

# Technology Innovation to Meet EU and US CO<sub>2</sub> and Fuel Economy Regulations

技术革新: 应对欧盟和美国关于车辆 CO<sub>2</sub> 排 放和燃油经济性的法规

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福特汽车公司 亚太区 可持续发展,环境和安全工程总监

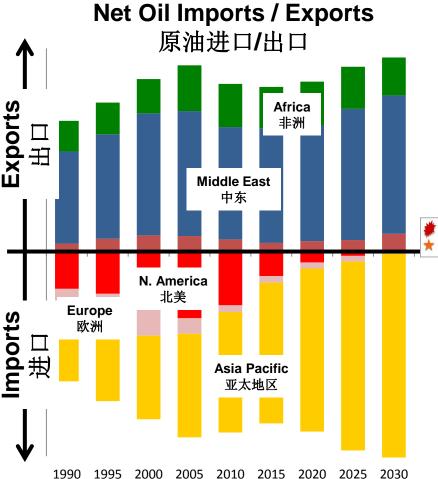
International Workshop on Technology and Policy Solutions for Energy Efficient and Low Carbon Light-duty Vehicles

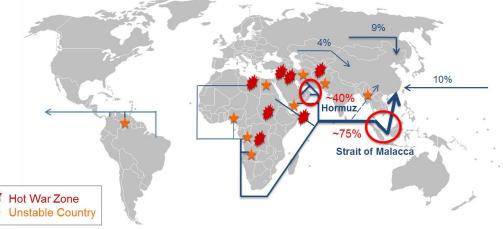
Beijing, China – June 4-5, 2014



#### **Energy Security Challenge in Asia Pacific**

亚太地区面临的能源安全挑战





Asia-Pacific is a Large Net-Importer of Oil,
Much of Which Comes from Unstable
Regions of the World
亚大地区对进口原油依赖程度高。

亚太地区对进口原油依赖程度高, 大量进口原油来自于政治环境不稳定地区





#### **Global Trends Driving Transportation System Changes**

### 全球发展趋势导致世界交通体系的改变

Expanding Volumes, Urbanization and City Growth

人口数量增加,城镇化发展和城市数量的增加

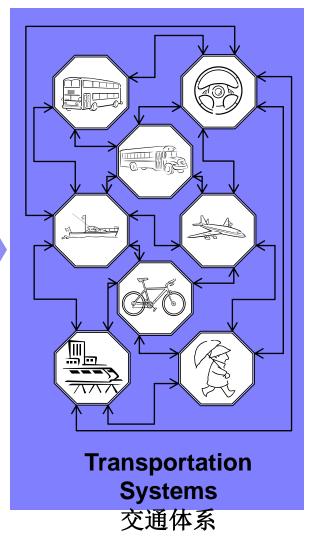
Increasing Mobility
Diversification
出行方式的多样化选择

Customer Demands for Efficiency 乘客需要更高效的交通方式

Volatile Energy Supplies 不稳定的能源供给



Drivers for Change 引发变革





#### Ford's Global Technology Migration Plan

福特汽车公司在全球推行的技术整合计划



2007 **IN PLACE**  2011

**NEAR TERM** 

2015 **MID TERM** 

2020 **LONG TERM** 

2035

Fundamental Technologies in Place

- Significant number of vehicles with EcoBoost engines
- ✓ Diesel use as market demands
- √ Battery management systems begin global migration
- Aero improvements
- ✓ Dual clutch and 6 speed automatic transmissions replace 4 & 5 speeds
- ✓ Increased unibody applications
- √ Introduction of additional small vehicles
- √ Stop/Start systems (micro) hybrids) introduced
- ✓ Add Hybrid applications
- ✓ Flex Fuel Vehicles
- ✓ CNG Prep Engines available where select markets demand

Fully Implement **Fundamental** Technologies: Introduce Significant Weight Savings

- EcoBoost engines available in nearly all vehicles: engine displacement reduction aligned with vehicle weight savings
- Electric power steering High volume
- ✓ Additional Aero improvements
- ✓ Six speed automatic transmissions - High volume
- Introduce substantial weight reduction: 250 - 750 lbs
- √ Increased application of Stop/Start
- √ Increased use of Hybrid **Technologies**
- ✓ Introduction of PHEV and BEV
- √ Vehicle and powertrain capability to leverage available renewable fuels
- Develop fuel cell stack technology

