Technology Procurement as a Market Transformation Tool

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ABSTRACT

No single tool or technology can transform the market. This paper introduces the concept of "technology procurement" as a potentially powerful but relatively unknown technique for the front-end of a market transformation process: the introduction of new technologies into commercial use. Drawing on experience with recent technology procurements in the United States and other countries (notably Sweden), we first define the concept of buyer-driven innovation, discuss the stages of a typical project, and present a series of important lessons learned — with others still in progress. Government can play an important role either as facilitator or as anchor buyer, often in cooperation with other market-based initiatives.

Important lessons include the importance of extensive interaction with both buyers and sellers, the role of non-energy features in gaining buyer acceptance of a new technology, attracting and maintaining manufacturer interest, identifying which products may be best suited for a technology procurement, and how to most effectively combine technology procurement with other tools to achieve broad and sustained market transformation.

What is Technology Procurement?

Technology procurement is a familiar tool in the defense and aerospace sectors, but relatively unknown as a means for promoting commercialization of new energy-saving technologies. In the case of new weapons or aerospace systems, the government agency defines unique, often highly innovative technology requirements and almost always serves as the only purchaser of the resulting products. Cost

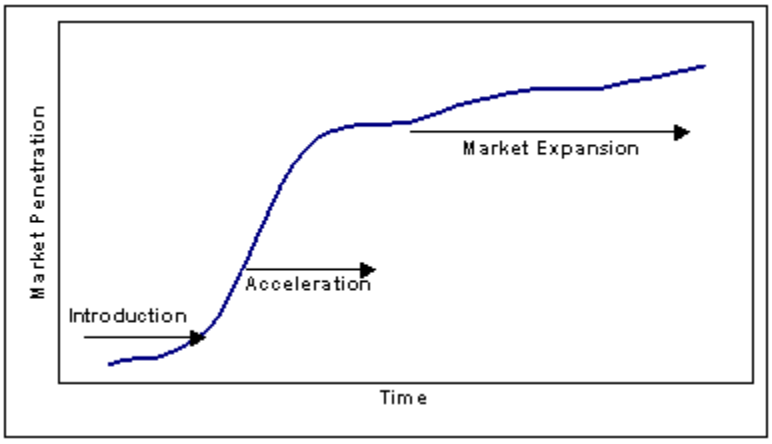

Figure 1: Procurement Goals: Market Introduction, Acceleration, Expansion

often plays a secondary role to innovation and high performance; uncertainties about future market prospects are rarely an issue. However, when we turn to the use of technology procurement for new, energy-efficient technologies, all of these familiar assumptions must be re-examined.

When used as a market transformation tool for energy efficiency, technology procurement is an effort to aggregate demand for energy-efficient products in order to encourage innovation and the introduction of new, more energy-efficient technologies. A successful technology procurement leads to the commercial availability of new technologies, opening up new choices for all buyers — not just the initial group — and eventually to broad and sustained market acceptance of a new generation of efficient products.

In the following sections, we discuss the technology procurement process and illustrate the lessons which have been learned through examples from recent projects. We conclude by offering specific recommendations for using technology procurement to achieve long term market transformation.

The Technology Procurement Process

The process of technology procurement, in the case of energy-efficient technologies, involves four main steps: preparation, procurement and evaluation of bids, product development, and market acceptance (Westling 1996(a), 1996(b)). As in many innovation projects, these steps may overlap in time.

During the **preparation** stage, the organizers of the procurement identify leading buyers, consisting of either a single, very large buyer such as a government agency, or a group of buyers with common interests in purchasing the proposed new product. Working with the buyers as well as manufacturers and technical experts, the project managers establish technical requirements for the product. Requirements typically center around specified energy efficiency levels, but could also include additional performance features, pricing guidelines, timing and conditions for delivery, warranties, and test methods. This stage requires a judicious balancing of buyer preferences and provisions that the manufacturers can realistically (and profitably) meet.

The **procurement** is launched when the final product requirements, test guidelines and any other specifications are announced in a request for proposals. To reach this stage, project managers discuss the project, technologies, and possible requirements with manufacturers, inviting questions and comments on draft requirements. Sometimes a two-stage process is used, to first evaluate concept-designs or prototype units, then solicit bids for larger-scale production and delivery.

