

BOSCH LTD. INVESTORS' MEET

Mobility Trends and Solutions for India

27th June 2017

Soumitra Bhattacharya, Managing Director, Bosch Limited

Agenda

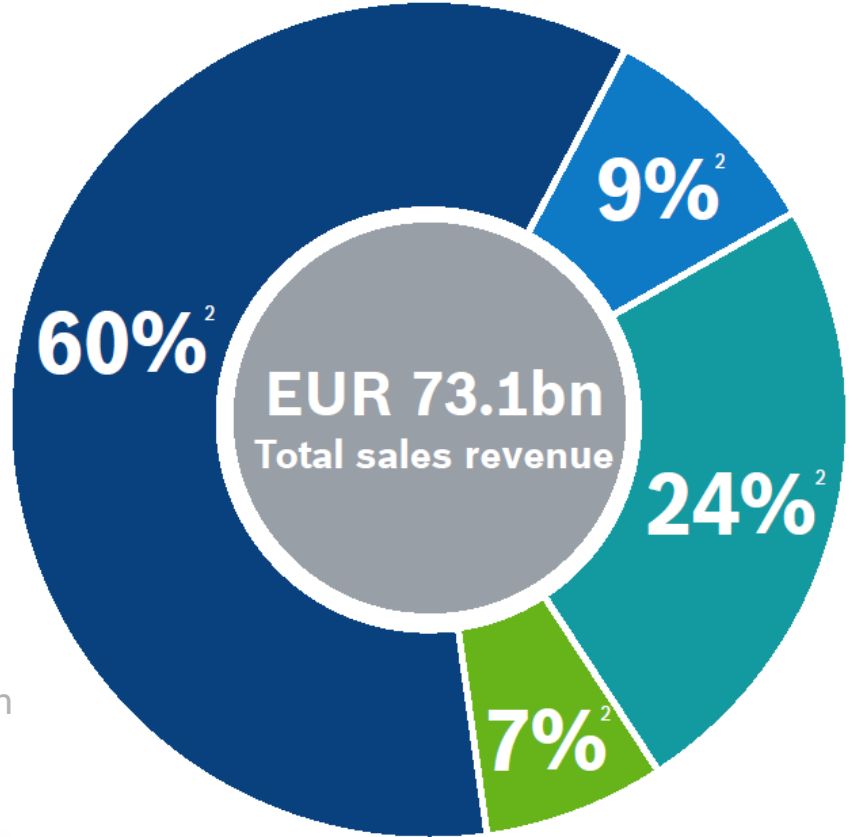
1. Bosch Group Overview
2. Global Mobility Trends
3. India - Legislative landscape affecting Mobility
4. Emission norm changes
5. Electrification roadmap in India
6. Connected Mobility

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Bosch Group Sales in 2016 by Business Sectors



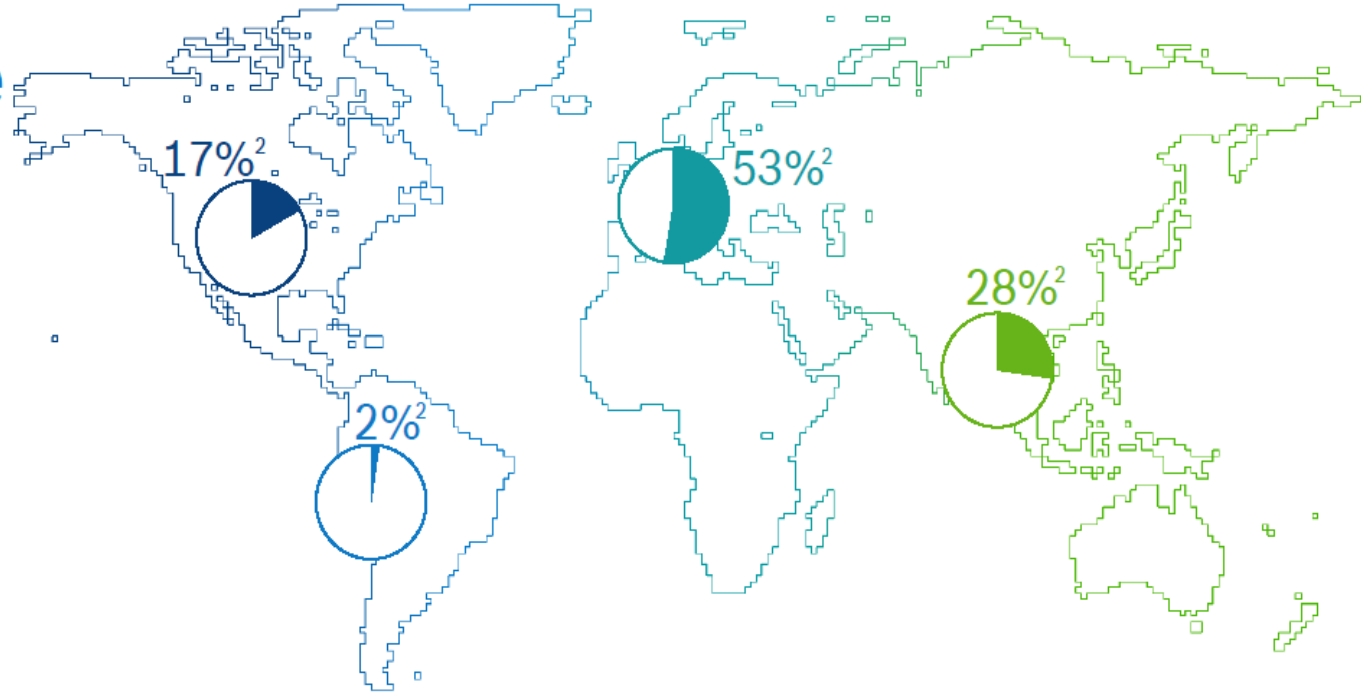
- 1 Figures representing Bosch Group sales
- 2 Share of total sales
- 3 Nominal change from 2015



