One in three cars in Sweden could run on biofuels by 2030

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By 2030 Sweden could increase its production of biofuels to cover just over a third of automotive fuel used by its transport sector today, a move that would mean a ten-fold increase on the current in-country production. Forest-sourced materials such as residue from forestry operations, wood from forest grown for bioenergy and agricultural waste products have the greatest potential to fill the gap.

These are conclusions by biorefinery researchers in Sweden, some of whom of Bio4Energy, submitting a report to the Swedish government this month on the 'Production of Today's and Future Sustainable Biofuels'. The report feeds into an encompassing official investigation on how to wean the Swedish transport sector of fossil fuels and make it "carbon neutral", to be released in October.

Signed by the Swedish Knowledge Centre for Renewable Transport Fuels, f3—of which B4E is a member—the report says the country could increase its annual biofuel production to as much as 25-35 terawatt hours (TWh), keeping within today's "technological restrictions, and to a certain extent also ecological and economic restrictions".

Sweden's current biofuel production has been estimated at three TWh, as part of a total energy supply in 2010 of 616 TWh, 96 TWh of which were put to final use in the transport sector, according to 2012 statistics from the Swedish Energy Agency.

The f3 report, meanwhile, assesses likely effects of increasing

production of a range of mainly second-generation or more advanced biofuels in commercial use or at a late development stage in Sweden, using a "well-to-thank" life-cycle approach. It also attempts to check the fuels against sustainability criteria set out in the European Union renewable energy directive from 2009. Estimates of the potential for increasing biofuel production internationally are given as a means for comparison, and the authors discuss the possibility of applying limits on production based on indirect land-use change considerations.

Check production systems, not just types of biofuel

While the report offers few general conclusions, instead assessing the different kinds of biofuels against a range of systemic aspects, one is for policy-makers not to single out any one type of biofuel for blanket support. Rather, each type of production system should be checked for its socio-economic and environmental impacts, taking into account choice of raw materials, conversion route, location and size of production units, transport logistics and possibilities for joint production with other energy carriers or food or feed production. In each case, local conditions should guide the choice.

"Perhaps the most important conclusion is precisely to not favour a particular [type of] biofuel, but instead support production systems that are sustainable", according to B4E scientist Joakim Lundgren, one of the report's lead authors.

"The type of biofuel matters less. For a production system to be considered sustainable, it should be energy efficient and not compete with today's production by the forestry industry or agricultural production", said Lundgren, who works as a researcher at Luleå University of Technology in Northern Sweden.

Largest potential for use increase in forest-sourced biomass

Especially the life-cycle approach points to biofuels made from residues from forestry operations via the thermal conversion route as an "efficient" alternative to fossil fuels. Brought to an industrial scale, biofuel such as methanol or dimethyl ether (DME) made via gasification of branches, tree tops or by-products from biorefinery or pulp and paper making, could deliver greenhouse gas reductions, require only low external energy input and cost per unit, where the outlook is long term. Wood from "energy forests" managed for the purpose of producing bioenergy also receives good marks for greenhouse gas reduction potential:

"Automotive fuels produced from energy forests via gasification or ethanol combined [with agricultural production] leads to a reduction per hectare which is about 50 per cent larger than for most fuel production systems based on traditional agricultural crops", the report says.

"If the perspective is long term and takes into account the outtake on a per-land ownership and landscape level then bioenergy [based on forest-sourced materials] is an efficient alternative from the perspective of [reduction of] greenhouse gases. If we add in initial carbon losses due to an increased use of bioenergy it still will be a better alternative in the long run than fossil fuels", according to the report.

External energy input for biofuel produced from lignocellulose via the gasification route is estimated at five-to-ten per cent, compared with about 50 per cent for bioethanol made from grains, the report states.

Finally, biomass-based waste from agricultural production could be used on a "somewhat" larger scale than today, in appropriate production

systems, according to the report authors. There is room for improvement in the technologies for making biogas via fermentation or rot of organic waste, they hint, and for further use of household waste in biogas production. Moreover, Sweden could increase its use of land unsuitable for agricultural production to grow energy crops or rapid-growth deciduous trees.

However, the authors conclude, the "largest potential is in forest-sourced raw materials".

More information: www.bio4energy.se/

Provided by Bio4Energy

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