

Transforming the West African Market for Energy Efficiency: Ghana Leads the Way with Mandatory Standards and Labels

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ABSTRACT

Ghana recently enacted the first appliance standards regulation in Sub-Saharan Africa, for room air-conditioner units. The comprehensive legislation also includes a provision for product labeling. Additional legislation will soon cover a range of products including refrigerators, lighting systems, and electric motors and drives. Ghana's move to improve its energy efficiency is part of a larger energy sector reform designed to support the country's long-term economic development plans. Ghana's appliance standards program is also providing a successful model and leadership to other countries in the region seeking to improve their efficiency.

The first section details the history of the Ghana Electrical Appliance Labeling and Standards Program (GEALSP), including efforts at building stakeholder support and developing the appropriate enabling legislation. This successful model of consensus building is applicable to many developing economies, particularly those without significant appliance and equipment manufacturers.

The second section analyzes the process of establishing the air conditioner standard, including a description of the various economic and political concerns that the policymakers faced. Partnership with the Collaborative Labeling and Appliance Standards Program (CLASP) gave Ghana access to expertise and sophisticated tools, including computer-based impact models, which helped to refine and improve the final standard.

The third section examines the possibilities for regional replication of the Ghana model, including the "Fast-Track" agreements with Nigeria and Burkina Faso. Ghana is a key port of entry for West Africa, and for much of the continent's interior.

Introduction

The development of the energy sector in Ghana has been the responsibility of the government, which has developed and managed the sector through state owned enterprises. The focus has, however, been on the production and supply of commercial energy such as electricity and petroleum products. The promotion of end use energy efficiency, particularly in the industrial sector, was initiated by the National Energy Board in the 1980s and later implemented by the Ministry of Energy. In response to the energy crisis of 1983/84, the Government of Ghana initiated an Energy Efficiency and Conservation Program with technical assistance from the World Bank Energy Sector Management Assistance Program (ESMAP), UNDP and CIDA (USG 1999; GOG 1995). "The primary aim of the program was to demonstrate the potential for energy conservation in Ghanaian industrial and commercial enterprises. The program involved energy audit[sic] in selected enterprises and training of local energy experts in identification and implementation of energy conservation measures" (USG 1999). Over the next 13 years, additional efforts to raise awareness among

government officials and major industry concerns were only partially successful in identifying energy efficiency as a tool for cost reductions (Energy Foundation 1999). However, these initial activities did not receive widespread attention in Ghana, mainly as a result of low energy prices and public apathy and even distrust towards government initiated programs (Energy Foundation 1999). Ghanaian industry grew at a modest 2-4% per year from 1989 to 1997, but energy consumption increased 10-14% over the same period (Energy Foundation 1999; GOG 1998).

In 1997 the Government of Ghana began to implement an energy sector reform program, which resulted in the separation and assignment of the key functions of tariff setting, sector regulation, policy formulation and efficiency promotion to institutions other than the Ministry of Energy.

Consequently, the Ghana Energy Foundation was established in November 1997 to promote energy efficiency and renewable energy, as a key strategy to meet Ghana's growing energy needs in a sustainable manner. The public and private sectors in Ghana shared a common objective of creating a consumer based institution that would avoid the bureaucracy, sluggishness and public mistrust that have hampered previous energy efficiency programs while also mobilizing resources from across the Ghanaian economy.

Consumer involvement in efficiency promotion through a politically neutral entity, in particular, has resulted in dramatic results which could not have occurred under a purely government institution or utility based effort (USG 1999).

History of the Ghana Electrical Appliance Labeling and Standards Program (GEALSP)

Establishing the Ghana Energy Foundation

The Ministry of Mines and Energy, the Private Enterprise Foundation, and other energy sector stakeholders established the Ghana Energy Foundation as a public-private partnership responsible for the promotion of energy efficiency in Ghana. It is registered as a company limited by guarantee under the Companies Code (1963) of Ghana.