The **product development** stage can vary greatly in length, depending on the nature of the technology development required. The buyers or sponsors may establish and evaluation committee or jury to evaluate the bids, using criteria established in the solicitation. The procurement sponsors or jury may announce a single winner that ranks first based on all the criteria, or may select multiple winners, each of whom meet the minimum requirements. The winning bidder(s) then begins to deliver products to the initial buyer group who agreed to participate, while also seeking additional buyers and submarkets.

The **market acceptance** stage is the true test of a procurement project's success. Once the manufacturer(s) have met their commitment to the initial buyer group, they are expected to build on the success of the procurement, and seek — sometimes with continued sponsor support — a broader, sustained market for the new energy-efficient product.

This approach has been successful in achieving market transformation outside the realm of energy efficiency. For example, the General Services Administration was the first to specify seat belts and later air bags for the federal auto fleet; this eventually led to these safety features becoming standard offerings for passenger cars. At this time, technology procurement is still in its early stages as a policy tool for

energy efficiency. However, a number of projects have been completed with others currently under way. Table 1 lists a few examples of energy efficiency procurements, some of which are discussed in more detail in later sections.

Table 1. Technology Procurement Examples

Product	Project Sponsors	Buyers Groups	Description	Results
Apartment-sized refrigerators	NY Power Authority, CEE, DOE	NY City Housing Authority	NYCHA as lead buyer	Purchase of 100,000 units, 30% efficient gain over conv.; low first cost
Clothes Washers and Dryers	NUTEK[1]	Social housing agencies	Efficient, quiet equipment for shared laundry rooms	50% more energy-efficient, reduced water and noise levels.
Computers, Printers	White House Executive Order	U.S. federal government	Require federal purchasers to specify ENERGY STAR criteria	High market penetration of qualified products; current focus on enabling power mgt.
Distribution Transformers	DOE, EPA, CEE, NEMA	Utilities, federal government, C&I customers	Voluntary promotion, purchasing of dry-type distribution transformers.	Projects still in early stages
Incandescent Lamp Replacements	a) DOE, EPA, b) IEA/Annexe III (managed for IEA by BRE of the UK)	a) U.S. DoD; b) utilities, retailers, hotels, purchasing agencies	Two separate procurements focused on 30% efficiency improvements, 3x lifetime vs. incandescent bulbs	U.S. project under revision; Annexe III procurement under way.
Industrial motors, copiers, light bulbs, HP clothes dryers	International Energy Agency (IEA) Annexe III, national project managers	Varies, including government and commercial	Establishing process for international technology procurements.	Projects still under way.
LED Traffic Lights	City of Stockholm	Swedish National Road Admin.	Purchase of 3-color LED light sets, 85% energy reduction and longer lifetimes.	Demonstrating feasibility and cost savings of 3-light units.
Super-Efficient Refrigerator Project (SERP)	Utilities, ACEEE, EPA, DOE	N/A	Rebate to manufacturers for 25% efficiency improvement vs. federal standards	Demonstrated technical potential for greater efficiency
Smaller CFLs	DOE, PNNL	Multi-family housing owners, operators	Small dimensioned screw-base CFLs to fit in existing fixtures	Awards to 3 suppliers, Initial sales significant.
H-axis washers	DOE, PNNL	Utilities, housing and public agencies	Efficient washers at attractive price	Award to Gibson , over 150 sold in Austin, TX through utility aggregators.

Lessons Learned

Although many of the projects listed above have not yet run their course, a number of useful lessons can be drawn from the experience to date. The most critical elements in planning a procurement project can be summarized in this list, which we discuss in greater detail below:

[1]NUTEK's (Swedish National Board for Industrial and Technical Development) energy efficiency responsibilities recently shifted to a new agency, the Swedish National Energy Administration, or STEM.

- Need for extensive interaction with buyers and manufacturers
- Importance of non-energy benefits in attracting buyers
- Incentives for manufacturers to participate
- Targeting the right projects for technology procurement
- Technology procurement in combination with other measures

Despite these common threads, perhaps the most important lesson is that each technology procurement project will have its own unique requirements, resulting from specific barriers and opportunities.

