

China Hydrogen & fuel cell update

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Policy Development

tax reductions and exemptions:

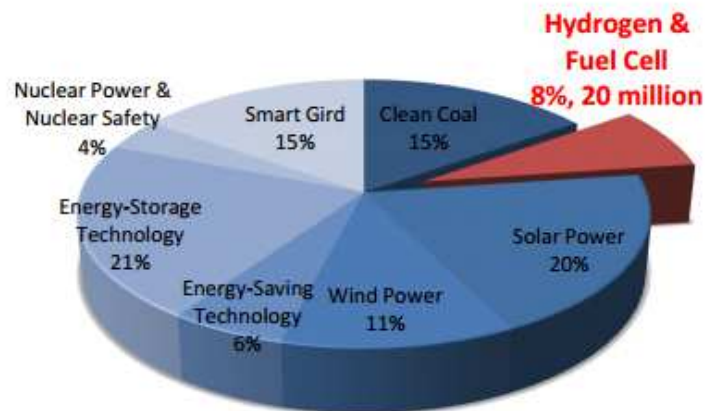
The Ministry of Finance announced in Dec, 2011 that a total of 49 domestically made electric and fuel cell passenger vehicle models will be exempted from sales taxes, including 7 FCV models produced by SAIC (3), FAW(1), Shanghai Volkswagen(1), Chery(1) and Changan(1). In March 2012, the tax cuts policy for energy-saving and new-energy vehicles were announced, and according to the new policy, half vehicle tax is to be collected on 4 types of FC Buses.

Funding:

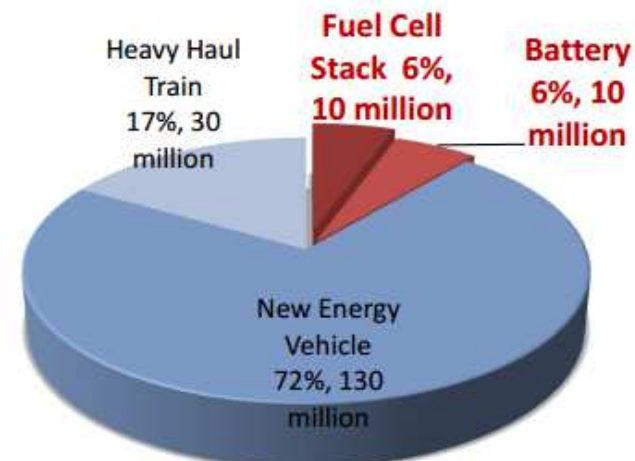
The Ministry of Finance announced Oct. 12, 2012 that the central government will allocate funding to support technological innovation projects in the nation's new energy auto industry. The funding will support new energy vehicles including electric vehicles, plug-in hybrid vehicles and fuel cell vehicles. The statement did not elaborate on the amount of funding.

Some fund from MOST

- In 2011, MOST launched two 973 projects (*the National Basic Research Program of China*) for SOFC and PEMFC, funding more than 30 million RMB for each.
- Recently, MOST issued the 2013 Projects Implementation Guide for the National Science and Technology Program (including 863 Program).