The Foundation's activities are governed by an Executive Council, made up of representatives of the Association of Ghana Industries (AGI), the Private Enterprise Foundation (PEF), the Ghana National Chamber of Commerce & Industry (GNCCI), the Ghana Chamber of Mines (GCM), the Volta River Authority (VRA), the Electricity Company of Ghana (ECG) and the Volta Aluminum Company Ltd (Valco).¹

The Energy Foundation coordinates and implements activities aimed at improving energy efficiency in the industrial, commercial, residential and transport sectors. The Energy Foundation has no constitutional powers to enact or enforce regulations. However, the Ministry of Energy officially designated the Energy Foundation as the institution responsible for implementing energy efficiency initiatives approved by the Ministry and other stakeholders. It also plays advocacy, consultative and advisory roles in legislation, policy directives and the formulation of regulations. The Foundation coordinates specific activities

¹ Valco is a subsidiary of Kaiser Aluminium Company and is the single largest electricity consumer in Ghana, accounting for about 30% of all electricity generated at the Akosombo Hydro power plant.

and liaises with other entities, such as the Ghana Standards Board, Energy Commission and Parliament, to ensure that the needed regulations are made and enforced.

One of the keys to insuring the success of these public sector initiatives is the strong credibility of the Energy Foundation with the private sector. The Energy Foundation does not answer directly to the government, despite its close working relationship, and the Foundation has been actively involved with advising, assisting, and promoting the development of energy efficiency with private companies.

One of the most successful efforts by the Foundation has been the establishment of the Ghana Association of Energy Services Companies and Consultants (GHAESCO), which has over 30 members. Technical experts at the Foundation are also available to assist individual companies and plants with energy efficiency projects, either directly or by identifying private firms capable of implementing the project. By building local private sector capacity and encouraging individuals and firms to participate actively in the market for energy efficiency, the Energy Foundation is also promoting the type of institutional reforms aimed at by government policy.

Thus the Energy Foundation can effectively represent consumer interests, both individuals' and firms', to the government and vice versa. The Energy Foundation uses this unique position to support the government's goals for reform, while at the same time helping the private sector address its bottom line through energy costs and performance. The Foundation uses its credibility and broad support not only to advocate for programs supported by the Ministry of Energy and the government, but also to support and implement initiatives to introduce new thinking and direction in the energy efficiency and renewable energy sectors.

Strategies of the Energy Foundation

From its inception, the Energy Foundation's mission to promote energy efficiency needed to overcome two related problems. The first challenge was the overall low state-of-awareness regarding energy use and ability to control that use. The second challenge was general apathy towards energy efficiency and conservation, even in cases where awareness was high. This was as true for government policy makers as it was for plant owners or individuals. The primary concern was the high cost associated with the chronic electricity supply problems through the grid, without any regard for the demand-side of the equation. To address this, the Energy Foundation adopted a three-part strategy to advance its cause:

1. Public Education and Demonstrations
2. Institutional Development and Capacity Building
3. Policy Advocacy and Market Transformation

In general, the Energy Foundation targets projects at specific consumer groups in the industrial, commercial, residential, or transportation sector. The first element of the strategy is essentially outreach, using mass media campaigns and special seminars to inform and empower the general public to conserve energy without sacrificing services. The second element, institutional development and capacity building, focuses on educational institutions, policy making or enforcing bodies, and professional bodies. The third element consists of activities aimed at transforming the market, including energy audits for manufacturers, trade

shows, exhibitions and advocacy for the introduction of energy efficiency policies and financial incentives that will encourage consumers to opt for energy efficient equipment and appliances. This paper examines the third element of the strategy by looking at the successful attempt to implement a minimum energy performance standard for room air conditioners in Ghana. Identifying the critical elements of this success can guide similar programs in other developing economies.

