Voluntary Advanced Standards and Labels

-Issue Paper Seven-

Energy Efficiency Working Group
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Preface

The Energy Sector Sustainability Table (ESST) was established in 2005 as a multi-stakeholder advisory mechanism - including senior representatives from governments, industry, and civil society – created by the Government of Canada to provide advice on how best to meet the energy needs of Canadians so as to improve the environmental and economic sustainability of energy systems in Canada and to make recommendations on short-and long-term sustainable energy objectives.

Energy efficiency was identified as key priority for the ESST so the Table established the Energy Efficiency Working Group (EEWG). The EEWG is a committee of industry, government and civil society experts mandated to provide the ESST with an expert perspective on energy efficiency in Canada. The EEWG has produced several products including its Energy Efficiency in Canada Foundation Paper, a series of issue papers, and a final report summarizing the key conclusions and recommendations that resulted from the EEWG's work.

This issue paper is one in a series of a total of eight issue papers. The paper, as well as all other EEWG products, was prepared by the EEWG in conjunction with Marbek Resource Consultants and Dr. Michael Margolick.

To access other EEWG documents or for more information about the Energy Sector Sustainability Table and its Energy Efficiency Working Group, please visit: http://www.sst.gc.ca

Table of Contents

1. INTRODUCTION 1

2. KEY CONCEPTS 2

2.1 Definitions **2**
2.2 Rationale **3**
2.3 Standard Development and Label Design **5**
2.4 Conformity Assessment **6**
2.5 Standard Promotion **7**
2.6 Program Evaluation **7**

3. SELECTED EXAMPLES 8

3.1 Equipment – ENERGY STAR **8**
3.2 Housing – R2000 ..... **12**
3.3 Transportation – EnerGuide for Vehicles **15**

4. IMPLICATIONS 19

4.1 Portfolio Planning **19**
4.2 Program Design **19**
4.3 Program Implementation **20**
4.4 Program Evaluation and Reporting **21**

5. KEY MESSAGES 22

1. INTRODUCTION

Regulated minimum energy performance standards contribute to transforming markets by removing inefficient equipment, vehicles and buildings. Their intent is to achieve societal goals and improve the overall economic welfare of consumers by constraining their choices to a small extent. These standards "push" the market towards better energy efficiency.

At the other end of the policy spectrum, voluntary advanced energy performance standards (and associated labels, known as *endorsement labels*) also contribute to transforming markets by empowering consumers to make their own, informed, choices about the energy implications of their purchases. Advanced standards provide a way to capture varying levels of potentially complex information and difficult concepts in a simple score or "seal of approval". As such they provide a basis for greater consumer awareness as well as for the application of a variety of other non-regulatory market incentives. Thus, advanced standards "pull" the market towards better energy efficiency.

The utilization of voluntary advanced standards and labelling is increasingly seen as a cost-effective and flexible policy instrument that can promote energy efficiency outcomes, paving the way and preparing markets for future regulated minimum energy performance standards.

This short paper examines the characteristics of advanced standards and the key players in their development and use. It explores some examples of their application in the equipment, buildings and transportation sectors and considers some lessons for the planning of energy efficiency program portfolios, for the design of energy efficiency programs, for their implementation and evaluation. The focus is on the use of voluntary standards and *endorsement labels*, however the paper also examines mandatory comparative labelling, associated with *endorsement labels*. The paper does not deal with regulated mandatory minimum standards nor does it deal with the pre-announcement of future regulated standards (sometimes referred to as "advance standards").

The paper draws on the initial scoping research for this topic completed by Alberta's Climate Change Central. It also draws on the extensive information contained in the Guidebook on Energy Efficiency Labels and Standards developed by the Collaborative Labeling and Appliance Standards Program (CLASP). Finally, it draws on the program information provided on the website of Natural Resources Canada's Office of Energy Efficiency (OEE).

2. KEY CONCEPTS[1]

2.1 DEFINITIONS

Standards

A standard, or norm, is a codified expression of a requirement applied to a product or process. Standards can be prescriptive, in which case particular features are mandated, or they can be performance-based, in which case there is flexibility in the approach used, provided that the desired outcome is attained.

Standards are typically comprised of five components: (1) definition of the product(s) or process(es) covered; (2) the identification of aspects, qualities, or parameters that are covered; (3) the specification of the features that are required or the performance target to be met for each aspect, quality or parameter; (4) a well-defined protocol for verifying the presence of features, or for measuring performance (this may be referenced as a separate standard); and (5) the date(s) when the target(s) are to be met.

Standards are normally mandatory (i.e. requirements are expressed as "must" or "shall") but they (in their entirety or some aspects) may also be in the form of guidance documents (i.e. expressed as "should" or "may"). They may apply to each individual product or they may apply to the average of all products in a class.

In the context of energy efficiency, prescriptive standards typically require the use of specific energy saving products, features, designs, or processes; whereas performance standards require the attainment of specific energy targets, expressed in terms of efficacy, efficiency or overall energy intensity.

Minimum energy performance standards are usually imposed through regulation (e.g. energy efficiency regulations or building codes) or through a negotiated agreement (usually associated with a regulatory threat or back-stop). Advanced standards go beyond the minimum by specifying premium features or higher levels of performance. In a regulatory context, advanced standards may also signal future regulatory intentions.

Labels

Labels are information certificates which may be physically affixed to manufactured products, posted on buildings, or associated with products or processes through written, audio or video communication.

There are two main types: comparative labels and endorsement labels. Comparative labels (e.g. EnerGuide) allow consumers to compare performance or features using either discrete levels or scores (e.g. Level A, B, C, D, E), or a continuous scale (e.g. actual energy efficiency rating).

[1] This section in particular draws extensively on the CLASP Guidebook: Stephen Wiel and James E. McMahon (Lead Authors). *Energy-efficiency Labels and Standards: A Guidebook for Appliances, Equipment, and Lighting, 2nd Edition*. Collaborative Labeling and Appliance Standards Program (CLASP), Washington, D.C. February 2005

Endorsement labels (e.g. ENERGY STAR®) are essentially "seals of approval" that indicate compliance with a particular standard.

Among endorsement labels, there are two types. Labels based on absolute standards, and labels based on relative standards. The first qualifies products based on the achievement of specific requirements, set in advance. The second qualifies products based on their relative ranking compared to other products in their class (i.e. best in class, top quartile, etc.). In practice, absolute standards are often set on the basis of the performance spread of existing products and so have a certain degree of relativity built-in. Similarly, the range of what constitutes best in class may be guided by a search for the point in the performance spread where there is a significant leap forward in absolute performance.

