Rapid Deployment Energy Efficiency (RDEE) Planning Guide

May 1, 2009

The Rapid Deployment Energy Efficiency (RDEE) Program Planning Guide is designed to help state and local authorities and energy efficiency program administrators choose successful programs as they advance energy efficiency program funding opportunities through the American Recovery and Reinvestment Act of 2009.

The RDEE Planning Guide was developed through a joint effort of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), building upon technical information provided by the Leadership Group of the National Action Plan for Energy Efficiency. It was prepared by Peter Lemoine, Tyler Huebner, David Pickles, and Bill Prindle of ICF International.

Table of Contents

Index of Tables

Planning Guide
Rapid Deployment Energy Efficiency Toolkit

I. Introduction and Purpose

The American Recovery and Reinvestment Act (ARRA) contains over $18 billion in energy efficiency funding that qualifying entities (primarily states, cities, and counties) can pursue. The primary objectives of this funding are to build jobs, save energy, and build energy efficiency infrastructure for the longer-term. To accomplish these objectives, the Administration and Congress have placed heavy emphasis on transparency and accountability in the use of ARRA funds.[1] At the same time, funds must be obligated and expended rapidly, to have a significant effect on economic recovery in the near future.

The **Rapid Deployment Energy Efficiency (RDEE) Toolkit** is being provided to help recipients of ARRA funding meet these objectives and challenges. The Toolkit provides information on 10 different programs across the residential, commercial and industrial sectors, drawn from the experience of hundreds of federal, state, local, private, and utility organizations.[2] In many cases, these programs have undergone years of scrutiny by diverse groups of stakeholders in both their design and implementation, and have been used to distribute hundreds of millions of dollars in training, support, marketing, administration, and customer incentives. And, in some cases, these programs present opportunities for leveraging field-tested, pre-existing infrastructure. The programs included in this Toolkit are:

1. Home Performance with ENERGY STAR
2. ENERGY STAR Labeled Products
3. Residential Efficient Heating and Cooling
4. Residential Energy Audit and Direct Installation
5. Non-Residential On-Site Energy Manager
6. Non-Residential Prescriptive Rebates
7. Non-Residential Retro-commissioning
8. Non-Residential Benchmarking and Performance
9. Non-Residential Custom Incentives
10. Commercial Food Service Efficiency

[1] See http://www.recovery.gov/?q=content/accountability-and-transparency.
[2] This includes the experience of the participants in the National Action Plan for Energy Efficiency, a public private initiative to pursue all cost-effective energy efficiency by 2025, www.epa.gov/eeactionplan.

Planning Guide

The first portion of the toolkit is this Planning Guide. The Planning Guide provides the information recipients of ARRA funding need to plan the early stages of these programs, both individually and as part of a portfolio of programs. This information includes:

- Program summary
- Target market
- Evaluation, monitoring, and verification requirements
- Infrastructure requirements
- Training requirements
- Staffing requirements
- Implementation timeline
- Energy savings
- Participation rates
- Total Budget
- Job creation estimates
- Cost-effectiveness
- Resources and assistance

This document also provides a brief overview of the energy efficiency related funding opportunities set forth in the ARRA. This document does not attempt to address the planning process and potential for renewable programs.

This planning guide is organized as follows:

II. Overview of the stimulus package. This section provides a summary of the key stimulus package provisions along with the total funding levels available, the recipients, and major features for each provision.

III. Considerations in Program selection and budgeting. This section outlines the key factors to consider in program selection and budgeting, including job impact, collaboration/leverage of funds, significance of savings, cost of savings, and sustainability and market transformation.

IV. Overview of the RDEE Programs. This section briefly describes each of the 10 programs in the Toolkit including the target market and major program elements.

V. Framework for Program Selection and Budgeting. This section outlines how to use the program-specific information presented in the planning guide to select and budget for one or more of the 10 RDEE programs.

VI. Program Snapshots. This section provides more detailed information on each program, along with links to additional resources.

Complete Toolkit

The complete RDEE Toolkit, including additional information for implementing each of the 10 RDEE programs, will be available in the near future. In particular, the complete Toolkit will include more extensive information and additional resource materials such as example Requests for Proposals (RFPs), program plans, training modules, evaluation methods, and similar resources to make it easier for states, local governments, and other program administrators to design and implement effective programs.

II. Overview of Stimulus Package

Most of the ARRA funds will flow through the State Energy Program (SEP), the Weatherization Assistance Program (WAP), and the new Energy Efficient Community Block Grant program. The Department of Energy (DOE) Office of Electricity Delivery and Energy Reliability will program $4.5 billion in "smart grid" funding, including $100 million in training funds. The Labor Department's Employment and Training Administration will also program $500 million for training and workforce development. These programs are summarized in Table 1. The rest of this section describes these programs in greater detail, with an emphasis on those funding opportunities most relevant to the energy efficiency opportunities discussed herein (EE Block Grants, SEP, and ENERGY STAR appliances). For more information, visit: www.energy.gov/recovery.

Table 1. Summary of ARRA Funding

Provision (Agency)	Dollar Amount	Notes
Energy Efficiency and Conservation Block Grants (DOE-EERE-OWIP) http://www.eecbg.energy.gov/	$3.2 Billion	• $2.8 billion by formula • $400 million competitive • Wide range of eligible uses
Weatherization Assistance Program (DOE-EERE-OWIP)	$5 Billion	• Per "dwelling unit" limit raised to $6,500 • Training/Tech Assist 10 to 20% • Income level raised from 150 to 200% of poverty level • Matching funding waived
State Energy Program (DOE-EERE-OWIP)	$3.1 Billion	• Uses current SEP program; requires assurance of utility regulatory reform and better building codes • Matching funding waived
Smart Grid (DOE-OE)	$4.5 Billion	• Includes "demand-responsive equipment" • Includes $100 m for training
ENERGY STAR Appliance Rebate Program (DOE-EERE-OWIP)	$300 Million	• Based on EPAct 2005 authorization • Allocated to states on a formula, 50% match basis • Any residential ENERGY STAR product
Grants for EE-RE Workforce Development (Labor) http://www.dol.gov/recovery/	$500 Million	• Competitive grants • Grants can cover research, labor exchange, and job training

Energy Efficiency and Conservation Block Grants (EE Block Grants)
The formal Funding Opportunity Announcement (FOA) has been issued by DOE for EE Block Grants; over $2.6 billion in formula grants are now available to U.S. states, territories, local governments and Indian tribes. To obtain a copy of the FOA, which contains complete information for grantees on the Program and application process, go to http://www.eecbg.energy.gov/downloads/EECBG_FOA_Instruction_For_Downloading.pdf

The authorizing legislation in the Energy Independence and Security Act of 2007 (EISA) contains the following provisions for EE Block Grants:

1. The overall purpose is to reduce fossil fuel emissions through energy efficiency improvements in buildings, transportation, and other sectors.
2. Eligible uses include a long list of activities, from developing an energy strategy to installing specific technologies.
3. The authorizing formula calls for sixty eight percent of the funds to go to local governments, defined as cities of 35,000 or larger, and counties of 200,000 or larger. Twenty eight percent goes to states, at least sixty percent of which is to be distributed as sub-grants to local jurisdictions smaller than the formula threshold. Two percent is targeted for Indian tribes, and two percent for competitive grants.
4. Local government grantees must submit a plan and strategy for use of the funds within one year of award. DOE must review the plan within 120 days; if rejected, the plan can be resubmitted until accepted. Reports are due at the end of each subsequent year. DOE is anticipated to elaborate on planning and reporting requirements in its forthcoming ARRA FOA guidance.
5. State grantees must submit a plan for their use of funds to DOE. The authorizing legislation calls for plans to be submitted within 120 days of enactment (EISA was enacted in December 2007). DOE will have to interpret and provide guidance on states' submission dates under ARRA. States will also have to file annual reports on expenditures and energy savings; DOE is anticipated to elaborate on plan and reporting requirements in its upcoming FOA guidance.
6. Limitations on expenditures include:
    - Administrative costs—greater of 10% or $75,000 (applies to state and local recipients)
    - Revolving loan funds—greater of 20% or $250,000 (applies to local recipients)
    - Grants to NGO for program implementation—greater of 20% or $250,000 (applies to local recipients)
7. EE Block Grant funds may not be used to supplant funds provided under the SEP or WAP programs

Weatherization Assistance Program (WAP)

DOE has issued an FOA, downloadable from http://ase.org/uploaded_files/5461/doe_wap_guidelines.doc. Key elements of this guidance include:

1. Initial applications were due March 23, 2009, with complete applications due May 12, 2009.
2. WAP grantees are defined by longstanding law and program rules as designated state agencies. WAP sub-grantees are also defined in the program, and serve as the primary delivery agents for program services. These definitions and associated rules have not changed, except that matching fund requirements have been waived for ARRA funds. The

FOA does acknowledge that a state may add new sub-grantees, as long as they are Community Action Agencies, public agencies, or nonprofit groups that meet program rules.

