Communications Note *

Energy Efficiency Indicators and the Design and Progress Monitoring of National and Sector Energy Efficiency Strategies in Developing Countries

Background

The *International Roundtable on Energy Efficiency Metrics and National Energy Efficiency Assessment in Developing Countries*, under the auspices of the Energy Sector Management Assistance Program (ESMAP), was held on June 3 and 4, 2010 in Washington DC. The Roundtable, co-hosted by ESMAP and the Energy Unit of the World Bank, was attended by energy efficiency officials and experts from China, India, Mexico, South Africa, Turkey, and Vietnam, as well as experts and representatives from the International Energy Agency (IEA), United Nations Industrial Development Organization (UNIDO), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), French Agency for Environment and Energy Management (ADEME), Lawrence Berkeley National Laboratory (LBNL), Inter-American Development Bank, and the World Bank.

The main objectives of the Roundtable were to

- Take stock of the on-going international and country-level activities in energy efficiency (EE) indicators development and applications;
- Review the lessons learned in using EE indicators for the design and progress monitoring of national and sector-level EE strategies;
- Examine the approaches and metrics of measurement of broader impacts and outcomes of EE project interventions in developing countries;
- Assess the needs for capacity building and resources for establishing and maintaining an effective EE indicators system in developing countries; and
- Discuss the roles and next steps of international partners in assisting the development and application of EE indicators.

This communications note, drawing on the presentations and discussions of the Roundtable, summarizes the main findings, broadly agreed conclusions, and specific recommendations on EE indicators development and applications and related international collaboration and assistance. It is hoped that these findings and recommendations will enhance the existing body of knowledge about EE indicators and help inform relevant international partner organizations, including the World Bank, in determining the approaches to providing future assistance for the development and applications of EE indicators in developing countries.

Status of EE Indicators Development and Applications

Energy efficiency indicators are widely recognized as an important tool to support EE policy design, focus policy efforts, and monitor progress toward policy objectives. EE indicators are broadly defined as the ratio of energy use per unit of activity or product – indicative of energy intensity, which can be either physical (e.g. per km driven or per ton crude steel) or monetary

(e.g. per dollar value-added). Depending on the boundary and aggregation of activities and the definition of products, EE indicators can be very broad and inclusive (country and sector level energy intensities) or narrow and explicit (individual end-use activities and manufactured goods). They are commonly used for: (1) understanding drivers of change in energy intensity through trend analysis, (2) identifying best practices and performance gaps through benchmarking, (3) informing policy design and strengthening progress monitoring with in-depth knowledge of drivers and best practices, and (4) enhancing modelling and scenario analysis of energy demand with detailed information about potentials and possibilities.

The explanatory power of EE indicators analyses depends on the level of disaggregation of energy-consuming activities and related data collection, as well as the knowledge of relevant contextual information necessary for interpreting the messages. In general the more disaggregated an indicator is, the more explicit the indicator reflects technical/engineering energy efficiency performance associated with a specific product or service. For example, energy use per unit of gross domestic product (GDP) is at the top of the aggregation, at the national level, that includes all possible underlying factors contributing to a specific value, including for examples, economic structure, income level, technologies, energy mix, and climate conditions. On the other hand, energy use per unit of light output level over a certain area, is an explicit EE indicator for lighting, at the bottom of disaggregation, that is, at the energy-end-use level. Disaggregation analysis is necessary to understand the underlying drivers of an energy intensity trend. Developing more disaggregated EE indicators requires greater efforts in data collection and tracking, that in turn, entails specific and regular energy consumption surveys.

Using aggregated "economic" EE indicators for performance benchmarking of country- and sector-level energy efficiency is often ambiguous and problematic. International comparison of such indicators is useful in identifying distinctive patterns and temporal trends for individual countries but could be misleading for cross-country benchmarking purpose. When aggregated economic EE indicators, such as national GDP-based energy intensity and even sector-level energy intensity (based on value added) are used as benchmarks for cross-country comparison, ambiguity arises because such aggregated indicators may mask a host of underlying factors which could explain the variations across countries. Many of these factors, such as climate, lifestyle, currency value, economic structure, and sector composition, are not related to activity specific energy intensity, which is more closely related to "physical" or technical energy efficiency performance. While some of these factors can be controlled by analytical normalization, cross-country comparisons at aggregate levels, especially with economic EE indicators, remain problematic and could be potentially misleading for benchmarking country- or sector-level EE performance. Thus, understanding country specific situations is critical in making informed interpretation from such comparisons.

