Importance of Biomass in the Energy Matrix

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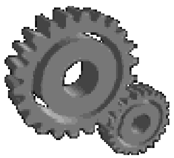
Introduction

Vision Oil & Gas sector on the current status of Renewable Energy, Biomass and Biofuels in the Energy Matrix.




Introduction

World Energy Demand and Economic Outlook

- In the IEO2010 projections, total world consumption of marketed energy increases by 49 percent from 2007 to 2035. *The largest projected increase in energy demand is for non-OECD economies. Total energy demand in non-OECD countries increases by 84 percent, compared with an increase of 14 percent in OECD countries.*

- The use of all energy sources increases over the time horizon of the IEO2010 Reference case.

- Given expectations that world oil prices will remain relatively high through most of the projection period, liquid fuels and other petroleum are the world's slowest-growing source of energy.

- Liquids consumption increases at an average annual rate of 0.9 percent from 2007 to 2035, whereas total energy demand increases by 1.4 percent per year.

- Renewables are the fastest-growing source of world energy, with consumption increasing by 2.6 percent per year.

- Projected oil prices, as well as concern about the environmental impacts of fossil fuel use and strong government incentives for increasing the use of renewable energy in many countries around the world, improve the prospects for renewable energy sources worldwide in the outlook.

Source: IAE

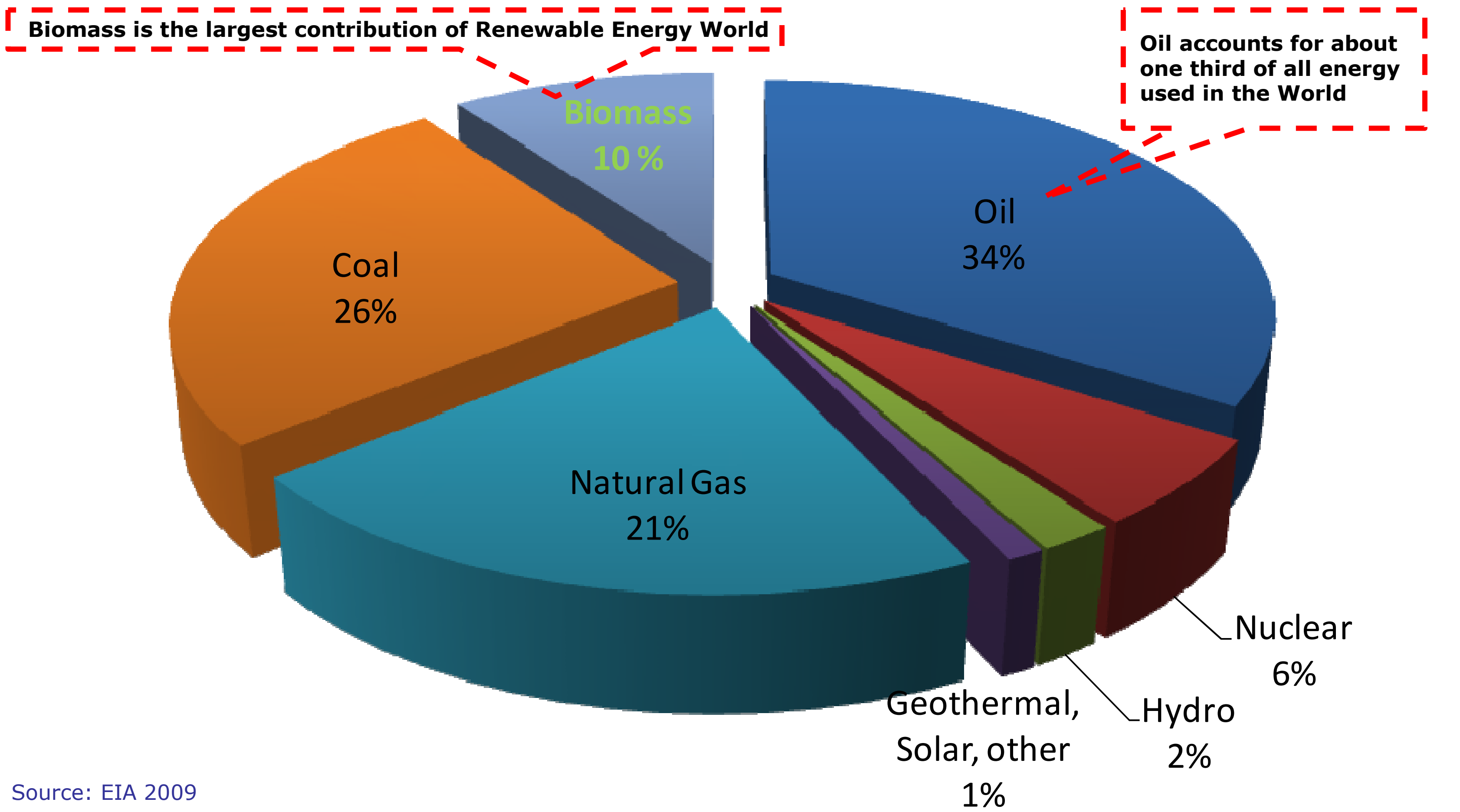
Introduction

Transportation Sector Energy Consumption

- In the IEO2010 Reference case, transportation energy use in non-OECD countries increases by an average of 2.6 percent per year from 2007 to 2035, as compared with an average of 0.3 percent per year for OECD countries .
- Energy use in the transportation sector includes the energy consumed in moving people and goods by road, rail, air, water, and pipeline.
- The transportation sector is second only to the industrial sector in terms of total end-use energy consumption.
- Almost 30 percent of the world's total delivered energy is used for transportation, most of it in the form of liquid fuels.
- The transportation share of world total liquids consumption increases from 53 percent in 2007 to 61 percent in 2035 in the IEO2010 Reference case, accounting for 87 percent of the total increase in world liquids consumption.

