# Communities of Practice: A New Approach for Coordinating Energy-Efficiency Standards and Labeling Programs

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## ABSTRACT

An expansion of individual national requirements for energy-efficient products may lead to higher compliance costs, which in turn is likely to raise further barriers to the uptake of efficient products. This paper makes the case for a greater degree of international co-ordination amongst those involved in designing and implementing energy efficiency programs around the world, with the aim of promoting harmonisation. Additionally, it proposes a mechanism for such co-ordination: "Communities of Practice", which can serve to link together experts in different locations and nations through the sharing of e-mail, documents, and proposals for coordinated international action. These communities can act as a medium for exchange of information and discussion of proposals for coordinated international action. Their advantage over the regular exchange of e-mail is that they provide an open, transparent, and inclusive platform, and can thus result in more informed and broader input into policy and regulatory decisions. Led by Australia, two international Communities of Practice are currently being tested for two product types: compact fluorescent lamps (CFLs) and TV set top boxes.

## Introduction

Until a few years ago, national or regional energy-efficiency programs tended to be developed with little or no interaction with similar programs in other countries or regions. Program managers commissioned national market studies and assessed the benefit-cost implications of regulating energy-efficiency levels for equipment and appliances. Many good ideas and best practices were swapped at conferences, and in the process many excellent programs and initiatives were spawned. As might be expected, the programs that resulted tended to be well suited to the interests of local manufacturers, suppliers, and customers.

Over the past few years it has become increasingly apparent that globalization has hit the world of energy efficiency. On the one hand, a growing number of countries are designing a range of different national programs to improve the efficiency of products; while on the other, there are suppliers dispatching products to markets in all corners of the globe. Not only are markets spread far and wide, but the development cycle for new products (if not new technology) is now far shorter.

The situation is most starkly apparent in the world of consumer electronics and office equipment; where it is not uncommon to see new models appearing every six months[1]. This contrasts with the traditional product development cycles for wet goods, where models may stay in the market for five years or more.

This situation presents particular challenges for those interested in stimulating the market for more energy efficient products. For example, how should governments meet national

[1] Although the basic product design does not change as frequently.

requirements in the context of this global marketplace, without creating barriers to trade and excessively increasing compliance costs? How do programs aimed at providing information on the performance of products to consumers remain up to date when new models are entering the market with such frequency?

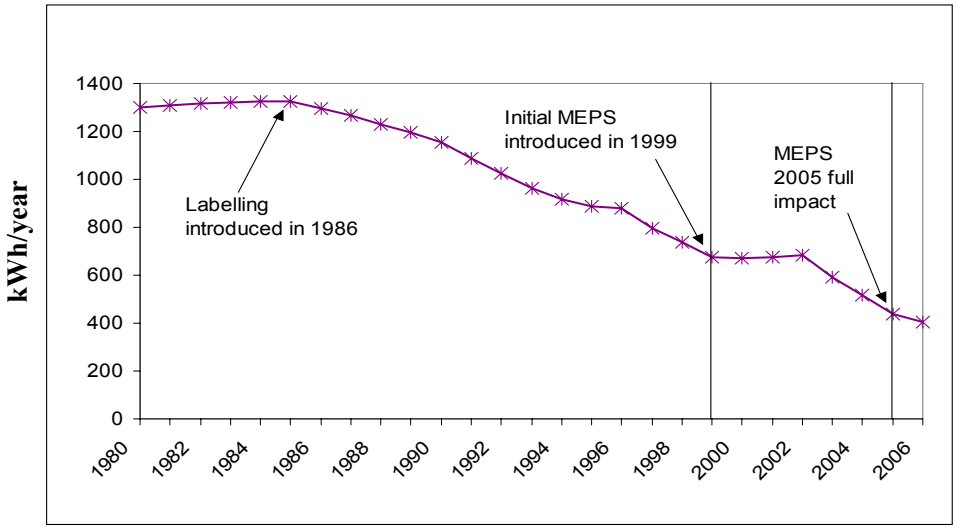
This paper explores some of these challenges for governments and industry, and also raises some possible solutions. In doing so, it draws heavily on the evolution of energy-efficiency policy in Australia over recent years.

## The View from Australia

### The Benefits

The Australian Government has approximately 15 years of experience in the implementation of regulations for energy efficiency. These regulations now cover a range of domestic and commercial appliances, and they have proved to be a reliable and effective policy mechanism, ensuring that energy savings are achieved and sustained over a long period (NAEEEC 2005a). The case of the domestic refrigerator is a good illustration, as shown in Figure 1.

