The NETL Modern Grid Strategy
Powering our 21st-Century Economy

SMART GRID CERTIFICATION AND LABELING

Conducted by National Energy Technology Laboratory
for the U.S. Department of Energy
Office of Electricity Delivery and Energy Reliability
September 2009

Office of Electricity
Delivery and Energy
Reliability

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EXECUTIVE SUMMARY

The increasing scope of government's investment in the smart grid has necessitated national standards to ensure interoperability. However, as the smart grid moves beyond its foundational stages, reaching long-term goals for the industry will require advanced applications and sustained innovation. Moving in this direction, the federal government has recently begun exploring a smart grid certification and labeling program. This paper analyzes the experiences of past certification programs, labeling programs, and legislation, and draws lessons for a smart grid certification and labeling program.

When designing a smart grid certification and labeling program, the government can draw lessons from prior energy labeling programs:

- Energy Star—A "best in class" labeling program emphasizing electronics with special energy efficiency or energy conservation features.
- Energy Guide—A neutral, information-centric labeling program that provides consumers with information on projected energy consumption and costs.
- Leadership in Energy and Environmental Design (LEED)—A tiered certification program for "green" buildings that requires builders to meet a certain set of requirements to achieve various tiers of LEED certification.
- 80 PLUS—A tiered certification program funded by electric power utilities promoting more grid-friendly power supplies for computers and servers.

In each of these programs, success has depended on the effective use of seven factors: government support and credibility; budget; publicity and partnerships; label clarity; targeted product category; government mandates; and incentives. The lessons from these programs suggest that the government could effectively accelerate the development of the smart grid industry by pursuing a combination of a "best in class" labeling program and an information-centered labeling program.

The federal government has taken the first steps in this direction through recent legislation. However, these draft programs should be expanded to encompass all parts of the smart grid ecosystem. These programs should also be designed with flexibility in order to provide consumers with information appropriate to their needs.

CASE STUDIES OF PREVIOUS PROGRAMS

The government has pursued a number of labeling efforts in the past with relatively high levels of success. Some of the most well known programs for promoting energy efficiency and conservation are detailed below.

ENERGY STAR

Energy Star is a voluntary labeling program, launched in 1992, designed to help manufacturers promote products meeting energy efficiency and performance standards (Webber, 2000). The program is jointly administered by the Environmental Protection Agency (EPA) and the Department of Energy (DOE). The program was originally started to promote energy-saving features in computers; however, it has since been expanded to include over 35 categories of consumer and commercial appliances. Products that meet certain energy efficiency standards or carry energy-saving features are allowed to bear the Energy Star logo. According to the U.S. Environmental Protection Agency in 2007, more than 2.5 billion Energy Star-qualified products have been purchased since 1992, and 60–70 percent of Americans are aware of the Energy Star.

Energy Star is largely considered to be among the most successful energy-efficiency labeling efforts. In 2007 alone, greenhouse gas (GHG) emissions avoided due to the program were equal to about 27 million vehicles, or 286 MMT CO_2e (million metric tons CO_2 equivalent), the avoided power demand was about 20 gigawatts, and the consumer savings on utility bills was about $17 billion. These savings have grown annually and continue to grow as the program expands.

Energy Star continues to focus on accelerating the adoption of energy efficiency technologies, which:

- Are commercially available but are not yet widely adopted.
- Have demonstrated approved environmental performance.
- Have the potential to significantly reduce GHG emissions across the marketplace at competitive costs in the future.

In order to achieve its goals, Energy Star has employed a number of key strategies:

- Identify emerging cost-effective technologies for energy efficiency.
- Promote energy-efficient products, energy management practices, and new technologies to improve energy efficiency standards.
- Engage partners by providing objective information, technical assistance, and recognition for environmental leadership.
- Reach out and educate the public about the benefits of the program.

Energy Star has been highly successful in pursuing these goals despite being a voluntary program, due in large part to substantial funding from the federal government and an executive order that requires federal agencies to purchase Energy Star-qualified appliances.