Policy Advocacy and Market Transformation - Using Regulatory and Economic Measures to Ensure End-Use Efficiency

A long period of low tariffs with an abundant supply of hydropower dominates the history of the modern power sector in Ghana. Unfortunately, this history resulted in underinvestment in energy infrastructure, wasteful energy end-use practices, and a high level of apathy about energy efficiency. In the 1980s and 1990s, growth in demand dramatically outpaced supply. The Ghanaian economy has experienced steady growth since 1995. Real GDP grew at an average annual rate of 4.7% from 1995 to 1997, but drought-induced power shortages in 1998 hampered industrial and service sector outputs and limited GDP growth to 2.0%. In 1999, there were rolling blackouts throughout the country, which placed a heavy burden on the energy sector to meet demand, particularly as the public resisted attempts to bring electricity tariffs in line with economic costs.

The government is struggling to come up with financing to increase supply, which is necessary in any case. But the energy crisis raises the stakes considerably. On top of that, developing new supply takes time, and it will be several years before the power sector can catch up with unmet demand. The question, then, is how can the government come up with funding for new supply while simultaneously stimulating the economy and making the best use of its current resources? Focusing solely on supply and pricing issues would over time tend to erode consumer and private sector support as energy bills rise. Energy efficiency policies generally offer a way for the government to free up electrons on the grid, essentially increasing supply, and for rate-payers to reduce electricity bills even in the face of rising tariffs and without reducing energy services. Growth in demand for energy can be accommodated by some combination of supplying more energy and improving the efficiency of energy consumption.

The Foundation has used formal and informal communication with policy makers to deliver its message about the need to undertake certain efficiency measures. Through interactions with Parliamentary Select Committees, the Public Utilities Regulatory Commission, and the Energy Commission, the Foundation has committed to raising electricity tariffs to economic levels, and has successfully advocated for a reduction on import tariffs for energy efficient products and renewable technologies. The Foundation sought to galvanize policy makers and energy sector stakeholders by organizing the first National Forum on Energy Efficiency Technologies in 1999 and several exhibitions of energy efficiency technologies. Round table meetings and workshops aggressively market energy efficiency in Ghana as an area for investment to the local banks and international financial entities.

It has been established that energy efficiency standards and labels for appliances, equipment, and lighting are among the most effective tools for ensuring energy efficiency in the residential and commercial sectors, limiting energy growth and at the same time

stimulating economic growth. However, the support for this sort of policy intervention took a long time to gather steam. Eventually, the Energy Foundation's championing of efficiency standards and labels, with the support of other Ghanaian institutions and international organizations, proved successful.

The Ghana Electrical Appliance Labelling and Standards Programme (GEALSP)

The idea of using efficiency standards to guide the purchase and use of energy consuming appliances was introduced in the early 1990's by the National Energy Board, which was at the time examining options to ensure end-use efficiency in Ghana. This idea, however, was not pursued further as the NEB was dissolved in 1991 and its functions were taken over by the Ministry of Energy. Still, the concept continued to circulate among policy advocates in Ghana and the value of Minimum Energy Efficiency Labels and Standards as a policy tool increased dramatically as the energy crisis of 1999 began to take shape.

In 1996, a delegation from the US Department of Energy visited Ghana following an earlier visit to the DOE's 1st Industrial Energy Efficiency Exhibition by the Ghanaian Minister for Energy. This exchange of visits led to cooperation between the two countries in the areas of energy efficiency and renewable energy. In February 1997 a formal agreement was signed between the two countries, paving the way for closer collaboration in energy efficiency promotion. Under this agreement, the Alliance to Save Energy (the Alliance) and the Lawrence Berkeley National Laboratory (LBNL) began assisting the Energy Foundation on several fronts, including the introduction of performance standards for energy consuming appliances.

Also that year, the Ghanaian Parliament enacted two important pieces of legislation. The Public Utilities Regulatory Commission Act (Act 538) charged the newly created PURC with the setting of tariffs and the regulation of power utilities. The Energy Commission Act (Act 541) empowered an Energy Commission to license energy sector operators and to oversee the development of the energy sector. Both of these pieces of legislation called for improved energy efficiency and ultimately the Energy Foundation was charged with leading all of the demand side activities in that regard.