Procurement Requires Extensive Interaction with both Buyers and Sellers

Strengthening market signals. Not surprisingly, it takes considerable effort and skill to carry out the role of intermediary between prospective suppliers and buyers of a new technology. The basic idea of technology procurement is to condense into a much shorter period the complicated exchange of market signals, intervening in a way that accelerates and strengthens — rather than displaces — long-term market relationships. For a public agency to play this role has proved challenging even in Sweden, with its well-established traditions of government-industry cooperation. According to NUTEK, initial efforts in technology procurement met with some skepticism from both buyer groups and manufacturers. Only after persisting over several years, and successfully carrying out more than 25 projects, has the agency established solid credibility with buyers and sellers in its role of brokering technology procurements. In the United States, with a far different tradition and political trends that discourage government "interference" in the market, it may prove even more difficult for a governmental agency to forge this open communication with both buyers and sellers. Rather than interfering, however, procurement projects can serve to gain manufacturer attention to specific user interests, and can, if managed well, serve to close the communication gap between buyers and sellers.

Establishing strong buyer demand. Technology procurement attempts to resolve the classic problem of the "chicken and egg," where manufacturers wait for demonstrated market demand before they will develop an energy-efficient new technology, but buyers in turn wait to see new products before making energy-efficient purchasing choices. The key to breaking this cycle lies with establishing buyer interest in a new product that has not yet been offered. Buyers may be motivated to join a procurement project in order to strengthen their positions by combining their voices in requesting specific technologies with those of other organizations, overcoming the perception that a single company cannot sufficiently influence suppliers to adopt new technologies. The IEA Heat-Pump Dryer project is attempting to overcome exactly this problem (IEA 1998). Developing a dryer that meets the challenging energy specifications outlined by the procurement is time consuming and expensive; suppliers want to be assured of an end market. Conversely, it has been very difficult to obtain commitments from prospective buyers who have yet to see the product (or market price). Project managers are continuing to work to build and demonstrate demand for the proposed efficient products.

There is no simple answer to the question of how many buyers or unit purchases are required to launch a technology procurement that will grow into a self-sustaining shift in the market. A successful procurement is not necessarily defined by the size of the initial buy (in dollars, units, or market-share), or by the number of buyers, but by these factors among many others, some of them largely symbolic. For example, the reputation of initial buyers within their industries as successful innovators, or general awareness of them as "household names" might help to convince manufacturers that a real market can be built on the new technology. Some buyers might represent a potential new market segment for a product,

not already captured by another competitor. And finally, the characteristics of the product itself, such as whether it is likely to appeal to either a broad segment of the market, or to a limited but lucrative one (custom home builders, for example, or specialty retailers) can affect the number and type of buyers required to make the manufacturers' investment worthwhile. All of these can indicate to manufacturers the importance of participating in the technology procurement, and continuing on to subsequent stages of marketing — if for nothing else then to pre-empt a competitor from making important gains.

Sustaining a market. The U.S. procurement of energy-efficient light bulb replacements illustrates a separate but related point: the need for not only a strong initial purchase, but a sustained mass market. The U.S. Department of Defense (DoD) committed $20 million over a three-year period to purchase 6 million light bulbs that would use 25-30% less electricity than a conventional incandescent bulb, screw into the same sockets, last three times as long, and cost no more than $3.00. The bulbs were intended for use in family housing and other on-base facilities, where neither replacement fluorescent fixtures nor screw-base CFLs were feasible. The initial procurement did not succeed in attracting bids that met the cost and performance specifications, in large part because even this sizeable purchase by one major customer did not demonstrate to lighting manufacturers a sufficiently robust long-term market to justify constructing an entirely new assembly line.

Long-term buyer relationships. Some of NUTEK's most successful technology procurements have relied on positive, long-term relationships with major buyer-groups, particularly in the social housing sector, which accounts for a large share of all housing in the country. These long-term relationships with buyers groups have not only overcome initial skepticism about the whole concept of whether a technology procurement can lead to new product innovations, but have increased buyers' enthusiasm and encouraged them to take an active role in defining new targets for technology procurements.

In brief, in order to convince manufacturers that there is both immediate and sustainable demand for energy-efficient products, procurement project managers will need to commit to working with buyers groups over an extended time period, addressing questions, coordinating performance requirements, securing commitments that are as significant and specific as possible, and altogether ensuring that a real market exists. When conducting a procurement for the first time, project managers will need to facilitate creation of trust among the players and build credibility among buyers by demonstrating their familiarity with the products and technologies as well as working to ensure that buyers' highest priorities — even if they are not energy efficiency — are met.

