

# ***BS-VI Challenges and Preparedness***

Dr. S.S. Thipse  
Senior Deputy Director, ARAI

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## Vision Statement

*Sustainable, safe, affordable, smart and integrated mobility system for the people of India.*

**Automotive Mission Plan 2026 (AMP 2026)**

**Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (Fame II India Scheme)**

**Make in India**

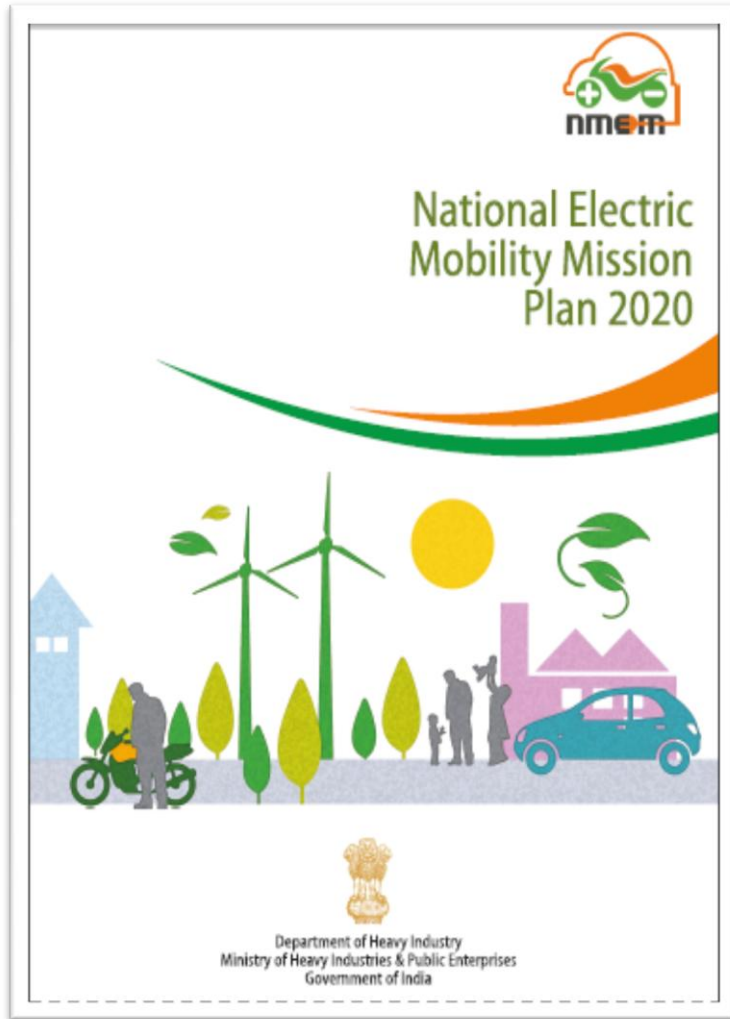
**Infrastructure Development**

**Skill Development**

**Alternative Fuels (CNG, LPG, Ethanol, Methanol, Hydrogen)**

**Smart Cities Mission**

**Rollout of GST**



## Faster Adoption and Manufacturing of Electric (& Hybrid) Vehicles in India

### FAME-India Scheme

The scheme has 4 focus areas:

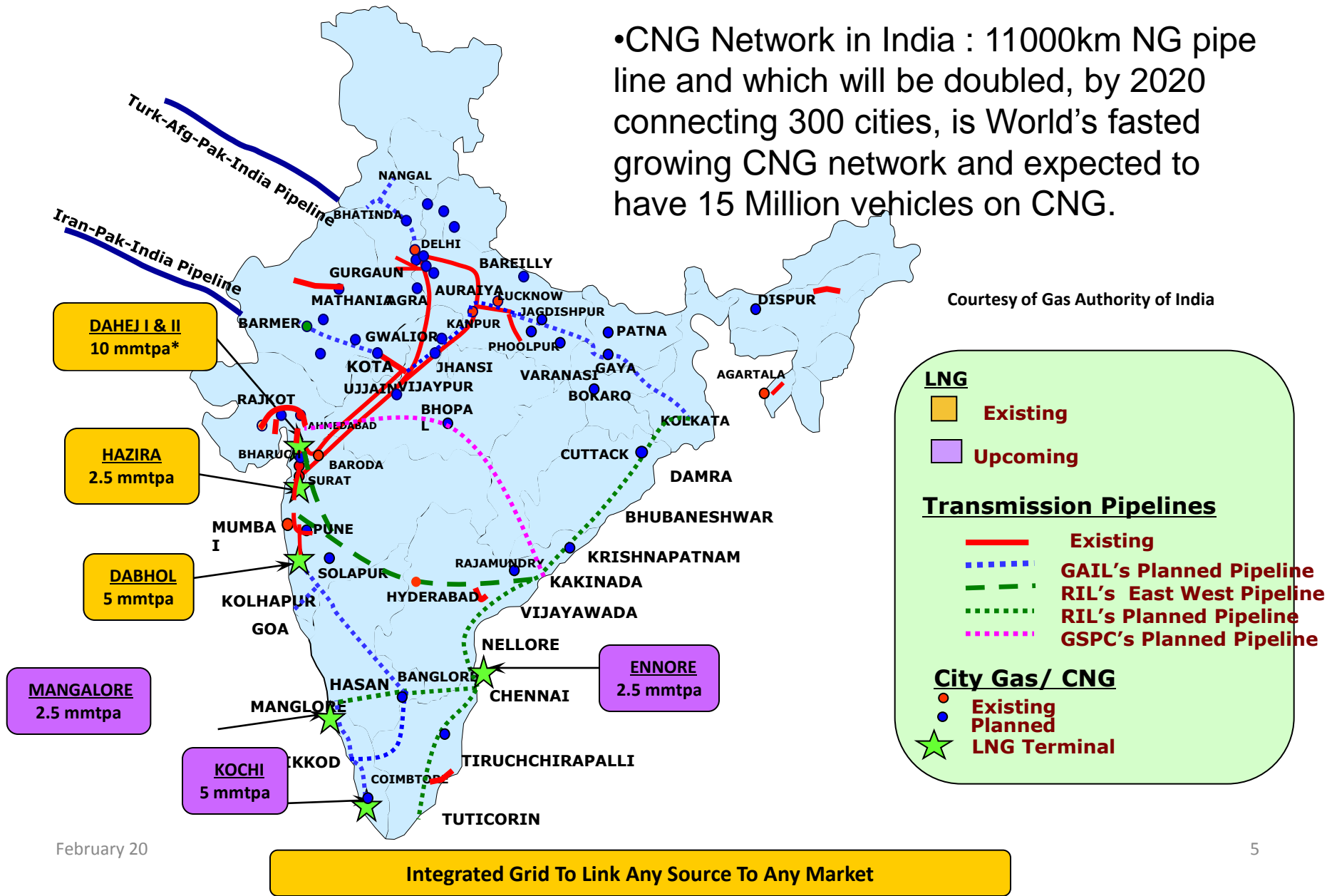
- Technology development
- Demand creation
- Pilot projects
- Charging infrastructure

- 1. CNG - GSR 889 (E) notified for BS-VI**
- 2. LPG - GSR 889 (E) notified for BS-VI**
- 3. Bio-CNG / Bio-Methane – GSR 498 (E)**
- 4. Ethanol (E-85, ED-95, E-100) – GSR 882 (E)**
- 5. Biodiesel (B-20 and B-100) – GSR 915 (E)**
- 6. Liquefied Natural Gas – GSR 643 (E)**
- 7. Hydrogen – GSR 889 (E) notified for BS-VI**
- 8. Methanol (M-15, M-85, MD-95 and M-100) – GSR 490 (E)**
- 9. Dual Fuel – Diesel - CNG – GSR 1151 (E)**
- 10. Hydrogen – CNG – GSR 889 (E) notified for BS-VI**
- 11. Di-Methyl Ether - GSR 37 (E)**

# Indian CNG Infrastructure

•CNG Network in India : 11000km NG pipe line and which will be doubled, by 2020 connecting 300 cities, is World's fastest growing CNG network and expected to have 15 Million vehicles on CNG.

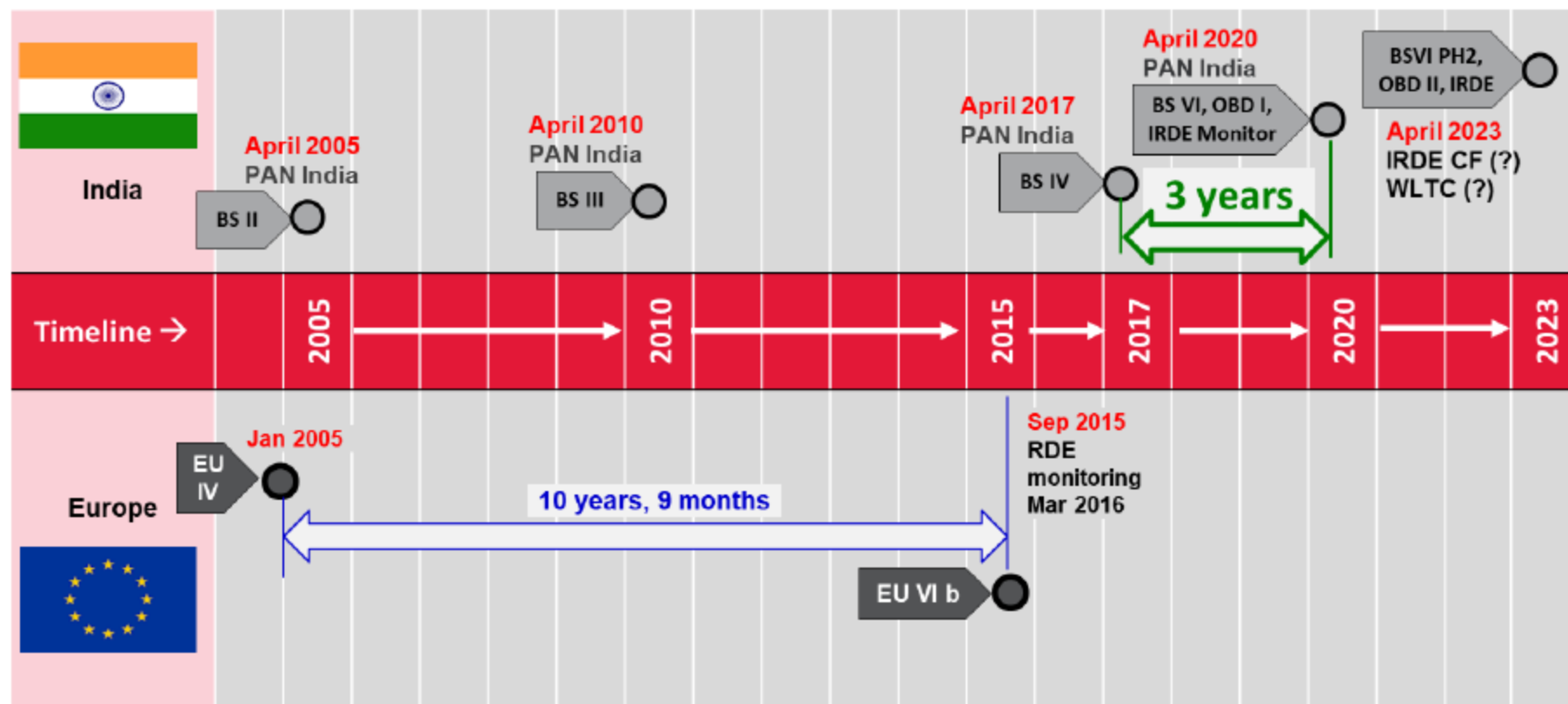
Courtesy of Gas Authority of India



# **BS-VI Regulation and Challenges Faced**

# Legislation Overview

## Legislation Roadmap : India & Europe



Stage 4 to Stage 6 Emission Migration, Europe in over 10 years and India in 3 Years