Energy Guide Labeling

The Energy Guide labeling program was mandated by the Energy Policy and Conservation Act of 1975, which requires new appliances to bear Energy Guide labels showing their energy use and expected operating cost. The scope of the program has since been expanded and now incorporates the Energy Star logo on high-performing appliances (Federal Trade Commission, 2008). Manufacturers of relevant appliances are required under federal law to conduct energy efficiency testing and display Energy Guide labels.

The Energy Guide labels are intended to be a neutral source of information about energy use, allowing consumers to make informed decisions based on their own priorities. The program is jointly administered by DOE and the Federal Trade Commission (FTC). DOE is responsible for creating standardized test procedures, minimum efficiency standards, and consumer education programs, while the FTC is responsible for establishing the format of the Energy Guide labels and implementing the labeling program (Banerjee & Solomon, 2003).

The Energy Guide labels provide more technical information than the Energy Star stickers, which do not show the actual performance of the appliance. However, because Energy Guide labels are more complicated, many consumers were confused about how to read them, and thus its influence on consumer behavior tends to be lower (Banerjee & Solomon, 2003).

Leadership in Energy and Environmental Design (LEED)

LEED is a green building certification program that provides third-party verification and certification of energy efficiency and environmental features in buildings (U.S. Green Building Council, 2008). LEED certifies homes, commercial interiors, building core and shell, new construction, and a variety of other areas. The certification is tiered based on the number of points a project earns on LEED's scale. Projects can be certified as LEED Certified, LEED Silver, LEED Gold, or LEED Platinum.

LEED's rating system is developed through a series of volunteer committees composed of members throughout the industry. The Green Building Certification Institute also offers individuals LEED educational materials and credentials (as LEED Accredited Professionals) for those who work in the industry (Green Building Certification Institute, 2008). By doing so, the LEED program manages to stay rooted in industry practices, continuously revamping its standards and educational material through a publicly reviewed process. By turning its users into stakeholders through the accreditation program, and by maintaining openly reviewed standards, LEED has managed to quickly expand its reach and credibility.

LEED is not officially affiliated with the government, although many local and state governments have mandated or provided incentives for LEED certification for construction done by their agencies.

80 PLUS

80 PLUS is a certification and incentive program, funded by utilities, to encourage consumers of desktop computers and servers to purchase more energy-efficient power supplies. The program requires power supplies for computers to be at least 80 percent energy efficient and to maintain a power factor of 0.9 or greater (80 PLUS). This reduces power consumption of the consumer and makes it easier for the utility to manage power loads.

The 80 PLUS program offers 4 levels of labels, 80 PLUS, 80 PLUS Bronze, 80 PLUS Silver, and 80 PLUS Gold, to distinguish among various levels of efficiency. While it operates primarily as a private-sector program funded by utilities and electric power organizations, its standards have been adopted in the most recent version of the Energy Star program as well. 80 PLUS serves as an example of a private-sector certification whose standards can be taken up and partly adopted by a government sector program. For many private-sector labeling programs, this is the ultimate goal—to become institutionalized as a permanent government program. While 80 PLUS may not have as much national prominence as other government-sponsored labeling programs, it nonetheless has made significant strides towards its goals by gaining legitimacy and permanence through its partnership with Energy Star.

SUCCESS FACTORS FOR EXISTING PROGRAMS

The successes of the Energy Star, Energy Guide, LEED, and 80 PLUS programs share some common threads, especially when compared to less popular certification programs. A paper by Banerjee and Solomon titled "Eco-labeling for Energy Efficiency and Sustainability" summarizes the main success factors of these programs.

- Government Support and Credibility—Government-run programs have tended to carry greater credibility than non-governmental and private-labeling programs. Government support or mandate has also been a key factor in accelerating the adoption of labeling programs. For example, government purchasing guidelines played a major role in accelerating acceptance for Energy Star, LEED, and a number of other environmental labels. The buying power of the government allows it to move the market consensus simply by changing its own consumer behavior.

