Technology Forcing Standards: for energy efficiency and innovation

ECEEE Ecodesign and innovation seminar, Brussels

Kevin Lane, 22 January 2013

Based on IEA 4E report

Overview

- Background
- What is a Technology Forcing Standard
- Example(s) of previous TFS
- Generic pros/cons
- TFS for appliance (eg TV, lighting)
- Summary - thoughts on TFS

Background

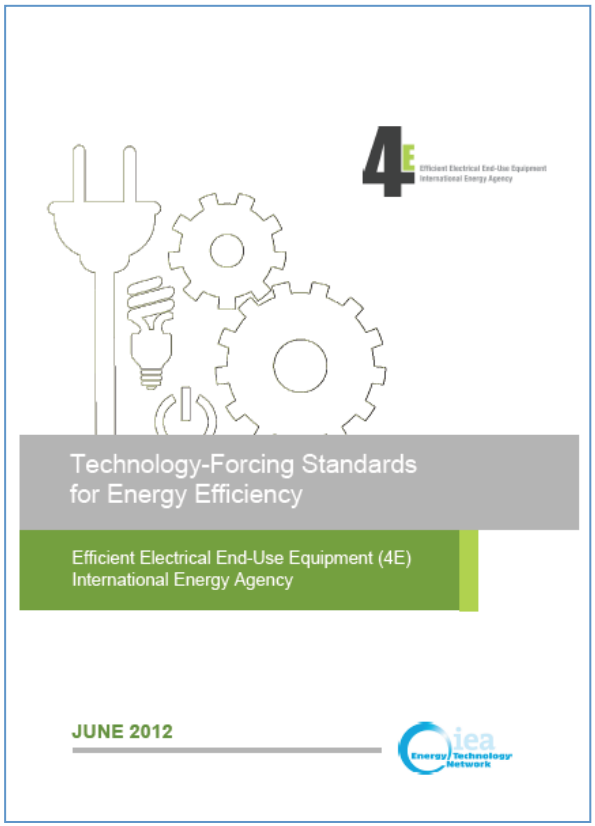
Small IEA 4E funded project, to examine:

- Past TFS experience
- Application for appliances

Project report:

Lane and Brocklehurst (2012) Technology Forcing standards. Available at:

www.iea-4e.org



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 reviewed

Non-appliance related:

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

Not explicitly TFS but appliance related:

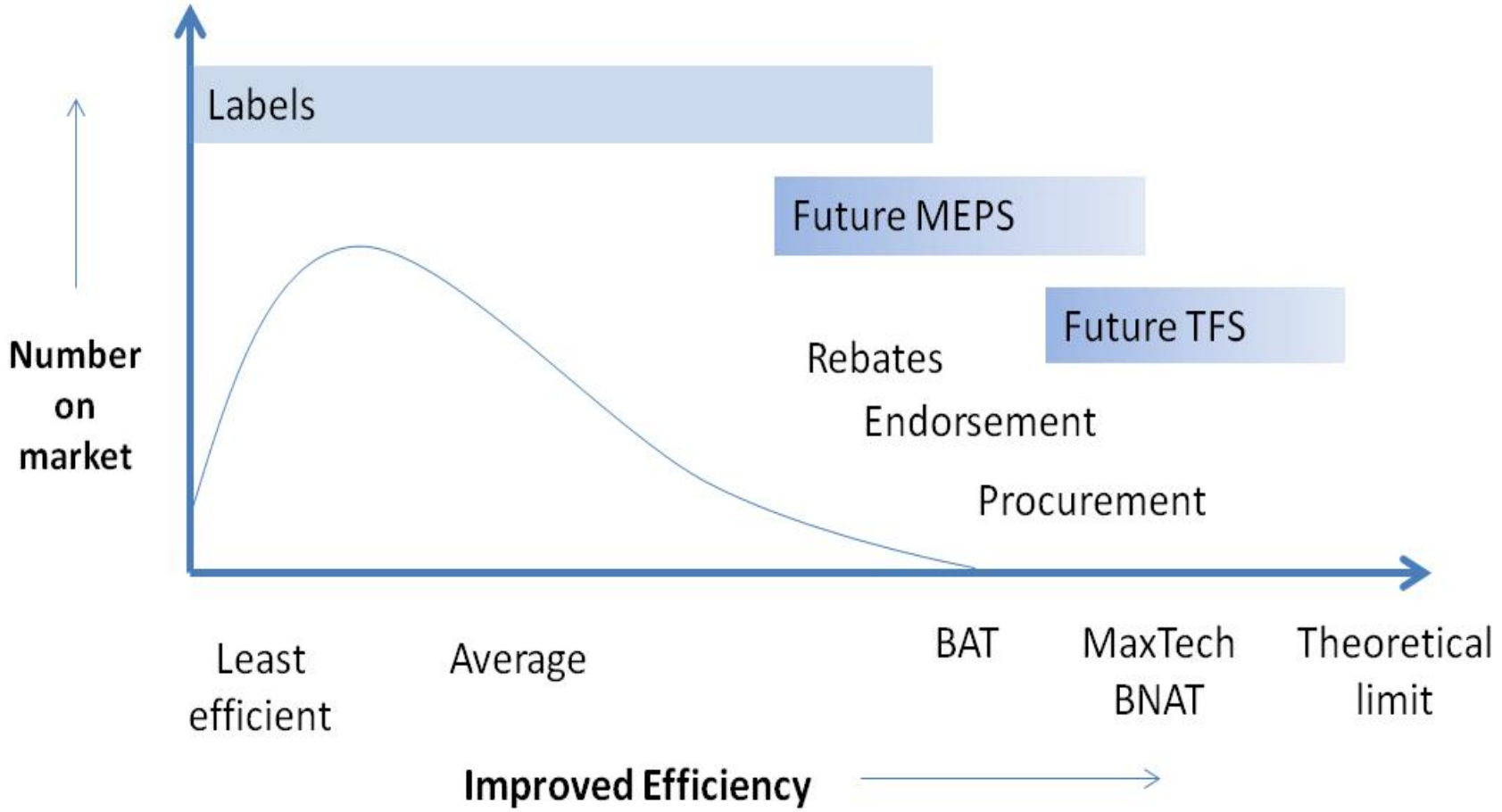
- US MEPS -Energy Conservation Standards
- EU MEPS - Ecodesign directive
- Japan Top Runner
- Low-efficiency incandescent lamp phase out

TFS – a working 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.

Efficiency (technology), Policy



Generic pros/cons of TFS

Pros

- Sends clear long term signal to the market
- Which should mean industry can deliver closer to optimal solutions of high efficiency technology
- Requires (essentially mandates) industry investment in energy efficiency - innovation requirement

Cons/risks

- Risk of missing savings opportunity if targets not met (or industry doesn't try)
- Longer lead time, may mean lost time if targets are not met
- Risk of low regulator credibility (if targets set too high, or don't enforce)
- Product range may be reduced (eg GLS lamps, top loading washing machines)
- Lack of access to capital to innovate (mitigate: provide/support R&D funding)
- Leakage/reduced competitiveness to non-regulated regions

When to use? (Success requirements) (skip)

- At least one ‘known’ pathway for future technology/efficiency development
- Much lower (life cycle) cost expected
- Measurement metrics sufficiently developed and robust
- No leakage:
  - Sufficiently wide scope of regulation
  - Implemented across a large (market) trading block(s)

Existing '*TFS-like' approaches* for appliances/equipment

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
- [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

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?

TFS for appliances

Requirements

- Based on energy service, not technology prescriptive
- Could consider company-level or product-level requirement
- Need to allow extra time to meet (more stringent)targets

Requirement specification metric - similar to existing MEPS?

- For refrigerators related to EEI
- For televisions related to W/cm^2 (or better EEI, to avoid size issue)
- Though reducing/removing 'technology categories' (ie different requirements for different products)

Service:

- Eg keeping home warm, rather than boiler efficiency (at full load)
- Water heating – energy for hot water used.
- Innovation can be stifled by testing procedure

