ANNEX I – Country Profiles

1 Country Profile - BRAZIL

1.1 Overview

The Brazilian energy mix is one of the cleanest in the world and currently more than 45 percent of all energy consumed in Brazil comes from renewable sources, reflecting the combined use of hydroelectricity (14.5 percent), and biomass (30.1 percent). The relative contribution of renewable and non-renewable sources in the Brazilian internal energy supply remained mostly stable between 2005 and 2006. This behavior reflects the growth in sugar cane products and other renewables, and the proportional parallel increase of petroleum and its co-products, uranium and natural gas.

The use of sugar cane in the internal renewable energy supply increased from 31 percent in 2005, to 32.2 percent in 2006, representing 14.5 percent of total internal energy supply. Wood and vegetal coal showed a slight reduction in the internal renewable energy supply, decreasing from 29.2 percent in 2005 to 28.2 percent in 2006.

Compared with 2005 numbers, in 2006 Brazil had:

- An increase of 5.6 percent in the production of oil, 34 percent in its exports, and 4.7 percent of reduction in oil imports;
- Maintenance of natural gas production levels and an increase of 8.8 percent in imports;
- Increase of 4.5 percent in power generation and 4.4 percent in electric energy imports;
- Increase of 12 percent in sugar-cane production, 17.8 percent in sugar production and 10.8 percent in ethanol production, as well as an increase of 50 percent in ethanol exports.

Table 1.1– [PJ]

Total Primary Energy Supply	Imported	Renewable	Biomass
100%	15%	40%	27%
8 577	1 312	3 468	2 313

Source: IEA, 2004

1.2 Country Objectives and Drivers

The Brazilian biofuels strategy addresses energy security and sustainability concerns, factors that have encouraged various countries to seek alternatives to fossil fuels and adopt measures to reduce GHG emissions. In the case of Brazil, this strategy consists of a variety of actions, organized under three approaches: global, regional and bilateral.

In its global approach, Brazil has advocated the adoption of international standards and technical requirements that would facilitate the establishment of a global market for such products. In order to create a coordinating mechanism among the largest producers and consumers of biofuels, the International Biofuels Forum was created in March 2007, in New York. Additionally, Brazil's goal is to stimulate scientific studies and technological innovations

that ensure both the long-term sustainability of biofuels production and ways of preventing the production of biofuels from interfering with food production.

Regionally, Brazil has advocated the energy integration of South America by promoting diversification of the energy mix in the countries of the region and by providing incentives for renewable sources of energy. To this end, the Mercosur Memorandum of Understanding was signed to expand cooperation in this area. By integrating the chains of production, distribution and sale of ethanol and biodiesel in the region and including applicable regulations and inspections, the aim is to promote a more effective use of the South American countries' important competitive advantages in the biofuels field, acknowledging that the region presently has an opportunity to produce wealth and development in a sustainable manner.

The third aspect of Brazil's engagement - working bilaterally - covers technical cooperation initiatives, including research on alternative sources for producing biofuels, as well as promoting scientific and academic exchanges. Making such exchanges operational has been achieved by signing memoranda with India, South Africa (i.e. IBSA), Chile, Denmark, Ecuador, Paraguay, Sweden, Uruguay, and other countries. The recent Memorandum of Understanding signed with the United States also provides for Brazil-U.S. cooperation in third countries to foster the development of biofuels.

The Brazilian Federal Government has issued *Agroenergy Policy Guidelines* prepared by an interministerial team. The document provides for the creation of the Interministerial Management Council to manage the agroenergy policy in accordance with the following general guidelines: Development of Agroenergy; Agroenergy and food production; Technology development; Community energy self-sufficiency; Job and income generation; Optimizing the use of areas affected by anthropic actions; Optimization of regional vocations; Leadership in the international biofuel market; and, Compliance with environmental policy. For the internationalization of the sector, the document highlights four main guidelines: Process based on Government-Government actions; policies to attract investments focused on the production for external market; International promotion; and logistics.

Linked to the overall policy of the federal government as set forth in the mentioned document, the Ministry of Agriculture, Livestock and Food Supply put together a program that meets the bioenergy needs of the country. The goal of the *Brazilian Agroenergy Plan* is to ensure the competitiveness of Brazilian agribusiness and support specific public policies, such as social inclusion, regional development, and environmental sustainability. For the purpose of this plan, agroenergy is made up of four main groups: ethanol, biodiesel from animal and plant sources of fat; planted energetic forests; and agricultural, forest and agroindustrial residues and wastes (including sugar cane bagasse).

The primary objective of the Brazilian Agroenergy Plan is to provide direction for the efforts of Brazilian science, technology and innovation organizations. These objectives comply with the guidelines of the *Research, Development and Innovation Program,* which should focus on raw material technology development and process improvement, and with the creation of *Embrapa Agroenergy.*

1.3 Bioenergy Policy by Subsector

Power Generation

Law 9.991 (2000) - Ministry of Mines and Energy. Establishes a specific percentage from the net operational revenue of generation companies (1 percent), transmission companies (2 percent), and distribution companies (0.75 percent) designated for R&D of the National Electric Sector.

Brazilian Renewable Energy Incentive Program (PROINFA) - Ministry of Mines and Energy. Establishes the inclusion of 3.300 MW of energy into the National Energy Grid supplied in equal amounts by wind sources, biomass and small hydroelectric centrals (PCHs). Created in April 2002 (law 10.438, revised by law 10.762 of November 11 2003), to secure the participation of a greater number of States, incentives to national industries, and the exclusion of low-income consumers from the payment share of this new energy.

National Program for the Universalization of Access and Use of Electric Energy - "Luz para Todos" – Ministry of Mines and Energy and Eletrobras. Launched in 2004, the program's target is to guarantee the access and use of modern energy in all Brazilian rural areas, resulting in two million additional connections by 2008, including the use of renewable sources to feed stationary generators in remote areas.

Heat Production

No specific policy addressing heat generation from biomass has been recognized.

Transport

Brazil has accumulated important expertise in the biofuels area, particularly regarding the use of ethanol as automotive fuel. The Brazilian experience with the use of ethanol fuel as a gasoline additive dates back to the 1920s. However, it was only in 1931 that fuel produced from sugar cane began to be officially blended with gasoline, which at that time was imported. Despite these early initiatives, however, it was only in 1975, with the launching of the National Ethanol Program (ProAlcool), that the Brazilian government created the necessary conditions for the sugar and ethanol industry to become, three decades later, one of the most modern in the world, having achieved significant results from both environmental and economic perspectives. Over the last 30 years, the use of ethanol as a substitute for gasoline has accounted for savings of over one billion barrels of oil equivalent, which corresponds to about 22 months of Brazil's current oil production. Over the last eight years, the use of ethanol produced savings in oil imports of $ 61 billion, which is currently the total amount of the Brazilian external public debt. The main goals of ProAlcool were to introduce into the market a mixture of gasoline and anhydrous ethanol and to provide incentives for the development of vehicles that were fueled exclusively with hydrated ethanol. In chronological terms, one can describe four separate stages in the large-scale production and use of ethanol fuel in Brazil.

In the first, from 1975 to 1979, following the first oil crisis in 1973 and, with the drop in sugar prices in the international market, the Brazilian government decided to offer incentives to increase the production of ethanol for use as a gasoline additive. Thus, in addition to preventing the sugar and ethanol industry from having idle capacity, the aim was to reduce Brazil's dependence on fossil fuels.

The second stage (1979 to 1989) is viewed as the peak of the ProAlcool program. During that period, a series of tax and financial public incentives were created, benefiting everyone from ethanol producers to final consumers. It began with the second oil crisis, in 1979, when the price of this international commodity once again rose sharply in the global market. However, due to the drop in oil prices and an increase in the price of sugar in the international market over the next ten years, the late 1980s were characterized by a scarcity of hydrated ethanol in Brazilian gas stations, which seriously undermined consumer confidence and had serious repercussions on sales of cars fueled with ethanol in Brazil.

The third stage, from 1989 to 2000, was characterized by the dismantling of the set of government economic incentives for the program as part of a broader deregulation that affected Brazil's entire fuel supply system. In 1990, the Sugar and Ethanol Institute (IAA), which had regulated the Brazilian sugar and ethanol industry for over six decades, was extinct. Thus, as a result of lower oil prices in international markets, the government gradually transferred the planning and implementation of the industry's production, distribution and sales activities to the private sector. With the end of the subsidies, the use of hydrated ethanol as fuel diminished drastically. On the other hand, however, the mixture of anhydrous ethanol with gasoline was boosted by the government, which in 1993 established the requirement that 22 percent anhydrous ethanol must be added to all gasoline distributed at retail gas stations in Brazil. In practice, this governmental requirement generated a boost in the anhydrous ethanol market that is still in effect today, with the Inter-Ministerial Board for Sugar and Ethanol (CIAA) establishing the required percentage, which can range from 20 to 25 percent.

The fourth stage began in 2000 with the revitalization of ethanol fuel, and was marked by the liberalization of prices for the products in this industry in 2002. Ethanol exports increased further to high oil prices in world markets and the introduction of flex-fuel vehicles in 2003, (powered by any mixture of hydrated ethanol and gasoline) During this stage, the dynamics of the sugar and ethanol industry began to depend much more on market mechanisms, particularly in the international market, than on government incentives. The industry made investments, expanded its production, underwent technological modernizations, and today sugar-cane ethanol is efficiently produced in Brazil at prices that are internationally competitive.

There were 320 sugar and ethanol mills in Brazil in 2005, with a total installed processing capacity in excess of 430 million tonnes of sugar cane. Together they could produce up to 30 million tonnes of sugar and 18 billion litres of ethanol[100]. The sugar industry generates around

[100] Brazil: Total Production of Ethanol 2006-2007 equals 17,763,133 m^3, and Total Production of Sugar 2006-2007 equals 29,681,578 tons. Source: UNICA (Sugar Cane Industry Union) (available at www.unica.com.br)

one million direct jobs, and six millions indirect jobs. The use of ethanol fuel during the period from 1970 to 2005 avoided the emission of 644 million metric tonnes of CO_2.

National Program for the Production and Use of Biodiesel – Ministry of Mines and Energy. The *Biodiesel law* (Lei 11.097/05) established minimal percentiles of 2 percent (B2) and 5 percent (B5) of biodiesel to diesel, to be accomplished by 2008 and 2013, respectively. Reflecting social inclusion and regional development concerns, a system of tax incentives and subsidies was established for the production of the raw materials for biodiesel on small family farms in the North and Northeast regions of Brazil, especially in the semi-arid areas.

In order to effectively be able to add 2 percent biodiesel to the diesel produced and sold in Brazil, the annual production will have to reach 820 million litres, beginning in 2008. Based on early results, however, the government is forecasting that it will be possible to achieve that target and possibly even surpass it.

Other policies:

The *"Social Fuel" Label* (Decree 5.297/04 – 5.457/05), established different levels of fiscal incentives, up to complete fiscal exemption. For companies to have access, it is necessary to demonstrate the acquisition of minimal percentiles of raw material from small farmers, involving price rules and technical assistance to these suppliers. In addition, aliquot the *PI (Imposto sobre Produtos Industrializados* – Brazil Federal Tax on industrialized goods on the biodiesel production chain (Decree 5.298/04) was adjusted to zero. In September 2005, the National Council for Energy Policy anticipated for January 2006 the blend of 2 percent (B2) of biodiesel into diesel. The new date was restricted to biodiesel with the "Social Fuel" label.

Mandatory Fuel Blend (Law 737-1938) – Ministry of Agriculture, Livestock and Supply (MAPA). Established mandatory blend of anhydrous ethanol into Gasoline. Portaria 143 - June 27 2007, *established* mandatory blend of 20 to 25 percent of anhydrous ethanol to gasoline. Beginning on July 1st, 2007.

Law 8723 (October 1993) - Refer to emissions reduction of pollutants from automobiles sources – National Council for the Environment (CONAMA). Establishes mandatory actions from automobile and fuels producers to reduce emissions levels of CO, NO_x and other contaminant elements according to Brazilian environmental policy.

Differentiated IPI (Brazilian Federal Tax on Industrialized Goods) rates for vehicles - Establishes differentiated IPI rates for vehicles running on anhydrous ethanol and gasoline. For IPI purposes, a Flex-fuel vehicle matches those that run exclusively on anhydrous ethanol.

1.4 Results and Challenges

The sugar and ethanol industry is among the productive sectors that employs a substantive number of workers in Brazil. It creates about one million direct jobs (including in family companies and cooperatives) and six million indirect jobs. Working conditions on sugar cane

farms are, generally speaking, better than in other industrial sectors of the Brazilian economy. The average family income of these employees ranks in the upper 50 percentile. The Brazilian government monitors the industry to ensure that labor laws and regulations respected. The occurrence of forced labor in sugar plantations is residual and the government has intensified its inspections, thereby curbing abuses.

An analysis of the growth sustained by the industry provides evidence to challenge the argument that growing sugar cane for the purpose of producing ethanol is harmful to the environment. On the contrary, biofuels have had positive social and environmental impacts, by recovering previously deforested areas, providing crop rotation and aeration of farmlands used for food production, in addition to employing almost one million workers, including through a system of family cooperatives. The production of sugar cane uses low levels of pesticides, has the largest program of biological pest control in Brazil, has the lowest level of soil erosion, recycles all its wastes, does not undermine the quality of water resources, and accounts for the largest area of organic production in the country.

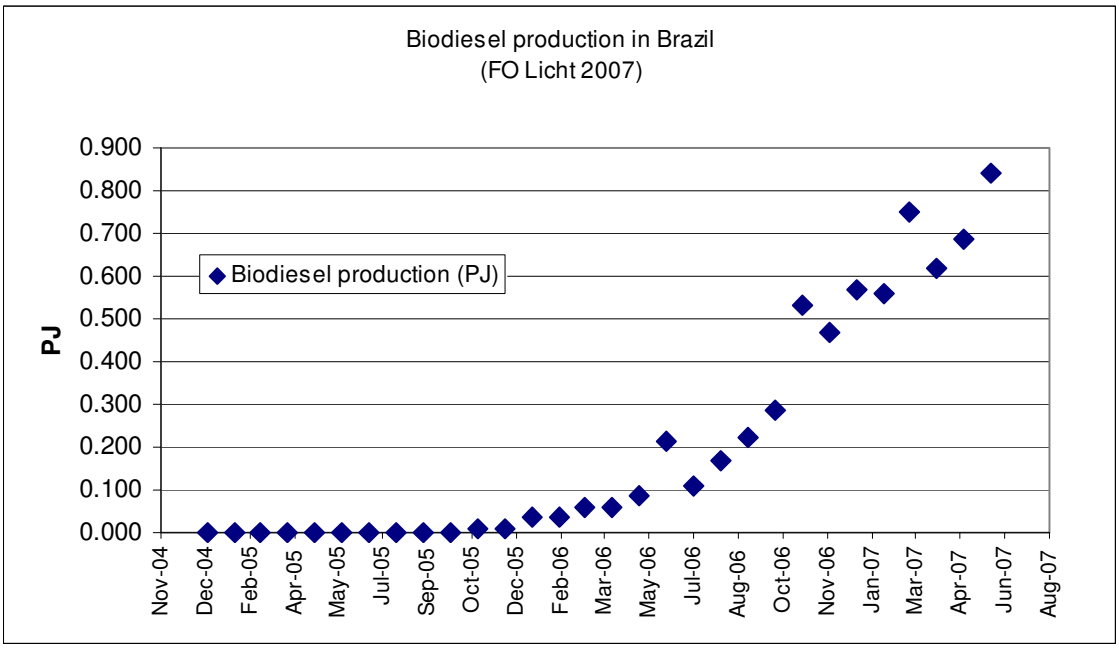
Moreover, the significant increase seen in sugar-cane agriculture in Brazil, which is concentrated mainly in the state of São Paulo, (distant from the Amazon region, and occupying only 0.6 percent of Brazil's land area) is primarily the result of productivity gains and research efforts. Over the last few decades, productivity gains have surpassed 30 percent, reducing the need to expand the cultivated farmland.

Brazil faces internal and external challenges that involve government policies and the large public and private investments required to meet the growing domestic and foreign demand. Such challenges require coordinated planning and action by both government and private sector. It is important to seek partnerships and collaborate activity, particularly with other sugar-cane producing countries and those that have a large demand, particularly the United States, and to work together to define international technical specifications for fuel alcohol. Another consideration on the Brazilian external agenda is to work diligently to increase business liquidity and fluidity in the biofuel market, which would require some adaptation of the legislation and much networking with and among the private production sector and the trade sector in Brazil and abroad. Internally, an important challenge to be tackled is the expansion of the sugar and ethanol industry, including considerations on spatial concentration of production and a renewed focus on greater energy efficiency on the part of producing units. The alternative to concentration is directly linked to another challenge: the need for investments in transportation infrastructure in the country's hinterlands.

Concerning the biodiesel program, the greatest challenge at the moment is to meet the goals established in the National Program for Biodiesel Production and Use. Another challenge is to take advantage of the potential of different regions of the country and derive the greatest social benefits from biodiesel production by applying advanced technology not only to traditional crops, but also new cultures. Large investments in RD&I would be necessary over a long period of time in order to produce the most adequate raw material for each region and a sufficient amount of each raw material to supply the biodiesel industry in an economically viable manner.

Lastly, the expansion of biofuels in the country will also depend on technological innovations, improvement of industrial processes and increasing the efficiency of the energy sources.

Figure 1.1



1.5 Country Policy Table - Brazil

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry of Agriculture, Livestock and Food Supply (MAPA)	Mandatory Fuel Blend	Policy - Target	Yes	Transport Fuels (Producers and Suppliers)	Established mandatory blend of 25% of anhydrous ethanol to gasoline. Beginning on July 1st, 2007. (MAPA - Portaria 143 - June 27,2007)	
	Differentiated IPI (Brazilian Federal Tax on Industrialized Goods) rates for vehicles	Policy - Incentive	Yes	Transport		Establishes differentiated IPI rates for vehicles running on hydrous ethanol and gasoline. For IPI purposes, Flex-fuel vehicle matches those that run exclusively on hydrous ethanol.
	Law 8723 (October 28, 1993) - Reduction on the emissions of hazardous gases from vehicles	Policy - Target	Yes	Transport - Automobile producers and fuel producers		Establishes mandatory actions from automobile and fuels producers to reduce emissions levels of CO, NOx and other contaminant elements according to Brazilian environmental policy.
Ministry of Mines and Energy; National Oil Agency (ANP)	National Program for the Production and Use of Biodiesel	Policy - Target/Incentive program	Yes	Bioenergy producers, including small farmers	The Biodiesel law (Lei 11.097/05) established minimal percentiles of 2%(B2) and 5%(B5) of biodiesel to diesel, to be accomplished from January 2008 and 2013 respectively. The "Social Fuel" Label (Decree 5.297/04 – 5.457/05), which established different levels of fiscal incentives- to the complete fiscal exemption. For companies to have access, it is necessary to demonstrate the acquisition of minimal percentiles of raw material from small farmers, involving price rules and technical assistance to these suppliers. In addition, it was established zero aliquot for IPI (Imposto sobre Produtos Industrializados – Brazil Federal Tax on industrialized goods) on the biodiesel production chain (Decree 5.298/04)	
Ministry of Agriculture, Livestock and Food Supply (MAPA)	National Agroenergy Plan	Activity - Incentives/R&D	No	Bioenergy producers, bioenergy suppliers, farmers, agro-industry.	The Plan directs the course of the strategic actions of the federal government as regard its overall policy. Its primary purpose is to provide the bearings for the efforts of the Brazilian science, technology, and innovations organizations ensuring the competitiveness of the Brazilian agribusiness.	
Ministry of Agriculture, Livestock and Food Supply (MAPA)	Research, Development and Innovation Program (RD&I)	Activity - Research and Development	No	Bioenergy producers, bioenergy suppliers, farmers, agro-industry.	As a program of the National Agroenergy Plan, it includes RD&I on ethanol and the cogeneration of energy from sugar cane; biodiesel from animal and plant source; forest biomass; and residues and waste from agriculture; and agro-industry.	
Ministry of Agriculture, Livestock and Food Supply (MAPA)	Embrapa Agroenergy Unit (Embrapa-Brazilian Agricultural Research Corporation)	Activity - Research and Development	No	Bioenergy producers, bioenergy suppliers, farmers, agro-industry.	Embrapa Agroenergy Unit will create a decentralized research unit focusing on agroenergy topics and issues to act as the central link of the country's Agroenergy Research System and the core component of the Brazilian Agroenergy Plan.	

Impact on Production Stream			Funding Mechanism	Comments
Production	**Conversion**	**Use**		
		Sets blending mandates on the end-use product, promoting the use of cleaner fuels.		
		Promotes the use of bioethanol and stimulates market growth.		
		Promotes the use of cleaner fuels		
A set of normative instruments aiming to promote the basis for the production and commercialization of biodiesel in the country, including special incentives for the inclusion of small farmers into the biodiesel production chain, and the development of regional potential for the production of biodiesel.			Small farmers have access to Pronaf's credit line, as well as technical assistance from the Ministry of Agro Development. For the biodiesel industrial sector, the Brazilian Development Bank (BNDES) makes available special financing plans for fixed investments (equipments, installations, etc).	In September 2005, the National Council for Energy Policy anticipated for January 2006 the blend of 2%(B2) of biodiesel into diesel. The new date refers to biodiesel with "Social Fuel" label.
For the purpose of this plan, agroenergy is composed of four main groups: ethanol and energy cogeneration from sugar cane; biodiesel from animal and plant sources of fat; forest biomass and residues; and agricultural and agroindustrial residues and wastes.				
RD&I should focus on raw material technology development and process improvement on the agroenergy field.			MAPA intends to gather and articulate companies and institutions as a consortium for either operational or sponsorship purposes. The central objective will be to design and execute the National RD&I program taking into account regional specificities.	The guidelines of RD&I agenda are to ensure the sustainability of the energy matrix; job and income generation; rational use of areas affected by anthropic actions; Brazilian leadership in biomarkets; energy autonomy at the community level; support to public policies; energy savings along agribusiness chains; and elimination of health risks.
Organize and develop a technology research, development and innovation, and transfer programmes that guarantees the sustainability and competitiveness of the agroenergy chain.				

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry of Mines and Energy	Brazilian Renewable Energy Incentive Program (PROINFA)	Activity - Incentive Program	Yes	Bioenergy Suppliers	Establishes the inclusion of 3.300MW of energy into the National Energy Grid supplied in equal amounts by wind energy sources, biomass and small hydroelectric centrals (PCHs).	
Ministry of Mines and Energy	Law 9.991 (2000)	Policy - Research & Development	Yes	Academic/Research Institutions		Establishes a specific percentage from the net operational revenue of generation companies (1%), transmission companies (2%), and distribution companies (0,75%) to be designated for R&D of the National Electric Sector.
Ministry of Mines and Energy and Eletrobras	National Program for the Universalization of Access and Use of Electric Energy - "Luz para Todos"	Activity - Target Program	Yes	Energy Suppliers	The program's target is to guarantee the access and use of modern energy in the entire Brazilian rural areas, resulting in additional 2 million connections by 2008, including the use of renewable sources to feed stationary generators in remote areas.	

For the purposes of this table:
"Policy" is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). "Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

Impact on Production Stream			Funding Mechanism	Comments
Production	**Conversion**	**Use**		
		Increased use of renewables from wind source, biomass and small hydroelectric centrals in the generation of electricity.	The Brazilian Development Bank (BNDES) established a credit line that finances up to 70% of the project, excluding imported goods and services, as well as the acquisition of land.The energy produced by selected units will be acquired by Centrais Eletricas Brasileiras S.A (Eletrobras), which will secure a 20 years contract starting at the beginning of operations.	
		Provides incentives for the development of new technologies and processes in the energy sector. This policy could impact production, conversion and/or use if applied for the agroenergy development.		
		Increase use of renewable energy, especially biomass, for the generation of electricity in rural and remote areas.		

1.6 Brazil Bioenergy Outlook

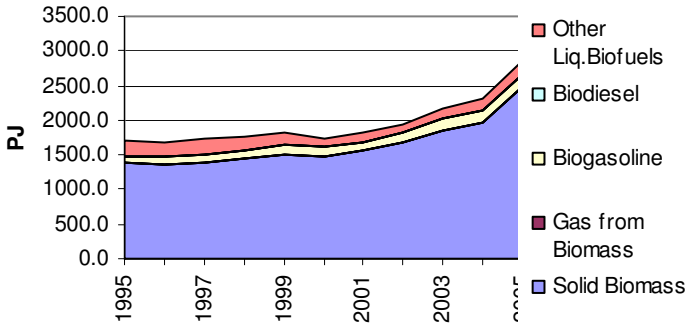
Table 1.2 - Brazil – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Biofuels	1694.0	1691.6	1749.4	1757.3	1816.9	1746.2	1824.7	1951.2	2170.4	2313.1	2862.7
Solid Biomass	1400.6	1368.0	1394.7	1432.5	1514.6	1486.1	1551.9	1667.0	1842.6	1977.2	2493.6
Gas from Biomass											
Biogasoline	63.0	93.5	121.0	120.8	132.7	121.5	136.7	147.6	188.6	167.0	175.7
Biodiesel											
Other Liq.Biofuels	230.4	230.1	233.8	204.0	169.6	138.6	136.1	136.6	139.2	168.9	193.3
All woodfuels (2)	1062.2	1073.4	1081.6	1094.7	1109.3	1118.8	1125.3	1129.5	1173.0	1186.8	1191.4
Fuelwood (2)	602.3	600.2	598.0	596.5	595.4	594.0	591.7	589.5	587.3	585.1	582.9
Charcoal (2)	337.5	344.1	350.8	357.3	364.2	371.2	377.5	384.0	390.5	397.2	404.0
Black Liquor (2)	122.5	129.1	132.8	140.9	149.8	153.6	156.1	156.1	195.2	204.5	204.5

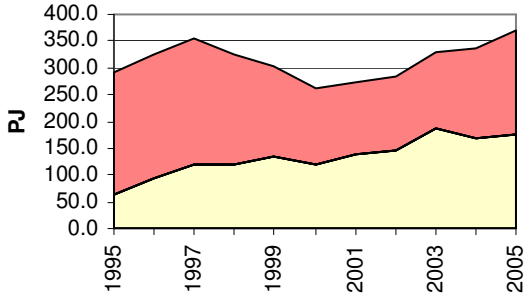
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	-2.3	2.0	2.7	5.7	-1.9	4.4	7.4	10.5	7.3	26.1
Gas from Biomass										
Biogasoline	48.4	29.4	-0.2	9.9	-8.5	12.5	8.0	27.7	-11.4	5.2
Biodiesel										
Other Liquid Biofuels	-0.1	1.6	-12.7	-16.9	-18.3	-1.8	0.3	2.0	21.3	14

(2) = Based on FAO data

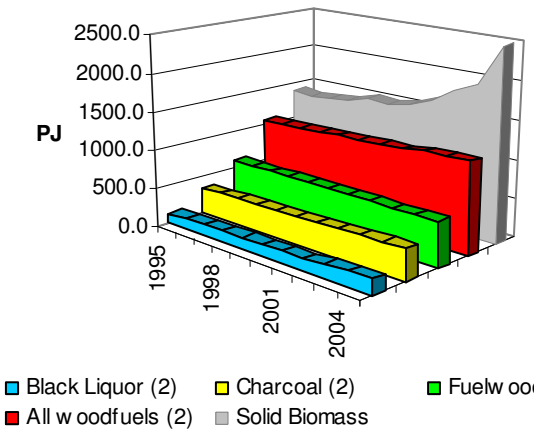
Brazil - Biofuels production



Brazil - Liquid and gaseous biofuels production



Brazil - IEA Solid Biomass vs FAO Woodfuels



Brazil - Change rate of biofuels production

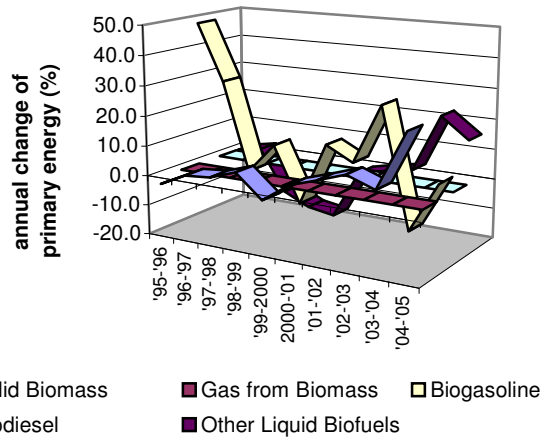


Table 1.3 - Brazil – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	52.5	28.8	19.2	3.5	8.3	0.2	2.6	0.1	0.1	0.1		
Solid Biomass	0.0	0.1	0.0	0.2	0.2	0.2						
Gas from Biomass												
Biogasoline	10.3		7.5	3.1				0.1	0.1	0.1		
Biodiesel												
Other Liquid Biofuels	42.1	28.8	11.6	0.3	8.2		2.6					
All woodfuels (2)	0.2	0.2	0.2	0.5	0.3	0.6	0.6	0.6	0.6	0.2	0.2	
Fuelwood (2)	0.0			0.2	0.0	0.0		0.0	0.0	0.0	0.0	
Charcoal (2)	0.2	0.2	0.2	0.3	0.3	0.6	0.6	0.6	0.6	0.2	0.2	

(2) = Based on FAO data

Table 1.4 - Brazil – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	8.7	4.7	3.8	3.1	8.9	5.0	7.0	16.9	16.8	51.5	66.9	
Solid Biomass												
Gas from Biomass												
Biogasoline								0.3	1.3	1.8	12.3	
Biodiesel												
Other Liquid Biofuels	8.7	4.7	3.8	3.1	8.9	5.0	7.0	16.6	15.5	49.7	54.6	
All woodfuels (2)	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.8	0.8	1.2	1.1	
Fuelwood (2)	0.1	0.0	0.0					0.5	0.5	0.6	0.7	
Charcoal (2)	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.6	0.5	

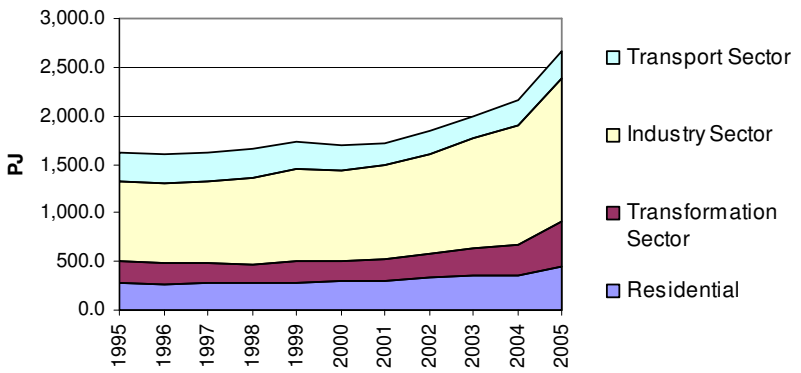
(2) = Based on FAO data

Table 1.5 - Brazil – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
All biofuels	Dom. Supply	1,733.0	1,709.6	1,720.6	1,757.7	1,838.3	1,794.6	1,823.6	1,950.8	2,110.3	2,277.1	2,801.4
	Transform.	225.4	205.9	205.2	193.4	207.3	215.7	219.9	235.4	274.6	307.8	468.4
	Industry	827.7	821.4	845.0	893.7	954.7	920.5	970.2	1,020.8	1,130.8	1,223.7	1,459.3
	Transport	291.5	302.7	290.8	284.8	284.4	256.7	223.0	251.7	239.0	266.9	288.9
	Residential	276.5	269.6	272.7	278.4	287.0	294.7	307.0	342.1	356.8	361.9	451.6
Solid Biomass	Dom. Supply	1,391.6	1,360.7	1,387.7	1,426.2	1,507.7	1,478.5	1,545.5	1,660.5	1,835.0	1,969.1	2,484.9
	Transform.	225.4	205.9	205.2	193.4	207.3	215.7	219.9	235.4	274.6	307.8	468.4
	Industry	804.0	799.9	825.4	872.9	934.5	893.2	944.1	1,002.4	1,114.1	1,204.7	1,447.0
	Transport											
	Residential	276.5	269.6	272.7	278.4	287.0	294.7	307.0	342.1	356.8	361.9	451.6
Gas from Biomass	Dom. Supply											
	Transform.											
	Industry											
	Transport											
	Residential											
Biogasoline	Dom. Supply	75.1	90.5	110.8	120.0	135.0	127.7	132.2	157.9	159.1	163.4	167.4
	Transform.											
	Industry											
	Transport	72.6	87.3	107.9	114.9	129.2	122.8	129.3	156.1	156.2	160.4	164.4
	Residential											
Biodiesels	Dom. Supply											
	Transform.											
	Industry											
	Transport											
	Residential											
Other Liquid Biofuels	Dom. Supply	266.3	258.4	222.1	211.5	195.6	188.4	146.0	132.4	116.2	144.6	149.1
	Transform.											
	Industry	23.7	21.5	19.6	20.8	20.2	27.2	26.1	18.4	16.7	19.0	12.3
	Transport	219.0	215.4	182.9	169.9	155.2	133.9	93.7	95.6	82.8	106.5	124.5
	Residential											

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

Brazil - Sectors of biofuels consumption



2 Country Profile - CANADA

2.1 Overview

In Canada, fossil fuels, such as petroleum and coal, have traditionally served as the main source of energy. Between 1984 and 2004, the share of oil in total energy consumption has remained mostly constant, while natural gas has increased from 21 percent to 25 percent of the energy supply. The increase in use of natural gas promoted a decrease in the use of coal, whose share of total energy consumption fell from 12 percent to 9 percent over the same time period.[101]

In an effort to reduce the adverse environmental effects of traditional energy sources, alternative sources - such as wind, solar, hydro, and bioenergy - have been integrated into the country's overall strategy. In 2004, total energy consumption in Canada amounted to the oil equivalent of 8,445 PJ[102]. Renewable energy sources (hydro and combined renewables and waste) generated 15.3 percent of total energy consumed.[103]

Canada is a net exporter of oil, natural gas, coal, and electricity serving as the most important sources for U.S. energy imports. In 2004, total energy supply was 20,070 PJ (indigenous production of 16,642 PJ + energy imports of 3,428 PJ) of which 9,038 PJ were exported.[104]

Table 2.1 – [PJ]

Total Primary Energy Supply	Imported[105]	Renewable	Biomass
100%	50%	15%	4%
11 265	-5 610	1 731	499

source: IEA, 2004

2.2 Country Objectives and Drivers

Bioenergy expansion in Canada is driven by the country's desire to promote environmental responsibility and limit GHG emissions while promoting economic and industrial development and strengthening Canada's science and technology base. The main objectives of the current federal energy policy are to ensure that:

1. Canada has secure, reliable access to competitively-priced, environmentally-friendly energy supplies;

2. The development of Canada's energy resources and associated technology provides economic benefit to Canadians; and

[101] EIA (2006) International Energy Annual 2004. Energy Information Administration (EIA), U.S. Department of Energy, Washington, DC. Updated May-July 2006. (available at http://www.eia.doe.gov/iea/carbon.html)
[102] APEC, Energy Handbook 2004, Section 3. Asian-Pacific Economic Cooperation (APEC), Japan. (available at www.ieej.or.jp/egeda/general/info/pdf/2004section3.pdf)
[103] IEA, Share of Total Primary Energy Supply 2004: Canada. International Energy Agency (IEA), Paris, France (available at http://www.iea.org/textbase/stats/pdf_graphs/CATPESPI.pdf)
[104] IEA, 2004 Energy Balances for Canada. International Energy Agency (IEA), Paris, France (available at http://www.iea.org/Textbase/stats/balancetable.asp?COUNTRY_CODE=CA)
[105] A negative value has to be intended as an Export

3. Canada obtains a reasonable level of energy security where energy needs are met and energy production and consumption are environmentally responsible.

2.3 Bioenergy Policy by Subsector

In Canada, jurisdiction over energy policy is divided between the federal and provincial governments. The provinces own their energy resources and orchestrate the development of energy policies, regulations, and implementation strategies associated with the management of these resources. Federal energy policies primarily focus on inter-provincial and international movement of energy, energy technology development, and on projects extending beyond a province's boundaries. Because of this distribution of control, energy programmes in Canada are a shared responsibility between the federal and provincial governments and have created a dynamic where federal bioenergy activities primarily focus on the development of incentive and R&D mechanisms to promote the use of renewable energy sources in the energy supply.

In effect since 1995, the Energy Efficiency Act gives the Government of Canada the authority to make and enforce regulations, primarily for the purpose of establishing performance and labeling requirements for energy-using products, doors and windows that are imported or shipped across provincial borders. The Act requires the manufacturers and importers of certain types of energy-using products to meet standards for the energy efficiency of these products. The companies are required to register their products with Natural Resources Canada (NRCan) with information which includes the energy efficiency of the product. In conjunction with Revenue Canada, NRCan then tracks the import of products and ensures that standards are met. The programmes most visible component is the “EnerGuide” label which denotes products that have met the energy-efficiency guide lines.

Ottawa has recently poured half a billion Canadian dollars into the largest biofuel fund in the world, open to companies ready for large, demonstration-scale projects of next generation biofuels. This fund, as announced in September 2007, will be managed by Sustainable Development Technology Canada, a not-for-profit, arm’s length foundation started in 2001.

Power Generation

An international commitment aims to reduce Canada’s GHG emissions to 6 percent below 1990 levels (596 Mtoe)[106] by 2008-2012.

Despite its best efforts, by 2004 GHG output had risen 27 percent above 1990 levels. Generation of thermal electricity contributed 18 percent of Canada’s 2003 GHG emissions and 27 percent of total emissions growth between 1990 and 2003.[107] To provide some leadership in the reduction of GHG, the federal government has instituted the “Purchases of Electricity from Renewable Resources Program.” The objective of this program, managed by NRCan, is to

[106] EC (2005). Canada’s Greenhouse Gas Inventory: Overview 1990-2003. Environment Canada (EC), Ottawa Canada. (available at: http://www.ec.gc.ca/pdb/ghg/inventory_report/2003_factsheet/2003ghgfac_e.pdf)
[107] EC (2003). Canada’s Greenhouse Gas Inventory 1990-2003. Environment Canada (EC), Ottawa, Canada. (available at http://www.ec.gc.ca/pdb/ghg/inventory_report/2003_report/toc_e.cfm)

purchase 20 percent of the Government of Canada's electricity from emerging renewable energy sources with low environmental impact, replacing use of electricity generated using high-carbon sources.

Additionally, NRCan has increased its R&D in clean coal technology to further reduce GHG emissions in electricity production. Emerging CO_2 capture and sequestration is tied to work in this area. Although sequestration research has been ongoing for several years, the cost of capturing CO_2 is a significant barrier. A number of companies are discussing ways to develop a CO_2 pipeline for enhanced oil recovery in the Western Canada Sedimentary Basin. Similar opportunities also exist in Alberta, Saskatchewan and within the "industry for future" partnerships.

Several Canadian provinces have initiated measures to promote use of energy from renewable sources - such as mandatory and voluntary renewable electricity targets, request-for-proposals, government procurement, and standard-offer contracts for renewable electricity. The Standard Offer Program helps Ontario meet its renewable energy supply targets by offering a standard pricing regime and access to the energy market for small electricity generators. Since its launch in November 2006, the Ontario Power Authority's (OPA) Renewable Energy Standard Offer Program has signed 104 contracts with small renewable generators.[108] Through activities such as these, the estimated amount of renewables expected from provincial and territorial RPS programmes and target is 9,140 MW by 2017[109].

Heat Production

Activities for domestic heat and building construction are primarily focused on increasing the energy efficiency. Canada gives incentives for increased energy efficiency in newly constructed homes and buildings to reduce energy consumption and decrease CO_2 emissions.

Through the EnerGuide for Houses Retrofit Incentive Program, the government targeted homeowners and homebuilders to promote construction and retrofit of housing to increase energy efficiency. The programme promoted the use of energy efficient technologies and practices in housing, an increase in the percentage of new housing built to higher standards such as R-2000, and attaining an EnerGuide for New Houses rating of 80 points or higher. Under this programme, managed by Natural Resources Canada, a homeowner could receive a maximum grant of $5,000 per property (and a total of $500,000 per individual or entity for multiple eligible properties over the life of the programme).[110] The programme was discontinued in 2006 but will continue to pay out grants until March 31, 2007.

NRCan also targets Canadian builders, designers and organizations with the aim of accelerating change in building design and construction practices, and to encourage individual organizations to increase the energy efficiency of their operations. One such programme, to promote energy efficiency in the building sector, is the Commercial Building Incentive Program.

[108] OPA. Renewable Energy Standard Offer Program. Ontario Power Authority (OPA). Ontario, Canada (available at http://www.powerauthority.on.ca/sop/)
[109] available at http://www.cec.org/files/pdf/ECONOMY/FREM_en.pdf
[110] OEE, Grants and Incentives. (available at http://oee.nrcan.gc.ca/corporate/incentives.cfm?attr=4#retrofit)

This program provides fiscal incentives to owners of newly constructed commercial, institutional and multi-unit residential buildings where the project has implemented energy efficient technologies and systems that exceed the efficiency levels prescribed by the Model National Energy Code for Building by at least 25 percent. Industrial facilities (new and retrofitted) receive incentives under a similar program called the "Industrial Building Incentive Program." To take advantage of the industrial program, proposed new building designs must incorporate technologies and systems the consume at least 15 percent less energy than a standard (or reference building) based on the Model National Energy Code for Buildings; retrofitted buildings must consume at least 10 percent less energy through specific process improvements.[111]

Transport

Canada aims as national targets:

- 5 percent renewable content in gasoline by 2010 and 2 percent renewable content in diesel fuel by 2012
- 25 percent improvement in the fuel efficiency of new light-duty vehicles sold in Canada by 2010

The above-mentioned national blending targets of 5 percent of gasoline and 2 percent of diesel will amount to a need for about 2.1 billion litres (555 million gallons US) of renewable fuel per year in 2010 and almost another 600 million litres (159 million gallons US) by 2012.[112]

To attain these targets, in early 2007 the government set aside C$345 million ($299 million) to fund two programmes: the Agricultural Bioproducts Innovation Program (to receive C$145 million) and the Capital Formation Assistance Program for Renewable Fuels Production (to receive C$200 million). These programmes provide assistance to farmers and rural communities to promote the development of biofuels and other bio-products.

Managed by Agriculture and Agri-Food Canada, the Agricultural Bioproducts Innovation Program[113] (ABIP) provides support for cross-sector research networks conducting scientific R&D on modeling and impact scenarios for a bio-based economy in Canada. For the purposes of this programme "bioproducts" are defined as "a commercial or industrial product that is composed in whole, or in significant part, of renewable domestic agricultural materials (including plants, animals, and microorganisms)".[114] The ABIP is focused on the production and development of feedstocks and systems suitable for conversion to bio-products; development of efficient biomass conversion technologies; and agro-commodity diversification through technologies relevant to production of bio-products (e.g. industrial chemicals, biomaterials and health products). It is anticipated that the ABIP will fund between 10 and 25 networks. The maximum amount a network may receive over the duration of the programme is $25 million. An

[111] OEE (2006). The State of Energy Efficiency in Canada. Natural Resources Canada, Office of Energy Efficiency (OEE). (available at http://oee.nrcan.gc.ca/Publications/statistics/see06/pdf/see06.pdf)
[112] Green Car Congress. "Canada Sets Biofuels Targets". December 22, 2006 (available at http://www.greencarcongress.com/2006/12/canada_sets_bio.html)
[113] AAC (2007). "Agriculture Bioproducts Innovation Program." Agriculture and Agri-Food Canada (AAC). (available at http://www.agr.gc.ca/sci/abip-piba/index_e.php)
[114] AAC (2007). "Agriculture Bioproducts Innovation Program (ABIP): Frequently Asked Questions (FAQ) Sheet (v. 1) (available at http://www.agr.gc.ca/sci/abip-piba/pdf/abip-piba_faq_e.pdf)

individual recipient within a network(s) may receive no more than $15 million over the duration of the programme.

The Capital Formation Assistance Program for Renewable Fuels Production provides producers with incentives for participation in new renewable fuels production capacity. The individual funding arrangements are based on the producer's contributions to the biofuels facilities and their contribution to eligible project costs (capped at the lesser 25 percent of total project costs or a maximum of $25 million per project).[115] The programme builds on the existing Biofuels Opportunities for Producers Initiative by providing an opportunity for agricultural producers to participate in the increase of new renewable fuels production capacity.

The Biodiesel Initiative was announced August 2003 under the Climate Change Plan for Canada and builds on the federal government's announcement to exempt biodiesel from the fuel excise tax for diesel ($0.04/L). The initiative allocates C$11.9 million over four years (2003 – 2007) to address technical and market barriers to the development of a biodiesel industry based on low-cost feedstocks.[116]

To complement the Biodiesel Initiative and reach the national targets, the government enacted the ecoABC Initiative. EcoABC is a federal C$200 million program that provides repayable contributions for the construction or expansion of transportation biofuel production facilities. Managed by Agriculture and Agri-Food Canada, the ecoABC Inititiave is designed to provide an opportunity for agricultural producers to diversify their economic base and participate in the biofuels industry through equity investment/ownership in biofuels production facilities.

