Five A's: Barrier Classification and Market Transformation Program Design for Energy Efficient Technologies

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ABSTRACT

This paper presents a methodology developed by the Canadian federal government and Navigant Consulting to evaluate barriers and design market transformation programs for energy efficient products. This methodology, called the 5A's framework, is used successfully in Canada to design effective market transformation programs for residential, commercial and industrial products. The 5A's framework enables governments, utilities, efficiency advocates and other stakeholders to identify and characterize market barriers. Building on the foundation of market transformation research and programs developed to date, the 5A's framework enables participants to rank barriers and design effective market solutions.

The 5A's framework considers all the steps in the value chain from manufacturer to enduser: *Availability* - does the technology exist? *Awareness* - does the market know about the technology? *Accessibility* - does the market have easy access to the technology? *Affordability* – is the technology affordable? *Acceptance* – are the form, fit and function of the technology acceptable? Each "A" in the framework represents a critical step along the path of new technology adoption in the market place.

Once barriers are classified, programmatic solutions are developed to overcome the barriers to a particular product or technology. Drawing on the wealth of market transformation programs in North America and Europe, solutions to the 5A's barriers were reviewed – identifying the best programmatic solutions for each of the 5A barriers. The second half of this paper will discuss how the barrier analysis shaped program development for specific products.

The 5A's method has proven to be a sound, workable framework in Canada, and has facilitated market transformation program design and evaluation.

Introduction

Markets are dynamic entities, characterized by new products, changing consumer demands and fluctuating prices. Generally, markets move toward technologies that provide a net improvement in social welfare - such as the transition from steam to diesel locomotives, or from black and white television to color. But occasionally, market dynamics are not sufficient to reach a desired objective that is projected to be in the greater social interest - such as shifting from incandescent torchieres to compact fluorescent, or toward a higher level of home insulation. In these cases, various informational, financial or other social barriers may prevent the markets from realizing all the benefits of a given technology.

There can be many reasons why a market resists change, for example, lack of familiarity with a new technology, perceived risks, difficulty finding it, or higher initial purchase prices. Sometimes, consumers are not aware of lower life-cycle costs associated with a more expensive, higher efficiency product. Where these and other failures occur, market transformation programs

can work to facilitate greater levels of penetration and overall societal benefit through the reduction or elimination of these market barriers.

The Office of Energy Efficiency at Natural Resources Canada (NRCan) works to design and implement market transformation programs for residential, commercial and industrial products. NRCan defines market transformation as 'any activity that seeks to create lasting changes that result in the accelerated and expanded market adoption of energy efficient products and services.' In essence, a market transformation program accelerates the natural rate of penetration of a technology and expands its overall market potential. In its review of successful market transformation initiatives, NRCan observed variability in the underlying mechanisms of these initiatives. For example, some programs focused on providing software design tools to highlight life-cycle costs while others combined a discount coupon scheme and multi-media advertising campaign. In order to design a targeted, cost-effective program, a barrier analysis tool that organized and prioritized issues was needed.

The 5A's Framework for Market Transformation

NRCan worked with Navigant Consulting to develop the 5A's framework, a tool to identify market penetration barriers affecting energy efficient products and technologies. This framework considers all the steps a product follows as it moves from the manufacturer to the end-user, starting with "Availability" of a technology and proceeding through to end-user "Acceptance". Each "A" in the framework represents a critical aspect of the market adoption path for a new technology. By considering the full market cycle of a technology from production through to installation and operation, the framework facilitates group discussion and identification of all barriers to market transformation. While the applicability of each of the steps in the cycle will vary depending on the technology or product under review, this approach enhances the analysis by characterizing the market barriers and understanding how the barriers can affect different market participants.

Figure 1 shows each of the 5A's in sequential order, from Availability through to Acceptance. While it is presented here in a simplistic linear flow, it is recognized that unique dynamics of a specific market can result in some reverse or concurrent activities in the full market cycle characterization.



Each of the 5A's addresses a critical step in the movement of product from the manufacturer to the end-user. These steps are described below.

