Why data matter for energy efficiency policies

Roberta Quadrelli – Head, Energy Balances, Prices, Emissions, Energy Efficiency
IEA Energy Data Centre

16 July 2018

#energyefficientworld
Data and indicators are essential at all stages of the policy cycle

- Inform design based on current state and ambition
- Adapt policy during its implementation
- Understand policy performance
- Evaluate what happened and why

Each individual measure requires appropriate data to be effective
Why does effective policy design require appropriate data?

Case study: defining MEPS in the absence of national market data

![Graph showing Energy Efficiency Rating (EER) vs. Energy consumption (BTU/h)]
Policy design without appropriate data may not be optimal

Efficiency rating of selected air conditioners in national/regional market – data collected after MEPS

Without appropriate data, minimum energy performance levels were set too low to impact the market
Evaluating policy impacts requires tailored data

Impacts are assessed compared to “control” group (what would have happened)
Integration of data in policy work is vital, as in IEA approach.

Energy efficiency data/indicators feed all IEA policy analysis and projections. Conversely, IEA data quality assessment benefits from broader IEA expertise.
What data to track efficiency progress: the IEA experience on indicators
Energy intensity extensively used as efficiency target - also in this region

Example: Thailand

Reduce EI by 20% in 2020
30% in 2025
based on 2005 level

Goal to reduce Energy Intensity by 30% in 2036, down to 5.97 ktoe/billion Baht

Current progress - 3.8%

EEP 2015 Overview

Concept

Long-term Implementation

Combination of Compulsory & Voluntary Measures

Performance-based Support

© OECD/IEA 2018
How to interpret the economy-wide energy intensity decrease?

More detailed information on demand is essential: End-use efficiency data and indicators

At national level:

• Have we been more efficient in supply or demand side?

• ...and in what sectors/end-uses?

• Has the economic structure changed?

• What are the implications for future energy needs?

Efficiency indicators to assess how measures affect overall intensity

Economy-wide target: decrease of energy intensity

Policy X  Policy Y  Policy Z  ...
A variety of individual measures

Efficiency indicators require “energy end-use” and “activity” data
“Energy end-use” data more sharply track demand trends

- What are the largest end-uses within the energy consumption?
- How are they changing over time?
- What are the priority areas for policy?

Energy demand for each end-use is driven by specific “activities” (e.g. residential: more people; more dwellings; larger dwellings; etc) …. 

Source: IEA Energy Efficiency Indicators Highlights
Indicators link energy end-uses with appropriate activity data

Residential energy consumption index (IEA20)

High level indicators

End-use indicators

Data for IEA 20

* Temperature correction using heating degree days

Data source: IEA, Energy efficiency indicators database

End-use (efficiency) indicators better support sectoral policy... and require more disaggregated data than traditional energy balances
Appropriate activity data vary across sectors of energy demand.

For example, activity data for industry: value added and physical production.
Cooling is the fastest growing use of energy in buildings.

Without action to address energy efficiency, energy demand for space cooling will more than triple by 2050 – consuming as much electricity as all of China and India today.

Source: IEA, The future of cooling, 2018
..and project energy demand economy-wide

**Figure 7.21** Global energy-related CO₂ emissions abatement and key contributions in the Sustainable Development Scenario

Energy efficiency and renewables are the two key abatement measures in the New Policies and Sustainable Development Scenarios.

Notes: Other refers to carbon capture and storage, nuclear, and fuel switching. The shares on the right-hand side of the graph represent the cumulative contributions by measures.

World Energy Outlook 2017 | Global Energy Trends
End-use data help quantify efficiency impacts from across sectors

Figure 1.8  Decomposition of final energy use in IEA member countries and major emerging economies

End-use analysis: a tool to assess overall energy efficiency progress

Source: IEA, Energy Efficiency 2017
Data for efficiency indicators: few key points
The energy balance is a starting point to study trends in energy demand.

We need good demand-side data in the national energy balance.

Total final consumption - Indonesia, 2016

- Industry: 24%
- Transport: 29%
- Residential: 38%
- Services: 4%
- Non-energy use: 1%
- Other: 4%

We need consistent, more detailed information than in energy balances. Further data collection (e.g. surveys) and cooperation among focal points.
How are countries collecting end-use data?

Results from an IEA survey for 160 practices from 40 countries

IEA online database of country practices

http://www.iea.org/eeindicatorsmanual
Sharing experiences and learning from each other is very important.