Source: IAE

World Energy Matrix



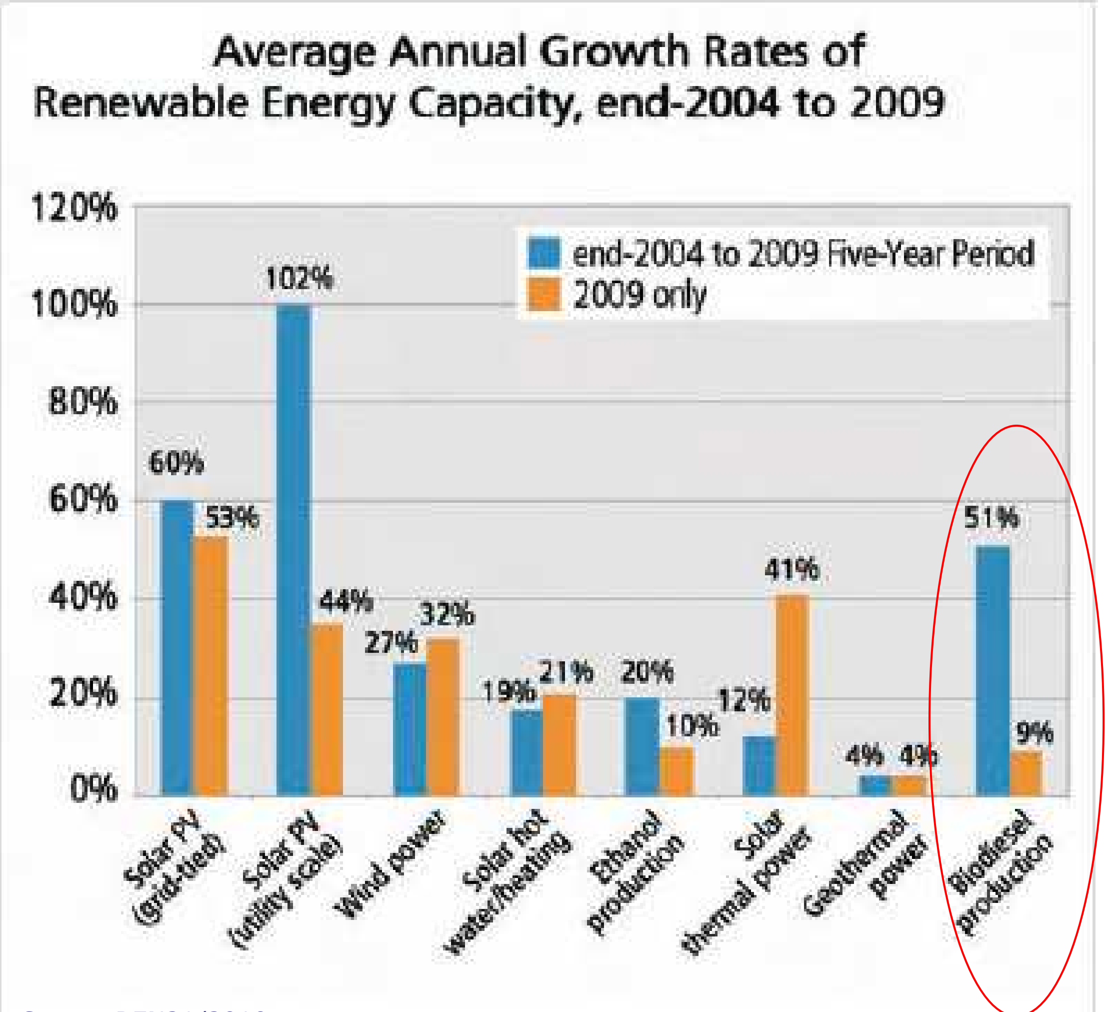
Source: EIA 2009

New capacity investment & Renewables power capacity

TOP FIVE COUNTRIES	#1	#2	#3	#4	#5
Annual amounts for 2009					
New capacity investment	Germany	China	United States	Italy	Spain
Wind power added	China	United States	Spain	Germany	India
Solar PV added (grid-connected)	Germany	Italy	Japan	United States	Czech Republic
Solar hot water/heat added[3]	China	Germany	Turkey	Brazil	India
Ethanol production	United States	Brazil	China	Canada	France
Biodiesel production	France/Germany		United States	Brazil	Argentina
Existing capacity as of end-2009					
Renewables power capacity (including only small hydro)	China	United States	Germany	Spain	India
Renewables power capacity (including all hydro)	China	United States	Canada	Brazil	Japan
Wind power	United States	China	Germany	Spain	India
Biomass power	United States	Brazil	Germany	China	Sweden
Geothermal power	United States	Philippines	Indonesia	Mexico	Italy
Solar PV (grid-connected)	Germany	Spain	Japan	United States	Italy
Solar hot water/heat[3]	China	Turkey	Germany	Japan	Greece

