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Review of methanol vehicle policies in China: current status and future implications

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Abstract

Methanol vehicles, as a type of alternative energy vehicle, become an approach to mitigate the dependence on petroleum and to reduce emissions. A number of policies for implementing methanol vehicles have been promulgated by the Chinese government to achieve sustainable development. This paper summarizes existing policies for pilot projects, methanol fuel and fuel stations, technological improvement and manufacturer engagement. Then, the paper systematically reviews the released policies based on their categorisation and timeline. Whilst the released policies for pilot projects were sufficient and effectiveness, there was a lack of incentive policies for other aspects. Based on the policy assessment, it is necessary to enhance the continuity and effectivity of the existing policy mechanism. As a contribution, this paper provides some suggestions including: developing follow-up policies after the accomplishment of pilot projects; providing more incentive policies to encourage technological improvement of methanol vehicles; creating a trans-provincial methanol fuel region and enhancing manufacturer engagement by narrowing the subsidy gaps between methanol vehicles and other AEVs.

Keywords: Methanol vehicle; Methanol vehicle pilot project; Incentive policy; Policy mechanism; Policy review

1. Introduction

Nowadays, many countries have released policies for the development of Alternative Energy Vehicles (AEVs) to deal with increasing energy consumptions and air pollution. In order to achieve sustainable economic growth and reduce severe smog, China as one of the largest automobile markets, has accelerated the implementation of AEVs

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which mainly include electric (blade electric, hybrid electric and fuel cell electric), gas, methanol and ethanol vehicles [1,2]. Whilst most incentive policies have been provided for electric vehicles, both the central and provincial governments also support other AEVs such as methanol vehicles to help form a comprehensive policy mechanism.

As a type of AEV, methanol vehicles could potentially bring environmental and socioeconomic benefits to China. Firstly, methanol vehicles are environmentally friendly, compared with gasoline vehicles [3]. The chemical composition indicates that methanol is composed of one carbon atom, compared with conventional gasoline which contains many hydrocarbons and additives [4]. Secondly, methanol vehicles can save fuel and vehicle costs [5]. Specifically, methanol is made from a variety of resources such as coal and natural gas. As energy production and consumption in China depends on coal to a major degree, using economical coal-based methanol as fuel could adjust the energy structure [6]. Since methanol can be blended with gasoline in different ratios, conventional vehicles are easily "methanolized" with engine modification, which significantly reduces vehicle cost [7,8]. Moreover, with approximately 31% gas and 65% oil dependence on foreign trade, China could reduce the importation of oil and gas by consuming more methanol as fuel [9]. Therefore, with the above advantages, methanol vehicles have been promoted by the Chinese government since the 2000s to mitigate the dependence on conventional energy sources and to reduce air pollution.

Whilst a list of policies has been provided, the comprehensive implementation of methanol vehicles in China is still slow, compared with other types of AEVs. Therefore, it is necessary to review all the released policies to figure out the existing problems and to provide suggestions for better implementation of methanol vehicle policies in the future. As very few studies have been conducted in the past, this paper aims to provide policy-makers with suggestions by reviewing the issued policies for methanol vehicles in China. The rest of the paper is organized as follows: Section 2 describes and explains the released methanol vehicle policies based on categorization and timeline; Section 3 summaries and reviews these policies; conclusions and policy implications are drawn in Section 4.

2. Methanol vehicle policies in China

A series of policies has been released by both the central and provincial governments for the development of methanol vehicles in China. Many actions have been taken by different departments to systematically develop and effectively implement these policies. This section describes the released policies, which can be mainly categorized as: policy for pilot projects, methanol fuel, technological improvement and manufacturer engagement.

