

6 Electrification of the Transport Sector

Stabilising CO₂ requires deep cuts to be made in emissions from all sectors. The transport sector emits almost 20% of the world's CO₂ emissions¹ and presents a challenge for emission reduction efforts as the sector is predicted to still rely heavily on oil-based fuels in the coming decades. Decarbonisation of the electricity sector can generate significant emission cuts in transport through substituting fossil fuels with low-carbon electricity. Capturing and storing CO₂ from a single, large point source, such as a coal-fired power station, is much simpler than reducing CO₂ emissions from many 1000s of vehicles, enabling these emission reductions to be delivered more cost effectively.

Electrification of the transport sector would offer significant emissions reductions potential and the World Coal Institute (WCI) encourages countries to:

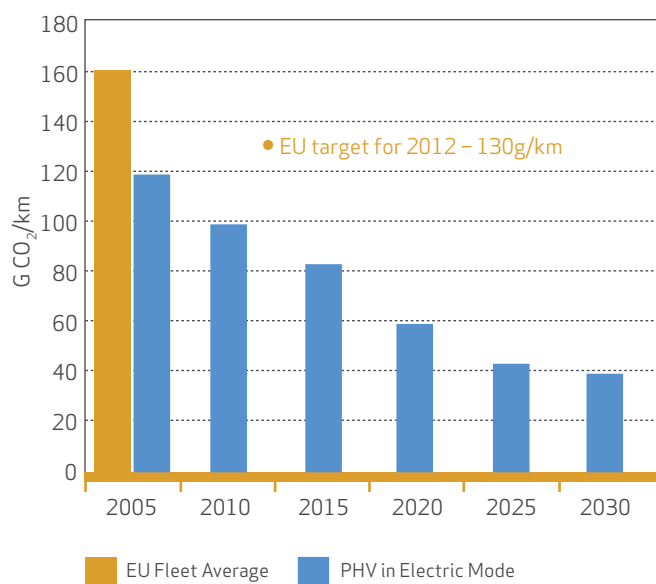
KEY POINTS

- >> Focus efforts on both supply-side power generation and demand-side transportation technologies
- >> Implement supply-side policies to decarbonise the power sector and scale up the installed capacity of low carbon electricity generation technologies
- >> Enhance research and development efforts to improve the performance and lower the costs of vehicle batteries
- >> Provide incentives that encourage the greater uptake of Electric Vehicles (EV) and Plug-in Hybrid Vehicles (PHV)

¹ World Resources Institute "Climate Analysis Indicators Tool (CAIT) Version 6.0" (2009)

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Figure 1. Comparison of CO₂ Emissions from a Conventional Petrol Car & Plug-in Hybrid Vehicles (predicted trend to 2030)



- >> Stabilising atmospheric concentrations of CO₂ requires deep emissions cuts across all sectors
- >> The transport sector emits almost 20% of the world's CO₂ emissions
- >> Substituting petroleum based vehicles with electric vehicles charged with low-carbon electricity can generate significant emission cuts in the transportation sector

Emissions from the transport sector are forecast to rise rapidly, particularly in developing countries; a concerted effort is required to reduce emissions from this sector

Transportation emissions are driven by two factors, the level of transport use and the carbon intensity of the transport system. Improvements to vehicle energy efficiency and the carbon intensity of vehicle fuels provide a strong emission reduction lever.

Switching from petroleum-based fuels to decarbonised electric power offers a viable opportunity to make dramatic emission reductions from light duty vehicles (private cars and small commercial vehicles)

In the long-term, EV powered by decarbonised electricity from the grid offers the potential for very low carbon transport emissions. The key barrier to the widespread use of EV is the availability of batteries with adequate capacity. Until such batteries become widely available at a reasonable cost, PHV offer the potential to make significant reductions in light duty vehicle emissions and act as a bridging technology to EV (Figure 1).