Exploring the possibility of hydrogen fuels, the Canadian Transportation Fuel Cell Alliance (CTFCA), managed by Natural Resources Canada (NRCan), is an important element of the federal government's climate change strategy. The C$33 million initiative was established in 2001 and has received funding through to March 2008 and focuses its efforts on showcasing hydrogen fuelled vehicles and hydrogen fuelling station demonstration projects. It also evaluates options for the production and delivery of hydrogen to light-, medium- and heavy-duty vehicles, monitors the resulting GHG emission reductions and develops training, certification and safety standards in support of hydrogen and fuel cell technologies.

To expand motor vehicle efficiency, the Motor Vehicle Fuel Efficiency Initiative is to bring about a 25 percent improvement in the fuel efficiency of new light-duty vehicles sold in Canada by 2010. NRCan reached agreement with the automotive industry to reduce GHG emissions from this sector. Through this voluntary initiative, the automotive industry will seek reduction in GHG emissions of 5.3 megatonnes (Mt) annually from light-duty vehicle use by 2010. This 5.3 Mt target goes beyond fuel consumption reductions by incorporating reductions in all GHG emissions associated with vehicle use[117].

[115] AAC (2007). "Capitol Formation Assistance Program". Agriculture and Agri-Food Canada (AAC) Ottawa, Canada (available at http://www.agr.gc.ca/index_e.php?s1=prog&s2=cfap-pafc)
[116] NRCan et al. (2003). "Biodiesel", Natural Resources Canada (NRCan). Ottawa, Canada (available at http://www.biofuels.arc.ab.ca/BTSC/NRCan/default.ksi)
[117] NRCan (2006). Improving Energy Performance in Canada – Report to Parliament Under the Energy Efficiency Act For the Fiscal Year 2005-2006. Natural Resources Canada (NRCan), Ottawa, Canada (available at http://oee.nrcan.gc.ca/Publications/statistics/parliament05-06/pdf/parliament05-06.pdf)

2.4 Results and Future Challenges

Natural Resources Canada (NRCan) is the primary federal government department responsible for energy. NRCan has the lead in general energy policy. It works with other government departments to promote energy efficiency, sustainable environmental practices around renewables, issues related to energy in transportation, research and development and the general balance between energy policy goals and other objectives relating to Canada's economic development. These are the source of the federal policies that are current enacted in Canada to promote the use of alternative sustainable energy.

Canada's financial incentive policies encourage final users of energy to employ energy efficiency and renewable energy technologies and practices. Currently, the federal government offers financial incentives for wind energy, ethanol plants, natural gas vehicles and refueling infrastructure.

Companies and institutions work with NRCan on a voluntary basis to establish and achieve energy efficiency objectives. NRCan's voluntary initiatives target large consumers of energy in the commercial/institutional and industrial sectors and organizations whose products are important determinants of energy use. The initiatives involve industry-government agreements and, for groups of large industrial energy users, energy efficiency target setting. The Federal Government provides a variety of support services to assist and stimulate action by companies and institutions on energy efficiency, including developing standards and training.

Other activities undertaken in Canada promote and support the development and dissemination of more energy-efficient equipment, processes and technologies, and alternative energy technologies. Research and development activities provide the scientific knowledge needed to develop the technologies, codes, standards and regulations required for the sustainable use of energy.

The federal government provides national leadership in energy science and technology by undertaking in-house research in its laboratories, contracting out research activities to other organizations and carrying out the federal funding initiatives, which are the only federal interdepartmental investment funds with a focus on the energy sector and its economic and environmental effects.

Canada is aligning its environmental policymaking with economic and market realities to protect its environment and promote the development of green technologies by Canadian firms. By partnering with industry, creating financial incentives, undertaking research and development, and innovative project the government hopes to create a healthy environment and vibrant economy.

2.5 Country Policy Table - Canada

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Agriculture and Agri-Food Canada (AAFC)	ecoAgriculture Biofuels Capital Initiative (ecoABC) (2007)	Activity - Incentive Programme	Yes	Transport Fuels (Producers)	Provides repayable contributions (up to $25 million per project) for the construction or expansion of transportation biofuel production facilities until March 31 2011.	
Agriculture and Agri-Food Canada (AAFC) and Natural Resources Canada (NRCan)	Future Fuels Initiative (2001)	Policy - Incentive Programme /Education	Yes	Transport Fuels (Producers/ Suppliers/ Consumers)	Plans to accomplish a four-fold (by 750 million litres) increase in Canada's annual ethanol production and use. That could mean 25% of Canada's total gasoline supply would contain 10% ethanol.	
Agriculture and Agri-Food Canada (AAFC) and Natural Resources Canada (NRCan)	Ethanol Expansion Programme (EEP) (October 2003)	Activity - Incentive Programme	Yes	Transport Fuels (Producers)	Aims to increase the production and use of fuel ethanol in Canada by providing financial contributions for the construction or expansion of ethanol plants. Sets the goal of having 35% of the consumption of gasoline-type fuels be E10 by 2010, ethanol demand should represent 3.5% of all gasoline-type fuels by 2010.	
Alberta Government	Renewable Energy Producer Credit Programme	Activity - Incentive Programme	Yes	Industry (Suppliers)	Helps Alberta industry effectively compete with other jurisdictions that provide programmes and tax exemptions to distributors who blend biofuels.	
Department of Finance Canada	Removal of Excise Tax Exemption for Renewable Fuels	Policy - Financial Incentive	Yes	Transport Fuels (Producers)	Eliminates the excise tax exemptions for ethanol and biodiesel as of April 1, 2008.	

Impact on Production Stream			Funding Mechanism	Comments
Production	**Conversion**	**Use**		
Provides an opportunity for agricultural producers to diversify their economic base and participate in the biofuels industry through equity investment/ownership in biofuels production facilities.	Provides funding for the development of transportation biofuel production facilities that is conditional upon new agricultural producer equity investment (minimum 5% of total eligible project costs) and use of agricultural feedstocks to produce the biofuel.		4 year $200 million federal programme.	ecoABC will help achieve the federal government's goal of reaching an average of 5% renewable content in gasoline by 2010 (regulation) and 2% renewable content in diesel fuel and heating oil by 2012.
Provides contingent loan guarantees to encourage financing for new plants that produce ethanol from biomass if all or part of the excise gasoline tax on ethanol is imposed before December 31, 2010.	Provides funding for the development of 3-6 new ethanol plants.	Increased supply and use of ethanol produced from biomass; funding for activities such as public education on fuel ethanol, analysis of fuel ethanol markets, and producer economics; and liaison with provinces/territories and industries that are interested in ethanol plant expansion.	The National Biomass Ethanol Programme (NBEP) provides for $140 million in contingent loan guarantees to encourage financing for new ethanol plants. The Future Fuels Initiative also adds $3 million over 5 years to provide market information to retail consumers.	This initiative is part of the Government of Canada's Action Plan 2000 on Climate Change and renews the NBEP launched in the mid-1990s to help overcome lender resistance to investing in ethanol plants because of uncertainty about the excise tax policy (currently there is an excise tax exemption on the ethanol portion of blended gasoline).
Enables the construction of several new ethanol facilities through incentives to producers, in the form of repayable contributions, amounting to $99.3 million.			$100 million initiative.	This initiative is part of the Climate Change Plan for Canada and is a component of the Future Fuels Initiative. Under Round 1, six new ethanol plants across Canada are eligible for up to $72 million in contributions toward construction costs. These plants plan to produce a total of 650 million litres of fuel ethanol per year and more than quadruple Canadian supply. Projects that receive funding under Round 2 of the programme will build on these amounts.
	Enables the introduction of renewable products into the traditional fuels and energy marketplace.		4 year $209 million programme. An additional $30 million (from the Energy Innovation Fund), 3 year commitment will be initiated immediately through a commercialization programme supporting technology investment in the province to support establishment of the infrastructure required to market and distribute bioenergy products within the existing market for fuel or electrical power.	This programme will replace the existing Alberta ethanol road tax exemption policy. The credits will be available to eligible commercial bioenergy products processed in Alberta from April 2007 to March 2011.
Promotes domestic production of renewable fuels.				

Implementing Agency	Policy/ Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Agriculture and Agri-Food Canada (AAFC)	Biofuels Opportunities for Producers Initiative (BOPI) (September 2006)	Activity - Incentive Programme	Yes	Transport Fuels (Producers) / Farmers	Helps farmers and rural communities hire experts who can assist in developing business proposals and undertake feasibility and other studies necessary to create and expand biofuels production capacity involving significant (greater than 1/3) ownership by agricultural producers.	
Agriculture and Agri-Food Canada (AAFC)	Capital Formation Assistance Programme	Activity - Incentive Programme	Yes	Transport Fuels (Producers)	Encourages agricultural producers' participation in the renewable fuels industry by providing repayable capital funding arrangements to renewable fuels projects based on agricultural producers' contributions to the biofuels facilities.	
Natural Resources Canada (NRCan)	Bioenergy Development Programme (1981)	Activity - Research and Development	Yes	Industry	Assists Canadian industry in the R&D and commercialization of bioenergy technologies (through cost-shared agreements) that can serve as reliable, cost-effective, and environmentally responsible alternatives to conventional energy production.	
Natural Resources Canada (NRCan)	Biomass for Energy Programme (2000)	Activity - Research and Development	Yes	Government		(Agriculture / Forestry) Assesses biomass resources in the fields of forestry and agriculture and develops methods to grow fibre for the production of bioenergy. This includes harvesting technologies, transport system efficiencies, and storage systems as well as designing scenarios to improve supply.
Natural Resources Canada (NRCan)	Biodiesel Initiative (August 2003)	Activity - Research and Development	Yes	Industry / Government	Addresses technical and market barriers to the development of a Canadian biodiesel industry based on low-cost feedstock such as yellow grease and severed canola.	
Department of Finance Canada	Tax Exemptions for Renewable Fuels (1992 and 2003)	Policy - Financial Incentive	Yes	Transport Fuels (Producers / Suppliers)	Encourages the use and production of renewable fuels (ethanol, biodiesel) in Canada by implementing an exemption from the federal excise taxes of $0.10/litre on gasoline and $0.04/litre on diesel fuel.	

Impact on Production Stream			Funding Mechanism	Comments
Production	**Conversion**	**Use**		
Greater involvement in biofuel production facilities by agricultural producers allowing them to become participants in the value chain and increase their share of the benefits from renewable fuels production beyond delivering feedstock.			The Industry Councils in each province and territory that administer AAFC's Advancing Canadian Agriculture and Agri-Food (ACAAF) Programme provide funding for this initiative. Demand generated by the first round of BOPI exceeded the initial allocation of $10 million. Up to $3 million of additional BOPI funding will be provided in 2006/2007 to fund approved projects and an additional $7 million will be provided in fiscal 2007-08 to accommodate a second round of BOPI for a total of $20 million over the two fiscal years.	
Provides agricultural producers with incentives for participation in new renewable fuels production capacity.			4 year $200 million programme.	Builds on the BOPI's technical feasibility and business planning components
	Provides research and development support in the areas of biomass handling, combustion, biochemical conversion, and thermochemical conversion.		Funded in part by the Programme on Energy Research and Development (PERD) and the Technology Early Action Measures (TEAM).	
Identifies sources of increased biomass supply, for both existing and new biomass; develops efficient methods of growing, harvesting, collecting and transporting biomass; and demonstrates the sustainability of increased biomass supply which can potentially be employed for bioenergy production.			Funded by the Canadian Forest Service (CFS).	
Addresses challenges facing the development and use of biodiesel from low-cost feedstock.			4 year $11.9-million initiative.	This initiative is part of the Climate Change Plan for Canada. It builds on the federal government's announcement under budget 2003 to exempt biodiesel from the fuel excise tax for diesel ($0.04/L).
Increases the production of blended fuels.		Increases the use of blended fuels.		The exemptions are part of the Excise Tax Act. Provincial governments have also exempt ethanol from fuel taxes (Ontario: $0.147/litre, Manitoba: $0.20/litre until August 2007, $15/litre from September 2007-August 2010, $10/litre from September 2010-August 2013, Alberta: $0.09/litre, British Columbia: $0.145/litre, Quebec: up to $20/litre, and Saskatchewan: $0.15/litre exemption).

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy /Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Finance Canada	Accelerated Capital Cost Allowance for Class 43.1 (1998)	Policy - Financial Incentive	Yes	Industry	Encourages business and industry to reduce energy waste and to use renewable energy sources for energy production equipment by providing an accelerated capital cost allowance at a rate of 30%.	
Agriculture and Agri-Food Canada (AAFC)	Agricultural Bioproducts Innovation Programme (ABIP)	Activity - Research and Development / Education	Yes	Government / Industry / University		(RD&D Support) Supports new and existing research networks and encourages the development of clusters to build greater research capacity in agricultural bioproducts and bioprocesses.
Ontario Power Authority	Standard Offer Programme	Activity - Incentive Programme	Yes	Electricity Suppliers	Sets a fixed price (feed-in-tariff) for small renewable energy generation projects in order to make it easier and more cost effective for businesses and entrepreneurs to sell renewable power to the provincial grid.	
Natural Resources Canada (NRCan)	Renewable Energy Technologies Programme (RETP)	Activity - Research and Development	Yes	Industry	Supports the continued improvement of the economics and efficiency of renewable energy technologies by providing cost-sharing and technical assistance in support of technology development and field trials.	
Natural Resources Canada (NRCan)	Programme of Energy Research and Development (PERD)	Activity - Research and Development	Yes	Government/ Industry / University	Provides funds directly to 13 partner departments and agencies to support early-stage and applied energy R&D.	
Natural Resources Canada (NRCan)	Canadian Transportation Fuel Cell Alliance (CTFCA)	Activity - Research and Development	Yes	Transport Fuels		(Industrial) Demonstrates and evaluates fuelling options for fuel cell vehicles in Canada.
Natural Resources Canada (NRCan)	ecoENERGY Technology Initiative	Activity - Research and Development	Yes	Government / Industry / University	Funds RD&D to support the development of next-generation energy technologies needed to break through to emissions-free fossil fuel production, as well as for producing energy from other clean sources, such as renewables and bio-energy.	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement

Impact on Production Stream			Funding Mechanism	Comments
Production	**Conversion**	**Use**		
	Invests in co-generation and specified waste-fuelled electrical generation systems, heat recovery systems, and specified waste-fuelled heat production equipment.			
Through supporting networks and clusters, the programme promotes research, development, technology transfer, and commercialization activities in areas such as biofuels, other forms of bioenergy, biochemicals, biopharmaceuticals, etc.			Multi-year $145 million programme.	It is anticipated that the ABIP will support 10-25 networks, each focused on a promising field of the agricultural bioeconomy.
		All small-scale renewable energy producers will be able to sell renewable power to the grid for 20 years. Over the next 10 years, this will add up to 1,000 megawatts of renewable power to Ontario's electricity system.		In 2004, the government committed to generating 5% of Ontario's total energy capacity from new renewable sources by 2007 and 10% by 2010.
	Supports Canadian industry efforts to develop renewable energy technologies including bioenergy (combustion, biochemical conversion of biomass to ethanol, thermochemical conversion of biomass to bio-oil and biogas, and biomass preparation and handling).			
Supports bioenergy R&D.			Funded by the Office of Energy Research and Development (OERD).	
	Encourages advancements in hydrogen and fuel cell technologies that are potentially transferable for use with other bioenergy sources.		$33 million federal government initiative.	This initiative is part of the Action Plan 2000.
Promotes bioenergy RD&D from basic research to near-commercialization of technologies.			$230 million investment in clean energy S&T by the federal government.	

provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment. "Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

2.6 Canada Bioenergy Outlook

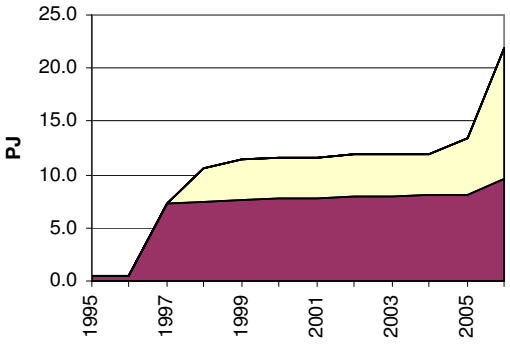
Table 2.2 - Canada – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	408.6	408.3	417.8	436.1	478.4	479.2	449.6	485.7	486.8	507.4	522.9	531.8
Solid Biomass	408.1	407.8	410.5	425.5	467.0	467.6	437.9	473.8	474.9	495.5	509.4	509.9
Gas from Biomass	0.5	0.6	7.3	7.4	7.6	7.8	7.8	8.0	8.0	8.0	8.0	9.6
Biogasoline				3.2	3.9	3.9	3.9	3.9	3.9	3.9	5.4	12.3
Biodiesel												
Other Liq.Biofuels												
All woodfuels (2)	372.2	361.6	363.7	332.8	387.7	394.4	380.6	389.7	390.9	392.2	376.4	
Fuelwood (2)	56.2	56.2	56.2	33.4	70.2	72.4	73.0	72.6	71.6	71.8	72.9	
Charcoal (2)												
Black Liquor (2)	316.0	305.3	307.5	299.4	317.5	322.0	307.6	317.1	319.3	320.4	303.5	

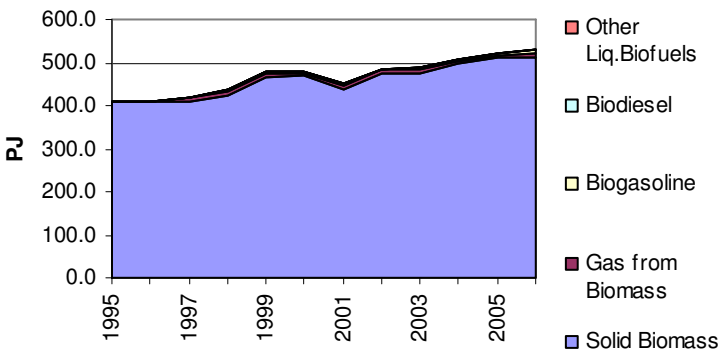
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	-0.1	0.7	3.7	9.7	0.1	-6.3	8.2	0.2	4.3	2.8
Gas from Biomass	9.3	1,192	1.6	3.1	2.0		2.8		0.4	
Biogasoline				20.0						39.6
Biodiesel										
Other Liquid Biofuels										

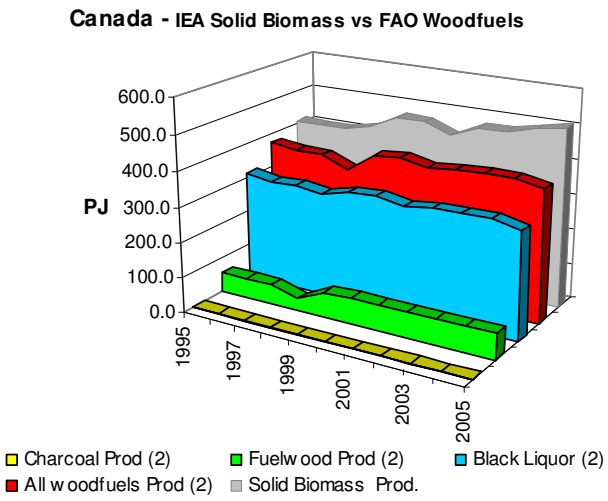
(2) = Based on FAO data

Canada - Liquid and gaseous biofuels production



Canada - Biofuels production





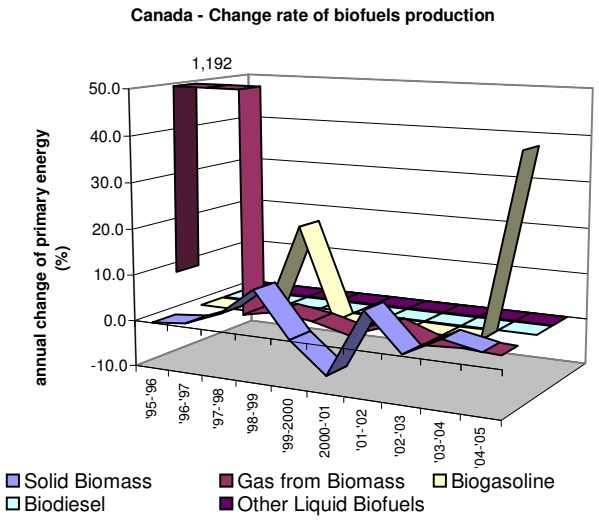


Table 2.3 - Canada – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels				1.7	1.7	2.1	2.1	2.1	2.6	2.6	2.1	1.1
Solid Biomass												
Gas from Biomass												
Biogasoline				1.7	1.7	2.1	2.1	2.1	2.6	2.6	2.1	1.1
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	1.1	1.1	1.4	1.2	1.2	0.8	1.0	1.2	1.0	2.1	2.8	
Fuelwood (2)	0.9	0.9	1.2	0.9	1.0	0.6	0.8	0.9	0.7	1.8	2.1	
Charcoal (2)	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.7	

(2) = Based on FAO data

Table 2.4 - Canada – Biofuel Export (PJ)

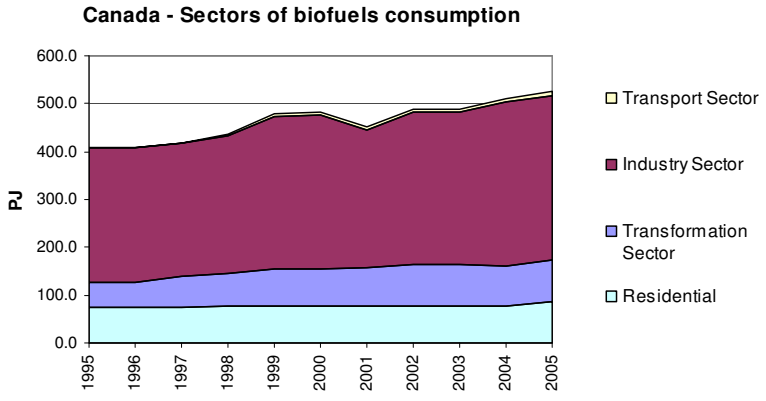
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels				0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6
Solid Biomass												
Gas from Biomass												
Biogasoline				0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.6
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	4.6	5.0	3.5	3.4	3.8	4.1	5.4	5.1	5.2	7.0	9.6	
Fuelwood (2)	4.6	5.0	3.4	3.3	3.7	4.0	5.3	5.1	5.1	6.9	9.6	
Charcoal (2)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	

(2) = Based on FAO data

Table 2.5 - Canada – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	*408.7*	*408.4*	*417.8*	*437.5*	*479.8*	*481.0*	*451.4*	*487.5*	*489.0*	*509.7*	*524.7*	*532.4*
	Transform.	53.0	54.9	65.7	69.8	79.2	78.5	82.2	86.4	86.5	84.2	87.8	
	Industry	283.0	280.4	277.4	287.2	318.9	320.1	286.7	318.4	319.3	342.1	344.4	
	Transport				4.5	5.1	5.6	5.6	5.6	6.0	6.0	7.1	
	Residential	72.7	73.1	74.8	76.0	76.6	76.8	76.9	77.1	77.2	77.3	85.4	
Solid Biomass	Dom. Supply	408.2	407.8	410.5	425.6	467.0	467.6	438.0	473.9	475.0	495.6	509.5	510.0
	Transform.	52.5	54.3	58.4	62.4	71.6	70.7	74.4	78.4	78.5	76.2	79.7	
	Industry	283.0	280.4	277.4	287.2	318.9	320.1	286.7	318.4	319.3	342.1	344.4	
	Transport												
	Residential	72.7	73.1	74.8	76.0	76.6	76.8	76.9	77.1	77.2	77.3	85.4	
Gas from Biomass	Dom. Supply	0.5	0.6	7.3	7.4	7.6	7.8	7.8	8.0	8.0	8.0	8.0	9.6
	Transform.	0.5	0.6	7.3	7.4	7.6	7.8	7.8	8.0	8.0	8.0	8.0	
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply				4.5	5.1	5.6	5.6	5.6	6.0	6.0	7.1	12.8
	Transform.												
	Industry												
	Transport				4.5	5.1	5.6	5.6	5.6	6.0	6.0	7.1	
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)



3 Country Profile - CHINA

3.1 Overview

The energy industry of China is under pressure to meet the demands of its booming economic growth and at the same time, maintain its social responsibility to protect the environment. Although endowed with large quantities of fossil fuel sources, China's per-capita energy resources, which is less than half of the world's average, is relatively lacking due to the size of its population. This deficiency has become a factor constraining the sustainable development of the country's economy. Furthermore, as about 80 percent of the primary energy supply still comes from fossil fuels, there are clear environmental pollution issues.

Modern renewable energy sources account for only 7.5 percent (*including large hydro)* of China's primary energy demand. In addition to supplying modern renewable energy, traditional biomass also plays an important role in China's energy mix (12 percent). Renewable energy contributes 15 percent of that used in electricity generation, with hydro-power plants as the largest technology used[118].

China is the world's third largest producer of fuel ethanol after the United States and Brazil. Chinese fuel ethanol production is estimated at 1,450,000 tonnes in 2007, up from a recorded output of 1,300,000 tonnes in 2006, reporting a 12 percent increase from 2006[119]. More than 80 percent of ethanol is made from maize; other feedstock used includes cassava rice, sugar and paper pulp waste. Ethanol from sorghum is being produced on a trial basis[120].

Chinese ethanol exports have been increasing over the last five years and have jumped dramatically from 138,000 tonnes in 2005 to 865,000 tonnes in 2006 in reaction to higher world petroleum prices.[121] Most ethanol exported from China is "un-denatured" ethanol (principally to Japan and Korea where it is used for alcohol production[122]).

Due to high tariffs, China levies an import tariff of 30 percent on ethanol[123] and restrictive import policies fuel ethanol imports have been relatively minor and are unlikely to increase in the short run. However, feedstock imports for biofuel production will rise over the next few years to meet the increasing domestic demand of fuel ethanol production. In 2006, more than half of China's imports (4.5 million litres) are in effect more re-distribution than true import. This is a result of Chinese production being sent to tariff-free zones and "imported". The "imported" product is counted as import instead of reduced exports.[124]

[118] REN21 Renewable Global Status report, 2006
[119] USDA-FAS, "China, People Republic of : Biofuels Annual Report 2007," GAIN Report - CH7039, January 6th, 2007
[120] UNCTAD, "The emerging biofuels market: regulatory, trade and development implications" United Nations 2006
[121] Masami Kojima, Donald Mitchell, and William Ward , "Considering Trade Policies for Liquid Biofuels", ESMAP report May 2007
[122] USDA-FAS 2007
[123] USDA-FAS, China, People Republic of: Biofuels An Alternative Future for Agriculture GAIN Report Number: CH6049 August, 8th , 2006
[124] USDA-FAS 2007

Biodiesel is still in the very early phases of testing and development. Its production in 2005 was between 100,000 and 200,000 metric tonnes (MT) with a production capacity of 1,020,000[125] with future production in 2007 estimated at around 300,000 metric tonnes.[126]

The feedstock used for biodiesel production includes waste cooking oil, some oil from oily plants, or animal fat. The product is low quality and not adequate for transportation purpose. Significant technological research is, however, underway. Official Customs data is not available for biodiesel trade. China does not currently import biodiesel because of the high price.

Biomass for cooking and heating in traditional ways is used especially in poor remote regions. Traditional biomass is still the *main source* of energy supply for 15 million rural Chinese, who do not yet have access to electricity. By the end of 2005, the installed capacity of modern biomass power was 2 GW[127].

Table 3.1 – [PJ]

Total Primary Energy Supply	Imported	Renewable	Biomass
100%	6%	16%	14%
67 380	3 784	10 505	9 232

Source: IEA, 2004

3.2 Country Objectives and Drivers

Rising oil import costs and concerns about rapidly growing demands for energy (growing at 15 percent annually) in a context of fluctuating world oil prices, are driving the government to seek alternative indigenous sources of energy. China's launch into biofuels production has also been motivated by the objective of stimulating rural economy, and improving farmers' income, through the creation of a new market for surplus grain in major Chinese corn-producing areas. Lastly, environmental protection and concerns for economic losses caused by environmental pollution in China,[128] has also motivated the current plan to substantially increase the percentage of renewable energy in its overall energy consumption and the adoption of the *Renewable Energy Law* dedicated to promote the development and use of renewable energy. This, the first national law dedicated to promote the development and use of renewable energy, came into effect on 1 January 2006. The "Renewable Energy Law", which draws particular attention to energy derived from biomass, confirms the importance of renewable energy in China's national energy strategy, encourages investment in the development of biomass, removes barriers to the development of the renewable energy market, and sets up a financial guarantee system for the development of renewable energy.

[125] USDA-FAS 2006
[126] USDA-FAS 2007
[127] EREC , "Global Energy [R]Evolution A Sustainable China Energy Outlook", April 2007
[128] In September 2006, the National Bureau of Statistics and the State Environmental Protection Administration jointly issued a aimed to address adjustments to GDP caused by environmental pollution. According to this report, the economic losses caused by environmental pollution in China in 2004 amount to 3.05% of China's GDP in 2004.

Fundamental principles of China's renewable energy legislation are the shared responsibility of companies and individuals, intervention of the government in establishing the market rules to encourage the creation of the market for energy resources, participation of companies and market players in investing in this sector, and promotion of mature and innovative technologies in an effort to solve rural energy access. In line with those principles, the "Renewable Energy Law" provides a comprehensive policy framework whose implementing regulations are to be formulated. Some of them have been already issued including those regarding the pricing mechanism, grid-connection and incentive policies.

The main policy instruments and mechanisms established through those implementing regulations for promoting bioenergy development are described below:

Establishment of renewable energy targets, including both economy-wide and technology specific targets. On the basis of medium and long-term targets and national RE development and utilization plan set at central level, and according to the economic context and availability of resources, each regional authority is obliged to set an RE plan for their own administrative regions. Mandatory renewable energy targets for individual utilities is considered too complicated and costly by the government, but China has confirmed that obligations under a quota system will be placed on generators, although not yet operational. Currently, only a feed-in tariff mechanism has been established to achieve the target.

Compulsory grid connection for renewable energy facilities to the State electricity grid. The Renewable Energy Law provides for the compulsory connection of renewable energy generators to the grid, and a regulation has been enacted to this effect[129]. The regulation deals with general rules governing grid connection, project management requirements, utility company responsibilities and generator responsibilities. Under the Regulation, a power generation project must be established upon obtaining the relevant licence or complying with relevant filing procedures with the department-in-charge.

3.3 Bioenergy Policy by Subsector

The principal document presenting the national renewable energy policy is the "National medium- to long term renewable energy development Plan". It has been recently formulated by the NDRC (National Development and Reform Commission) and should be published in the near future as a guide for development of the renewable energy industry and create certainty for investors, although still awaiting final, formal approval by the State Council. The table below shows the overall and technology-specific targets for 2010 and 2020 included in the latest draft of the Plan. If these targets are met, renewable energy would constitute approximately 16 percent of China's projected energy consumption by 2020.

[129] Power Generation Regulation, NDRC Energy, 2006

Table 3.2

Energy sources	by 2010	by 2020
Total primary energy supply (TPES)	79 131 PJ	97 008 PJ
Renewable Energy Share of TPES	10%	16%
Total Renewable Energy Consumption	7 913 PJ	15 533 PJ
Hydro	180 GW	300 GW
Wind	5 GW	30 GW
Photovoltaic	3 GW	18 GW
Biomass generation[130]	5,5 GW	30 GW
Solar Water heater	150 million m^2	300 million m^2
Biogas	19 billion m^3	48 billion m^3
Solid biomass fuel	10 million tonnes	50 million tonnes
Bio-ethanol	2,0 million tonnes	10 million tonnes
Bio-diesel	0,2 million tonnes	2 million tonnes
Solar Water heater	150 million m^2	300 million m^2

Source: Xinhua news Agency, October 2006, Zhong Guo Dian Li bao (China Electric Power news), June 2006

Although the Plan has not yet been published, the overall target has been announced publicly on several occasions and most of the components of the Plan (including measures to achieve the target) have been implemented already.

The approach used by the Chinese government for the development of renewable energies and biofuels for transportation focuses on establishing a market through government support and participation of state companies. Previous reforms have served to break the power sector monopoly and create competition within the power market via separation of power generators and utilities.

Under the Kyoto Protocol, China has no obligation to assume binding targets to reduce GHG emissions, but has institutional and reporting obligations.

In June 2007, China took a significant step forward in addressing the risks of climate change with the publication of a new National Climate Change Program (prepared by the National Development and Reform Commission, or NDRC). The Program outlines steps that China will take to meet the previously-announced goals of improving energy efficiency by 20 percent in 2010 over 2005 levels. The Program contains several statements relating to the promotion of renewable energy investment through “government investment, government concession and other measures” and clearly indicates the objective of introducing “the *obligation* of *national electricity grids* and *petroleum sales enterprises* under the Renewable Energy Law to purchase renewable energy products will be implemented”. Regarding biomass energy development and utilization, the new National Climate Change Program gives significant importance to bioenergy based power generation, marsh gas, biomass briquette and biomass

[130] Agriculture & Forestry

liquid fuel. It foresees preferential measures in favour of bioethanol and other biomass fuels to promote biomass energy development and utilization to a considerable level.

Given that energy is such a priority, the State Council has appointed an *energy co-ordination task force* under the leadership of the Premier. This task force replaced the Ministry of Energy established in 1988. Renewable energy projects seeking government approval are required to comply with the national and provincial renewable energy plan, and with environmental assessment laws. NDRC oversees the application of government policy and/or funding support for the biomass power generation projects.

Under the institutional framework of China, the central government is responsible for the formulation of the national regulations which guide individual provinces. However, since there are great disparities between various provinces in terms of resource availability and industrial capacity and demand, in some cases provincial governments need to formulate detailed provisions for their area, within the central government's general policy framework.

Moreover, NDRC has recently invited proposals for the construction of 10-15 pilot plants based on non-grain feedstocks. Funding will be based on meeting specific technology and efficiency objectives. All production facilities must continue to sell their ethanol to the state - owned China Petroleum and Chemical Corporation (SINOPEC) or the China National Petroleum Corporation (CNPC).

Among the non-food feedstock the central government is willing to promote the use of cassava, already produced in southern China, as well as sorghum that can be produced nationwide and shows great potential in the country. Significant R&D initiatives have been started, included small scale test ethanol plants using cellulose, like straw.

Ethanol subsidies have been declining and may be phased out entirely by the end of the 11th Five-Year Period.

The policy direction, articulated in a recent NDRC report[131], is to increase demand by requiring ethanol use in State municipalities (Beijing, Shanghai, and Tianjin) and expand supply up to a production capacity of 6 million tonnes a year during the 11th five year, through government sponsored constructing of new ethanol production plants, including one in Guangxi Province (cassava-based) and one in Hubei Province (rice-based). Other proposals for the future detailed in the report includes the spill-over effects on agriculture related industries and the contribution to industrializing agriculture and boosting farmers' income and the development of new technologies and secure environmental conservation.

NDRC Department of Industry plays a central role in promoting expansion of ethanol industry through the coordination of a stakeholder group of industries and other representatives from government and provinces. Although it has initiated research on energy development through the use of biomass, and despite its pertinent role as the coordination point for feedstock

[131] On May 2006 the NDRC Department of Industry presented to the State Council's National energy leading Group an evaluation report of the National Ethanol Programme, from which it emerges a positive evaluation of the results achieved from the 5 year Programme. The report was titled in Chinese "The evaluation of auto ethanol test project and further step on bio-ethanol industries development"

production (both grain-based feedstock and non-grain based (NGB) feedstock), the Ministry of Agriculture does not participate in the NDRC subcommittee on biofuels promotion.

Although the Renewable Energy Law addresses all types of renewable energy, regulations and official support have been focused mainly on solar and wind projects and only recently has the Government given priority to biomass energy projects. Completion of detailed regulations and technical standards for biomass energy grid connection and power purchase as well as biomass utilization is expected in the near future.

Also envisioned is a Fund for Biomass Utilisation and Renewable Energy application in rural regions that could promote small decentralised electricity and heat generation for household applications- to be completed in 2007.

In fact, China has large potential for biomass resources from agriculture and forest residues and large wasteland that could be used for a larger bioenergy development in rural areas, while currently most agriculture residues are burned in the field.

Power Generation

China has announced and was finalizing a revised target for 16 percent of primary energy from renewables by 2020, including large hydro, an increase of 7.5 percent actual share in 2005. Development planning includes technology targets by 2020 of 30 GW of biomass power[132].

According to the new Renewable Energy Law, power grid operators (in addition to fuel and heat network operators and petroleum distributors) who fail to perform the above obligation may incur liability and may even be penalized. Under the "Power Generation Regulation", power generating enterprises, especially large scale power generating enterprises, are also urged to invest in and fulfil the quota requirements for generating electricity using renewable energy as imposed by the government (but not yet imposed).

Moreover, in areas not covered by a power grid, the Government will fund the construction of independent renewable energy electricity generation systems to provide electricity locally.

The *price support mechanism*[133] established by China's central government, designed to encourage investors to participate in the market, is based on feed-in tariff systems. The government - NDRC Department of Price - establishes fixed prices at which energy utilities must buy all energy produced by renewable energy enterprises, significantly reducing the time necessary to negotiate power purchase agreements and gain project approvals from Government authorities, thus decreasing transaction costs. Under the Renewable Energy Law, renewable energy prices are determined in accordance with various factors, among others: the characteristics of technology, the varied geographic locations and the need to facilitate the development and utilization of renewable energy on a reasonable commercial basis. Under the

[132] China's targets are present in a draft renewable energy development plan that is pending approval by the government. The Chinese renewable energy law of February 2005 requires the government to publish the renewable energy development plan, including targets, by January 2006. From RE21 renew global status 2006

[133] Established through regulation on "Pricing and Cost Sharing for Renewable Energy Power Generation" - NDRC Price No.7, 2006)

current arrangement prices established under feed-in tariff laws are not differentiated according to source and technology used.

A *cost-sharing system* has been established targeting all consumers and power grid operators to collectively share the extra costs resulting from the development of renewable energy. In fact, the additional cost that power grid operators have to pay to purchase electricity generated from renewable energy at the tariff set by the government as above calculated, may be added to the price of electricity sold to end-users, by means of a tariff surcharge. The other component of the excess cost is shared by all energy utility companies nationwide and cannot be passed down to consumers. There is not yet any detailed formula to calculate the proportions of the costs to be paid by consumers and utilities respectively. The details of how the cost-sharing revenue will be divided among the 31 provinces, and how the additional costs will be borne by energy utilities, have not yet been clarified.

The *incentives scheme* (currently being drafted) includes *preferential tax treatment* and *financial support* through low interest loans or special purpose grants, or preferential tariff. Renewable energy projects that fall within the description of the Catalogue on Renewable Energy Industrial Development[134] may be entitled to preferential tax treatment and upon satisfying other requirements, funding designated. The exact forms that these schemes will take and the level of incentives which will be provided are not yet known.

Heat Production

No official heat targets exist in China.

The Renewable Energy Law provides regulations also for gas and heat sourced from biomass. The mechanism and incentives described above relate also to heat production from biomass (compulsory grid connection and “punishment and reward” system, the modalities for setting the purchase price).

Transport

The “Renewable Energy Law” obliges petroleum distributors to supply fuel generated from biomass resources into the distribution system only if it complies with relevant technical and quality standards, in accordance with applicable laws and regulations. Although these regulations have not yet been implemented, E10 blending mandates are on a trial period within a National Fuel Ethanol Programme, launched in 2002 in some regions of the Country.

A target of replacing 15 percent of its transportation energy needs through the use of biofuels has been set for 2020. This corresponds with 12 million tonnes and has been announced by the Government together with the plan of setting aside $101.1 billion by 2020 to promote biofuels[135].

[134] Circular on the Catalog Issue for the Guidance on Industrial Development of Renewable Energy by the National Development and Reform Commission (NDRC), promulgated and implemented on November 29, 2005（the Guidance Catalog)
[135] Financial Express October 4th 2006

To ensure development of liquid biofuels, the central government takes an active role in regulating both the supply and demand sides of the biofuel market.

The history of China's bioethanol development can be divided into three main phases: *research and development* of relevant technologies for bioethanol production, accompanied by a period of demonstration (1986-2001); *legislative* infrastructure (2001-2004); and *enforcement*, accompanied by pilot programmes that gradually expand, if successful (2004-present).

In addition to the mandatory obligation, the "Renewable Energy Law" includes a "reward and penalty" system designed to encourage the entire society, particularly companies, to develop and use renewable energy, financially penalizing those companies and individuals that do not meet the obligations as set by law.

China launched its *National Fuel Ethanol Program* in 2002 in five cities throughout China's central and north-eastern region. The sites were chosen for their abundance of maize which, at the time, was overproduced and under-priced. The sum of two billion yuan ($250 million) has been allocated for the five-year programme. In 2004 the trial programme was expanded to seven new provinces and certain cities extending the compulsory use of a 10 percent blend of bioethanol to gasoline (E10) in all those areas. The government planned to expand the E10 program to 27 cities within Shandong, Jiangsu, Hebei, and Hubei from 2006. The type of feedstock used in these ethanol projects is divided as follows: facilities in Heilongjiang, Jilin, and Anhui use corn, while the facility in Henan uses wheat. The Guagxi Xhuang autonomous region plans to build a fuel plant that will use cassava and is scheduled to begin operations in October 2007. The use of potato, sorghum, rice, and lignocelluloses for bio-ethanol production are in the experimental stages. Thanks to a series of incentives, subsidies and tax exemption measures[136] provided by the Programme, China's bioethanol production capacity reached 1,300,000 tonnes in 2006.

While the government has been addressing ethanol for the past twenty years, it only began including *biodiesel* in 2006 in its policy mix. There is no national standard for biodiesel use as a transportation fuel, and currently no national or provincial programmes to promote the use of biodiesel in transportation. Only in December 2006, the government announced that biodiesel made from animal fat or vegetable oil is not subject to consumption tax[137]. Consequently, present production is very limited, ranging between 100,000 and 200,000 MTons, although increased development of biodiesel is expected since the diesel market in China is twice that of the gasoline. The principal difficulty of biodiesel production is the lack of feedstock, resulting from the short supply of edible vegetable oils. China is the largest importer of soybeans and imports significant quantities of other oil-based products. Coupled with the lack of fatty organic matter, the lack of arable land exacerbates the difficulty of biodiesel production.

In May 2006, China took some preliminary steps towards biodiesel promotion by setting up the "Special Development Fund for Renewable Energy Resources" to encourage research, development, and production. Up to that time, only a few small biodiesel plants had been built.

[136] According to the Law Concerning Testing for the Extensive Use of Ethanol Blended Gasoline for Automobiles and the Regulations Concerning the Conduct of Testing for the Extensive Use of Ethanol Blended Gasoline for Automobiles
[137] Xinhua Business Weekly, 2006

Currently, about 80,000 tonne of biodiesel are produced from waste cooking oil. Biodiesel production from jatropha, Chinese pistachio and rapeseed is still in the testing phase. Last year China purchased nearly 3 million tonnes or 75 percent of its total palm oil imports from Malaysia and imported tapioca from Thailand[138]. Rapeseed is a promising oilseed for biodiesel and is a potential source of biodiesel production for China. Biodiesel from animal fats and oils, while a great potential for the future, is not being explored at present probably due to competition with feed demand.

3.4 Results and Future Challenges

Regarding R&D in RES, the national budget quota has been increasing steadily from 53 million yuan in 2001 to 325 million yuan in 2006 with an increased share for bioenergy (although wind and solar have the biggest share).

China has increased its annual production capacity of fuel ethanol to 1.3 million tonnes (2006) thanks to direct funding, preferential tax policies and subsidies provided in National Pilot Ethanol Programme. Through pilot projects running in several regions (northeast China, central China's Henan Province, north China's Hebei Province and east China's Anhui, Shandong and Jiangsu provinces), the government objective is to develop a stable ethanol supply system.

Corn has been used as the major feedstock for producing bioethanol determining an increase in the market demand for corn and consequently an increase of domestic corn price.

Concerned that ethanol fuel production using food crops could affect the food supply problem, the Chinese government has started to restrict production of ethanol from maize at the end of 2006 and announced further subsidies and tax breaks for both biofuel producers and farmers who raise feedstocks other than grains.

In the foreseeable future, the government will dominate ethanol development. Thus, while there are countless small private natural ethanol production plants in China producing food grade alcohol, the four ethanol fuel production plants are all run by state-owned enterprises.

Biodiesel is in the very early phases of testing and development, further development is foreseen thanks to favourable initiatives recently adopted by the Government.

Feedstock availability for biodiesel production is the main barrier to larger production. According to official sources (Director Jia Zhibang of the State Forestry Administration)[139] China plans to grow 13.33 million hectares of forests by 2020 to produce bio-diesel oil and fuels for power generation, and also plans to produce more than six million tonnes of biodiesel oil with materials from the forests and increase the installed capacity of power generation by more than 15 million KW by 2020.

