Biogas x Four - Revenue x Six

This article introduces a creative approach to biogas production as one of the 100 innovations that shape "The Blue Economy". This article is part of a broad effort to stimulate entrepreneurship, competitiveness and employment.

The Market
The world market for biogas barely reached €2 billion in 2006, however it is expected to increase to €25 billion by 2020. Selected countries will enjoy growth rates of 20 and even 30 percent per year. Europe and China are the leaders on the market. The European biogas output could reach by 2020 some 500 billion cubic meters (cum) per year, which is more than the present levels of import of natural gas from Russia. The investments in biogas facilities in the EU is expected to reach €7.5 billion with up to a couple thousand plants added each year. The German industry is expected to generate some 85,000 full time jobs, where it is considered to be the technical leader with over 400 companies active in the field and about 100 offering the complete value chain. Eastern Europe, often supplied by German experts, had by 2010 already 5,900 biogas installation, adding another 3,000 over the next three years bringing the total energy capacity from biogas in that part of Europe to 4.0 GigaWatts of electrical power (GWel).

China had in 2010 some 5,000 industrial units in operation capable of generating 13 billion cum of gas. China has a great tradition in small scale biogas installations. However, with an identified potential in the order of 100 GWel the government is pushing hard to achieve 40 GWel by 2020. Only about half of the +300 million tons of municipal solid waste (MSW) discarded annually is collected and shipped to landfills in China. Part of this unused resource that contaminates the environment and endangers the population's health, expanded the number of rural households' access to biogas as their main source of energy from 22 million in 2006 to 40 million last year. The growth in the sector is expected to maintain a solid 10 percent per year. It has been estimated that biogas in China already replaces 30 million tons of raw coal burning, representing a major saving in carbon emissions.

Biogas thus generated is not a commercial product for immediate use. It contains about two thirds methane gas, nearly 30 percent percent CO₂, a few percent H₂S, and water vapor. The purification of methane gas, and the separation of CO₂ are a pre-condition to achieve commercial success. The advantage of biogas is that it can be used in the existing infrastructure for natural gas which is a finite energy source, whereas biogas is permanently renewable.
The Innovation
Biogas is still widely associated with the small scale conversion of animal waste through an anaerobic process into energy and a mineralized slurry. This is typified by the worthy initiative in Bagepelli (India) sponsored by the Bangalore Women for Sustainable Development, who invested €1.1 million in the construction of 5,500 biogas plants converting cow dung into gas. While this initiative generates each year 19,800 Certified Emission Reduction (CER) certificates, its small scale applications renders it useful for rural areas. The opportunities for biological waste to energy lies in the smart exploitation of existing urban industrial and waste water facilities, and a fine understanding of the chemical reactions that permit a considerably higher output of biogas, using the available infrastructure and existing waste streams.

Erik Danielsson, who served as CEO of Pharmacia AB, a leading pharmaceutical company based in Sweden prior to its merger with Pfizer, pursued a career as an entrepreneur after he retired from traditional business. He observed how the disposal of sewage sludge represented a major cost in a water treatment plant, and how on the other hand several waste streams like the left-overs from energy crops, animal manure, food scraps from industrial processing were all treated separately at considerable expense. He imagined that the existing waste water treatment plants, which have insufficient organic matter to make biogas production commercially viable, could adapt their business model and infrastructure to include readily available organic waste.

Mr. Danielsson went on to create Scandinavian Biogas exploiting the fact that liquified gas can be transported over long distances in standard containers. The combination of food waste from either MSW or from scraps from industrial food processing, with sludge created the correct chemical combination to increase biogas output at an industrial scale. A professional approach to the output permits the generation of liquid CO₂ as a valuable by-product in the production of compressed vehicle grade gas, directly substituting gasoline by a renewable resource while reducing the pressure on the landfill, and increasing the revenues at the water treatment facility. This combination of benefits and revenues through clustering at an existing infrastructure, is a typical characteristic of emerging business models of The Blue Economy.

The First Cash Flow
The first plant in operation is located close to Pusan, Korea. Scandinavian Biogas decided to design, build, operate and transfer a 14,000 cum digester adjacent to the municipal waste water treatment plant (MWWTP) at Ulsan. Through the blending of food waste, sludge pre-treatment and gas cleaning the output of biogas increased from the original 3 million cum of biogas per year to 12 million cum, an improvement of factor four. The complete output of purified methane gas is sold to SK Chemical. The return on investment (ROI) is in excess of 20 percent, turning a plant that relied solely on tax revenues into an income generating operation. The positive result is obtained thanks to the generation of multiple cash flows: gate fees for food waste, gas revenues, with a considerable price increase thanks to the
upgrade to vehicle quality gas, revenues from liquid CO\textsubscript{2} and even extra income generated by the sale of heat. The traditional MWWTP has never looked that profitable before.

The Opportunity
The case of Korea offers an insight in the vast potential worldwide for biogas. Whereas the Ulsan plant is one of the smaller industrial facilities in Korea, it is already good for 30,000 cum of biogas per day. If the same technology were installed at all MWWTP in Seoul, the capital of Korea, the daily output of biogas could reach nearly one million cum of biogas, good for 360 million cum annually. It is no surprise that once Scandinavian Biogas has proven the business model, that investors are keen on following this business concept. Whereas the Korean government is pursuing a clear strategy towards renewable energy with all necessary incentives, it is clear that several hundred sewage treatment plants would need to be renovated. While the ROI is still attractive, the advantage is for countries that have yet to develop their MWWTS.

If biogas can be made competitive in Germany and Sweden, and when these operations are bankable in Asia at a large scale, time has come to reach out to the municipalities where the waste water system is not warranting quality water to the local population, and where raw sewage makes otherwise beautiful beaches unsafe, as is the case in prominent tourist centers like Cape Town (South Africa) and Rio de Janeiro (Brazil) for extended periods of the year. The proposal initiated by Mr. Danielsson, and now actively pursued by a team of nearly 50 professionals proves that while water treatment costs money, and waste disposal undertaken separately also costs money, the two combined generates money. This is once more an indication that the traditional management model of “core business based on core competence” is coming to the end of its logic. It is this out of the box thinking of clustering activities emulating natural systems, that could render world economy sustainable, powered by renewable energy resources where even the slurry at the end of the production helps create new top soil.

The Blue Economy

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… Further information on the 100 innovations at www.theblueeconomy.org

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