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Interpretation of "Made in China 2025": Promoting the development of energy-saving and new energy vehicles

Central Government Portal www.gov.cn 2016-05-12 18:00 Source: Equipment Industry Department of the Ministry of Industry and Information Technology

【Font size: large, medium, small】 Print

"Made in China 2025" proposes "energy-saving and new energy vehicles" as a key development area, and clearly defines the development strategy of "continue to support the development of electric vehicles and fuel cell vehicles, master the core technologies of low- carbon, information-based, and intelligent vehicles, and enhance the engineering and industrialization capabilities of core technologies such as power batteries, drive motors, high-efficiency internal combustion engines, advanced transmissions, lightweight materials, and intelligent control, forming a complete industrial system and innovation system from key components to complete vehicles, and promoting independent brands of energy-saving and new energy vehicles to be in line with international advanced levels." This has pointed out the direction for the development of my country's energy-saving and new energy vehicle industry.

1. The automobile industry is an inevitable choice for the strategy of building a strong manufacturing country

From the perspective of manufacturing power, the automobile industry is listed as a national strategic competitive industry for its important position in the national economy and its important contribution to economic growth. The second industrial revolution represented by automobiles lasted for more than a hundred years, and manufacturing powers such as Europe, the United States, and Japan are all automobile powers. At present, with the third industrial revolution as the background, global technological innovation and economic recovery are becoming increasingly active. The automobile industry is the most comprehensive and large- scale carrier and platform for technological innovations such as digitalization, networking, intelligence, and new energy, new materials, and new equipment involved in the third industrial revolution. Therefore, it has once again become a representative industry of the industrial revolution and industrialization level.

Whether from the perspective of innovation-driven development or the sustainable and healthy development of the national economy, the automobile industry, which has a large-scale effect and industrial linkage, should be a strategic industry. The added value of China's automobile industry accounts for only 1.53% of GDP, which is a big gap from the 4% level of automobile powers. The reason is that we are at the low end of the industrial chain, manufacturing rather than creating. Therefore, strengthening the automobile industry will play a more important role in the development of the national economy. At the same time, the strong industrial linkage and driving force of the automobile industry are also a concentrated reflection of the level of technological innovation in China's manufacturing industry.

II. Major Problems and Restrictions Facing the Development of the Automobile Industry

(I) There is insufficient understanding of the important strategic position of the automobile industry in the construction of a strong manufacturing country and economic transformation and upgrading, and there is a lack of a clear, systematic and sustainable industrial development strategy and top-level design . In recent years, my country's automobile industry has developed rapidly, but the automobile industry development strategy is still unclear, and there is a lack of a systematic and complete automobile power strategy. The unsustainability of automobile industry policies has led to large fluctuations in the domestic automobile market, and the production capacity of enterprises is either difficult to adapt or idle, which has intensified the low-level competition in the domestic market and the industry is large but not strong.

(II) Key core technologies are controlled by others, and independent innovation capabilities are relatively weak. At present, my country's major automobile groups have not yet fully mastered key technologies in the fields of passenger car platform technology, engine systems, new energy batteries, etc., and have not yet formed a complete industrial system and capabilities.

(III) Lack of common technology platform and innovation system support for basic research. At present, my country has initially established an innovation system that combines government, industry, academia and research. However, due to various factors such as industrial organizational structure, enterprise scale and governance model, research on basic common technologies is still weak. In addition, there is currently no cross-industry, cross-field and cross-technology coordination and management mechanism.

(IV) The overall technical level and R&D capabilities of the traditional automobile industry are weak, and the supply chain system is incomplete, which restricts the rapid development of strategic emerging industries. Since the innovation capabilities and R&D investment intensity of my country's traditional automobile and Related industries are relatively weak, the relevant industrial chain is not yet perfect, and some key parts and components rely on foreign countries, the rapid development of energy-saving and new energy vehicles is restricted.

(V) The soft environment such as business operation model and humanities is lagging behind, and it will take time to cultivate independent brands. At present, the business model dominated by the automobile industry has not yet been determined, and the construction of the automobile cultural environment is lagging behind. At the same time, the technical level, product quality, performance and other aspects of domestic automobiles are still lagging behind the international advanced level, lacking core competitiveness.

3. Energy-saving and new energy vehicles are the only way to become a strong automobile manufacturing country

With the rapid growth of the global automobile ownership, the pressure on energy, environment and safety is increasing. From the perspective of sustainable development, the automobile industry must solve the four major automobile hazards recognized by the world: energy, pollution, safety and congestion . Low-carbon, information-based and intelligent automobiles have been considered the ultimate solution.