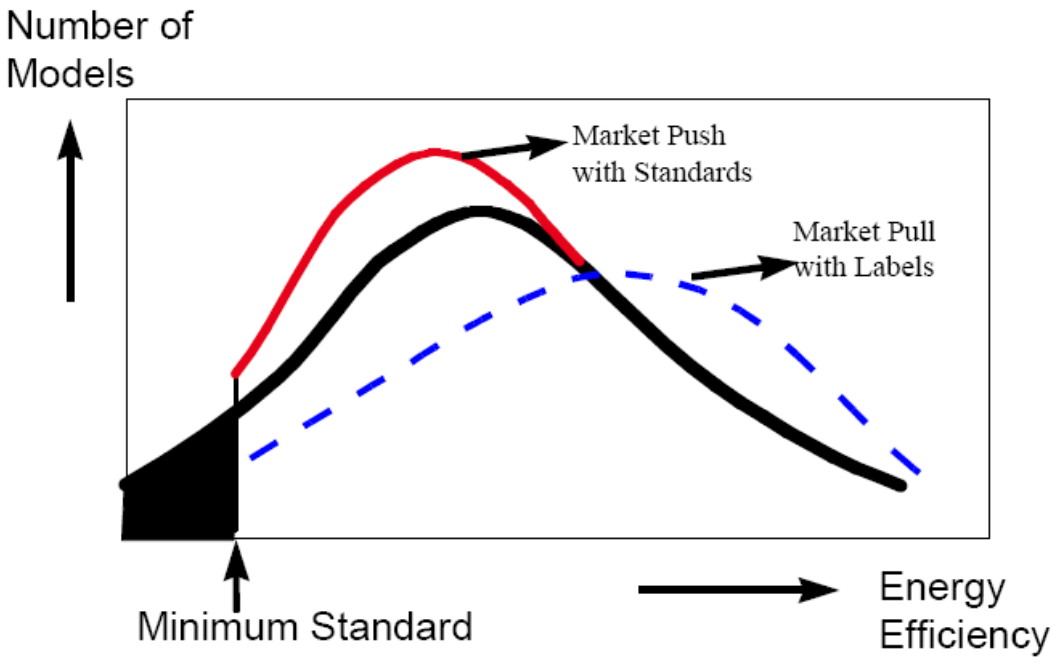
Labelling may be mandatory or voluntary. Endorsement labels are usually voluntary, although some jurisdictions may also require a type of endorsement label to indicate compliance with minimum performance standards. Comparative labels are often mandatory or they start off as voluntary and become mandatory over time. When voluntary, it would be expected that higher performers would apply the label while poor performers would not. Mandatory labelling involves the application of a labelling standard (usually prescriptive) which specifies the design of the certificate, where and when it is to be affixed to the product.

There is also the possibility of a third type of label, a "dis-endorsement" label. This label (which would have to be mandatory) would indicate that the product or process fails to meet a particular advanced standard. There are few existing examples of these types of labels however the Australian Greenhouse Office is considering such an approach as part of its National Appliance and Equipment Energy Efficiency Program (NAEEEP).

2.2 RATIONALE

As noted in the Introduction, both minimum energy performance standards and voluntary advanced standards and labels have a role to play, by helping to remove inefficient products from the marketplace and by stimulating the development of cost-effective technology. As shown in Figure 2.1, minimum standards push the distribution of models upwards by eliminating the left-hand tail of the normal distribution. Advanced standards and labels pull the right-hand tail of the distribution upward by providing information and incentives for better products. They are typically two iterations ahead of the minimum standards.

Figure 2.1[2]
Complementary Effects of Minimum Standards and Advanced Standards/Labels



The advantages of minimum standards include:

- Potentially large economy-wide energy savings
- Apply to all manufacturers, distributors, and retailers equally – providing a level playing field[3]
- Energy savings are generally assured, comparatively simple to quantify, and readily verified.[4]
- Sends a clear message to the marketplace, instilling consumer and industry confidence.

In contrast, advanced standards and labelling have the following advantages:

- Promotion of innovation leading to potential for large energy savings in the long run
- Preserve consumer choice
- Provide better consumer information
- Provide a basis for the application of incentive programs for energy-efficient products
- Provide manufacturers with flexibility to experiment with different products and approaches
- Stimulate improvement in production capacity
- Stimulate improvement in institutional capacity.

[2] North American Energy Working Group. *North American Energy Efficiency Standards and Labels.* December 2002.

[3] Although the treatment of all may be the same, minimum standards can have unequal impacts on some. For example, simple designs of company average fuel consumption standards will affect manufacturers of larger vehicles more than manufacturers of smaller vehicles. One way around this is to use *attribute-based* standards, such as those based on weight class (used in Japan and China).

[4] This is not to minimize the usual challenges of measuring extent and intensity of use, rebound, etc.

By meeting advanced standards, early adopters engage a variety of stakeholders, improving institutional capacities and creating market certainty. For builders and manufacturers, the rewards of meeting advanced standards normally come in the form of increased marketing advantage but a variety of government incentives may also be tied to the achievement or adoption of these standards.

The advantages of standards and labels can also be enhanced by the harmonization of standards across jurisdictions. This can reduce compliance costs, avoid trade barriers and avoid the dumping of inefficient products on trade partners.

2.3 STANDARD DEVELOPMENT AND LABEL DESIGN

The development of advanced standards may be sponsored by governments, by industry associations or by various categories of consumers. In practice, governments often have a leading role.

The first step is to determine what standards to pursue (i.e. which markets are ripe for this type of intervention). This decision should based on the technical, economic and achievable energy efficiency potential for the various products or processes, the cost and availability of resources, the complexity of the issues and capacity of the partners involved, and other factors, such as the desirability of a sound mix of policies in each sector. Governments should develop an overall strategy to guide their actions in each sector.

The second step is to determine how the standards should be sourced. One option is to draw from available international standards (e.g. ISO) or standards developed in other countries (e.g. the U.S. ENERGY STAR program). In some cases, there may be opportunities to participate in standard development or review; however, in other cases, the only choice may be to adopt existing standards. Provided there are no domestic concerns, this may be the best option because of the harmonization advantages described above. Another option may be to engage the services of an accredited standards development organization. These organizations (e.g. the Canadian Standards Association – CSA) are accredited by the Standards Council of Canada (SCC) to develop standards eligible to become part of the National Standards System. Alternatively, the sponsor(s) may choose to develop the standards themselves. In some cases, the standards development process may be mandated by legislation or regulation. To the extent possible, it is in everyone's interest to avoid a patchwork of different provincial standards and to adopt national or international norms.

