What Is To Be Expected and Gained from International Harmonization of Equipment Energy Efficiency Requirements?

Paul Waide and Michael Scholand, Navigant Consulting Europe
Yamina Saheb, Collaborative Labeling and Appliance Standards Program
Lloyd Harrington, Energy Efficiency Strategies

ABSTRACT

Efficiency standards and labeling schemes are currently in place for a variety of end-use equipment types in countries that account for about 80% of the world's population and a higher share of its GDP, energy use and CO_2 emissions. Policymakers in the major economies are increasingly paying heed to developments in the other economies and this raises the prospect for increased international cooperation and enhanced alignment of policy settings. Were equipment energy using test procedures and energy performance metrics to be more closely internationally aligned it would facilitate trade, conformity assessment and comparison of policy settings across the major economies. But what might it do to facilitate energy savings?

This paper reports early findings of an extensive on-going investigation of the energy efficiency standards and labeling programs in place in China, the EU, India, Japan and the USA. The broad aim of the research is to identify what might be gained through closer coordination and alignment of technical requirements and policy settings among the major economies and to explore what additional savings could be realized were economies to extend the coverage and stringency of their programs to align with international best practice. The paper summarizes key findings regarding the alignment of test procedures for the 24 most significant electrical end-uses in the residential, commercial and industrial sectors and it gives examples of the types of savings that might accrue were the ambition and coverage of existing programs to be raised in line with current international best practice. It estimates very roughly that the global CO_2 savings potential in 2030 from best practice policy harmonization for equipment energy efficiency standards is about 8% of all energy-related emissions from all sectors.

Introduction

Efficiency standards (MEPS) and labeling schemes are currently in place for a variety of end-use equipment types in countries that account for about 80% of the world's population and a higher share of its GDP, energy use and CO_2 emissions. While these programs have saved significant amounts of energy and CO_2 emissions and are generally highly cost effective, there is still scope for improvement in all economies. In the past there was only limited cooperation between these programs but in the last two years there are signs of more international engagement. Major economies including China, the EU, India, Japan and the USA have recently established the International Partnership for Energy Efficiency Cooperation (IPEEC), which is a high-level forum to facilitate the exchange of information and cooperation on energy efficiency policy. The IEA's 4E Implementing Agreement brings together some of the major economies in a common cooperative framework addressing energy efficiency in electric equipment; the EU and USA have established a cooperative forum (the US-EU High Level Regulatory Forum) where senior program managers exchange information on their standards and labeling programs and numerous other bilateral efforts are accelerating the rapidity of knowledge transfer between the principal policy makers.

Given the high degree of international activity with respect to energy efficiency standards and labeling schemes it seems appropriate to consider what lessons may be derived from a better understanding of current practices among the major economies and when might it be appropriate to consider greater alignment, or harmonization, of practices and requirements.

In principle the existing programs have much to learn from each other, notably because:

- The share of energy using products subject to energy efficiency policy requirements such as minimum energy performance standards or fleet-average efficiency targets varies significantly and there is no economy where all end-uses are currently subject to requirements and in most there are still significant gaps
- The stringency of requirements varies appreciably, suggesting there is on-going scope for ambition to be increased
- The degree to which requirements encourage system-level, as opposed to component level, efficiency improvement are markedly different
- The apparent effectiveness of product energy labeling varies significantly
- Compliance with requirements is often poorly assessed and sometimes weakly enforced
- The energy test procedures and energy efficiency metrics frequently vary among economies, thereby making performance comparison difficult. In some cases, the test procedures are inadequate for public policy purposes and in others energy performance test procedures have not been developed
- The degree to which complementary policies to stimulate energy savings in products operated within energy using systems are applied varies even more greatly and may have even larger savings potential.

At present it is a relatively complex matter to compare requirements across the globe because product definitions can differ, energy test procedures are not fully aligned, efficiency metrics diverge and policy terms of reference differ. Nonetheless, in many cases there is a sufficient degree of alignment in these factors that it is possible to make more informed comparisons and in some other cases full alignment renders direct comparison possible. Such comparisons can greatly assist the policy making process because they remove uncertainty about the feasibility of reaching certain efficiency levels and facilitate fast-tracking of policy development through a "follow-my-leader" effect. Furthermore, harmonized testing and efficiency definitions can greatly facilitate industry in the design, production and diffusion of energy efficient equipment because they: enhance clarity over efficiency requirements in different jurisdictions, reduce testing and compliance costs and minimize the need for regionally distinct product platforms.

