

# Status of hydrogen fuel cell vehicle and its battery

## The Status of hydrogen Fuel Cell vehicles and Battery

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**Abstract:** New Energy fuel cell, It is a hydraulic, Fire and nuclear power generation, etc. Next Generation technology after, is a non-combustion direct electrochemical conversion of the chemical energy of the fuel and oxidizer into an efficient continuous power plant with electrical energy. Because the rationale for this device is the primary battery reaction without involving burning, so its energy conversion efficiency is not affected by the Carnot Loop Restrictions, theoretical efficiency is up to 90%, The actual efficiency is normal internal combustion engine 2-3 times. other, It also has fuel diversity, Low noise, Less environmental pollution, Benefits of good reliability and maintainability. Fuel cell as a new car power source, has been considered a strategic product by the world's major industrial countries.

**Keywords:** battery Car hydrogen fuel New Energy

## 1. Introduction

Current, energy shortages and air pollution are serious challenges to the world.

Energy on earth is limited, Especially oil resources are non-renewable, So oil becomes global strategic goods. With estimate, Global Energy Minerals resources are less than year years; Global oil reserves are limited to approximately +year, Energy shortages become global issues. and our oil can only support domestic consumption. year, Coal supports up to Year. to 2020 year, China motor vehicle's fuel demand will reach 2.56 million tons, supply very tight. energy shortage all humanity faces H benefits Serious and urgent issues, is a global war slight problem.

Car is one of the industries with a larger carbon footprint, and the number of cars increases every year. Press one car year average travel 1.5 million km, Total carbon emissions 4T-count, Press A small city tenure \$ million car total carbon emissions exceeded up million ton. Press per mu plantation can be absorbed 1.83 ton carbon dioxide calculation, The carbon emitted by these cars will require a 140 mu top plantation in order to carbon and. and it does not contain those emissions. Never reach GB model, a standard vehicle for hazardous emissions The amount is only for cars that are not compliant 1/7.

New Energy fuel cell, It is a hydraulic, Fire and nuclear power generation etc Next Generation of power generation technology after, is a non-combustion direct electrochemical reverse to convert the chemical energy of fuel and oxidizer into electrical energy Gao continuous hair

Electrical Appliance. because the basic principle of this device is the original battery reaction without involving the burn, so its energy conversion efficiency is not affected by the Carnot Loop Restrictions, rationale efficiency up to 90%, the actual efficiency is the normal internal combustion engine 2~3 times. other, It also has fuel diversity, low noise, low pollution, all the benefits of good sex and maintainability. fuel cell as a new generation of automotive power source, has been considered a strategic product by the world's major industrial countries.

## 2. Status of hydrogen fuel cell vehicles

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for the above reasons, Nearly all the world's car giants are currently studying the New energy car. hydrogen fuel cell vehicles are the main varieties of new energy vehicles one. The status of hydrogen fuel cell vehicles in countries is as follows:.

(1) Japan. Toyota will sell to consumers "affordable" hydrogen fuel power pool car. learned, 2015 Year sales price 5 million-dollar hydrogen fuel cell The car will be first in the US city, as the world's largest hybrid car builders, Toyota does not want to lag behind people in developing hydrogen fuel cell vehicles. revealed by the company's owner, Toyota's first hydrogen fuel cell car will be a car, continuous mileage is comparable to ordinary petrol vehicles, But production costs will be should increase. Universal is currently testing a new hydrogen fuel cell system, pre to load the system with hydrogen fuel cell car 2015 year put into production. new system only in the current Chevrolet Equinox with a hydrogen fuel cell system half, and lighter than the latter The points. because the new system has a smaller outline size,

so "Fitted in a high-end sedan, SUV Even the MU [two.

(2) Han min. Research and development of modern third-generation fuel cell vehicle technology in Korea Hyundai has on near Ira: succeeded. learned, hydrogen fuel cell vehicle with this technique winix will R·Enter test phase later this year, And in the 2015 Year implementation big gauge Lam Cattle. This path winsix with a ]00kwh fuel cell system and two storage 3 jar, driving mileage up to 650km, more than second-generation hydrogen fuel cell vapor 高 approximately 76%, and gasoline version of the road IX continue with I: [Process quite.