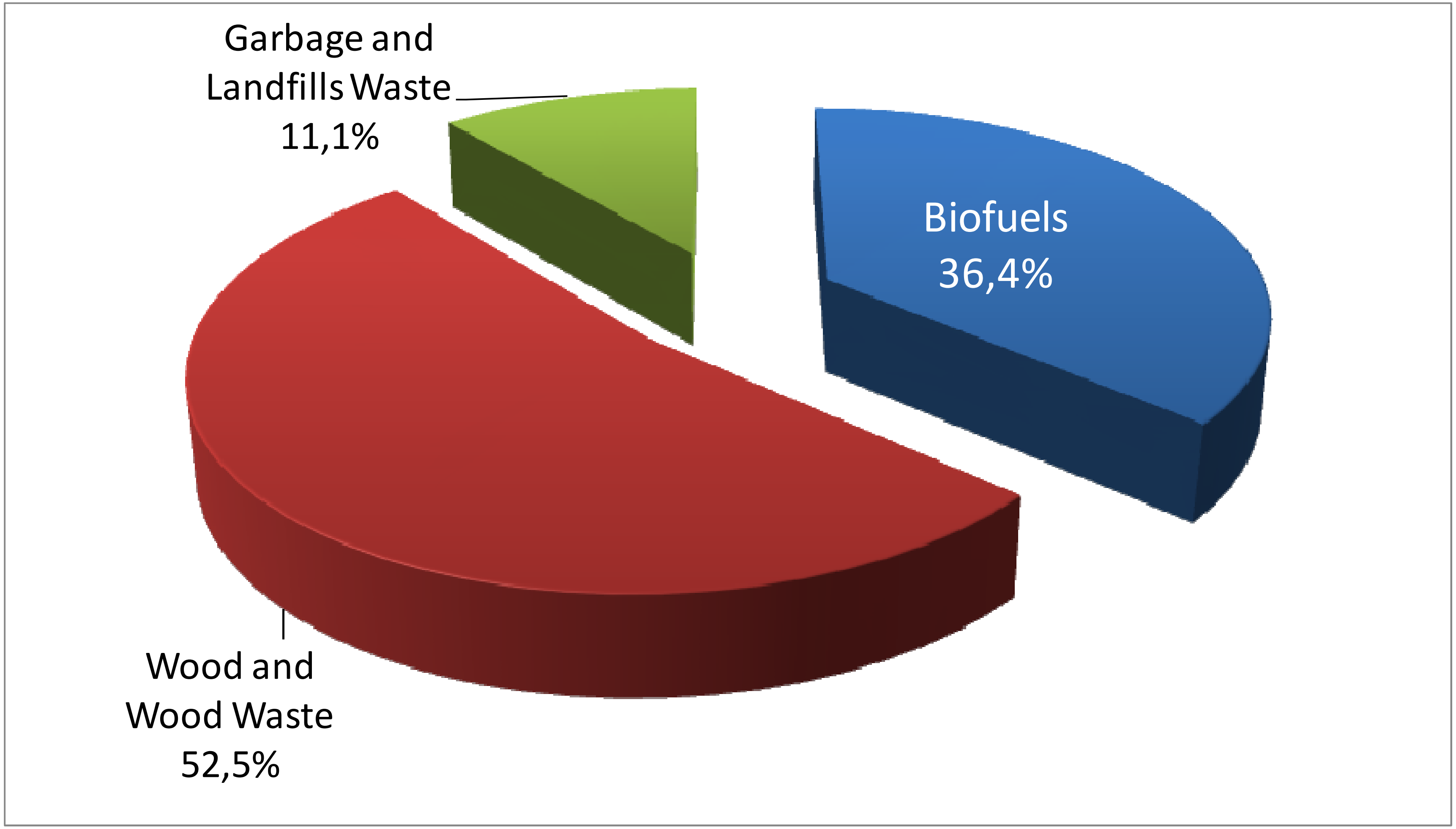
Source: REN 21/2010

Average Annual Growth Rates of Renewable Energy Capacity



Source:REN21/2010

U.S. Sources of Biomass



Source: EIA 2009

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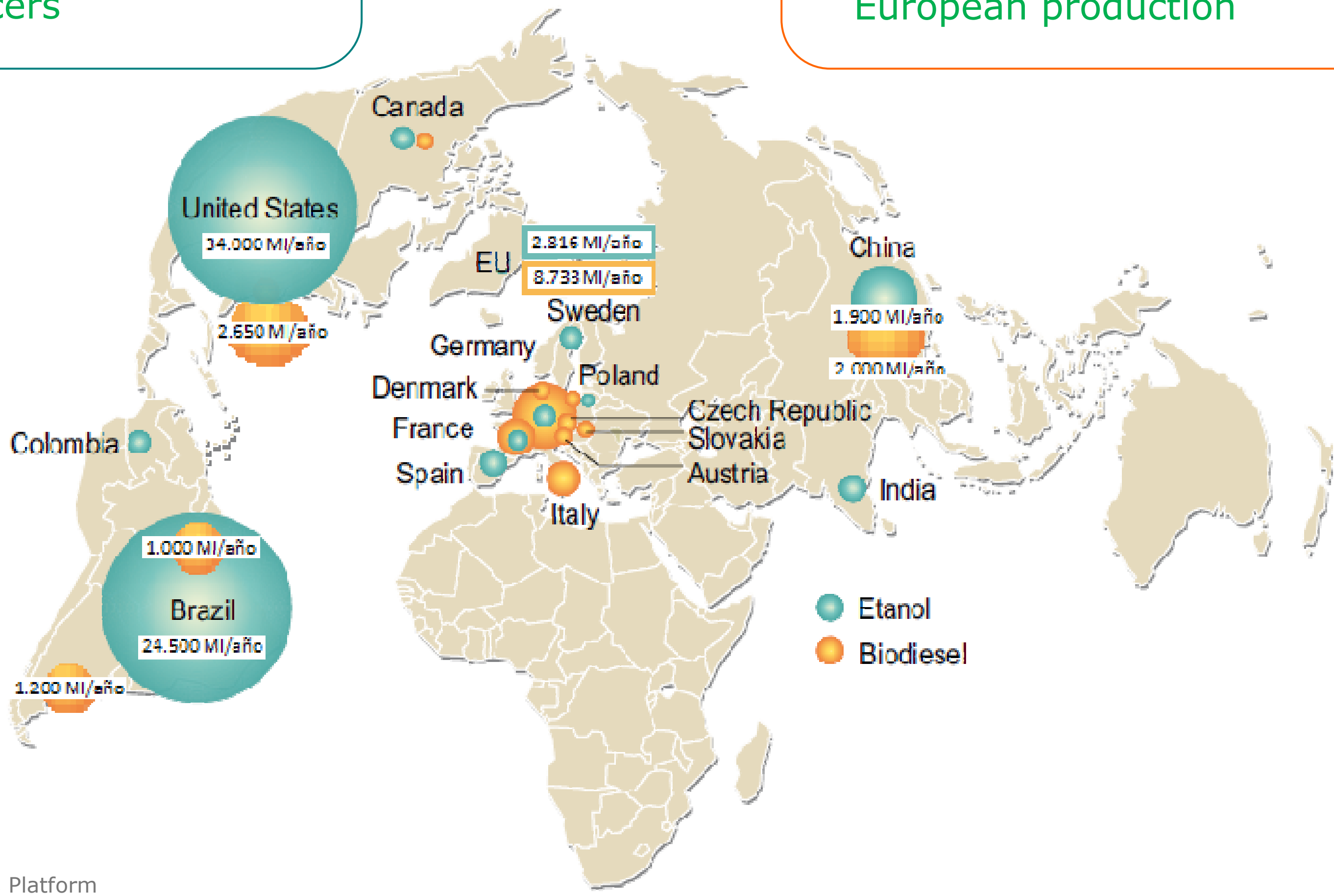