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Bosch Group Sales in 2016 by Region

Total sales revenue
EUR 73.1bn
+ 3.5%³



1 Figures representing Bosch Group Sales
2 Share of total sales
3 Nominal change from 2015
4 Including other regions

North America
EUR 12.4bn
- 2.0%³

South America
EUR 1.3bn
- 5.7%³

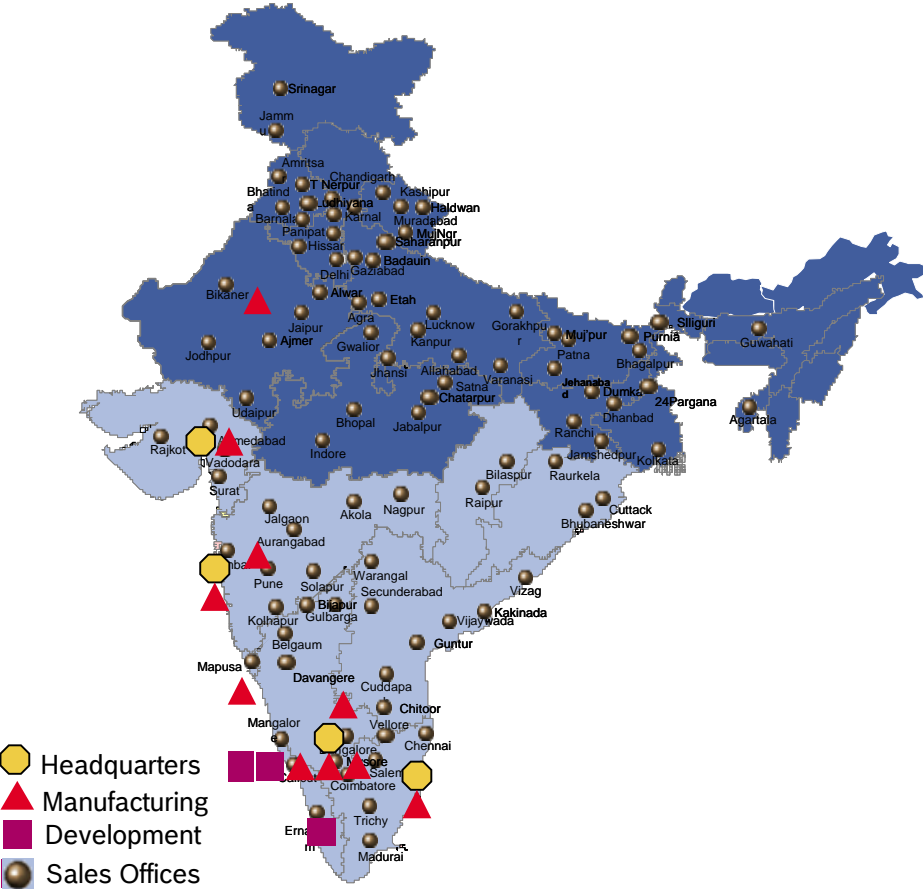
Europe
EUR 38.6bn
+ 3.4%³

Asia Pacific⁴
EUR 20.8bn
+ 8.1%³



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Bosch in India



1
Group


Manufacturing Plants


18 Manufacturing Plants


Companies

11 Companies


Sales Outlets

>4000 Sales Outlets

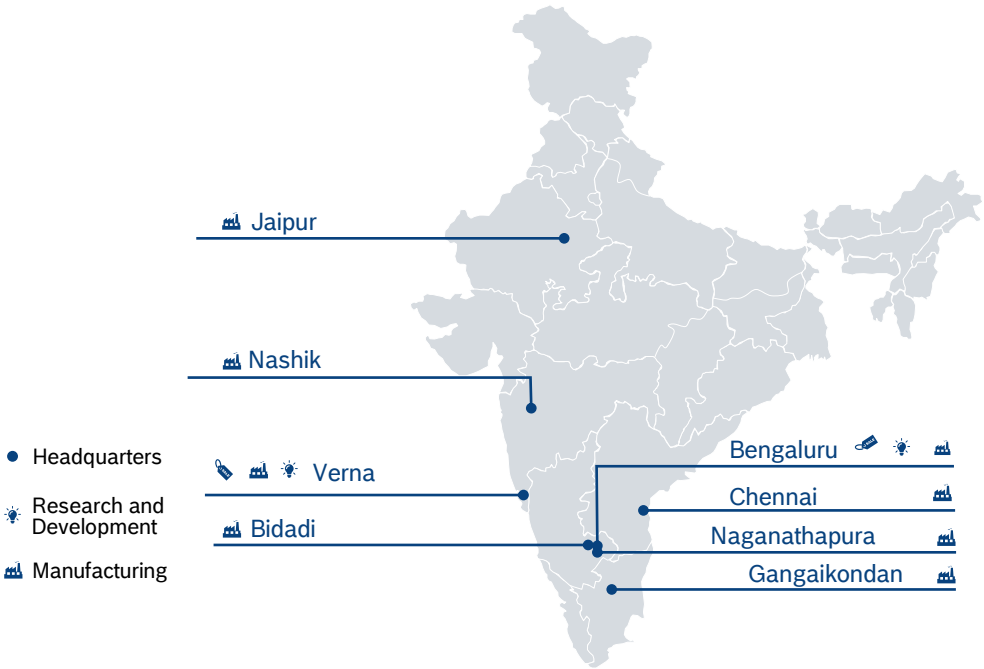

Suppliers

>1500 Suppliers

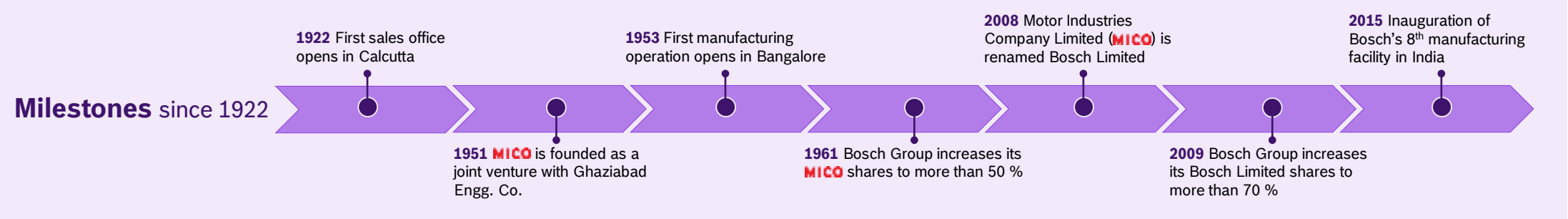
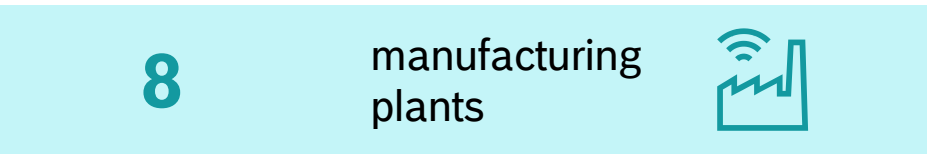
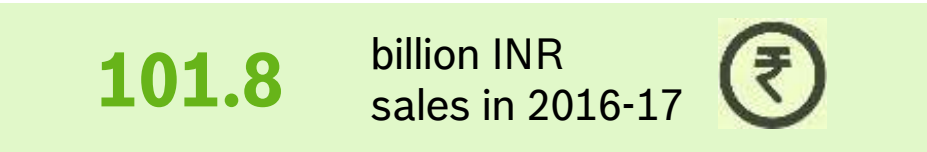
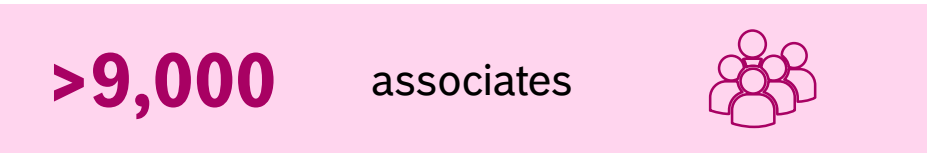

