

Development of methodology for the assessment of changes in household electricity consumption and calculation of CO₂ emissions

Ilze Laicane, Andra Blumberga, Marika Rosa, Dagnija Blumberga, *Riga Technical University*

Abstract – Purpose and rationale for this study is based as a case study research within the first smart metering pilot project in Latvia „Promotion of energy efficiency in households, using smart technologies”. This study outlines the general principles for the development of the methodology for assessing changes in household electricity consumption and the calculation of CO₂ emissions. The methodology has been established on several successive steps: 1) regression analysis based on variable multi criteria analyses approach to provide overall changes in residential electricity consumption, 2) normalization of electricity consumption data, 3) assessment of changes in electricity consumption, 4) assessment of electricity consumption reduction, and 5) calculation of CO₂ emissions.

Keywords – Smart metering, electricity consumption, household, energy efficiency, CO₂ emissions, data normalization, assessment of changes in household electricity consumption.

I. INTRODUCTION

In line with the EU total energy consumption reduction targets (Latvia is obliged to reach 9% reduction in end use energy consumption during the period from 2009 to 2016 (Directive 2006/32/EC) [1]), there is still a growing need for improved means of evaluating policy instruments determining the purpose of promoting energy efficiency in the residential sector. Use of smart metering systems in households has been identified as a promising pathway for achieving significant electricity consumption reduction. In this context, the European Union has set an ambitious target for 2020: to equip 80% of households with smart meters (DIRECTIVE 2009/72/EC) [2]. In order to successfully reach this goal, increasing emphasis is being placed on involving every consumer in implementing energy efficiency measures, as well as by providing consumers with qualitative and quantitative information on smart systems and technologies.

II. GENERAL DESCRIPTION OF THE PROPOSED METHODOLOGY

Countless studies related to comparison of household electricity consumption with end-user behavioral characteristics have been reflected recently. The main conclusions from these studies highlight that information has a significant impact on a user's behavior contributing to electricity consumption savings. Some of these estimations show that 10% of energy savings can be achieved due to changing end-user habits and daily routines.

The development of a methodology for the evaluation of electricity consumption savings and CO₂ emission reduction from households has been provided (see Figure 1). Sensitivity analyses is planned to be used for the validation of results. A simple cross-sectional multi criteria analysis is employed to try to explain the differential impacts on electricity consumption across different households.

This analysis considers that the impact on household electricity consumption will include various aspects: resident's

personal situation socio-economic and households structural characteristics; household electric appliances and consumption; energy related behavior/attitudes/awareness; information/feedback; technology development etc. factors.

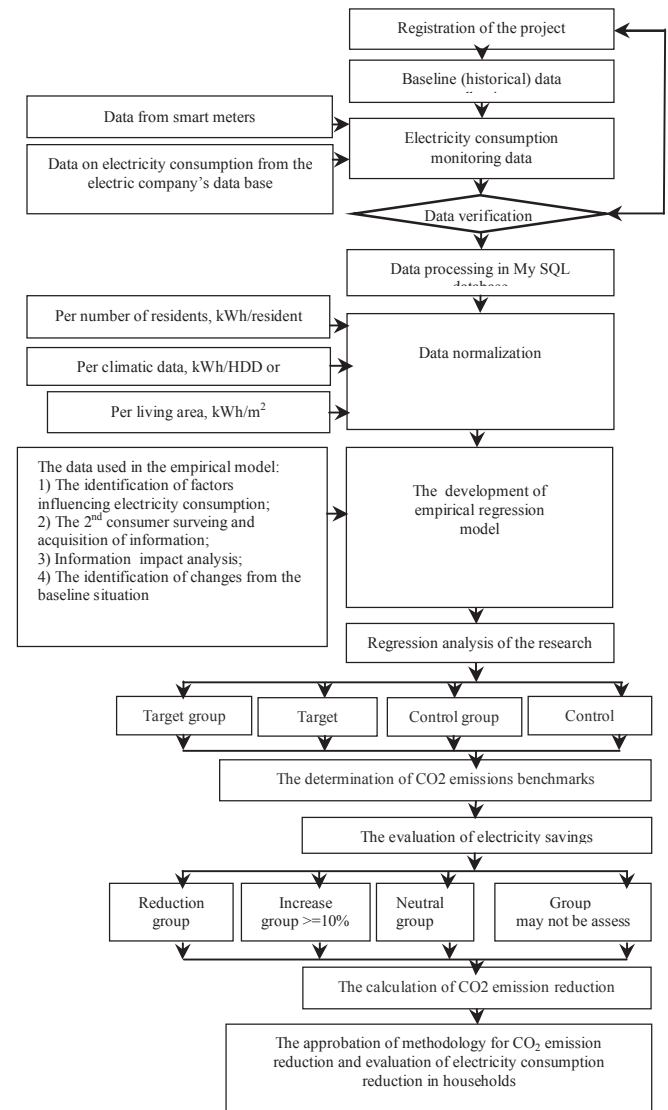


Fig. 1. The algorithm scheme of the proposed methodology.

III. REFERENCES

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