Standby Power and How to Limit it
Korea’s 1-Watt Plan

18 December 2007

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Korea Energy Management Corporation

WARNING
This product fail to meet standby product standard required by the Rational Energy Utilization Act

MEPS
1. Korea's Energy Situation

- World’s 10th largest energy consumer
  - 7th oil consumer
    Korea import 97% of energy
  - Korea $US85.6 billion on energy import in 2006

< Energy Dependence on Imports >

unit: %

'80  '90  '06
73.5  87.9  96.8

< Energy Import Cost >

unit: bil. USD

'80  '90  '06
6.7  10.9  85.6

27.2% of total import

Korea’s 1-Watt Plan

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Status on Standby Power

◆ Standby power is “Power Vampire”

- Standby is wasted energy
- 300 million electronic devices
  : Average Standby Power is 3.66W
- Annual loss of $US 476 million
  : 1.7% of national power consumption
  : 850 thousand kW power plant
## Standby Power per Korean Home

<table>
<thead>
<tr>
<th>No</th>
<th>Product</th>
<th>Average Standby</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TVs</td>
<td>4.33W</td>
</tr>
<tr>
<td>2</td>
<td>VCRs</td>
<td>5.45W</td>
</tr>
<tr>
<td>3</td>
<td>Audios</td>
<td>9.12W</td>
</tr>
<tr>
<td>4</td>
<td>DVD Players</td>
<td>12.20W</td>
</tr>
<tr>
<td>5</td>
<td>Microwave Ovens</td>
<td>2.77W</td>
</tr>
<tr>
<td>6</td>
<td>Cassette radios</td>
<td>1.11W</td>
</tr>
<tr>
<td>7</td>
<td>Cord/cordless phones</td>
<td>2.15W</td>
</tr>
<tr>
<td>8</td>
<td>Washing machines</td>
<td>1.90W</td>
</tr>
<tr>
<td>9</td>
<td>Set top boxes</td>
<td>7.85W</td>
</tr>
<tr>
<td>10</td>
<td>Mobile phone chargers</td>
<td>1.72W (0.86W*2)</td>
</tr>
<tr>
<td>11</td>
<td>Computers</td>
<td>3.26W</td>
</tr>
<tr>
<td>12</td>
<td>Monitors</td>
<td>2.53W</td>
</tr>
<tr>
<td>13</td>
<td>Printers</td>
<td>3.07W</td>
</tr>
<tr>
<td>14</td>
<td>Modems</td>
<td>6.43W</td>
</tr>
<tr>
<td>15</td>
<td>Video phones</td>
<td>1.23W</td>
</tr>
<tr>
<td>16</td>
<td>Bidets</td>
<td>3.39W</td>
</tr>
</tbody>
</table>

**Total**

57W (average 3.66W)

306kWh/year

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Korea’s 1-Watt Plan

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2. Korea’s Energy Efficiency Policy

MOCIE
(Korean Government)

KEMCO
(Under MOCIE)

Energy Efficiency

- Industry
  - VA Energy Audit
  - ESCO Soft Loan

- Transport
  - Indication Mileage
  - Hybrid car

- Building
  - Certification

- Appliance
  - MEPS Energy Label Rebate

New & Renewable Energy

Climate Change Mitigation

15 Department, 12 Branches
1 Affiliate (New & Renewable Energy Center)
Korea’s Energy Labels & Standards

Energy Efficiency Label and Standard Program (including MEPS)
- Mandatory (since 1992)
- MEPS & 5-grade labeling
- Refrigerators, Automobiles, etc (20 items)

High-efficiency Appliance Certification Program
- Voluntary (since 1996)
- LED traffic lights, Pumps, etc (37 items)

Energy Standards & Labeling

e-Standby Program
- Voluntary (since 1999)
- TV's, STBs (21 items)

Programs Related Standby

Korea’s 1-Watt Plan
◆ Energy Efficiency Label and Standard Program (Including Minimum Energy Performance Standard)

- Mandatory indication of energy efficiency grade from 1 to 5
  Number one is the best in Korea
- MEPS below 5 grade
- Target products
  Refrigerators, Freezers, Kimchi refrigerators, Air Conditioners, Washing machines, Drum washing machines, Dish washers, Dish driers, Coolers, Rice cookers, Vacuum cleaner, Electric fans, Air Cleaners, Incandescent lamps, Fluorescent lamps, CFLs, Ballasts, 3 Phase Electric Motors, Gas Boilers, Automobiles