2.1. Policy for Pilot Projects

The central government aims to test vehicles and find out existing problems before implementing methanol vehicles on a national level. Therefore, more than 10 pilot projects have been launched in five different provinces. In 2009, the Ministry of Industry and Information Technology (MIIT) entrusted Beijing Institute of Technology to test methanol vehicular emissions and performance in the laboratory. The results indicated that tested methanol vehicles generated less vehicular emissions, compared with similar petrol and diesel vehicles [10]. In 2010, to select the pilot cities which might be suitable for methanol vehicles, a panel formed by MIIT assessed methanol fuel and demo methanol vehicles in many provinces. In 2012, *"Key Points of Energy Conservation and Comprehensive Utilization in Industry"* officially proposed methanol vehicle pilot projects [11]. The follow-up policy *"Notice on launching Methanol Vehicle Pilot Projects"* explained the main purposes of launching the pilot projects: balancing energy structure, enhancing energy security and reducing energy consumptions [12]. Mr. He Guangyuan, the director of methanol vehicle pilot projects, declared that these pilot projects might have a profound impact on energy restructure by reducing oil imports from overseas [13].

In 2013, Shanxi and Shaanxi which account for nearly 40% of the total coal reserves were selected to test whether methanol vehicles could reduce fuel cost and deal with heavy smog in practice [14]. Shanghai with its advanced automobile technology was also involved [15]. In total, over 400 methanol taxis were operated in Shanxi (Jinzhong), Shaanxi (Xian, Baoji, Xianyang, Yulin and Hanzhong) and Shanghai as the first batch of methanol vehicle pilot projects. To constantly monitor the pilot projects, MIIT released *"Data Acquisition and Management for Methanol Vehicles"* which highlighted the collection of data from methanol vehicles [16]. In 2014, to assess the existing pilot projects, MIIT organized the 1st summit of methanol vehicle pilot projects in Jinzhong. Officials and industrial executives attended the summit and shared their opinions. Accordingly, *"The Policies for the Acceleration of New Energy Automobile Industry in Shanxi"* was released. In this file, electric, methanol and gas vehicles were all categorized as AEVs, which implied

the importance of methanol vehicles [17].

In 2015, three more pilot projects were launched in Gansu and Guiyang, which have rich coal and methanol resources [18]. More than 1,000 methanol vehicles including taxies and trucks were on the road. In 2016, a panel was formed by MIIT, the Ministry of Science and Technology (MOST) and the National Development and Reform Commission (NDRC) to enhance implementation of the pilot projects [19]. In 2017, the panel organized the 2nd summit of methanol vehicle pilot projects in Beijing to summarize the completed pilot projects [20]. The obtained results, released at the summit, indicated that the tested methanol vehicles saved approximately 41% of fuel costs. The vehicular emissions from methanol vehicles met the national standard. In addition, there was a marginal difference between methanol and conventional vehicles regarding overall performance [21].

In summary, methanol vehicle pilot projects in China can be divided as: the preparation stage (2009-2012), the first batch of pilot projects (2013-2014) and the second batch of pilot projects (2015-2017). After laboratory testing and pilot province selection, methanol vehicles were tested in Shanxi, Shaanxi and Shanghai as the first batch of pilot projects. Then, a lot more methanol vehicles were operated in Guizhou and Gansu as the second batch. As these pilot projects proved the economic and environmental advantages of methanol vehicles, the panel organized by MIIT, MOST and NDRC recommended to continuously implement methanol vehicles in China [21].

2.2. Policy for methanol fuel and fuel station

Methanol fuel is the key to implementing methanol vehicles. Based on proportion, methanol fuel in China can be divided into low proportion, high proportion and pure methanol fuel (Table 1). At the current stage, only M85 has been announced as a national standard, while other types of methanol fuel are still on provincial standards.

Table1. The division of methanol-added gasoline in China.