Availability of arable land for biofuel production and food security concerns are the main critical issues for future bioenergy expansion that requires agricultural land, which may not be available in a sufficient amount to support the development of the industry.

[138] Reuters News, 2006
[139] Xinhua News Agency July 17, 2007

The support to electricity production from biomass has derived specially from the Renewable Energy Law, and its implementing regulations about subsidized prices setting and compulsory access to the grid. Although the framework has been set by the Law, a number of major issues still need to be addressed to give full effect to the intent of the Renewable Energy, as the provisions for preferential tax measures, financial incentives and low-interest loans, and the setting of a RES mandatory quota system.

Chinese experience in developing a renewable energy policy is recent and therefore the formulation and implementation of appropriate regulations will take time. Implementation of these regulations will also need to take into account existing support measures at a provincial level, and how the implementation of a national framework law will affect their continued operation.

Unfortunately, as the National Renewable Energy Development Plan containing guidelines for the renewable energy industry has not yet been published, there is still a measure of uncertainty for investors regarding regulations in the field. Detailed regulations on biomass energy grid connection and power purchase as well as biomass utilization are still to be completed.

A first official government review of the Renewable Energy Law was carried out by the NDRC in early 2007. The results of the review, including recommendations from Chinese industry stakeholders, were published on 20 April 2007. The review suggested the following policy measures:

- Implement a renewable portfolio standard as soon as possible to increase market confidence about prices;
- Accelerate the formulation of preferential tax and other fiscal policy;
- Accelerate the formulation and publication of national renewable energy targets and the long-term plan for renewable energy, and formulate and publish specific plans for wind energy, biomass, solar energy and other technologies. The purpose of the plan is to provide a ‘road map’ for development of all sectors in the renewable energy industry. Align policy mechanisms with long-term targets.
- Clarify responsibilities for implementation of renewable energy strategies and policies, both nationally and within each province;
- Clarify responsibilities for resource assessment and initiate data collection projects as soon as possible (with wind and biomass as a priority);
- Increase funding for research and development into high-tech and industrial equipment technology projects in the renewable energy sector;
- Streamline government approvals process to minimize the administrative burden of new project development on project participants.

3.5 Country Policy Table - China

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments		
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area
National Development & Reform Commission (NDRC)	Renewable Energy Law (adopted on 28/02/2005)	Policy- target, incentive, R&D and education	Yes	Industry, bioenergy producers. bioenergy suppliers
National Development & Reform Commission (NDRC)	National Renewable Energy Planning	Activity- targets	No	Industry, bioenergy producers, bioenergy suppliers
Ministry of Finance and NDRC	Bioethanol Programme	Activity- incentives	No	Bioethanol producers
Ministry of Finance	Special Fund for Renewable Energy development	Policy- Incentive, R&D	Yes	Industry, bioenergy producers
NDRC	Climate Change Programme (June 2007)	Activity-Target, Education	No	Industry
National Development & Reform Commission (NDRC)	Renewable Energy Law (adopted on 28/02/2005)	Policy- target, incentive, R&D and education	Yes	Industry, bioenergy producers. bioenergy suppliers
National Development & Reform Commission (NDRC)	National Renewable Energy Planning	Activity- targets	No	Industry, bioenergy producers, bioenergy suppliers
Ministry of Finance and NDRC	Bioethanol Programme	Activity- incentives	No	Bioethanol producers
Ministry of Finance	Special Fund for Renewable Energy development	Policy- Incentive, R&D	Yes	Industry, bioenergy producers
NDRC	Climate Change Programme (June 2007)	Activity-Target, Education	No	Industry

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

Impact on Bioenergy		Impact on Production Stream			Funding Mechanism
Direct	Indirect	Production	Conversion	Use	
It provides the general framework for promoting the development and use of renewable energy.				It promotes use of biomass for electricity and fuel for transport	
It sets a target of 10 percent and 16% of total power capacity produced by RES (excluding large hydropower) by 2010 and 2020 respectively. This entails 5.5 GW and 30GW of biomass for power generation and other biomass energy use, 2 and 12 million tons biofuels production by 2010 and 2020 respectively.				It promotes use of biomass for electricity and fuel for transport	Incentives by feed in tariff
It provides incentives and subsides for biofuels production		It provides direct subsidies to bioethanol producers			
Provides subsides for the development of all types of renewable energy				Promotes the development and use of bioenergy	
It sets a target of improving energy efficiency by 20% in 2010 over 2005 levels, raising the proportion of renewable energy in the primary energy supply to 10% by 2020. It also provides for education and public awareness on environmental issues. It asks for a stable mechanism for renewable energy investments to be established through government investment, government concession and other measures in order to establish a sustainable and stably market for renewable energy. However, no specific measures are identified				It promotes biomass energy and biofuels development and utilization	
It provides the general framework for promoting the development and use of renewable energy.				It promotes use of biomass for electricity and fuel for transport	
It sets a target of 10 percent and 16% of total power capacity produced by RES (excluding large hydropower) by 2010 and 2020 respectively. This entails 5.5 GW and 30GW of biomass for power generation and other biomass energy use, 2 and 12 million tons biofuels production by 2010 and 2020 respectively.				It promotes use of biomass for electricity and fuel for transport	Incentives by feed in tariff
It provides incentives and subsides for biofuels production		It provides direct subsidies to bioethanol producers			
Provides subsides for the development of all types of renewable energy				Promotes the development and use of bioenergy	
It sets a target of improving energy efficiency by 20% in 2010 over 2005 levels, raising the proportion of renewable energy in the primary energy supply to 10% by 2020. It also provides for education and public awareness on environmental issues. It asks for a stable mechanism for renewable energy investments to be established through government investment, government concession and other measures in order to establish a sustainable and stable market for renewable energy. However, no specific measures are identified				It promotes biomass energy and biofuels development and utilization	

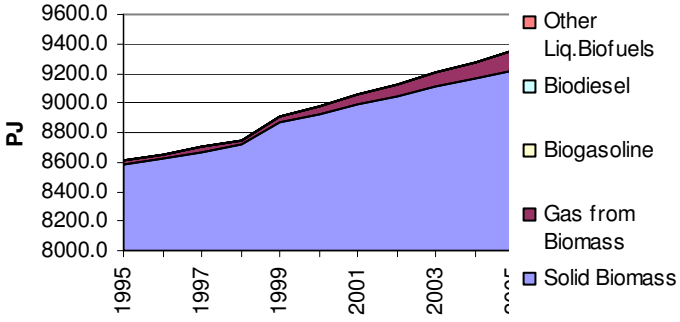
3.6 China Bioenergy Outlook

Table 3.3 - China – Biofuel production

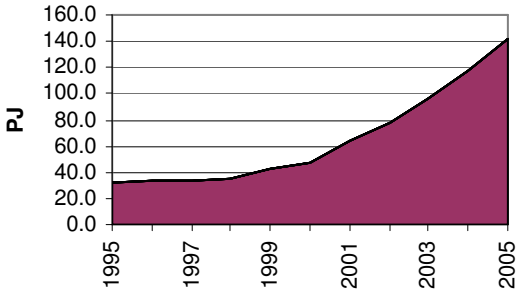
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Biofuels	8610.1	8656.0	8703.0	8750.3	8905.6	8973.2	9052.6	9127.0	9201.9	9276.8	9360.1
Solid Biomass	8578.4	8622.8	8669.0	8715.5	8863.6	8925.7	8988.2	9048.6	9105.1	9159.9	9218.9
Gas from Biomass	31.7	33.2	34.0	34.8	41.9	47.6	64.5	78.4	96.8	116.9	141.2
Biogasoline											
Biodiesel											
Other Liq.Biofuels											
All woodfuels (2)	2116.9	2080.4	2097.1	1966.9	1997.6	1998.8	2006.0	2006.0	2034.6	2054.5	2054.5
Fuelwood (2)	2085.0	2060.3	2063.8	1933.2	1933.2	1931.8	1932.9	1932.8	1959.9	1979.8	1979.8
Charcoal (2)	0.9	1.2	1.5	1.5	1.5	2.3	1.7	1.7	3.2	3.3	3.3
Black Liquor (2)	31.0	18.9	31.7	32.2	62.9	64.8	71.4	71.4	71.4	71.4	71.4
Production growth (%)											
Solid Biomass											
Gas from Biomass											
Biogasoline											
Biodiesel											
Other Liquid Biofuels											

(2) = Based on FAO data

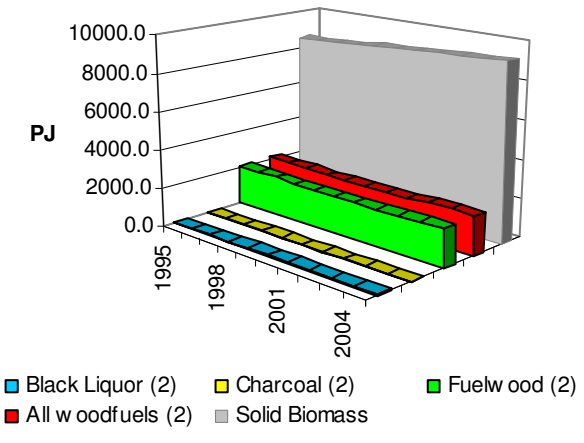
China - Biofuels production



China - Liquid and gaseous biofuels production



China - IEA Solid Biomass vs FAO Woodfuels



China - Change rate of biofuels production

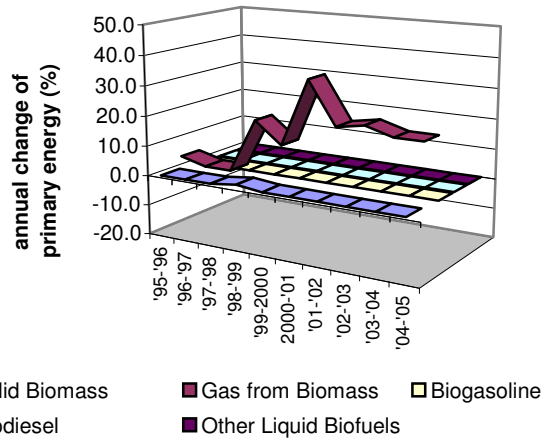


Table 3.4 - China – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.7	0.7	0.4	0.8	0.8	1.1	1.1	0.9	1.1	1.3	1.8	
Fuelwood (2)	0.6	0.7	0.4	0.7	0.7	0.4	0.2	0.3	0.3	0.4	0.2	
Charcoal (2)	0.1	0.0	0.0	0.1	0.1	0.8	1.0	0.7	0.8	1.0	1.6	

(2) = Based on FAO data

Table 3.5 - China – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	1.1	1.2	1.6	1.6	1.4	2.6	3.2	3.3	3.5	2.2	1.4	
Fuelwood (2)	0.3	0.2	0.2	0.1	0.2	0.0	0.1	0.1	0.2	0.1	0.2	
Charcoal (2)	0.8	1.0	1.4	1.4	1.2	2.5	3.0	3.2	3.3	2.1	1.2	

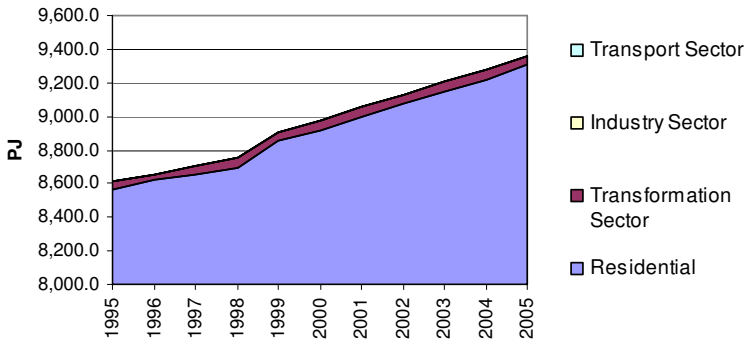
(2) = Based on FAO data

Table 3.6 - China – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	8,611.7	8,657.7	8,704.7	8,752.0	8,907.3	8,975.0	9,054.4	9,128.8	9,203.7	9,278.6	9,361.9	
	Transform.	48.6	29.8	49.3	53.9	54.8	55.2	55.6	56.0	56.4	56.8	57.1	
	Industry												
	Transport												
	Residential	8,563.	8,627.	8,655.	8,698.	8,852.	8,919.	8,998.	9,072.	9,147.	9,221.	9,304.	
Solid Biomass	Dom. Supply	8,580.0	8,624.5	8,670.7	8,717.2	8,865.3	8,927.4	8,989.9	9,050.3	9,106.9	9,161.7	9,220.7	
	Transform.	48.6	29.8	49.3	53.9	54.8	55.2	55.6	56.0	56.4	56.8	57.1	
	Industry												
	Transport												
	Residential	8,531.	8,594.	8,621.	8,663.	8,810.	8,872.	8,934.	8,994.	9,050.	9,105.	9,163.	
Gas from Biomass	Dom. Supply	31.7	33.2	34.0	34.8	41.9	47.6	64.5	78.5	96.8	116.9	141.2	
	Transform.												
	Industry												
	Transport												
	Residential	31.7	33.2	34.0	34.8	41.9	47.6	64.5	78.5	96.8	116.9	141.2	
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

China - Sectors of biofuels consumption



4 Country Profile - FRANCE

4.1 Overview

In 2005 the primary energy supply in France was measured at 11 555.5 PJ of which biomass contributed 422.8 PJ. Renewable Energy Sources (RES) comprises around 14 percent of the total electricity consumption; the production from solid biomass was 1.698 TWh in 2004 and 1.774 TWh in 2005, showing an increase of +4.5 percent.

The heat sector is responsible for the utilization of more than half of the primary energy consumption: the current production of heat from RES amounts to approximately 418.7 PJ while biomass forms the main renewable source with a consumption of 350 PJ.

Liquid Biofuels: France produced about 570 000 tonnes of biodiesel (Fatty Acid Methyl Ester - FAME) in 2006, with a related production of 730 000 tonnes of "seed cake" and 57 000 tonnes of glycerin; 70,000 tonnes of ethanol from wheat (88,000 tonnes of DDGs - Dried Distillers Grains with Solubles), 165,000 tonnes of ethanol from sugar beet (and 115,000 tonnes of feed by-products, 74,000 tonnes of liquid by-products).

This biofuel consumption has represented 1.76 percent of the total fuel consumption in transport in 2006.

Table 4.1– [PJ]

Total Primary Energy Supply	Imported[140]	Renewable	Biomass
100%	8%	6%	4%
11 521	-884	730	504

Source: IEA, 2004

4.2 Country Objectives and Drivers

Bioenergy policies in France are driven by three main objectives:

- prevention of Global Warming (reduction of GHG emissions);
- reduction of energy imports;
- development of rural areas;
- improvement of farm incomes and job creation fostering a new industry.

4.3 Bioenergy Policy by Subsector

There are several Policies contributing to create a framework for the development of bioenergy in France as the 2005 Energy Law ("Loi de programme fixant les orientations de la politique énergétique" 2005-781), the 2006 Agriculture Law ("Loi d'orientation agricole" 2006-11), and the

[140] A negative value has to be intended as an Export

Multi-annual Plan for the electricity production for the years 2005-2015. Moreover, financial incentives are included, year by year, in the Financial Law.

To develop new process and sources of bioenergy, different programmes of calls for proposals for innovative or R&D projects have been implemented:

- The *National Research Programme on Bioenergy* that finances R&D projects at 8 M€ per year;
- The calls for proposals organized in the framework of Competitiveness Poles, for innovative industrial projects;
- The *French agency for industrial innovation* (AII) that attributes subsidies and special credits for big bio-refinery projects.

The responsibilities for the development of Bioenergy are shared between the Ministry for Ecology and Sustainable Planning and Development, Ministry for the Economy Finance and Employment and the Ministry for Agriculture and Fisheries

Power Generation

The 2005 Energy law sets, in article 4, a *production of electricity from renewable sources of 21 percent by 2010*, compared to 14 percent in 2005.

The 2005 Energy law also requests the revision of the "Multi annual Plan for Electricity Investment". This document was published in 2006 and sets for electricity made from biomass a target of 1.000 MWe by 2010. To reach this target, two main instruments are implemented:

- Feed-in tariffs for biogas and biomass projects:
  - *Biogas tariff* (increased in 2006): 7.5 to 9 c€/kWh + 2 c€ co-digestion + 0 to 3 c€ for CHP (energy efficiency)
  - *Biomass tariff* (for combustion plants projects <5MW): revision in discussion (currently 5 c€/kWh)
- A system of call for tenders for biogas and biomass projects >5MWe:
  - One call for tender has been concluded in 2005: 15 projects (including 1 of biogas) has been selected, for 200 MWe.
  - A second call for tender has been launched at the end of 2006 for 300 MWe for CHP projects. The selection phase is not concluded yet.

Heat Production

The 2005 Energy law sets, in article 4, an *increase of heat production from renewable sources of 50 percent by 2010* (compared to 2004) and requests, in article 50, the publishing of a "Multi annual Plan for Heat Investment". This document has been developed, although not yet published, and shows that in a business-as usual scenario, the objective of +50 percent of RES heat should be reached between 2010 and 2015.

Biomass is the main source of RE for heat production representing 92 percent of RES heat in 2005. This proportion should remain important in the future with a 90 percent in 2010 and with a 84.5 percent in 2015.

The main instruments to favor biomass heat are the following:

- Reduced VAT (value added tax) of 5.5 percent for the renewable heat sold to collective grids;
- Public Support for collective biomass boilers (through the ADEME – Agence pour l'environnement et la maîtrise de l'énergie);
- Income-tax credit for inviduals that buy efficient boilers.

In order to develop efficient conversion process, CHP projects are fostered.

Transport

France, as all the EU Member States, has a voluntary target derived by the Directive 2003/30/CE setting a *minimum blend of biofuels* into the fuel placed to the market. Nevertheless, with the 2006 Agriculture Law the French Government established more stringent, even if not binding, targets (*5.75 percent by 2008, 7 percent by 2010 and 10 percent by 2015*).

Those targets, through the utilization of 2 Mha of land (1.6 Mha of rapeseed and sunflower; 0.25 Mha of wheat; 0.05 Mha of sugar beet), will drive the production of biofuel up to 3.5 Mt (80 percent from Biodiesel) and the construction of 20 new bio-refineries, with an expected creation of 25,000 new job posts.

To reach these targets, an incentive tax system based on two main instruments has been implemented:

1. The first is a *fuel tax rebate* which is granted to eligible producers of bioethanol and biodiesel. Indeed, since 1992, the annual Financial Law has established a partial exemption for biofuels. In particular the reduction of TIC (Taxe Intérieure de consommation) is authorized for certain biofuels plants after a European Tender. In 2006 the exemption was 0.33 €/hl for ethanol; 0.25 €/hl for FAME and synthetic biodiesel, 0.30 €/hl for Fatty Acid Ethyl Ester (FAEE).
2. The second instrument is an "*additional tax*" (Taxe Générale sur les Activités Polluantes – TGAP) which is *due by suppliers that do not comply with the national target* set by the law. This additional tax acts as a penalty for the fuel suppliers who do not incorporate enough biofuels into road fuels. This instrument has been introduced by the financial law for 2005.

4.4 Results and challenges

In the last years the French Government made significant steps forward for the development of the bioenergy sector: the development of a multi annual plan for electricity production that sets an increase of electricity produced by bioenergy up to 1000 MWe by 2010 and the system of incentives put in place to facilitate the reaching of the target, together with the establishment of

biofuels blend targets linked to biofuels tax exemption and fines for not complying are driving a significant increase in bioenergy production (in 2004, 300,000 hectares were used for production of biofuels compared to the 766,000 hectares in 2006 and with a trend that should arrive at 2 millions Hectares in 2010).

For heat production from bioenergy, the incentives put in place do not seem to be sufficient to meet the 50 percent increase target established by the 2005 Energy Law. However, this target should be reached before 2015.

4.5 Country Policy Table - France

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments		
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area
EU	Regional Incentive for Agriculture: in accordance with EU Common Agricultural Policy (CAP) regulation CE n.1973/2004 and n. 660/2006.	EU policy - Incentives		Farmers
EU	Agricultural European fund for rural development	Policy (Direct aid)		Farmers and foresters
Ministry of Energy	Energy act	Not binding targets		Industries and individuals
Ministry of Finance		Incentive		Industries and individuals
Ministry of Finance		Incentive		Industries and individuals
Ministry of Finance		Incentive		Producers/suppliers
ADEME: Environment and Energy use Agency	Environmental protection and development of renewable energy	Incentive		Industries, farmers, local authorities
Ministry of the Environment, Water and Physical Planning	Rural excellence poles	Incentive		Industries, farmers, foresters
Ministries of finance, industry, environment, agriculture and interior affairs	Competitiveness pole	R&D		Industries, SME research and development
ADEME: Environment and Energy use Agency	National programme of research on bioenergies	R&D		Industries, Research Institutes, Universities

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.

Impact on Bioenergy		Impact on Production Stream			Funding Mechanism
Direct	Indirect	Production	Conversion	Use	
	(Agriculture) EU Directive originally provided a bonus to farmers for the retirement of agricultural land due to the mass production of agricultural goods in the EU. This act allows farmers to cultivate retired lands with energy crops. Additionally, it provides a bonus of 45 Euros per Hectare to farmers who produce energy crops on non-retired agricultural lands. Incentive is capped at 1.5 million hectares.	Promotes production of energy crops through financial incentives			
This aid could finance investments related to renewable energies	This aid could finance the implementation of training programmes on renewable energy, the service roads and forestry development				Instituted and partly financed by the European Commission
			Call for tender covering the electricity production produced from biomass, Obligation to purchase the electricity produced from biomass, Energy saving certificates		Consumers and producers of energy
VAT reduction for the subscription to the network for heat supply made from biomass. VAT reduction on wood energy supply				Incentive to use of biomass energy	State Budget
				Income tax rebate for the acquisition of certain equipment using biomass	
Partial exemption of the internal tax on fuels for biofuels and blending obligation for fuel suppliers				Stimulation of biofuel production thanks to tax incentives	State Budget
Incentive to the development of local biomass channels					State Budget
Incentive to the development of local biomass channels					
Calls for proposals for industrial development projects (including for bioenergies)	Stimulation of research and of development (Increase in competitiveness, new outlets, etc.)				
Calls for proposals for innovative research and development projects (between companies and research and development centers)	Stimulation of research and development (Increase in competitiveness, new outlets, etc.)				

"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

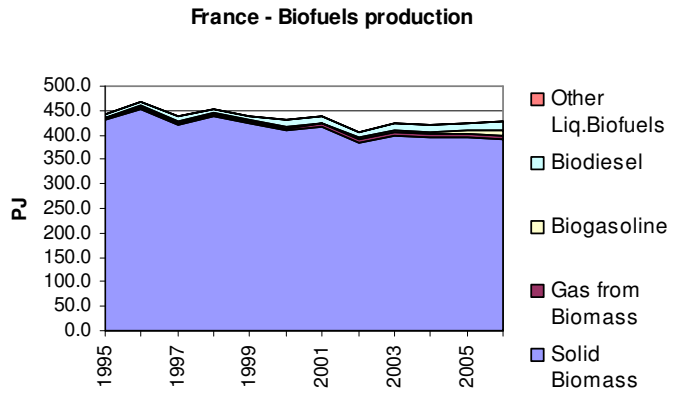
4.6 France Bioenergy Outlook

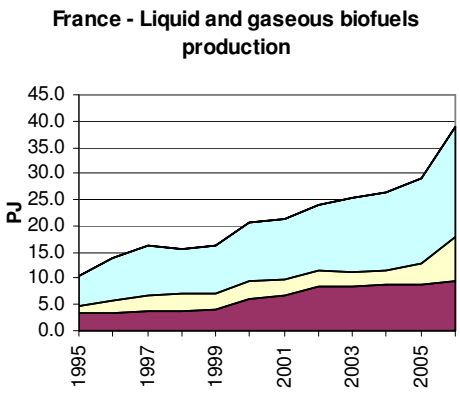
Table 4.2 - France – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	440.4	467.1	437.8	452.6	439.3	429.4	436.7	407.2	422.4	421.5	423.9	429.0
Solid Biomass	429.8	453.2	421.7	437.2	422.9	408.6	415.4	383.2	397.0	395.1	394.8	390.1
Gas from Biomass	3.4	3.5	3.6	3.6	4.0	6.1	6.7	8.3	8.5	8.7	8.7	9.5
Biogasoline	1.4	2.2	3.0	3.5	3.3	3.3	3.3	3.3	2.8	2.9	4.2	8.4
Biodiesel	5.8	8.2	9.5	8.3	9.1	11.4	11.4	12.4	14.2	14.9	16.2	21.0
Other Liq.Biofuels												
All woodfuels (2)	169.3	166.6	163.0	103.0	102.4	105.0	102.8	104.1	95.0	97.7	103.6	
Fuelwood (2)	123.9	124.2	115.5	55.9	57.5	59.1	59.2	60.6	56.0	57.7	62.8	
Charcoal (2)	2.4	2.2	2.1	3.4	3.4	1.8	1.8	2.2	1.5	1.6	1.6	
Black Liquor (2)	43.0	40.1	45.3	43.6	41.5	44.0	41.8	41.3	37.5	38.4	39.2	

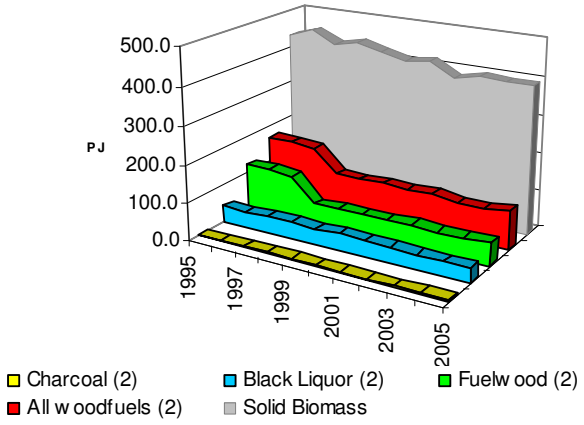
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	5.4	-7.0	3.7	-3.3	-3.4	1.7	-7.8	3.6	-0.5	-0.1
Gas from Biomass	1.5	4	-1.2	11.2	53.0	9.8	24.9	1.9	2.1	0.7
Biogasoline	57.9	38.3	18.1	-7.1	2.2	-2.2		-15.4	5.2	44.4
Biodiesel	41.8	15.7	-12.4	9.1	25.0		9.0	14.7	4.8	9.2
Other Liquid Biofuels										

(2) = Based on FAO data





France - IEA Solid Biomass vs FAO Woodfuels



France - Change rate of biofuels production

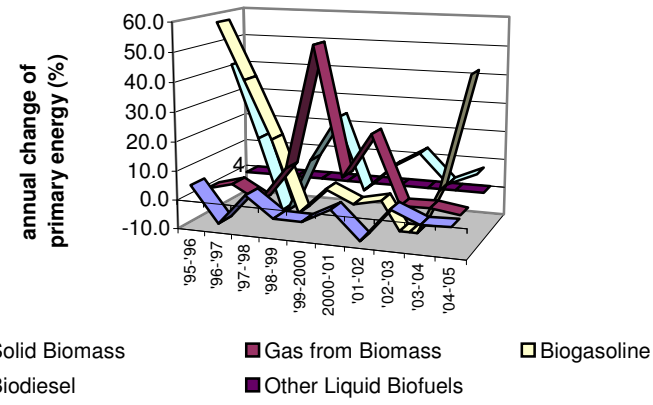


Table 4.3 - France – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels				0.2	0.2	0.3	0.4					
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel				0.2	0.2	0.3	0.4					
Other Liquid Biofuels												
All woodfuels (2)	2.3	2.8	3.1	3.3	3.1	3.8	3.1	3.3	4.4	5.5	6.2	
Fuelwood (2)	1.6	2.0	2.3	2.0	2.4	2.9	2.1	2.5	3.1	4.0	4.6	
Charcoal (2)	0.7	0.7	0.9	1.3	0.8	0.9	1.0	0.8	1.3	1.5	1.6	

(2) = Based on FAO data

Table 4.4 - France – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels								0.7	2.0	2.6	2.3	-0.5
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel								0.7	2.0	2.6	2.3	-0.5
Other Liquid Biofuels												
All woodfuels (2)	9.3	8.2	8.5	9.2	9.9	10.1	9.0	10.4	10.8	10.7	11.2	
Fuelwood (2)	8.7	7.7	7.9	8.6	9.3	9.6	8.5	9.9	10.3	10.1	10.6	
Charcoal (2)	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.6	0.5	

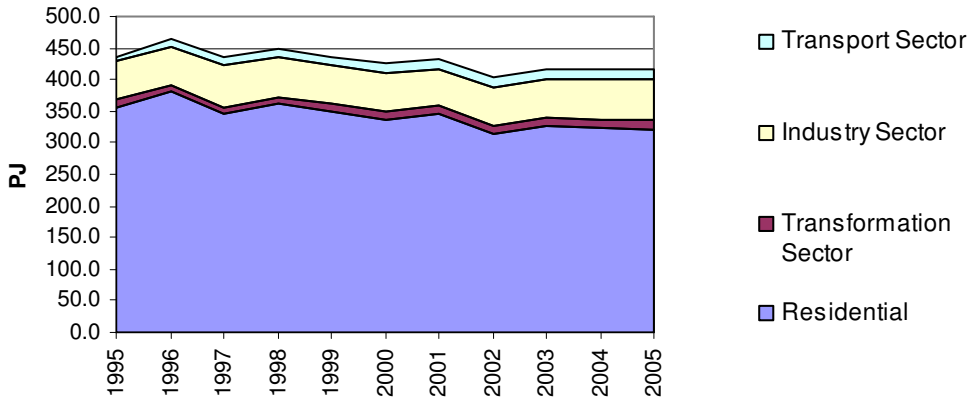
(2) = Based on FAO data

Table 4.5 - France – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	*440.5*	*467.2*	*437.8*	*452.9*	*439.6*	*429.8*	*437.2*	*406.6*	*420.5*	*419.0*	*421.7*	*429.7*
	Transform.	11.1	11.1	12.3	11.9	11.6	13.5	13.3	14.7	15.1	15.2	15.5	
	Industry	61.9	60.4	64.4	64.3	61.1	60.8	58.3	59.7	60.8	62.0	63.7	
	Transport	7.2	10.7	13.6	11.8	12.6	14.9	14.7	15.4	14.2	15.4	17.7	
	Residential	356.6	381.5	344.8	360.9	350.5	336.3	346.6	313.0	325.6	322.5	320.3	
Solid Biomass	Dom. Supply	429.9	453.3	421.7	437.3	423.0	408.7	415.5	383.2	397.0	395.2	394.8	390.2
	Transform.	10.3	10.4	11.5	11.1	10.5	10.6	9.7	9.7	9.9	9.9	10.1	
	Industry	61.4	59.8	63.8	63.6	60.4	60.1	57.5	58.8	59.9	61.0	62.7	
	Transport												
	Residential	356.6	381.5	344.8	360.9	350.5	336.3	346.6	313.0	325.6	322.5	320.3	
Gas from Biomass	Dom. Supply	3.4	3.5	3.6	3.6	4.0	6.1	6.7	8.3	8.5	8.7	8.8	9.5
	Transform.	0.8	0.8	0.8	0.8	1.1	3.0	3.6	5.0	5.2	5.3	5.4	
	Industry	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.9	1.0	1.0	
	Transport												
	Residential												
Biogasoline	Dom. Supply	1.4	2.2	3.0	3.5	3.3	3.3	3.3	3.3	2.8	2.9	4.2	8.4
	Transform.												
	Industry												
	Transport	1.4	2.2	3.1	3.6	3.3	3.3	3.0	3.2	2.7	2.9	3.9	
	Residential												
Biodiesels	Dom. Supply	5.8	8.2	9.5	8.6	9.3	11.7	11.7	11.7	12.2	12.3	13.9	21.5
	Transform.												
	Industry												
	Transport	5.8	8.5	10.5	8.3	9.3	11.7	11.7	12.2	11.5	12.6	13.8	
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

France - Sectors of biofuels consumption



5 Country Profile - GERMANY

5.1 Overview

In Germany more than two-thirds of renewable energy generation comes from bioenergy, followed by wind power, and hydro-electricity power.

In 2006, bioenergy contributed 4.2 percent to the coverage of the total primary energy demand in Germany. The bulk of the energy derived from biomass is for heat generation (65 percent in 2006). Bioenergy met 3.3 percent of the electricity requirements, 5.7 percent of the heat requirements, and 6.3 percent of the fuel requirements in 2006.

In 2005, the percentage of biogenic fuels in the total fuel consumption totaled 3.7 percent, rising to 6.6 percent in 2006 (excluded ships, railroad and airplanes). Biodiesel is currently used most commonly as pure fuel (as opposed to being used in a blend as is common in other countries). However, since 2004 blending with fossil diesel has increased. The annual production capacity of biodiesel currently amounts to almost 5 million tonnes. In the ethanol sector, three large plants, alongside smaller plants, are already producing bioethanol at an annual capacity of ca. 500 000 tonnes.

In 2006, energy crops were grown on approx. 1.6 million ha (13 percent of the arable land in Germany), including around 1.4 percent million ha for energy recovery. Ca. 265 000 ha were used for the production of materials.

In Germany, an estimated 90 000 jobs are currently linked to the bioenergy industry. Of the total of €21.6 billion of domestic turnover achieved by the renewable energies sector, the bioenergy field accounted for around €8.2 billion (38 percent) in 2006.

Table 5.1– [PJ]

Total Primary Energy Supply	Imported	Renewable	Biomass
100%	62%	4.3%	3%
14 572	9 033	628	443

Source: IEA, 2004

5.2 Country Objectives and Drivers

The goals of the German energy policy as outlined in a recent energy summit are to ensure energy security, competitiveness and environmental sustainbility, including climate stability.

At National level, the following support schemes or regulatory framework should be pointed out in connection with the use of renewable resources and climate change:

- Energy Tax Act
- Biofuels Quota Act
- Renewable Energies Act
- Market Incentive Programme for Renewable Energies

- Renewable Resources Funding Programme
- Market Introduction Programme for Renewable Resources

5.3 Bioenergy Policy by Subsector

Power Generation

- *Renewable Energy Act:* Increases the proportion of renewable energy in Germany's electricity supply to 12.5 percent by 2010, 20 percent by 2020, and improved the funding condition for this activity. In particular, the funding that has been improved since 2004 has resulted in a substantial increase in feeding into the grid of electricity generated from biomass.
- The Renewable Energy Act replaced the Electricity Feed Act in the promotion of large-scale generation of electricity from all kinds of renewable energy sources. Under this new Act, grid operators shall be obliged to connect to their grid installations to purchase electricity from renewable sources as a priority, and to compensate the suppliers of this electricity. This obligation shall apply to the grid operator whose grid is closest to the location of the electricity generation installation, providing that the grid is technically suitable to feed in this electricity. The Renewable Energy Act will be amended in 2008, adding sustainability standards for bioenergy, increasing the feed-in tariffs for smaller-scale biogas plants.

Heat Production

- Market Incentive Reform Programme: This program was established in conjunction with the Environmental Tax Reform to exploit renewable energy sources for the production of heat and reduce GHG emissions.
- General Fund for Renewable Energy Sources (RES): Provides direct subsidies for the installation of biomass plants for heat production smaller than 100 kW: €52 per kW, maximum of €2046 per installation; and loans with special interest rates for the installation of biomass plants for heat production larger than 100 kW; installation or extension of biogas plants for the energetic use of agricultural waste products; and installation of biomass plants for combined heat and power production.
- The Renewable Heat Act is under discussion in the Parliament with CO_2 objectives of 40 percent reduction by 2020.

Transport

- *The Biofuel Quota Act*: Imposes requirements on fuel suppliers to sell a minimum quota of biofuels and offers tax privileges (through 2012) for blended biofuels sold above the quota and tax privileges (through 2015) for E-85 and Second Generation Biofuels used for transport. Biofuels used for agriculture remain tax-exempt. The quota can be met either by

mixture or pure fuels. This regime envisages the meeting of a total energy quota of 6.75 percent for 2010, which is set to rise to 8 percent by 2015.

- The *Biofuel Quota Act* confers the authorization to tie the proof of quota exhaustion to such biofuels that:
  - verifiably meet specific requirements for a sustainable management of farmland in the production of biomass; and
  - meet specific requirements for the protection of natural habitats; and
  - show a specific potential for CO_2 cutbacks.
- *Energy Tax Act:* Makes use of EU Directive 2003/96/EC to provide tax relief for biofuels and bio-heating fuels produced from biomass and imposes mandatory biofuel blending targets (Biodiesel 4.4 percent, Bioethanol 2 percent; full taxation for biofuels within the quota: Biodiesel 47 ct / l Bioethanol 65 ct/l; a system of tradable biofuel credits and tax exemptions for biofuels above the quota until 31 Dec. 2009.
- *Vegetable Oil Quality Standard:* Sets the quality standards for vegetable oils to be used as fuels. It will be amended according to the EU Fuel Quality Directive (end of 2007).
- *Federal Pollution Prevention Act:* Lays down the first quality requirements for biodiesel as fuel and establishes targets for GHG emissions reduction in end-use biodiesel.

5.4 Results and Challenges

In 2005, the ruling coalition of the federal government committed itself in the coalition agreement to an energy policy geared to sustainability criteria (see Section 2.4 for more on sustainability standards and criteria development). The following targets are in the process of being implemented:

- By 2010, the share of renewable energies in electricity generation should rise to at least 12.5 percent and to at least 20 percent by 2020;
- Double the share of renewable energies of the total energy consumption by 2010, increase of 20 percent by 2020, and then increase it continuously along the lines of the National Sustainability Strategy;
- Substantial rise in the share of biomass in primary energy consumption in the medium-term perspectives; and
- Boost the share of biofuels in the total fuel consumption to 10 percent by 2020.

According to the commitments detailed in the coalition agreement, the introduction of a new instrument to step up the use of heat generated from renewable resources is under examination. Proposals have been made for a so-called “Regenerative Heat Act”, ranging from an investment cost model to a feed-in model along the lines of the Renewable Energies Act or the exhaustion of untapped biomass potential.

Following up on the EU biomass Action Plan, the federal government will present a national *Biomass Action Plan* this year that will highlight the strategic orientation of the future

use of bioenergy, and the concrete need for action. This plan will provide for the efficient and sustainable expansion of the production of electric power, heat and fuels. A *German Research Centre for Biomass* (BDFZ) will be established in Leipzig and will be expanded into a center of excellence for bioenergy research. The BDFZ is to perform the task of carrying out practical research and development in the field of the energy exploitation of agricultural and forestry biomass, and shall assume a leadership in science role. The research activities will range from conditioning to conversion into electric power, heat, and fuels.

The federal government considers general policy conditions for trade necessary when it comes to the import of biomass and biofuels. These conditions should take into account both the need for a further liberalization of global trade as well as the target of a further expansion of biofuel production in Germany, and in the EU. The federal government is working to draw up sustainability standards and a certification system that would be applied equally to domestically produced bioenergy as well as imported bioenergy in an effort to assure sustainable production without creating trade barriers.

5.5 Country Policy Table - Germany

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
	Energy Tax Act (Amended) (Energiesteuer gesetz)	Legislation - Incentive/Targets	Yes	Suppliers	Makes use of EU Directive 2003/96/EC to provide tax relief for biofuels and bioheating fuels produced from biomass and imposes mandatory biofuel blending targets (Biodiesel 4.4%, Bioethanol 2 %; full taxation for the biofuels within the quota: Biodiesel 47 ct / l Bioethanol 65 ct/l; a system of tradable biofuel credits and tax exemption for biofuels above the quota until 31st of Dec. 2009.	
Federal Ministry of Food, Agriculture, and Consumer Protection	Vegetable Oil Quality Standard (DIN 51605)	Legislation - Criteria	Pending	Producers	Sets the quality standards for vegetable oils to be used as fuels.	
Federal Ministry of Food, Agriculture, and Consumer Protection	100 Tractor Program	Activity - Research and Development	No	Farmers / Industry		(Agriculture) To develop a tractor engine design that will run on pure vegetable oil and meets the latest emissions standards.
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Federal Pollution Prevention Act - Tenth Ordinance	Legislation - Targets	Yes		Lays down the first quality requirements for biodiesel as fuel.	
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Renewable Energy Act (Erneuerbare - Energien - Gesetz) (EEG)	Legislation - Targets and Incentives	Yes	Suppliers	Increases the proportion of renewable energy in Germany's electricity supply to 12.5% by 2010, 20% by 2020, and improved the funding condition for this activity.	
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Market Incentive Reform Programme	Activity - Incentives	Yes	Suppliers / Industry		(Environment) This program was established in conjunction with the Environmental Tax Reform to exploit renewable energy sources for the production of heat and reduce GHG emissions.
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Federal Emission Control Act (Bundesimmissions-schutzgesezt) (Sections 1,2,4,9,17)	Legislation - Guidelines and Standards	Yes	Industry / Development		(Environment) Designed to promote practices for human beings, animals, plants, soils, water, the atmosphere, as well as other cultural assets and material goods that reduce harmful effects on the environment.
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Closed Substance Cycle and Waste Management Act (1994) (Kreislaufwirtschafts - und Abfallgesetz)	Legislation - guidelines	Yes	All Sectors		(Environment) Supports a "closed substance cycle" in order to preserve natural resources and secure ecological waste disposal - gives distinction between "waste for disposal" and "waste for recovery."

