Real Drive Emissions

Status Update from India

Indian Delegation
9th /10th July 2019
6th RDE IWG Meeting
Venue: BMVIT Offices ,Vienna Austria

Global RDE: GTR Harmonization with regional requirement

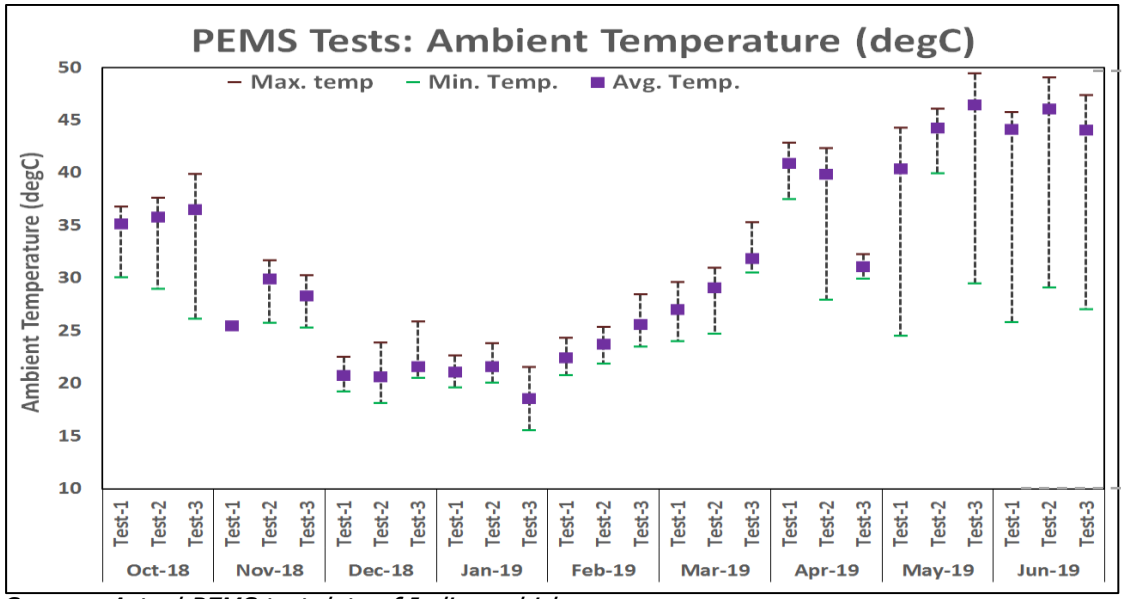
Indian regional requirements are different from other CPs based on following

- Environment Boundary Conditions
- Trip dynamics.
- Trip Share requirements based on Types of vehicle
- Lab test Cycle (for Correlation test and CO2)

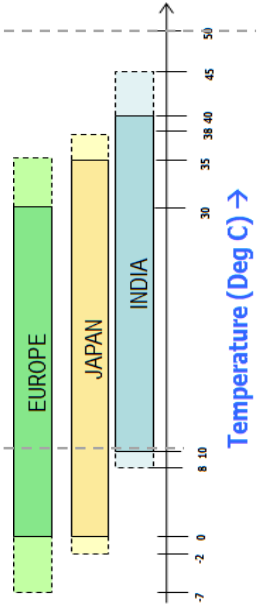
India support inclusion of Regional requirement for RDE-GTR implementation

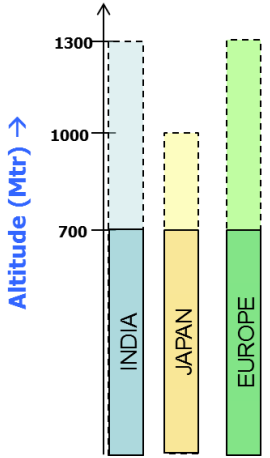
Environment Boundary Conditions

Environment Boundary Conditions		
1	Temperature	Moderate: 10 ≤ T ≤ 40, Extended:40 < T ≤ 45 ; 8 ≤ T < 10
2	Altitude	Moderate: A ≤ 700 m , Extended: 700 < A ≤ 1300 m



