

suez



BIOMASS,  
AN ENERGY SOURCE

# BIOMASS

## A renewable and flexible fuel

Environmental concerns have meant that SUEZ has turned to renewable energy sources, including biomass. Biomass is a viable alternative fuel for generating electricity, steam and domestic heating, urban or industrial, at a lower cost, while simultaneously reducing polluting gas emissions. Biomass is a carbon-neutral energy source because when burnt, it returns the CO<sub>2</sub> captured during its lifecycle to the atmosphere.

The term 'biomass' covers a series of organic materials derived from forestry, agricultural and industrial activities: wood (forest residue, granules...), farm residue (straw, olive pulp...) and organic waste.

Biomass is a reliable and sustainable source of energy with numerous advantages: the use of different types of biomass, the availability of many sources of supply worldwide (Europe, Canada, Brazil, South Africa, Asia) and synergy with coal in the supply chain. In addition, it is the only source of renewable energy, apart from hydroelectricity, which is both reliable and flexible. And finally, it is increasingly favoured by legislation which recognises the environmental advantages of biomass.

SUEZ has therefore decided to make this technology part of its generation capacity. The Group now manages around fifty sites in the United States and Europe with an annual consumption of two million tonnes of different types of biomass.



## A fuel for the future

The use of biomass is an integral part of SUEZ's thinking in terms of energy production within a global regulatory framework which favours carbon-neutral sources. The Kyoto protocol provides the means of acquiring emission credits through its project mechanisms such as the Clean Development Mechanisms aimed at developing countries. The SUEZ Group is committed to developing substitution energies to respond to the need for energy independence, security of supply and the preservation of the planet's resources.

# SUEZ

## A competitive advantage in biomass

Ready to meet the challenge of sustainable development, the teams at SUEZ have turned to biomass based energy production, since the Group has a unique skill in managing the technical aspects of this energy source.

The existing coal plants belonging to SUEZ are equipped to develop coal-biomass co-combustion, and even reconvert units designed to use biomass as the sole fuel. The first of these units started operations at the plant in Awirs (Belgium) in 2006, producing 80 MW of power entirely from wood pellets. Research teams at SUEZ are working on extracting energy potential from different types of biomass, and administrative teams are there to make sure the latter become certified. SUEZ burns a large variety of biomass in its plants: sawdust, wood cuttings and wood pellets, forest chips, recycled wood, olive residue, coffee dregs, rice husks, sugar cane bagasse, frying oil, sewage sludge residue, and many others besides. Its experience has enabled SUEZ to achieve a commanding position in the biomass market and to buy supplies in large quantities. SUEZ is one of Europe's leading biomass users. At the end of 2006, the Group possessed installed electricity capacity in Europe of 480 MW. SUEZ also burns biomass in plants on the American continent with an installed energy capacity of 160 MW. SUEZ operates in numerous countries which are able to generate emission credits under the Kyoto protocol. Using biomass in its plants allows SUEZ to capitalise on this advantage. The cogeneration plant in Lages in Brazil is a prime example of this. With a capacity of 25 MW (electricity), it burns wood residue and produces 25 tonnes of steam per hour. This plant is one of a number of projects worldwide which has been certified under the Kyoto Protocol's Clean Development Mechanisms. The São Jõa sugar cane biomass project, a 70 MW thermo-electric power plant to be constructed in the São Paulo State, Brazil, will equally apply for carbon credits. Biomass as a source of green energy, along with hydro and wind power, represents an important development area for SUEZ, as well as helping to diversify its portfolio of renewable energy.

SUEZ is also developing the energy potential of biomass as part of its global management of domestic waste. An example is the contract awarded to its subsidiary, Norvegie, for the incineration of some 170,000 tonnes of waste a year for the city of Clermont-Ferrand in France, which will enable it to supply 29,000 households.