The United States, Japan, Europe and other countries have proposed development goals for low-carbon, electrified and intelligent automobiles, and have accelerated the transformation and change of the automobile industry in the context of the development of new-generation information technology and clean energy technology by strengthening technological innovation, cross-industry collaborative integration and other plans.

In terms of low carbonization, major automobile-developed countries have basically proposed a goal of passenger achieving car fuel consumption of 5L/100km by 2020 and around 4L/100km in 2025.

In terms of electrification, with the active promotion of governments and the efforts of major automakers, the global automotive electrification process is accelerating based on the advancement of power battery technology and cost reduction. In 2014, global electric vehicle sales reached 300,000. According to the International Energy Agency, electric vehicles will account for 30% of global car sales by 2030.

In terms of intelligence, the world's advanced countries have determined the development blueprint of the automotive industry as a digital model that integrates network-based design, manufacturing, and services. For example, Germany's Industry 4.0 clearly defines the cyber-physical fusion system of smart cars, facilities, and manufacturing services based on the Internet, and clarifies the timetable for advancing cyber-physical fusion from automotive mechatronics to smart driving. The European Union plans to form a traffic zone of integrated smart and interconnected cars by 2050, and interconnected cars will be available in 2015.

In 2014, China's automobile sales reached 24.39 million units. By the end of 2014, the number of cars in China was 145 million. In recent years, China's dependence on oil imports has been close to 60%, and the proportion of oil consumption in the transportation sector has been close to 50%, of which nearly 80% is consumed by cars. At the same time, urban road traffic conflicts are becoming increasingly prominent, and cars have become an important source of environmental pollution emissions. It can be seen that the automobile industry shoulders important responsibilities such as improving transportation, protecting the environment, and saving energy. It is urgent for China's automobile industry to develop energy-saving and new energy vehicles and achieve low-carbon, electrified, and intelligent development. From the current situation of China's automobile industry, based on the existing foundation of the automobile industry, under the promotion of national strategic emerging industries and energy-saving and emission reduction regulations, after solid progress and key breakthroughs during the "13th Five-Year Plan", it is possible to form a low-carbon, information-based, and intelligent energy-saving and new energy vehicle advantage field in the "14th Five-Year Plan".

IV. Strategic goals for promoting the development of energy-saving and new energy vehicle industries

1. Pure electric vehicles and plug-in hybrid electric vehicles

1. Significant progress has been made in industrialization. By 2020, the annual sales of pure electric and plug-in new energy vehicles of independent brands will exceed 1 million, accounting for more than 70% of the domestic market; by 2025, the annual sales of new energy vehicles in line with international advanced levels will reach 3 million, accounting for more than 80% of the domestic market.

2. Significantly improve industry competitiveness. By 2020, create star models, enter the top 10 in global sales, and export new energy buses in batches; by 2025, sales of two vehicle manufacturers will enter the top 10 in the world. Overseas sales account for 10% of total sales.

3. Supporting capacity has been significantly enhanced. By 2020, key systems such as power batteries and drive motors will reach international advanced levels, with a domestic market share of 80%; by 2025, key systems such as power batteries and drive motors will be exported in batches.

4. Gradually realize vehicle informatization and intelligence. By 2020, realize vehicle-to-vehicle and vehicle-to-facility informatization; by 2025, realize regional pilot projects for intelligent networked vehicles.

2. Fuel Cell Vehicles

1. Gradually localize key materials and components. By 2020, achieve quality control and assurance capabilities for mass production of key fuel cell materials; by 2025, achieve localization and mass supply of high-quality key materials and components.

2. The performance of fuel cell stacks and vehicles will be gradually improved. By 2020, the life of the fuel cell stack will reach 5,000 hours, the power density will exceed 2.5 kW/L, the durability of the vehicle will reach 150,000 kilometers, the driving range will be 500 kilometers, the hydrogen refueling time will be 3 minutes, and the cold start temperature will be lower than -30° C; by 2025, the reliability and economy of the fuel cell stack system will be greatly improved, and it will have certain market competitiveness compared with traditional vehicles and electric vehicles, and mass production and market promotion will be achieved.

3. The scale of fuel cell vehicle operation will be further expanded. By 2020, 1,000 fuel cell vehicles will be produced and put into demonstration operation; by 2025, the supporting infrastructure such as hydrogen production and hydrogen refueling will be basically complete, and fuel cell vehicles will be put into small-scale operation in the region.

3. Energy-saving vehicles

By 2020, the overall fuel consumption of new passenger cars (including new energy passenger cars) will be reduced to 5 liters per 100 kilometers, and by 2025, it will be reduced to about 4 liters per 100 kilometers. By 2020, the fuel consumption of new commercial vehicles will be close to the international advanced level, and by 2025, it will reach the international advanced level.

