JKR and UNDP's Building Sector Energy Efficiency Project

Contributions to the building industry

Current energy consumption trends

Building sector electricity consumption is increasing at a rapid rate. As figure 1 shows, electricity consumption in Malaysian buildings has grown at an increasing rate in a highly predictable manner since 1990. If this trend was continued to 2020, building sector electricity consumption will be 50% higher than in 2012. Furthermore building sector electricity consumption has grown at a faster rate than GDP (constant prices). In 2012 building sector electricity consumption intensity was 49% higher per unit of GDP than in 1997.

What is BSEEP and what is BSEEP's contribution to Malaysia

The Building Sector Energy Efficiency Project (BSEEP), with financial support of Global Environment Facility (GEF) / UNDP, and implemented through JKR (Public Works Department), aims to reduce the annual growth rate of GHG emissions from the Malaysia buildings sector. BSEEP aims to do so by improving the energy utilization efficiency in Malaysian buildings, particularly those in the commercial and government sectors by promoting the energy conserving design of new buildings and by improving the energy utilization efficiency in the operation of existing buildings. The realization of this objective will be facilitated through the removal of barriers to the uptake of building energy efficiency technologies, systems and practices (https://www.jkr.gov.my/bseep/).

BSEEP strives to assist Malaysia to meet its commitments to reduce its CO2 emissions by 40% by the year 2020. This commitment made at the 15th Conference of Parties (COP 15) in Copenhagen, Denmark in 2009, was ambitious especially for the building sector in Malaysia.

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Is it possible to decouple energy use and GDP

Energy efficiency can break this trend and provide other benefits. It is possible to have GDP growth without ever increasing energy use. In the UK between 2000 and 2012 GDP grew by 58%, yet energy use dropped by 12%. In Australia electricity consumption in the National Electricity Market has dropped 8% since 2008/09, yet GDP has continued to grow. Belarus, whose GDP and GDP growth matches Malaysia's, reduced its energy intensity per unit of GDP by two-thirds between 1990 and 2010.

Why consider energy efficiency

Broadly speaking it costs much less to save one megawatt-hour (MWh) of electricity than it does to purchase one MWh of electricity. BSEEPs modelling indicates that energy efficiency can cost effectively deliver large savings at a cost of roughly RM 0.15/kWh, far lower than the RM 0.30/kWh required to generate electricity from fossil fuels as reported by the Malaysian media.

To meet the growth in electricity demand it is cheaper to invest in energy efficiency at the point where energy is used – in buildings – rather than investing in new power plants, transmission and distribution infrastructure. Treating energy efficiency as the first fuel – as California has done since the 1970s – provides wide ranging economic, environmental and social benefits.

The most cost effective time to undertake energy efficiency in a building is at the design stage, and with strong rates of construction, Malaysia has the opportunity to deliver savings at lower costs than in developed countries where retrofits form the backbone of energy efficiency policy. Malaysia has had an active green building community since 2007, focussed on reducing the energy consumption of new buildings. Based on data estimates for the first 50 green certified buildings provided by the Malaysian Green Building Index (GBI), BSEEP calculates that every ringgit invested in making a building more efficient reduces

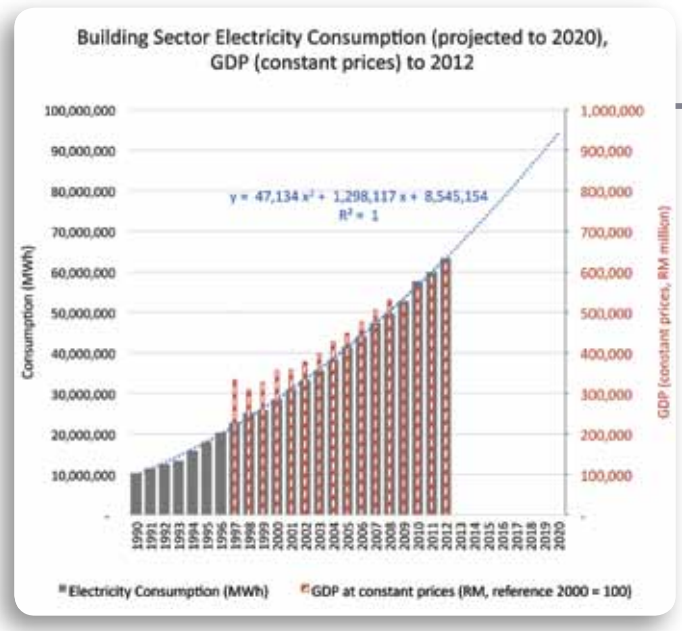

Figure 1 – Trend line of building sector electricity consumption projected forward to 2020. Based on Energy Commission (EC) for Malaysia on the Malaysian Energy Information Hub, in accordance with the following categories: Agricultural, Transport, Commercial, Residential (Domestic) and Industrial, with Commercial and Residential assumed to represent building sector electricity consumption. GDP is based on data published by the Malaysian department of statistics, with a reference of the year 2000 = 100.

electricity consumption by RM 0.30 per year. Over a 25 year building lifetime this results in a total return of RM 7.50 for every RM 1 invested.

