Toolkit:
The relationship between product efficiency and price

Session 6
Kevin Lane, IEA – Pretoria, 15 October 2019

#energyefficientworld
# Overview of the appliance and equipment training sessions

<table>
<thead>
<tr>
<th>Monday 14 October 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0</strong> Introduction and roundtable</td>
</tr>
<tr>
<td><strong>1</strong> Planning energy efficiency programmes</td>
</tr>
<tr>
<td><strong>2</strong> Selecting products for MEPS and Labelling programmes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuesday 15 October 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3</strong> Assessing efficiency performance and setting MEPS</td>
</tr>
<tr>
<td><strong>4</strong> Special - Regional harmonisation</td>
</tr>
<tr>
<td><strong>5</strong> Industry transformation</td>
</tr>
<tr>
<td><strong>6</strong> Stakeholder involvement and communication</td>
</tr>
<tr>
<td><strong>6</strong> The relationship between product efficiency and price</td>
</tr>
<tr>
<td><strong>7</strong> Modernising energy efficiency through digitalisation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wednesday 16 October 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8</strong> Insights into energy labels</td>
</tr>
<tr>
<td><strong>9</strong> Monitoring, verification and enforcement</td>
</tr>
<tr>
<td><strong>10</strong> Evaluating policies and programmes</td>
</tr>
<tr>
<td><strong>11</strong> Special - Available resources U4E</td>
</tr>
<tr>
<td><strong>11</strong> Roundtable discussion, review and report back</td>
</tr>
</tbody>
</table>
Scenario

You have been asked to prepare an impact statement for your regulations, including the effect on product prices.

*How would you go about the task of estimating future product prices?*
Why are appliance costs/prices important?

- A core aim of energy efficiency programs is to deliver cost benefits to consumers

- In principle, any **additional costs** of more efficient equipment is offset by lifetime **savings in fuel bills**

- Consumer Life-cycle cost = Capital cost + lifetime running costs

- Often used to set performance thresholds, i.e. via least life-cycle costs
# Consumer life-cycle costs

<table>
<thead>
<tr>
<th></th>
<th>Average product</th>
<th>Energy efficient product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost ($)</td>
<td>$300</td>
<td>$350</td>
</tr>
<tr>
<td>Running cost per annum</td>
<td>=150kWh x 0.2$</td>
<td>=120kWh x 0.2$</td>
</tr>
<tr>
<td></td>
<td>= $30</td>
<td>= $24</td>
</tr>
<tr>
<td>Lifetime (years)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Total lifetime cost (LC)</td>
<td>= 300 + (30 x 12)</td>
<td>= 350 + (24 x 12)</td>
</tr>
<tr>
<td><strong>LC</strong></td>
<td><strong>$660</strong></td>
<td><strong>$638</strong></td>
</tr>
</tbody>
</table>
Setting MEPS at Least Life-cycle cost

- Life-cycle Cost (€)
- Energy Efficiency
- Base Case Product
- Improvement A
- Improvement B
- Minimum Life-cycle Cost (LLCC)
- Improvement C
- Improvement D
- Best Product

Current efficiency level

Proposed MEPS level
Impact of product prices on setting MEPS

• If you are setting MEPS based on least life-cycle cost....

• What impact is there if efficient products costs are higher/lower?
Setting MEPS at Least Life-cycle cost

Life-cycle Cost (€) vs. Energy Efficiency

- Base Case Product
- Improvement A
- Improvement B
- Minimum Life-cycle Cost (LLCC)
- Improvement C
- Improvement D
- Best Product
What is actually happening to product prices?

