

Small Engines Future: IC or Electric

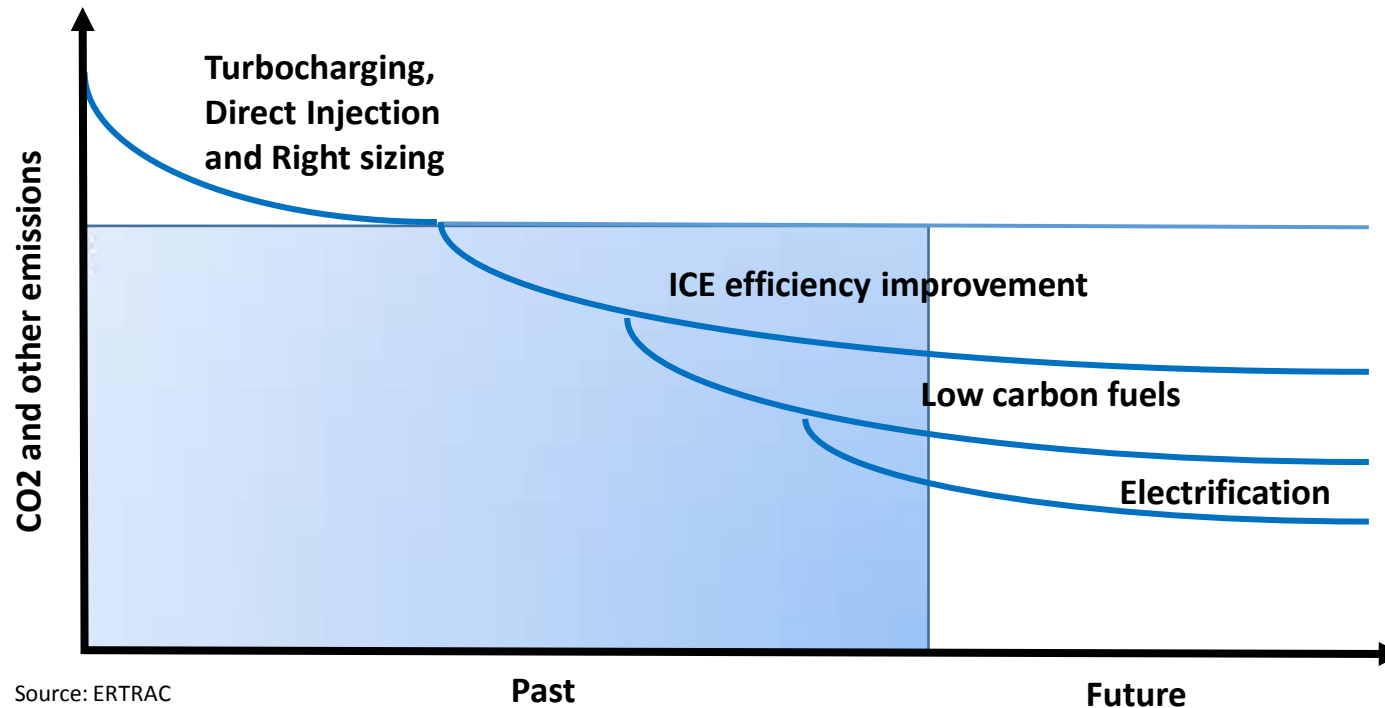
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Challenges for Small IC engines in India

- Environmental pollution and Green House Gases
- Energy security for the nation – oil import
- Electrification
 - Government “threats” to ban small IC engine vehicles
 - Last mile commute vehicles are seen as most amenable to electrification