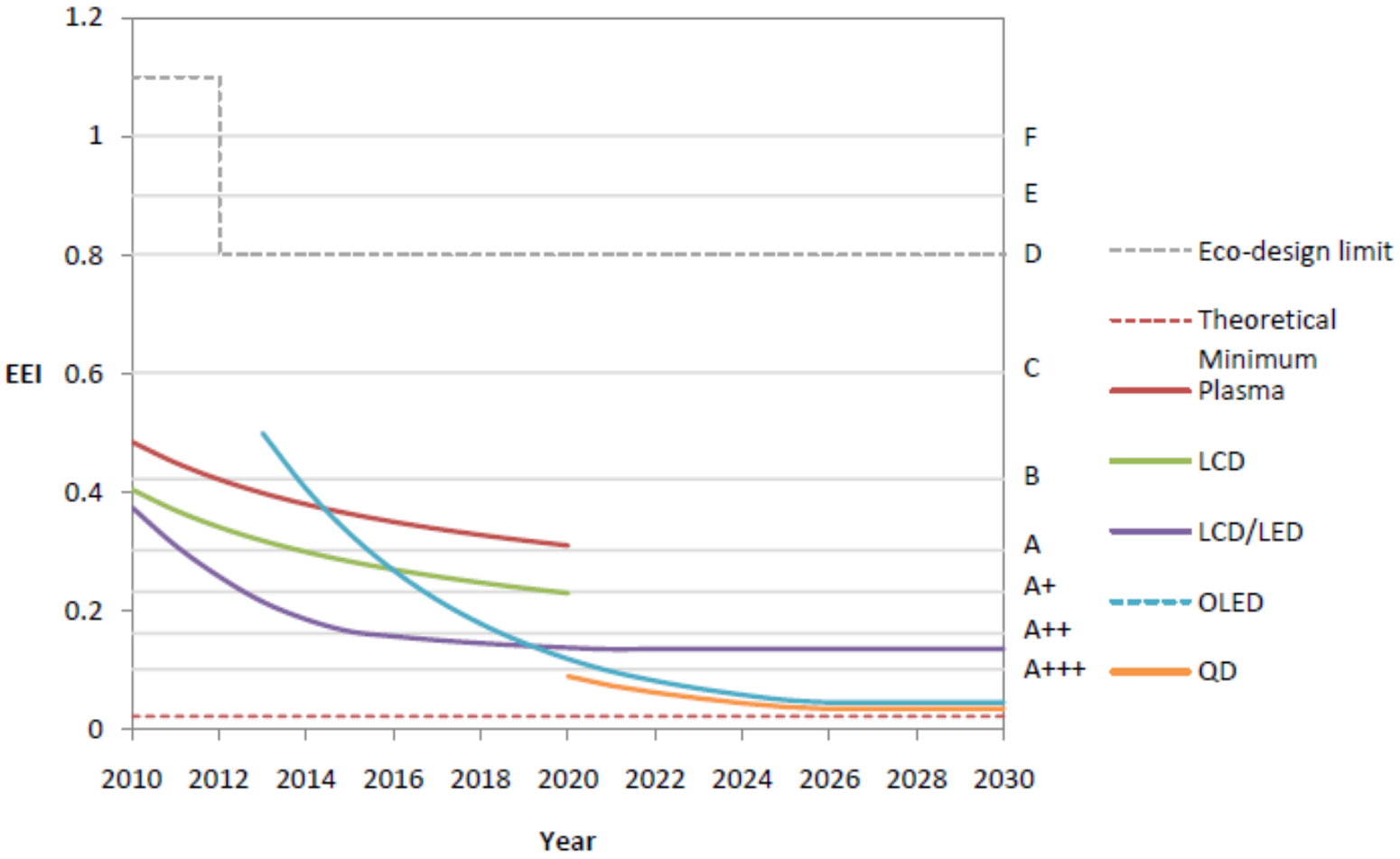
Product examples

Run through two examples, to show potential levels and issues.

- Televisions
- Lighting

[Refrigerators, boilers and small A/C also considered in report]

