

**New Initiative for Enhanced Climate Protection through Emerging Technologies**  
**A Scoping Paper for Stakeholder Comment**  
July 2007

Global climate change is an important environmental issue. The recent G-8 meeting highlights the need for additional progress toward a long-term goal for reducing greenhouse gas emissions. The U.S. government manages a number of market-based programs designed to lower barriers to generally cost-effective technologies and practices. There may be opportunities to expand on the experience and lessons learned from these programs and to make greater progress.

With this paper, the U.S. Environmental Protection Agency (EPA) is outlining a potential new initiative for enhancing climate protection by highlighting emerging technologies that could with greater market penetration make significant and cost-effective contributions to reducing greenhouse gas emissions. The intent is to use some form of EPA recognition (and possibly additional technical assistance) to help jump-start, streamline, and accelerate the adoption of emerging technology into the market place.

This paper outlines a variety of approaches for achieving this goal for the purposes of stakeholder comment. It addresses issues of potential target audience, possible scope, key criteria, and possible mechanisms. It also outlines key next steps including convening a workshop early this fall to encourage broader discussion and feedback. This new initiative would be a complement to the ENERGY STAR program, which broadly promotes proven, cost-effective products that save consumers money while protecting the environment and conserving natural resources.

## **1. Background**

Market-based initiatives such as the ENERGY STAR program have proven to be successful and powerful tools that help to broadly deploy efficient technologies so as to protect the environment. The success of this program suggests that complementary efforts focused on advanced or emerging efficient technologies could also play an important role in advancing climate-friendly technologies in the market place.

To understand the opportunity for such complementary efforts, it is useful to review the design and role of the ENERGY STAR program. Then gaps and opportunities for a new initiative can be identified and explored.

### ***Definition and Role of ENERGY STAR***

ENERGY STAR has been playing a well-defined role in the market place for more than fifteen years, helping consumers find products that save them money while offering good product performance and helping them protect the environment. It is designed to appeal to the broadest set of consumers across the country and targets all consumers in the market to purchase new products.<sup>1</sup> ENERGY STAR is designed to be an easy choice for a broad set of consumers in a number of ways, and the practical implications of this program design are:

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<sup>1</sup> This statement describes the role of the ENERGY STAR on products. The ENERGY STAR program is much broader than the product label. It also includes corporate energy management strategies, standardized measurement tools for commercial and industrial facilities, and strategies for improving the efficiency of new and existing homes.

- **Simple way for consumers to find and select energy saving products and practices.** Products either earn the ENERGY STAR by meeting performance requirements or they do not. There are not tiers for higher efficiency products.
- **Products must be highly cost-effective to the consumer.** A strong financial case is critical for today's consumer – as recently confirmed in the McKinsey survey of the paybacks people will accept when pursuing energy efficiency which reported that about 75 percent of the respondents require a 2 year payback or less. The specifications for ENERGY STAR are typically set where there are a variety of available products that offer consumers simple paybacks within two to three years, with many providing an immediate payback (no additional first cost), and the maximum payback period being about 5 years.<sup>2</sup>
- **Products offer same, if not better, performance.** ENERGY STAR is only used if the products meeting the higher efficiency levels will deliver the same, if not better, performance as typical alternatives. ENERGY STAR is designed to help show that energy efficiency is not about sacrifice or doing without, but rather that with efficient technologies on the market today, consumers can cut their energy bills substantially while reducing greenhouse gas emissions. Where additional performance requirements are necessary so that ENERGY STAR qualifying products offer similar or better performance, they are included in the ENERGY STAR specification for that product category.
- **Products provide real energy savings to the consumer.** For ENERGY STAR to be successful, consumers must routinely experience real savings from their product purchases. These savings cannot depend upon the consumer's ability to solve issues such as complicated design, installation, and maintenance. Where solving such issues is integral to the consumer realizing the expected savings, ENERGY STAR may not be the appropriate tool.
- **Program offers a level playing field for program partners and technologies.** ENERGY STAR is designed to establish performance levels that differentiate highly efficient products from less efficient home and office products. ENERGY STAR provides technology-neutral performance requirements across competing technologies. ENERGY STAR is not used to give one technology an advantage over another if they perform similarly.

