Appendix

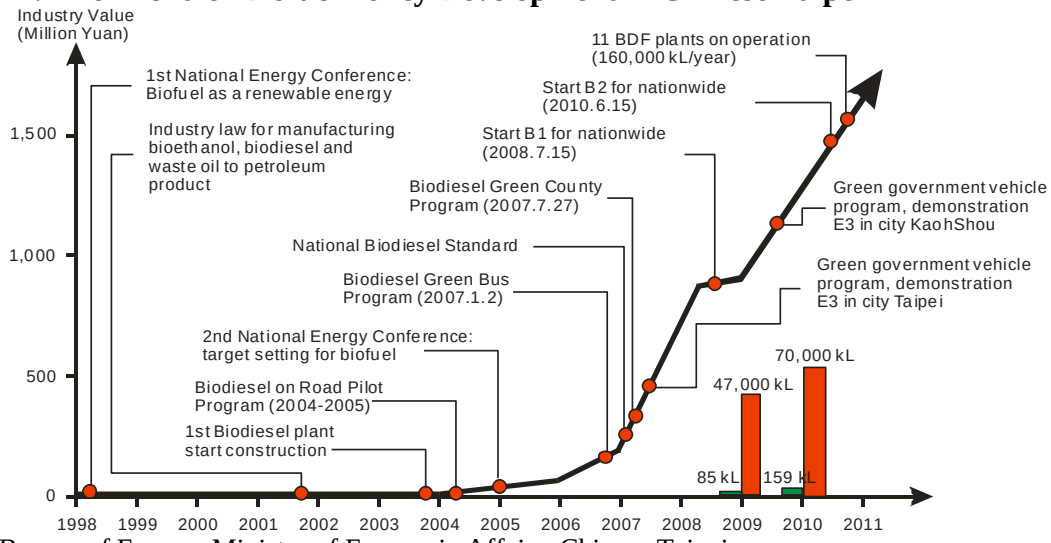
Development of Biofuels in Chinese Taipei

Policies

Chinese Taipei's biofuel development is built on government policy for recycled energy development statute and greenhouse gas reduction. The biofuel policy has also significantly become very apparent in the wake of a green energy industry development trend and rising oil price.

Chinese Taipei has recognized biofuel as a renewable energy at the first "National Energy Conference" in May 1998. Subsequently, the promotion of biofuel as an initial activity was centered on research and development. The first biofuel industry law has promulgated in 2001; the law was a provision for manufacturing and utilization of bioethanol, biodiesel and petroleum product fuel from waste oil. One small pilot project call "Biodiesel on Road Program" was conducted in the early part of 2004. Based on the results from the pilot project, Chinese Taipei had set their first biofuel target for the transportation sector at the second "National Energy Conference" in 2005. The first biofuel target was focused on biodiesel industry chain development from feedstock, manufacture and utilization (impact on vehicle). The national biofuel standard was implemented in 2007 to complete the law and regulations on biofuel promotion.

Figure A1: The Trend of Biofuel Policy Development in Chinese Taipei



Sources: Bureau of Energy, Ministry of Economic Affairs, Chinese Taipei.

Existing Policies and Regulations

1) Renewable Energy Development (8th July 2009)

The Renewable Energy Development was passed right after the "National Energy Council" of 2009. The objective of the Act was to promote the utilization of renewable energy, increase energy diversification, improve environment quality, energize related industries and enhance the national sustainable development. Feed in tariffs (FIT) has become the main measure to implement the policy to promote the utilization of renewable energy. Biodiesel has mandated the mixture obligation of 2%, but bioethanol by a voluntary program has mandated a mixture obligation of 3%.

2) Petroleum Administration Act (Article 38 and Article 57)(11 October 2001)

Article 38:

A business engaging in the production, import, blending, sales of alcohol gasoline, biodiesel, or renewable oil products must apply for prior approval of the central competent authority for operating the business. Other than petroleum products used for blending, rules related to the security stockpile and Petroleum Fund do not apply to renewable energy sold by businesses. The central competent authority will stipulate measures for the administration of businesses engaging in the production of the renewable energies of alcohol gasoline, biodiesel, or renewable oil products.

Article 57:

Prior to the enforcement of the amendment of this Law, any business engaged in alcohol gasoline, bio-diesel, or renewable oil products granted the permit(s) of establishment in accordance with Article 38 will be regarded as already granted the valid approval for the production and sales of alcohol gasoline, bio-diesel, or renewable oilproducts.

