

Biogas Developments in Europe — Snapshots

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In New Zealand biogas has to this day remained a niche technology, despite some outstanding field examples, leading edge manufacturing capabilities and leadership shown by many industry players, not least members of the Biogas Interest Group (BIG). The picture is vastly different in Europe where biogas technology has become mainstream and in some regards a real game changer providing enhanced local energy security, novel markets for primary producers and enhancing the usefulness of renewable energy systems. The authors had an opportunity to experience some leading examples first hand during a trip to Europe in June and July 2010. Since there is so much biogas activity going on in Europe the projects we visited in Sweden, Germany and Austria can be describes as snapshots of some among many.

Sweden

Stephan Heubeck paid a brief visit to this Scandinavian country, where the main focus for biogas is on the provision of vehicle fuel; a development mainly driven by local council and community interests. The foundation for the attractiveness of biogas vehicle fuel is a high national mineral fuel tax on petrol and diesel in combination with a tax-break enjoyed by biogas vehicle fuel. However on the ground it is local councils and their commercial arm companies that have been pivotal in establishing biogas to transport fuel systems. In most large cities in southern Sweden city bus fleets and other council vehicle fleets have in recent years been converted to run on biogas, based on the financial advantages provided by the tax-break. Public refuelling stations “piggy-backed” onto this infrastructure are now providing an increasingly dense network of biogas refuelling points that allow businesses like taxi companies as well as private motorists to enjoy the environmental and financial benefits of biogas. In 2010 ~ 2.5% of Sweden’s road fuel demands will be met by biogas, and growth in this sector is predicted to burgeon. Vehicle manufacturers that retail in Sweden are taking biogas vehicle fuel very seriously; many offer some models with an optional biogas configuration. Here again the focus is on commercial and fleet vehicles.

A diverse range of feedstocks from sewage sludge to energy crops and agro-industrial processing wastes currently provides Sweden’s biogas vehicle fuel, and industry experts don’t expect feedstock availability to restrict growth of the biogas sector in the near future.

Talking to the deputy CEO of an electricity and gas lines company, Stephan was told that for local energy infrastructure companies, biogas is the most crucial energy resource for the near future for a number of reasons. Firstly, linking an increasing number of anaerobic digestion facilities with biogas refuelling stations is in many cases most easily done by co-utilizing existing natural gas pipeline infrastructure. Secondly upgraded biogas would be a handy replacement for dwindling natural gas supplies currently imported from Denmark (North Sea) that would allow for the continued use of established infrastructure, which is of particular relevance for many gas fired CHP and district heating schemes operated by local energy infrastructure companies. Thirdly biogas based electricity generation is seen as a useful tool for balancing intermittent electricity generation e.g. from wind at a local level, thereby avoiding the need for transmission infrastructure upgrades that would otherwise be required to enable remote fossil fuel or hydro back-up of local wind generation developments.

Germany

Germany has over 5,000 operating biogas plants, most of them operated by individual farmers or farmer cooperatives, digesting a combination of farm wastes, residues and energy crops. Currently almost all of these biogas plants use the biogas in CHP units and supply electricity to

the grid. However the German government has set a target of 6 bcbm / year of upgraded biogas to be injected into the national gas pipeline network unit 2030, which will require the establishment of at least 120 gas grid connected biogas upgrading plants per year for the next 2 decades. No doubt, many of these biogas upgrading set-ups will also provide biogas transport fuel for local use.

Stephan has a long established linkage to researchers at the Bavarian State Research Centre for Agriculture in Freising near Munich. The centre conducts research into the technology and mechanical aspects of biogas plants, the microbiology of anaerobic digestion as well as biogas energy crop production. Rocky and Stephan spent several days with the researchers at the centre and intensively discussed field trials with energy crops that fit into rotations of food and feed crops with good prospect to give high biogas yields and achieve overall sustainability. The Kiwi visitors were also invited to tour a large commercial biogas facility that digests organic wastes from local government, roadsides, food processors etc. and besides biogas energy provides nutrient rich liquid digestate as well as compost for agricultural and landscaping use. Many of the lessons learned in Germany are highly relevant for New Zealand, in particular where biogas technology can provide better waste management as well as land use, thereby avoiding environmental target conflicts.

Austria

Two facilities toured near Vienna were full of interesting elements. The biogas plant at Bruck an der Leitha was initiated by a 'community think tank' and adopted by local council. The biogas plant digests agro-industrial processing wastes and by-products (e.g. canning waste, brewers grain) as well as organic municipal solid waste. Large storage capacity onsite allows digestate to be held all winter then applied to crop land as a good source of available nutrients.

The most innovative biogas plant, and potentially also the most relevant to NZ, toured by Rocky and Stephan is located near Vienna's airport. The plant was established by a 12 farmer co-operative and digests pig manure as well as a range of energy crops grown on 220 ha of co-op members land.

The biogas is put to 3 uses: running a 625 kW generator exporting electricity into the grid, fuelling a boiler that in combination with the generator waste heat feeds hot water to a residential district heating scheme in the nearby village, and upgrading and compressing the gas for use as transport fuel. The biogas transport fuel is used in cars, courier vans as well as 2 experimental biogas tractors, and community support for this scheme is very strong.

The nutrient rich digestate is reapplied to cropland, which in combination with the nutrient inputs from pig manure makes the biogas cropping system nutrient self-sufficient.



Both authors are part of the NZ research project funded by MAF. It is called Closed-Loop N Supply biomass cropping (described in a [previous BANZ newsletter article](#)). We used the visit to Austria to strengthen our links with research collaborators at the Dept of Sustainable Agricultural Systems at the University of Natural Resources (BOKU), Vienna. BOKU leads the 9-nation, 13-organisation, Agrobiogas Forum for R&D. The group is now able to accurately model biogas yields from crop rotations of several crop feed-stocks, as well as associated nutrient fluxes. We were encouraged to collaborate with the BOKU to calibrate the model for NZ crops and conditions, and hope to be able to support rural biogas schemes in New Zealand with our work in the not too distant future.

While our visit only provided us with snapshots of all the exciting developments going on in the EU, with our ties to the Agrobiogas Forum we will now be able to convey a fuller picture of overseas activities to the NZ biogas community over time.