No. of Associates

~31000

Bosch Ltd. Overview



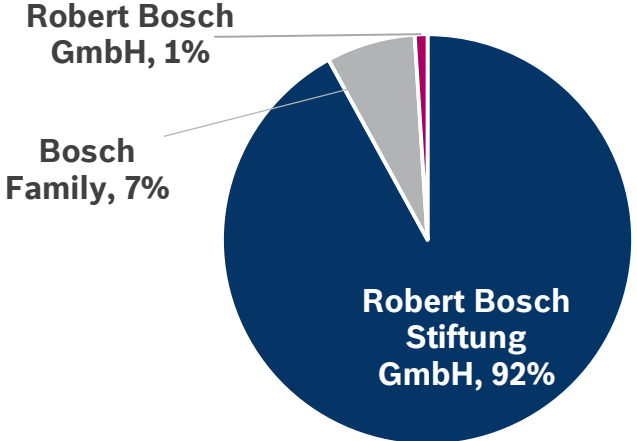
Key Figures



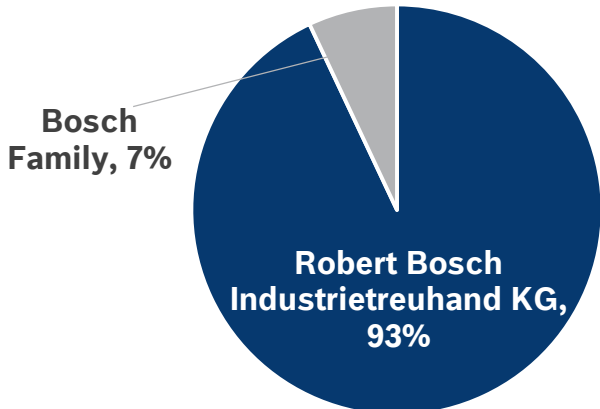
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Bosch's uniqueness