Potential target – Television/screen

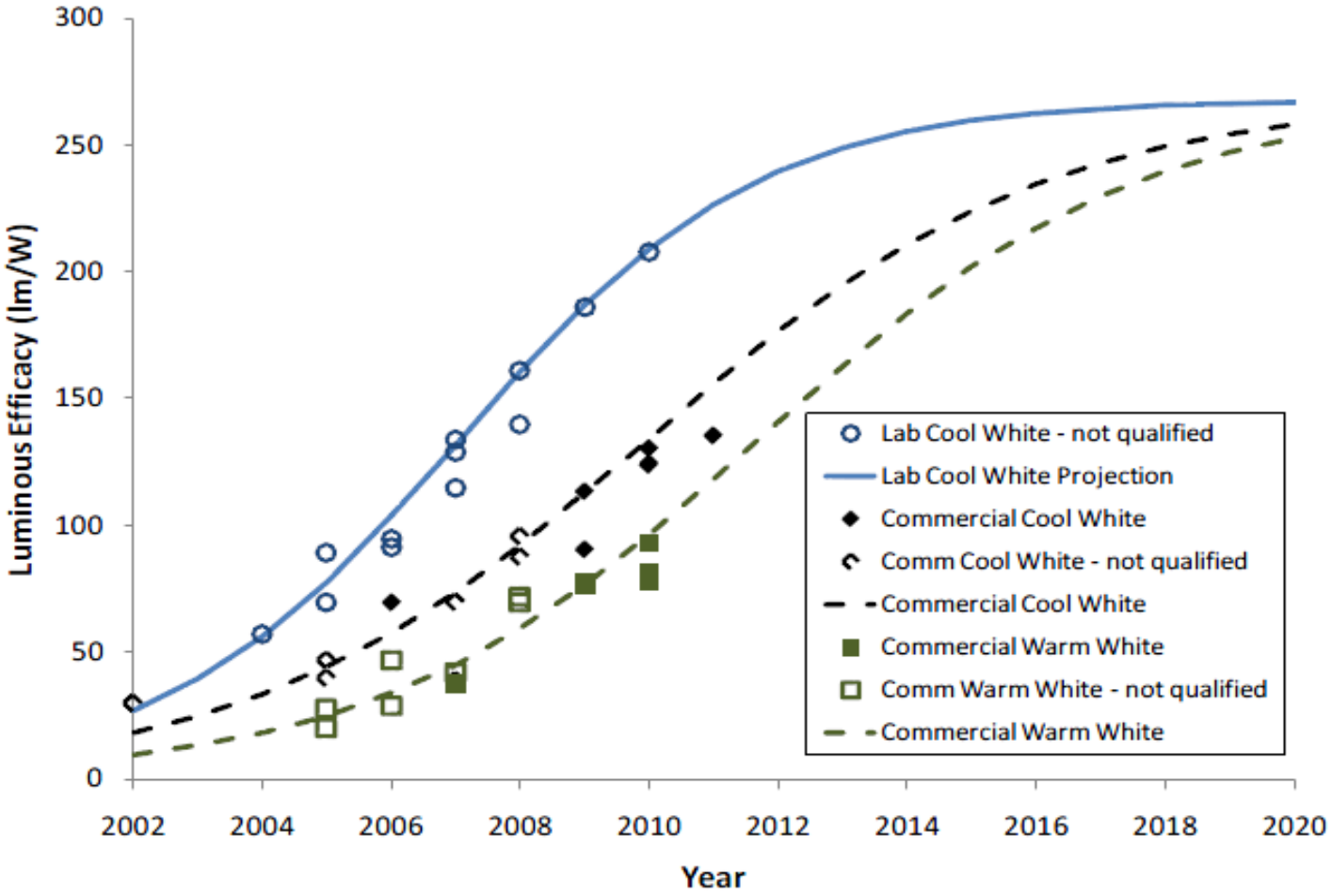


Source: Defra (2011)

Issues with television TFS

- Current regulations (eg EuP, labelling) are not keeping pace with efficiency improvements.
- Current increasing TV Efficiency not necessarily being driven by industry efficiency concerns.
- 'known' future technology (LED, OLED, quantum dots)
- How to set future level (for TFS, or even MEPS)?
  - Consider review periods, interim targets
- More later today.....

