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# The role of **technology-forcing standards** and innovation to dramatically accelerate product energy efficiency

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# Overview

- Background (standards)
- What is a Technology-Forcing Standard
- Lessons learned from different sectors
- Risks, mitigation
- Possible ways forward for equipment

# Success of Ecodesign/MEPS!

Past MEPS have been effective:

- EU MEPS/ecodesign requirements
- US refrigerators, removed entire range of products from market over a few years.
- Similarly Australia, evaluation proved MEPS a very successful policy measure.

Though how much more stringent could the mandatory MEPS level be made, towards innovative TFS? How desirable? And how?

# Existing approaches for appliances/ equipment MEPS

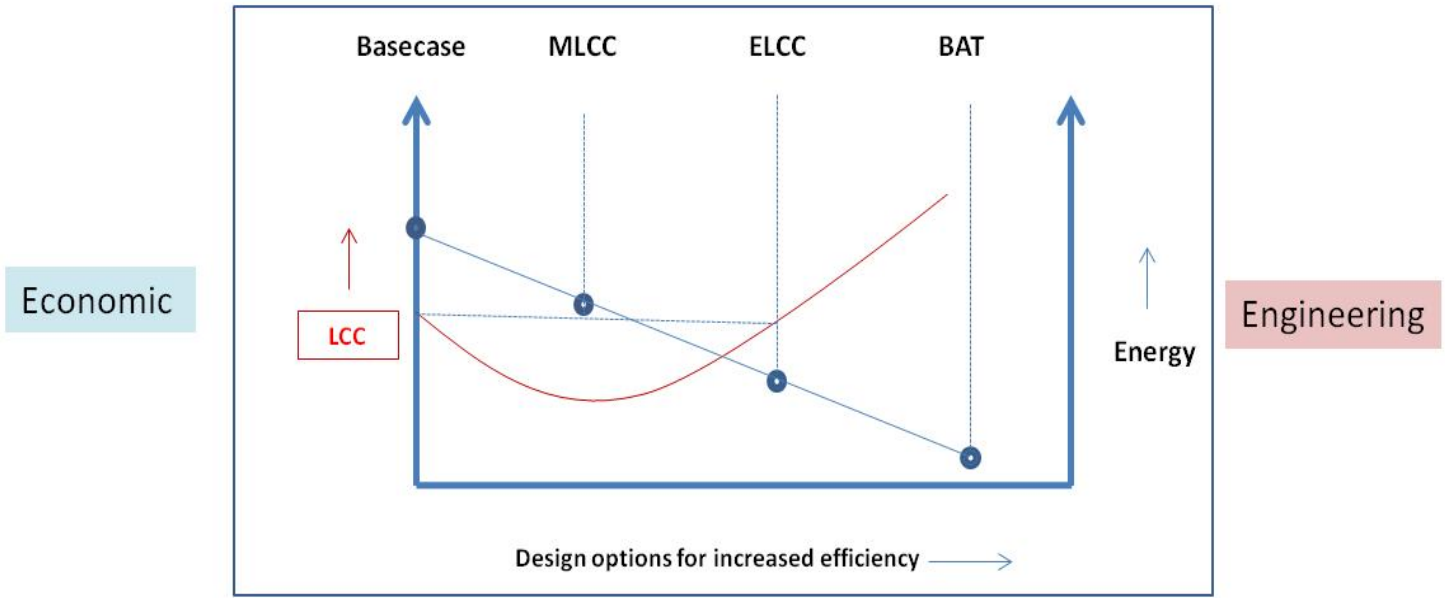
**Minimum Energy Performance Standards** (MEPS) (EU, USA)

- Based on engineering analysis (expensive to do properly)
- Based on currently known technology (or near term)
- Tend to overestimate costs, underestimate potential
- Externalities and learning not included directly in target setting
- [technology diffusion, rather than significant innovation]

**Top Runner** (Japan)

- Future targets based on statistical analysis of the current market (the best in each category)
- Allows for market average compliance, difficult to check

# MEPS – based on life cycle cost (LCC)




$$LCC = PC + OC + MC$$

LCC – life cycle cost
PC – purchase cost
OC – operating cost
MC – maintenance cost

LCC – life cycle cost
MLCC – minimum life cycle cost
ELCC – equivalent life cycle cost
BAT – best available technology

# What is a Technology-forcing Standard?

**General**: A legal requirement to bring forward technology that is currently not available or commercialised or considered too costly.