- Budget—The ability to maintain a consistently large budget is necessary for labeling programs to reach national prominence and establish long-term credibility. Government programs clearly have an advantage in this regard due to the general stability of government funding. However, some private and non-profit programs offer services other than just certification. For example, LEED has education and accreditation programs, which generate significant sources of revenue. It is generally difficult for a non-governmental entity to offer certification programs when the certification does not offer a tangible marketable value for prospective customers, as the cost to verify a project generally would exceed the willingness of the customer to pay. Other programs like 80 PLUS carve out niche areas where there are tangible benefits that can be gathered and beneficiaries can be identified. Non-governmental labeling programs that are successful generally have found a previously unexplored area where they can add value and generate a steady stream of revenue in return.

- Publicity and Partnerships—Publicity is especially important in labeling in order to gain recognition with end-users and potential customers. The impact of a labeling program is built on the ability of consumers to recognize, understand, believe, and incorporate a label into their decision-making process. Partnerships are also important to labeling organizations by helping them to gain visibility and recognition as well as broadening participation in the program among manufacturers. All of the labeling programs analyzed make extensive use of partnerships with manufacturers or vendors, and many make efforts to improve public awareness of their label as well.

- Label Clarity—While technical data is important for some consumers, especially purchasers for large institutions (such as the federal government), most consumers are unable to effectively use highly technical labels. Simple "seal of approval" labels, such as Energy Star, though they offer consumers an easy guide, leave out important information about how the rating was determined. Thus, it is important to offer technical labels such as Energy Guide in conjunction with simpler labels like Energy Star in order to provide the most benefit for targeted audiences. A partial solution to this is to offer tiered certifications, like the LEED and 80 PLUS systems, that are based on a scale system or point system determined by technical merit.

- Targeted Product Category—It is important for labeling organizations to choose product categories carefully to ensure that there is room for improvement in that category and to ensure that the improvements can be achieved with relatively low effort. This is especially important for private-sector programs that have limited resources. They must choose a product category where they can effectively garner funding and make a marked improvement in performance.

- Government Mandates—Government mandates forcing participation have been effective at increasing the adoption of a number of labels, such as Energy Guide. While legislative mandates carry the risk of added cost for manufacturers, they can be useful for providing important information to consumers that otherwise would not be accessible. If government mandates focus strictly on providing additional information, they actually improve market efficiency by reducing asymmetrical information problems.

- Incentives—Consumer incentives to buy products certified by a label help to institutionalize that product and establish its legitimacy. In addition, a direct financial incentive will spur market acceptance of that label. In many cases, there is a legitimate societal case for providing a financial incentive where the label represents the mitigation of an otherwise unidentified negative externality. In the case of 80 PLUS, an incentive is coupled with the label, directly representing a payment from the utility to the consumer, in order to spur greater capital investment in energy efficiency and power quality. These kinds of payments can help to bridge gaps in decision-making and realign consumer incentives with what is socially optimal.

These seven factors should be taken into account in designing a smart grid certification and labeling program.

EXISTING AND PENDING LEGISLATION

Existing legislation has put the United States on the road toward a smart grid certification and labeling program. Current law focuses on the need for interoperability and standards, but given the ambiguity of these standards, it is unlikely to push new technology development significantly. A "best in class" smart grid certification and labeling program may spur development of new, integrative smart grid technologies in a more direct way.

ENERGY INDEPENDENCE AND SECURITY ACT (EISA) OF 2007

(Title XIII, Section 1305)—Smart Grid Interoperability Framework

The EISA act of 2007 laid the foundation for a smart grid certification and labeling program when it gave the NIST (National Institute of Standards and Technology) the primary responsibility for developing standards for smart grid technologies. These standards generally include interfaces, protocols, and other consensus standards that allow for interaction between components manufactured by different companies.

In cooperation with DOE, National Electrical Manufacturers Association (NEMA), Institute of Electrical and Electronics Engineers (IEEE), Grid Wise Architecture Council (GWAC), and other stakeholders, NIST has "primary responsibility to coordinate development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems" (National Institute of Standards and Technology, 2008).