Biomass for Biofuels current situation
... America, well ahead of Europe in biofuel production

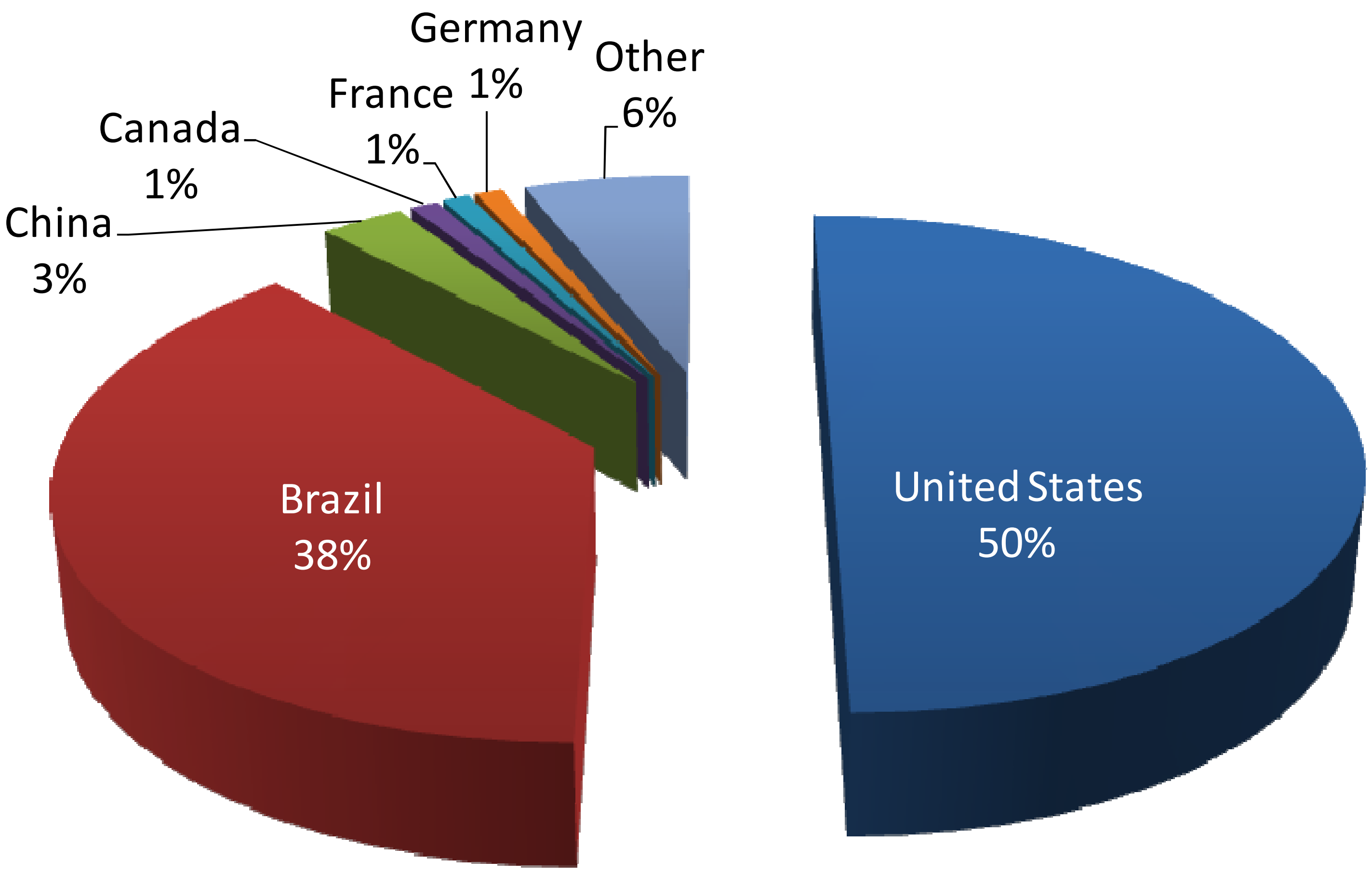
- Ethanol production is concentrated in America:The United States and Brazil as major producers

