Energy Efficient Prosperity: a new concept for emerging economies

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Abstract

Primary energy demand is expected to grow by nearly one third over the next 20 years, almost all of this growth will come from emerging economies and two thirds of the growth will be in Asia. The recent COP21 agreement provides a route to reduce carbon emissions but there is still a gap between the agreement at COP21 and the emissions reduction necessary to keep global temperature rise below 2 degrees Celsius above pre-industrial levels.

Analysis by the International Energy Agency (IEA) has demonstrated that the gap can be bridged through tried and tested cost-effective mechanisms. 49% of the carbon savings under this bridge scenario are through energy efficiency. However, only one third of the climate pledges at COP21 included energy efficiency measures among their actions to reduce carbon emissions.

Based on their work with emerging economy governments, the IEA identified a need for new indicators that reflected the multiple benefits of energy efficiency actions, local conditions, capabilities and aspirations; and that were practical for emerging economy policymakers to produce.

This paper describes the work conducted by the IEA and their consultants to develop the concept of Energy Efficient Prosperity. This involved:

- A review of literature relating to energy efficiency policies, targets and programmes in six emerging economies
- Research with around 100 stakeholders
- A concept development process
- Concept testing in detail with policy makers from three key emerging economies.

The paper recommends how evaluators can use the Energy Efficient Prosperity concept in both ex-ante and ex-post evaluation and describes the next steps that the IEA is taking in developing the concept and providing guidance on its use.

Background – the role of energy efficiency

The Intended Nationally Determined Contributions (INDCs) agreed at COP21 by more than 150 countries will substantially reduce carbon emissions. However, the agreement recognized that much greater emission reduction efforts will be required to meet the aim of keeping global temperature rise this century well below 2 degrees Celsius above pre-industrial levels.

Figure 1 shows the IEA's forecast for energy demand in 2035 by region. This represents a growth of nearly one third from 2013; 97% of the growth in energy demand will be outside the OECD and two thirds of the growth will be in Asia.

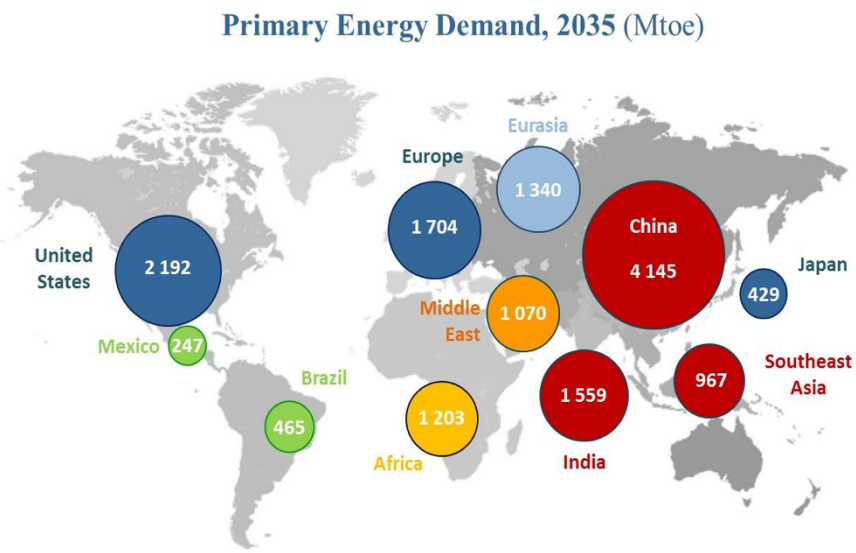

Figure 1: Forecast Energy Demand in 2035 (IEA, World Energy Outlook, 2013)

Analysis by the IEA has identified a "bridge scenario" of tried and tested cost-effective mechanisms that could be adopted to meet the gap between the INDCs and the action needed to meet the 2 degree target. The chart in Figure 2 shows this analysis:

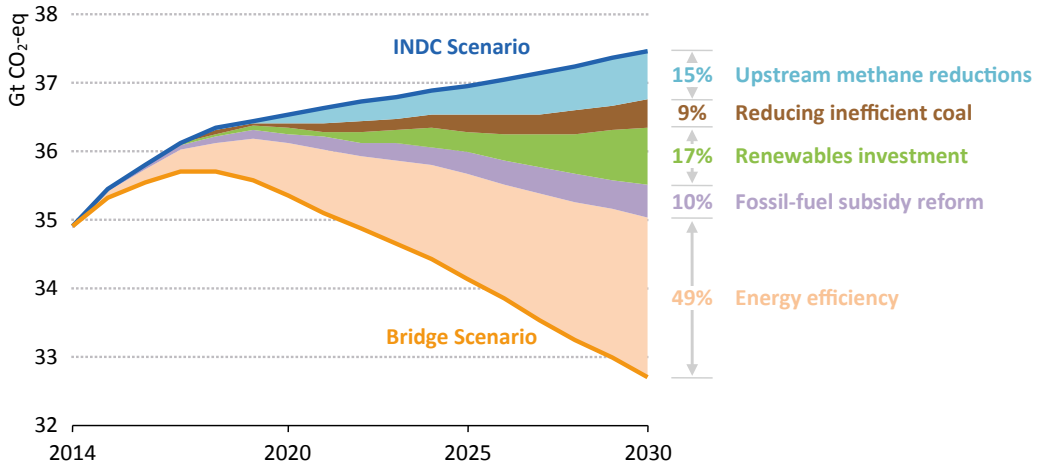

Figure 2: Bridge Scenario (IEA, World Energy Outlook Special Report on Energy and Climate Change, 2015)

The chart shows that 49% of the additional carbon savings required to meet the 2 degree target can be achieved through energy efficiency. However, only one third of INDCs include energy efficiency measures among their actions to reduce carbon emissions.

The IEA established the Energy Efficiency in Emerging Economies (E4) Programme[1] in 2014. This four-year programme will support the scale up of energy efficiency activities that generate economy-wide benefits in major emerging economies. The E4 Programme is funded by the Government of Denmark and the European Commission and builds on IEA's well-established energy efficiency portfolio of experience and analysis, combining data collection, indicators and modelling with energy efficiency policy design, implementation and evaluation.

1 http://www.iea.org/topics/energyefficiency/e4/

In addition, the IEA launched its guide to the Multiple Benefits of Energy Efficiency in 2014. The aim of this book is two-fold: to build knowledge of the multiple benefits of energy efficiency, and to demonstrate how policy makers and other stakeholders can use existing tools to measure and maximise multiple benefits. The guide identifies five key benefits areas – macroeconomic development; public budgets; health and wellbeing; industrial productivity; and energy delivery. These multiple benefits were thought to be particularly important to policy makers in emerging economies.

The need for new indicators

In implementing the E4 Programme the IEA's Energy Efficiency Division is working closely with policy makers in emerging economies; particularly India, Indonesia, Mexico, Brazil, Thailand and South Africa. During this engagement IEA staff received feedback that the IEA's existing energy efficiency indicators were not helpful in securing support for energy efficiency actions within emerging economy governments.[2] The problems with the indicators fell into two broad categories:

- Indicators such as energy consumption per capita are showing increases in emerging economies as more households gain access to more energy services – for example where a householder installs air conditioning for the first time energy consumption per capita will rise, however efficient the air conditioner. These indicators were seen as contradicting the primary goal of governments which is development and improving the living standards of their population.
- Many emerging economies do not have the capacity to produce the traditional IEA energy efficiency indicators as set out in their 387 page manual.

On the other hand, IEA staff received very positive feedback from emerging economy policy makers about the Multiple Benefits of Energy Efficiency approach and it was felt that this could provide an opportunity to engage wider support for energy efficiency. Energy efficiency has an important role to play in an emerging economy context, by improving the service value of every unit of energy consumed. The broader benefits of energy efficiency are well aligned with the economic growth and social development aspirations that drive policy in these countries.

To respond to this feedback, the IEA commissioned a research project to articulate this aspect of the rationale for energy efficiency more clearly and to investigate improved methods for capturing metrics of progress in energy efficiency that are relevant in the context of emerging economies. The intention was that these metrics could then be used to set meaningful objectives for energy efficiency and shape policy.

Research programme

Aims and approach

The research focused on the needs of large energy users among the emerging economies; particularly Brazil, India, Indonesia, Mexico, South Africa and Thailand[3]. The aims of the project were to identify:

- The economic and social context of emerging economies in which decisions about energy efficiency are made

2 Source; discussions with IEA staff

3 China is an E4 partner country but was not a focus of this research as they have already made good progress on energy efficiency indicators and targets.

- The potential for an enhanced contribution of energy efficiency and metrics for assessing that contribution.

The work involved four main elements, a literature review, consultation with stakeholders, discussion with IEA to develop a concept and then testing of that concept with policy makers in emerging economies.