(3) Medium-min, The year Shanghai World Expo is the first to formally propose Low Carbon Expo "World Expo, A number of technologies used in the Expo site are winffH: bounded or idle. Exosite K has the world's largest large New Energy vapor demo run, about More new energy cars alive Expo Park | X demo run inside and outside. and 1 New Energy cars at Expo venues and Peripherals run \* This is the world's largest new energy car demo run, including net pure electric bus, Super Capacitor bus and 6 Fuel cell car demo run by bus, 140 Pure electric venues car and 1 a fuel cell sightseeing vehicle meets the public by a particular form total demand. to reduce carbon dioxide emissions 1.3 ton, make the garden | x: Public intersection Pass Implementation "Zero Emissions. public transport inside and outside the Expo site practice Low Carbon, Green, Green concept, Visitors can not only enjoy the easy and comfortable travel way, This is also a practical action to join the green action of Low-carbon travel.

China | Changan car in 2007 finished the first efficient zero emission hydrogen internal combustion engine ignition, and on 2008 year Beijing Auto Show self-developed China's hydrogen-powered concept sports car "hydrogen" h Poseidon offers vapour hydrogen fuel cell, for Shanghai World Expo Zero Emissions. ¥ • on 2008 Year Olympics, fuel cell bus driving on Beijing Street at first glance car, and where The batteries for are provided by Shanghai Supernatural technology. after Olympic Games, Those fuel cell cars are with the new energy cars of the rest of the world., on State California demo run 6 Month. the product of supernatural technology also goes to many countries in the world by the way. this time, hydrogen power fuel battery appearance, like a ruoma Ark., U: people from crisis See/Climit of Hope.

(4) US. early in 2006 year Los Angeles International Auto Show, Ford Motor Company launches new for hydrogen fuel cells Explorer, valid mileage Can be reached "" miles, Far more than the new energy for its bunker batteries for the powered car dumb. Ford displays at the Los Angeles Auto Show 7 with green ring Tech-Rich, except six Explorer outside, and a new 2008 Ford Escape hybrid car, 0 pollution-emitting Ford Fusion pzev, Ford Fox and using Ford Clean diesel Technology F Series model. with fuel cell powered Explorer models are only a (-), and this project is supported by the U.S. Department of Energy. due to oil etc no" | Renewable Resources, using new energy sources for hydrogen fuels The car year of the force will be the inevitable trend of future auto industry development, and new can the Source also has a significant reduction in the degree of environmental pollution. with these new trick the model show, the Ford Motor will increase its development in hydrogen fuel technology. pair T gas Fuel Research, and Ford with S Fuel powered Explorer at first glance, it's proving Ford's challenger to the new technology for climate change face and energy innovation efforts. at the same time Ford in the new technology should with square broken also go in the

Forefront, Package Trichosanthes Ford's Escape Hybrid car and Mercury Mariner Hybrid car, hydrogen fuel cell technology, hydrogen combustion machine technology, ethanol, Clean Diesel, improved gasoline engine, and drive improvements. Some of these technologies are currently the latest technology, This can be in the blessing is seen in. Other technologies such as hydrogen fuel cells will go with T. The continuous development of automotive technology is becoming increasingly popular with. the first vehicle to be launched by the Ford auto and The U.S. Department of Energy will be powered by a fuel cell Force Ford Explorer, The car uses advanced electric All-wheel four drive technology. hydrogen-fired 燃料 storage tank installed in original model 6 location of the speed drive, Change the volume of the storage box to larger, complete all miles complete no Problem. in less than a year, hydrogen fueled Explorer Cumulative stroke exceeds 17000 miles, where the package trichosanthes once hours to exercise 1556 for Miles I Record.

General Motors has also developed a successful use of liquid hydrogen fuel cells to generate power Zero-emission concept car "hydrogen move". Its proton exchange membrane fuel cell from 200 fuel cell unit connected to, power tokw, power to Spontaneous motor, and the current that drives the generator comes from fuel cell. motor driver system is = (phase Synchronous motor, power 60 kilowatt, torque 305 niu mi. this car Acceleration Quick, Flexible operation, from (hookr accelerates only seconds, Top speed up to | \$km, mileage km. Air Products company, Plax Company as leading liquid hydrogen supplier, Its hydrogen station is already available for hydrogen fuel pool car supply [~%MP] liquid hydrogen for. fuel cells consume liquid hydrogen, The exhaust is steam. Liquid hydrogen can be obtained in many ways, its source, Unlimited; Water vapor will never cause damage to the environment, It really stings as an excellent environmental combination. ^

Mercedes-Benz B the class fuel cell vehicle uses a new fuel cell system, has Good fuel economy, Its fuel consumption is equivalent to every hundred kilometers diesel oil consumption 3.3l. It also has a lithium ion battery pack, maximum output power is kw, Maximum Energy reserves are 1.4kwh. Mercedes-Benz B-level fuel cell vehicles maximum output power 4 up 100kw, Peak torque up to 290 niu mi. maximum speed to 170km/hours. Mercedes-Benz B maximum drive of fuel cell car 1 path to public 1, only takes three minutes to complete its hydrogen fuel. complement 完. The inside of the car's compartment also uses a series of S. leather Decoration, Dynamic Temperature control and COMAND Comfort Configuration system.

