Barriers to maximising compliance with energy efficiency policy

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Abstract

The acceptance of energy efficiency as an important policy tool to achieve a range of public policy outcomes appears to be gaining momentum globally. Yet at the same time, most energy efficiency practitioners and policymakers are aware of an "implementation gap", where the actual, measured outcomes of a policy fall short of its projected or anticipated energy savings. This paper focuses on one of the many causes for this gap which remains under explored, that of poor *compliance* by industry with energy efficiency policy.

The lack of comprehensive data on levels of non-compliance within energy efficiency programmes is itself indicative of the low priority given to this area in many countries. The evidence that is available suggests that non-compliance is a real problem across countries and policy types, reflecting inadequate planning and under-resourcing as well as limitations in enforcing energy efficiency policies.

The authors postulate that among the explanations for this is an unwillingness to undermine energy efficiency efforts has prevented this issue from being fully discussed and publicly reported.

This paper argues for the importance, and cost effectiveness, of addressing non-compliance in order to reach policy objectives. A better understanding of the extent of non-compliance, and the identification of a key set of activities which can improve compliance rates is required for policymakers to effectively plan, resource and implement energy efficiency policy.

Based on experience of good practice within the energy efficiency and other fields, a range of key compliance and enforcement mechanisms are highlighted.

Introduction

Many policies and measures now exist, both of a voluntary and mandatory nature, for improving energy efficiency. The continued development of this field of policy reflects growing acceptance of the importance of such measures in seeking to reduce carbon dioxide emissions, minimise the cost of energy services, enhance energy security and address wider environmental concerns. Alongside the continued evolution of energy efficiency policy measures, however, is the emergence of a gap, between expectations of what a programme will achieve and its actual, measured impacts.

One possible explanation for the 'implementation gap' is high rates of non-compliance with the requirements of energy efficiency programmes. As a result this paper presents some preliminary research undertaken over the past 12 months to ascertain known levels of compliance. This includes the presentations and findings from a workshop held at the International Energy Agency in February 2008, *Meeting Energy Efficiency Goals: Enhancing Compliance, Monitoring and Evaluation*[1] and subsequent detailed country reviews.

Policy measures designed to conserve energy take numerous forms. Some measures are designed and administered by governments, others by the private sector and yet others are the

1. Those interested in further background material can access the presentations and summary report at http://www.iea.org/Textbase/work/workshopdetail.asp?WS_ID=349.

result of public-private partnerships. In this paper, we use the term 'compliance' in a broad sense to indicate where an actor that is the subject of a policy acts in accordance with the specifications of that measure. Non-compliance may be relevant even where a policy does not create legally binding obligations since, even in the case of voluntary schemes, once an actor chooses to participate, conformity with the provisions of that scheme is important for the credibility of the scheme.

It is important to realise that compliance is not usually a black and white concept with either full compliance on the one hand, or zero compliance on the other. Rather, most programmes include multiple requirements spanning both process and performance issues, and non-compliance can occur at any of these levels. As such, this paper uses the terms optimal and sub-optimal compliance, as well as non-compliance.

This paper begins by discussing why the topic of compliance is important, before presenting selected information on rates of compliance together with evaluations of compliance and enforcement activities undertaken by energy efficiency programmes. We then address the question of why compliance does not attract more attention, and finally highlight some of the key mechanisms that can be used to improve rates of compliances.

Why is it important to address non-compliance?

At a fundamental level, the most direct consequence of non-compliance is a failure to meet policy objectives, in terms of lost energy savings, carbon dioxide and other emissions reductions. While the effect of this may arguably be reduced by ensuring that realistic levels of non-compliance are built into policy impact projections from the outset, this will nonetheless increase the cost of unit savings.

More importantly, failure to address issues of non-compliance can lead to serious long-term consequences through the erosion of confidence not only in the policy measure itself, but also in the use of energy efficiency measures as a policy tool more broadly. Many energy efficiency programmes rely upon the credibility of the scheme established over a period of time, developing a brand that industry and consumers view as reliable. Building and appliance labelling programmes are typical examples of measures that function effectively only because consumers trust that the information provided is accurate. Instances of non-compliance, which can even amount to misleading conduct in some instances and lead to consumers paying for performance that they do not get, can seriously erode this trust. There is considerable evidence that consumers already require short payback periods and heavily discount future savings, so that the addition of further risk (that savings will not be realised) may make investment in energy efficiency even less attractive. Moreover, once credibility is lost it requires a considerable effort to re-establish.

For industry, a lack of adequate compliance frameworks penalises the compliant industry participant, through a loss of economic returns and competitive advantage, leading to a disincentive to invest in innovation. For example, a manufacture or housebuilder may participate in a voluntary labelling programme on the understanding that by investing in meeting the scheme requirements their products will be eligible for labelling or certification, and this will provide a marketing advantage over non-participants. However, if there is a lack of compliance verification, non-compliant product may be labelled or certified, and the supplier of the compliant product is disadvantaged. Conversely, if non-compliance is rife, this only reinforces the perception that previously compliant product should be de-engineered to lower cost without a corresponding lowering of the associated performance claims – so as to remain competitive. With reasonable enforcement activity built into the policy, the vast majority of participants would not seriously consider such an option.

