

# Turning Biomass Direct Liquefaction Concept into a Realistic Solution-ENERGREEN, a Case of Success and Innovation in Portugal

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## Abstract

While, in Paris, climate changes are discussed, and the new directives and targets regarding the global warming for the upcoming years are being outlined and established, there are already some companies that have begun to include alternative energies in their daily reality, thus reducing their carbon dioxide emissions, a long time ago. One of these enterprises is a Portuguese company of cement production, SECIL S.A. Herein, this case of success and innovation is disclosed through one of their latest projects, the construction of a pilot plant to liquefy biomass into bio-oil for use as fuel in their cement kilns.

**Keywords:** Alternative energies; New policies; Carbon dioxide emissions; Biomass; Liquefaction; Portugal

With the failure of the 1992 Rio de Janeiro's agreement and the Kyoto protocol signed in 1997, none of the faulty countries, legally bound to those documents, were ever sanctioned. After that, the negotiations conducted in Bali, in 2007, the world was placed, finally, on the right track into the decreasing of carbon dioxide emissions. These negotiations were the basis for the difficult discussions that were held at the Copenhagen Summit 2009, which made the world believe, that even though no binding treaty was ever signed, the developed countries would finally fulfill the agreement.

At the time that about 150 Nations are gathered in Paris discussing climate change and revising the Kyoto Protocol it is very likely that the objectives for the upcoming years of 2020 and 2030 will be reviewed and once and for all, begin to be fulfilled. With those goals in mind, the introduction of the alternative energies plays a crucial role in the decrease of carbon dioxide emissions [1].

It is already well recognized that sustainable, renewable and alternative energies can be produced from a wide variety of resources such as wind, solar, hydro, geothermal, and biomass, amongst others [2].

With the use of renewable sources the dependence on fossil fuels decreases, making the energy production more clean and sustainable, therefore lowering the CO<sub>2</sub> emissions.

Before proceeding, and as a statement of conflict of interest, let me straighten out my opinion regarding the conversion of biomass into fuels. I belong to the group of those who fiercely believes and stands up to defend that the conversion of biomass into liquid fuels is better and easily achieved with the thermochemical liquefaction catalyzed by an acid catalyst in organic solvents.

Being an organic chemist by nature, vocation and devotion my mind was highly widened to the world of renewable and sustainable energy sources with a project in which I was gracefully allowed to participate. The project was entitled ENERGREEN-Production of a clean fuel for use in cement furnaces, led by SECIL S.A. and endorsed by Portuguese funds (QREN), within its course a pilot plant was planned, projected, and built for the liquefaction of biomass. Presently, the unit is built, and the process is being optimized and fine-tuned. Predictably, will be fully operational by the end of the first trimester of 2016 and will be able to produce three tons of bio-oil per day. From swine and paper sludges, lignocellulosic residues to, even, refuse-derived fuel,

all of these biomasses have been successfully liquefied with high yields. Even those who possess greater amounts of moisture afforded bio-oils with similar requirements to those demanded for fuels derived from fossil sources.

Neither is needed to say that this kind of technology is not entirely new in the international panorama, but nationally SECIL is and has been a forerunner in the front line of the enterprises who innovate in the area of renewable energies, since the middle eighties, with the introduction of alternative energies as part of the company policy.

Despite the differences of opinion that we may have, respecting the use of biomass for the production of fuels, one thing we should all agree, as researchers, we have the responsibility to offer, demonstrate, prove, and finally convince industries that they must follow the path to the inclusion of alternative energies in their strategic plans for the upcoming decades. Companies that refuse to do so will fail the directives established by Governments and in the medium and long term will struggle to remain active or to compete with technologically modern industries.

If, for those businesses with limited resources and smaller profits is tough, if not impossible, to be at the vanguard of this technological revolution; for larger companies it is a lot easier to invest in alternative energy sources and new technologies. Nevertheless, since they are the same businesses that contribute more to the carbon footprint of each country is part of their societal demands and obligation to do so.

By taking the first step in the development of new technology for the inclusion of the so-called alternative energy in their production lines, and, therefore, taking the chances and assuming the risks of potential economic losses, big companies are clearing the way for smaller ones

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to follow them with lower risks and expenses. This was the philosophy and vision that I had the opportunity to meet by working closely with SECIL research team.

Incorporating up to 50% of alternative energies in their production line, SECIL is way up ahead from directives established by the European Union, who set the target to 20% of alternatives consumption by 2020.

All over the world, there are still many companies waiting for us, scientists, to introduce and persuade them to take the first step towards the Innovative Energies and Policies, whatever is the solution in which you believe or have to offer.

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