Division	Code	Explanation	Standard in China
Low proportion	M5, M15, M25, M30	i.e. M30 stands for 30% methanol mixed with 70% gasoline; 0.5% additive is required.	Provincial standard
High proportion	M50, M85	i.e. M85 stands for 85% methanol added into 15% gasoline; engine modification is required.	National standard (only M85)
Pure methanol fuel	M100	100% methanol; methanol engine is required.	Provincial standard

In 2009, the first national standard methanol-added gasoline (M85) was established [13]. Although low proportion methanol-added gasolines were not passed on a national level, Zhejiang, Guangdong and other 13 provinces released provincial standards for different methanol fuels. *"The Development of Methanol Fuel"*, provided by China Petroleum and Chemical Industry Association, described the advantages and barriers of methanol fuel [22]. According to CPCIA, one of the main advantages was the low price of methanol fuel, compared to gas and gasoline (Fig. 1). Also, methanol fuel, as shown by laboratory tests, generates less $PM_{2.5}$ than that of petrol and diesel.

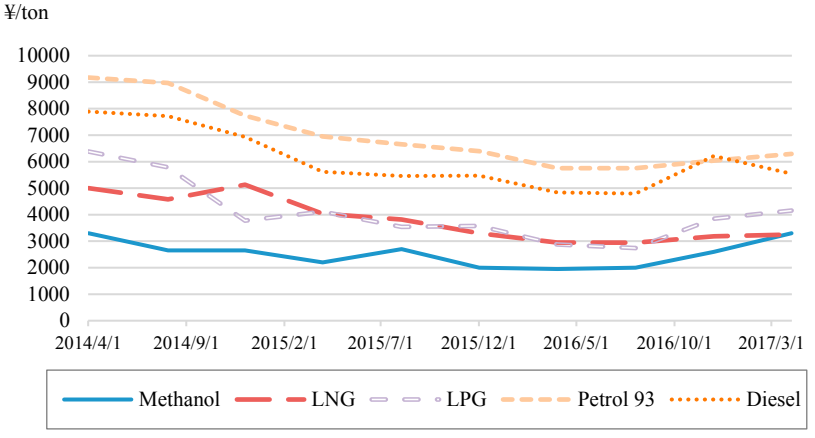

Fig. 1. The comparison of energy price in China (National Bureau of Statistics, 2017)

When promoting methanol fuels, it is necessary to build sufficient methanol fuel stations. In 2015, *"The Regulation of Constructing Methanol Fuel Station"* and *"Safely Using Methanol Fuel"* were issued to guide and regulate the construction of methanol filling stations in pilot provinces [23].

2.3. Policy for technological improvement

Technological improvement is crucial to the development of AEVs in China. While the technology of methanol vehicles in China is relatively mature, the government still has published strict requirements for strengthening technological improvement. In 2012, *"Technical Requirement for Methanol Vehicles"* was published to minimize the potential technical risks when implementing methanol vehicles in pilot provinces [24]. In 2013, *"Suggestions on Strengthening the Energy Saving and Emission Reduction of the Internal Combustion Engine Industry"* was released by the General Office of the State Council (GOSC). The file highlights the importance of resolving technical problems for petrol/methanol and diesel/methanol dual fuel vehicles [25]. With the pilot projects launched in Shanxi and Shaanxi, technical improvements to methanol vehicles were achieved. The modified methanol vehicles had strong adaptability in low temperature. In 2016, a forum on methanol vehicle development was held in Jiangsu province. During the forum, issues regarding methanol vehicle technology such as engine modification issues, producing methanol from carbon capture technology and engine problems caused by additives were all discussed [26].

2.4. Policy for manufacturer engagement

Unlike the development of electric vehicles which has many manufacturers involved, few policies were provided to methanol vehicle manufacturers at the national level. However, some provincial governments which launched pilot projects provided incentive policies for methanol vehicles implementation in local areas. For instance, according to *"The Policies for the Acceleration of New Energy Automobile Industry in Shanxi Province"* which was released in 2014, subsidies were provided for supporting methanol vehicle manufacturers [17]. In detail, ¥10,000 per methanol heavy-duty vehicle and ¥ 5,000 per methanol passenger vehicle were offered, respectively. However, compared with up to ¥ 50,000 subsidy for electric vehicles, the incentive policies for methanol vehicles were insufficient. As a result, only a few domestic companies were engaged. In 2012, Geely Holding Group produced a model of methanol vehicle, which was the first methanol vehicle made by the Chinese automobile industry. Most methanol vehicles including taxis and buses operating in pilot projects were made by Geely Holding Group (Fig. 2). Geely also launched an international methanol vehicle project in Iceland to achieve further research and development, which was supported by Reykjavik Municipal Government [10]. Apart from Geely, manufacturers such as Shanxi Automobile Holding Group were also engaged to design and make methanol/diesel dual fuel trucks, although the investment was relatively small.