Further issues arise from non-compliance. In some cases, consumer safety may even be jeopardized by non-compliance, for example where insulation materials that do not meet required standards lead to an increase in damp conditions or lower indoor temperatures, while windows that do not meet glazing standards might be more likely to shatter than those that do (Barnsley et al, 2008).

These issues demonstrate that significant rates of non-compliance can pose serious risks. On the evidence available, improving compliance rates may be a highly cost-effective means of accessing further energy efficiency resources, as compared to developing totally new measures to meet policy objectives.

What do we know about levels of compliance?

Considering the growing number of energy efficiency programmes, and the large amount of analysis and discussion on aspects of their design and implementation, it is surprising that more space note is devoted in the literature to the topic of compliance. The rate of compliance with any policy measure is a key input for the evaluation of programme effectiveness and value, and therefore of great significance. Despite this, there is a considerable lack of comprehensive, publicly available data on the rates of compliance with particular policy measures.

Since much of the evidence regarding non-compliance is piecemeal, this section provides a number of examples from different regions where attempts have been made to quantify compliance rates. Although it is not possible to present a more comprehensive picture at this stage due to the lack of data, the paper seeks to stimulate further work in this area.

In the context of an energy efficiency programme, it is important to understand that a programme can have several layers of requirements and a corresponding number of elements that provide an opportunity for non-compliance. For example, an appliance labelling scheme often requires suppliers to provide a designated authority with product information which may or may not include a report on the product performance from a laboratory according to a specified test methodology. Within this process there is scope for products to be non-compliant with any or all of these elements. In most cases, products must then be correctly labelled according to the information provided. There may be stipulations on where labels are to be attached to products, the time when new stock must be labelled, and who is responsible for undertaking the labelling. Finally there may be requirements on retailers to carry labelled stock, or to train staff to provide consumer advice relating to the label.

Other regulatory measures for appliances or buildings, such as mandatory building codes, tend to have similar quantities of compliance elements. While different types of programmes may have more or less layers, most energy efficiency schemes

Table 1: Record of check tests and the results undertaken between 2004 and 2007 (NAEEEP, 2005; E3, 2006, 2007a, 2007b)

Year	Number Tests	Failed Screen test	Deregistered
2004 (AU)	58	28	11
2005 (AU & NZ)	40	24	10
2006 (AU & NZ)	18	13	9
2007 (AU & NZ)	85	35	10

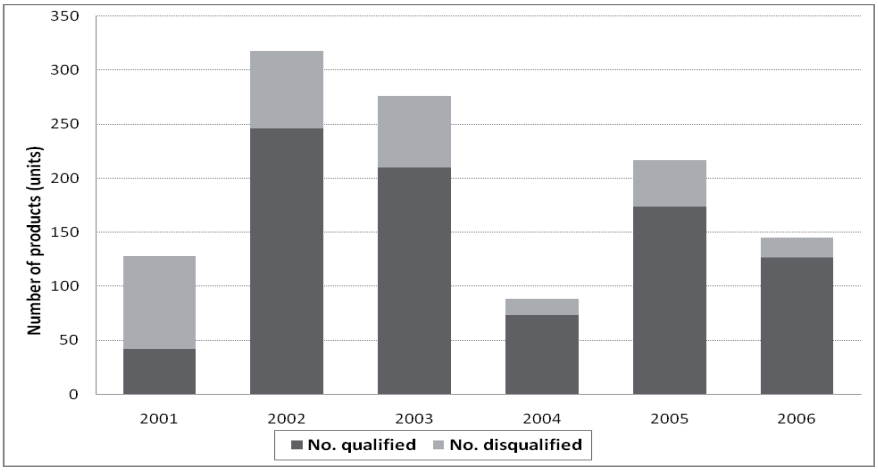

Figure 1: Results of product performance testing, 2001-2006 (CLASP, 2007)

have multiple requirements placed on participants. This highlights the potential complexity of ensuring and monitoring compliance, and the importance of having a comprehensive compliance framework or regime with the means to verify compliance with *all* compliance components.

It should be noted that the following examples have not been singled out because they indicate the worst practices, but simply because they comprise some of the few pieces of publicly available analysis. Indeed, the fact that this information is available confirms that these programmes have some sort of a compliance regime or are at least concerned about the issue. It is a reasonable supposition that the compliance rates indicated in these examples may well exceed those programmes that do not undertake enforcement activities or where no data is published.

AUSTRALIA AND NEW ZEALAND

Australia and New Zealand have a long established and comprehensive compliance regime in support of their equipment energy efficiency programme, which has resulted in some well publicised enforcement actions. Overall, nearly 800 appliance models have been tested in laboratories with a 35% rate of non-compliance. Between 2004 and 2007, that rate climbed to 50%, with 201 = products tested failing an initial laboratory verification test, as shown in Table 1. Although it should be noted that the products selected for testing were identified as having a higher than average risk of non-compliance compared to the whole stock, nevertheless this data indicates that the rate of non-compliance is significant.