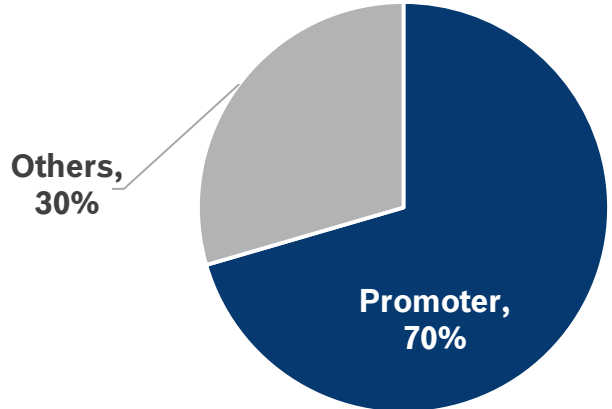
RB GmbH Shareholding



RB GmbH Voting Rights



Bosch Ltd. Shareholding and Voting Rights

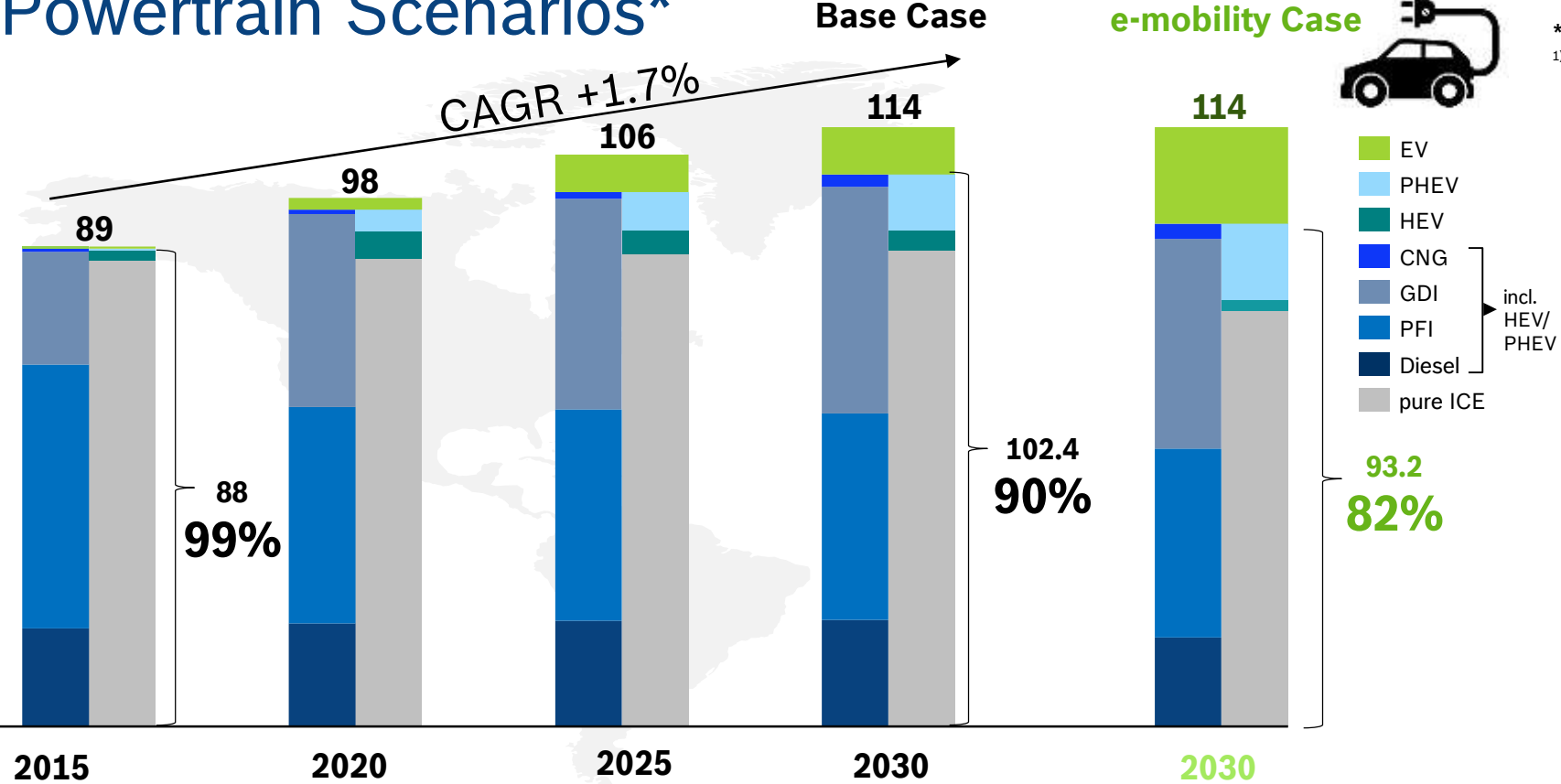


Unique shareholding pattern → Globally: majority shareholding with a Trust

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*Vehicle sales PC incl. LCV<6t [m vehicles]¹⁾
¹⁾ Estimation Bosch



... but also VUCA world

VOLATILITY
UNCERTAINTY
COMPLEXITY
AMBIGUITY

**Global mobility market with moderate growth (CAGR₂₀₁₅₋₂₀₃₀ : +1.7%).
 