# BS-VI Fuel Requirements

Fuel parameter	BS VI	Euro 6	EPA RFG average (2005)	EPA conventional gasoline average (2005)	Japan	South Korea	Worldwide Fuel Charter (Category 4)
Sulfur, ppm, max.	10	10	30 ppm (Tier 2) 10 ppm (Tier 3)	30 ppm (Tier 2) 10 ppm (Tier 3)	10	10	10
Research Octane (RON), min.	91/95	95*	NS	NS	89/96	91/94	91/95/98
Motor Octane (MON), min.	81/85	85*	NS	NS	NS	NS	82.5/85/88
Anti-Knock Index (AKI), min.	NS	NS	87/87/91	87/87/91	NS	NS	NS
Olefins, vol%, max.	21/18	18	11.2-11.9	11.6-12.0	NS	16-19 <sup>b</sup>	10

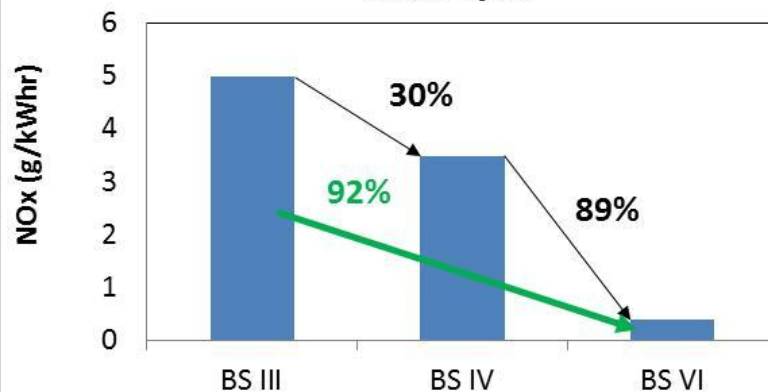
Fuel parameter	BS VI	Euro VI	EPA conventional diesel	CARB designated equivalent limit	Japan	South Korea	Worldwide Fuel Charter (Category 4)
Sulfur, ppm, max.	10	10	15	15	10	10	10
Cetane Number (CN), min	51	51	Cetane index $\geq 40$ or aromatics $\leq 35\%$	53	45	52*	55
Density @ 15°C, kg/m <sup>3</sup>	820-860	845 (max)	NS	NS	NS	815-835	820-840
95% Distillation Boiling Point (T <sub>95</sub> ), °C, max.	370	360	NS	NS	360 <sup>b</sup>	360 <sup>b</sup>	340
Polycyclic aromatic hydrocarbons (PAH), mass %, max.	11	8	NS	3.5	NS	5	2
Flash Point, Abel, °C, min.	35	55	NS	NS	45	40	55

*Impact of PAH to be taken care during engine development due to agglomeration of soot, PM, HC. Uncertainty due to non-availability of commercial fuel. Commercial fuel also shows gap.*

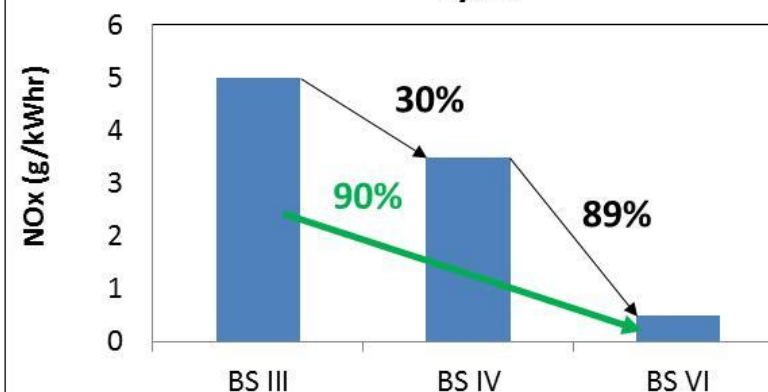


# Stringency of Emission Norms

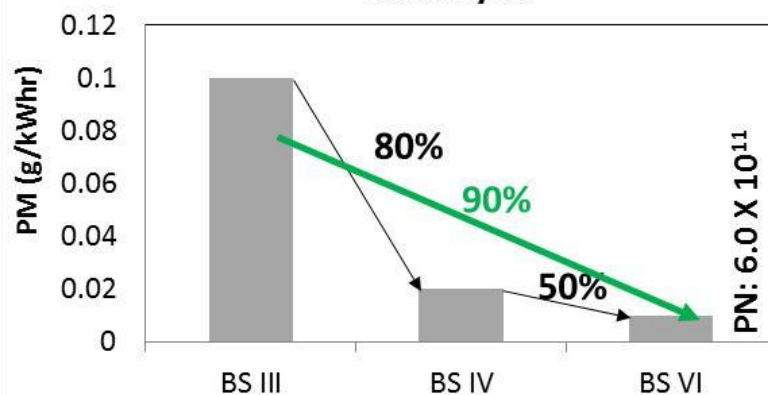
**Heavy Duty Vehicle Engines – Steady State Cycle**



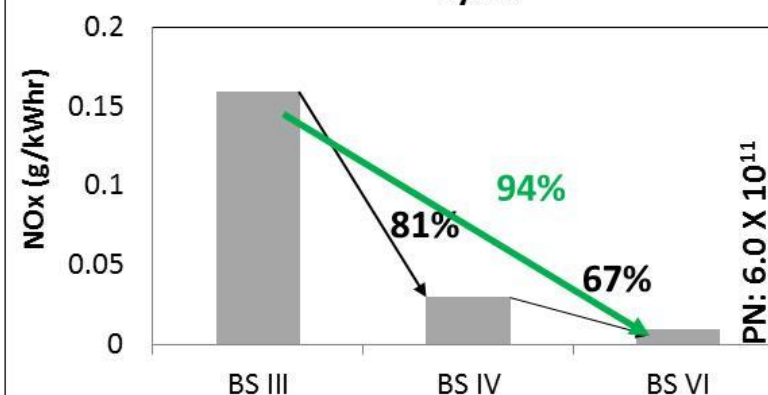
**Heavy Duty Vehicle Engines – Transient Cycle**



**Heavy Duty Vehicle Engines – Steady State Cycle**



**Heavy Duty Vehicle Engines – Transient Cycle**



# BS-IV vs BS-VI

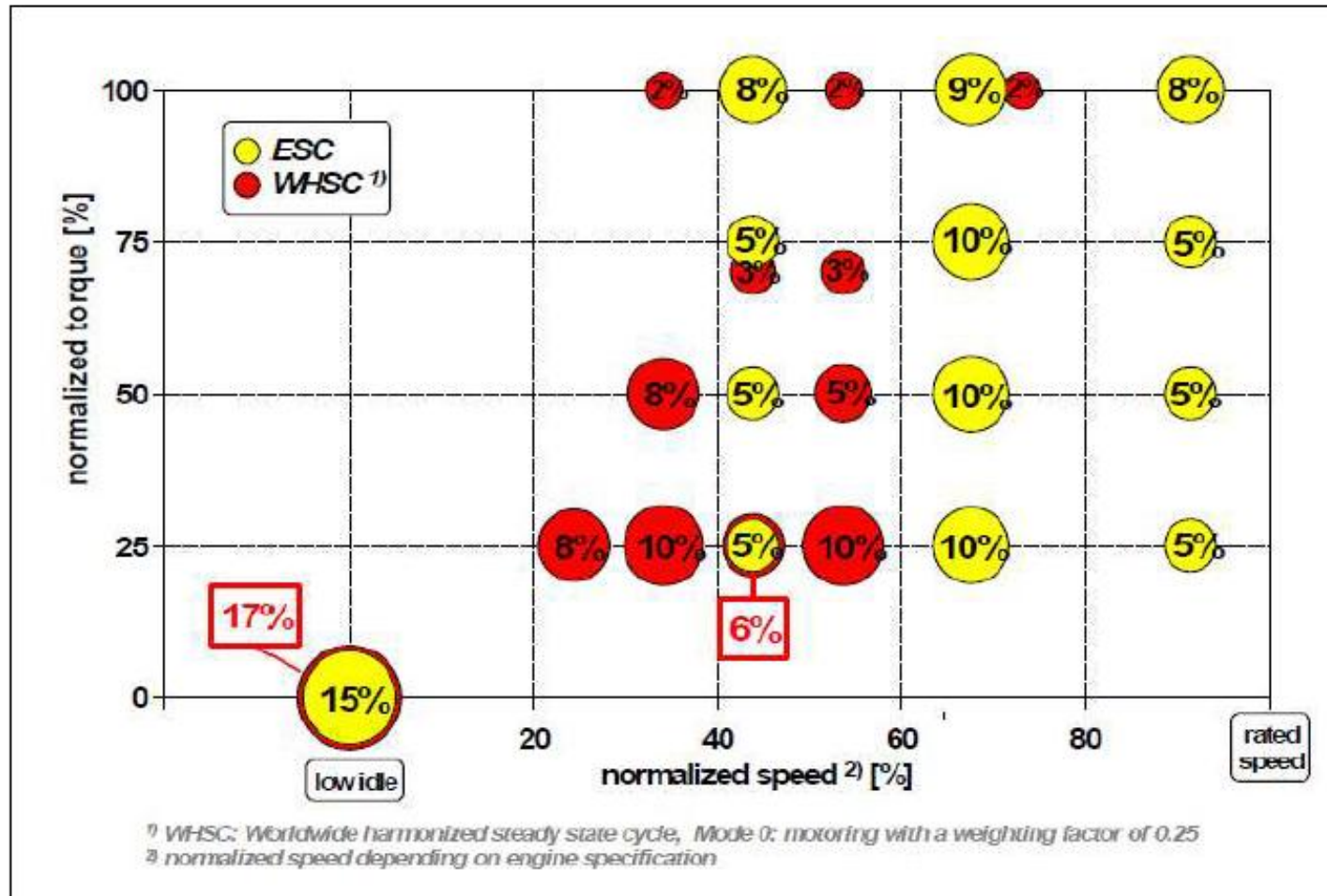
Tests	BS - VI	BS-IV
Test cycles	WHTC, WHSC, WNTD	ETC, ESC
Particulate Number (PN) Measurement	Yes	No
Crank case emissions	Yes	No
OBD (BS VI-A in 2020 / VI B in 2023)	Yes (WWH-OBD)	Yes (OBD-II)
IUPR- (Probability of OBD monitoring happening in Real driving cycles – Min 10%) *	Yes	No
In-service conformity (w/ PEMS) *	Yes	No
PEMS demo test during type approval *	Yes	No