Adjusting these results for market share, Australian and New Zealand regulatory authorities suggest that the sales-weighted non-compliance rate is closer to 20%. Even if these estimates are correct, it is not considered acceptable for the community at large for one out of five products to be non-compliant. In response, these governments have ramped up verification testing in 2009 to include 4,000 lamps and 1,000 other electrical products, both being orders of magnitude more than historic testing levels.

CHINA

Failure to meet energy conservation standards in the construction of new buildings has been highlighted by the Vice-Minister for Construction (Baoxing, 2008), and subsequent information suggests that only 53% of new buildings in China meet national requirements (Reuters, 2008). In addition, the Chinese central government announced that 14 provinces had not complied with energy conservation rules in April 2007 (French, 2007).

In the electrical appliance field, approximately 1,200 products have been tested between 2001 and 2006, with an overall compliance rate of 75%, as shown in Figure 1. Although compliance rates appear to be improving, CLASP has noted that the sample sizes are small in comparison with the number of products produced and sold in China, and that the total budget for product testing in the fields of household appliances, home electronics, and lighting is small, totalling about USD 72,000 per annum (CLASP, 2007).

In 2006, CNIS conducted testing on 48 sample refrigerators and room air-conditioners purchased from retail markets in Beijing, Heifei, and Guangzhou, and tested in three national test laboratories. A similar exercise was undertaken in 2007 for a total of 73 refrigerators, air-conditioners and clothes washers. In 2006, 11 out of 43 products (26%) were found to be non-compliant: a situation which appears to have improved by 2007 when only 4% of products failed (Zhou, 2008).

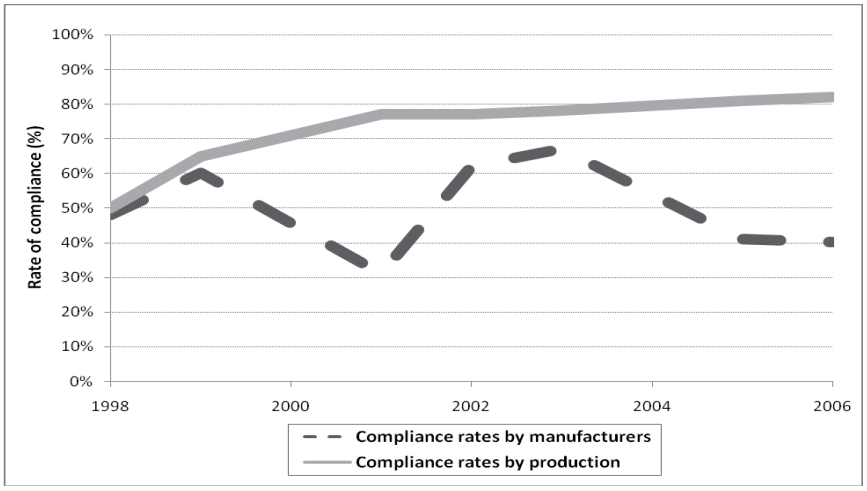

Figure 2: Results of NSI testing on CFLs, 1998-2006 (NLTC, 2008)

Table 2: Test results on sample of European air-conditioners (Falcioni, 2008)

Model	*Declared Capacity (kW)*	*Measured Capacity (kW)*	*Declared energy consumption (kWh)*	*Measured energy consumption (kWh)*	*Declared energy class*	*Measured energy class*
1	2.62 (cool)	1.87	335	458	C	F
2	2.62 (cool)	1.78	335	463	C	F
3	3.70 (cool)	3.61	575	609	A (cool)	C
	4.10 (heat)	3.73			B (heat)	D
4	2.60 (cool)	2.24	405	466	A (cool)	F
	2.80 (heat)	2.57			A (heat)	F
5	2.60 (cool)	2.19	405	450	A (cool)	E
	2.80 (heat)	2.57			A (heat)	F
6	3.508 (cool)	2.68	625	654	A	F
7	3.508 (cool)	2.72	625	660	A	F
8	2.41 (cool)	2.03	505	527	C	F
9	2.41 (cool)	2.00	505	528	C	F

In addition to the verification activities identified above the Chinese government has implemented a National Supervision and Inspection (NSI) programme for CFLs since 1998. Figure 2 shows the results of testing for the period from 1998 to 2006, indicating that although the proportion of CFLs that complied with energy (and other) performance requirements has grown, the rate of non-compliance was still nearly 20% by the end of this period (NLTC, 2008).

EUROPE

Although there is little publicly available data on measured compliance rates with European directives on energy efficiency, an independent review into compliance activities by EU member states in relation to energy performance labelling requirements for appliances was undertaken in 2006-7 (ANEC, 2007). This study found that there was insufficient centralized collection of compliance data making it impossible to quantify the extent and effects of the compliance 'problem', let alone undertake analysis that might identify repeat offenders.

Additionally, the review found a high degree of variation in verification and enforcement activity among the nine member states interviewed. A minority of countries reported market surveillance activities in shops and, where information was available, a significant number of products appeared either unlabelled or incorrectly labelled. In most countries, an inadequate number of products were tested to check that the label rating was correct, and very few countries appeared to pursue compliance problems when these were brought to attention. This may be explained by the fact that no regular or sufficient budgets are allocated to product testing in the nine EU member states studied.