• <u>Availability</u> - Does the technology exist? What information or policy mechanisms are available to support and promote the adoption of the given technology? Availability addresses the existence of a technology, policy or other element targeted for market transformation. And for that technology, it evaluates the availability and/or barriers of these three elements in promoting its market adoption.

- <u>Awareness</u> Does the market know about the technology? What is the overall level of awareness among all market players with respect to the more efficient technology being evaluated? This critical step evaluates to what extent market participants (i.e., distributors, retailers, designers, electrical contractors, and end-users) are aware of a more efficient technology, and what barriers might be preventing them from becoming informed.
- <u>Accessibility</u> Does the market have easy access to the technology through traditional distribution channels? Once a technology is available and people are aware of it, the market needs to have easy access to purchasing the technology. Accessibility concentrates on the flow of products, technologies, and information to all stakeholders.
- <u>Affordability</u> Is the market able to bear the selling price? Does the higher purchase price of the more efficient technology represent a market barrier? Some sectors (e.g., residential) can be particularly first cost sensitive, while others (e.g., commercial) are more likely to look at life-cycle cost and payback periods. If a more efficient technology is more expensive than the source it seeks to supplant, it may experience an affordability barrier to capturing a greater share of the market.
- <u>Acceptance</u> The last step of the 5A's barrier analysis brings together elements of the preceding four A's, with other factors that impact a purchasing decision the form, fit and function of a product. These attributes of a particular product (e.g., operating life, performance quality, noise production) can represent a barrier to market acceptance. Market barriers found in Acceptance typically lead to programs or solutions being carried out in one or more of the preceding four A's.

The 5A's framework is intended to be a flexible tool that can be adapted by its users to specific challenges facing a market transformation team. The classification and boundaries of products and technologies, market barriers, and other key elements of the framework requires experience and sound professional judgment.

5A's Walk-Through

The 5A's framework was first developed for use by the Canadian Lighting Industry Collaborative (CLIC) in April 2002. CLIC is composed of a group of manufacturers, distributors, retailers, utilities and government representatives, established to develop short and long term strategies for market transformation of energy efficient lighting equipment in Canada.

The 5A's framework was originally developed to facilitate discussion at CLIC on accelerating the market adoption of more energy efficient lighting products. The framework provided a common taxonomy to evaluate the barriers affecting a diverse set of energy-efficient lighting products. The 5A's tool provided an easy way to map barriers to all the players in the value chain, from manufacturers to end-users. The 5A's method then used a series of questions and a scaling system to create a subjective measure of the strength of each barrier. The final product was a set of matrices that prioritized the barriers with respect to the various target audiences.

The 5A's method classifies market barriers from both systematic analysis discussion and free-form brainstorming. In general terms, the 5A's tool is an iterative process that takes the results from expert group discussion and allows its users to create matrices that subjectively rank

the market barriers. In practical terms, a 5A's evaluation is conducted by following the process outlined below:

- 1. Identify the target technology or product
- 2. Determine the target-market segmentation or end-user sectors
- 3. Develop a list of discussion questions directed at identifying issues
- 4. Format the questions into matrices that quantify relative barrier strength
- 5. Assess and quantify the key barriers identified
- 6. Complete the matrix, ranking the barriers along value chain
- 7. Design the market transformation program

This first step in the 5A's framework - Availability - addresses the existence of a technology for market transformation. Availability also addresses the key issues around the documentation of benefits, policy and market intelligence as they apply to a selected product, technology or practice. The goal during this stage is to formulate and attempt to answer key questions such as: What energy efficient technologies are available that could lead the market transformation? What key elements (e.g., benefits, policy and market intelligence) are available to support the transformation?

For example, consider reviewing the Availability issues of an integral ballast compact fluorescent lamp (CFL). There are several types of integral CFLs available with a range of product and performance attributes, although it is recognized that certain qualities may not be developed or commercialized (i.e., available), such as a small ballast that fits in the screw-cap or instant-on at full light output. The second part of the Availability step in the 5A's framework reviews the availability of benefits, policy and market intelligence. For example, are the energy savings and quality of CFLs demonstrated and documented? What about the regulatory environment? Is it promoting the adoption of this technology? Do we have information on residential consumer behaviour in the lighting market and how to transform it?