In summary, the ENERGY STAR label is a trustmark for consumers. It has grown tremendously over the last fifteen years and is now used on products in more than fifty product categories. ENERGY STAR has helped the nation save billions of dollars each year on energy bills and avoid significant amounts of greenhouse gas emissions. This growth represents significant government and stakeholder investment. Thousands of manufacturers, retailers, utilities, and others have invested in ENERGY STAR's definition and role. The ENERGY STAR brand will continue to grow within this program definition. A recent review of the ENERGY STAR label

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<sup>2</sup> This statement summarizes the paybacks across the products covered in the ENERGY STAR program from the most recent review of the cost-effectiveness of ENERGY STAR products which will be included in the next Annual Report on Protecting the Integrity of the ENERGY STAR label.

by branding experts emphasized that the future success of the ENERGY STAR program would require the program to continue to conform to a number of core tenets, including:<sup>3</sup>

- Technology must be proven, impeccable, and predictable
- Benefits must be reasonably immediate and measurable
- Outcomes must contribute to carbon reduction
- Opportunities must be easy to access and simple to manage

#### ***Opportunities for New Initiatives for Emerging Technologies***

There may be additional opportunities to market emerging technologies that can help reduce greenhouse gas emissions that are not being pursued under current market-based initiatives such as the ENERGY STAR program. From a target audience standpoint, there are consumer markets, or market segments, in addition to the broad consumer market that ENERGY STAR has been designed to serve, that may have important and different consumer preferences. Two such market segments include:

- **Early adopters.** Some portion of consumers routinely seeks out advanced technologies. These “early adopters” may have already adopted cost-effective technologies –such as those meeting ENERGY STAR requirements –and want to go “above and beyond.” They may be interested in being on the cutting edge of new technology for any number of reasons.
- **Environmentally-motivated consumers.** A growing number of consumers are interested in taking the right steps to help the environment across a range of environmental issues including reducing greenhouse gas emissions, reducing water use, etc. This consumer group seems willing to invest in environmentally-preferable products and services that have substantially longer pay backs due to the environmental reward that they value.<sup>4</sup>

These two market segments represent more than fifteen percent of the consumer market. This estimate is based on the work that has been performed to characterize the second, “environmentally-motivated” segment. The overall market is likely larger, although a more refined estimate is dependent upon a good estimate of the size of the “early adopter” market present and the degree to which these market segments overlap.

At the same time, many existing and emerging technologies show great potential to reduce greenhouse gas emissions, but must overcome important market challenges--such as achieving economies of scale, demonstrating reliable performance, building installation and maintenance infrastructure, meeting short investment payback criteria, etc.--in order to gain a wider market.

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<sup>3</sup> See Interbrand Report, “Building a Powerful and Enduring Brand: The Past, Present, and Future of the ENERGY STAR Brand,” June 2007, available online at:

[http://www.energystar.gov/ia/partners/downloads/ENERGY\\_STARBndManf508.pdf](http://www.energystar.gov/ia/partners/downloads/ENERGY_STARBndManf508.pdf)

<sup>4</sup> This group is tracked through a variety of ways including the annual Roper-Starch Green Gauge Report that is a survey of consumer attitudes about the environment and environmentally conscious purchasing decisions. It consistently identifies more than 10 percent of consumers as True-Blue Greens who are the ones most likely to go out of their way to buy goods with environmentally preferable attributes and more than 5 percent as Greenback Greens who will spend more for green products, but not consider changes in lifestyles or housekeeping due to environmental concerns.

This paper outlines a range of options for a new market-based recognition program to help bring these consumers and technologies together to help companies offering “advanced climate-friendly technologies” to find “early adopter” and/or “environmentally-motivated” customers, and to help these consumers find the technologies they want to proactively reduce emissions of greenhouse gas emissions.

