ECMA 17TH FLAGSHIP CONFERENCE — ECT 2026

SESSION 04: TWO-WHEELED VEHICLES | KEYNOTE ADDRESS

Two-Wheelers and India's Clean Air Agenda

Emission Journey, Technology Performance, Gaps, and the Road to Clean Urban Mobility

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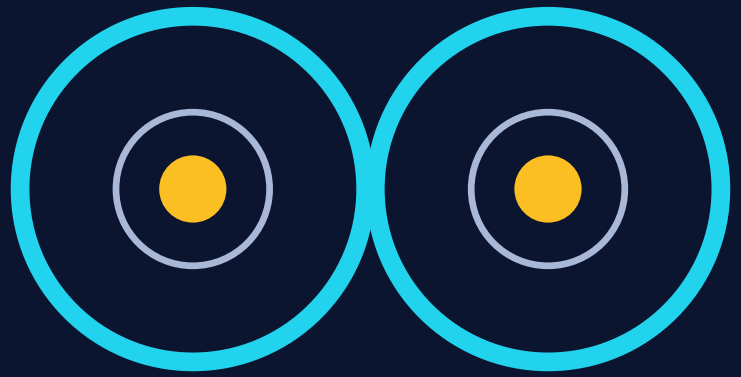

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KEYNOTE SCOPE & STRUCTURE

What This Keynote Covers

01 Scale & Air Quality Impact

World's largest 2W fleet, outsized urban pollution

02 Emission Standards

1991 to BS6 Phase 2: limits, cycles, technology

03 OEM Performance

Technology adoption, compliance record, in-use gaps

04 Gaps & Challenges

Ageing fleet, evaporative emissions, PM, PUCC

05 BS7 Horizon

What a 2W-specific BS7 architecture must demand

06 Future Opportunities

E2W transition, advanced aftertreatment, flex-fuel

310M+ Two-Wheelers Demand Attention

310M+
2W on Indian roads; world's largest fleet

21M+
sold in FY2024-25 (~77% of all vehicles)

>35%
of urban HC emissions from pre-BS6 2W

40–50%
of NCR-registered 2W are BS4 or older

DELHI NCR AIR QUALITY – 25-35% PM2.5 & SEC. 2W CONTRIBUTE DISPROPORTIONATELY.

- Overwhelming 2W fleet dominance generates massive cumulative pollution footprint in urban areas.
- Challenge of tight spatial constraints and low price points of 2W that prevent packaging of bulky, expensive aftertreatment hardware like multi-stage catalytic converters used in cars.
- 2W short, erratic trips prevent small exhaust systems from maintaining optimal operating temperatures, leading to frequent tailpipe emission spikes. New 2W under current standards can emit more than a compliant petrol car as it emits cleaner per kilometer compared to 2Ws.
- More cost effective innovation is needed under BS7 that will have to address the remaining gaps. The ultimate solution is transition to zero emissions electric 2Ws.

35 Years of Tightening the Screw

1991	2000	2001	2005	2010	2020	2023	2026
Pre-BS	**BS1**	**BS2**	**BS3**	**BS4**	**BS6 Ph 1**	**BS6 Ph 2**	**BS7 draft**
First CO/HC limits; carburettors	India 2000; closed-loop carburettor	Metro rollout; HC+NOx limit	13 metros; 3-way catalyst	OBD-I; evap control; national by 2017	EFI on all 2W; OBD-II; 10 ppm fuel	RDE: real-driving conformity factors	PN limits, OBM, tighter RDE

Next: BS7. PN limits, on-board monitoring and tighter RDE; a 2W-specific architecture is still being debated

Each Standard Mandated a Technology Leap

1991–1999

Pre-BS Era

- Carburettors, no aftertreatment
- 2-stroke dominates small-cc

2000–2004

BS1: India 2000

- Closed-loop carburettor tuning
- 3-way catalyst on premium 4-stroke

2005–2016

BS2 & BS3

- TWC mandatory; EFI on 125cc+
- 150 → 50 ppm fuel; 2-stroke disappears

2017–2019

BS4: OBD Era

- OBD-I plus evaporative controls
- NOx limit introduced (0.10 g/km)

2020–2022

BS6 Phase 1: EFI Era

- EFI on all 2W; 10 ppm fuel
- OBD-II; advanced Pd-Rh TWC

2023–Present

BS6 Phase 2: RDE Era

- RDE conformity factors
- GPF and OBM pilots under way

BS6: A Genuine Inflection Point

Completed in 4 years: one of the fastest standard upgrades by a major economy

80%

NOx reduction, BS4 → BS6 (0.10 → 0.06 g/km + real-world CF)

97%

CO reduction over 35 years (1991 norms → BS6, 4-stroke)

10 ppm

fuel sulphur, down from 150 ppm in BS3 era; enables TWC longevity

100%

EFI on all new 2W sold in India since Apr 2020

4 yrs

BS4 → BS6: unprecedented pace for a 310M-vehicle country

OBD-II

on all 2W: the foundation for OBM / BS7

What BS6 Has Not Solved

1 In-Use vs. Type Approval

Real-world emissions are above limits

PUCC tests at idle, missing most real-world NOx and HC

2 Evaporative Emissions

Under-regulated source of urban VOCs

A canister degraded at 5 years emits as if none were fitted

3 No PN Limits for Most 2W

BS6 limits PM mass only (4.5 mg/km)

PN10 not mandatory; GPFs exist but are not required

4 The Ageing Fleet

>40% of 2W are pre-BS4; no scrappage programme

On-road fleet lags new standards by 12–15 years

Gaps: Key gaps between certification and sustained clean-air performance

01 Certification vs Real-World Emissions 2W

- Does the vehicle remain equally clean on the road as it is during certification?

