

# The State Of Efficient-Energy Utilization in Some Mubi Metropolis Hotels, Nigeria

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## ABSTRACT

It is as important to recognize efficient-energy towards achieving sustainability among less committed or transitioning hotels to avoid wastage of energy. This study aimed to state efficient-energy practices with emphasizes to the current adopted attributes in some Mubi metropolis hotels. The questionnaire survey method was adopted in the study. It was observed that, most hotels are moderate in utilizing efficient-energy, and are still approaching to be excellent in practice. This is not, but due to availability of energy-efficient appliances and willingness by hotels to enquire to achieve an organizational objective. Also, the results are useful to help the government and hotel managers to take actions for improving the efficient-energy utilization. Therefore, it is suggested that, hotel managers should know that every appliance can be replaced with most efficient one to save energy.

**Keywords:** Efficient-energy; Hotels, Mubi; Appliances

## INTRODUCTION

Energy efficiency is the use of less energy to provide the same service. Energy efficiency is the use of technologies that require less energy to perform the same function <sup>[1]</sup>. Energy efficiency has become a tradeable commodity in several countries <sup>[2]</sup>. Especially nowadays as several studies indicated that the increasing prices of energy resources and growing pressure from governments and stakeholders provided increased motivation to lodging operators to enhance energy efficiency in their properties <sup>[3]</sup>. Energy-efficient technologies offer

considerable promise for reducing the costs and environmental damages associated with energy use, but these technologies appear not to be used by consumers and businesses to the degree that would apparently be justified, even on the basis of their own (private) financial net benefits <sup>[4]</sup>.

The industrial sector uses more energy than any other end-use sectors, currently consuming about 37% of the world's total delivered energy <sup>[5]</sup>. Historically, industrial energy efficiency has improved at a rate of 1 percent annually, but experience demonstrates that improvements can occur at twice this rate over medium- or longer-term time frames (i.e., 10 years or more) <sup>[6]</sup>. The hotel industry with its high energy demands requires more attention and effective actions than other sectors. Hotels are rated high among energy consuming public buildings <sup>[7]-[10]</sup>. And research confirms that due to their operational characteristics, hotels are amongst the highest energy consuming buildings after shopping malls and hospitals <sup>[11]</sup>. Hotels are immense energy users and for instance their operations require the use of energy on a daily basis for 24 hours, irrespective of seasonality, number of guests and location <sup>[12]-[14]</sup>. The energy consumed by hotels is used for space heating, cooling, ventilation, hot water, lighting, laundry, kitchen, recreation and other miscellaneous uses <sup>[14]</sup>. Energy resources is one of the assets of a hotel need for a manager to decide how best to use them to achieve an organizational objective <sup>[10]</sup>. It is even noted that energy efficient practices are extremely important

to hotels, since they provide savings of 20% or more, due to the fact that, among all operating costs, those of energy utilities are the ones of the most controllable<sup>[15]-[16]</sup>. The introduction of the energy efficient practices allows enriched guests comfort, increased hotel aesthetic value, reduced maintenance system failures and so forth<sup>[16]</sup>. Furthermore, the vast majority of guests started considering not only the quality of the hotels, low cost and other related services, but also how efficient energy they provided. For example, good, efficient lighting in stores can improve sales.

The recent 'energy and economic crises' faced in Nigeria and some other oil rich countries of the world resulting from the fall in prices of crude oil and cases of instability in some parts of those region has more than before made the adoption of sustainable energy management practices in homes and public buildings necessary<sup>[17]</sup>. The challenges are not limited to insecurity but also to the Nigerian electricity supply which has been characterized as inadequate and unstable for decades induced by an overburden and failing energy system<sup>[10]</sup>. Presently, energy utilization in Nigeria is far from being efficient<sup>[18]</sup>. However, the real problem with energy consumption by hotels is wastage of energy<sup>[19]</sup>.