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		Promotes the use of biofuels and bioheating fuels from biomass. Energy Tax Act (energiesteuergesetz) enacted in 2007 to tax biofuels from vegetable oils to balance overcompensations detected in the Petroleum Act of 2004. Implements a graduating tax scale for blended and unblended fuels from 0 cents per litre for pure plant oil to .45 cents per litre for blended biodiesel through 2012.		biogenic fuels and biofuels blended with fossil fuels are exempt from this tax incentive
		Standard designed to promote use and fault-free operation of farm tractors on vegetable oil based fuels.		
Develops opportunities for research and data collection to reduce GHG output during the production of agricultural crops.				
	Sets targets for reduction of GHG emissions in end-use biodiesel.			
	Creates incentive for electricity produced from cheap non-agricultural and non-forestry biomass and establishes a bonus program of 2 to 6 cents per kilowatt hour (cent/kWh) for electricity generated from agriculture and forestry biomass (i.e. energy crops or slurry).			
	Provides grants and loans to promote the expansion of heat production from biomass, solar, and geothermal energy.		Government set asides totaling approximately 745 Million Euros has generated market interest and increased investment volume to over 5 Billion Euros	
Develops standards and practices that would be replicable in the production of energy crops				
		Redefines the categories of waste products for disposal and waste product for recovery - further delineating the definitions provided by the EU Directive		

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Federal Forestry Act (Bundeswaldgesetz)	Legislation - guidelines	Yes	Industry / Farming		(Environment) Regulates timber supplies and safeguards forestlands and woodlands from cultivation for agricultural and energy purposes.
	State Forest Act - Westphalia (Forstgesetz)	Legislation - guidelines	Yes	Industry / Farming		(Environment) State level legislation to promote environmental practices for cultivation of forests that preserve soil and supply with a focus on use of forestry biomass for fuel, wood and charcoal burners.
Federal Ministry of Food, Agriculture, and Consumer Protection	Plant Protection Act (Pflanzenschutzgesetz)	Legislation - Targets	Yes	Industry / Farming		(Environment) Promotes more stringent regulations governing "plant protection agents" (fertilizers, pesticides); promoted shift to use of more biodegradable-eco friendly products and more selective implementation regimens.
Federal Ministry of Food, Agriculture, and Consumer Protection	Programme for the Retirement of Agricultural Land (Flachenstillegungsprogramme)	Activity - Incentives		Farmers / Industry	Originally provided a bonus to farmers for the retirement of agricultural land due to the mass production of agricultural goods in the EU. Act shifted in 1993 to also provide a bonus to farmers for the production of renewable energy crops in lieu of retiring agricultural lands.	
Ministry of Economics and Technology	General Fund for Renewable Energy Sources (RES) (Richtlinie zur Förderung von Maßnahmen zur Nutzung erneuerbarer Energien - Marktanreizprogramm zur Nutzung erneuerbarer Energien)	Activity - Incentive/Targets		Industry	Provides direct subsidies for the installation of biomass plants for heat production smaller than 100 kW: 52 € per kW, maximum of 2046 € per installation; and loans with special interest rates for the installation of biomass plants for heat production larger than 100 kW; installation or extension of biogas plants for the energetic use of agricultural waste products; and installation of biomass plants for combined heat and power production.	
Federal Ministry for the Environment, Nature Protection, and Nuclear Safety	Biofuels Quota Act 2007 (Biokraftstoffquotengesetz)	Activity - Incentive/Targets	Yes	Suppliers	Imposes requirement on fuel suppliers to sell a minimum quota of biofuels and offers tax privilege (through 2012) for blended biofuels sold above the quota and tax privilege (through 2015) for E-85 and Second Generation Biofuels used for transport. Biofuels used for agriculture remain tax-exempt.	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Regulates the supply of forestry biomass usage and forestry land use to mitigate the environmental impact of crop development and promote sustainability of forestry products and lands.				
Reduced the environmental impacts of farming practices and provides positive outputs for soil and water quality.				
Promotes the use of agricultural land previously retired by EU Directive and promotes the development of energy crops on these lands.				
	Provides direct subsidies for the installation of biomass plants for heat production smaller than 100 kW: 52 € per kW, maximum of 2046 € per installation; and loans with special interest rates for the installation of biomass plants for heat production larger than 100 kW; installation or extension of biogas plants for the energetic use of agricultural waste products; and installation of biomass plants for combined heat and power production.		Government earmarked funds totalling over 265 Million Euros (1994-2003).	
Sets blending targets and increases minimum share of biofuels to 6.75% by 2010 and 8% by 2015 in				

biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

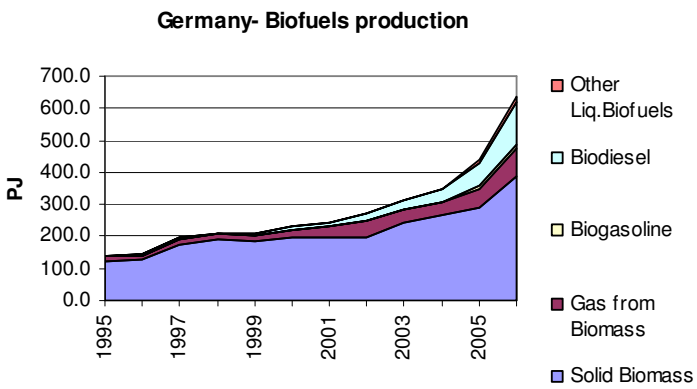
5.6 Germany Bioenergy Outlook

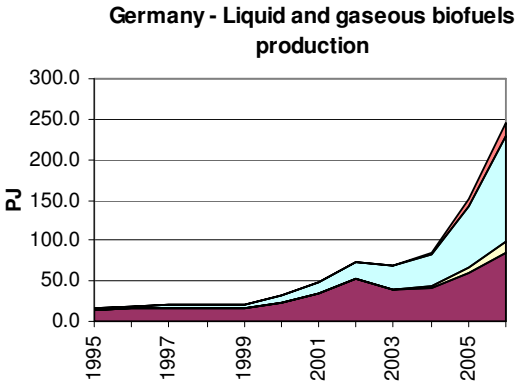
Table 5.2 - Germany – Biofuel production

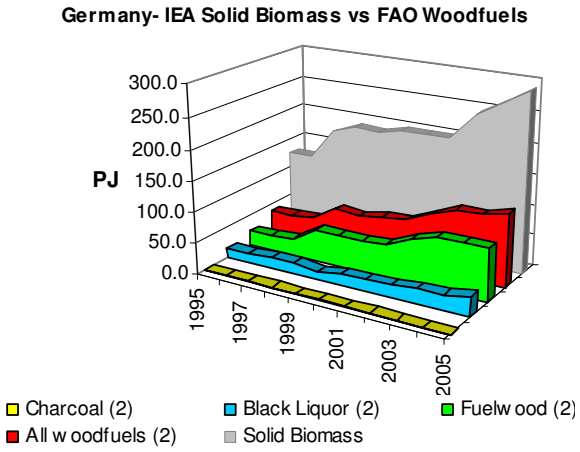
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	139.2	142.8	195.1	210.3	206.6	229.0	245.6	270.7	312.4	348.2	440.5	635.2
Solid Biomass	124.0	125.3	175.4	190.1	186.5	196.4	197.2	196.8	243.1	264.5	289.1	389.9
Gas from Biomass	13.9	15.4	16.4	16.5	15.2	23.3	35.3	53.2	38.7	42.0	60.0	85.2
Biogasoline										1.7	7.0	12.9
Biodiesel	1.3	2.0	3.4	3.7	4.8	9.3	13.0	20.5	29.8	39.1	74.3	130.7
Other Liq.Biofuels							0.2	0.2	0.8	0.8	10.2	16.5
All woodfuels (2)	39.9	40.4	44.0	68.4	62.9	71.1	74.7	91.6	107.8	108.6	117.5	
Fuelwood (2)	24.3	24.8	27.2	51.0	50.6	51.1	54.7	71.2	82.6	83.4	85.4	
Charcoal (2)												
Black Liquor (2)	15.6	15.6	16.8	17.3	12.3	19.9	19.9	20.4	25.2	25.2	32.2	

Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	1.1	39.9	8.4	-1.9	5.3	0.4	-0.2	23.5	8.8	9.3
Gas from Biomass	10.8	6	0.9	-8.1	53.7	51.1	50.7	-27.2	8.6	42.7
Biogasoline										300.0
Biodiesel	57.1	63.6	11.1	30.0	92.3	40.0	57.1	45.5	31.3	90.1
Other Liquid Biofuels							50.0	266.6		1,127

(2) = Based on FAO data







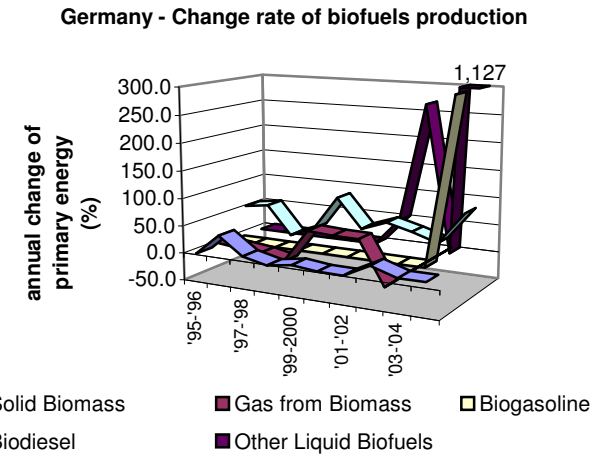


Table 5.3 - Germany – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	5.8	6.2	6.5	9.9	8.7	7.5	8.4	8.1	7.0	11.0	11.4	
Fuelwood (2)	3.2	3.5	3.8	7.0	5.2	4.1	4.9	4.6	3.5	6.8	7.4	
Charcoal (2)	2.6	2.7	2.7	2.9	3.5	3.5	3.5	3.5	3.5	4.3	4.0	

(2) = Based on FAO data

Table 5.4 - Germany – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	4.6	9.2	8.9	23.7	7.7	6.4	6.5	5.1	4.5	5.1	3.4	
Fuelwood (2)	4.6	9.2	8.8	23.7	7.5	6.3	6.4	5.0	4.4	5.0	3.4	
Charcoal (2)	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	

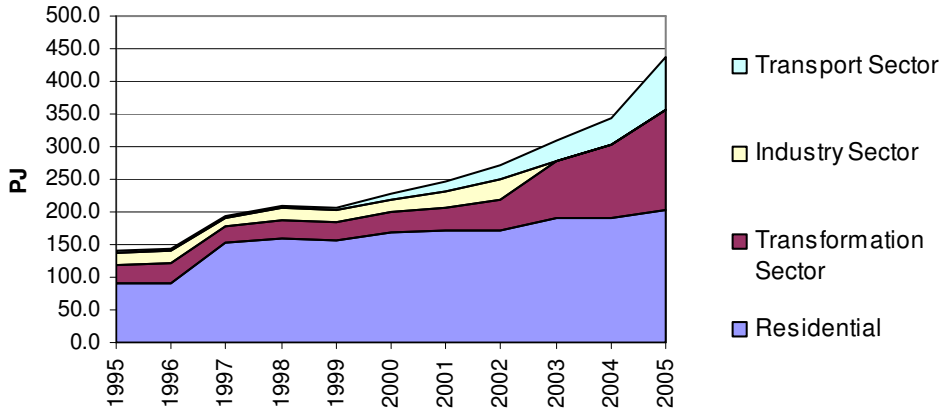
(2) = Based on FAO data

Table 5.5 - Germany – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	*139.2*	*142.8*	*195.1*	*210.4*	*206.6*	*229.1*	*245.7*	*270.8*	*312.4*	*348.2*	*440.6*	*635.3*
	Transform.	26.8	29.1	24.3	28.0	26.0	32.2	34.3	45.4	88.8	111.7	154.2	
	Industry	19.5	20.1	13.6	18.9	18.9	19.0	26.6	31.8				
	Transport	1.3	2.0	3.4	3.7	4.8	9.3	13.0	20.5	29.8	40.8	81.3	
	Residential	91.6	91.6	153.9	159.7	156.8	168.6	171.7	173.1	190.4	192.0	201.6	
Solid Biomass	Dom. Supply	124.0	125.3	175.4	190.1	186.6	196.4	197.2	196.9	243.1	264.5	289.1	390.0
	Transform.	16.2	17.3	11.5	16.1	15.7	13.8	11.5	9.8	52.8	72.5	87.5	
	Industry	16.2	16.4	10.0	14.3	14.1	14.0	14.0	14.0				
	Transport												
	Residential	91.6	91.6	153.9	159.7	156.8	168.6	171.7	173.1	190.4	192.0	201.6	
Gas from Biomass	Dom. Supply	13.9	15.5	16.4	16.5	15.2	23.3	35.3	53.2	38.7	42.0	60.0	85.2
	Transform.	10.7	11.8	12.8	11.9	10.4	18.4	22.7	35.4	35.2	38.4	56.5	
	Industry	3.3	3.6	3.6	4.6	4.8	5.0	12.6	17.8				
	Transport												
	Residential												
Biogasoline	Dom. Supply										1.7	7.0	12.9
	Transform.												
	Industry												
	Transport										1.7	7.0	
	Residential												
Biodiesels	Dom. Supply	1.3	2.0	3.4	3.7	4.8	9.3	13.0	20.5	29.8	39.1	74.3	130.7
	Transform.												
	Industry												
	Transport	1.3	2.0	3.4	3.7	4.8	9.3	13.0	20.5	29.8	39.1	74.3	
	Residential												
Other Liquid Biofuels	Dom. Supply							0.2	0.2	0.8	0.8	10.2	16.5
	Transform.							0.2	0.2	0.8	0.8	10.2	
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

Germany - Sectors of biofuels consumption



6 Country Profile - INDIA[141]

6.1 Overview

India recognized the increasing role of renewable energy sources in the 1970s and since then has been pursuing several demonstrative programmes to facilitate the development of this sector.

The Planning Commission of India is responsible for defining the Multi Annual Plans then implemented by the states under the coordination of the Federal Ministry for Non Conventional Energy Sources (MNES).

The 11th Annual Plan for the years 2007-2012 proposed the following programmes:

(i) Grid-Interactive and Distributed Renewable Power;

(ii) Renewable Energy for Rural Applications;

(iii) Renewable Energy for Urban, Industrial & Commercial Applications;

(iv) Research, Design & Development for New & Renewable Energy; and

(v) Supporting Programmes.

Deployment activity is proposed to be implemented through the first three programmes; distributed renewable power would include that for captive use in industry. It is proposed that all research design and development activity is covered under a single umbrella programme. This activity is sought to be made product development oriented, with industry as lead partner and with clear well defined outcomes. Deployment and development activities are sought to be given a multiplier effect through supporting programmes.

One of the most successful supporting programmes, the Integrated Rural Energy Programme (IREP) was initiated in the Planning Commission during 7th Plan and was transferred to MNES in 1994-95. Support has been extended under this programme for preparation of state/district level energy plans, limited extension of renewable energy systems/devices and establishment of five regional training centers. The necessity to enhance the capability of states, especially in the implementation of renewable energy programmes, recognized in the 11th Multi Annual Plan, will encourage states to strengthen the administrative set-up and get local self-government institutions involved in planning and implementation process.

6.2 Country Objectives and Drivers

The development and deployment of renewable energy, products, and services in India is driven by the need to:

- decrease dependence on energy imports;
- sustain accelerated deployment of renewable energy system and devices;

[141] The information contained in this country profile will be finalized once the Indian authorities send their input.

- expand cost-effective energy supply;
- augment energy supply to remote and deficient areas to provide regular consumption levels to all section of the population across the country;
- switch fuels through new and renewable energy system/ device deployment.

6.3 Bioenergy Policy by Sub-sector

In 1992 the MNEs announced a new strategy and action plan to replace subsidy-driven programs with commercialization. Financial incentives were trimmed and fiscal incentives, such as assisted tax rates, along with soft loans, were introduced to encourage enterprise.

Now India faces the challenge of mobilizing investments for renewable power generation in order to encourage private sector investment for large-scale grid-connected projects, but also to mobilize resources for rural areas for off-grid generations.

The MNES coordinates the programmes implemented by the states through public utilities for buying power from renewable at subsidized rates.

Fiscal incentives are being offered to increase the viability of RE projects, the main incentive being 100 percent accelerated depreciation. Other incentives include a tax holiday, lower customs duty, sales tax, and excise tax exemption for RE projects.

The Indian Renewable Energy Development Agency is the main financing institution for renewable energy projects. It offers financing to the renewable projects with lower interest rates, which vary with the technology, depending on their commercial viability. Though interest rates are falling in India, they are not in the renewable sector for various reasons. The interest rates vary from 11 percent (for biomass cogeneration) to 14.5 percent (for wind).

The Clean Development Mechanisms of the Kyoto Protocol are playing in India a major role in making renewable energy projects more attractive.

Transport

According to the Committee for the Development of Biofuel set up by the India Planning Commission in 2003, a blending mandate of 5 percent for ethanol into gasoline and of 10 percent of biodiesel into diesel is achievable thanks to domestic production.

Ethanol production derived in 2003 principally from molasses (8.77 MMT with an increase up to 11.36 MMT in 2007), but a significant production of ethanol from sugar cane (7.33 MMT) was registered in 2006. A 5 percent blending mandate for ethanol will be established before the end of 2007, and the Planning Commission proposed to raise the mandate to 10 percent.

Regarding biodiesel, the Committee for the Development of Biofuels has decided 20% of diesel consumption as the blending target for 2011-2012.

Biodiesel production is currently deriving from Jatropha curcas using more that 11 Million hectares of land. A comprehensive demonstration project has been implemented since 2003, aimed to create a biodiesel market (facilitating the involvement of private investments), create the required infrastructures and start a process for the development of rural areas.

6.4 Results and upcoming challenges

India is a nation in transition. Increasing GDP is driving the demand for additional electrical energy as well as transportation fuels. Nevertheless poverty remains in areas with no energy services, while wealth grows in the new business hubs.

Despite his current generation capacity is from coal (2/3) and hydropower (1/3), India has vast resources of renewable energy in solar, wind, biomass and small hydro that potentially exceeds the present installed generation capacity.

Expanding electrical capacity is essential. Renewable energy remains a small fraction of installed capacity even if India is blessed with over 150 000 MW of exploitable renewable sources. Tapping into India's wind, solar, biomass and hydro, could bring high quality jobs from a domestic resource. Extending the electric grid between all states, and ultimately between neighbouring nations, will expand international trade and co-operation on the subcontinent.

6.5 Country Policy Table - India

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry of Non-Conventional Energy Sources	Sardar Swaran Singh National Institute of Renewable Energy (NIRE) - State Nodal Agency	R&D	Yes	Academic / Technology	NIRE coordinates state grant activities - using federally allocated funding - to promote technology development, testing and certification of renewable energy systems.	
Ministry of Non-Conventional Energy Sources	Solar Energy Center (SEC) - State Nodal Agency	R&D	Yes		Undertakes activities related to design, development, testing, standardization, consultancy, training and information dissemination in the field of solar energy.	
Ministry of Non-Conventional Energy Sources	Centre for Wind Energy Technology (C-WET) - State Nodal Agency	R&D	Yes		Focuses on areas not being taken up by the existing centres such as in biomass energy, energy recovery from wastes, new technologies, energy needs in rural areas and hybrid and integrated systems to promote commercialization, human resources development, training and international cooperation in these areas.	
Ministry of Non-Conventional Energy Sources	Indian Renewable Energy Development Agency (IREDA)	Fiscal Mechanism	Yes		A revolving fund that provides concessional financial support to energy efficiency/conservation and renewable energy sectors to promote self-sustaining investment in energy generation from renewable sources and energy efficiency for sustainable development.	
Ministry of Non-Conventional Energy Sources	Rural Electrification Corporation Ltd.	Fiscal Mechanism	Yes		A government established corporation that administers funds and grants from the Government of India and other sources for financing rural electrification generation projects of capacity up to 25 MW. The corporation also provides consultancy services and project implementation assistance in related fields including renewable energies; finances and executes small, mini and micro generation projects; and develops other energy sources. REC promotes, develops and finances viable decentralized power system organizations in cooperative, joint, and private sector ventures.	
TBD	Renewable Energy Policy	Targets	No - Legislation Pending		Legislation would establish a goal of 10% share for renewable energy or 10,000 MW in the power generation capacity to be added during the period up to 2012.	
Ministry of Non-Conventional Energy Sources	Guidelines to State Utilities for Buying Power from Renewable Sources	Incentives	No	Producers, Users	The MNES established guidelines and offers fiscal incentives for states participating in the program. The main fiscal incentives being offered to increase the viability of renewable projects are a 100% accelerated depreciation for installation of renewable technologies for the production of electricity; a tax holiday, lower customs duty, sales tax, and excise tax exemption for renewable energy projects.	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

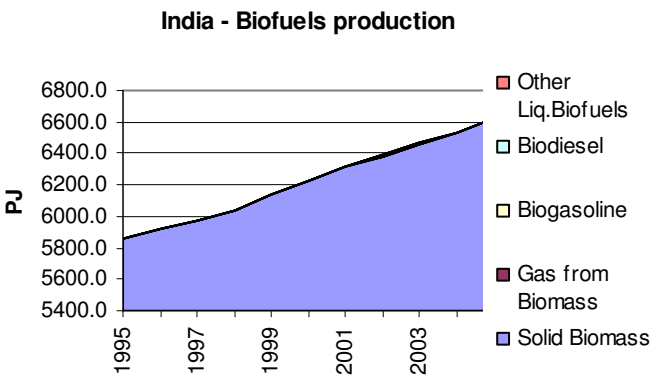
Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
			Ministry provides annual funding allocations to State Nodal Agencies (SNA's) that are state controlled	

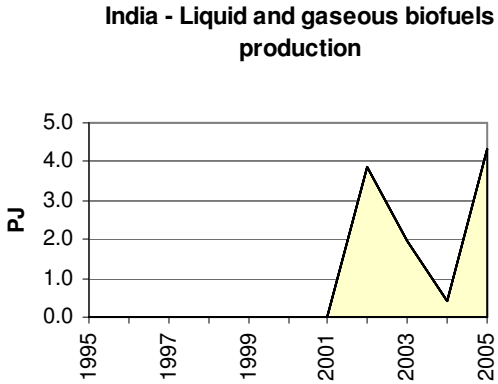
6.6 India Bioenergy Outlook

Table 6.1 – India – Biofuel production

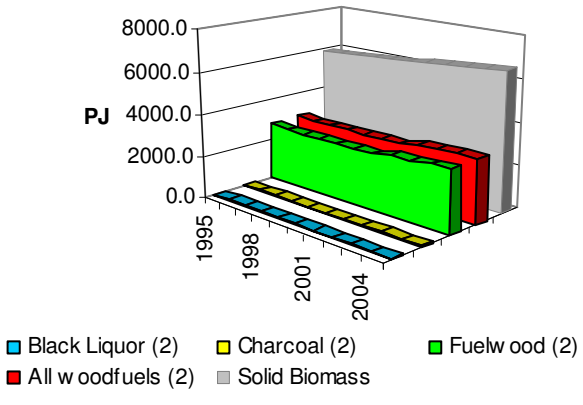
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Biofuels	5861.7	5917.6	5978.2	6038.7	6143.9	6229.7	6312.8	6389.2	6463.8	6538.8	6620.1
Solid Biomass	5861.7	5917.6	5978.2	6038.7	6143.9	6229.7	6312.8	6385.3	6461.8	6538.3	6615.8
Gas from Biomass											
Biogasoline								3.9	2.0	0.4	4.3
Biodiesel											
Other Liq.Biofuels											
All woodfuels (2)	2855.0	2743.5	2748.7	2749.6	2750.6	2751.0	2750.6	2948.2	2963.6	3022.2	3040.7
Fuelwood (2)	2788.6	2677.1	2676.5	2675.8	2675.1	2674.5	2673.7	2838.6	2848.9	2936.0	2951.6
Charcoal (2)	49.8	49.8	50.1	50.5	50.8	51.2	51.6	85.6	88.7	52.8	53.2
Black Liquor (2)	16.6	16.6	22.1	23.3	24.6	25.4	25.4	24.0	26.0	33.4	35.9
Production growth (%)											
Solid Biomass	1.0	1.0	1.0	1.7	1.4	1.3	1.1	1.2	1.2	1.2	
Gas from Biomass											
Biogasoline								-49.7	-78.1	906.3	
Biodiesel											
Other Liquid Biofuels											

(2) = Based on FAO data





India - IEA Solid Biomass vs FAO Woodfuels



India - Change rate of biofuels production

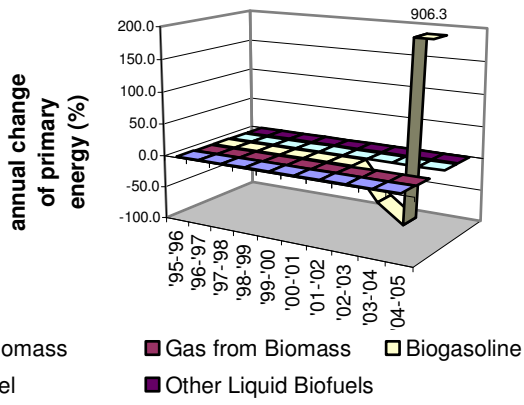


Table 6.2 – India – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)		0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	
Fuelwood (2)		0.0	0.0	0.0	0.1	0.1				0.0	0.1	
Charcoal (2)						0.0	0.0	0.0	0.0	0.0	0.0	

(2) = Based on FAO data

Table 6.3 – India – Biofuel Export (PJ)

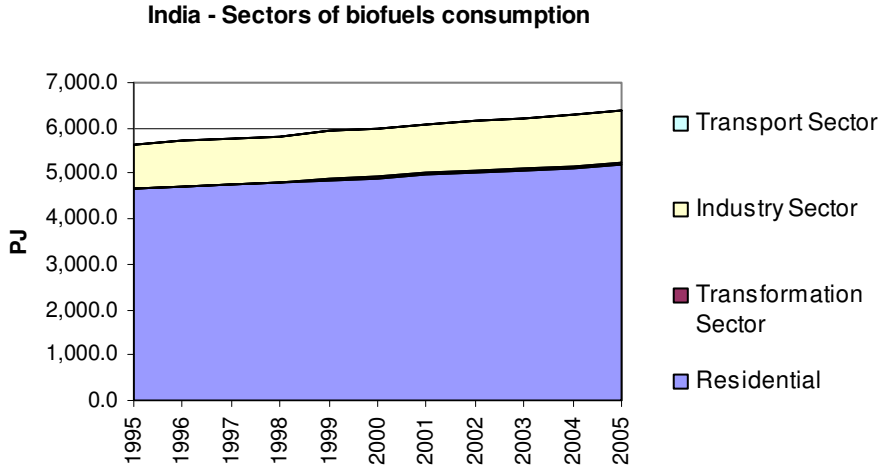
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.2	
Fuelwood (2)	0.0	0.0	0.0	0.0	0.0					0.0	0.0	
Charcoal (2)	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.2	0.1	0.2	

(2) = Based on FAO data

Table 6.4 – India – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	5,862.8	5,918.7	5,979.4	6,039.9	6,145.1	6,230.9	6,314.0	6,390.5	6,465.0	6,540.0	6,621.4	
	Transform.					23.3	32.3	43.7	44.2	44.7	45.3	45.8	
	Industry	990.0	999.6	1,011.8	1,024.8	1,052.3	1,070.6	1,085.0	1,099.1	1,113.5	1,128.0	1,142.7	
	Transport								3.9	2.0	0.4	4.3	
	Residential	4,665.5	4,709.8	4,754.5	4,797.7	4,849.8	4,901.9	4,954.0	5,006.2	5,062.6	5,119.6	5,177.3	
Solid Biomass	Dom. Supply	5,862.8	5,918.7	5,979.4	6,039.9	6,145.1	6,230.9	6,314.0	6,386.6	6,463.0	6,539.6	6,617.1	
	Transform.					23.3	32.3	43.7	44.2	44.7	45.3	45.8	
	Industry	990.0	999.6	1,011.8	1,024.8	1,052.3	1,070.6	1,085.0	1,099.1	1,113.5	1,128.0	1,142.7	
	Transport												
	Residential	4,665.5	4,709.8	4,754.5	4,797.7	4,849.8	4,901.9	4,954.0	5,006.2	5,062.6	5,119.6	5,177.3	
Gas from Biomass	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply								3.9	2.0	0.4	4.3	
	Transform.												
	Industry												
	Transport								3.9	2.0	0.4	4.3	
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)



7 Country Profile - ITALY

7.1 Overview

In Italy, domestic fossil fuel resources are very limited with over 80 percent of the fossil fuels used for national consumption, imported.

In 2005, gross electricity production from solid biomass in Italy was 22 337 TWh (estimate) against a total renewable sources value of 49.9 TWh (corresponding to 14.1 percent of total consumption)[142]. Biomass is the main contributor to Renewable Energy Sources (RES) heat production with over over 92 percent at 100.2 PJ (in 2004) showing an average annual growth of 3 percent. About 75 percent of solid biomass is nationally produced from agro-industrial residues, waste and wood residues; the remaining 25 percent is imported principally from Spain, Tunisia, Greece, Eastern Europe and the Americas. However, as confirmed by the Italian Biomass Association (ITABIA), the data on heat production from biomass seems to underestimated, probably because thermal energy from *self-produced* agro-industry is not included in official commercial statistics (Thermal energy from self-produced agro-industry residues is estimated at about 30 000 MW_{th}).

- Wood pellet seems to be an attractive option for the Italian market and continued development in this sector is foreseen during the next few years.
- Biofuels: Activity in the Italian biodiesel sector was initiated in 1993 and experienced strong growth between 1997 and 2005. The average annual growth was 29 percent; in absolute figures, 14.8 PJ were produced in 2005. In terms of production capacity, Italy has made significant progress with a total installed capacity of 35.9 PJ in 2006, representing the second highest biodiesel production capacity in the EU25, after Germany[143].
- Biodiesel is obtained mainly from seeds and oils (rapeseed and soybean oil), about 70 percent of which is imported (particularly from France and Germany)[144].
- The bioethanol industry is still in its early stages in Italy. Italian bioethanol is produced from national feedstock (wine alcohol, molasses/sugar beets, cereals). Future production will be mainly from cellulose waste material when the technology will be commercially available. Ethanol production for transportation use was 3,000,000 hl/year[145] but represents only 5 percent of expected bioethanol use in Italy.[146]

Table 7.1– [PJ]

Total Primary Energy Supply	Imported	Renewable	Biomass
100%	86%	7.5%	2.9%
7 723	6 612	580	225

Source: IEA, 2004

[142] Source: ENEA
[143] Source: EurObserv'ER 2006
[144] Source: ITABIA
[145] Source: assodistil 2006
[146] Source: AssoDistil

7.2 Objectives and Drivers

The production and use of bioenergy and biofuels in Italy has been encouraged by a number of policies with the reduction of GHG emissions, the diversification of fuel supply sources and the improvement of agricultural economy as its highest priorities.

7.3 Bioenergy Policy by Subsector

The principal document presenting the national energy policy is the National Energy Plan issued in 1998.

Although no new strategic plan has been established since then, a range of provisions and regulations were issued through laws or other specific legislative acts following the energy sector reform initiated at EU level[147]. The recent decentralization process applied in many sectors (thanks to the Bassanini Reform), has transferred more responsibility in decision-making and preparation of regional energy plans to the local authorities (particularly in the provinces). Unfortunately, the transfer of the competences in this field occurred without the support of national guidelines and monitoring instruments. Only recently the proposal of legislative decree 691/2006, although not yet implemented, established identification of RES and GHG reduction targets to be assigned and shared among the regions. Several policies currently support bioenergy development in the country and are detailed below.

The Ministry of Economic Development is the main body responsible for implementing the Italian energy policy, in conjunction with the Ministry of Environment and the Ministry of Agriculture and Forestry, responsible for activities related to the agricultural aspect. Regional and local authorities have also introduced some measures to promote bioenergy.

Apart from green certificates, other incentives are available for the promotion of biomass for electricity and heat production, including:

- White certificates (marketable documents which encourage energy saving) promote the development of boilers and high efficiency cogeneration of heat and power (CHP) fed by biomass, giving incentives to electricity and fuel distributors and related companies to operate energy conversion efficiency measures under the obligations set by Energy Saving Decrees 20/07/04 (1 January 2005). There is considerable potential in the use of CHP in Italy but only a negligible part of the residential heat demand in Italy is supplied by district heating. White certificates cannot be combined with green certificates.
- RECS-certificates: Use of these certificates, issued for every MWh of renewable energy on a voluntary basis, is still in its early stages in Italy.
- EU funds: These funds are managed directly by regions and local authorities and coordinated by the Ministry of Agriculture MIFAP (Structural Funds and Rural Development Funds, CAP,). Details can be found in Annex II where EU policies are analyzed. In fact, following the decentralization process, capital grants are now mainly given by Regions and

[147] The liberalization of energy market has been implemented in Italy through legislative decree 79/99

local authorities through their own budget, while at central level the government intervenes with fiscal reduction measures and financing given for the creation and revamping of enterprises.

Power Generation

The Italian White Paper has set up an official target of 78 TWh/yr of electricity production from renewables. In order to start a renewable market in the electricity sector, the government has introduced a legislative decree (79/99) - requiring a tradable percentage obligation (with green certificates) - for producers of electricity that deliver electricity to the grid.

RES-E Directive has been acknowledged in Italy by Decree 387/2003. It sets a national reference target of 22 percent of renewable share in electricity production by 2010 (against the current 16 percent and the 25 percent share by 2010 indicated in the RES-E Directive). Nationally, producers and importers of electricity, producing or importing more than 100 GWh/year, are obliged to deliver a certain percentage of renewable electricity to the market every year (2 percent obligation for 2002 according to legislative decree 79/99 then increased of 0.35 percent per year from 2005 to 2007, with the quota reaching 3.05 percent in 2007 under decree 387/2003). The increase of the minimum quota for the period 2007-2009 has not yet been implemented. Electricity suppliers can fulfill the obligation by buying green certificates from authorized new renewable energy plants, by building new renewable energy plants, or by importing electricity from new renewable energy plants from countries with similar instruments on the basis of reciprocity.

In order to promote RES-E, Italy has adopted a quota system based on tradable green certificates including:

- Priority access to the grid system is granted to electricity from RES and CHP plants;
- An obligation for electricity generators to feed a given proportion of RES-E into the national grid. In case of non-compliance, sanctions are foreseen, but enforcement in practice is considered difficult because of ambiguities in the legislation.
- Tradable green certificates, which are tradable commodities issued for each 50 MWh, as modified by the Marzano decree[148], produced each year to qualified plants, providing that electricity is generated using any renewable energy sources. The price of this certificate on the market was € 109/MWh in 2005.

Certificates are only issued for new RES-E capacity during the first eight years of operation (period of certification was increased to 12 years by decree 24/10/2005 for plants fuelled with biomass and waste).

There are many obstacles to production of electricity from dedicated biomass plants (low efficiency of conversion plants, supply and transportation problems). Co-generation and co-combustion are more feasible (particularly if combined with district heating). Today, because of the high cost of modern and more efficient biomass technologies, the green certificates for

[148] Law 23/08/2004 n. 239

biomass do not seem sufficient to guarantee an adequate and further development of such technologies. Incentives are now only addressed to RES as defined in article 2 of the EU directive 2001/77/CE, therefore non-biodegradable waste and sources as refinery and urban wastes, and other non-renewable sources, are now excluded from the green certificate scheme. Electricity production from district heating and co-generation are no longer eligible for green certificate issue.

Heat Production

No official RES-H targets exist in Italy.

National legislation is currently being developed for RES-H. Up to 30 percent of capital costs (maximum limit of € 300 000) is provided for development of a heat generation infrastructure that incorporates biomass (pellets and chips) and other renewable energy sources used in the production of heat (150-1000 kW).

Transport

Directive 2003/30/CE, under which fuel suppliers are required to include a given percentage of biofuels in the total amount of fuel placed on the market, was adopted by Decree 128/2005 (the decree sets a reference value of 1 percent by 2005, and 2.5 percent by 2010 - lower than the 2 percent and 5,75 percent reference values in the EU Directive). The targets have progressively been adjusted to the EU Directive values through Law n.81 (11/03/2006) and Law 27/12/06 n.296 (Tax Law 2007).

The Italian Government, in the context of the G8, led the initiative towards the launch of the Global Bioenergy Partnership which aims to support wider, cost-effective biomass and biofuels deployment. The institutional framework governing bioenergy development in the country is composed by several Ministries acting within their own specific areas of competences.

In order to promote a national biofuels industry and market, and in view of the high cost of producing fuels from biomass, the government uses fiscal incentives and obligatory quotas (established in the Tax Law 2007).

Italian legislation, in accordance with Community rules on indirect taxes on energy products and electricity (Directive 2003/96/EC), established a number of provisions reducing the final cost of the products concerned by cutting taxation. This renders certain fuels produced from biomass competitive with the fossil fuels they replace and encourages their use.

Although legislation in favour of biodiesel has been in place since 1993, it has not been enforced until recently, causing a delay in the implementation of these measures.

Particularly, fiscal measures have targeted biodiesel and vegetable-based ethanol, substituting diesel oil and petrol respectively. Regarding biodiesel, the 2007 Tax Law (art.22-bis) establishes an excise duty reduction of 80 percent for biodiesel production up to 250 000

t/year[149]. A decree issued by the Minister for Economic Affairs and Finance may decrease this amount to prevent overcompensation of the additional costs involved in the production of biodiesel (compared with the cost of diesel oil). Average industrial production costs of biodiesel will be monitored to provide a basis for assessing whether or not there is overcompensation. For vegetable-based ethanol and derivatives used as fuel or fuel additives, Italian law (paragraph 372 of Tax Law 2007) provides for reduced excise duty with a ceiling on total expenditure of € 73 million.

In order to promote domestic production, a tax reduction priority for 70 000 ton is granted to national production coming from national agreements and contracts involving all players in the biofuel supply chain (from farms to biofuel distributors and final users). For that purpose, a registration system aimed at retracing the full biofuel chain and particularly the origin of energy feedstock, has been established.

Application of these rules was foreseen starting from 1 January 2007 after receiving authorization from the EC (received state aid approval for new biofuel tax exemptions), but lack of a transparent and clear policy framework and the lack of authorization from the EC DG Competition led to the relatively small amount of 99 600 hl ethanol (imported) actually placed on the market. Consequently, only €15 million have been used of the €73 million allocated per year in the period 2005-2007 to support bioethanol production. Total excise exemption is foreseen for pure vegetable oil used for auto-consumption in agriculture enterprises. Administrative, proportional sanctions are foreseen for distribution companies not complying with the obligation, and sanctions will increase the fixed amount benefiting from excise reduction although they will not be applied in 2007.

Other policies affecting bioenergy development:

Climate Change sector - Apart from the GHG reduction obligation dictated by the Kyoto Protocol that promotes bioenergy projects through the use of the CDM, CIPE Resolution 12/2002 (revision of national policies and measures for GHG reduction) introduces fuel blending for transportation with biodiesel of up to five percent as an optional measure to reduce GHG.

Agriculture sector - Incentives to biofuel deployment are indicated in the National Biofuel Programme (PROBIO) launched in 1999, with the objective of contributing to the national strategy for GHG reduction and promoting the agroenergy supply chain. The Program provided capital grants (5 billion Lira /yr- about €2600/yr) for the expansion of the national and state agroenergy production chains through interregional and regional demonstration projects and the dissemination of national bioenergy information.

Further support will come from the Rural Development Program - for the period 2007-2013. Through this Program, regional authorities can provide co-financing (up to 65 percent) for projects aimed at agro- and wood biomass and bioenergy production.

[149] Limits on biofuels volume eligible for tax exemption have been introduced. Before 2007 there was a total exemption from excise duty.

The Ministry of Forestry and Agriculture (MIFAP) has recently presented the first national framework agreement with the inclusion of farm associations as well as biofuel industry in a first step toward the creation of a national agroenergy chain that can offer new opportunities to the agriculture sector in the framework of the reformed Common Agriculture Policy (CAP).

7.4 Results and upcoming challenges

Italy has made significant progress in terms of production capacity of biofuel. Yet, the fact that ethanol is still missing from the energy market and development of ethanol is negligible, probably due to limited financial resources for demonstrative and support activities. The lack of a transparent and clear policy framework for the production and commercialization of bioethanol in a tax exemption regime has delayed the application of the law. New prospects come from a recently signed voluntary agreement for the annual production of 1 million hl and will benefit from the partial tax exemption foreseen in the Italian law.

Contrary to an increasing productive capacity and unlike results in other EU member countries, Italian production of biodiesel fuel decreased in 2005 since the reduction of tax relief due to budget limitations[150]. As for electricity generation from biomass, 32 plants have been installed with a total capacity of 400 MW, but unfortunately only a few of them use the heat produced for residential and industrial uses.

Public funds have been used almost exclusively for supporting district heating capital costs, while individual heating with wood is neglected. The Italian incentive policy has, until now, totally neglected the upstream side of the biomass path (cut, collection and transport); only existing Decree 124/02 provides some tax deduction for interventions limited to forest maintenance. Strategy outlined for the promotion of sustainable use of biomass and biofuels focuses on the following measures and criteria:

- Use of national resources;
- Creation of a national agroenergy supply chain;
- Balanced use of direct (tax reduction) and indirect (blending quota obligation) incentives;
- Progressive phase-out of tax reductions favoring an increase of the obligation quota;
- Possibility of revising tax reductions to prevent overcompensation;
- Revision of the green certificate scheme to give incentives for energy use from agriculture crops, waste and residues from livestock, forestry and food industry and for energy use from sustainable agricultural practices (pending).

It is difficult to reach EU targets for biofuels. Agroenergy crops for biofuels production could use a maximum of 20-30 percent of the total surface available for agricultural purposes (8,000,000 hectares) and still only reach a maximum potential of 5-6 percent biofuels use. Real development of biofuels production, distribution and utilization chains is not possible within the framework of the existing policies; there is a lack of a clear legislative framework and strong support measures, although progress in this direction has recently been made.

[150] Government sources

7.5 Best Practices

Several best practices regarding different aspects of the bioenergy sector have been developed:

Biomass district heating network - In the last decade, the biomass district heating networks spread widely in northern Italy, especially in the Autonomous Province of Bolzano and then throughout Piedmont, Lombardy, Aosta Valley and Province of Trento. Many of these plants are situated in remote municipalities of the Alpine valley where, due to the cold climate, the demand for thermal energy is drawn out over long periods of the year and where large quantities of woody materials are locally available.

The plants (about 60) have a size ranging from 1 to 20 MWh; the overall installed thermal power is about 400 MWh. The biomass used is mainly wood chips coming from wood industries. About 0.2 Mt/y of biomass is consumed at 40 percent of water content. The combustion technology is based on mobile grid boilers coupled with different systems for gas cleaning.

In the Italian northern valleys, the replacement of individual heating plants with a single centralized, efficient plant (the central district heating station) has produced a series of positive effects (whether from a technical-operational, economic, or environmental point of view) such as, for example:

- Less pollution: instead of operating hundreds of individual plants, there is only one central plant, which can best regulate combustion (greater energetic efficiency) and utilize advanced systems of emission control;
- Lower costs (excluding initial installation costs and predisposition to the network);
- Greater safety and comfort inside the living space: eliminating the possibility of gas leaks, explosions or fires;
- The elimination of maintenance responsibilities on the part of the consumers;
- The recovery of energy use of residual biomass that would otherwise be destined for dumping with consequent disposal costs;
- Broad social consensus.

Wood pellet for household uses - Wood pellets are going to be widely used in the household sector together innovative domestic appliances supported by an efficient promotion campaign.

Italy is the most important Mediterranean pellet market, with over 90 production sites. Nevertheless, national production of approximately 160 000 t/year cannot satisfy the growing demand, which is nearly 300,000 t/y, making it necessary to import large quantities of the product from abroad. The price of pellets varies from €150 to 200/t; nevertheless it is more convenient to use in respect to traditional fuels, and there is a steady rise in the number of companies producing the pellets.

In Italy, almost all pellets are used in over 125 000 domestic heaters, while less than 2 percent are used for larger heating boilers (approximately 500 units installed).

The penetration of biomass into the energy sector is strictly linked to the benefit that the citizen may gain from its use. These benefits range from the ease of handling the raw material to the use of a more efficient, viable and environmentally-sound appliances. The pellet chain is a good example of how the convenience of using biomass may be linked to technological innovation. As a matter of fact, the progressive evolution of the biomass market offers not only wood fuel from logs, but also from wood that is chopped or ground and pressed (pellets and briquettes), which is easier to transport and store. At the same time, environmentally compatible combustion technologies have reached levels of efficiency, reliability and comfort very similar to traditional plants running on gas or diesel fuel. Suffice to say that a modern heater or boiler running on biomass has an efficiency close to 90 percent, saving biomass feedstock and optimizing emission control in respect to old fireplaces and heaters. For those reasons the niche market for the production of thermal energy from biomass is shows constant growth, not just due to the economic convenience involved, but also in regard to the ever-increasing awareness of the use of renewable energy sources.

Biogas chains - In Italy the production of biogas in waste treatment plants, through anaerobic digestion, is sufficiently widespread. The main sources of biogas are:

- animal manure;
- organic residues present in controlled municipal dumps;
- activated sludge from waste-water treatment.

About 100 plants are installed for production of thermal energy used for the space heating of the breeding. Co-generation (combined production of heat and electricity) is currently the prevailing application in the centralised installations, while only in some tens of firm plants co-generation devices are used.

Stakeholders are always more conscious of the benefits of anaerobic digestion processes. It seems clear that biogas collection and use benefit the energy sector are also advantageous for the environment as the system reduces certain pollutants e.g. methane (a very effective GHG), ammonia, noxious organic compounds and unpleasant odors. In the future the two main processes for treating organic solid wastes - aerobic composting and anaerobic digestion- will be incorporated in order to minimize the drawbacks and enhance the advantages of both. This project frame will be beneficial for agriculture as well as for the livestock sector, and at the same time will overcome most of the barriers (not only technical) encountered in the disposal of all kinds of wastes. Furthermore, energy recovered from the treatment process will contribute to the national energy balance. Co-digestion, aerobic treatment and co-generation are therefore the stepping stones for the success of future activity in this area.

Development and demonstration of a process for the production of biodiesel from Jatropha Curcas seeds by enzyme extraction and ethyl trans-estherification - This project,

developed in the framework of a Memorandum of Understanding between the Italian Ministry for the Environment, Land and Sea and Egypt, is aimed at implementing an integrated biodiesel production system using Jatropha Curcas seeds as raw material. This system will be optimized by means of the various activities to be developed for large-scale application. It includes the entire biodiesel production cycle: the cultivation of the Jatropha, the oil production process, the exploitation of the different by-products coming from the system itself, first of all the use of the cakes/pellets for energy recovery. The biodiesel production process will be based on the following last-generation technologies:

- presso-extrusion technology for extracting the oil from Jatropha seeds;
- etyhl-trans-estherification technology for producing biodiesel from vegetable oil.

Both the above-mentioned technologies are currently in use in Italy for biodiesel production from soybean and sunflowers seeds.

The expected results are:

- experimentation and fine-tuning of innovative biodiesel production technologies;
- reduction of investments for the construction of biodiesel plants and related production costs;
- promotion of the cultivation of vegetable crops such as Jatropha Curcas in order to effectively combat desertification which presently affects large tracts of land in developing countries;
- contribution to the reduction of GHG on the basis of a “cradle to grave” analysis (the cultivation of Jatropha Curcas, production of biofuel, and combustion of biofuel) is characterized by a reduced emission of CO_2 when compared to the equivalent fossil fuel production-combustion cycle.

Development of a biochemical method for extracting oil to be used in biodiesel production - The R&D research project, developed in the framework of a Memorandum of Understanding between the Italian Ministry for the Environment, Land and Sea and Egypt, aims at developing an innovative process for extracting oil to be used for the production of biodiesel fuel from seeds of the oleaginous Jatropha Curcas, currently under cultivation in Egypt . The proposed research activities focus on development and testing of a biochemical method involving an enzymatic - rather than mechanical/ solvent – oil extraction.

The proposed biochemical method overcomes the drawbacks of the current extraction systems; it is economically convenient and advantageous from the environmental point of view thanks to the conditioning and recycling of the generated residues and by-products.