This paper reports some of the provisional findings of a new study (Waide *et al* 2010), conducted by Navigant Consulting and Energy Efficient Strategies and commissioned by the Collaborative Labeling and Appliance Standards Program with support from ClimateWorks

Foundation, that considers the situation applying in the five major economies of China, the EU, India, Japan and the USA. The study examined 24 major electric end-uses[1] in each of the economies and assesses:

- The characteristics and similarity of energy performance test procedures and the prospects for greater international alignment or harmonization
- The characteristics and similarity of energy efficiency metrics used in standards and labeling schemes and the extent of comparability between them
- Similarities and differences in product classifications
- The extent of coverage of energy efficiency standards and labeling schemes
- The ambition and stringency of the schemes
- Initial estimates of the potential to increase savings through harmonization of requirements aimed at today's most efficient level.

This paper reports a summary of the findings regarding test procedures and presents illustrations of the differences that product policy coverage and policy ambition have on savings. It begins by considering the conceptual issues underpinning harmonization and the degree to which they may influence future cooperative thinking.

A Conceptual Discussion of Harmonization

Greater international harmonization is conceivable for all the different activities that underpin equipment energy efficiency programs but easily the largest potential to stimulate energy savings is via greater policy-level harmonization[2]. The key determinants of policy induced savings are the range, ambition and rigor of the energy efficiency policy portfolios. These can directly apply to the products, as do standards and labels, or they can apply to energy using systems, as do system energy performance requirements applied through building codes or other mechanisms. In theory policy harmonization will only lead to energy savings if the parties concerned agree to harmonize at more ambitious policy levels than are the current norm. For example, were there to be agreement to harmonize at the highest international requirements currently in force it would generate appreciable energy savings with the amount varying depending on the degree of harmonization as follows:

[1] The end-uses investigated are: room air conditioners (non-ducted), central air conditioners (ducted), chillers, household refrigeration appliances, household clothes washers, household clothes dryers, household clothes dishwashers, water heating appliances, televisions, digital television decoders (set top boxes), external power supplies, lighting (GLS, CFLs, fluorescent lamp ballasts, directional lamps, linear fluorescent lamps, HID lamps, LEDs), space heating devices, fans & ventilation, electric motors, cooking appliances, transformers, and commercial refrigeration equipment.

[2] Harmonisation of test procedures and efficiency metrics for energy using products will only indirectly facilitate energy savings and only then providing important technical factors are properly managed i.e. that there isn't harmonisation to a technically inadequate test procedure or metric. However, such harmonisation does facilitate policy setting harmonisation because it permits direct comparison of efficiency levels. Harmonisation of compliance regimes is similar in that it would facilitate greater savings providing harmonisation was to a more comprehensive compliance regime than current norms.

- Large energy savings would accrue were each economy that currently has specific product energy efficiency requirements to harmonize those at the level of the most stringent requirement currently applied in any economy
- Larger savings would accrue were every economy to adopt the most stringent product energy efficiency requirements in place for all end-uses, regardless of whether they currently have requirements for the products concerned or not
- Greater savings again would accrue were in addition to the above there would also be international harmonization of end-use energy systems energy efficiency requirements at the highest current level[3]

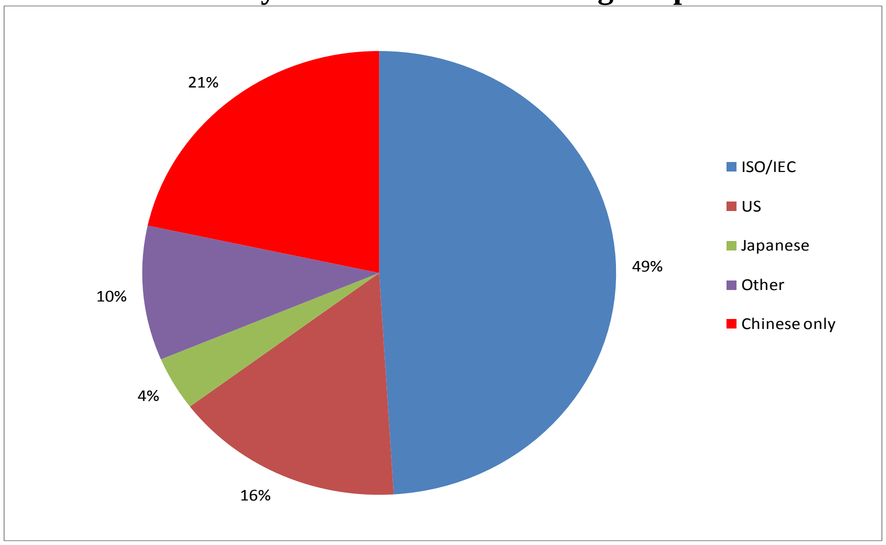
Thus conceptually very significant savings could accrue were there to be an upwards harmonization that served to increase the coverage, scope and ambition of end-use energy efficiency policy settings above base-case levels. Furthermore, in principle the highest level is not a static requirement. Technologies improve and manufacturing costs decline as better manufacturing techniques are developed and economies of scale are achieved. Therefore if harmonization were to be based on regular revision to new highest justifiable levels, in principle it would save more energy again.