Standard development usually involves a consensus approach, involving consumers, manufacturers and other stakeholders. The following steps are typical:

- Identification of the need for new standard
- Preliminary study and preparation of a draft outline
- Establishment of a committee (pre-existing or new)
- Committee meetings and consensus building on the draft
- Vote on the draft standard
- Publication of the standard.

The products to be covered, the parameters to include, the levels to be attained, the timelines and the testing protocols to use should be established on the basis of technical and market analysis and a consideration of costs and benefits to the various stakeholders, as well as for society as a whole. This should include consideration of product performance spreads, etc.

In setting the appropriate level, the following gradation of performance should be considered:

- Highest level – representing the state-of-the-art
- High level – representing the higher levels of performance that are widespread in the market and anticipating "realistic" future minimum standards
- Minimum standard – representing the regulated "floor level"

Ideally, advanced standards should be set to the highest level or somewhere between a high level and highest level. In some cases, builders or manufacturers may sponsor less stringent advanced standards, in an attempt to forestall the imposition of regulated minimum standards.

Design of a labelling approach involves choosing between comparative and endorsement types and/or determining how the two types should be linked. If a comparative label is used, a decision must be made on whether to include categories or levels of performance or to use a continuous scale. Once these choices are made, the design should be guided by consumer research and should consider the extent to which current consumer response should be accommodated as opposed to striving for long-term change in consumer awareness and behaviour.

2.4 CONFORMITY ASSESSMENT

Several options are available to assess conformity with an advanced standard.

A first party assessment is conducted by the manufacturer and leads to a self-declaration. Such declarations have limited value in the marketplace. A second party assessment is conducted in the context of a specific transaction between a buyer and a seller (e.g. a purchaser may assess the energy performance of a large building against a particular standard). This approach is possible for large transactions but becomes cost-prohibitive for large numbers of small transactions.

The most common form of conformity assessment is the third-party audit and certification approach.[5] This may involve one or more of the following bodies: a certification body, an inspection body, and/or testing laboratories. These bodies may in turn rely on certified personnel. Typically, each standard that involves third-party certification is accompanied by an accreditation framework, identifying the various categories of parties and their roles. In the context of National Standards, the SCC establishes the framework and accredits the various bodies. In other cases, government departments may establish the framework through regulation and may accredit the various bodies themselves. The oversight role may also involve occasional audits.

[5] In many cases, third-party assessments also rely to some degree on first-party information and assessments, augmented by audits of a sample of submitted reports.

A uniform testing or inspection procedure is a vital precursor to the implementation of a label or standard. All products or facilities must be evaluated in the same way. This requires a standard test/inspection facility or organization, a standard test/inspection procedure, and a process for assuring compliance with testing requirements. The development of testing methods needs to consider the potential degradation of product performance over time and the reality that manufacturers/builders will have a strong interest in promoting measurement approaches that benefit their products.

Whatever approach is used, it should also be combined with a standardized process for dealing with non-compliance. For endorsement labels, this includes procedures for withholding or withdrawing the use of the physical label, the de-listing of products or services in applicable directories, and the prohibition of the use of the label in publicity and communications. For comparative labels, this includes measures to compel the use of correct labels.

2.5 STANDARD PROMOTION

Ultimately the effectiveness of advanced standards depends on their appeal to consumers. Thus, effective standards and labelling programs require a communications campaign to support awareness and understanding of the new standards and/or labels. A communication strategy should identify target audiences, key messages, key formats and key delivery mechanisms. Such a campaign should be continually evaluated and adjusted to take into account consumer response.

In addition to creating awareness, there is also the practical issue of helping all parties (e.g. manufacturers, retailers, consumers) understand the standard and the advantages of relying on it. This will involve activities such as training programs in product engineering and compliance for manufacturers, label interpretation for salespersons, etc.

Aside from the inherent product advantages, the value of advanced standards can also be enhanced by targeting them in the promotional activities of utilities and governments. This may include, for example, subsidies for ENERGY STAR products or rebates for fuel-efficient vehicles.

2.6 PROGRAM EVALUATION

A key feature of the use of advanced standards is the need for continual "ratcheting up" of the standards as energy efficient products move from early adopters to the mainstream. Evaluations provide the means to assess program performance and results (e.g. changing product performance spreads and associated energy savings), evaluate label designs, test procedures and implementation methods. Review cycles for products typically range from three to 12 years, depending on the type.

Beyond the evaluation of energy savings, evaluations should also address the demonstration, education and marketing value of advanced standards and labels.

3. SELECTED EXAMPLES

Advanced standards can emerge from provincial, national or international processes. Although governments are frequently involved, the lead may also come from industry associations or even consumers. This section examines examples of advanced standards and labels in each of three sectors: equipment, housing and transportation. There are, of course, other examples, including the international Leadership in Energy and Environmental Design (LEED) green rating system for buildings, the Environmental Choice ecologo program, which also considers the energy characteristics of products, along with their environmental profile, and a variety of provincial and industry-led programs (some of which are mentioned in passing in the following sub-sections).

One sector that is not represented below and that has comparatively less access to advanced standards and labels is the industrial sector. To date, there are few examples of industrial processes or products which are in wide enough use to justify the adoption of advanced energy efficiency standards and labels. Similarly, although an example of a transportation label is provided, it is a more limited application of the concept and does not cover a large portion of the sector (e.g. freight).