3. The WAP allocation formula was modified slightly, to ensure a more even distribution of funds, such that warmer states will receive somewhat higher amounts than under the previous formula.
4. Three significant WAP rule changes were included in ARRA: (1) eligibility threshold income was raised from 150% to 200% of the poverty level; (2) training and technical assistance funds can account for 20% of total funds, up from 10%; and (3) average per-home spending limits were raised from $2500 to $6500.

More information on the Weatherization Assistance Program is available at http://apps1.eere.energy.gov/weatherization.

Smart Grid

DOE will distribute the $4.5 billion in ARRA funds in this category primarily through competitive grants. No detailed guidance has been issued, although an RFP has been posted for a Smart Grid Clearinghouse. Uses of these funds could go towards advanced utility metering, demand-response technologies, advanced transmission, distribution, and control technologies, planning and analysis efforts, and other purposes.

ENERGY STAR Appliance Rebates

ARRA provides $300 million for a program authorized in the Energy Policy Act of 2005 (EPAct 2005). The authorizing language calls for states to receive funds on a formula basis, and use them to provide rebates or other incentives for ENERGY STAR-certified residential products. DOE has yet to issue detailed guidance on this program, including any specifications for eligible products, product performance levels, preferred methods for program administration or coordination, or other details. It is also unclear whether states are encouraged to program these funds through existing programs.

Green Jobs

Department of Labor's Employment and Training Administration will program $500 million for "green jobs" training and workforce development. While it is expected that these funds will be allocated mostly as grants, little additional detail has yet been issued, including definitions of green job categories, criteria for training programs, or other features.

State Energy Program (SEP)

State energy offices will receive supplemental grants under the terms of ARRA. These entities have received SEP funds for many years under existing law and program rules. DOE has issued a FOA for SEP grants, downloadable from http://apps1.eere.energy.gov/wip/pdfs/sep_arra_foa.pdf. Under the terms of ARRA, funds are subject to some additional conditions, including:

1. Governors must submit assurances that:
    A. The applicable State regulatory authority will seek to implement, in appropriate proceedings for each electric and gas utility, under its rate-making authority a general

policy that ensures that utility financial incentives are aligned with helping their customers use energy more efficiently and that provide timely cost recovery and a timely earnings opportunity for utilities associated with cost-effective measurable and verifiable efficiency savings, in a way that sustains or enhances utility customers' incentives to use energy more efficiently.

B. The State, or the applicable units of local government that have authority to adopt building codes, will implement the following:

   i. A residential building energy code (or codes) that meet or exceed the most recent International Energy Conservation Code, or achieve equivalent or greater energy savings.

   ii. A commercial building energy code (or codes) throughout the State that meets or exceeds the ANSI/ASHRAE/IESNA Standard 90.1–2007, or achieves equivalent or greater energy savings.

   iii. A plan to achieve 90 percent compliance with the above energy codes within eight years. This plan will include active training and enforcement programs and annual measurement of the rate of compliance.

2. States are guided to prioritize grants toward funding energy efficiency and renewable energy programs, including:
   A. expansion of existing energy efficiency programs run by state agencies or utilities
   B. expansion of existing state or utility renewable programs
   C. cooperation and joint activities between States to advance more efficient and effective use of ARRA funding

3. As with WAP, SEP Comprehensive Applications must be filed by May 12, 2009, with Initial Applications due March 23.

4. States have substantial flexibility in program funds, notwithstanding the guidance to build on existing programs above. In addition, the FOA encourages priority focus on the following kinds of activities:
   A. Establishment and enforcement of energy efficient building codes and standards, and implementation of voluntary programs that impact new design.
   B. Loans, grants and incentives for energy efficiency and renewable energy measures.
   C. Building retrofits.
   D. Traffic signal synchronization and replacement with LEDs.
   E. Industrial retrofits.

5. DOE encourages states to go beyond typical utility metrics of cost-effectiveness in selecting measures and programs to fund, and DOE promises further guidance in this area. The FOA also, however, suggests that SEP-funded activities produce (as a portfolio) at least 10 million Btu (source energy) in annual energy savings per $1,000 spent.

6. Recommended performance metrics in the FOA are:
    A. Jobs created
    B. Energy (kwh/therms/gallons/Btus/etc.)saved
    C. Renewable energy installed capacity and generated
    D. GHG emissions reduced (CO2 equivalents)
    E. Energy cost savings
    F. Funds leveraged

Most states have energy plans under their current SEP program umbrellas. ARRA funded initiatives should be consistent with these plans' goals. To the extent the state energy office programs funds through existing programs, consultation may be needed with the relevant agencies or regulatory authorities, to ensure consistency with these institutions' policies and practices.

III. Considerations in Program Selection and Budgeting

Recipients face a formidable challenge in allocating their resources and potential stimulus funding across a broad array of potential programs, both existing and new. The SEP FOA identifies many of the criteria and considerations that DOE has outlined as important in the SEP grant process. Some criteria are explicit and quantifiable, and others are more general in nature, emphasizing the need for the programs to be consistent with the requirements of the ARRA and with DOE's guiding principles for the State Energy Plans. While many of the criteria are addressed in multiple sections of the FOA, and are expressed in slightly different terms, many of the primary considerations are captured in the following five prioritization criteria:[3]

1. **Job Impact**. The ARRA and SEP FOA are clear in their guidance that the funding should have a significant impact on creating new or sustaining existing jobs. The FOA emphasizes the urgency of this need by preferring programs that can be initiated prior to June 17, 2009, and that can be completed expeditiously. Tracking and reporting of the nature and duration of jobs created by the funds is also required.
2. **Collaboration/Leverage of Funds**. The SEP FOA requires states to commit to using funding to expand existing programs, including ratepayer-funded (utility or public-benefit fund) programs, or to create new programs, and not to supplant or replace existing funding. Collaboration among Federal and state agencies, and across public and private agencies, is explicitly encouraged, as is use of best practices from other states. Given the need to expend funds quickly and the need to mitigate the risks associated with "greenfield" start up of new programs, the use of existing programs and infrastructure is also encouraged.

[3] Note that these criteria include a mix of pass/fail criteria, as well more ordinal criteria (e.g., where the project can satisfy the criteria to varying degrees.) Note also that the FOA and related documents should be consulted for the specific criteria and requirements. This document does not modify, limit, or change in any way the requirements of the FOA.

3. **Significance of Savings**. The SEP FOA reinforces that states should pursue a minimum goal of reducing per capita energy consumption at least 25 percent relative to a 1990 base year, by 2012. Combined with the goal of a significant increase in jobs and a reduction in environmental impacts, the FOA anticipates that the programs and resulting energy impacts will be large.
4. **Cost of Savings**. The SEP FOA strongly encourages state portfolios of SEP programs to achieve at least 10 million annual source Btus in savings for every $1,000 spent. While individual programs may, for good reason, provide lesser savings, the relative cost of the programs will be an important consideration. Note that this standard of cost effectiveness equates to approximately $1/kWh for electric utilities, whose program portfolios often achieve energy savings for one-fourth this cost.
5. **Sustainability and Market Transformation**. The SEP FOA anticipates preservation of the jobs and activities initiated by the ARRA even after the funds have been expended. States are requested to focus program efforts on market transformation activities which cause lasting changes in the function of markets or behavior of participants. Programs which can continue to provide value by leveraging other sources of funds (such as ratepayer or private sector funds) or by having permanently changed behavior (such as teaching quality installation and maintenance practices) are appropriate.

Note that these are not the only criteria. Other important criteria (such as the Governor's Assurance) also apply. These criteria may, however, prove very useful to recipients in the analysis, prioritization, and funding of programs.