\* - From 2023

**Requires – Engine Test Bed cycle change, Additional equipment, Emission protection throughout life and calibration throughout map, Control strategy robustness**

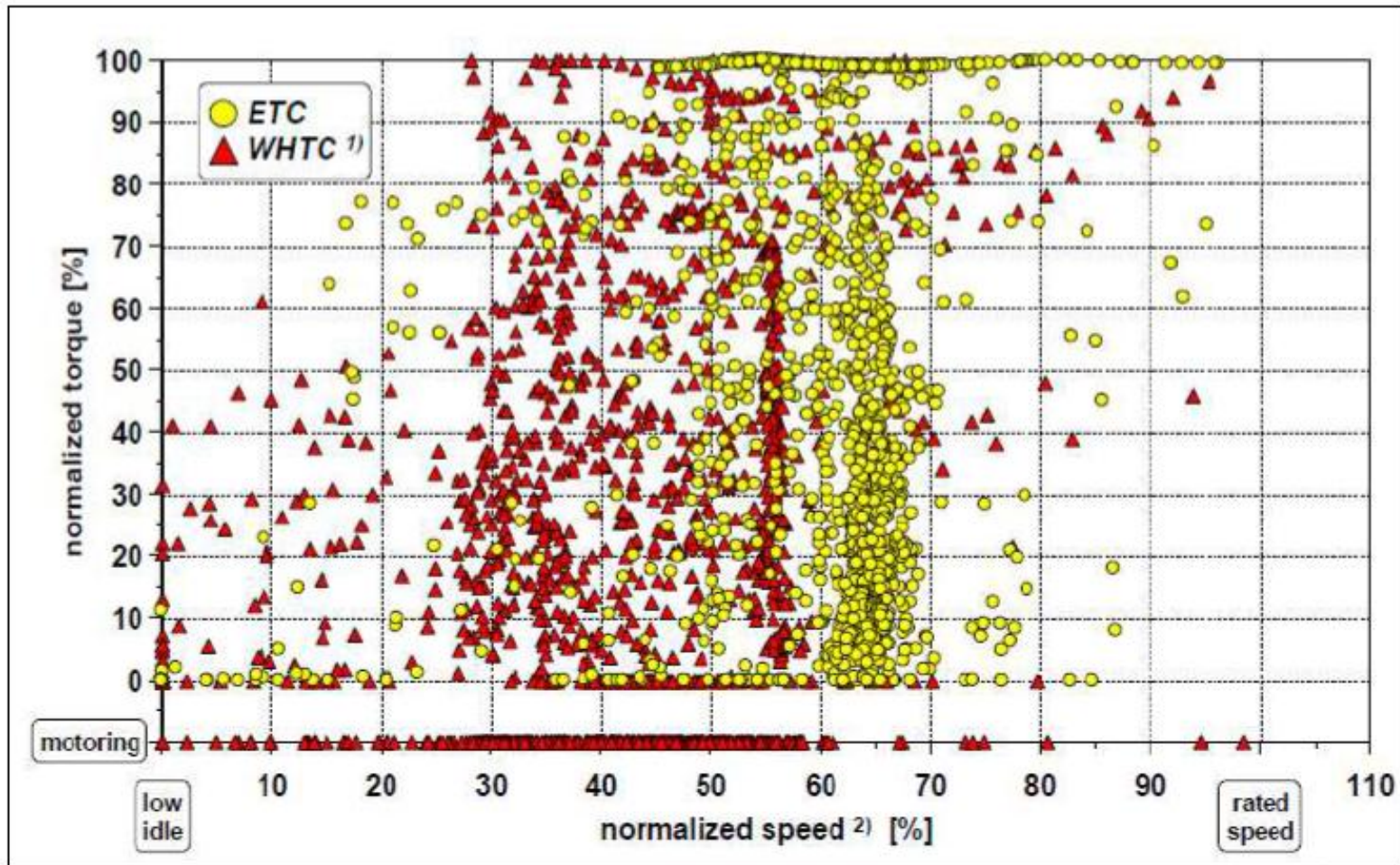
# ESC vs WHSC

## Steady State Cycle



**Low operation zone – challenge for emission conversion due to lower temp**

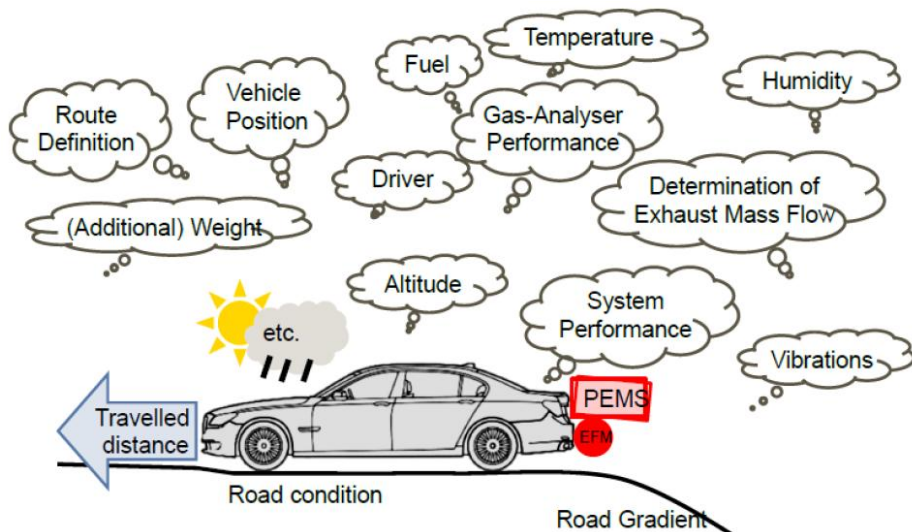
## TRANSIENT CYCLE



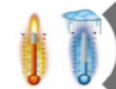
***Low operation zone – challenge for emission conversion due to lower temp***



- Emission testing under normal conditions of use in real world driving

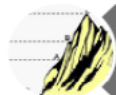


## RDE Test Procedure



### Temperature

Moderate 0°C to 30°C / Extended (-7°C to 35°C)



### Altitude

Moderate < 700 m / Extended < 1300m



### Trip / Driver / Dynamics

City (34%) / Rural (33%) / Motorway (33%), up to 160 km/h, 90-120 min, min. share of accelerations