(5) German. BMW made and put into operation 6 hydrogen gas car,

It overcomes the biggest obstacles to the massive market-building of hydrogen-fueled cars. Establish cryogenic fuel Add station, let robot automatically raise ultra-low temperature liquid chlorine for hydrogen-fueled car. BMW on its 745H The is used on the car 4.4LV8 hydrogen/gasoline Double fuel engine, output power up to 135KW, Top speed 215km/Li, maximum mileage reached km. early in 2007 year Shanghai car H, BMW Company brings the most interesting BMW 7 System hydrogen Power version hydrogen 7. Open the trunk to find, in back row K 1kg heavy liquid hydrogen tank. BMW hydrogen 7 by ability to use hydrogen fuel and gasoline 191kw/260HP's 12-cylinder engine provides power, on 9.5 seconds to accelerate from zero to -public 1/hours, The GAO electronic speed limit is 230km/hours.

### 3. Basic characteristics of hydrogen

using hydrogen as a vehicle fuel this is a scary word when it comes out., but things Thereal his based on. hydrogen has high energy density, free energy full to make the car engine run, and hydrogen and oxygen in fuel cells. Learn to react only water, no pollution. so, hydrogen powered car is traditional steam One of the best alternatives to the car is. compared to traditional power cars, Force car cost at least Gao 20%.

is known to, hydrogen fuel cells drink water, Spit on energy, can say is World cleanest Energy now. Unlimited hydrogen resources, hydrogen-oxygen binding produces water and electricity, Water humid air, electric drive car, with tank I E increase of force, car hydrogen-filled travel distance up to 300400 gu. current Chinese fuel cell car only trial to second wheel sample car, foreign big Cars Company prototype car 5~6 ground, close to dry mature products.

#### 3.1 hydrogen-fueled cars are compared to traditional cars, has many unique advantages

- (1) hydrogen Power Vehicle Energy conversion efficiency upto 60~80%, is an internal combustion engine, 2 to 3 times;
- (2) Fuel cell fuel is hydrogen and oxygen, New Cheng is clean water, its own work does not produce carbon monoxide and carbon dioxide, and no sulfur and particulates discharge;
- (3) The fuel cell itself works without noise, does not vibrate, its electrodes are only as the place of chemical reaction and conductive channel, does not participate in chemical reaction, no loss, Long Life;
- (4) The first of the periodic table of hydrogen table elements, its atomic number is 1, in the regular ambient to gaseous, at ultra-low temperature to become liquid again.

### 3.2 as energy, Hydrogen has the following characteristics

- (1) all elements, hydrogen is the lightest weight. in standard state, its density is 0.0899 g/L; in the -252.7°C, to become a liquid, if the pressure is increased large to hundreds of atmospheres, liquid hydrogen can become metal hydrogen;
- (2) all gases, the best thermal conductivity of hydrogen is, it is more than most gases in heat factor 10 times, therefore oxygen is an excellent carrier for heat transfer in the energy industry;
- (3) hydrogen is the most common element in the world, it is estimated that it constitutes the 75% of the quality, excluding hydrogen from air, it is primarily a compound of the form stored in water, and water is the most extensive substance on Earth. calculated, if you extract all the hydrogen from seawater, it produces more calories than the earth. all fossil fuels on the emit a lot of heat. 9000 times. in addition to nuclear fuel hydrogen, its value is all fossil fuels, the highest in chemical fuels and biofuels, for 142351 kJ/kg, is a gas-calorific value of 3 times;
- (4) Good hydrogen combustion, light fast, has a wide range of when mixed with air, burn range, and high ignition, burn faster;
- (5) hydrogen itself is non-toxic, cleaner when hydrogen burns than other fuels, except generate water and a small amount of hydrogen nitride will not produce such as carbon monoxide, carbon dioxide, hydrocarbons, lead chemicals and dust particles, etc. harmful to the environment, a small amount of hydrogen nitride is properly treated and does not pollute the environment, and burning raw water can continue to be made hydrogen, recycle repeatedly;
- (6) Hydrogen utilization forms more, can generate heat by burning, in hot force engine generated mechanical work, and can be used as energy material for fuel power pool, or convert to solid hydrogen as structural material;
- (7) substituting hydrogen for coal and oil, does not need to be significant for existing technical equipment, modification of the current internal combustion engine is slightly modified to use;
- (8) hydrogen can be in gaseous, a liquid or solid metal hydride appears, to adapt to storage and different requirements for various application environments. visible hydrogen is an ideal new energetic energy.