The tendency to rely on energy-efficiency information and to neglect actual energy consumption when estimating the energy friendliness of electric goods may further explain why overall energy consumption is still increasing despite advancements in energy efficiency<sup>[20]-[21]</sup>. Misperception, lack of information, and limited attention to operating costs are considered as primary contributors to the energy-efficiency gap<sup>[22]-[27]</sup>. A number of general best practices and measures can be applied for reducing energy consumption<sup>[28]</sup>. To successfully reduce energy consumption, it is therefore important to investigate the reasons for the undesirable increase in energy consumption<sup>[20]</sup>. Also, the power utilization can be lowered by adapting strategies such as change of

organizational practice with low or no cost; implementation of energy efficient technologies that require capital investment; and encouraging guest to consume low power in all their activities in hotel building towards supporting the efforts of hotel in minimising their GHG emissions<sup>[29]</sup>. The results of<sup>[30]</sup> showed that the education of electricity saving has a significant influence on the energy-efficient behavior and awareness.

Global policies also have a significant goal on energy efficiency. The attributes of energy policy may include legislation, international treaties, incentives to investment, agreements, guidelines for energy conservation, taxation, energy efficiency standards, energy guide labels<sup>[31];[5]</sup>. In particular, a higher proportion of business hotels had an energy management policy in place (67%), used energy-saving light bulbs (100%), had key cards in guestrooms (42%), reviewed energy bills (100%), used alternative energy sources (67%) and used energy-efficient appliances (83%) (Sucheran and Bob, 2015). Thus the regulation of energy efficiency standards is believed to be an effective tool for energy policy at national levels<sup>[32]</sup>. Trying to achieve this goal of energy efficiency, countries have included new policies to improve both energy saving for example, the inclusion of light-emitting diodes (LEDs) to replace old incandescent bulbs. Generally, there are four major aspects that serve to support substantial promotion of energy efficiency management programs, including (i) energy saving technology (ii) energy efficiency test procedures, (iii) energy efficiency standards and labels, and (iv) incentive programs<sup>[3]-[34]</sup>. And the necessary conditions to set the stage for achieving substantial improvements in industrial energy efficiency (as in other sectors, in most cases) include access to information; improved decision-making processes; access to financing, company (human) resources, and technology; and the ability to measure and verify the achieved energy savings<sup>[6]</sup>. Various national

governments have initiated rating systems that measure the extent to which both residential dwellings and commercial buildings adhere to energy efficiency standard<sup>[35]</sup>. Energy efficiency standards and energy labeling schemes, together with incentive policy, have been used to encourage purchase of energy efficiency products.

Energy efficiency labels are informative labels affixed to manufactured products to indicate the product's energy performance<sup>[36]</sup>. A common energy labeling framework from most efficient (class A++) to least efficient (class-G) categories account for substantial energy efficiency improvements in the highest energy efficiency. Moreover, the study by<sup>[20]</sup> had detected that excellent energy-efficiency ratings (e.g., A+++ ) could even distort the perception of entire product categories. The importance of Labelling appliances in terms of energy performance is well recognized worldwide. Energy labelling is an interesting measure to overcome the lack of information barrier by providing consumers the necessary information<sup>[37]</sup>. Labeling schemes are expected to shift consumers' purchasing decisions towards more energy efficient products<sup>[38]</sup>. Energy-efficiency labels affixed to manufactured products to describe the product's energy performance give consumers the data necessary to make informed purchases<sup>[39]-[40]</sup>. Furthermore, the energy-label requirement is constantly broadened to new product types<sup>[20]</sup>. Understanding this concept will help you make more informed buying decisions when purchasing products that use electricity in your home Hotel.

The commitment in shifting to replace inefficient practices taken in this study would reduce energy cost and maintenance in hotel facilities. Therefore, this study aims to improve the state of existing efficient-energy standards in hotels best practices related to existing standards, emphasizing to find out the current attributes of energy efficiency adopted in Mubi metropolis hotels.

## METHODOLOGY

Mubi is located at the coordinates of 10°16'N 13°16'E / 10.267°N 13.267°E in Adamawa state, Northeastern, Nigeria. The Mubi consist of two local government, including Mubi North and South. The major tribes of the town are: Gude, Nzanyi, Fali, Kilba, Marghi, Higgi, Hausa and Fulani. Mubi is the largest commercial center of Adamawa State and has an international cattle market, which biggest in region. Also, their communities engage in farming, both local and international businesses and cattle rearing.