### Load

no „empty“ vehicle, <90% payload, heating or air condition on

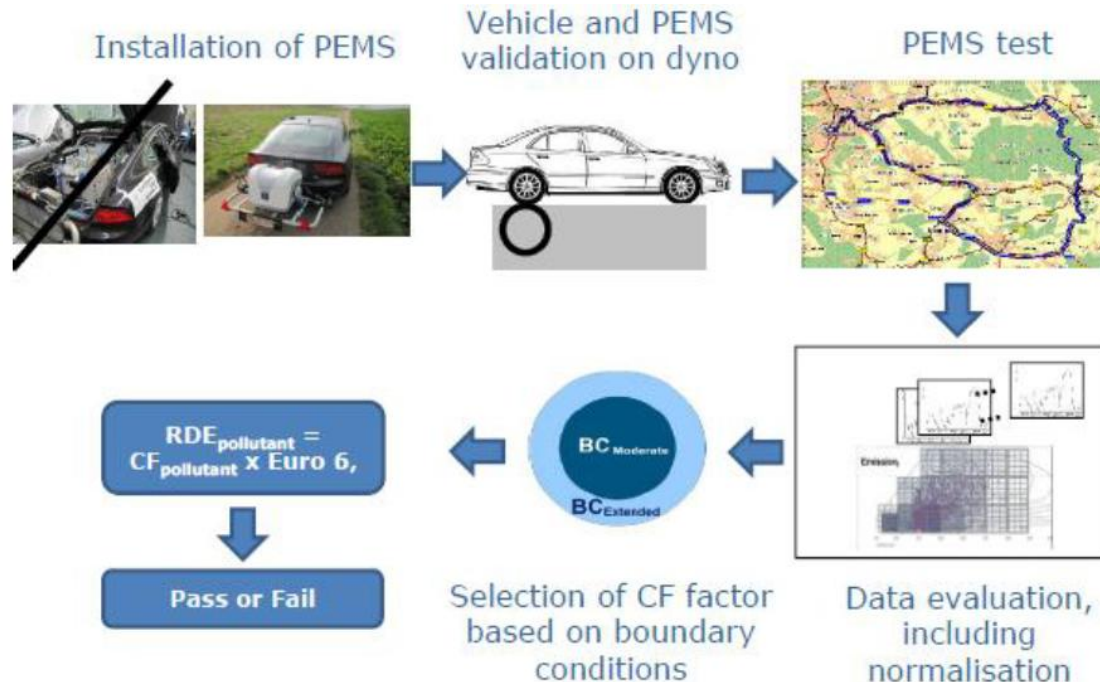


## Portable Emission Measurement System (PEMS)

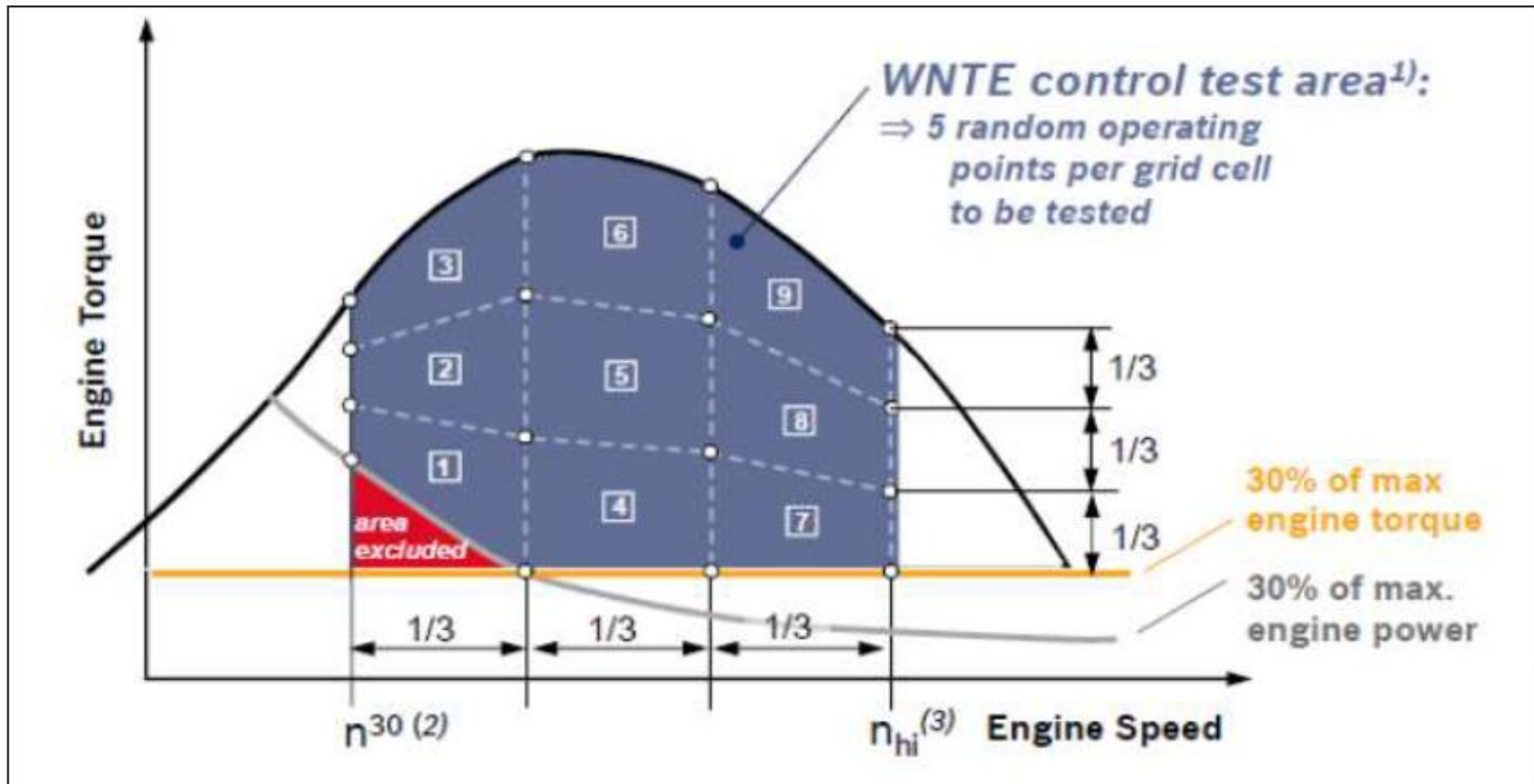
- ☐ CO<sub>2</sub>, CO, NO<sub>x</sub> and PN
- ☐ Exhaust flow rate, Speed and GPS data

Driving Conditions	City	Highway
Speeds [km/h]	V ≤ 50 15 < V <sub>avg</sub> (including stops) < 30	50 < V < 90
Max. speed [km/h]	V <sub>max</sub> ≤ 90 km/h	
Min. Distance [km]	16	26
Trip duration [min]	90 - 120	
Share [of total trip distance]	40% (±10%) Shall never be less than 55%	60% (±10%)

# Challenges for RDE



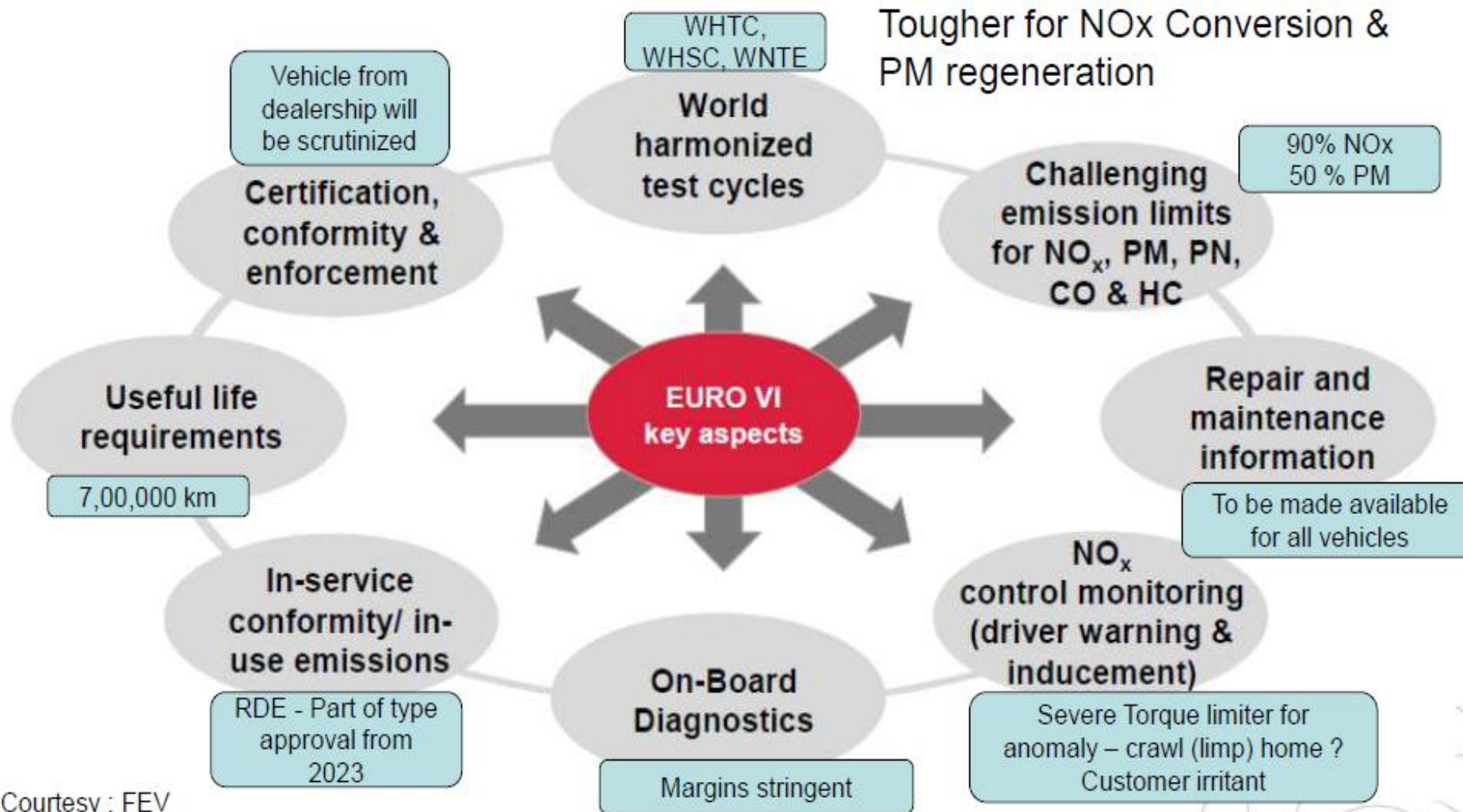
- Indian Driving / Road conditions / Ambient conditions are different
- Boundary conditions in India need to be defined close to the actual road driving behaviour
- RDE adoption means developing compatible vehicles
  - ☐ Hardware Development
  - ☐ Calibration / Validation efforts
  - ☐ Verifying the repeatability and consistency of test results
- Adoption of RDE will mean additional efforts beyond BSVI



**Emission to meet all points at stringent limits – challenge for transient operation all through**



# BS-VI In Service Compliance



Courtesy : FEV

- Engine Test cycle changes warrants test bed software updates and additional equipment
- Emission compliance for life and OBD efficiency - to be demonstrated from 2023 only



## BS VI : Impact to Customer

### Key Challenges

**Performance  
Driveability**



- Heavy exhaust system & Drivability deterioration

**NVH**



- Increased fuel pressure & fuel injection in favor of emission

**Fuel Economy**



- High exhaust pressure drop & after treatment tuning

**Price**



- High initial cost and cost of ownership due to technology

Heavy trucks	Rs 175,000 to Rs 225,000	SCR + DPF make up around 80 percent of the cost increase
Diesel cars	Rs 65,000 to Rs 95,000	DPF + LNT make up around 70 percent of the cost increase
Petrol cars	Rs 8,000 to Rs 12,000	Cost increase spread out across in-cylinder and after-treatment measures
Two-wheelers	Rs 3,500 to Rs 6,000	Cost increase spread out across in-cylinder and after-treatment measures

- PUC testing and norms are governed by Rule 115 (2) of CMVR
- Bharat Stage VI norms for PUC notified vide GSR 881 (E) Dt. 26 November 2019
  
- Requirements for electronically uploading PUC test results to Vahan database
- Amendment in CMVR Rule 115 Sub rule 2
- Notified vide GSR 527 (E) Dt. 6<sup>th</sup> June 2018
- What does it mean:
  - All approved PUC test equipment, installed in authorized PUC test centres, shall be connected to Vahan server
  - All PUC test equipment model, approved as per CMVR, shall be enabled for interface to Vahan through a unique / model specific Application Program Interface (API)
  - Emissions data of each PUC test shall be acquired and electronically uploaded to Vahan database through an online process

**Table A: Petrol / Compressed Natural Gas / Liquefied Petroleum Gas Driven Vehicles Manufactured as per Bharat Stage IV or Bharat Stage VI Norms**

Sr. No.	Type of Vehicle	Idle Emission Limits		High Idle Emission Limits (RPM: 2500±200)	
		CO, %	HC (n hexane equivalent), ppm	CO, %	Lambda $\lambda$
1	Compressed Natural Gas / Liquefied Petroleum Gas driven four wheelers manufactured as per Bharat Stage IV or Bharat Stage VI norms	0.3	200	---	1 ± 0.03 or as declared by the manufacturer
2	Petrol driven four wheelers manufactured as per Bharat Stage IV or Bharat Stage VI norms	0.3	200	0.2	
3	Compressed Natural Gas / Liquefied Petroleum Gas driven two / three wheelers manufactured as per Bharat Stage VI norms	0.5	500	---	
4	Petrol driven two / three wheelers manufactured as per Bharat Stage VI norms	0.5	500	0.3	

