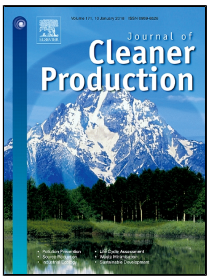
Accepted Manuscript



Opportunities and Challenges: Landfill Gas to Biomethane Injection into Natural Gas Distribution Grid through Pipeline

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PII:	S0959-6526(17)32866-4
DOI:	10.1016/j.jclepro.2017.11.193
Reference:	JCLP 11332
To appear in:	*Journal of Cleaner Production*
Received Date:	02 April 2017
Revised Date:	24 November 2017
Accepted Date:	24 November 2017

Please cite this article as: Poh Ying Hoo, Haslenda Hashim, Wai Shin Ho, Opportunities and Challenges: Landfill Gas to Biomethane Injection into Natural Gas Distribution Grid through Pipeline, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.11.193

Opportunities and Challenges: Landfill Gas to Biomethane Injection into Natural Gas Distribution Grid through Pipeline

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Biomethane, a renewable gas (RG), is gaining popularity globally since the advocacy for greenhouse gas (GHG) emission reductions. Biomethane includes upgraded biogas and upgraded landfill gas. Upgraded biogas is generated and upgraded from biomass, for example, energy crops or agricultural waste through anaerobic digestion, while upgraded landfill gas is collected and upgraded directly from gas released from a landfill site. In Malaysia, biogas and landfill gas are usually used on site. The potential for transporting upgraded biogas for off-site utilisation through pipeline injection is yet to be explored. This paper presents economic models, spatial analysis and scenario analysis to identify an appropriate biogas supply chain to different demand: industrial area, commercial area and residential area at different pressures: 20 psig, 4.3 psig and 0.43 psig through injection into the natural gas grid. The trade-off between the compression pressure and the distance of transportation is assessed and the results reveal that injection of biogas into the natural gas gate for industrial usage at 20 psig is the best option, with associated costs of 2.07×10^9 MYR/y. The cost is higher than supplying the demand with natural gas, which has an annual cost of MYR 985.87 M. Therefore, incentives for sales of biogas and turning the environmental liability of methane gas emitted from the landfill into an economic opportunity is essential so that the biogas can be sold at a competitive price as natural gas. The methodology can be applied at regional and country level to support policy makers to define and implement a strategy for future landfill gas to be injected into the natural gas grid in order achieve the country's renewable energy target of 30 % in 2025.

Keywords: landfill gas, biomethane, injection, Malaysia, Non-Linear Programming