As a policy priority, the Energy Foundation sought technical, educational, and financial support from the Alliance and LBNL to provide Ghana with the resources to successfully initiate the design and implementation of a comprehensive equipment standards and labeling (S&L) program. In early 1998, LBNL staff traveled to Ghana to meet with important stakeholders and to assess data and information needs. Working with the Energy Foundation, the LBNL team developed a survey to determine the potential impact of energy efficiency standards in Ghana. The "*Ghana Residential Energy Use and Appliance Ownership Survey: Final Report on the Potential Impact of Appliance Performance Standards in Ghana*" was published in March 1999 and became the basis for all subsequent S&L activities.

The report indicated that, at a minimum, standards on domestic refrigerators, freezers, room air conditioners and lighting systems could provide Ghana with a net benefit of \$64 million and reduce future carbon emissions significantly.² Although the analytical model used in the report was quite robust, the data available was not. Estimates of saturations and

² Over the period 2000-2010 and using a 5% discount rate, expressed in 1998\$

energy consumption were extremely conservative so even at the time of publication the report's conclusions defined the low-bound of potential savings.

The 1999 energy crisis in Ghana coincided with a rapid increase in the saturation of major appliances and equipment, including refrigerators, air conditioners and lighting equipment. Economic and political reform throughout the 1990s stimulated the market and demand for such goods is expected to continue its steady growth. In the absence of focused efforts to improve energy efficiency, inexpensive but also inefficient products may be “dumped” on the Ghanaian market to supply this demand, further exacerbating strain on the grid. Unfortunately, the power crisis also meant that policy makers and the Energy Foundation were focused on immediate crisis management activities, and activity on standards and labels was again delayed for some time.

Just as this was happening, the Alliance, LBNL and the International Institute for Energy Conservation began to discuss the collaboration that eventually became the Collaborative Labeling and Appliance Standards Program (CLASP). Ghana, despite the distraction of the power crisis, became one of the first countries to voice its support for this collaboration and to seek ways of utilizing the vast knowledge and experience embodied in these institutions. By the Spring of 2000, the CLASP partners were actively looking for a formal relationship with Ghana to develop the first standards and labels for sub-Saharan Africa.

Collaboration with CLASP

CLASP formally signed a memorandum of understanding with the Ministry of Mines and Energy in the Fall of 2000. Based on the earlier survey work and relationships developed with key stakeholders, the Energy Foundation was to lead the process of establishing energy efficiency standards and labels in Ghana with the direct support of the CLASP partners. The Ghana Standards Board, which is the statutory standards organization in the country, was requested to develop the standards with technical support from the Energy Foundation, CLASP and local and international technical experts.

Ghana's elections in November, 2000 represented both an opportunity and a challenge for the nascent standards program. This was the first opportunity for the CLASP team to meet with the new Energy Minister and to establish a connection between the new administration and the efforts of the Energy Foundation and its partners. While the government of President J.A. Kuffuor delayed the implementation of some policies prepared under the previous administration, the overall response of the government to energy efficiency has been positive and strong.

The CLASP team also met with the Ghana Standards Board to finalize the implementation plan for the first rulemakings under the GEALSP. Several Standards Board staff members attended the first meeting, where strategies for sustaining government support were discussed as well as the schedule for the first rulemaking. Based on feedback from the Kuffuor Administration, the meeting participants suggested that room air conditioners be the target of the first rulemaking instead of refrigerators as originally planned.

The primary concern leading to this change was the effect that refrigerator standards might have on low-income groups, since refrigerators are considered a basic necessity and have already achieved high saturation levels in grid-served areas of the country. Efficiency standards could be expected to increase purchase costs over current models, which might

shut poorer consumers out of the market. Air conditioning, it was noted, is used primarily in the affluent residential sector and within commercial enterprises with sufficient capital resources to pay higher first costs and reap future operating cost savings.

As a follow-up to this meeting, the Energy Foundation and CLASP also met with the President's chief energy policy advisor to seek his approval and support. He reaffirmed the Administration's concern with the effect of efficiency standards on low-income groups, but indicated that the government was generally supportive of the idea of improving efficiency through regulation. He also emphasized the need to make it feasible and affordable for Ghanaians to purchase energy efficient goods and services, as well as to make it attractive for businesses to supply the technology and services, before any regulation could be enforced.