The smart grid interoperability framework designed by NIST is to have the following features:

- Flexibility enough to accommodate legacy systems.
- Technology-neutral.
- Voluntary uniform standards for appliances and equipment for homes and businesses (U.S. Department of Energy, 2008).

This represents a shift in the responsibility for an interoperability framework from state regulators, vendors, utilities, and private organizations to a federal agency in the Department of Commerce. Part of the logic for this is to expedite the development of standards and to unify those standards across the nation. At the same time, by centralizing the definition of those standards, the federal government creates a precedent that can later be expanded to include a smart grid certification and labeling program. In addition, by giving NIST (a non-regulatory agency) the authority to promulgate standards, the federal government aims to play a consensus-building role rather than a regulatory and enforcement role. By making these standards voluntary instead of mandatory, the federal government appears to be taking a looser approach to intervention. This is the case because the government is trying to magnify a "good" rather than regulate or control a "bad."

THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009

Title III, Section 404

The American Recovery and Reinvestment Act of 2009, called the "stimulus bill," further strengthens the federal government's role in determining smart grid standards by requiring that smart grid projects receiving funding from the federal government use "open protocols and standards (including Internet-based protocols and standards) if available and appropriate" (U.S. Government, 2009). Supposedly, this language will be further clarified by DOE, at which point the stimulus projects may be required to use the voluntary smart grid standards put in place by NIST. By putting its buying power behind the voluntary NIST standards, the federal government will make these standards the de facto rule for the industry. This two-part "label" and "buy" strategy is essentially the same strategy that underlies the fundamentals of the Energy Star program.

THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009

Title I, Subtitle E, Section 142

At the time of this writing, this bill had passed the House but not the Senate. The American Clean Energy and Security Act of 2009, better known for its inclusion of a greenhouse gas cap-and-trade system, also proposes what may be the beginning of a smart grid certification and labeling program under the Energy Star framework. The Act directs EPA and DOE to investigate whether it would be cost-effective to include smart grid technologies under Energy Star products. Also, the Act directs EPA and DOE to decide within 3 years whether to include a "prominent" note on Energy Star appliances if that appliance has smart grid capabilities. The note is also required to explain the use and value of those capabilities and potential "best case" dollar savings to the consumer (U.S. Government, 2009).

With this law, the federal government would essentially create a smart grid certification and labeling program that is a combination of the Energy Star and Energy Guide. The program would mainly target individual homeowners with information about smart grid-capable appliances, which have yet to gain prominence in the home appliance market. Even with this limited scope, the program would still be very large, as it is set to encompass all products currently under review for the Energy Star designation. The expansion is not entirely unprecedented, however, since the scope of the Energy Star and Energy Guide programs have been progressively expanded since their creation.

However, despite the size of the program, it would only encompass one part of the smart grid system, namely consumer-side appliances. Much of the purchasing for smart grid will not be done by individual homeowners but by utilities. Next, we will discuss the various parts of the smart grid system and how a smart grid certification and labeling program might be expanded to include the utility segments.

THE SMART GRID ECOSYSTEM

The smart grid ecosystem has a variety of subsystems. NIST has identified a number of key areas within the smart grid ecosystem for interoperability standards and has created working groups to address them:

- Transmission and Distribution (FitzPatrick, 2008), which includes remote diagnostics, monitoring, and connect-disconnect; load mangement; coordination of electric vehicles (EVs); and local power generation and ancillary services.
- Building to Grid (Holmberg, 2008), including demand response, load control, and energy storage; integration of onsite generation; EV-building integration; and real-time meter data.
- Industry to Grid (NIST, 2009), including bidirectional communication of dynamic pricing information and a market for industrial distributed energy resources.
- Home to Grid (Wacks, 2009), which includes home-area networks, education, and outreach.
- Business and Policy (Melton, 2008), including support for state and federal policymakers and review of the implications of smart grid policy on business.
- Cyber Security Coordination (Lee, 2009), which insures cyber-security standards and application across groups.