The questionnaire survey method was adopted in this study to grasp the present state of energy efficiency in hotels located in Mubi metropolis in the North Eastern part of Nigeria. Hotels ranging from small to large including; Jambas hotel, Bano hotel, Gaya annex, Lokuwa guest house, ADSU guest inn suites and events, Polytechnic guests house, ABATI guest inn, ASURA guest inn, Determ lodge, and Starling motel. The exercise which lasted between July 13 and 14, 2018 was taken by the researcher who had go round within the period the questionnaires were administered to 10 participated hotels, consisting of 115 living and 381 bed rooms and 9 meeting halls. This study does not seek to identify one best practice amongst the hotels size or capacity. The questionnaire survey records 96% response rate and data collated were subjected to the analysis of the current state of energy-efficient practices.

The survey took in the form of questionnaire, interview and by allowing interviewer to record appliances label data on each targeted available samples. Some data was not feasible take because not all product types are labeled. The samples was focused on 5 appliances including; lighting, television set, fans, air conditioners, and refrigerators that constitute a major share of the electricity used within hotels. The questionnaire contained 7 questions in total and was divided into two. The first-sixth part of questions are for respondents to provide precise information regarding their

hotel, while the sixth for interviewer to take record on labeled appliances.

The aim of the first question was to find out; the types of their energy source; second, the percentage of annual operational cost, third, whether they are storing energy or not; fourth, how much are they spending daily on energy; fifth, the running energy hours a day and sixth is appliances operational hours a day. Two categories of labels adopted around the world: categorical ranking system and a continuous scale or bar graph system.

For many of the appliances, there is a large variation in size, types, energy operational hours (for example, kWh/year), price, and others technical features labeled. Irrespective to these features, researcher adopted to convert the specified label with regards to the prescriptive wattages requirements for the analysis. For example, 1 British Thermal Unit (BTU) = 1.055KW and 0.746KW=1 horsepower (hp) that most labeled on Air conditioners and Refrigerators. This is because, some energy-

efficiency rating does not provide adequate information and usually wattages are simple to understand not like conventional labelling. Also, respondents struggle with the interpretation of technological terms<sup>[41]</sup>. In other words, the participants do not find it easier to understand energy-related information (e.g., kilowatt-hours), with or without the energy label<sup>[21]</sup>. Therefore, questionnaire survey based on appliances watts performance was adopted for the analysis in this study to figure out the status of efficient-energy utilization in Mubi metropolis hotels.

## RESULTS AND DISCUSSIONS

All respondents returned their questionnaire. Hence, a total of 10 questionnaires representing 10 respondents were gathered. Percentage distributions was used to analyzed data and presented in charts form. This analysis also supported by examples and highlights of best practices as follows:

### Q1: How many percent does your hotel energy operational cost account for annually?

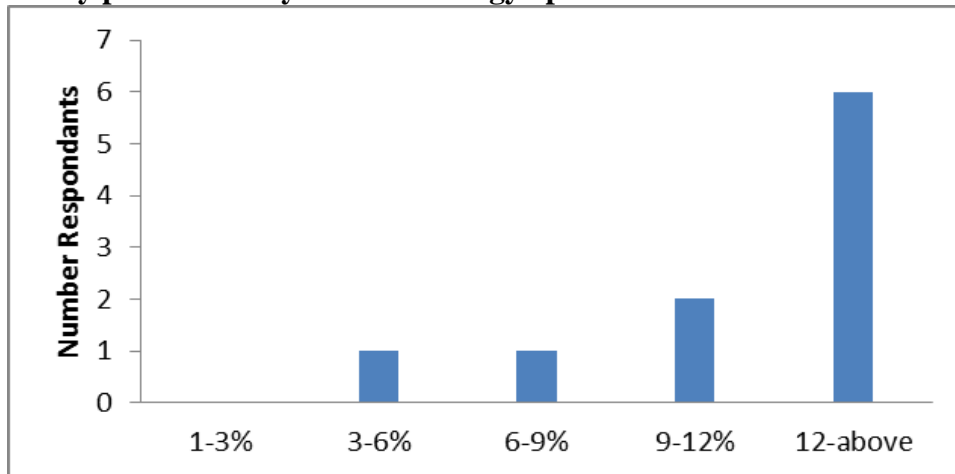


Fig. 1: How many percent does your hotel energy operational cost account you annually.