Energy Test Procedures

Energy performance test procedures underpin all equipment standards and labeling programs because they are the means by which equipment energy performance is measured and compared. There are many institutions involved in developing, issuing and adopting equipment energy performance test procedures but only a few operate at the fully international level. The principal international standards bodies dealing with equipment energy performance test standards are: the International Organization for Standardization (ISO) and the International Electro Technical Commission (IEC). The membership of both bodies is made up of national standards institutes and it is these which arrange for nationally designated experts to participate in the standards development committees and vote to adopt standards which are developed by the technical committees. Many economies use ISO or IEC energy performance standards directly in their standards and labeling programs, other adopt national versions of the international standards, which may or may not have some variations, others adopt them on a piecemeal basis and also make use of other preferred national or international standards (e.g. in use in another international economy but not necessarily adopted by ISO or IEC). Figure 1 shows an example of this for China, where just under half (25) of the 51 energy performance test procedures used in their 47 distinct equipment energy efficiency standards and labeling regulations are of ISO or IEC origins, five are from other international standards bodies (International Telecommunications Union, Institute of Electrical and Electronics Engineers, International Energy Star), eleven are of purely national origin, eight are of US origin and two are Japanese.

[3] With the proviso that these would need to be enforceable and enforced.

Figure 1. Origins of Energy Performance Test Procedures Used in China for Energy Efficiency Standards and Labeling Purposes



Even those economies which have the highest use of ISO and IEC standards do not exclusively use those standards and of the five major economies the degree of usage of unadulterated ISO and IEC standards is found to vary from highest to lowest in the following order: the European Union, China, India, Japan and the USA. As part of the establishment of the single European market the EU created their own EU-level shadow standards bodies to the ISO and IEC called CEN (the European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization) respectively. These bodies frequently adopt ISO and IEC standards, but also sometimes modify them or less commonly adopt wholly different standards. ISO and IEC sometimes adopt or adapt CEN or CENELEC standards too. The Standardization Administration of China, the national body which develops test standards, is a member of ISO and IEC and votes in their standardization committees. The same is true of the Indian Standards Institute and the Japanese Industrial Standards (JIS) body. The USA is represented by NIST (National Institute of Standards and Technology) but depending on the equipment type US standards experts participate in ISO and IEC standards development institutes from numerous dedicated industry standardization bodies such as AHRI (Air-Conditioning, Heating and Refrigeration Institute) for air conditioning, AHAM (Association of Home Appliance Manufacturers) for household appliances, NEMA (National Electrical Manufacturers Association) for electric motors and lighting, etc. Thus there is a considerable degree of interconnection between the principal technical bodies charged with developing standards at the national or economy-wide level and there is a lot of commonality in the methodologies used internationally. Nonetheless, while these bodies may create or assist in the creation of energy performance test standards, the decision about which test standard will be adopted for use in national energy efficiency requirements often resides with regulatory bodies such as the DOE (US Department of Energy) and EPA (US Environmental Protection Agency) in the USA, the European Commission in Europe, CNIS (China National Institute for Standardization) in China, BEE (Bureau for Energy Efficiency) in India and METI (Ministry of Economy, Trade and Industry) in Japan. These agencies sometimes issue their own technical standards or adapt existing ones developed by technical standards bodies, but most commonly they simply adopt an existing standard. The EPA is the main exception to this as they have developed many wholly new test standards to determine the energy performance of products subject to Energy Star requirements.