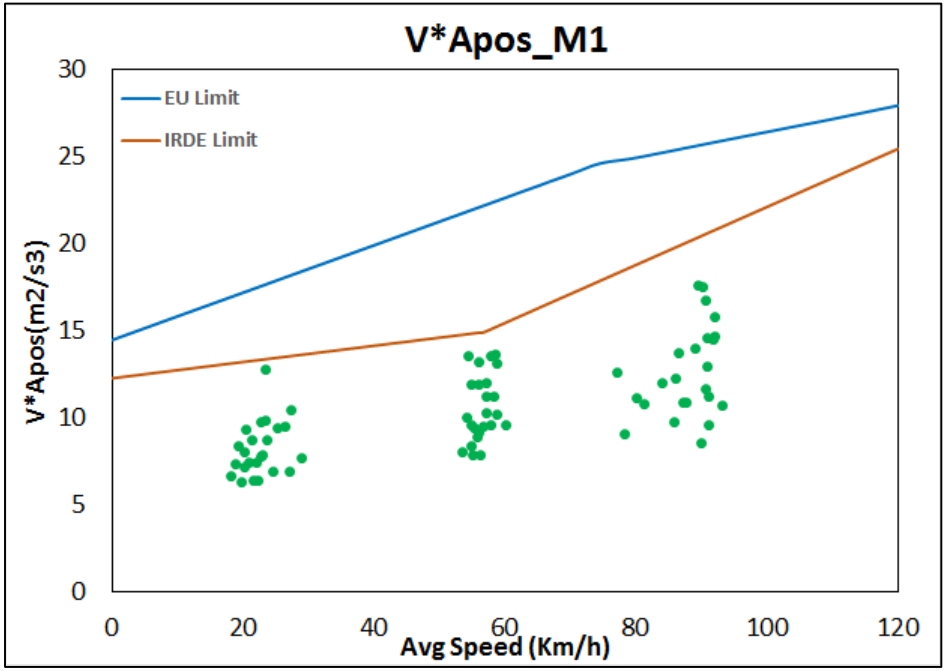
Source : Actual PEMS test data of Indian vehicles