Although these criteria are designed to reflect the key considerations of DOE during the award process, states may also wish to overlay their own additional requirements. While these criteria will be situation specific, they might include:

- Alignment with the mission and statutory authority of the state agency and previously filed SEP plans
- Availability of tracking systems for program funds, QA/QC of work conducted with the funds, and accounting and anti-fraud controls
- Electric system requirements (e.g., timing of future capacity or energy driven additions)
- Availability of programs for all taxpayers and a broad based opportunity to participate in at least one program
- Special accommodations for low-income customers
- Sensitivity to competitive market operations and a desire not to create programs that compete with or provide inappropriate competitive advantage to individual market participants
- Ability of the program to integrate with plans by regional utilities to introduce an Advanced Metering Infrastructure or Smart Grid
- The impact on the ability to reach goals that may have been established for existing energy efficiency program providers, especially utilities

IV. Overview of the Rapid Deployment Energy Efficiency Programs

The **Rapid Deployment Energy Efficiency (RDEE) Toolkit** provides information on 10 energy efficiency programs. These programs each have a proven track record and are consistent with the criteria and considerations outlined by DOE. Each of these programs typically,

- Addresses broad target audiences
- Creates jobs
- Saves significant amounts of energy
- Is cost-effective
- Has established measurement and evaluation methods
- Leverages existing infrastructure
- Is sustainable, at least in part, and results in long-term market transformation
- Is comparatively low-risk
- Has manageable complexity
- Has available extensive design support and case study information

The programs span energy efficiency options across the residential, commercial, and industrial sectors. The programs are:

1. **Home Performance with ENERGY STAR (HPwES)**. This residential sector program offers whole home retrofits using qualified contractors, established home assessment protocols, and incentives from the program sponsor. This program can be a good strategy particularly for older pre-code constructed homes. The program is estimated to reduce home energy bills by 20 percent on average.

2. **ENERGY STAR Labeled Products.** This residential and small commercial sector program promotes efficient lighting (CFLs and fixtures) and appliances through a variety of incentive structures including direct rebates to the customer as well as upstream incentives. This program generally targets the broad residential and small commercial market place. Particular products may be selected for inclusion in this program such as lighting or one or more appliances; savings depend upon the products included. Typical savings range from approximately 0.5 to 3.0 MBtu per participant

3. **Residential Efficient HVAC** . This program targets HVAC contractors and homeowners to increase sales and proper installation of ENERGY STAR qualified HVAC equipment, such as air conditioners, furnaces, and split systems. Savings are very sensitive to weather, but the minimum savings range per participant is approximately 5 to 20 MBtu.

4. **Residential Energy Audit and Direct Installation**. This program targets the same market and works with the same set of contractors as HPwES; the key difference is a more basic audit and less extensive and lower cost set of measures, such as CFLs, hot water heater wraps, pipe insulation, and low flow showerheads. Typical savings are approximately 3 to 6 MBtu per participant.

5. **Non-Residential On-Site Energy Manager**. This program assists businesses by hiring and training an On-Site Energy Manager (OEM) to work with them for a six-month period. During their tenure with a business, the OEM will evaluate facilities' energy use and work with maintenance staff to reduce energy usage and costs. Long-term energy and cost savings of 10 to 15 percent are achievable, largely through behavioral changes.

6. **Non-Residential Prescriptive Rebates**. This program provides incentives to the commercial, institutional, and industrial market for upgrade or retrofit of equipment with new, more energy efficient equipment, such as lighting, HVAC equipment, and products like motors and refrigerators. Particular equipment and products may be selected for inclusion in this program, such as lighting; savings depend upon the equipment and products included. Generally, a large percentage of program savings come from lighting retrofits.

7. **Non-Residential Retrocommissioning**. Retrocommissioning offers building owners a systematic process for evaluating a structure's major energy-consuming systems and identifying opportunities to optimize equipment operation. Retrocommissioning tunes-up existing buildings, improving their energy efficiency and operational procedures. Retrocommissioning is typically carried out through local networks of commissioning providers. Typical savings range from approximately 4,000 to 20,000 MBtu per participant.

8. **Commercial Benchmarking and Performance**. This program works with commercial facility operations staff and owners to benchmark and monitor building energy performance using tools such as ENERGY STAR Portfolio Manager and building sub-metering equipment, as well as to recommend energy efficiency upgrades based on analyses of building performance data. This program is estimated to reduce building energy use by 10 to over 30%.

9. **Non-Residential Custom Incentives**. A commercial and industrial (C&I) Custom Program supports C&I customers in identifying and implementing site-specific and unique cost-effective energy efficiency opportunities, which often require calculations to determine energy savings. A typical project may involve industrial process efficiency, chillers/boilers, data center efficiency, or electric motor retrofits, or projects that otherwise fall outside of the Prescriptive program. Savings per project can be very large, but vary widely by state/industry.

10. **Commercial Food Service Efficiency**. This program rebates energy-efficient commercial food service equipment such as refrigerators, freezers, steamers, fryers, hot food holding cabinets, ice machines, dishwashers, ovens, and other technologies, primarily aiming to influence the buyer to purchase more efficient equipment when their existing equipment has failed. Typical savings range from approximately 20 to 60 MBtu per participant.

This Planning Guide includes the following information for each of these programs, as presented in Section VI.

Summary of Information Provided for Energy Efficiency Programs in RDEE Planning Guide

- Program summary
- Target market
- Evaluation, monitoring, and verification requirements
- Infrastructure requirements
- Training needs
- Staffing requirements
- Implementation timeline
- Energy savings
- Participation rates
- Total Budget
- Job creation estimates
- Cost-effectiveness
- Resources and assistance
- Leveraging opportunities

V. Framework for Program Selection and Budgeting

This **Planning Guide** presents information that can be used to select and plan for any one of these programs or for the development of a portfolio of these programs. To assist in determining which of these programs may be appropriate for use of SEP and EECBG funding in a particular area, the Planning Guide presents the following basic program information and planning assumptions:[4]

- Target audience
- Likely near-term annual penetration rates
- Average energy savings per participant
- Annual program costs per participant, and
- Jobs created

This program planning information permits interested parties to scale the numbers up or down based on population, location, or other specific information.[5] Potential program sponsors are encouraged to consult the resources identified and/or contact EPA for assistance in identifying appropriate planning assumptions for their own states/cities/counties and anticipated program designs (more detailed implementation guides will be available between May 15th and June 15th).

The use of this information is illustrated below for various hypothetical residential and non-residential populations. Based upon assumptions for participation rates, average costs per participant, average savings per participant, and estimated jobs created the following program planning information can be developed (as illustrated in Table 2):

- Total annual program costs
- Total annual energy saved
- Jobs created
- Source Btu saved per $1,000 invested

[4] These are initial planning assumptions based on the experience of a number of organizations implementing these programs. However, recipients are encouraged to evaluate these assumptions as their plans are developed to address local circumstances that could be different from the circumstances of past program implementers due to different climate conditions, economic activity levels, incentive strategies, and market infrastructure, etc.

[5] The information provided is by necessity somewhat generic, and may not reflect individual program design approaches or be achievable under all circumstances.

Table 2. Illustrative Program Metrics 2009-2012

		Eligible Population	Participation Rate	Participants	Average Cost per Participant	Program Cost	Jobs per $1M	Jobs Created	Per Unit Source MBtu Saved	MBtu Saved	Source Mbtu Saved per $1,000
Residential	ENERGY STAR Products	1,000,000	23.4%	235,530	$ 26	$ 34,700,000	9	296	3	3,029,000	87
	Easy Audit and Direct Install	250,000	3.5%	8,700	$ 993	$ 8,636,000	21	184	5	43,500	5
	HPwES	250,000	1.0%	2,500	$ 5,850	$ 14,625,000	20	297	60	150,000	10
	Efficient HVAC	1,000,000	3.2%	31,818	$ 399	$ 12,709,091	15	187	5	159,091	13
C&I	Prescriptive	100,000	1.8%	1,820	$ 3,610	$ 6,571,000	9	57	400	722,500	110
	Custom	100,000	0.3%	261	$ 20,000	$ 5,220,000	16	81	1,500	391,500	75
	Retrocommissioning	20,000	0.5%	100	$ 48,100	$ 4,810,000	12	58	5,500	495,000	103
	Benchmarking + Building Performance	20,000	0.2%	45	$ 40,000	$ 1,800,000	12	21	2,800	126,000	70
	On-Site Energy Manager	20,000	0.5%	105	$ 47,631	$ 5,001,250	8	39	4,500	472,500	94
	Commercial Food Service	40,000	7.7%	3,075	$ 1,400	$ 4,307,750	7	29	56	172,000	40

Allocation of Funds among Programs

Applicants will likely need to make decisions as to which programs should be pursued in their areas and how large a budget to allocate to each selected program, as implementation of all attractive programs will likely more than exhaust allocated ARRA and other available funds,. This section outlines a framework for making these decisions. These decisions will likely be based on both quantitative and qualitative considerations. These considerations are addressed in turn below.

A primary goal of a portfolio of programs should be to maximize its value, subject to applicable constraints. In this case, the value could encompass several metrics, including number of jobs created and total energy saved. Constraints might include the available budget, cost per MBtu saved, and the perceived riskiness of the projects.

There are many approaches to this challenge, some founded in mathematical scoring models, and others based on qualitative assessments. Given that the criteria established above are both quantitative and qualitative, a hybrid approach may be most appropriate for allocating ARRA funds.