**Figure 1. Graph (kWh/year) of Average New Family Refrigerators Use 60% Less Power in Australia than 20 Years Ago**




Source: Australian Greenhouse Office

These regulations on end-use equipment in Australia have also proved to be extremely cost effective. Regulation *saves* on average $US 20 for every tonne of carbon abated[2] as compared with other greenhouse gas abatement projects that *cost* between US$ 30 – $400 per tonne of saved carbon (NAEEEC 2005b).

[2] Net present value at a 10% discount rate.

By 2020, the cumulative impact of regulations on end-use equipment will reduce carbon emissions by more than 200 million tonnes and save the Australian economy around $US 4 billion (NAEEEC 2005b).

**Evolution of Australia's Regulation Policy**

In setting regulated performance levels, the Australian government policy has evolved. Initially, the Government focussed on products in the local market – identifying the range of performances exhibited and picking an appropriate threshold for the minimum energy performance level (or in the case of label, appropriate threshold levels for each star rating category).

This approach worked well initially, and was indeed common practice in other countries, but it begged the question: "What if technology used in Australia was less advanced than in other parts of the world?". The problem with the existing regulatory process was that we had no incentive to compare products in Australia with those used elsewhere.

As in many other fields, the Australian Government took the position that there is no reason why Australia should not benefit from the best technology available, so long as it was being used successfully in a similar economy. Policy was therefore altered, and the strategy for setting energy-efficiency requirements became one of matching *the most stringent regulated efficiency levels in force in a major trading-partner country*.

As a result of this change, Australia currently has a policy of matching "international best regulatory practice" when developing new MEPS and labeling requirements. The Australian approach is that its MEPS levels should not be lower than any other economy – or stated another way, if a product is made in Australia, it should meet the energy and environmental criteria and be able to be sold in any market in the world (NAEEEC 2001).

This policy position also acknowledged that Australia, as a country with a population of 20 million and only 1% of the world's manufacturing industry, imports the majority of its consumer products. Nor are these products made for our market: Australia generally receives products that are primarily designed for Europe or Asia, which have similar electricity supply conditions. Australia has always had a limited capacity to influence product design and performance and now in a global market, that capacity has further diminished. Since it is such a small market, there is a danger that if Australia sets its performance requirements too high, suppliers may simply opt out of this market, reducing the choice of products available. This is why a policy to match the performance of the best products in the world makes sense for Australia at the current time.

This policy does require that considerable analysis of overseas programs is undertaken prior to the adoption of efficiency levels. In particular, attention is given to the requirements in place in countries that represent Australia's major trading partners.

During this process, Australia has become increasingly aware of the diversity in test methods and energy performance requirements for a wide range of products. For example, a recent survey of mandatory and voluntary performance requirements for compact fluorescent lamps (CFLs) found that there currently exist over 38 different CFL specifications or programs around the world.[3]

[3] Based on a review of the APEC Energy Standards Information System (APEC ESIS 2006), there are a total of at least 38 CFL programs or standards in place internationally: 13 minimum CFL standards are in place (9) or under

While setting national requirements is of course the right of any sovereign nation, the existence of disparate requirements almost certainly adds to compliance costs for internationally traded products. For some manufacturers, the cost of doing business is simply too much, and some markets may be limited in the products available.

Clearly, the price premium for energy efficient products is an important issue for consumers. It is sufficiently important that governments over the years have put considerable effort into reducing the barrier caused by higher capital costs, through educational programs focusing on payback periods, and through programs that offer direct incentives such as rebates and low-interest loans. Where compliance costs are raising the price to consumers, this is therefore a significant issue. It would be ironic if programs designed to promote high efficiency products were in themselves adding to costs and therefore limiting the uptake of these products.[4]

The information available at the current time does not prove the case one way or another – there is simply not enough detailed data available; however, it should be recognised as a conceivable possibility that national efficiency programs lead to higher purchase costs for some end-use equipment, and this situation should be avoided (du Pont 2005). This is further justification for supporting the harmonisation of test methods, and some rationalization of performance specifications.

Harmonisation is one of those terms that is ubiquitous and may be in danger of losing its meaning. To understand what we mean by harmonization may mean in the energy efficiency field, we briefly describe two recent projects below.