The smart grid is clearly broad and complicated. A smart grid certification and labeling program realistically would be forced to focus on a specific part of this ecosystem. The most immediately obvious option, which recent legislation has centered on, has been the home-to-grid side, focusing on consumer appliances.

WHERE CAN CERTIFICATION ADD VALUE BEYOND STANDARDS?

Earlier sections of this paper outlined existing government action to establish smart grid standards and legislation that has pressed in this direction. In general, the government's goals in promoting smart grid standards can be described as—

- Consensus-building among the smart grid community.
- Reducing technology risk for utilities and consumers by ensuring interoperability.
- Promoting competition through open standards.
- Reducing uncertainty in the sector.
- Driving private-sector investment in smart grid through matching grants and demonstration projects.

These goals are entirely consistent with the government's ongoing development of smart grid standards and best practices and are important factors for the success of an emerging industry. These voluntary standards are being created by existing programs outlined in the 2007 EISA. However, as the smart grid market matures, the government's goals for smart grid technology will have to take a societal view on the benefits that the technology can deliver, such as—

- Improving power quality and reliability.
- Reducing the cost of power for consumers.
- Providing consumers with greater control and flexibility over energy use.
- Increase the resiliency of the grid in responding to attack and natural disaster.
- Reducing the environmental impact of existing power generation.
- Increasing grid support for renewable energy.
- Integrating electric vehicles and plug-in hybrids.

These are the overarching goals that have driven the development of the smart grid from the beginning. However, these goals cannot be achieved through piecemeal standards. These goals require an integrated system that enables and rewards new applications. In other words, simply creating interoperable standards does not guarantee that these goals will be met.

ACHIEVING NATIONAL SMART GRID GOALS WITH A SMART GRID CERTIFICATION AND LABELING PROGRAM

Creating an emergent system that meets national goals requires that individual products be set up to support a broad smart grid vision. These products must go beyond basic functionality to enable advanced applications such as demand response, real-time pricing, transactive (market transaction based) controls, and distributed energy management. This is where a "best-in-class" or "seal-of-approval" smart grid certification and labeling program can help drive innovation beyond the foundational gains in interoperability.

The government took the first steps toward a certification program by including smart grid labeling in the Energy Star program in the American Clean Energy and Security Act of 2009. Historically, the Energy Star program has been used as a "best-in-class" program for driving gains in energy efficiency and promoting inclusion of energy-saving features in products, such as "sleep modes" in computers. This new labeling program goes beyond the existing efforts by NIST to determine appropriate interoperability standards for the smart grid.

Generally, best-in-class labeling programs are most effective (Banerjee & Solomon, 2003) when—

- There is a specific, measurable characteristic that the program will improve (example: energy efficiency).
- There is significant variance in performance among existing products.
- The gains can be made cost-effectively by manufacturers.
- The improvements result in some benefit for consumers or society.

While the consumer-side smart grid market has yet to reach maturity, it appears likely that smart grid technology could potentially benefit from a best-in-class labeling program. Much of the uncertainty in how the market will evolve is driven by questions about what federal and state policies towards smart grid projects will look like. Best-in-class labeling programs can therefore be seen as part of a broader package of federal- and state-level tools that will comprise a comprehensive smart grid strategy.

The government can use best-in-class labeling programs to help achieve several goals:

- **Push existing products' performance to converge on a "gold standard" based on the best existing technology,** and by providing high-performing products with a market advantage. Some examples are the Energy Star certification, energy-use labeling of computers and

appliances, the Corporate Average Fuel Economy (CAFÉ) standards, and car energy labeling.

- **Getting manufacturers to include features that would otherwise not be included with products** by giving products with those features a market advantage. An example is airbags in cars. Sometimes a mandate is needed to implement certain features.
- **Drive innovation in the market to achieve a goal above what can be done with existing technology** by providing a prize to those that achieve it. Two examples of this are the Space X-prize for private-sector space flight and the progressive Automotive X-prize for 100 miles-per-gallon cars.