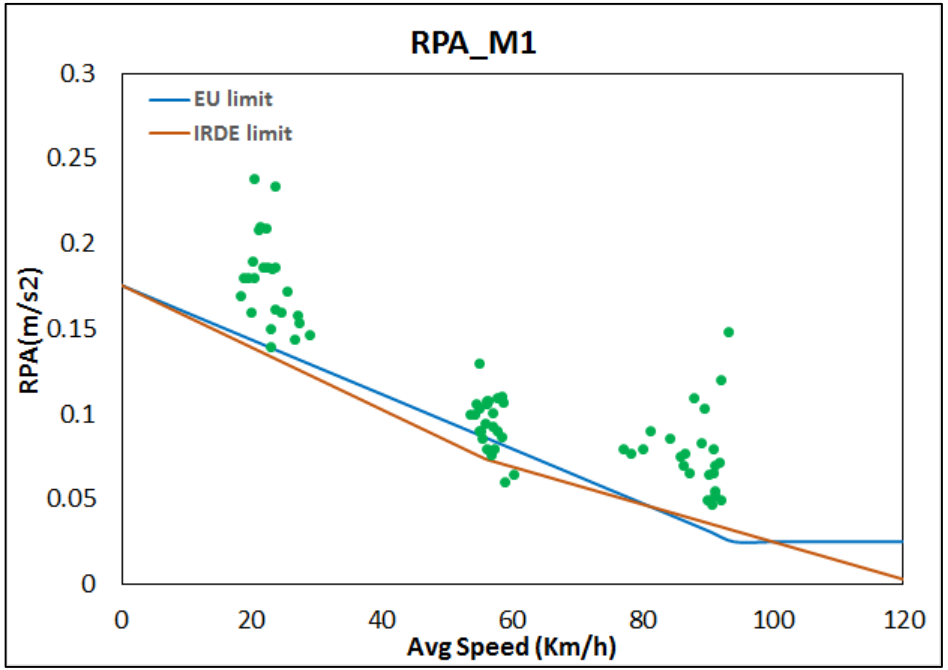




Environment Temperature requirement are way different for India

Trip Dynamics – M1 Category Vehicles



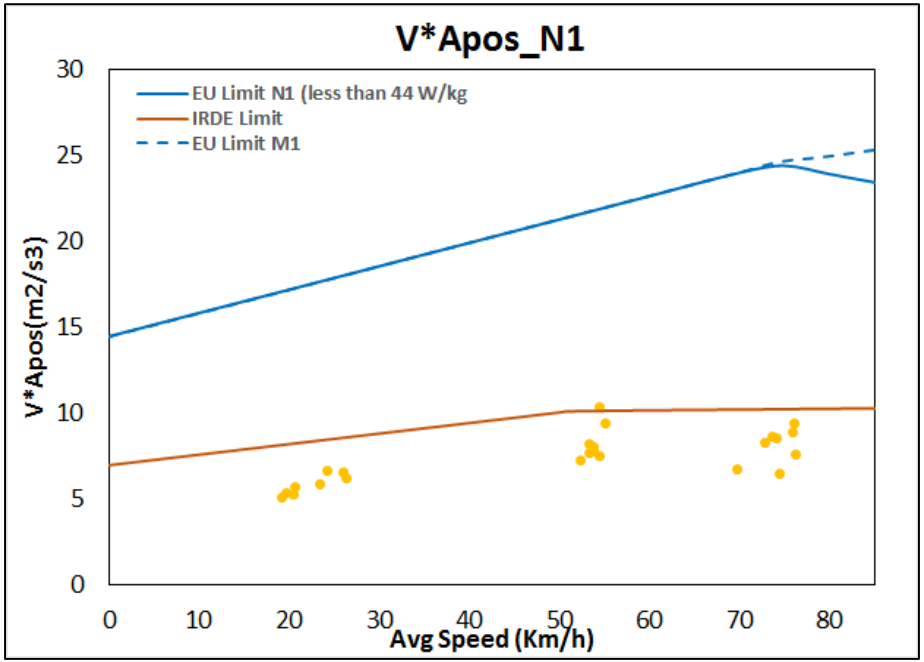


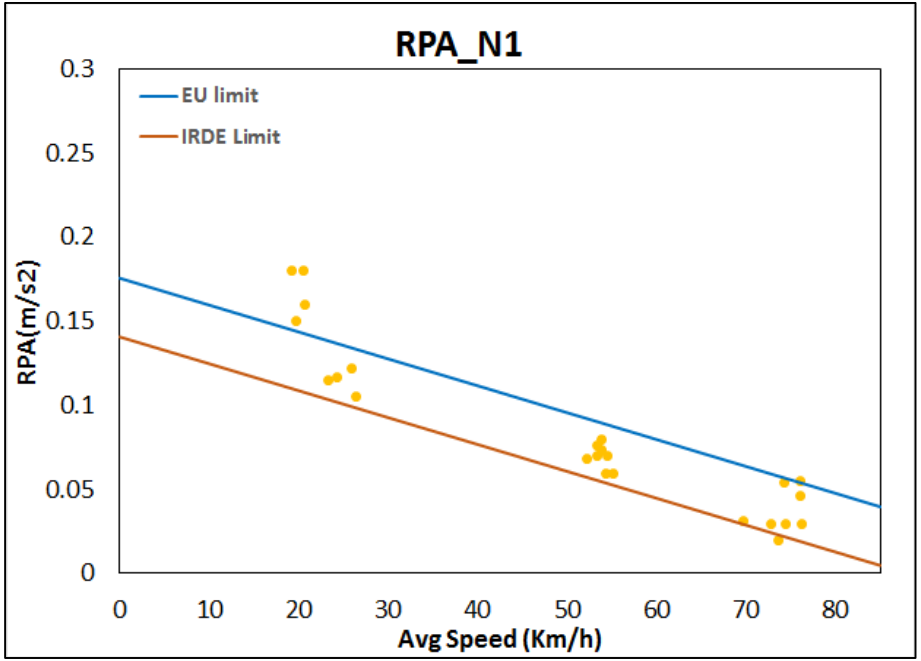
Source : Actual PEMS test data of Indian vehicles