## Case Study: External Power Supplies

In 2003, Australia took the decision to begin investigating the efficiency of external power supplies -- those small black boxes used to charge mobile phones and attached to almost all electronic devices nowadays. Every household in Australia has between 5 and 10 of these devices, which remain plugged into household power outlets more or less permanently (E3 2006).

In 2004, the U.S.-based Natural Resources Defense Council (NRDC) hosted a meeting on power supplies in San Francisco. The meeting was attended by manufacturers, researchers and representatives from several energy-efficiency agencies, including Australia. In addition to the potential for huge energy savings, it was apparent that manufacturers were less interested in the actual requirements were placed on them in terms of performance, than in ensuring that these requirements were uniform across their international markets.

This was a different message to the one we'd been hearing in previous negotiations with local manufacturers of products, such as washing machines, which were not intended for export. It was our first real contact with suppliers of a mass-produced, internationally traded product with global sales of over 1 billion.

Importantly, it was also the first time that most agencies involved in energy efficiency were required to confront the need for a global response. Although there has been international

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consideration (4); 25 CFL labeling programs are in place (24) or under consideration (1); and one-third of existing programs are mandatory, while two-thirds are voluntary.

[4] To our knowledge, there has not been any systematic research done to assess the impact of energy-efficiency regulations on product costs. One recent benchmarking study of CFLs surveyed suppliers in seven countries found that the costs of compliance – i.e. efficiency testing and registration for efficiency programs -- were in the range of 1-5% of production costs (du Pont and Kumpengsath 2005).

contact between different national organisations, these links have previously been sporadic, informal, and dependent upon the personnel involved.

What has evolved over the past two years is a coalition of interested parties that undertake a coordination role, including US Energy Star, the California Energy Commission, the China Standards Certification Center (CSC) in China, the Joint Research Centre (JRC) in Europe and the Australian Greenhouse Office (AGO) (EPS IEMP 2005).

These organizations have all overseen the development of a common international test method; have undertaken tests in their own countries that have contributed to a large database of tested products; and have participated in round-robin testing of power supplies.

This large and diverse database of product performance allowed the actors to propose a set realistic performance requirements based on a larger sample than any single country would normally have at their disposal.

Early on in the process it became clear that one performance requirement would not suit the needs of the various agencies involved. For example, the U.S. Energy Star program is intended to promote the best-performing products, while Australia and California wanted to set a minimum performance level to remove the worst products from the marketplace.

Therefore, a system was devised that contains a limited number of performance requirements which, like rungs on a ladder, increase in stringency. The key elements of this system are listed below:

- Countries can still select the "level" at which to set their requirements.
- However, the number of different performance tiers is limited.
- Countries can elect to move requirements "up the ladder" in due course -- for example, after three to four years, when technology improves.
- Manufacturers benefit from a clear suite of performance targets used internationally, and applicable many years into the future.

One further element to this project is the development of a special "marking" system as an aid to compliance monitoring (see Figure 2). Comprising a roman numeral that corresponds to each performance level, this "efficiency mark" is placed on the product nameplate, alongside safety and other compliance information (EPS IEMP 2005). It is not a label for consumers, and indeed will be meaningless to most people that see it.

Yet the purpose of the "mark" is to indicate to those involved in enforcement that the product has been tested according to a unified international test method, and claims to meet a certain performance level. This gives regulators in any country the chance to make a first assessment of compliance, and provide a claim against which to check. All of this can be done quickly without resort to test reports, which are often difficult to source and may take months to track down from the parent company.

**Figure 2. Illustration of the Efficiency "Mark" for External Power Supplies**


Note: The Roman numeral "IV" in the lower left-hand corner indicates an international energy-efficiency performance category.

Two years after that initial meeting in 2004, there now exists a single test method used by all national and regional agencies running programs for external power supplies. Australia and New Zealand have published this as a national standard in 2005 (AS/NZS 4665.1:2005) and are committed to submitting this for adoption by the International Electrotechnical Commission (IEC) as an international test method.

There is also a timetable for a variety of national and regional programs in the United States, China, and Australia which are all using one of two performance specifications. The pre-existing "Code of Conduct" program in Europe will also become aligned with these other national programs within a couple of years time.

Most recently, a further six States in the US have announced that they will adopt harmonized standards for external power supplies, and China will also introduce a mandatory minimum energy performance standard. Europe is preparing minimum efficiency standards for external power supplies in the framework of the ecodesign directive.