## **2. Defining Emerging Technology for Climate Protection and Establishing Criteria**

The scope of this potential initiative is broadly defined in this paper. The term “technology” is used broadly to encompass discrete end-user products, components, and systems, as well as processes and know-how—such as proper installation practices and procedures. Eligible emerging climate technologies are defined as emerging and/or existing technologies that:

- Are likely to have large climate protection benefits
- Are not yet widely adopted
- Are commercially available
- Have demonstrated performance
- Have acceptable environmental tradeoffs

This definition excludes technologies that are still in the research and development stage. Technologies to be marketed to a select, while significant, segment of the market should be marketable. Technologies that are not readily available generally do not meet that qualification. This definition also excludes technologies that already enjoy widespread use, instead focusing on those technologies which could provide large climate benefits but need assistance to build economies of scale and reduce costs, motivate infrastructure changes, or overcome other barriers. The definition also currently excludes products that are covered within the ENERGY STAR program but which meet a higher efficiency tier, such as the Tier II established by the Consortium for Energy Efficiency (CEE). Additional strategies for these products are currently being explored through a set of pilots with CEE members.<sup>5</sup>

This definition includes many emerging technologies, including but not limited to:

- solar photovoltaic
- solar thermal
- wind technologies
- solar water and space heating
- innovative residential building practices
- residential cogeneration
- stationary fuel cells
- tankless water heaters
- gas-fired air conditioning
- energy storage devices
- biomass or biofuel heating systems<sup>6</sup>
- highly efficient (non vehicle) motors

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<sup>5</sup> Please contact the Consortium for Energy Efficiency for additional information on this set of pilots.

<sup>6</sup> See: <http://www.takomaparkmd.gov/publicworks/recycle/green.html> (bottom of page, Corn Silo section) for information on municipal programs for biomass or heating systems or <http://www.countryflame.com/corn.php> for product information.

- premium refrigerant recovery and recycling technology
- advanced residential geothermal heating and cooling, and
- other distributed supply technologies

Each part of the above definition of emerging climate technology is elaborated upon below as part of outlining the types of issues that need to be addressed to help interested consumers find the advanced technologies they may be interested in and to ensure that federal resources are used effectively.

***Large potential benefits for climate protection.***

The criterion for “large” potential benefits is to maximize the climate benefits of the market-based emerging technology initiative. Selected emerging technologies for this initiative must be able to demonstrate large potential for greenhouse gas emission reductions. There are many innovative technologies on the market with laudable environmental properties; however, not all technologies have the potential to provide a significant reduction in greenhouse gas emissions. The determination of whether the technology offers the potential for large climate protection benefits would be based on quantitative information provided to EPA. Where economies of scale are the primary barrier, EPA would expect manufacturers to demonstrate the potential to be cost-competitive with other commercial options once economies of scale are achieved.

Further discussion is required on the methods that would be used to estimate the potential for reductions in emissions of greenhouse gases, the many issues that arise, the information that may be required, and the process for reviewing the information. While it is understood that the information necessary to evaluate the greenhouse gas emission reduction potential from a technology varies from one technology to another, it is also important to recognize that processes that tend toward greater standardization tend to be more efficient to manage and may have greater consistency that would be of greater value to consumers. Some of the options for evaluating the greenhouse gas reduction potential and the issues involved include:

- Case-by-case technical review of data submitted to EPA by technology providers. EPA could require a basic set of information about technologies and their performance, their unit energy (or greenhouse gas) savings, the method used to calculate this information, expected savings given a particular market share, and any key assumptions (e.g. “these results achieved under X conditions”). EPA could then review the data with a panel of experts and confirm the climate protection potential. A benefit of this approach is that it would be broadly applicable across a wide range of potential technologies and practices. Downsides include that this non-standardized approach may present difficulties in comparisons across technologies, it may be difficult to assess the accuracy of the data of standardized testing procedures are not yet developed, and it may be administratively burdensome to implement.
- Requirement for existing, recognized performance tests (e.g. ENERGY STAR, Florida Solar Energy Center Certification, Solar Rating Certification Corporation certification, etc.).<sup>7</sup> The benefit of this requirement is that evaluation would be based on well-developed tests. The downside is that testing procedures have not been developed for all technologies and this may unnecessarily limit the participation of some beneficial technologies. This may limit the scope to fairly mainstream technologies which may or