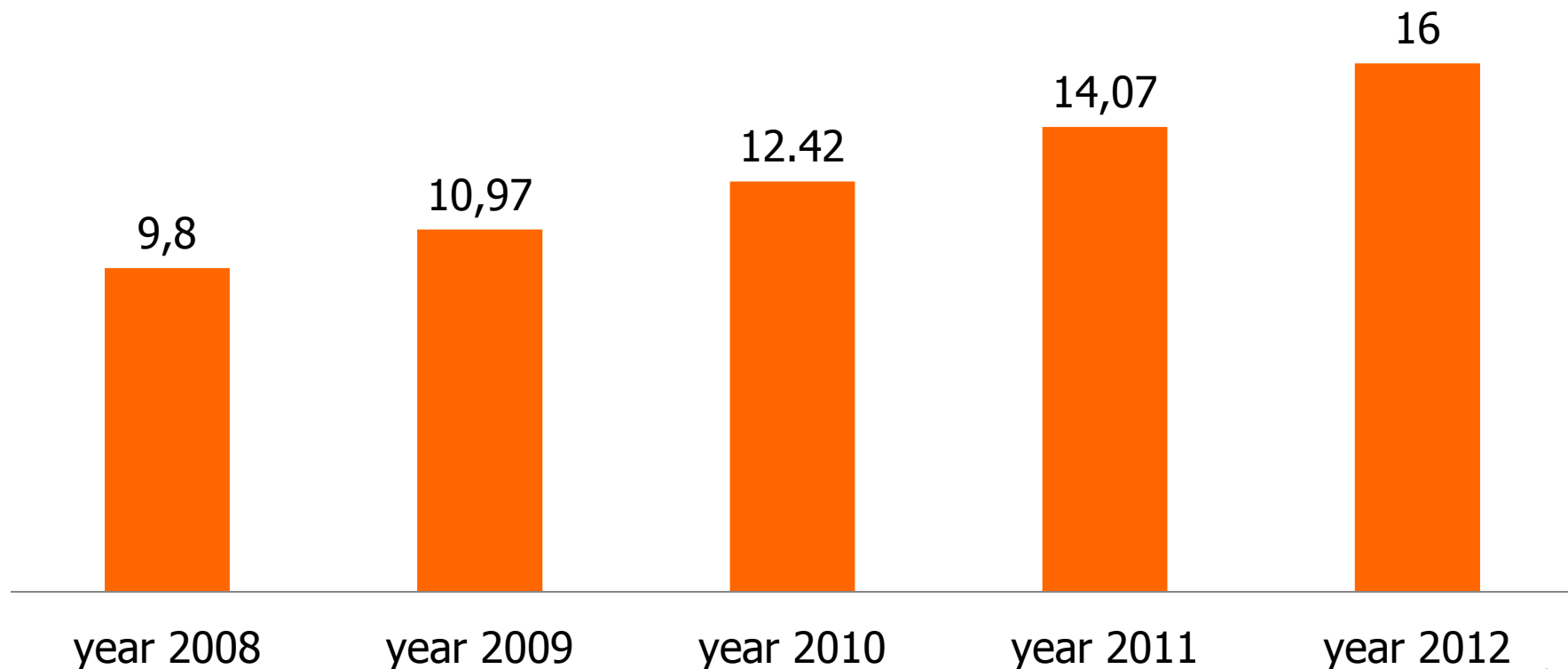
Budget of Advanced Energy Technology



Budget of Transportation Technology

I) China hydrogen background

Hydrogen production in China during 2008-2012 (Million ton)



Transportation

SAIC (Shanghai Automotive Industry Corporation) is planning FCVs National Road Tour 2013.

Five Hydrogen Stations are planned in Shanghai.



FCV developed by SAIC



Malu Hydrogen Station in Shanghai

Fuel Cell Rail Application in China

- China First Fuel Cell Locomotive has operated on January 24, 2013 in Chendu, China



Fuel Cell Integration System



Fuel Cell Type	PEM FC
Power	150KW
Hydrogen Pressure	35 M Pa
Hydrogen Weight	23kg
Cylinders	9
Design speed	65 km/h

The Further Upgrading And Improvement

- Upgrading air supplied system to improve air supply turbulent disturbance.
- Optimization heat management system to improving efficiency
- upgrading fuel cell system realtime online responses
improving power efficiency.
- Upgrading power system to hybrid power module system to
increase power efficiency

II) Fuel cell backup market in the near future in China

◆ Three telecom operators

中国移动 China Mobile

中国电信 China Telecom

中国联通 China Unicom



◆ Mobile users and the number of communication stations



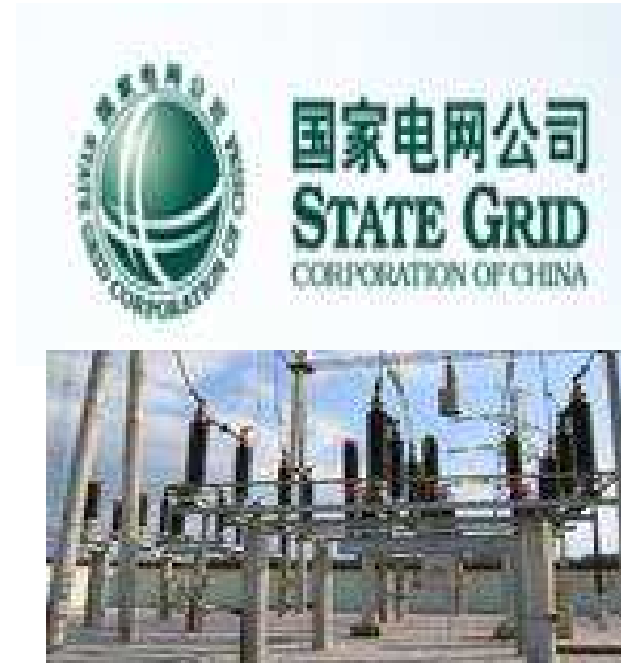
2011年底	中国移动	中国电信	中国联通
Mobile users# (million)	649.60	126.47	199.66
Stations (1000)	920	440	614