Literature review

The policy context for energy efficiency appears positive; all the countries examined had developed INDCs and were committed to reducing their carbon emissions. Brazil, Mexico, China, India and South Africa are members of the International Partnership for Energy Efficiency Cooperation (IPEEC) which is implementing the G20 Energy Efficiency Action Plan. Key findings from the research for individual countries are:

- Mexico established the Comission Nacional para el Uso Eficiente de la Energia (CONUEE) in 2008 with the objective of promoting the sustainable use of energy. The National Energy Strategy for 2013-27 places energy efficiency in the context of two high level objectives: energy security, "without energy efficiency, Mexico could become a net energy importer by 2020"; and social inclusion, through access to improved energy services at lower cost.
- Indonesia has a target of reducing energy consumption by 17% compared to a business as usual scenario by 2025 through energy efficiency. This is implemented through the Directorate of Energy Conservation within the Ministry of Energy and Mineral Resources. The benefits are seen as increased energy security in the context of rapidly increasing energy demand alongside prosperity for communities.
- The Indian Government established the Bureau of Energy Efficiency (BEE) in 2002 as part of the Energy Conservation Act 2001. Energy efficiency is placed in the context of meeting increasing energy demand and constraining the growth in CO_2 emissions from energy use. Targets for energy efficiency have been expressed in terms of avoided generation capacity (e.g. in the 2007-2012 five-year plan period energy efficiency avoided the need for over 10,000MW of generation capacity)
- Brazil adopted a National Energy Efficiency Action plan in 2011 which aimed to reduce energy consumption compared to a business as usual scenario by 10% by 2030 (around 106TWh). The key benefits are seen as being reducing the costs to consumers, energy security, and the generation of jobs through energy efficiency projects.
- The Government of South Africa's Integrated Resource Plan for Electricity, 2011 sees energy efficiency as a mechanism for reducing electricity demand but not one that can be relied upon to deliver energy security.
- Thailand adopted a 20-year Energy Efficiency Development Plan in 2011. This set out an aim of reducing energy intensity by 25% which would strengthen energy security, reduce household expenditure on energy and cut pollution and greenhouse gas emissions.

Thus all the countries considered in this project have adopted energy efficiency policies and plans and all have implemented energy efficiency programmes; particularly policies for industry and minimum energy performance standards and energy efficiency labelling (S&L). Several countries had established ESCOs and some were able to justify funding energy efficiency measures on the basis of avoiding subsidies to consumers (Mexico and India).

The principal benefits of energy efficiency that underpinned the rationale for energy efficiency policies were:

- Increasing energy security –through helping to manage electricity generation capacity constraints, through avoiding investment in additional capacity or reducing imports of fuel
- Increasing consumers' access to affordable energy services
- Job creation through work to install energy efficiency measures

Stakeholder consultation

The research team consulted stakeholders at two events, the European Council for an Energy Efficient Economy (ECEEE) Summer Study in June 2015 and the Energy Sector Management Assistance Programme[4] (ESMAP) Knowledge Exchange Forum in July 2015. In total around 100 individuals were consulted including:

- Policy makers from emerging economies
- Consultants and academics working on energy efficiency
- Representatives of non-governmental organisations
- Representatives of multi-lateral development bodies and international development agencies

The key messages emerging from the stakeholder consultation were:

- That metrics developed specifically for emerging economies would be welcome; respondents confirmed the informal feedback to IEA that the existing energy efficiency indicators were inappropriate for emerging economies
- Metrics would be valuable at different jurisdictional levels; for example cities, provinces, nations and regions. Mayors might use metrics to assess their performance and to compare with similar cities (possibly in other countries) while national governments would use the metrics to set targets and benchmark their performance over time.
- There was a keen sense among respondents that better metrics were needed to justify funding energy efficiency projects and programmes. They wanted measures that could be used in developing business cases for finance ministries and treasuries.
- Most stakeholders thought that metrics would be most effective if they were expressed in financial terms; these are particularly important when communicating with policy makers outside the energy field as it is hard for non-specialists to see the relevance of energy and carbon indicators to their work.
- To be effective, stakeholders said metrics had to be simple to produce and to communicate. It was recognised that there may be a trade off between simplicity and accuracy. However, respondents felt that, providing there was a reasonable level of accuracy, ease of production was more important.
- The metrics also need to be easy to communicate and understand if they are to be effective in engaging people outside the energy sector.
- Respondents with experience of emerging economies were keen to stress that there would be challenges relating to the availability and quality of data and that it would be

4 A World Bank initiative to assist low- and middle-income countries to achieve environmentally sustainable energy solutions for poverty reduction and economic growth

necessary to work with existing data sources rather than commission new data collection exercises.