The basic principle of the hydrogen fuel cell power generation is the reverse reaction of electrolytic water, to put the hydrogen and oxygen supply cathode and anode respectively, hydrogen through cathode outward diffusion and electrolyte after reaction, releasing electrons through external load reach anode. Fuel electricity pool hydrogen as fuel on a car-powered fuel cell, with the in the atmosphere oxygen chemical reaction, to generate power start motor, then drive car. The popular point says is to send hydrogen to the fuel cell's anode plate (negative extreme), through catalyst (uranium) the role of, an electron in a hydrogen atom is divided into from out, hydrogen ions lost electrons (proton) through the proton exchange membrane, arrives at fuel cell cathode board (positive), and electrons cannot be passed through the proton exchange membrane, this electronic, only external circuit, to the fuel cell cathode panel, thereby generate current in external circuit. electrons to the cathode panel, with oxygen atoms and hydrogen ion re-binding to water. because the oxygen supplied to the cathode plate, can be from air get, so just keep supplying hydrogen to the anode plate, supply the cathode plate with air, and timely water (vapor) take the, to continuously supply power.

The chemical reaction process of the fuel cell does not produce harmful products, burns material battery vehicle is non-polluting car, fuel cell energy conversion efficiency ratio inside burn high 2~3 times. methanol, gas and gasoline can also replace hydrogen (from these substances indirectly extract hydrogen, but there will be extremely little

oxidation carbon and nitrogen oxides. but generally, this kind of chemical reaction except electricity is only generate water. so, hydrogen fuel cell car is really zero emissions, 0 contaminated cars.

## 4. the way and method of hydrogen fuel production

On the earth of human existence, hydrogen is the richest element, but there is no pure hydrogen in the field. The most common hydrogen-containing substance is water ( $H_2O$ ); second is a variety of hydrogen-containing compounds such as oil, natural gas, hydrogen sulfide and various organisms, etc. So let's do it by industry. River, Lake, Sea called "hydrogen mine" is everywhere, is not difficult to find.

### 4.1 Configuration of hydrogen fuel for fuel cell vehicles

(1) Some vehicles carry pure hydrogen fuel directly, some vehicles outside can be fitted with fuel reformer, convert hydrocarbon fuels into hydrogen-rich gases. fuel cells for individual must be combined into fuel cell group, to get the necessary power, meet requirements for use;

(2) fuel cell vehicles by main fuel type is divided into: burns with pure hydrogen fuel cell vehicles; fuel fueled with nitrogen from methanol conversion battery car;

(3) Fuel cell car power is configured differently, can be divided into: Pure fuel cell; fuel cell and battery mix power; fuel cell with storage pool and super capacitor hybrid power. The configuration of the two multiple power supplies after is burning main configuration of battery car, where the secondary power supply provides starter power of the streaming braking feedback.

### 4.2 Hydrogen production method

(1) current China 97% The hydrogen of the is produced by fossil fuels, fossil fuel makes hydrogen to emit large amounts of greenhouse gases to the atmosphere. To the environment.

(2) Hydro-Solution makes hydrogen without greenhouse gas, but production costs are more than high. hydrolysis of hydrogen for power resources such as hydropower, geothermal energy, a region where tidal energy and nuclear energy are more abundant.

(3) Coal is China's most wanted fossil energy source, The main ingredient of is carbon, also has very few hydrocarbons. The essence of hydrogen in coal is carbon instead of chlorine in water, The final generation of hydrogen and carbon dioxide, Carbon acts as chemical reagent and for replacement reactive heating, hydrogen is almost entirely from water.