As primary goals of the ARRA are to create jobs and save energy, this guide provides the information necessary to estimate these benefits, in particular. While there is some uncertainty in these estimates, ranges of probable impacts have been established and are provided. The energy savings estimates are derived from past program experience. The process used to develop ranges for the jobs created from the programs is outlined in Appendix A.

Similarly, estimates of the cost-effectiveness of the programs, expressed in terms of the MBtu per $1,000 spent should be developed. Again, these can reasonably be expressed in terms of ranges using the information in the Toolkit and other sources.

In addition to these quantitative items, each program should be evaluated relative to the qualitative criteria that are of significance to each applicant. Examples of these criteria might include:

1. The applicability of the program to broad range of constituents. Equity across taxpayers may have different facets depending upon individual circumstances, but will generally require that, over time, all taxpayers have the opportunity to participate in the programs, or will at least share materially in their benefits.
2. The comparative simplicity and risk level of the program. Relative risk of individual programs, and of the portfolio as a whole, is difficult to judge since there is often a lack of reliable information and projections regarding future performance by the programs. Therefore, concepts that should be considered in assessing risk include: the quality and reliability of information used in determining the quantitative metrics; track record of the program and/or its implementer in hitting goals and maintaining budgets; and dependence of the program on factors outside the recipient's direct control.
3. The sustainability of the program after ARRA funding has been expended, which in part depends upon the degree to which the program permanently increases the supply of energy efficiency (for example, by training contractors in efficient methods or changing the stocking practices of distributors), or increases the demand for energy efficiency by educating users on the importance of energy efficiency in their purchases and habits.
4. The degree to which the program leverages other funding sources or programs. Opportunities for leverage are in part a function of the existence of other programs, or entities willing and able to introduce such programs. Utilities, both public and private, as well as cities, counties, environmental and planning agencies, and regional transmission organizations may all serve as potential sources of funds.

The evaluation process might include a ranking of each program from "low" to "high" relative to these criteria, as illustrated in Table 3.

Table 3. Illustrative Metrics of Potential Programs

Program	Mbtu per $1, 000 Range	Jobs per $M Range	Applic-ability	Simplicity & Lack of Risk	Sustain-ability	Leverage
RESIDENTIAL						
Home Performance with ENERGY STAR	5-15	18-25	High	Moderate	High	Moderate
Residential Energy Audit and Direct Installation	5-12	18-25	High	Moderate	High	Moderate
Residential Efficient Air-Conditioning	10-20	11-20	High	High	Moderate	High
ENERGY STAR Labeled Products	80-100	8-10	High	High	Moderate	High
NON-RESIDENTIAL						
Non-Residential Custom Incentives	50-150	15-18	Moderate	Moderate	Moderate	Moderate
Non-Residential Retro-commissioning	80-120	11-15	Moderate	Moderate	Moderate	Moderate
Non-Residential Benchmarking & PCx	20-40	11-15	Moderate	Moderate	High	Moderate
Non-Residential Prescriptive Rebates	80-130	8-11	Moderate	High	Moderate	High
Commercial Food Service Efficiency	25-40	6-8	Moderate	Moderate	Moderate	Moderate
Non-Residential On-Site Energy Manager	80-120	5-11	Low	Moderate	High	Moderate

Recipients should consider the environment in their own jurisdictions when assigning rankings. For example, a state with utilities who are actively promoting similar programs might provide "high" opportunities for leverage. In contrast, states with few or no such programs might have a "moderate" or "low" opportunity for leverage. Details about the attributes of each program are provided in Section VI, and support the evaluation of each program.

States and local governments can use the information in Table 3 to prioritize the programs based on a combination of their qualitative and quantitative rankings. This framework would be appropriate to apply holistically to all programs under consideration, both existing and new, as well as to all existing SEP and potential ENERGY STAR or other programs. Of course, each situation is unique and the above may not be a complete or relevant list of considerations for every applicant. Section VI provides additional information regarding each program.

VI. Program Snapshots

PROGRAM	Home Performance with ENERGY STAR (HPwES)
Program Summary	Together, the Tier 1 Energy Audit and Direct Install and the Tier 2 Audit program (Home Performance with ENERGY STAR, or HPwES) comprise the Residential Retrofit initiative. These programs work with the same pool of contractors and population of homeowners. The primary differences between HPwES and Energy Audit and Direct Install are the level of the audit (the Tier 1 program offers a basic, visual home energy checkup whereas the HPwES audit is comprehensive and involves diagnostic tools) and the measures available for incentives (Tier 1 only offers inexpensive, direct install measures whereas HPwES offers a wide range of measures for all end-uses, and at many price points). This market-based program motivates homeowners to use highly skilled home energy analysts and contractors that offer a whole-house approach for reducing energy use. These contractors provide comprehensive energy audits for qualified homeowners and provide incentives from the state/utility program sponsor (often either rebates and/or low-interest loans) for qualifying energy efficiency projects. Typical projects might include: insulation, duct sealing and repair, high-efficiency HVAC systems, windows, lighting, and appliances. The energy analysts are usually free to establish their own pricing for the audits and subsequent work and to determine their own basic business model (e.g., just providing audits, or also providing installation of the efficiency improvements). However, they are required to adhere to strict training, engineering, reporting, quality assurance, and other requirements set forth by the EPA, DOE, and the program sponsor. Incentives to homeowners typically have a value of approximately 10%-20% of the value of the improvements, or between $300 and $1,500 (including cash incentives and low-interest financing) depending on the measures installed, though some programs have paid much high rebates for projects, on the order of $5,000 or more. A variation of the program called “Assisted Home Performance” provides greater levels of incentives for low and moderate income participants. Incentives and other support to contractors typically include items such as job completion bonuses, and cost-sharing for training with existing nationally recognized building performance associations. Other key elements of the program include contractor recruitment, training and mentoring, and independent verification of a sample of homes to verify quality of the work and data collected. Extensive support in the design and implementation of this program is available from the EPA and DOE in the form of a sponsor guide, template program outline, financing guidebook, marketing materials, case studies, and other information. Note: Some program sponsors elect to roll-out HPwES first as a pilot in selected areas; then, based on their leanings from the pilot, expand the program to their entire eligible population. However, running a pilot is an option, not a requirement of becoming an HPwES sponsor.
Target Market	HPwES typically targets homes 15 years or older – this constitutes approximately 80 percent of the housing stock, nationwide.[6] Program sponsors may elect to target participants with certain demographic characteristics, or whose energy consumption exceeds established metrics.
EM&V	Basic accounting for the impacts of the program includes tracking of the number of participants, the measures installed and their anticipated savings, the field measurements taken by contractors before and after the work, as well as the basic characteristics of the home where the work was performed. In some cases, additional measurement and verification may be required by the program sponsor or regulators, and typically focuses on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of homes, the nature of the energy efficiency improvements installed, actual usage characteristics and utility consumption of the home, and whether or not the owner would have undertaken the work even in the absence of the program. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.

[6] U.S. Census Bureau, “American Housing Survey: 2007,” www.census.gov/hhes/www/housing/ahs/ahs07/tab1a-1.xls

PROGRAM	Home Performance with ENERGY STAR (HPwES)
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A process for recruiting and screening qualified contractors to participate in the program • A process for training, certifying, and monitoring the performance of contractors • A standardized process for conducting the audit and calculating and reporting energy savings to the homeowner and to the program • A process for marketing the program to homeowners • A process for disbursing incentives • A process for ensuring that work performed and contractor business practices meet the quality standards of the program • A system for tracking and accounting for program results • A process for conducting EM&V • Customer support, including a call center and a program website
Staffing Requirements & Job Creation	Program Administration Depending on the size of the program, HPwES requires at least 2-4 full-time employees. At a minimum, the program requires one manager, one part-time staff member for conducting contractor trainings (typically available from existing consultants), and one staff member for providing contractor mentoring and verifying projects. Initial phases of the program may require an additional 2-3 staff for a period of 6 months to perform start-up activities. As the program grows over time the need for additional technical staff for quality assurance purposes and administrative staff for processing jobs and incentives will increase. Participating Contractors Initial roll-out of the program (0-6 months) typically involves recruitment of 3-5 contractors, ideally who have or can quickly attain the appropriate certifications from the program. While implementation models vary, it might be expected that by the end of the first program year, approximately 15 certified contractors will be needed (experience suggests that approximately one third of contractors will be very active, a third moderately active, and a third relatively inactive) for each million dollars of program budget. However, this assumption is sensitive to the scale of individual contracting organizations and the size of the market. Job Creation In addition to the direct jobs associated with implementing the program, additional jobs are created for contractors and others through the incremental equipment, supplies, and installation induced by the program, as well as through economic effects resulting from homeowner spending of those dollars that would otherwise go toward utility bills. In total, it is estimated that approximately 18 to 25 jobs will result per million dollars spent by the program.
Implementation Timeline	Approximately seven months is needed to design and introduce an HPwES program, although this may be sensitive to the local infrastructure, training needs, and the time of year. Spring and fall are typically attractive times to secure contractors and provide training. An illustrative program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
Project kick-off							
Review draft program plans with ENERGY STAR							
Recruit home performance contractors							
Contractor training							
Initiate marketing							
First Job Completed							

PROGRAM	Home Performance with ENERGY STAR (HPwES)

Illustrative Program Performance

Savings

Energy savings per home varies widely by climate zone, measures installed, incentive levels, and average job size. Annual source energy savings reported by program sponsors are in the range of 34 MBtu to 66 MBtu per average home[7], as illustrated in the table below.