From Fig. 1 it was observed that out of 10 hotels, 6 response that more than 12% of their annual incomes were dedicated to energy operational cost, while 2 hotels are in between 9-12%, and 1 hotel 3-6% annually. This shows the operational differences between the hotels. This happen because hotels that have low energy use do not have laundry, conference centers,

catering facilities, pool facilities, etc. while high energy using hotels contained large facilities that would cost them more than 12%. Despite according to<sup>[42]</sup> find evidence that consumers inaccurately estimate energy use from appliances. But, with application of the most efficient appliances according to<sup>[43]</sup> an average total value of 71% of energy bill can saved.

**Q2: How many rooms are in your hotel?**

Out of 10 hotels participated in this study, a total of 505 rooms was counted, a large proportion of hotels 8 (80%) had 1 to 50 rooms whilst 1 (20%) had 51 to 100 rooms, and 1 (20%) had 150 to 200 rooms. This shows that most hotels in Mubi metropolis are small scale.

**Q3: What is your main source of energy?**

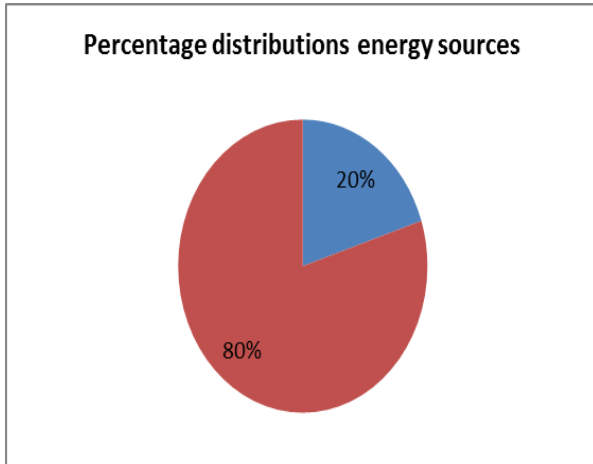


Fig. 2: What is your main source of energy

Hotels were asked what is your main source of energy. Of the total 8 (80%) respondents that they using both on and off grid source of energy, while 2 (20%) are independent, using gasoline generators. This shows non of them depends on on-grid source of energy, because most them affirmed not comfortable with it. Alternative to the source of energy help hotels to meetup efficient-energy, especially renewable energy. According to [44] some commercially viable applications of renewable energy technologies in the hotel sector include solar water heater, space heating, solar Photovoltaic (PV), solar passive house techniques, ground source heating to name a few. With that hotels in Mubi metropolis could take the advantage of alternative source, being most of them running in small scale.

**Q4: How much are you spending daily on energy?**

Hotels were asked how much are you spending daily on energy. Since hotels

participated in this study are of difference capacities. And hotels have an energy end use profile that is distinct from other sectors, due to the amenities that hotels offer including a pool and spa, laundry, guest room showers, common spaces, and some amount of kitchen equipment [45], and this may be ascribed to the fact that higher rated establishments generally consume substantially more energy than the others due to the large number of facilities and services that they offer [46]-[47]. Therefore, with that this study takes average of the entire hotels daily expenditure on energy and was found to be 11,491.75 naira per hotel.