IRDE → India RDE Procedure

Regional requirements of Trip Dynamics are different for India

Trip Dynamics – N1 Category Vehicles (Restricted to 80 km/h)



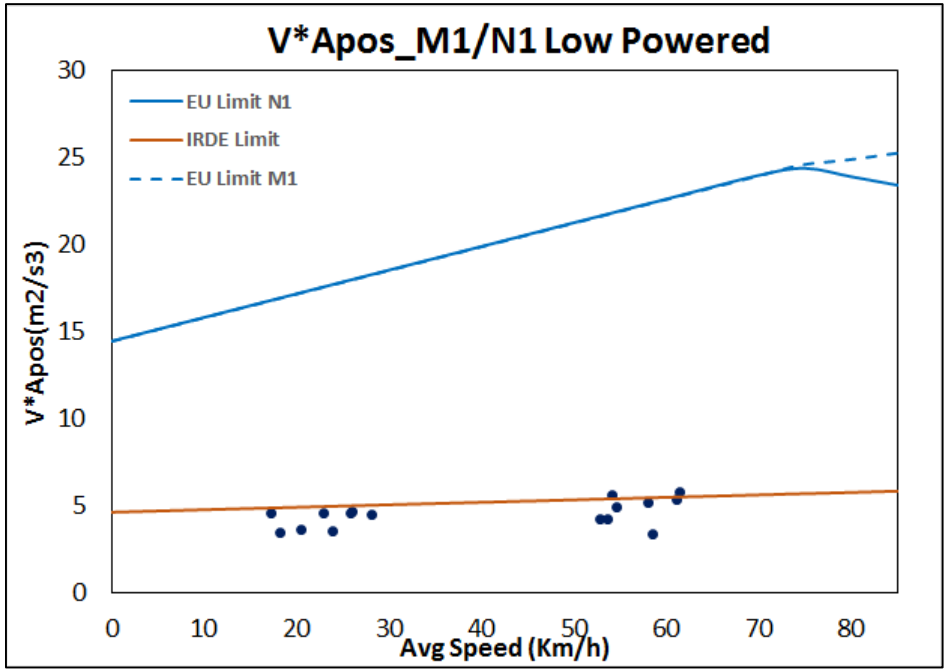


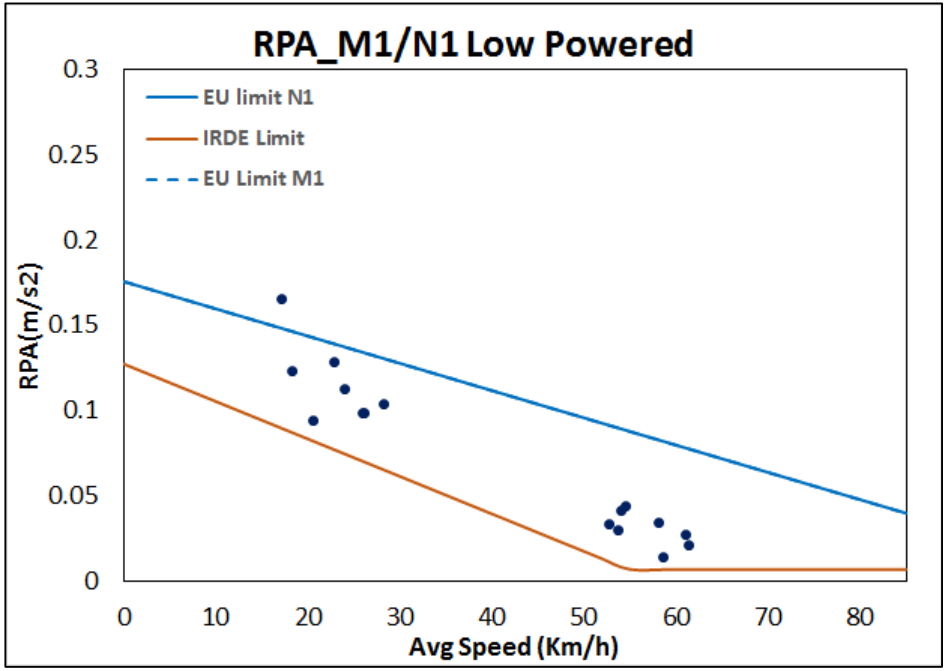
Source : Actual PEMS test data of Indian vehicles

IRDE → India RDE Procedure

