ENERGY STAR's Retail Focus—A Nationally Coordinated Midstream Approach

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ABSTRACT

For decades, efficiency programs have targeted consumers with rebates based on basic microeconomic theory: make a product cheaper using rebates and you will sell more. This blunt instrument was sufficient until recently, when increasing national efficiency standards and ENERGY STAR® performance levels reduced the kWh savings for many consumer products. "Cost effectiveness" is now challenging, which opens the door for the energy efficiency community to take a hard look at program design with the goal of reducing program costs while increasing participation and savings.

This paper will discuss the ENERGY STAR Retail Products Platform, a nationally scalable market transformation program. The approach is to offer "midstream" incentives to retailers that will provide program administrators with significant leverage to transform the efficiency market, for both traditional large appliances and also smaller consumer electronics such as room AC, sound bars and air cleaners. The paper will illustrate the program elements that need consideration and suggested direction for designing an effective program evaluation.

We will present the program model, describe the challenges of evaluating the impacts of this midstream approach, and report on progress to date in the California and Northwest pilots.

Introduction

The ENERGY STAR Retail Products Platform (ESRPP) is a collaborative initiative of ENERGY STAR energy efficiency program sponsor and retailer partners facilitated by the U.S. Environmental Protection Agency (EPA).

Energy efficiency programs have been successfully run in the USA since the 1980s. During this time, significant energy savings have been achieved. Simultaneously there have been significant changes in the efficiency marketplace, resulting in dramatic reductions in energy use for common household appliances and some home electronics due to changes in federal minimum efficiency standards, and increasing efficiency levels for ENERGY STAR products. Because of this general increase in energy efficiency across numerous devices and appliances, the savings available to efficiency programs has decreased, putting pressure on program cost-effectiveness. Although this increased efficiency is a welcome change in the marketplace, the challenge now is whether efficiency program managers can adapt to this new environment by improving program delivery.

Viewing this as an opportunity to increase the uptake of energy efficiency at a national level, EPA has been working with national stakeholders on a new approach to energy efficiency programs—the ESRPP—since the fall of 2014. The ESRPP is centered on a nationally coordinated market intervention targeted at the retail sector. Participants have agreed to coordinate on a national pilot program, partnering with national retailers to promote ENERGY

STAR products across a group of product categories using midstream incentives. EPA is assisting pilot members with program facilitation and tool development in areas such as program evaluation.

The ESRPP is based on the concept of developing national infrastructure for the design of program delivery and engagement with retailers. The ESRPP gives program sponsors new access to a low-cost retail program through national coordination. The goal of the ESRPP is to transform markets by strengthening the link between retailers and efficiency programs through a nationally harmonized program design. The shift in product availability will generate energy savings as utility customers purchase and install these more efficient models in their homes.

Measuring the effectiveness of this program will require adopting new methods and tools for many participants. EPA is working with stakeholders to develop evaluation techniques that are specifically targeted at market transformation programs, which, in some areas of the country, represent a new approach. Using standard "resource acquisition" evaluation methods for a market transformation program such as the ESRPP could lead to faulty conclusions and negative results that have the potential to undermine the value of the effort. EPA is providing guidance to efficiency programs, evaluators, and regulators on developing effective evaluation plans for the ESRPP.

Overview

Informed by input from participating sponsors, and with their agreement, the ESRPP Product Task Force determined that, in the first pilot period (2016), the ESRPP would launch as a pilot with a suite of five product categories, all of which have active ENERGY STAR specifications. The products included in the 2016 ESRPP pilot are as follows:

- ENERGY STAR-certified dryers—new category, gas and electric;
- ENERGY STAR-certified air cleaners—small-unit sales, high per-unit energy savings;
- ENERGY STAR-certified freezers—difficult-to-administer cost-effective downstream rebates;
- ENERGY STAR-certified sound bars (+15%)—high growth category, limited per-unit savings; and
- ENERGY STAR-certified room air conditioners—new specification effective 2016, low market share expected.

Several of these categories have been challenging for traditional retail-based efficient products programs because of low per-unit energy savings and, therefore, are typically not included as measures in most retail programs today. This will benefit 2016 ESRPP pilot sponsors because, with few downstream programs currently covering these product categories, there should be limited overlap. The pilot sponsors are now in the process of selecting products for the calendar year 2017. The current plan is to expand the existing portfolio by adding new product categories starting first with a list of nominations from sponsors and discussions with retailers. This relatively full list has been developed and discussed with retail partners and the group anticipates finalization of the 2017 list in the fall of 2016.