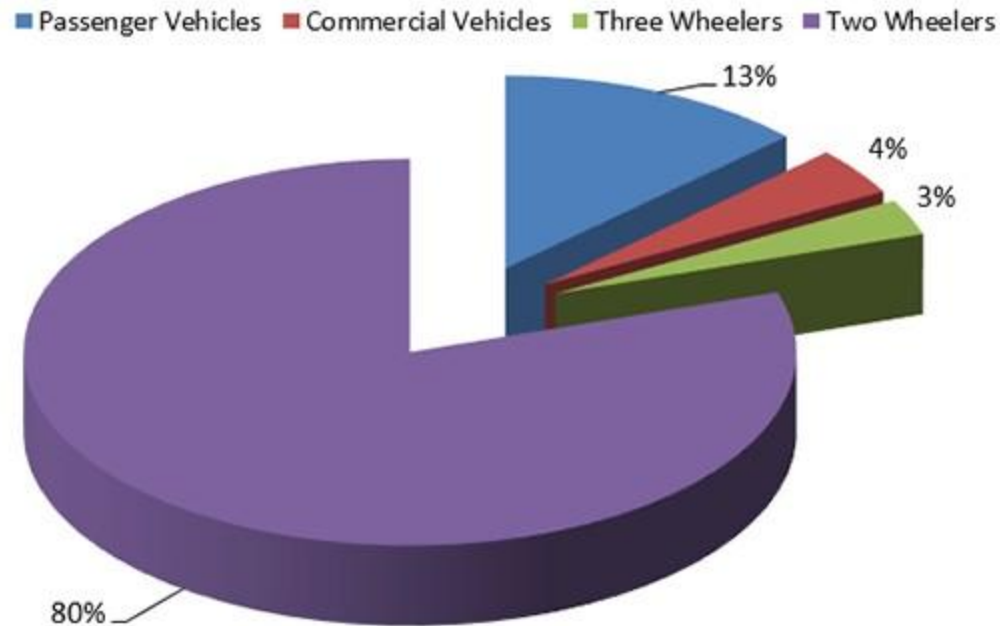
- Provided that the test as specified in Table A shall not be carried out if the On-Board Diagnostic (OBD) Malfunction Indication Lamp (MIL) of Bharat Stage IV or Bharat Stage VI vehicle (as applicable) is noticed to be in switched on condition after starting of engine, and in such cases, the vehicle shall be re-submitted for the above test after repair or servicing
- Provided also that the testing procedures for vehicles manufactured as per Bharat Stage VI emission norms shall be as laid down in AIS 137, as amended from time to time
- Provided also that in case of Compressed Natural Gas and Liquefied Petroleum Gas Vehicles as specified at Sr. Nos. 1 and 3 of Table A, the Lambda requirement shall be applicable to only Bharat Stage VI Compressed Natural Gas or Liquefied Petroleum Gas vehicles of categories M1 (with GVW not exceeding 7.5 tonnes), M2, N1, Quadricycle and two or three wheelers

**Table B: Diesel Vehicles**

Sr. No.	Method of Test	Maximum Smoke Density	
		Light Absorption Coefficient (1/meter)	Hartidge Unit
(1)	(2)	(3)	(4)
1	Free acceleration test for turbo charged engine and naturally aspirated engine for vehicle manufactured as per <b>pre</b> Bharat Stage IV norms	2.45	65
2	Free acceleration test for turbo charged engine and naturally aspirated engine for vehicle manufactured as per Bharat Stage IV norms	1.62	50
3	Free acceleration test for turbo charged engine and naturally aspirated engine for vehicle manufactured as per Bharat Stage VI norms	0.7	26
4	Free acceleration test for turbo charged engine and naturally aspirated engine for two / three wheelers manufactured as per Bharat Stage VI norms	1.5	48

- Provided that the test as specified in Table A shall not be carried out if the On-Board Diagnostic (OBD) Malfunction Indication Lamp (MIL) of Bharat Stage IV or Bharat Stage VI vehicle (as applicable) is noticed to be in switched on condition after starting of engine, and in such cases, the vehicle shall be re-submitted for the above test after repair or servicing
- Provided also that for Type Approval purposes as per the Central Motor Vehicles (11<sup>th</sup> Amendment) Rules, 2016, published in the Official Gazette vide notification number GSR 889 (E), dated 16<sup>th</sup> September 2016 and complying with requirements of free acceleration smoke as provided in this sub-rule, need not be re type approved

# Indian Automotive Composition



Indian automotive composition is dominated by 2 Wheelers which is an extremely price sensitive segment. BS-VI Impact will alter the dynamics of 2 wheeler industry

# BS-VI for Two Wheelers

**Bharat Stage IV Motorcycle and Moped Exhaust Limits (since April 2016)**

**Bharat Stage VI Motorcycle and Moped Exhaust Limits (from April 2020)**



The Bharat Stage VI (BS VI) standards will apply to all vehicles manufactured from 1 April 2020 and are summarised in the following sections. Full details of all the test procedures relating to BS VI will be included in the upcoming AIS-137 standard. The published document however indicates that WMTC cycles will be used for 2-wheelers of Class 1 and higher; for mopeds and 3-wheelers the Indian Drive Cycle (IDC) will be used.

Class / Sub class	Engine Type	Engine Displacement	Maximum speed	CO [mg/km]	HC + NOx [g/km]		HC [mg/km]	NOx [mg/km]	NMHC [mg/km]	PM [mg/km] <sup>(1)</sup>	Evaporative Emissions [mg/test]	Durability [km]
					Opt. 1	Opt. 2						
1	PI	50 ≤ D ≤ 150	V <sub>max</sub> ≤ 50	1000 1403	790	590	100	60 390	68	4.5 <sup>(1)</sup>	1500	20000
2.1		D ≤ 150	50 < V <sub>max</sub> ≤ 100									
		D ≤ 150	100 < V <sub>max</sub> ≤ 115									
		D >150	V <sub>max</sub> ≤ 115									
2.2		-	115 < V <sub>max</sub> ≤ 130	1000 1970	670	470	100	60 340	68	4.5 <sup>(1)</sup>	1500	
3.1		-	130 < V <sub>max</sub> ≤ 140	1000 1970	400	200	100	60 200	68	4.5 <sup>(1)</sup>	1500	35000
3.2		-	V <sub>max</sub> >140									
All	CI			500 380	380		100	90	68	4.5 42.5		35000
Moped	PI	≤ 50	V <sub>max</sub> ≤ 50	500 750	750		350	150				

The Bharat Stage VI assigned deterioration factors are as follows. Alternatively, manufacturers may opt for the evaluation of deterioration factors according to the procedure that will be outlined in AIS-137.

Deterioration Factors Bharat Stage VI						
Engine Type	Vehicle Class	CO	HC	NOx	NMHC	PM
Spark ignition	All	1.3	1.3	1.3	1.3	-
Compression ignition			1.1	1.1	1.1	1.0

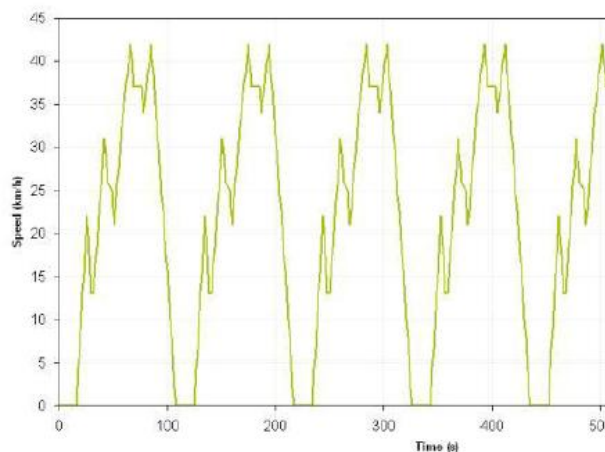
# BS-VI for Three Wheelers

**Bharat Stage IV**  
**Bharat Stage VI**



Engine Type	Standard		CO [mg/km]	HC + NOx [g/km]		NOx [mg/km]	PM [mg/km]	Evaporative Emissions [mg/test]	Durability [km]	Test Cycle
				Opt. 1	Opt. 2					
PI	Emissions Limit	Gasoline	440	435		130	-	1500	35000	IDC
			940	940	740					
		CNG / LPG	940	940						
	Deterioration Factor		1.2	1.2		1.2	-	-		
CI	Emissions Limit		220	200		160	25	-		
	Deterioration Factor		1.1	1.0		1.0	1.2	-		

IDC (Indian Drive Cycle) test Cycle



## Stage II OBD (Emissions Stage VI) thresholds for 3-wheelers

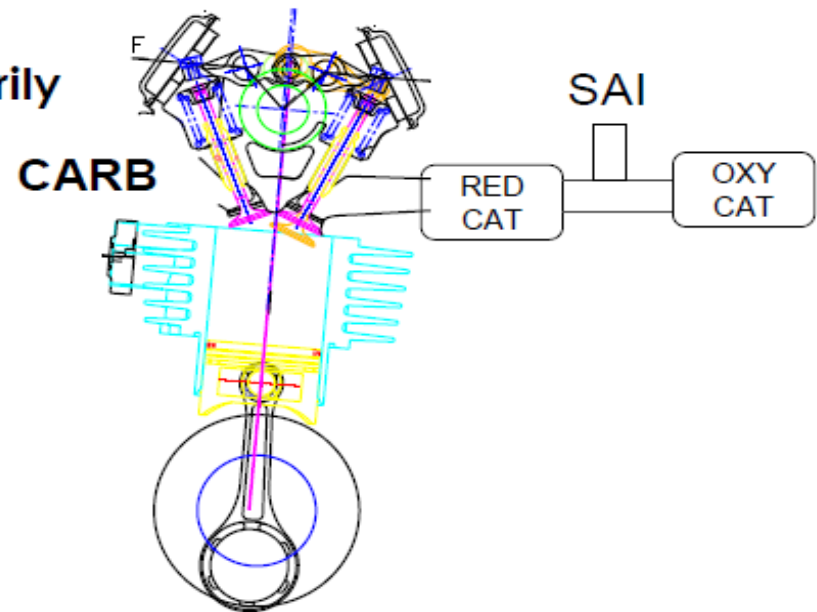
Vehicle Class	Fuel Type	Emissions thresholds (mg/km)	
		CO	NOx
All	Gasoline	880	425
	Diesel	440	300

## Required OBD Features

Circuit continuity for all emission related power train components
Distance travelled since the malfunction indicator lamp (MIL) is illuminated
Electrical disconnection of the electronic evaporative purge control device (if fitted and active)
Catalytic converter monitoring
EGR system monitoring
Misfire detection
Oxygen sensor deterioration

## Meeting BS-VI With CARB Engines

- Tune engine richer to minimize NO<sub>x</sub>
- Use special reduction catalyst, primarily Rh, to reduce NO<sub>x</sub>
- Add SAI after reduction catalyst
- Use oxidation catalyst to primarily convert remaining CO and HC
- Issues:
  - Need secondary air injection into muffler
  - Need SAI port and piping
  - Requires two catalysts – higher cost