The second step of the 5A's framework, Awareness, evaluates to what extent market participants (i.e., distributors, retailers, designers, electrical contractors, and end-users) are aware of the more efficient market technology or practice. What is the overall level of awareness among market participants with respect to the more efficient products, technologies or practices being evaluated?

For example, consider evaluating the Awareness barriers affecting integral CFLs. Once the technology is available, distributors, retailers, designers and end-users must be made aware of CFL lamps, their benefits, performance, and other qualities before market adoption can occur. Educational and promotional aspects of a market transformation program, as well as the target audience, all depend on understanding where, in the supply chain, the greatest awareness barriers exist. In the table below, workshop participants would rank the degree to which supply-chain awareness is or is not a barrier on a scale from 0 to 5. Table 1 represents the awareness matrix for the benefits of CFL lamps. Similar Awareness tables can be prepared for awareness of performance or other qualities associated with a given technology.

| Technology: Integral CFL | Manufacturer | Distributor | Retailer | Designer / Specifier | Installer | End User | | |
|-----------------------------------|--|-------------|----------|-------------------------|-----------|----------|--|--|
| Benefits: are market participants | Benefits: are market participants aware of the <i>benefits</i> of more efficient lighting? | | | | | | | |
| Energy savings/LCC* savings | | | | | | | | |
| Other environmental benefits | | | | | | | | |
| Product reliability | | | | | | | | |
| Improved performance | | | | | | | | |

Table 1. Example of Awareness Assessment Table

* LCC: Life-cycle cost savings analysis, considers both the purchase price and the operating costs over the life of the lighting technology.

| not a barrier | 0 | 1 | 2 | 3 | 4 | 5 | significant barrier |
|------------------|---|---|---|---|---|---|------------------------|
| Durrier | | | | | | | |

Accessibility is the third critical step, concentrating on the flow of products, technologies, and information. In other words, if a technology is available and people are aware of its existence, the market needs to have easy access to purchasing the technology. Accessibility addresses questions like: Is there a barrier between customers who are aware of more efficient lighting technologies and their ability to actually make the purchase?

For example, considering integral CFL lamps, if we found that CFL lamps are available and people are aware of them and their benefits, why don't we see greater market penetration? One reason could be a failure in the retail distribution channels, affecting customer access to the product. Are the distribution channels carrying a good selection of CFL lamps? Are they prominently placed and visible in retail stores? Are the sales people knowledgeable to answer consumer questions about this technology? Table 2 illustrates an example of a matrix use to quantify accessibility barriers along the value chain for this technology.

| Value Chain Stage: | Manufacturer | Distributor | Retailer | Designer / Specifier | Installer | End User |
|--|---------------------------------|-------------|----------|-------------------------|-----------|----------|
| Why is accessibility a barrier? | Where do these problems appear? | | | | | |
| Distribution | | | | | | n/a |
| Stocking practices | | | | | | n/a |
| Product placement | | | | | | n/a |
| Informed sales force | | | | | | n/a |
| Educational or Promotional displays | | | | | | n/a |
| Total Percentages: | % | % | % | % | % | n/a |

 Table 2. Example of Accessibility Assessment Table

Affordability is the fourth step in the 5A's barriers to market transformation analysis tool. Higher sales prices often pose barriers to higher levels of market adoption of a given technology.

This is particularly true in sectors like the residential sector where consumers are highly first-cost sensitive. If a more efficient technology is more expensive than the source it seeks to supplant, it may experience an affordability barrier preventing it from capturing a greater share of the market. The key question to answer at this point is: Does the higher purchase price of this more efficient technology represent a market barrier?

For example, consider the degree of market penetration of CFLs in the residential sector. This is a proven technology that will pay its owner back more than four times its purchase price in electricity savings over the lamp's life. However, CFLs have not been successful in competing for market share with general service incandescent lamps. Focusing on the Designer / Specifier and End-User groups, the Affordability barrier may utilize direct subsidies, coupons, mail-in rebates, leasing schemes, or other mechanisms to reduce the purchase price.