Nature of Market Transformation Programs

The midstream ESRPP approach is an example of a market transformation approach to energy efficiency. Market transformation programs differ from resource acquisition programs, which rely on direct incentives to achieve near-term savings. An example of a definition of market transformation comes from the 2009 California Public Utilities Commission (CPUC 2007), which defines market transformation as follows:

> *Long-lasting sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where further publicly-funded intervention is no longer appropriate in that specific market.*

The key element of the definition is the focus on eventually eliminating public funding while maintaining the market changes. In contrast, resource acquisition programs typically function to provide a utility with an alternative to purchasing energy, and it is expected that the utility will continue to fund the program as long as the program cost is less than the cost of purchasing additional energy. In general, there is limited or no focus on sustained energy efficiency in the absence of the utility funding. Table 1 illustrates the difference between a program designed for resource acquisition and one designed for market transformation (Keating 2014).

Table 1. Distinctions between resource acquisition and market transformation

Attribute	Resource acquisition	Market transformation
Scale	Program	Entire defined market
Target	Participants (retailers, contractors, consumers)	All consumers of targeted products
Goal	Near-term savings	Structural changes in the market leading to long-term savings
Approach	Save energy through customer participation.	Save energy by mobilizing the market
Scope of effort	Usually from a single program	Results from effects of multiple programs or interventions
Amount of program administrator's control	Program administrators can control the pace, scale, and geographic location, and can identify participants in general	Markets are very dynamic. Program administrators can have large market impacts over time, they have less control of short-term territory-specific changes that are influenced by factors beyond the program administrator's control
What is tracked, measured, and evaluated	Energy use and savings, participants, and freeridership	Interim and long-term indicators of market penetration and structural changes, attribution to the program, and cumulative energy impacts
Timeframe for cost-effectiveness	Usually based on first year or cycle savings	First-year savings can be small, impacting cost-effectiveness in the early

		years. Savings ramp up over the mid- to long term, while measure costs decline. Cost-effectiveness is generally measured over multiple program years.

The programmatic differences between a resource acquisition program and a market transformation program, such as the ESRPP, result in the need for different evaluation approaches for the respective programs. As noted in Table 1, market transformation programs have less direct control over participation than is available in a resource acquisition program. Consequently, market effects are inferred by observing the changes in leading market indicators such as product availability and market share of the program—in other words, qualified products rather than the number of rebates issued or some other direct observation commonly used in evaluation of resource acquisition programs.

Program Structure and Logic Model

The ESRPP focuses on retailers as the point of intervention because of their unique position to impact markets for energy-efficient products. Traditional downstream rebate programs are based on the economic theory of price elasticity: that is, make a product cheaper with a rebate and more will be sold. This approach has been successful for years; however, it is much less effective when rebate levels are small relative to the purchase price of the product, which is more common now even with many major appliances (Michael 2016). The other area where rebates are ineffective is lower-cost plug load products like consumer electronics since rebates cannot be applied. Retailers, on the other hand, can be motivated by small incentives and are in a position to sell those products using their expertise, rather than by simply lowering the price.

The structural issues addressed and activities undertaken by the ESRPP are illustrated in a logic model. The logic model is a useful tool for displaying program theory. It usually specifies barriers as well as activities that can be used to address those barriers. A logic model also specifies expected outcomes from the activities, which can be used to create measureable indicators that determine if market transformation is occurring. Refer to Appendix A for the logic model of the ESRPP.

Setting Realistic Expectations

For market transformation program launch and evaluation to be successful, it is critical that realistic expectations be set and agreed to up front among participating parties. This cuts across all aspects of the program, from efficiency programs having prior agreement on data needs from retailers to details of what the evaluation, measurement, and verification (EM&V) process can and cannot show to regulators. Previous experience in other areas of the country has shown that without realistic expectations and prior agreement on evaluation methodology and outputs, problems can emerge. Because of the new nature of some of the techniques in this document, we recommend that EM&V methods are agreed to early on, rather than when the program is underway.