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<sup>7</sup> For more information on the Florida Solar Energy Center Certification, visit: <http://www.fsec.ucf.edu/en/industry/testing/index.htm>. For information on the Solar Rating Certification Corporation, visit <http://www.solar-rating.org/>.

may not be consistent with the definition for advanced technologies above. It would likely be more administratively manageable.

- Requirement for assessments of system performance. It may be important to evaluate some technologies at the system level and to track or predict with some certainty (e.g. in the case of solar, California Energy Commission Photovoltaic Calculator 2.0 or the U.S. National Renewable Energy Laboratory's PV-Watts<sup>8</sup>) a technology's performance at the system level over a period of time in order to verify its climate benefits.
- Requirements for varying climate-related impacts. In cases where technology performance varies depending on geographic location, information on performance by geographic region would be important to evaluate the potential overall greenhouse gas reduction benefit. Whether this initiative should address technologies with national applicability or also those with regional applicability (and how to do that well) also needs to be addressed.
- Importance of design, installation and maintenance issues and infrastructure. Issues of design, installation, and maintenance can have a significant impact on the performance of a technology and therefore the expected potential for reducing emissions of greenhouse gases. Requested information could include information on the assumptions involved in the design, installation and maintenance of such systems. Materials that outline these issues for consumers may also be requested so that EPA could integrate this information as part of outreach on the technology.

As can be seen from the discussion above, the requirements for submitting information for the estimation of greenhouse gas reduction potential could have a significant impact of the final scope of this initiative. Some of these issues may introduce significant uncertainty into the estimate of potential benefits as well as the benefits that can be delivered to the target market, and it may be important to focus on technologies with large estimated potential benefits that offer greater certainty and greater likelihood of delivering benefits to a customer.

EPA is interested in stakeholder comments on these criteria and this set of issues and options, plus any additional ones that stakeholders may suggest. From this feedback, EPA would further refine the scope of the initiative and define a set of information requirements for manufacturers to respond to as part of participating in the initiative.

### ***Not yet widely adopted***

This criterion underscores the purpose of this proposed market-based initiative. Technologies that already enjoy widespread use do not need assistance overcoming important market barriers to gain greater market acceptance. Therefore, this initiative would not aim to help successful technologies; rather, it would aim to help technologies with large potential climate benefits with low market-share gain wider use. EPA would request information on the current market share of the technology in its primary markets.

### ***Commercially available***

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<sup>8</sup> The California Energy Commission Photovoltaic Calculator 2.0 can be found at: [http://www.gosolarcalifornia.ca.gov/nshpcalculator/download\\_calculator.html](http://www.gosolarcalifornia.ca.gov/nshpcalculator/download_calculator.html). The U.S. National Renewable Energy Laboratory's PV-Watts calculator is available at: [http://rredc.nrel.gov/solar/codes\\_algs/PVWATTS/](http://rredc.nrel.gov/solar/codes_algs/PVWATTS/)

Technologies that are the focus of a market-based initiative should be marketable. Commercial availability would be a necessary condition for this initiative. In some cases, qualified technology is only available regionally—particularly if a technology’s climate performance depends on access to natural resources or particular climate conditions such as day length and sun conditions. These regional issues are understood and EPA would request information to capture these regional issues. Further, EPA may request information on the production volume or anticipated production volume of the technology.

***Demonstrated Performance***

Part of being marketable and commercially available is having a proven track record for product performance. EPA would request information on the performance track record of the technology and issues with ease or difficulty with design, installation, and maintenance.