Using disaggregated "physical" EE indicators for performance benchmarking of specific energy-consuming activities, such as residential lighting, or a defined industrial process/product, is useful for identifying underperforming areas and potential solutions. Many developing countries find international comparison of "physical" energy intensities of similar and well defined energy-consuming activities and industrial processes/products useful since it provides meaningful measures of relative energy performance and identifies best practices. Such activity, product, or process-specific EE indicators, which are often defined in

physical terms, are more closely related to technical/engineering energy efficiency than subsector-level or more aggregated EE indicators expressed in monetary terms and in general improve comparability across countries. Still, complications may arise with comparability of similar products (quality may vary) or process (operating condition may differ).

Existing EE indicator initiatives have generated a wealth of knowledge, improved methodologies, produced useful tools/templates for data collection and analysis, particularly in OECD countries, and demonstrated potential modalities of collaboration with developing countries and among international partners. These initiatives have been carried out through multilateral efforts, as exemplified by the IEA's Energy Indicators Project (primarily for OECD countries) and the European Union's ODYSSEE Project (primarily for EE Indicators in Europe), bilateral support, such as the assistance which ADEME has provided to several developing countries, and by individual countries, such as the efforts in China, India, Mexico, South Africa, Turkey, and Vietnam. The World Energy Council (WEC), with technical support from ADEME, also maintains a global EE indicators database focusing on a small set of aggregated indicators. The Asia Pacific Economic Cooperation (APEC), through EE indicators capacity building activities organized by its Energy Working Group, has been forging collaboration and information sharing among its member countries.

EE indicators development and applications in many developing countries is limited by the availability and quality of data and a lack of dedicated resources and expertise to collect, track and analyze data. Substantial capacity building efforts and resources – both human and financial – are needed to strengthen the existing programs and institutions. In developing countries, the amount and quality of available data differ widely among countries as do the ability to gather data, capacity to assess data, fill data gaps and develop and interpret indicators. A number of countries have set up elaborate systems and are collecting substantive amounts of data and conducting necessary analysis. In other countries, energy data are mostly limited to supply data or consumption data at national and sector levels, making it difficult to assess energy efficiency and target policy intervention in a meaningful way.

Main Findings and Conclusions

A harmonized (or standardized) process of data gathering, indicators development, and indicator and policy selection is desirable and beneficial to all countries but may not be possible to establish in the short term. Harmonization of methodologies facilitates appropriate use of EE indicators in policy design and evaluation by increasing the consistency and comparability when cross-country comparisons are used to flag distinctive patterns and trends and inform improvement potentials and priorities. Distinction should be made between harmonization of methodologies and harmonization of indicators. The latter could be controversial and not necessarily desirable because certain activity-specific EE indicators are related to country specific characteristics.

But even for the benefits of using harmonised methodologies for EE indicators, there are concerns that participation in such a common framework may lead to using cross-country performance benchmarking for purposes other than supporting national EE policy making, especially in the context of the international climate change negotiations. There also are concerns

that performance benchmarking may be used to define conditions for climate change related development assistance. Finally, data requirements vis-a-vis data availability would continue to be a major impediment in the short term, in the context of setting up an enabling environment for promoting a harmonized methodological framework for EE metrics across all countries.

EE indicators for designing and monitoring specific EE interventions (for examples, implementation of appliances standards or promotion of energy service companies) are most relevant within the direct-impact boundaries of the interventions (for examples, the applicable appliances market or energy service in public buildings). Such specific program or project indicators may have limited relationship with the aggregate energy efficiency performance, rather, energy intensity of the sectors where the interventions are implemented. In the context of the activities of multilateral development banks (MDBs) to support EE improvement in developing countries the question arises what EE indicators can be used to assess the effectiveness of EE projects and programs which MDB funding supports. Here a distinction must be made between (1) the assessment of the effectiveness of individual projects or programs; and (2) the effectiveness/contribution of the project/program toward improving national or sector-level EE performance. The former is feasible, useful and relatively straightforward so long as appropriate performance indicators are chosen for each of the projects and programs. The latter is much more difficult and may not provide clear-cut conclusions.

While country- and sector-level EE indicators are related to subsectoral and end-use level EE indicators, clearly linking the impact of a specific EE intervention in a subsector (public buildings, for example) or an end-use (air conditioning, for example) to country- or sector-level EE performance (the buildings sector, for example) will be difficult, requiring extensive data to disaggregate attributes and effects of different extraneous factors, and may not establish a direct and apparent causal relationship because of the compounding effects of factors unrelated to the specific intervention. This is especially true in fast growing economies where both the base and level of demand for energy services are increasing. A rise in electricity consumption per household (residential sector) may coincide with successful implementation of a national program on energy efficiency standards for major appliances.

