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Recent Development of Bio-fuel Policies and Regulations in Taiwan

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Abstract

Energy efficiency, environmental protections, reducing the dependence on fossil fuels, and securing the autonomy of energy supply are becoming the major concerns in developing new energy policy of many countries. In recent years, Bio-fuel, a much debated and controversial alternative energy, has become a solution or a strategic policy tool, to answer those aforementioned concerns in transportation sector of many countries. A number of countries or regions developed comprehensive regulations in promoting the usage of bio-fuel, such as mandates or direct/indirect subsidies, etc.

Taiwan, a part of the global village with deep reliance on fossil fuel, the government also carried out several programs/regulations to promote the use of bio-fuel in accordance with the national policy to promote the alternative energy, such as “Green Bus”, “Green County”, as well as nationwide mandate use of B1 biodiesel (mandatory B2 nationwide in 2010). Meanwhile, a legal framework has been developed as the base to carry out those policies, in particular, the pass of the first comprehensive renewable energy law in 2009 and amendments to several energy laws from 2008 to 2009. Although the overall deployment of renewable energy, in particular biofuel, is still in initial stage in compared to some leading countries or regions, the current development in Taiwan still shows the government’s intention to achieve the sustainable development as well as to create more possibilities for the green economy in Taiwan.

This article focuses to review on the recent renewable energy policies promulgated in Taiwan, in particular on the promotion of bio-fuel; including laws, administrative programs and regulations, and further investigate the effects of such legal/policy frame works.

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1. Introduction

Energy efficiency, reducing the greenhouse gas (GHG) emissions, reducing the dependence on fossil fuels, and securing the autonomy of energy supply are becoming the major concerns in developing new energy policy of many countries. In recent years, Bio-fuel, a much debated and controversial alternative energy, has become a solution or a strategic policy tool, to answer those aforementioned concerns in transportation sector of many countries. In comparison to other renewable energies , biofuel is one of the most attractive alternative energy source which could be used as the traditional fossil fuel and possess the long-term history trusted by people. [1]Yet, the deployment of large scale biofuel use also addresses other policy considerations, such as national security, environmental concerns, foreign exchange saving, and socioeconomic issues related to the rural sector. [2]Therefore, a number of countries or regions developed comprehensive regulations in promoting the usage of bio-fuel, such as mandates or direct/indirect subsidies, etc. [3]

Taiwan, a part of the global village with deep reliance on fossil fuel,[4] the government also carried out several programs/regulations to promote the use of bio-fuel in accordance with the national policy to promote the alternative energy, such as "Green Bus", "Green County", as well as nationwide mandate use of B1 biodiesel (mandatory B2 nationwide in 2010). Meanwhile, a legal framework has been developed as the base to carry out those policies, in particular, the pass of the first comprehensive renewable energy law in 2009 and amendments to several energy laws from 2008 to 2009. Although the overall deployment of renewable energy, in particular biofuel, is still in initial stage in compared to some leading countries or regions, the current development in Taiwan still shows the government's intention to achieve the sustainable development as well as to create more possibilities for the green economy in Taiwan.

Aiming to provide a policy and legal framework background review, this article will first introduce the recent development of energy policies directed by national policy/legal framework from 1996, especially on the part of renewable energy policies and the new promulgated renewable energy laws. Next, this article will explore the policies, administrative programs, laws and regulations on the promotion of biofuel deployment in Taiwan.

2. Background Review on the Development of National Energy Policy Framework in Taiwan

2.1. "Energy Policy and Implementation in Taiwan Area" in 1996 and" The First National Energy Conference" in 1998

The renewable energy concerned in Taiwan's national policy could be dated back to "Energy Policy and Implementation in Taiwan Area" in July, 1996.[5] Among the policy, one of the guidelines listed the goal of

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[1] Mark Rosegrant and Siwa Msangi, *Agriculture and the Environment: Linkages, Trade-Offs and Opportunities*, 19 GEO. INT'L ENVTL. L. REV., 2007, p. 699,703.

[2] Ayhan Demirbas, *Global biofuel strategies*, Energy Education Science Technology, 2006; 17:27-63. *See* also, Ayhan Demirbas, *Progress and recent trends in biodiesel fuels*, Energy Conversion and Management 50, 2009, pp.14-34, p. 30.

[3] Poonam Singh Nigam and Anoop Singh, *Production of liquid biofuels from renewable resources*, Progress in Energy and Combustion Science(2010), pp.1-17.