Importance of Non-Energy Benefits

Although it may seem counterintuitive to energy efficiency proponents, the most important motivator for prospective buyers of a new, energy-efficient technology is often not the energy savings themselves, but other, non-energy features that are also part of the package (Sandberg 1998).

Energy related cost savings. Of course, lower energy operating cost can also be an important motivator in some cases — especially for equipment that provides "pure" energy services, such as distribution transformers. In this case, efficiency trends have been quite mixed since the energy shocks of the 1970s, if one compares transformers purchased on the utility side of the meter with those on the customer side (for commercial and industrial installations). Utility purchases have focused more on life-cycle energy cost, resulting in gradual increases in the efficiency of liquid-filled distribution transformers to the today's range

of 98-99% (Barnes et al., 1996, 1997). Conversely, commercial and industrial (C&I) buyers often base their purchase decisions of (mainly) dry-type distribution transformers on lowest first-cost, with the result that the average efficiencies for these generally low- and medium-voltage on-site transformers — lower to begin with — have actually declined by about one percentage point over the past two decades (*op. cit.*).

Recognizing the significant potential for efficiency gains in distribution transformers, several initiatives are now converging, all aimed at improving transformer efficiency through creation of demand for more efficient products on the customer side of the meter. Through the Consortium for Energy Efficiency (CEE), utilities nationwide are promoting the purchase of energy-efficient distribution transformers by their C&I customers. The EPA has expanded its utility-based ENERGY STAR Transformers Program to encourage C&I buyers to choose more efficient units. Finally, the Federal Energy Management Program (FEMP) has issued recommendations for federal agencies to specify and purchase efficient distribution transformers as part of the "Federal Procurement Challenge." In all of these initiatives, the focus is on transforming the market by shifting buyer demand toward purchasing more efficient units based on lower life cycle costs.

Non-energy cost savings. While transformers show how energy cost savings can be a primary motive for buyers, recent purchases of LED traffic lights point to the importance of other economic benefits. A number of cities in the U.S. and Europe have begun to convert to more efficient red-only LED traffic lights, while waiting for technical improvements to reduce the first cost of the green (and to a lesser extent, yellow) LED sources. The city of Stockholm recently conducted a procurement for 3-color traffic light sets; their main motivation was not the 85% savings in electricity costs but the much lower maintenance costs due to the extended lifetime of LED lights. The cost of changing the lamps in traffic signals dwarfs the energy costs for operating the signal and controls; thus the reduced frequency of lamp replacements makes the technology appealing to public works departments.

Performance Advantages. Beyond electricity or other life-cycle costs, it may be the performance improvements associated with an energy-efficient product that interest buyers even more. For example, the procurement of energy-efficient clothes washers in Swedish apartment buildings was successful largely because the machines were quieter than earlier models, based on a specification written into the procurement requirements at the explicit request of the buyer group (Westling 1996(a)). The lower noise level for the efficient washers allowed building operators to extend the hours of common-area laundry rooms without disturbing residents, and therefore also allowed them to meet the needs of the building residents with fewer machines.

Another example of non-energy, non-price benefits is the safety advantage offered by energy-efficient fixtures designed to replace the popular halogen "torchiere" floor lamps. Halogen torchieres are notorious for the fire hazard they pose (Siminovitch, 1997). Energy-efficient fixtures with equally appealing designs, but using much cooler, more efficient compact flourescent lamps are safer for indoor use. As soon as the first CFL-based torchieres appeared on the market, several universities in the United States began offering to exchange them for student-owned halogen torchieres in dormitories in a coordinated effort, both reducing electricity costs and improving the safety of student residences.

Both of these examples suggest that eliminating a product attribute that consumers see as a negative can be as important as, or more important than, adding a new feature. Reducing clothes washer noise and eliminating the heat and potential fire-danger of a halogen torchiere both address negative product characteristics in a way that many consumers find convincing.

While an ideal procurement will offer prospective buyers both energy savings and other benefits, a key lesson is that energy efficiency must not detract from the performance that consumers value. One of the main user complaints about energy-efficient copiers is the long recovery time for some models with a low-energy standby mode. The IEA copier procurement will specify a highly energy-efficient copier that not only overcomes this problem, but adds other features that appeal to buyers, including faster duplexing, digital scanning, and network-based printing and fax capabilities. The copier project sponsors expect that it is these performance features, rather than the potential energy and operating cost savings, that will encourage leading buyers to purchase the "Copier of the Future" (IEA 1998). We further conclude that, in the future, project managers should not only remain open to specifying non-energy features favored by buyers, but actually try to identify these buyer preferences early in the project.

