Manure could heat your home

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Farm manure could be a viable source of renewable energy to help reduce greenhouse gas emissions that cause global warming.

Researchers at the University of Waterloo are developing technology to produce renewable natural gas from manure so it can be added to the

existing energy supply system for heating homes and powering industries. That would eliminate particularly harmful gases released by naturally decomposing manure when it is spread on farm fields as fertilizer and partially replace fossil natural gas, a significant contributor to global warming.

"There are multiple ways we can benefit from this single approach," said David Simakov, a professor of chemical engineering at Waterloo. "The potential is huge."

Simakov said the technology could be viable with several kinds of manure, particularly cow and pig manure, as well as at landfill sites.

In addition to being used by industries and in homes, renewable natural gas could replace diesel fuel for trucks in the transportation sector, a major source of greenhouse gas emissions.

To test the concept, researchers built a computer model of an actual 2,000-head dairy farm in Ontario that collects manure and converts it into biogas in anaerobic digesters. Some of that biogas is already used to produce electricity by burning it in generators, reducing the environmental impact of manure while also yielding about 30 to 40 percent of its energy potential.

Researchers want to take those benefits a significant step further by upgrading, or converting, biogas from manure into renewable natural gas. That would involve mixing it with hydrogen, then running it through a catalytic converter. A chemical reaction in the converter would produce methane from carbon dioxide in the biogas.

Known as methanation, the process would require electricity to produce hydrogen, but that power could be generated on-site by renewable wind or solar systems, or taken from the electrical grid at times of low

demand. The net result would be renewable natural gas that yields almost all of manure's energy potential and also efficiently stores electricity, but has only a fraction of the greenhouse gas impact of manure used as fertilizer.

"This is how we can make the transition from fossil-based energy to renewable energy using existing infrastructure, which is a tremendous advantage," said Simakov, who collaborates with fellow chemical engineering professor Michael Fowler.

The modelling study showed that a $5-million investment in a methanation system at the Ontario farm would, with government price subsidies for renewable natural gas, have about a five-year payback period.

A paper on modelling of a renewable natural gas generation facility at the Ontario farm, which also involved a post-doctoral researcher and several Waterloo students, was recently published in the *International Journal of Energy Research*.

Provided by University of Waterloo