Korea’s 1-Watt Plan

Korea Energy Management Corporation
Korea Energy Label & Standard (2)

◆ e-Standby Program
- Core program to reduce standby power < 1W
- Voluntary (Mandatory from 2009)
- “Energy Boy” label (or Warning label from 2009)
- Government purchase
- Target products
  TVs, VCRs, Audios, DVD players, Set top boxes,
  Microwave ovens, Home gateways,
  Computers, Monitors, Printers, Fax machines,
  Copiers, Scanners, Multifunction devices,
  Bidets, Energy saving & controlling devices,
  Door phones, Cordless phones, Radios, Modems
3. Why Standby is Important?

◆ Most cost-effective way to save energy
- Standby : $US 1-3
  : 3-4W → <1W (from 0.03W-1W)
  : Reducing standby power 75%-90%
  : only if you change semiconductor is good

- Air conditioners : $US 150-200
- Gas boilers : $US 200

Korea’s 1-Watt Plan
Active Standby, Serious Issue

◆ Standby power of networked devices

- Set top box : 20-40W
- Home network : 70-80W
  : Equivalent to adding 700L refrigerator that take up 20% of total home energy
- Standby power will be 25% of home energy because of home network by 2020
  : Korea will construct 10 million digital home
# Type of Waste Standby

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
<th>Power</th>
<th>Products</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>No load</td>
<td>State of the power supply when no power is being provided to the rest of the appliances</td>
<td>-</td>
<td>External power supplies(&lt;0.5W), Rice cookers</td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>The appliances is switched off and has no capacity</td>
<td>Switched Off</td>
<td>TVs, VCRs, Audios, DVD Players, PCs, Monitors, Printers, Scanners, Copiers, Washing machines</td>
<td>Main Target of &lt;1W Policy</td>
</tr>
<tr>
<td>Passive Standby</td>
<td>The appliance is off, but can be powered up remotely</td>
<td>Switched Off</td>
<td>TVs, VCRs, Audios, DVD Players</td>
<td></td>
</tr>
<tr>
<td>Active Standby</td>
<td>The appliances in on, but is not providing a primary function</td>
<td>Switched Off</td>
<td>Set top boxes, Home network systems</td>
<td>Networked Standby</td>
</tr>
<tr>
<td>Sleep</td>
<td>Mode entered after a period inactivity</td>
<td>On and Standby</td>
<td>PCs, Monitors, Printers, Fax machines, Copiers, Scanners, Multifunction Devices</td>
<td></td>
</tr>
</tbody>
</table>

Korea’s 1-Watt Plan
4. How Can Limit Standby?

◆ **Necessity of new mandatory policy tool**

- Voluntary policy have limit
  : Most of manufacturers ignore voluntary policy

- **Minimum Energy Performance Standard** is good, but…..
  : MEPS is excessive policy tool only for standby
  : IT Technology change so fast
  : Government worry about wrong standard

**MEPS**
## Current Policy Tools

### Policy tools for market transformation

<table>
<thead>
<tr>
<th>Policy Tool</th>
<th>Label</th>
<th>Characteristic</th>
<th>Related Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Label</td>
<td>Yes</td>
<td>Mandatory</td>
<td>Korea’s 1-1 Watt Plan</td>
</tr>
<tr>
<td>Energy Label</td>
<td>Yes</td>
<td>Voluntary</td>
<td>Korea’s 1-1 Watt Plan</td>
</tr>
<tr>
<td>MEPS</td>
<td>-</td>
<td>Mandatory</td>
<td>Korea, USA, EU, Australia, China</td>
</tr>
<tr>
<td>Target</td>
<td>-</td>
<td>Mandatory</td>
<td>Top Runner Program (Japan)</td>
</tr>
<tr>
<td>Voluntary Agreement</td>
<td>-</td>
<td>Voluntary</td>
<td>Code of Conduct (EU)</td>
</tr>
<tr>
<td>Benchmarking</td>
<td>-</td>
<td>Voluntary</td>
<td>Market Transformation Program (UK)</td>
</tr>
<tr>
<td>Procurement</td>
<td>-</td>
<td>Mandatory</td>
<td>FEMP(USA), Green Purchase Law (Japan), China</td>
</tr>
</tbody>
</table>

Korea’s 1-Watt Plan
Thank You! Australia

- Australia is grandfather of warning label idea
Korea’s Warning Label Plan

Korean National Assembly approved to amend “Rational Energy Utilization Act” on November