Fig. 2. Geely methanol taxis and buses (Geely Holding Group, 2016)

3. Review of policies

This section is developed to review the existing policies for methanol vehicles implementation in China which have

been listed in the above section. Table 2 concludes and compares different categories of policies for methanol vehicles in general. It briefly summarizes the released policies for each category, followed by details of involved department, policy duration and number. By following the four categories, policies for the pilot project are first reviewed, followed by policies for methanol fuel and fuel station, technological improvement and manufacturer engagement.

Table 2. Summary of the released policies for methanol vehicles in China.

Policy category	Policy summary	Involved department	Duration	No. of Policy
Pilot project	Launching pilot projects in selected provinces to test methanol vehicle in real market and find out the potential problems before implementing on a national level.	MIIT, NDRC, MOST, MOF, GOSC, etc.	Since 2009	14
Methanol fuel and fuel station	Regulating the standards of methanol-added gasoline from national and provincial levels in market.	NDRC, MIIT, GOSC.	Since 2012	3
Technological improvement	Enhancing technological improvement of methanol vehicles	MIIT, GOSC	Since 2012	2
Manufacturer engagement	Few incentive policies for manufacturers are provided by provincial governments for the launch of pilot projects.	MIIT (Shanxi)	Since 2014	1

According to Table 2, most policies were provided for pilot projects. Departments from the central and provincial governments were widely engaged to ensure the smooth development of pilot projects. Early in 2009, policies for pilot projects in Shanxi, Shaanxi and Shanghai were provided as the preparation. Throughout the whole pilot projects process, 14 relevant policies were released in total. However, since 2012, five main policies had been provided for methanol fuel, fuel station and technological improvement in total. The involved departments were also less than that of pilot projects. In the five years since policies for pilot projects were released, only one subsidy policy was offered on a provincial level to encourage methanol vehicle manufacturers. Therefore, it can be concluded that the released policies for implementing methanol vehicles were focused on pilot projects rather than other aspects. Compared with other AEVs, especially electric vehicles which enjoyed a huge number of subsidies and political support, the governments provided fewer incentive policies for methanol vehicles in China.

3.1. Review of policies for pilot projects

The released policies for methanol vehicle pilot projects were based on an orderly and structured mechanism: implementing pilot projects on a lower administrative level. The main purpose of launching pilot projects on provincial level was to incur minimum cost in a closed area to assess whether methanol vehicles should be promoted in a wider range. Also, since the pilot projects were completed over a short-term (two to three years), it showed that the governments planned to avoid a long-term investment.

Developing “pre-project” policies before launching pilot projects was necessary to reduce unnecessary failures. MIIT released sufficient policies for testing methanol vehicles in laboratory which increased the probability of successfully launching projects. Also, as a part of “pre-project” policies, selecting appropriate pilot cities was crucial. Since provinces in China have different resource distributions, the selection of pilot projects for energy-based vehicles, such as methanol, ethanol and gas vehicles, needed to be strictly based on local energy reserves. Methanol vehicle pilot projects in the proposed provinces were basically matched according to this principle, which ensured smooth progress of the projects. For example, the pilot projects in Shanxi which is the capital of coal in China offered an approach to integrate coal resources for sustainable consumption. Also, the pilot project in Guizhou which lacks oil and gas provided a way of balancing energy structure by producing more coal-based methanol. During the implementation of pilot projects, both the central and provincial governments released policies for data collection, subsidy management and summit organization. With these polices, the pilot projects were comprehensively monitored, systematically managed and well-assessed. Therefore, it can be concluded that the released policies for methanol vehicle pilot projects were well-structured and effectively applied as all pilot projects achieved the established goals within the stipulated year.