- Europe is dominated by production Biodiesel. Germany and France leading European production



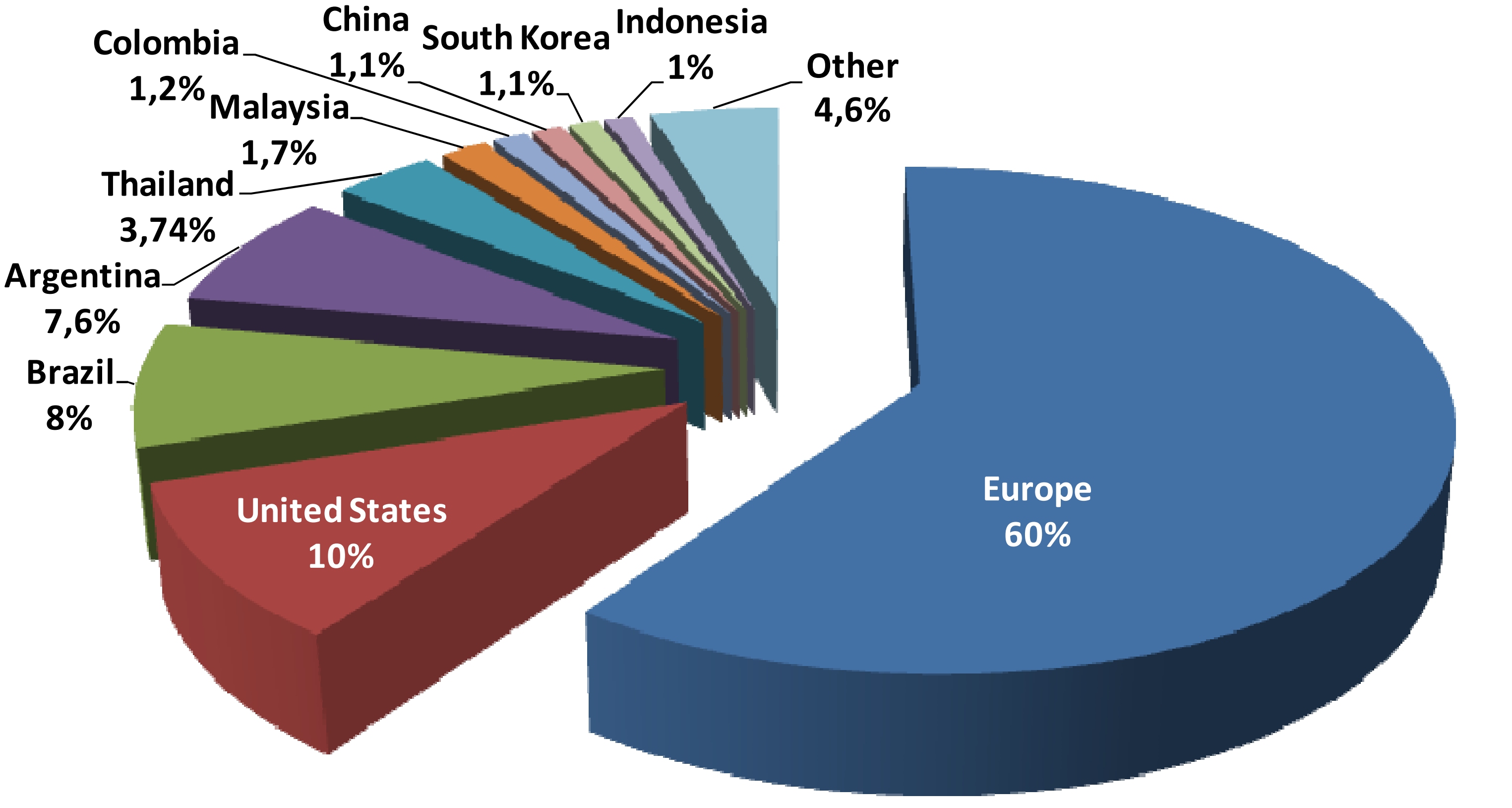
- Fuente: UNEP y Biofuels Platform

World Ethanol Production



Source: EIA 2009

World Biodiesel Production



Source: (S&T)2 Consultants Inc. From Canada

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By subsector, the solar energy continues in an uncertain environment and wind energy has performed poorly. Biofuels from biomass have a very positive and promising future

Subsector	Evolution 1S2010	Comments
Wind Energy		• The sector is in a difficult moment because of the overcapacity, reduced margins and continues the downward revision of tariff systems. • In the third quarter was the only sector that has reduced average benefit. Analysts recommend underweight the sector, saving only the promoter companies.
Solar Energy		• Their situation is similar to the wind industry, as the capacity building of panels increased 30% above demand, delving into the excess capacity. • Competition from Chinese manufacturers is eroding margins as well as the drastic reduction in premiums in Europe. • Both in terms of capitalization and profit is in average 50% over 2007.
Biofuels from Biomass		•During the third quarter of 2010, the rising price of derivatives and the recovery of demand for fuel have boosted the sector's performance on the stock exchange in terms of profit. •In October, the EPA agreed to allow U.S. refiners to add up to 15 percent ethanol in blending, compared to 10 percent today (will deepen the report 4Q).
Electric vehicle and H2 cells		• Countries continue to announce tax incentives for the purchase of such vehicles. • In the medium term, the constraints imposed by China on the export of "rare earths" may increase the manufacturing costs of the batteries.
Geothermal and Tidal Energy		▪ In the third quarter of 2010, the sector has increased its market value and reduced its debt levels.

