Opportunities and Constraints of Waste-to-Energy Technology for Municipal Solid Waste in Vietnam

*Nguyen Thi Doan Trang1), Kosuke Kawai2), Toyohiko Nakakubo1)
1) Ochanomizu University, 2) National Institute for Environmental Studies

1. Introduction
In Vietnam, recent years witness the rapid socio-economic development as well as the speedy increase of population in many regions across the country. Urban areas are expanding and upgrading with denser population, consequently resulting in higher pressure on technical and social infrastructures. Together with risen demands on energy consumption, basic urban service in term of urban domestic waste (UDW) collection and treatment stands in need as the foundation for the living of the urban citizens. According to the Ministry of Natural Resource and Environment (MONRE), accounting for 60-70% of the total waste in urbans, an estimation of 63 million tons of UDW generated daily over the time of 2011-2015. This volume gained by 10-16% on average per annum, more steeply than that during 2006-2010 period, especially in some big and rapidly urbanized cities such as Ho Chi Minh City, Ha Noi, Hai Phong, Da Nang [1, 2]. In 2011, there were 98 centralized landfills serving major urban among 450 sites nationwide. Of those, only 16 sites are sanitary and engineered landfills. It is observed in landfills the combustion practice of DSW, with roughly 40-50% of waste burned without energy recovery [3]. Waste-to-Energy (WtE) provides a notable advantage by minimization of waste volume after treatment, thus remarkably saving the land utilization in dumping sites. Moreover, the energy recovered from waste stream potentially contributes to the share of renewable energy in the national gross energy supply. These two highlighted benefits significantly bring the promising measure to Vietnam as the landfilling-dominant country facing the threats of pollutions from landfilling sites and increasing demand for electricity.

This study aimed to clarify the opportunities and incentives to install WtE technology in Vietnam, review the current situation, and summarize the constraints.

2. Opportunities and Incentives
It exists such kind of obstacles for the WtE technology to be introduced into Vietnam. However, it can be observed that there is a high potential. Firstly, the government, realizing the need for advanced technology for urban waste treatment as an alternative to landfilling, has been calling for investors and consultants investing the WtE technology to Vietnam. The incentives regarding investment legislations adopted recently offer the crucial mechanisms enabling the WtE projects to be carried out in the country. Decision No.31/2014/QD-TTg indicates the price of electricity derived from solid waste being increased from 4 USScents to 10.05 USScents/kWh. This price is positively considered to bring profitable investments to the investors. Others are Decree No.322/QD-BXD by the Ministry of Construction (MOC) announcing the treatment cost by WtE technology is 410,000 VND/ton of waste (equivalent to USD 19.23/ton of waste), Circular No.32/2015/TT-BCT issuing by the Ministry of Industry and Trade on Project development and Standardized Power Purchase Agreement for power generation projects using solid wastes. Secondly, there is much room for energy recovery demand from waste sector applying WtE technology as planned in the Decision No.1208/QD-TTg on Planning on National Electricity Development in the 2011-2020 period with a vision to 2030, targeting to reach 6,000 MW in total with other renewable sources (geo-thermal, landfilling gas). While the current exploited amount is just merely 2.4MW (MONRE, 2017 [2]; MOC, 2018 [4]) under the potential estimation to be 320MW. Last but not least, with the ambitious of greenhouse gas (GHG) emission reduction target in solid waste sector at 5% (compared to 2005 level) by 2020 as specified in Decision No.1775/QD-TTg on managing GHG emissions in order to implement the UNFCCC and other international agreements, the nation is in urgent searching for the appropriate and effective measures to make this goal on track, and WtE is focused since the waste sector is one of the GHG savers.
3. **Current situation**

According to Technical Infrastructure Agency-MOC, as of 11/2018, there are 202 incinerators nationwide treating the solid waste, popularly in range of lower than 50 tons/day in capacity (Fig. 1) [4]. Main targeted input for these locally incinerators are medical waste and hazardous waste from agricultural as well as industrial activities in compliance with the legislation, a few partly share of municipal solid waste contributed. Locally installed incinerators often run under limited treatment capacity and low efficiency, simply burning to reduce the waste volume without any functional modules for flue gas treatment, ash collection, and disposal while energy recovered from waste un-enabled. Domestic technologies for incineration are also available, namely ENVIC of the Research Center for the Application of New Technology and the Environment, and BD-ANPHA of Duc Minh Limited Company, which have been certified by environmental agencies. The domestically available technologies gain the competitive aspect during the consideration for installing by the local government through the lower investment and treatment costs, especially with the government certified technologies which also implied the guarantee of environmental protection efficiency.

Regarding centralized waste treatment facilities, till 11/2016 nationwide there are 35 facilities in operating with the total treatment capacity at 7,500 tons (MONRE, 2017 [2]), of which, 4 incinerators accounting for 11.4%. As the only one WtE incinerator till then, the pilot project sponsored by the non-refund aid from NEDO-Japan and equipped with Hitachi Zosen Corp. technology of incineration is operating under the administration of Hanoi URENCO at the capacity of 75 tons of industrial waste daily generating 1.93MW recovered energy. Quite recently, in 12/2018, the first WtE plant for municipal solid waste started operating in Can Tho Province. This plant is designed to handle 400 tons/day and bring 150 MWh/day of energy, using the technology by Everbright International (China).

4. **Constraints**

Since 2014 there have been a number of proposals for WtE technology introduced to Vietnam from foreign investors such as Waste to Energy Pte. Ltd, Keppel–Singapore Co. (Singapore), Fluid Tech (Australia), Partnership of Dai Lam Co. and Eutropic Energy Co. (USA). However, due to the disagreement between the Vietnam side and the investors on the treatment cost and electricity sale price, as mainly known, these projects are still pending. As for the government, typical concerns come from the large initial investment expense for WtE plant and skilled labor required for operation/maintenance the high-technology, followed by the contracting with an investor about the electricity connecting to the national grid during the project life. In another side, the investors expose their consideration more in the investment environment with not-yet sufficient enough regarding policy, regulatory, and market incentives on waste to energy projects. They still could not find thoroughly clear in investment procedure and mechanism for stimulating the investment on WtE plant due to the complex, and in some cases, overlapped in roles as well as responsibilities involved agencies.

Despite the aspects mentioned above, from the perspective of the environmental pollution prevention and health risk control, flue gas treatment with the potential risk of dioxin/furan from burning process still receive much concerns from the environmental agency and the communities. Hence, the technology of WtE needs a supportive solution to overcomes such barriers.

5. **Conclusions**

On the way of urbanization, the rapid increase of DUW volume raises the demand of WtE as an advanced technology for saving the land utilization, securing the energy consumption while reaching the target of GHG emission reduction in the waste and energy sectors. Although several incentives recently adopted, still the constraints are existing. An identified recommendation regarding technical, regulatory, and economic aspect is truly expected to enforce the practicability of WtE projects, hence, contributing to the sustainable development for urban areas in Vietnam.

**References**