In the end, all parties agreed that the room air conditioner (RAC) standard would be implemented first, followed by standards for lighting systems, refrigerators and deep freezers in that order. In making this decision, the various stakeholders acknowledged that an RAC standard would not provide the maximum savings, but would represent the least controversial regulation. This would allow the GEALSP to establish a precedent and to improve its technical capacity, increasing the chances of successful implementation of future standards. A standard for electric motors would be included later.

In accordance with the practices of the Ghana Standards Board, a Technical Committee was formed to establish the standard. The technical committee is made up of representatives of RAC dealers, experts in Refrigeration and HVAC systems, electrical engineering consultants, the universities, the Energy Commission, the Ministry of Energy, the Ministry of Trade and Industries, the Association of Ghana Industries, the Private Enterprise Foundation and consumer groups.

To aid the Technical Committee in its decisions, a local energy engineering company and an air conditioning service company were hired to conduct detailed studies on the saturation of RACs, the present energy efficiency levels and all technical information that could be used to establish a minimum efficiency standard acceptable to all the stakeholders. Based on initial analysis and with technical advice from CLASP, the Committee recommended a minimum Energy Efficiency Ratio (EER) for RACs of 2.5 watts/watt and a test procedure adopted directly from the ISO 5151 test procedure.

Implementation of Mandatory Standards

Before Ghana joined the WTO, all regulations issued by the Ghana Standards Board were mandatory in Ghana. These primarily consisted of safety and output performance regulations (e.g. rated motor capacity). However, based on the WTO regulations and the complexity of initiating an energy performance standards and labeling program, GEALSP recognized the need to build further consensus and to establish a vigorous and WTO-compliant regulation and enforcement process.

Consequently, the Energy Foundation had embarked on a policy advocacy drive even before the Technical Committee came out with its initial recommendation. This involved meetings with members of parliamentary select committees on Energy, Trade and Industry and the Environment. Finally, with financial assistance from the United Nations Department of Economic and Social Affairs (UNDESA) through CLASP, a study tour was organized to Lawrence Berkeley National Laboratories for key stakeholders in August 2001. The group consisted of:

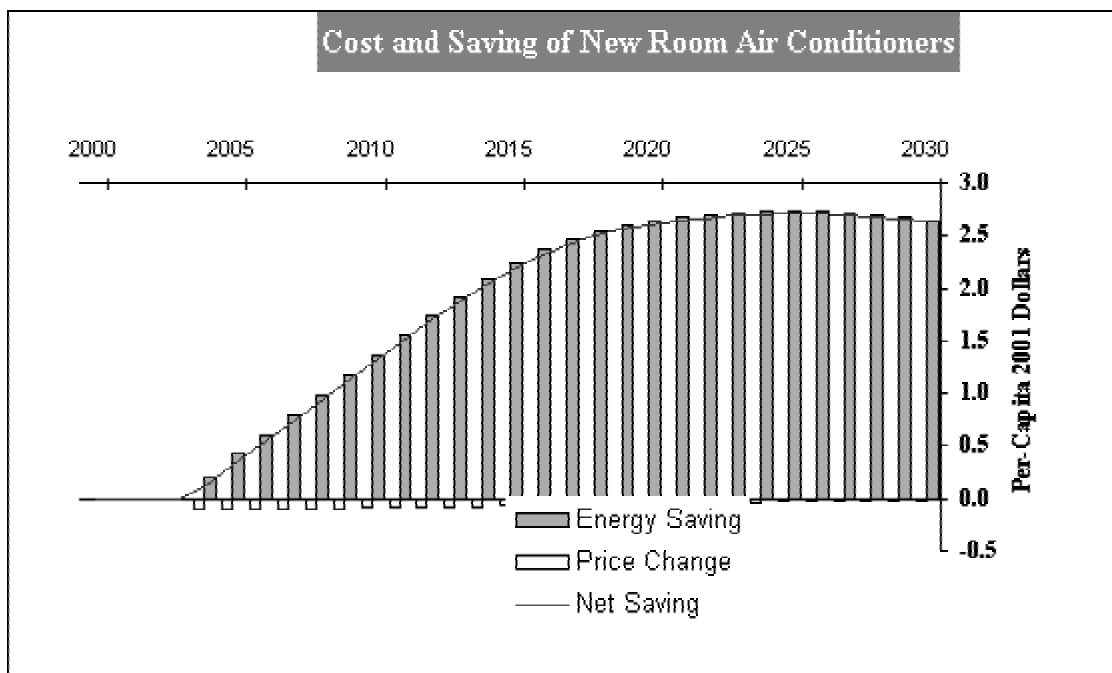
1. Chairman of the Parliamentary Select Committee on Energy
2. The Ranking member of the Parliamentary Select Committee on Energy
3. A Scientific Officer of the Ghana Standards Board
4. A local private engineering consultant who conducted the surveys, and
5. A technical expert from the Energy Foundation