Regional requirements of Trip Dynamics are different for India

Trip Dynamics – M1/N1 Low Powered Vehicles (Restricted to 70 km/h)





Source : Actual PEMS test data of Indian vehicles

IRDE → India RDE Procedure

Regional requirements of Trip Dynamics are different for India

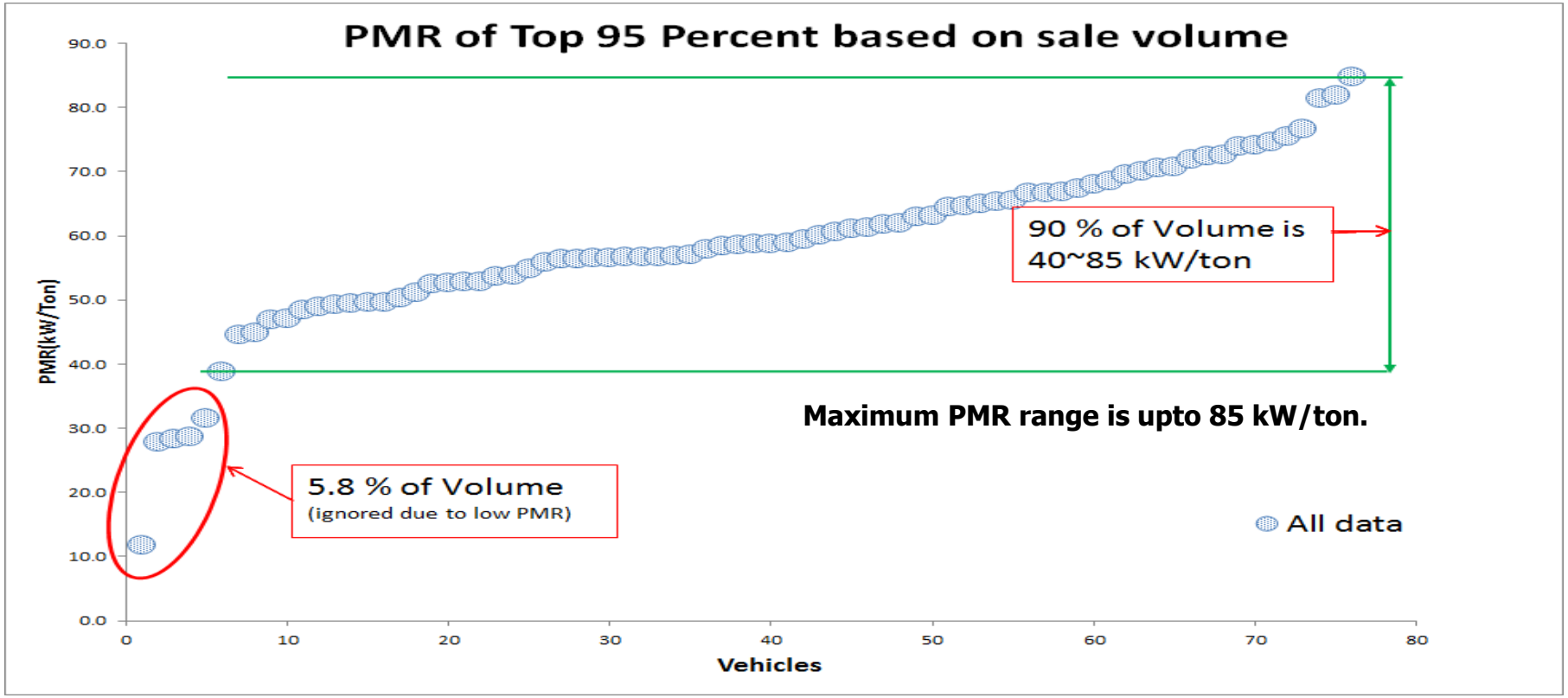
Trip Share requirements based on Types of vehicle