4. Intelligent Connected Vehicles

By 2020, we will master the overall technology and key technologies of intelligent assisted driving, and initially establish an independent R&D system and production supporting system for intelligent networked vehicles. By 2025, we will master the overall technology and key technologies of autonomous driving, establish a relatively complete independent R&D system, production supporting system and industrial cluster for intelligent networked vehicles, and basically complete the transformation and upgrading of the automobile industry.

V. Key areas for promoting the development of energy-saving and new energy vehicle industries

1. Pure electric vehicles and plug-in hybrid electric vehicles

A pure electric vehicle is a vehicle whose power system is mainly composed of a power battery and a drive motor, which obtains electricity from the power grid and provides electric energy to the drive motor through the power battery. A plug-in hybrid vehicle is a hybrid vehicle that can charge its energy storage device from an external power source and has a pure electric driving mode. Focusing on pure electric vehicles and plug-in hybrid vehicles, work will be carried out mainly in the following key areas:

1. Research and develop an integrated pure electric platform. Develop highly integrated electric integrated chassis product technology, highly integrated battery system, high-efficiency and highly integrated electric drive assembly, active suspension system, wire-controlled steering/brake system, integrated control system, and realize the research and application of vehicle handling stability, battery pack safety protection, and lightweight chassis system.

2. High-performance plug-in hybrid powertrain and range extender engine. Develop high-performance plug-in hybrid powertrain, carry out clutch, motor and gearbox integrated development, hybrid power system control and integrated technology development. Focus on mastering the development of new structural engines and high-efficiency and high-density generators, research the core key technologies of the integration of high-efficiency engines and generators, and form independent development and supporting capabilities for range extender systems.

3. Research and develop and industrialize the next generation of lithium-ion electric power batteries and new system power batteries, high power density, and high reliability electric drive systems, and build an independent and controllable industrial chain. Establish and improve the industrial chain of next generation lithium-ion power batteries and new system power batteries such as lithium-rich oxide cathode materials/silicon-based alloy systems, all-solid-state lithium-ion batteries, metal-air batteries, and lithium-sulfur batteries, and promote the research and development of high power density, high efficiency, lightweight, and miniaturized drive motors.

4. Build an intelligent automobile industry chain based on big data systems, and break through key technologies such as Internet of Vehicles applications, information fusion, vehicle integrated control, and information security. Establish an independent R&D system and production supporting system for intelligent networked vehicles based on big data systems, and basically complete the transformation and upgrading of the automobile industry, breaking through key technologies such as environmental perception and multi-sensor information fusion technology, information support platform and collaborative communication technology, intelligent decision-making and intelligent wire control technology, vehicle integration technology for intelligent networked vehicles, and information security technology for intelligent networked vehicles.

2. Fuel Cell Vehicles

Fuel cell vehicles refer to vehicles that use the electricity generated by the electrochemical reaction of hydrogen and oxygen in the air under the action of catalysts in fuel cells as the main power source. Focusing on fuel cell vehicles, work will be carried out mainly in the following key areas:

1. Construction of mass production capacity and quality control technology research for key materials such as fuel cell catalysts, proton exchange membranes, carbon paper, membrane electrode assemblies, and bipolar plates. Carry out research on the development and quality control technology of low-Pt catalysts, composite membranes, diffusion layers (carbon paper, carbon cloth), high-performance and tolerant proton exchange membrane materials, high-reliability and low-Pt-load membrane electrodes (MEAs), and high-performance and high-reliability metal bipolar plates for high-power density fuel cells to form mass production capabilities.

2. Research on improving the reliability and engineering level of fuel cell stack systems. Improve the antioxidant capacity of catalysts and their carriers, and the mechanical and chemical stability of proton membranes; improve the preparation process and quality control of fuel cell materials, and improve the design level of fuel cell stacks; verify the operating life of fuel cell stacks, and solve the problem of uniformity of fuel cell stacks under vehicle operating conditions; combine the dynamic operating characteristics of vehicles to match and optimize system-level operation and operating conditions; achieve system-level life verification and parameter characterization, and improve product-level life; improve the reliability of system components, and carry out system reliability analysis and design improvements.

3. Research on universal fuel cell technologies for automobiles, backup power supplies, deep-sea submersibles, etc. Carry out research on universal fuel cell technologies, achieve key technology breakthroughs in 2020, develop a new generation of metal bipolar plate stacks, and complete the construction of the entire industrial chain of commercial products in 2025.

