

Hydrogen can contribute to Sask. energy mix

Paul Hanley, Special to The StarPhoenix

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An innovative Saskatchewan company is developing technologies that could make the production of hydrogen economically viable in the next two to three years.

For decades, hydrogen has been touted as the ultimate in environmentally-friendly energy sources. So far, that promise hasn't panned out. It still takes more energy to produce hydrogen using existing methods than you get from burning it. Hydrogen fuel cells, which were expected to provide a practical, cost-effective approach, haven't lived up to their early promise thus far.

Speaking at an event sponsored by the Prairie Policy Centre (www.prairiecentre.com) last week, Lionel Kambeitz of HTC Pureenergy of Regina (www.htcenergy.com) reported that his company is close to commercializing technology that would produce hydrogen economically from biofuels. The technology would integrate hydrogen production with ethanol production processes. Hydrogen could then be substituted for natural gas used in the ethanol plant to make process heat or electricity.

Substituting hydrogen for natural gas would significantly improve the economics, the environmental performance and the sustainability of ethanol. Currently, ethanol production uses natural gas -- a non-renewable fossil fuel -- as the main energy source. Because of its very rapid growth, the North American ethanol sector is becoming a major user of natural gas.

Demand for natural gas will rise rapidly as the Alberta oilsands expansion comes on stream. The oilsands are the world's largest consumer of natural gas. Another big consumer is electrical utilities. The additional demand from biofuels production could push gas prices up.

Kambeitz pointed to the irony of using more and more of a limited, non-renewable fossil fuel resource to make what is considered a green alternative fuel. Finding ways to substitute hydrogen, produced on site, would give ethanol a significant advantage. It would also lower the greenhouse gas emissions of the industry.

HTC is also developing technology to produce hydrogen from glycerol, a by-product of biodiesel production. Glycerol currently has a limited market and as the biodiesel industry grows, glycerol will become little more than a waste product. Producing hydrogen from glycerol would turn this waste stream into a new energy source, improving the economics of biodiesel.

HTC uses a dry reforming process to make hydrogen. The process is highly scaleable, from appliance-size processors that might be located in private homes to industrial-size plants. This means the process can be deployed at a wide range of sites where hydrogen is produced for local consumption. This overcomes one of the main barriers to the widespread adoption of hydrogen as a consumer end-use fuel, which is the difficulty in storage due to metal embrittlement and leakage.

HTC says its process can also be used to make hydrogen from natural gas. Dry reformation of natural gas into hydrogen extracts more usable energy content from gas (at least 1.4 times) than combusting it in even the most efficient steam boiler or turbine. It extracts more energy content in the form of hydrogen than the natural gas itself contains.

Out of the four atoms in natural gas (CH₄) the overall dry reforming process actually extracts eight atoms during the process. The extra four atoms are obtained from water. This increase is also applicable to crude ethanol reforming.

HTC is part of a research and development consortium (www.co2-research.ca) in Regina focused on greenhouse gas emissions reduction and carbon sequestration. Kambeitz said two key policy decisions are required to mitigate climate change. The first is a carbon cap and trade system. The second is opening the energy grid to independent producers. Once these policies are in place, capital and financing will follow and alternative fuels will move into the mainstream.

With regard to the power grid, his view is that it should be as easy for independent producers to connect to the grid and supply power as it is for consumers to buy power. When the grid opens up in this way, utilities will have access to multiple sources of environmentally-friendly power at low capital costs.

Hanley is a Saskatoon freelance writer with a special interest in the environment.

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