**Classic example:**

- 1970 Clean Air act (Car pipe emissions)
  - Required a 90% reduction in emissions in 5 years
  - No 'known' technology available (a priori)
  - Led to developed catalytic converters
  - Successfully introduced (with a few hiccups)

# Example and comparison

| Variable affecting TFS | Clean Air act 1970 (catalytic) | DoT 1969 airbag decision |
|---|---|---|
| Technology cost | $200-250 | $235 (GM) |
| Asymmetric information | EPA erases advantage | GM reveals information |
| Regulatory mandate | Legislative (congress) | Regulatory (agency) |
| Raise rivals' costs | | Yes |
| Non-compliance | EPA 'winks' at Chrysler | ? |
| Liability concerns | recalls | Yes |

TFS strongly regulatory approach apparently more effective than the DoT approach via NHTSA

Clean Air Act (1970) requires emission reduction: new **catalytic converter**
Dept of Transport **airbag** decision – drawn out, ineffective

Source: Gerard and Lave (2007)

# Other policies examined

- USA SOx emissions reduction via cap and trade
- Renewable energy (portfolio) standards
- Montreal Protocol, banning ozone depleting substances
- UK Climate Change Agreements
- Zero emission vehicles in California
- English Building regulations (zero Carbon by 2016)

# TFS – a definition

Requirements on new appliances/products/service:

- Where efficiency performance levels are currently:
  - Not on the market at present,
  - Considered too costly at present,
- Which require:
  - Innovation,
  - broad diffusion,
- Which importantly, are delivered via regulation.

# Lessons learned:
# Possible benefits of TFS

- Sends clear long term signal to the market
- Industry can deliver closer to optimal solutions of high efficiency technology
- Requires (essentially mandates) industry investment in energy efficiency - innovation requirement
- Result in better technology sooner, at lower cost

# Lessons learned: how to apply

- the importance of flexibility:
  - Specify goal not solution
  - Include frequent reviews
- Needs strong regulation
  - dependent on public/other support
- the importance of industry cooperation:
  - Industry knows technology best
  - Industry sign up makes strong action easier

# Risks and mitigation for TFS (1/2)

1. Targets too stringent, too costly, delay risk:
- Mitigate by:
  - Regular reviews of progress
  - Support TFS with other measures (eg rebates, procurement, tax breaks)

2. Information asymmetry:
- What levels? Industry tends to knows more than regulators. Push-back.
- Mitigate by:
  - Developing expertise through contracts, panels
  - Use competition (within region, foreign vs domestic)
  - Information from component suppliers

3. Low Industry access to capital for innovation & R&D:
- Mitigate by:
  - Encouraging and supporting collaboration (to reduce costs)
  - Offering grants and tax breaks in support of R&D
  - Providing policy confidence (no flip-flopping)

# Risks and mitigation for TFS (2/2)

4. Leakage/reduced competitiveness:

- Mitigate by:
  - Making regulation geographical coverage as wide as possible
  - Reducing cost of innovation by supporting R&D

5. No policy mandate for TFS:

- Change in approach may need new legislation to adopt requiring political will and causing delay
- Mitigate by:
  - Developing existing approaches (MEPS, Top Runner) to have more stringent targets
  - Providing evidence to policy makers of where this could work

# Some final thoughts on TFS

- In theory, TFS can deliver additional savings and drive innovation
- However, considerable risks and challenges, and could be politically difficult

Are there any practical steps we can take to drive innovation and ratchet standards?

# Pragmatic considerations, steps forward for appliances

1. Make existing MEPS/Ecodesign methodology more stringent
2. Use other supporting policy measures (full market transformation approach, including innovation)
   - Use Government incentives and other mechanisms to generate greater innovation (policy-driven innovation)

# 1. More stringent/effective MEPS?

- Use Equivalent life cycle cost (beyond LLCC)
  - Larger savings
  - Reduce rebound concern
  - More savings possible at next iteration of MEPS (starting LCC higher)
- Include external costs/benefits in LCC calculation
  - Such as carbon cost, air quality benefits
- Include likely costs reductions due to 'learning' in LCC
  - These are increasingly included in Impact Assessment (not LCC)
- Focus on energy service and select appropriate metrics
  - Reduce/remove technology classification, eg different standards for side-by-side and top-bottom mounted fridge freezers

# 2. TFS (levels) within market transformation strategy

Set long-term aggressive targets, using a suite of other measures to get help there = policy-driven innovation:

- Use other policy measures to identify next best technology level (eg competitions, prizes)
- Other policy measures to develop market, and bring down costs (eg rebates, gov contracts)

Drive innovation through:

- Procurement, grants
- tax incentives, investment funds
- reduced interest loans, research networks

# Summary

- MEPS have been used successfully
- Scope for further ambition
- TFS could deliver significant additional savings
- Some risks and require strong political will
- Pragmatic choice could be:
  - Enhancement (and increased stringency) of existing MEPS/ecodesign regulations
  - Use of TFS as aspirational targets within a coordinated market-transformation strategy
  - Additional policy support for innovation

# Thank you!

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**Separate project report:**

Lane, K and Brocklehurst, F (2012) Technology-forcing standards. Report for IEA 4E, available at:

www.iea-4e.org