4. Fuel cell vehicle reliability improvement and cost control technology. Carry out fuel cell engine system integration and optimization to improve the reliability of fuel cell vehicles; promote the localization of key fuel cell materials (membranes, carbon paper, catalysts, MEA, bipolar plates, etc.) and key system components (air compressors, membrane humidifiers, solenoid valves, on-board 70MPa hydrogen bottles, etc.), develop ultra-low platinum and non-platinum catalysts, reduce material costs, promote the productization and engineering of fuel cell systems, realize modularization of fuel cell system design, and improve production and manufacturing processes.

3. Energy-saving vehicles

Energy-saving vehicles refer to vehicles that use internal combustion engines as their main power system and have comprehensive fuel consumption that is better than the target value for the next stage. They mainly include advanced gasoline and diesel vehicles, alternative fuel vehicles, hybrid vehicles, etc. Focusing on energy-saving vehicles, work will be carried out in the following key areas:

1. Vehicle lightweight technology, low rolling resistance tires, and optimized body shape design. Promote the application of lightweight materials such as aluminum alloys, magnesium alloys, high-strength steel, plastics, and non-metallic composite materials, as well as lightweight body, chassis, power system, and core component design. Develop and industrialize vehicle integrated technologies such as low rolling resistance tire development technology, energy-saving, safety, and comfort performance control technology, low wind resistance vehicle development technology, and vehicle intelligent thermal management technology.

2. High-efficiency engines such as diesel high-pressure common rail, gasoline direct injection, homogeneous combustion and turbocharging will improve the efficiency of thermal energy conversion. Promote the independent development of diesel high-pressure common rail technology and promote the application of diesel engines in passenger cars. Promote the independent development and industrialization of high-efficiency gasoline engines, improve the efficiency of thermal energy conversion and reduce energy consumption. Promote the development and independent supply of high-efficiency combustion technologies such as gasoline direct injection, homogeneous fuel, exhaust gas recirculation + high compression ratio, variable valve timing (VVT), variable valve lift (VVL), exhaust gas turbocharging and mechanical supercharging technology; develop low-friction new products and new processes such as low-friction bearings, low-viscosity engine oil, laser honing; and form the development and commercialization capabilities of high-efficiency accessories such as electronic thermostats, electronic water pumps, and intelligent generators.

3. Research and optimization of commercial vehicle automatic control mechanical transmission, high-efficiency transmission, energy-saving air conditioner, start-stop technology and brake energy recovery technology. Achieve breakthroughs and localization of core technologies of dual clutch assembly, electro-hydraulic coupling hydraulic valve body, torque converter and high-pressure silent oil pump. Promote automatic control of mechanical transmission, multi-gear transmission, platformization of manual transmission, and improve transmission efficiency to keep pace with international trends. Research and optimize the development of energy-saving air conditioning technology, start-stop technology, brake energy recovery technology and components to achieve localized mass supply.

4. Intelligent Connected Vehicles

Intelligent connected vehicles are vehicles that are equipped with advanced on-board sensors, controllers, actuators and other devices, and integrate modern communication and network technologies. They have complex environment perception, intelligent decision-

making, and automated control functions, enabling information sharing and control coordination between vehicles and external nodes, achieving "zero casualties and zero congestion", and achieving safe, efficient, and energy-saving driving. Focusing on intelligent connected vehicles, work will be carried out mainly in the following key areas:

1. In-vehicle intelligent information service system based on Internet of Vehicles: Based on the existing Telmatics system, it provides a full range of information services for passengers' safe and convenient travel.

2. Networked information management system for public transportation and operating vehicles. Comprehensively upgrade and optimize the information service and management system for public transportation, taxis and various operating vehicles, provide all-round information services for professional drivers' safe, green and efficient travel, and provide systematic monitoring, dispatching and management services for operation management and traffic management departments.

3. Intelligent connected cars equipped with intelligent assisted driving systems. Including lane departure warning system, blind spot warning system, driver fatigue warning system, adaptive cruise control system and predictive emergency braking system, which can provide at least two main control functions that can operate together, such as the combination of adaptive cruise control (ACC) and lane departure warning, to reduce the burden on drivers. Reduce traffic accidents by more than 30% and reduce traffic deaths by more than 10%.

4. Intelligent connected cars equipped with autonomous driving systems. This includes autonomous driving systems on structured roads and various roads, which can perform complete safety-critical driving functions, detect road conditions throughout the entire driving process, and achieve fully autonomous driving. The maximum Safe speed of unmanned driving reaches 120km/h, and the comprehensive energy consumption is reduced by more than 10% compared with conventional cars, reducing emissions by more than 20%.

VI. Main paths to promote the development of energy-saving and new energy vehicle industries

(I) Strengthen support for the R&D and industrialization of key core technologies and components. Master the core technologies of batteries, motors, and electronic controls, increase support for the R&D and industrial chain construction of key fuel cell materials and components, and promote the development and industrialization of new generation turbocharged direct injection, hybrid power, low friction and other technologies in traditional energy power systems, form a complete energy-saving and new energy vehicle industry supporting system, promote the engineering and industrialization level of plug-in hybrid, pure electric and fuel cell vehicles, and promote the application of energy-saving products.