Recovery and energy- Use of biogas produced from landfill - The project is implemented in the framework of cooperation between Italy and China. It covers wide range of activities, from research to training and consultancy and in the field of climate change, implementation of the Kyoto Protocol mechanisms and energy development projects in the western regions. The rationale is to develop projects in China in the sector of energy production from renewable sources, with particular emphasis on Landfill Gas (LFG) reuse for energy production, in

accordance with the rules, modalities and guidelines of the CDM adopted under the Kyoto Protocol. The project can be divided in three components:

1. utilization of Ningxia landfill gas, with specific reference to the pilot site of Yinchuan;
2. utilization of methane in cattle farm, with specific reference to the pilot site of Pingjipu;
3. methodology research of biogas digester for household use.

Most of the Chinese landfills were not able to collect the biogas, resulting in large emissions of CH4 in the atmosphere. The project aims include installation of a 3 MW plant producing electricity to be fed into the grid, resulting in controlled emission in the atmosphere. Landfill emission control is a priority in China due to the increasing amount of waste produced in the Chinese urban areas. The large quantity of manure produced each day represents a serious pollution problem because it is accompanied by severe emissions into the atmosphere. The installation of a digester connected to a gas turbine can solve the problem of handling the manure with an environmentally-friendly practice and produce energy to be fed into the grid. Suitable households will be identified and a system of anaerobic digesters for farmers' waste will be designed. Exhaustive research is needed in order to obtain CDM certification for the emission reduction due to the household digesters.

Use of biomass for energy production – The use of biomass is an effective measure to control and reduce anthropogenic emission of GHG. China is the largest growing economy in the world and this involve several environmental issues. The use of coal and other fossil fuels creates severe damage to the environment, hence the use of biomass for energy generation has a great value for the emission reduction and energy security and independence.

As China has an abundance of agricultural residues, the project, established under a cooperation agreement between China and Italy, plans to design a 5 MW cogeneration plant based on the complete combustion of rice husk to introduce an economically viable example of biomass for energy plants. Use of large plants is not economical because of the high cost of biomass collection and use of small facilities is expensive, thus the 5 MW plant can provide a feasible solution to both problems.

The project has been developed in two stages, the first offering a general design and pre-feasibility of the project itself, while the second phase provides a more detailed analysis of the state of the art of technology, environmental and social implication of the project and design of the plant and equipment list. Results to be achieved by best practice:

- Identification of a suitable size and technology for biomass plants using rice husks in China;
- Design of the plant, of the collection system for rice husks and evaluation of potential benefits for proposal of the project as a Clean Development Mechanism activity under the Kyoto Protocol, with the preparation of the related documents (PIN and PDD);
- Evaluation of the cost/benefits ratio of the use of biomass for energy and for other applications;
- Promotion of the project to international institutions and awareness-raising regarding the use of biomass for energy production among the Chinese public and private sector.

Agroenergetic Integrated District "Valle dei Latini" - The project aims to respond to the environmental pollution problem in the Sacco River Valley (caused by local industries) through an integrated strategy of agricultural and rural development. Such a strategy implies the implementation and integration of three agro-energetic value chains within the local agriculture and economy, namely:

- Wood-energy: energy valorization of forests and pruning from grape and olive production plus production of wood through short rotation forestry. Local consumption of energy produced by the diffusion of specific eater machinery for the local institutions, farms and agro-tourism enterprises.
- Biodiesel: cultivation of sunflower and colza expressly for oil production, and transformation into biodiesel through tailored technology. Utilization of biodiesel in public transportation in Rome.
- Biogas produced by dedicated cultivation processes of fermentable crops and refuse from the manure sector. Biogas will be used to co-produce electricity and heat.

Major results include:

- Most public buildings are now heated through locally produced energy (wood, short rotation forestry, valorization of wine and olive oil production pruning waste);
- All of the area prohibited to food production has a new market orientation giving local farms the needed income and protecting the communities from health risks through the destination of the area to energy-wood production (creation of a barrier between food production and pollution);
- An integrated local chain for biodiesel production from vegetal oil (sunflower) is implemented and sustains local farmers' income (complete chain means a local association for sunflower production, oil extraction and transformation, bio diesel consumption for local public transports);
- Biogas production through the integration of manure with dedicated agricultural productions helps the income generation process of local agriculture and contribute to the generation of renewable energy.

Evaluation studies for the "Souss-Massa biogas project – This project is being implemented under a cooperation agreement between Italy and Morocco. Collection of data related to 100 biogas mini-plants installed in the region of Souss-Massa (Morocco) has been carried out in order to evaluate performances of such installations and potential evaluation for build up more units. Technical, financial and socio-economic evaluation of these installations has also been completed in order to facilitate the development of projects in other regions. Majors results already obtained:

- Data collected will be potentially useful to potentially set up a national strategy for biogas exploitation in rural villages and to potentially replicate projects;

- A number of tests have been carried out in order to evaluate best practices for adaptation of diesel engines to biogas utilization, as well as utilization of water heaters, cooling systems and ovens.

7.6 Country Policy Table - Italy

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry for Economic Development and Ministry of Environment	Energy Saving Decrees 20/07/04 modifying the quantitative objectives established by the Law Decree n. 164 (23 May 2000) and the Law Decree n. 79 (16 March 1999). Came into force on January 1st, 2005.	Policy-targets	Yes	Electricity and gas distribution companies	Promotes energy conversion efficiency setting a target, in the five –year frame 2005-2009, of an energysaving of 0.2 Mtoe/year at the beginning and of 2.9 Mtoe/year within 2009. Actors under obligation can comply with it through energy efficiency projects or energy saving management directly implemented or through the purchase of energy saving "White Certificates" on the market. The mechanism is directed to the energy and gas distribution companies with over 100,000 clients. At least 50% of energy savings must be achieved through a corresponding reduction of consumption. The White Certificates can be exchanged by means of bilateral contracts, or in the frame of a specific market ruled by GME (Energy Market Administrator)	
Ministry for Economic Development (ex-Ministry for Production Activities)	Electricity Liberalization Act n.79 16/03/1999 according to Directive 96/92/CE on common rules for establishing an internal electricity market	Policy-target (quota obligation system based on tradable green certificate	Yes	Energy producers and importers	Requires energy producers and importers (producing or importing more than 100 GWh/year) to ensure that, starting from 2002, 2% of all electricity supplied to the national market came from plants fed by renewable sources entered in operation after 1 April 1999. The government can increase the quota to meet the renewable energy target (as it has been done by legislative decree 387/2003). Suppliers can fulfill the obligation by buying green certificates from entitled new renewable energy plants, by building new renewable energy plants, or by importing electricity from new renewable energy plants from countries with similar instruments on the basis of reciprocity. Priority access to the grid system is granted to electricity from RES and CHP plants.	
Ministry for Economic Development (ex-Ministry for Production Activities)	Decree 387/2003 according to EU Directive 2001/77/CE on the promotion of the electricity produced from renewable energy sources in the internal electricity market	Policy-target (quota obligation system based on tradable green certificate	Yes	Energy producers and importers	It acknowledges the EU framework for RES penetration in the electricity market. It sets a national reference target of 22% of renewables share in electricity production by 2010. It integrates Decree n.79 16/03/1999 on the following aspects: increases the minimum quota of 0.35% per year from 2005 to 2007, with the quota reaching 3.05% in 2007; proposes regional objectives of RES penetration (not implemented); sets rules for priority of dispatching; promotes dissemination campaign for the use of RES; simplifies procedures of authorization at local level (introduction of a single authorization); introduces the rule of origin.	
Ministry of Forestry and Agriculture (MIFAP)	Law on Biofuels (Law n. 81 11/03/2006) that modified Decree 128/2005 through which Italy absorbed EC Directive 2003/30/EC	Policy - not binding Mandates and Targets	Yes	Producers / Suppliers (Transport)	Sets legal biofuel blending requirements on transport fuels through 2010 (1% starting from 1st July 2006, up to 5% by 2010 through incremental annual increases).	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
	Helps the realization of energy saving from biomass (thermal use) 1) installation of plants for the use of low enthalpy heat (for example heat from co-generation plants), using also wastes for space heating; 2) projects aimed at improving the efficiency of current energy conversion plants and 3) projects aimed at replacing traditional devices with innovative ones, for example, substituting electric water heaters or fossil fuels space heating plants with biomass fed district heating plants.		The AEEG (Italian Regulatory Authority for Electricity and Gas) grants the distribution companies a contribution of 100 €/year for 5 years for each **tonne/oil equivalent (TOE)** saved directly or indirectly by the white certificate marketing. This grant will cover part of the costs met by the distribution companies to reach own targets of energy saving. The remaining part can be covered by other resources, such as, state or regional funds, clients' participation shares, revenues from selling the surplus of white certification quotas with respects to the proper obligation	
		Establishes a credit market system for producers and suppliers, promoting an Increase in the use of biomass in the generation of electricity	Market mechanism (tradable green certificate)	Certificates are only issued for new RES-E capacity during the first 8 years of operation (period of certification has been increased to 12 years by decree 24/10/2005 for plant fuelled with biomass and waste. Sanctions are foreseen in case of non compliance but enforcement is difficult
		Promotes an increase in the use of biomass in the generation of electricity.		
		Sets blending mandate on the end-use product and promotes use of bioenergy and energy crops in the production of transport fuels.		Targets established with Law 81/2006 have not been reached due to the lack of agreement within the agroenergy production chain over the uncertainty about normative rules and consequences for fuels producers who do not comply with the blending mandates. No sufficient availability of feedstocks and limited industrial capacity for bioethanol production are also responsible for not achieving the targets. Moreover no sanctions are foreseen for not complying with the Law

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/ Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry for Economic Development and Ministry of Forestry and Agriculture (MIFAP)	Law n.266/05 (Tax Law 2006)	Policy-incentives and grant		Farmer and industry	It foresees an exemption from excise duty for an annual quota of 200 000 tonnes of biodiesel under a six-year programme running from 1 January 2005 to 31 December 2010. Priority of excise exemption up to 20.000 ton is given to producers who sign on to supply chain contract programmes. It includes the production of electricity from RES among the income productive activities of farmers. It establishes a grant for the development of agroindustrial energy chain	
Ministry for Economic Development (a.k.a. Ministry for Production Activities)	Law 27/12/2006 n. 296 (Tax Law 2007)	Policy-binding targets (mandate) and Incentives	Yes	Producers/ Suppliers (Transport)	It requires fuel suppliers to include a given percentage (1% by 2005, 2,5% by 2008 and 5,75% by 2010) of biofuels in the total amount of fuel they place on the market. Apart from obligation it establishes a tax reduction (excise reduction) of 80% for biodiesel production up to 250.000 t/year.A tax reduction priority for 70,000t is provided for producers who sign on to the program. As regards vegetable-based ethanol, it provides for reduced rates of excise duty on vegetable-based ethanol and products derived used as fuel or fuel additives in order to encourage the use of this biofuel. For the year 2007, excise reduction foreseen for year 2006 are confirmed. Starting from 2008 reduced rates will be applied:(a) bioethanol produced from agricultural products: €289.22 per 1 000 litres;b) ethyl-tertio-butyl-ether (ETBE) produced from agricultural alcohol: €289.22 per 1000 litres; (c) additives and reformulates produced from biomass: 1) for lead-free petrol: €289.22 per 1 000 litres; 2) for diesel oil, excluding biodiesel: €245.32 per 1 000 litres. The programme provided for the application of the above reduced rates to bioethanol, with a ceiling on total expenditure of €73 million. Excise exemption is foreseen for pure vegetable oil used for auto consumption in agriculture enterprises. Rules about excise reduction will be applied starting from 1/1/2007 after receiving authorization from the EC (received state aid approval for new biofuel tax exemptions). Sanctions are foreseen for distribution companies not complying with the obligation. In 2007 sanctions will not be applied.	
Ministry of Environment	Program for promoting RES for electricity and heat production (implementation of Decree n. 687)	Activity-Incentives	Yes	Industry (Small and Medium Suppliers)		
Ministry for Economic Development and Ministry of Environment	Decree 3/11/2004, following the EU Directive 2004/8/EC	Policy/ incentives and grant	Yes	Public and private entities, ESCO, agriculture and forest firms	It promotes the diffusion of high-efficiency micro, small scale and cogeneration units with the main scope of verifying their feasibility and replication capabilities.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Provides funding to encourage optimization of the collection, transportation and transformation process of biomass	Provides funding for optimization of the conversion process from biomass.	It provides funding for feasibility studies for energy production from biomass.	€42,5 mil allocated by the tax law 2006 and other funding will derive from the tradable green certificates (once the discipline about TIC will be reviewed incorporating tradable green certificates for the promotion of the agroenergy sector)	
		Promotes use of biodiesel and bioethanol and stimulates market growth. Promotes development of national agroenergy production chain and identification of preferential criteria for biofuels use.		The size of the reduction may be amended, by means of a decree issued by the Minister for Economic Affairs and Finance, in order to prevent overcompensation of the additional costs involved in the production of biodiesel (compared with the cost of diesel oil). It is planned to monitor the average industrial production cost of biodiesel to provide a basis for assessing whether or not there is any overcompensation.
	Provides funding (up to 30% of costs) for development of heat generation infrastructure that incorporate biomass (pellets and chips) and other renewable energy sources used in the production of heat (150- 1000kW). The minimum plant production levels under this program are 150kW			Due to the lack of financial resources, applications received after 26/02/2007 are ineligible for financing.
	It promotes high efficiency co-generation from biomass plants, with a range of contributions depending on the type of primary energy source used (EU definitions included in the EU Directive). The right to the contribution is conditioned to the execution of monitoring campaigns on the energy and environmental results. Up to 30% of capital cost (maximum limit of 300.000 euro) for units fed by biomass or for hybrid units fed by natural gas-biomass		Provides capital contributions up to an overall amount of €30.000.000	

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy /Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
EU	Regional Incentive for Agriculture: in accordance with EU Common Agricultural Policy (CAP) - Council Regulation 1782/2003	EU policy - Incentives	Yes	Farmers		(Agriculture) EU Directive originally provided a bonus to farmers to set aside agricultural land due to the mass production of agricultural goods in the EU. This act allows farmers to cultivate retired lands with energy crops. Additionally, it provides a bonus of €45 per Hectare to farmers who produce energy crops on non-set aside agricultural lands. Incentive is capped at 1.5 million hectares.
EU	European Structural Funds (2007-2013)	EU policy - Incentives	Yes	Farmers and Industry		Agriculture - EU Funds addressed to Regional authorities for the promotion of biomass. They provide funding for: energy crop; electrical and thermal conversion plants and equipment and facilities linked to the development of the bioenergy supply chain
Ministry of Forestry and Agriculture (MIFAP) and Regional authorities	National and State Programme for Rural Development (2007-2013)	Activity - Incentive and Education	Yes	Farmers and bioenergy producers		(Agriculture/ Rural Development) Provides grants (up to 65% of the total costs) for the development of state agroenergy sectors with a focus on increasing the competitiveness of bioenergy / biofuels vis-à-vis fossil fuels. It promotes demonstration projects for the agroenergy chain and infrastructure development.
Ministry of Forestry and Agriculture (MIFAP)	National Programme for Agricultural and Forestry Biomass (PNVBAF) and National Programme for the Use of Biomass (PNERB), CIPE resolution of December 1999	Activity - Targets and Guidelines	Yes	Industry		Agriculture / Climate Change) Sets targets for the reduction of GHG (3-4% by 2010/12), using renewable energy from agro-forestry products and by-products, and development of ecocompatible agricultural methodologies - promoting the use of energy crops.
Ministry of Forestry and Agriculture (MIFAP)	National Plan on Biomass Fuels (PROBIO)	Activity - Incentive and Education	No	Farmers/ bioenergy Producers / local administratio ns		(Agriculture/ Climate Change) - Beginning in 1999, with the objective of contributing to national strategy for GHGs reduction, provides capital grants (5 billion Lira /yr) for the expansion of the national and state agroenergy production chains through demonstration projects and dissemination activities designed to educate and disseminate national bioenergy information. Serves as the implementation mechanism for the PNVBAF and PNERB. Four interstate projects have been promoted in the first period 1999-2001: certification processes within the agroenergy production chain; production of energy from biomass in the South of Italy; energy from forestry biomass; development of biogas with hydrogen content.

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Promotes production of energy crops through financial incentives				Incentives in Italy had a limited use of set aside land for production of oilseed for biodiesel due to the serious economic and structural obstacles in Italy
	Provides funding for electrical and thermal conversion plants and equipment and facilities linked to the development of the bioenergy supply chain			
Promotes production of vegetable and wood biomass for energy use			€16.6 billion - over 5 years - allocated to the whole agriculture sector	
Provide National targets and guidelines for the development of an incentive framework (administrative, economic, fiscal) to promote the use of agroenergy crops and the use of byproducts with the goal of unifying the current fragmented normative framework and promoting standardization for end-use products.				
Promotes projects aiming at increasing energy crops cultivation for biodiesel production for fuel uses and heat production for residential uses. Promotes use of agriculture residues for heat production and teleheating. Promotes projects for biogas production from animal sludge			€7 milions for financing 19 demonstration projects in the period 1999-2001 (4 interstate projects and 15 at regional level). €4 950 761 have been allocated for 13 projects. In 2004 the budget available for PROBIO was €1 936 713	

provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

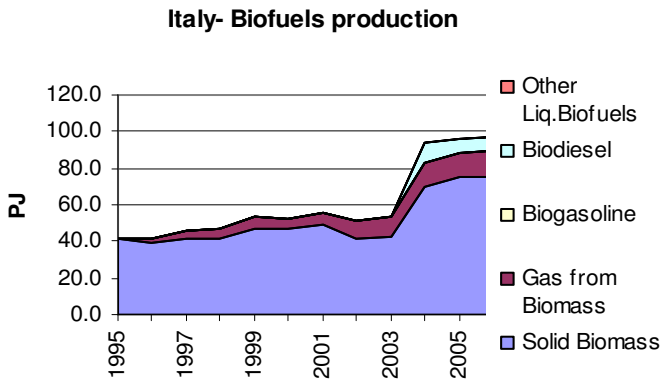
7.7 Italy Bioenergy Outlook

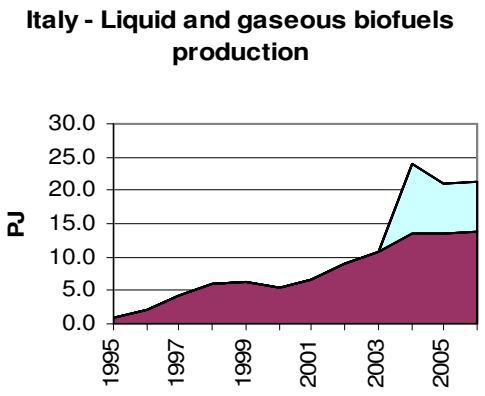
Table 7.2 - Itay – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	41.9	41.0	45.3	47.4	53.1	52.7	55.5	51.0	53.2	93.9	95.9	97.1
Solid Biomass	40.9	39.1	41.2	41.5	46.9	47.2	48.9	41.9	42.5	70.0	74.9	75.8
Gas from Biomass	0.9	2.0	4.1	6.0	6.2	5.5	6.6	9.0	10.7	13.4	13.6	13.9
Biogasoline												
Biodiesel										10.5	7.4	7.4
Other Liq.Biofuels												
All woodfuels (2)	55.1	52.1	56.2	58.1	71.7	61.2	55.6	52.8	59.7	61.8	57.6	
Fuelwood (2)	53.1	50.2	53.5	54.2	69.6	57.2	51.9	49.3	56.3	58.6	54.1	
Charcoal (2)	1.0	0.9	0.9	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Black Liquor (2)	0.9	0.9	1.8	3.6	1.8	3.7	3.4	3.2	3.1	2.9	3.2	

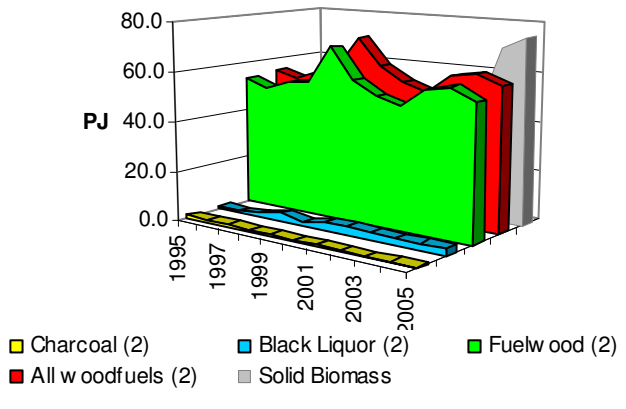
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	-4.6	5.5	0.6	13.0	0.7	3.7	-14.3	1.3	64.7	7.1
Gas from Biomass	107.7	108	45.7	4.3	-11.9	20.1	37.4	18.2	24.9	1.5
Biogasoline										
Biodiesel										-30.1
Other Liquid Biofuels										

(2) = Based on FAO data





Italy- IEA Solid Biomass vs FAO Woodfuels



Italy - Change rate of biofuels production

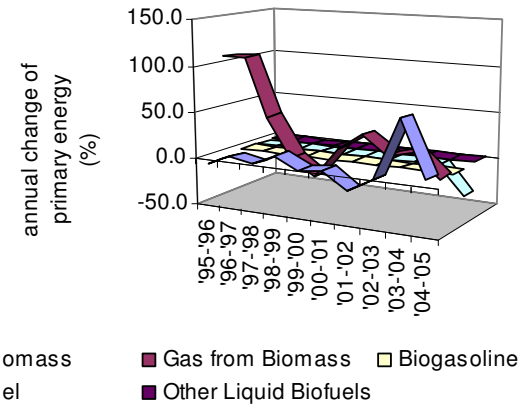


Table 7.3 - Italy – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	9.7	9.8	13.4	15.2	15.7	21.7	23.8	25.1	27.4	27.1	27.4	27.4
Solid Biomass	9.7	9.8	13.4	15.2	15.7	21.7	23.8	25.1	27.4	27.1	27.4	27.4
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	4.6	5.5	6.0	6.4	7.6	9.6	10.4	12.3	13.7	18.2	20.7	
Fuelwood (2)	3.6	4.4	4.8	5.2	6.4	8.2	9.1	11.0	12.2	16.7	19.0	
Charcoal (2)	1.0	1.1	1.2	1.2	1.2	1.4	1.3	1.3	1.4	1.5	1.8	

(2) = Based on FAO data

Table 7.4 - Italy – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels				0.1	0.0	0.1	0.1	0.1	0.1			
Solid Biomass				0.1	0.0	0.1	0.1	0.1	0.1			
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	
Fuelwood (2)	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Charcoal (2)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	

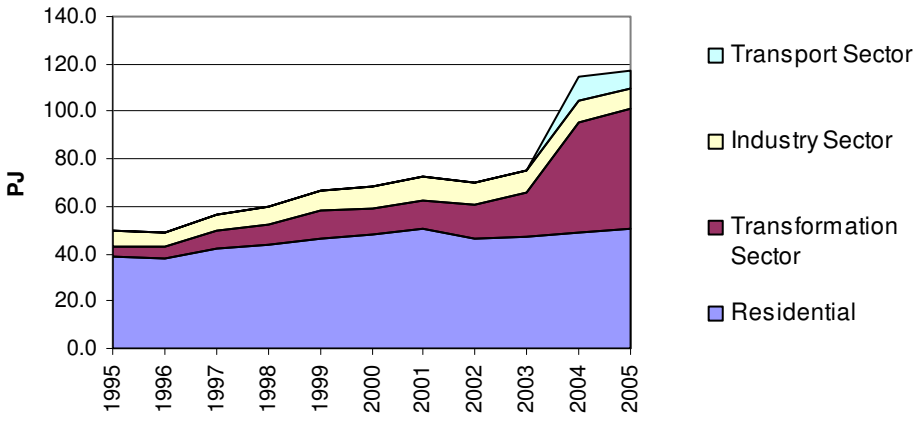
(2) = Based on FAO data

Table 7.5 - Italy – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	*51.6*	*50.9*	*58.7*	*62.6*	*68.7*	*74.3*	*79.2*	*76.0*	*80.6*	*121.0*	*123.3*	*124.5*
	Transform.	3.8	5.0	7.5	8.5	11.4	10.8	12.6	14.0	18.3	46.3	50.1	
	Industry	6.9	5.7	6.4	7.9	8.5	9.5	10.0	9.6	9.3	9.2	8.9	
	Transport										10.5	7.4	
	Residential	39.0	38.2	42.4	43.6	46.5	48.3	50.2	46.5	47.2	49.1	50.8	
Solid Biomass	Dom. Supply	50.6	48.9	54.6	56.7	62.5	68.8	72.7	66.9	69.9	97.1	102.3	103.2
	Transform.	2.8	3.1	3.6	3.2	5.2	5.3	6.0	5.0	7.6	32.9	36.6	
	Industry	6.9	5.7	6.4	7.9	8.5	9.5	10.0	9.6	9.3	9.2	8.9	
	Transport												
	Residential	39.0	38.2	42.4	43.6	46.5	48.3	50.2	46.5	47.2	49.1	50.8	
Gas from Biomass	Dom. Supply	0.9	2.0	4.1	6.0	6.2	5.5	6.6	9.0	10.7	13.4	13.6	14.0
	Transform.	0.9	2.0	3.9	5.3	6.2	5.5	6.6	9.0	10.7	13.4	13.6	
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply										10.5	7.4	7.4
	Transform.												
	Industry												
	Transport										10.5	7.4	
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

Italy - Sectors of biofuels consumption



8 Country Profile - JAPAN

8.1 Overview

In 2004, Japan's total primary energy consumption was 22 324 PJ, with renewables representing about 1 percent (262 PJ). Total electricity production was 93 Mtoe with biomass covering 1.1 percent (1 Mtoe); heat production was 2.2 Mtoe with biomass covering 22 percent (0.5 percent)[151].

The production of ethanol[152] in 2004 was 30 kl; the production of biodiesel[153] was of 4 500 kl.

Table 8.1– [PJ]

Total Primary Energy Supply	Imported	Renewable	Biomass
100%	83%	3.4%	1.2%
22 324	18 453	760	262

Source: IEA, 2004

8.2 Country Objectives and Drivers

The main drivers for the development of bioenergy are the mitigation of climate change, creation of a recycling-oriented society, development of the agricultural sector and the creation of competitive industrial technologies.

8.3 Bioenergy Policy by Subsector

The 2002 Biomass Nippon Strategy (as revised in 2006) is the main policy exemplifying the strategy for promoting biomass utilization in Japan.

Other policies on specific aspects are: the "Research and Development Program for Prevention of Global Warming", the "Program for the Establishment of a Regional System for Practical Use of Ecofuel" and the "Subsidy for establishment ecofuel plants and related infrastructure in Japan", the "Kyoto Protocol Achievement Plan" and "Roadmap for Increased Production of Domestic Biofuels".

Power Generation

The "Kyoto Protocol Target Achievement Plan" require both biomass power generation and waste power generation in the amount of 5 860 000 kl of oil equivalent by 2010.

The Biomass Nippon Strategy sets the technological target of reaching of 20 percent efficiency rate for the conversion of biomasses into electricity for plants operating 10 tonnes of

[151] IEA Energy Statistics 2004
[152] Mostly from sugarcanes
[153] Mostly from rape seed and waste edible oil

biomass per day and an efficiency of 30 percent for plants operating more than 100 tonnes of biomass per day.

Heat Production

The "Kyoto Protocol Target Achievement Plan" envisions biomass thermal utilization in the amount 3 080 000 kl (this amount includes biomass-derived fuel – 500,000 kl of oil equivalent – for transportation) by 2010.

The Biomass Nippon Strategy sets the technological target of reaching an efficiency of 80 percent for the conversion of biomass into heat for plants operating 10 ton of biomass per day.

Transport

The "*Kyoto Protocol Target Achievement Plan*" envisions consumption of biomass derived fuel for transportation in the amount of 500,000 kl, as converted to crude oil, by 2010.

The Biomass Nippon Strategy promotes small-scale tests on 3 percent mixtures of ethanol to gasoline (E3) and the oil industry's demonstration activity using bioethanol as ETBE to verify its quality and safety at all stages of production to end-use. Moreover, the *Law for Quality Control of Gasoline and Other Fuels* (Law No. 88 1976, or "Quality Control Law"), sets a 3 percent mixture of ethanol to gasoline to be the upper limit to ensure the safety of vehicles and control the quality of gas emissions; for biodiesel the Quality Control Law of 2007 sets a limit at not to exceed 5 percent for mixture in gasoline

As a middle-long term plan (until 2030) the Roadmap for Increased Production of Domestic Biofuels promotes technical development and expanded production at a competitive price by using the lignocellulosic feedstock. Moreover, the government will consider the introduction of fiscal incentives to promote the use of biofuel.

Regarding imports, biofuels are object to a 0.16 dollar tariff.

No data are available on the actual quantities of biofuel imports.

8.4 Results and Challenges

The strategy implemented by the Japanese government seems to address the main technological and policy challenges related to the development of bioenergy, moreover the research and development activities carried out by the different ministries focusing on biofuels and electricity and heat production will help Japanese industries compete with countries that have a long tradition of bioenergy utilization.

8.5 Country Policy Table - Japan

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct
Ministry of Agriculture, Forestry and Fisheries Cabinet Office Ministry of Education, Culture, Sports, Science and Technology Ministry of Internal Affairs and Communications Ministry of Economy, Trade and Industry Ministry of Land, Infrastructure and Transport Ministry of the Environment	Biomass Nippon Strategy	Policy-Strategy	No	Government	Provides general support for three main goals by 2010: - utilizing more than 80% of waste biomass and more than 25% unused biomass in terms of carbon equivalent (i.e. electricity, heat, transportation fuels, etc.); - improving energy conversion efficiency; - launching 300 Biomass Towns which are local municipalities having a system for utilizing biomass.
Ministry of Agriculture, Forestry and Fisheries Cabinet Office Ministry of Education, Culture, Sports, Science and Technology Ministry of Internal Affairs and Communications Ministry of Economy, Trade and Industry Ministry of Land, Infrastructure and Transport Ministry of the Environment	Boosting the Production of Biofuel in Japan	Policy-Strategy	No	Government	Provides the roadmap for increased production of domestic biofuels.
Ministry of the Environment	Research and Development program for prevention of global warming	Activity-research and development	No	Industry/government/university	Promotes research and development activities for new technologies which contribute to curb the GHG emissions, such as energy-saving technologies and renewable energy including bioenergy.
Ministry of the Environment	Program for the Establishment of a Regional System for Practical Use of Ecofuel	Activity-Incentive Programme	No	Industry/ bioenergy producer/ supplier	Perform large-scale demonstration of the use of bioethanol blended gasoline in big cities and Miyako-jima Island in Okinawa to accelerate the widespread use of ecofuel.
Ministry of the Environment	Subsidy for establishment ecofuel plants and related infrastructure in Japan	Activity-Incentive Programme	No	Industry/ bioenergy producer/ supplier	Establish ecofuel plants and related infrastructure in Japan

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Activates agriculture, forestry, and fisheries, as well as associated rural communities	Improves energy conversion efficiency.	・Creates a Recycling-oriented society ・Develops new strategic industries.		Activates agriculture, forestry, and fisheries, as well as associated rural communities
Develops new energy crops	Promotes R&D for the production of biofuels from cellulosic feedstocks.			Develops new energy crops
	Support the development of the new technologies for the conversion of cellulosic biomass into ethanol etc.		Approx. 3.3 billion yen will be disbursed from government to support this activity.	
	Establish the overall systems for the demonstration(from conversion plants to gas filling facilities)		Approx. 2.8 billion yen will be disbursed from government to support this activity.	
	Support for the establishment of ecofuel plants and the conversion of related infrastructure		Approx. 0.8 billion yen will be disbursed from government to support this activity.	

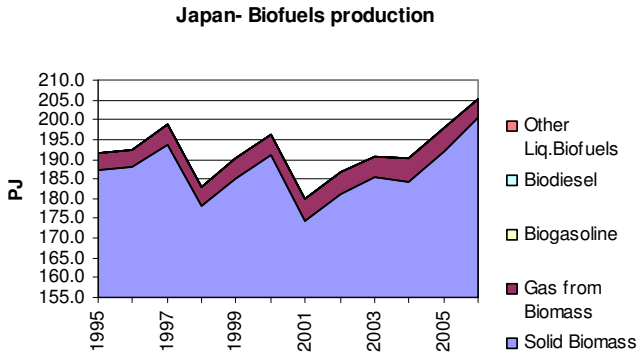
8.6 Japan Bioenergy Outlook

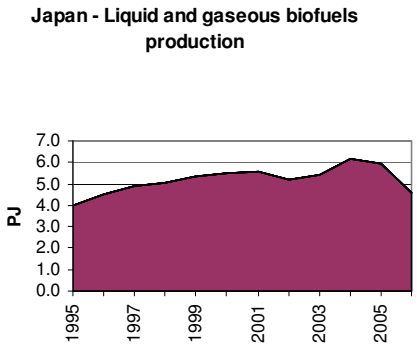
Table 8.2 - Japan – Biofuel production

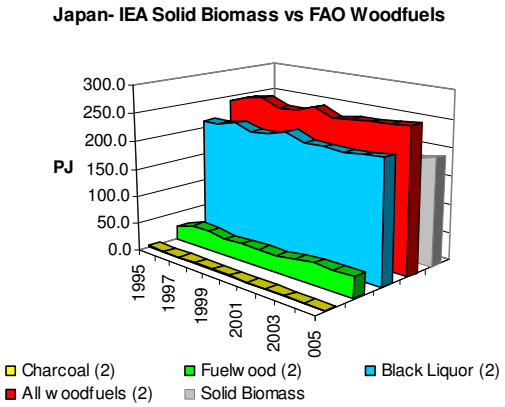
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	191.4	192.6	198.6	183.1	190.4	196.4	179.9	186.6	190.7	190.4	198.0	205.1
Solid Biomass	187.4	188.1	193.7	178.0	185.0	190.9	174.3	181.4	185.3	184.2	192.1	200.5
Gas from Biomass	4.0	4.5	4.9	5.1	5.4	5.5	5.6	5.2	5.4	6.2	5.9	4.6
Biogasoline												
Biodiesel												
Other Liq.Biofuels												
All woodfuels (2)	241.3	250.9	257.8	244.0	246.9	258.1	244.1	249.3	251.9	253.5	257.3	
Fuelwood (2)	24.9	34.9	34.4	29.2	30.0	30.8	29.9	35.1	39.3	37.9	38.6	
Charcoal (2)	4.2	2.6	2.5	2.5	2.1	1.7	1.6	1.3	1.2	1.1	1.1	
Black Liquor (2)	212.2	213.4	221.0	212.3	214.8	225.6	212.6	212.9	211.4	214.4	217.6	

Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	0.4	3.0	-8.1	3.9	3.2	-8.7	4.1	2.1	-0.6	4.3
Gas from Biomass	12.9	9	2.6	6.5	2.0	1.6	-6.5	4.3	14.0	-4.1
Biogasoline										
Biodiesel										
Other Liquid Biofuels										

(2) = Based on FAO data







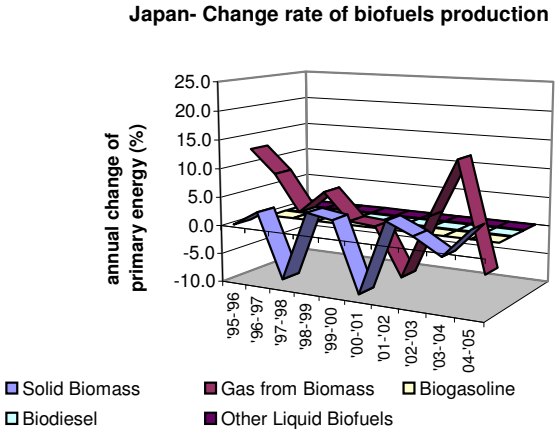


Table 8.3 - Japan – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	1.6	3.1	3.3	3.2	3.8	4.1	4.2	4.3	4.5	4.5	4.7	
Fuelwood (2)	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Charcoal (2)	1.6	3.1	3.2	3.2	3.6	4.0	4.1	4.2	4.4	4.4	4.6	

(2) = Based on FAO data

Table 8.4 - Japan – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	
Fuelwood (2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Charcoal (2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	

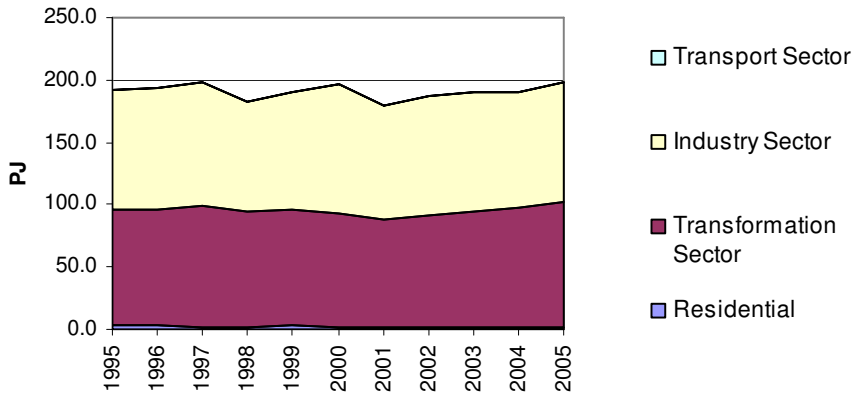
(2) = Based on FAO data

Table 8.5 - Japan – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	191.4	192.6	198.7	183.1	190.4	196.4	179.9	186.7	190.8	190.4	198.1	205.1
	Transform.	92.5	93.6	97.5	92.8	93.7	91.4	86.1	89.3	93.2	96.7	101.8	
	Industry	95.9	96.4	98.8	88.1	94.2	103.1	91.9	95.7	96.1	92.5	95.2	
	Transport												
	Residential	3.1	2.7	2.3	2.2	2.5	2.0	1.8	1.7	1.4	1.2	1.1	
Solid Biomass	Dom. Supply	187.4	188.1	193.8	178.0	185.0	191.0	174.3	181.5	185.3	184.2	192.1	200.6
	Transform.	88.5	89.0	92.6	87.8	88.3	85.9	80.6	84.1	87.8	90.5	95.9	
	Industry	95.9	96.4	98.8	88.1	94.2	103.1	91.9	95.7	96.1	92.5	95.2	
	Transport												
	Residential	3.1	2.7	2.3	2.2	2.5	2.0	1.8	1.7	1.4	1.2	1.1	
Gas from Biomass	Dom. Supply	4.0	4.5	4.9	5.1	5.4	5.5	5.6	5.2	5.4	6.2	6.0	4.6
	Transform.	4.0	4.5	4.9	5.1	5.4	5.5	5.6	5.2	5.4	6.2	6.0	
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

Japan - Sectors of biofuels consumption



9 Country Profile - MEXICO

9.1 Overview

Mexico is endowed with large quantities of fossil fuel sources (oil and natural gas) and is a net energy exporter country. Although extensive oil discoveries occurred in the 1970s, experts believe that the country's oil reserves may be depleting rapidly and will become insufficient to cover the country's energy needs. Furthermore, Mexico's energy consumption has grown considerably in the past ten years. Because of limited refining capacity, the country typically exports crude and imports refined gasoline and diesel. According to official sources[154], 87 percent of the energy originates from fossil fuels. The contribution from renewable energies (RE) is marginal and used mainly for heating purposes and for electricity generation. Biomass contributes 8 percent of primary energy consumption[155]. Principal biomass sources used in the country are sugar cane bagasse, mainly used for electricity and heat production for the sugar cane industry, and wood used mainly for heating and cooking. In 2004, 92 PJ of energy consumption was derived from sugar cane bagasse and 250 PJ derived from wood.[156] At the end of 2005 the Energy Regulatory Commission (CRE) authorized permits for electricity generation from biogas (19 MW to generate 120GWh/year), from sugar cane bagasse (70 MW to generate 105 GWh/year) and from hybrid system fuel oil-sugar cane bagasse (224 MW for producing 391 GWh/year)[157]

Mexico produces 49.2 million litres of ethanol (2006)[158] yearly, which are currently not used as fuel for transportation, but rather processed by the chemical and pharmaceutical industry. Currently, Mexican consumption of ethanol is 165 million litres per year, thus Mexico imports the remaining litres needed mainly from the United States, Brazil, Cuba and just recently, China.[159] The tariff regime foresees a mixed tariff (10 percent ad valorem +$0.36 per kilogram). The tariff is equal to 0 when importing from the United States.[160] Biodiesel is produced only on small scale demonstration projects, with a total production of approximately 3,300 MT per year.[161] Currently there are no full-size commercial biofuels plants in Mexico. Small, isolated experimental ethanol and biodiesel projects already exist but due to the lack of a domestic market and national biofuel public policy, these early initiatives have yet to develop into an integrated mature industry.

It is relevant to mention that Mexico has an important agricultural sector, potentially apt for bioethanol and biodiesel production.[162] Wood is the main energy source used for cooking by 25 million people living in rural areas and used also in a great number of small industries.

[154] Source: CMM 2005, made with data from the National Energy Balance 2004, SENER 2005.
[155] Masera, O. (Coordinador), "Bioenergía en México, un catalizador del desarrollo sustentable". CONAFOR. Multimundo, 2006
[156] Data from the Energy Information System of the Secreteria de Energia
[157] Masera 2006
[158] RFA, Industry statistics. Available at: http://www.ethanolrfa.org/industry/statistics, accessed on April 4, 2007.
[159] USDA-FAS, "Mexico: Biofuels Annual Report 2007," Gain Report no. MX7042, June 12, 2007
[160] USDA-FAS, "Mexico: Biofuels Annual Report 2006," Gain Report no. MX6503, June 26, 2006
[161] USDA-FAS 2007
[162] Libro Blanco de la Bioenergía en México, Red Mexicana de Bioenergía 2005, México.

Table 9.1– [PJ]

Total Primary Energy Supply	Imported[163]	Renewable	Biomass
100%	52%	10%	5%
6 928	-3 607	679	348

Source: IEA, 2004

9.2 Country Objectives and Drivers

Bioenergy is scarcely exploited (about 408 PJ), against a technical potential estimated between 3 035 and 4 550 PJ per year, representing between 54 percent and 81 percent of total national energy supply[164]. Of the estimated potential, the most significant sources are wood (between 27 percent and 54 percent) energy crops (26 percent) and biogas from municipal by-products wastes (0,6 percent). Moreover, estimates show that 73 million tonnes of agricultural and forest waste are potential sources of energy and that the use of the municipal solid waste, from the ten main cities[165], for electricity generation could lead to the installation of 803 MW and generate 4,507 MWh/year[166]. The growing interest in bioenergy comes in response to a number of domestic and global drivers to: stimulate the rural economy; diversify energy supplies and reduce GHG emissions.

9.3 Bioenergy Policy by Subsector

No specific bioenergy promotion program is currently operational in Mexico. However some recent initiatives have been taken by the government towards laying the groundwork for future regulatory and policy frameworks promoting bioenergy.

The principal document presenting the national energy policy is the Sectoral Program of Energy 2001-2006 (PSE for its acronym in Spanish) that, besides indicating the 2,5 percent energy saving goal to be reached by 2006, defines a national strategy for RES by mandating the incorporation of at least 1,000 MW of renewable energy sources to the installed electricity generation capacity by the year 2006 (excluding large hydropower plants), in order to double the contribution of RE compared to the 2000 value.

In order to achieve this goal, the PSE proposed the establishment of necessary actions that would allow private and public sectors to participate in the development of new renewable energy projects, including the following technologies: solar, wind, geothermal, small hydropower, biomass and biogas, among others.

This Program also contains the guiding principles of the Mexican Energy Policy: energy sovereignty, assurance of supply, social commitment, modernization of the energy sector,

[163] A negative value has to be intended as an Export
[164] Masera 2006
[165] Ciudad de México, Guadalajara, Puebla, Nezahualcoytl, Tijuana, Ecatepec, Mérida, Acapulco, Ciudad Juárez, y Tlalnepantla.
[166] available at www.wheelabratortechnologies.com/WTI/CEP/nbroward.asp

growing private sector participation, orientation towards sustainable development and commitment to future generations. In this context, renewable energy sources play a key role.

The Sectorial Program of Energy for the period 2007-2012 is being designed by the Secretaría de Energia (SENER- Ministry of Energy) and will define guiding principles of Mexico's energy policy. Because of the interest generated in ethanol over the last year, it is highly probable that a biofuels section will be included in the new PSE

Regarding promotion of bioenergy, two laws (Law for the Utilization of Renewable Sources of Energy (LAFRE) and Law for the Promotion of Biofuels) have been proposed and are still in the approval process. They aim to establish the legal framework under which SENER will define its strategy for biofuels, biomass and other sources of energy. The Government of Mexico (GOM) took an important step recently initiating work on a feasibility study requested by the Secretaría de Energia[167] to GTZ, aimed to analyse the potential for ethanol and biodiesel use and production in Mexico and identify possible scenarios for ethanol adoption in Mexico.