Combustion Engine (ICE) expected to remain dominant propulsion technology (82 to 90% in 2030).
 Hybridization gains momentum to meet emission and CO₂ requirements.**

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Regulatory and Market impulses



Emission Norms

BS4 countrywide, BS6 in 2020

Fuel Consumption Regulations

CAFE 2017/2022

Crash Standard

All models from 2019

Safety

CV ABS 2015, PC and 2Wh ABS 2018,

Market Trends

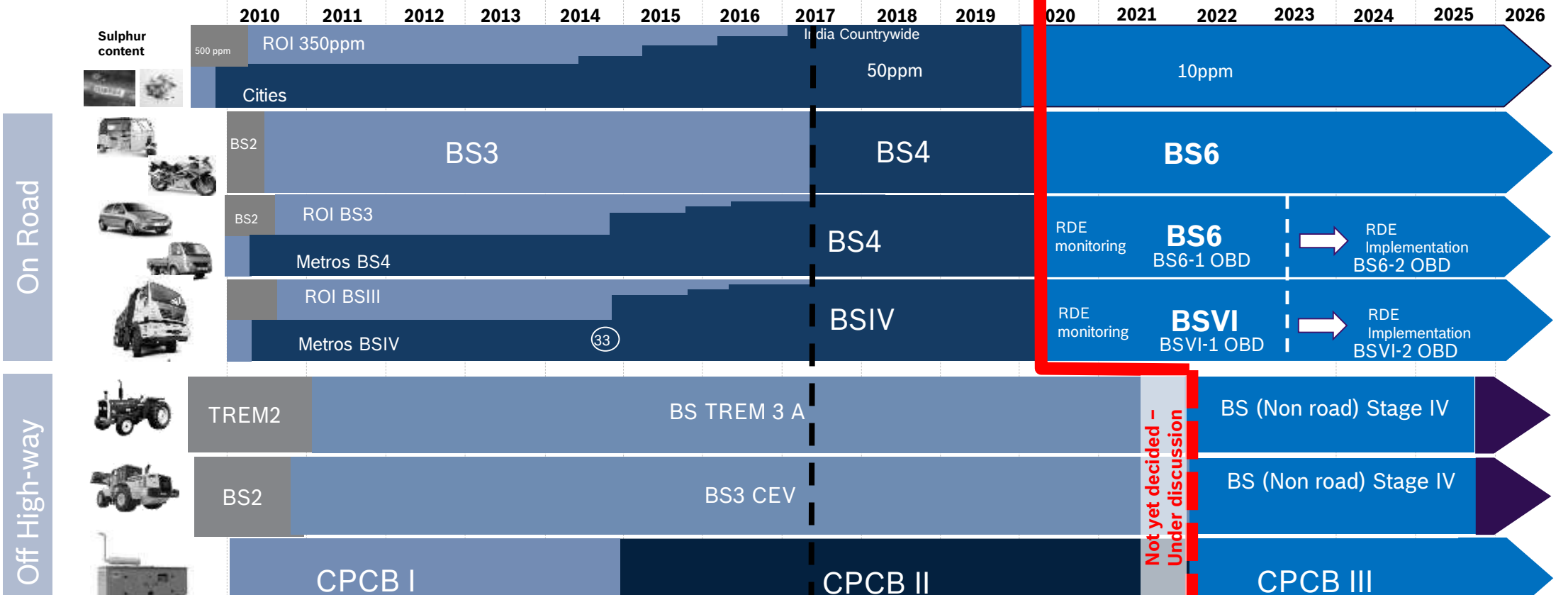
Electrified – NITI Aayog (e-mobility 2030)