The last step of the 5A's barrier analysis brings together elements of the preceding four A's, with other factors that impact a purchasing decision - the form, fit and function of a product. These attributes of a particular product (e.g., life, performance, noise) can also be a barrier to market acceptance. Market barriers found in Acceptance typically lead to programs or solutions being carried out in one or more of the preceding four A's. Similar to Affordability, Acceptance barriers center around the Designer / Specifier and End-User groups. The key questions to address here include: With all the right conditions in place for market transformation, what is preventing customers from adopting this technology? Is the product providing an acceptable service or function to the end-user?

Considering the CFL example, even with programs to address key barriers including affordability, there are still be some barriers to market adoption (e.g., light colour, or incompatibility with some fixtures due to ballast or lamp shape. In this example, some product attributes may be preventing consumers from switching to CFLs despite the affordable price and energy savings. One solution to this problem would be to develop new miniature ballasts and alternative phosphors (both Availability issues) to overcome these market barriers.

After completing the five stages of the 5A's framework, the quantified results of the ranking exercises are reduced into a summary table that creates a useful visual matrix of the strength and location of market barriers. The visual location and subjective quantification of the barrier strength combined with the qualitative summary of the discussions generated during the exercise enable program managers to design more effective market transformation programs. Summary tables for several products evaluated in Canada are presented in the following sections of this paper.

Application of the 5A's Barrier Analysis Tool

As part of the CLIC activities, the 5A's analysis has been applied to integral CFLs, light emitting diode (LED) exit signs, LED traffic signals and compact fluorescent torchieres. The 5A's help CLIC fulfill its mandate to determine where NRCan and other stakeholders should concentrate program activities. The results of three of these analyses are summarized in this paper. The summaries also provide an outline of the program activities that were undertaken to address the barriers raised in the analyses:

Case Study: Integral Compact Fluorescent Lamps

CFL technology has a long history in the energy efficiency market, but continues to be a source of potentially significant energy savings. The table below is a summary which tallies the

results from all of the questions in the 5A's matrix, assessing the barrier strength and the intervention required by each market actor. The results of this analysis show that market transformation efforts will have to tackle multiple barriers, primarily for the Installers and End users in the supply chain.

| Integral CFL | Manufacturer | Distributor | Retailer | Designer /Specifer | Installer | End User | |
|---|--------------|-------------|----------|-----------------------|-----------|----------|--|
| Residential | | | | | | | |
| Availability | 58% | _ * | - | | | - | |
| Awareness | 2% | 12% | 44% | 40% | 48% | 77% | |
| Accessibility | 0% | 20% | 42% | 68% | 68% | - | |
| Affordability | - | - | - | 64% | | 64% | |
| Acceptance | - | - | - | 57% | | 57% | |
| Minimal Intervention Stronger intervention Strongest Intervention | | | | | vention | | |

 Table 3. Summary 5A's for Compact Fluorescent Lamps



In general terms, the barrier analysis showed that a range of strategic interventions are necessary for CFL market transformation, such as:

- Increasing the availability of CFLs meeting different application needs in the market place.
- Educating market participants about the benefits of this technology, how to properly use the technology and how to effectively compare products.
- Improving access to these products and information about them across the supply chain.

5A's as a program design tool. For integrated CFLs, the 5A's framework provided the basis for the development of the marketing and communications strategy that has engaged multiple stakeholders, ranging from manufacturers, retailers, distributors, provincial governments and utilities.

The 5A's analysis indicated that awareness and affordability were two elements that the strategy needed to address. Hence, the marketing strategy included the development of a national campaign in collaboration with a group of market participants (retailers, manufacturers, utilities and governments) to that would address the awareness of buyers and end-users on the energy efficiency and cost-saving benefits of CFLs. The program would also address the other 5A's, such as affordability, accessibility and acceptance, through negotiations with stakeholders. It was felt by the collaborators that information on CFLs needed to be simplified, and that a strong financial argument as to why consumers should pay slightly more to get substantial energy savings, needed to be made. Furthermore, the analysis showed that many users dropped out of the CFL market due to previous negative experience with the product. A campaign would have to encompass difficult awareness issues and be conveyed through a compelling and attractive look and feel, which would focus on key product attributes and information on cost.