Source: Repsol

Evolution1S2010

Very Positive | Positive | Neutral | Negative

Worldwide, in 2010, the industry leaders increased the commitment to second generation biofuels….

¿How?

1 - Take direct participation in specialized companies

- U.S. firm expands its capital and a pilot plant and a semi-commercial production of 2G biofuels
- Latin American company acquired 47% of a company devoted to biofuel research 2G.
- In Europe, a company acquires a stake in another company with which it cooperates in R & D to produce biodiesel from 2G.
- Another European firm buys 17% of another company specializing in research and 2G biofuel production from sugar cane bagasse
- European company acquired by M $ 98 unit 2G biofuels one whose assets consist of purchased R & D facilities and pilot plant.
- Another European company acquires 20% of a company that researches the production of biofuels from microalgae 2G
- U.S. firm and other equity partners provide another 52 M $ to continue the program for the development of fuels from microalgae.

2010

February

March

April

May

June

July

August

Source: Repsol

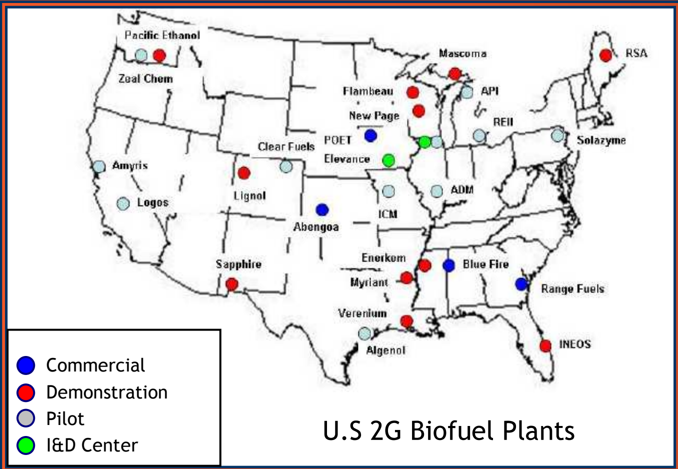
2 - Formation of Joint Venture with biotechnology companies for development projects *adhoc*

- Two European companies create a JV in the ethanol business. (R & D of 2G biofuels)
- European company is committed to provide funds for another two years to the JV which develops and operates a pilot plant for waste processing corn into bioethanol
- Latin American company announced the creation of a JV for the technological development of biomass conversion into biofuels and is committed to provide funding for research programs and to build a pilot plant
- U.S. company announced an investment commitment of $ 600 million in the JV sharing for the construction of a pilot plant that will transform algae into biofuels

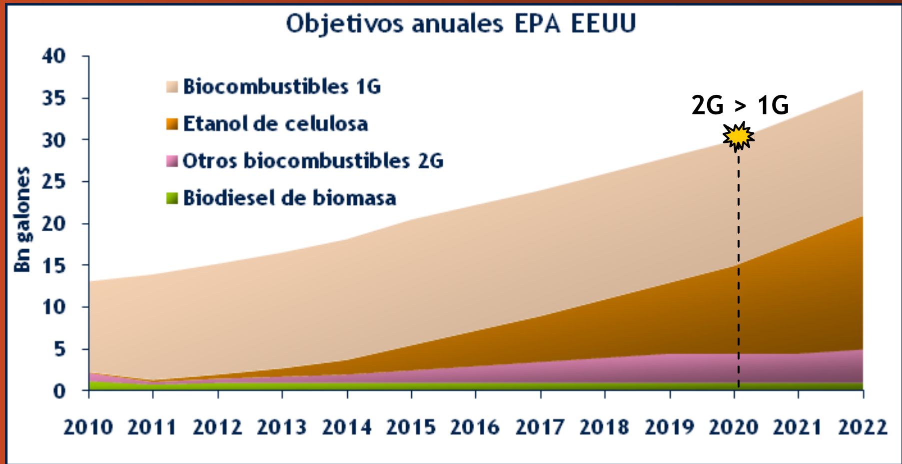
However, in the United States in recent years, expectations about the rapid development of 2G biofuels have been reduced.

CASE STUDY - Reference U.S. market in the development of 2G biofuels

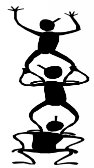
- In 2007, EPA established annual quotas for biofuel production. According to these, in the next decade, cellulosic ethanol would lead the growth of the second generation, which would surpass the first in about 2020.
- In early 2010, the EPA had to lower the objective of cellulosic ethanol by 2010 over 90% of the impossibility of compliance (from 100 M gal. Up to 6.5 M gal).



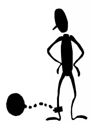
U.S 2G Biofuel Plants



There are other factors that support and which hinder the future development of 2G biofuels



- ✓ Flexible and abundant supply.
- ✓ The government provides funding of projects.
- ✓ The state provides 80% of the debt.
- ✓ Accelerated depreciation is allowed 50% investment



- × The difficulties in finding funding has caused the cancellation of some projects.
- × The investment costs are still very high compared to the bio. conventional .
- × In the medium term will require increasing the blend wall (technical limit of biofuels in the mix accepted by engine components and guaranteed by the manufacturers, now 15%)

Technological alternatives concerning the production of 2G biofuels from biomass … ..