Evaluation Approach

Measuring the success of a market transformation program requires different metrics than a resource acquisition program. The evaluation plan is based on the program implementation theory outlined by the program logic model (Appendix A). The intent of this evaluation plan is to present an evaluation framework that is sufficiently detailed to determine the progress and success of the program while allowing flexibility to tailor the evaluation to the specific needs of each program sponsor. Table 2 illustrates the information needs of various users of the evaluation.

A number of inputs are necessary to develop a successful evaluation. In this case, participating retailers will provide detailed historical and ongoing sales data to the program sponsors as part of their participation agreement. These quantitative indicators will be essential for tracking changes in the marketplace. EPA plans to coordinate the development of a standardized survey and data collection process for the qualitative indicators that are determined to be necessary by the pilot members. Additional market data may be gathered from national sources and discussions with market actors to supplement the data used to evaluate the program.

Experience with market transformation programs has demonstrated that proper planning around the timing and scope of an evaluation is critical. Ideally the timing needs to be more real time than a resource acquisition program evaluation, which is typically evaluated annually and when the program is completed. In contrast, market transformation evaluation should be done using an iterative approach, beginning immediately and continuing over the long term. The reason for this is that the qualitative metrics under evaluation are frequently only observable in real time and the observation/evaluation window is short. However, changes in some metrics may only occur over a long term, that is, over two or more years.

One example of a short observation window for a tracking metric is a retailer's promotional activities. An observation would need to be conducted when stocking practices change and prior to the next change in stocking. Asking the retailer for evidence of these changes a year after they were put in place would add administrative costs to the retailer and may not even be possible because there may have been other significant changes undertaken during that time period.

Table 2. Evaluation audiences and information needs

Audience	Decisions	Information/needs
ESRPP Working Group	Should the program be modified? Are incentive levels correct? How can this project be designed most effectively?	Process evaluation Performance on key progress indicators (Is the program transforming markets? If not, why not?) Savings assumptions Program cost Validation of program theory/logic model
Stakeholders	Short term: Will the program be an effective use of ratepayer money over the planning horizon? Long term: Has the program demonstrated its effectiveness?	Savings assumptions Program cost
Regulators	How will the program's outcomes be measured? Should the program be included in the utility portfolio? Is the program eligible for shareholder incentives (if applicable)?	Process evaluation Performance on key market progress indicators Savings assumptions Program cost

The evaluation of market transformation programs relies heavily on the establishment of a baseline against which the program impacts can be measured. Unlike resource acquisition programs, market transformation evaluations begin at the beginning of the program when a comprehensive market study is conducted to establish the market baseline conditions. It is typically more effective to gather this baseline data at the onset of the program or early on in the program implementation period, before significant influence on the market has occurred. Since the ESRPP program is starting with five product categories and increasing from there in the latter years, setting rigorous baselines may be difficult. As such, discussions with regulators about acceptable levels of detail are necessary.

During the initial implementation of the program, a formal market assessment is used to establish the baseline levels of the market indicators, such as the current market share of the incented products, consumer and retailer awareness of energy efficiency levels, and current product assortment and promotional practices. In some jurisdictions, market progress evaluations carried out by independent contractors are conducted regularly to track market changes against the initial baseline. In other jurisdictions, progress is tracked through more informal means, such as analysis of program records, contacts with supply-side market actors, and reviews of market share statistics prepared by vendor organizations or other government agencies at the local, regional, and national levels (Rosenberg and Hoefgen, 2009).

Baselines and progress are commonly tracked through the use of *market transformation indicators*. Indicators are chosen based on the expected outcomes from the program logic model; the information needs of the evaluation audiences; and the availability, cost, and timeliness of the data. The expected market changes occur at different stages of the market transformation. The

following list of potential market transformation indicators is organized into short term (one to two years), medium term (three to six years), and longer term (seven to ten years) to demonstrate the point at which one would expect to begin observing changes. Each indicator is expected to be tracked over time. Table 3 illustrates potential market transformation indicators.