#	Items	M Category	N1 Category (Restricted to 80 km/h)	M1 & N1 (Low Power) (PMR < 22kw/ Ton) (Restricted to 70 km/h)
1	Speed Ranges	Phase1: V < 45 km/h Phase2:45 ≤ V <65 km/h Phase3: V ≥65 km/h V>75km/h for min 5 min	Phase1: V < 40 km/h Phase2:40 ≤V <60km/h Phase3: V ≥ 60 km/h V>70km/h for min 5 min	Phase1: V < 45 km/h Phase2: V ≥ 45 km/h V>55km/h for min 5 min
2	Trip distance share	Phase 1: 34 % (±10%) Phase 2: 33 % (±10%) Phase 3: 33 % (±10%) (Same for M1 / N1)		Phase 1: 50 % (±10%) Phase 2: 50 % (±10%)
3	Maximum vehicle velocity	• For M1: Wherever **legal max speed limit permits**, the vehicle velocity **can exceed 100 km/h** for not more than **3 % of the time duration of the Phase 3 driving** • **For N1: Restricted to 80km/h** • **For LP M1/N1: Restricted to 70 km/h**		

- Indian Normal powered vehicles are typically lowered powered as compare to global benchmark.
- India also have concerns of even Low Powered Vehicles (single / two cylinder engine), How to address these vehicles for GTR harmonization