(II) Build a common industry technology platform, strengthen the shared application of superior technologies and the joint batch supply of general technologies and components. Give full play to the role of industrial innovation alliances, strengthen overall coordination, carry out key common technology research and development and engineering application, adopt various forms of commercial cooperation models, innovate the supply system, establish an industry-shared automotive product development database, and comprehensively improve my country's automotive industry's independent development capabilities and overall technical level.

(III) Improve the standard and regulatory system, enhance testing and evaluation capabilities, and strengthen product supervision during and after the event. Further improve the new energy vehicle access management system and automobile product announcement system, and strictly implement access conditions and certification requirements; strengthen the research and formulation of new energy vehicle safety standards, and accelerate the research and formulation of new energy vehicles and relevant standards for charging and refueling technologies and facilities; formulate phased fuel consumption target values for passenger cars, light commercial vehicles, and heavy commercial vehicles, and implement the average fuel consumption management of passenger car companies and the fuel consumption labeling system for heavy commercial vehicles.

(IV) Improve the policy guarantee system. Through tax, subsidy and other incentive policies, strengthen the scale application of hybrid power systems; promote the popularization and application of new energy vehicles; improve the charging infrastructure guarantee system and accelerate the construction of supporting systems such as hydrogen production, storage and refueling; accelerate the application of fuel cells in transportation, communications, energy, aviation, ships and other fields, and promote the coordinated development of the industry.

(V) Strengthen international cooperation and strengthen international layout. Strengthen cooperative development in new technologies, new materials, key components, etc., and strengthen international industrial layout. Actively participate in the formulation of international standards and regulations to lay the foundation for my country's energy-saving and new energy vehicles to go global.

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《中国制造2025》解读之：推动节能与新能源汽车发展

中央政府门户网站 www.gov.cn 2016-05-12 18:00 来源： 工信部装备工业司

《中国制造2025》提出“节能与新能源汽车”作为重点发展领域，明确了“继续支持电动汽车、燃料电池汽车发展，掌握汽车低碳化、信息化核心技术，提升动力电池、驱动电机、高效内燃机、先进变速器、轻量化材料、智能控制等核心技术的工程化和产业化能力，形成从关键零部件的完成工业体系和创新体系，推动自主品牌节能与新能源汽车与国际先进水平接轨。”的发展战略，为我国节能与新能源汽车产业发展指明了方

一、汽车产业是制造强国战略的必然选择

从制造强国看，汽车产业以其在国民经济中的重要地位和对经济增长的重要贡献被列为国家的战略性竞争产业。以汽车为代表的第二次工业了百余年，欧美日等制造强国也无一不是汽车强国。当前，以第三次工业革命为背景，全球技术创新与经济复苏日趋活跃，汽车产业又是第三次涉及的数字化、网络化、智能化以及新能源、新材料、新装备等技术创新最全面、大规模的载体与平台，因此再次成为工业革命和工业化水平的业。

无论是从创新驱动发展，还是国民经济的可持续健康发展，具有大规模效应与产业关联带动作用的汽车产业都应是战略必争产业。中国汽车值占GDP的比重仅为1.53%，与汽车强国4%的水平存在较大差距，其原因就是我们在产业链的低端，是制造而非创造，因此汽车工业做强将为国民发挥更重要的作用。同时，汽车工业极强的产业关联与带动性，也是中国制造业技术创新水平的集中体现。

二、汽车产业发展面临的主要问题与制约因素

（一）对汽车产业在制造强国建设和经济转型升级中的重要战略地位认识不足，清晰系统持续的产业发展战略和顶层设计缺失。近年来我国发展迅猛，但汽车产业发展战略依旧不清晰，缺乏系统完整的汽车强国战略。汽车产业政策的不持续性，导致国内汽车市场波动大，企业产能要应，要么出现闲置，加剧了国内市场的低水平竞争，产业大而不强。

（二）关键核心技术受制于人，自主创新能力偏弱。目前，我国主要汽车集团在乘用车平台技术、发动机系统、新能源电池等领域仍未完全技术，尚未形成完整工业体系及能力。

（三）缺乏基础研究共性技术平台与创新体系支撑。目前，我国初步建立官产学研相结合的创新体系，但是由于产业组织结构、企业规模及等多种因素制约，对基础共性技术的研究仍偏弱，另外，目前尚无跨行业、跨领域、跨技术的协调管理机制。