Despite the lack of comprehensive monitoring, a number of isolated tests indicate that rates of non-compliance with energy labelling in Europe may be high. For example, industry tests on nine labelled air-conditioners shown in Table 2 highlights major discrepancies between the performance of products purchased by consumers and that indicated by energy labels. This data also shows that, even when the allowable tolerances of 15% are taken into account, most of the nine products were labelled incorrectly.

JAPAN

The first example from Japan relates to the monitoring and evaluation of energy efficiency programmes, and demonstrates that the maintenance of relevant test methodologies can be seen as an integral part of a comprehensive compliance process. It

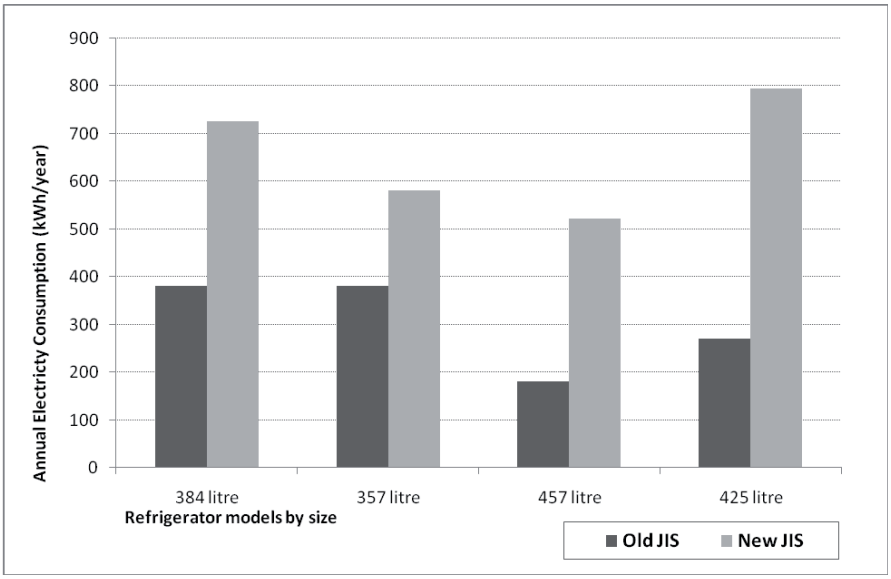

Figure 3: Comparison of energy consumption values based on original and new version of JIS 9801 (Saito et al., 2008)

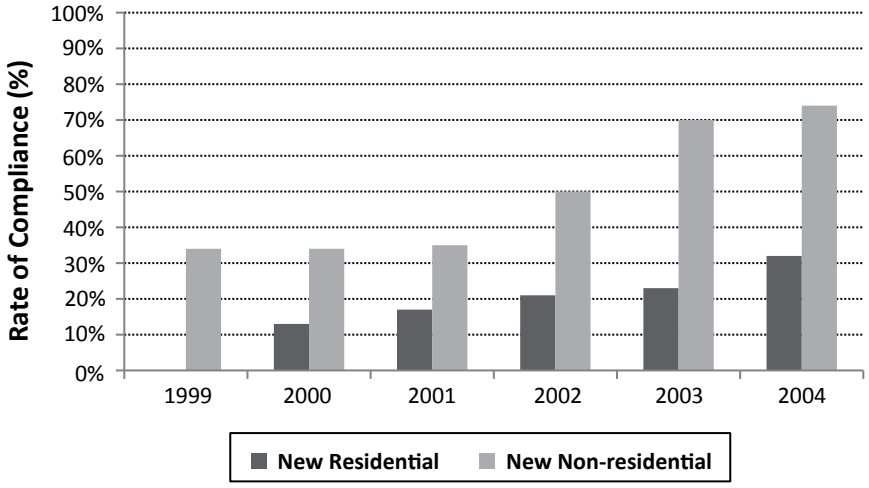

Figure 4: Compliance rates of new buildings with 1999 energy conservation standards in Japan (Yoshino, 2008)

does not shed light on compliance rates, but is an illustration of the need for vigilance in ensuring that test methodologies accurately reflect real usage patterns when the outputs are used to estimate end-use consumption.

In 2004 the average consumption of refrigerators was assessed to have fallen by 55.2% from 647.3 kWh per annum to 290.3 kWh under the Top Runner programme (according to the test methodology, JIS 9801). However, concerned that in-house electricity consumption did not appear to be falling as quickly as these results would suggest, consumer groups surmised that the test method did not provide a good reflection of the energy consumption of modern refrigerators as they were being used in Japanese households. A number of tests by the Japanese Consumer's Association and the National Consumer Affairs Centre of Japan between 2001 and 2004 confirmed this view. This was further verified by the Jyukankyo Institute, which monitored major appliance usage in 96 households, finding that the average consumption of refrigerators and freezers was 65% larger than the value indicated by the JIS test (JRS, 2006).