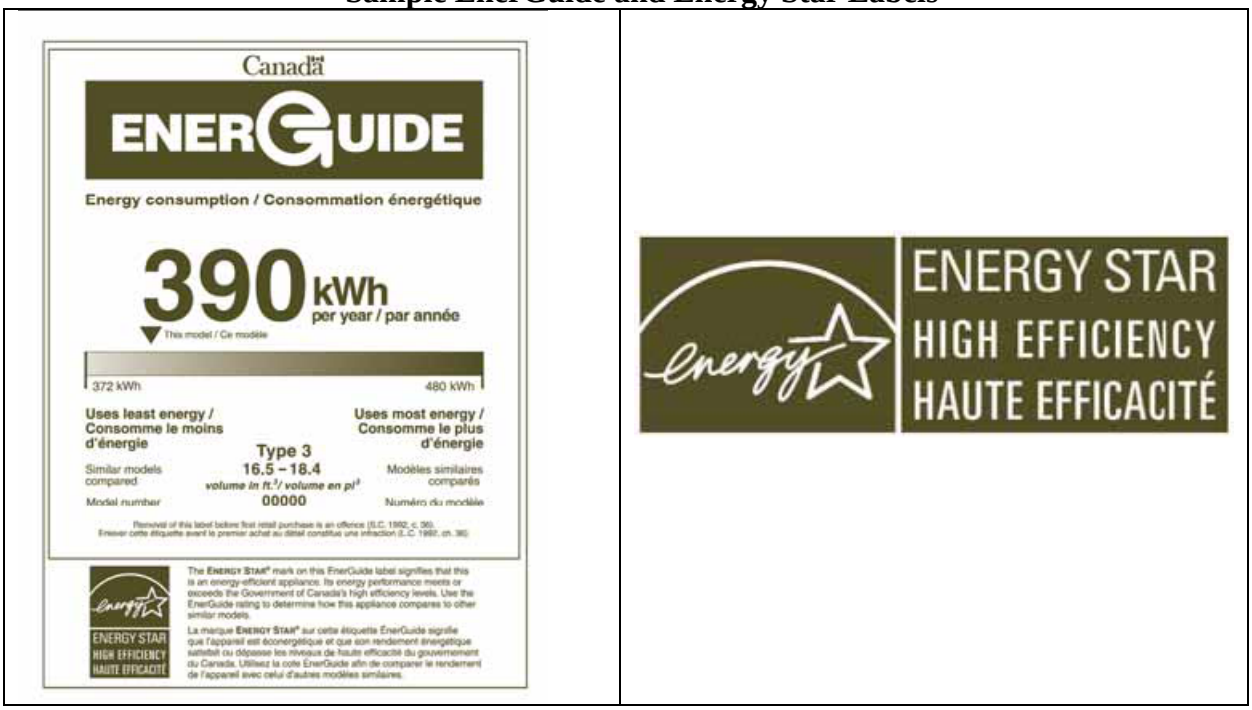
3.1 EQUIPMENT – ENERGY STAR

Minimum performance standards for equipment are set out in the Energy Efficiency Regulations under the Energy Efficiency Act. The regulations cover a wide range of products, including appliances, lamps, pumps and motors.

Natural Resources Canada also operates two labelling programs (see Figure 3.1), which cover some of the same products as the regulations and some additional ones. The EnerGuide comparative label, in place since 1978, provides the means to compare the energy consumption of one product with another in the same category. The ENERGY STAR endorsement label, introduced into Canada in 2001, identifies the best performers in each class.[6] This example deals with ENERGY STAR.

[6] Natural Resources Canada. *Improving Energy Performance in Canada – Report to Parliament under the Energy Efficiency Act for the Fiscal Year 2005-2006.*

Figure 3.1
Sample EnerGuide and Energy Star Labels



Through an agreement signed with the U.S. Environmental Protection Agency and the U.S. Department of Energy, the Office of Energy Efficiency is the official custodian of the program for Canada. Canada is the fifth country to join the ENERGY STAR program, along with Australia, New Zealand, Japan and Taiwan.

ENERGY STAR establishes high efficiency criteria and levels for selected products for the residential and commercial sectors (e.g., percentage above the minimum standard or product in the top percentiles in performance). Product categories are selected for their technical potential for high efficiency. This is a voluntary program; however, organizations must demonstrate that products meet the admissibility criteria and high performance levels endorsed by ENERGY STAR. For appliances and heating and cooling products, the criteria are based on the same test standards as those applied under the Energy Efficiency Regulations and are used to qualify products for the ENERGY STAR symbol.

Canada promotes specific product categories for which levels and criteria can be harmonized with those of the United States, including the following:

- Major appliances
- Heating, cooling and ventilation
- Consumer electronics
- Office equipment
- Windows and doors (Canadian levels)
- Selected lighting products (currently not fixtures)
- Selected commercial equipment.

Canada has also integrated ENERGY STAR with the EnerGuide label for major appliances to help consumers identify the best-performing products. While the EnerGuide label shows how much energy a product uses under normal conditions in one year, the ENERGY STAR symbol on the label identifies the most energy-efficient product. Now that industry-accepted standards of high efficiency have been established, ENERGY STAR has also become the criterion to meet for incentive and rebate programs, and has been referenced by a wide range of federal, provincial and utility programs. Organizations across Canada have also used ENERGY STAR as a campaign driver to promote replacement with, or purchase of, higher-efficiency products.

Energy Star product specifications are developed in the U.S. using an established development cycle (see Figure 3.2).[7] NRCan participates in this process.

Figure 3.2
Specification Development Cycle

In Canada, where ENERGY STAR qualified products are also subject to Canada's Energy Efficiency Regulations, products must first meet the testing and verification requirements of the Regulations before qualifying for ENERGY STAR. Canada's Energy Efficiency Regulations call for third-party verification to the regulated standard, by an agency accredited by the Standards Council of Canada. The accreditation includes for example, ability to, or have the equipment for, testing to a product test method. Where products are not subject to Regulations, but considered by ENERGY STAR in Canada, Canada would follow step with the US technical specifications where self-certification is typically required.

The third-party certification process involves: (1) selection of an accredited certification organization (e.g. CSA, Intertek, etc.); (2) an initial plant audit to examine the manufacturing process and verify quality control processes; (3) physical testing or simulation of product performance by an accredited laboratory and using a standard test procedure; (4) final

[7] See http://www.energystar.gov/index.cfm?c=prod_development.prod_development_spec_rev.

compilation and certification. Certification organizations will also have ongoing requirements for periodic in-plant audits.[8]

Once certification has been obtained, the manufacturer is eligible to enrol as an ENERGY STAR Participant. To complete the process, the manufacturer signs the Administrative Arrangement, and submits the completed Commitment Form and one or more Product Entry Forms to NRCan. After these documents have been reviewed and accepted, manufacturers are notified of acceptance into the ENERGY STAR program in Canada. The company name is posted on the NRCan Web site, along with the submitted data on all registered product models. The registration process takes 2 to 4 weeks.