Harmonization of energy performance test procedures is not an end in its own right but is potentially a means of facilitating common energy policy, technology diffusion and trade objectives. In principle greater harmonization facilitates trade, conformity assessment, comparison of performance levels, technology transfer and the accelerated adoption of best practice policy settings; however, it is important that this doesn’t come at the expense of the fitness for purpose of the test procedure in the local context. The ideal test procedure is: repeatable (gives the same result each time the product is tested in the same lab); reproducible (gives the same result each time the product is tested in different labs); gives an accurate measure of energy consumption reflective of in-situ consumption; gives an accurate measure of energy efficiency reflective of the in-situ energy efficiency ranking; and is not costly or overly time consuming. In practice, any test procedure is a compromise between these objectives. Therefore when considering the merits of harmonizing test procedures it is also important to consider whether a single international test procedure will be adequate for local usage and to consider the adequacy of the existing international test procedures for energy policy purposes.

The review of energy performance test procedures done for this study assessed each test procedure in use for the 24 equipment types in each of five economies against these criteria and assessed the degree to which they are already aligned, the nature of the differences that exist between them and the fitness for use of the international test procedures. The analysis then reviewed test procedure development dynamics and assessed the status of discussions at the international level to determine what the prospects were for greater harmonization at the international level. The main findings of the test procedures comparisons are summarized in Table 1 for the products included in the study. For each product, a subjective assessment was made of the degree of international harmonization based on analysis of the ongoing work on test procedures at regional and international levels. It was found that the degree of harmonization for test procedures is relatively high for air conditioners and chillers, external power supplies, some of the lighting products (incandescent lamps (GLS), CFLs, and linear fluorescent lamps (LFLs)), electric motors and transformers. While for products like refrigerators, clothes washers and dryers, water heating appliances, and space heating appliances the degree of harmonization of test procedures is relatively low. Not surprisingly, the greatest prospects for harmonization occur when a new product is developed or when there are few existing national test procedures. This is the case for green-field products like LEDs, but can also be the case when test procedures or national efficiency requirements have not yet been set or have only been set in a single economy, such as for directional lamps. But it is also possible to harmonize test procedures for mature products. The recently revised IEC test procedure for asynchronous electric motors is an excellent example of this where the adoption of the best elements of other widely used international test procedures has enabled a broad international consensus to be established around the adoption of the new test procedure. This standard is now being written into energy performance legislation in Europe, North America and China.

Table 1. Synthesis of Test Procedure Harmonization by Product

Product/end use	Degree of harmonization for energy test procedure	Regions with greatest difference from international standards	Potential for harmonization of energy test procedure	Comments and recommendations
Room air conditioners (non - ducted)	High	Japan, USA and soon EU	Fair	Treatment of split units in USA and variable capacity units everywhere are the main sources of difference; however, EU is about to adopt a SEER for all non-portable units
Central air conditioners (ducted)	High/ Moderate	USA	Fair	New ISO standard under consideration, US would need to re-categorize split AC systems
Chillers	High/ Moderate		Good	No international test procedure; however work on an ISO standard has been approved
Household refrigeration appliances	Low	India, Japan, USA	Moderate/Poor	New IEC standard expected in 2011 should help improve prospects
Household clothes washers	Low	Japan, USA	Moderate/Poor	New IEC standard will address all clothes washers types (horizontal and vertical) but local wash temperatures and cleaning requirements vary dramatically
Household clothes dryers	Low	All	Moderate/Poor	IEC 61121 is under revision and should encourage greater harmonization
Household clothes dishwashers	Moderate	USA	Fair	New IEC standard could be made more attractive if prescriptive requirements were optional
Water heating appliances	Low	All	Moderate	New IEC standard under development could form the basis of a global standard
Televisions	Moderate	EU is first to adopt new international test procedure	Fair	IEC 62087, Edition2-2008 was specifically developed as a global energy measurement standard and should be adopted
Set top boxes	Moderate		Good	IEC 62087, Edition2-2008 was specifically developed as a global energy measurement standard and should be adopted
External power supplies	High		Very good	The international draft is based on Energy Star test procedure; delay in issuance presents risk