The study tour included meetings with the California Energy Commission, the Alliance, the UN Foundation, US DOE and other technical advisors. These meetings provided for an objective and well-informed debate when the issue was brought to Parliament at the end of the 2001 session.

It also proved useful in a more concrete way. Using computer models they developed for CLASP, experts from LBNL conducted further analysis of the collected survey data. The model is based on the work LBNL has done to set US standards and determine their impacts. It represents the state of the art in economic analysis, but is packaged in such a way as to be useful in a variety of contexts and for many levels of users. Ghana was to be the test case of the new analysis model (Iyer 2001).

The results indicated that increasing the EER from 2.5 Watts/Watt to 2.8 Watts/Watt would yield significantly higher benefits with only moderate, if any, additional costs. Figure 1 shows the net energy bill savings per capita.

Fig. 1. Cost Saving Potential of New RAC based on New Ghana Standard



Source: Iyer, 2001

The analysis concluded that:

- *The Room Air Conditioner Standard will save Ghanaian consumers over \$775 million by 2020. In 2020, Ghanaian RACs will use 950GWh less than they would have in the absence of a standard.*
- *Payback on the initial incremental investment in efficiency by consumers is less than 9 months. The average price of the air-conditioner may go up by about 3% for the proposed standard; however, the new RACs will use about 9% less energy, paying off the investment very quickly.*
- *Carbon dioxide emissions will be reduced by about 2.8 million tons over 30 years (104,890 tons average per year).*

Equally important, given Ghana's strained electricity grid, the RAC standard has the potential to release significant capacity into the grid. By 2013, analysis suggests, the standard could be saving the equivalent of a 150MW generating plant and by 2020 may free up nearly 250MW of generating capacity that can be used for other productive purposes. Incremental investments in more efficient RACs to achieve that 250MW savings would total approximately \$35 million but would be entirely offset by consumer energy bill savings. In contrast, the 200MW Bui hydropower plant is being constructed at a cost of nearly US\$600 million.

The Ghana Standard for Non-ducted air conditioners – Testing and rating for performance, *GS362:2001*, was gazetted in December 2001 marking the completion of the first of five appliance standards (Air Conditioners, Refrigerators, Lighting Systems, Deep Freezers and Industrial motors) to be developed under the initial standards program (GOG 2001).

Implementation

The issues of enforcement and scheduling still remained. In February 2002, a two-day workshop organized by the Energy Foundation for Parliamentarians and other stakeholders specifically addressed these issues. Backed by the LBNL analysis and with CLASP support, the GEALSIP team presented the Parliamentarians with their recommendations.

The workshop participants adopted the recommendations of the Technical Committee on Standards, and also endorsed the Energy Foundation plan for the enforcement of the Standard as follows:

1. A Legislative Instrument enforcing standards will be prepared for cabinet approval and subsequent passage into law by Parliament, under article 56 (1), (a), (i) of Act 541 of 1997 (Energy Commission Act), – by June 2002
2. A Labeling Regime will be introduced by January 2003, which will make it mandatory for all appliance manufacturers exporting to Ghana to provide approved Ghanaian labels on room air conditioners exported to Ghana. Voluntary compliance with the RAC standard will also begin in 2003.
3. A Testing Facility to test and certify the energy efficiency of Room Air Conditioners at the Ghana Standards Board is expected to be completed by December 2004.