A comparison of values obtained under the previous and new JIS test method has been undertaken by the Japanese Electrical Manufacturers' Association (JEMA), and results illustrated in Figure 3. One of the issues this highlights is that the discrepancies are larger for products with a capacity above 400 litres, which is particularly significant since the market for larger refrigerators has been growing rapidly in Japan.

It should be noted that since the problem became evident, manufacturers and governments have worked extremely quickly to implement revisions to JIS C 9801, thereby limiting a potentially serious loss of credibility among consumers and other stakeholders. It has, however, raised an important issue for the many countries that rely on the results of laboratory performance tests for a range of appliance types to make appraisals of programme achievements.

The second example from Japan shows the rates of compliance with 1999 energy conservation standards for new buildings from 1999 to 2004. As shown in Figure 4, compliance rates for the mandatory non-residential requirements reach just over 70% by the end of this period, while just over 30% of residential buildings meet the voluntary residential code.

Table 3: Summary of building measure non-compliance estimates in California (Quantec, 2007)

Building Measure	*Estimated non-compliance rate*	*Precision of estimate*
Residential		
Hardwired lighting	28%	3%
Window replacement	68%	7%
Duct improvement	73%	1%
Non-residential		
Lighting control under skylights	44%	10%
Cool roofs	50%	3%
Bi-level lighting controls	n/a	n/a
Ducts in existing buildings	100%	2%
Duct testing/sealing in new buildings	100%	1%

Table 4: Summary of appliance measure non-compliance estimates in California, 2006 (Quantec, 2007)

Appliance Category	*Estimated non-compliance rate*	*Certainty level of estimate*
Televisions	41%	Medium
DVD players	57%	Medium
Residential pool pumps, tier 1	15%	Medium
General service incandescent lamps, tier 1	27%	Medium
Metal hallide luminaires	37%	Low
Walk-in refrigerator/freezers	0%	Medium
Pre-rinse spray valves	4.2%	High
Unit heaters and duct furnaces	44%	Low
Refrigerated canned/bottled beverage vending machines	63%	Low

UNITED STATES

California

A thorough examination of compliance rates with Californian building codes and Title 20 (mandatory) requirements for appliances was undertaken in 2006, with the results shown in Table 3 and Table 4. Generally non-compliance rates varied considerably by measure: in some cases this can be explained by the different lengths of time that measures have been in force. Nevertheless, for such a long-standing and well-publicised programme, these levels of non-compliance are surprisingly high.

Energy Star

An evaluation report by the Office of Inspector General in 2007, noted that Energy Star began verification testing in 2002, some ten years after the programme began (OIG, 2007). Between 2002 and 2006, a total of 311 units had been tested out of the estimated two billion Energy Star products sold since 1992, and 160 of the 44,000 qualified models.

Although this report did not cite the results of these investigations, other sources state that tests in 2007 found a 0% failure rate by 15 computer monitors, a 9% failure rate by 11 air cleaners, and a 20% failure rate by 10 light fixtures (Egan, 2008).

In addition, during 2007/8, 40 compact fluorescent lamp (CFLs) models and over 1,000 lamps carrying the Energy Star label (version 3) were tested as part of an international investigation into CFL performance. The results showed that 33% of the models claiming compliance with the Energy Star criteria failed to meet one or more of the required criteria, and hence would have failed verification testing (DEWHA, 2008).

The OIG report highlighted the need for the introduction of more formal quality assurance processes to *"help protect the integrity of the Energy Star Program"*, noting that it relied too heavily on voluntary industry certification programmes and Federal government oversight without evidence that these were effective. The OIG also noted that in 2006, only 0.38% of the programme budget was allocated for verification testing, and suggested that further resources should be diverted towards quality assurance activities.

As an indication of the rising status of energy efficiency programmes, the OIG stated in a second report in 2008: *"The accuracy of the program's reported energy savings is important in monitoring the United States' efforts to reduce greenhouse gas emissions"* (OIG, 2008). OIG called on Energy Star to adopt more accurate monitoring mechanisms in order to evaluate its performance and substantiate claims of energy and greenhouse savings.

SUMMARY

While a lack of available information on energy efficiency programmes makes a comprehensive analysis of compliance rates impossible at the current time, this snapshot suggests that incidents of non-compliance are widespread, even within mandatory programmes. At the IEA workshop in February 2008, participants postulated that non-compliance rates are com-

monly between 25% and 50%. Both the examples shown at the workshop and above appear to support this view.

Based on the research undertaken by the authors over the past 12 months, the major reason for higher than expected rates of non-compliance is the lack of appropriate activities undertaken in support of energy efficiency programmes. Some programmes do little or no regular market surveillance, while others fail to follow-up on instances of non-compliance. Commonly the arrangements for enforcement are too cumbersome to be practical, or appropriate powers are lacking. Moreover, measures to *facilitate* or help obligation holders to comply are often limited. Although most programmes undertake some of the monitoring and verification activities required, very few programmes can claim that they have a well-planned and comprehensive regime in place.

There are several examples of good practice in particular areas of compliance work or enforcement, however there have been very few attempts made to systematically share these experiences with other programmes.