Product/end use	Degree of harmonization for energy test procedure	Regions with greatest difference from international standards	Potential for harmonization of energy test procedure	Comments and recommendations
Lighting: GLS (incandescent)	High	Japan, USA	Fair	
Lighting: CFLs	High		Good	New IEC likely to have a good broad support
Lighting: fluorescent lamp ballasts	High/Moderate	Japan/USA	Moderate	No technical justifications for differences in test procedures
Lighting: directional lamps	Too soon to say		Good	Greenfield products: opportunity for new international standards to gain board acceptance
Lighting: linear fluorescent lamps	High/ Moderate	Japan, USA	Moderate	No technical justifications for differences in test procedures
Lighting: HID lamps	High/Moderate	Japan, USA	Moderate	No technical justifications for differences in test procedures
Lighting: LEDs	Too soon to say		Good	Greenfield products: opportunity for new international standards to gain board acceptance
Space heating devices	Low	All	Poor except air to air heat pumps	Too much regional product diversity except for air to air heat pumps
Fans & ventilation	High/Moderate		Good	International Energy Star is the most common testing platform; broad support for IEC standby power standard
Electric motors	High		Very good	New IEC standard has broad support
Cooking appliances	Low	All	Moderate/Poor	Cooking appliances are poor candidates for international harmonization expect for microwaves and ovens
Transformers	High		Good	Little variation in test procedures implies good potential for harmonization
Commercial refrigeration equipment	Moderate		Uncertain	Some confusion at present but the field is relatively open

Comparisons of Policy Settings

The full study that this paper draws upon compares policy settings across the five economies and determines the benefits that might accrue from wider alignment of policy settings and especially minimum energy performance regulations at the current highest international level. Here we give two examples of the impact of policy scope, stringency and coverage.

Impact of Scope and Ambition: The Example of High Intensity Discharge Lamps

Given the progressively broader coverage of minimum energy performance requirements in these economies the relative effectiveness of the measures in saving energy is increasingly a question of scope and ambition rather than whether a standard is in place or not. The example of high intensity discharge lamps, which are used for street lighting, outdoor lighting and also for high bay interior lighting is a good illustration of how these factors vary from one economy to the other and what further efficiency could be achieved through adopting international best practice in terms of scope and stringency. The main HID lamp technologies used internationally are high pressure sodium lamps (HPS), which have a relatively high efficacy (light output per unit input power) but emit a yellow/orange light with a low color rendering index (a measure of how faithfully colors are reproduced by the source of illumination) and white light HID sources that include: metal halide lamps (MH), which have relatively high efficacy levels; mercury vapor lamps (MV), which are an outdated technology with low efficacy levels; and self-ballasted blended mercury lamps (SB MV), which operate on the mains power supply and don’t use a separate ballast but which have very low efficacy levels. These latter have not been used in OECD countries for many years but are still very common in less affluent economies due to their low first cost. In addition to the lamp efficacy the system energy performance is also determined by the ballast efficiency and the optical efficiency of the luminaire, which is also related to the choice of light source. Lighting controls offer another option to reduce energy use and in recent times LED and plasma lamp street lights have been developed that offer the prospect of superior performance to HIDs in the near future.

Of the five economies, two (Japan and India) currently have no minimum energy performance requirements for HIDs. China has MEPS for High Pressure Sodium lamps (HPS), Metal Halide (MH) lamps and for HPS ballasts and MH ballasts. The USA has MEPs for MH lamps and for MH ballasts used with new luminaires (with different requirements depending on whether the ballast is to be used with a pulse-start MH or with a MH using an electronic-ballast). The US has no MEPS for Mercury Vapor (MV) lamps but has banned the sale of new ballasts for use with MV lamps and thus is phasing them out at the rate the ballasts fail and cannot be replaced. The EU has recently adopted MEPs that apply to all HID types and HID ballasts which have the effect of prohibiting the sale of all MV lamps and prohibiting the sale of the less efficient varieties of HPS and MH lamps and ballasts. It is instructive to examine how the scope and ambition of these policy settings impacts the energy savings potentials from MEPS. For example, were China to adopt the world’s most stringent MEPS for MH lamps and ballasts it is estimated that it would lower MH energy consumption by 29%, but if they were to extend these requirements to apply to all white light HID sources and ballasts they would lower the energy consumption compared to MV lamps by 47% and for SB MV lamps by 78%. Overall this would eventually lower their street lighting energy use by 38%, see Table 2. Adopting the World’s most stringent MEPS would eventually reduce EU street-lighting energy use by 15%, mainly through completing the phase-out of MV lamps, as is already underway, but also by improving MH efficiency by another 14%; however, using world best HID technology would increase this saving to 35% (partly through better optical efficiency of the luminaire). The US has a lower savings potential, largely because it began to phase out MV through the ban on MV ballasts much earlier, but still could reduce HID energy use by about 25% were best HID technology adopted across the board. Overall this example illustrates the importance of not just having MEPS by lamp and component type but also of ensuring that when the service offerings between technologies are sufficiently similar (as they are for MH and MV) that the scope of the MEPS is broadened to preclude the inefficient option. It equally shows that current MEPS do not capture a significant proportion of the overall technical savings potential because they do not influence some key parts of the overall system (the luminaire optical efficiency in this case).

