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Efficient energy building and pollution control

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Abstract. The purpose of the Research paper is through the development of new integrated low energy building solutions entirely based on extensive energy savings and renewable energy supply to meet the society's demands of 2030 and beyond for zero energy buildings. This is an attempt to develop a working definition for Zero Energy Building, which can be used by the participants in the research paper to focus their research and their development of new technologies. Secondly, the working definition might also be used as basis for a discussion of "Near Zero Energy Building" definition for future energy regulations in Kosovo that fulfills the recast of the EU Directive on Energy Performance of Buildings. A quantitative approach for managing construction pollution control that is based on construction resource leveling is presented. The parameters of construction pollution index, hazard magnitude are treated as a pseudo resource and integrated with a project's construction schedule. When the level of pollution for site operations exceeds the permissible limit identified by a regulatory body, a genetic algorithm (GA) enhanced leveling technique is used to re-schedule project activities so that the level of pollution can be re-distributed and thus reduced. The GA enhanced resource leveling technique is demonstrated using some on-site construction activities in a project
Keywords: Energy efficiency, near zero energy building, pollution control.

1 Introduction

Energy efficiency (EE) is considered to be a major lever for action to enhance Kosova energy policy, which is currently based on a system of subsidies to ensure affordable energy supply. The objective of the project is to improve the energy efficiency of end-use equipment, namely building appliances and lighting systems,. The implemented activities aim at transforming the market towards energy efficient appliances, reinforcing the existing labeling and standardization schemes, implementing new schemes, and ensuring the sustainability of energy efficiency measures developed during the project time-frame. The purpose of the mid-term evaluation is to provide the relevant information to make an overall independent assessment about the past performance of the project. Particular attention is given to the impact of the project actions against its objectives,

In accordance with the Terms of Reference (ToR), the objectives of the evaluation are to assess the achievement of project results, to analyze the quality, strengths and weaknesses of the project, to review how the project team has performed to

implement the project activities, and if baseline indicators were appropriate to monitor the project.

2 Methodology and emission reduction estimates-pollution control

The direct GHG emission reductions arising from the use of CFLs are determined using CDM methodology AMS-II.J., "Demand-side activities for efficient lighting technologies". The sequence of calculations is reproduced as follows:

The electricity saved by the project activity in year *y* is calculated as indicated in equations (1) and (2):

$$NES_y = \Sigma Q_{PJ,i} \, x \, (1- LFR_{i,y}) \, x \, ES_i \, x \, 1/(1- TD_y) \, x \, NTG \quad (1)$$

where

$$ES_i = (P_{i, BL} - P_{i, PJ}) \, x \, O_i \, x \, 365/1000 \quad (2)$$

NES_y	Net electricity saved in year (kWh)
$Q_{PJ,i}$	Number (quantity) of pieces of equipment (CFLs) of type *i* distributed or installed under the project activity (units). In total for all "i", this value shall be equal to or less than the documented number of all baseline incandescent lamps destroyed. Once all of the project CFLs are distributed or installed, $Q_{PJ,i}$ is a constant value independent from y
i	Counter for equipment type
n	Number of types of equipment *i*
ES_i	Estimated annual electricity savings for equipment of type *i*, for the relevant technology (kWh)
$LFR_{i,y}$	Lamp Failure Rate for equipment type *i* in year *y* (fraction)
TD_y	Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g., theft/pilferage). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. Reliability of the data used (e.g., appropriateness, accuracy/uncertainty, especially exclusion of non technical grid losses) shall be established and documented by the project participant. A default

value of 10% shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable

NTG Net-to-gross adjustment factor, a default value of 0.95 is to be used unless a more appropriate value based on a lighting use survey from the same region and not older than 2 years is available

$P_{i, BL}$ Rated power of the baseline lighting devices of the group of "i" lighting devices (Watts)

$P_{i, PJ}$ Rated power of the project lighting devices of the group of "i" lighting devices (Watts)

O_i Average daily operating hours of the lighting devices replaced by the group of "i" lighting devices. For ex post values use either (a) 3.5 hours per 24 hour period or(b) the average measured value determined from measurements of a representative sample conducted once, prior to or concurrent with the first ex post monitoring survey

3 Results

Concerning the first outcome, political instabilities have slowed activities implementation, but some achievements have to be underlined. Technical assistance has been provided for designing pilot projects for replication, building on lighting audits in clubs, Government buildings, universities, hospitals, etc., The project has contributed to the preparation of the Energy Efficiency National Plan up to 2030.

The agreement brokered with manufacturers to raise the minimum temperature setting on new AC units from 16 degrees Celsius to 20 degrees should, in the long run, also have a substantive impact on emissions and may open up new opportunities for private-sector collaboration. The success of the activities undertaken is emphasized by the reduction of 0.3 million tCO_2 of direct emissions (end-of-project target: 0.95 million tCO_2). Regarding the electricity supply and demand issue, the EE project is considered as relevant. It is an appropriate solution because energy efficiency represents the most cost-effective option to reduce the growing shortages in electricity supply. Impacts of the project are various. First, in economic terms, the markets for energy efficient appliances are growing. With the local unit in the Ministry of Local Development which supervises the promotion of energy efficient street lighting now established, The environmental impact has been assessed: the achieved energy savings have been estimated at 558,093 MWh, which equates to 0.3 million tonnes of CO_2 reduction. The project emissions reduction target is for direct incremental reduction of GHG emissions 0.95 million tonnes of CO2eq by the end of the project and cumulative indirect GHG emission reductions of at least 53 million tonnes of CO2eq by 2025.

In conclusion, the cross-cutting issues are appropriately addressed by the project.

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