- So that is the theory

- Now lets look at what is actually happening........
Thailand – Retail price vs capacity (and country manufacture)

Retail price normalised by capacity versus SEER, by country of manufacture

- Thailand
- China
- Malaysia
- Vietnam
- Korea

MEPS ASEAN 2020 3.08 W/W
Thailand - Retail price vs capacity (and technology)

Retail price normalised by capacity versus SEER, by type

- Inverter - not popular
- Fixed - not popular
- Inverter - popular
- Fixed - popular

Retail price per 12,000 BTU/h

SEER (W/W)
Ratcheting MEPS have reduce energy consumption of new US refrigerators by 75%
Analysis: Impact of Refrigerator Standards: Energy Consumption in the USA

Analysis: Impact of refrigerators standards in Ghana

Source: Kofi Agyarko, IEA EE Global 2018
Analysis: Impact of Clothes Washer Standards on Annual Energy Consumption in the US

Source: IEA 4E, Achievements of appliance energy efficiency standards and labelling programs - A Global Assessment in 2016
Examination of MEPS impacts: Cold appliances: % change

Source: IEA 4E, Achievements of appliance energy efficiency standards and labelling programs - A Global Assessment in 2016
Examination of MEPS impacts: other appliances: % change

United States (clothes washers) | Australia (clothes washers) | Australia (clothes dryers) | United States (a/c) | Japan (a/c)

-40% | -35% | -30% | -25% | -20% | -15% | -10% | -5% | 0% |

Source: IEA 4E, Achievements of appliance energy efficiency standards and labelling programs - A Global Assessment in 2016
What does this tell us?

- No evidence that Standards and Labeling policies have increased real prices to consumers
  - Some minor movements, usually explained by other factors

- Generally average real prices for studied products have fallen faster than for other goods in these markets

- No correlation with energy/electricity prices
  - Increasing energy price is a less effective policy, and has inequity issues

- Manufacturers confirm that, given notice, energy efficiency requirements can be absorbed into design process with little or no extra cost
What does this tell us?

- No correlation between product price and efficiency

- However, sometimes the most efficient products are also the most expensive, because:

- High priced products differentiate through:
  - branding
  - quality of materials
  - design
  - energy efficiency is a further indicator of quality
Implications for policy

• So how does this impact on our policy settings?
<table>
<thead>
<tr>
<th>Appliance Type</th>
<th>DOE estimate price BEFORE</th>
<th>Census prices AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerators</td>
<td>56</td>
<td>37</td>
</tr>
<tr>
<td>Clothes washers</td>
<td>54</td>
<td>-35</td>
</tr>
<tr>
<td>Clothes washers</td>
<td>199</td>
<td>10</td>
</tr>
<tr>
<td>Electric water heaters</td>
<td>108</td>
<td>28</td>
</tr>
<tr>
<td>Non-electric water heaters</td>
<td>121</td>
<td>34</td>
</tr>
<tr>
<td>Central ac</td>
<td>267</td>
<td>207</td>
</tr>
<tr>
<td>Room ac</td>
<td>13</td>
<td>-162</td>
</tr>
<tr>
<td>Commercial ac</td>
<td>512</td>
<td>-224</td>
</tr>
<tr>
<td>Ballasts</td>
<td>6.73</td>
<td>-1.78</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>148</strong></td>
<td><strong>-12</strong></td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td><strong>108</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>
Why did we get it wrong?

- Predictions made prior to regulations based on engineering analysis
- Observed prices may be 5-10 years later
- In the meantime:
  - Regulations stimulate growth in the market
  - Costs have reduced as the market share has grown
  - Some shift to offshore manufacturing
  - Companies find innovative solutions
  - Technologies rarely predicted
Price changes over time

- **Assumed price premium**
- **Existing products**
- **Efficient product – new technology**
- **Observed price premium**

Time:
- Engineering analysis
- Retrospective analysis

Regulations
Conclusions

• Current cost-benefit analysis tends to overstate the future costs of efficient appliances
  - Politically conservative

• Observations fit ‘learning-by-doing’ model

• Suggests that we have not been optimising policies to reduce energy and CO$_2$

• Policies could be more stringent and still show positive benefits

• Some countries now reduce estimates for future cost impacts
Resources

• [www.iea.org/efficiency](http://www.iea.org/efficiency)

• [www.iea-4E.org](http://www.iea-4E.org)