Powertrain Technology & Emission reduction



USA,
Europe, Japan



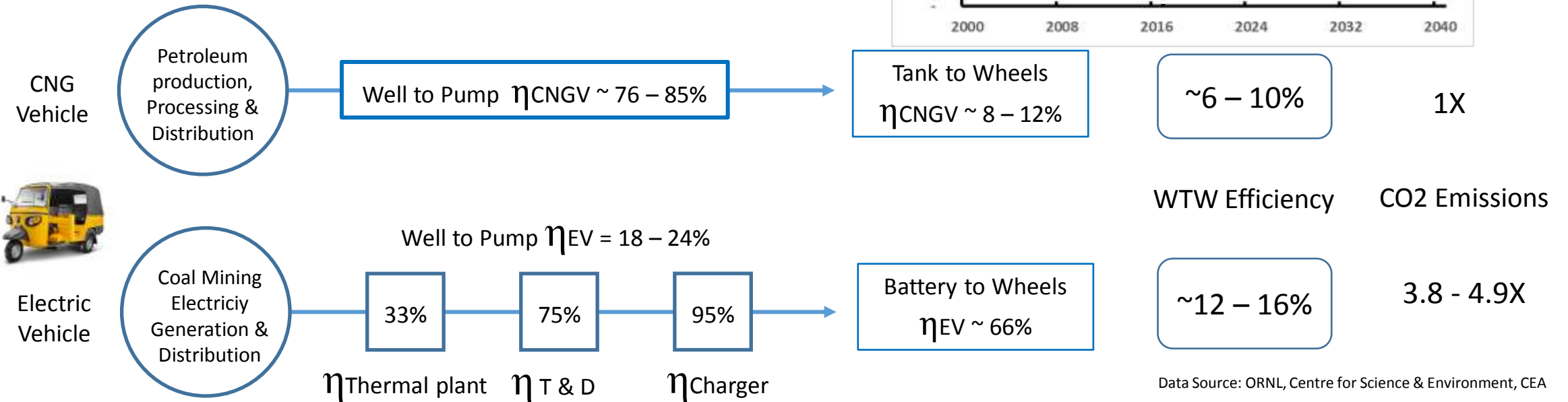
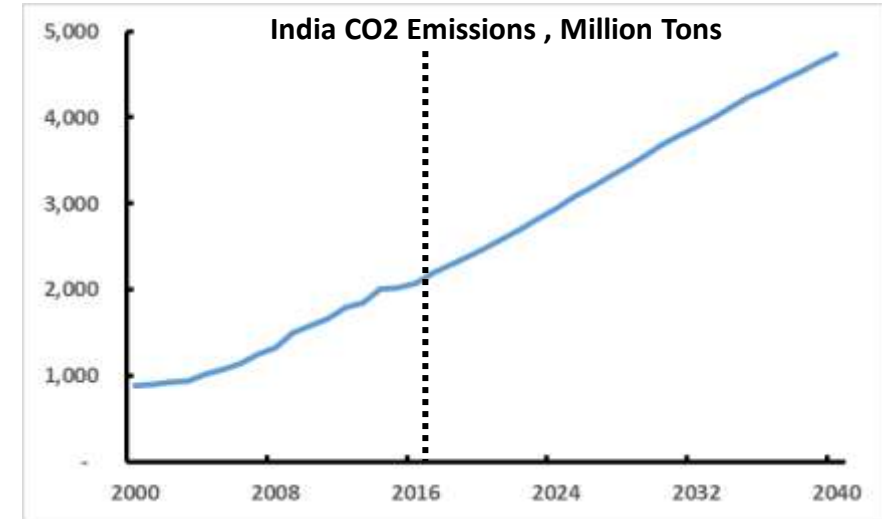
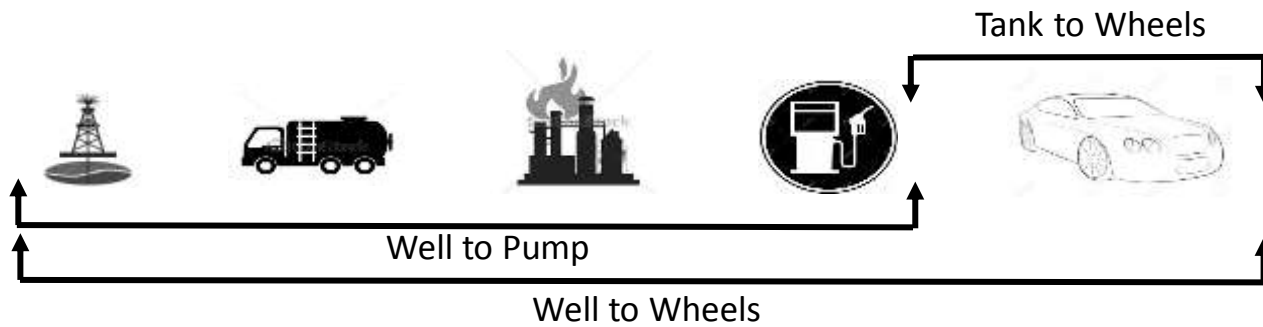
India,
ASEAN



- Powertrain technologies and electronics have helped reduce CO2 emissions
- Use of low carbon fuels in the energy mix is the next step before electrification in Small Engine vehicles

Efficient and Clean ICE technologies in a low carbon fuel energy mix is today's best choice