Large amount of regulatory requirements and new market trends will drive fast technology and product adaptation for Indian Market

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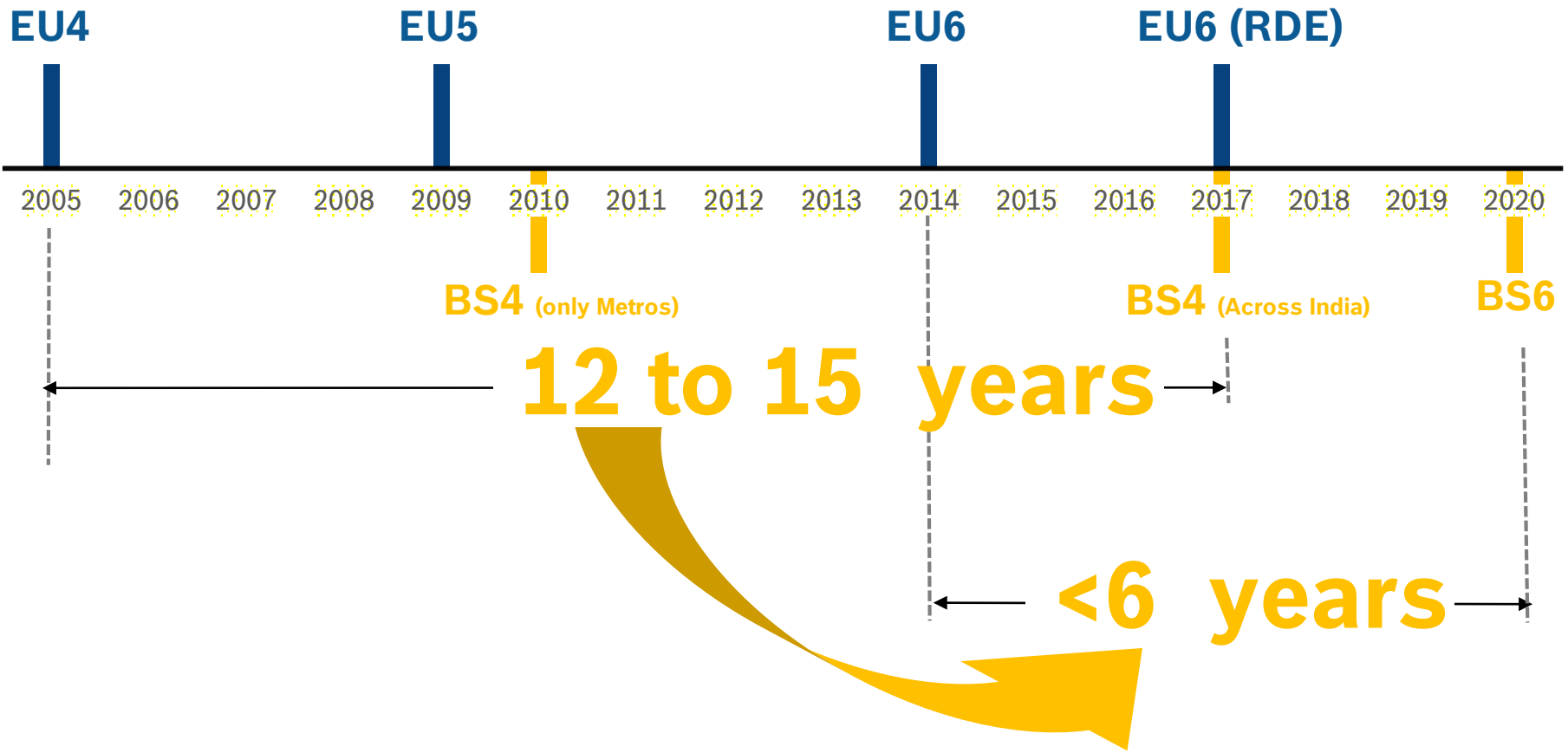
Emission Legislation – All Segments



With leapfrogging to new stringent emission, monitoring and CO₂ norms in all on- and off-road segments India is undergoing a disruptive technology change.

