

# Transforming Greenhouse Gas Emissions into Energy



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## At a Glance:

### GE Jenbacher Gas Engines turn Waste into Energy

- Environmental challenge: Reduce greenhouse gas emissions; generate clean energy
- Technology solution: Jenbacher gas engines convert waste to energy and useful heat
- Global technology dissemination: GE technology and associated know-how
- Transactions: Sales, provision of services, training local partners
- Key players: General Electric; local GE distributor in Philippines and biogas plant owner/operator; Ukraine Milk Company, Ltd.; local GE distributor in Ukraine and biogas plant provider
- WIPO GREEN support: The database contains several technology solutions for green energy generation; services are available to facilitate transactions, such as assistance with obtaining financing.

## The environmental challenge

Greenhouse gases such as methane and carbon dioxide are emitted from landfills, as well as from agricultural facilities due to concentrated animal waste, contributing to climate change. Safe and environmentally sound disposal of animal wastes is a major challenge for larger scale agricultural producers. Using fossil fuels for energy contributes to global warming, and energy needs are growing in many countries. Capturing waste gases and converting them to energy can help to mitigate climate change by lowering consumption of fossil fuels, at the same time reducing the release of harmful gases. According to the United Nations Environment Programme (UNEP), in order to ensure the average global temperature does not rise by more than 2°C by 2020, the percentage of primary energy that is produced from non-fossil fuel energy sources, such as biogas, will need to increase by as much as 28% by 2020<sup>1</sup>.

## The technology solution developed by General Electric

The Jenbacher gas engine, produced by General Electric (GE), is a proprietary waste-to-energy technology solution. It generates energy using waste gases – such as biogas, landfill gas, gas from coal mines, sewage gas, and combustible industrial waste gas – as inputs. Jenbacher engines have been deployed around the world for municipal and industrial use. GE Energy's Jenbacher product team has its headquarters, its production facilities, and most of its employees in Jenbach, Austria.

Jenbacher gas engines are part of GE's portfolio of "ecomagination" products. Ecomagination is an initiative launched in 2005 that is aimed at developing products with better performance and value for customers, in addition to better environmental performance. So far, more than USD 5 billion has been invested in green R&D as part of ecomagination<sup>2</sup>. Moreover, GE has earned over USD 85 billion from the technologies developed under

1. "Bridging the Emissions Gap", UNEP, 2011, at [www.unep.org/pdf/UNEP\\_bridging\\_gap.pdf](http://www.unep.org/pdf/UNEP_bridging_gap.pdf)
2. Ecomagination Annual Report 2010, at [http://files.gecompany.com/ecomagination/progress/GE\\_ecomagination\\_2010AnnualReport.pdf](http://files.gecompany.com/ecomagination/progress/GE_ecomagination_2010AnnualReport.pdf)
3. See [www.ecomagination.com/portfolio](http://www.ecomagination.com/portfolio)
4. Figure from GE press release of 14 July 2010, at [www.genewscenter.com](http://www.genewscenter.com)

the program, making it a sustainable business. There are four models of the Jenbacher engine among the 110 product offerings in the ecomagination portfolio<sup>3</sup>.

### Global technology diffusion

In the Philippines, four Jenbacher (JGC 320) gas engines are used at a biogas plant outside of Manila to transform gases from the San Pedro Landfill into electricity for domestic consumption. This plant captures methane and other harmful gases, transforming them into energy that is sold to the local grid. The plant began operating in 2011. It is expected to reduce methane emissions from the landfill by more than 70%, in addition to reducing carbon dioxide and nitrogen emissions. This project is certified under the UNFCCC Clean Development Mechanism (CDM), and it supports the government's goal of developing alternative and clean sources of energy over the next twenty years.

Technology diffusion is occurring not only as a result of the sale and deployment of the Jenbacher at the San Pedro Landfill, but also through the transfer of skills and knowledge to local experts. While the plant uses GE technology, it was built by a local company and is owned and operated by a Filipino local waste-to-energy developer. As part of the transaction, GE will work with its distributor in the Philippines to provide a significant number of service hours, resulting in the transfer of skills and knowledge to Filipino engineers working for its distributor as well as the operator of the plant.

In Ukraine, a Jenbacher (JMC 312) gas engine is being used successfully to generate energy and heat at the Ukrainian Milk Company, Ltd., which produces milk for child nutrition products. Working with GE's distributor and service provider in Ukraine, and a leading provider of turnkey biogas plants in CIS countries, the Ukrainian Milk Company established the first "biogas cogeneration" plant in Ukraine in 2010. The plant uses a Jenbacher engine to turn the waste products of 4,000 cows into electricity for its own use, as well as producing useful heat.

The company produces excess electricity, which it sells to the local grid under the Ukrainian government's "green tariff" program. The government encourages investments in bioenergy facilities by offering benefits to producers, including a higher price for electricity generated from alternative sources of energy, including biogas – the so-called "green tariff". The difference between the green tariff and retail energy tariff provides an incentive to increase production of energy using alternative sources, which helps to mitigate climate change.

By turning cow manure into biogas, which it uses to power the Jenbacher engine, the plant is able to substitute the equivalent of 1.2m cubic meters of natural gas annually. This could result in a reduction of carbon dioxide emissions by as much as 18,000 metric tons per year. At the same time, the plant provides a means of disposal for manure, thus reducing emissions of methane and other gases. And the Ukrainian Milk Company uses waste products from the energy generation process as high-quality agricultural fertilizer.

This transaction resulted not only in the deployment of the Jenbacher engine in Ukraine, but also in the transfer of know-how to local engineers who service the biogas plant. A regional provider of biogas plants set up the plant, working with GE's distributor and on the basis of GE technology, and that entity's experts are tasked with service and maintenance.

### Outlook for the Jenbacher

Jenbacher engines are being used in several biogas projects that turn manure into energy. China has adopted both cow and chicken manure applications, and the country is home to the world's largest biogas project based on cow manure. The Jenbacher gas engine has also been deployed in India, where a large demonstration manure cogeneration project was established near Punjab. GE waste-to-energy technology could be deployed in many countries, using a range of inputs.

WIPO GREEN provides a platform for connecting potential users and providers of technologies for clean energy generation. In addition, WIPO GREEN provides services to facilitate transactions involving climate change mitigation technology solutions.

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