

# Theoretical estimation of the production of biogas from the landfill of Batna city and its electrical conversion by a SOFC

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**Abstract:** Amongst the interests in fuel cells is exploring the possibility of using different fuel types; one of them is biogas or Landfill gas (LFG) from landfills or from controlled digesters. Biogas; a gas produced by an anaerobic digestion of organic waste represents an environmental problem that could turn to a renewable energy source. The valorization of biogas into energy (electricity, heat, fuel) will save other sources of energy. The authors of the study are interested in evaluating three technologies: fuel cells, micro turbines and internal combustion engine. In this paper, we discussed the conversion of biomass into electricity in two steps: the first step (biomass-to-biogas) is based on an evaluation of biogas potential generated by solid waste of landfill the Batna city (Algeria) by the kinetic model (U.S.EPA, 1993). In the second step (biogas-to-electricity), the paper considers the technology of a stack of standard solid oxide fuel cells (Ni-YSZ/YSZ/LSM) SOFC; this allowed us to determine the best temperature, hydrogen concentration and electrolyte thickness for maximum power density in the fuel cell SOFC. At a temperature  $T = 1273$  K and thickness of electrolyte of the order of 0.1 mm and at higher hydrogen concentration, a maximum power density of  $P = 1.4$  W/cm<sup>2</sup> was obtained.

**Keywords :** LFG, Biogas, Anaerobic digestion, Electricity, SOFC