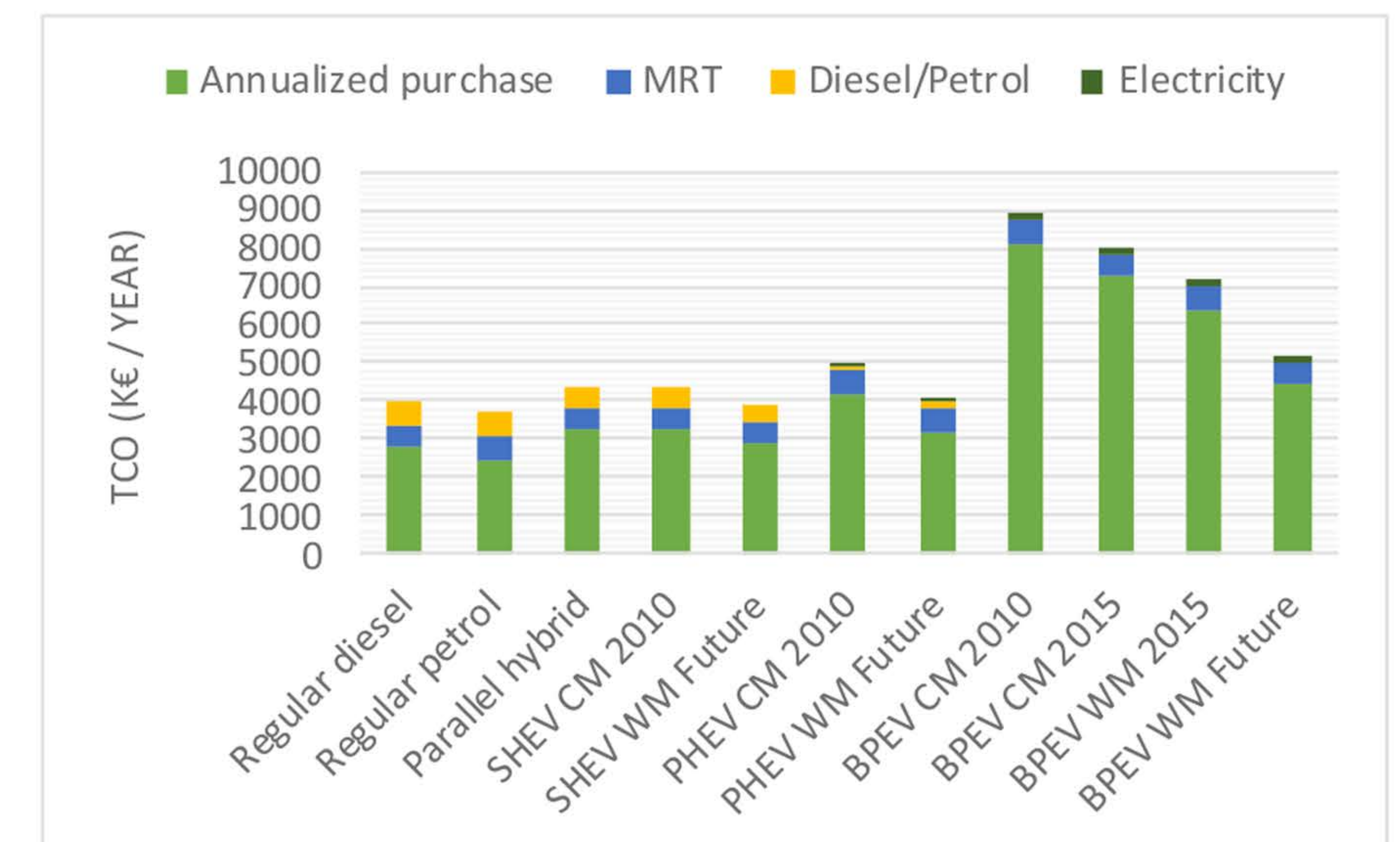


Figure 4: Chart illustrating total cost of ownership for different types of vehicles. [5]

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