Table 2. Estimated HID Lighting Energy Savings Potentials

Savings potential from adopting world's most stringent MEPS						
	China	EU	India	Japan	USA	All
MH	29%	14%	32%	17%	0%	13%
HPS	26%	0%	28%	17%	8%	14%
MV	47%	47%	47%	47%	47%	47%
SB MV	78%		78%			78%
All HID	38%	15%	42%	27%	5%	22%
Savings potential from adopting world highest efficiency HID technology						
	China	EU	India	Japan	USA	All
MH	47%	35%	49%	37%	25%	34%
HPS	40%	14%	42%	33%	20%	28%
MV	62%	62%	62%	62%	62%	62%
SB MV	85%		85%			85%
All HID	53%	33%	56%	44%	25%	39%

Impact of Policy Coverage and Ambition: The Example of the European Union

In many of the economies considered in the study the coverage of energy efficiency standards and labeling is already high or will be within a few years. China has the highest coverage of MEPs and labeling as a proportion of total energy use in the residential and commercial sectors, followed by the USA, the EU/Japan (both similar) and India. The situation is far from static in any of these economies and new rafts of efficiency standards and/or labels are being introduced quite rapidly in all of them. The EU, which includes some of the first countries in the world to have set energy efficiency standards, has ironically taken rather a long time to adopt framework legislation to facilitate the rapid adoption of mandatory requirements. However, since the adoption of the Eco-design directive (EUP 2005) in 2005, a proactive process has been underway to develop and adopt implementing regulations that require minimum performance levels to be satisfied by a range of different energy using equipment types. The projected impact of these measures can be seen in Table 3. From this it is apparent that in 2008 the MEPS in place in the EU only covered 4% of electricity use in all sectors and 72% of oil and gas use in the residential and commercial sectors. As of April 2010 the coverage had increased to 38% of electricity use in all sectors and about the same share of oil and gas use in the residential and commercial sectors. MEPS which are currently pending regulatory approval are liable to increase this coverage to 75% of electricity use in all sectors, and about the same share of oil and gas use in the residential and commercial sectors. Were the world's best MEPS to be adopted this would increase to 85% of electricity use in all sectors and 98% of oil and gas use in the residential and commercial sectors. Adopting these MEPS would save about 200 TWh of additional energy use per year in 2030 compared to what is envisaged with the existing and pending regulations, yet universal adoption of the world's best current technology would save about 940 TWh annually.

What Could the Global Savings Be?

A simplified analysis, based on an extrapolation of more detailed savings analyses for China, the EU and India and more approximate analyses for Japan and the USA, finds that were the current most broadly based and stringent equipment energy efficiency regulations to be adopted world-wide by 2030 it would save:

- 4000 TWh of final electricity demand (12% of the projected total) and 45Mtoe of oil and gas demand in the residential, commercial and industrial sectors excluding energy used for transport and industrial process heat
- 2600 Mt of CO_2 emissions (11% of the projected total from the sectors addressed)

These savings arise because existing policy coverage is incomplete (ranging between 0% and about 70% of the energy use in the sectors considered and because the stringency and manner in which permissible energy per unit service is determined leaves some large unexploited opportunities, even in the most advanced programs. Policy coverage is particularly incomplete for the commercial and industrial sectors while increased stringency in line with current world best practice would lead to substantial additional energy savings for the broad end uses of: lighting, HVAC, industrial electric motors, consumer electronics and white goods.

Conclusions: Back to Reality

Traditionally the major OECD member economies of the EU, Japan and the USA have only paid limited regard to the test procedures and policy settings in place in the other major economies when setting their own requirements. This has led to today's pattern where product policy-settings are only weakly internationally aligned, with some notable exceptions[4], beyond the regional level[5]. By contrast the major emerging economies of China and India have generally paid more regard to the policy requirements in place in other major markets as the starting point for many of their own policy development deliberations In recent times there has been an increased interest within all the major economies in understanding what is happening in other jurisdictions when introducing or revising MEPS and labels.

