

# Study on the Utilization of Hydrogen Generated at Municipal WWTPs

(Research for FY 2017)

## 1. Purpose

Hydrogen production from sewage sludge discharges less CO<sub>2</sub> than such as town gas from fossil fuel. Besides, it enables the cost reduction for transport when its area of demand is close. Because of these features, hydrogen is highly expected as promising renewable energy

Ministry of Land, Infrastructure, Transportation, and Tourism (MLIT) of Japan established "Study committee on resource utilization from sewerage in the hydrogen society." The committee released "Guidelines for Energy Conversion Technology of Sewage Sludge 2017" based on the investigations in multiple municipalities in 2015-2016.

This study aims to collect information on the domestic or international efforts for the hydrogen production from sewerage and its utilization, study the strategy for its realization, and promote it.

The consortium of JS and Nihon Suido Consultants Co., Ltd implement the research as an entrusted project from the sewerage and wastewater management department, National land conservation bureau of MLIT.

## 2. Achievements of this year

### **(1) Investigation on the domestic or international efforts for the hydrogen utilization from biogas**

A questionnaire survey was carried out for the following target groups:

- Ministry of Economy,

- Ministry of Environment,
- MILT,
- Experts who were members of “Study committee on resource utilization from sewerage in the hydrogen society” held in 2015-16,
- Municipalities that made FS last year,
- Three manufacturers that experimentally produce hydrogen from digestion gas generated at WWTPs

The hearing survey to experts and municipalities proved that further technical innovation, deregulation, and a support system for CO<sub>2</sub>-free hydrogen were required.

(2) **Study on the strategy for the hydrogen utilization**

A feasibility study was carried out for a renewable energy transport model. Biogas generated at WWTPs is transported through town gas pipeline (figure 1.)

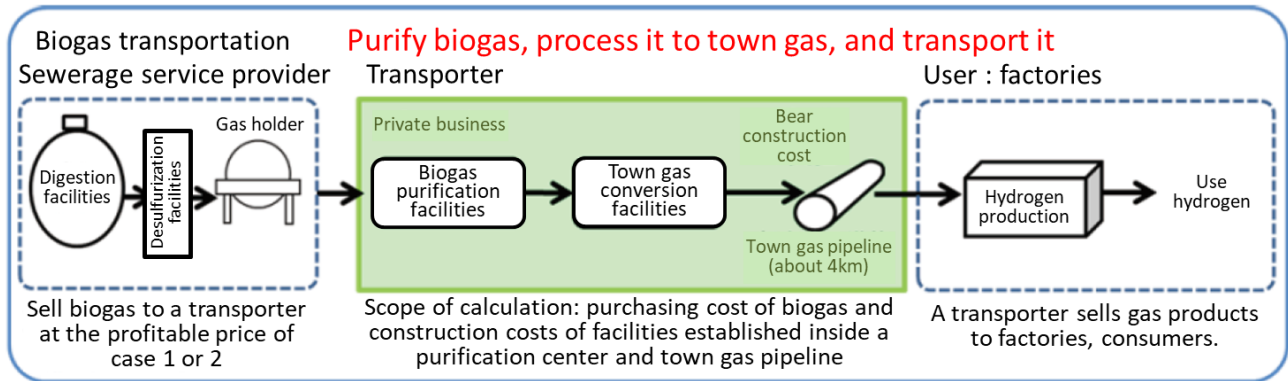


Figure1: Schematic flow diagram of renewable energy business

The business scheme of hydrogen utilization assumes sewerage service provider sells generated hydrogen to renewable energy transporter such as a gas supplier. The unit sales price was set up to be more economical

than the consumption of supplemental fuel to the internal incinerator. For example, when WWTP with a treatment capacity of 250,000m<sup>3</sup> per day (daily mean) adopts digestion for its generated sludge, biogas yields per day are 4,500Nm<sup>3</sup> for partial digestion and 23,600Nm<sup>3</sup> for whole quantity digestion. When deducting two-third construction fee by Japanese governmental subsidy, each unit sales price of generated gas was estimated 235 and 128 Japanese yen per Sm<sup>3</sup>, respectively. For the execution of the hydrogen project, the business framework and operation periods should be considered. When WWTP with no digestion system adopts the technology, the impacts on the whole WWTP should be noted.

### 3. Conclusion

The information collection and investigation on the international or domestic examples of the hydrogen utilization from biogas shows that it has some issues on the hydrogen demand and profitability. To solve these problems, not only the deregulation and the cost reduction by technical innovation but the enhancement of a project support system and the incentive providing system for CO<sub>2</sub>-free hydrogen are required.

Feasibility study on the renewable energy transport model shows the unit sales price of biogas is 128 Japanese yen per Sm<sup>3</sup> when considering the government subsidy of two-thirds. The consideration of the business framework is an issue for project implementation.

---

***Keywords: Utilization of sewerage-derived resources, Hydrogen utilization, CO<sub>2</sub>-free hydrogen, Hydrogen society***

---