Potential target levels - Lighting



Source: US DOE (2011)

Issues with lighting TFS

- Large potential, expected low cost
- Some current technical issues, though 'known' technology pathway
- Need to consider luminaire also?
- Insufficient testing standards?
- TFS metric (long term) can be wider, and need not list all features used in short term MEPS/labels (eg quality, start-up)
- Challenge of multiple uses (service) of lighting
- TFS service could be related to floor area (already used in commercial requirements, Watt/m^2), rather than product level service (lumens/Watt)

Generic issues for setting TFS (or other stringent targets)

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

Political will:

- TFS intrinsically bold (difficult/impossible to prove cost-effective savings, apriori)
- Mitigate by:
  - Extension of existing (eg MEPS) arrangements?
  - Trade-off between pure TFS and integration with other MT policies (and using as TFS levels as aspiration longer term targets)

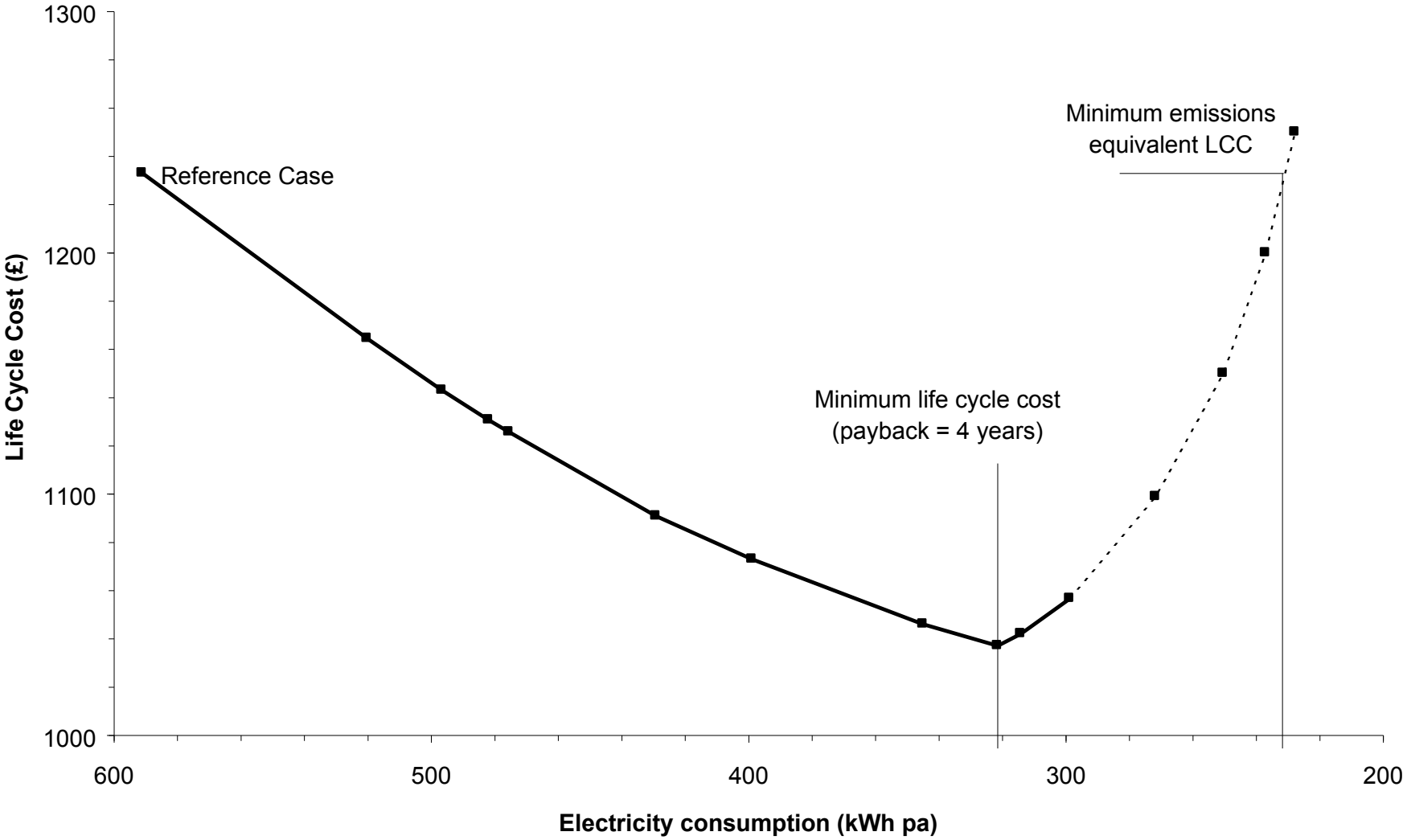
Delay risk

- Trade-off between stricter target/longer lead time and reduced target with shorter lead time.