Table 3. Market Transformation Indicators

Short-term indicators 1-2 Years	Number of participating retailers
	Retailer promotional activities and support
	Number of households in participating geographic area
	Program administrator budget (including number of incentives processed)
Medium-term indicators 3-6 Years	Participating retailers' market share for qualifying and non-qualifying product sales
	National and regional market share for qualifying and non-qualifying product sales
	Retailer purchasing and stocking
	Changes to ENERGY STAR specifications
Longer-term indicators 7-10 Years	Expansion or change of manufacturing facilities and process
	Number and types of products offered
	New entrants into the market
	Changes to national minimum DOE standards

Data Collection

The market share of qualified products forms the basis for evaluating the impact of the program. It is worth noting, however, that developing baseline market share or other indicators can be expensive and difficult. EPA will attempt to minimize the cost and effort by centralizing some of the data efforts. Pilot members can reasonably expect to receive the following data to support their programs: national sales data for ENERGY STAR and non-ENERGY STAR products for each product category;[1] territory level sales data (coming from the retailer, through prior agreement); and national sales data for each retailer for the products in the program. Additional data sources are illustrated in Table 4.

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[1] ENERGY STAR shipment data (reported nationally by manufacturers) are available roughly midyear, for the prior year (e.g., available June 2016 for all shipments in 2015). Market share is estimated based on ENERGY STAR partners' reported sales of ENERGY STAR products divided by estimates of national shipments (using other industry and commercial sources).

Table 4. Key indicators and potential data sources

Potential source	Data collection method	Market transformation indicator
Retailers	Survey questions Participant sales data reporting Field verification	Market share Retailer promotional activities and support Retailer purchasing and stocking Sales
Manufacturers	Telephone interview Qualified products list	Changes in manufacturing Number and types of products produced New entrants in the market
Program staff	Telephone/in-person interview	Number of retailers Potential households Program budget, lessons learned

Savings Calculation

Estimating savings from the program is an important element of the evaluation. A number of potential methods for estimating savings have been proposed for the pilot being conducted in California (Malinick 2015). These methods are described below.

Program-Qualified Share

In addition to total sales volumes of program products, as part of the evaluation to assess savings claims for the ESRPP, the *program qualified share (PQS)*—that is, the proportion of total unit sales volumes within targeted product subcategories—can be calculated.

The PQS can be computed and tracked for individual participating retailers as a means of assessing short-term to midterm program effects and can also be used at the market level over the longer-term to assess the market-transformative aspect of the program. In general, the expectation is that the retailer-specific PQS values will increase over time as the participating retailers increase sales of energy-efficient models.

Unit Energy Savings

Unit energy consumption (UEC) is the average estimated annual electricity use, in kWh, for a specific product or device. The estimate for annual hours of use is multiplied by the measured power (in Watts) to derive the estimate for annual UEC in each of a device's operating modes. The UEC estimates for each mode are then summed to arrive at the estimate for total device UEC.

The basic premise of calculating the *unit energy savings (UES)* in kWh for an energy-efficient model within a particular subcategory is the difference between the average UEC for the non-qualified models and the average UEC for qualified models. These may be computed during the initial program implementation period based on the 12 month historical sales data that will be provided by the participating retailers.

Ex Ante Gross Program Energy Savings

Ex ante gross program energy savings are derived by multiplying the UES in kWh for a qualifying product by the total number of units sold for that product and then summing across all products included in the ESRPP to determine the total savings achieved by the program.

Unit Demand Reduction

In addition to energy savings, the ESRPP will also result in demand reductions. To estimate *unit demand reduction,* peak coincident factors for each sponsor can be derived for each product subcategory as well as the average kW demand for non-qualified models and the average kW demand for qualified models for the product subcategory.

Ex Ante Gross Program Demand Savings

Ex ante gross program demand savings will be derived by multiplying the unit demand reduction in kW for a qualifying product by the total number of units sold for that product and then summing across all products included in the ESRPP to determine the total savings achieved by the program.

Estimating Savings Attributed to the Program

Quantitative sales data will serve as a significant input to any evaluation so that the program's influence on any observed increases in the sales of program-qualified products can be reliably estimated[2]. The simplest approach to assessing program effects based on participating retailer data involves using a 12-month historical data series for participating retailers to forecast a counterfactual program qualified sales volume[3]. Forecasting based on a short timeframe may require a simple average over the timeframe (to eliminate any seasonality) and tying the sales to other indicators (such as income). Over a longer timeframe, the baseline can be adjusted based on changes of those indicators.