Census Region	Savings		
	Electricity kWh	Gas Therms	Source MBtu
Northeast	1,400	400	54
Midwest	1,700	400	57
South	4,600	200	66
West	1,400	200	34

Participation

An aggressive HPwES program could reach approximately 1% of eligible homes after three years, depending upon the degree of marketing and the ratio between audits conducted and projects completed. Under a less aggressive scenario, participation after three years may be closer to 0.025%.

Budget

Illustrative program implementation costs are expected to decline from approximately $7,500 per completed home in the initial year to $5,000 per completed home after three years. Reported costs vary depending upon the implementation approach taken and degree of participation. An *illustrative* participation schedule and budget are shown in the table below; this budget reflects an early emphasis on market conditioning, including contractor recruitment and training, as well as marketing. *[Potential program sponsors are encouraged to consult the resources identified below and/or contact the EPA/DOE for assistance in identifying appropriate planning assumptions for their own states/cities/counties and anticipated program designs]*

	Year			
	1	2	3	Cumulative
Population of Eligible Homes	250,000	250,000	250,000	250,000
Participation rate	0.10%	0.30%	0.60%	1.0%
Participants	250	750	1,500	2,500
Average Cost per Participant	$7,500	$7,000	$5,000	$ 5,850
Program Cost	$ 1,875,000	$ 5,250,000	$ 7,500,000	$ 14,625,000
Jobs per $1M	25	22	18	20
Jobs Created	**47**	**116**	**135**	**297**
Per Unit Source MBtu Saved	60	60	60	60
MBtu Saved	15,000	45,000	90,000	150,000
Source Mbtu saved per $1,000	**8.0**	**8.6**	**12.0**	**10.3**

[7] Source Btus assuming an average electric generation heat rate of 10,000 Btu/kWh.

PROGRAM	Home Performance with ENERGY STAR (HPwES)
Resources and Assistance	• HPwES program sponsor support website: www.energystar.gov/hpwessponsors -EPA's HPwES program implementation plan outline: www.energystar.gov/ia/home_improvement/Program_Implementation_Plan.pdf -Current HPwES programs: www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_hpwes_partners • Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits • Building Performance Institute: www.bpi.org • Residential Energy Services Network: www.natresnet.org Contact: homeperformance@energystar.gov or Chandler von Schrader at EPA (202-343-9096; vonschrader.chandler@epa.gov) Patricia Plympton at Navigant Consulting (for DOE) (202-481-7397; patricia.plympton@navigantconsulting.com)

PROGRAM	Home Performance with ENERGY STAR (HPwES)
Program Characteristics Summary	HPwES is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. Given the relative fragmentation of the home contracting industry and the comparatively small size of each job, HPwES is a training and labor intensive program. It therefore results in a comparatively large number of jobs created. Per dollar spent, HPwES results in perhaps more new job opportunities than any other program. These are skilled jobs that include significant exposure to engineering and building performance science, as well as skills required by the HVAC industry and related trades. Leveragable training staff and curricula for this program exist in many parts of the country. Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of home services and energy efficiency. In addition, bill savings by residences tend to recirculate in the economy to a greater degree than do savings by commercial or industrial customers, and therefore have a greater multiplier effect on jobs and economic activity. 2. Collaboration and Leverage of Funds. HPwES provides an excellent opportunity to collaborate with EPA/DOE, utility companies, state and local agencies, local trade allies and their associations, as well as the building science and consulting communities. EPA and DOE have completed considerable research and design regarding HPwES and provide a large library of implementation support and other materials. The program also benefits from the considerable brand recognition and value associated with the ENERGY STAR program. EPA and DOE also support regular conferences demonstrating best practices and peer experience. EPA and DOE provide selective marketing funding and other support for qualifying programs, and utilities (both municipal and investor owned). With increasing regional energy efficiency goals in many portions of the country, utilities may provide an excellent opportunity for collaboration, funding, and/or direct implementation of HPwES programs. Finally, homeowners implementing projects with the help of HPwES can also leverage Federal tax credits for energy efficiency investments (see, www.energystar.gov/index.cfm?c=products.pr_tax_credits). 3. Significance of Program Savings. On a "per job" basis, HPwES provides a lesser impact on energy and environmental emissions than many commercial or industrial programs. However, the potential participant base is very large, consisting of all owner-occupied dwellings older than just a few years, and the measures installed by the program typically have long lives and persist even if home ownership changes. Not only does this large base provide an opportunity for large impacts, it also provides an equitable and highly visible opportunity for the largest single group of tax-payers to participate in a program and benefit from ARRA stimulus dollars. In addition, the program can accommodate the needs of lower-income individuals with increased incentive levels and other support functions. Further, the potential impact of the program is (after the initial introduction) largely scalable and a function of the budget dedicated to the program. 4. Cost of Savings. HPwES is a relatively expensive program due to its extensive requirements for training and verification of the work, as well as the need for public education. However, these expenses are also the key drivers of the program's strong performance relative to job creation, quality, and accountability. Despite being comparatively expensive on a $/Btu saved basis, a typical program is still anticipated to be less expensive than the 10 MBtu per $1,000 guidance provided in the FOA. 5. Sustainability and Market Transformation. Through its broad outreach and education components, HPwES creates a more educated and aware public. The need to be sensitive to energy issues and the basic understanding of energy systems and financial payback principles will be retained by participants long after their initial contact with the program. This will result in spillover benefits to other energy investments or behavioral changes they may consider in the future, even if they are not elements of the HPwES program. Similarly, an HPwES program seeds a competitive market of contractors who develop a variety of business models and approaches. Through competitive innovation, these contractors often integrate the HPwES services with other services such as HVAC service and repair, insulation, and window replacement. The training regarding proper analysis and installation of efficient measures, as well as customer education and sales techniques, remains with the contractors even in the absence of the program. Indeed, as the market matures and as the general public comes to understand and demand efficient and properly installed products, the level of incentive offered by the program can be reduced or eliminated while the benefits are expected to persist.

PROGRAM	Non-Residential Prescriptive Program
Program Summary	Prescriptive programs encourage non-residential customers to upgrade or retrofit working equipment with new, energy efficient equipment. This program has been run cost-effectively in nearly every region of the country, and provides an opportunity to quickly deploy energy efficient technologies into a state's businesses, industries, and schools. Focusing on easy opportunities to produce verifiable energy savings, such as lighting upgrades from T12 to T8 linear fluorescent lamps, efficient HVAC equipment, and products like motors and refrigerators, this program will provide a simple, expedited solution for non-residential customers to save energy. The majority of incentives are geared towards customers who are in the market for new equipment when their old equipment burns-out. In some instances, such as for T12 lighting, the program should also encourage the replacement of working but inefficient technologies with newer and more energy efficient technologies (retrofit opportunities).
Target Market	The program is targeted at commercial, institutional, and industrial customers. Program sponsors may elect to target participants with certain demographic characteristics, or whose energy consumption exceeds established metrics.
EM&V Support	Basic accounting for the impacts of the Prescriptive program include a unique participant ID, a business SIC and/or NAICS code, participant contact information, contractor name and contact information; and, for each project, a unique project ID, measures installed, the project incentive amount, anticipated project savings, as well as project audit/verification status and date. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of facilities, the nature of the energy efficiency improvements installed usage characteristics of the facility, and whether or not the business owner would have undertaken the projects. Due to the well-researched assumptions surrounding the products in this program, deemed savings values will be used for most measures. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • Processes for trade ally recruiting, training, and account management. • Processes for participant marketing, recruiting, training, and account management. • A process calculating and disbursing incentives • A process for inspecting projects • A process for ensuring that work performed and contractor business practices meet the quality standards of the program • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V • Customer Support including a call center and online help

PROGRAM	Non-Residential Prescriptive Program
Staffing Requirements & Job Creation	Program Administration Depending on the size of the program, a prescriptive initiative requires 3-5 full-time employees. At a minimum, the program requires one manager, and two staff engineers for reviewing project documentation and inspecting projects. As the program grows over time the need for additional staff will increase. Participating Contractors Participating contractors are required to sign a participation agreement with the program. Although many contractors may sign a participation agreement, typically only about a third are very active in the program. By the end of the second year, you can expect to have about 150 contractors signed up per million in program spending, although this is very sensitive to the scale of individual contracting organizations and the size of the market. Job Creation This program helps develop the market for installation contractors and associated trade allies. Additional jobs will be created in related fields as a result of program spending. In total, expect from 8 to 11 jobs to result per million dollars spent on this program.
Implementation Timeline	Approximately four months are required to introduce a Prescriptive program. The key to rapid deployment is timely recruitment of installation contractors. An illustrative program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4
Project kick-off				
Develop program processes, policies and procedures				
Recruit equipment contractors and vendors				
Contractor and vendor training				
Initiate marketing				
First rebates disbursed				

PROGRAM

Non-Residential Prescriptive Program

Illustrative Program Performance

Energy Savings

Energy savings will vary considerably by state/industry. One Prescriptive program in the Midwest (see table below) verified energy savings of about 400 MBtu per participant. A similar program, also in the Midwest, verified 600 MBtu per participant. In general, a large percentage of program savings come from lighting retrofit projects.