# SUEZ

## Skills and know-how throughout the biomass value chain

SUEZ BRINGS TOGETHER ITS TEAMS' EXPERTISE IN ITS ENERGY AND ENVIRONMENTAL DIVISIONS, TO PROVIDE THE MARKET WITH UNIQUE GLOBAL SERVICES

### INVESTMENTS

Biomass has already proved to be a technically feasible and viable way of investing in renewable energy. Providing a regular supply, producing fuel at a suitable price and obtaining green certificates are three key factors governing investments in this promising sector. As with all other SUEZ investments, biomass projects have to meet the Group's investment profitability criteria, as measured by their ability to make a profit in their own right and long term prospect.

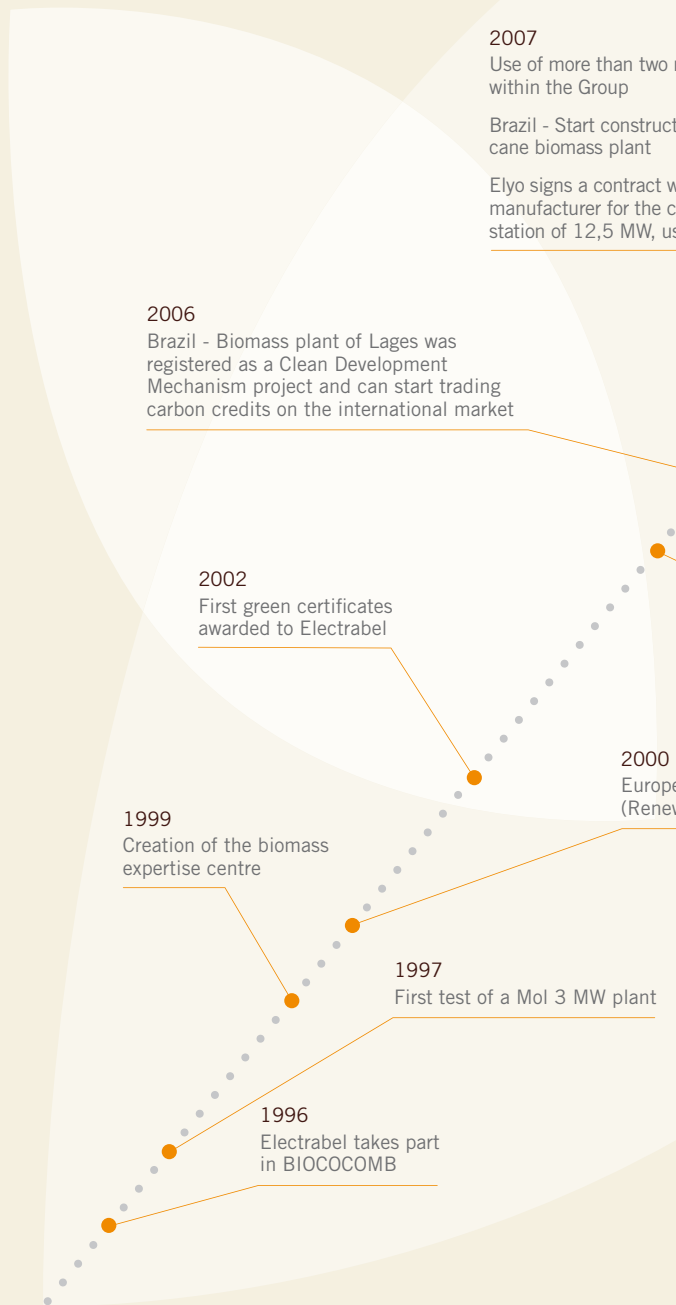
### RESEARCH

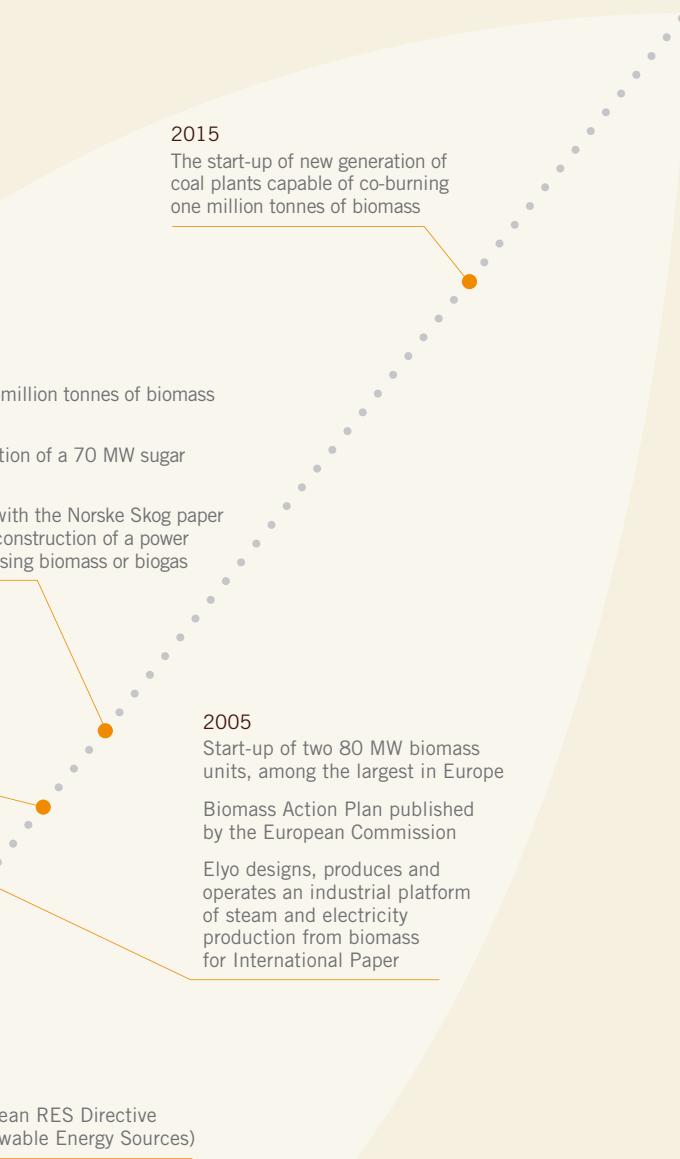
Innovation is central to the SUEZ culture and is supported by intensive research and development.

SUEZ has invested in promoting the energy potential of biomass alongside Laborelec, the technical expertise centre for energy processes and use.

Research activities, conducted by Laborelec and Elyo Cylergie, sometimes in collaboration with universities or other research centres, or even through participation in European projects, have led to consistent improvements in the quality, reliability and competitiveness of its range of biomass fuels. Their use requires special qualification and combustion techniques as well as special techniques for cleaning installations. Particular attention also needs to be paid to the safety of the installations.

Experts from SUEZ's International Research Centre On Water and Environment (CIRSEE) have developed a research programme by applying Bioreactor technology to enhance the energy potential of the waste storage installations, leading to an increase in the amount of landfill biogas.





## PROJECT MANAGEMENT

Projects involving biomass-based electricity and heat generation require a wide range of skills, not only in design and construction but also management, an essential element in biomass projects.

SUEZ teams have acquired know-how in Europe as well as in the United States and Brazil, allowing them to design projects for creating plants, projects for the 100% conversion of coal-fired plants into biomass-fired plants, or the implementation of joint biomass-coal combustion.

SUEZ also has legal expertise which is essential for administering projects, so that they may, where appropriate, qualify as flexible mechanisms under the Kyoto protocol, or be awarded green certificates.

SUEZ is also investing in producing energy from waste through biogas conversion and incineration. In France, Belgium and Hong Kong, almost all discharge installations are fitted with systems for recovering biogas. In 2006, more than 5.8 million tonnes of waste were burnt and converted into energy, generating 2364 GWh of electricity.

## SUPPLY

SUEZ has extensive experience in logistics, notably in maritime transport, giving the Group privileged access to producing countries.

