

Technology Opportunities Using E100 for CO2 Benefit

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Overview

- Introduction
 - Brazilian Legislation
 - Fuels in Brazil: Particularities

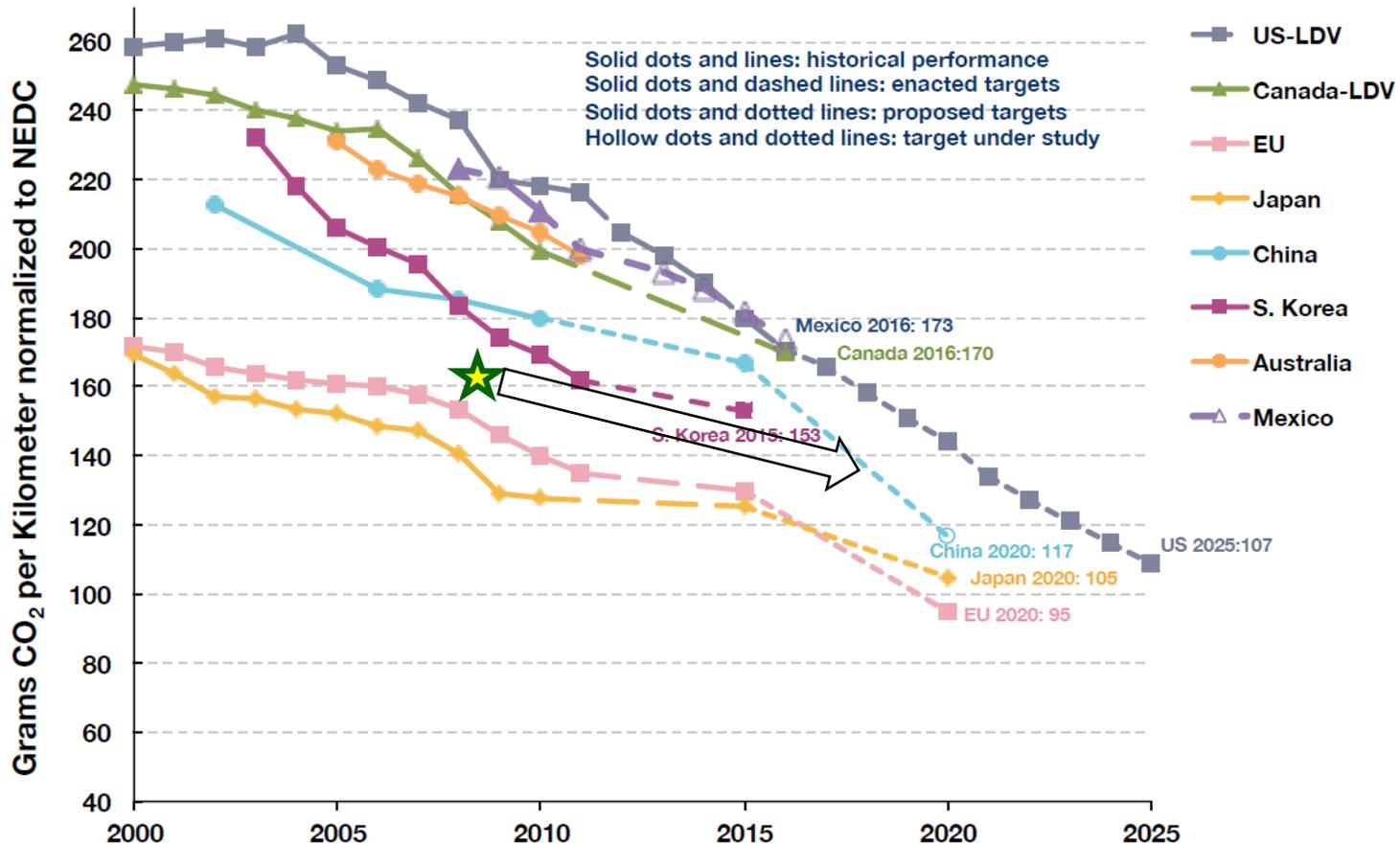
- Technology road map

- Time to market

- Main Conclusions

Introduction – Brazilian Legislations