Participation

An illustrative three year participation schedule for a Prescriptive program run in a large metropolitan area in the Midwest with a million electric customers is shown below. Note that in the first program year, participation is relatively low – this is because the program started later in the year than expected.

Budget

Reported costs vary depending upon the implementation approach taken and degree of participation. Illustrative program implementation costs are shown below.

	Year			
	1	2	3	Cumulative
Population of Eligible C&I Customers	100,000	100,000	100,000	100,000
Participation rate	0.1%	0.9%	0.8%	1.8%
Participants	110	880	830	1,820
Average Cost per Participant	$2,700	$4,300	$3,000	3,610
Program Cost	$ 297,000	$ 3,784,000	$ 2,490,000	$ 6,571,000
Jobs per $1M	11	9	8	9
Jobs Created	**3**	**34**	**20**	**57**
Per Unit Source MBtu Saved (elec)	350	400	400	400
Per Unit Source MBtu Saved (gas)	0.3	0.3	3.4	3.4
MBtu Saved	39,000	352,000	335,000	726,000
Source Mbtu saved per $1,000	**131.3**	**93.0**	**134.5**	**110.5**

Incentive levels

Illustrative incentive levels for some C&I prescriptive measures are listed below.

- T12 upgrade to HP-TS lamps and electronic ballast — $10/ficture
- New high-efficiency troffer fixture with HP-T8/T5 — $20/fixture
- New high-efficiency, low-glare troffer fixture with HP-T8/T5 — $25/fixture
- New indirect low-glare troffer fixture with HP-T8/T5 — $30/fixture
- New 4' strip fixture with reflector with HP-t8/T5 — $20/fixture
- New 8' strip fixture with reflector with HP-t8/T5 — $20/fixture
- Hard-wired compact fluorescent fixture, new or retrofit kit — $10/fixture
- New compact fluorescent fixture with dimmable ballast — $40/fixture
- Occupancy sensor:
  - Wall mount — $25/sensor
  - Remote mount — $75/sensor
  - High/low control — $40/ballast
  - Daylight dimming — $40/ballast

PROGRAM	Non-Residential Prescriptive Program
Illustrative Program Performance (con't)	• LED exit signs — $25/sign • LED traffic signals — $50-$75 • Premium efficiency 1 - 200 HP motors — $45 - $700 depending on motor size • Rooftop/unitary AC — $60/ton • Split system AC (<5.4 tons) — 14 SEER - $100; 15 SEER - $150; 16 SEER - $200 • Furnace — 92 AFUE - $200; 94 AFUE - $300 - $700 • Variable frequency drives in HVAC applications — $900 - $9,500 depending on horsepower of controlled motor • Vending machine occupancy controls: o Refrigerated beverage machine — $75/control o Snack machine — $30/control
Resources and Assistance	• EPA's ENERGY STAR Products page: www.energystar.gov/products • Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits
Program Characteristics Summary	Prescriptive is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. The main employment benefit of the Prescriptive program is stimulating the market for installation contractors. Unlike some programs, Prescriptive does not involve skilled training, or direct employment with the program. However, Prescriptive is a contractor-driven initiative, and experience shows that contractors active in similar programs see significant increases in business. 2. Collaboration and Leverage of Funds. Prescriptive provides an excellent opportunity to leverage EPA/DOE resources for ENERGY STAR rated products rebated through the program, and to collaborate with utility companies, state and local agencies, and local trade allies and their associations. 3. Significance of Program Savings. The Prescriptive program should be one of the first programs off the block, and will also yield significant savings over a relatively short timeframe. The best-run Prescriptive programs do this by keeping participation simple and picking low-hanging fruit, such as T-12 to T-8 retrofits. 4. Cost of Savings. This program tends to be very cost effective because it requires low overhead while paying incentives for a large volume of projects. Prescriptive incentives are attractive to a wider range of commercial customers than other C&I programs because participation is relatively simple, and does not require a significant upfront investment on the part of business owners. 5. Sustainability and Market Transformation. In terms of market penetration, the Prescriptive program will reach more nonresidential customers across more customer segments than any other C&I program. Research shows that C&I customers who experience the benefits of energy efficiency through a relatively simple program, such as Prescriptive, are more likely to participate in other programs that require more significant investments.

PROGRAM	Retrocommissioning (RCx)
Program Summary	Retrocommissioning (RCx) offers building owners a systematic process for evaluating a structure's major energy-consuming systems and identifying opportunities to optimize equipment operation. Retrocommissioning tunes-up existing buildings, improving their energy efficiency and operational procedures. Retrocommissioning is typically carried out through local networks of commissioning providers. Each customer goes through a five-phase process: 1. *Application*: Building owners or managers apply for RCx program assistance. 2. *Planning*: An analysis of the entire building, including a study of past utility bills and interviews with facility personnel. 3. *Investigation*: Use of benchmarking tools, such as ENERGY STAR Portfolio Manager (can be used to develop Building Energy Performance rating) to assess overall performance against peer buildings. 4. *Implementation*: Diagnostic monitoring and functional tests of building systems are then conducted, leading to system adjustments and maintenance actions. ENERGY STAR Portfolio Manager can be used to identify under-performing buildings to target for energy efficiency improvements, and establish baselines to set goals and measure progress for energy efficiency improvement projects over time. 5. *Verification*: Building systems are then retested and re-monitored to fine-tune improvements. ENERGY STAR Portfolio Manager can be used to provide a level of transparency and accountability to help demonstrate strategic use of ARRA 2009 funding by generating a Statement of Energy Performance (SEP) for each building, and summarizing important performance indicators, including energy use intensity and greenhouse gas emissions associated with building energy use. A final report, retrocommissioning plan, and operations and maintenance schedule are given to the building owners and operators. Each commissioning provider should develop a pre-and post-commissioning Energy Performance Rating using ENERGY STAR Portfolio Manger and submit the results in its final report for each building. In many cases, building operators receive additional training in keeping systems operating at optimum levels, and monitoring methods are established to track performance on an ongoing basis. Incentives typically include cost sharing for planning and investigation up to a per-project cap of $10,000-15,000. Implementation incentives are offered on a dollar per kWh basis covering some of the incremental cost of implementing recommended energy efficiency measures.
Target Market	RCx is typically performed only on large commercial and industrial facilities. Facility qualification criteria may include: 1. A size minimum (though priority should be granted to facilities with high energy use intensities). 2. A funding commitment (i.e. of $15,000) from the building owner for completing the project plan and implementing measures. The facility must have an existing building or system energy management system (EMS) with direct digital control (DDC). 3. The facility must be free of major problems requiring costly repairs or replacements and have no planned major system renovations or retrofits. 4. The facility must have accessible and up-to-date building documentation and records. 5. The facility owner and O&M staff must express a commitment to be actively involved in the RCx process with a commitment of at least 40 hours by the O&M staff. 6. The facility owner and O&M staff must deliver a persistence plan prior to project completion demonstrating strategies for maintaining energy savings identified as part of the RCx process.

