

EU-Commission

JRC Contribution to EVE IWG:

*In-vehicle battery durability HDVs V2X
and PTO virtual mileage updates*

61th meeting of the GRPE Informal Working Group
Electric Vehicles and the Environment (EVE)

*Elena Paffumi, Gian-Luca Patrone
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Presentation Summary

Follow-up of the JRC activities in support to EVE IWG “in-vehicle battery durability” topic

- Additional inputs on e-HDVs V2X and PTO virtual mileage concept

e-HDVs V2X and PTO virtual mileage concept

- GTR 22: V2X,...

$$Virtual\ km = \left(\frac{\text{total discharge energy during V2X [Wh]} }{\text{worst case certified energy consumption of PART B family [Wh/km]} } \right)$$

The total distance used for confirming the compliance with the minimum performance requirements will consist of the sum of the distance driven and the virtual distance. The total percentage of the virtual distance shall be recorded and monitored.

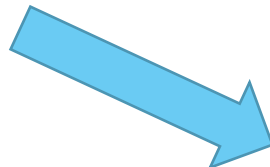


Table 1
Battery Energy based (SOCE) MPR

<i>Vehicle age/km for categories 1-1 and 1-2 in the scope of this GTR</i>	<i>OVC-HEV</i>	<i>PEV</i>
From start of life to 5 years or 100,000 km, whichever comes first	80 per cent	80 per cent
Vehicles more than 5 years or 100,000 km, and up to whichever comes first of 8 years or 160,000 km	70 per cent	70 per cent

e-HDV's V2X and PTO virtual mileage concept

- GTR 22: V2X,...

$$\textit{Virtual km} = \left(\frac{\text{total discharge energy during V2X [Wh]}}{\text{worst case certified energy consumption of PART B family [Wh/km]}} \right)$$

The total distance used for confirming the compliance with the minimum performance requirements will consist of the sum of the distance driven and the virtual distance. The total percentage of the virtual distance shall be recorded and monitored.

- e-HDV's GTR: V2X, PTO, ...



$$\textit{Virtual km}(V2X + PTO + \dots) = \textit{Odometer km} \times \left(\frac{\text{total discharge energy during V2X + PTO + ... [Wh]}}{\text{total discharge energy while driving [Wh]}} \right)$$

Total distance km = Odometer km + virtual km


- Requires two counters: Total discharge energy while driving or total discharge energy during V2X+ PTO+..., etc.
- Counts all energy usage i.e., while parked and extreme use cases
- ***As per GTR 22 the total distance used for confirming the compliance with the minimum performance requirements will consist of the sum of the distance driven and the virtual distance. The total percentage of the virtual distance shall be recorded and monitored.***

e-HDVs V2X and PTO virtual mileage concept

- e-HDVs GTR: V2X, PTO, ...

$$\text{Virtual km}(V2X + \text{PTO} + \dots) = \text{Odometer km} \times \left(\frac{\text{total discharge energy during V2X} + \text{PTO} + \dots \text{ [Wh]}}{\text{total discharge energy while driving [Wh]}} \right)$$

Total distance km = **a***Odometer km + **b*** virtual km

-  With **a**, **b** weighting factors ?
- Requires two counters: Total discharge energy while driving or total discharge energy during V2X+ PTO+..., etc.
- Counts all energy usage i.e., while parked and extreme use cases
- ***As per GTR 22 the total distance used for confirming the compliance with the minimum performance requirements will consist of the sum of the distance driven and the virtual distance. The total percentage of the virtual distance shall be recorded and monitored.***

e-HDV V2X and PTO virtual mileage concept



Guastalegname
https://www.politesi.polimi.it/bitstream/10589/79998/3/2013_04_Guastalegname.pdf

	Nominal power	Operational time
crane	24.3 kW	9 h
concrete mixer	68 kW (PTO)	4 h
truck mounted pump	85 kW (PTO)	4 h

Garbage press truck. For the tested loaders the average power for the PTO during PTO operation was about 4-10% of the maximum engine power.

<https://repository.tno.nl/islandora/object/uuid%3Ac42fc43d-ca1f-45b5-bd12-2257ae7601ef>



<https://rmi.org/insight/electrify-trucking/>

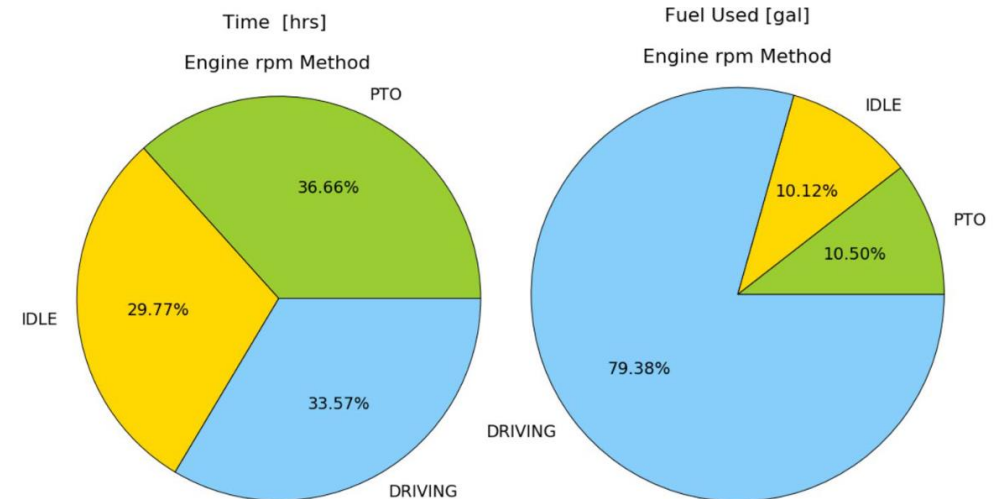


Figure 5. Percent of time [left] and fuel [right] spent in each operating mode

NREL https://afdc.energy.gov/files/u/publication/pto_idle_behavior_utility_vehicles.pdf

e-HDVs V2X and PTO virtual mileage concept

Open points

- Availability of the selected quantities on the vehicle
- Varieties of V2X, PTO, ... usage. Is it possible and practical for the vehicle ECU to recognise and quantify all forms of V2X, PTO,...usage? one counter for all of them or separated ones to be summed up?
- How specific must the text of the GTR be?
- Accuracy of counters during the Part A test, accuracy of the counters during lifetime of the vehicle
- V2X, PTO, ... counters verification

Thank you

Contacts Info:

EC DG JRC DIR-C EMC Sustainable, Smart and Safe Mobility Unit
elena.paffumi@ec.europa.eu, gian-luca.patrone@ec.europa.eu



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