The method of making hydrogen gas from coal as raw material: There are two types of:

1) coking of coal (or high temperature dry distillation) Coal in isolated air condition, to make a coke, by-product of coke oven gas <Coke Oven gas group share hydrogen gas ~60% (Volume), Methane 23-27% and carbon monoxide 5~8%, and so on. per ton of coal available gas 350 ~m<sup>3</sup> as City gas, also system take raw material for gas;

2) coal gasification, make coal at elevated temperature or pressure, with steam or oxygen (Air) reaction of to gas products. gas products with the quantity varies with different gasification method. Coal gasification hydrogen production is a feature of China hydrogen production method. the usual practice is to dig coal out of the ground, break, after category they are placed in a specialized device for this response. can also be in the same way for coal hydrogen, a build two wells on the surface of coal mines, one intake, a out hydrogen mixed gas. on the ground purify, get available hydrogen. coal gasification method of gasification nearly dozens of years have been valued by the people, China has been in Shandong, River North for child industrialization Demonstrations, works fine. Underground gasification technology features high utilization of coal resources and reduction or avoidance of surface environmental damage.

(4) The main ingredient of natural gas is methyl burns, itself contains hydrogen. and coal system hydrogen compared to, high production of hydrogen from natural gas, lower processing cost, emitted temperature room gas less, So natural gas becomes the main raw material for hydrogen production abroad. its natural gas vapor conversion is a more

common method of manufacturing hydrogen. Industrial Methane Steam conversion process using nickel catalysts, Operating Temperature (K) 920°C, Action

Force 2.17~2.86 MPa. higher pressure can improve process efficiency. reaction is endothermic, heat burns through combustion chamber methane supply. Methane vapor conversion synthetic syngas after a high temperature conversion reaction converts carbon monoxide to two carbon oxides and extra hydrogen gas. to prevent methane vapor from converting process carbon The reaction feed should be used in excess of the water vapor. final hydrogen yield versus Technical Route with. The nature of hydrogen production in natural gas is in the form of carbon in methane. hydrogen in water, The carbon acts as a chemical reagent and provides heat for the replacement reaction. hydrogen most from water, Small part from natural gas itself.

(5) Heavy oil is a residual Song in the refining process, can be used to make  $H_2$  gas, hydrocarbons and oxygen during partial oxidation of heavy oil, steam reaction generation hydrogen and carbon dioxide. This procedure under certain pressure, can take Catalyst, also no catalyst, Depending on the selected raw material and the Pass. Catalytic partial oxidation is usually based on methane or naphtha low carbon hydrocarbons raw material, instead of catalytic partial oxidation, heavy oil is used as the raw material, reaction temperature in, CH<sub>3</sub>15I. The hydrogen from partial oxidation of heavy oil comes mainly from water vapor. water Electrolysis of hydrogen is a mature method of manufacturing hydrogen, already has Grieving production history. The hydrogen purity of the hydro-solution is high, Easy, but consumes power. The efficiency of hydrogen production by hydro-electricity is generally in 75-85%, General Production LM<sup>3</sup> hydrogen and 0.5m<sup>3</sup> Power consumption for oxygen 4~5 kWh. based on thermodynamics, Electrolytic water get LM<sup>3</sup> Hydrogen and 0.5m<sup>3</sup> minimum consumption of oxygen to 2.95 degree Power. so The inventor with the gets a lower-than-value result that's not believable. of course, If this is Electrolytic aqueous solution, get hydrogen and another non-oxygen product, Its power consumption another argument. The essence of hydrogen production in hydro-electric power is the combination of hydrogen and oxygen in the water, eventually generate hydrogen and oxygen. All the hydrogen here comes from water.

## 5. Technical challenges

(1) hydrogen production, high cost of storage and portability, Infrastructure Investment Big wait. recent years, fuel cell technology has made significant progress, all leading automotive manufacturers are actively developing fuel cell engine technology. from Worldwide, The current fuel cell vehicle is still in the research and development phase, to mount it to scale, there are a number of technical challenges that need to be resolved. For example hydrogen production, Storage and carrying cost Gao, Infrastructure Investment etc. vehicles PEMFC The cost of proton exchange diaphragm (USD 300/m<sup>2</sup>) approx. This is 35% Platinum Catalyst accounts for 40%, Both are noble materials; Fuel Power The pool starts at a slower rate than the internal combustion engine. reactivity to increase electrode activity sex, Increase operating temperature and reaction control parameters to, But improve stability You must avoid the occurrence of side effects. reactivity and stability often the fish and the bear's paw not available. except methanol, All other hydrocarbon fuels must go through converter, Carbon monoxide oxidation process after pure hydrogen production, for today's fuel Cell Utilization, These devices also increase the investment in the fuel cell system. currently FCV The oxygen fuel is based on compressed hydrogen as the primary, carriage Load so Restricted, only about per fill 2.5~3.5kg, is not enough to meet today's vapor car one-way run 480~650 Endurance. with -253°C Keep hydrogen liquid State hydrogen system tested successfully, but with significant flaws: approximately 1/3 The power must be used to maintain low temperature of the tank, To keep the hydrogen in a liquid state, and the slot The amount of hydrogen lost by the slot evaporation is approximately the total stock of 5%. hydrogen has been in the industry for Many years use for a long time and economic scale, But the worldwide oxygen-filling station is only about Station, Is still a value Demonstration Promotion phase. addition, plus gas time quite long, About Time 5 minute, is still can't keep pace with the business age. Current research and development efforts focus on lowering low cost and development of large-scale manufacturing processes, increase fuel cell power density also is a technical challenge that cannot be ignored. the other most fatal problem, extraction of

