Hydrogen distribution not an option in biomass gasification

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When using fuel cells to generate electricity from biomass, the best approach is to do so centrally, in combination with a gas turbine. The production and subsequent distribution of hydrogen is an inefficient process. This is the view of Richard Toonssen, who will defend his doctoral dissertation on this subject at TU Delft in the Netherlands on Thursday 8 July.

Biomass is seen as a renewable energy source for the production of electricity and heat. The conversion of biomass for this purpose must, of course, be as efficient as possible. With this in mind, biomass gasification in combination with the use of fuel cell systems could be a very promising technology (in the future). Richard Toonssen of TU Delft compared suitable conversion chains.

In the first conversion chain that Richard Toonssen studied, biomass is first centrally converted into syngas (a mixture of hydrogen and carbon monoxide). This gas is then used directly in fuel cells (of the SOFC type), in combination with a gas turbine, to produce electricity. The electricity generated in this way is distributed through the grid for household use. Some of this electricity is used to power household heat pumps, for heating purposes.

The second conversion chain that Richard Toonssen examined also starts with the centralised conversion of biomass into syngas. This is then reprocessed into a gaseous fuel (clean syngas, hydrogen, or synthetic natural gas). The fuel is then distributed to customers via a supply

network. The customers in question are households that use this fuel in micro-cogeneration/coupling systems, consisting of a fuel-cell system and a heat pump.

The distribution of syngas is the most efficient variant of this second chain, closely followed by synthetic natural gas. According to Richard Toonssen, the variant involving the distribution of hydrogen is the least efficient of the three. The major conclusion here is that, in this case, hydrogen is an unsuitable energy carrier. Electricity is a better option.

However, none of the second conversion chain options are as promising as the first chain which, as stated above, involves the central conversion of biomass into electricity in a combined fuel-cell/gas-turbine system.

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