PHVs combine an efficient petroleum engine with a battery charged from the grid and significantly reduce the carbon intensity of vehicles

For relatively short journeys, such as in urban environments, PHV are powered solely by the battery. For longer journeys, over 30 – 100 km, the PHV reverts to a conventional petroleum engine.

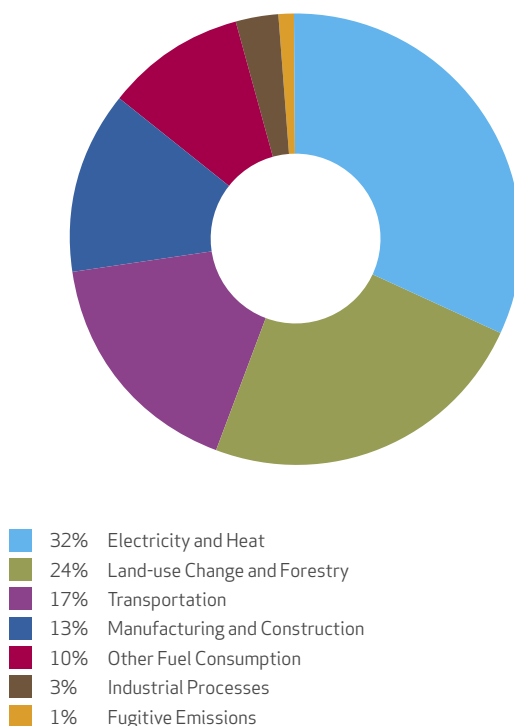
Decarbonisation of the transport sector through electrification requires a dual focus from governments on supply-side power generation and demand-side transportation technologies

Successful electrification and decarbonisation of the transport sector requires a power generation sector able to deliver the low carbon electricity necessary. In addition, a prerequisite to the widespread uptake of EV and PHV is the development of vehicles that meet consumer demands for performance, cost and reliability.

Electricity supply-side policies must focus efforts on decarbonising the power sector and scaling up the installed capacity of low carbon electricity generation technologies; coal-fired power plants fitted with CCS can deliver this decarbonised power at the scale needed

Countries must prioritise efforts to decarbonise electricity generation through the deployment of the full range of low carbon and energy efficient technologies including fossil-fuel based power plants fitted with CCS, renewables, and nuclear power. High penetration of electric and PHV vehicles could require an additional 2000GW of additional clean generating capacity² representing almost half of the currently installed generation capacity. Meeting this increased demand necessitates the installation of low carbon power technologies at a scale beyond that required just to meet the challenge of decarbonising the existing power sector. Global coal reserves are huge relative to other fossil fuels enabling coal-fired power plants fitted with CCS to be deployed at the scale necessary to deliver these emissions reductions to the transportation sector.

Figure 2. Global CO₂ Emissions by Sector (2000)



Source: World Resources Institute "Climate Analysis Indicators Tool (CAIT), version 3.0" (2006)

²IEA "Energy Technology Perspectives" (2008)

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Enhanced research and development efforts are needed to improve the performance and lower the costs of EV and PHV batteries

The limited performance and high costs of currently available batteries is constraining the development of electric and PHV vehicles. It is necessary to develop batteries capable of repeated charge – discharge cycles and with a capacity many times greater than current batteries to allow vehicles to travel an acceptable distance before recharging³. In addition to improving battery performance, significant cost reductions are needed in order that EV and PHV can compete with conventional petroleum vehicles.

Countries should implement policies to incentivise the greater uptake of EV and PHV

Policies that increase the uptake of EV and PHV will play an important role in driving technological change, improving performance, lowering costs and commercialising the technology. Countries should consider policies that: lower the cost of EV and PHV relative to conventional petroleum vehicles; encourage the greater use of EV and PHV by establishing low-emission zones; consider switching their government and municipal government vehicle fleets to EV and PHV; and encourage the development of vehicle recharging infrastructure.

³IEA “Energy Technology Perspectives” (2008)