The important points to note from this example are that all of this has been achieved in a relatively short period -- just two years. Also, there has been a remarkable degree of coordination, despite that lack of any formal agreements between the countries. And finally, this example helped to develop a workable framework – a Community of Practice -- for a system that meets the needs of manufacturers in terms of harmonized standards, without sacrificing the rights of individual nations. Without a common agreement on a transparent platform for systematically sharing information, along with periodic physical meetings to discuss and develop proposals, it would likely not have been possible to develop the trust needed to achieve the successful outcome so quickly.

It is interesting to note that along the way, the group of collaborators have also established a voluntary international agreement that may make it easier for other jurisdictions to join up to (e.g., additional U.S. States).

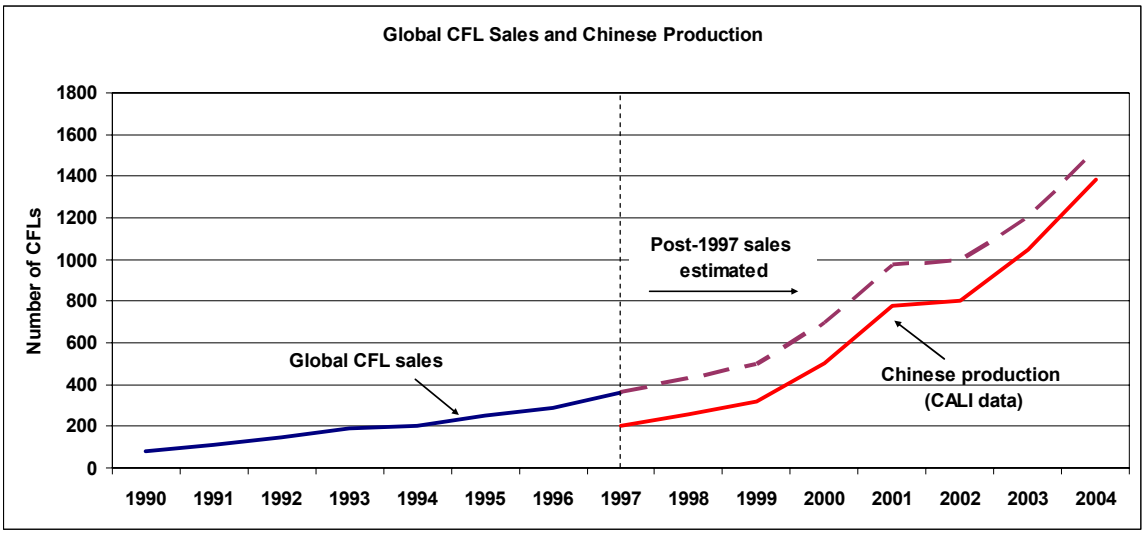
## Case Study: Compact Fluorescent Lamps

The second example concerns compact fluorescent lamps (CFLs), which have become something of an icon for energy-efficiency programs around the world. CFLs represent a nearly ideal energy-efficient solution, being relatively low-cost, easily retrofitted by householders, and leading to substantial energy and greenhouse savings (75% compared to the standard incandescent lamps they replace).

However, unlike many other energy-efficient products, the degree to which consumers accept them is determined not so much by their energy features as by other characteristics, such as lifetime, colour size, and perceived quality (Artcraft 2005). As mentioned previously, there are now a plethora of programs that aim to ensure consumers confidence in CFLs thereby encouraging their purchase in increased quantities.

The success of these programs is reflected in the phenomenal growth in sales in recent years (see Figure 3), which in turn has helped to reduce the price. In many countries the value of CFL sales now exceeds the value of incandescent lamps.

**Figure 3. Estimated Global Sales and Production of Compact Fluorescent Lamps 1990-2004**




Source: du Pont and Gooneratne 2006

The rapid rate of the growth in international trade of CFLs, and the increasing number of national programs have highlighted the variation in requirements of these different programs. In order to maintain the momentum through further cost reductions while maintaining quality, the proposal to initiate a harmonization process was put to participants at the Sixth International Conference on Energy-Efficient Lighting (Right Lights 6), held in Shanghai during May 2005. More than 80 delegates from 13 countries attended a Special Session on CFL Harmonization and the majority voiced their support in principle for the program.