[4] There is about 98% energy supplied by imported energy. Bureau of Energy, Ministry of Economic Affairs (MOEABOE), *The White Paper on Energy Industry and Technology of 2010*, available at: http://www.moeaboe.gov.tw/Download/Policy/files/2010 年能源產業技術白皮書.pdf (last visited: 2011/12/5)

[5] MOEABOE, *Energy Policy and Implementation in Taiwan Area*, available at: http://www.moeaboe.gov.tw/Policy/PoMain.aspx?PageId=executepolicy (last visited: 2011/12/5)

"Reinforce Energy Research and Development (R&D) - Encourage R&D and Promote Incentives on Renewable Energies and New Energy Technologies" and was expected to apply “Review and Proceed the Research on Various Renewables, such as solar, wind, biomass, ocean, and water to promote them economically” to be the implementing measures. For reference, table 1 depicts the outline of Taiwan’s Energy Policy Framework with the guidelines, contents, and master goal in “Energy Policy and Implementation in Taiwan Area”.

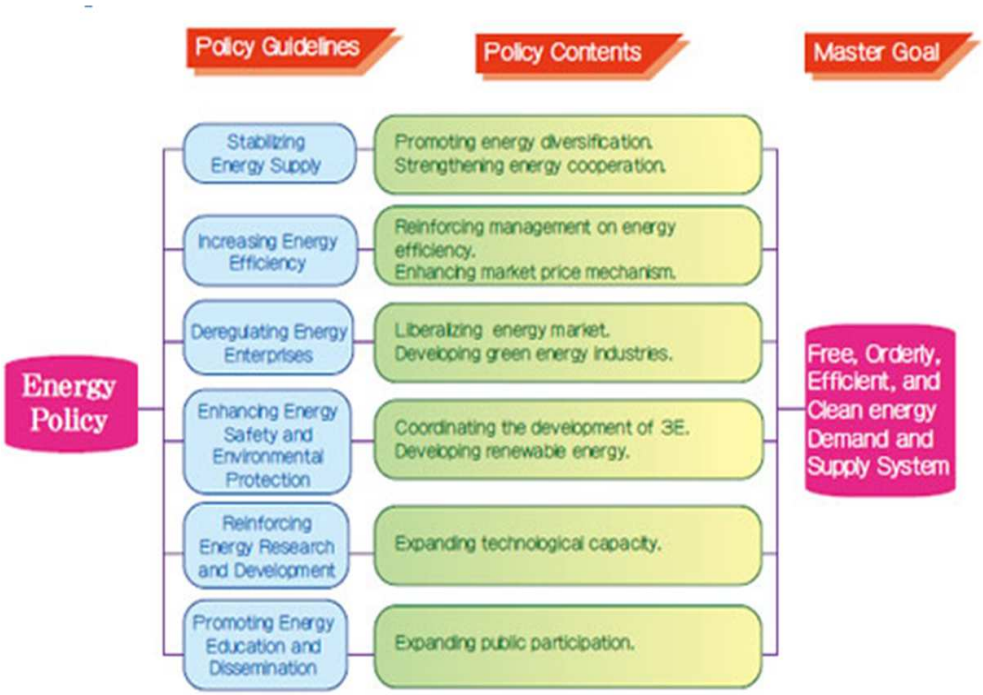

Table 1: Energy Policy Framework of 1996- Energy Policy and Implementation in Taiwan Area.

(Source: MOEABOE, *Taiwan's Energy Policy and Supply-Demand Situation-Implementation Measures*, available at: http://www.moeaboe.gov.tw/About/webpage/book_en3/page3.htm (last visited: 2011/12/5))

In response to the Kyoto Protocol, the supplementary provision of United Nations Framework Convention on Climate Change of 1997 (UNFCCC), [6] Taiwan’s government convened “The First National Energy Conference” in May, 1998. [7] This conference reached consensus to set out the goal to increase the share of new energies, including solar, wind, biomass, geothermal, ocean, and water, etc., up to 3% in Taiwan’s total energy supply by 2020; the first time that the deployment of renewable energy was introduced into the energy policy in Taiwan.

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[6] United Nations Framework Convention on Climate Change(UNFCCC), *Kyoto Protocol*, available at: http://unfccc.int/kyoto_protocol/items/2830.php (last visited: 2011/12/5)

[7] Ministry of Economic Affairs, *Executive effects and review on the conclusion of “The First National Energy Conference” in 1999*, March 12, 2009, available at: http://www.moeaboe.gov.tw/Download/Policy/98EnergyMeeting/meetingpolicy/important/files/87_年全國能源會議結論執行成效與檢討.pdf (last visited: 2011/12/5)

To carry out the consensus reached in this conference, the Executive Yuan approved several administrative programs and plans after the conference. For instance, the "Renewable Energy Development Plan" announced in January, 2002, [8] proposed to appropriate a budget of NT$266.7 billion to support the development of renewable energies in 2003 -2022 period. Further, "Challenge of Year 2008, National Development Plan-Water and Green Building"[9] in May, 2002 and "Nuclear-free homeland Guideline-Development Policy of Energy Saving and Clean Energy Industry" [10] in September, 2003, are also directed the promotion on green technologies with clean, high efficiency, and sufficient alternative energies to encourage the energy diversification, decrease the dependence on the imported energies and draw up the budget of 3 billion as the incentives for energy saving and industries of renewable energies.

