Why Energy Efficiency Is not Sufficient
– Some Remarks on “Green by IT” –

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Overview

1. Green IT

2. Case Study: The Smart Vending Machine

3. Conclusions
1. Green IT

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3. Conclusions
Since 2008: Initiatives of the IT industry to reconcile IT and environmental concerns

Green in IT:
Reducing the energy and materials consumption of IT hardware.

Green by IT:
ICT as an enabling technology for energy and materials efficiency.
<table>
<thead>
<tr>
<th>Sector</th>
<th>Estimated Energy Saving Potential by „intelligent Optimisation“</th>
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<tbody>
<tr>
<td></td>
<td>in % of sector energy demand</td>
</tr>
<tr>
<td>Industrial Production</td>
<td>25% - 30%</td>
</tr>
<tr>
<td>Transport</td>
<td>26%</td>
</tr>
<tr>
<td>Buildings</td>
<td>5% - 15%</td>
</tr>
</tbody>
</table>

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The First Generation of Smart Vending Machines

Features:

- Intelligent energy management
- Monitoring and forecasting the ambient temperature
- Motion detectors to sense the presence of potential customers
- Remote monitoring for optimized servicing

Saves up to 50% of energy or 100-200 US-$ per year.

“Dull” soft drink vending machines

Smart soft drink vending machines
Did You Know?

A typical vending machine meeting the ENERGY STAR criteria will save more than 1,500 kWh per year compared with non-qualified models.

Learn how your facility can save with ENERGY STAR qualified vending machines.

Come learn ways your organization can save money with ENERGY STAR vending machines by listening to the "Always Count Your Change: How ENERGY STAR Refrigerated Vending Machines Save Your Facility Money and Energy" webinar hosted by EPA’s Una Song. (View Transcribed Version) 25 (76KB)

Smart machines save energy:

_Vending machine innovations quench thirst for savings_

By Alvin Powell
Gazette Staff

The vending machines in Holyoke Center won't pour your soda for you, but they know you're there.

**Quick Facts**

State University of New York at Buffalo
132 vending machines

Annual Savings: $20,948
Annual Energy Savings: 261,849 kWh
More Efficient Machines Means more Machines

Number of Enterprises in Millions by Size Class (EU-27, 2005)


Number of Locations in Millions by Number of Potential Customers per day (idealized)

Under the assumption of a negative exponential distribution of the number of locations by the number of the potential customers of a vending machine, any factor of decreasing operating costs (factor 2 in the example) will lead to an overproportional growth in the number of profitable locations for the given type of machine.
Smart Vending Machines?

Estimates for EU situation, refrigerated beverage vending machines, 1990-2005

The Second Generation of Smart Vending Machines

Features:

- Large touch screen instead of window
- Can display ad's on touch screen
- Cameras for face recognition, recommendations based on age and sex of customer
- Payment by cell phone, credit card etc.
- Free WiFi

Increased sales
Smart Vending Machine?

A vending machine in Japan which recommends drinks to customers based on facial recognition data has tripled sales. JR East Water Business has previously installed two...
Smart Vending Machines?
Number of soft drink machines in Japan (blue bars), energy consumed per machine (green line), and total energy consumed by the machines (red line).
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How to Avoid the Rebound Effect

• IF you improve energy efficiency in processes where energy costs are a *minor* cost component, there is no rebound effect. ELSE

• IF you improve energy efficiency in processes where energy costs are a *major* cost component, there may be a rebound effect. THEN look for the limiting factor that currently prevents the system under study from growing:
  
  o IF the limiting factor is something else than energy, the risk of a rebound effect is small. ELSE
  
  o IF energy *is* the limiting factor in the system under study: THEN growth must be prevented by regulation if the goal is to reduce energy use.
There has been some decoupling since the 1970s, when GDP started to grow faster than total resource extraction. Source: Krausmann et al., 2009, cited in UNEP, 2011, p. 18.
Illustration of decoupling (idealized). The trajectories of human well-being, economic activity, use of natural resources, and environmental impact are normalized to an initial value; the vertical axis is therefore dimensionless.
Types of decoupling

- Decoupling of well-being from GDP
- Resource decoupling
- Impact decoupling
- Decoupling of resource use from environmental impact

UNEP, 2011: Decoupling natural resource use and environmental impacts from economic growth (extended by the author)

1. Democracy, education for all
2. Efficiency without rebound effects
3. Design smart products without toxic components (incl. “Green in IT“)
4. Intelligent recycling powered by renewable energy
Decoupling and ICT

Decoupling goal:
1. Decouple well-being from GDP
2. Decouple GDP from resource use
3. Decouple GDP from environmental impact
4. Decouple resource use from environmental impact

Potential ICT contribution:
1. Democracy, education, self-determination
2. Efficiency without rebound effects
3. Find smart solutions without toxics (incl. “Green in IT“)
4. Intelligent recycling powered by renewable energy