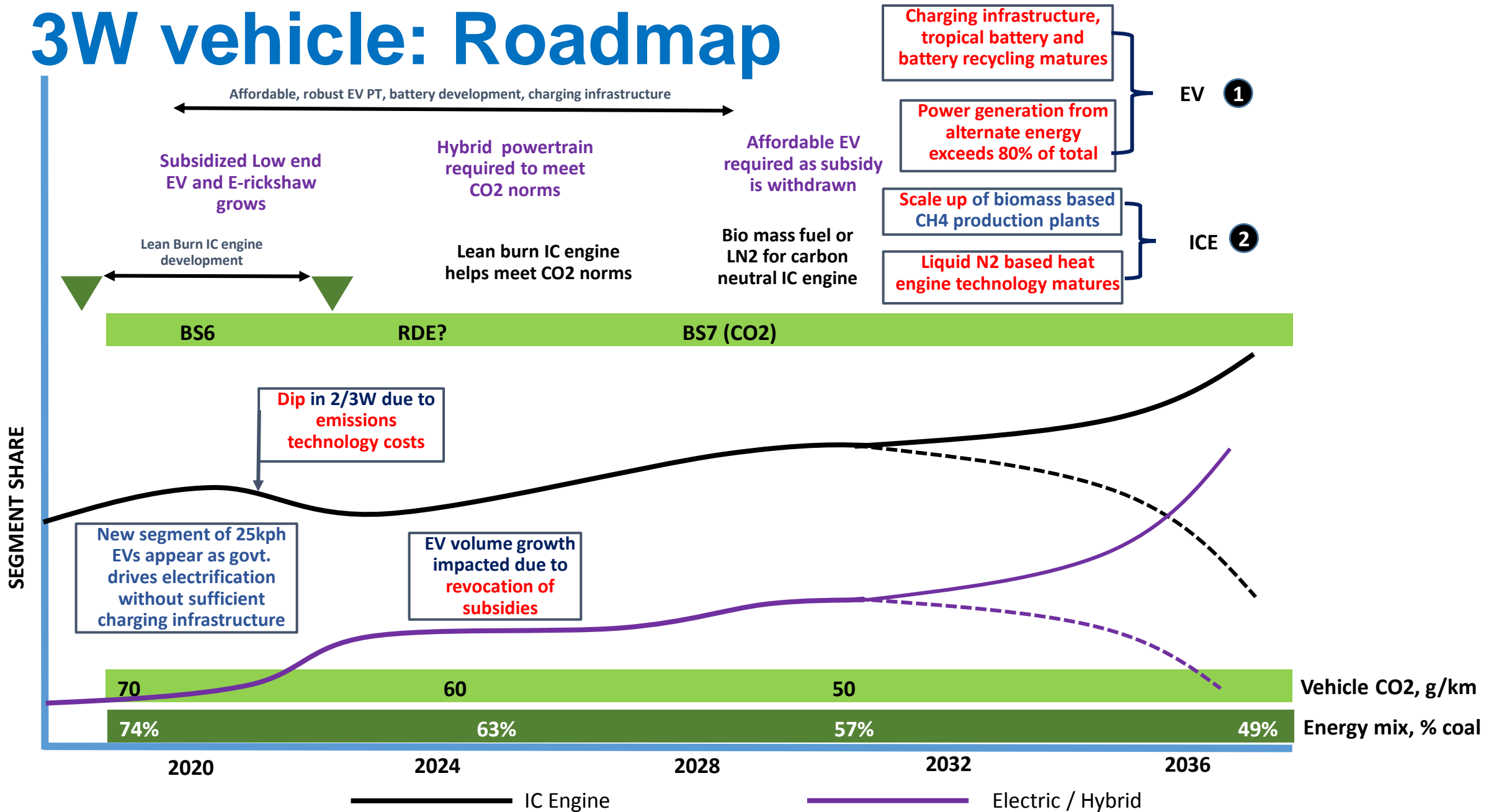
Well to Wheels Data: India Coal Scenario for 3W



Data Source: ORNL, Centre for Science & Environment, CEA

Electrification in India today not energy efficient & will produce more GHG

3W vehicle: Roadmap



Summary

- Powertrain technologies for transportation and power will be driven by India's energy mix and investment capacities of various industries
 - Energy mix in India do not favour mass electrification for the next two decades
 - Electrification will not reduce India's import bill
 - Investments required for electrification by 2030 is beyond the investment capacity of the industry
- Efficient IC engine Technologies in a low carbon energy mix are today's best choice
 - Cheaper to invest in clean and efficient powertrains today to reduce pollution
 - Reduces the import bill and provides energy security
 - Bio mass based fuels are a viable alternative to EVs in the long run