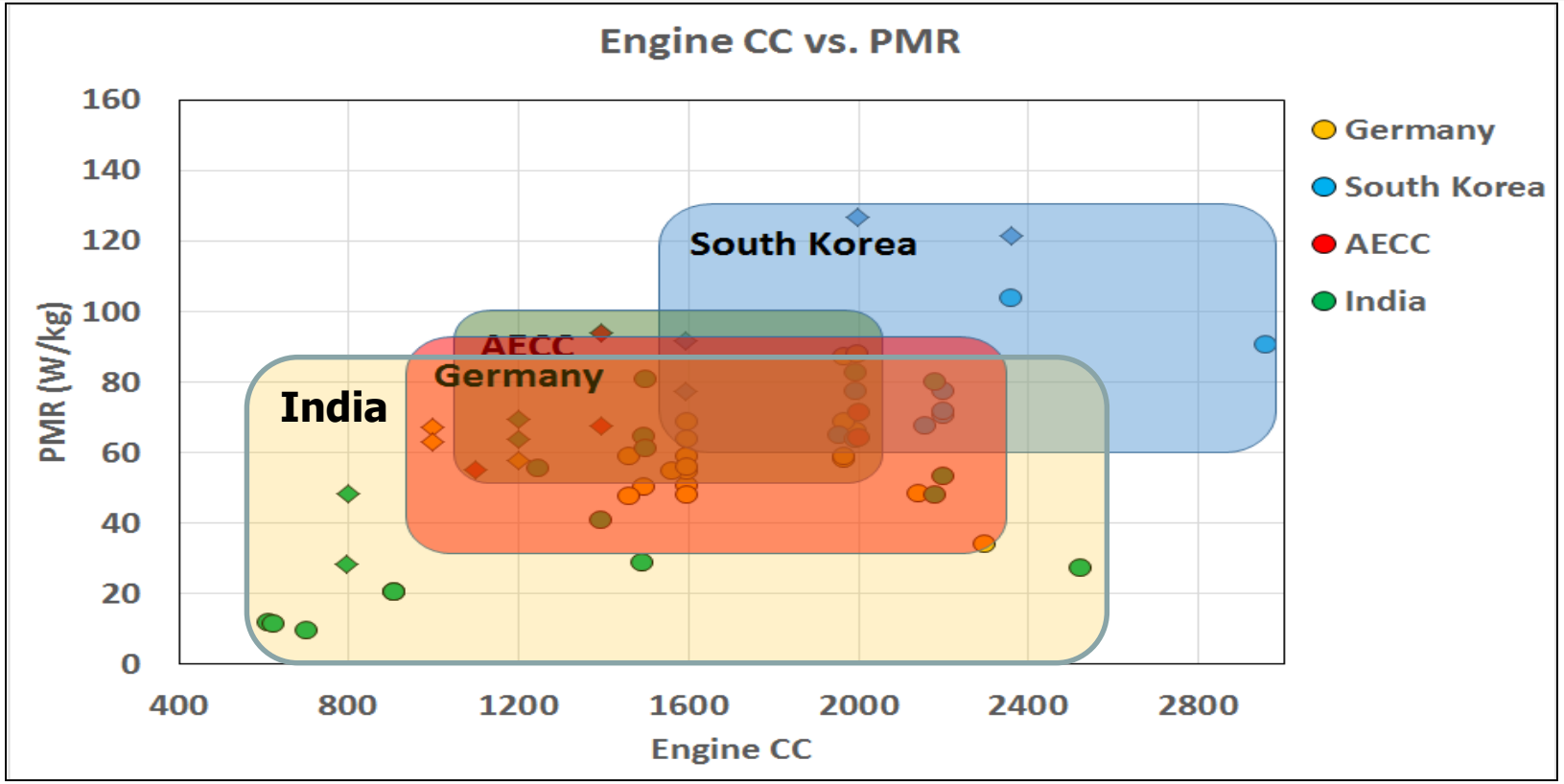
India support inclusion of trip share based on vehicle category for RDE-GTR implementation

Indian Vehicle PMR Range



Majority volume of vehicles sold in India are typically lowered powered as compare to global benchmark

