



COMPARISON STUDY OF ENERGY EFFICIENCY ACTIVITIES PROGRAMS AMONG THE SELECTED REGION AND COUNTRIES: LESSONS LEARNED FOR MALAYSIA

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ABSTRACT

This study reviews the contemporary tendencies in energy efficiency performance in chosen regions and countries. It also reviews the energy efficiency strategies and activities accomplished in these countries which pursue the program of reduction in energy consumption while maintaining the comfort level. These become the objectives and today's energy efficiency requirement. This study also aims to highlight these activities and the outcomes of the energy efficiency implementation. The extent of this action and its effectiveness is being ascertained. The indicator used to evaluate the Energy Efficiency activities is the Energy Intensity Indicator which is provided by International Energy Agency (IEA). The reports and measurements of the International Energy Agency (IEA) are considered in order to make comparison among the selected countries. The main reason of focus on Energy Intensity levels is because this indicator reflects the result of all activities in different sectors and make sense which country has fulfilled the requirement of Energy Efficiency. The regions and countries are selected on the basis that their level of achievement in the energy efficiency programs are high. However, comparison is still made because each region and country has different emphasis and focus. Despite that Malaysia is a developing country, the achievement towards satisfactory energy efficiency implementation can be considered as encouraging and can only advance further if energy efficiency practice in these selected countries will be learned.

Keywords: energy efficiency, energy efficiency indicator.

INTRODUCTION

We can define the term of Energy efficiency as "the proportion of output of performance, service, goods or energy, to input of energy" [1]. Energy efficiency evaluates and measures the reduction in the energy needed to manufacture the same quantity of services and goods or the increase of output of services and goods whereas conserving energy consumption unflinching. Besides, this immediate commitment to enhance competitiveness, energy efficiency measures and indicators can provide roundabout or "non-energy benefits" which may increase the level of profitability. These comprise minimum maintenance costs, safer working environments and higher motivation level [2]. In this study, the energy intensity of an economy is frequently used as a measurement which measures the energy consumption of an economy and its energy efficiency. The main focus of this study is on the energy intensity levels of the chosen countries which have achieved success in energy efficiency strategies in industries, residents and transports. The precipitation in renewable energy deployment and industrial capacity for renewable energy source; the diffusion of CO₂ pricing; and inducing energy intensity which must be encouraging. The main focused sectors of energy efficiency activities

are power, transport (the vehicle area represented 27% of worldwide last energy utilization in 2010), buildings "energy use in residential, commercial and public buildings was in charge of half of worldwide last power utilization in 2010" and industry (Industry represents 28% of worldwide last energy utilization in 2010) [6].

ENERGY EFFICIENCY INDICATOR

Energy intensity is "generally used to assess how proficiently energy is utilized, and it can give signs to leaders about energy efficiency tendencies". In any case, energy intensity is impacted by numerous components, among which energy efficiency is one and only part [3]. Energy Intensities may be defined as "proportional between energy utilization, measured in energy units - tones of oil equivalent/(toe) - and indicators of economic activity, measured in pecuniary units at fixed prices (gross domestic product (GDP), value added, etc)" [4]. This pointer measures the amount of energy is obliged to create one unit of GDP. Higher GDP with lower energy consumption bringing about expansive energy funds at the world level. According to International Energy Agency report [6], the indicator of Energy intensity at a worldwide



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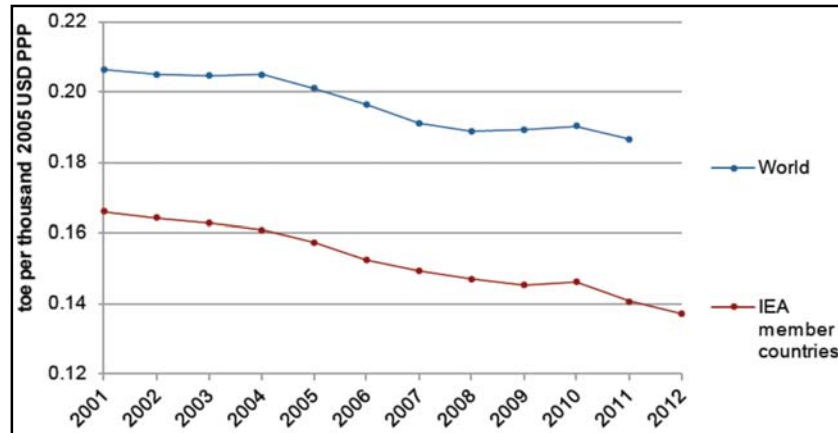