The Ministry of Energy is the lead institution with regards to the country's energy policy and planning: it has a key role in the future application of LAFRE and the Law for the Promotion of Biofuels.

Power generation

The main policy to promote the use of RE is the "Law for the Utilization of Renewable Sources of Energy" (Ley para el Aprovechamiento de las Fuentes Renovables de Energía - LAFRE), currently debated in the Senate (Cámara de Senadores).

Other policy initiatives include:

- The modification of the Income Tax Law, which proposes a fiscal credit of 30 percent for the investment in RE electricity generation equipment (CONACYT) (Ley del ISR, art. 219). This law allows also companies to deduct the cost of energy transformation equipment from their revenue taxes in one fiscal year (Ley del ISR, art. 40). In theory this accelerated depreciation strategy can provide substantial improvements in the financial analysis of RE self-generated projects.
- Policy supporting bioenergy use in rural electrification include the 'Integrated Energy Services for Small Rural Mexican Communities' (SIEPCRM, for its acronym in Spanish). Within the next 5 years, the SIEPRCM intends to provide electricity to 50 000 homes in rural areas, using diverse technologies including small biomass generators and hybrid RE-diesel systems. Sixty percent of the communities to be linked to the power system are of indigenous population.
- The Interconnection Contract for Intermittent Sources with Credited Capacity was created by the Energy Regulatory Commission (CRE for its acronym in Spanish) and came into effect during the month of January 2006. This contract allows to calculate and credit the

[167] SENER-BID-GTZ (edit), "Potenciales y Viabilidad del Uso de Bioetanol y Biodiesel para el Transporte em Mexico" , México, November 2006

capacity that these projects provide to the electric grid. It is estimated that this will allow for the installation of more than 700 MW through permits granted by CRE[168].

- The "National Strategy for Climate Change" (see "transport section").
- Proposal for the introduction of a carbon tax on fossil fuels. The Carbon Dioxide Income generated will be destined for the promotion of RE.

Heat Production

No specific policy addressed to heat generation from biomass has been developed.

Transport

Today there is no mandatory biofuel blend in Mexico.

In April 2007, the Senate (Camara de Senadores) passed the Law for the utilization of biofuels, now waiting to be approved by the Federal Government. Since the approval of the law was surrounded by controversy and comments from deputies and civil society representatives, a revision of the Law is foreseen to be held in September 2007 before being sent to the Federal Government. However, 3 September 2007 President Calderón vetoed the proposed law stopping the negotiation process for the time being.

Other policy initiatives promoting the use of bioenergy for transport follow below:

- The National Sugar Development Plan (PRONAC) addresses ethanol production from sugar cane. Through it, the Mexican government highlights the need to diversify the sugar industry and foresees the participation of the industry in bioenergy production, seeking to build capacity to produce about 7 840 barrels a day (120 million gallons per year or 454 million litres) of ethanol by 2012. It also foresees the use of bagasse and biomass residues to cover the electricity needs of the mills. This amount of ethanol would allow the replacement of 35 percent of the gasoline oxygenate, MTBE, with ethanol. However, due to the current low efficiency and low productivity of the sector, major changes to the industry's structure will be necessary to make sugar production an important ethanol feedstock.
- The "National Strategy for Climate Change" (2007) which specifically recognises the role of bioenergy (for electricity, heat and fuel for transportation) in decreasing GHGs emissions. Conservative estimations about GHGs reduction from biomass sources by 2012 account to 5.7 million ton/CO_2.

[168] The Public Electricity Service Act (LSPEE), that regulates electricity provision in Mexico, does not allow the free purchase and selling of electricity to private investors, but it allows energy generation for either self-supply or to complement productive processes through cogeneration, subject to a permit by the Energy Regulatory Commission (CRE).

9.4 Results and Future Challenges

Although no specific bioenergy promotion program is currently operational in Mexico, some recent steps have been taken by the GOM aimed at improving the policy and regulatory framework, and therefore promoting the development of bioenergy.

Two laws are currently in the process of approval and although they lack clear targets, mandates and economic incentives, they aim to set the legal framework for future regulations and measures that could effectively enable bioenergy development and the creation of a national biofuel industry. However, concerned about the potential impact biofuels production will have on agriculture, food production and prices, and economic development, the Government of Mexico is proceeding cautiously and carefully analysing the opportunities and threats that will accompany biofuel production and consumption.

A veto has recently been put by President Calderón on the Biofuel Law proposal which stopped the approval process for the time being.

The need for R&D and strengthening of RE research groups of limited resources has been officially recognized by SENER that identified the need to strengthen RE research groups that currently have limited resources, resulting in incipient technological development in new areas like liquid fuel production, biomass gasification or hydrogen production through.

9.5 Country Policy Table - Mexico

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/ Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Intersecretarial Commission for Sustainable Rural Development	Law on the Promotion and Development of Bioenergy (2007)	Policy - strategy	Pending	Farmers /bioenergy producers	It provides guidelines for encouraging the use and production of bioenergy as a key element to achieve national energy self-sufficiency and sustainable development provide support for the agricultural sector and contribute to pollution reduction. The Preamble refers the goal of improving the air quality of metropolitan areas in Mexico. The Law states that the Intersecretarial Commission for Sustainable Rural Development will be responsible for: 1) elaborate programmes and strategies (at national, federal and municipal level) for promoting biofuels production from maize, sugar cane and oilseeds; 2) establish targets, blending requirements and date of entry into force of them; 3) formulate and implement economic incentive programmes to build biofuel plants; 4) promote R&D activities related to bioenergy; 5) advise farmers and producers on any issues related to the production of bioenergy feedstocks (including any change in bioenergy technology or agriculture practice); 6) realize dissemination and education activities. The Law provides for the Government to prioritize projects in particularly depressed areas and respects indigenous rights.	
Ministerio Publico de Fiscalia	Law on income taxation (Ley del ISR- 2004)	Policy- incentives	Yes	Industry	It sets a number of mechanisms that promote the utilization of renewable sources of energy: 1) allows accelerated depreciation for infrastructure projects that use renewable sources of energy; 2) allows fiscal credit of 30% to R&D projects	
Ministry of Agriculture and Rural Development (Secretaria de Agricultura Ganaderia, desarrollo rural, pesca y alimentacion)	National Sugar Development Plan (2007-2012)	Activity-strategy	Yes	Sugar cane Industry		Agriculture promotes the energy use of sugar cane through the diversification of sugar industry activities and the promotion of the use of bagasse and biomass residues for the electricity needs of the mills.
Comision Intersecretarial de Cambio Climatico	National Strategy for Climate Change (2007)	Activity-strategy	Yes	Industry-energy producers		Climate Change promotes the use of bioenergy (for electricity, heat and fuel for transportation) for reducing GHGs emissions

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

Impact on Production Stream			Funding Mechanism
Production	Conversion	Use	
It promotes production and use of bioenergy		It promotes production and use of bioenergy	The Secretary of Treasury shall include a budget item to finance the implementation of the programme deriving from the National Policy of Renewable Energy which shall be monitored by the Intersecretarial Commission for Sustainable Rural Development. Other sources of financing for the implementation of the bioenergy projects will come from the use of Clean Development Mechanism
	Provides financial incentives for development of infrastructure projects that incorporate biomass and other renewable energy sources		
Foresees 6.5 mil tons increase of sugar cane production for the production of 7840 barrels a day of ethanol by 2012. This amount of ethanol would allow the replacement of 35% of the gasoline oxygenate, MTBE, with ethanol.			
It promotes production, conversion and use of bioenergy	It promotes production, conversion and use of bioenergy	It promotes production, conversion and use of bioenergy	

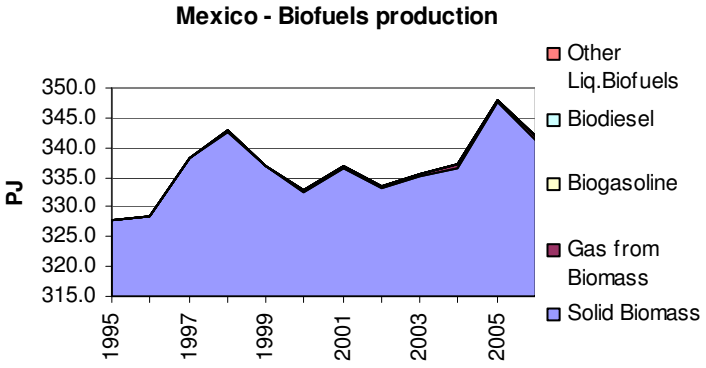
9.6 Mexico Bioenergy Outlook

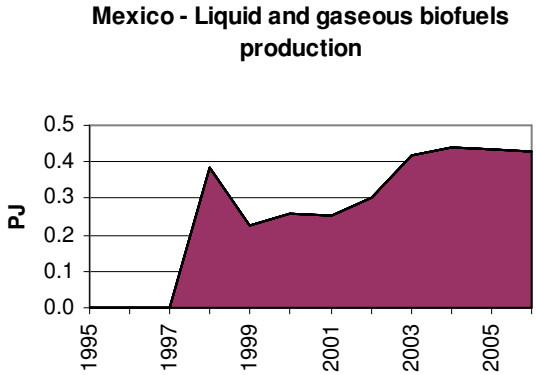
Table 9.2 - Mexico – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	327.8	328.6	338.3	343.0	336.9	332.7	336.8	333.3	335.5	337.1	347.9	341.8
Solid Biomass	327.8	328.6	338.3	342.6	336.7	332.4	336.5	333.0	335.1	336.7	347.5	341.4
Gas from Biomass				0.4	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Biogasoline												
Biodiesel												
Other Liq.Biofuels												
All woodfuels (2)	370.5	374.6	375.8	378.1	375.5	379.4	377.4	380.9	383.0	384.2	377.3	
Fuelwood (2)	363.3	366.3	367.6	366.3	363.4	367.6	369.3	374.8	376.9	376.8	361.4	
Charcoal (2)	0.8	0.9	1.1	2.5	5.1	4.1	4.2	2.3	2.2	3.1	11.8	
Black Liquor (2)	6.4	7.4	7.0	9.4	7.0	7.6	3.9	3.8	4.0	4.3	4.0	

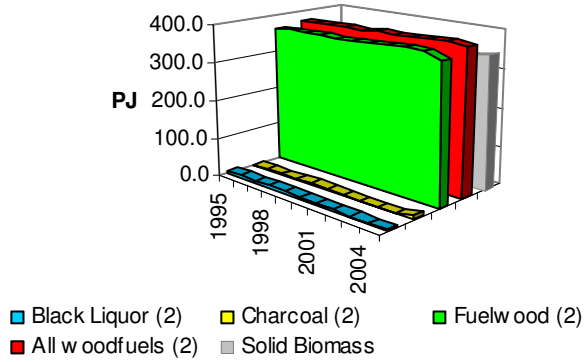
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	0.2	3.0	1.3	-1.7	-1.3	1.2	-1.0	0.6	0.5	3.2
Gas from Biomass				-42.1	14.7	-2.3	19.9	39.5	5.0	-2.0
Biogasoline	'95-'96	'96-'97	'97-'98	'98-'99	'99-2000	2000-'01	'01-'02	'02-'03	'03-'04	'04-'05
Biodiesel	0.2	3.0	1.3	-1.7	-1.3	1.2	-1.0	0.6	0.5	3.2
Other Liquid Biofuels				-42.1	14.7	-2.3	19.9	39.5	5.0	-2.0

(2) = Based on FAO data





Mexico - IEA Solid Biomass vs FAO Woodfuels



Mexico - Change rate of biofuels production

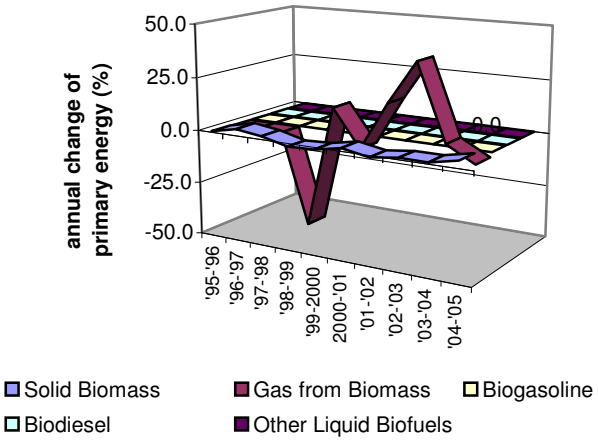


Table 9.3 - Mexico – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.1	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.1	0.1	0.2	
Fuelwood (2)	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.2	
Charcoal (2)	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.0	

(2) = Based on FAO data

Table 9.4 - Mexico – Biofuel Export (PJ)

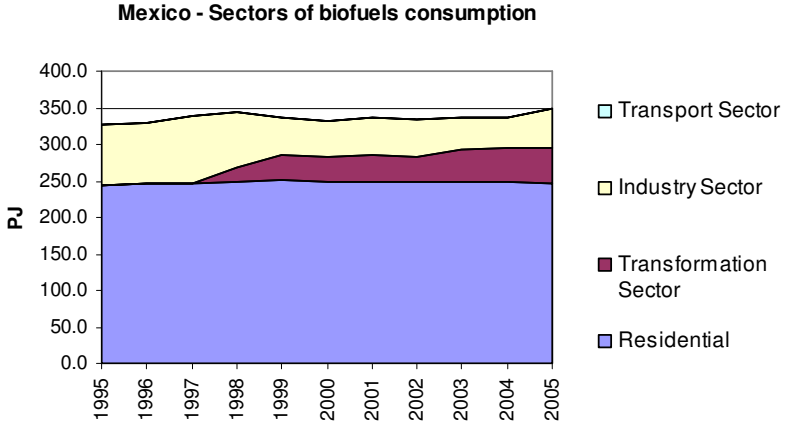
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.7	0.8	0.8	0.5	3.8	2.3	1.6	1.6	1.6	1.4	1.6	
Fuelwood (2)	0.2	0.1	0.1	0.1	2.7	1.1	0.1	0.1	0.1	0.3	0.3	
Charcoal (2)	0.6	0.7	0.7	0.4	1.1	1.2	1.5	1.5	1.5	1.1	1.3	

(2) = Based on FAO data

Table 9.5 - Mexico – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	327.9	328.7	338.4	343.1	337.0	332.8	336.9	333.4	335.6	337.2	348.0	341.9
	Transform.				20.9	36.4	34.2	35.7	35.1	45.5	46.6	48.1	
	Industry	84.0	83.2	91.4	73.6	50.4	48.7	51.8	49.5	41.8	42.8	52.7	
	Transport												
	Residential	243.8	245.4	247.0	248.6	250.2	249.9	249.4	248.8	248.3	247.7	247.2	
Solid Biomass	Dom. Supply	327.9	328.7	338.4	342.7	336.8	332.5	336.6	333.1	335.2	336.7	347.6	341.4
	Transform.				20.5	36.2	33.9	35.4	34.8	45.1	46.2	47.7	
	Industry	84.0	83.2	91.4	73.6	50.4	48.7	51.8	49.5	41.8	42.8	52.7	
	Transport												
	Residential	243.8	245.4	247.0	248.6	250.2	249.9	249.4	248.8	248.3	247.7	247.2	
Gas from Biomass	Dom. Supply				0.4	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
	Transform.				0.4	0.2	0.3	0.3	0.3	0.4	0.4	0.4	
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)



10 Country Profile - RUSSIA

10.1 Overview

Russia is known to be rich in bioenergy resources: its cultivated agricultural lands comprise 9 percent of the total world reserves; forest (wood reserves) account for 25 percent of the world reserves. However, Russia's energy balance is dominated by fossils both in the transport sector than for power and heat generation. The share of renewable energy sources (RES) in electricity generation is very small: in 2002 just 0.5 percent of the total production, which amounts to 1 percent of the total annual energy consumption. The current share of biomass in the total energy balance is really negligible: it mainly relates to use of wood in households (5 mln households) (for these purposes over 50 million tonnes of wood are consumed).

Table 10.1– [PJ]

Total Primary Energy Supply	Imported[169]	Renewable	Biomass
100%	80%	3.5%	1.1%
26 860	-21 395	946	299

Source: IEA, 2004

10.2 Country Objectives and Drivers

Russia's Energy Strategy up to 2020 (approved by the Russian Government's Resolution dated 28.08.2003 No 1234), called for institution of a more active use of granulated peat and other types of wastes (including municipal solid wastes and agricultural/forestry residues) for electricity and heat generation. Russia's Energy Strategy up to 2030 (draft currently under discussion) proposes an increase of the RES's share in the total energy consumption after 2020 from 2 percent (initially planned) to 7 percent.

A bioenergy sector in the Russian economy is expected to be established through integration of related sectors of agro-industrial complex, transport, petroleum refining industry, farm machine industry. The current basis for activities aimed at developing the bioenergy sector is a state program coordinated by the Russian Ministry of Agriculture – the Federal program "Development of agriculture and regulation of the agricultural products' market, feedstock and food for 2008-2012" (approved by the Russian government on 14.07.2007 No 446). Among the measures envisaged by this program include: substantial increases in cultivated cropland areas (expected to be used mainly for rapeseed cultivation); technical modernization of the agricultural machines utilized in growing oil crops as well as development of manufacturing capabilities (which includes construction of large-scale facilities for biomass processing) and incentives for increased cultivation of energy crops. Among the incentives aimed at stimulating energy crop cultivation and production of biofuels and bio-additives (which are presently in place), are

[169] A negative value has to be intended as an Export

subsidized loans provided by the government for purchase of high energy crop seeds, purchase of equipments for cultivation of the said crops and for the construction of facilities for processing oil crops and others.

The key driver for development of bioenergy sector in Russia is the need to ensure:

- *Domestic (regional) energy security*: Primary energy resources are known to be unevenly distributed throughout the territory of the Russian Federation, some of them are located in the areas far away from the end users. As a result, high transportation costs have a considerable effect on the end price of energy products. Because of high oil prices in the world energy markets and the steadily growing demand for energy due to accelerated economic growth (taking into account the ambitious task to accelerate the rate of Russia's economic growth to 10 percent) it is vital to ensure a reliable supply of the country's population and its national economy with adequate and affordable energy resources and preclude any disruptions in the energy supply, especially to areas with decentralized energy supply or some far-away, mountainous, not easily-accessible regions, with severe climatic conditions where supply of energy resources is effected on a seasonal basis (the Far East, the Far North, the North Caucasus, Kaliningrad, the lake of Baikal and the Altay region). Diversification of the region's energy mix through enhanced use of locally available resources, predominantly from renewable energy sources, is believed to be one of the best ways to ensure their energy security.
- *Agricultural interests:* Some regions (Republic of Tatarstan, Kransnodar, Rostov and Volgograd Regions) with a substantial share of agriculture in their economic structure and some experience in growing energy crops (rapeseed, mainly) show strong interest in implementing bioenergy projects due to increased cultivated lands employment in rural area. Environmental security is a major concern (mitigation of harmful effects on the environment and climate change through reduction of CO_2 emissions). Substantial environmental benefits are obtained in case of biogas production from wastes.
- *Russia's integration into the world energy markets and its competitiveness in these markets:* Energy efficiency of the national economy, the most effective use of the available energy potential is recognized to be a top priority for Russia and a pre-condition for its transition from raw-materials-based development to innovative development.

10.3 Bioenergy Policy by Subsector

Recent steps have been taken to maximize use national bioenergy resources relating both to processing of biomass into different types of biofuels for transport and use of biogas for electricity and heat generation.

To coordinate work related to the preparation of the bioenergy investment projects, a National Bioenergy Association, embracing all interested stakeholders from industrial and agricultural sections, was established in early 2007.

Through the Federal Program "R&D in priority fields of development of scientific-technological complex in 2007-2012", coordinated by the Federal Agency of Science and Innovations, funding is provided for strategic research and development of innovative technologies for the bioenergy sector. Additional resources are also allocated by the private sector, as most of the projects are implemented on a public-private partnership basis.

Bioenergy-related projects currently funded through the programme include:

- a research project for designing a biostation for generation of electricity from agricultural residues;
- optimization of biogas technology in processing complex organic wastes (residues) generated by the agro-industrial complex of Russia;
- optimization of the universal biogas technology for environmentally-clean use of natural gas for electricity and heat cogeneration and obtaining synthetic liquid fuels;
- project aimed at developing methods of deep purification of biogas collected at the municipal solid waste sanitary landfills for obtaining an environmentally-clean source of energy; and
- a large-scale demonstration project that envisages construction ofa bioethanol production plant (the first stage of the production facility is planned for operation by the end of 2008; the whole complex is expected to be operative and reach designated production capacity by end 2010.

In early 2008 a Russian - EU coordinated call is planned to be announced to enhance strategic cooperation in the field of biomass cofiring (about €2 mln will be allocated for the project by each side).

To ensure implementation of President V. Putin's Executive Order dated 04.12.2006 No Pr-2097 directed to ensure accelerated development of biofuels production and use, a coordinated plan of action is being developed by the Russian government. Among others, it will include measures aimed at establishing legal and regulatory frameworks for production and use of biofuels (including taxation and customs regulations) as well as financial incentives for investors and innovations meant to facilitate the development of a biofuels market in Russia.

The current legal basis for biofuels is neglibile. It has been proposed that federal laws on "guidelines for bioenergy development in the Russian Federation" and on "use of alternative types of motor fuels" should be developed. The legislative bill of the second federal law was initiated and approved by the State Duma (the Russian Parliament) on 22 May 2007. It is expected to define the state policy in respect to use of alternative fuels, as well as regulate the relationship between biomass producers (agricultural energy crops and plants) and producers of biofuels and biodiesel engines.

The need for amending the currently effective federal law on "state regulation of production and distribution of ethyl alcohol and alcohol containing products" is frequently voiced as tax limitations established by it hinder development of the biofuels domestic market in Russia. The law is expected to regulate the establishment of conditions for investment and

innovative activities in relation with development of the bioenergy sector. Among the tasks to be addressed include: development of national standards; training of specialists for the bioenergy sector; establishment of the technical basis for growing energy crops; manufacturing of equipment for energy crop cultivation; as well as for storage of high energy seeds and energy crop processing and use.

The National Bioenergy Association embracing all interested stakeholders from industrial and agricultural sections was established in early 2007 to coordinate the work related to preparation of the bioenergy investment projects.

10.4 Results and Future Challenges

It should be mentioned that presently a strong knowledge and expertise base exists in biomass processing (including processing of different types of wastes) and biogas generation, both for the biochemical and thermochemical systems, and there are a number of production technologies available now in Russia. The challenge is to substantially increase the production of biofuels by using innovative processes and technologies that are both competitive and sustainable.

10.5 Country Policy Table – Russia

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Ministry of Education & Science, Federal Agency for Science and Innovations	Federal Program "R&D in priority fields of development of scientific-technological complex in 2007-2012"	Research and Development, Education	Yes	Provides funding (based on state-private partnership) for strategic research and development of innovative technologies in bioenergy, in general, and biofuels, in particular.	Promotes innovative technologies of biofuels production and use in transport sector; as well as technologies of electricity generation from biomass.	Promotes introduction more efficient methods (technologies) of waste management
Ministry of Agriculture	Program of feedstock and biofuels production development	Incentive	Yes	Bioenergy producers & suppliers	Incentives for agricultural sector, forestry & new energy production opportunities	
Ministry of Industry and Energy	Program for converting hydrolyzed ethanol manufacturing facilities in bioethanol plants	Targets	Pending			
State Duma (the Russian Parliament)	Hearings on the national bioenergy policy	Incentive		Energy production sector & transport sector (including fuel production sector)		
State Duma (the Russian Parliament)	Hearings on the law delimitating usage of ethanol as biofuel and component of alcoholic beverage	Incentive	Pending decision		Allows mass ethanol production for transportation	Positive impact on agriculture industry development
Federal Assembly (the Upper Chamber of the Russian Parliament)	Development of standards to facilitate large-scale use of renewable energy sources, including use of biomass for energy	Targets	Pending decision	Energy production sector & transport sector (including fuel production sector), agricultural production sector		

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
3 large-scale projects to be implemented within the framework of the program will result in construction of a bioethanol production complex, establishment of biodiesel fuels production and lay down the foundation for complex use of different types of biomass			Fundamental R&D projects are funded by the government. Development of pre-commercialized technologies is funded by the state and private sector on the 50/50 basis.	3 large-scale projects to be implemented within the framework of the program will result in construction of a bioethanol production complex, establishment of biodiesel fuels production and lay down the foundation for complex use of different types of biomass
	conversion of the existing			

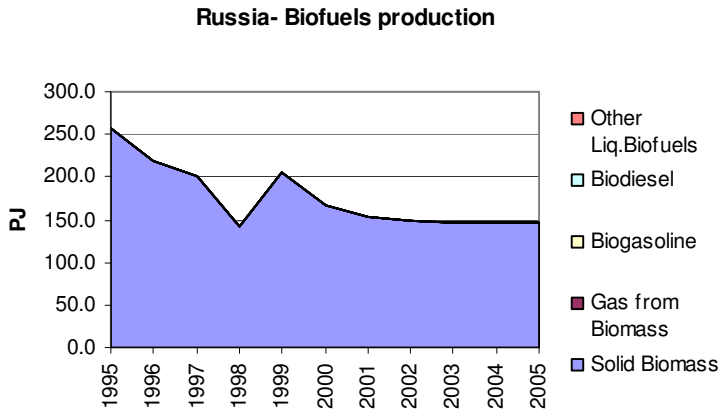
10.6 Russia Bioenergy Outlook

Table 10.2 - Russia – Biofuel production

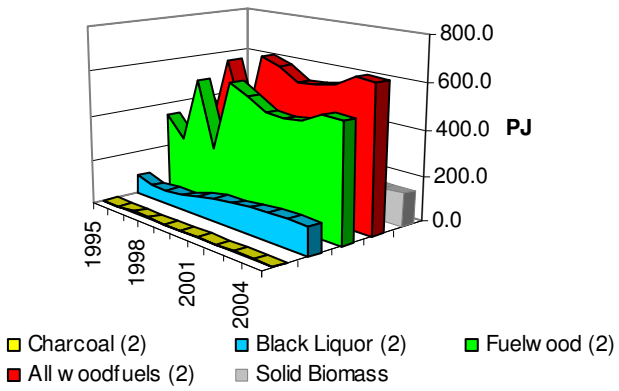
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	258.0	218.8	200.2	141.1	205.1	167.7	153.4	149.6	145.6	145.9	146.7	
Solid Biomass	258.0	218.8	200.2	141.1	205.1	167.7	153.4	149.6	145.6	145.9	146.7	
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liq.Biofuels												
All woodfuels (2)	429.3	313.8	607.7	318.0	653.8	625.4	577.1	580.4	596.6	643.9	639.0	
Fuelwood (2)	345.3	249.9	543.1	249.7	563.7	519.6	465.6	460.6	472.3	517.1	511.6	
Charcoal (2)	1.4	0.9	1.7	1.4	1.5	1.8	1.8	1.8	1.8	1.8	1.8	
Black Liquor (2)	82.5	63.1	62.9	66.8	88.5	103.9	109.7	117.9	122.4	124.9	125.5	

Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	-15.2	-8.5	-29.5	45.4	-18.2	-8.5	-2.5	-2.6	0.2	0.6
Gas from Biomass										
Biogasoline										
Biodiesel										
Other Liquid Biofuels										

(2) = Based on FAO data



Russia- IEA Solid Biomass vs FAO Woodfuels



Russia - Change rate of biofuels production

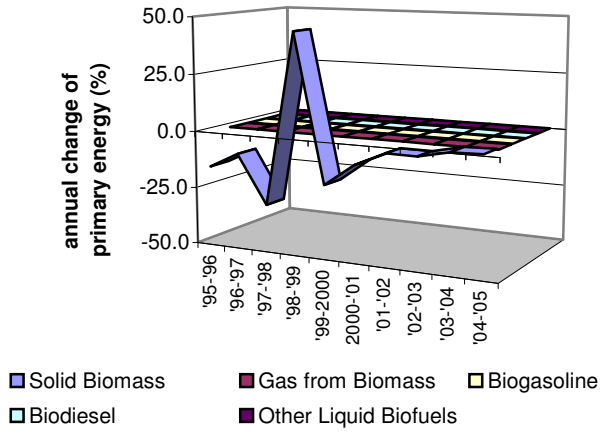


Table 10.3 - Russia – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)						0.0	0.2	0.1	0.1	0.0	0.0	
Fuelwood (2)						0.0	0.2	0.1	0.1	0.0	0.0	
Charcoal (2)							0.0		0.0	0.0	0.0	

(2) = Based on FAO data

Table 10.4 - Russia – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels			13.8									
Solid Biomass			13.8									
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	1.6	2.9	9.1	9.8	6.8	12.2	12.0	9.8	3.7	4.0	4.0	
Fuelwood (2)	1.6	2.9	9.1	9.8	6.8	12.1	12.0	9.7	3.7	4.0	4.0	
Charcoal (2)	0.0	0.0	0.0			0.0	0.0	0.1	0.1	0.1	0.1	

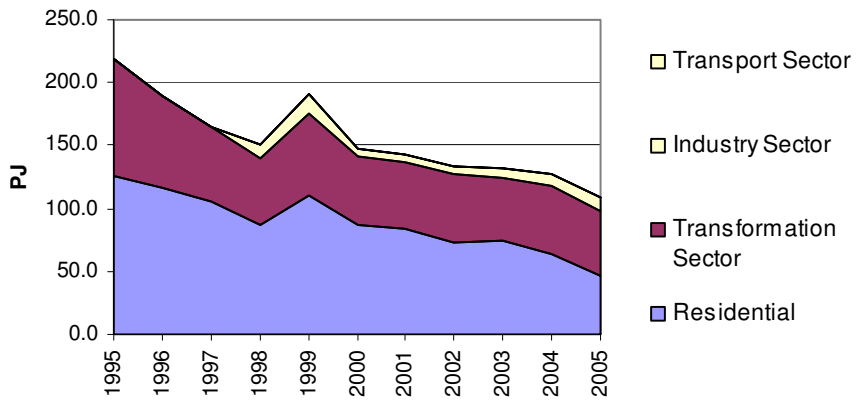
(2) = Based on FAO data

Table 10.5 - Russia – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	259.3	221.4	190.3	157.4	208.2	163.1	157.9	150.6	149.1	143.2	146.2	
	Transform.	93.8	72.5	58.6	53.1	64.3	53.5	51.8	54.3	49.7	54.3	50.4	
	Industry				10.6	16.5	7.4	6.8	6.2	7.2	9.3	11.0	
	Transport												
	Residential	125.4	116.8	105.9	86.7	110.7	87.3	84.1	72.6	74.4	64.2	47.1	
Solid Biomass	Dom. Supply	259.3	221.4	190.3	157.4	208.2	163.1	157.9	150.6	149.1	143.2	146.2	
	Transform.	93.8	72.5	58.6	53.1	64.3	53.5	51.8	54.3	49.7	54.3	50.4	
	Industry				10.6	16.5	7.4	6.8	6.2	7.2	9.3	11.0	
	Transport												
	Residential	125.4	116.8	105.9	86.7	110.7	87.3	84.1	72.6	74.4	64.2	47.1	
Gas from Biomass	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

Russia - Sectors of biofuels consumption



11 Country Profile - SOUTH AFRICA

11.1 Overview

South Africa relies heavily on domestic coal and imported oil to meet its energy needs (approximately 90 percent) and is well endowed with Renewable Energy sources (RES), although so far they have remained largely untapped.

The contribution of biomass (fuelwood and bagasse) to the country's commercial and non-commercial final energy supply is estimated at 20 percent, whereby non-commercial biomass sources are mainly from unsustainable use of fuelwood, dung and waste[170]. Fuelwood is the main source of energy in the rural domestic sector (over 65 percent)[171].

Other sources of biomass include bagasse in the sugar industry, wood, pulp and paper waste in the commercial forestry and paper industries, for in-house heat and electricity generation. In these industries there is already some heat and power generation taking place and there is potential for upgrading and expansion. With the sugar mills currently generating a significant amount of power for own use and even limited export, bagasse offers some of the best potential for independent power producers using renewable resources.

Transport is the highest-cost component of the South African economy and road transport dominates it. Road transport energy is provided by diesel and petrol, of which 60 percent is sourced from imported crude oil, the rest from local coal and natural gas converted into liquid (synthetic fuels)[172]. Ethanol production in 2005 accounted for 390 million litres[173] and bioethanol is produced mainly by sugar industry as potable alcohol for local and export markets.

South Africa is becoming an active exporter of ethanol taking advantage of preferential trade arrangements with the EU. Until December 2005, South Africa benefited from a 15 percent tariff reduction under the Generalised System of Preferences scheme. From January 2006 South Africa is subject to the full MFN duty.

A more recently explored ethanol-based option is ethanol gel, for cooking in cookstoves as substitute of paraffin. Initial market penetration has occurred in South Africa (since 2000) with the establishment of 30,000 litres/month production facilities[174].

There is no biodiesel production at this time but feasibility studies on biodiesel production from soybeans are currently under way.

[170] Energy policies for sustainable development in South Africa, Energy Research Centre (ERC), 2006.
[171] Data from PROBEC - Programme for Biomass Energy Conservation in Southern Africa, GTZ
[172] Manny Singh - Division of Central Energy Fund (Pty.) “Economics of biofuels for the transport sector in South Africa”, Energy for Sustainable Development, 2006
[173] Source: annual world production by country (available at http://www.ethanolrfa.org/industry/statistics)
[174] Advancing Bioenergy for Sustainable Development Guideline for Policymakers and Investors, ESMAP

Table 11.1– [PJ]

Total Primary Energy Supply	Imported[175]	Renewable	Biomass
100%	-18%	10.1%	9.9%
5 490	-1005	559	547

Source: IEA, 2004

11.2 Country Objectives and Drivers

The dominant motivation for developing the biofuel industry is to stimulate economic growth and create job opportunities.

Other objectives behind the government's interest in bioenergy are the reduction of dependence on imported crude oil, protection of the country against volatility of oil prices, and climate change mitigation.

South African government has started actively investigating the suitability of different crops, providing support to small-scale farmers and developing technical standards for biofuels, showing encouraging activity for the expansion of this sector for both farmers and other interested stakeholders.

Maize and sugar (ethanol) as well as soya bean and sunflower (biodiesel) are identified as the potential crop to satisfy the country's biofuel production. However, South Africa has only 14 percent of its total area available for arable land and irrigation consumes about 60 percent of the national water supply. Surpluses in corn and sugar production occurred in 2004-2005 season; the possibility of using this surplus for ethanol production to meet more than 5 percent of its gasoline demand[176]. But since then, prices have picked up and successive harvests were poor, due also to the serious drought South Africa is experiencing.

11.3 Bioenergy Policy by Subsector

With the end of Apartheid, South Africa experienced a fundamental change in the energy policy as reflected in the White Paper on Energy Policy (1998). This policy establishes the energy policy direction for the country aiming at achieving guaranteed access to safe, reliable and affordable energy, liberalization of the energy sector including the transformation of the electricity distribution sector into regional electricity distributors, and introduction of greater levels of competition in electricity markets.

The Integrated Sustainable Rural Development Strategy (ISRDS 2000) puts major emphasis on providing energy services to rural areas for both basic needs and income generating activities, including non-grid electrification and mini-grids. The Department of Minerals and Energy (DME) as per a mandate in the White Paper on Energy Policy, has elaborated a Draft Energy Efficiency Strategy setting a national target for energy efficiency

[175] A negative value has to be intended as an Export
[176] Department Of Minerals and Energy, "Draft Biofuels Industrial Strategy of the Republic of South Africa",November 2006, p.10.

improvement of 12 percent by 2014 together with sectoral targets. In addition, it provides guidelines for energy efficiency interventions to be implemented through a phased approach. Bioenergy is not specifically addressed as an option for energy efficiency measures.

Acknowledgment of the potential and benefits of Renewable Energy (RE) applications and their promotion emerges in the White Paper on Renewable Energy that sets a target of 10000 GWh of renewable energy contribution to total energy consumption by 2013. The renewable energy is to be utilised for electricity generation (4 percent of projected electricity demand), heat and biofuel production.

Although industries representatives and farmers are asking for an increase in the level of incentives proposed in the draft strategy, it is unlikely that subsidies will be introduced to support the biofuel programme. The country's farming sector underwent a massive cut in state subsidies in the post-apartheid era which is why the Government is concerned that subsidizing biofuels producers would spark an outcry from farmers[177].

At the moment, only biodiesel and ecodiesel are exempt from a percentage of fuel levies and taxes, under specific conditions[178].

Power Generation

The White Paper sets a target of 4 percent of projected electricity demand for 2013 to be reached with contribution from RES.

In order to reach the above target, the White Paper proposes a strategic Programme of Action to develop South Africa's RES, particularly for power generation. It recognizes the need to create a constructive environment in many areas: the introduction of fiscal and financial support mechanisms; the development of physical infrastructure to link RE supplies into existing grid; and the creation of an appropriate legal and regulatory framework to encourage the entry of multiple independent power producers into the current electricity sector and stimulate RE market creation. The approach envisaged foresees the facilitation of "early win" investments in commercially - proven technologies that can demonstrate the benefits of renewable energy and low level of national subsidies. Foreign investment through Global Environment Facility and Clean Development Mechanisms is expected as relevant contribution to domestic financial support.

The government has already started to apply the Renewable Energy Subsidy Scheme, with the objective of developing a sustainable market share of RE. The subsidization is given per unit of installed capacity. An investigation into appropriate financial and fiscal instruments to stimulate the implementation of RE technologies is ongoing.

[177] Biofuel subsidy unlikely, says minister, Engineering news, 30 July 07
[178] Draft biofuels strategy to be presented to Cabinet in May By: Helene Le Roux, Creamer Media's Engineering News Online Published: 20 Apr 07

According to current position[179], a combination of a set-aside[180], coupled with an investment incentive (subsidies and/or tax credit), could form the basis of utilising renewable energy funding for an initial power generation programme in South Africa. A decision about which option or combination would be in the best interests of South Africa will be based on a macroeconomic analysis and the outcome presented in the Renewable Energy Strategy (RES). The RES will translate the goals and objective detailed in the White Paper into practical implementation steps. A mid-term assessment is foreseen at the end of 2008, which could bring a revision of the included objectives and provisions in light of progress made.

The Department of Minerals and Energy has the overall responsibility for renewable energy policy in South Africa in a framework of cooperative governance with other departments and concerned stakeholders.

The Central Energy Fund will assist the implementation of renewable energy through the extension of its operational support but implementing provisions have not been issued yet.

Heat Production

No official targets exist in South Africa and no specific policy addressed heat generation from biomass has been developed. Heat generation in South Africa is mainly for industrial use, while indoor heating is primarily supplied by either electricity or gas in the urban areas, biomass and coal are the predominant space heat sources in other areas.

Transport

Voluntary blending targets up to 9 percent exist since 2006 and a 10 percent blending target has been proposed. The development of the biofuels industry is one of three key priority sectors of the government's Accelerated and Shared Growth Initiative for South Africa (ASGISA) which aims to halve unemployment and poverty by 2014 by stimulating economic growth.

In December 2005 an Interdepartmental Biofuel Task team was established with the aim of developing the industrial strategy of the country's biofuels programme. A Draft Biofuel Strategy was released and approved by DME in December 2006[181]; the presentation and approval of a final document by the Cabinet was scheduled in May, after a broad stakeholder consultation process aimed to include diverse views regarding biofuels.

The Draft Biofuel Strategy outlines government's approach to addressing policy, regulations and incentives for biofuel industry. It proposes a 4.5 percent use of biofuels in liquid road transport fuels (gasoline and diesel) by 2013, contributing 75 percent to the national Renewable Energy target (10 000 GWh by 2013) with over a billion litres. The proposal should

[179] White Paper on Renewable Energy (DME, 2003), pag 29
[180] Set-aside is a block of energy supply that is earmarked by law for renewable energy capacity. Potential renewable energy generators tender to provide the block of renewable energy supply. Winning projects receive financial support e.g. subsidy per kWh or a guaranteed fixed electricity tariff" - White Paper on Renewable Energy (DME), 2003
[181] Department of Minerals and Energy, "Draft Biofuels Industrial Strategy of the Republic of South Africa," 2006

be met with the adoption of national blending specification of 8 percent for ethanol (E8) and 2 percent for biodiesel (B2)[182].

The driver to enable these volumes is utilization of the Petroleum Products Licensing system (Petroleum Products Amendment, Act n.58/2003) that will require existing petroleum wholesalers to buy biofuels according to the national market share. The Petroleum Act amendment establishes that the volume of licences for biofuel production are delivered according to the percentage of local content and the participation of the Black Economic Empowerment. The Draft Strategy claims that the above requirements could be achieved without excessive support from the government and by using surplus agricultural capacity (maize and sugar) and expanding production on underused arable land.

Although recognizing the need for financial incentives to make the nascent biofuels market competitive with existing fossil fuels, the government wants to keep its financial support light, leaving to public and private sector funding the task of commercialising the biofuel technology.

Already existing support mechanisms and incentives like the ones described below, will be used and adjusted if necessary, by the government for creating an enabling investment environment:

- Currently 40 percent[183] fuel levy reduction applied on biodiesel could be extended to bioethanol based on the energy content[184],
- Renewable Energy Subsidy Scheme recently launched by the Department of Minerals and Energy to support investment in renewables,
- Accelerated tax depreciation of biofuel investments: 50 percent in 1st year, 30 percent in 2nd year, and 20 percent in 3rd.

Current agriculture programmes managed by the Department of Agriculture to support small scale farmers and emerging farmers that can be better targeted to biofuel production (support farmers in crop selection, hedging, agricultural methods, research and development, and contract negotiations with biofuels manufacturers), until a stable feedstock supply is established.

Additional support to the creation of the biofuel industry will come from a simple price hedge mechanism for biofuels prices taking into account low and high oil prices, to be established within the existing Equalization Fund. The principle is that it should balance upside benefits to motorists with downside benefits to biofuels producers[185] without implying additional cost for the state budget. The details need to be developed and agreed.

[182] South African Government, "An investigation into the Feasibility of Establishing a Biofuels Industry in the Republic of South Africa," October, 2006
[183] This was increased from 30 percent in the latest budget, February 2006.
[184] South Africa has a relatively low fuel levy by comparison with other countries, currently taxes and levies represent 27 percent of the gasoline and 25 percent of the diesel price (USDA-FAS, "South Africa: Biofuels Annual Report 2006," Gain Report no. SF6021, June 8, 2006)
[185] When oil prices exceed $ 65/bbl, no special incentives for the biofuels industry should be necessary in the longer term and the Fuel Levy reduction could eventually fall away. If the oil price is below $ 45/bbl, biofuels producers would need some form of additional support. For world oil prices above $ 65/bbl, the biofuels industry could pay in (back) and slightly reduce pump price increases

Finally, the Central Energy Fund (CEF), originally created for promoting synthetic fuel production can be extended to the promotion of biofuel. Government Investment through its agencies and existing funds are foreseen for promoting biofuels projects in those underutilised agricultural land (usually very poor areas) where the investment risk is higher. Contribution from the National Empowerment Fund and other specific incentives that may be introduced in the future, is encouraged. Following this provision, it has been recently announced that 5 small towns will benefit R3.2 billion for biofuel production from different types of feedstocks and managed by local farmers. Funding will come from the Industrial Development Corporation (IDC) and the Central Energy Fund[186].

Government procurement is also envisaged as an option to provide an alternative or additional market for biofuel (in case of failure by the petroleum sector to reach the proposed target)

The Ministery of Minerals and Energy is responsible for the governance of the liquid fuels industry in South Africa and for coordination of initiatives from the other Government Departments. Government has accepted a process of managed liberalization of the liquid fuels industry, to take place in a ten-year timeframe, with the aim of allowing time for the black empowerment companies to consolidate their positions within the industry.

No coordinated national bioenergy research program currently exists although various groups are working on the bioconversion of lignocellulosic biomass as feedstock for biofuels. South Africa recently joined IEA Bioenergy to interact with the liquid biofuel community.

Other policy initiatives promoting the use of biofuels for transport follow below:

- Cleaner Fuels Programme, approved by Cabinet, that aims to reduce emissions and environmental impact, has phase-out leaded petrol and reduced sulphur in diesel to a maximum of 0.05 percent (mass) from 2006.
- Climate change: South Africa ratified the Kyoto Protocol in 2002. Although South Africa is not committed to a specific timeframe to reduce GHG emissions, it counts on the opportunity to utilize international funding within Kyoto Protocol framework for the penetration of renewable energy into South Africa's energy mix. Large potential for low cost emission reduction options exist in South Africa having an energy-intensive economy and high dependence on coal for primary energy. The DME has established the Designated National Authority (DNA) to process CDM projects. Biofuels projects may apply for such CDM credits, however bioethanol CDM methodology needs to be further explored.

11.4 Results and Future Challenges

The policies set by the government aim to create the conditions for the development and commercial implementation of renewable technologies (including bioenergy technologies).

[186] Creamer Media's Engineering News Online, April 2007 (available at http://www.engineeringnews.co.za/eng/news/today/?show=78440)

The White Paper on Renewable Energy sets a general framework and overall RES target without indicating concrete measures to be used in order to achieve the target. Implementing rules and a Renewable Energies Strategy are called upon to be developed in the future.