However, there are a lack of follow-up policy mechanisms for further methanol vehicles implementation after the accomplishment of pilot projects. Whilst policies for the preparation and two batches of pilot projects were tightly

linked, the continuity of policies for pilot projects and future implication was weak. Few policies have been published since the last pilot project completed in 2017. As the first batch of pilot projects were finished even earlier, the process of implementing methanol vehicles in Shanxi and Shaanxi could be significantly delayed due to the discontinuity of policy mechanisms following on from the pilot projects. Also, the released policies for pilot projects were not thorough. Whilst the issued policies covered many pilot cities and involved different types of methanol vehicles, the total number of pilot cities and vehicles was much less than that of other AEVs in China. Accordingly, with a small group of methanol vehicles operating in limited pilot cities, the influence of pilot projects was greatly reduced and the potential issues of implementing methanol vehicles could hardly be discovered.

3.2. Review of policies for methanol fuels and fuel stations

The implementation of methanol vehicles is highly dependent upon the development of methanol fuel products and fuel stations. Both the central and provincial governments issued different methanol fuel standards which legalize the use of methanol fuels to power vehicles. Although the central government only released a single M85 methanol fuel standard, local governments published M15, M30 and M100 standards at the provincial level for the purpose of reducing fuel price. The released policies regarding methanol fuel stations regulated station construction and the safe use of methanol fuels as safety was of major concern to the various governments.

However, the released policies for methanol fuels and fuel stations were insufficient. Whilst the development of methanol fuels was relatively flexible at provincial level, with the exception of M85, it is difficult to promote them for wider use without support from the central government. For the network of methanol fuel stations in China to expand, more policies should be provided to overcome obstacles from competitors such as oil companies.

3.3. Review of policies for technological improvement

The central government released policies for strengthening the development of methanol vehicle technology because technological improvement is the core to implementing AEVs. Accordingly, to meet the standard of launching pilot projects, most of the technical issues facing methanol vehicles were resolved. Apart from the released policies, the governments also organized forums to discuss technological development of methanol vehicles, which was an effective approach to attract more stakeholders.

However, without incentive policies from the governments, few stakeholders were involved in technological improvement as they could hardly gain from the investment. Although the technology is mature, the research and development of methanol vehicles is slow and few models have been produced, compared with other types of AEVs.

3.4. Review of policy for manufacturer engagement

Unlike policies for other AEVs which were abundant, only one policy was released by a provincial government which clearly offered subsidies to support manufacturers. This indicated the determination to implement methanol vehicles in pilot provinces and provided an example of classifying subsidies for the development of AEVs. This experience should be valued by both the central and provincial governments when implementing more pilot projects for methanol and other AEVs in China.

A clear signal of to develop methanol vehicles is required from both the central and local governments to engage more automobile manufacturers who always tightly follow governmental instructions. At the current stage, there is a lack of incentive policies for manufacturer engagement, which has resulted in the slow development of methanol vehicles after the initial accomplishment of pilot projects.

4. Conclusion and policy implications

To achieve sustainable and comprehensive development of AEVs in China, many policies for enhancing the implementation of methanol vehicle were released by both the central and local governments. Over 20 policies covering different aspects have been provided in the past decade. However, the development of methanol vehicles in China is still slow. It is vital to evaluate the released policies if better implementation of methanol vehicles is to be realised in the coming stages.