（四）传统汽车产业整体技术水平和研发能力薄弱，供应链体系不完整，制约战略新兴产业的快速发展。由于我国传统汽车及其相关产业的力、研发投入强度相对薄弱，相关产业链尚不完善，部分关键零部件原材料和关键元器件依赖国外，制约了节能与新能源汽车的快速发展。

（五）商业运营模式、人文等软环境发展滞后，自主品牌培育仍需时日。目前，汽车产业主导的商业模式仍未确定，汽车文化环境建设滞后产汽车技术水平、产品质量、性能等方面仍与国际先进水平存在差距，缺乏核心竞争力。

三、节能与新能源汽车是汽车制造强国的必由之路

随着全球汽车保有量的迅速增长，面临能源、环境和安全的压力日益加大。从可持续发展看，汽车产业必须解决能源、污染、安全和拥堵全四大汽车公害，低碳化、信息化与智能化汽车已被认为是最终解决方案。

美日欧等国家都已提出了汽车低碳化、电动化、智能化的发展目标，并通过加强技术创新、跨产业协同融合等规划，加快推动实现汽车产业信息技术、清洁能源技术发展大背景下的转型和变革。

在低碳化方面，主要汽车发达国家基本都提出了乘用车燃料消耗量达到2020年5L/100km，2025年4L/100km左右的目标。

在电动化方面，在各国政府的积极推动和主要汽车制造商努力下，基于动力电池技术进步和成本降低，全球汽车电动化进程不断加快。2014动汽车销量达30万辆。据国际能源机构预测，到2030年电动汽车将占世界汽车销量的30%。

在智能化方面，世界先进国家已将汽车产业的发展蓝图确定为要实现基于网络的设计、制造、服务一体化的数字模型。如，德国工业4.0清晰于互联网的智能汽车、设施及制造服务的信息物理融合系统，以及明确了从汽车机电一体化到智能驾驶信息物理融合推进时间表。欧盟计划2050体化智能和互通互联汽车的交通区，互联汽车将于2015年上市。

2014年中国汽车销量达2439万辆，截至2014年底，汽车保有量1.45亿辆。近年来，中国石油进口依存度已接近60%，交通领域石油消费占比接其中近80%被汽车消耗。同时，城市道路交通矛盾日益突出，汽车成为环境污染排放的重要来源，由此可见，汽车产业肩负改善交通、保护环境、等的重要责任，中国汽车产业发展节能与新能源汽车，实现低碳化、电动化、智能化发展刻不容缓。从中国汽车产业的现状看，依据汽车产业的础、在国家战略性新兴产业与节能减排法规的促进下，经过“十三五”期间的扎实推进与重点突破，有可能在“十四五”形成低碳化、信息化、节能与新能源汽车优势领域。

四、推动节能与新能源汽车产业发展的战略目标

（一）纯电动汽车和插电式混合动力汽车

1. 产业化取得重大进展。到2020年，自主品牌纯电动和插电式新能源汽车年销量突破100万辆，在国内市场占70%以上；到2025年，与国际先步的新能源汽车年销量300万辆，在国内市场占80%以上。

2. 产业竞争力显著提升。到2020年，打造明星车型，进入全球销量排名前10，新能源客车实现批量出口；到2025年，2家整车企业销量进入10。海外销售占总销量的10%。

3. 配套能力明显增强。到2020年，动力电池、驱动电机等关键系统达到国际先进水平，在国内市场占有率80%；到2025年，动力电池、驱动键系统实现批量出口。

4. 逐步实现车辆信息化、智能化。到2020年，实现车-车、车-设施之间信息化；到2025年，智能网联汽车实现区域试点。

（二）燃料电池汽车

1. 关键材料、零部件逐步国产化。到2020年，实现燃料电池关键材料批量化生产的质量控制和保证能力；到2025年，实现高品质关键材料、现国产化和批量供应。

2.燃料电池堆和整车性能逐步提升。到2020年，燃料电池堆寿命达到5000小时，功率密度超过2.5千瓦/升，整车耐久性到达15万公里，续驶里，加氢时间3分钟，冷启动温度低于-30℃；到2025年，燃料电池堆系统可靠性和经济性大幅提高，和传统汽车、电动汽车相比具有一定的市场实现批量生产和市场化推广。

3.燃料电池汽车运行规模进一步扩大。到2020年，生产1000辆燃料电池汽车并进行示范运行；到2025年，制氢、加氢等配套基础设施基本完电池汽车实现区域小规模运行。

（三）节能汽车

到2020年，乘用车（含新能源乘用车）新车整体油耗降至5升/100公里，2025年，降至4升/100公里左右。到2020年，商用车新车油耗接近国平，到2025年，达到国际先进水平。