Until now the use of biofuels for transportation fuel has received major attention from the government compared to the other final uses. Timing for the proposed 10 percent blending will be largely determined by the level of support provided by the government which needs to ensure that the level of support is such that the interests of bio-ethanol investors and feedstock providers are balanced with those of fuel consumers and small-scale farmers.

11.5 Country Policy Table – South Africa

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Minerals and Energy (DME)	White Paper on Renewable Energy (2003)	Activity - strategy	No	Bioenergy producers	It sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also sets a target of 10000 GWh of renewable energy contribution to final energy consumption by 2013.	
Department of Minerals and Energy (DME)	Draft biofuel industry strategy (2006)	Policy-incentives/targets	Pending	Fuel producers/refineries	It proposes a strategy approach for a biofuel industry development based on the following key elements: 1) Focus on domestic technologies already developed in South Africa, and on local feedstocks, 2) Mandatory take off of biofuel production to reach a 4,5% target (volume licensed under local content and BEE participation); additional volumes over percentage licensed will be sold on negotiated commercial terms. A 10% blend of ethanol into the petrol is proposed. Oil companies are identified by the Government as the most suited to be licensed for biofuel production under the blending target framework; 3) a moderate government support to be phased out once the industry has started and the 4,5% mandatory target achieved	
Department of Minerals and energy (DME)	Petroleum Products Amendment Act (Act No. 58 of 2003)	Policy-mandate/incentives	Yes	Fuel producers/sellers	It enables the Minister of Minerals and Energy to require licensed wholesalers and licensed producers to supply petroleum products made from “vegetable matter”, and to comply to certain specifications before they supply petroleum products made from other raw materials. It mandates specific fuel standards for biodiesel and fuel ethanol according to South African National Standards (SANS). It allows the integration of renewable energy derived liquid fuels such as bio-diesel and ethanol into petroleum industry regulatory framework.	
Ministry of Finance	Federal Gas Act (Act n. 48/2001)	Policy-incentives	Yes	Fuel producers/sellers	It allows fuel levy exemption for biodiesel of 30% from 2003, then increased to 40% from 2005. South Africa Revenue Service (SARS) allows for 100% exemption for small producers (less than 300m3 annually). It allows the integration of landfill gas into the gas industry regulatory framework.	
Department of Minerals and Energy (DME)	Draft Energy Efficiency Strategy	Activity-strategy	No	Industrial, commercial, residential and transportation sectors	It sets a national target for energy efficiency improvement of 12% by 2014 together with sectoral targets. Implementation plans for the Industrial Sector and Commercial and Public Building Sector are currently being finalized for action following approval of the Strategy. Plans for the Residential and Transport Sectors were foreseen to be developed during 2005.	
Ministry of Finance	CEF Act (Act N.38 1977)	Policy-incentives	Yes	Bioenergy and biofuels producers	It allows to impose levies on liquid fuels products for collection into the Central Energy Fund (CEF) and/or the Equalisation Fund. The fund is controlled by the DME in concurrence with the Ministry of Finance. The CEF was created for promoting synthetic fuel production and now proposed to be used also for promoting biofuel, and facilitate universal access to energy, including the increased use of renewable energy. The CEF provides operational support to the energy sector in the form of treasury services, including the raising of funds both locally and internationally. Mechanisms will be investigated to extend the operational support available from the Central Energy Fund to renewable energy programmes (including biomass projects, landfill gas and biofuels projects.)	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement

Impact on Production Stream			Funding Mechanism
Production	Conversion	Use	
	It promotes biomass energy conservation through the use of more efficient renewable technologies such as improved woodstoves and ethanol gel stoves.	It promotes use of bioenergy	
It promotes production of local feedstock for biofuels.		It promotes the creation of a local market for the domestic biofuel industry.	Moderate government support (fuel tax reduction, capital investment incentives, Equalization Fund) is foreseen to facilitate a conducive environment for investments. Use of tradable carbon credits is seen as an important contribution for financing biofuel projects
		It promotes use of biofuels.	
		It promotes use of biofuels.	
	Promotes cogeneration using biomass industrial boilers. Promotes investigation on biomass -using appliances for residential sector		
	Promotes biomass projects, landfill gas and biofuels projects	It promotes use of bioenergy	

provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.
"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

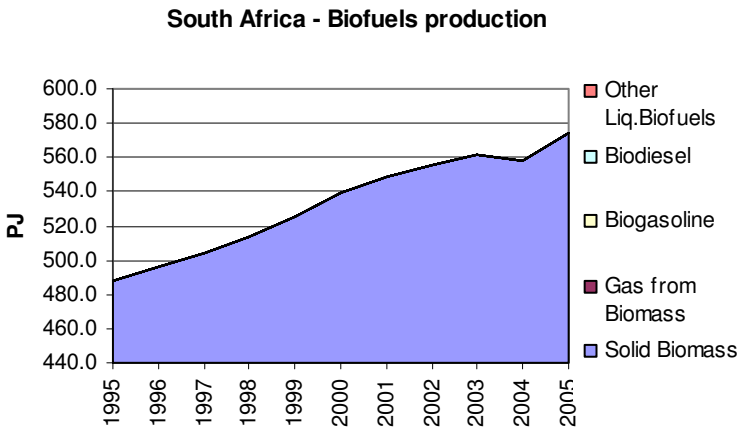
11.6 South Africa Bioenergy Outlook

Table 11.2 - South Africa – Biofuel production

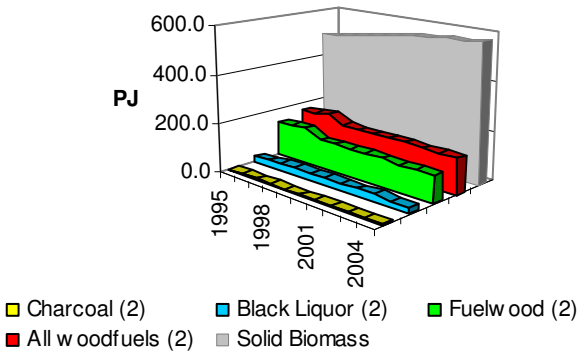
Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	487.9	496.2	504.1	513.2	525.8	538.9	548.9	555.4	561.3	557.4	574.3	
Solid Biomass	487.9	496.2	504.1	513.2	525.8	538.9	548.9	555.4	561.3	557.4	574.3	
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liq.Biofuels												
All woodfuels (2)	170.4	174.4	184.8	154.4	151.9	153.0	151.8	154.4	148.5	147.5	145.7	
Fuelwood (2)	145.0	149.0	153.0	119.4	119.4	119.4	119.4	119.4	110.4	114.8	111.1	
Charcoal (2)	0.8	0.8	0.8	1.3	1.3	1.3	1.3	1.3	6.2	3.9	5.8	
Black Liquor (2)	24.6	24.6	31.0	33.7	31.3	32.4	31.1	33.7	31.9	28.8	28.8	

Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	1.7	1.6	1.8	2.4	2.5	1.8	1.2	1.1	-0.7	3.0
Gas from Biomass										
Biogasoline										
Biodiesel										
Other Liquid Biofuels										

(2) = Based on FAO data



South Africa - IEA Solid Biomass vs FAO Woodfuels



South Africa - Change rate of biofuels production

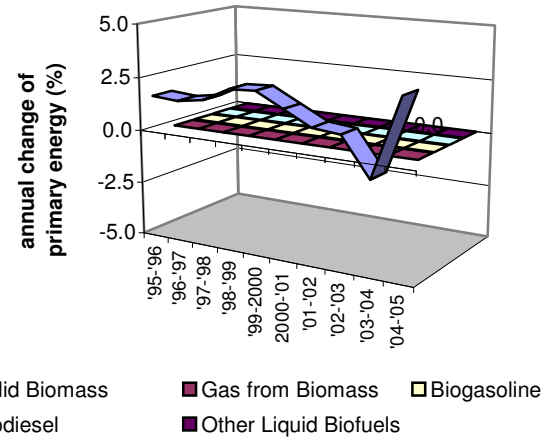


Table 11.3 - South Africa – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.7	0.7	0.3	0.3	0.2	0.2	0.3	0.0	0.2	0.3	0.4	
Fuelwood (2)	0.4	0.4	0.0	0.0	0.0							
Charcoal (2)	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.0	0.2	0.3	0.4	

(2) = Based on FAO data

Table 11.4 - South Africa – Biofuel Export (PJ)

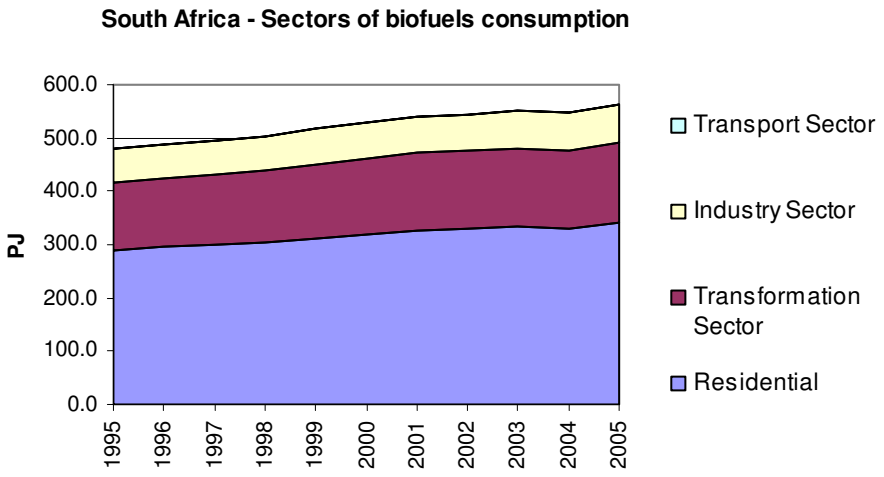
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	9.0	9.1	9.3	9.5	9.7	9.9	10.1	10.3	10.4	10.3	10.6	
Solid Biomass	9.0	9.1	9.3	9.5	9.7	9.9	10.1	10.3	10.4	10.3	10.6	
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	1.1	1.0	0.9	0.9	1.4	1.4	1.2	1.0	0.9	1.2	1.6	
Fuelwood (2)	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.1	0.1	0.1	
Charcoal (2)	1.0	1.0	0.9	0.9	1.4	1.4	1.2	1.0	0.8	1.1	1.5	

(2) = Based on FAO data

Table 11.5 - South Africa – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	479.0	487.2	494.9	503.9	516.2	529.1	538.9	545.3	551.1	547.2	563.8	
	Transform.	125.0	128.0	131.3	134.8	137.6	142.5	145.1	146.0	147.6	146.6	150.9	
	Industry	64.0	64.2	64.0	64.0	66.1	66.3	67.6	69.1	69.9	69.4	71.6	
	Transport												
	Residential	290.0	294.9	299.6	305.0	312.5	320.3	326.2	330.1	333.6	331.3	341.3	
Solid Biomass	Dom. Supply	479.0	487.2	494.9	503.9	516.2	529.1	538.9	545.3	551.1	547.2	563.8	
	Transform.	125.0	128.0	131.3	134.8	137.6	142.5	145.1	146.0	147.6	146.6	150.9	
	Industry	64.0	64.2	64.0	64.0	66.1	66.3	67.6	69.1	69.9	69.4	71.6	
	Transport												
	Residential	290.0	294.9	299.6	305.0	312.5	320.3	326.2	330.1	333.6	331.3	341.3	
Gas from Biomass	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biogasoline	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Biodiesels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)



12 Country Profile - UNITED KINGDOM

12.1 Overview

Bioenergy expansion in the United Kingdom is driven by the potential it holds to provide an affordable, practical, renewable source of secure energy, while addressing climate change mitigation and promoting rural development.

In 2006, 81 percent of the United Kingdom's primary energy supply was produced from indigenous sources. The United Kingdom imported energy equivalent to 61 percent of total supply but exported energy equivalent to 40 percent of total supply. Total final energy consumption amounted to 7 100 PJ (169.6 million tonnes of oil equivalent). This is 3 098 PJ (74 Mtoe) less than total primary supply (10 207 PJ or 243.8 Mtoe) because of conversion and distribution losses, energy industry use, and non-energy uses. Of this total primary energy supply, 770 PJ (18.4 Mtoe) came from non-carbon sources such as nuclear power, hydroelectricity, and imports of electricity (net of exports) and a further 172 PJ (4.1 Mtoe) came from combustible renewables and wastes.

Renewable energy sources accounted for 1.8 percent of total primary energy supply in 2006. Of these sources, solid municipal waste combustion accounted for approximately 49 PJ (1.167 Mtoe), with biomass providing 29.5 PJ (0.704 Mtoe) and solid waste providing 19.4 PJ (0.463 Mtoe) of the energy supplied.

Table 12.1– [PJ]

Total Primary Energy Supply	Imported[187]	Renewable	Biomass
100%	50%	15%	4%
11 265	-5 610	1 731	499

Source: IEA, 2004

Table 12.2– [PJ]

SUPPLY	Coal	Crude Oil	Petroleum Products	Gas	Nuclear	Hydro	Wind and wave	Combustible renewables and waste (1)	Electricity	Heat	Total
Production	11376	83958	0	80013	16945	396	400	3579	0	0	196668
Imports	33299	64872	29335	20983	0	0	0	497	884	0	149870
Exports	-462	-54875	-31474	-10369	0	0	0	0	-238	0	-97417
International Marine Bunkers**	0	0	-2486	0	0	0	0	0	0	0	-2486
Stock Changes	-966	-391	-917	-553	0	0	0	0	0	0	-2827
TPES	43248	93564	-5543	90073	16945	396	400	4076	646	0	243808
TFC	2638	0	82044	53572	0	0	0	603	29474	1275	169606

(1) includes geothermal and solar heat

Source: Digest of UK Energy Statistics 2007, Tables 1.1 and 7.7

[187] A negative value has to be intended as an Export

12.2 Country Objectives and Drivers

United Kingdom's energy policy is driven by four factors: the environment; energy reliability and security; affordability for the poor; and competitive pricing for businesses, industries, and households.

The key aims of the United Kingdoms's policies on renewable energy are:

- Meeting national and international targets for emission reductions, including GHG;
- Providing secure, diverse, sustainable, and competitive energy supplies;
- Stimulating the development of new technologies to promote sustainable long-term growth in renewables;
- Creating a competitive, United Kingdom-based renewables industry for domestic and export markets and thereby generating employment opportunities; and,
- Contributing to rural development.

The dominant motivation for developing renewable energy is climate change mitigation, although energy security is also rapidly emerging as another important factor. The United Kingdom has a legally binding target under the Kyoto Protocol to reduce its GHG emissions by 12.5 percent below 1990 levels by 2008-2012. In addition, the United Kingdom's draft Climate Change Bill[188] proposes a legally binding requirement to reduce United Kingdom carbon dioxide emissions by 26-32 percent by 2020 and 60 percent by 2050. The United Kingdom has also set a demanding target to meet 10 percent of electricity from renewable sources by 2010 and an ambition to meet 20 percent in 2020.

The UK Climate Change Programme 2006[189] sets out the government's policies and priorities for addressing climate change. The important role that renewable energy, including bio-energy, can play in delivering the United Kingdom's wider energy and climate change goals is recognized in the Programme as well as in the Energy White Paper[190] and UK Biomass Strategy[191], both published in May 2007. The Biomass Strategy incorporates the objectives of the Non-Food Crops Strategy, which provides a framework for the sustainable and competitive development of renewable materials and fuels from biomass.

12.3 Bio-energy Policy by Sub-Sector

The first policy to support renewable energy was the Fossil Fuel Levy, which was introduced in the 1989 Electricity Act through the Non-Fossil Fuel Obligation (NFFO). Under NFFO, suppliers were invited to enter into fixed-term contracts at premium rates for electricity. The overarching

[188] UK Draft Climate Change Bill (March 2007) (available at http://www.defra.gov.uk/environment/climatechange/uk/legislation/index.htm)
[189] UK Climate Change Programme 2006 (March 2006) – HM Government
[190] Energy White Paper (May 2007) – UK Department for Business, Enterprise and Regulatory Reform: (DBERR) (available at http://www.dti.gov.uk/energy/whitepaper/page39534.html)
[191] UK Biomass Strategy (March 2007) – DEFRA, Department for Transport and DBERR: (available at http://defraweb/environment/climatechange/uk/energy/renewablefuel/index.htm)

goal of this United Kingdom energy sector policy was to establish open, competitive markets for energy products and services, and reduce public ownership of electricity services.

The NFFO was later augmented by "The Renewable Obligation Order 2002" which placed a requirement on all licensed electricity suppliers in the United Kingdom to supply a specified and growing proportion of their sales from renewable sources – with the aim of achieving 10 percent by 2010, subject to the costs being acceptable to the consumer. Under the 2002 programme revision, corporations could also sign onto a climate change agreement. Energy generated from renewables would be exempt from the Climate Change Levy imposed on energy use by all businesses. Effective April 2001, this tax applies to gas, electricity, liquefied petroleum gas, and coal[192]. Fuel oils are exempt from the Climate Change Levy because they are already subject to the Hydrocarbon Duty Levy. If a company fails to reach the targets, they may remain in the Climate Change Agreement, but are ineligible to receive the tax discount for two years. If the company manages to meet the targets by the next review, the tax discount can be reinstated.

A further part of the United Kingdom's renewable policy involves the development of renewable materials to provide energy, fuels and industrial products. The government recognizes the potential of these sectors and the important part they can play in helping to meet sustainable development targets, benefiting industrial competitiveness and the rural economy, and protecting the environment by replacing products made from fossil fuels.

Renewable materials, including biomass, produced by agriculture can be put to a wide variety of non-food uses. Crops can form the basis of renewable energy and fuels, and can form the feedstock for an increasing range of industrial materials such as starch based plastics and polymers, plant based lubricants, solvents and panelling for the automotive and construction industries. In addition they can be used for an array of novel uses such as toiletries, pharmaceuticals, antimicrobials or as part of a programme of bioremediation.

In November 2004 the United Kingdom Department of Environment, Food and Rural Affairs and the then Department of Trade and Industry jointly published "A strategy for non-food crops and uses - creating value from renewable materials"[193]. The strategy sets out an extensive range of actions to encourage the development and wider use of renewable materials. Implementation of the Strategy is overseen by a Project Board comprising representatives from government, industry, consumers, academia and other stakeholders, including representative of feedstock growers. The government-sponsored National Non-Food Crops Centre[194] (NNFCC) takes a lead role delivering strategy actions. The NNFCC was launched in 2003 and provides a single, authoritative source of information in the United Kingdom on the use and implementation of non food–crop products and technologies. The main function of the NNFCC is to derive, maintain and disseminate data on the non-food uses of crops and to help turn ideas into successful products and supply chains. The NNFCC has

[192] European Renewable Energy Council, "Renewable Energy Policy Review: United Kingdom," May 2004
[193] UK Strategy for Non-food Crops and Uses (November 2004) – DEFRA and DTI (available at http://defraweb/farm/crops/industrial/non-food/strategy/index.htm)
[194] UK National Non-Food Crops Centre (available at http://www.nnfcc.co.uk/metadot/index.pl)

established a Strategy Group which provides strategic guidance to government on the future development of the non food crop sector.

The strategy is supported by a research and development programme. This aims to fund high quality, innovative, pre-competitive research that enhances the non-food uses of renewable materials for sustainable development and positive environmental outcomes, and which also have clear potential for commercial uptake. The programme encourages the exchange of knowledge between the private sector and the research based in furthering the non-food uses of renewable materials to support sustainable development.

The government published a two year progress report of the Strategy in 2006. This showed that significant progress had been achieved in the way the United Kingdom produces and uses bio-energy and renewable materials. In particular, there had been a fivefold increase in sales of biofuels in United Kingdom between 2004 and 2005, with production of biodiesel increasing at a similar rate between 2003 and 2005, while the amount of land being used for non-food crops increased by 75 percent over the same period. The strategic action plan has been revised in line with recommendations in the progress report for some re-focusing of the strategic actions.

Power generation

The national envisaged target is 10 percent of electricity supply from renewable energy by 2010 with a further aspiration to derive 20 percent of electricity from renewable sources by 2020[195].

In 2005, the Renewable Obligation Order was again revised. Under the 2005 amendment, the required percentage of electricity supplied from renewables will increase incrementally between 2011 and 2016 from 11.4 percent to 15.4 percent and level off at 15.4 percent through 2027[196].

Heat Production

There is a national target to produce at least 10,000 MWe of installed good quality CHP capacity by 2010 with at least 15 percent of electricity in government buildings being supplied in this way.

In 2004, the United Kingdom Government laid out its strategy for implementing CHP through 2010[197]. Developed by the Department for Environment, Food, and Rural Affairs, the strategy incorporates the full range of support measures to support the growth of CHP capacity, meet national targets, and lay the foundation for long-term growth. For example, Combined Heat and Power, including Combined Heat and Power from renewable sources, benefits from

[195] DTI, The Energy Challenge: Energy Review, UK Department of Trade and Industry (DTI), 2006. (Now Department for Business, Enterprise, and Regulatory Reform - BERR)
[196] BERR, Implementation Guidance for the Renewables Obligation Order 2005, Department for Business, Enterprise, and Regulatory Reform (BERR), 2005.
[197] DEFRA, The Governments Strategy for Combined Heat and Power to 2010, Department for Environment, Food, and Rural Affairs (DEFRA), 2004.

Enhanced Capital Allowances, exemption from the Climate Change Levy, and a favourable regime under the second phase of the EU Emissions Trading Scheme.

Renewable heat, usually, but not always, sourced from biomass, currently accounts for only around 1 percent of heat supply in the United Kingdom.[198] Primarily, the United Kingdom has supported the development of renewable heat through capital grant schemes (e.g. the Bioenergy Capital Grants Scheme and the Low Carbon Buildings Programme) and programmes to support growing and supplying biomass (e.g. the Energy Crops Scheme and the Bioenergy Infrastructure Scheme). Renewable heat through CHP has been supported through a wide range of mechanisms. Large renewable heat loads (over 20 MWth) receive incentives/benefits under the Emissions Trading Scheme.

The United Kingdom Government is currently seeking to secure sustainable investment to support further development of renewable heat and achieve the growth potential that has been identified in the sector. To meet targets, the United Kingdom Government recently enacted legislation to extend the scope of its Energy Efficiency Commitment (EEC) and promote micro-generation by energy suppliers, including biomass, as part of their activities. The statutory consultation on EEC 2008-11 is underway.

Transport

The main national target is the introduction of an obligation requiring transport fuel suppliers to ensure that biofuels make up 5 percent of their total road transport fuel sales by 2010.

By the end of 2006, biofuels made up around 0.5 percent of overall road transport fuel sales in the United Kingdom. These biofuels came from both imported and domestically produced feedstocks. Included as part of the Energy Act 2004, the Renewable Transport Fuel Obligation (RTFO) – which is due to come into effect in April 2008 - will require transport fuel suppliers to ensure that 5 percent of all road vehicle fuel is supplied from sustainable renewable sources by 2010. In practice, meeting this obligation will most likely be achieved by blending bioethanol and biodiesel (derived from sources such as palm oil, oilseed rape, cereals, sugar cane, sugar beet, and reprocessed vegetable oil) with fossil fuels. This program, managed by the United Kingdom Department for Transport, is expected to promote additional imports/trade and assist the United Kingdom in complying with the European Union biofuels directive, which sets a reference value for biofuel usage of 5.75 percent by the year-end 2010. The RTFO should reduce carbon emissions in the transport sector by around 2 - 3 percent.

In 2002, the Department for Transport published “Powering Future Vehicles (PFV) Strategy” which outlines some targets and policies for cutting GHG emissions from the transport sector. Several bioenergy activities have emerged as a result of the PFV framework such as the formation of the Low Carbon Vehicle Partnership and the voluntary Fuel Economy Labeling Scheme for new cars. The government’s overarching goal is to ensure that the United Kingdom takes a leading role in the global shift towards low carbon transport.

[198] DEFRA (2007), UK Biomass Strategy, Department for Environment, Food, and Rural Affairs (DEFRA), London, UK.

To promote stakeholder engagement and provide broad input, the PFV called for the establishment of a stakeholder partnership which begun in 2003. The Low Carbon Vehicle Partnership[199] plays a key role in helping the government deliver its objectives to promote the development, introduction and take-up of new low carbon vehicle technologies and fuels.

The United Kingdom Government revised the Vehicle Excise Duty ('road tax') – managed by the Driver and Vehicle Licensing Agency - so that cars registered on or after March 1, 2001 are taxed according to their CO_2 emissions. There has been a noticeable increase in the ownership of diesel cars, which produce lower CO_2 emissions, but generally produce increased particulates.

During 2005, a voluntary Fuel Economy Labeling scheme was also introduced for labels to be displayed on new cars. Managed by the Department for Transport and the Vehicle Certification Agency, this scheme brings the United Kingdom into line with European Directive 1999/94/EC. It aims to influence the behavior of consumers and manufacturers by disclosing information about the Vehicle Excise Duty and likely fuel costs[200] on vehicles sold in the United Kingdom.

12.4 Results and Future Challenges

Modern United Kingdom renewable energy policy objectives and targets incorporate the United Kingdom climate change programme targets introduced in November 2000 and lay out a strategy to achieve the United Kingdom's Kyoto targets for reducing GHG emissions. The national carbon dioxide emissions targets in the draft Climate Change Bill will, when implemented, continue to drive renewable energy policies forward. Keeping an eye on market and development opportunities, the United Kingdom is working to stimulate the development of new and renewable energy technologies where they have prospects of being economically attractive and environmentally acceptable in order to contribute to: a diverse, secure, and sustainable energy supplies; a reduction in pollutant emissions; and, the encouragement of internationally competitive renewable energy industries.

Bio-energy remains a key component of the United Kingdom's renewables policy. Key national instruments and incentives, including the Renewables Obligation and the Renewable Transport Fuel Obligation, are either in place or under active development.

The United Kingdom Government is committed to making the most of the potential of biomass heat and power, including anaerobic digestion. Through its Biomass Strategy, the United Kingdom aims to realize a major expansion in the supply and use of biomass. The United Kingdom Government estimates that biomass energy has the potential to produce about 6 percent of electricity demand by 2020. Currently only about 1 percent of United Kingdom heat demand is supplied by renewable sources, but it is believed that renewable heat, including biomass, has the potential to make a larger contribution to delivering low carbon heat in the

[199] Low Carbon Vehicle Partnership (available at http://www.lowcvp.org.uk/about-lowcvp/our-working-groups.asp)
[200] The Guardian, "Wake Up Call from Woking", June, 2005 (available at http://politics.guardian.co.uk/interviews/story/0,,1516676,00.html)

United Kingdom. It is anticipated that by 2020 some 1 million hectares of land will be used to support biomass production. This is in line with European Environment Agency estimates of land available to support environmentally sustainable biomass production in the United Kingdom. The England Woodfuel Strategy[201], published in March 2007, highlighted the potential of 1 million tonnes of currently under-utilized resource in existing under-managed woods. The United Kingdom intends to bring about an increase in biomass supply by:

- Sourcing an additional 1 million tonnes of wood from unmanaged woodlands;
- Increasing the recovery of wood for energy from managed woodlands by using waste timber products;
- Increasing land used for production of perennial energy crops by some 350,000 hectares, and
- Increasing utilization of organic waste materials.

The United Kingdom Government estimates that up to 3.5 million tonnes of carbon could be saved annually if all the potentially available biomass is used for heat and electricity.

Following the review of the Non-Food Crops Strategy in 2006, a more focused action plan has been drawn up and this will focus in particular on:

- The development of biorefineries to provide a sustainable manufacturing base for energy, fuels, biomaterials and chemicals;
- Plant-based pharmaceuticals, nutriceuticals and bio-actives;
- Renewable construction materials, and
- Renewable chemicals, including oils, monomers and polymers.

12.5 Best Practices

In the United Kingdom, *construction and demolition* generates 90 million tonnes of waste annually – three times the waste produced by all United Kingdom households combined – and more than a fifth of the United Kingdom's hazardous waste. The energy used in constructing, occupying and operating buildings represents about half of GHG emissions in the United Kingdom. Therefore, the government believes that the potential for the use of new and innovative environmental technologies to promote sustainable development is strong in construction. To reduce waste generated from during construction, DEFRA is promoting the development of the renewable construction materials sector as one of its four priority areas under the Defra Renewable Fuels and Materials Programme.

The use of renewable materials in construction promotes carbon savings as most of these products are carbon negative rather than carbon neutral and require less fossil fuel energy to produce. For example, it takes 1.84 tonnes of CO_2 to make a tonne of dry hemp. Therefore each tonne of a hemp based construction material has carbon trapped within it equivalent to 330 kg of CO_2, thus removing the carbon from the atmosphere for the life of the

[201] A Woodfuel Strategy for England (March 2007) – Forestry Commission England

building.[202] Similarly, the use of renewable materials can add to the social benefits by improving the health of those in the construction sector working with the materials (natural sheep's wool or hemp fibre insulation is less toxic than some of the rockwall/fibre glass alternatives) and those living in the homes (i.e. hemp lime blocks are more 'breathable' than other materials, can improve the air flow and quality, and help avoid many of the 'symptoms' of sick building syndrome).

Another area in which the United Kingdom is exploring opportunity is *bio-lubricants*. Lubricants made from renewable bio-resources are not a new technology, but for the last 100 years, mineral oil based lubricants have predominated. However mineral oil has poor biodegradability, greater persistence in the environment and more pronounced toxicity. This fact prompted interest by the government to explore opportunities in vegetable based lubricants.

The use of synthetic esters derived from harvestable resources has proved highly successful in the United Kingdom in recent years. Product formulations have been developed, trialed and put into service for almost all lubricant applications with some of the performance pluses giving pronounced advantages.

[202] GBEP – UK Examples (provided by the UK Country Representative as part of this report)

12.6 Country Policy Table – United Kingdom

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department for Business, Enterprise and Regulatory Reform	Renewables Obligation (RO) (April 2002 - March 2027)	Policy - Targets	Yes	Electricity Suppliers	Requires electricity suppliers to provide an increasing amount of electricity from renewables (including biomass) until 2016/17. Target of 10% by 2010 and 20% by 2020 have been proposed.	
Department for Transport	Renewable Transport Fuel Obligation (RTFO) - (Proposed for Implementation in April 2008)	Policy - Targets/Criteria	Pending	Transport Fuels (Producers/Suppliers)	Will place legal requirement on transport fuel suppliers to ensure that a certain percentage of overall fuel sales is from a renewable source (up to 5% by 2011)	
Department for Environment, Food and Rural Affaris	EU Emissions Trading Scheme	Policy - Targets	Yes	Industry	Under the scheme's monitoring and reporting guidelines, biomass fuel is given a zero rating in terms of how much CO_2 it release's when used. Installations maybe able to meet their cap through the use of biofuel and be able to sell spare EU allowances (one allowance = 1 tCO_2)	(Industrial)The generation of a carbon price has incentivised industry to invest in carbon abatement technologies and to consider the use of alternatives to fossil fuel.
Department for Business, Enterprise and Regulatory Reform; Department for Environment Food and Rural Affairs, Big Lottery Fund	Bio-energy Capital Grant Scheme	Policy - Targets	No	Industry, commercial and community sectors	Provides capital grants to install dedicated biomass-fuelled heat, combined heat and power (CHP) and electricity generating projects.	
Department for Environment Food and Rural Affairs	Bio-energy Infrastructure Scheme	Policy -Targets	No	Farmers, foresters and feedstock supply businesses	Provides funding to help develop the supply chain required to harvest, store, process and supply short rotation coppice, miscanthus, other grasses, straw and woodfuel to heat and power end users.	
Department for Environment Food and Rural Affairs; Natural England	Energy Crops Scheme	Policy - Targets	No	Farmers	Grants to support the establishment of short rotation coppice and miscanthus for energy end-use. Production must meet environmental standards.	
Department for Business, Enterprise and Regulatory Reform	Low Carbon Buildings Programme	Policy - Targets	No	Householders, public, not-for-profit and commercial sectors.	Grants to support the installation of a range of microgeneration technologies, including bio-energy boilers/heaters	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		Increased use of renewables from biomass in the generation of electricity.	Market driven, based on the sale of Renewable Obligation Certificates (ROCs) earned by renewable energy generators for each 1MWh of electricity generated, or re-cycling of a buy-out fund to companies presenting ROCs	Mandate increase requirements end in 2016/17 but policy in affect until March 2027.
		Sets blending mandate on the end-use product, including a requirement to report against sustainability criteria.		
		Increased use of biofuel by installations covered by the scheme.	Global carbon market valued at €22.5 billion in 2006	
Will help to stimulate the UK biomass feedstock supply chain.	Promote innovation and capacity building in low carbon boiler technology.	Promotes the efficient use of biomass for energy.	Grants of nearly £75 million made available since 2002. Further funding expected for 2008/09-2010/11	
Intended to stimulate production and supply of biomass feedstocks for energy.			£3.5 million available from 2005/06.	
Intended to stimulate production and supply of certain biomass feedstocks for energy.			The Scheme forms part of the England Rural Development Programme and is administered by Natural England who disburse payments.	Farmers can also receive the annual €45/ha Energy Aid payment for energy crops grown on non-set aside land for heat, power and transport, and the Single Payment for energy crops on set-aside land.
		Intended to stimulate the availability and application of a range of microgeneration technologies in the sectors covered by the scheme	Approximately £80 million available through two phases.	

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department for Transport	Refueling Infrastructure Grant Programme (July 2005)	Activity - Incentive Programme	No	Transport Fuels (Suppliers)	Increase in infrastructure for alternative refueling stations for road vehicles.	
Department for Business, Enterprise and Regulatory Reform	Regional Grant Assistance Programme (2005)	Activity - Incentive Programme	No	Industry / Infrastructure	Establishes bioenergy plants and related industries in the UK	
Department for Transport	Fuel Duty Incentive	Policy - Incentive Programme	Yes	Transport Fuels (Suppliers)	Provides a 20 pence duty differential on biodiesel and bioethanol with the level of duty incentive guaranteed through 2008/09	
Department for Environment Food and Rural Affairs; Natural England	National Non-Food Crops Centre	Activity – Centre of excellence and expertise in bio-energy technologies	No	Provides advice and information, supports strategic implementation and market innovation in bio-energy technologies	Is the UK's independent authority on plant-based renewable materials and technologies; brings products to market by building and strengthening supply chains supports producers, manufacturers and consumers; provides comprehensive information on all sectors; supports implementation of the UK Strategy for Non-food Crops	
Forestry Commission	Biomass Energy Centre	Activity – on-line advisory service in biomass	No	A one-stop-shop for information on biomass-derived solid, liquid and gaseous fuels, and associated conversion technologies	Provides information and advice of use to those operating in the bio-energy field. To improve understanding on a range of biomass fuels and conversion technologies	Also likely to be of indirect benefit as a source of advice to those such as farmers interested in getting involved in bio-energy field.
Department for Business, Enterprise and Regulatory Reform	Center of Excellence (CENEX)	Activity - Research and Development	No	Academic/Research Institutions		(Industrial) Promotes research and development UK wide of hydrogen and fuel cell demonstration programmes.
Department for Transport	Low Carbon Vehicle Partnership	Activity - Research and Development	No	Industry / Government	Develops a robust and user-friendly carbon saving calculation methodology for different biofuel product chains, and a biofuel standard to ensure biofuels are sourced sustainably and creates the Biofuels Sustainability Unit within the DfT which will take the LowCVP work forward and develop sustainability and carbon certification reporting frameworks to implement the RFTO	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		Promotes development of bioenergy infrastructure for consumer use		
	Provides funding for the development of bioenergy facilities in qualifying regions			Qualifying regions and industrial areas are not always aligned.
		Promotes use of biodiesel and bioethanol and stimulates market growth	This program has been the major bioenergy funding mechanism in the UK prior to the introduction of the RFTO	
Influences developments across all three parts of the production stream	Influences developments across all three parts of the production stream	Influences developments across all three parts of the production stream	A not-for-profit organization. Funded by Defra, partner organizations, subscriptions and commercial activities.	
Potential to influence developments across all three parts of the production stream	Potential to influence developments across all three parts of the production stream	Potential to influence developments across all three parts of the production stream	Funded by Government	
	Provides development of fuel cell technologies that are potentially transferable for use with other bio-energy sources		£15 Million disbursed over 4 years from UK Government to support this activity.	
	Assesses the comparative advantage of the UK is the development of bio/renewable energy looking at various renewable resources. Pilot work underway for Hydrogen and hydrogen fuel cells.			

"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

12.7 United Kingdom Bioenergy Outlook

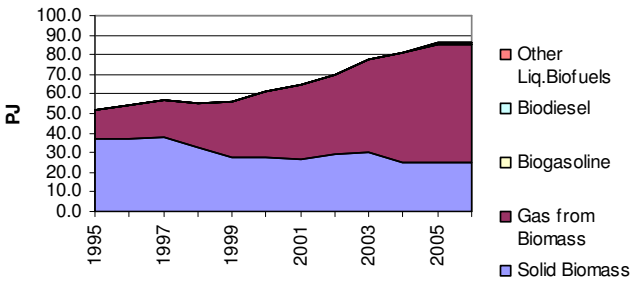
Table 12.3 - United Kingdom – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	51.9	54.0	56.7	55.1	56.3	61.5	64.4	69.7	77.5	81.4	86.0	86.0
Solid Biomass	37.1	37.3	37.6	33.2	27.6	27.6	26.5	29.5	30.2	24.7	25.3	25.3
Gas from Biomass	14.8	16.7	19.1	22.0	28.7	33.9	37.8	40.2	47.2	56.7	60.3	60.3
Biogasoline												
Biodiesel											0.4	0.4
Other Liq.Biofuels												
All woodfuels (2)	19.8	19.8	19.6	19.4	19.4	6.6	6.4	6.7	6.9	6.8	5.8	
Fuelwood (2)	17.6	17.8	17.4	17.5	17.5	5.0	4.8	4.7	4.7	4.7	5.6	
Charcoal (2)	0.1		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Black Liquor (2)	2.1	1.9	2.0	1.7	1.7	1.4	1.4	1.8	2.1	2.0		

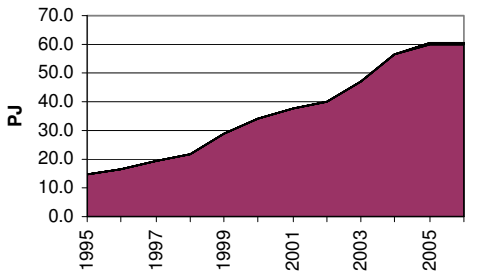
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	0.6	0.8	-11.8	-16.7	-0.2	-3.9	11.3	2.5	-18.2	2.2
Gas from Biomass	12.7	15	14.9	30.5	18.3	11.6	6.2	17.5	20.0	6.4
Biogasoline										
Biodiesel										
Other Liquid Biofuels										

(2) = Based on FAO data

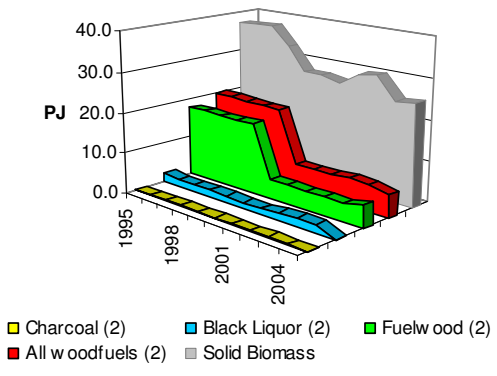
UK- Biofuels production



UK- Liquid and gaseous biofuels production



UK- IEA Solid Biomass vs FAO Woodfuels



UK- Change rate of biofuels production

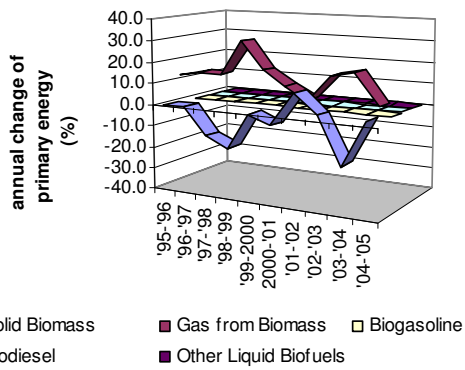


Table 12.4 - United Kingdom – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels								0.1	4.5	14.8	29.5	29.5
Solid Biomass									3.9	14.1	26.5	26.5
Gas from Biomass												
Biogasoline											1.9	1.9
Biodiesel								0.1	0.6	0.7	1.0	1.0
Other Liquid Biofuels												
All woodfuels (2)	1.9	2.4	1.8	2.0	1.6	2.1	2.1	2.1	2.4	2.5	3.5	
Fuelwood (2)	0.5	0.6	0.4	0.5	0.3	0.7	0.8	0.8	0.7	0.7	1.8	
Charcoal (2)	1.4	1.8	1.4	1.5	1.3	1.4	1.3	1.3	1.7	1.8	1.6	

(2) = Based on FAO data

Table 12.5 - United Kingdom – Biofuel Export (PJ)

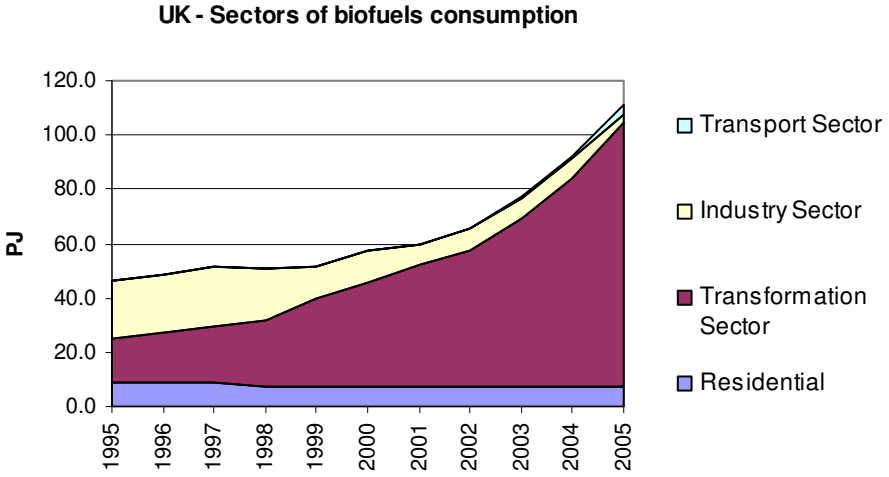
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	0.1	0.1	0.4	1.4	1.4	2.4	1.7	1.2	3.7	1.8	2.2	
Fuelwood (2)	0.1	0.0	0.3	1.4	1.4	2.3	1.6	1.1	3.4	1.6	2.0	
Charcoal (2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.2	

(2) = Based on FAO data

Table 12.6 - United Kingdom – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	51.9	54.0	56.7	55.1	56.3	61.5	64.4	69.8	82.0	96.2	115.5	115.5
	Transform.	16.7	18.4	21.2	24.6	32.9	38.3	45.4	50.6	62.3	76.4	97.2	
	Industry	21.4	21.8	21.8	18.8	11.7	11.7	7.4	7.4	7.4	7.4	3.4	
	Transport								0.1	0.6	0.7	3.4	
	Residential	8.5	8.5	8.5	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	
Solid Biomass	Dom. Supply	37.1	37.3	37.6	33.2	27.6	27.6	26.5	29.5	34.1	38.9	51.8	51.8
	Transform.	4.7	4.6	4.9	5.2	6.8	6.7	9.9	12.9	17.5	22.3	39.3	
	Industry	20.9	21.1	21.2	18.3	11.1	11.1	6.9	6.9	6.9	6.9	2.8	
	Transport												
	Residential	8.5	8.5	8.5	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	
Gas from Biomass	Dom. Supply	14.8	16.7	19.1	22.0	28.7	33.9	37.9	40.2	47.2	56.7	60.3	60.3
	Transform.	12.0	13.8	16.4	19.4	26.1	31.6	35.5	37.6	44.7	54.2	58.0	
	Industry	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	Transport												
	Residential												
Biogasoline	Dom. Supply											1.9	1.9
	Transform.												
	Industry												
	Transport											1.9	
	Residential												
Biodiesels	Dom. Supply								0.1	0.6	0.7	1.5	1.5
	Transform.												
	Industry												
	Transport								0.1	0.6	0.7	1.5	
	Residential												
Other Liquid Biofuels	Dom. Supply												
	Transform.												
	Industry												
	Transport												
	Residential												

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)



13 Country Profile - UNITED STATES

13.1 Overview

The United States' bioenergy initiatives are primarily designed to increase energy security for the transport sector and reduce GHG emissions while improving environmental quality and creating economic growth. Current United States biofuel production is primarily from ethanol from corn[203] with production levels reaching more than 314 PJ in 2005, followed by biodiesel from soybean which reached 8.4 PJ - a significant increase compared to the 2.9 PJ in 2004. Moreover 11.7 PJ of ethanol was imported in 2005, with a large portion of that from Brazil. The United States is also devoting significant resources towards the development and implementation of next generation biofuels technologies in order to help meet the President's goal of reducing gasoline consumption by 20 percent in ten years.