The national campaign with stakeholders will take place in September and October 2004, when consumers increase the use of electric light due to seasonal and time changes. The role of the Canadian government in this campaign will be to coordinate the development and delivery of materials, media relations and promotional advertising to the campaign. The strategic objective is to bring consumers into stores (or on line) to introduce them to the wide range of ENERGY STAR® qualified product offerings available. Consumers must be given information that is quick, effective, and believable in order to educate and convince them to purchase a more energy efficient replacement light source. Market collaborators will coordinate the development and delivery of incentives at the point of sale.

Evaluation will be an important element of the campaign. Evaluation instruments will determine whether the 5A's approach has provided the correct guidance in the development of the campaign. Aggregate sales data, consumer opinion surveys and a review of changes in business practices will determine if this type of national activity has an impact on the public's perception and acceptance of CFLs.

Other opportunities for enhancing consumers' awareness and understanding of CFLs have been identified, including the provision of information on web sites and improvement in the development and delivery of information through a toll-free information line. The Canadian government is also working through its EnerGuide for Houses Initiative to promote CFLs. EnerGuide for Houses is a home energy rating system associated with a retrofit grant for consumers. Auditors are given detailed information on the opportunities for CFLs in the residential sector, identifying preferred locations, criteria and issues on the use and installation of energy efficient lighting sources.

Case Study: LED Exit Signs

LED exit signs are a mature product that offers dramatic energy savings while improving reliability and reducing maintenance costs. During the 5A's barrier analysis, the CLIC participants initially identified two distinct markets for LED exit signs with different influencers and drivers. The first are the new and retrofit market, which is usually specified as part of a new building or a major retrofit. The second market is the replacement market, focused on exit sign purchases to upgrade or replace existing exit signs.

| LED Exit Signs New/Retrofit | Manufacturer | Distributor / Retailer | Designer / Specifier | Installer | End User |
|--------------------------------|--------------|---------------------------|-------------------------|-----------|----------|
| Availability | 40% | - | - | - | - |
| Awareness | 18% | 33% | 13% | 13% | 17% |
| Accessibility | 16% | 16% | 32% | 32% | - |
| Affordability | - | - | 35% | - | 35% |
| Acceptance | - | - | 5% | - | 5% |

Table 4. Summary 5A's for LED Exit Signs (New/Retrofit)

The New / Retrofit Market did not identify any strong market barriers in any of the 5A's. The perception of stakeholders was that the distribution chain understood the benefits and accepted the technology. However, the higher purchase cost of the signs would result in it being

dropped in favour of lower priced options when costs became an issue. The installers are not necessarily the end users and do not appreciate or benefit from the long-term operation and energy savings. Studies showed that the market would reach a maximum 70% penetration of the higher efficiency technology without further intervention.

| LED Exit Signs | Manufacturer | Distributor/ Retailer | Designer / Specifier | Installer | End User |
|----------------|--------------|--------------------------|-------------------------|-----------|----------|
| Availability | 50% | - | - | - | - |
| Awareness | 18% | 33% | - | - | 77% |
| Accessibility | 16% | 16% | 32% | 32% | - |
| Affordability | - | - | 43% | - | 43% |
| Acceptance | - | - | 65% | - | 65% |

 Table 5. Summary Table for LED Exit Signs (Replacement)

The barriers for the replacement market were found to be highest in end-user awareness. Significant work is required to reach these users who are not always aware of the issues. Better market intelligence and information communication are both required to reduce this barrier. In terms of availability, participants raised concerns about the visibility of LED screw-in replacement retrofit lamps, and their ability to meet code.