4. Training of officials and technicians of GSB on the use of the facility will be completed by December 2004.
5. Testing and Full enforcement of standards will commence by January 2005
6. The standardization program will be extended to other Economic Community of West African States (ECOWAS) countries through the regional integration network, using the Ghana standards and test facility as the basis.

Other details regarding the enforcement process will be handled in the drafting of the Legislative Instrument, which is unlikely to meet any opposition when it comes up for a vote. In fact, both parties in Parliament are insisting that the process move faster and more vigorously to improve efficiency standards, in stark contrast to the political controversy over standards in the US.

Replication of the Ghana Experience

How did Ghana achieve this consensus so quickly? After all, it took more than a decade for the first standards in the US to come into effect after Congress mandated them, but Ghana took only five.

One easy answer is that Ghana has no domestic manufacturing industry for appliances or lighting. Therefore, it faced a less hostile or controversial political climate. This answer, however, does not give enough credit to the well thought out and executed program carried out by the Energy Foundation. While the exact conditions and history that led to Ghana's success may not be recreated in other countries, the essential elements of the process can be.

First of all, there was a clear need for improvements in the energy efficiency of appliances and equipment. While the degree of need may vary, virtually every developing economy is demonstrably behind in deploying efficient technologies. This condition will be met almost everywhere, even in more developed countries.

Second, enabling legislation was passed very early in the process with a flexible mandate. This is the basis for a successful standards and labeling program. Each country's particular motivations and capacities may influence the specific language of this legislation, but there are enough examples for policy makers to draw on that it is unlikely that a useful model won't be found in almost every case.

In Ghana, the issue of legitimizing efficiency regulations fell to the newly created Energy Foundation, based on its capacities and credibility with various stakeholders. Other countries may choose another institution, either within or outside the government, but care must be taken to clearly transfer the mandate to a capable organization and to provide adequate support. International organizations like CLASP can provide access to the combined expertise and experience of countries with well established standards programs.

The final element in Ghana's successful implementation has more to do with the process itself than any particular technical skills or economic conditions. In truth, the technical analysis required for effective standards programs is well established in the US, Europe, Japan and other industrialized nations. The basic model, in this case the LBNL Analysis Tool used in Ghana, must be applied to the specific conditions and parameters of the country considering the policy. But the real trick is in developing the right level and breadth of stakeholder support. In Ghana, the Energy Foundation and its partners could have come up with a 2.5 or a 2.8 EER standard four years ago, but it would never have succeeded

without the buy-in from industrial leaders, parliamentarians, regulators, and even the public, which has been hearing about the issue in numerous outreach campaigns by the Energy Foundation over the years.

Fast Track Adoption

Ghana has adopted a “Golden Age of Business” development policy, which seeks to turn the country into a major investment destination and the center of business in West Africa. Consequently Ghana has adopted a “Fast-Track” approach to regional integration with countries in the 16-member ECOWAS. A special Ministry for Economic Integration has been established and agreements have been reached with Nigeria and other neighboring countries to “fast track” economic integration.

The Ghana Standards Board already agreed in principle to joint standards development with Nigeria. The Nigerian Standards Bureau provided input for the passage of the Ghana RAC standard. Ghana intends to collaborate with other ECOWAS countries on future standards through the Ghana Standards Board. Ghana and Nigeria alone account for an estimated 65% of all trade in West Africa and therefore have the potential of providing leadership and market-pull for other countries in the region.

Conclusion

Ghana’s pioneering effort to establish a room air conditioner standard will provide significant benefits to individual consumers and the national economy. The basic elements of this effort, including the analytical model, can be successfully implemented in many developing country contexts. There is a strong possibility that the Ghana Appliance Efficiency Labeling and Standards Program will be expanded within the sub-region and this can serve as a model for other regional harmonization and integration programs dealing with energy efficiency standards.

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