

KIT Bio-CNG Upgrade



Expanding Opportunities

TBEC has been operating the Kitroonguang Biogas Energy Project (KIT) since 2007, but the market for electricity produced from biogas has become saturated in Thailand. New power purchase agreements are no longer issued for biogas projects, so TBEC decided to upgrade KIT's biogas plant to make it more efficient.

After the upgrade, surplus biogas is no longer flared, but cleaned and compressed before being sold to the transport sector as bio-CNG, a clean replacement of fossil fuel-based compressed natural gas.

It was difficult for TBEC to secure financing for the upgrade as banks were not interested in biogas projects. After EEP Mekong decided to fund this innovative project, TBEC could also secure project financing from other sources.



EEP funded **24%**

KIT was upgraded in four ways:


Converts **2**
types of tapioca starch waste

Improved
gas handling system




Bio-CNG
production

Selling to the
public



Bio-CNG vs CNG

CO₂ emissions p.a.

18,000 tonnes



Cost per kg

US\$0.46

Carbon-Neutral



US\$0.437

KIT's Bio-CNG Upgrade

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From Waste to Revenue

Thai Biogas Energy Company Ltd (TBEC) is the leading biogas plant owner in Thailand and has been operating the Kitroonguang Biogas Energy Project (KIT) since 2007. KIT used waste water from its partner tapioca starch factory to create biogas for power generation, but over the years, Thailand's market for biogas-based power has become saturated. At present, it is impossible to get power purchase agreements for new biogas projects, making it harder for small biogas plants like KIT to remain profitable.

In response, TBEC decided to upgrade KIT to generate a new income stream. TBEC wanted to produce compressed biogas (bio-CNG) and sell it to the public as an alternative to fossil fuel-based compressed natural gas (CNG). Changing KIT's business model had several benefits. The plant could generate an income from biogas that it would have needed to flare before. It would also be able to use starch pulp (a type of waste from the starch production process) in addition to the waste water it used before to produce more biogas for sale, and then reduce the factory's use of fossil fuel in its drying process. All these changes would add up to 18,000 tonnes of avoided greenhouse gas emissions per year.

Financing the necessary biogas plant upgrades was a challenge because banks were not interested in financing biogas projects. TBEC proposed the project to EEP Mekong, which decided to fund 24% of the project's total value (€1.13 million). This allowed TBEC to convince other financing institutions to invest in the project.

The Project

The project started in November 2017 and was completed 16 months later in February 2019. It reached the following milestones:

1. Retrofitment of the existing biogas plant to include cassava wet pulp as a feedstock in addition to starch process waste water
2. Installation and commission of the biogas upgrading system, including gas compression to produce bio-CNG
3. The opening of a public filling station to provide bio-CNG to the transport sector as a fossil fuel CNG replacement

A revenue sharing agreement between the project and the host starch factory is a key factor to the project's success. Under this agreement, the starch factory receives 20% of the project's revenues and in exchange provides guaranteed quantities of waste water and starch pulp as feedstock to the biogas plant free of charge. About 40% of the raw biogas is sold back to the factory as a fossil fuel replacement in the starch drying process. The plant's bio-CNG production capacity is three tonnes per day, with the bio-CNG being sold at a 5% lower price than that of fossil fuel CNG.

Sustainability and Scale-Up

- The KIT project's operating cash flow was positive within one month of project completion, with an operating margin of over 45%.
- The project's technical solutions are price-competitive and suitable for the starch industry as well as other agro-industry factories.
- The project showcases a more efficient biogas technology. Several starch factories in the Greater Mekong Subregion show an interest in replication.
- 80 starch factories in Thailand have project replication potential.
- TBEC is preparing to implement similar projects in Cambodia, Viet Nam, and Myanmar.
- Bio-CNG is an economic alternative to fossil fuel in the transport sector and contributes to a reduced national import bill.



The project supplies bio-CNG to the public at lower costs than fossil fuel-based CNG.



Bio-CNG storage



Retrofitting the plant

Socio-Economic Impact

The project offers several economic benefits to its partner starch factory:

1. Utilisation of a waste product (starch pulp) for energy generation and avoidance of disposal costs
2. Replacement of fossil fuel in the starch drying process
3. Additional income from its share of bio-CNG sales

Benefits to the local community include:

1. Elimination of environmental pollution from the dumping of starch pulp
2. Employment generation for 20 persons
3. Access to clean fuel at lower costs than fossil fuel CNG

About 21,000 community members benefit from project activities. The project also contributes to the Government of Thailand's promotion of bio-CNG and the reduction of the country's import bill.