At the Shanghai meeting, five Focus Areas were established, with the following specific goals over the three-year period:

- create a uniform *international testing method,* covering the performance features of self-ballasted CFLs;
- identify a number of *performance specifications* for self ballasted CFLs to facilitate international comparisons of CFL performance requirements;
- develop and initiative a program for *inter-laboratory comparison* of test results to ensure confidence in the quality and accuracy of testing of CFLs;
- propose a set of *compliance mechanisms* for CFL testing and performance regimes; and
- propose and promote these initiatives to the wider international lighting community.

There are several novel aspects to this ambitious project, which potentially reflect a new paradigm for development of energy-efficiency policy – the Community of Practice. There is no structured literature on Communities of Practice, but it appears that the term was first used by Ruopp (1993) in reference to a national experiment to link up physics teachers across the country.[5] The pilot efforts described in this paper may mark one of the first times that an international "Community of Practice" has been implemented in the field of energy efficiency.

The way in which this initiative is organized is neatly described by the term "community of practice". It is an open community, which invites participation from industry, governments and NGOs, using web-based tools to communicate and maintain a dialogue. The input is channelled through a number of "virtual working groups" on specific topics, such as performance specifications, test protocols, and compliance mechanisms. In this way the process, debate and decisions are transparent. (See http://www.apec-esis.org/cfl)

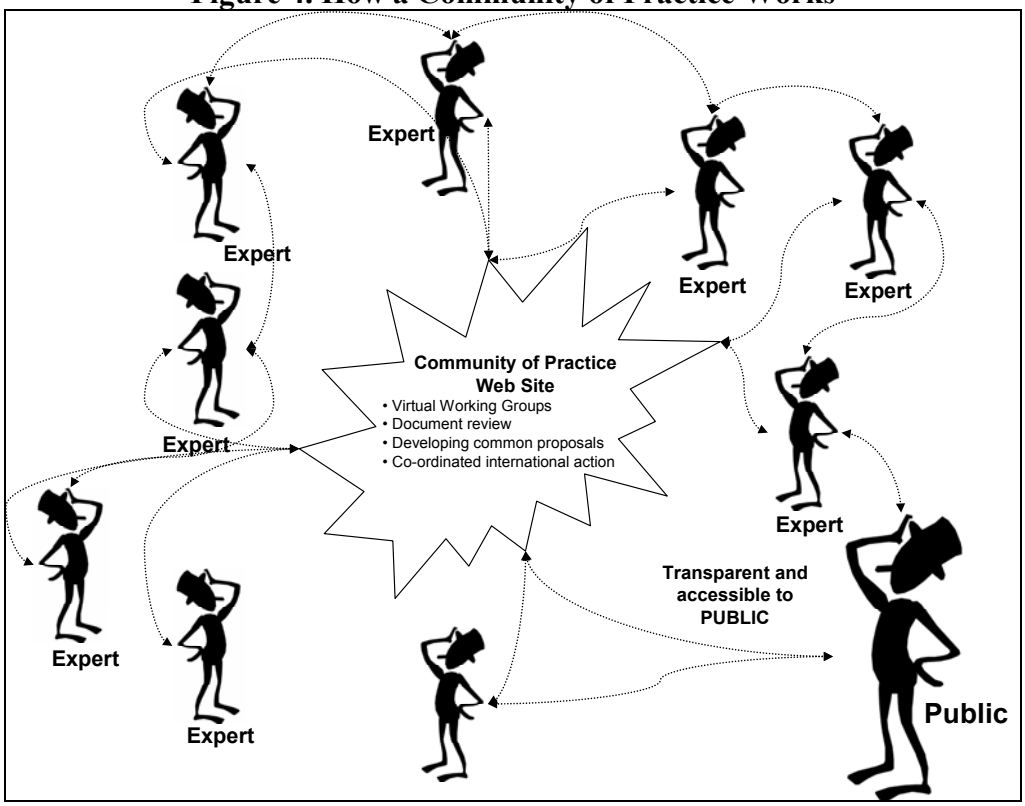
The other salient feature of this community is its focus. It is a single-product initiative, dedicated to achieving clearly articulated goals within a given timeframe. There is no intention of creating a new organization, with a structure and a need to maintain itself beyond the lifetime of the project.

This makes it a relatively low-cost exercise. In this instance, the Australian Greenhouse Office has provided some seed money, but most participating organizations are self-financing their input and support (i.e. time spent reviewing proposals and attending international meetings). A small number of previously scheduled events have been identified for future meetings where further discussion and reporting on progress can take place. Again, most organisations will be funding their attendance at these events.