Figure-1. Evolution of IEA and world average energy intensity, TPES per GDP [4].

level has fallen over the previous decade. Total energy intensity crosswise over member countries of IEA fell by 1.7% every year on average between 2001 and 2012 (Figure-1).

Looking further back, TPES/GDP decreased by 50% between 1973 and 2012, while GDP increased by 150%, denoting an apparent improvement in the way energy is used to produce economic value. A GDP increase of 20% between 2000 and 2012, and a TPES/GDP decrease of 19%, highlights a slowing of the improvement rate in recent years (TPES: Total primary energy supply).

ENERGY EFFICIENCY POLICIES AND TRENDS

European Union

In 2007, (EU) [4], part nations concurred they would work to enhance energy efficiency by 20% by 2020, communicated as a point of confinement on energy utilization 20% beneath the anticipated 2020 level.

Overhauled to mirror Croatia's promotion to the EU, the farthest point is situated at 1483 million tones of oil equivalent (Mtoe) of essential energy utilization in 2020.

This strategy of EU Union will contribute not only in energy consumption reduction but will reduce the carbon emissions which in turn reduce the environmental pollution as well. Furthermore, this policy will face the incremental inquiry of energy due to the publication growth. As indicated by the EU's Odyssee markers, energy utilization per unit of GDP has fell continually at more or less 1.5% yearly since 2001 (Figure-2). The markers property give or take 20% of the decrease in energy intensity to structural changes in the economy, to be specific the movement from more energy concentrated exercises towards less energy escalated administrations. Per-capita utilization remained moderately unfaltering from 2001 to 2008. In the wake of declining in 2009, it came to 3.42 toe for each capita in 2010, well over the World normal of 1.87, however underneath the IEA normal of 4.7.

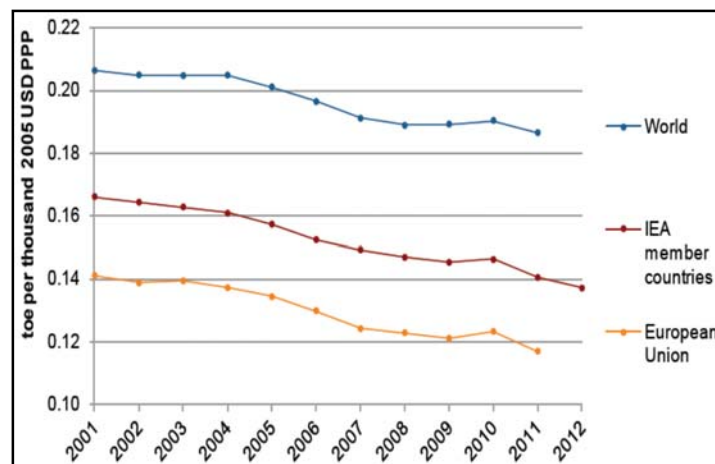


Figure-2. Evolution of energy intensity as a function of GDP, 2001-12((Notes: PPP = purchasing power parity. Data for 2012 are estimates) [4].