After explaining all the released policies for methanol vehicles, this paper systematically and critically reviews them

from different perspectives. Specifically, policies for pilot projects, methanol fuel and fuel stations, technological improvement and manufacturer engagement were provided by five central departments and provincial governments. Since the implementation of methanol vehicles is currently at the beginning stage, most policies were offered to help launch the pilot projects. However, the policy support for methanol fuel, fuel stations, technological improvement and manufacturer engagement was less apparent and weak. Accordingly, it is difficult for policy-makers to effectively implement methanol vehicles after the accomplishment of pilot projects. Without continuity, the effectiveness of released policies for methanol vehicles will fade, which means that the completed pilot projects are futile. Therefore, policy-makers from both the central and provincial governments should develop an integrated and practical policy mechanism to comprehensively realize the further implementation of methanol vehicles in China. This paper provides the following recommendations as policy implications:

- *Developing follow-up policies after the accomplishment of pilot projects.* As most pilot projects have proven the advantages of implementing methanol vehicles, the marketization of methanol vehicles in pilot cities should be rapidly developed. More methanol taxis, buses and trucks could be continuously operated on the road for enhancing public understanding of methanol vehicles. Meanwhile, more manufacturers should be engaged in pilot cities, with appropriate incentive policies provided by the local governments.
- *Enlarging pilot provinces and comparing methanol vehicles with other AEVs.* Except for those provinces who completed pilot projects, more provinces who are coal rich and have also launched other AEV projects could be involved. Thus, more methanol vehicles could be operated and they could be directly compared with other AEVs especially ethanol and gas vehicles. In this case, even if it is difficult to rapidly develop follow-up policies for methanol vehicles, it would still be valuable to adjust policies for ethanol and gas vehicles based on the comparison results of different pilot projects.
- *Creating a trans-provincial methanol fuel region.* As the largest methanol vehicle pilot province, Shaanxi is bounded by Shanxi and Gansu. By publishing unified methanol fuel and fuel station standards among these provinces, a cross-provincial region centred on Shaanxi could be established, which potentially increases the usage and impact of methanol fuels. Accordingly, more heavy-duty methanol vehicles and trans-provincial methanol coaches could be operated, which also pushes the development of methanol vehicles and the engagement of manufacturers.
- *Providing more incentive policies to encourage technological improvement of methanol vehicles.* The development of technological improvement should involve more stakeholders. To reduce the financial pressure, more government-oriented joint projects should be offered. Although the central government may still focus on the development of electric vehicle technology, provincial governments should provide more subsidies for methanol vehicle technology development and innovation. Policies and other non-governmental activities for encouraging technical cooperation among stakeholders including industry and institution should be enhanced.
- *Enhancing manufacturer engagement by narrowing the subsidy gaps between methanol vehicles and other AEVs.* Compared with the incentive policies for other AEV manufacturers, the subsidies for methanol vehicles were far less. More subsidies should be offered because the pilot projects have already proven the environmental and socioeconomic benefits of methanol vehicles. Similar to the investments on technological development, the pilot project provinces should increase the subsidy level to encourage more manufacturers to support the follow-up policies or the launch of new pilot projects.
- *Developing a comprehensive policy mechanism for the further implementation of methanol vehicles in China.* Previous policies for methanol vehicles have basically achieved the original targets especially the launch of pilot projects. To accelerate and expand the implementation of methanol vehicles, the current mechanism could be rapidly developed by enhancing their continuity and effectiveness. Long-term and short-term strategies for methanol vehicle development should be clarified and classified. Accordingly, a strong and clear signal to constantly implement methanol vehicles in China can be indicated by the governments.

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References

[1] Yuan X, Liu X, Zuo J. The development of new energy vehicles for a sustainable future: A review[J]. Renewable & Sustainable Energy Reviews, 2015, 42(C):298-305.

[2] Zhang X, Liang Y, Yu E, et al. Review of electric vehicle policies in China: Content summary and effect analysis[J]. Renewable & Sustainable Energy Reviews, 2017, 70:698-714.

[3] Hao H, Liu Z, Zhao F, et al. Biofuel for vehicle use in China: Current status, future potential and policy implications[J]. Renewable & Sustainable Energy Reviews, 2018, 82:645-653.