The amount of additional resources and time required to establish and maintain a meaningful system of EE indicators in developing countries will be substantial. The ODYSSEE project experience provides some indication of the resource needs and time required: an annual budget of one million Euro is spent to develop, maintain and apply a set of 200 indicators for 29 countries. Experiences in new EU Member States joining the project suggests that bringing such countries up to the mid-point (to be able to deliver about half of the 200 indicators) requires about four years. Bilateral cooperation projects on EE indicators development between ADEME and developing countries show similar timeframes of 4-7 years before capacity and systems are developed and local entities are able to establish and maintain a system of EE indicators. The actual amount of additional resources will also depend on currently available and tested resources and institutions in specific countries.

New methodology development starting from scratch is unnecessary for replicating the EE indicators work in developing countries. However, there is a strong need for complementing the existing methodologies based on OECD conditions with developing country specifics (for

examples, the use of non-commercial energy sources like fuelwood, different products, etc). IEA's Energy Indicators Project, through broad-based cooperation among its member and non-member countries, with the ODYSSEE project, APEC, United Nations, the World Bank, and several other international organizations, is building broad consensus on EE indicators methodologies and data collection guidelines. However, this effort has focused primarily on OECD countries. Data availability and tracking systems are weak in developing countries and, therefore, the EE indicator modalities have to be adapted to specific circumstances of individual countries. The various collective and stand-alone EE indicators efforts provide multiple channels for knowledge sharing and mutual learning, which will facilitate the emergence of relatively consistent understanding of and simpler and manageable approaches to EE indicators across developing countries.

Recommendations and Next Steps

Most developing country representatives at the Roundtable welcomed assistance from the international community to finance and support their own energy data collection systems and EE indicators development and applications.

With increased recognition of the role of energy efficiency in fostering energy security and contributing to climate change mitigation, there have been increased political commitments by both developed and developing countries toward efforts to build and strengthen national capacities for monitoring, reporting and analyzing energy use and efficiency. Such efforts are further boosted by the emergence of the concepts of Nationally Appropriate Mitigation Actions (NAMAs) and Measurement, Reporting, and Verifications (MRVs) as a part of the Copenhagen Accord, the need for monitoring and reporting in the new programmatic climate funds (e.g. Clean Technology Fund), as well as the need for baseline benchmarking in carbon market mechanisms (e.g. CDM projects). International organisations and development agencies can utilize this opportunity to support country-driven efforts in development and application of EE indicators through dissemination of best-practice and workable methodologies and tools, and by integrating such support in their core technical assistance programs in the energy sector.

Going forward, increased coordination among international partners will be important, especially in terms of promoting broadly consistent EE indicators methodologies and data collection guidelines. International support to country-driven EE indicators efforts could benefit from an orchestrated program by creating a formal partnership among key organizations such as IEA, ADEME, UN Energy, and MDBs to better coordinate capacity building activities, consistent data gathering and indicator development and application. This would also provide a regular venue for international workshops, knowledge exchanges and training.

The IEA is currently putting in place a training and capacity building program, which contains modules on data statistics, energy efficiency indicators and energy efficiency policies. This could become a good platform to share best practices and enhance collaboration between different countries.

Regional organizations are a good platform for information exchange and knowledge sharing within a specific region or a group of economies. The existing frameworks, such as that offered

through the APEC model could be considered for replication by other regional organizations (for examples, League of Arab States and South Asian Association for Regional Cooperation) which have an interest in promoting energy efficiency among their constituents.

Given the diversity in developing countries experience, capabilities and preferences it is clear that international assistance in EE indicators cannot be a one-size-fits-all program. This could be enhanced through greater in-country collaboration between IEA, ADEME and MDBs in helping developing countries adapt EE indicators methodologies and guidelines to suit their specific needs and conditions. Countries that have already set up a functioning system for data gathering and interpretation may not need further assistance but would be interested in participating in knowledge exchange. But others in early stages may request direct technical and/or financial support in the development of capacities and systems for energy data gathering and EE indicators. There are also countries which are interested in aligning their EE indicators systems with internationally recognized norms and guidelines, such as those adopted by IEA, WEC, and EU.

In particular, MDBs could ramp up their support to country-driven EE indicators development and applications with financing support augmented by the Global Environment Facility (GEF) by

- Allocating resources to fund multi-year technical assistance work in selected client countries to help them set up national energy database, develop EE indicators, and support energy analysis, in conjunction with support to help them formulate strategies for reducing energy intensities in underperforming sectors, implementing NAMAs, developing EE investment programs if so desired;

- Increasing funding for project preparation for EE programs to include systematic market assessments and sector data collection and analysis and using internationally accepted methodologies and indicators to the extent possible; and

- Providing resources for sub-national level data collection (important for large developing economies) related to EE. This can include broader industrial benchmarking, developing city-level indicators, and EE indicators for key utility service sectors such as power, district heating, water and sanitation.

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