hydrogen need to use electrolytic water or natural gas, In this way, you also need to consume a lot of energy.

(2) hydrogen Storage, Keep, Transport and filling or reorganization are all relatively complex. Miscellaneous, High Security requirements. Although fuel cell electric vehicles in recent years get great progress, But the manufacturing costs from the current major auto companies \$ Million fuel cell concept car see, current fuel cell promotion also need to resolve the following issues: 1) first drive mileage is too short. due to hydrogen storage save difficulty, that uses a traditional fuel tank three times more volume to store hydrogen gas, also to guarantee half of the mileage of a petrol-powered car 2) Second hydrogen price not cheap, The operating cost of a fuel cell vehicle is therefore not optimistic; 3) is the hydrogen station and other basic network infrastructure construction is almost zero, is currently a global. The hydrogenation station used by the cast only has the "home, and most of the - F experiment with path. to see, fuel cell vehicles really going to the market still time to go. the hydrogen in the oxygen synthesis water in the air because of pollution-free naturally respected by experts, only is the general consumer for hydrogen energy still feel the "remote unreachable". But no matter how to say, fuel cell is a fundamental method in the long run, hydrogen is a

More ideal future energy.

There are various solutions around hydrogen powered cars, Even though the a lot of getting closer to the utility, But the pros are expecting to wait. Twenty or thirty year. but, Reporting recent two scientific research from Canada and the United States organization, come up with a simple workaround, Let hydrogen motor cars have [The probability of universal access. This latest workaround is: will use a special not prepared alloy, Its composition is approximately 80% aluminum and for 20% gallium for, as Catalyst, quickly and easily get hydrogen by putting this metal in water. differs from previous pure scientific research, This time scientists have publicly declared: only need %kg alloy with water, is able to have a hydrogen fuel-fueled The car for the battery with kilometers per hour 560km, this big weight The body is the same weight as the traditional car., The cost is only the latter 1/3. But even if the fuel is technically successful, should also see a technique Going from the lab to the market there is a certain degree of difficulty, gratifying to be, this year 2 month, Shanghai first for fuel cell vehicle Service hydrogenation station in Jiading Anting official opening, Current, This hydrogen station is only for children. Running fuel cell vehicle service, The relevant departments are also inviting bids, buy Fuel Battery bus, opening Anting to Shanghai Kbus line for. current fuel Battery car If you can reach million production scale, The cost will be the normal gasoline car quite. Even so, But let the current car replace the engine now, plus Change the petrol station into a hydrogen station and let the relevant personnel quickly switch to, Short term feasible. Our current resource energy situation is unsustainable, NJ • live Landa year half of soil erosion, Existing, main mineral deposits, year will be left with only 6 species, 560% The oil for needs to enter the | 1. not only China so, The World is also so, In response to climate change and energy crisis, World Countries are actively searching for and using new energy.

## 6. Epilogue

Hydrogen Energy is not only clean and environmentally friendly, Has an unlimited, can cycle through Advantages, not only to solve the energy crisis can provide help, to choke Also works with climate warming. But hydrogen replaces traditional energy. Have a long way to go. First, it must have the support of the state, only get to Policy's No., hydrogen can become new Source; Second it must be updated with the related industry, to Machine, auto industry with Update Ample time. can hydrogen win the war with oil? need ask for help from humans. with the volume power and mass power of the fuel cell by the Step increase, declining production costs, further for manufacturing materials and processes Improve and refine, near future, A fuel cell powered car will be The is widely used.

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