There is no cost to participate in the ENERGY STAR program in Canada. However, the various certification agencies, testing laboratories and simulation facilities charge for their services. The initial cost to fully certify one product line, including all testing, simulations and audits, ranges from $20,000 to $25,000. Annual certification costs are typically about $3,500 per product line per year. Certification costs can be significantly lower if existing test and simulation results are accepted by the certification agency.

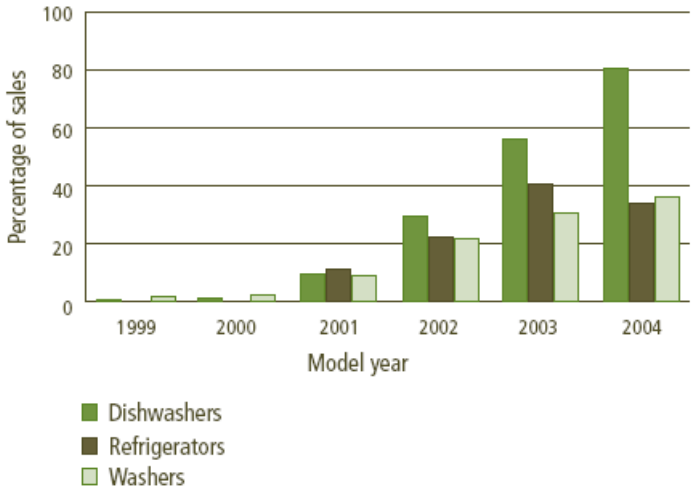
Participants are expected to respect the technical specifications; use the ENERGY STAR symbol and name according to the guidelines set out by NRCan; train their staff about ENERGY STAR; and include ENERGY STAR in their promotions and on their Web sites. Participants are also expected to complete an annual survey that allows NRCan to collect statistics on the success of the initiative and to receive comments on possible changes or improvements. Participants and their registered product models are listed on the NRCan Web site. Participants also receive marketing materials and are able to take part in joint marketing and networking activities with government, utilities and others organizations. Their products also become eligible for incentives targeted to ENERGY STAR products.

Continuous efforts to promote ENERGY STAR qualified appliances seem to have paid off.[9] Industry figures for 2004 show an increase in market penetration from almost nil in 2000 to 34 percent for refrigerators and 81 percent for dishwashers (see Figure 3.3). The increase in market penetration indicates growing acceptance of ENERGY STAR as the brand for high efficiency and the willingness of manufacturers to raise product offerings to qualifying levels. At the same time, it indicates that the technology has matured to the point that performance levels can be raised further. Thus, for example, the ENERGY STAR requirements for clothes washers and dishwashers were made more stringent in on January 1, 2007, and retailers were given three months to remove ENERGY STAR labels from units that no longer qualified.

[8] Natural Resources Canada. *Fenestration Manufacturers' Guide to Applying for ENERGY STAR® in Canada*. June 2007.

[9] Natural Resources Canada. *Improving Energy Performance in Canada – Report to Parliament under the Energy Efficiency Act for the Fiscal Year 2005-2006.*

Figure 3.3
Energy Star Qualified Appliances as a Percentage of Sales[10]



Surveys on the awareness of ENERGY STAR have shown an increase in unaided awareness and understanding of the symbol. A survey of 2000 Canadians revealed that unaided awareness was 36 percent in 2005 and aided awareness of ENERGY STAR has reached 80 percent. Recognition of ENERGY STAR has shifted from seeing the symbol on computer equipment to seeing it more often on major appliances.

3.2 HOUSING – R2000

Provincial building codes set the minimum construction standards for houses, usually based on the model National Building Code. In some cases provinces also adopt minimum energy performance requirements, although, to date, no province has adopted the Model National Energy Code for Houses.

Started in 1981, R-2000 is both a program and an endorsement label that encourages Canadian builders to build, and Canadian consumers to purchase, houses that are more energy efficient and environmentally responsible than is required by current Canadian building codes.[11] NRCan trains and licenses R-2000 homebuilders and other professionals in R-2000 Standard construction techniques and practices, and provides third-party quality assurance by testing and certifying R-2000 homes.

The EnerGuide for (New) Houses is a complementary energy-performance rating and comparative labelling scheme. The EnerGuide for Houses scheme is based on the R-2000 Standard and training, and it targets large-volume, mass-market builders. All R-2000 homes also receive an energy-rating label and the EnerGuide rating system. The EnerGuide rating is also referenced by the various regional premium performance programs and is used to qualify homes

[10] Ibid.

[11] Ibid.

for preferential mortgage insurance rates. It is also being proposed as the energy-rating component of the LEED green rating system for homes.

The R-2000 Standard includes requirements related to energy efficiency, indoor air quality and the use of environmentally responsible products and materials.[12] The Standard sets out a series of house performance requirements that are in addition to those required by building codes, including the following:

- **Energy budget:** R-2000 homes must operate within a specific energy budget, based on the characteristics of the home and the climate conditions where it is built. Typically, R-2000 homes need 30 percent less energy to operate than conventional new homes. Common in R-2000 homes are additional insulation; double-glazed, low-emissivity, gas-filled windows with insulated spacers; and high-efficiency heating systems. R-2000 houses must attain a score of 80 points or higher on the EnerGuide rating scale.[13]

- **Whole-house ventilation.** Every R-2000 home must have a whole-house ventilation system that supplies fresh outdoor air to all living areas in the home. This system must be designed and tested to meet the CSA International standard CAN/CSA-F326 M91 ("Residential Mechanical Ventilation Systems"). Installers must be trained by the Heating, Refrigeration and Air Conditioning Institute of Canada, or equivalent.

- **Air Quality and Environmental Features.** Every R-2000 home builder must choose from a "pick list" of options for indoor air quality and environmental features. The indoor air-quality features can include items such as hardwood flooring, low-emission cabinetry, low-emission (low volatile organic compound [VOC]) paints, and non-solvent-based adhesives and finishes. Features to conserve materials include choices for insulation, siding, sheathing, wall studs and foundation drainage.

- **Cleaner heating.** The heating systems in the home must not be susceptible to combustion spillage.

- **Water conservation.** Every R-2000 home must be equipped with water-conserving toilets, faucets and shower heads.