The recent inclusion of the smart grid under the Energy Star framework appears to fall under the second goal (above), which views "smart grid" as an "on or off" feature in consumer appliances. However, within smart grid technology, there are significant variations in features and applications. There is no single, unifying metric along which smart grid products can be classified as "better" or "worse." This may pose a challenge for Energy Star as it seeks to determine a minimum set of features that qualify a product as "smart grid capable."

This "smart grid capable" stamp ideally would be stringent enough to allow all needed applications to be included but flexible enough that it does not pose an excessive cost-of-entry for new manufacturers looking to enter the market.

One way to achieve this level of gradation is to provide a tiered "smart grid capable" label that, like the LEED and 80 PLUS programs, provides varying levels of certification based on the number of features included. However, the Energy Star framework will have to be slightly modified to accommodate a smart grid certification and labeling program. The inclusion of smart grid features is more akin to the inclusion of the "sleep mode" feature in computers (the goal of the early Energy Star program) than it is to the reduction of electrical consumption (its focus in the consumer appliances sphere). This integration can be accomplished by focusing on rewards for appliances that enable new end-user applications rather than a focus on only process efficiency in determining into which tier a specific product should fall.

Figure 1 shows a sample smart grid mockup, which incorporates some of the design elements mentioned above.

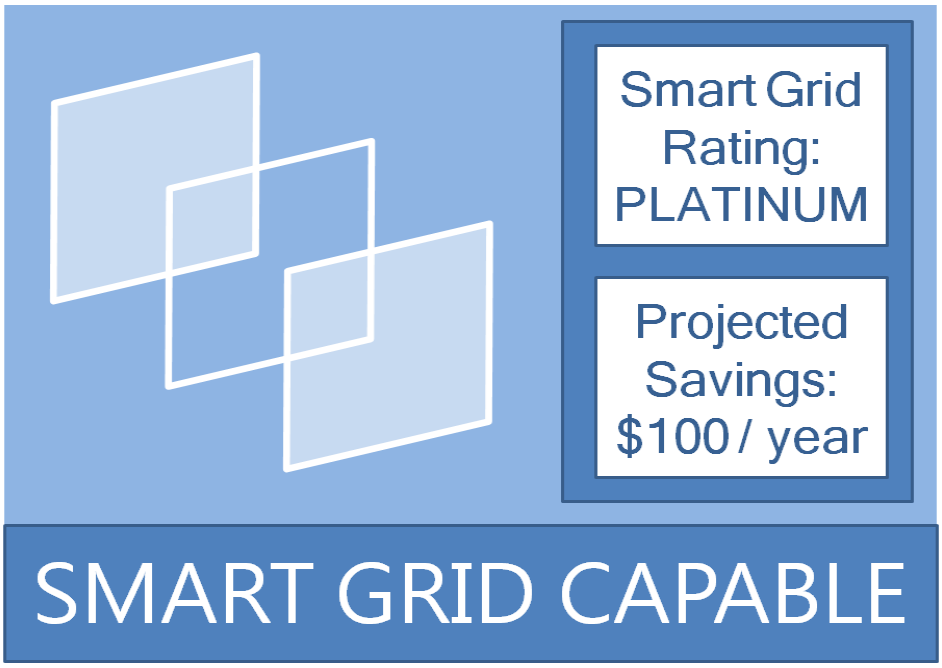

Figure 1: Smart Grid Certification Label Mockup

The sample label prominently features the level of certification that this smart grid appliance has achieved, as well as projected savings that an average consumer would realize from using this appliance over the course of a year. Additional details about this product could be made available through a website or standardized technical fact sheet for buyers who have additional interest in specific details. A more comprehensive label and fact sheet would need to be developed for products aimed at the commercial and industrial sectors, which have greater informational needs.