Incentives for Manufacturers of Energy-Efficient Products

While we have already discussed the importance of securing clear commitments from buyers, another lesson is that throughout the procurement process, manufacturers must have the incentive to participate. Procurement managers need to ensure that at least one, preferably several, suppliers will be willing and able to manufacture and market the new product; in most cases several viable bidders may be required either to keep costs down through competition or to meet procurement requirements for open, competitive bidding. There are several ways to encourage manufacturer participation in a technology procurement.

Positive public relations. According to a study of the U.S.-based Super-Efficient Refrigerator Project (SERP), the main factor cited by manufacturers for participating in the competitive bidding process was not the promise of a financial incentive (totaling $30 M over several years) but rather the positive publicity enjoyed by the "winner" — and arguably, the opportunity to deny their competitors that same market advantage (Sandahl et al 1996). Similarly, the Annexe III sponsors are offering positive publicity to both the winning manufacturers and the lead buyers participating in their technology procurement pilot projects, including designation of an "IEA Award for Excellence."

Preference for voluntary programs. Another incentive for manufacturers to participate in a technology procurement is a decided preference for working with voluntary efficiency levels, wherever there is a credible chance of government-imposed mandatory standards in the absence of successful market-driven programs. The example of energy-efficient distribution transformers again comes to mind. The Energy Policy Act of 1992 directed the US Department of Energy (DOE) to evaluate the need for efficiency standards for both utility- and privately-owned distribution transformers. The release of DOE's report on feasibility and potential savings from efficiency standards coincided with the surge of interest by the National Electrical Manufacturers Association (NEMA) and its industry members in the voluntary programs described above. Should the voluntary efforts to expand the market for energy efficient transformers succeed, they would go a long way toward reducing the need for mandatory standards.

The possibility that DOE might adopt mandatory efficiency standards may also have played an important, role in encouraging energy-saving innovations for clothes washers, in the form of horizontal-axis designs that are common in Europe but virtually unknown in the U.S. residential market. In the case of both transformers and washers, manufacturers and industry organizations had a strong reason to pre-empt possible mandatory standards by promoting their own voluntary alternatives.

Build new markets or expand existing markets. The ready market identified through a procurement project reduces some risks to manufacturers, by ensuring that at least some buyers are interested in the new technology. In some cases, manufacturers may choose to enter new areas of the market in order to capture new business. It is often the manufacturers who are not necessarily market leaders who can afford to take technology risks and experiment with new markets. For example, the the NYPA refrigerator procurement, the manufacturer with the strongest response was not a large player in the public housing market, but identified the procurement as an opportunity to build new business. Similarly, in the case of the current procurement of smaller CFLs, large U.S.-based manufacturers have appeared unwilling to risk their existing market bases by expanding into this arena, and the participating suppliers are looking for ways to increase their customer base.

Targeting Projects with Appropriate Technical and Market Characteristics

One further lesson to be drawn from experience with technology procurement is the importance of choosing a product that is appropriate for this method. Both NUTEK and IEA Annexe III used a somewhat intuitive approach to select candidate technologies. For IEA Annexe III, selection of pilot projects was based to a large extent on the judgment of the Experts Group and the level of interest expressed by their respective agencies. Although preliminary studies of technical feasibility were prepared for most of the target products, there was no formal process of screening potential technologies according to well-defined criteria, though some guidance was offered through earlier technology projects (Westling 1991). Such criteria must look well beyond the technology itself, to include the degree of interest by potential buyers, the likelihood that manufacturers will participate, and the feasibility of these same manufacturers reaching a broader mass market following their initial success with lead buyers.

Opportunity for significant energy savings. Distribution transformers again provide an example of a product with important savings potential despite the limited attention they have received. Transformers by their nature are rarely given much thought by facility operators; most units are highly reliable, requiring little or no maintenance over their lifetimes of 30+ years. However, *all* electrical energy used in a building or factory passes through one or more distribution transformers, so the moderate percentage which they extract and the actual quantities of energy which could be saved become immense. Although efficiency losses in utility-owned transformers have been reduced to 1 or 2%, losses from smaller, customer-owned units can reach 10% or more. With dry-type transformers consuming an estimated 80 billion kWh annually, it is important to improve the efficiency of this non-utility owned equipment. By contrast, if a product offers only marginal energy savings at a significant cost to manufacturers or buyers, procurement may not be an appropriate tool to encourage efficiency gains.

