



2. Outlook transport update

APERC Workshop

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Outline of this presentation

- Use preliminary projections of the USA and China for the 9th edition of the Energy Outlook.
- Observe sales shares assumptions and their relation to stock shares.
- Observe the comparative oil displacement by EVs between the USA and China.
- Identify drivers of changes in emissions in the USA and China in the passenger road transport sector using decomposition analysis.
- Utilise electricity generation emissions factors and lifecycle analysis to help understand how overall emissions are affected.



APERC's new transport model

- This presentation will be based on insights from the new transport model.
- The two 9th edition Outlook scenarios are:
 - The **Reference** scenario illustrates a pathway where existing policies are retained.
 - The **Target** scenario illustrates a pathway for each economy towards realizing energy and emission policy targets.
- We can share our results for your economy if you email us.
- Focusing on passenger-road, we will utilize the sales shares model which is based on government targets and expectations around consumer preferences and price.



USA – BEV vs ICE sales and stock shares:

- Reference (based on EIA Reference case):
 - BEV sales share slowly increases to 50% by ~2060
 - Stock share reaches 20% by ~2050, 30% by 2070.



- Target (Government's EV sales shares targets):
 - Sales share reaches 50% by ~2026, 100% by 2040
 - Stock share reaches 50% by ~2043, 100% by ~2060.





China – BEV vs ICE sales and stock shares:

- Reference:
 - BEV sales share reaches 50% by ~2027, 100% by 2040
 - Stock share reaches 50% by ~2039, 100% by ~2060.





- Sales share reaches 50% by ~2025, 100% by 2035
- Stock share reaches 50% by ~2037, 100% by ~2055.





Oil displacement from switching to EV's – USA vs China Reference case



Oil displacement for passenger in China in Reference (BEV)



- A higher rate of switching to EVs in China compared to the USA leads to higher oil displacement and efficiency.
- China is expecting a high amount of growth in passenger-km, so oil use could be much higher if not for the growth in the stock share of EVs.



Oil displacement from switching to EV's – USA vs China Target case



Oil displacement for passenger in China in Target (BEV)

Oil displacement for passenger in USA in Target (BEV)

- In 2050 in the Target case, there are similar amounts of oil and electricity use. This is partly because in this scenario the USA and China have similar levels of EV adoption.
- Although, due to assumptions about future population, passenger-km is lower for China in 2070, leading to a drop in expected oil displacement.



Drivers of changes in emissions - USA, 2050 (Mt CO2)

- In Target, the **Engine switching effect** causes a 387Mt decrease in emissions.
- Mixing of biofuels and other zero-emissions fuels causes a 61Mt decrease in the Reference scenario, seen by the emissions intensity effect.
- Effect of electricity emissions are relatively low in the USA.
- A movement to smaller vehicles and buses helps to induce a -117Mt drop from the Vehicle type effect in Target.







Drivers of changes in emissions - China, 2050 (Mt CO2)

- In Target and Reference, the Engine switching effect causes a large decrease in emissions.
- Switching to buses causes a 119Mt Vehicle Type effect decrease in both scenarios.
- Effect of electricity emissions is larger in Reference because the grid uses more coal.
- More driving in the Reference case results in a larger passenger-km effect, which is why the Engine switching effect is also larger.







Analysing USA's EV transition (Reference case):



- USA has, and is expecting a greener grid but larger cars, so the annual emissions from use are similar for EV's to China.
 On the other hand, annual emissions from use of ICE's are higher in the USA.
- Emissions from use of ICE's decrease between 2035 and 2050 as the mixing of biofuels increases from around 10% to 20%.
- Low EV uptake means that emissions from all cars in USA remains relatively high. Policies to improve the efficiency of new ICE's would have a significant effect in this case.



Analysing China's EV transition (Reference case):



- The **emissions from use** show how, if China has a near 80% stock share of passenger EVs by 2050, the emissions intensity of electricity generation almost becomes the largest cause of transport related emissions.
- The **emissions from production** shows how many emissions are also created from manufacturing, inputs and disposal. If this was included in the decomposition it would show nearly as large an effect as **electricity emissions**, and even more in 2035, when the most EVs are being purchased.
 - Please note that disposal emissions are assumed to take place at the time of purchase.



Conclusion

•We have created a transport model that allows us to project energy use and emissions based on numerous assumptions, related to expected policies and trends within the APEC region.

•The trajectories of the USA versus China's EV uptake are very different in the Reference case. This has a significant effect on comparative energy/emissions intensity changes, with the USA seeing much less improvement.

•The effect of electricity generation emissions is an important factor to consider in analysing the effects of switching to EVs, and by including it we can better compare the effect of EVs vs ICEs on emissions. This is also true for other emissions associated with the manufacturing, manufacturing inputs and disposal of cars.

•Significant amounts of emissions intensity improvement can come from improving the emissions intensity of generation at the same time as electrifying transport, especially in China.

•Emissions from manufacturing, inputs and disposal of EVs and ICEs can be incorporated into modelling to provide more information about the effect of the transition to EVs on emissions.



References

- <u>Volvo study</u> (https://www.volvocars.com/images/v/-/media/marketassets/intl/applications/dotcom/pdf/c40/volvo-c40-recharge-lca-report.pdf)
- <u>IEA study</u> (https://www.iea.org/data-and-statistics/charts/comparative-life-cycle-greenhouse-gasemissions-of-a-mid-size-bev-and-ice-vehicle)
- <u>8th edition outlook</u> (https://aperc.or.jp/reports/outlook.php)
- <u>My preliminary projections for China and USA.</u> Note that these are still to be reviewed by their respective economies and therefore should be treated as extra-preliminary
 - They show our assumptions about mileage, efficiency, average age and more.
 - https://drive.google.com/drive/folders/1tS4XdxVhfR9Rqz_AGkabrxRa4i-0eiUx







Thank you.

https://aperc.or.jp