（四）智能网联汽车

到2020年，掌握智能辅助驾驶总体技术及各项关键技术，初步建立智能网联汽车自主研发体系及生产配套体系。到2025年，掌握自动驾驶总各项关键技术，建立较完善的智能网联汽车自主研发体系、生产配套体系及产业群，基本完成汽车产业转型升级。

五、推动节能与新能源汽车产业发展的重点领域

（一）纯电动汽车和插电式混合动力汽车

纯电动汽车是指其动力系统主要由动力蓄电池和驱动电机组成，从电网获得电力，并通过动力蓄电池向驱动电机提供电能驱动的汽车。 插电力汽车是一种能从外部电源对其能量存储装置进行充电的混合动力汽车，具有纯电行驶模式。围绕纯电动汽车和插电式混合动力汽车，将主要在领域开展工作：

1. 研发一体化纯电动平台。开发高集成度的电动一体化底盘产品技术，高度集成电池系统、高效高集成电驱动总成、主动悬架系统、线控转系统、集成控制系统，实现整车操纵稳定性、电池组安全防护、底盘系统的轻量化的研究应用。

2. 高性能插电式混合动力总成和增程式器发动机。开发高性能插电式混合动力总成，开展离合器、电机及变速箱集成开发、混合动力系统控技术开发。重点掌握新型结构发动机、高效高密度发电机的开发，研究高效发动机与发电机的集成的核心关键技术，形成增程器系统的自主开发力。

3. 下一代锂离子电动力电池和新体系动力电池，高功率密度、高可靠性电驱动系统的研发和产业化，构建自主可控的产业链。建立和健全富物正极材料/硅基合金体系锂离子电池、全固态锂离子电池、金属空气电池、锂硫电池等下一代锂离动力电池和新体系动力电池的产业链，并推动度、高效化、轻量化、小型化的驱动电机的研发。

4. 基于大数据系统的智能化汽车产业链建设，突破车联网应用、信息融合、车辆集成控制、信息安全等关键技术。建立基于大数据系统的智车自主研发体系和生产配套体系，基本完成汽车产业转型升级突破环境感知与多传感器信息融合技术、信息支撑平台与协同通信技术、智能决策控技术、智能网联汽车的车辆集成技术、智能网联汽车信息安全技术等关键技术。

（二）燃料电池汽车

燃料电池汽车是指利用氢气和空气中的氧在催化剂作用下，在燃料电池中电化学反应产生的电能作为主要动力源的汽车。围绕燃料电池汽车在以下重点领域开展工作：

1.燃料电池催化剂、质子交换膜、碳纸、膜电极组件、双极板等关键材料批量生产能力建设和质量控制技术研究。开展高功率密度电堆用的剂、复合膜、扩散层（碳纸、碳布）、高性能及耐受性质子交换膜材料、高可靠性及低铂担量的膜电极（MEA）、高性能及高可靠性的金属双极板质量控制技术的研究，形成批量生产能力。

2.燃料电池堆系统可靠性提升和工程化水平的研究。提高催化剂及其载体的抗氧化能力，质子膜的机械和化学稳定性；改进燃料电池材料制质量控制，提高电堆设计水平；验证电堆运行寿命，解决车辆运行条件下的电堆均一性问题；结合车辆动态运行特征，对系统级运行与操作条件化；实现系统级寿命验证与参数表征，提高产品级寿命；提高系统零部件的可靠性，开展系统可靠性分析与设计改进。

3.汽车、备用电源、深海潜器等燃料电池通用化技术研究。开展燃料电池通用化技术研究，2020年，实现关键技术攻关，研发出新一代的金电堆，2025年，完成商业化产品全产业链的建设。

4.燃料电池汽车整车可靠性提升和成本控制技术。开展燃料电池发动机系统集成与优化，实现燃料电池整车可靠性提高；推动燃料电池关键（膜、炭纸、催化剂、MEA、双极板等）及系统关键部件（空压机、膜增湿器、电磁阀、车载70MPa氢瓶等）国产化，开发超低铂，非铂催化剂，成本，促进燃料电池系统产品化和工程化，实现燃料电池系统设计模块化，并改进生产制造工艺。

（三）节能汽车

节能汽车是指以内燃机为主要动力系统，综合工况燃料消耗量优于下一阶段目标值的汽车,主要涵盖先进汽柴油汽车、替代燃料汽车、混合动等。围绕节能汽车，将主要在以下重点领域开展工作：

1.整车轻量化技术、低滚阻轮胎，车身外形优化设计。推广应用铝合金、镁合金、高强度钢、塑料及非金属复合材料等整车轻量化材料和车化、底盘轻量化、动力系统、核心部件轻量化设计。形成低滚阻轮胎开发技术、节能、安全、舒适等性能控制技术、低风阻整车开发技术、整车理技术等整车集成技术的开发和产业化能力。