2.2. The Second National Energy Conference in 2005[11]

In light of the fact that the Kyoto Protocol has taken effect from 2005, "The Second National Energy Conference" was held in the same year and addressed "Sustainability, Security, Efficiency, and Clean" as the core issue of this meeting. Through several proposed plans, such as "Develop the harmonization of 3 E (energy, environment, economy)", "Promote Non-regret Strategy", "Boost Independent Energy", "Strengthen Regional Cooperation", "Intensify Price Function", "Increase Energy Efficiency", "Broaden Technology Capacity", and "Support Clean Industry", the conclusion of this conference set out to reduce imported energies for lower consumption percentage and achieve the target of renewable energy account for 10% among total energies in 2010.

In addition, concerning biofuels, this conference first introduced the promotion of biofuel as one of the important strategic to promote the use of renewable energy in the transportation sector. Through "Green Energy Development and Energy-using Efficiency Promotion" plan, this conference set out two goals on the use of biofuel : (a) Ethanol consumption should be up to 100,000-300,000 kiloliters by 2010, and 200,000-600,000 kiloliters by 2015, and 300,000-900,000 kiloliters by 2020; (b) Biodiesel consumption should be up to 100,000 kiloliter by 2010, and 150,000 kiloliters by 2020.[12] These goals were incorporated in "Administrative Regulations on the Production and Sales of Renewable Energies Such as Ethanol, Biodiesel, or Oil from Recycled Waste", [13] which was authorized by "Petroleum Administrative Act" and aims to rule the producers

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[8] MOEABOE, *Meeting No. 09100000755 of Executive Yuan*, January 17, 2002.

[9] Council for Economic Planning and Development, *Challenge 2008 National Development Plan*, available at: http://www.cepd.gov.tw/m1.aspx?sNo=0001539&ex=1&ic=0000015 (last visited: 2011/12/5)

[10] Government Information Office, Republic of China(Taiwan), *News Release-The Announcement on the 5th council of Nuclear-free homeland Promotion Committee*, July 22, 2003, available at: http://info.gio.gov.tw/ct.asp?xItem=23287&ctNode=919 (last visited: 2011/12/5)

[11] MOEABOE, *The conclusion and executive effect of National Energy Conference of 2005*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/MeetingMain.aspx?pageid=mainfream (last visited: 2011/12/5)

[12] MOEABOE, *Issue 3 of The conclusion and executive effect of National Energy Conference of 2005*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/conclusion/conclusion_3.html (last visited: 2011/12/5)

[13] The administration regulation was amended the provisions with the title of "Administrative Regulations on the Production, Import, Blend, and Sales of Ethanol, Biodiesel, and Renewable Oil" on December 17, 2008. Laws & Regulations Database of The Republic of China, Administrative Regulations on the Production, Import, Blend, and Sales of Ethanol, Biodiesel, and Renewable Oil , available at: http://law.moj.gov.tw/News/news_detail.aspx?id=52660 (last visited: 2011/12/5)

and distributor of biodiesel, ethanol, and renewable oil to comply the certain obligation and regulations.

2.3. Framework of Taiwan's Sustainable Energy Policy in 2008[14]

In 2008, "Framework of Taiwan's Sustainable Energy Policy" , which was approved by the Executive Yuan (the cabinet of Taiwan) , proposed the policy object "Win-Win-Win Solution for Energy, Environment and Economy" and introduced the policy guidelines of "Improving energy efficiency, Developing clean energy, and Securing stable energy supply" to achieve such object. Several measures were proposed including: (a) To improve energy efficiency over 2 % among 2008-2015 for decreasing the energy intensity over 20% in 2015 and over 50% in 2025 compared with it in 2005; (b) To reduce nationwide CO2 emission for aiming to return it in the standard of 2008 among 2016-2020 and in the standard of 2000 in 2025. Further, the share of low carbon energy in electricity generation systems should be from 40% currently to 55% in 2025; (c) To build a security system of energy supply to meet the goal of annual economic growth rate up to 6% among 2008-2012 and US$30,000 per capita income by 2015.