Intro 2<sup>nd</sup> Gen EcoBoost and **Advanced Tech Diesel** 

**Expand Weight** 

Savings, Hybrids and

Plug-ins

- Efficient HVAC for Hybrid/Plugin/All-Electric vehicles
- High volume 6+ speed automatic transmissions
- Continued weight reduction actions via advanced materials
- Volume expansion of Hybrid and PHEV technologies
- Evolve All-Electric and Plug-in vehicle ecosystem
- Optimize engines/vehicles for higher octane/alt fuels
- Continue to develop/pilot fuel cell vehicles

2<sup>nd</sup> Gen EcoBoost and Adv Tech Diesel high volume

Leverage Hybrids

and Introduce

Alternative Energy

Sources

Continued efficiencies in electrical architecture and

intelligent energy management

- Lightweight materials models proliferate to global platforms
- Next gen Hybrid and Plug-in technologies
- Continued leverage of All -Electric vehicles
- Engines capable of operating on fuels with increased renewable hydrocarbons
- Fuel cells implementation timing aligned with fuels and infrastructure availability

To Significantly Address Key Issues, Transportation Solutions Must Be Implemented at Large-Scale and Thus Must Be Affordable and Cost-Effective 必须大力推行低成本, 高效率的交通革新方案





# Auto Industry 汽车行业

Advanced Technology Engines: EcoBoost

采用先进技术的发动机: EcoBoost

Produced over 2 million EcoBoost engines globally
 全球产量超过 2 百万台

Produced in Chongqing – available in 8 vehicles in China
 在中国重庆建有生产基地,目前国内销售的8款福特品牌车辆配备

• Electrification: HEVs, PHEVs, BEVs电动车辆: 混合动力车辆, PHEVs, BEVs

Weight Reductions and Improved Aerodynamics车身轻量化设计和优化的风阻设计

• Improved Combustion and Aftertreatment Systems 高效的发动机燃烧和后处理

系统





Automakers are Introducing a Range of Technologies to Improve Efficiency and Reduce Exhaust Emissions

全球汽车制造商们开发大量新技术以提高能源使用效率,并降低车辆尾气排放



#### Fuel Industry 燃油行业

 Air quality is not improved solely on restricting emissions standards – fuel quality plays a key role in air quality improvements

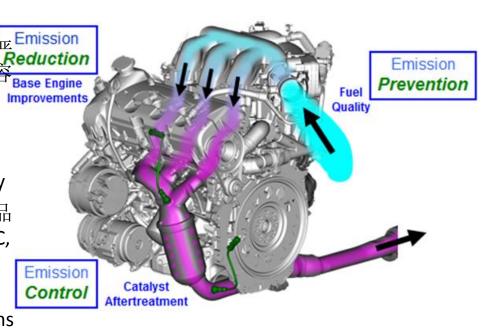
空气质量的改善不能只寄希望于采用愈加严 苛的排放技术法规 – 车用燃油的品质也不容 忽视

 Reductions in NOx, HC, CO, CO2, etc. are achieved through a harmonious relationship between vehicle technologies and fuel quality

• 应该在改进车辆排放控制技术和提高燃油品质方面采取步调一致的行动以降低 NOx, HC, CO, CO2的排放.

 Vehicle emission equipment without the appropriate fuel quality can increase emissions

• 即使车辆本身采用了先进的排放控制技术,但如果车辆使用的燃油品质不佳,也会导致车辆排放水平的劣化.