***Acceptable environmental tradeoffs***

The purpose of this criterion is to ensure that technologies have a net positive environmental impact. This criterion would prevent recognition of technologies that unduly increase NOx emissions in order to reduce CO2 or unduly increase the use of water while saving energy, for example.

EPA is requesting stakeholder comment on this initial definition of advanced technology and set of broad parameters as well as stakeholder comment on initial technology opportunities that fall within these parameters and ones that would not.

**3. Distinguishing Technology that Advances Climate Protection**

Several options are under consideration to recognize technologies that advance climate protection. These options include product labeling, technology awards, government procurement of technologies meeting certain criteria, a “cool climate technology” website featuring the new technologies, or a combination of these options. Each option is described further below:

***Labeling/branding***

Technology labeling could be approached in a variety of ways. The purpose of any label would be to identify product models in a given technology category that deliver significant greenhouse gas reductions while meeting performance expectations. The fact that emerging technologies, by their very nature, may lack established standardized performance criteria may present particular challenges for product labeling. For this reason, it may make sense to award a label based on a case-by-case review of products against more general objectives related to greenhouse gas reductions and performance. Other options include leveraging existing program lists where they exist (such as American Council for an Energy-Efficient Economy’s Most Efficient Appliances list), or assessing independent performance test results (such as those conducted by the International Standards Organization, the Society of Automotive Engineers, or Underwriters Laboratories).

There are several advantages to product labeling. Product labeling recognizes those striving to produce the most efficient technologies. It also maximizes program impacts by providing consumers with a wide list of technologies to choose from (for example, a consumer looking to outfit his or her home could find the best furnace, the best AC system, the best water heater, the best refrigerator, etc.). With particular technologies, such as mainstream appliances, it would be relatively easy to identify top performers because test procedures are solid and well-accepted. Labeling or listing top performers could also spur competition to improve technology performance. A list of top performing technologies could also be a useful tool for policymakers that desire to provide tax benefits or other incentives for early adopters.

There are several challenges to the labeling approach, however, for example, if ENERGY STAR product categories were included, extreme care would have to be taken to ensure that the advanced technology initiative recognition complements ENERGY STAR, rather than impeding the progress of the ENERGY STAR label or confusing consumers.

In addition, such a labeling program would need to be kept current and could require substantial resources and frequent updating by product manufacturers as these top performing technologies quickly evolve. Or the label could be dated with the year, with the intent that different technologies would be expected to be highlighted with each passing year or several years. See illustrative examples provided above.

Another consideration with product labeling is the cost associated with tracking the label for misuse. This is not an incidental cost.

Also, this approach would likely exclude “best practice”-type technologies, although beginning a “cool service” venter certification could be considered as another option. Further, there would continue to be challenges for emerging technologies, such as solar photovoltaic systems, whose performance can be highly dependent upon design, installation, maintenance, and other variables.

On the other hand, an option for addressing some of the challenges with emerging technologies is to use performance methods similar to those currently used in several states for emerging technology systems and their clean energy funds.

### ***Awards***

One component of this climate protection initiative may be to establish an awards program for emerging climate technology based on the criteria described above and information that manufacturers would provide. This could be a stand-alone project or a complement to other approaches. The awards could recognize a singular “product of the year,” the top ten technologies, the best technology from a set of categories (residential, appliance, commercial,



power supply, etc.), or some other construction. A website could be developed featuring each year's award winning technology describing its potential climate benefits, laying out any conditions necessary for the technology to achieve those benefits, and informing consumers as to where they can obtain the technology and how much, on average, it may cost.

The award and web page could offer a compelling logo, such as the illustrative examples above, that the manufacturer could use with the technology for a specific period such as one to two years from the time of winning the award. The logo would be designed to highlight the following characteristics:

- Climate protection
- Right environmental action
- Technology leader

### ***Government procurement***

Another market-based option is to facilitate government procurement of advanced climate technologies. Working with large purchasers like the U.S. Department of Defense or the Government Services Administration, EPA could help purchasers identify technologies that meet certain performance and cost criteria. This option could be particularly useful for demonstrated technologies that have trouble gaining market share due to longer pay-back times. This could be a stand-alone market-based initiative, or it could be combined with other options.