The Community of Practice concept is being pilot-tested through the CFL web site, as well as through a similar web site being established to mediate a discussion on the regulation of "set top boxes", the boxes that sit on top of television, receiving signals from providers of cable TV and other related services (http://www.apec-esis.org/settopbox. The devices have large energy losses that can easily be reduced through concerted international action.

[5] Ruopp documented development of a Community of Practice in a national project called LabNet, which began in January 1989 and ended in mid-1992. During that time, some 562 high school teachers of physics from 37 states, Puerto Rico, and American Samoa were involved in network that cooperated on three levels: project-based learning and the sharing of information about the projects; regular, at least annual, face-to-face contact in meetings; and interaction via computer (peer-to-peer interaction via modem connections. Ruopp defined the concept as such: "continuous interchange about common work is the hallmark of a community of practice."

**Figure 4. How a Community of Practice Works**




What is being attempted through these Communities of Practice is an appropriate multinational response to voluntarily regulating the energy use of globally traded end-use products. Communities of Practice establish a means for coordinated policy development, but do not in themselves implement, or mandate measures – this responsibility remains with the participants, such as national governments or national or state energy-efficiency agencies. It is critical to highlight that, ultimately, these bodies retain their sovereign rights to decide on national implementation issues. However, the framework provided by the Community of Practice enables nations to readily compare performance levels of products within their country with those elsewhere (using a common test method), and to set appropriate performance requirements.

Figure 4 is a schematic diagram that shows how the Community is meant to work. The Community serves to link together experts in different locations and nations through the sharing of e-mail, documents, and proposals for coordinated international action. It acts as a medium for exchange of information and discussion of proposals for coordinated international action. Its advantage over the regular exchange of e-mail is that it provides an open, transparent, and inclusive platform, and can thus result in more informed and broader input into policy and regulatory decisions.

One of the potential benefits of this transparent "community" concept is that countries that do not currently have programs may find it easier to be linked to such an international initiative, confident that they are not taking action in isolation.[6]

[6] The need for international efficiency guidelines and specifications can be seen in the recent adoption by a number of countries of the CFL specifications put forth by the Efficient Lighting Initiative, an international, non-profit

An additional, important aspect concerning the sharing of information, which may bring considerable benefits, concerns program monitoring, verification, and enforcement. All programs currently undertake some form of compliance monitoring to ensure that program requirements are met. This is a difficult task, yet one which is vital to the integrity of all programs and to protect the investment of program participants.

In general, it is fair to say that enforcement is not given the emphasis it probably deserves, mainly because of the limited resources available. For CFLs, it is proposed that the results of any verification testing undertaken by program managers should be shared with the "Community" through the web site. Such an international database of CFL performance results will be extremely useful in determining which manufacturers and products other countries should target for verification, and will therefore help optimize the use of the limited resources available for verification activities.

## Conclusion

This paper describes the challenges caused by both the increase in globally traded products, and the growth of governmental interest in promoting greater energy efficiency levels. In this context, an expansion of individual national requirements may lead to higher compliance costs, which in turn is likely to raise further barriers to the uptake of efficient products.

This paper describes a new paradigm for international collaboration in the area of energy-efficiency product regulation: the Community of Practice. The paper describes two pilot Communities of Practice that have been used to coordinate and develop voluntary agreements on regulation of end-use equipment (external power suppliers and CFLs). It makes the case for a greater degree of international co-ordination amongst those involved in designing and implementing energy efficiency programs around the world, with the aim of promoting harmonisation.

It is suggested that "Communities of Practice" provide a focused means of achieving this objective. Based on the examples for external power supplies, and the current pilot communities for compact fluorescent lamps and set top boxes, communities of practice can provide the following:

- a means of drawing together expertise from governments, industry, NGOs, academia, etc;
- international focus on a single device, piece of equipment or appliance;
- a high degree of transparency through the use of electronic media;
- low establishment costs, and limited on-going commitment;
- international co-ordination without sacrificing national rights.
- higher efficiency products at lower cost to government industry and consumers.

It is envisaged that additional communities will be established over the next two years for standby power losses, televisions and electric motors.

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energy labeling initiative (www.efficientlighting.net). Within the past year, agencies in Vietnam; Bangalore, India; South Africa; and Uganda have developed CFL procurement programs using the ELI technical specifications.

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