The forecasted baseline is then compared to the actual program-period sales data post-implementation. The difference between the program-period data and the forecasted baseline is the net effect of the program. Figure 1 illustrates this approach[4]. Given that this is proposed and managed as a mass-retail and multiple-product program, while sales measurements can be made at the measure level, the program impact will be derived as the sum of the products. In this way, variation in product shipments or unexpected results will not jeopardize the product portfolio.

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[2] For detailed discussions on baselines and attribution, see, for example, the Uniform Methods Project Chapter 23: Estimating Net Savings: Common Practices (http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf) and SEE Action Energy Efficiency Program Impact Evaluation Guide (https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/emv_ee_program_impact_guide_1.pdf)

[3] Other techniques that rely on longer term historical data sets are also used to evaluate market transformation programs.

[4] The forecast will depend on a number of factors and will vary by product. In some cases, the net effects of the program may not appear until the second or subsequent years.
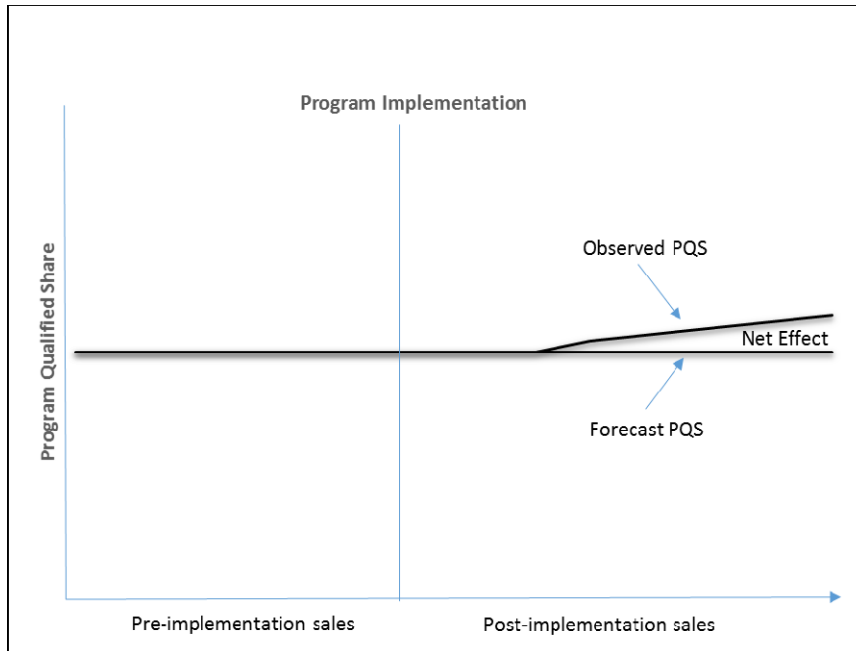
Figure 1. Forecasted monthly PQS versus recorded

Non-Experimental Methods

To provide additional verification, a self-report methodology[5] may be used as a method for assessing change in the program-qualified sales volumes and the overall influence of the ESRPP. For budgetary, timing, statistical, and research design issues, the more traditional designs and analyses may be replaced or supplemented with this self-report approach. The self-report approach can include both quantitative and qualitative information and can consist of data collection efforts such as surveys and in-depth interviews. To minimize individual program sponsor costs and retailer transaction costs, these surveys may be coordinated nationally by ENERGY STAR or a group of program sponsors.

For the ESRPP, various market actors, especially retail purchasing and marketing staff, may be asked to report how changes in program-qualified sales may be attributable to the program. These actors may also be probed in terms of likely behaviors absent the ESRPP intervention, the influence of the ESRPP on their behaviors, and the extent to which the program is being successfully implemented. The results of the surveys may be used as another piece of evidence to support the attribution of savings to the program activities.

Conclusion

This paper shows how the shrinking savings margins for major appliances and the growing load for electronics is pushing efficiency programs toward midstream incentive programs that require modified approaches to evaluation. The ESRPP is a national effort that

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[5] A self-report methodology relies on responses from survey participants rather than direct observation. This methodology is generally used to reduce the costs of data collection.

will be introduced in several areas of the country that may not have experience with market transformation. In these areas, in particular, careful planning will be required to set realistic expectations for program outcomes. One of the strengths of the ESRPP is that retailers fully support the effort and will be reporting on actual sales data, which will be a powerful tool for the program. However, even with this support, there will be evaluation challenges as the program gets off the ground. As the ESRPP develops throughout 2016 and into 2017, the group will be actively discussing EM&V techniques and experiences with the goal of developing a robust set of time-tested methods that can be used by program sponsors nationwide.