Looking forward, there are indications that policy makers and programme administrators are becoming more aware of the need to treat the issue of enforcement more seriously. Around the world, budgets have increased over recent years and there appears to be greater attention given to achieving compliance in the design of new policy measures. For example, the European Ecodesign Directive is far more specific about the requirements placed on member states with respect to verification and enforcement activities than previous energy efficiency directives.

Why doesn't compliance attract more attention?

There are a plethora of reasons why more compliance activity does not occur, some of which flow directly from a lack of resources devoted to the area, while others are more related to the allocation of powers and responsibilities. Almost all are symptomatic of the lack of priority given to the implementation of energy efficiency policies and measures.

The 2008 IEA workshop highlighted a long list of common deficiencies that require improvement before programmes are able to be adequately monitored and enforced. These included:

- A lack of adequately trained staff to make conformity assessments;
- Insufficient budget to undertake verification activities, including field and laboratory tests;
- Jurisdictional conflicts resulting in unclear allocations of responsibility;
- Programme staff torn between the development of new policies and the 'maintenance and implementation' of existing measures;
- A lack of appropriate enforcement powers and processes; and
- Poor awareness of requirements among target audiences;

Although serious in themselves, these barriers arise because of more fundamental issues which mean that the importance of compliance activities, and the related opportunity to increase energy savings, is rarely articulated within discussions among policy makers.

The authors speculate the following are possible explanations:

- There is little available data or information on the extent of the missed opportunity represented by non-compliance, and the potential costs and benefits of making substantial improvements to the rate of compliance. Not only does this reflect a general failure to monitor compliance in a systematic manner and to evaluate existing policy measures, it makes it difficult to present a compelling case to policy makers.
- Most people who work with energy efficiency programmes recognise that there is a level of sub-optimal compliance that takes place, either within their immediate sphere or elsewhere. However, there may be unwillingness on the part of these often very committed staff to identify any shortcomings since this may bring their programmes into disrepute and jeopardise the resources made available in the future.
- Governments or their representatives may be hesitant to admit publicly that greenhouse gas or energy efficiency targets may not be accomplished, or that policies are less successful than intended lest it weakens their political status or negotiating position. This may apply within the local political arena or in the field of international relations and negotiations.
- There appears a structural division between policy development and implementation in most countries. Often very considerable effort is put into the initial processes to establish policy measures and these resources are then diverted elsewhere once the policy has been 'signed off'. In many instances there is little understanding on the part of policy makers of the enforcement activity required to deliver an acceptable level of compliance with the policy.

These issues mitigate against a serious consideration of the problem of sub-optimal compliance. Unless they are addressed, the resources required to substantially improve compliance will not be forthcoming.

What do we know about improving compliance?

The task of building a comprehensive compliance regime can appear daunting, considering the quantity and geographical spread of stakeholders and products, and the number of elements that need to be monitored, verified and, in some cases, passed on for enforcement action. There also can be considerable costs involved, not only in terms of staff time, but also in establishing test facilities, commissioning tests and surveillance activities, and the analysis of results, among other expenses. While the task of increasing compliance activities should not be downplayed, it should be noted that the scale of additional energy and greenhouse gas savings available (as indicated in the previous section) suggests that investment in compliance and enforcement regimes is likely to be highly cost-effective.

As mentioned previously, there is a growing body of experience on compliance and enforcement, drawn from within the

energy efficiency arena and from environmental programmes facing similar issues. The following points are derived from this knowledge base and are considered as elements of a comprehensive compliance regime.

DESIGNING FOR COMPLIANCE

Ensuring that, at the time of its formulation, a policy measure is clear about the type and level of compliance expected is the first key step to ensuring optimal compliance. In the case of the former, various actors could potentially be liable and the policy must make clear whether it is the manufacturer or seller, builder, owner or occupier that is responsible for compliance.

This needs to take into account the needs, resources and activities of the intended policy subjects, and potential barriers to implementation, in order to avoid making a policy measure overly complex, or difficult the intended subjects to understand how to comply (Klinkenberg, 2006; UEAPME, 2007). The costs of compliance, in terms of technical, financial and/or human resources, may be too burdensome for the intended subjects. Related to this, the lead time for commencement of the policy, if too short, can exacerbate compliance difficulties for some actors (World Energy Council, 2007). First, consultation with stakeholders is worthwhile, particularly when there is significant variation in terms of the capabilities and interests of the intended subjects of the policy measure, such as where the subjects range from large, multi-national enterprises to micro businesses. Consultation may thus help to achieve stakeholder buy-in and awareness, thereby indirectly facilitating implementation. Relevant stakeholders include more than the intended subjects of the policy measure to include, for example, consumer groups.

Second, policy makers should consider the particular mechanisms and resources necessary for monitoring and enforcing compliance from the outset, and determine who is responsible for co-ordinating these activities. Responsibility for market surveillance and verification testing usually rests with the policy administrator or enforcer, though this responsibility is frequently delegated to decentralized agencies. Consumers, retailers and manufacturers can also play a role. The Office of Enforcement of the US Federal Energy Regulatory Commission, for example, runs an Enforcement Hotline via which it receives information about behaviour that might be inconsistent with regulations. In the appliances and equipment sector, manufacturers and industry associations regularly conduct tests for the purposes of evaluating each others' energy performance declarations.