**Q5: Do you have any energy storage facilities?**

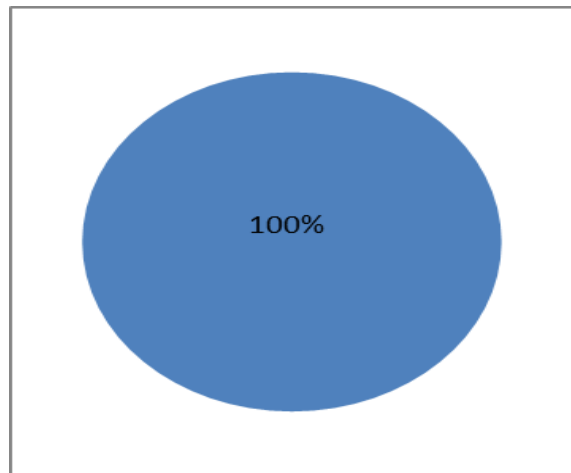


Fig. 3: Do you have any energy storage facilities?

From Fig.3 100% of the respondents do not have any storage facilities. This shows that they not saving energy for later usage. This could lead hotels into inefficient energy, because of the operational cost of running it. According to [45] hotels surveyed had equipment that appeared to be properly sized and either met or slightly exceeded the minimum required recirculation rate, with not enough energy savings for the project to pay back in a reasonable amount of time. With that, having good energy saving facilities, hotels could easily be efficient-energy.



**Q6: How many hours are you energy operating daily?**

All hotels affirmed that, they have no specific energy running hours, but

usually 12 hours at nights, with or without costumers. This is due fluctuations resulted from combined energy source (on/off grid systems).

**Q7(a): Lighting**

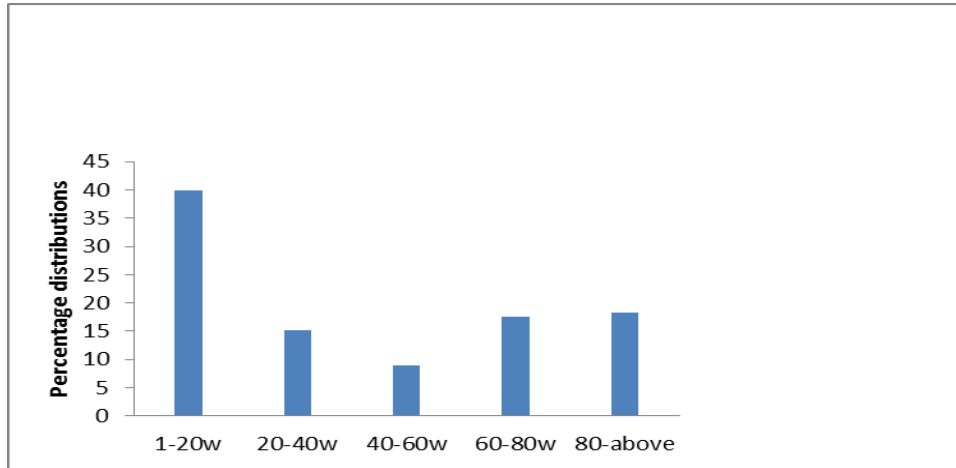


Fig. 4: percentage distributions of lighting in watts

Fig. 4 illustrates the results from the total percent distributions of lighting in watts for different hotels. Lighting constitute the major appliances used in hotels participated in this study, covering a total of 970 samples. The results shows that the majority of hotels used the most efficient-energy lighting with 40% (1-20W), with less efficient-energy having a slight lower share of 18.34% (above 80W) in the hotels, while the moderate efficient-energy of 15.22% (20-24W), 9.01% (40-60W), and 17.65% (60-80W). It appears most efficient-energy lighting account for the most adopted in Mubi's hotels, but there are still some concerns with using incandescent light bulbs. As incandescent lamps are extremely energy inefficient, almost all Organization for Economic Co-operation and Development (OECD) governments and many non-OECD countries have adopted a policy to stop producing standard incandescent lamps since the end of 2006 [48]. The technology gain in LED lighting coupled with the long hours of operating in the hotel sector result in large savings opportunities for lighting (Michaels Energy, 2015). You can get a wide range of low-energy light bulbs that use about a fifth of

the energy of traditional incandescent bulbs, for the same amount of light [49]. For example, Grand Lapa Macau has replaced all exterior neon signs with LED lights and thus energy is saved by 58% [50]. Electricity consumed by lighting reduced from 30% to 10% by replacing 22 halogen bulbs with the same number of LED bulbs (Ansari et al. 2020). Light bulbs have the highest potential of energy and cost saving from the most efficient models followed by ceiling fans and refrigerators [51]. A major factor working against the shift from incandescent bulbs to energy saving bulbs is the cost [18]. With the LED and Compact fluorescent lamps compared to incandescent light bulbs, depending on the daily use, an annual average 24-74% cost saving can be achieved [52]. With these validations, replacing the less-efficient with the most efficient lighting is the best option for hotels managers to adopt.