3) Administration Act for Manufacture, Import, Mixture and selling of Bioethanol, Biodiesel, and Recycled Oil Production

The law was conducted with the desired provisions on administrative legislation for biofuel manufacture, import, mix, sales based on the Petroleum Administration

Act, Article 38-3. The biofuel developers are requested to submit the details of the project and receive permits for each stage from related administrative departments. The law also clarifies that biomass liquid fuel that does not meet national standards for biodiesel fuel is available to the industrial and power generation sectors.

4) Standards for the Composition of Automobile Gasoline and Diesel Fuels

For the effective regulation of biodiesel quality, Chinese Taipei had announced on March 2, 2007 the biodiesel (fatty acid methyl ester) standard (CNS-15072). According to the project of norms and standards, Taiwan basically refers to the norms of the European biodiesel standards, including the EN14214:2003 and the American Society for Testing and Materials (ASTM) D6751 standard from the United States.

Target

Target

Chinese Taipei has set up a target for biodiesel B2 by 2011 and B5 by 2016. As planned, the mandatory B2 target nationwide was successfully enforced in June 2010, and the construction was underway for following the B5 target by the year 2016. Although there was feedstock shortage for biodiesel in the domestic market, they successfully completed the biodiesel industry chain by using waste edible oil.

The early target for the bioethanol E3 nationwide was set for 2011, but was finally postponed to 2018. The current introduction of bioethanol is behind schedule because of uncertainty of feedstock supply in the domestic market, where the program has affected the food supply system in the country. In 2010, only 159 kL was used in the pilot projects “Green Public Service Vehicles” at Kaohsiung and Taipei.

Table A1: Current Status and Target of Biofuel Promotion

	Unit	Actual		Target	
		2009	2010	2016	2018
Biodiesel	kL	47,000	70,000 (B2)	250,000 (B5)	-
Bioethanol	kL	85	159 (E3)	-	300,000 (E3)

Sources: Bureau of Energy, Ministry of Economic Affairs, Chinese Taipei.

Production

Currently, Chinese Taipei biodiesel feedstock supply is mainly from waste edible oil in the domestic market and a small amount feedstock imports from the international palm oil market. At the end of 2011, 11 biodiesel refinery plants were operating with the total capacity 160,000 kL per year. But when we look at the domestic biodiesel production in 2012, the utilization of the facility is around 50% with 83,000 kL per year. This is because the import of biodiesel or import of feedstock is cheaper than domestic manufacturing of biodiesel. Meanwhile, stricter environmental regulations on the disposal of waste edible oil and recycling and refinery of waste oil has been successful, from securing the biodiesel raw materials, biodiesel refinery sector, distribution and retail sector until the final consumption sector, the biodiesel industry chain has been completed. The focus on future policy is appropriated to the expansion of the supply of feedstock whether the feedstock comes from domestic sources or abroad.

Table A2: Production Trend of Bioethanol and Biodiesel in Chinese Taipei

Year	Bioethanol (kL)	Biodiesel (kL)
2005	-	679
2006	-	1,876
2007	123	3,717
2008	23	19,088
2009	93	31,620
2010	215	43,774
2011	115	56,939
2012	235	82,872
2013.1-3	24	22,155

Sources: Bureau of Energy, Ministry of Economic Affairs, Chinese Taipei.

Development Program

Biodiesel

1) Biodiesel on Road Pilot Program (2004-2005)

This was the first biofuel program conducted by Chinese Taipei on biofuel promotion activities. The program was carried out from 2004 to 2005 by introduced a biodiesel target of B20 in 780 units of municipal waste collecting trucks at 13 cities and counties. The source of biodiesel in this pilot program was from waste cooking oil in the domestic market. This program had consumed about 1,300 kL biodiesel

(3,195 kL from different sources) and the government had paid out 100 million Yuan for the activity.

2) Green Bus Program (2007.1.2)

This program was promoted at Kaohsiung City and Chiayi County and limited to selected public buses. Kaohsiung city had started the B5 program since January 2007 with 428 city buses. However, Chiayi County had started the B2 program since December 2007 with 79 city buses. Most of the feedstock came from recycled cooking oil and small amounts were from soybean.