In addition, this policy submitted to establish a energy consumption and supply system of "Two High and Two Low- High efficiency, High value-added, Low emission, and Low dependency". It stated "Cleaner Energy Supply" and "Rationalized Energy Demand" as the main steps. The former addressed to restructure energies mixing and improve energy efficiency, like the share of renewable energies in the electricity system could be reached 8% by 2025 through the measures of developing carbon-free renewable energies, increasing the usage of low carbon natural gas over 25% among total power generated in 2025. On the other hand, rationalized energy demand focused on promoting energy conservation schemes in various sectors, such as industrial, transportation, residential and commercial, and public sectors.

Further, "Framework of Taiwan's Sustainable Energy Policy" emphasized to provide a comprehensive regulatory framework and relative mechanisms by facilitating or amend several laws, acts, and regulations and apply some specific measures to support the framework. Such as, to establish a fair, efficient, and free-opened energy market, [15] design a carbon emission trading scheme, set carbon reduction funds, increase the annual energy research budget from NT$5 billion to NT$10 billion, and promote energy conservation and emission reduction education. Table 2 is the policy object, "Win-Win-Win Solution for Energy, Environment and Economy", proposed in "Framework of Taiwan's Sustainable Energy Policy" as the national energy policy since 2008 in Taiwan. And Table 3 is the basic principle to establish a energy consumption and supply system of "Two High and Two Low- High efficiency, High value-added, Low emission, and Low dependency".

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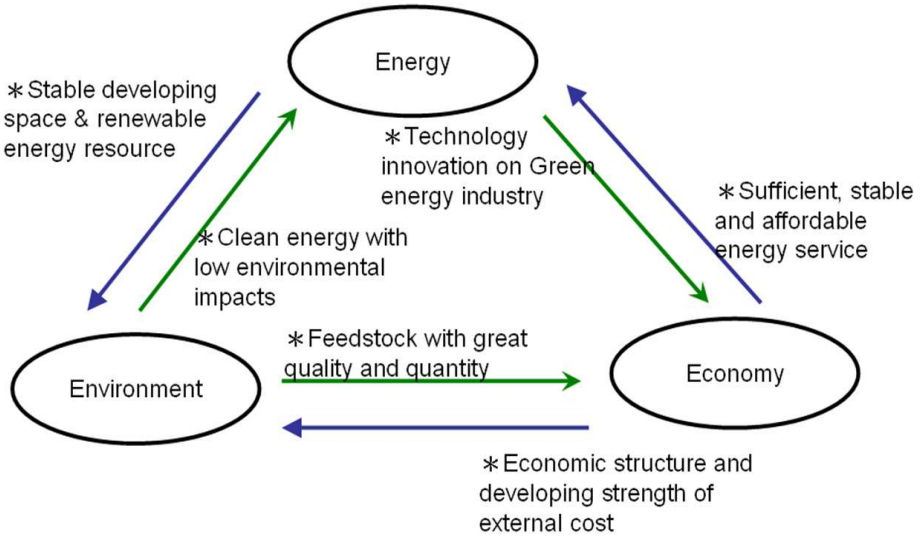
[14] MOEABOE, *Framework of Taiwan ' s Sustainable Energy Policy*, available at: http://www.moeaboe.gov.tw/Download/Policy/files/永續能源政策綱要.pdf (last visited: 2011/12/5)

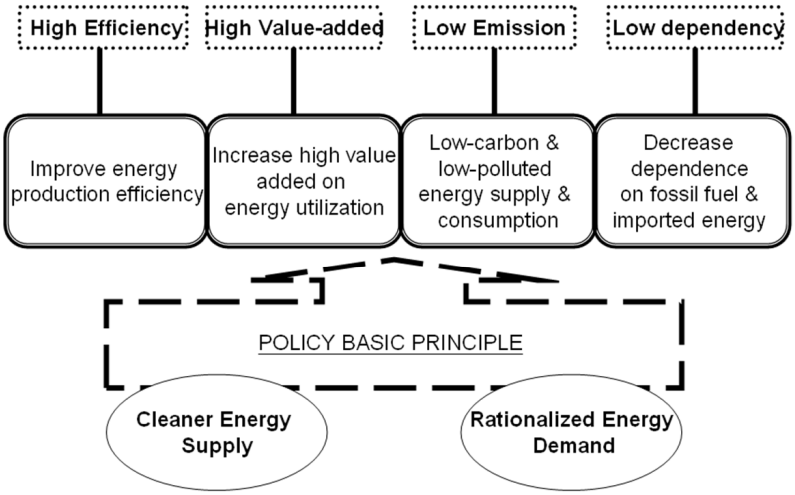
[15] For example, "Greenhouse Gas Emissions Reduction Act" for substantially build emission reduction capacity and enforce reduction measures, "Renewable Energy Development Act" to develop clean energy, "Regulations on Energy Tax" to reflect the external cost of energy consumption, and "Energy Management Act" to effectively promote energy saving measures.