**7(b): Television set**

From Fig.5 it was observed that out of 295 televisions the most adopted and moderate efficient with 35.25% fall in between 40-80W, while less adopted and most efficient with 3.28% (1-40W). Follow

by 28.69% (80-120W) and the less-efficient are, 21.31% (120-160W) and 11.48% (above 160W), likely to be Cathode Ray Tube (CRT) or Liquid Crystal Display (LCD). Various types of TVs are available in the market namely: Cathode Ray Tube

(CRT), Liquid Crystal Display (LCD), Light Emitting Diodes (LED), Plasma & Organic Light Emitting Diodes (OLED) [51]. Today almost all are available to purchase in Mubi. Recommended that OLED is currently the most efficient television to save energy.

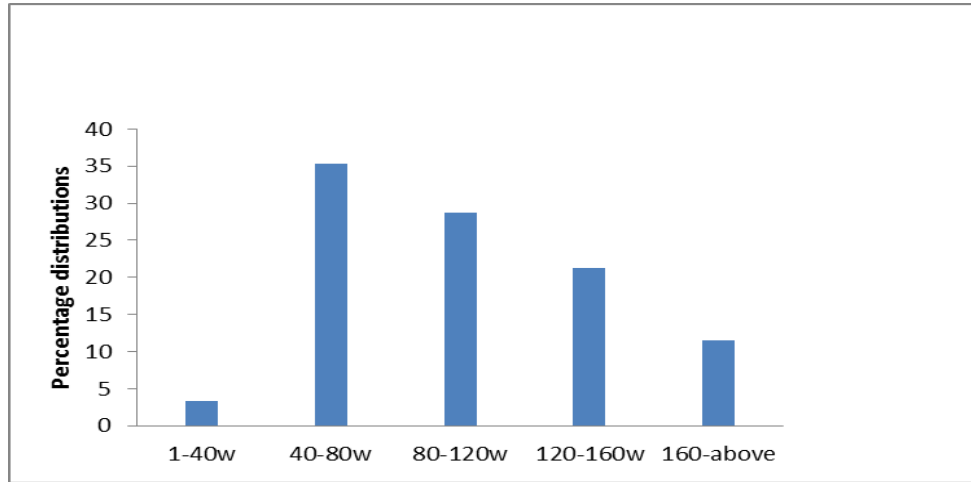


Fig. 5: percentage distribution of Television set watts

### 7(c): Ceiling/standing fans

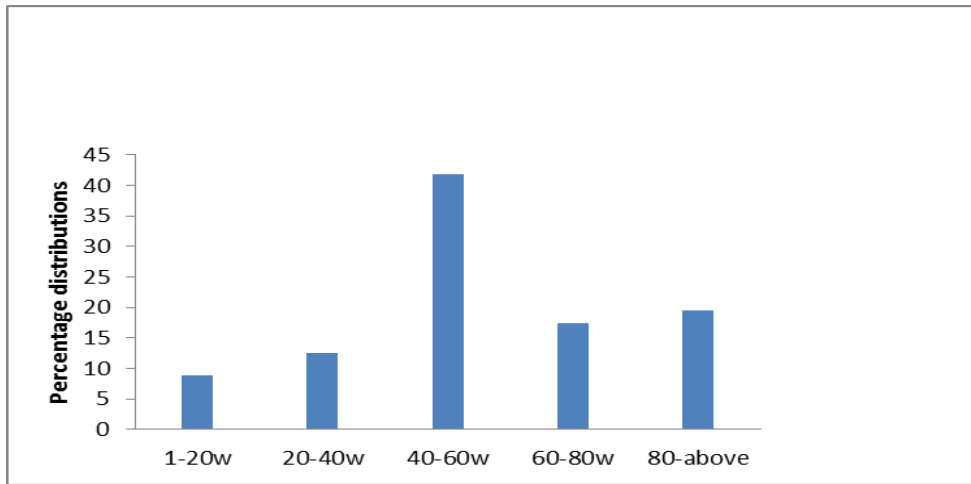


Fig. 6: percentage distribution of Ceiling/standing fans watts