This development suggests there is an opportunity to share information and to establish cooperative efforts to lower program costs and increase their overall effectiveness and dynamism. The research done for CLASP and partly presented in this paper suggests, that in the medium-term, there are numerous product/end-use specific harmonization efforts that would benefit from greater support and would facilitate direct performance comparison and hence accelerated higher policy ambition. These include:

[4] Energy Star for IT equipment is an example.
[5] The EU nations apply a harmonised scheme and there is a high degree of harmonisation in the schemes of the NAFTA economies.

- Targeted harmonized test procedure development (aiming to secure globally harmonized test requirements and efficiency metrics for all new or emerging products which don't yet have test procedures, e.g. for LEDs) and alignment efforts (supporting efforts to agree aligned revision of existing test procedures and efficiency metrics)
- Instigating and supporting dialogues on best practice and opportunities with respect to harmonized conformity assessment
- Pooling international data used in techno-economic assessments of savings potentials that underpin standards development and setting processes
- Sharing information on best practice in standards setting tools and methodologies
- Sharing information of policy settings, scope and ambition

Were there to be accelerated adoption of leading international energy efficiency policy requirements it would produce significant savings even within economies that currently have many of the highest energy efficiency policy settings. For economies that currently have only limited efficiency requirements the savings from accelerated adoption of world's best requirements would stimulate much larger savings. There are clear signs that all major economies are becoming more receptive to dialogue and information exchange on the policies in place and in all cases there is increasing pressure to adopt international best practice, or at least not be too far behind it. The most viable route therefore is one that takes a soft path and aims to strengthen awareness and cooperative actions while illustrating what is achievable through broad-based and suitably ambitious policy settings.

References

EUP (2005) **Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005: Establishing a Framework for the Setting of Ecodesign Requirements for Energy-Using Products and Amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council**, Official Journal of the European Union L 191/29, 22.7.2005.

IEA (2008) **World Energy Outlook 2008**, International Energy Agency, Paris

Waide, P., Harrington, H. & Scholand, M. (2010), **Study to Assess Opportunities for Success and CO2 Savings from Appliance Energy Efficiency Harmonisation**, draft report. Navigant Consulting Europe with Energy Efficiency Strategies on behalf of the Collaborative Labeling and Appliance Standards Program, Washington D.C.

Table 3. Energy Consumption, Share of Energy Subject to MEPS, and Potential Future Savings for the EU