Pragmatic considerations, steps forward

- Make existing MEPS/Ecodesign more stringent
- Use other supporting policy measures (full market transformation approach, policy-driven innovation)

MEPS – based on LLC



More stringent/effective MEPS?

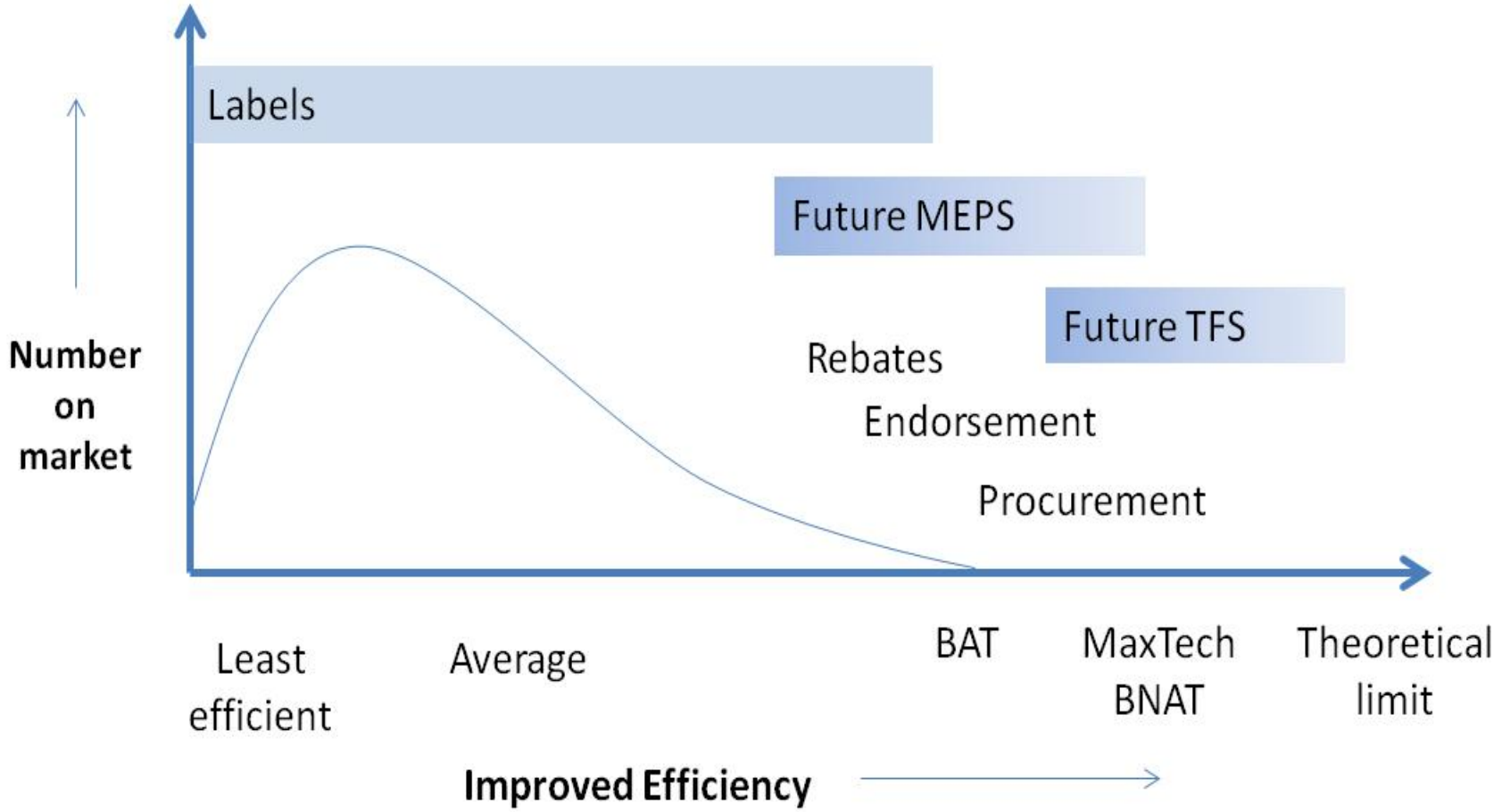
- Use Equivalent life cycle cost (beyond LLCC)
  - Larger savings
  - Reduce rebound concern
  - More savings possible at next iteration of MEPS
- Include external costs/benefits in LCC calculation
  - Such as carbon cost, air quality benefits
  - Include likely costs reductions due to 'learning'
  -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