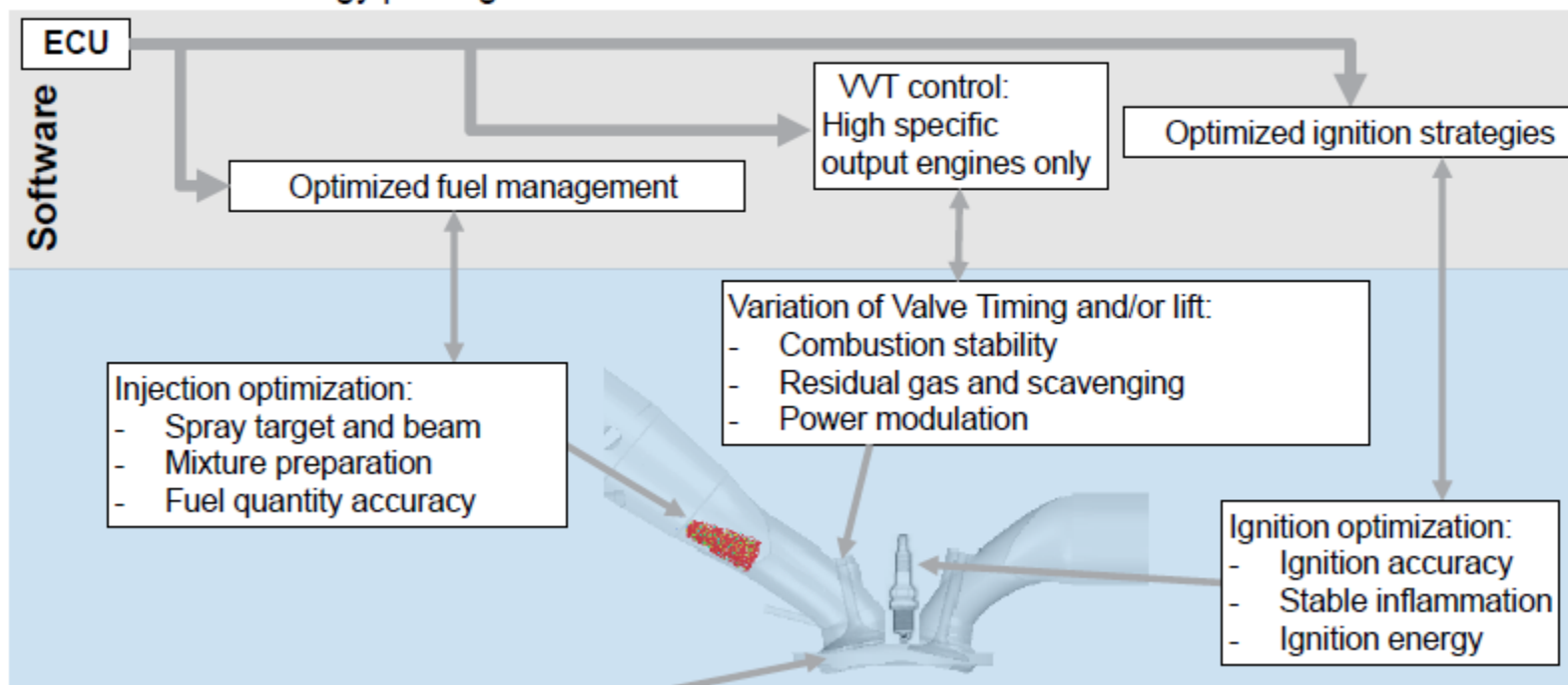




## 2-3 Wheeler Industry Preparedness

- Adoption of Injection technologies with OBD Controls
- Increased dependence on after treatment
- Cost of vehicle expected to rise by approx 6000 Rs

- Possible technology packages:



# BS-VI for Passenger Cars

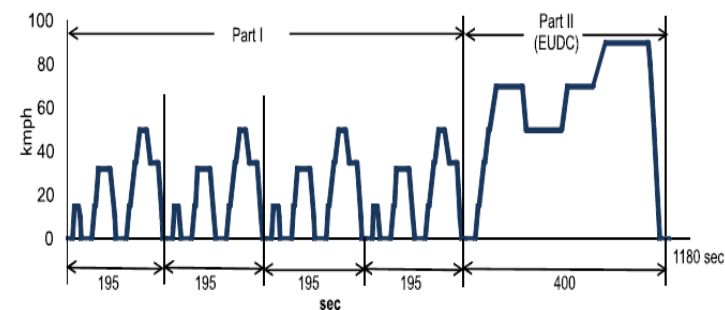
		Reference Mass (RM) (kg)	Mass of Carbon Monoxide (CO)		Mass of Total Hydrocarbons (THC)		Mass of Non-Methane Hydrocarbons (NMHC)		Mass of Oxides of Nitrogen (NOx)		Combined Mass of Hydrocarbons and Oxides of Nitrogen (THC + NOx)		Mass of Particulate Matter (PM)		Number of Particles (PN)	
			L1 (mg/km)		L2 (mg/km)		L3 (mg/km)		L4 (mg/km)		L2 + L3 (mg/km)		L5 (mg/km)		L6 (numbers/km)	
Category	Class		PI	CI	PI	CI	PI	CI	PI	CI	PI	CI	PI <sup>(1)</sup>	CI	PI <sup>(1)(2)</sup>	CI
M (M1 & M2)	—	All	1000	500	100	—	68	—	60	80	—	170	4.5	4.5	6.0X 10 <sup>11</sup>	6.0X 10 <sup>11</sup>
N1	I	RM ≤ 1305	1000	500	100	—	68	—	60	80	—	170	4.5	4.5	6.0X 10 <sup>11</sup>	6.0X 10 <sup>11</sup>
	II	1305 < RM ≤ 1760	1810	630	130	—	90	—	75	105	—	195	4.5	4.5	6.0X 10 <sup>11</sup>	6.0X 10 <sup>11</sup>
	III	1760 < RM	2270	740	160	—	108	—	82	125	—	215	4.5	4.5	6.0X 10 <sup>11</sup>	6.0X 10 <sup>11</sup>
N2	—	All	2270	740	160	—	108	—	82	125	—	215	4.5	4.5	6.0X 10 <sup>11</sup>	6.0X 10 <sup>11</sup>

**Deterioration Factor shall be as given below: BS VI**

Engine Category	Assigned Deterioration Factor						
	CO	THC	NMHC	NOx	HC + NOx	Particulate Matter (PM)	Particle Number (PN)
Positive Ignition	1.5	1.3	1.3	1.6	—	1.0	1.0
Compression Ignition	1.5	—	—	1.1	1.1	1.0	1.0

Note: Alternatively the vehicle manufacturer may opt for vehicle ageing test of 1,60,000 km or bench ageing durability test

**1. Modified Indian Driving Cycle (Bharat stage Norms)**



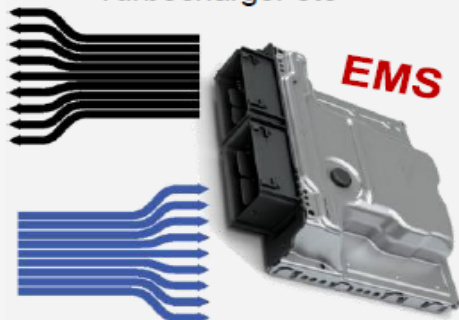
Total test time: 1180 sec  
Total distance: 10.647 km  
Max. speed: 90 km/h  
Maximal Acceleration: 0.833 m/s<sup>2</sup>  
Maximal Deceleration: 1.389 m/s<sup>2</sup>

# BS-VI for Passenger Cars

## Engine Management System(EMS) – Controls & Monitors

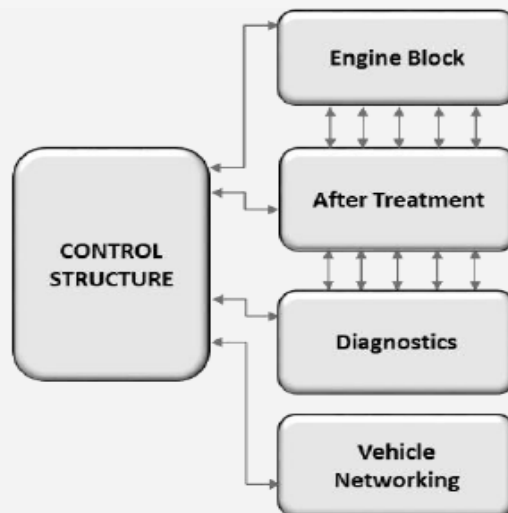
### ACTUATORS

- Injector
- AdBlue dosing
- Turbocharger etc



### 18 SENSORS

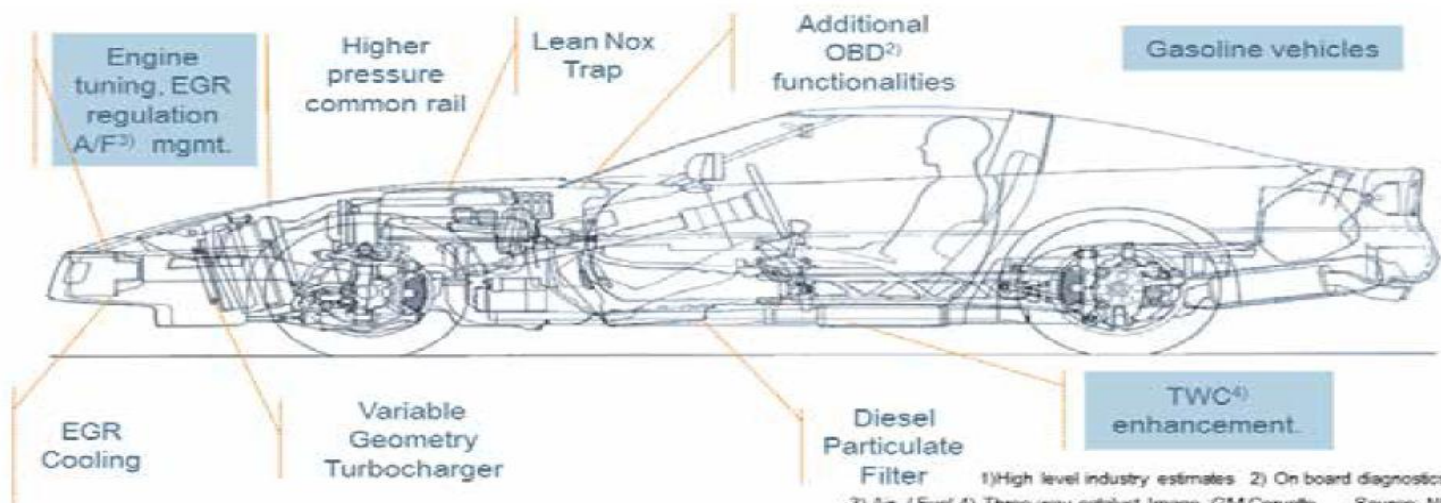
- Pressure
- Temperature
- Flow etc



- Control structure connects various functions such as

- Engine
  - After treatment
  - Diagnostics
  - Vehicle Networking
- and the output is given to actuators.