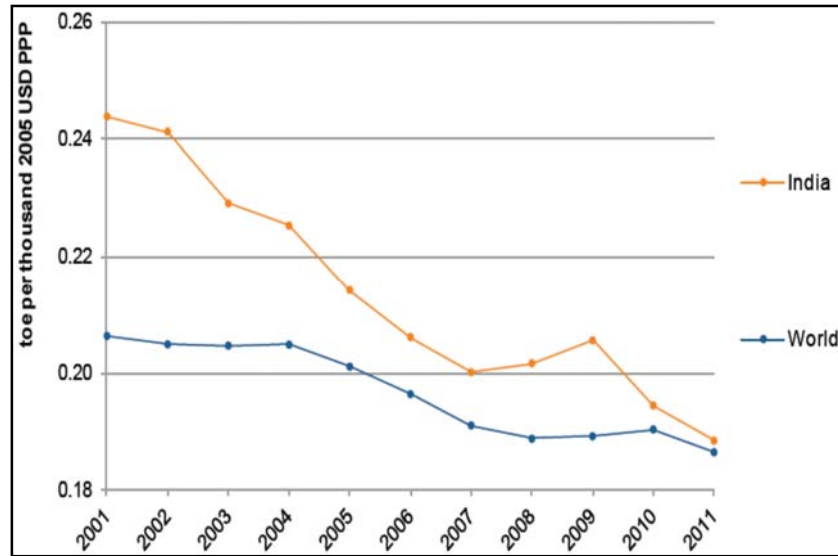


Figure-3. Evolution of energy intensity as a function of GDP, 2001-11[4].

India

As argued in [4], noteworthy advancement has been made in making a feasible arrangement also, administrative structure in India since the “institution of the Energy Conservation” Act 2001, that will encourage a business opportunity for energy efficiency and result in low environmental pollution. In the same time, this will contribute in energy saving and faces the publication growth. Energy intensity in India, measured as far as TPES per unit of GDP, has diminished fundamentally in India contrasted with different nations (Figure-3). Energy supply per capita expanded by more than 20% somewhere between 2001 and 2010, however at 0.59 toe for each capita still is not as much as a large portion of that of the world average.

Japan

As in [4], Japan has maintained critical advancement in energy efficiency since the 1970s, and as of now organizing energy efficiency to oversee energy-supply focuses in the fallout of the March 2011 seismic tremor. The development in industrial sector is obvious in Japan; therefore the Japanese government was motivated to verify a low level of energy consumption per unit of (GDP) and encouraged the industries to follow the plan of energy efficiency program. Japan’s energy use per unit of GDP, at give or take 0.11 toe for every USD 1 000 in 2012, is beneath the IEA average of 0.137 (Figure-4). Furthermore, per-capita energy utilization has additionally declined subsequent to 2004, coming to 3.5 toe for each capita in 2012, likewise underneath the IEA average of 4.5.

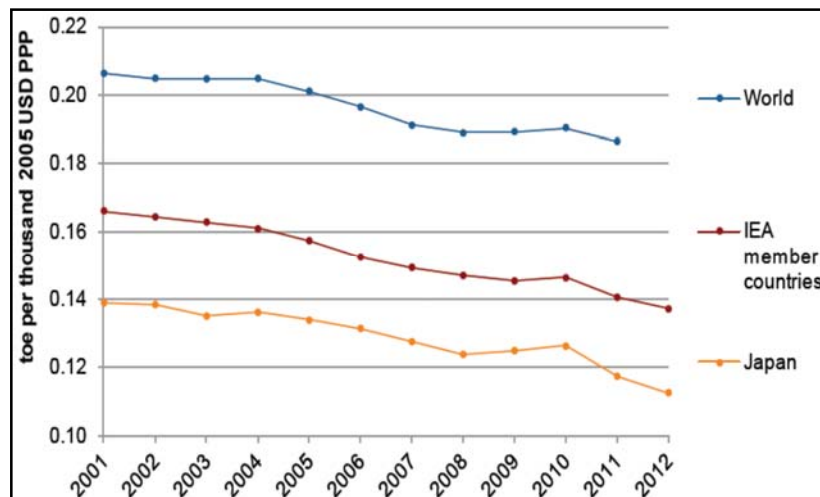


Figure-4. Evolution of energy intensity as a function of GDP, 2001-12 [4].