SUEZ has developed expertise in negotiating contracts to guarantee a reliable supply source for its plants. Its specialised unit - Trade Portfolio Management - has got the best from the fluctuating

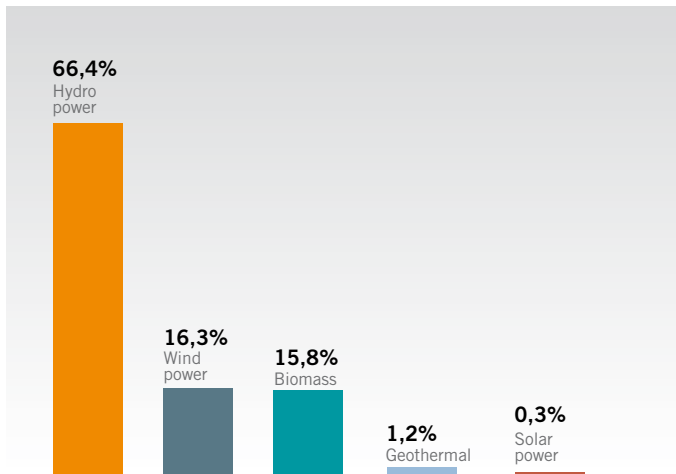
prices of biomass given the expanding nature of the market on a world scale. There are, as yet, few wholesale providers, and contracts tend to be short term (one to three years).

In addition, the availability of raw materials is dependent on political decisions which favour particular soil uses, or even a particular outlet for crops.

# SUEZ

## Facts and figures

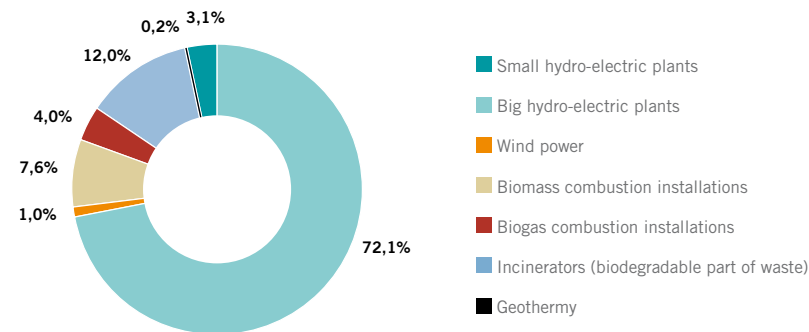
### SHARE OF EACH RESSOURCE IN THE RENEWABLE ELECTRICITY GENERATION (IN %)



State of renewable energy in Europe - 2006. Barometer prepared by EurObserv'ER

The European Union has decided to double the share of renewable energy in primary energy consumption within 13 years, but attempts to reach the target of 12% by 2010 apply globally to all energy sources. Therefore in December 2005 the European Commission put forward a specific Action Plan for biomass representing approximately two thirds of renewable energy consumed in the EU in the last 15 years (including the incineration of organic waste). Nevertheless, although the absolute figures are increasing, in relative terms they are stagnating due to the increasing demand for energy. SUEZ is committed to regularly increasing the share of electricity generated from renewable energy.

### RENEWABLE ENERGY PRODUCTION OF SUEZ IN 2006: 20 864 GWh<sup>eq</sup> \*



\* These values reflect the energy production of the entities included in the environmental reporting structure. The share of renewable production so calculated is 11%. It does not include the production of the CNR (14,600 GWh<sup>eq</sup> in 2006).

### ENERGY CONTENT OF THE DIFFERENT TYPES OF BIOMASS (electrical MWh)

1 ton of coal	● = 2.5 MWh
1 ton of wood pellets	● = 1.8 to 2 MWh
1 ton of sawdust	● = 1.8 MWh
1 ton of wood cuttings	● = 0.8 to 1.5 MWh
1 ton of coffee dregs	● = 1.6 MWh
1 ton of sewage sludge	● = 1.0 MWh

Biomass includes a wide variety of fuels depending on the physical supply networks which provide by-products with energy potential. The water content and the homogeneity of the products have a strong influence on the energy content. If one type of biomass runs out, it is often possible to find an alternative, provided the technical challenges can be met.

# OUR EXPERTS

## ELECTRABEL

A diversified production capacity, using a broad range of technologies and fuels, is essential for Electrabel. This diversity makes it less vulnerable to market fluctuations and contributes to security of supply. Renewable energies, such as biomass, have a role to play in this strategy in addition to helping to achieve environmental targets. Electrabel is continually investing in installations which use biomass and respect its yield criteria. The company has set itself a target of devoting 18% of its European generation capacity to renewable energy by 2009 (including biomass).