From Fig.6 the result shows that the highest adopted ceiling/standing fans out of 397 sampled, the most adopted with 41.78% lie between 40-60W, follow by less-efficient with 19.56% (above 80W). While the moderate efficient are 8.89% (1-20W), 12.44% (20-40w), and 17.33% (60-80W). This shows that they are moderately efficient, despite being the efficient one are in smaller sizes.

### 7(d): Air conditioners

From Fig. 7 the result shows that out of 252 air conditioners, 26.97% represent (200-800W) and (800-1200W) are the most efficient, while the less efficient is 2.63% (1-400W), and the moderate efficient are 23.68% (above 1600W) and 19.74% (1200-1600W). Based on this result, it was observed that Mubi's metropolis hotels are doing their best practices to most efficient products, despite being high number of the less-efficient ones.

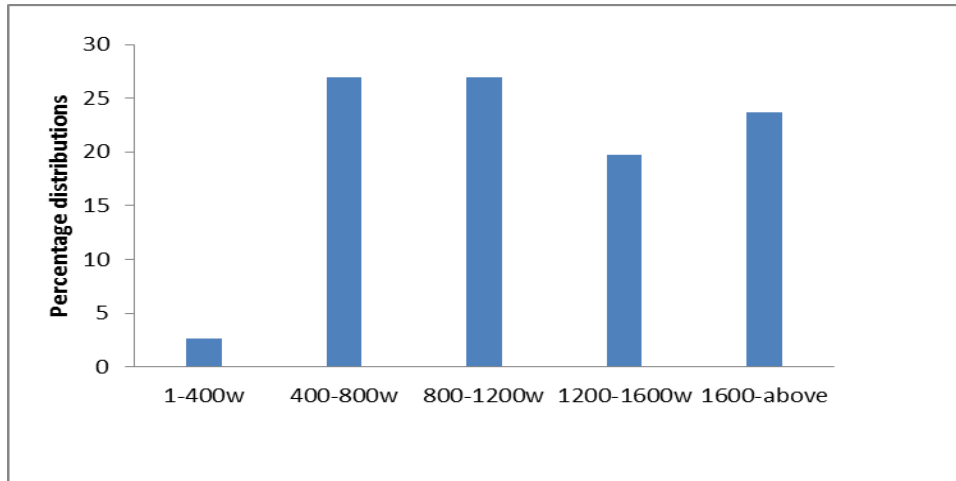


Fig. 7: percentage distribution of air conditioners watts

### 7(e): Refrigerators

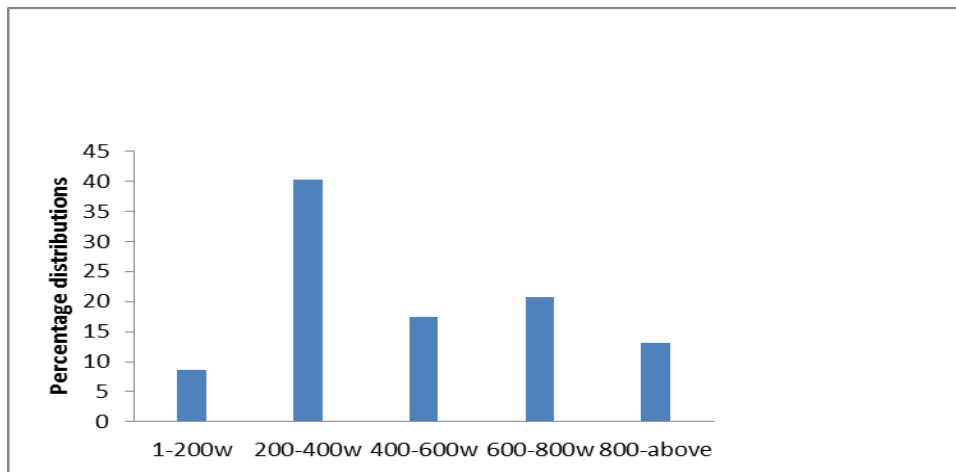


Fig. 8: percentage distribution of refrigerators watts.