Table 2 Win-Win-Win Solution for Energy, Environment and Economy



Source: "Framework of Taiwan's Sustainable Energy Policy"

Table 3 A energy consumption and supply system of "Two High and Two Low- High efficiency, High value-added, Low emission, and Low dependency"



Source: "Framework of Taiwan's Sustainable Energy Policy"

2.4. The Third National Energy Conference in 2009[16]

The Third National Energy Conference in 2009 emphasized on four subjects: (1) Sustainable development and Energy Security; (2) Energy management and Efficiency promotion; (3) Energy prices and Market openness; (4) Energy technology and Industrial development. Besides, it also combined with the "Action Program of

[16] MOEABOE, *The conclusion of "National Energy Conference of 2009*, available at: http://www.moeaboe.gov.tw/Policy/98EnergyMeeting/MeetingMain.aspx?pageid=convention (last visited: 2011/12/5)

Energy Saving and Carbon Reduction" , [17]enacted by the "Framework of Taiwan's Sustainable Energy Policy of 2008", as "Action Program of Sustainable Energy Policy" by six developing strategies of energy, industry, transportation, environment, life, and law into practice. [18]

2.5 2010 National Establishment Plan of Republic of China (Taiwan)-Policy and Establishment[19]

Taiwan government stated the principle of "Populace Economy" to response the industrial reforms worldwide and the economic structure in the post-financial-crisis period. In 2010, the government focuses on "Promote investment, Adjust framework, Amuse livelihood, Expand energy-saving" as the policy to execute. Especially, it emphasized "Green Energy" on several aspects, like industries, transportation, technologies, buildings, education, tax system, the public, and laws, etc..

2.6 The"Regulation for Renewable Energy Development"in 2009

In addition to those policy or administrative actions to promote the renewable energy in Taiwan, several legislative efforts were introduced for realizing those aforementioned national energy policies. The latest and most noted legislation, "Regulation for Renewable Energy Development", was passed on June 12, 2009 and promulgated by the president on July 8, 2009, after seven years long legislative process in the Legislative Yuan.[20]

The regulation grants the Bureau of Energy (BOE) authorities to promote the usage of renewable energies in Taiwan, increase energy diversification, reduce greenhouse gases, improve relative industries, and boost national sustainable development. The regulation contains only 23 articles but covers several aspects of renewable energies, including of operation, facilities, incentives and subsidies, developments, feed-in tariff (FiT), obligations, mediation, and penalties. The categories of renewable energies identified in this bill are solar, ocean, wind, biofuels, geothermal, non-pump and storage hydropower, hydrogen, waste, fuel cell, and other renewable electricity.

The feature of "Regulation for Renewable Energy Development" is to provide the incentive for generation capacity of renewable energies by 650-1,000 MW within 20 years. Further, it is expected to achieve the goal of over 845 MW in 2025 and occupy the share of more than 15% in the total energy generation capacity in Taiwan.[21] The legislation of this regulation represents Taiwan's government has made a clear and strong commitment to develop renewable energy. [22]

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[17] Council for Economic Planning and Development, *Framework of Sustainable Energy Policy-Action Program of Energy Saving and Carbon Reduction* ,September 4, 2008, available at: http://www.moeaboe.gov.tw/Download/Policy/98EnergyMeeting/meetingpolicy/important/files/節能減碳行動方案-全國能源會議上網版(經建會).pdf (last visited: 2011/12/5)

[18] Council for Economic Planning and Development, News release- Practice Sustainable Energy Policy, *Establish low-carbon and energy-saving society*, December 4, 2009, available at: http://www.cepd.gov.tw/m1.aspx?sNo=0012689&key=%e6%b0%b8%e7%ba%8c (last visited: 2011/12/5)

[19] *2010 National Establishment Plan of Republic of China(Taiwan)-Policy and Establishment*, the meeting No.3177 of the Executive Yuan, December 31, 2009, available at: http://www.ey.gov.tw/public/Attachment/01119451771.pdf (last visited: 2011/12/5)

[20] The Legislative Yuan-legal system, *Regulation for Renewable Energy Development*, available at: http://lis.ly.gov.tw/lgcgi/lglaw?@16:1804289383:f:NO%3DC708101*%20OR%20NO%3DC008101%20OR%20NO%3DC108101$$4$$$NO (last visited: 2011/12/5)

