Development of an investment decision tool for biogas production from biowaste in Mediterranean islands

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**Abstract.** Biomethane is the Renewable Energy Source (RES) derived from the purification of biogas obtained from Anaerobic Digestion (AD) process using biomass, usually as biowaste and agro-industry by-products. Biomethane can be injected into the natural gas grid, thereby complementing towards the energy demands. The first Sicilian AD plant aimed at producing biomethane was built in the province of Caltanissetta in 2021. The innovative Enersi Sicilia plant treats 36,000 tons per year of biowaste (wet and green) to produce 400 Sm³ h-1 of biomethane, that is used as a biofuel or alternatively fed into the regional natural gas grid. This plant yields a yearly total of 3.6 million Sm³ of advanced biomethane, that is equivalent to a yearly travelled distance of more than 46 million km. This translates to over 3,000 methane cars that can be powered every year, thereby replacing 2,798 t of oil equivalent and avoiding the emission of 5,291 t of fossil CO2 into the atmosphere. The solid fraction of digestate is recovered and processed into compost, that corresponds to approximately 25-30% of the original feed in biomass weight. This compost is – classified as a "mixed composted soil conditioner", that can be used in agriculture within Circular Bioeconomy (CBE). The production and use of biomethane and other renewable gases in existing infrastructures would allow EU to achieve the climate objectives of Paris Agreement, i.e. to save € 140 billions ca. a year by 2050. The interest of the growing market in biomethane mobility demonstrates the great potential of alternative uses of this gas. The aim of this paper is to present an investment decision tool for the economic evaluation of a biomethane plant using biowaste.