<table>
<thead>
<tr>
<th><strong>Country</strong></th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sector</strong></td>
<td>Residential</td>
</tr>
<tr>
<td><strong>Methodology</strong></td>
<td>Surveying</td>
</tr>
</tbody>
</table>

**Organisation**
Department of Energy / Philippine Statistics Authority (formerly National Statistics Office)

**Name**
2011 Household Energy Consumption Survey (HECS)

**Purpose**
The primary goal of HECS is to generate comprehensive and reliable data/information and analyze consumption in the residential sector of the country which is essential in formulating and implementing programs that aim to improve the quality of life of the Filipino, in accordance with the government particularly expanding energy access and strengthening consumer and welfare protection.

**Data collection purpose**
The specific objectives are as follows:
- Provide detailed information on the changing energy consumption patterns in Filipino households
- Conditions affecting energy use
- Establish the fuel/energy mix of the residential sector based on its energy consumption
- Determine the most energy consuming appliances, devices and equipment used for household
- Assess the current energy efficiency and conservation techniques in the residential sector
- vs.a. implementation of energy consumption regulation for household appliances and equipment
- Measure and analyze the incidence of inter-fuel substitution in the households
- Determine awareness and/or perception of the household on major energy issues (i.e. nuclear energy labelling program, renewable energy, natural gas) in the energy sector.

**Data collection**
Multi-stage sampling design using the 2003 Master Sample (MS) developed by the Philippine Stat...
Emerging opportunities for end-use statistics from digital world

Beyond models, EIA has begun testing new technologies to objectively measure end use demand. Recent research shows:

- So-called “NILMs” (Non-Intrusive Load Monitoring) are definitely “the” hot topic, and shared by different interests:
  - Energy Efficiency, Demand Response, Measurement & Verification, Energy Audits, Appliance Diagnostics, Cost of Service, etc.

In this initial pilot study of NILM technologies, EIA will conduct analyses to...

- Compare usage patterns between NILM device and respondent, (e.g., number of clothes washer cycles)
- Compare usage characteristics (e.g., self-reported versus observed water temperature for a clothes washer or heated drying for a dishwasher)
- Compare actual consumption by end use to the RECS 2015 model results

We’ll prioritize the research in three tiers in preparation for the 2020 RECS:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>Refrigerators, Dishwashers, Clothes Washers, Dryers, Cooking, Air Conditioning, Heating</td>
</tr>
<tr>
<td>Tier 2</td>
<td>Computers, Televisions, Home Entertainment</td>
</tr>
<tr>
<td>Tier 3</td>
<td>Lighting, Rare End Uses, Residual</td>
</tr>
</tbody>
</table>

Every appliance has its own energy draw on the power line.

Pilot experiences across countries to assess statistical applicability.

© OECD/IEA 2018
IEA energy efficiency statistics tools
The IEA Efficiency statistics: pdf publication and excel database

- Data from IEA Members
- Annual updates
- Cover **four sectors** (residential, services, industry, and transport)
  - End use data
  - Energy efficiency indicators
  - Carbon intensity indicators
- Available online for download

**Energy efficiency indicators: an area of fast international development**

- [pdf publication](http://www.iea.org/media/statistics/EnergyEfficiencyIndicators.xls)
- [excel database](https://webstore.iea.org/energy-efficiency-indicators-2017-highlights)

---

**What's inside:**

- End use data
- Energy efficiency indicators
- Carbon intensity indicators

**Sources:**

  - The original version of the file, as provided by the International Energy Agency, is available at the IEA’s data services website: [http://data.iea.org](http://data.iea.org)
  - In particular, external dissemination of any IEA data, including online software or other tools, requires specific permission and may be subject to an additional license fee.
  - Please contact us at info@iea.org if you have any questions on the terms.
  - The data and any copyright or sourcing statements must not be removed from this file.
  - All data and other IEA Energy data products are available at: [the IEA Online Bookshop](https://webstore.iea.org/energy-efficiency-indicators-2017-highlights)
  - The IEA Online Bookshop is available at: [http://www.iea.org/bookshop](http://www.iea.org/bookshop)
IEA indicators manuals: publications and online courses

- Global tool; self-paced and interactive
- For policy makers and statisticians
- Use by all countries is welcome

https://edx.iea.org/

Online courses accessible any time
The importance of end-use data for energy efficiency policy

- Detailed end-use energy / activity **data and indicators** are vital for energy demand **policy and planning**, across sectors and end-uses.

- Data collection needs appropriate resources – Having **no data will cost** more!

- Collaboration among **statistics and policy** experts and **across institutions** that may contribute relevant data – is essential to enhance outcomes.