2.柴油机高压共轨、汽油机缸内直喷、均质燃烧和涡轮增压等高效率发动机，提高热动能量转化效率。促进柴油机高压共轨技术的自主开发油发动机在乘用车上的应用。推动高效汽油发动机的自主开发和产业化，提升热动能量转化效率，降低能耗。促进汽油机缸内直喷、均值燃料、环+高压缩比、可变气门正时（VVT）、可变气门升程（VVL）、废气涡轮增压和机械增压技术等高效燃烧技术的开发与自主供应；低摩擦轴承、低油、激光珩磨等低摩擦新产品和新工艺的开发；形成电子节温器、电子水泵、智能发电机等高效附件的开发与商品化能力。

3.商用车自动控制机械变速器、高效变速器、节能空调、起停技术和制动能量回收技术的研究优化。实现双离合器总成、电液耦合液压阀体矩器、高压静音油泵核心技术突破与国产化。促进机械变速器自动控制、变速器多档化、手动变速器平台化、提升变速器效率，与国际趋势接轨化节能空调技术、启停技术、制动能量回收技术和零部件的开发，实现国产化批量供应。

（四）智能网联汽车

智能网联汽车是指搭载先进的车载传感器、控制器、执行器等装置，并融合现代通信与网络技术，具备复杂环境感知、智能化决策、自动化能，使车辆与外部节点间实现信息共享与控制协同，实现“零伤亡、零拥堵”，达到安全、高效、节能行驶的下一代汽车。围绕智能网联汽车，以下重点领域开展工作：

1、基于车联网的车载智能信息服务系统。在现有的Telmatics系统基础上，为乘客的安全便利出行提供全方位的信息服务。

2、公交及营运车辆网联化信息管理系统。全面升级及优化公交、出租及各种运营车辆信息服务及管理系统，为专业驾驶员的安全、绿色与高供全方位信息服务，同时为营运管理与交通管理部门提供系统的监控、调度和管理服务。

3、装备智能辅助驾驶系统的智能网联汽车。包括车道偏离预警系统、盲区预警系统、驾驶员疲劳预警系统、自适应巡航控制系统及预测式紧统，能提供至少两种可共同运行的主要控制功能，如自适应巡航控制（ACC）与车道偏离预警的结合，以减轻驾驶人负担。减少交通事故30%以上通死亡人数10%以上。

4、装备自动驾驶系统的智能网联汽车。包括结构化道路下和各种道路下的自动驾驶系统，可执行完整的安全关键驾驶功能，在行驶全程中检
况，实现可完全自动驾驶。无人驾驶最高安全车速达到120km/h，综合能耗较常规汽车降低10%以上，减少排放20%以上。

六、推动节能与新能源汽车产业发展的主要路径

（一）加强对关键核心技术和零部件研发和产业化支持。掌握电池、电机、电控核心技术，加大对燃料电池关键材料和零部件的研发支持和
设，以及促进传统能源动力系统应用新一代增压直喷、混合动力、低摩擦等技术的开发和产业化，形成完整的节能与新能源汽车产业配套体系，
式混合动力、纯电动及燃料电池汽车工程化和产业化水平，促进节能产品的应用。

（二）搭建产业共性技术平台，加强优势技术的共享应用以及通用技术与部件的联合批量供应。发挥产业创新联盟的作用，加强统筹协调，
共性技术研发与工程化应用，采取多种形式的商业化合作模式，创新供应体系，建立行业共享的汽车产品开发数据库，全面提升我国汽车工业自
力和整体技术水平。

（三）完善标准法规体系，提升检测评价能力，加强产品事中事后监管。进一步完善新能源汽车准入管理制度和汽车产品公告制度，严格执
件、认证要求；加强新能源汽车安全标准的研究与制定，加快研究制定新能源汽车以及充电、加注技术和设施的相关标准；制定分阶段的乘用车
用车和重型商用车燃料消耗量目标值标准，实施乘用车企业平均燃料消耗量管理和重型商用车燃料消耗量标示制度。

（四）完善政策保障体系。通过税收、补贴等鼓励政策，加强混合动力系统的规模应用；推动新能源汽车的推广应用；完善充电基础设施保
加快制氢、储氢、加氢等配套体系建设；加快燃料电池在交通、通讯、能源、航空、船舶等领域的应用，促进产业协同发展。

（五）加强国际合作，强化国际化布局。加强在新技术、新材料、关键零部件等方面的合作开发，加强国际化产业布局。积极参与制定国际
的制定，为我国节能与新能源汽车走向国际奠定基础。

责任