Appendix A: Residential Products Program Logic Model

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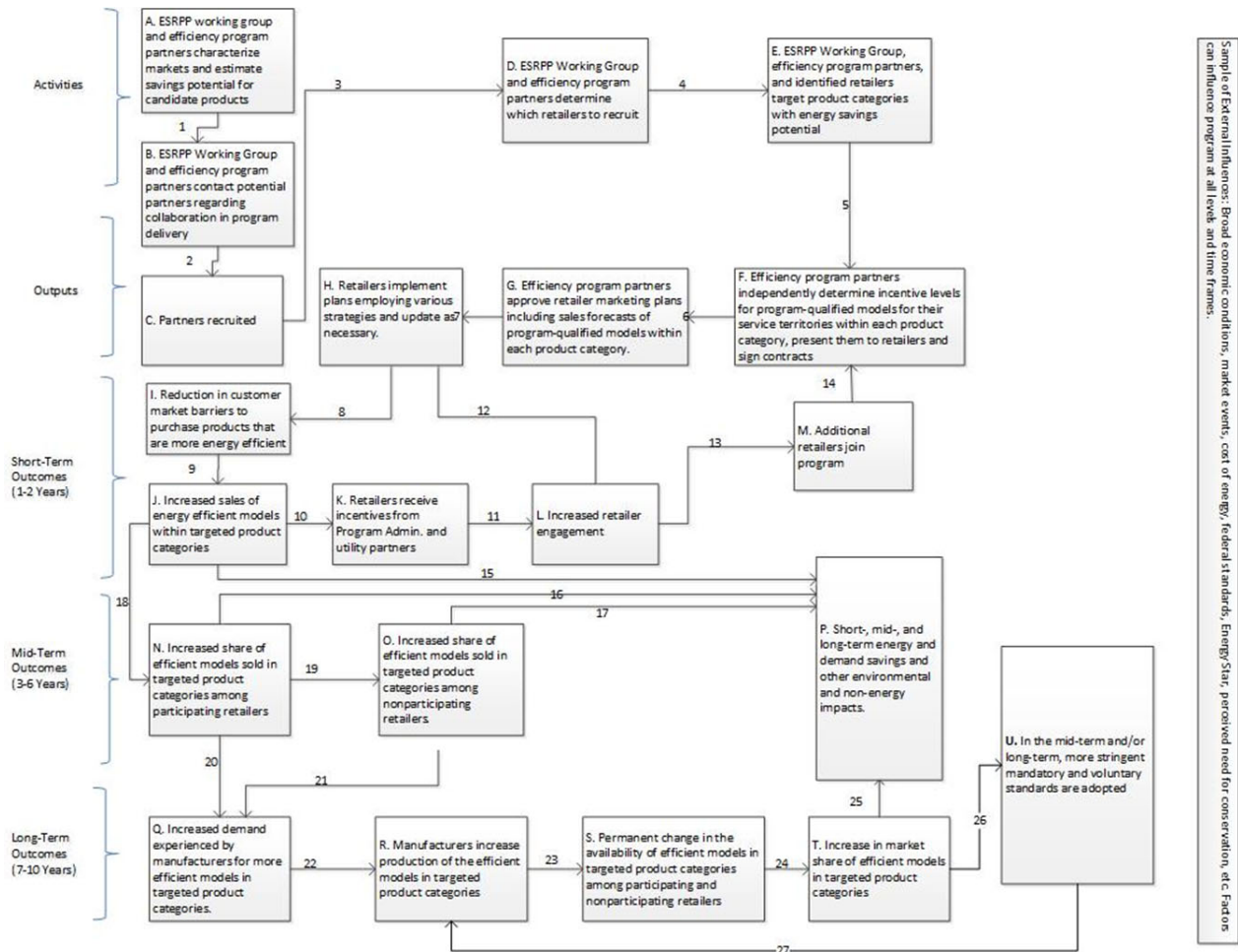
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