- There would be a need for training and capacity building for individuals who will be responsible for producing, using and communicating the metrics.

Respondents provided a number of ideas about what metrics should cover and how they should be structured. Suggestions included covering trade and competitiveness, access to energy, the market penetration of specific technologies and the effect of energy efficiency on industrial and commercial productivity.

One respondent suggested thinking about energy efficiency as an accelerator for development rather than as an end in itself. Another suggestion was that metrics should focus on energy waste rather than energy efficiency.

Concept development

The research team held two meetings with the IEA steering group to consider the research results and develop a way forward. This process resulted in the concept of Energy Efficient Prosperity, this describes a locally defined standard of prosperity that has been achieved in an energy efficient way.

Using the word, "prosperity", was felt to be important because it reflected the development aspirations of emerging economy populations and their governments. It supports the idea that energy efficiency allows access to more energy service. The term prosperity also was thought to appeal more to middle class consumers and so avoid energy efficiency as being limited to something for the fuel poor or those with limited energy access.

The standard would need to be locally defined as there is a significant range in what prosperity might mean in different countries; this will depend on:

- The local climate; in some areas a prosperous home will have heating, in others it will have some form of cooling
- The level of development/expectations; in urban areas in many emerging economies air conditioning is seen as essential by a middle class household whereas in rural areas a prosperous home would be cooled with electric fans.

The energy efficient metric would indicate the proportion of the relevant population that has achieved a prosperous standard of living in an energy efficient way; thus there would be two components.

- Local prosperity benchmarks would be established for different sectors following a centrally developed model to be provided by the IEA. The benchmarks would be set by local experts drawing from international experience and comparators. They would, reflect local objectives for improvements in standards of living, reflect climate, living conditions, stage of development, average income levels.
- A definition of the energy efficient way of meeting that prosperity benchmark would be agreed. This would also depend on local circumstances and could be based on the use of products that met a particular energy efficiency standard.

As an example a prosperous home in a particular locality could be defined as one with air conditioning in at least one bedroom and the living room. Energy efficient prosperity could be defined as one of those air conditioners being at least 4 stars. The Energy Efficient Prosperity indicator would be the proportion of homes in that locality that had 4-star air conditioners in at least one bedroom and

the living room.

The data to populate the indicator could come from surveys of housing conditions (which are conducted by most governments). They could provide information on the proportion of homes that met the prosperity criterion – such as the proportion that had air conditioners. This could be used with data on sales of energy efficient products (e.g. air conditioners with 4 or more stars) from manufacturers or S&L schemes. Together these data would establish the proportion of installations and homes that met the energy efficiency prosperity criteria.

The availability of data would be considered in defining the metrics; it would be preferable to have an indicator that could be calculated from readily available data than one which required primary data collection to calculate.

Energy efficient prosperity metrics would be developed for housing, the public, commercial and industrial sectors and transport.

Training and support would be provided by the IEA through their E4 support to emerging economies.

Outputs could be in the form of a dashboard as shown by the fictional illustration in Figure 3.