Indian Vehicles compared with other CPs

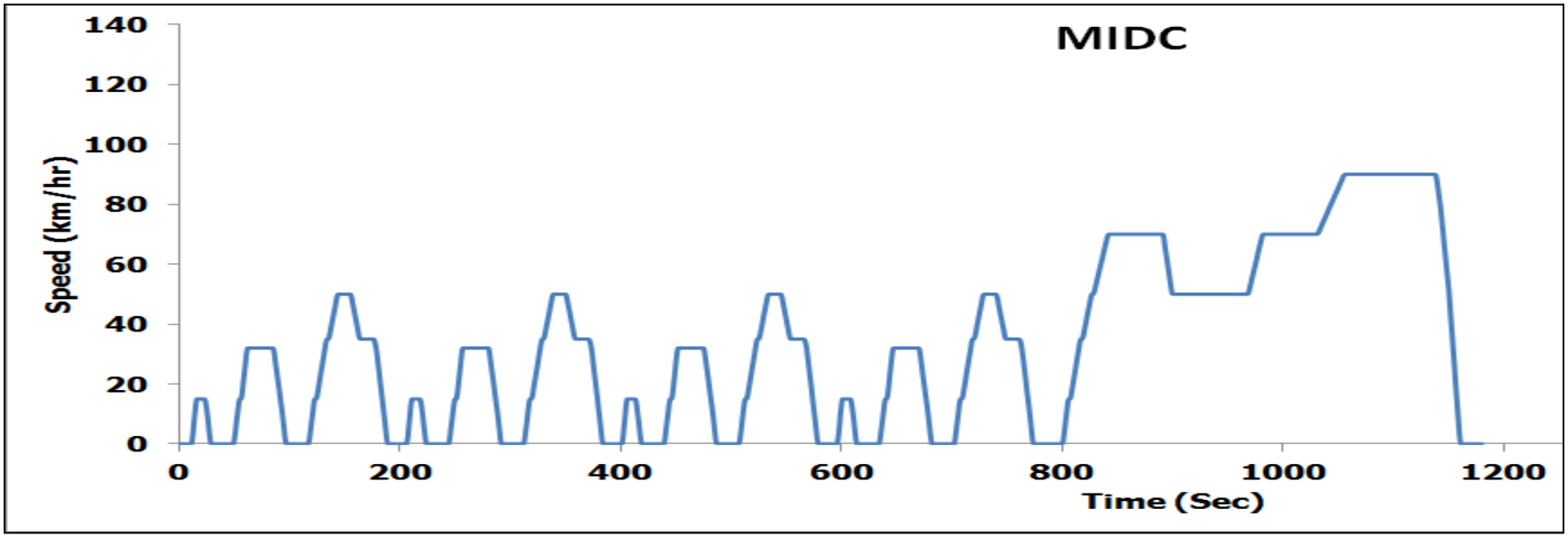


Source : JRC Server for South Korea, ACEE & Germany data

Indian vehicles in India are typically covers lower engine volume (cc) and PMR range as compare to other CPs

Lab test Cycle (for Correlation test and CO2)

Certification lab cycle (India) : MIDC



- **Regional requirements of Test Cycle are different for India.**
- **Effect of different cycle on post processing method needs further analysis.**

Indian RDE Regulation Post processing method (customized based on EU RDE Package 3)

Sr. No	Points	M Category	N1 Category (Restricted to 80 km/h)	M1 & N1 (Low Power) (PMR < 22kw/ Ton) (Restricted to 70 km/h)
Post Processing				
1	Reference Cycle	MIDC (Cold Start) as per Emission Type Approval Procedure		
2.	CO2 Multiplication Factor	1.1,1.1	1.05,1.05	1.05,1.05
3	Moving Avg. Window Speed Bins	35,55	35,55	35
4	CO2 Weightage for MAW Window	100 % CO_2 (Grams) of MIDC Cycle		
5	Normality / Completeness	Normality – 50% Completeness – 10%		

PEMS Manufacturers (Horiba , AVL) have developed Indian RDE Software (IRDE) including customized Post processing method

Development & Certification PEMS test are being done & post processed with latest Indian RDE (IRDE) Software

Summary & Future Action

Summary

Indian Submission is to keep following Regional requirement as defined by respective CPs for GTR harmonization.

- Environment Boundary Conditions
- Trip dynamics.
- Trip Share requirements based on Types of vehicle
- Lab test Cycle (MIDC for Correlation test and CO2)

Future Action

- Submission of the research data to IWG-RDE for GTR development within July 2019
- PEMS Uncertainty & Conformity Factor Evaluation.
- Effect of different lab cycle (MIDC) on post processing method.
- Study & evaluate EU RDE package 4 requirements.
- Whenever WLTP is adopted as certification cycle for India, WLTP may be adapted for Indian RDE regulation

Thank You