3) Green County Program (2007.7.27)

The B1 Green County program was conducted at 297 gas stations own by Chinese Petroleum Corp. and Formosa Petrochemical Corp. in Taoyuan and Chiayi County since July 2007. Until June 2008, the program consumed around 330 kL and more than 1,500 trucks from 13 major fleet operators were fueled by B1 without any incidents being reported.

4) Establishment of Energy Crops Production and Marketing System Plan

The Agriculture and Food Agency, Council of Agriculture had promoted an energy crops cultivation plan of fallow lands to increase the domestic biofuel feedstock supply. Soybean and sunflower were selected as a biodiesel feedstock to increase the additional cultivation area in 2009 to 14,000 Ha of soybean and 6,000 Ha of sunflower. The farmers will be subsidized with 45,000 Yuan per hectare in one year for those works on energy crops cultivation. The Agricultural Union had signed a contract with the farmers to purchase all of their products.

Table A3: Chinese Taipei's Energy Crops Cultivation Plan for Year 2009

Energy Crops	Spring Crop (Jan-May)	Fallow Period	Autumn Crop (Sep-Dec)
Soybean	4,000	Soil Management	10,000
Sunflower	2,000		4,000
Total	6,000		14,000

Sources: Agriculture and Food Agency, Council of Agriculture.

5) Mandatory Targets for B1 Nationwide (2008.7.15) and B2 Nationwide (2010.6.15)

The introduction of B1 was mandated in the main island on the 15th July 2008 (Isolated Islands had carried out from 1st Jan 2010) and increased to B2 nationwide on the 15th June 2010. However, all oil retail companies were given six months to complete the transition. The distributing company was allowed to arrange their biodiesel supply from the free market without any restraints from the government.

Bioethanol

1) Green Public Service Vehicle

A pilot project on using E3 in public service vehicles was carried out in Taipei city and Kaohsiung city from 2nd July 2009 to 30th June 2011. The subsidies were given to gas stations which completed their application before 31st July 2009. The contents of the subsidy were as follow;

- The difference in cost between bioethanol and gasoline
- Additional investment cost on facility for bioethanol
- Additional subsidy on retail selling price
- Promotion cost for selling bioethanol (pamphlet, postal service cost, others)

RD & D Information on Biofuel

Basically, the first generation biofuel technology has been established in Chinese Taipei. Currently the government is focusing on second-generation and third-generation biofuel technology development. Recently, Taiwan Motor Cosmo Co., LTD. and Japanese manufacturers had set up an ethanol demonstration plant at Changpin by technical cooperation in cellulosic base technology. The installation was the first cellulosic based ethanol plant in Chinese Taipei where they imported the technology from Japan. The refinery plant had succeeded in converting cellulose to ethanol by a 20% conversion rate. The company claims its technology can process 30,000 tonnes (dry weight) of cellulose per year, and produce about 6,000 tonnes of alcohol, as well as 1,500 tonnes of organic fertilizer byproducts. Third-generation biofuel technology development is still in the academic stage.

Way Forward

Domestic Feedstock Supply

Domestic feedstock supply is dependent on policy grants to reduce costs because of the lack of agriculture land and low production of energy crops. Many local industries have been actively looking at Southeast Asian countries for a large number of first generation biomass raw materials cultivation.

Second Generation Biofuel Technology Development

High investment costs for second generation biofuel technology had resulted in most of the domestic industry to exercise great care and maintain a wait-and-see attitude. Even though the coming second generation cellulosic technology has great prospects and potential for industrial development, there are still a lot of restrictions and obstacles leading to industrial development falling short of expectations.

Trend of Biofuel Trade

The B5 mandate requiring biodiesel supply in 2016 is not expected to gain from the domestic feedstock supply. Some manufacturers had begun importing raw materials from abroad, and among them were companies that had invested directly in feedstock production overseas. Currently, they are importing the palm oil based biodiesel from Malaysia and Indonesia.

Table A4: Biodiesel Import in Chinese Taipei

	2008	2009	2010	2011
Import from Malaysia (kL)	3,081	5,571	159	9,223

Sources: Malaysia Palm Oil Board.

Conclusion

Chinese Taipei has a scarcity of domestic resources and 98% of the energy supply is dependent on imports. The introduction of biofuels must rely on imports eventually, because of the difficulty in establishing feedstock supply system due to the limited agriculture land. The economic effects are not expected to be high for the industry. Therefore, the promotion of biofuels policy goals should focus on

environmental improvement like air pollution improvement, reduced emissions of global warming gases and waste oil recycling.