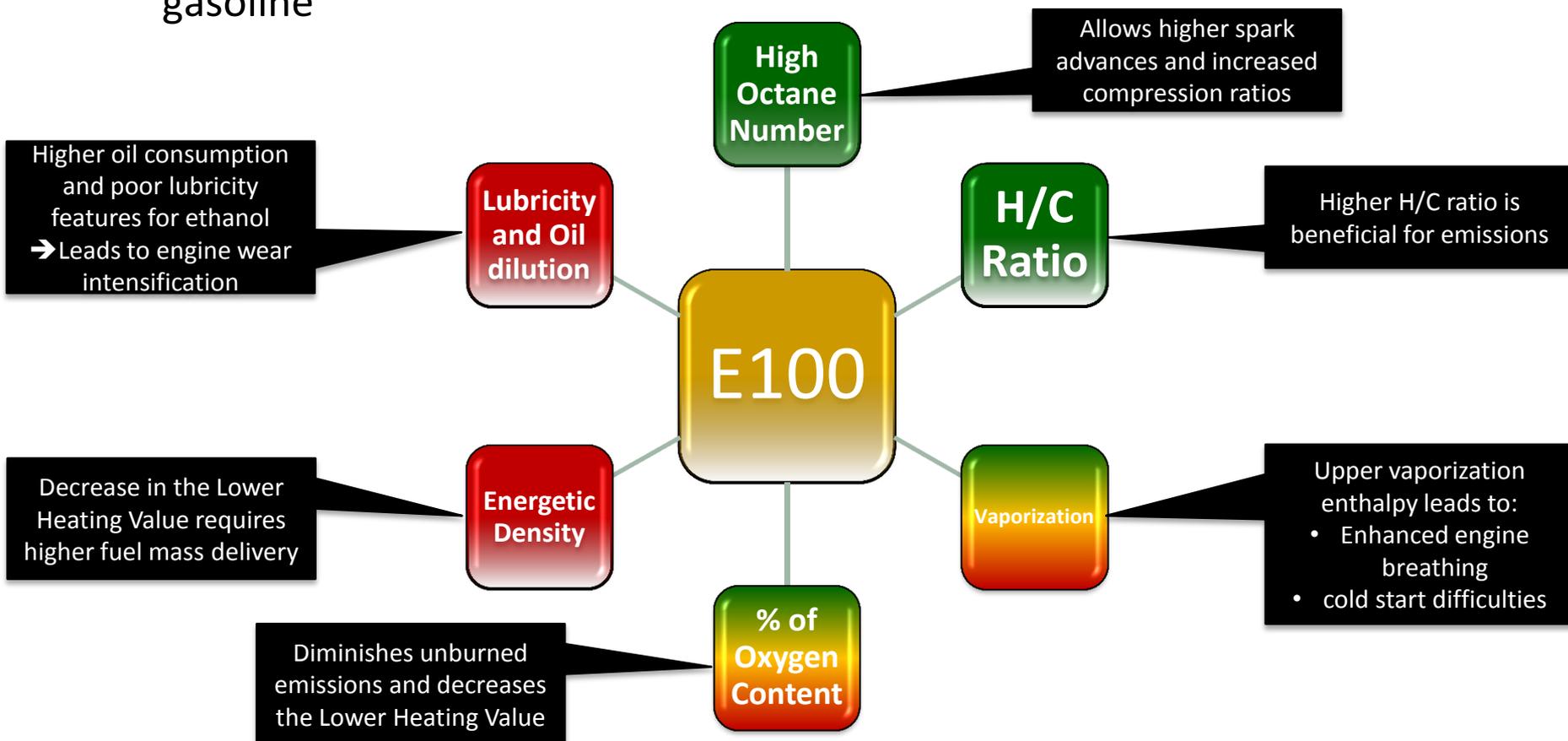
- Brazilian future emission legislation will enforce a decay on CAFE
 - **InovarAuto**: decree-law that imposes new limits



SOURCE: “Global Comparison of Light-Duty Vehicle Fuel Economy/GHG Emissions Standards” ICCT – The International Council on Clean Transportation – agosto/2011