EXTENDING THE SMART GRID CERTIFICATION AND LABELING PROGRAM BEYOND CONSUMER APPLIANCES

Because the Energy Star program primarily deals with consumer appliances, it is not clear how a smart grid certification and labeling program would extend to other parts of the smart grid ecosystem. Clearly, more technical data should be offered on the label when the main consumers are institutional buyers and utilities. However, these parts of the system should still be judged on the same metrics as the consumer appliances, namely, the extent to which they allow consumers to achieve the goals stated above.

Given these requirements, the Energy Star framework may not be the right framework to incorporate an expanded certification of other parts of the smart grid ecosystem (transmission and distribution, industrial, large buildings). While flexibility and simplicity will be important factors for the consumer appliance sector, these features may not be as important in other sectors. A highly technical label, necessary for the level of information requested by some consumers, would not fit well within the simplistic seal-of-approval framework of Energy Star. In addition, what Energy Star deems "best in class" in highly technical categories may not be universally applicable, given the highly diverse and regional nature of the electric power system. The usefulness of purchasing guidelines and federal certification, above and beyond interoperability standards, may be less useful to commercial and industrial customers, as many of these systems are one-of-a-kind, customized solutions.

What may be better suited for these customers is a standard technical performance form, mandated by law, like the Energy Guide label. Because of their technical savvy, these consumers will then be able to determine the best fit for their own networks based on this information. This information should be neutral, like the Energy Guide, because there are legitimate differences in each utility's priorities and criteria. It can safely be implemented as a mandatory program rather than a voluntary program because it is not looking to modify consumer behavior per se, but to allow utilities to more easily gather information to make their decisions. This minimizes the risk that federal government intervention will have negative impacts on the market. In fact, by providing additional information, the federal government may improve market efficiency by reducing asymmetrical information problems.

The information on the technical performance report included with these products will vary based on which part of the smart grid ecosystem they are part of, but generally information on these labels might include—

- Applications supported.

- Communications systems supported.
- Projected capital and operating costs.
- Projected impact on power quality and reliability.
- Lifecycle product emissions.

BENEFITS OF A CERTIFICATION PROGRAM

A smart grid certification and labeling program, if implemented properly, can yield a number of important benefits:

- Product convergence on higher end technologies.
- Improvement of consumer awareness of smart grid products.
- Provision of a premium for smart grid products.
- Increased participation in voluntary smart grid programs.
- Accelerated development of advanced smart grid applications.
- Greater consistency in smart grid deployment across states.
- Easier access to information for advanced consumers.

This goes beyond what can be accomplished with mere interoperability standards. These benefits will encourage continued growth, investment, and innovation in the smart grid industry.

BARRIERS TO A SMART GRID CERTIFICATION AND LABELING PROGRAM

There are a number of barriers to overcome in implementing a smart grid certification and labeling program:

- Uncertainty about underlying smart grid standards, which are still evolving.
- Breadth and complexity of the smart grid market.
- Uncertainty about future smart grid capabilities and applications.
- Additional difficulties for new manufacturers trying to enter the market.
- Consumer confusion about what a label means.
- Cost of implementing a program.

While these barriers are significant, they are not insurmountable. A carefully crafted program can address these concerns appropriately.

SUMMARY

A smart grid certification and labeling program will accelerate innovation in the smart grid.

A smart grid certification and labeling program can build on the progress already made in energy efficiency and conservation programs by providing consumers with information about smart grid capabilities. By providing a combination of a best-in-class smart grid seal for general consumers and a more detailed fact sheet for technical consumers, the government will provide manufacturers with an incentive to include smart grid features in their products. This will accelerate the market for value-added smart grid products and will result in accelerated innovation for the smart grid industry.

For more information

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ACRONYMS

CHP	Combined Heat and Power
DER	Distributed Energy Resources
DOE	U.S. Department of Energy
DR	Demand Response
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
GHG	Greenhouse Gas
GWAC	Grid Wise Architecture Council
IEEE	Institute of Electrical and Electronics Engineers
KWH	Kilowatt Hour
LEED	Leadership in Energy and Environmental Design
NEMA	National Electrical Manufacturers Association
NIST	National Institute of Standards and Technology