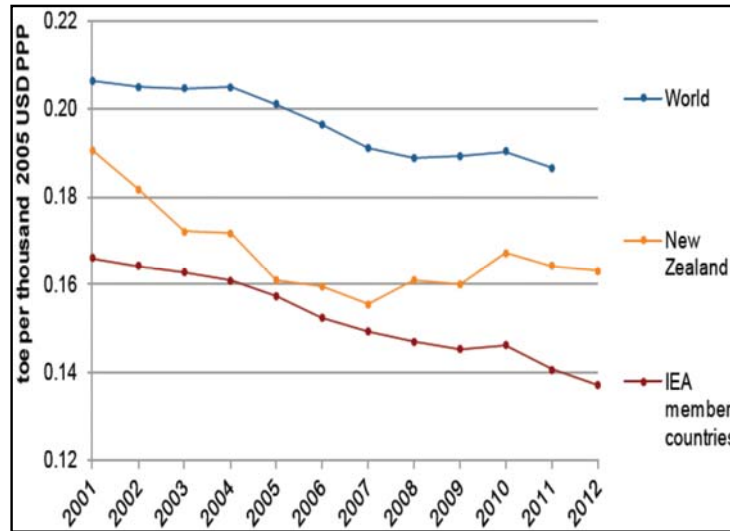


Figure-5. Evolution of energy intensity as a function of GDP, 2001-12 [4].

New Zealand

Government strategies focusing on home protection and apparatus effectiveness are considered to have been the essential boost of business procurement of efficiency improvement in the residential sector. The residential and building sector is one of the most important sectors in energy efficiency focus and activities because this area is considered very important for energy efficiency activities and strategies due to the high energy consumption in this area. The quantifiable extra advantages of these strategies incorporate good and better wellbeing impacts and upstream value chain activity. The combination of rising “gross domestic product (GDP)” and strong structural change somewhere about 2005 and 2008 prompted a fall of 14% in New Zealand’s total energy intensity “TPES per unit of GDP” in the decade to 2011. This change was speedier than the IEA average during the period before the budgetary emergency (Figure-5). As far as this metric, New Zealand moved from being near to the

World average to being closer to the IEA average, and to a great extent balanced out at around 0.16 toe for each USD in 2012 [4].

United State

The United States remains escalated in respect to other IEA part nations as far as energy utilization per unit of “gross domestic product (GDP)” (Figure-6), and additionally in per-capita terms. In any case, energy intensity improvements over the previous decade have been more claimed in the United States than in other IEA part nations because the United States’s energy consumption per unit (GDP) is still below the IEA member countries level. During recent years, the United States Expected energy efficiency market development throughout the following decade is relied upon to yield proceeding intensity improvements [4].

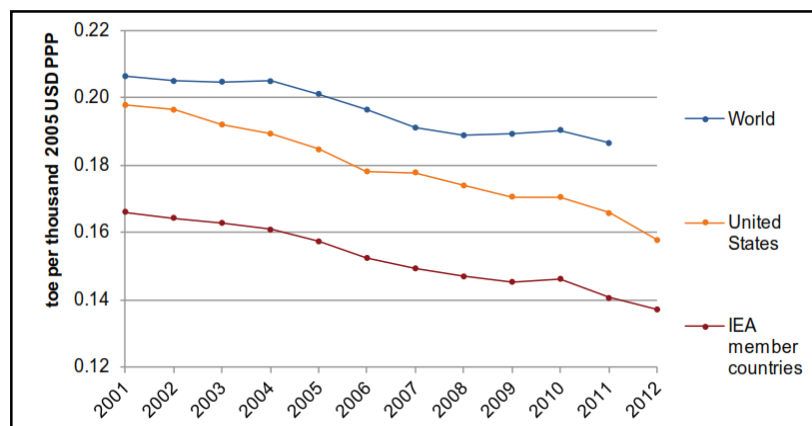


Figure-6. Evolution of energy intensity as a function of GDP, 2001-12 [4].