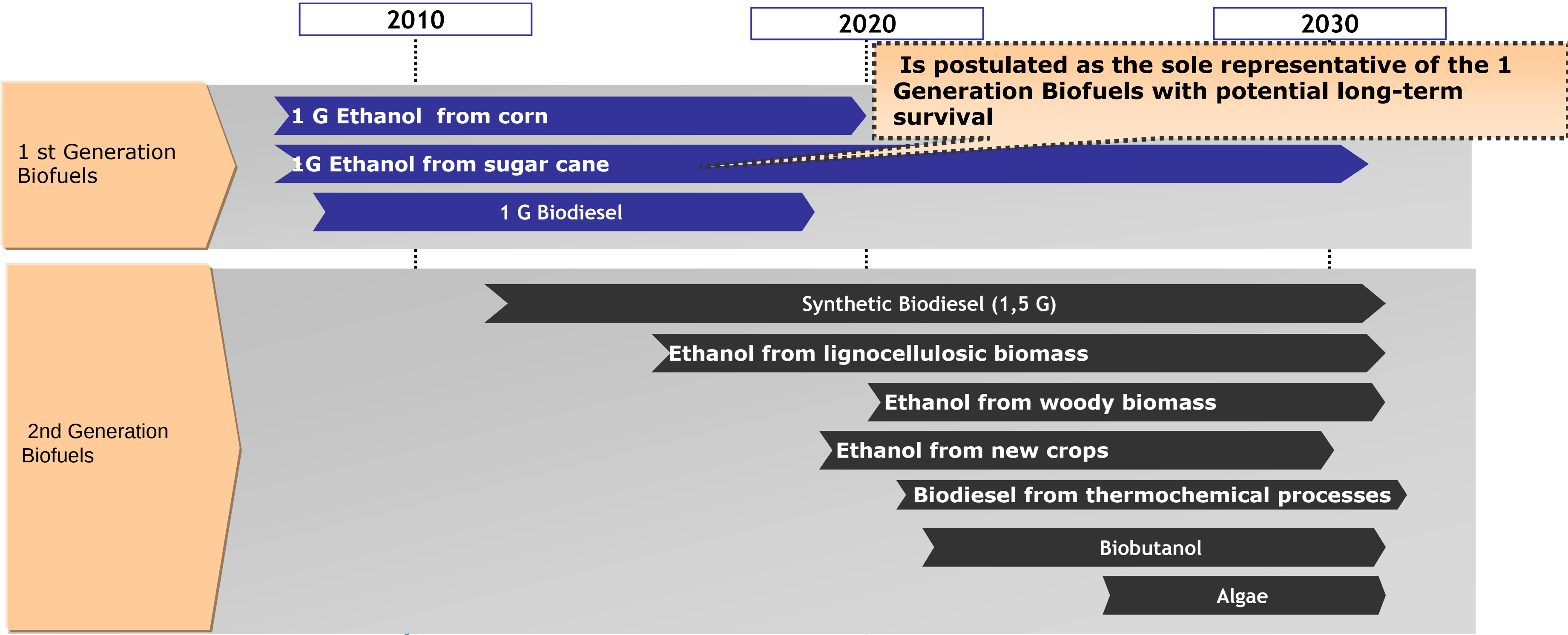
Process Type	Input	Product	Estate	Strengths	Challenges
Biochemical processes (enzymes)	Lignocellulosic biomass (corn stover, bagasse, wheat straw)	**Ethanol**		✓Higher yields per hectare than biofuels 1G	× Current technology does not allow the simultaneous fermentation of various components, firing costs
	Bioethanol from sugar cane and / or waste	Components of gasoline and diesel		✓It can be mixed in larger volumes than ethanol in gasoline	× It required a reduction in process costs
	Woody biomass (forest residues)	**Ethanol**		✓Complementary activity for wood and paper industry	× Pending technology to optimize various processes to be more commercially attractive
	Other crops (jatropha, Halophytes, Camelina, switchgrass)	**Ethanol**		✓Higher yields per hectare biomass	× Competition with arable land
Thermochemical Processes	Hydrogenation oil (jatropha, palm) (Biofuels 1.5 G)	**Biodiesel**		✓High quality diesel ✓More calorific than fossil diesel	× Requires hydrogen × Higher costs than traditional biodiesel
	BTL (*Biomass to Liquids*)	**Biodiesel**		✓Can be directly mixed with diesel ✓Higher yield per hectare	× Intensive costs × Fischer Tropsch technology still untested on a large scale
	Biomass hydrolysis	**Biodiesel**		✓Flexibility of input ✓Simple technology	× Requires a costly upgrade before mixed with traditional fuels
	Micro algae	**Biodiesel** **Jet Fuel** **Glycerin**		✓High yield per hectare ✓Variety of fuels	× The structure of algae complicates the process of separating components
	Bioforming (from glucose)	**Biodiesel**		✓Variety of fuels	× Uncertainty about the possibility of commercial-scale process

Laboratory   **Pl. Pilot**   **Industrial Scale**

Source: Repsol

…different timeframes depending on the period required to mature each technology …

It is expected that during this decade the first generation biofuels are replaced by more efficient and sustainable technologies