FACILITATING COMPLIANCE

Lack of awareness about a policy among its intended subjects can significantly hinder the chances of optimal compliance. Similarly, capacity issues may affect compliance rates, in particular insufficient skills or resources necessary for complying. Compliance cannot be viewed by policy formulators as a matter that is solely the responsibility of the policy subject. If a policy exists to achieve some kind of underlying 'good', then maximizing compliance is everybody's business. Moreover, it is ultimately the policy creator and/or administrator that will (theoretically) be held accountable if a measure does not meet its intended objectives

The designation of resources and the creation of mechanisms for arming obligation holders with the knowledge and means necessary to comply with a policy measure is thus an important component of an effective compliance framework, and one which is often overlooked. All manner of mechanisms can be employed, such as policy guides, telephone help lines, petition procedures, compliance manuals or other awareness raising measures. Importantly, such measures should be updated after the policy enters into force to ensure they take account of new knowledge.

Policy administrators may also wish to hold consultations with policy subjects throughout the implementation phase. This may help to identify compliance-related problems, clarify misunderstandings and encourage ongoing support for the measure (Schakenbach et al., 2006). Similarly, fiscal or financial incentives are often a useful tool to foster awareness of energy efficiency measures.

TRANSPARENCY INCREASES COMPLIANCE

There are good reasons why energy efficiency programmes should actively publicise both the details of their compliance activities and the results of their enforcements actions. Providing stakeholders with details of compliance and enforcement activity makes subjects aware that that any transgression will be discovered and provides a tangible demonstration of the commercial risks of non-compliance.

However, it is unfortunate that some programme regulations, contractual obligations and arrangements with third-party assessment agencies specifically inhibit programmes from providing information to the public or other stakeholders. In addition, the public reporting of non-compliance is unattractive to some administrators of voluntary programmes, perhaps because of the need to balance competing considerations like compliance with encouraging new participants to join.

This type of thinking however is short term as it fails to give due weight to the damage to the programme and to other participants of allowing some elements to flout the rules. Indeed, anecdotal evidence exists that if participants observe non-compliance by others not being sanctioned, it is a reasonable for them to extend their own implementation gap for their products.

As a result, while there may be reasonable commercial reasons for limiting specific data that is made public, this should not prevent reporting the extent and frequency of compliance and enforcement activities undertaken, and the overall results, even though specific details may remain confidential.

The threat of public notification of non-compliance can also be an effective enforcement tool, with companies keen to avoid the type of adverse publication that may negatively impact on their brand image.

ENFORCEMENT

Effective enforcement regimes require a multi-layered approach, with the ability to identify breaches and respond in a manner commensurate with the transgression. Making all stakeholders fully aware of their responsibilities upon induction into the scheme and undertaking market surveillance are relatively low-cost activities that can minimize enforcement action, however, these are only effective when backed up by a willingness to use appropriate sanctions when required.

In addition to the application of sanctions that 'fit the crime', some level of enforcement action needs to available to remedy transgressions speedily to account for the transitory nature of some suppliers, and to allow the marketplace to place its own value on non-compliance. Being seen to deliver timely action is particularly important where competitors suffer damage from the unfair marketing of non-compliant products.

While it is important that enforcement power exist as a threat, once stakeholders become aware that governments (or other agencies) are willing to use these, they may be required only sparingly. For example, in Australia after proven failure to comply for five separate models, LG was referred to the Australian Competition and Consumer Commission (ACCC) and in September 2006 agreed to compensate customers for increased electricity costs to a value of up to AUD $3.1 million. In addition, LG made undertakings to publish corrective notices and improve their in-house compliance regime (ACCC, 2006).

Demonstrating that a little enforcement action goes a long way, following publicity regarding the LG case, two major suppliers have voluntarily announced incidents of non-compliance during 2007. As an indication of corporate responsibility, Mitsubishi Electric and Carrier Air-Conditioning informed the Australian Greenhouse Office that a small number of models had been incorrectly labelled, and that they were voluntarily withdrawing them from the market and recompensing consumers to the value of additional operating costs (E3, 2007c).

LOCAL AND INTERNATIONAL CO-OPERATION

Many energy efficiency programmes have developed relationships with other local agencies, government departments, consumer groups and trade associations in order to work co-operatively towards meeting similar aims and reduce costs. Typical examples include the organisation of combined market surveillance activities with staff responsible for checking with safety requirements, or the use of customs powers to monitor compliance of imported stock at the point of entry.

Similarly, the cross-jurisdictional sharing of information on experiences in ensuring effective compliance and evaluation can facilitate increased compliance rates in other countries or improve the effectiveness of similar measures elsewhere. This has been recognised in the environmental sector, where there is a growing body of empirical literature that seeks to identify and respond to the major barriers to effective compliance (see the various studies referred to in Zaelke et al., 2005). It has also been recognised within the energy efficiency sector itself, with the international conference "Delivering Energy Efficiency?" (Energy Charter Secretariat, 2007) noting the need to *"[r]eview periodically and exchange information on institutional developments and successful approaches to strengthening the development and implementation capacity for energy efficiency programmes both at national and local level?*" (Energy Charter Secretariat, 2007).

