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Controlling energy consumption in Imaging departments: The case of Rafic Hariri University Hospital

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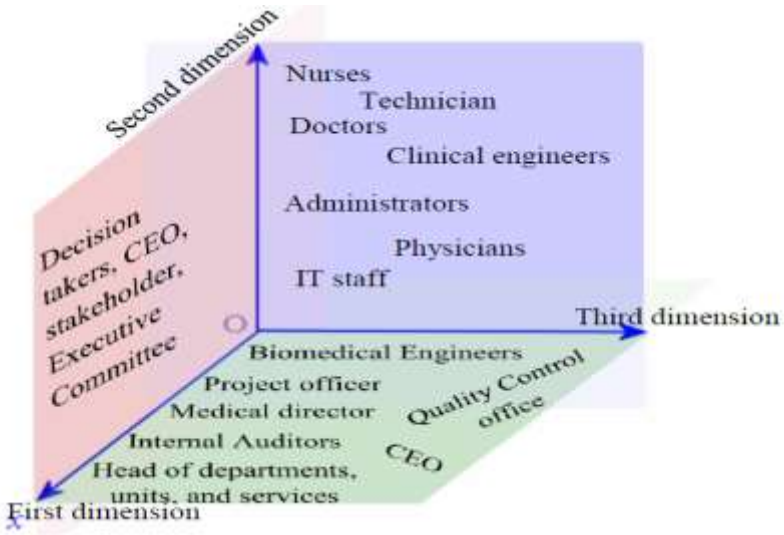
Energy consumption is a challenge that burdens most of organizations. Nowadays, Lebanese hospitals are especially suffering from this problem due to the frequent power outages that the country endures on regular basis. Many tried to discuss that issue in an attempt to minimize it. However, measuring energy performance is easier said than done. There are many forms of energy: chemical, mechanical, radial, solar, electrical, and the energy in form of heat. In hospitals and mainly in the imaging department, the form of energy is electrical. Conserving energy is a priority to reduce the impact on the health and environment on one front and to bring down the electricity expenses on the other one. Energy management control systems should be considered as a part of the hospital automation system [1]. Hospitals are considered as a high energy consumers since they operate on a continuous manner, being in service 24 hours a day, 7 days a week, all over the year. This may result in extreme burdens on hospitals. For example, Victorian public hospitals consume 60 % of public sector energy in the state, in Western Australia they consume around 45 % [2]. Generally speaking, it is widely known that hospitals are increasingly under financial pressure [3]. Many studies were done on energy consumption and found that saving energy is equivalent to an increase in revenue and Earning Per Share (EPS). The Energy Star, an environmental protection agency which considers the conservation of energy as a main environmental call, found that reducing energy use by 5 percent is equivalent to increasing the EPS by 1 cent, and as a result each dollar of energy savings is equivalent to 20 $ of increase in revenue [4].

Poor preplanning and energy management are weaknesses that diminish energy efficiency and increase long-term costs in hospitals. In addition, the lack of energy standards is considered a threat that forces the hospitals to set their own internal standards for controlling energy consumption. Studies showed that matching energy conservation measures with architectural design to harness natural light and ventilation could save about 10% of electricity consumption [5]. The core of the solution is not just by awareness; it is by setting a well-organized plan that involves relevant stakeholders at the hospital starting from the Head Manager of the Biomedical Engineering Department to the doctors, nurses, technicians, physicians, architectures, and even the cleaning staff. All these resources contribute to the conservation of energy consumption program with different percentages according to the load of energy usage at each working site. Good energy management will have a great effect on the length of hospital in-patient time as well as on patients' satisfaction [6]. Not surprisingly, that the Biomedical Engineering Department at Rafic Hariri University Hospital could increase the salaries of the employees about 7 years ago because of the energy saving plans that were implemented.

To control wasted energy, we need a three-dimensional solution; two indirect involving the administrators and the Biomedical Engineers, whereas the third is direct involving the staff. By applying this plan over a long period of time, the hospital can boost in earning and shrink its carbon footprint. This plan requires measurements and continuous recordings to assess how much the hospital consumed electrical energy due to the usage of lights, medical imaging equipment, and air-conditioners over a period of time and to reassess by recording the excess use as a benchmarking for measuring the trend of energy use [7].

To support our study with live evidence on electrical energy consumption, we took a sample case in the imaging unit at RHUH, since they tend to use much electricity than other units [8]. The sampling was done on five of the imaging equipment found there (Magnetic Resonance Imaging, Computed Tomography Scan, General Radiology, Fluoroscopy, and Angiography), on the air-conditioners and on the lighting system. Just five medical equipment with their air-conditioning and lighting system, waste large amount of kilowatts per hour, leading to a noticeable record of carbon dioxide emission. Our aim through this paper is to implement an energy management plan that minimizes the emission of carbon dioxide, cuts costs, and increases patients' and staff satisfaction through the three dimensional solution as shown in the diagram below:



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