PROGRAM	Retrocommissioning (RCx)
EM&V	Basic accounting for the impacts of the RCx program includes a unique participant ID, a business SIC and/or NAICS code, participant contact information, commissioning provider name and contact information along with the current commissioning phase and date; facility baseline energy consumption; pre-and post-commissioning ENERGY STAR Energy Performance Rating; for any projects completed, a unique project ID, contractor name and contact information, measures installed, the project incentive amount and anticipated project savings. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of commissioned facilities, the nature of the energy efficiency improvements installed, usage characteristics of the facility, and whether or not the business owner would have undertaken the projects in the absence of the program. Typical savings verification techniques include spot-metering, detailed engineering calculations, and billing analysis. The evaluator should also estimate the persistence of savings from RCx activities. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A standardized process for screening applications • A process for recruiting and training commissioning providers • Processes for conducting the planning, investigation, implementation and verification stages of RCx • A process for marketing the program to business owners and building managers • A process for calculating and disbursing incentives • A process for ensuring that work performed and commissioning provider business practices meet the quality standards of the program • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V • Customer support, including a call center and on the program website
Staffing Requirements & Job Creation	<u>Program Administration</u> Depending on the size of the program, RCx requires 3-5 full-time employees. At a minimum, the program requires one manager (an individual with significant commissioning experience), and two staff engineers with commissioning experience who can handle both supervising and conducting the planning, investigation, implementation, verification stages of RCx, conducting program trainings with commissioning providers, as well as additional education of building owners and operators. As the program grows over time the need for additional engineers for will increase. <u>Participating Contractors</u> During the first 6 months as RCx rolls out, you will need to recruit 3-5 commissioning providers per million program dollars spent. As the program grows over time the need for additional providers for will increase, although this is very sensitive to the scale of individual contracting organizations and the size of the market. <u>Job Creation</u> This program helps develop the market for commissioning providers and associated trade allies. Additional jobs will be created in related fields as a result of program spending. In total, expect from 5 to 15 jobs to result per million dollars spent on this program.

PROGRAM	Retrocommissioning (RCx)

Implementation Timeline

Approximately five months are needed to introduce an RCx program, although this may be sensitive to the availability of local commissioning providers. An illustrative RCx program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4	Month 5
Project kick-off					
Develop program processes, policies and procedures					
Recruit commissioning providers					
Initiate marketing					
First RCx project					

Illustrative Program Performance

Savings

Savings for RCx projects vary widely depending on the baseline efficiency of the facility, as well as facility size and type, the types of measures installed, and incentive levels. Generally, savings of 4,000 to 20,000 MBtu per RCx project are realistic.

Participation

An aggressive RCx program could reach about 0.5% of eligible facilities after three years. An illustrative three year participation schedule is shown below. Under a non-aggressive scenario, participation after three years may be closer to 0.1-0.2%.

Budget

RCx projects tend to be expensive, as they involve extensive on site analysis and training. One program reported average per participant costs of about $200,000, though the savings were commensurately higher, around 20,000-25,000 MBtu per project. An illustrative RCx program participation schedule with implementation costs is shown below.

	Year			
	1	2	3	Cumulative
Population of Eligible C&I Customers	20,000	20,000	20,000	20,000
Participation rate	0.13%	0.18%	0.20%	0.5%
Participants	25	35	40	100
Average Cost per Participant	$50,000	$48,000	$47,000	$ 48,100
Program Cost	$ 1,250,000	$ 1,680,000	$ 1,880,000	$ 4,810,000
Jobs per $1M	15	11	11	12
Jobs Created	**19**	**18**	**21**	**58**
Per Unit Source MBtu Saved (elec)	4,000	5,000	5,500	4,950
Per Unit Source MBtu Saved (gas)	500	800	1,100	845
MBtu Saved	112,500	203,000	264,000	579,500
Source Mbtu saved per $1,000	**90**	**121**	**140**	**120.5**

Resources and Assistance

- ENERGY STAR Portfolio Manager: www.energystar.gov/benchmark
- ENERGY STAR Guidelines for Energy Management: www.energystar.gov/guidelines
- ENERGY STAR Building Upgrade Manual: www.energystar.gov/bldgmanual
- Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits
- Building Commissioning Association: www.bcxa.org

PROGRAM	Retrocommissioning (RCx)
Program Characteristics Summary	RCx is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. An RCx program requires expertise in building commissioning--these jobs require a higher skill level and pay than is required for some programs. Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of building science, facility management and energy efficiency. 2. Collaboration and Leverage of Funds. RCx offers an excellent opportunity to collaborate with the EPA/DOE through the use of its Building Portfolio Manager, and with utility companies, state and local agencies, and local commissioning providers. 3. Significance of Program Savings. RCx programs tend to yield very high energy savings per customer, which translates into real cost savings for participating businesses. Lowering operational costs increases profit; this can be reinvested in additional energy saving opportunities and/or human resources. 4. Cost of Savings. RCx is an expensive program due to the comprehensive and time-consuming nature of the commissioning process, as well as the level of expertise required to complete it. However, these expenses are also the key drivers of the program's strong performance relative to job creation, quality, and accountability. The program is very cost-effective because it takes a whole-facility approach to reducing energy use, and sustains savings by training building owners and operators to maintain optimal building performance after the program has pulled out. 5. Sustainability and Market Transformation. Retrocommissioning helps create sustained energy savings because it goes well beyond reducing prices on efficient equipment. The program teaches building owners and operators how run to their facilities more efficiently, and that by doing so they are also reducing operating costs, as well as improving building health and safety.

PROGRAM	Residential Efficient Heating and Cooling
Program Summary	The objectives of this program are to increase sales of efficient (ENERGY STAR qualified, or better) heating and cooling equipment in replace-on-burnout, retrofit, and new construction opportunities, and to improve the operating efficiency of equipment through tune-ups of existing units, and quality installation of new units. HVAC contractors are the main vehicle for deployment of this program. Contractors must complete trainings for AC tune-ups (refrigerant charge, coil cleaning, filter change, and a blower speed test), AC quality installation (proper sizing, refrigerant charge, and air flow test), furnace quality installation (proper sizing, air flow adjustment, furnace on-rate check) and other program requirements. Since the measures in this program are weather sensitive, savings vary by climate region and so do incentives. Contractors receive incentives for performing AC tune-ups (typically $50-75) and quality installations ($70-100). Homeowners receive incentives for installing efficient equipment (typically 50-75% of incremental cost). The measure mix (the technologies that are cost-effective for the program to rebate) of HVAC programs varies largely based on weather and primary fuel (electric or gas). For example, in some areas of the country measures such as ground source heat pumps and hydronic heating systems are cost-effective and have been incorporated into residential HVAC programs.
Target Market	This program targets HVAC contractors, and homeowners with CACs and furnaces.
EM&V Support	Basic accounting for the impacts of the HVAC program includes a unique participant ID, a business SIC and/or NAICS code, participant contact information, HVAC contractor name and contact information; and, for each project: A unique project ID, measures installed, the project incentive amount, anticipated project savings, as well as project audit/verification status and date. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of homeowners, the nature of the energy efficiency improvements installed usage characteristics of the home, and whether or not the homeowner would have undertaken the projects in the absence of the program. For this program, evaluators will also interview a sample of HVAC contractors to see how the program influenced their practices. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A process for recruiting contractors • A process for training contractors to perform tune-ups and quality installs • A process for ensuring that work performed and contractor business practices meet the quality standards of the program (including a quality installation verification process) • A process for marketing the program • Customer Support including a call center and online help • A process for calculating and disbursing incentives • A process for inspecting projects • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V

PROGRAM	Residential Efficient Heating and Cooling
Staffing Requirements & Job Creation	Program Administration Depending on the size of the program, a residential HVAC initiative requires 2-4 full-time employees. At a minimum, the program requires one manager (a seasoned HVAC expert), and two staff engineers for assisting with tune-up and quality install training, quality installation verifications, project documentation review, and other administrative tasks. As the program grows over time the need for additional engineers for will increase. Participating Contractors Although many contractors may sign a participation agreement, typically about a third is very active in the program. By the end of the second year, you can expect to have about 15 contractors signed up per million in program spending (expect about five to be very active in the program). Note this is very sensitive to the scale of individual contracting organizations and the size of the market. Job Creation This program helps develop the market for HVAC contractors and associated trade allies. Additional jobs will be created in related fields as a result of program spending. In total, expect from 11 to 20 jobs to result per million dollars spent on this program.
Implementation Timeline	Approximately four months are required to introduce an HVAC program. A key challenge for this program is motivating HVAC contractors to conduct tune-ups, especially during the cooling season when they are usually focused on replacing units – this will be a particular challenge for 2009, as you will not have much opportunity to train contractors prior to the cooling season. For this reason, if resources and timing are constrained, you should start quality install training before your start tune-up training. Furnaces have fewer installation issues than ACs so less training for contractors is required prior to the heating season than prior to the cooling season.

Task	Month 1	Month 2	Month 3	Month 4
Project kick-off				
Develop program processes, policies and procedures				
Recruit HVAC contractors				
Start quality install training				
Start HVAC tune-up training				
Initiate marketing				
First quality install completed				

PROGRAM	Residential Efficient Heating and Cooling

Illustrative Program Performance

Energy Savings

Energy savings are very sensitive to weather, primary heating fuel type, and technology, as shown in the table below, which includes illustrative savings for the minimum level of heating and cooling upgrade typically required for centrally cooled/heated homes (upgrade to SEER 14 AC and/or 90 AFUE furnace) in "warm" and "cool" climates. Savings in hotter climates on efficient ACs can be considerably higher. In addition, AC Tune-Up savings typically range from 200 kWh in cooler climates, to almost 700 kWh in hotter regions.