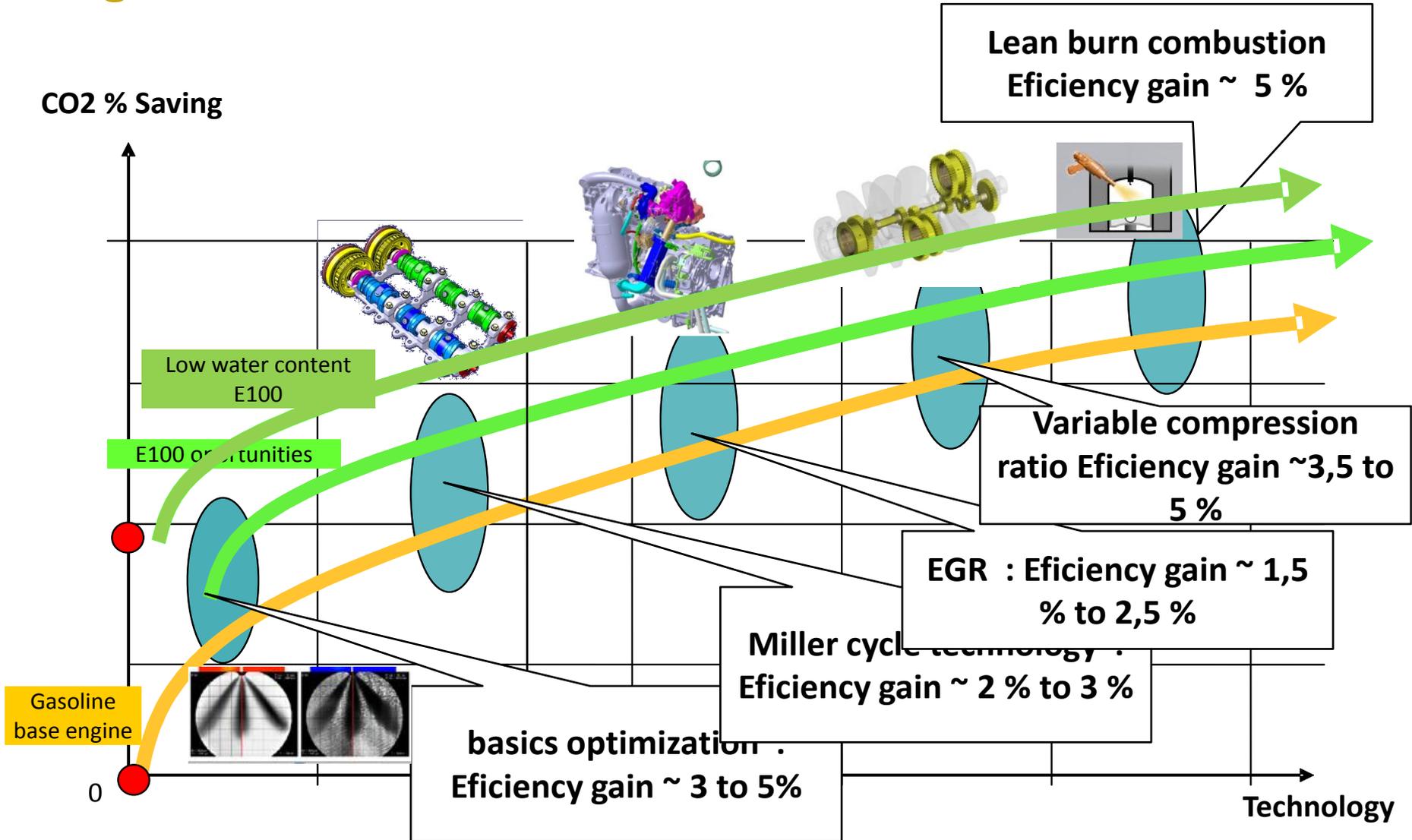
Introduction – Fuel Particularities

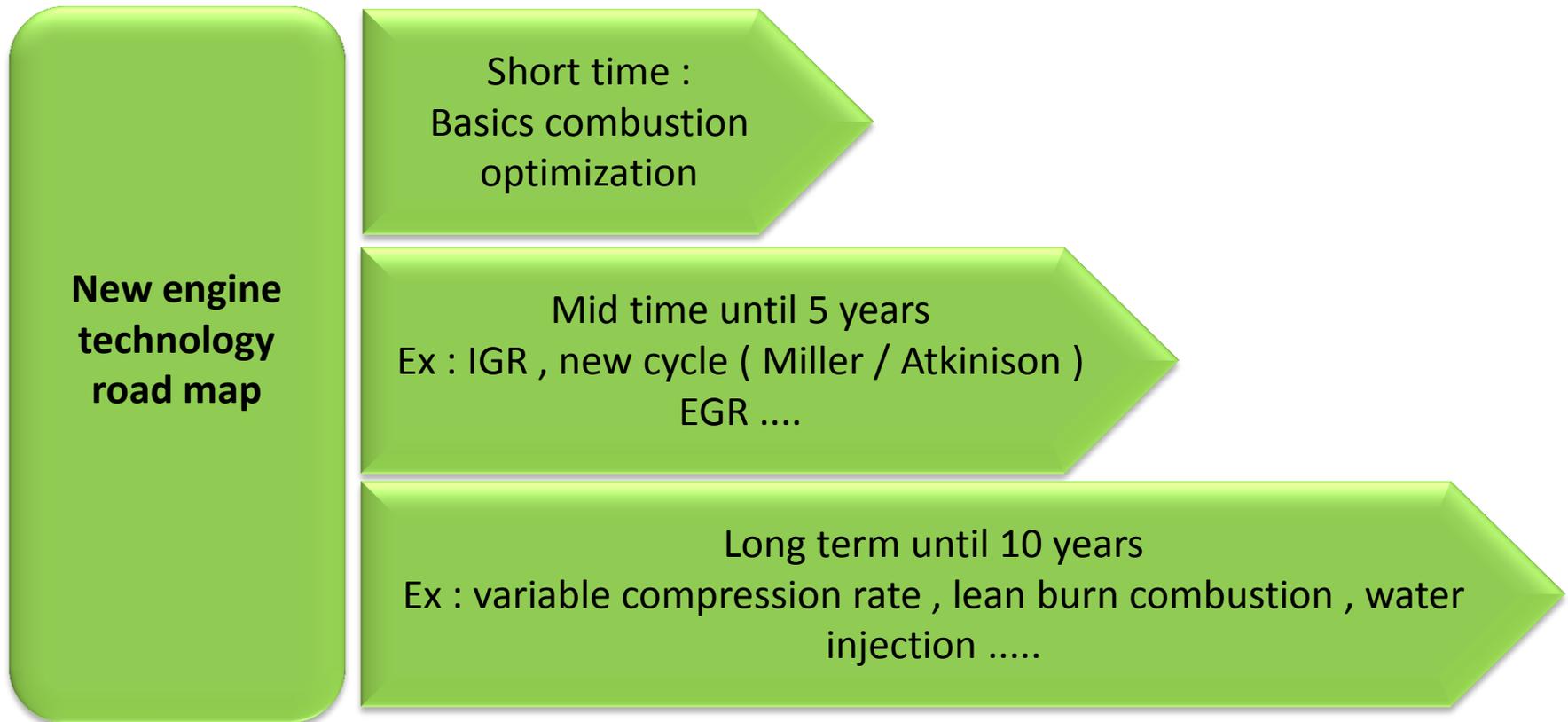
- Brazilian market requires Flex Fuel engine operation
 - The engine should work properly with mixtures between E22 and E100
 - Ethanol has several different properties in comparison with regular pure gasoline



Technology Optimization roadmap for internal combustion engines and additional CO2 benefit by using E100 Fuel

2010





Main Conclusions

- Has to get a good state of the art with E100 fuel
 - Understand physical and chemical phenomena concerned
 - To enhance remarkable properties for combustion

- E100 specific features can bring significant additional CO2 benefit to gasoline engine technology as :
 - Miller cycle
 - EGR
 - Variable compression ratio
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- Low water content ethanol introduction can be an additional opportunity for fuel consumption reduction .