In 2005, the United States' primary energy consumption was 105,089 PJ with energy from biomass representing 3,479 PJ[204] (half of the 9% generated by renewable energy). Production levels for electricity from bioenergy was 60.8 TWh in 2004 and 61.8 TWh in 2005 - representing an increase of 1.6%.

In 2006, the United States' primary energy consumption was 105,360 PJ with energy from biomass representing 3,457 PJ[205]. Roughly three quarters of the biomass energy is use of wood and wood wastes to produce heat and electricity. The use of this wood energy has been relatively stable in the United States in recent years. The production of liquid biofuels, ethanol and biodiesel has been growing rapidly over the last few years and as of 2006 represents roughly a quarter of total bioenergy in the United States (Source: U.S. Energy Information Administration, 2006)

Table 13.1 – [PJ]

Total Primary Energy Supply	Imported[206]	Renewable	Biomass
100%	31%	4.5%	3%
97 380	29 915	4 399	2 944

Source: IEA, 2004

13.2 Country Objectives and Drivers

There are several key goals of United States' bioenergy policy, including reducing dependence on imported oil, environmental considerations including climate change and addressing the need for replacement of oxygenate in motor gasoline, increased economic development, job

[203] Corn constitutes about 90 percent of the feedstock for ethanol production in the United States, the other 10 percent is largely grain sorghum, along with some barley, wheat, cheese whey and potatoes.
[204] EIA, Us Department of Energy
[205] EIA, Us Department of Energy
[206] A negative value has to be intended as an Export

creation in rural economies, expansion of new industries and technologies, and diversification of energy sources.

13.3 Bioenergy Policy by Sub-sector

There are several policies for the promotion of bioenergy in the United States, including the Energy Policy Act of 2005 (EPACT 2005), the 2002 Farm Bill and the Biomass Research and Development Act of 2000 (as amended).

The 2002 Farm Security and Rural Investment Act contained an energy title designed to promote biofuels. The title included: biorefinery development grants, biomass research and development, and federal procurement of bio-based products.

The American Jobs Creation Act of 2004 extended an alcohol fuel mixture tax credit of 51 cents/gallon for mixtures containing ethanol (until 2010 and expanded the flexibility of these credits so that they apply to up to gasoline with up to 10 percent ethanol). The EPACT 2005 provisions included: creation of a Renewable Fuels Standard (RFS) that requires the production of 7.5 billion gallons (28 billion liters) of ethanol by 2012 (which was increased by the President's 20 in 10 proposal in January 2007 by nearly five times, to 35 billion gallons of alternative fuels by 2017), tax incentives for E85 refueling stations, tax and performance incentives, authorizations for loan guarantees, a bioenergy research and development program, and biorefinery demonstration projects. The new five-year Farm Bill for 2007 currently being debated in Congress, is expected to contain significant biofuels incentives. Enactment of the biofuels provisions could have significant impacts on the biofuels industry.

The United States State governments have also been strong supporters of biofuels. Twenty-six states have passed legislation supporting biofuels. Several states have legislation establishing mandates for biofuel blending and measures aimed to support bioenergy production and utilization. Minnesota has enacted a mandate for 20 percent ethanol in gasoline by 2013 and a 2 percent biodiesel blend. In 2005, North Dakota committed up to $4.6 million over two years towards: a tax incentive for consumers who purchase E85, an investment tax credit for ethanol and biodiesel production facilities, and income tax credits and other benefits for biodiesel. In 2005, New York began to implement a "Strategic Energy Action Plan" that included tax credits of up to $10,000 for alternatively fueled vehicles. In 2006, New York announced an initiative to make renewable fuels tax free and available at service stations throughout the state.

Authorized from 2002 through 2015, the Biomass Research and Development Initiative is a multi-agency effort to coordinate and accelerate all Federal biobased products and bioenergy research and development activities.

The Initiative is guided by the Biomass Research and Development Act of 2000 (Title III of the Agricultural Risk Protection Act of 2000, P.L. 106-224). This Act was revised by Section 937 of EPACT2005. Administrated by the Department of Energy and the Department of Agriculture, during 2002 – 2006 the Initiative disbursed almost 160 Million dollars to finance

projects in feedstock production, cellulosic biomass conversion technologies, and manufacturing of bio-based products in biorefineries. Nine cellulosic ethanol facilities are currently under construction in the United States. Other Research and Development activities have been proposed for the FY 2008.

The expansion of the biofuels industry requires the cooperation and coordination of many agencies of the U.S. government. The United States Department of Energy (DOE) and the United States Department of Agriculture (USDA) are the primary agencies responsible for the implementation of initiatives aimed at supporting the development of the bioenergy sectors in the United States of America. In addition, the Environmental Protection Agency issues regulations governing the implementation of the Renewable Fuels Standard. The President has directed the United States Environmental Protection Agency (EPA) and the United States Departments Of Energy (DOE), Transportation (DOT), and Agriculture (USDA) to take the first steps toward regulations that would cut gasoline consumption and GHG emissions from motor vehicles, using as a starting point his "Twenty in Ten" plan to reduce the United States' gasoline consumption by 20 percent over the next 10 years. The Executive Order will ensure coordinated agency efforts on regulatory actions aimed at protecting the environment with respect to GHG emissions from motor vehicles, non road vehicles, and non road engines proceed in a manner consistent with sound science, analysis of benefits and costs, public safety, and economic growth. DOT is involved in regulating pipelines that might be used in the future to transport ethanol or ethanol-gasoline blends. The Department of Defense (DOD) is a large user of all kinds of transportation fuels and is interested in reducing fuel costs by using ethanol and biodiesel. It has an on-going test program to determine the feasibility of blending biofuels into their transportation infrastructure.

A first of its kind interagency workshop was held in November 2006 to develop a National Biofuels Action (NBA) Plan. The NBA Plan will improve government, industry, and other stakeholders' ability to work together to successfully meet the President's Advanced Energy Initiative goal for biomass: to make cellulosic ethanol cost competitive by 2012. The DOE Biomass Program, which was the direct recipient of the President's Advanced Energy Initiative increased funding, has also set a longer term goal to displace 30 percent of the 2004 United States' motor gasoline demand with biofuels by 2030. The DOE refers to these two goals as the *Biofuels Initiative*. The workshop gathered and organized the details of all federally funded activities, both current and planned, that will support the two goals of the Biofuels Initiative. This will range from basic to applied research as well as activities to support deployment and market readiness. Workshop participants helped identify gaps and overlapping efforts across the federal sector, as well as the areas of strength and focus for each agency in the area of biofuels. The meeting outcomes were used to develop the NBA Plan[207]. Participating federal agencies included: USDA, DOE, National Science Foundation, DOT, EPA, Department of Interior, Office of Science and Technology Policy, Office of the Federal Environmental Executive, Department of Commerce, and DOD.

[207] NBA Plan, available at http://www.biofuelspostureplan.govtools.us/

Power Generation

There are no national level mandated targets for the production of electricity from biomass in the United States

The Energy Policy Act of 2005 extended the Renewable Electricity Production Tax Credit (PTC), which is 1.9 cents/KWh for closed-loop biomass and 1 cent/KWh open-loop biomass and is provided to facilities that begin producing electricity by January 2008.The Renewable Energy Production Incentive (REPI) provides financial incentives payments for electricity produced and sold by new qualifying renewable energy generation facilities, REPI payments amount to1.5cents/KWh for the first ten years of operation. The Clean Renewable Energy Bonds (CREBs) were established by the Energy Tax Incentive Act of 2005, under Title III of the 2005 Energy Policy Act. CREB is a financing mechanism that can be issued by cooperative electric companies and governmental bodies (States or Territory) for public sector renewable energy projects; $1.2 Billion have been allocated for the period 2007 – 2026. The Renewable Energy System and Energy Efficiency Improvements Program, was established by the 2002 Farm Bill to make direct loans, loan guarantees and grants to agricultural producers and rural small business to purchase renewable energy systems (including biomass) and make energy efficiency improvements.

Heat Production

No specific policies addressing heat generation from biomass have been identified.

Transport

The Renewable Fuels Standard (RFS), established by the Energy Policy Act of 2005, mandates that all motor gasoline sold in the United States contain 7.5 billion gallons (28.4 billion litres) of renewable fuels by 2012. By 2013 the renewable fuels used should contain 250 million gallons (946 million litres) of fuel derived from cellulosic biomass.

The President's "20 in 10" Initiative set an ambitious Mandatory Fuel Standard of 35 billion gallon (132.5 billion litres) of biofuels by 2017, roughly equivalent to 15 percent of United States' annual gasoline use.

Biofuels incentives started in the Carter Administration with the 1978 Energy Tax Act, following the oil price shocks of the 1970s. The act provided an excise tax exemption for alcohol fuel blends at 100 percent of the gasoline tax, which at the time was 4 cents per gallon. More recently, the American Jobs Creation Act of 2004 introduced the Volumetric Ethanol Excise Tax Credit (VEETC), a tax credit of 51 cents per gallon of ethanol for blenders and retailers. The VEETC was extended by the 2005 Energy Policy Act through 2010, and was expanded to include biodiesel. Producers of biodiesel who use agricultural feedstocks are eligible for a tax credit of $1.00 per gallon, while producers of waste-grease biodiesel can receive a credit of 50 cents per gallon.

VEETC is applied to biofuels regardless of their country of origin. The United States, however, imposes, a 54 cents/gallon other duty and charge on imported ethanol that has been extended by the Tax Omnibus Legislation of 2004 through January 2009, moreover, imports of ethanol are subject to a 2.5 percent Ad Valorem Tariff[208] .

Moreover the Energy Policy Act of 2005 also continued funding for the Biomass Program. The Act provided more than $500 million to promote use of biotechnology and other advanced processes to make biofuels from lignocellulosic feedstocks cost-competitive with gasoline and diesel, to increase production of bio-products that reduce the use of fossil fuels in manufacturing facilities and to demonstrate the commercial application of integrated bio-refineries that use a wide variety of lignocellulosic feedstocks to produce liquid transportation fuels, high-value chemicals, electricity, and heat.

The 2002 Farm Bill included several provisions to promote the development of biorefineries, to provide incentives to feedstock producers and to realize education programs for farmers, local authorities and civil society about the benefits of production and utilization of biofuel. The new Farm Bill is currently being debated in Congress.

The United States private sector has led the world in the development of Flexible Fueled Vehicles (FFV) which are capable of operating on either conventional gasoline or ethanol blends up to 95 percent (E85). The use of FFVs are the most flexible way to allow fuel ethanol consumption to rise beyond 10 percent of gasoline consumption. The United States' private sector is also expanding the ethanol distribution infrastructure. Ford and VeraSun Energy will establish a "Midwest Ethanol Corridor" by converting 40 existing fuel pumps in Illinois and Missouri to E85. General Motors (GM) announced that it will add 26 new E85 pumps in the greater Chicago area through a partnership with VeraSun Energy and Shell.

13.4 Results and Future Challenges

The most significant challenge faced by the United States is to rapidly reduce the cost of cellulosic ethanol feedstock production, transport, and conversion technologies. USDA is working to enhance sustainable strategies, systems and practices for bioenergy feedstock development, production, management and harvest. DOE's Office of Biomass Program is working on both the biochemical and thermochemical conversion platforms to bring the production cost down to competitive levels as quickly as possible. Another challenge is the construction of large number of commercial scale plants that utilize cellulosic feedstocks. The DOE has embarked upon a $385 million program to construct 6 biorefineries that will utilize cellulosic biomass feedstocks and produce ethanol and a variety of bio-products. Additional challenges include: rapid ramp-up of flex-fuel vehicles that can use E85, and construction of infrastructure such as pipelines, retail dispenser pumps, rail, barge, and trucks to move biofuels from production centers into areas of demand. DOE is working with other federal agencies and

[208]Under the Caribbean Basin Initiative (CBI), countries in Central America and the Caribbean have had duty-free access to the United States since 1989 for ethanol from regional feedstocks. Access for ethanol derived from non-regional feedstocks has been limited by a CBI quota equal to 7 percent of total United States ethanol consumption.

the private sector to overcome these challenges and facilitate the growth of biofuels in the United States transportation sector.

13.5 Best practices

Several best practices regarding different aspects of the bioenergy sector have been developed.

Regarding *Resources Potential Assessments*, DOE and USDA have jointly published the report "Biomass as a Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply"[209] in order to determine whether the land resources of the United States are capable of producing a sustainable supply of biomass sufficient to displace 30 percent or more of the country's 2004 petroleum consumption.

The report has generated a significant amount of questions and has highlighted the need for additional analysis in the area of feedstock resource assessment. The technical potential of the resource base has been a valuable tool that can be used to bound estimates of the long-term potential for the contribution of biomass to the United States' energy picture.

Regarding *Life Cycle Analysis*, DOE's Argonne National Laboratory has developed a transportation analysis tool that allows users to accurately evaluate the energy and environmental benefits of advanced vehicle technologies and alternative transportation fuels. The GREET (GHGs, Regulated Emissions, and Energy use in Transportation)[210] model addresses the need for truly comparative full fuel cycle (or well-to-wheel) analyses, calculating, for a given vehicle and fuel system, consumption of total energy; emissions of CO_2-equivalent GHGs - primarily carbon dioxide, methane, and nitrous oxide; emissions of six criteria air pollutants.

Regarding *Reduction of Environmental Impacts*, the Nitrogen Neutrality Policy requires for structural and documentable / verifiable practices that offset predicted increased of nitrogen loadings as a consequence of the growing of biofuel feedstocks.

The policy is analogous to current agricultural policy called "conservation compliance" that is designed to prevent water quality impacts associated with sediment runoff from highly erodible lands or on which federally-supported commodity crops are grown. Research suggests that drainage management could reduce nitrate transport by 30 percent for regions where appreciable drainage occurs in the fall and winter[211]. Although water table management could potentially alter nitrification and de-nitrification reaction, reported reductions in nitrate export with controlled drainage are primarily due to reductions in the volume of flow rather than reductions in nitrate concentration. Some uncertainty arises from difficulties in closing water balances (and

[209] available at http://www1.eere.energy.gov/biomass/publications.html
[210] available at http://www.transportation.anl.gov
[211] Cooke et. al., 2007

therefore N balances) in field studies, and an unknown amount of subsurface flow reduction could be due to lateral seepage and/or increased surface runoff[212]. Simulation studies predict increased surface runoff when higher water tables are maintained by controlled drainage[213], suggesting a potential tradeoff between reduced subsurface drainage and increased surface runoff. Although raising the water table can decrease the volume of infiltrating water entering drainage tile, higher water tables can also increase surface runoff resulting in increased erosion and loss of particulate contaminants such as soil bound phosphorus[214].

Regarding *Information Management and Public Education*, USDA announced the release of the Department's Energy Matrix: a navigational aid that resides on the USDA website that allows the public to search energy related programs that USDA has to offer[215] providing the public and potential recipients with an easy way to navigate the various programs to determine what might be available to meet their needs[216].

Moreover, USDA implements the Biodiesel Education Program that sponsor national conferences, conduct technical workshops and develop partnerships with stakeholders such as engine manufacturers, health organizations, environmental groups, fuel marketers, and State Department of Transportation Offices.

Regarding *International Activities*, the United States Forest Service with funding from USAID, recently completed a biomass project in Russia that focused on developing sustainable forest plantations for fuel wood. The Sustainable Forestry Project built capacity to develop and use GIS in both research and management applications, developed expertise in using prescribed burning for hazard reduction and site preparation for reforestation, improved silvicultural prescriptions and reforestation, improved harvest techniques and harvest equipment, and assessed the economic feasibility of expanded sustainable timber harvesting for biomass utilization.

[212] Cooke et. al., 2007
[213] Skaggs et al. 1995; Singh and Helmers 2006
[214] available at http://www.epa.gov/sab/pdf/5-24-07_hap_draft.pdf
[215] USDA programs support framers, other rural residents, and the nation respond to energy-related issues and opportunities, ranging from basic scientific research to the development and commercialization of new technologies
[216] available at http://www.usda.gov/rus/index2/0208/EnergyPrograms.htm

13.6 Country Policy Table – United States

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Biomass Research and Development Board US Department of Agriculture	Biomass Research and Development Act of 2000, as amended	Legislative-R&D and Demonstration	Yes	Government		
Biomass Research and Development Technical Advisory Committee (Department of Energy / Department of Agriculture)	The Biomass Research and Development Act of 2000, as amended	Legislation - R&D and Demonstration	Yes	Education Institutions, private industry and environmental interest groups	Promotes development of new and emerging technologies for the use of biomass, including processes of production of bio-based fuels and biobased products	
Department of Agriculture	FARM ACT 2002	Legislation - Omnibus	Yes		sec IX Energy	Sec 1 commodities programmes; Sec 2 conservation; Sec 3 Trade; Sec 4 Nutrition Program; Sec 5 credit; Sec 6 Rural development; Sec 7 Research and related matters; Sec 8 Forestry; Sec 10 Miscellaneous.
Department of Agriculture	section 9002, Federal Procurement of Bio-based Products; Farm Act 2002	Legislation - Guidelines	Yes	Government	Establishes a new program for purchase of bio-based products by federal agencies, modeled on the existing program for purchase of recycled materials. A voluntary bio-based labeling program is included.	
Department of Agriculture	section 9003, Bio-refinery Grants; Farm Act 2002	Legislation - Incentives	Yes	Industry	Establishes a competitive grant program to support development of bio-refineries to convert biomass into multiple products such as fuels, chemicals and electricity.	
Department of Agriculture	section 9004, Biodiesel Fuel Education Program; Farm Act 2002	Legislation - Incentives and Education	Yes	Government / Private Entities	Establishes a competitive grant program to educate government and private entities with vehicle fleets, as well as the public, about the benefits of biodiesel fuel use	
Department of Agriculture	section 9005, Energy Audit and Renewable Energy Development Program; Farm Act 2002	Legislation - Information	Yes	Farmers, Ranchers, and Rural Small Business	Authorizes a competitive grant program for the administration of energy audits and renewable energy development assessments to include bioenergy and energy crops.	
Department of Agriculture	section 9006, Renewable Energy Systems and Energy Efficiency Improvements; Farm Act 2002	Legislation - Incentives	Yes	Farmers, Ranchers, and Rural Small Business	Establishes a loan / loan guarantee / grant program to assist eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems and making energy efficiency improvements.	
Department of Agriculture	section 9008, Biomass Research and Development; Farm Act 2002	Legislation - R&D	Yes	Academic Institutions	Promotes research and development activities for development of new and emerging bioenergy technologies and processes for production of bio-based fuels, including biomass.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
	Coordinates federal policies and procedures for promoting R&D and Demonstration activities leading to production of biofuel and biobased products		Same as Biomass R&D Advisory Committee	
	Promotes R&D and Demonstration activities to advance the availability of new technology for the conversion and the use of Biofuels and biobased products		$5 million from Commodity Credit Corporation for 2002 and $14 million/year in the period 2003/2007 + $200 million/year in the period 2006/2015	
			Conservation Security Program (CSP) provides payments and incentives for further environmental management and conservation by farmers who are already implementing such practices. This is a comparatively new program with spending amounts to $260 million annually	
Designed to increase the use of voluntary certification frameworks in the production of bio-based products			Mandates funding of $1 million annually through the Commodity Credit Corporation (CCC) for fiscal years (FY) 2002-07 for testing bio-based products.	
	Provides grants for up to 30% of the costs for development of new and emerging technologies for the use of biomass, including lignocellulosic biomass		Authorization only, no funding	
		Promotes the use of Biodiesel fuel in the by raising public awareness on the benefits of utilizing this biofuel source for transport	$1 million/year from Commodity Credit Corporation in the period 2002-2007.	
Promotes the use of biomass (and renewable in general) by showing to farmers, ranchers and rural small businesses the economic advantage of their use in production schemes			Authorization only, no funding	
		Supports end-use implementation and access to bioenergy for farmers, ranchers and rural small business.	$23 million/year from Commodity Credit Corporation in the period 2002-2007.	
	Promotes new and emerging technologies for use in the production of biofuels and bioenergy.		$54 million from Commodity Credit Corporation for 2002 and $63 million/year in the period 2003-2007	

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Agriculture	section 9010, Bioenergy Program; Farm Act 2002	Legislation - Incentive and Targets	Yes	Producers of Biodiesel and fuel grade ethanol from energy crops, oil seed, or vegetable oils that produce bioenergy.	Lays out targeted incentives based on production levels. Production less than 65,000,000 gallons of bioenergy reimbursed at 1 feedstock unit for every 2.5 feedstock units of eligible commodity used for increased production; Producers of more than 65,000,000 gallons of bioenergy reimbursed at 1 feedstock unit for every 3.5 feedstock units of eligible commodity used for increased production.	
Department of Energy	section 701, Use of Alternative Fuels by Dual-Fueled Vehicles; Energy Act 2005	Legislation - Mandates	Yes	Government	Requires U.S. Government vehicle fleets to use alternative fuels in dual-fuel vehicles unless the Secretary of Energy determines an agency qualifies for a waiver. Grounds for a waiver are: alternative fuel is not reasonably available to the fleet and the cost of alternative fuel is unreasonably more expensive that convention fuel.	
Department of Energy	section703, Incremental Cost Allocation; Energy Act 2005	Legislation - Mandates	Yes	Government	Requires the U.S. General Services Administration (and other federal agencies that procure vehicles for fleets) to spread the incremental vehicle costs of all vehicles.	
Department of Energy	section 704, Alternative Compliance for State and Flexibility; Energy Act 2005	Legislation - Strategy	Yes	Government	Establishes flexible compliance options under the Environmental Protection Act of 1992 to allow agencies to choose a petroleum reduction path for their vehicle fleets in lieu of acquiring Alternative Fuel Vehicles (AFVs). Program has a waiver requirement where agencies must provide evidence to DOE that their petroleum reduction program will achieve results equivalent to alternative fuel vehicles (AFVs) running on alternative fuels 100% of the time.	
Department of Energy	section 705, Report Concerning Compliance with Alternative Fueled Vehicle Purchasing Requirements; Energy Act 2005	Legislation - Mandates	Yes	Department of Energy	Establishes annual agency reporting date of February 15th, for Executive Order 13149 Compliance Reporting to Congress on use of Alternative Fuel Vehicles in government fleets.	
Department of Energy	section 706, Joint Flexible Fuel / Hybrid Vehicle Commercialization Initiative; Energy Act 2005	Legislation - R&D	Yes	Industry / Private Sector / Non Profit Sector	Establishes a research program to advance the commercialization of flexible fuel or plug-in hybrid vehicles. The Act requires vehicles to achieve at least 250 miles per petroleum gallon.	
Department of Energy	sec 1501, Extension and Modification of Renewable Electricity Production Credit; Energy Act 2005	Legislation - Targets and Mandates	Yes	Industry / Transport	This section establishes a program requiring gasoline sold in the United States to be mixed with increasing amounts of renewable fuel (usually ethanol) on an annual average basis. In 2006, 4 billion gallons of renewable fuels are to be mixed with gasoline, and this requirement increases annually to 7.5 billion gallons of renewable fuel by 2012. For 2013 and beyond, the required volume of renewable fuel will include a minimum of 250 million gallons of cellulosic ethanol.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Encourages increased purchase of eligible commodities (energy feedstocks) for the purpose of expanding production of bioenergy and supporting new production capacity.			$150 million/year from Commodity Credit Corporation in the period 2003-2007.	
		Promotes use of biofuels in transport fleets used by government. - Leading by example.		This mandate modifies 42 USC 13212 (EPAct 1992 Section 303)
		Promotes the use of energy efficient vehicles in Government vehicle fleets.		Amending Section 303 of the Energy Policy Act of 1992
		Promotes use of biofuels and energy efficient transportation models at the government level.		Amending the Title V of the Energy Policy Act of 1992
		Establishes national reporting structure for review and analysis by Legislative bodies on government use and implementation of alternative fuel vehicles.		
Promotes development of alternative energy vehicles for transport with a goal of increasing energy efficiency.			Government allocation of $3,000,000 for fiscal year 2005 / $7,000,000 for fiscal year 2006 / $10,000,000 for fiscal year 2007 / $20,000,000 for fiscal year 2008	
		Establishes blending mandates and incrementally increases in the use of ethanol for transportation by setting minimum targets.		

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Energy	section 902, Bioenergy Program; Energy Act 2005	Legislation - R&D	Yes	Industry / Academic Institutions	Provides a framework for Department of Energy biomass and bio-product programmes to partner with industrial and academic institutions to advance the development of biofuels, bio-products, and bio-refineries.	
Department of Energy	section 941, Amendments to the Biomass Research and Development Act of 2000; Energy Act 2005	Legislation - R&D	Yes	Academic Institutions	Promotes development of crops and crop systems that improve feedstock production and processing; convert recalcitrant cellulosic biomass into intermediates that can be used to produce bio-based fuels and products; develop technologies that yield a wide range of bio-based products that increase the feasibility of fuel production in a bio-refinery; analyze biomass technologies for their impact on sustainability and environmental quality, security, and rural economic development.	
Department of Energy	section 942, Production Incentives for Cellulosic Biofuels; Energy Act 2005	Legislation - Incentives and Targets	Yes	Producers	Accelerate deployment and commercialization of biofuels; deliver the first 1,000,000,000 gallons in annual cellulosic biofuels production by 2015; ensure biofuels produced after 2015 are cost competitive with gasoline and diesel; and ensure that small feedstock producers and rural small businesses are full participants in the development of the cellulosic biofuels industry	
Department of Energy	section 932, Bioenergy Program; Energy Act 2005	Legislation - R&D	Yes	Industry / Academic Institutions	Directs the Department of Energy to conduct a program of research, development, demonstration, and commercial application for bioenergy, including: biopower energy systems; biofuels; bioproducts; integrated biorefineries that may produce biopower, biofuels, and bioproducts; cross-cutting research and development in feedstocks; and economic analysis.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
Sets goals for promoting use of biotechnology and other advanced processes to make biofuels from lignocellulosic feedstocks cost-competitive with gasoline and diesel, increasing production of bio-products that reduce the use of fossil fuels in manufacturing facilities, and demonstrating the commercial application of integrated bio-refineries that use a wide variety of lignocellulosic feedstocks to produce liquid transportation fuels, high-value chemicals, electricity, and useful heat.			$167,650,000 for fiscal year 2006; $180,000,000 for fiscal year 2007; and $192,000,000 for fiscal year 2008.	
Promotes development of crops and crops systems that improve feedstock production.	Creates systems for conversion of recalcitrant cellulosic biomass into intermediates that can be used to produce biobased fuels / develop of technologies to increase efficiency of bio refineries.			
Authorizes the establishment of incentives to ensure that annual production of one billion gallons of cellulosic biofuels is achieved by 2015.			$250,000,000	
Develop, in partnership with industry and institutions of higher education: advanced biochemical and thermochemical conversion technologies capable of making fuels from lignocellulosic feedstocks that are price-competitive with gasoline or diesel in either internal combustion engines or fuel cell-powered vehicles; advanced biotechnology processes capable of making biofuels and bioproducts with emphasis on development of biorefinery technologies using enzyme-based processing systems; advanced biotechnology processes capable of increasing energy production from lignocellulosic feedstocks, with emphasis on reducing the dependence of industry on fossil fuels in manufacturing facilities; and other advanced processes			$213,000,000 for fiscal year 2007; $251,000,000 for fiscal year 2008; and $274,000,000 for fiscal year 2009.	

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Energy	20 in 10 initiative	Executive Branch Initiative	Legislation introduced spring 07 and pending	Industry, Academic, State, Environmental, Government, Trade Associaton	35 billion gallons of ethanol equivalent alternative fuels by 2017	Increased alternative fuels vehicles, gas station, infrastructure; new feedstock investment models
Department of Energy	Advanced Energy Initiative	Executive Branch Initiative	DOE Budget reprioritized and approved by Congress in FTY07C/R	Industry, Academic, State, Environmental, Government, Trade Associaton	Making cellulosic ethanol cost competitive by 2012	Increased alternative fuels vehicles, gas station, infrastructure; new feedstock investment models
Department of Energy	Executive Order: Cooperation Among Agencies in Protecting the Environment with Respect to Greenhouse Gas Emissions From Motor Vehicles, Nonroad Vehicles, and Nonroad Engines	Executive Branch Directive	Not needed	Interagency coordination	Encourages DOE, DOT, DOE and EPA to work together to reduce greenhouse gases	Supports 20 in 10 goals
Biomass Research and Development Technical Advisory Committee (Departments of Energy and Agriculture)	section 941, Amendments to the Biomass Research and Development Act of 2000; Energy Act 2005	Legislation - FACA	Yes	Industry, Academic, State, Environmental Government, Trade Associaton, Analyst, Economist	Established a Federal Advisory Committee to advise the Secretary of Energy, the Secretary of Agriculture, and the points of contact concerning: the technical focus and direction of requests for proposals issued under the Initiative; and procedures for reviewing and evaluating the proposals; to facilitate consultations and partnerships among Federal and State agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative; and to evaluate and perform strategic planning on program activities relating to the Initiative.	
Biomass Research and Development Board (Departments of Energy and Agriculture)	section 941, Amendments to the Biomass Research and Development Act of 2000; Energy Act 2005	Legislation - Interagency Board	Yes	Government	Establishes an Interagency Board to coordinate programmes within and among departments and agencies of the Federal Government for the purpose of promoting the use of biobased industrial products by maximizing the benefits deriving from Federal grants and assistance; and bringing coherence to Federal strategic planning.	
Department of Agriculture	Environmental Quality Incentive Program	Incentives	Yes	All working agricultural lands	Provides assistance to agricultural producers in a manner that will promote agricultural production and environmental quality as compatible goals,	
Department of Agriculture	Conservation Security Program	Incentives	Yes	Working agricultural lands in selected watersheds	A voluntary conservation program that supports ongoing stewardship of private agricultural lands by providing payments for maintaining and enhancing natural resources.	
Department of Agriculture	Conservation Reserve Program	Incentives	Yes	Highly erodible soils and target conservation areas	Provides incentives to prevent expansion of agriculture, including bioenergy crops, into marginal lands for agriculture that are prone to soil erosion.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
35 billion gallons of ethanol equivalent alternative fuels by 2017	35 billion gallons of ethanol equivalent alternative fuels by 2017	35 billion gallons of ethanol equivalent alternative fuels by 2017	Regular budget process and congressional appropriations	
Production in 2010 and later	Conversion on 2010 and later	Use on 2010 and later	Regular budget process and congressional appropriations	
May favor renewable feedstocks versus hydrocarbon feedstocks	May favor renewable conversion processes versus hydrocarbon based conversion processes	May favor renewable fuels versus hydrocarbon fuels	None	
Advises on program activities and planning.	Advises on program activities and planning.	Advises on program activities and planning.		
Coordinates government activities and strategic planning.	Coordinates government activities and strategic planning.	Coordinates government activities and strategic planning.		
			Since EQIP began in 1997, USDA has entered into 117,625 contracts, enrolled more than 51.5 million acres into the program, and obligated nearly $1.08 billion to help producers advance stewardship on working agricultural land.	Applies to all agriculture, not restricted to bioenergy crops. Applies to establishment of new practices.
			Since its inception in 2004, 19,400 farms and ranches representing 15,800,000 acres in 280 different watersheds have been enrolled. In 2005, CSP made payments of $202 million.	Applies to all agriculture, not restricted to energy crops. Can apply to existing practices.
			As of 2005, CRP has a total of 34.9 million acres enrolled that if farmed would be very susceptible to erosion and runoff. CRP payments for land retirement in 2005 totaled $1.79 billion.	Applies to all agriculture, not restricted to bioenergy crops

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/ Activity Target Area	Direct	Indirect
Department of Agriculture	Wetlands Reserve Program	Incentives	Yes	Restoration of wetlands marginal for agriculture	Provides incentives to prevent expansion of agriculture, including bioenergy crops, into marginal lands for agriculture that have a high environmental value.	
Department of Agriculture	Woody Biomass Utilization 2005 Grant Program, Public Law 108-447 & Public Law 108-148.	Grants	Yes	State foresters and local communities		
Department of Agriculture	Biomass for small-scale heat and power	R&D	Yes	Bioenergy users		
EPA	EPAct 2005 / Renewable Fuel Standard (RFS)	Policy / Regulation	Yes			
EPA	EPAct 2005 / National Clean Diesel Campaign	R&D / Education	Yes			
EPA	Clean Air Act	Policy / Regulation	Yes	Biofuels producers		
EPA	EPAct 2005	Policy / R&D	Yes		Vehicle/Engine testing, statistical analysis, emission inventory/air quality analysis, emission inventory/air quality analysis,	
EPA / Region		R&D			Grant to produce cheaper biodiesel by means of continuous production technology, reducing NOx by removing nitrogen compounds in feedstock, creating less toxic process by using ethanol derived from renewable sources.	
EPA / Region	Urban Biofuel Initiative	R&D		Restaurant, biofuels producers, flexfuel fleet managers	Facilitate the creation of a large-scale market for bio-diesel derived form waste cooking oil.	
EPA / National Science Foundation	Technology for a Sustainable Environment	R&D		Research Centre	Researching on conversion technologies; analysis of lifecycle tradeoffs for celluloses ethanol	
EPA	Pollution Prevention Act	R&D			Research on life cycle assessment of corn based ethanol used as fuel additive	

For the purposes of this table:
“Policy” is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers. bioenergy suppliers, farmers, educational institutions).
"Direct" is defined as policies or activities that directly impact the energy sector. These items may include policies or activities that promote national/state bioenergy action plans; production and use of biofuels for transport (including blend mandate, type of fuel, market segment, target flexibility, enforcement provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
			Currently there are 7,831 projects on 1,470,998 acres enrolled in the program. The 2002 Farm Bill authorized the continuation of the program by enabling the Secretary of Agriculture to enroll up to 250,000 additional acres annually into the program.	Applies to all agriculture, not restricted to bioenergy crops
		Promote the use of alternate energy sources, benefiting local communities, while at the same time reducing the costs of forest management.	The Congressional language authorizes up to $5 million a year for forest product projects that increase the use of woody biomass from national forest system lands. Funding is planned to run from 2005 until 2009.	
		Provides technology to more efficiently utilize biomass for energy production in convenient forms	A program of the USDA Forest Service's Forest Products Laboratory	
		Works to bring greater access to biodiesel and E85 along key transportation corridors Funds demonstration projects Provides technical assistance to communities and industry regarding ethanol and biodiesel		
		Partners (restaurants, waste haulers, biodiesel producers, fleet mgrs) create community-based pollution reduction project in which feedstock collection, fuel production, and distribution are all in close proximity.		

"Production" relates to feedstock, farming practices, land use, or other aspects associated with the production of bioenergy agricultural crops (raw materials). “Conversion" refers to the practices (processing, refining, etc...) and energy efficiency methodologies used in the conversion of raw bioenergy materials into end-use products. "Use" refers to end-use (i.e. electricity, heat, fuel for transport, etc...). In this section of the table, we asked each country to show what part of the production stream would be affected by the listed policies and activities (i.e. Production, Conversion, Use).

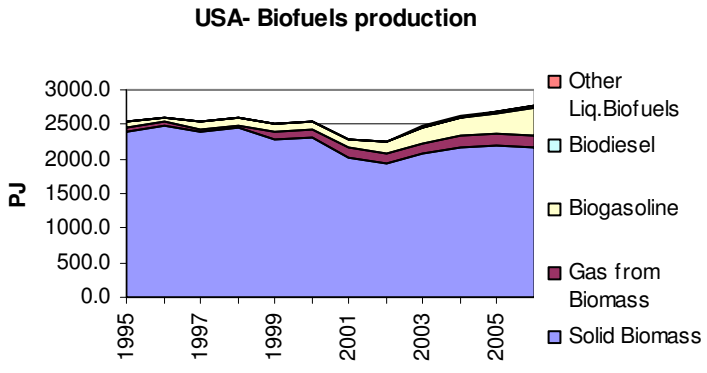
13.7 United States Bioenergy Outlook

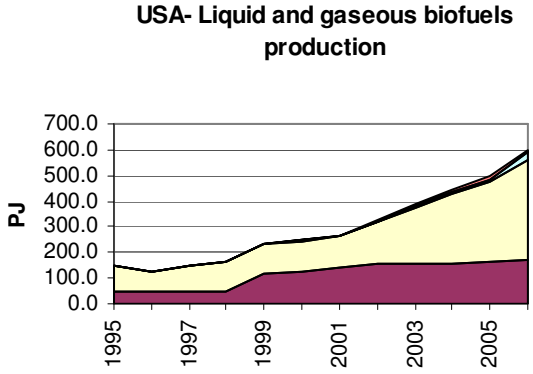
Table 13.2 - United States – Biofuel production

Production (PJ)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	2552.2	2605.4	2533.3	2602.8	2508.6	2548.5	2286.5	2261.8	2469.9	2620.4	2689.2	2768.4
Solid Biomass	2400.8	2480.8	2384.3	2442.1	2272.1	2303.4	2021.3	1938.2	2078.8	2175.3	2191.7	2169.4
Gas from Biomass	42.8	46.5	46.8	49.4	118.6	123.9	137.3	152.4	152.2	156.6	159.8	169.1
Biogasoline	108.7	78.1	102.2	111.3	117.9	120.3	127.0	164.8	224.9	272.9	313.1	389.4
Biodiesel						0.9	0.9	2.1	3.3	4.5	12.4	29.2
Other Liq.Biofuels								4.4	10.7	11.1	12.2	11.4
All woodfuels (2)	2115.4	2022.3	1905.3	1910.2	1626.5	1613.4	1533.5	1506.7	1499.0	1536.1	1538.7	
Fuelwood (2)	858.8	792.3	649.6	670.8	407.6	403.4	404.1	372.5	369.7	379.9	382.1	
Charcoal (2)	23.0	24.3	24.7	25.1	26.8	28.5	28.0	29.5	30.3	28.7	29.0	
Black Liquor (2)	1233.7	1205.6	1231.0	1214.3	1192.1	1181.4	1101.4	1104.7	1099.1	1127.6	1127.6	

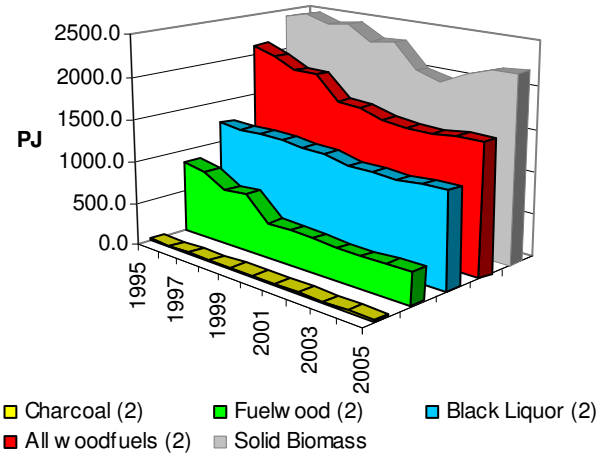
Production growth (%)	'95-'96	'96-'97	'97-'98	'98-'99	'99-'00	'00-'01	'01-'02	'02-'03	'03-'04	'04-'05
Solid Biomass	3.3	-3.9	2.4	-7.0	1.4	-12.2	-4.1	7.3	4.6	0.8
Gas from Biomass	8.8	1	5.5	140.2	4.5	10.8	11.0	-0.2	2.9	2.1
Biogasoline	-28.1	30.8	8.9	6.0	2.0	5.5	29.8	36.5	21.3	14.7
Biodiesel							142.9	58.8	35.8	175.5
Other Liquid Biofuels								141.2	4.1	10

(2) = Based on FAO data





USA- IEA Solid Biomass vs FAO Woodfuels



USA- Change rate of biofuels production

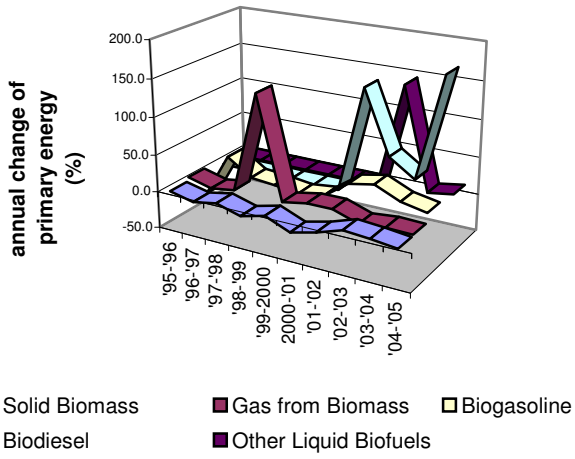


Table 13.3 - United States – Biofuel Import (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels	1.3	1.0	0.3	0.2	0.3	0.4	1.1	1.0	0.7	9.7	8.9	58.5
Solid Biomass												
Gas from Biomass												
Biogasoline	1.3	1.0	0.3	0.2	0.3	0.4	1.1	1.0	0.7	9.7	8.9	58.5
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	5.9	5.1	5.1	4.7	5.1	5.6	7.1	7.3	6.7	7.3	7.5	
Fuelwood (2)	5.2	4.6	4.3	3.9	4.4	5.0	6.4	6.4	5.0	5.3	5.7	
Charcoal (2)	0.7	0.6	0.8	0.8	0.7	0.6	0.7	0.9	1.7	2.0	1.8	

(2) = Based on FAO data

Table 13.4 - United States – Biofuel Export (PJ)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
Total Biofuels												
Solid Biomass												
Gas from Biomass												
Biogasoline												
Biodiesel												
Other Liquid Biofuels												
All woodfuels (2)	2.4	2.5	2.8	3.8	3.4	3.4	2.8	3.2	2.3	2.3	3.8	
Fuelwood (2)	1.5	1.6	2.0	3.0	2.8	3.0	2.4	2.8	1.8	1.8	3.1	
Charcoal (2)	0.9	0.9	0.9	0.8	0.6	0.5	0.4	0.4	0.5	0.5	0.6	

(2) = Based on FAO data

Table 13.5 - United States – Total Biofuel domestic supply (TPES) and sector of use (PJ)

	Sector of use	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006 Est.
All biofuels	*Dom. Supply*	2,554.7	2,607.3	2,531.2	2,601.8	2,507.3	2,551.4	2,285.0	2,255.0	2,469.6	2,633.0	2,697.0	2,816.6
	Transform.	1.324.	1.436.	1.417.	1.354.	547.5	565.7	568.0	695.7	632.4	644.1	592.0	
	Industry	477.1	451.1	538.3	603.7	1.349.	1.351.	1.169.	1.032.	1.117.	1.214.	1.272.	
	Transport	110.9	79.5	100.7	111.3	115.7	133.4	140.5	168.4	230.0	289.4	337.9	
	Residential	597.4	596.4	434.0	486.8	414.8	434.4	370.9	313.7	411.0	410.9	421.0	
Solid Biomass	Dom. Supply	2,401.2	2,481.2	2,384.8	2,442.6	2,272.5	2,303.8	2,021.7	1,938.5	2,079.2	2,175.7	2,192.1	2,169.8
	Transform.	1.281.	1.390.	1.370.	1.304.	494.7	502.4	494.0	620.0	552.5	562.0	510.7	
	Industry	477.1	451.1	538.3	603.7	1.285.	1.294.	1.107.	953.7	1.039.	1.130.	1.182.	
	Transport												
	Residential	597.4	596.4	434.0	486.8	414.8	434.4	370.9	313.7	411.0	410.9	421.0	
Gas from Biomass	Dom. Supply	42.8	46.6	46.8	49.4	118.6	124.0	137.4	152.4	152.2	156.6	159.8	169.1
	Transform.	42.8	46.6	46.8	49.4	52.8	63.3	74.1	73.2	77.8	79.8	78.7	
	Industry					63.6	57.4	62.8	78.7	73.9	74.6	80.4	
	Transport												
	Residential												
Biogasoline	Dom. Supply	110.7	79.5	99.6	109.8	116.1	122.8	125.0	159.4	228.7	285.1	320.5	437.2
	Transform.												
	Industry												
	Transport	110.9	79.5	100.7	111.3	115.7	132.6	139.6	166.3	226.6	284.9	325.5	
	Residential												
Biodiesels	Dom.						0.9	0.9	2.1	3.3	4.5	12.4	29.2
	Transform.												
	Industry												
	Transport						0.9	0.9	2.1	3.3	4.5	12.4	
	Residential												
Other Liquid Biofuels	Dom. Supply								2.6	6.2	11.1	12.2	11.4
	Transform.								2.6	2.2	2.3	2.6	
	Industry									4.0	8.8	9.6	
	Transport												
	Residential	2,401.	2,481.	2,384.	2,442.	2,272.	2,303.	2,021.	1,938.	2,079.	2,175.	2,192.	2,169.8

The sum of biofuel use in various sectors and the total domestic supply do not tally due to interproduct *transfers* and to *statistical differences* (IEA 2007)

USA - Sectors of biofuels consumption