TFS (levels) within market transformation strategy

Consider TFS (target levels) within an integrated market transformation approach

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

TFS, market transformation strategy



Market Transformation (skip)

Strategic integration of multiple policy measures:

- mandatory energy labels for the entire market, which provides additional information to consumers (address information gap issue);
- endorsement labels can also be used to help consumers identify the best products;
- 'dis-endorsement' labels can also be considered (though rarely used) to help identify the worst products;
- incentives for consumers to purchase the most efficient products (usually via rebates, but could be through other mechanisms, such as obligations on energy suppliers to install efficiency measures);
- incentives for the supply chain to source more efficient products (eg through procurement contracts);'
- mandatory energy performance standards are used to remove the worst products from the market though can be used to set mandatory levels at least life cycle cost to consumers (perhaps already proven by more expensive measures to bring forward technology).

Initial thoughts on TFS (skip)

- Due to the risks of TFS (since targets may be under/over, industry push-back, risk of lost time to develop), would not recommend 'chasing' a pure TFS programme alone, especially if no political will (or mandate) to do so.
- Rather, suggest some pragmatic steps which would move in the direction of TFS ambition:
  - consider how to make existing MEPS (and similar) regulations more challenging/ambitious;
  - describe how TFS targets (or stretching performance standards) could be more strategically integrated with other policy measures;
  - undertake research/development/support to identify more ambitious targets.
  - Use other policy measures to identify and develop (reduce costs of) efficient technology, which can form future MEPS. Policy-driven innovation

- ... Though if there is a political will ....

Summary thoughts

- TFS has potential to deliver significant additional savings
- TFS possible only with sufficiently clear vision of future technology pathway, and strong will
- Provides clearer (longer term) pathway for industry
- Requires increased investment in efficiency by industry (though the savings will be bought at a lower cost than if through incentives and other voluntary measures)
- Risks if targets set poorly (scale, scope, stringency)
- Pragmatic choice could be enhancement (and increased rigour) of existing ecodesign regulations

Thank you!

Contact:

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Project report:

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

www.iea-4e.org

Initial recommendations, some tasks

At a general level, consider the following:

- review the root regulations/legislations for existing MEPS (Top Runner, etc) in member countries to establish the scope for stretching targets further;
- review the existing policies that could reinforce stretching standards in member countries and internationally;
- look in more detail at which products/systems are most suitable for stretching standards and what level of ambition those standards could be set at;
- continue work on establishing common metrics for the target products to help benchmark the best, reducing the information gap and reducing risk;
- extending this last task on harmonizing test procedures, there may be tasks to develop more appropriate standards for longer term TFS which are less constrained by current technology;
- review the existing research or undertake new research that would help to win political support for ambitious targets;
- develop TFS (performance levels and targets) within a coordinated market transformation strategy.

Policy-driven innovation

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

Other examples

- Renewable obligations/portfolio standards
  - Usually expensive cost (less technology issue)
  - Led to significant increased capacity, reduced costs (learning)
- Banning Ozone depleting substances (Montreal Protocol)
  - Alternatives not available when evidence provided
  - Successfully removed CFCs/other
  - Costs lower than expected

Example 2: Banning Ozone depleting substances

ie the Montreal Protocol. Very successful (removed CFCs, total international coverage). Learning points:

- Strong public support and political will to act – enabled strong targets
- Regulation set goal but not solution – developed in response
- Frequent reviews of targets helpful
- Strong collaborative engagement of private sector helped keep on track
- Costs lower than expected

Refrigerators

- Conceptually the easiest (developed test procedures, known technology pathway)
- In EU an EEI of less than 0.2 should be possible at little extra cost or technology (1993 study suggested 'Max Tech' at 0.12, with ViPs). Current MEPS (next tier) still do not aim this low.
- If a 'service', then reduce the number of categories (or groups) of refrigeration appliances (eg standards for side-by-side should be no different to vertical fridge-freezer, which is not the case in Australia)