This approach could help satisfy new federal mandates for Environmentally Preferable Purchasing (EPP) that specify that “the Government’s Policy is to acquire supplies and services that promote energy and water efficiency, advance the use of renewable energy products, and help foster markets for emerging technologies.”<sup>9</sup>

### ***Website***

A final recognition option is to establish a website that helps link consumers that want to reduce greenhouse gas emissions with the latest climate protection technologies. This “What’s Hot” or “Cool Climate Technologies” website could be organized in several ways. It could feature the top ten technologies overall; it could be divided up into sections for individuals, communities, businesses and institutions, and governments –much like the <http://www.epa.gov/stewardship/> website; or it could be organized according to market sector. The website could feature the top three, five, or ten technologies based on established criteria (i.e. climate performance, availability, etc.), and/or it could include content describing emerging technologies. Much like the awards option, a logo could be developed for the technologies listed on the website, allowing technology providers to distinguish their technologies for some period of time. The content of the website could describe each technology’s potential climate benefits, laying out any conditions necessary for the technology to achieve those benefits such as regional limitations or design and/or installation issues, and informing consumers as to where they can obtain the technology and how much, on average, it costs. Information on the website could be easily referenced by the media and marketing professionals.

A different website layout would provide rankings based on technology performance. Instead of a logo, the website would be the informational tool helping link consumers with technology by

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<sup>9</sup> Source: U.S. Environmental Protection Agency (2007). Contracting Officer’s Representative Recertification Manual, April 2007 Edition. Prepared by the Acquisition Policy and Training Service Center of the Policy, Training and Oversight Division of the Office of Acquisition Management. U.S. EPA: Washington, DC.

itself. Much like other EPA programs that include online rankings (such as EPA's Green Power Partnership <http://www.epa.gov/greenpower/partners/top25.htm>), public disclosure of performance in relation to competing technology suppliers could provide recognition of top performers and encourage those with lower performing products to improve. Technology providers could submit systems for consideration, providing the necessary performance and design specifications to estimate system climate benefit potential.

### ***Technology Assistance***

A final option, which would require additional resources, is one where EPA could offer independently of or in combination with the market-based recognition options outlined above tailored technology assistance. EPA would help emerging or demonstrated technologies with large potential climate benefits overcome barriers through a tailored approach depending on what obstacles each technology is facing. This technology assistance could include verification and documentation of product performance through publications, assistance in identifying and removing barriers, encouraging government procurement, and/or other activities.

## **4. Coordination**

There are a number of programs underway that seek to advance the market share of climate-friendly technologies at the state, regional, and federal level, including the at the U.S. Department of Energy. This initiative will be coordinated with these other efforts with the goal of spurring greater results. EPA would like stakeholder input on opportunities for coordination with other technology programs and feedback on where synergies may exist.

## **5. Next Steps**

Tentative schedule for this initiative is as follows:

July 2007:	Solicit stakeholder input; comments due by July 31st
August 2007:	Revise and refine proposal based on stakeholder input
September 2007:	Hold stakeholder conference
September 2007:	Design and conduct market research with target audience
October 2007:	Create "business plan" for new market-based program based on outcomes of stakeholder conference and market research
November 2007:	Launch pilot program
January 2008:	Announce first Advanced Technologies under this Initiative
June 2008:	Initial assessment of Pilot

## **6. Comments**

This scoping paper for public comment will be available online at <http://www.epa.gov/cleanenergy/climatetechnology.htm> until July 31<sup>st</sup>, 2007. Comments are due to James Critchfield ([critchfield.james@epa.gov](mailto:critchfield.james@epa.gov)) by July 31<sup>st</sup>, 2007. E-mail is preferred. Alternatively, comments may be submitted by postal mail to:

U.S. EPA  
c/o James Critchfield  
Mail Stop (6202J)  
1200 Pennsylvania Avenue, NW  
Washington DC, 20460