The Standard is supported by a program of research, development and testing and a team of technical experts, including experts from NRCan and industry technical experts. The technical experts review the R-2000 Standard regularly. Before changes to the R-2000 Standard are adopted, thorough consultation is carried out. Once the Standard is changed, home builders and other industry professionals receive training updates.[14]

[12] http://oee.nrcan.gc.ca/residential/personal/new-homes/r-2000/standard/standard.cfm?attr=4

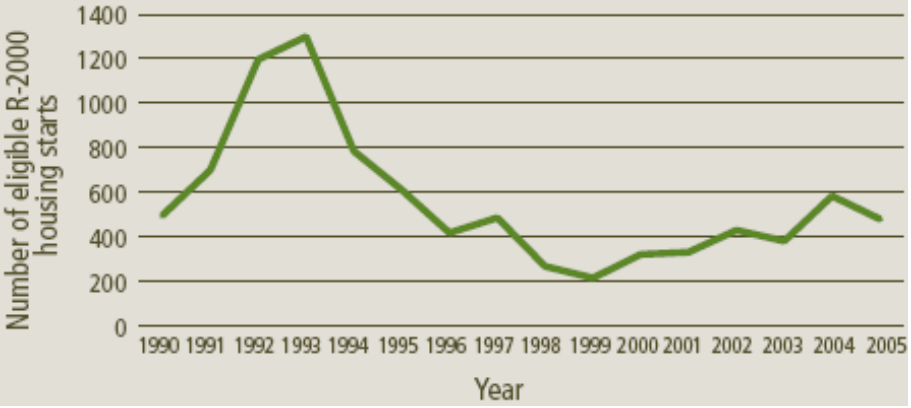
[13] NRCan indicates that this standard may soon be raised.

[14] Beyond R-2000, there is also a more stringent standard, known in some areas as Zero Energy Housing, and recently branded "Equilibrium Housing" by Canada Mortgage and Housing Corporation (CMHC). These brands have not yet achieved significant market awareness or application.

Only home builders who have completed R-2000 builder training, have built and certified an R-2000 Demonstration Home, and hold a current R-2000 builder licence can build homes that can be certified to the R-2000 Standard. In addition, every home submitted for R-2000 certification must undergo a series of independent inspections and tests, including a plan evaluation, an inspection, and airtightness testing (each by licensed R-2000 service providers).

In 2005–2006, 480 homes were certified R-2000 (see Figure 3.4). This relatively low level of activity has been relatively constant for the past ten years, however it partly reflects the emergence of a number of alternative regional brands that use the R-2000 Standard and training, including Energy Star for New Homes in Ontario and Saskatchewan, Built Green in Alberta and BC, Novo climat in Quebec, Power Smart in BC and Manitoba and the Yukon Green Home. Overall, 8700 homes across Canada were built under various provincial and territorial initiatives and over 2000 people were trained.

Figure 3.4[15]
R-2000 Housing Starts (1990-2005)



A 1995 evaluation of R-2000 found that, because of low uptake, the Program had not been successful in achieving direct energy savings.[16] The main problems identified were the high incremental cost and demanding requirements of the Standard coupled with relatively low energy prices (at the time) and low public awareness.

R-2000 owners reported a high level of satisfaction despite a very long payback period for the incremental cost. The results indicated that the owners placed greater importance on the quality of the construction as opposed to the energy benefits. Similarly, builders, who tended to be smaller custom builders, participated in order to build their reputation for quality and to stay abreast of technological developments. None of them expected a significant market demand for R-2000 homes. Builders appreciated the value of the training but most found that the standard

[15] Natural Resources Canada. *Improving Energy Performance in Canada – Report to Parliament under the Energy Efficiency Act for the Fiscal Year 2005-2006.*

[16] Marbek Resource Consultants and ARA Consulting. *Evaluation of the R-2000 program of Natural Resources Canada*. September 1995.

too onerous. In addition, many found the certification process too risky because the pass/fail decision was made only at the very end.

Notwithstanding the low direct uptake of the Program, the evaluation concluded that the Program had been successful overall in achieving energy savings due to the uptake of R-2000 technologies and practices by the residential construction industry as a whole, applied to non-R-2000 houses and through R-2000's influence on the development of other energy related codes and standards. In particular, the evaluation recognized the effect of R-2000 on building codes: houses built today are at least 25-30% more energy efficient than houses built prior to the R-2000 program.

The evaluation recommended that R-2000 clarify its objectives and target markets, that it increase and realign its marketing efforts, and that it involve builders to a greater extent in the review of the standard.

In contrast, a 2004 evaluation in the US found that mass-market builders were very interested in the Energy Star for Homes label, with over 30% of the top 100 builders using the label in 2002.[17] Part of the explanation for these different levels of interest may be that the Energy Star brand in the US is much less demanding and rigorously controlled than R-2000. In fact there is some evidence that the Energy Star for Homes brand may have become somewhat devalued as interest tapered off, leading some to speculate that the Energy Star brand had become too widely used and had lost some of its cachet.

In response to the R-2000 evaluation and the continued low uptake of the program, OEE has now abandoned the objective of trying to make R-2000 the definitive brand and is instead supporting a variety of different brands, as noted above. The EnerGuide rating system has had a much greater uptake than R-2000, and although it is not a premium housing program, it helps promote energy efficient housing by encouraging high standards from builders. Overall, levels of interest in both EnerGuide as well as the "premium" programs have grown dramatically in the past few years, leading OEE to speculate that the market as a whole may have reached a 'tipping point' beyond which there will be a wider acceptance of energy efficient housing. One reason for this could be a move in the industry towards standardised quality control. Many provinces are looking at mandating labelling for housing and the emergence of independent third-party home assessment services is leading builders to appreciate the value of meeting explicit standards. If independent rating becomes the norm, it will be in builders' best interests to make sure they comply with rating systems such as EnerGuide and, within this framework, exceptional performance such as that associated with R2000 or other premium brands could set a builder apart.

3.3 TRANSPORTATION – ENERGUIDE FOR VEHICLES

Minimum standards for fuel consumption in Canada are currently set out in Company Average Fuel Consumption (CAFC) goals which, though voluntary, have the effect of ensuring that Canadian vehicles meet or exceed the U.S. Corporate Average Fuel Economy (CAFE) standards.

[17]Rashkin, Sam. R*esults of Mainstream Builders Selling ENERGY STAR Labeled Homes*. 2004 ACEEE Study on Energy Efficiency in Buildings.