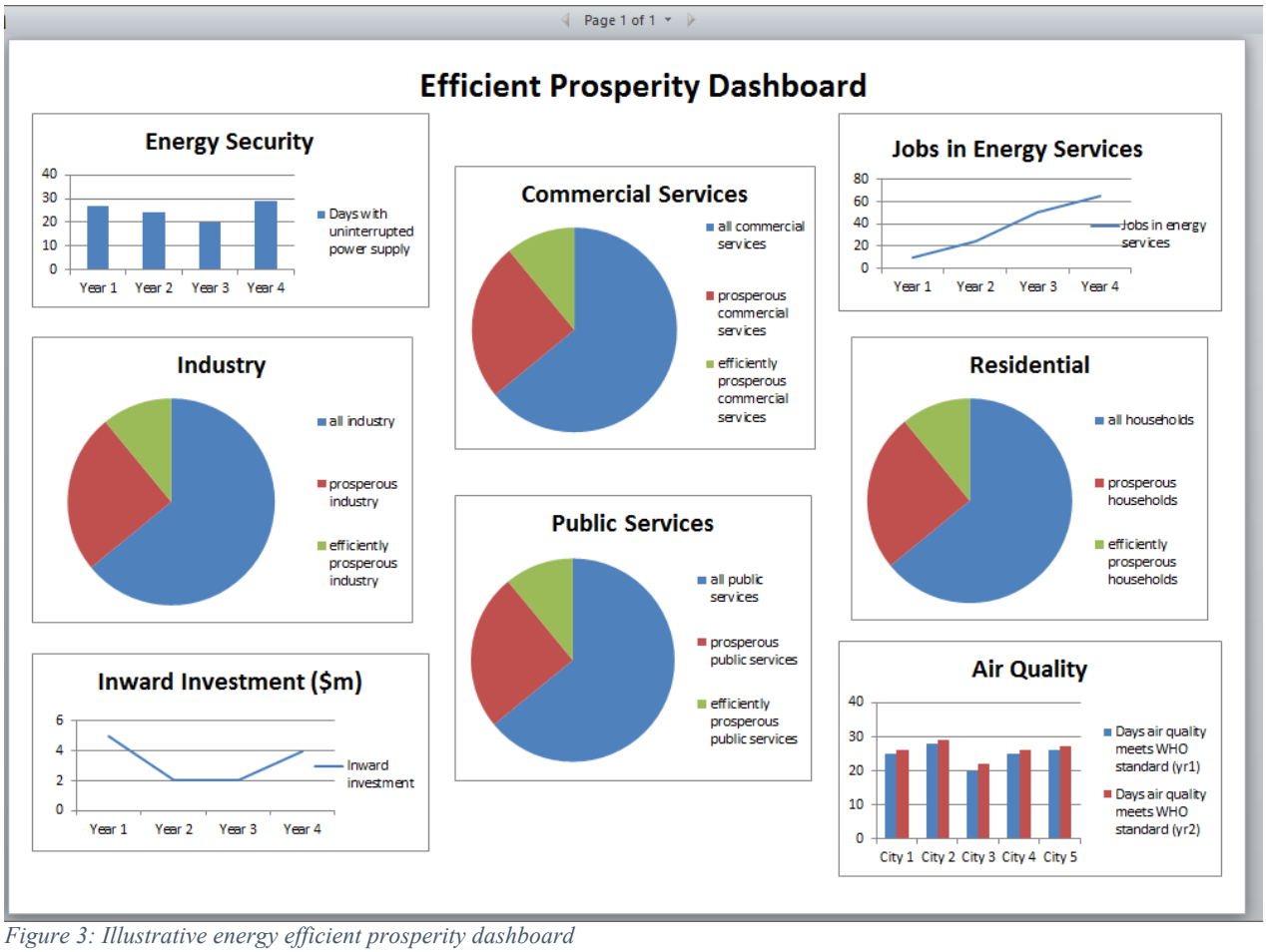

Figure 3: Illustrative energy efficient prosperity dashboard

There was some discussion at the concept development stage about whether it would helpful to have a metric to compare the affordability of prosperity and energy efficient prosperity. For example, this could be the ratio of the running costs of an energy efficient home compared to that for a normal home. This metric could help to underline the contribution of energy efficiency to household budgets.

This could be further refined by establishing the proportion of the local median income that was needed to pay for fuel in an energy efficiency household.

Some members of the steering group had reservations about considering affordability. There

was a risk that by including another two variables (incomes and fuel costs) the clarity of the metric could be lost. It was agreed to test this in the concept testing.

Concept testing

The Energy Efficient Prosperity concept was tested through in depth interviews with policy makers in Mexico, China and India. Respondents were provided with a concept note explaining Energy Efficient Prosperity followed by a telephone discussion. The interviews covered the following questions:

1. Do you think it is useful to try to define an energy efficient prosperity goal to support and inform the development of energy efficiency programmes?
2. What might be an appropriate local energy efficient prosperity benchmark for any subsector?
3. How relevant and useful do you think an energy efficient prosperity benchmark could be to you?
4. Would you find it helpful to have a metric which reflected the economic appropriateness (i.e., affordability) of the energy efficient prosperity benchmark?
5. What relevant data are already available to you? Would you be willing to collect new data to establish energy efficient prosperity metrics?
6. How would you use energy efficient prosperity metrics?
7. Would international comparison be of interest to you?
8. Do you have any suggestions for how the concept of energy efficient prosperity could be developed?

All three participants were very clear that it was valuable to try to define an energy efficient prosperity goal, and that a benchmark could be very useful and relevant to them. In addition, they all said that it would be helpful for the metric to include a reflection of affordability. The concept was seen as ambitious but had the potential to engage political leaders and development agencies that have not traditionally been interested in energy efficiency. Respondents mentioned examples of projects they had undertaken which they felt would have benefited from being considered in the context of energy efficient prosperity. An indicator was seen as a way for policy makers to present their performance and the IEA's endorsement would provide authority and credibility.