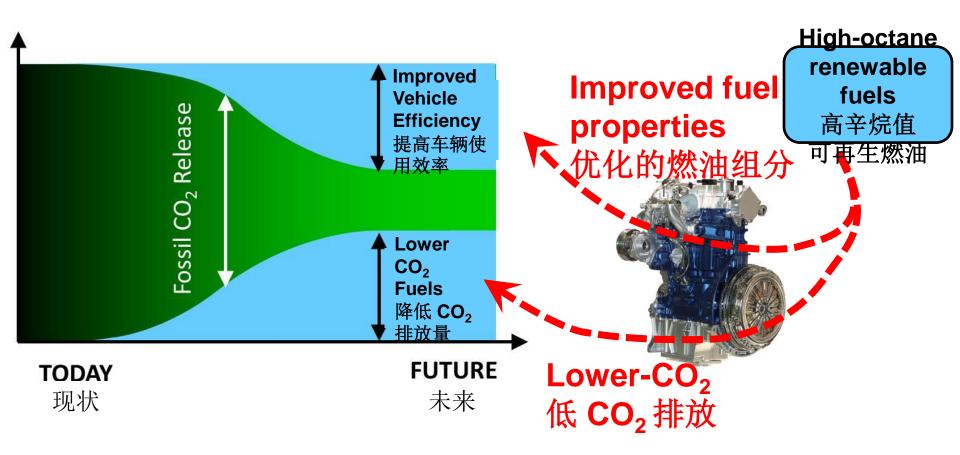


Fuel Quality Improvements Are a Key Enabler for Future Emission Control Systems and Can Result in Air Quality Benefits Across the Existing Car Parc

改善燃油品质对提高车辆排放水平至关重要,对于优化环境质量起着不可或缺的作用



## Fuel Industry 燃油行业



Fuel Properties (e.g., octane ratings) Can Also Contribute by Enabling More Efficient Engines

高品质燃油 (如高辛烷值油品) 可用于高效能的发动机以降低车辆排放



# Government 政府机构 Employment &

**Economic Electric Vehicle Impact Technology** Infrastructure 就业率 & 对经济的影 **Improvements** 电动汽车 技术进步 基础设施建设 **Fuel Consumption** Status of and Air Quality Weight **National Goals** Regulations **Reduction &** 节能目标的 降低能耗和改善环境 **Safety Impact** 实现情况 空气质量方面的法规 降低车辆重量& **Revisit Previous** 对安全性能影响 **Assumptions** Other Regulatory 对之前目标的重新评估 **Alignment Market Realities Fuel Prices** 与其他相关法规的协调性 市场情况 油价

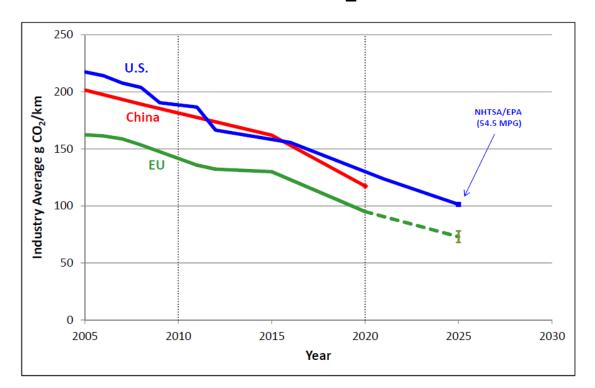
Broad Set of Considerations for Setting Fuel Consumption and Air Quality Regulations

全面考虑完善燃油经济性和环境空气质量相关法规体系





# Global Fuel Economy / CO<sub>2</sub> Standards 全球燃油经济性 / CO<sub>2</sub> 减排相关标准法规



Direct comparison of standards is not possible given differences in:

考虑到以下方面的差异,单纯对比法规技术内容没有意义:

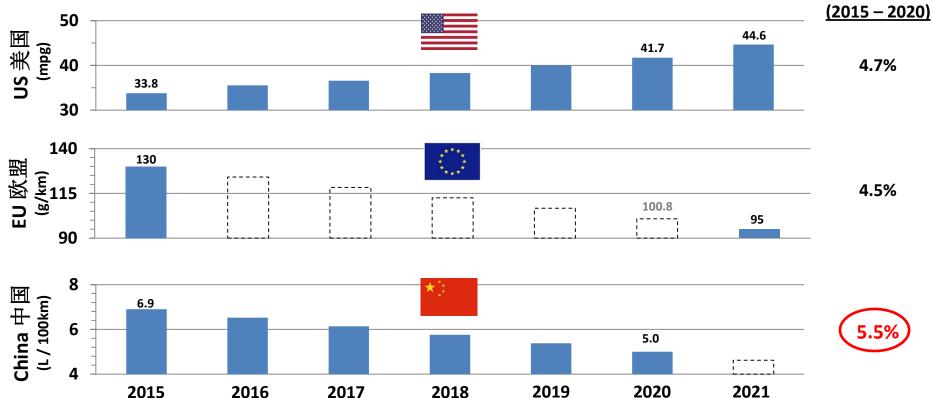
- Test Cycles 测试循环
- Procedures试验操作程序
- Fuels (Gasoline, Diesel)试验基准燃料 (汽/柴油)
- Vehicles (Cars, Trucks)试验 车辆 (轿车, 卡车)