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Regulation comparison



Leapfrogging from BS4 to BS6 in 2020 reduces the current technology backlog from ~12 years to < 6 years

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ICE Technology approach to meet future market requirements

Fuel Injection Equipment

Exhaust Gas Treatment

Optimization of air system

New Software Functions

"electrified" Hybrids

"connected"

Drive Train

Exhaust Gas Treatment Diagram: DOC → SCR/DPF → SCR/Cu/C → NSC/cDPF → pSCR → TWC

Exhaust Gas Treatment Parameters: T, Δp, λ, PM, T

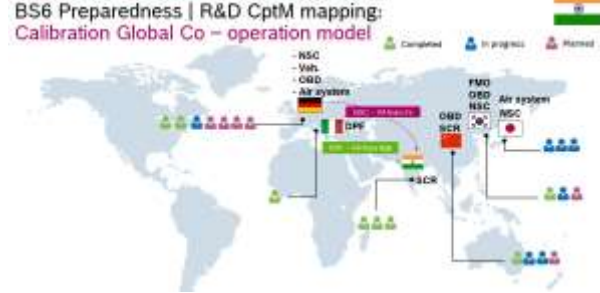
Engine Performance Graphs:

- IMEP vs Engine Speed:** Shows Brake Mean Effective Pressure (IMEP) in bar on the y-axis (0 to 24) and engine speed in rpm on the x-axis (1000 to 4200).
- Crane Angle vs Cylinder Pressure:** Shows cylinder pressure in bar on the y-axis (0 to 100) and crane angle in degrees on the x-axis (-30 to 30).
- NOx engine out vs Time:** Shows NOx engine out in g/h on the y-axis (0 to 400) and Time in seconds on the x-axis (1150 to 1200). Compares Base, FTC, MCC-T & FTC.
- Torque vs Time:** Shows Torque in Nm on the y-axis (0 to 300) and Time in seconds on the x-axis (1150 to 1200).

Holistic technology optimization necessary to meet future requirements – strong demand for system solutions. Bosch able to offer wide range of required products and engineering services as system solution provider.

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Gearing up for the future



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Electrification roadmap in India

Vision of Government of India

India aims to become 100% e-vehicle nation by 2030: Piyush Goyal

March 2017

Leapfrog to Shared, Electric and Connected Mobility

Niti Aayog - May 2017

Monitor how the plans develop in to action

Recent developments in India

India To Skip Bharat Stage-V, Stricter Car Emission Norms Advanced To 2020

By India | Written by Kinshy Gang | Updated: January 01, 2016 08:27:00

Rs 500 and 1000 currency demonitised: PM Modi

India ranked second in renewable energy attractiveness index

India reaffirms Paris climate commitments

Govt to electrify all rural households by May 2018

Companies under Piyush Goyal's ministries to switch to e-cars

Nagpur becomes first city with electric mass mobility system

High GST to drive hybrid car sales into slow lane

Mahindra to invest in high-end electric powertrain technology

Ashok Leyland launches first India-made electric bus: All you need to know about 'Circuit'

Suzuki, Toshiba and Denso to manufacture lithium ion battery packs

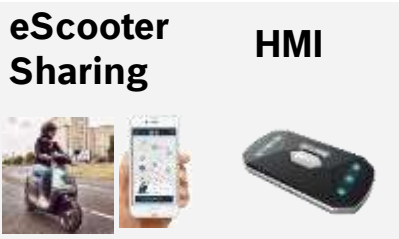
Tata Power Delhi Distribution and Russian Federal Test Centre sign MOU for developing smart grid technologies

845 Megawatt capacity solar power plants installed across India: NTPC

Mindset change: Decisive decision making on policies and implementation. OEMs / Suppliers have started investing

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Bosch Solutions for Electrification



Solutions ranging from 48V Hybrids to high voltage electric for all performance / vehicle classes



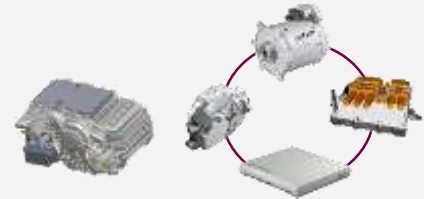
Re-generative braking systems PC



Thermal Management Solutions



System integration



48V and higher hybrid Solutions



A modular product and services portfolio covering the entire ecosystem of electrification