5A's as a program design tool. For exit signs, the strategy indicated that the market intervention to be addressed was the communication of benefits of adopting energy efficient exit signs to designers and end-users for the replacement market. A technology profile provided a sound basic understanding of the products currently being utilised in the replacement market, as well as who the key market participants are, the appropriate channels of distribution, and the venues and activities at which information could be conveyed. Standardized presentations on key benefits, and the presentation of a life-cycle costing scenario using the ENERGY STAR calculator were presented to organizations such as Apartment Associations, Municipal governments, materiel management professionals, professional trade shows and meetings. Web based information was enhanced to focus on awareness and acceptance barriers, as well as integration of material into other energy efficiency program areas of the federal government.

A more traditional market transformation has taken place in the New/Retrofit market. Voluntary labelling programs such as Energy Star and utility rebate programs have improved awareness of all players in the distribution chain of the benefits of energy efficient products. Previously high incremental costs are becoming less of a barrier with increased market penetration. With 70% market penetration, stakeholders were receptive to establishing a regulated minimum energy performance level for exit signs. This amendment to the regulation is on schedule to be approved by July 2004 with an effective date of November 1, 2004.

Case Study: LED Traffic Signals

LED traffic signals are another mature product technology that offer significant energy savings while improving reliability and reducing maintenance costs. Due to the methods by

which traffic signals are distributed in the market place, the supply chain participants were modified for this analysis.

| LED Traffic Signals | Manufacturer | Distributor | End User (Municipality) |
|---------------------|--------------|-------------|-------------------------|
| Availability | | - | - |
| Awareness | 20% | 50% | 40% |
| Accessibility | 16% | 20% | - |
| Affordability | - | - | 30% |
| Acceptance | - | - | 70% |

Table 6. Summary 5A's for LED Traffic Signals

Initially, members of CLIC felt that the major barrier for LED traffic signals was the high first cost of the product. However, the 5A's analysis identified acceptance by the municipality and awareness of the benefits at both the distributor and municipal level as more important. In addition to energy savings, one of the compelling reasons identified for transitioning to LED traffic signals is the maintenance savings. Members of CLIC also recommended, through discussion of the acceptance barrier, the need to develop a specification for LED traffic signals, so that end users can be confident they're getting a quality product.

While many energy-efficient products face affordability barriers, for LED traffic signals, CLIC found that the constraint was not so much access to capital funds, but a problem of institutional accounting. When municipalities are facing budget crises, there is a lack of awareness of the long-term benefits at the decision-making level, creating a barrier. Despite economically sound and compelling business cases, LED traffic signal upgrades are often dropped or postponed for short-term reasons.

The majority of the barriers identified were to do with acceptance by the end-user, there were concerns about perceived quality assurance problems, lack of standards and issues around reliability in extreme weather conditions.

5A's as a program design tool. LED traffic and pedestrian signals are available today as virtual drop-in replacements for incandescent lamps in most applications, but they can cost over \$100 per lamp versus \$3 for incandescent lamps. As discovered during the 5A's analysis, initial cost is commonly cited as a barrier to upgrading, particularly when there the end user doesn't have complete information the benefits. Accurate data on lamp life and maintenance requirements are essential to addressing the affordability barrier.

To address the issue of affordability and acceptability, NRCan is supporting an initiative by Manitoba Hydro Power Smart Program to conduct field-monitoring of LED traffic and pedestrian signals in the City of Winnipeg. This project will gather data on the conversion, assess the viability, and provide information enabling NRCan to address barriers to LED traffic and pedestrian signals across Canada. The project will also prove instrumental in the City of Winnipeg's future decisions on conversion to LED traffic and pedestrian signalling.

This multi-year field-monitoring project will gather data on many aspects of the technology, including operational impacts due to climatic extremes, degradation of optical performance, estimated life expectancy, and other technology issues raised in the 5A's analysis. The study will also gather information from research reports and from jurisdictions that have adopted LED traffic signal technology regarding the performance, costs, benefits and problems

encountered. The results will lead to the development of a case study on the benefits associated with installing, and maintaining LED traffic signals when compared to traditional traffic signal technology and provide decision-making information on the benefits.