From Fig. 4 out of 133 refrigerators sampled for the analysis 40.22% (200-400W) represent the scores the highest adopted percentage, while the less adopted and most efficient represent 8.69% (1-200W), and the moderate efficient are 17.39% (400-600W), 20.65% (600-800W) and the less-efficient represent 13.04% (above 800W). The result shows that the hotels are doing their best practices, despite being such range of appliances are small size refrigerators. Among all home appliances, refrigerators consume the most energy in the world accounting for around 30% of the total energy consumption<sup>[40]</sup>. Full considerations are needed to be given to this appliance, especially having large number of refrigerators in hotel.

### RECOMMENDATIONS

- 1) It is expected that hotels managers should know that every appliance can be used to save energy or to use less energy if they use it efficiently. For example, replace all light bulbs with LED or CFL (energy saving) light bulbs, because an Incandescent light bulb will not save energy.
- 2) Hotels shall lay down the necessary measures to establish a regular inspection of automatically turn on or off appliances as needed. A good example to understand the benefits of regulators and stabilizers is the research carried out by<sup>[53]</sup> because the power consumption was reduced by 726 W, which represents, in its case, more than



the 25 % of the total energy consumption.

- 3) Awareness and knowledge of a label is helpful in informing consumer choices especially Energy Guide, Energy Star logos, and LEED certification, Energy Star etc. labels, expected that hotel managers should strictly understand them.
- 4) Governments should help drive greater efficiency in existing appliances by organizing different activities to promote energy conservation, policy and funding to improve its energy efficiency in the hotel industries.
- 5) Hotel should give priority to staff training programs such as exchange of information by attending conferences, workshops, seminars, etc. to make sure that a piece of equipment is operated and maintained in an energy-efficient manner. The employment of individuals with specific education and competences in energy efficiency also affect firms' energy performance significantly<sup>[54]</sup>. Increased knowledge and skills among employees not only influences the development of energy-efficient solutions, but also facilitates the implementation process<sup>[55]</sup>. This study supported the findings of<sup>[56]</sup> that hotel managers overall, focus more on technology adoption that receive customer visibility rather than improving existing operational management by investing in staff training and education.<sup>[43]</sup> found approximately 4–5% average energy savings from several efforts to encourage employees in hospitals and government buildings to use energy more efficiently.
- 6) Hotels should consider to continue introducing alternative energy sources.<sup>[57]:[47]</sup> correspondingly advise that hotels should take full advantage of solar energy.
- 7) Hotels shall lay down the necessary measures to include building efficiency techniques that maximize the available

daylight include: insulation and thermal mass to reduce indoor temperature variability, orienting new buildings to gain maximum sunlight and natural ventilation and wherever appropriate shading the building. According to<sup>[43]</sup>, these buildings efficiency features alone typically reduce energy use by about 40% relative to an average new building.

## CONCLUSION

The role of efficient-energy is vital and has greatly expanded in hotel industries. It was found that Mubi's metropolis hotels are moderate in adopting efficient-energy and they are approaching to be excellent, due to the disappearance of less-efficients and availability of the most efficient appliances in the markets. It has been observed, that while most hotels have now technical requirements in place to adopt efficient-energy, there are still missing gaps which are yet to adopt and are needed to examine what differentiates some hotel organizations from others in regards to their commitment towards sustainability, in particular, improving energy performance by the adoption of energy conservation, efficiency and renewable energy measures/technologies. Therefore, there are most efficient appliances in Mubi metropolis markets labeled with; Energy Guide labels, Energy Star logos, and LEED certification, etc. available for hotel managers to purchase to replace the existing (less-efficients) ones.

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