[21] MOEABOE, *The comparison between Erneuerbare-Energien-Gesetz (EEG) of German and Regulation for Renewable Energy Development of Taiwan*, December 4, 2009, available at: http://unfccc.epa.gov.tw/unfccc/chinese/_upload/copenhagen/01_wang_2.pdf (last visited: 2011/12/5)

[22] Jenn Jiang Hwang, *Promotional policy for renewable energy development in Taiwan*, Renewable and

3. The Promotion of Biofuel in Taiwan- Administrative and Legislative Efforts

Pursuant to the policy and legal frameworks depicted in national energy policies, Taiwan's administrations carry out these policies by laws, regulations, and administrative rules. In the vein of promotion the usage of biofuels in Taiwan, the implementations are mainly executed through Council of Agriculture (COA), Environmental Protection Administration (EPA), and Bureau of Energy (BOE). The followings will introduce the administrative actions and its achievements related to biofuel promotion of these agencies.

3.1. Council of Agriculture, Executive Yuan (COA)

In 2005, COA issued "Plan for Production and Distribution of Energy Crops System Establishment" for promoting fallow lands to plant the energy crops with the subsidy of NT$60,000 per hectare. Initially, the plan selected Yunlin, Chiayi, Tainan, Kaohsiung, and Pingtung in Taiwan as the demonstrative regions and were planted soybean, rape, and sunflower. It was estimated that the area would expand from 90 hectares to 8,000 hectares in 2007. [23]

3.2. Environmental Protection Administration, Executive Yuan (EPA)

3.2.1. "Biodiesel Road-Test Program"[24]

EPA has cooperated with BOE to engage in "Biodiesel Road-Test Program" from 2004. It encourages the garbage and recycled trucks in 13 counties and cities to fuel B20 (20% biodiesel blended into 80% diesel) for replacing the conventional diesel.[25]

3.2.2. "The Recycled System for Waste Edible Oil"[26]

EPA has established "The Recycled System of Waste Edible Oil" form September 1, 2007. The system requires the large-scale chain stores of fast food , such as McDonalds, KFC, Mosburger, and the instant noodles producers, such as Uni-President, Vedan, Weilih, have to provide the waste edible oil for the local cleaning team or other recycled organizations and report thru on-line system. Further, EPA also encouraged the resident, institutions, schools, and companies to voluntarily participate in this system to achieve the goal of recycle the waste edible oil up to 4,692 kiloliter by the end of June 2008.

3.3. Bureau of Energy, Ministry of Economic Affairs (MOEABOE)[27]

According to "Developing Green Energy-Biofuel Executive Program" submitted by Ministry of Economic Affairs (MOEA) and approved in the cabinet meeting No. 3010 of Executive Yuan in October 11, 2006, BOE followed the direction to propose "Executive Project on Promote Biodiesel" and "Executive Project on Ethanol

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Sustainable Energy Reviews 14, 2010, pp.1079–1087, p. 1086.

[23] Lin Mei Hua,Su Tzung Jen , *Executive effect on the adjustment of paddy field and upland utilization in 2007-2009*, Agricultural policy and information, September, 2010, Vol 219., available at: http://www.coa.gov.tw/view.php?catid=22082 (last visited: 2011/12/5)

[24] Environmental Protection Administration (EPA), *The Environmental Benefits and Strategy Analysis of the Biodiesel Vehicles*, executed by The Energy and Environment Research Laboratories (EERL) of the Industrial Technology Research Institute(ITRI), available at: http://epq.epa.gov.tw/project/projectcp.aspx?proj_id=HTYUJPORFC (last visited: 2011/12/5)

[25] *Id.*

[26] EPA, *The Project of Used Cooking Oil Recycling, PVC Controlling, and Estimation of General Waste Clearance and Treatment Costs (2nd year)*, executed by Sinotech Engineering Consultant, LTD., available at: http://epq.epa.gov.tw/project/projectcp.aspx?proj_id=QJHAMTKLSW (last visited: 2011/12/5)

[27] *Development & Dissemination of Bio-fuel Technologies*, Industrial Technology Research Institute, 96-D0133, 2007.

Promotion" in 2007, with the assistance of the Industrial Technology Research Institute (ITRI) through the industry technology project such as the "Development and Promotion Plan on Biofuel Technology." The plan is divided into two parts, biodiesel and ethanol, and applied gradual steps to execute its individual programs and measures from 2006 till now.

3.3.1 Biodiesel

3.3.1.1. The First Step- "Subsidy Program for Energy Crop on Green Bus"[28]

According to "Subsidy Program for Energy Crop on Green Bus", the BOE will subsidize the cost when the public buses use the convention diesel with 1-5% domestic biodiesel blended. The detail of this program required that the qualified feedstock source for the subsidies should come from the energy crops promoted by COA and blend with the biodiesel produced from the waste edible oil. The program started from November 1, 2006 and expired on June 30, 2008.

