

Development and Implementation of An "Electric Island" Monitoring Infrastructure for Promoting Energy Efficiency in Schools

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Abstract : The concept of "electric island" is involved with achieving the balance between the self-power generation ability of each educational institution and energy consumption demand. Photo-Voltaic (PV) solar system installed on the roofs of educational buildings is a common way to absorb the available solar energy and generate electricity for self-consumption and even for returning to the grid. The main objective of this research is to develop and implement an "electric island" monitoring infrastructure for promoting energy efficiency in educational buildings. A microscale monitoring methodology will be developed to provide a platform to estimate energy consumption performance classified by rooms and subspaces rather than the more common macroscale monitoring of the whole building. The monitoring platform will be established on the experimental sites, enabling an estimation and further analysis of the variety of environmental and physical conditions. For each building, separate measurement configurations will be applied taking into account the specific requirements, restrictions, location and infrastructure issues. The direct results of the measurements will be analyzed to provide deeper understanding of the impact of environmental conditions and sustainability construction standards, not only on the energy demand of public building, but also on the energy consumption habits of the children that study in those schools and the educational and administrative staff that is responsible for providing the thermal comfort conditions and healthy studying atmosphere for the children. A monitoring methodology being developed in this research is providing online access to real-time data of Interferential Therapy (IFTs) from any mobile phone or computer by simply browsing the dedicated website, providing powerful tools for policy makers for better decision making while developing PV production infrastructure to achieve "electric islands" in educational buildings. A detailed measurement configuration was technically designed based on the specific conditions and restriction of each of the pilot buildings. A monitoring and analysis methodology includes a large variety of environmental parameters inside and outside the schools to investigate the impact of environmental conditions both on the energy performance of the school and educational abilities of the children. Indoor measurements are mandatory to acquire the energy consumption data, temperature, humidity, carbon dioxide and other air quality conditions in different parts of the building. In addition to that, we aim to study the awareness of the users to the energy consideration and thus the impact on their energy consumption habits. The monitoring of outdoor conditions is vital for proper design of the off-grid energy supply system and validation of its sufficient capacity. The suggested outcomes of this research include: 1. both experimental sites are designed to have PV production and storage capabilities; 2. Developing an online information feedback platform. The platform will provide consumer dedicated information to academic researchers, municipality officials and educational staff and students; 3. Designing an environmental work path for educational staff regarding optimal conditions and efficient hours for operating air conditioning, natural ventilation, closing of blinds, etc.

Keywords : sustainability, electric island, IOT, smart building

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