[4] Werner D, Arno R, Andrea S, et al. Automotive Fuels[M]. Ullmann's Encyclopaedia of Industrial Chemistry. Wiley‐VCH Verlag GmbH & Co. KGaA, 2007.

[5] Xiao X. Analysis and outlook on China's methanol industry development since global financial crisis[J]. Energy of China, 2010.

[6] Wang J, Dong Y, Wu J, et al. Coal production forecast and low carbon policies in China[J]. Energy Policy, 2011, 39(10):5970-5979.

[7] Olah G A. The Methanol Economy[J]. Chemical & Engineering News, 2003, 81(38):5-5.

[8] Olah G A, Goeppert A, Prakash G K S. Beyond Oil and Gas: The Methanol Economy, 2nd, Updated and Enlarged Edition[J]. 2011.

[9] National Bureau of Statistics. (2016). China Energy Statistics Yearbook. China Statistics Press, Beijing.

[10] Li C, Yue W, Zou X. Study on the Optimal Subsidy Policy for the Development of Methanol Vehicle in China[C]. Eastern Asia Society for Transportation Studies. 2017.

[11] MIIT. Key Points of Energy Conservation and Comprehensive Utilization in Industry. 2012. Retrieved from http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c3761006/content.html

[12] MIIT. Notice on Launching Methanol Vehicle Pilot Projects. 2012. Retrieved from http://www.miit.gov.cn/n1146290/n1146397/c4241013/content.html

[13] Yang C J, Jackson R B. China's growing methanol economy and its implications for energy and the environment[J]. Energy Policy, 2012, 41:878-884.

[14] MIIT. Notice on Launching Methanol Vehicle Pilot Project in Shanxi and Shaanxi Provinces. 2013. Retrieved from http://www.miit.gov.cn/n1146295/n1146592/n3917132/n4061768/n4061770/n4061771/n4061773/c4067819/content.html

[15] MIIT. Notice on Launching Methanol Vehicle Pilot Project in Shanghai. 2013. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057544/c3865081/content.html

[16] MIIT. Data Acquisition and Management for Methanol Vehicles. 2013. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057544/c3865084/content.html

[17] Shanxi provincial government. The Policies for the Acceleration of New Energy Automobile Industry in Shanxi. 2014. Retrieved from http://www.shanxi.gov.cn/sxszfxxgk/sxsrmzfzcbm/sxszfbgt/flfg_7203/bgtgfxwj_7206/201411/t20141112_161402.shtml

[18] MIIT. Notice on Launching Methanol Vehicle Pilot Project in Gansu and Guizhou Provinces. 2015. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057555/c3609332/content.html

[19] MIIT. The Seminar of Methanol Vehicles Development in China is held in Beijing. 2016. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057548/c4777604/content.html

[20] MIIT. The Seminar of Methanol Vehicles Pilot Projects (for Panel) in China is held in Beijing. 2017. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057555/c5560657/content.html

[21] MIIT. The Seminar of Methanol Vehicles Pilot Projects in China is held in Beijing. 2017. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057545/c5996715/content.html

[22] CPCIA. The Development of Methanol Fuel. 2015. Retrieved from http://www.cpcia.org.cn/html/13/201510/150653.html

[23] MIIT. The Regulation of Constructing Methanol Fuel Filling Station and Safely Using Methanol Fuel. 2015. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057545/c4377007/content.html

[24] MIIT. Technical Requirement for Methanol Vehicles. 2012. Retrieved from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057545/c3545891/content.html

[25] GOSC. Suggestions on Strengthening the Energy Saving and Emission Reduction of the Internal Combustion Engine Industry.2012. Retrieved from http://www.gov.cn/gzdt/2012-03/28/content_2101852.htm

[26] MIIT. The Forum of Methanol Vehicles Development in China is held in Jiangsu. 2016. Retrieve from http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057542/n3057547/c5349205/content.html