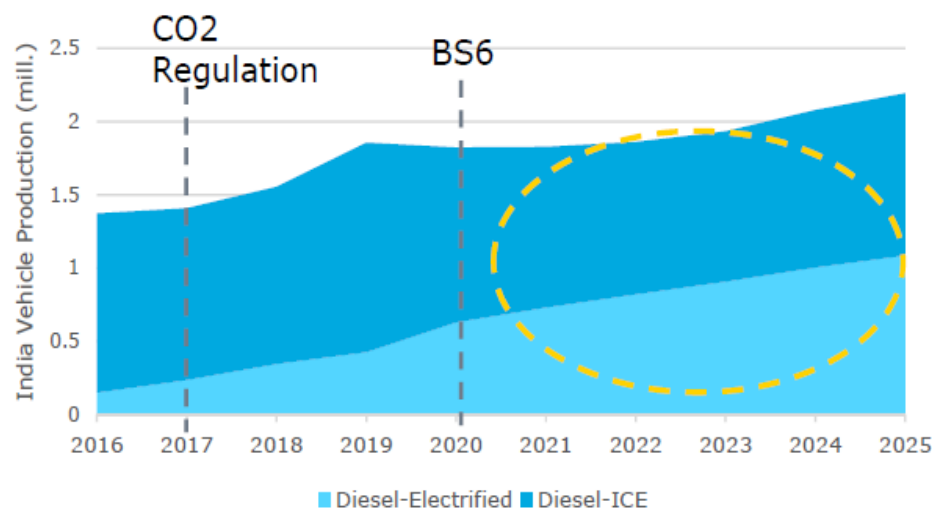
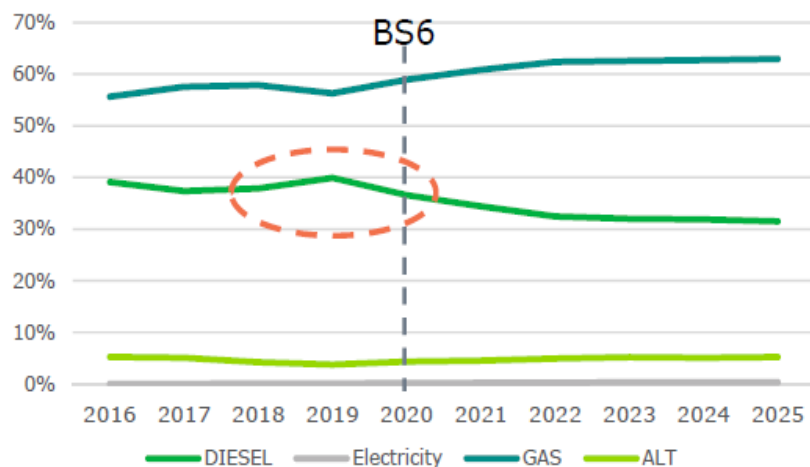
- Calibration : Complex , lengthy and fine programming for system to perform



1) High level industry estimates 2) On board diagnostics  
3) Air / Fuel 4) Three-way catalyst Image : GM Corvette Source: NRI

## Consumer Evolution

### The Petrol vs Diesel Scenario

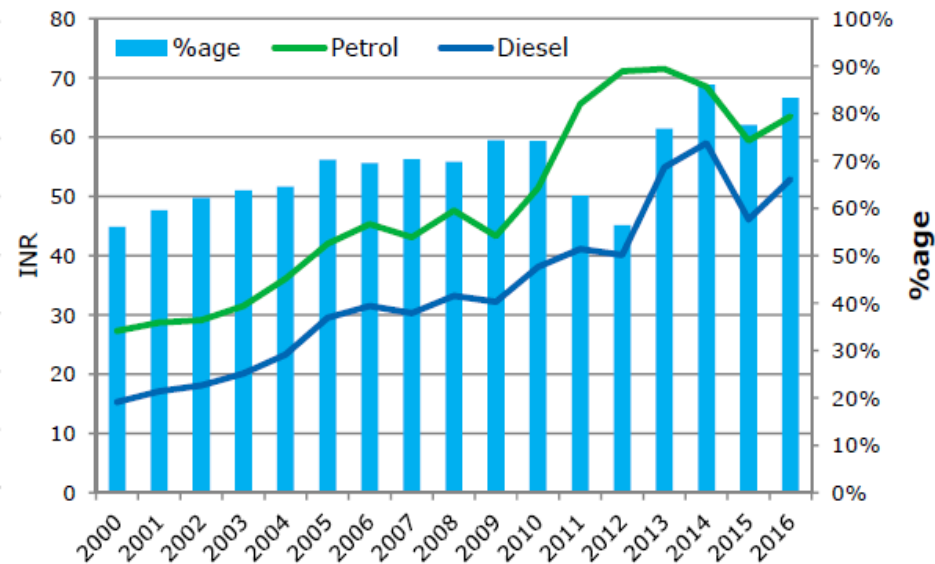
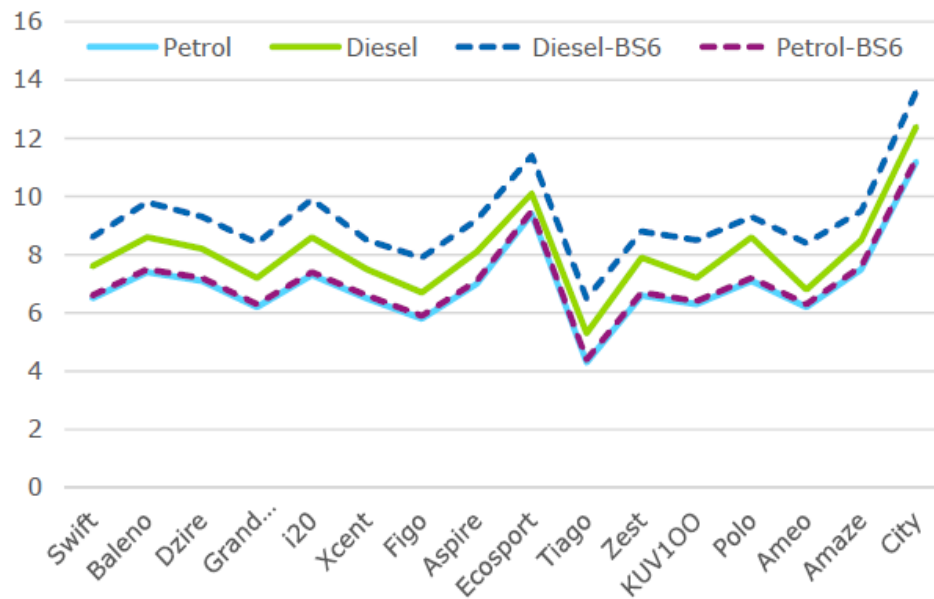


- Diesel share in PV segment will reduce to about 35% by 2020.
- Correspondingly, petrol share will increase to about 60%.
- Almost 40% of diesel cars will have some sort of electrification.
- Pre-buy effect expected in 2019.

# BS-VI for Passenger Cars

## Consumer Evolution – Why diesel car is losing favor?

Gap in Initial price & Fuel price



- Earlier the savings made on fuel expenditure justified higher initial price.
- Diesel cars will only get more expensive post-BS6.
- Subsidy on diesel fuel may never be back.

# BS-VI for Commercial Vehicles

Notes :  
 PI = Positive Ignition  
 CI = Compression Ignition

	Limit values							
	CO mg/kWh	THC mg/kWh	NMHC mg/kWh	CH <sub>4</sub> mg/kWh	NOx mg/kWh	NH <sub>3</sub> (ppm)	PM mass mg/kWh	PM number (numbers/kWh)
WHSC (CI)	1500	130	—	—	400	10	10	8.0x10 <sup>11</sup>
WHTC (CI)	4000	160	—	—	460	10	10	6.0x10 <sup>11</sup>
WHTC (PI)	4000	—	160	500	460	10	10	6.0x10 <sup>11</sup>

## Deterioration Factors for BS-VI

Test cycle	CO	THC <sup>1</sup>	NMHC <sup>2</sup>	CH <sub>4</sub> <sup>2</sup>	NOx	NH <sub>3</sub>	PM mass	PM number
WHTC	1.3	1.3	1.4	1.4	1.15	1.0	1.05	1.0
WHSC	1.3	1.3	—	—	1.15	1.0	1.05	1.0

(1)Applies in case of a compression ignition engine.

(2)Applies in case of a positive ignition engine.

BS-VI-OBD -II threshold for BS VI vehicles  
 manufactured on or after 1st April 2023





	Limit in mg / kWh		
	NOx	PM Mass	CO
Compression ignition engines	1200	25	—
Positive ignition engines	1200	—	7500

World Not-To-Exceed (WNTe) Off-cycle laboratory testing limits for  
 gaseous and particulate exhaust emissions.

Test cycle	CO mg/kWh	THC mg/kWh	NOx mg/kWh	PM mg/kWh
WNTe	2000	220	600	16

# After Treatment Challenges

## DPF, SCR, LNT : India specific key challenges

Challenge	DPF Impact	SCR Impact	LNT Impact
 <b>Wide Geographical Conditions</b>	<ul style="list-style-type: none"> <li>• Frequent Regeneration</li> <li>• FE impact</li> </ul>	<ul style="list-style-type: none"> <li>• Urea Deposits</li> </ul>	<ul style="list-style-type: none"> <li>• Low efficiency</li> </ul>
 <b>Congested City Traffic</b>	<ul style="list-style-type: none"> <li>• Temperature Overshoot</li> <li>• DPF Damage</li> </ul>	<ul style="list-style-type: none"> <li>• Low Temperature</li> <li>• FE Penalty</li> </ul>	<ul style="list-style-type: none"> <li>• FE Penalty</li> </ul>
 <b>Unique Driving behavior</b>	<ul style="list-style-type: none"> <li>• Fuel - Oil Dilution</li> </ul>	<ul style="list-style-type: none"> <li>• White Deposits</li> </ul>	<ul style="list-style-type: none"> <li>• Real Driving Emission</li> </ul>
 <b>Fuel Adulteration</b>	<ul style="list-style-type: none"> <li>• Ash Deposition</li> </ul>	<ul style="list-style-type: none"> <li>• Catalyst Poisoning</li> </ul>	<ul style="list-style-type: none"> <li>• Catalyst Poisoning</li> </ul>



## ADVANCED ENGINE TECHNOLOGY with FUEL ECONOMY



## ADVANCED CONTROL TECHNOLOGY, SENSORS & ACTUATORS



## ADVANCED EXHAUST TECHNOLOGY

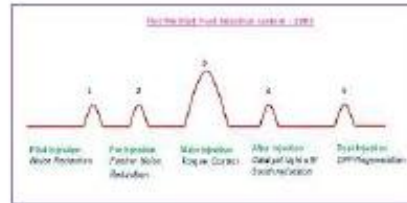




# BS-VI HCV Engine Changes



High Injection Pressure

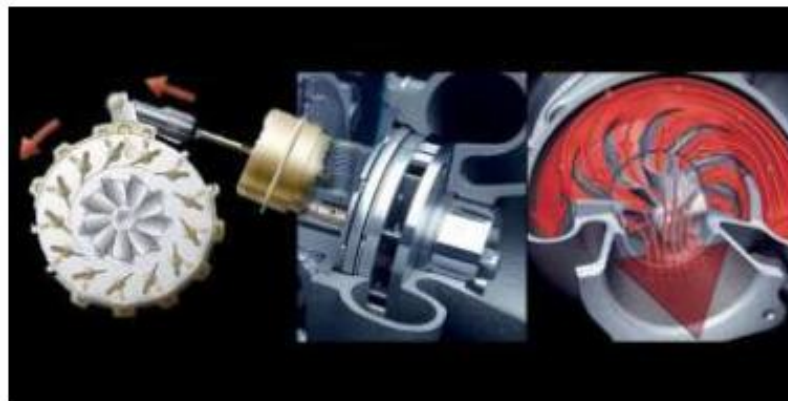


Variable Valve

- Targeted Engine Out Emission
- Efficient Combustion
- Best Air Path Management
- Best Fuel Efficiency