3.3.1.2. The Second Step- "Subsidy Program for the Application on Green Country"[29]

This pilot program designated Taoyuan County, Chiayi County and Chiayi City as the demonstrative regions to provide and sell B1 in the local petroleum station which subsidy for costs between biodiesel and conventional diesel would be covered by the administration. The qualified feedstock for the subsidy included sources from the waste edible oil, energy crops, or biodiesel procured by domestic refiners, i.e. the CPC Cooperation or Formosa Petrochemical Cooperation. The period of this program was from July 27, 2007 to July 14, 2008.

3.3.1.3. The Third Step- Mandatory B1 nationwide in 2009[30]

Pursuant to "Rules related to the Range and Ways of Blending Percentages for the Refiner and Importer of Petroleum in Domestic Transportation" authorized by Article 38 (1) of "Petroleum Administration Act", the domestic refiners are mandated to blend B1 biodiesel in Taiwan island from July 15, 2008. This mandatory rule also provided refiners three months grace period to replace the supply and storage system, but a nationwide full force mandate started from 2010. Nonetheless, the order did not stipulate the source of biodiesel blended nor provide subsidy.

3.3.1.4. The Forth Step-National Mandatory B2 in 2010[31]

After the implementation on mandatory B1 since 2008, BOE was further ruling mandatory B2 in June 15, 2010, and BOE estimates the demand of biodiesel will achieve the goal of 80,000 kiloliters per year.

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[28] MOEABOE, *Subsidy Program for Energy Crop on Green Bus*, available at: http://www.moeaboe.gov.tw/opengovinfo/laws/secondaryenergy/LSecondaryMain.aspx?PageId=l_secondary_06 (last visited: 2011/12/5)

[29] MOEABOE, *Subsidy Program for the Application on Green Country*, available at: http://www.moeaboe.gov.tw/opengovinfo/laws/secondaryenergy/LSecondaryMain.aspx?PageId=l_secondary_07 (last visited: 2011/12/5)

[30] MOEABOE, *Rules related to the Range and Ways of Blending Percentages for the Refiner and Importer of Petroleum in Domestic Transportation-Used Diesel blended with Fats*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx?PageId=l_secondary_11 (last visited: 2011/12/5)

[31] *Id.*

3.3.2. Ethanol

3.3.2.1. The First Step-"Program of Green Public Fleet"[32]

The pilot program required the public fleet of Taipei city as the demonstrative region and operated from September 29, 2007. It ruled the public fleet belonged to Legislative Yuan, Judicial Yuan, Examination Yuan, Control Yuan, Executive Yuan and its subsidiary agencies, and Taipei City Government had to apply E3 (3% ethanol blended into 97% gasoline) with the subsidy for purchasing, cost differences, maintenances, and the marketing on ethanol promotion. In addition, the general public could also purchase E3 from selected gas stations which the oil price may cheaper than regular unleaded gasoline upto NT$1 per liter on account of the subsidy provided by BOE.

3.3.2.2. The Second Step-"Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis"[33]

To boost ethanol into usage in the market is the second step of "Executive Project on Ethanol Promotion". From July 29, 2009, the petroleum refiner offer and sell E3 in Taipei City and Kaohsiung City could apply the subsidy for cost differences, repairing, promotion, and marketing.

3.4. The Effect of Biofuel Promotion Policy in Taiwan

In order to balance the requirement on energy, environment, and economy to achieve the target of national energy policies directed from 1996, Taiwan has executed and practiced biofuels since 2004 and made some initial progress through the efforts from the administrative departments. Especially, COA, EPA, and BOE under Executive Yuan have implemented various programs to promote biofuel in Taiwan.

3.4.1. COA-"Established Plan for Production and Distribution System on Energy Crops" [34]

The plan estimated the energy crops could be planted 2,000 hectares for producing 1,000 kiloliters biodiesel in 2006, planted 6,000-8,000 hectares for producing 3,000-4,000 kiloliters biodiesel in 2007, and planted 20,000 hectares for producing 10,000 kiloliters in 2008. And the actual achievements were 1,721 hectares in 2006 and 2,334 hectares in 2007. Further, the biodiesel produced by these energy crops, like soybean, rapes, and sunflower, were used in the program of "Green Bus" and "Green Country" executed by BOE.

3.4.2. EPA-"Biodiesel Road-Test Program" and "The Recycled System for Waste Edible Oil"[35]

EPA executed and promoted "Biodiesel Road-Test Program" with the budget 100 million every year in accordance with "Nuclear-free homeland Guideline-Development Policy of Energy Saving and Clean Energy Industry" promulgated by Executive Yuan from 2004. There have already 13 counties and cities received the subsidy on using B20 as the alternative fuel which the feedstock source is mainly from the waste edible oil.