	Domestic (electric) (TWh)									**Domestic (oil+gas) (TWh)**			
	Lighting	HVAC	Hot Water	White Goods	Consumer electronic	Standby	ICT	Cooking	**Total**	Heating	Hot Water	Cooking	**Total**
Energy consumption in 2010	87	192	71	233	100	45	37	74	839	1742	441	68	2251
Energy consumption in 2020	61	219	81	260	77	24	42	84	846	1817	451	74	2342
Energy consumption in 2030	70	249	92	293	98	15	47	96	961	1892	461	88	2441
Energy subject to MEPS in 2010	66	0	0	127	88	45	0	0	325	1742	441	0	2184
Energy subject to MEPS in 2020 (with pending)	51	219	81	260	77	24	42	74	826	1817	451	0	2268
Energy subject to MEPS in 2020 (with worlds best)	61	219	81	260	68	24	34	73	818	1817	451	0	2268
Energy subject to MEPS in 2030 (with worlds best)	70	249	92	293	88	15	39	83	929	1892	461	0	2353
MEPS coverage 2010	75%	0%	0%	54%	88%	100%	0%	0%	39%	100%	100%	0%	97%
MEPS coverage 2020 (with pending)	84%	100%	100%	100%	100%	100%	100%	88%	98%	100%	100%	0%	97%
MEPS coverage 2020 (with worlds best)	100%	100%	100%	100%	89%	100%	81%	87%	97%	100%	100%	0%	97%
MEPS coverage 2030 (with worlds best)	100%	100%	100%	100%	90%	100%	81%	87%	97%	100%	100%	0%	96%
Additional 2030 savings from Worlds Best MEPS	3	26	9	0	1	0	4	8	50	0	9	0	9
Additional 2030 savings from Worlds Best Technology	19	124	37	108	15	4	7	14	328	132	28	0	160
Additional 2030 savings from Worlds Best MEPS	4%	10%	10%	0%	1%	0%	9%	9%	5%	0%	2%	0%	0%
Additional 2030 savings from Worlds Best Technology	26%	50%	40%	37%	16%	25%	16%	14%	34%	7%	6%	0%	7%
	Commercial (electric) (TWh)									**Commercial (oil+gas) (TWh)**			
	Lighting	HVAC	Hot Water	Refrig-eration	Standby	ICT	Cooking	Pumps	**Total**	Heating	Hot Water	Cooking	**Total**
Energy consumption in 2010	168	223	109	68	10	84	42	47	751	626	181	24	831
Energy consumption in 2020	192	229	124	78	3	95	47	53	823	678	198	26	902
Energy consumption in 2030	219	267	142	89	6	109	54	61	946	730	216	31	977
Energy subject to MEPS in 2010	168	54	0	0	10	0	0	0	232	0	0	0	0
Energy subject to MEPS in 2020 (with pending)	192	126	0	78	3	67	47	53	568	0	0	0	0
Energy subject to MEPS in 2020 (with worlds best)	192	79	124	78	3	46	0	53	576	678	198	0	876
Energy subject to MEPS in 2030 (with worlds best)	219	90	142	89	6	52	0	61	658	730	216	0	946
MEPS coverage 2010	100%	24%	0%	0%	100%	0%	0%	0%	31%	0%	0%	0%	0%
MEPS coverage 2020 (with pending)	100%	55%	0%	100%	100%	70%	100%	100%	69%	0%	0%	0%	0%
MEPS coverage 2020 (with worlds best)	100%	34%	100%	100%	100%	48%	0%	100%	70%	100%	100%	0%	97%
MEPS coverage 2030 (with worlds best)	100%	34%	100%	100%	100%	48%	0%	100%	70%	100%	100%	0%	97%
Additional 2030 savings from Worlds Best MEPS	2	23	14	9	0	6	0	0	53	58	4	0	63
Additional 2030 savings from Worlds Best Technology	61	96	57	22	1	12	9	0	258	95	13	0	108
Additional 2030 savings from Worlds Best MEPS	1%	8%	10%	10%	0%	5%	0%	0%	6%	8%	2%		6%
Additional 2030 savings from Worlds Best Technology	28%	36%	40%	25%	25%	11%	16%	0%	27%	13%	6%		11%

Table 3. Energy Consumption, Share of Energy Subject to MEPS, and Potential Future Savings for the EU, Continued.

	Industry (electricity) (TWh)								**All (TWh)**		
	Motors >1kW	Motors >375kW	Pumps	Mechanical Motion	Fans	Compr-essors	Other	**Total**	Electricity	Oil+Gas	All
Energy consumption in 2010	609	203	166	301	127	198	372	1185	2775	3082	5856
Energy consumption in 2020	634	211	173	313	132	206	388	1233	2903	3244	6147
Energy consumption in 2030	660	220	180	326	137	214	404	1284	3190	3418	6609
Energy subject to MEPS in 2010	609	0	0	0	0	0	0	609	1167	2184	3350
Energy subject to MEPS in 2020 (with pending)	634	0	173	0	0	0	0	807	2201	2268	4470
Energy subject to MEPS in 2020 (with worlds best)	634	0	0	0	0	206	0	840	2235	3144	5379
Energy subject to MEPS in 2030 (with worlds best)	660	0	0	0	0	214	0	875	2462	3299	5761
MEPS coverage 2010	100%	0%	0%	0%	0%	0%	0%	51%	42%	71%	57%
MEPS coverage 2020 (with pending)	100%	0%	100%	0%	0%	0%	0%	65%	76%	70%	73%
MEPS coverage 2020 (with worlds best)	100%	0%	0%	0%	0%	100%	0%	68%	77%	97%	88%
MEPS coverage 2030 (with worlds best)	100%	0%	0%	0%	0%	100%	0%	68%	77%	97%	87%
Additional 2030 savings from Worlds Best MEPS	17	0	7	0	7	11	0	41	145	72	217
Additional 2030 savings from Worlds Best Technology	39	10	67	65	55	54	0	289	875	268	1142
Additional 2030 savings from Worlds Best MEPS	3%	0%	4%	0%	5%	5%	0%	3%	5%	2%	3%
Additional 2030 savings from Worlds Best Technology	6%	5%	37%	20%	40%	25%	0%	22%	27%	8%	17%