1146million users in March 2013

II) Fuel cell backup market in the near future in China

◆ State Grid

Electrical power is centrally administered by State Assets



Substations	Beijing	China	Note
35KV - 110KV	Over 1500	Over 50,000	Roughly

II) Fuel cell backup market in the near future in China

◆ Railway

Backup Power for 10 KV

Distribution Substation

Every 40KM - 60KM along the railway lines



Total Railway Lines	10KV Substations	Note
Over 100,000 km	Over 2000	Roughly

II) Fuel cell backup market in the near future in China

◆ IT Industry

Backup Power as UPS

In IT Data Centers and various deployments



Total Units Delivered	Total Sales in USD	Note
18 millions	555 Millions	2011-2012

II) Fuel cell backup market in the near future in China

◆ Backup Market Capacity

Deployment Areas	Total Market USD	Note
telecom stations	20 Billions	1.3M Telecom stations
No duty substations	4 Billions	50K grid substations
Oil fields, mining communications	100 Millions	3000 Telecom Stations
Railway communication	50 Millions	2000 Distributions
IT industry UPS	550 Millions	Backup UPS sale in 2012

III) Fuel Cell backup Demo in China

◆ Demo only , no commercialization

◆ Some cases of fuel cell backup station

1. 2 kw air-cooled fuel cell backup station supply for mobile Liang Zi lake wuhan mobile communication base station, since 2009 since the trial run, the effect is good. Wuhan university of science and technology/the ReliOn cooperation. www.wutenergy.com

2. 5 kw water-cooled fuel cell backup station for one department, started in 2011, and damaged after six months. Production company: Shanghai SI-technology co.

www.sl-power.com

III) Fuel Cell backup Demo in China

3. Eight air-cooled fuel cell backup power stations in Beijing, Jiangsu, Henan, Sichuan and other. Since 2011, Demo is successful. Its were made by cooperation of Beijing azure/China. Dantherm/Denmark and Ballard/ Canada.

www.azurehydrogen.com

4. One 1.7kw water-cooled fuel cell backup power station in Zhenjiang, Jiangsu' communication base station. Demo is successful also. It was made by Zhong-Jing/ china and Hyundai/South Korea. *www.zhong-jing.com/xnymindex.html*

III) Fuel Cell backup Demo in China

5. One 5kw water-cooled fuel cell backup power station in Kunshan, Jiangsu' communication base station since 2010. Demo is successful also. It was made by Foresight/China.◦

www.foresight-energy.cn

6. One 5kw fuel by Methanol fuel cell backup power station in Xuqian, Jiangsu' communication base station. Demo is processing. It was made by Beijing GH2 Power Technology Co.itd. www.gh2power.com

III) Fuel Cell backup Demo in China and tendency

7. Large scale demo Since 2012, China strengthens to the fuel cell propulsion of standby power. In May 2012, the ministry of science and technology (MOST) concerned China mobile, China telecom and China unicom three operators, to discuss the demo of 100 sets of the communication base fuel cell backup power station. This work is a priority task in 2013.

Arranged by MOST the one hundred base stations will be set up in Shanghai and Jiangsu province. **Azure/Beijing** and **Foresight/ Jiangsu** will response 30 and 70 stations respectively.

The challenge of fuel cell backup in China

- By Chinese law, state-owned enterprises such as China telecom official order number have to more than 10,000 units. Request FC supplier product quality strictly comply with Chinese telecommunications power standards. FC supplier can't provide mass product quality stability.
- China required FC supplier offer 7 x 24 hours technical support and services
- China telecom standard YDB 051-2010 is not fully compatible with the international current standard **CE/IEC-62282 and CSA/ANSI FC 2012.**

IV) Some hydrogen news in china

TECH +CAPITAL

Ballard and Azure Aim to Bring Zero-Emission Fuel Cell Buses to China

Ballard Power Systems has signed a non-binding memorandum of understanding (MoU) with partner Azure Hydrogen to extend the scope of their collaboration to include fuel cell buses.

**Ballard Signs Agreement For technology cooperation in Beijing
China, May 28, 2013**



IV) Some hydrogen news in china

IAC join with Hydrogen TECH

The **Investment Association of China**, (IAC) has been registered with The ministry of civil affairs of PR China is a national professionally qualified social group, is China's authoritative, comprehensive social organizations invest in the construction field. The competent department for national development and reform commission (NDRC) .

- General secretary of IAC, Dr. Zhang Yonggui, he is director of Institute of investment NDRC attend the MOU signing ceremony and delivered a speech.