[www.electrabel.com](http://www.electrabel.com)

## ELYO

ELYO provides energy efficiency and environmental services, designing and implementing means to produce and distribute useful forms of energy. Its know-how is unique in the design, construction and operation of thermal and electrical generation units using biomass to provide heat and steam for social housing, hospitals, schools and retirement homes. In France, Elyo operates more than 50 wood-fired heating plants with a capacity of between 300 kW and 6 MW, and two large-capacity cogeneration plants which convert a wide variety of locally available biomass fuels.

[www.elyo.fr](http://www.elyo.fr)

## FABRICOM GTI

Fabricom GTI is Belgium's benchmark in innovative installations and technical services for industry and infrastructure, both in its

home country and internationally. Its expertise covers a wide range of technical disciplines. The Energy and Environment division provides bespoke ways of supplying, converting and treating biomass (wood, olive pulp, sugar cane bagasse,...) for electrical plants and cogeneration units.

[www.fabricom-gti.com](http://www.fabricom-gti.com)

## LABORELEC

Since 1962, Laborelec has been the competence centre for energy processes and energy use, playing a vital role in the present and future activities of both its partners and clients in the world market. Its 145 specialists are continually finding ways to save energy, protect the environment and promote sustainable development. Ten of these specialists (the Biomass Competence Centre) have, for the past ten years, been providing specialised expertise in bio-energy matters to ELECTRABEL.

[www.laborelec.com](http://www.laborelec.com)

## SITA FRANCE

A subsidiary of SUEZ, SITA France serves 3,000 municipalities and 55,000 industrial and commercial clients, covering every aspect of recycling and waste management. Its subsidiaries Norvegie and Fairtec specialise in waste incineration, domestic waste and the extraction of biomass to produce energy. Norvegie operates 38 treatment and energy conversion units: 1.74 million people have access to lighting and heating provided by Norvegie, the electrical equivalent of 149 windmills. Fairtec converts biogas into electricity on ten sites in France,

representing an installed capacity of 25 MW.

[www.sita.fr](http://www.sita.fr)

## SUEZ ENERGY INTERNATIONAL

For many years now, one third of SUEZ Energy International's capacity has consisted of biomass and hydro-electric plants, so the company is well placed to take advantage of any development opportunities linked to biomass technology, and to negotiate carbon emission reduction certificates. This know-how also means that it is able to promote projects in emerging countries, some of which offer the chance of obtaining emission credits which contribute to the SUEZ Group's objective of reducing emissions.

[www.suezenergyint.com](http://www.suezenergyint.com)

## TRACTEBEL ENGINEERING

Tractebel Engineering offers cutting-edge engineering and consultancy to public and private clients. Its main focus is on energy efficiency, allowing it to establish a sustainable balance between respect for the environment and reliability requirements. In particular, Tractebel Engineering analyses the technical and economic feasibility of new technologies for biomass and the conversion of thermal plants into biomass-fired plants. It selects the best technologies for converting biomass into energy. In addition, it offers expertise in establishing contracts and assists the Project Manager during the realisation phase.

[www.tractebel-engineering.com](http://www.tractebel-engineering.com)



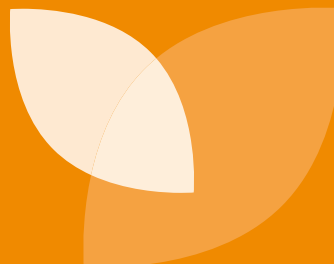
## Our identity

SUEZ, an international industrial and services Group, designs sustainable and innovative solutions in the management of public utilities, as a partner of public authorities, businesses and individuals, in the electricity, gas, energy services, water and waste management.

## Our mission

Delivering the essentials of life.

**€44.3** billion revenues in 2006  
**200** million individual customers  
**500 000** industrial and commercial clients  
**140 000** employees throughout the world  
**60 000** MW of installed power production capacity  
**3 000** municipalities served daily  
**600** researchers in **8** R&D centers



16, rue de la Ville l'Evêque  
75008 Paris, France  
Tel +33 (0)1 40 06 64 00

[www.suez.com](http://www.suez.com)