Standards are Being Introduced Globally That Are Significantly Increasing Fuel Efficiency, Reducing CO<sub>2</sub> Emissions and Converging by Mid-2025 世界各国都致力于2025年中期之前, 引入并实施严格的标准法规以期显著提高燃油经济性并降低CO<sub>2</sub> 排放量.



# Comparison of FE / CO<sub>2</sub> Standards 燃油经济性和 CO<sub>2</sub> 减排相关标准法规比较





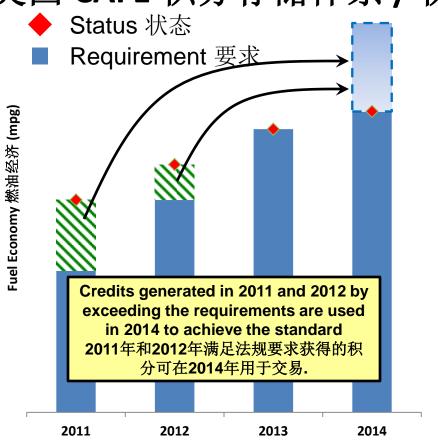
The Rate of Improvement for China Standards is Much More Aggressive than for Comparable Standards in the US or EU

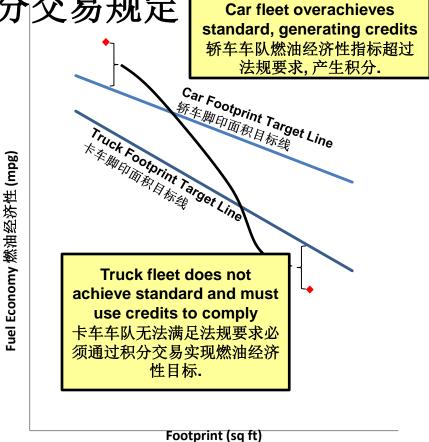
中国相关标准法规的改进程度远高于美国和欧盟的同类标准法规.



#### **US CAFE Credit Banking / Credit Transfer Provisions**

美国 CAFE 积分存储体系 / 积分交易规定





脚印面积(平方英尺)

Credit Banking / Transfer Provisions Incorporated To Allow Flexibility For Manufacturers To Manage Fleet Compliance

积分存储/积分交易制度使得车辆制造商可以采用灵活的方式,确保其车队平均燃油经济性指标满足法规要求.





#### Eco-Innovations 计划

	*3		
Definition	-Plan to add new definitions of off cycle technology to the current 4 technologies - TPMS, high-efficiency A/C, start-stop system, Gear-shifting indicator.	For new and innovative motor-vehicle and engine-technologies     Effect can not (significant) be measured with 2-cycle-test	Not (fully) measurable in the NEDC Intrinsic to the transport function Min. saving potential >1g/km Market penetration in all new passenger cars in 2009 <3%
		• Max. credits via Opt1: 6.2g/km (fleet)	• Max. credits: 7g/km (fleet)
Verification	TBD	Opt1: Predefined list of technologies and assigned CO <sub>2</sub> savings Opt2: 2-cycle-test <-> 5-cycle-test Opt3: Alternative method (approved by EPA)	Opt1: Comprehensive approach (measurement) Opt2: Simplified approach (calculation)
Application	TBD	Off-cycle credits according to predefined list are included in manufacturer's annual GHG compliance report	Application for eco-innovation technology by manufacturer or supplier  Approval by JRC/EU Commission  Publication of the accepted technology
			Homologation and CO <sub>2</sub> reduction entry in COC paper

**Eco-Innovations Are Important To Encourage Advanced Technologies That Improve Fuel Consumption** 

"Eco-Innovations" 计划鼓励开发使用有助于改善车辆燃油经济性的各种先进技术





#### **Great Products, Strong Business, Better World**