- Mandatory reporting on standby
  : US$ 5 thousands per model with penalty
- Mandatory indication warning label for products failing standby standard
  : US$ 5 thousands per model with penalty

WARNING
This product fail to meet standby product standard required by the Rational Energy Utilization Act
Benefits of Warning Label

- **Similar MEPS effect, but free for government**
  - All manufacturers do not like warning label
  - It is free for government
    - IT technology change fast
  - **Warning concept is good for standby**
    - Standby wasted energy = Tobacco
  - All kinds of standby can be controlled
    - No load, off, passive standby, active standby, sleep mode
# Policy Tools Comparison

Policy Power: MEPS > WARNING LABEL > 1st Energy Efficiency Label > Energy Boy Label

<table>
<thead>
<tr>
<th>Category</th>
<th>Label</th>
<th>Merits</th>
<th>Demerits</th>
<th>&lt;1W Possibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEPS</td>
<td>(Mandatory)</td>
<td>Very strong</td>
<td>Sometimes MEPS can prohibit technology development</td>
<td>100%</td>
</tr>
<tr>
<td>WARNING LABEL</td>
<td>(Mandatory)</td>
<td>Strong.</td>
<td>If product is not famous brand, sometimes manufacturer do not care (ex: external power supplies)</td>
<td>90%</td>
</tr>
<tr>
<td>1st Energy Efficiency Label</td>
<td>(Mandatory)</td>
<td>Strong.</td>
<td>It can not cover all category of product</td>
<td>70%</td>
</tr>
<tr>
<td>Energy Boy Label</td>
<td>(Voluntary)</td>
<td>It is very free for government.</td>
<td>It have limit for &lt;1W</td>
<td>50%</td>
</tr>
</tbody>
</table>
5. Declaration of Standby Power 1W

All products <1W by 2010

- Declare of Standby Power to 1W
  - Prime Minister, the 26th Energy Saving Promotion Rally (2004.11.12)
    - "the government will offer full assistances----by 2010, the standby power of all electronic product shall be reduced to below 1W"

- Korea is the 3th country with 1W Policy
  - after USA(2001), Australia(2002)
  - Korea comply IEA’s "1W Initiative"
Products Subject to 1W Policy

◆ Standby Power Consuming Products

- Consumer Electronics
  : TVs, VCRs, Audios, DVD Players, Set top boxes, Microwave Ovens, Cordless phones
- Office Equipments
  : Computers, Monitors, Printers, Fax machines, Copiers, Scanners, Multifunction devices, Modems, External power supplies
- White Goods
  : Washing machines, Dish washers, Fans, Rice cookers

Source: Lawrence Berkeley Laboratory

Korea’s 1-Watt Plan
Main Target Product of Standby

- **External power supplies**
  - Adaptors or Chargers etc
  - 100 million external power supplies in Korea
  - 1 billion new power supplies supplied globally
  - Need from linear (2-3W) to SMPS (0.3-0.5W)

- **Set top boxes**
  - 20-40W on active standby
  - 15 million will be supplied by 2010

- **Home networked appliances**
  - Home gateways, Appliances etc
Standby Korea 2010 Objectives

- Standby Korea 2010 objectives at each stage

<table>
<thead>
<tr>
<th>Category</th>
<th>2005</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2007</td>
</tr>
<tr>
<td>Number of target appliances</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>(c Standby Program)</td>
<td>(19)</td>
<td>(20)</td>
</tr>
<tr>
<td>(Energy Efficiency Label and Standard Program)</td>
<td>(0)</td>
<td>(2)</td>
</tr>
<tr>
<td>Average standby power of equipment sold in the market</td>
<td>-</td>
<td>3.0W</td>
</tr>
<tr>
<td>Average standby power of equipment owned by household</td>
<td>3.66W</td>
<td>3.3W</td>
</tr>
<tr>
<td>Standby power 1W diffusion rate</td>
<td>22%</td>
<td>30%</td>
</tr>
<tr>
<td>Annual standby power reduction effect</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Annual CO₂ emission reduction effect</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Korea’s 1-Watt Plan

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6. Korea’s 1W Policy

Korea’s 1-watt plan, Standby Korea 2010

1st phase (2005-2007) Voluntary 1W policy

2nd phase (2008-2009) Preparation for transition to mandatory policy and applying mandatory regulation partially to certain product groups