Canada also has the *Motor Vehicle Fuel Consumption Standards Act* (MVFCSA), which was adopted in 1982 but was only promulgated November 2, 2007, since manufacturers agreed to meet the equivalent of the CAFE standards.[18]

In addition, in 2005, the Government and the automotive industry negotiated a voluntary agreement to reduce annual greenhouse gas (GHG) emissions from Canada's vehicle fleet by 5.3 megatonnes (Mt) in 2010. In 2006, the Government announced that it would use the MVFCSA to regulate minimum fuel-efficiency standards, beginning in 2011.

EnerGuide for Vehicles promotes the purchase of fuel efficient vehicles in order to reduce vehicle emissions and mitigate other vehicle-related environmental impacts.[19] It offers a series of tools to help Canadian motorists consider fuel efficiency in their vehicle purchase decisions and encourages buyers to choose the most fuel-efficient vehicle that meets their everyday needs. Each year, the free Fuel Consumption Guide provides comparative fuel consumption ratings and the estimated annual fuel cost, fuel consumption and carbon dioxide (CO2) emissions for new passenger cars, light-duty pickup trucks, vans and special purpose vehicles sold in Canada. The EnerGuide comparative label, which is affixed to the side window of new light-duty vehicles sold in Canada, provides specific fuel consumption information for each model. Models are divided into 10 classes (six for automobiles and four for trucks, vans and SUVs). Every year, the EnerGuide for Vehicles Awards recognize the most fuel-efficient vehicles in each of the 10 classes. Awards are presented to the manufacturers.

Unlike ENERGY STAR or R-2000, EnerGuide for Vehicles does not include an absolute standard. The comparative label is based on rated fuel consumption and does not include discrete grades. The award system is based on the EnerGuide rating and recognizes the most fuel-efficient vehicles in each class. There is no equivalent to ENERGY STAR for vehicles.

Vehicle manufacturers use standardized testing and analytical procedures, approved by Transport Canada, to generate the vehicle fuel consumption data published in the Fuel Consumption Guide and on the EnerGuide label.[20] Transport Canada verifies the accuracy of the data received from the vehicle manufacturers, and NRCan uses this data and other information to publish the annual Fuel Consumption Guide. It is worth noting that the standardized testing process, while useful in this context, actually results from the need to meet regulated/negotiated minimum standards. It is not clear that such an elaborate process would be appropriate in the absence of the minimum standards.

The standardized testing includes the use of standardized fuels, laboratories and testing equipment. This ensures that all vehicles are tested under identical conditions and that the results are consistent and repeatable. The Federal Test Procedure (FTP) is a standardized laboratory test method used in Canada and the United States on new vehicles. Selected pre-production prototypes of new vehicle models are "run in" for about 6000 kilometres (km) before testing.

[18] The Act was proclaimed on November 2, 2007 but the required regulations have not yet been promulgated.

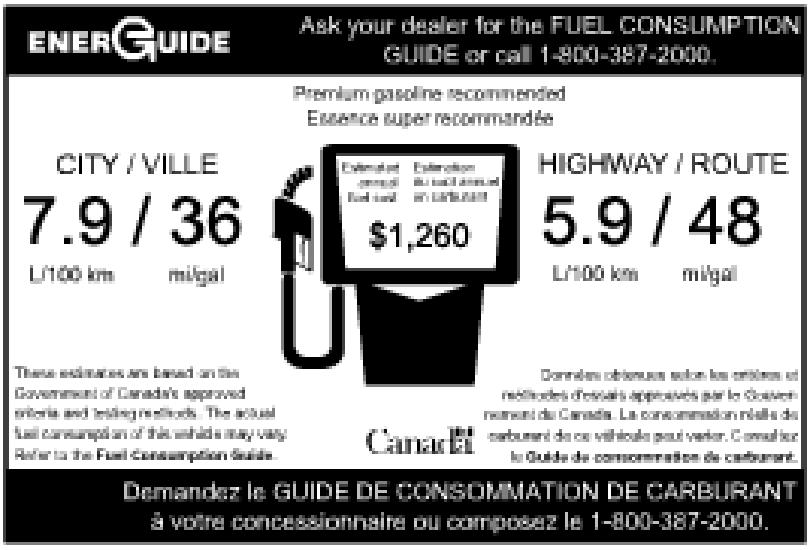
[19] Natural Resources Canada. *Improving Energy Performance in Canada – Report to Parliament under the Energy Efficiency Act for the Fiscal Year 2005-2006.*

[20] Natural Resources Canada. *EnerGuide Fuel Consumption Guide – 2007*.

Vehicles are mounted on a programmable two-wheel laboratory chassis dynamometer. Then a trained driver runs them through simulated city and highway driving cycles. Fuel consumption ratings are generated based on test cycles and correction factors that take into account the aerodynamic efficiency, weight, rolling resistance and drive mode of different vehicles and the achievable real-world driving conditions in Canada. Other adjustments are made to reflect the average fuel consumption of vehicle configurations, options and sales mixes sold in Canada. The FTP is composed of two tests – the city test and the highway test.

The EnerGuide label is affixed to all new light-duty vehicles – including passenger cars, pickup trucks, special purpose vehicles (SUVs) and vans – for retail sale in Canada. The label provides the model-specific fuel consumption for the vehicle to which it is affixed. The EnerGuide Label for Vehicles has a standardized design (see Figure 3.5). It is affixed to the vehicle alone or as part of the vehicle options and price label.

Figure 3.5
EnerGuide for Vehicles Label



The fuel consumption rating provides the basis for the application of both the ecoAuto rebate program and the Green Levy on fuel inefficient vehicles.

A 2006 Study by the Centre for Data Analysis in Transportation (CDAT) assessed the impact of the EnerGuide for Vehicles program on vehicle choice.[21] The study found that 60% of Canadians had knowledge of at least one component of EnerGuide for Vehicles program but that the correlation with purchases of energy efficient vehicles was weak compared to the effect of similar programs such as EnerGuide for Equipment Program. Unfortunately the study did not reveal the causes of the low impact on decision-making. Additional studies are planned by

[21] Boucher, Nathalie. *Information programs and the importance of energy efficiency and the environment in the choice of personal vehicles.* Université Laval Centre for Data Analysis in Transportation (CDAT) Document N05-02pa. Preliminary report produced for Natural Resources Canada, April 13, 2006.

CDAT to: (1) investigate the possibility that selectivity bias is affecting the results (i.e. that certain characteristics of those who report awareness of the EnerGuide for Vehicles program affect the correlations); and (2) examine indirect effects on purchasing (i.e. through perceptions of energy efficiency and environmental issues.