"The Recycled System for Waste Edible Oil" aimed to put the waste edible oil recycle and reuse as the transportation fuel with the goal of recycling it up to 4,692 kiloliter by the end of June 2008. According to the government public information, there were 5,370 kiloliters waste edible oil recycled and accounted from July

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[32] MOEABOE, *Program of Green Public Fleet*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx?PageId=l_secondary_09 (last visited: 2011/12/5)

[33] MOEABOE, *Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis*, available at: http://www.moeaboe.gov.tw/opengovinfo/Laws/secondaryenergy/LSecondaryMain.aspx?PageId=l_secondary_15 (last visited: 2011/12/5)

[34] Lin Mei Hua,Su Tzung Jen , *supra* note 23.

[35] *Supra* note 27.

2007 to June 2008.

3.4.3. BOE-" Plan of Development and Promotion on Biofuel Technology"[36]

"Subsidy Program for Energy Crop on Green Bus" had implemented from November 1, 2006 to June 30, 2008 and made the public buses usage of biodiesel in Kaohsiung City and Chiayi County reach the amount about 160 kiloliters B100. It contributed Kaohsiung and Chiayi to be the second and the third city with the public buses fueled biodiesel entirely after Kyoto of Japan in Asia. Moreover, "Subsidy Program for the Application on Green Country" , which started from July 27, 2007, selected Taoyuan County, Chiayi County and Chiayi City as the demonstrative regions to supply B1. The government public information indicated that there were 297 gas stations participated in this program and supplied 343,241 kiloliters B1 accounted on July 14, 2008. Further, Taiwan has approved 9 biodiesel refineries to produce, blend, and distribute nationally and also implemented the mandatory B2 on June 15, 2010 authorized by the amendment of Article 38(1) of "Petroleum Administration Act"[37] with the target of 100,000 kiloliters. The study showed the consumption of biodiesel reached 36,000 kiloliters and reduced 120,000 metric tons CO2 in 2009.

In addition, the development on promoting ethanol sets are also in progress, for example, "Program of Green Public Fleet" had consumed 123 kiloliters E100 from September 29, 2007 to July 28, 2009 and decreased 258 metric tones CO2 emission. Besides, there are 8 gas stations in Taipei City and 6 gas stations in Kaohsiung supplied E3 and consumed about 145 kiloliters accounted from July 2009 to July 2010 based on " Promoting Program for Ethanol in Taipei and Kaohsiung Metropolis".

4. Conclusion and Perspective

Through tracking and observing the international trend, energy policies currently address some issues related to develop the technology with environmental friendly for increasing energy supplies, encouraging cleaner and more efficient energy usage, reducing air pollution and carbon dioxide emission to alleviate the global warming and climate change.[38] Taiwan's energy policies has emphasized on renewable energies since 1996 while the government promoted biofuel from 2004.

Based on the review of the track of recent Taiwan energy policy developments, one could find that through the proposal of several administrative actions, such as the establishment of "Framework of Taiwan's Sustainable Energy Policy", as well as latest legislative action on new renewable promotion regulations, Taiwanese government has taken the step to incorporate sustainable considerations into its energy policy. However, based on the background reviews of the formation of Taiwan's recent energy policy, we also can find the fact of lacking of comprehensive and solid legal scheme, heavily relying on administrative pilot programs, short of interagency cooperation, which indicate the limitation of current policy formation.

In observing the progress of introducing and promoting the usage of biofuel in Taiwan, we could conclude

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[36] *Id.*

[37] The Executive Yuan Gazette Online, *Amend Executive Period, Range, and Way of Esters Blended Percentage on Petroleum Refinery and Importers to Sell Domestic Transportation Diesel*, issued on June 10, 2010, effected on June 15, available at: http://gazette.nat.gov.tw/EG_FileManager/eguploadpub/eg016112/ch04/type1/gov31/num5/Eg.htm (last visited: 2011/12/5)

[38] Ayhan Demibras, *Importance of biodiesel as transportation fuel*, Energy Policy 2007; 35:4661-70.

the initial progress is successful thru the stages of pilot programs and mandates. However, lack of strategic policy goals, industry, technology or agriculture fostering measures and comprehensive developing schemes, reveal the deficiency of current policy. In addition, currently, many countries or regions are adapting their biofuel policies to incorporate sustainable criteria in terms of biofuel production and deployment, which should also be one of the major policy consideration for Taiwan to deploy the large scale of biofuel use in the future.

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