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Summary

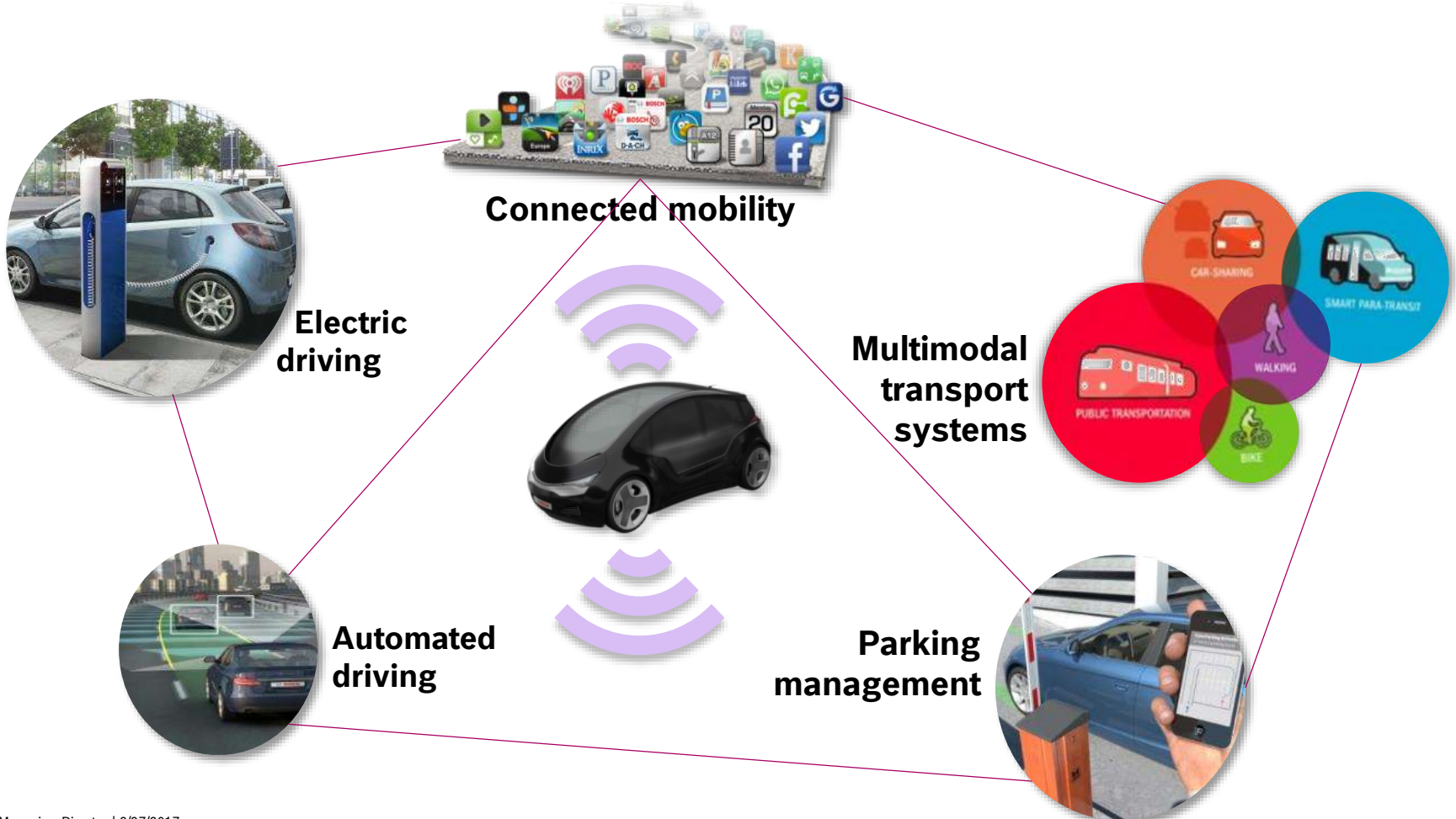
- ▶ **Disruptive technology change ahead**
- ▶ **All elements of value chain are effected**
- ▶ **Speed of change calls for demand for System Solution Providers**
- ▶ **Bosch**
 - ▶ one of the leading automotive suppliers and
 - ▶ strong local footprint in India **is in pole Position**

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Future mobility centered around connectivity



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Open for Discussion....

Robert Bosch
1861-1942

Founding Father of the Bosch Group

The 7 Bosch Values

- Future and Result Focus
- Fairness
- Openness and Trust
- Reliability, credibility and legality
- Responsibility
- Cultural Diversity
- Initiative and determination