4. IMPLICATIONS

The experience with Advanced Standards provides some lessons for portfolio planning, program design, program implementation and evaluation. These include the following:

4.1 PORTFOLIO PLANNING

- **Employ a Mix of Policy Instruments.** As noted in the Introduction, Advanced Standards help to pull the market towards greater energy efficiency. However, they affect only a portion of the market (e.g. early adopters) and their effect may be limited without major marketing efforts or promotion through other programs. Ideally, the market sectors with the greatest potential should be targeted by a robust market transformation approach, including a combination of measures, including broad education, incentives, government purchasing power, and regulation. The portfolio should also be underpinned by a strong price signal.

- **Experiment with Different Approaches.** Voluntary standards and labelling programs have inherently less predictable outcomes. They are highly vulnerable to changes in energy prices and to the unpredictable nature of consumer decision-making. Thus, it is appropriate to try different approaches, to continually reassess the success of programs, and to adjust the mix accordingly.

- **Fill Sector Gaps.** There are currently gaps in the use of advanced standards, notably in the transportation and industrial sectors. These provide opportunities to consider new applications. For example, in the transportation sector: ENERGY STAR – type standard and label for vehicles, standard and/or labels for heavy trucks, freight and passenger services. In the industrial sector, ENERGY STAR – type standard and label for motors, pumps, and other kinds of standards and/or labels for unit process or unit operation designs, controls, or design processes.

4.2 PROGRAM DESIGN

- **Use Existing and Trusted Brand Names.** Whenever possible, it is advantageous to start with an existing brand name that already has a market presence and established credibility. To take advantage of harmonization benefits, it also makes sense to share brands across jurisdictions. In some sectors or situations, some level of brand competition might also be advantageous provided this does not affect the ability to achieve a critical mass of market recognition.[22]

- **Use a Consensus-Based Approach.** Given the voluntary nature of Advanced Standards and Labels, it is critical to involve manufacturers/builders, consumers and other

[22] The current coexistence of various premium housing brands appears advantageous because each of these has a critical mass of awareness. However, in the area of super-premium housing, there is currently some brand confusion between the generic "net zero energy home" and CMHC's new brand: "EQuilibrium Housing", neither of which has achieved critical mass.

stakeholders in the process. Ideally, a consensus-based approach should provide an opportunity to gain buy-in from the maximum number of parties.

- **Set Standards on the Basis of Credible Technical and Market Research.** The development of the standards should take into consideration the availability of products and their performance spread. The analysis should consider a base case and various scenarios. The use of best in class labels is one way to avoid setting absolute standards but this may limit the potential market for the label. Build-in a process for updates.

- **Establish Credible Test Protocols.** Credible standards are underpinned by credible test methods. These need to be clear and well established. Ideally they should be harmonized with other jurisdictions. It is helpful to base advanced standards on test protocols already in place for minimum performance standards.

- **Advanced Standards should Stretch Performance but be Achievable.** The cost of meeting more stringent standards should be considered as well as the benefits. At the same time the standards need to be set high enough to establish and defend the "premium" nature of the brand. Using the results of evaluations, standards should be reviewed at regular intervals and tightened as appropriate to continue pulling the market towards greater energy efficiency.

- **Label Design should be guided by Market Research.** Labels should be simple, understandable, and consistent. It is possible to educate and lead consumers to accept labels that reflect new concepts, but progress should be incremental and educational objectives should be modest and achievable. Labels should be tested with consumers.

4.3 PROGRAM IMPLEMENTATION

- **Adopt a Credible Approach to Conformity Assessment.** To protect the brand, third-party assessment is preferable.

- **Simplify the Process and Provide Opportunity for Early Feedback to Applicants.** To attract participants, the process should be as simple as possible. To minimize the costs for those who do not qualify, the process should include steps to identify problems before a final inspection.

- **Promote the Brand but be Flexible.** Brand awareness needs to be built up over an extended period. This will likely require a significant and sustained investment in marketing. At the same time, if local markets demonstrate a preference for different brands, it is important to weigh these preferences and know when to adapt accordingly.

- **Promote the Broad Benefits.** Consumers often report that their primary motivation for purchasing the labelled products is something other than the energy efficiency advantages. These other advantages (e.g. quality, "cool" factor, etc.) should be featured in marketing.

- **Focus on Target Audiences.** To maximize results, it is important to focus resources on those most likely to be receptive (e.g. early adopters). These audiences need to be identified and profiled in order to develop appropriate messages and select appropriate delivery mechanisms. Target audiences may include retailers and other intermediaries as well as ultimate consumers.

- **Leverage the Brand.** Using the standard to define eligibility for other incentive programs is an excellent way to help raise awareness of the brand, while meeting the needs of other programs.

4.4 PROGRAM EVALUATION AND REPORTING

- **Evaluate Results.** The uncertain nature of these programs make it more important than ever to evaluate results so that programs can be adjusted or shut down if shown to be ineffective. An evaluation plan should be developed from the start of the program.

- **Consider Various Indicators.** Program awareness is important but may not be sufficient to indicate success in changing behaviour. It is important to evaluate the impacts of Advanced Standards and Labels on actual purchases.

- **Consider Indirect Impacts.** Evaluations should consider both direct impacts of standards on purchases as well as indirect impacts that may be achieved through adoption of best practices and improved technology in the broader market.

5. KEY MESSAGES

- Voluntary advanced standards and associated labels (known as endorsement labels) are potentially important components of a complete portfolio of policy instruments to promote energy efficiency and market transformation. Ideally, they should be part of the portfolio of instruments in all sectors of the economy.

- There are a variety of options available in designing standards and labelling programs. For voluntary programs, it is important to use a participative and consensus-based approach, involving key stakeholders in the design process.

- The stringency of advanced standards needs to be determined carefully. Such standards need to confer a "seal of approval" that is meaningful but they also need to be achievable at a reasonable cost. They should be updated on a regular basis to reflect changing technology and markets.

- Standards and labels must be accompanied by a credible conformity assessment system. The system should as simple and cost-effective as possible and provide early feedback to applicants on eligibility. If there is already a compliance system for regulated minimum standards, it may be helpful to leverage this system to assess conformity to the advanced standard.

- Standards and labels should be supported by targeted, consistent and sustained marketing, education and capacity building, and be leveraged by other incentive programs.

- Results need to be evaluated frequently, to adjust program design and terminate ineffective programs.