Potential for long-term market. As we have discussed at length, strong and sustained buyer demand is an essential part of successful technology procurement. Therefore, projects that hold the prospect of appealing to a critical mass beyond an initial procurement period are those most likely to succeed. In the United States, the 1993 Executive Order mandating that federal computer and printer purchases be based on the criteria set by the ENERGY STAR program has been highly successful in encouraging manufacturers to incorporate energy efficiency features into these products. The U.S. federal government is a sufficiently large computer and printer customer, and has given all indications that it will abide by the Executive Order indefinitely, that manufacturers have found it a necessary part of business to maintain their focus on energy efficiency.

Tying energy to market trends. Another consideration when selecting a candidate for technology procurement is the possibility of tying energy efficiency improvements to anticipated market trends or competitive gains for the participating manufacturers; timing is important. A case in point is the emerging trend for separate office imaging devices — copiers, fax machines, printers — to be packaged together as multi-function, digital devices operated through computer networks. The IEA copier project, viewing this trend, realized that the combination of functions in a single machine offers office-wide energy saving opportunities and user benefits even beyond the initial focus (i.e., a copier with very low standby energy and fast recovery time). Some non-energy benefits of digital technology include the convenience of electronic document management from the desktop, "smart" duplexing (any type of originals), and perhaps faster throughput since digital machines can scan and print simultaneously rather than sequentially. At the same time, the convergence of what used to be distinct markets for copiers, faxes, and computer printers and scanners is introducing new competitive pressures for some firms, and opportunities for others to significantly increase their market-share. The hope is that by tying these market trends with the potential energy savings, manufacturers will find it to their advantage to participate in the technology procurement.

High-volume products. Some otherwise promising technologies may pose a special challenge for a technology procurement. For example, mass-produced consumer items with little product differentiation, such as light bulbs, may prove especially difficult because so many buyers are required in order to establish an initial point of entry — let alone transform the market. In such cases, it is all the more important to involve very large and high-profile purchasers, including major retailers. A perfect example is the recent effort of the home furnishings retailer, Ikea, to stimulate the market for compact flourescent lamps by arranging its own high-volume purchase directly from a low-cost producer, and passing the savings on to consumers (Lundberg 1998(b)). After a three-week giveaway campaign in Sweden, Ikea now offers regularly priced CFLs with electronic ballasts for the equivalent of about $5.00 in stores throughout the world. This shows how a large distributor or retailer could serve as an effective partner in a technology procurement for mass-produced consumer products.

Technology procurement may work best in combination with other policies.

Experience suggests that technology procurement is more likely to lead to a permanent change in the market if it is linked, in a planned way, with other concurrent or subsequent actions such as coordinated rebates; buyer education and promotional campaigns; energy efficiency labels or endorsements; volume purchasing by large buyers; and voluntary or mandatory efficiency standards (Fig. 2).

The SERP project illustrates this interplay of market-shaping policies. Conceived as a technology innovation strategy based exclusively on rebates, this project provided a fixed payment to a single winning bidder (manufacturer) for the confirmed sale of each unit that was 25% more efficient than the existing national refrigerator standard. While the rebate itself helped to keep the selling price of this model comparable to that of a standard unit, the absence of supportive efforts to promote volume purchasing, labeling, retailer promotions, or other market-based measures may all have contributed to the limited popularity of the SERP refrigerator. (Also, this was a large-capacity, upscale model targeted to only a limited market segment.) The project is credited, however, with encouraging several manufacturers to introduce other refrigerator models with similar efficiency improvements (Lee and Conger, 19969(a)). It also helped demonstrate the feasibility of meeting more stringent performance levels, thereby laying the groundwork for DOE's adoption of tighter national efficiency standards.

In the longer term, mandatory appliance standards may help encourage technology and product innovation in yet another way. In a highly cost-competitive sector like home appliances, efficiency standards may reduce the risk that innovative manufacturers will see their new, more efficient models and advanced technologies undercut by the sale of less efficient (but lower first-cost) conventional products. However, procurement of the best on the market, as illustrated in Figure 2, can help drive demand for products that exceed efficiency standards where there is room for improvement. These tools, and others can help in different ways to encourage a more energy efficient market.