Hydrogen direct reduction iron-making technology

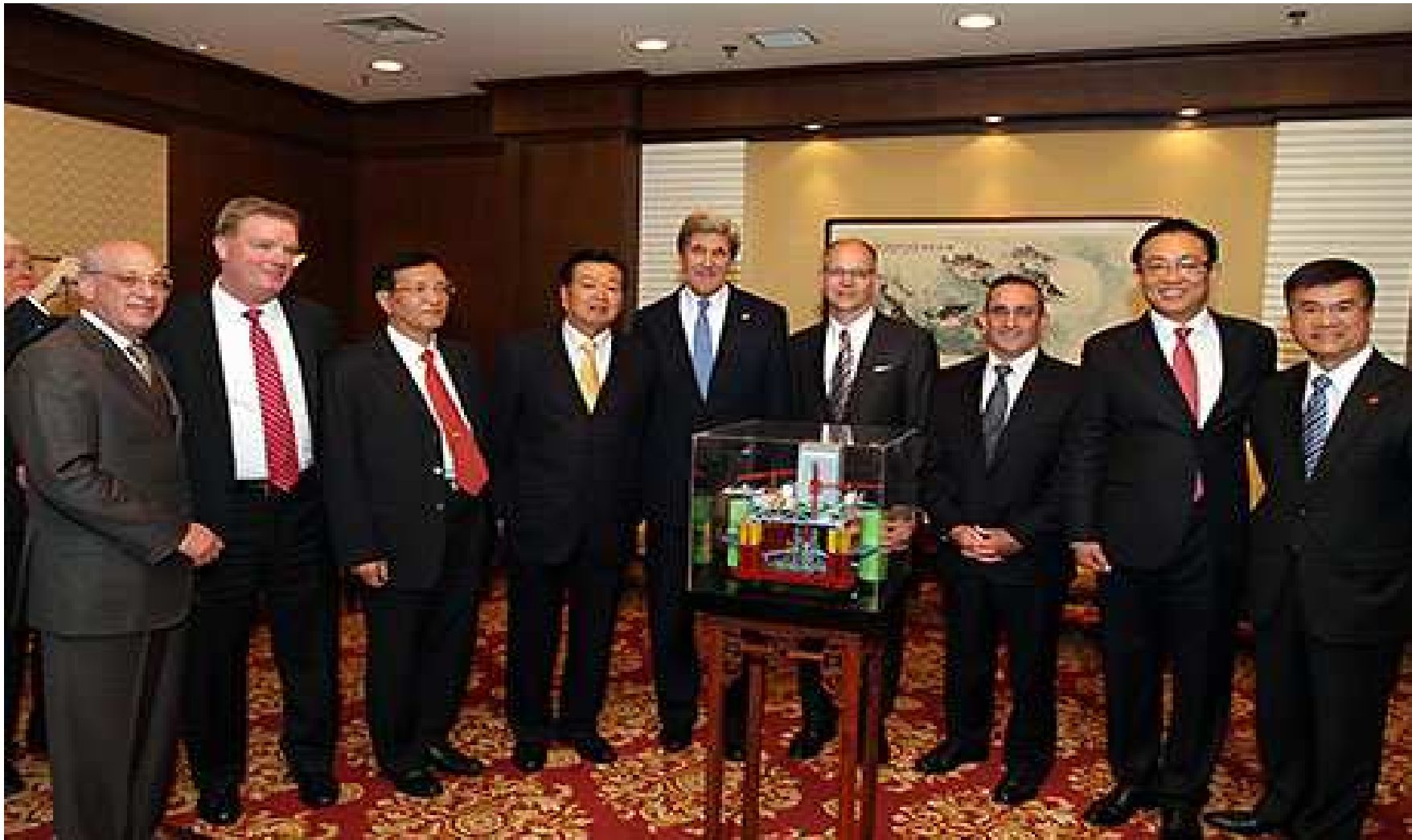
Shenwu Hydrogen Shaft Furnace Direct Reduction Iron-making Technology

氢气竖炉直接还原炼铁技术是以富氢气作为还原剂进行冶炼，是目前能耗最低、最清洁的炼铁方法。生产的直接还原铁是生产优质钢、特殊钢、高级铸锻件的优质铁原料。其具有以下优势：

Hydrogen shaft furnace direct reduction iron-making technology uses hydrogen rich gas as the smelting reductant, which is currently the most clean iron-making method that consumes least energy. The output DRI is favorable raw material for quality steel, special steel and top-grade castings and forgings. This technology has following advantages:

Started in July 2013, plans were completed and put into operation in 2015

Lockheed Martin Signs Agreement For Largest Ever OTEC Plant in China, April 13, 2013



WHTC2013, Shanghai, China, 25-28,
Sept. 2013;

Abstract: >650

Expo: >50

Invister: > 100



**5th World Hydrogen
Technologies Convention**
25th – 28th September 2013, Shanghai, China



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www.whtc2013.com

Thank you for your attention!