Where Are We, and Where Are We Going?

The 5A's were used to facilitate discussions at stakeholder workshops on lighting, commercial refrigeration, air handling and many other technologies. The 5A's are used to provide a common lexicon for NRCan when conducting market analyses, to ensure that all market transformation barriers related to a product are thoroughly investigated and understood. The 5A's were used in 2003 and again in 2004 to provide a framework for evaluating nominees for Canada's ENERGY STAR® Market Transformation awards, enabling the awards committee to evaluate a wide variety of submissions.

There are four key advantages that the 5A's framework offers the energy efficiency community. (1) The structure of the framework requires workshop participants to look broadly at all potential barriers, and not simply focus on the one or two primary barriers. (2) The 5A's framework is flexible and can accommodate a broad range of comments from the most obvious to the "Eureka" type that are often exposed during brainstorming sessions. (3) Because North America is an integrated market, barrier discussion and programmatic solutions to address these barriers can benefit US and Canadian organizations alike. (4) The methodology is logical, and offers individuals, involved in a variety of technologies and programs, a clear, consistent framework through which to understand technologies and unique market drivers for those targeted technologies.

While NRCan has found the 5A's to be a very powerful tool it is not without limitations. (1) The tool works best when focused on specific end-use equipment technologies, it is less effective when discussing multi-component systems such as HVAC controls systems or when discussing barriers to social concepts such as changing behaviour. (2) There can be occasions when a group might have difficulty in agreeing on how to categorize a barrier, such as split incentives, where it could be an accessibility or and affordability issue. A good facilitator can focus the group on the issue rather than the structure and ensure that the barrier is identified and quantified within one of the five A's. (3) The percentages are an attempt to quantify and create relative rankings for some difficult-to-quantify issues. For consistency, NRCan has found that is more effective for one group (e.g., 8 to 10 stakeholders) to determine all of the numeric values for one product rather than having a number of smaller groups tackle one "A" each.

Originally developed for use by CLIC to apply limited resources around market transformation programs for lighting more effectively, the 5A's became widely accepted and adopted for use in several other energy efficiency areas of Canada's federal government. Based on the insight and structure gained from applying the 5A's framework, NRCan has proceeded with demonstration projects, publications, incentive programs and regulations for these products that required distinct interventions.

References

Arthur D. Little, Inc., 1999. Potential for Future Energy Savings through EquipmentReplacement and Shell Retrofit, U.S. Department of Energy, Washington D.C.

- Egan, C., and E. Brown, 2001. An Analysis of Public Opinion and Communication CampaignResearch on Energy Efficiency and Related Topics, ACEEE Report Number A013. American Council for an Energy-Efficient Economy, Washington, D.C.
- Eto, J., R. Prahl, and J. Schlegel, 1996. *A Scoping Study on Energy-Efficiency MarketTransformation by California Utility DSM Programs*, LBNL-39058, Lawrence Berkeley National Laboratory, Berkeley, CA.
- Geller H., and S. Nadel, 1994. *Market Transformation Strategies to Promote End-Use Efficiency*, American Council for an Energy Efficient Economy, Washington DC, Annual Review Energy Environment, 1994, 19: 301-46.
- Nadel S., and L. Latham, 1998. The Role of Market Transformation Strategies in Achieving a More Sustainable Energy Future, ACEEE Report Number U983. American Council for an Energy-Efficient Economy, Washington, D.C.
- Nadel, Steven, 1999. Adapting the Market Transformation Approach to Expand the Reach of Private Energy Efficiency Providers, ACEEE Report Number A013. American Council for an Energy-Efficient Economy, Washington, D.C.
- Navigant Consulting, Inc., 2002. U.S. Lighting Market Characterization, Volume I: National Lighting Inventory and Energy Consumption Estimate, U.S. Department of Energy, Washington D.C.
- Suozzo, M., 2001. *LED Traffic Signal Market Transformation: An Update with Boston-Area Case Studies*, ACEEE Report Number A011. American Council for an Energy-Efficient Economy, Washington, D.C.