However for existing buildings there is also opportunity to cost effectively improve the performance buildings. This is particularly the case at the time of refurbishment, which typically happens every 15 to 20 years. Upgrading to the most efficient lighting or air conditioning has a lower lifetime cost than purchasing a cheaper less efficient system.

Malaysia's electricity supply has over recent years moved to greater dependency on imported coal. As a result the greenhouse gas emissions factor – the amount of greenhouse gas produced for each MWh of electricity generated – has increased.

Energy efficiency reduces carbon emissions, a key environmental benefit. Energy efficiency is labour intensive, unlike electricity production which is fuel intensive. As a result more jobs are created when investment is made in energy efficiency than when it is invested in generation.

There are, however, a range of barriers that require government intervention in order to capture the benefits of EE. These barriers have not yet been effectively addressed in Malaysia, with the consequence of ever increasing electricity consumption as shown in figure 1.

Benefits of energy efficiency yet to be realised in Malaysia

As figure 1 shows, electricity consumption in Malaysian buildings has grown at an increasing rate in a highly predictable manner since 1990. A number of EE building sector initiatives have been undertaken – for example rebates on energy efficiency chillers – and whilst these initiative have been effective in reducing energy use in individual buildings, they have not be done so at a sufficiently large scale to make an observable impact on Malaysia's overall building sector electricity consumption.

If this trend was continued to 2020, building sector electricity consumption would be 94,000,000 MWh in 2020, and 50% higher than in 2012.

Compared with other countries, Malaysia's building sector EE policies are still predominantly voluntary as illustrated in a poor score shown in Figure 2 above as postulated by BSEEP.

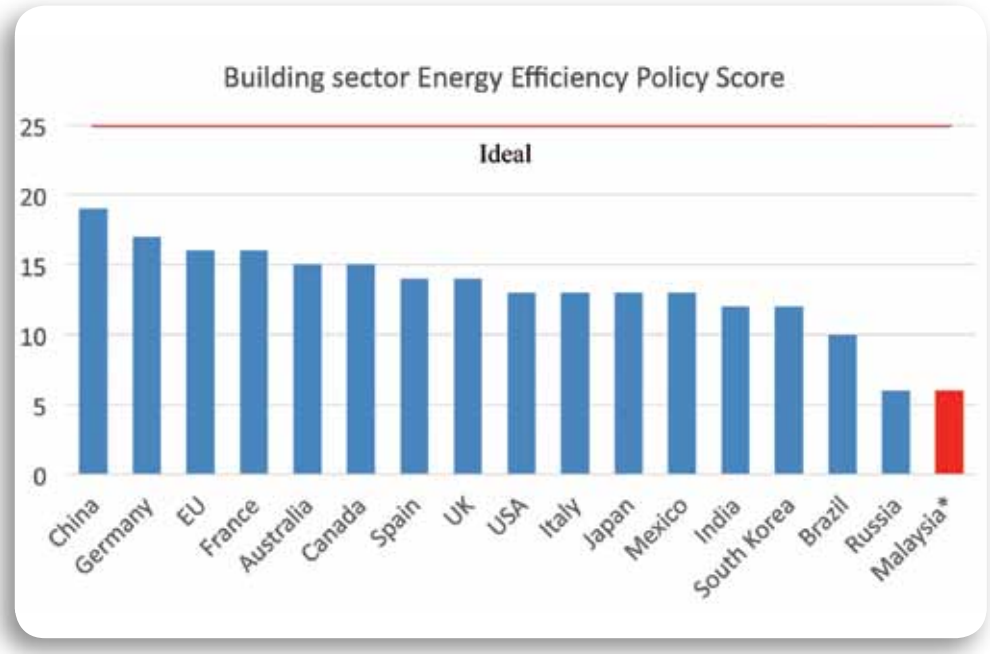

Figure 2 – Malaysia's Building Sector Energy Efficiency Policy Score. As reported in the 2014 International Energy Efficiency Scorecard, ACEEE. *Malaysia's policy performance was not reported in the scorecard, but has been derived by BSEEP using the methodology presented in the scorecard

Policy recommendations

BSEEP has carried out work to assess the energy efficiency scenario in Malaysia and has come up with the following recommended strategy to drive the adoption of energy efficiency by the industry and public. These are: enable the market, create a stable financing mechanism, incentivise the market, have government lead by example, strengthen institutions, and monitor and evaluate.

Enabling the market:

- The Uniform Building By Laws, 2012, which incorporate energy efficiency provisions from MS 1525, need to be gazetted by the states and municipalities who have not done so in Malaysia (readers should note that only the state of Selangor has gazetted this).
- Energy usage and the opportunity provided by energy efficiency needs to become more visible through the mandatory disclosure of energy building performance. To enable this an energy efficiency rating tool for existing buildings which covers a range of building types needs to be available.
- A National Building Energy Consumption Database (NBECD) needs to be developed.
- Awareness should be raised through Appliance and Equipment Standards and Labelling (S&L) and expansion of the S&L program to cover commercial equipment, notably chillers and commercial air-conditioners.
- Subsidies on electricity prices should be totally removed.