Source: **UBSW**

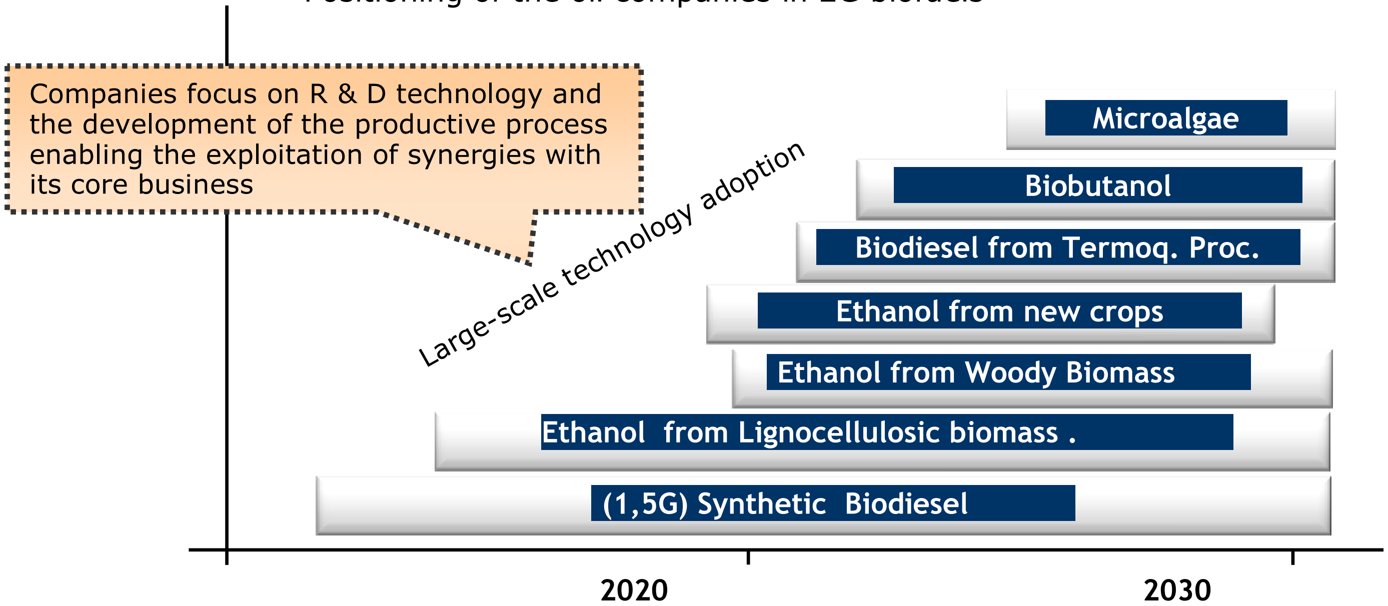
MILESTONE

- Ethanol production will increase from 2G industrial scale pilot plant.
- The bins allocated resources to the production of ethanol from woody biomass seeking fringe benefits.
- 1.5 G will supply biodiesel niche.
- China will gain importance in the technological development of 2G biofuels.
- Elimination of U.S. ethanol subsidies.
- Biofuels from algae begin to occur in pilot plants

- Ethanol from biomass from various sources will be competitive.
- Biofuel from thermochemical processes begin to occur on a large scale.
- Biofuels from algae begin to occur on an industrial scale

Currently, oil companies are positioning tending towards long-term alternative with high potential

Positioning of the oil companies in 2G biofuels

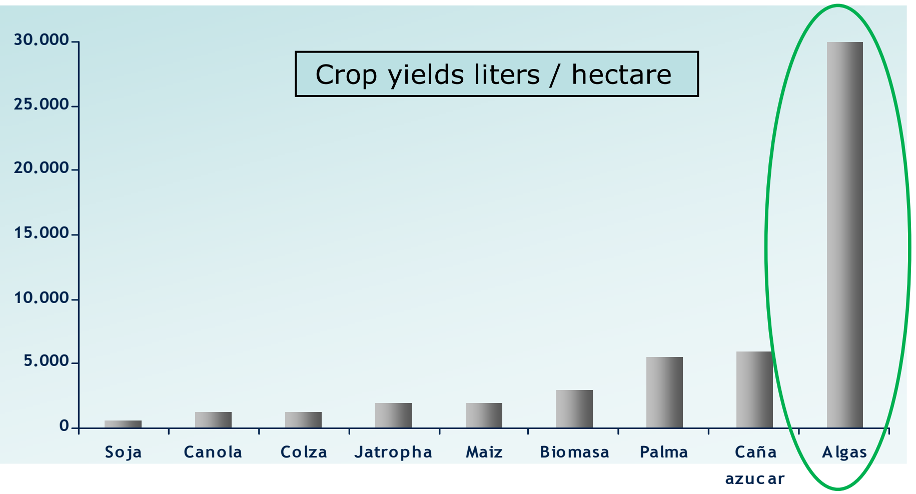


The Biomass option in the longer term…..

Although research into the generation *biofuels from algae* is expected to be the technology that provides longer term results, it is an alternative that provides differential advantages:

✓ It is the highest performance option generates per hectare (The highest yield)
✓ Does not compete for arable land.
✓ The life cycle of algae is the shortest

Source: UBSW



Conclusion

Renewable Energy Developments, 1st. quarter 2010

- The company's most important O & G sector are materializing a growing interest in the area of renewable energies, mainly in power generation from biomass, focusing their attention on biofuels.

- During 2010, especially in the third quarter, several oil companies have announced partnerships and / or transactions aimed at increasing its presence in the 2nd generation biofuels.

- Within the global growth that has sustained the production of Energy from Renewable Energy, Biomass maintains its leadership. Other wind and solar alternatives that are threatening the sustainability of its business model as a result of production overcapacity installed solar panels and wind turbines and a downward revision of tariff systems in the relevant markets.