3rd phase (2010-) Mandatory 1W policy

※ Mandatory 1W policy tools: MEPS, Warning label & Energy efficiency 1st grade label
Stage 1 (2005-2007)

◆ <1W Standard for Energy Boy
- <1W standard on standby & off mode
  : <0.5W-0.75W for external supplies
- Office equipment : Sleep mode + <1W off mode

◆ <1W Standard for 1st grade
- 1st grade : Best efficiency + <1W off mode

◆ Government procurement

◆ KS C IEC 62301
- Test procedure of standby power
## Implementation <1W Standard

### 1st phase (2005-2007)

<table>
<thead>
<tr>
<th>Category</th>
<th>Date of enforcement</th>
<th>Target products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Boy Label</strong></td>
<td>2006</td>
<td>TVs, external power adaptors, battery chargers for mobile phone, copiers, cord/cordless phones, energy saving &amp; controlling devices</td>
</tr>
<tr>
<td></td>
<td>2007.1.1</td>
<td>Monitors, printers, scanners, radios</td>
</tr>
<tr>
<td></td>
<td>2007.7.1</td>
<td>VCRs, audios, DVD players, microwave ovens, set-top boxes</td>
</tr>
<tr>
<td></td>
<td>2008.1.1</td>
<td>Modems, bidets, door phones</td>
</tr>
<tr>
<td></td>
<td>2009.1.1</td>
<td>Computers, multifunction devices</td>
</tr>
<tr>
<td><strong>Energy efficiency 1st grade</strong></td>
<td>2007.1.1</td>
<td>Washing machines, dish washers</td>
</tr>
<tr>
<td></td>
<td>2008.1.1</td>
<td>Rice coolers, air cleaners</td>
</tr>
<tr>
<td></td>
<td>2009.1.1</td>
<td>Drum washing machines, electric fans</td>
</tr>
</tbody>
</table>
Stage 2 (2008-2009)

◆ **Amending “Rational Energy Utilization Act”**
  - Mandatory warning label from 2009
  - e-Standby Program: Voluntary → Mandatory

◆ **Applying MEPS for external power supplies**
  - Standby (No Load): < 0.5W (for Adaptors & Chargers)
  - On-mode: > 0.09*Ln(P_{no})+0.5 (only for Adaptors)
  - from 2009
Products of Warning Label

20 products will be applied Warning Label
- On the nameplate of failing products standby specification
- Target products: e-Standby Program
  From 2009: TVs, Set-top boxes, microwave ovens, computers, monitors
  From 2010: VCRs, Audios, DVD Players, Bidets, Printers, Fax machines, Scanners, Modems, Copiers, Multifunction Devices, Home gateways, Door Phones, Cordless phones, etc

Mandatory
Products failing standby specification

Voluntary
Products satisfying standby specification
## Stage 3 (from 2010)

### Policy Tools for <1W standby products

<table>
<thead>
<tr>
<th>Policy Tools for &lt;1W</th>
<th>Standby</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEPS (minimum Energy Performance Standard)</td>
<td>&lt;0.5W (No load)</td>
<td>External power supplies</td>
</tr>
</tbody>
</table>

**WARNING LABEL**
(e-Standby Program)

- **<1W** (Off or Passive standby)
- TVs, VCRs, Audios, DVD players, Bidets, Sep top boxes, Microwave ovens, Cordless phones, Door phones, Modems, Computers, Monitors, Printers, Fax machines, Copiers, Scanners, Multifunction devices, Home gateways, Energy saving & controlling devices

**1st Energy Efficiency Label**
(Energy Efficiency Label and Standard Program)

- **<1W** (Off or Passive standby)
- Washing machines, Dish washers, Drum washing machines, Air Cleaners, Rice cookers, Air conditioners, Electric Fans, Home networked appliances(<3W)
The Effect of 1W Policy

- Standby power reduction effect per household

Korea’s 1-Watt Plan
Energy Saving Effect

◆ 2010
- 1,100GWh ($US 11.5 million)/year
  Accumulation of 2,550GWh($US 26.7 million) by 2010
- 530 thousand ton of CO$_2$/year

◆ 2020
- 6,800GWh ($US 71.2 million)/year
  Accumulation of 42,000GWh($US 4.4 billion) by 2020
- 3.29 million ton of CO$_2$/year
Thank you

If you have any question,

please e-mail to yrkim@kemco.or.kr