Practical examples of co-operation include the joint production of a handbook on best practices in market surveillance by European market surveillance authorities in 2007/8. In 2006, the European lamp industry, under the guidance of the European Lamp Companies Federation, supported the creation of ICSMS, an internet-based information and communication system to enable the exchange of information and joint operations for all authorities involved in the market surveillance of lamps. The system is open to the public so as to provide individuals with further information on products (ELCF, 2006).

Particularly in the field of internationally traded appliances, the opportunity to improve compliance through the sharing of verification information amongst energy efficiency regulators has not yet been fully explored, however there is considerable potential for regulators use information on non-compliant products in other jurisdictions to better target their own resources. For example, LG refrigerators in the US were found to have been wrongly labelled as Energy Star compliant as a result of incorrect testing procedures (DOE, 2008). This raises the question of whether similar issues arise in other markets where LG products are sold and suggests a role for greater co-operation between governments and their agencies in respect to sharing information on compliance issues, particularly in respect of multi-national suppliers.

In addition, there is benefit in sharing enforcement outcomes amongst enforcement agencies. For example, in addition to fines, product recalls and other penalties, there are instances in Australia and now in the US, where agreements have been reached to recompense consumers for the value of foregone energy savings as a result of incorrectly labelled appliances. Awareness of the range of agreements reached in other jurisdictions may help agencies in their dealings with instances of non-compliance.

Conclusion

The gathering of publicly available data on compliance rates from different regions suggest that incidents of non-compliance are widespread, and supports the view that non-compliance rates are commonly between 25% and 50%. Further, it is evident that the major reason for higher than expected rates of non-compliance is the lack of appropriate compliance and enforcement activities undertaken in support of energy efficiency programmes. Very few programmes can claim to have a comprehensive, transparent regime in place.

This represents a substantial missed opportunity in terms of energy and greenhouse gas savings, and jeopardises future savings from energy efficiency policy measures as other stakeholders lose faith in the credibility of programmes. A further risk is that policy makers lose confidence in the abilities of energy efficiency policies to deliver projected savings; if the purported cost effective abatement opportunities presented by energy efficiency programmes must be heavily discounted then the attractiveness of these measures will be reduced.

These are particularly serious risks at a time when governments are increasingly looking to energy efficiency to help meet policy objectives to reduce carbon dioxide emissions, minimise the cost of energy services, enhance energy security and address wider environmental concerns.

On the evidence available, it would appear that the lack of compliance activity results from a widescale under-investment in the field, a lack of clear delineation of responsibilities, insufficient authority and real or perceived limitations in releasing the available data. These in turn stem from some more fundamental issues, which may include:

- A lack of quantitative data on the extent of the missed opportunity represented by non-compliance, and the potential

costs and benefits of making substantial improvements to the rate of compliance, making it difficult to present a compelling case to policy makers;

- An unwillingness on the part of those who work in the industry to identify any shortcomings in their own programmes since these may reflect badly on the sector and jeopardise the resources made available in the future;
- Hesitancy amongst governments or their representatives to admit that current policies are less successful than expected or projected; and
- A lack of understanding on the part of policy makers of the additional continuous work required to implement efficiency policy effectively.

Rather than question the ability of energy efficiency to deliver policy outcomes cost-effectively, policy makers need to recognise that building an enforcement capability and compliance investigation capacity are crucial components for any effective efficiency programme.

Looking forward, there are indications that policy makers and programme administrators are becoming more aware of the need to treat the issue of compliance more seriously. Around the world, budgets have increased over recent years and there appears to be greater attention given to achieving compliance in the design of new policy measures.

Nevertheless, there is still a considerable shortfall between the compliance activities commonly undertaken and those which are warranted by the risks involved.

As a result the IEA made the following policy recommendations to G8 leaders in 2008 (OECD/IEA 2008):

- *Governments should ensure that both voluntary and mandatory energy efficiency policies are adequately monitored, enforced and evaluated so as to ensure maximum compliance. At a minimum, this should include:*
  - *Considering and planning for optimal compliance, monitoring and evaluation procedures at the time new policies and measures are formulated;*
  - *Establishing legal and institutional infrastructure for ensuring compliance with energy efficiency requirements;*
  - *Ensuring transparent and fair procedures for assessing compliance, including specification of the methods, frequency and scope of monitoring activities;*
  - *Ensuring regular and public reporting of monitoring activities, including instances of non-compliance;*
  - *Establishing and implementing a suite of enforcement actions commensurate with the scale of non-compliance and the value of lost energy savings; and*
  - *Establishing and implementing a robust system for evaluating policy and programme success during and after implementation.*

Although prepared for the G8, these points are equally applicable in all countries and any energy efficiency programme. Other parties which should address these issues within their programmes include international organizations, funding bodies, national bilateral programmes and carbon finance administrators that fund the development of energy efficiency policies.

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