02 New Vehicle Vs In-Use Vehicle Performance 2W

- Certification demonstrates compliance at defined stages, but clean-air benefit ultimately depends on emissions over useful vehicle life.

03 Evaporative Emissions Temperature Profile for Diurnal Test

- Current Temp. profile up to 35 °C looks unreal when we see actual temperature in summer. Where peak temperature goes up to 50 °C

04 Beyond Tailpipe Emissions

- Future clean air regulation needs a whole-vehicle perspective, rather than looking only at exhaust.
- Existing material identifies brake/tyre wear and other non-exhaust emissions for further evaluation.

Expectations from BS-VII (L-Category)

- Deliberation on strict BS-VII Emissions Norms.
- Aggressive target of emission reduction (may be up to 50% or more) will ensure better & prolonged future of ICE based vehicles
- Phased approach can be adopted
- Introduction of new test requirements to be enforced such as RDE, ISC, Brake & Tyre Emissions. Other non-exhaust emissions.

From the Regulator's Chair

- **PUCC regime reform**
  Move from idle CO test to a full emissions assessment
- **Expert Committee (Prof Jhunjhunwala)**
  2W standards, PUCC efficacy, E2W roadmap
- **EV Policies in Delhi NCR / e-mobility directions**
  2W phase-out mandates/timelines, subsidies, charging
- **ITMS deployment**
  Cut 2W congestion and cold-start emissions
- **No PUCC- No Fuel enforcement in Delhi NCR**
  500 ANPR Cameras, Visibly polluting older 2W penalised

KEY CAQM INSIGHT

Type-approval vs. on-road emissions across 310M 2W is the largest under-addressed gap in vehicular air quality.

BS7: Draft - Effective Apr 2029 (Cars) & 2035 CVs

MoRTH draft expected imminently; final consultations underway (Sept 2026)

Oct–Dec 2026	2027 Q1–Q2	Apr 2028	Apr 2030	2032–35
MoRTH draft notification	**SCoE / AISC deliberations**	**BS7 for new type approvals**	**BS7 for all new registrations**	**ISC data and enforcement**
Open for public comment; first sight of 2W-specific rules	ECMA, OEM and supplier inputs consolidated; final rules framed	OEM start-of-production for compliant models	Expected; ISC baseline established	First OBM enforcement actions; fleet turnover visible

E2W Is Surging; ICE Remains Through 2035

1.9M
E2W sold FY2024-25 (~9% of 2W market)

5M+
E2W/year target by 2030 (NITI Aayog)

₹10,900
PM e-Drive subsidy per E2W (2024-25)

Zero
tailpipe PM, NOx and HC

Policy

CAQM direction 94 and Delhi EV Policy target (Apr. 28) new 2Ws and also replacement in fleets and delivery (for Agg./DSP and eCOM)

Batteries & charging

LFP vs NMC for 45°C heat; swappable packs; 12,000 → 75,000+ chargers by 2030

Life-cycle view

Grid is ~60% coal: assess well-to-wheel; advantage grows toward 50% RE by 2030

The transition

>200M ICE 2W through 2035: aftertreatment is essential, not optional

POLICY & INDUSTRY RECOMMENDATIONS

Eight Actions for a Cleaner 2W Future

1. **Design BS7 specifically for 2W**
   Own standard: PN, tighter RDE CF, OBM, ISC
2. **Fix the PUCC system urgently**
   Replace idle CO test; digital PUCC linked to Vahan
3. **Mandate PN10 / GPF under BS7**
   PN limits for all 2W; Indian suppliers are ready
4. **Address the legacy fleet**
   Scrappage incentive linked to EV or BS6+ ICE purchase
5. **Strengthen evap enforcement**
   Canister durability testing; evap included in OBM
6. **Build an Indian RDE database**
   ARAI / ICAT / NATiO programme; mini-PEMS to set CFs
7. **Accelerate E2W with the grid**
   One life-cycle framework: PM e-Drive, FAME-III, RE
8. **Align BRSR with 2W emissions**
   Fleet operators disclose per-vehicle emission metrics

CLOSING THOUGHT

From Emission Control to Clean Mobility

1. **310 million two-wheelers** moved from BS4 to BS6 in four years, thanks to the people in this room.
2. **The work is not done:** a pre-BS4 fleet, idle-only PUCC, unmonitored evap emissions, uncounted particles. BS7 must get 2W right.
3. **Air quality first:** an immediate priority, as in most advanced countries, ahead of longer-term CO_2 and net-zero goals.

The citizen breathing Delhi's air in 2030 will breathe better or worse depending on decisions made in rooms like this one.

Thank you, and I look forward to the discussion.

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