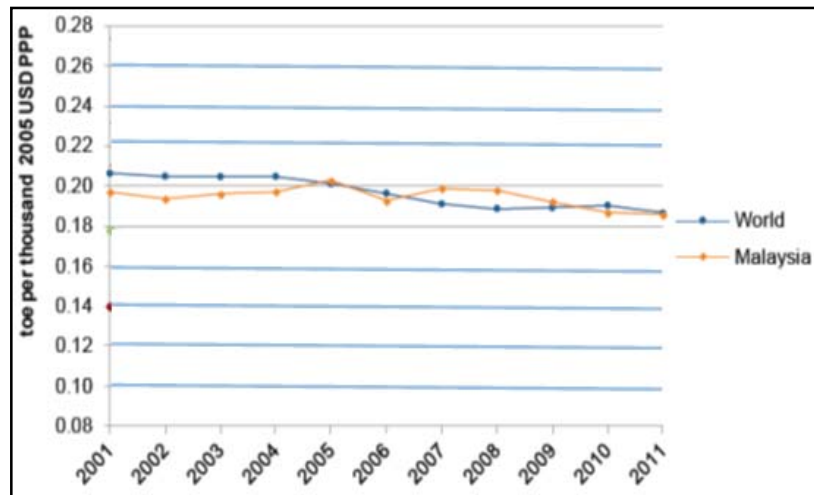


Figure-7. Evolution of energy intensity as a function of GDP, 2001-11 [4].

Malaysia

Enhancement of energy efficiency programs in residential and industrial sectors is one of Malaysian government's objectives. Now days, Malaysian government focuses on planning good strategies to reduce the energy consumption and promote energy efficiency improvement. "Malaysia's National Energy Efficiency Master Plan", through the 18 projects proposed within it, is relied upon to decrease energy utilization by no less than 10% beneath the BAU level anticipated for 2020. Initially set to be actualized in 2011, the arrangement was evaluated to lead to 85 TWh of investment funds throughout the years of 2011 to 2020 period and to lessen yearly power utilization by 19 TWh. This is relied upon to stay away from the expense of introducing 3.9 GW of new capacity, proportional to more than five average power plants in Malaysia. In Malaysia, per-capita energy utilization stays well underneath the world average, energy use has stayed unflinching in the industry sector between 2001 and 2011 (Figure-7), and final energy consumption was commanded by transport in 2011. Executing the arrangement will cost more or less "MYR 255 million (USD 80 million)" every year [7]. Total public expenditure to 2020 is required to reach "MYR 2.3 billion (USD 722 million)", utilizing "MYR 12.1 billion (USD 3.8 billion)" in private sector investment, and prompting to energy cost investment funds of "MYR 52 billion (USD 16.3 billion)" over the lifetime of the energy effectiveness activities [4].

CONCLUSIONS

EU and Japan could verify Per-capita consumption below IEA average by 2011-12. This implies that the policies and activities of these countries in all three sectors for energy efficiency improvement can be considered satisfactory.

Followed by America and New Zealand which they could also reach to very good energy intensity levels

and they should pursue to improve the Energy Efficiency in the important sectors which they have not focused on. India's Energy intensity has decreased significantly in India compared to other countries. In Malaysia, the recent policies can reduce the energy consumption and avoid a cost of 3.9 GW of new capacity by 2020.

REFERENCES

- [1] A Report Climate Strategies Organization. 2014. Europe's Path to a Successful Low-Carbon Economy.
- [2] A Report of Institute for European Environmental Policy (IEEP) 15 Queen Anne's Gate London SW1H 9BU United Kingdom 2013. Review of Costs and Benefits of Energy Saving.
- [3] A Report of International Energy Agency, (IEA, 2012).
- [4] A Report of the World Energy Council in Collaboration with ADEME. 2004. A Worldwide Review Indicators, Policies, Evaluation.
- [5] Energy Efficiency Market Report. 2013. Market Trends and Medium-Term Prospects, International Energy Agency.
- [6] A Report of the World Energy Council in Collaboration with ADEME. 2004. World Energy Council and French Environment and Energy Management Agency.
- [7] Asia Pacific Economic Cooperation, APEC. 2011. Report Peer Review on Energy Efficiency in Malaysia.