INTRODUCTION
The environmental performances of EE produced by AD plants should be carefully evaluated by means of scientific and robust methodologies. In this context the Life Cycle Assessment (LCA) allow a fair and complete evaluation of the biomass-to-electricity process. The aim of this study is to assess the environmental profile of electricity production from an AD plant fed with cattle slurry (100 kW).

METHODS
The functional unit is 1 kWh of electric energy. The system boundary includes cow slurry transport and anaerobic digestion, EE generation and digestate storage. Cow slurry production has been excluded because it is a waste. The emissions from the digestate application are similar to the ones from slurry application; therefore, this process has been excluded too. The surplus heat valorized and offset the production of the same thermal energy by a natural gas boiler. The following impact categories have been evaluated: Climate Change (CC), Ozone Depletion (OD), Photochemical Ozone Formation (POF), Acidification (AC), Freshwater Eutrophication (FE), Marine Eutrophication (ME), Mineral, Fossil and Renewable resource Depletion (MFRD).

RESULTS AND DISCUSSION
The Table reports the environmental performance for the FU. The hotspots are: (i) the digestate storage for CC and TE due to the emissions of CH₄ and NH₃; (ii) the CHP emission for POF, TE and AC; (iii) the anaerobic digestion for FE. The transport, thanks to the short distance, has a little impact for all the impact categories. For OD, FE and MFRD the score is negative: EE presents an environmental benefit thanks to the valorization of surplus ET.

Alternative scenarios (AS) to reduce the environmental impact of EE have been evaluated. In AS1 all the ET is valorized and AS2 the digestate storage tank is covered and, therefore, CH₄ and NH₃ emissions are reduced (~80%).

The two alternative scenarios improve the environmental performance of EE. In particular, the full utilization of surplus heat causes considerable improvement for OD, FE and MFRD while to store the digestate in covered tanks reduces significantly CC (~70%) but also AC (~24%) and TE (~21%). The two AS achieve only little impact reductions for POF and ME, that are mainly due to CHP emissions.

CONCLUSIONS
The results of this study indicate that livestock slurries are a good feedstock for AD plants from an environmental point of view. Furthermore, a full exploitation of TE and the covering of the digestate storage tank can lead to significant reductions in most impacts of electricity from anaerobic digestion.