The respondents agreed that, wherever possible, it would be important to use data that were already available. However, none of the respondents ruled out collecting new data to inform metrics. Concerns were expressed about the reliability of data within the respondents' countries. This was felt to be a risk that could reduce confidence in the metrics. In addition to government statistics, all three respondents were aware of other sources of data such as academics or utilities. There was enthusiasm for working alongside the IEA to review what data were available and how they could be used.

The main use for the indicator was expected to be benchmarking, both to track their own progress towards their goals over time and also for comparison with other countries. Respondents differed on the value of comparisons between cities; one was enthusiastic about using the metric for cities while another felt that cities were too different from each other for comparisons to be useful. The respondent from India mentioned the dashboard approach used by www.delp.in which publishes live energy statistics by state.

Respondents wanted to see the concept linked to other tools such as the United Nations Development Programme (UNDP) Human Development Index or the Tool for Rapid Assessment of City Energy (TRACE). They also felt the concept could be used in the ex-ante assessment of energy efficiency projects to encourage adoption of projects that make the biggest difference to energy efficient prosperity.

All three respondents were willing to assist the IEA in developing the concept. They provided different suggestions for how this could be done:

- In China a trial could be established using government buildings to develop guidelines, case studies and a handbook which could then be rolled out across the public sector.
- India would prefer to pilot the concept in the residential sector as this is politically important and attractive to policy makers. The agricultural sector would also be an interesting area for a pilot.
- A city wide trial could be conducted in Mexico; this would be aligned with TRACE which is widely used in that country.

Conclusions from the research

The research confirmed IEA's idea that there was a need for new metrics for energy efficiency in emerging economies and helped to define what such metrics could look like and how they could be developed. Considerable work is still needed to pilot potential approaches and to build the capacity of policy makers in emerging economies to use these metrics.

The respondents involved in the concept testing were all interested in piloting the concept; each suggested a different focus so there is an opportunity to explore a range of applications. This would provide valuable further learning for the IEA.

Energy Efficient Prosperity in practice

The concept of energy efficient prosperity can be used by evaluators as a tool to compare a conventional approach with an energy efficient approach. This makes it possible to identify the difference that energy efficiency makes to the desired development outcomes such as employment, energy security, social inclusion, industrial productivity, air quality, health and well being.

Energy efficient prosperity should be a key consideration in ex-ante evaluations to consider different policy options as it will allow policy makers to select the activities that generate the most important multiple benefits as well as reducing energy consumption and carbon emissions. Energy efficient prosperity can also provide a tool to engage policy makers from other disciplines and secure their co-operation.

Where a range of energy efficiency policies are being considered their potential impact on multiple benefits should be assessed. This should be factored into the policy selection process as, all other things being equal, the best choice will be the policy that generates the most benefits. Policy makers and non-government stakeholders with an interest in those benefits should be engaged in this process which will provide an opportunity to refine the policy design. There may be potential to secure additional funding for energy efficiency projects from other budgets. The actual effect of energy efficiency programmes on multiple benefits should be monitored in order to provide evidence to inform future policy design.

For example; many energy efficiency programmes create jobs, this potential should be identified at an early stage and economic development policy makers should be involved in designing the programme as they will be able to advise on where the job creation effect would be most valuable and how it could be maximised. They may also be able to provide investment in the programme from their budgets to increase the impact.

Similarly, in ex-post evaluations, the multiple benefits of energy efficiency should be considered and measured to provide a full understanding of the benefits secured by a policy or programme.

Energy efficient prosperity indicators can be used to benchmark progress and track improvements. They can be an effective way to secure the interest and support of policy makers outside the energy efficiency field.

Next steps

Since the completion of this project the IEA presented the concept of Energy Efficient Prosperity at the COP 21 in December 2015 and the Bali Clean Energy Forum in February 2016. Both presentations were well received and there is considerable interest in developing the concept further to support policy making and evaluation.

The IEA is currently working with the Government of Indonesia to support their Directorate of Energy Conservation to develop policies to achieve their target of 17% energy efficiency. The concept of Energy Efficient Prosperity will be used to in the selection of projects and to support funding applications to the Ministry of Finance.

The IEA also intends to work further with the participants in the concept testing to refine, develop and pilot the concept in those jurisdictions.

If these four pilots are successful, the IEA will produce further guidance for policy makers and evaluators to enable the Energy Efficient Prosperity concept to be implemented widely.

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