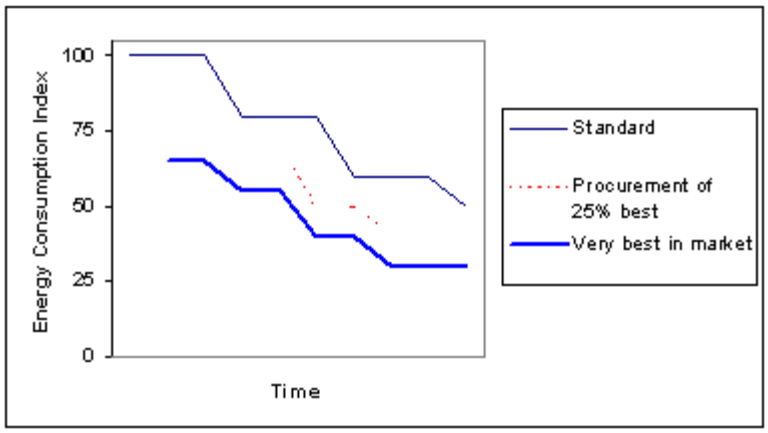

Figure 2: Combinations of technology procurement, market-pull, and standards influence efficiency trends over time.

Conclusions

Conditions for a successful technology procurement

Technology procurement holds significant promise as a tool to introduce, accelerate, and expand the market for energy-efficient products. Selecting appropriate procurement projects and timing them effectively, however, is critical to success. The choice of products for technology procurement should be based in part on potential energy efficiency gains, but also on other benefits to buyers, and on taking best advantage of technical or structural trends already underway in the market.

Suppliers should recognize that the organization of initial buyer demand does not guarantee a long-term market if the products do not perform well or are priced above what the market can sustain. While initial government purchases of environmentally friendly products such as recycled-content paper or low-flow showerheads initially led to new product introduction, many suppliers assumed this guaranteed initial market would be sufficient. The poor performance of some early products was sufficient to create a buyer backlash such that manufacturers have realized that their products can not be marketed solely on environmental or energy attributes — they must perform their basic functions at least as well as existing products on the market.

The primary guide in both technology selection and project design should be the willingness of lead buyers to get involved — but an equally important consideration is whether manufacturers are willing and able to deliver the product, profitably, not just to the initial buyers but to the larger markets they serve. For technology procurement to lead to long-term market transformation, there must be a smooth transition from an initial entry market dominated by a few well-organized buyers to a sustained, mainstream demand for

the new product. While public agencies or utilities can play a supportive role, the main responsibility for this transition ultimately rests with manufacturers and their commercial allies in the chain of distribution and marketing.

For their part, project managers must be able to establish and sustain open communication among different buyers and manufacturers, in order to play the role of honest and credible broker between the interests of buyers and potential suppliers and to find good reasons for both parties to participate with enthusiasm. Developing these relationships may take considerable time and patience, but it is a necessary investment and one with cumulative returns. The organizers of a technology procurement project must have a long term commitment to the project, and to overcoming the inevitable obstacles in a complex process of learning and creating new institutional relationships. Continued support from high levels of the participating organizations is critical to many complicated technology development projects.

The true test of a technology procurement policy, as with other attempts at market transformation, is not just whether it succeeds in introducing one new, efficient product at a time, but whether it can also create a lasting change in perspective and expectations on the part of both buyers and sellers. Buyers must come to expect that they can have a say, through their purchasing-power, in calling for new technologies to be brought to market. Manufacturers, in turn, can come to realize that leading buyers can be their partners in helping to reduce the risk — and in turn to reap the rewards — of timely product innovation for energy efficiency.

Technology procurement - the opening act of market transformation.

Given the goals of technology procurement, to speed the market introduction of energy-efficient technologies, it is not surprising that this is an element of market transformation that is future-focused and may even anticipate future R&D requirements. We foresee great potential for technology procurement to be used as a for stimulating the leading edge of the market for energy efficiency. If truly successful, procurement may even influence manufacturers' research or engineering design decisions, anticipating future buyer demands based on organized buyers markets. If this is the case, technology procurement can act as a swinging door that opens both to let new technologies out into the market, and inward to signal market desires, in turn stimulating further waves of successful innovation.

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