Create a stable financing mechanism and tools

- Create a public-private for profit investment fund dedicated to energy efficiency projects
- Create a revolving fund for large energy users to access ESCO delivered project
- To setup a on bill financing schemes

Create the market

- As mandatory disclosure is introduced incentives can be used to drive early compliance.
- Create market based incentives using methods which clearly enable energy savings to be determined, should be used. When energy savings can be clearly quantified, incentives can be created (and funded) based on the "negative

watts" saved, which can be priced to compete with generated megawatts. A Utility Energy Efficiency Obligation or dedicated Energy Efficiency Generator could be established to enable this.

Have government lead by example

- Government ministries should be required to adhere to energy performance requirements for their buildings.
- Mechanisms and contracts should be in place to enable ESCOS to deliver EE to government
- Government should adopt green procurement principles.
- Greatly increase resourcing for the administration of EE programs
- Enhance capacity including cooperation with the private sector

Monitor and Evaluate.

- Compliance with MS1525
- The disclosure of building energy consumption (enabled through analysis of data in the National Building Energy Consumption Database)
- Monitor compliance with Standards and labelling
- Monitor the impact and effectiveness of incentives
- Improve the monitoring of how well government is leading by example (i.e. PEMANDU)
- Input the results of monitoring and evaluation into the Malaysian Sustainable Consumption and Production Indicators (MYSCPI) – a comprehensive SCP monitoring system

Public offerings

BSEEP has produced a range of useful design guidelines and reviews which can be access for free by the public. These documents provide readers with information on how to design and manage effectively the energy use of a building.

The documents below can be downloaded:

- Review of best practices around the world for Energy Management programs
  https://dl.dropboxusercontent.com/u/40344193/EM%20Program%20Report%20%28final%29.pdf
- Energy Management Guidelines (Draft)
- Energy Efficiency Policy Reviews and Proposals
  https://dl.dropboxusercontent.com/u/40344193/BSEEP-EE_policy_for_bldgs.pdf
- Energy Efficiency Financing Best Practices
  https://dl.dropboxusercontent.com/u/40344193/BSEEP_A1_EE_financing_best_practices_v6.pdf
- Report on Building Energy Intensity Calculation Methodology
  https://dl.dropboxusercontent.com/u/40344193/Report%20on%20the%20Development%20of%20Proposed%20BEI%20Computation%20Methodology%20-%20Part%202.docx
- Assessment report on viability of local industry to manufacture EE building materials, equipment and components (C5)
  https://dl.dropboxusercontent.com/u/40344193/BachelorThesis_S.Kupfer_FinalDraft.pdf
- Active and passive technical design guideline
  http://www.scpmalaysia.gov.my/?q=node/73

Conclusion

As living standards and comfort expectations rise in Malaysia, energy use per building is increasing. The rapid construction rate – at current rates of growth in 2031 Malaysia will have twice the number of electricity consumers that is now has in 2014 – is also causing building sector consumption to rise.

The building sector accounts for 54% of Malaysia's electricity use. Building sector electricity consumption is growing faster than industrial electricity consumption, and at current growth rates by 2020 buildings will use 50% more electricity than they did in 2012. Carbon emissions and coal imports will increase accordingly.

This trend of ever increasing consumption can be halted with energy efficiency (EE) – using less energy to provide the same outcome. For example using less energy to illuminate a workspace. Energy efficiency provides three key benefits:

Economic benefits. These benefits can be very high. For example, investing RM 1 million to make a building more efficient can yield up to RM 15 million in lifetime energy savings. Over the 20 years from 2016 to 2035, RM 34 b of government investment in building sector EE could yield RM 174 b in energy savings across Malaysia. It costs less to save 1 GWh than it takes to generate 1 GWh of electricity. Which is why globally there is a shift to make energy efficiency the "first fuel".

Environmental benefits. The building sector represents around 15% of Malaysia's greenhouse gas (GHG) emissions. 274 million tonnes of GHG could be saved by 2035 with the investment outlined above, reducing building sector emissions by one third compared with Business as Usual (BAU).

Social benefits. Investments in energy efficiency are labour intensive and geographically dispersed. Roughly 5 times as many jobs are created in EE than when the same amount of money is invested in building and operating fossil fuel power plants. 15,000 jobs could be created by 2025 with the investment in building sector EE outlined above. EE creates jobs and builds skills for the growing global green economy.

Whilst energy efficiency (EE) is economically, environmentally and socially more beneficial than building more power plants, government intervention is required to address the barriers to EE and create a market for EE.

The barriers to building sector EE include a widely disconnected market between developers and occupants of buildings, low awareness of the value of energy efficiency, fragmented and weak institutional setups, gaps in regulation and enforcement and lack of data on building energy use.

Addressing these barriers involves enabling and incentivising the market, creating a stable financing mechanism, having government lead by example, strengthening institutions, and monitoring and evaluation.