Increased Combustion  
Control



Adv Turbo control

# BS-VI HCV Engine Sensors

Air Mass Flow Sensor



High Temp Sensor

Differential Pressure  
sensor



NOx sensor

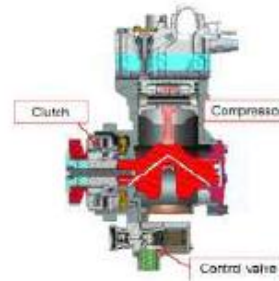


PM sensor



# BS-VI HCV Engine Accessories

Variable speed  
water pump



Clutched air  
compressor

Electric  
water pump

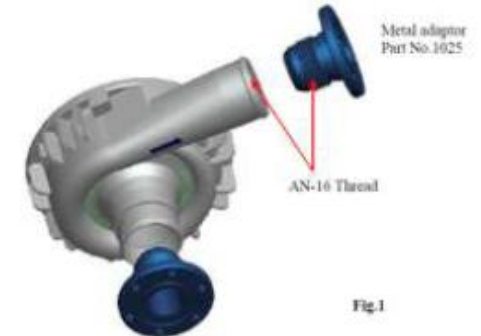


Fig.1

Reduced tension  
oil control rings



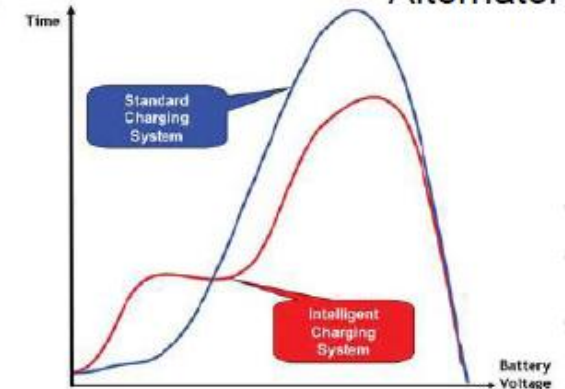
Miscellaneous related to  
pistons, liners, bearings



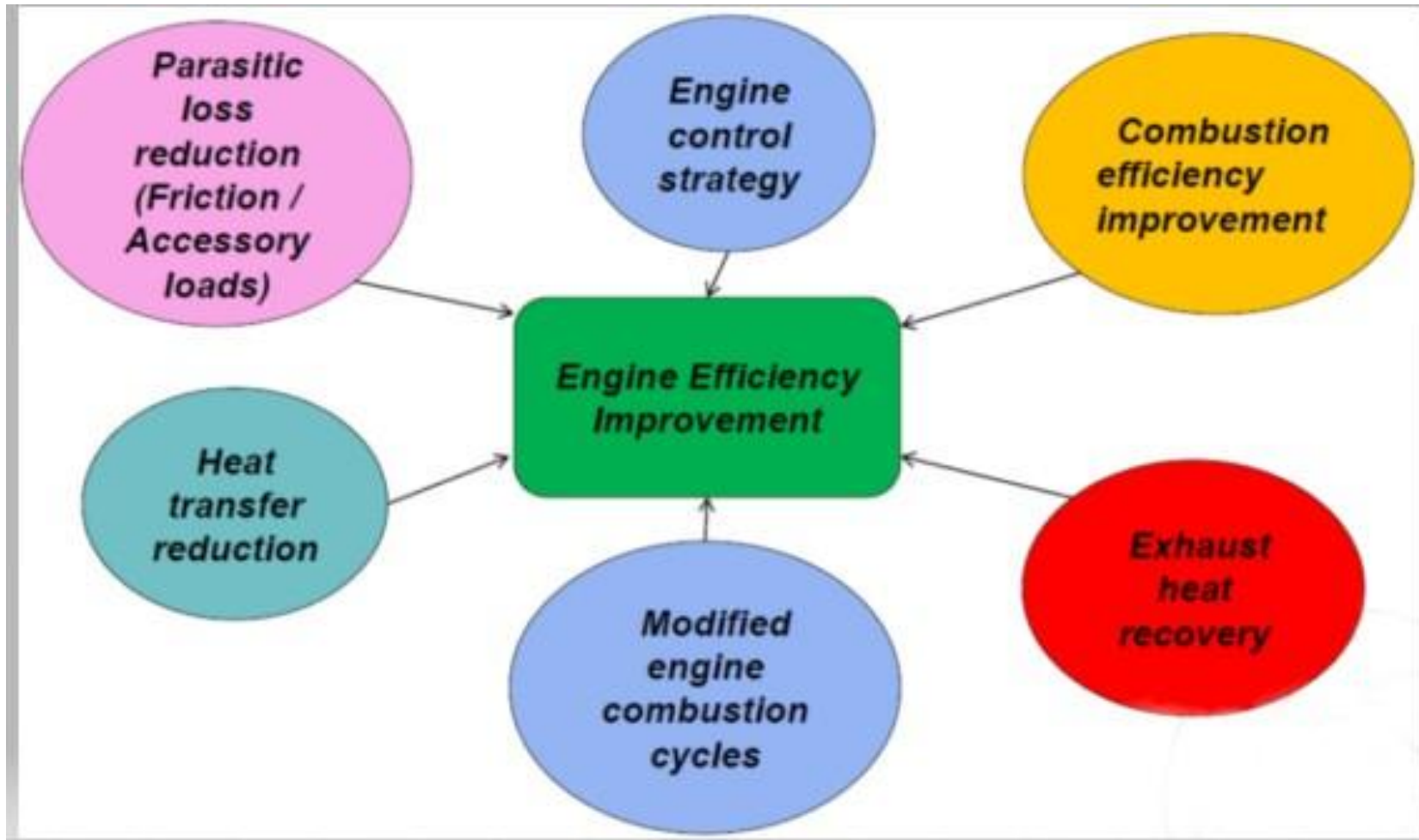
Low viscosity  
oil



Smart  
Alternator

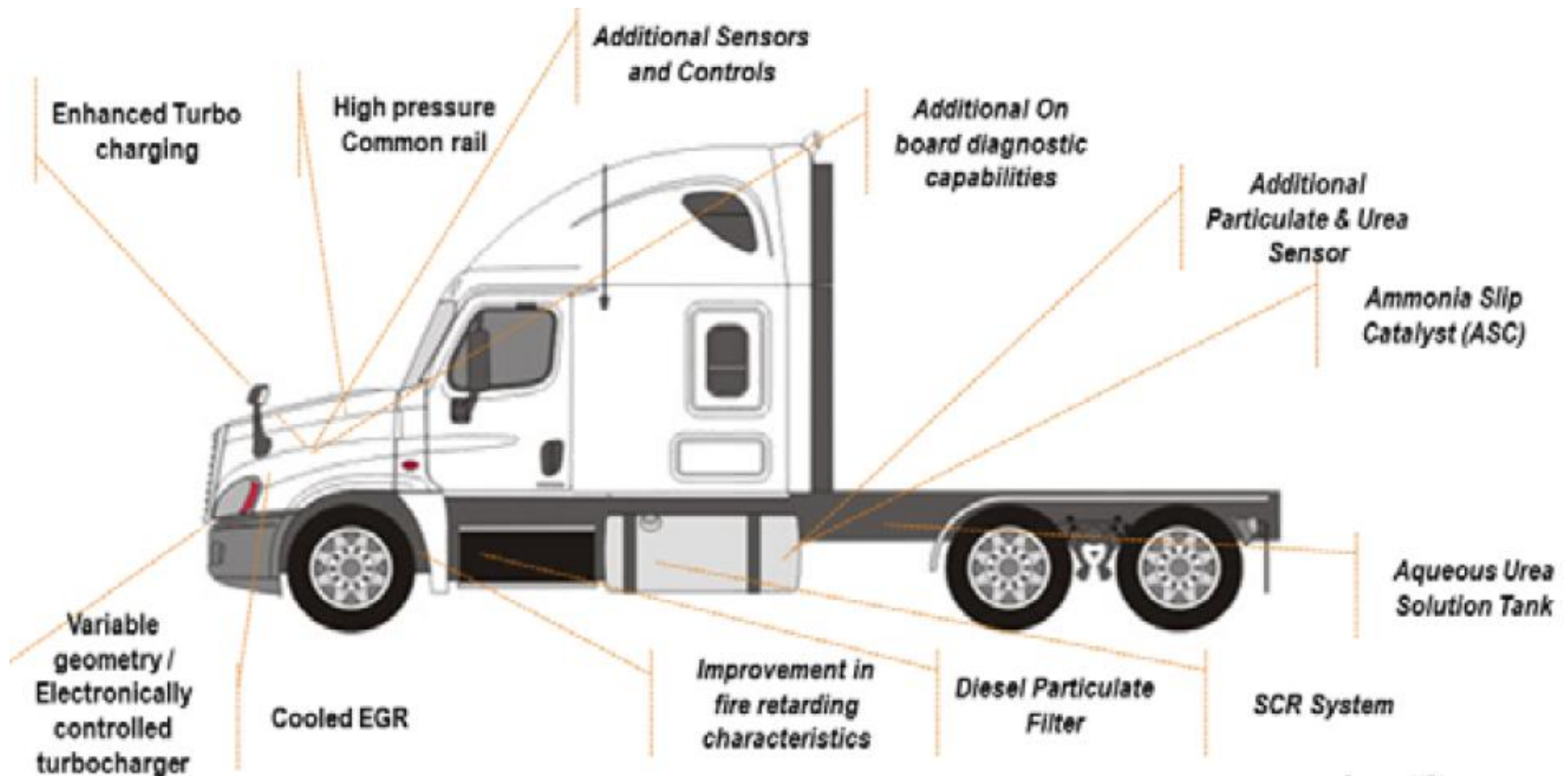


# BS-VI HCV Engine Efficiency





# BS-VI Impact on HCV



# BS-VI Impact on the Industry

OEMs:



	Global OEMs	Domestic OEMs
Technology	Indigenize	New development
Suppliers	Developed	New collaboration
Investment	Localization	New set-up



Huge opportunity for global suppliers of fuel injection systems, after-treatment devices, EGR systems, ISG systems etc.

# Summary

- BS VI implementation – Requires significant changes to Engine & After treatment systems
- Extensive calibration effort is required for latest OBD and IUPR standards
- BS VI commercial fuel quality & availability is critical for completion of development on time
- Public awareness and strict implementation required to ensure the practical success of BS VI norms pan India
- Make in India initiatives on all new technologies to have less impact on cost and availability.



# Thank You!