Warm Climates			Cool Climates		
Electricity kWh	Gas Therms	Source MBtu	Electricity kWh	Gas Therms	Source MBtu
400	35	8	250	200	23

Illustrative savings for quality installation (QI) procedures are shown below.

	Energy Savings	
QI Procedure Element	**Cooling**	**Heating**
Refrigerant Charge	2-6%	
Airflow	2-5%	
Sizing	3-7%	11-18%
Duct sealing	11-18%	11-18%

Participation

An aggressive program could reach about 3% of eligible homes after 3 years, though this is very sensitive to the climate zone and local infrastructure of HVAC contractors. An illustrative three year participation schedule from a residential HVAC program run in a large metro area on the East Coast (with about a million residential customers) is shown below.

Budget

Illustrative program implementation costs are shown below. This is very sensitive to the degree of participation, the nature of the HVAC contractor network, and the measures that are cost-effective for the program to offer for rebates.

	Year			
	1	**2**	**3**	**Cumulative**
Population of Eligible Residential Customers	1,000,000	1,000,000	1,000,000	1,000,000
Participation rate	1.0%	1.2%	1.8%	4.0%
Participants*	10,000	12,000	18,000	40,000
Average Cost per Participant	$ 330	$ 280	$ 280	$ 290
Program Cost	$ 3,300,000	$ 3,360,000	$ 5,040,000	$ 11,700,000
Jobs per $1M	20	14	11	14
Jobs Created	**66**	**47**	**55**	**168**
Per Unit Source MBtu Saved (elec-AC)	5	5	5	5
Per Unit Source MBtu Saved (gas-Furnace)	20	20	20	20
MBtu Saved	250,000	300,000	450,000	1,000,000
Source Mbtu saved per $1,000	**75.8**	**89.3**	**89.3**	**85.5**

*Assumes 50% AC installs, 50% furnance installs

PROGRAM	Residential Efficient Heating and Cooling
Resources and Assistance	• ENERGY STAR HVAC Contractor Resources: www.energystar.gov/index.cfm?c=contractors.cont_prod_installcheck • ENERGY STAR HVAC Quality Installation Program contact Ted Leopkey at EPA (202-343-9659; leopkey.ted@epa.gov) • Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits
Program Characteristics Summary	HVAC is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. Given the relative fragmentation of the HVAC contracting industry and the comparatively small size of each job, HVAC is a training and labor intensive program (it involves specialized training in both HVAC tune-ups and quality installation for *all* participating contractors). It therefore results in a comparatively large number of jobs created. These jobs gain exposure to skills required by the HVAC industry and related trades. Leveragable training staff and curricula for this program exist in many parts of the country. Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the HVAC and energy efficiency industries. In addition, bill savings by residences tend to recirculate in the economy to a greater degree than do savings by commercial or industrial customers, and therefore have a greater multiplier effect on jobs and economic activity. 2. Collaboration and Leverage of Funds. HVAC provides an excellent opportunity to collaborate with EPA/DOE, utility companies, state and local agencies, and local HVAC trade allies and their associations, as well as the building science and consulting communities. The program also benefits from the considerable brand recognition and value associated with the ENERGY STAR program. With increasing regional energy efficiency goals in many portions of the country, utilities may provide an excellent opportunity for collaboration, funding, and/or direct implementation of HVAC programs. 3. Significance of Program Savings. On a "per job" basis, HVAC provides a lesser impact on energy and environmental emissions than some programs. However, the potential participant base is very large, consisting of all owner-occupied dwellings with a central AC or furnace, and the measures installed by the program typically have long lives and persist even if home ownership changes. Not only does this large base provide an opportunity for large impacts, it also provides an equitable and highly visible opportunity for the largest single group of tax-payers to participate in a program and benefit from ARRA stimulus dollars. Although it is not a focus here, this program can have a considerable impact on peak demand – ENERGY STAR Central ACs save around 0.3-1.0 kW, depending on the efficiency of the unit. 4. Cost of Savings. HVAC requires a significant investment due to its extensive requirements for training and verification of the work, as well as the need for public education. However, these expenses are also the key drivers of the program's strong performance relative to job creation, quality, and accountability. Despite being comparatively expensive on a $/Btu saved basis, a typical program is still anticipated to be less expensive that the 10 MBtu per $1,000 guidance provided in the FOA. 5. Sustainability and Market Transformation. Through its outreach and training components, this program helps transform the HVAC contractor market. Most HVAC contractors are focused on replacing burned-out equipment during the heating and cooling seasons, and research shows that more often than not, these units are both oversized and improperly installed. This program changes contractor behavior by teaching HVAC personnel to properly size units and to perform quality installations. The program also helps build demand for these contractors by teaching them how to properly tune-up functioning equipment, and by marketing tune-ups to homeowners. As the market matures and homeowners come to understand and demand efficient and properly installed HVAC equipment, the level of incentive offered by the program can be reduced or eliminated while the benefits are expected to persist.

PROGRAM	Commercial Food Service Program
Program Summary	A Commercial Food Service (CFS) program rebates energy-efficient commercial food service equipment such as refrigerators, freezers, steamers, fryers, hot food holding cabinets, ice machines, dishwashers, ovens, and other technologies, primarily aiming to influence the buyer to purchase more efficient equipment when their existing equipment has failed. The existing ENERGY STAR specifications should be utilized to denote efficient equipment that would be eligible for rebates, and will help with marketing the product to the supply chain and the end-users. States with advanced codes for some equipment types may also wish to offer incentives at CEE (Consortium for Energy Efficiency levels. The food service network is complicated, consisting of manufacturers, manufacturers reps, dealers, dealer reps, equipment stores, and often cash-strapped end-users including restaurants, schools, hotels and motels, and hospitals. The network varies locally and regionally. Best practices include cultivating the food service network, providing identifiable point of purchase marketing with eligible rebate amounts at the distributors' warehouses, actively training and offering incentives to equipment distributors and dealers to market the program, and leveraging ENERGY STAR marketing and resources.
Target Market	The program is targeted at commercial food service equipment distributors, and dealers who are the key access points for delivery of efficient products to restaurants, schools, hotels and motels, and hospitals. Independent restaurant chains are also a good target for direct outreach as influencing the way they specify equipment in their franchising requirements can result in a large number of installations over the long-term.
EM&V	Basic accounting for the impacts of the program includes tracking of the number of participants, the measures installed and their anticipated savings, and verification of measure installation for a sample of projects. In some cases, additional measurement and verification may be required by the program sponsor or regulators, and typically focuses on establishing the kW, kWh, and Btu saved by the program through a more rigorous evaluation of the equipment installed, verification of installation and satisfaction with the energy-efficient equipment, and actual usage characteristics and utility consumption of the business, Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • Processes for trade ally recruiting, training, and account management • Processes for participant marketing, recruiting, training, and account management. • A process for calculating and disbursing incentives • A process for inspecting projects • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V • Customer Support including a call center and online help

PROGRAM	Commercial Food Service Program
Staffing Requirements & Job Creation	Program Administration A CFS program requires one program manager and at least two support staff for training, materials development, incentive application verification, and project inspection and verification, for programs with budgets of $250,000 to $1 million annually. Typically one additional administration employee is needed per $1 million expended by the program. Incentives for CFS programs can also be included as part of an existing C&I Standard Offer Program. This approach has reduced overhead expenses and offers quicker deployment. However, it likely results in fewer equipment installations due to lack of sector-specific education and marketing; and it does not offer the same potential for creating lasting change in the demand for energy efficient products and services in the marketplace., so is best used as a bridge strategy to an eventual full-scale CFS program. Trade Allies Trade allies, such as equipment distributors, dealers, manufacturers, and manufacturer reps will largely be re-trained and re-oriented to focus effort on manufacturing, distributing, and selling energy efficient equipment, instead of standard equipment. Job Creation Additional jobs will be created through program administration as well as indirect and induced effects such as the additional design and manufacture of new, more energy-efficient equipment and the reduced operating costs of restaurants. The latter effect can be particularly significant as utility costs are a major operating expense for the CFS industry, which operates on slim profit margins. [8]In total, expect from 6 to 10 jobs to result per million dollars spent on this program.
Implementation Timeline	This program typically requires significant relationship building with trade allies. This schedule assumes an aggressive roll-out.

Task	Month 1	Month 2	Month 3	Month 4	Month 5
Program kick-off					
Develop program processes, policies, and procedures					
Recruit equipment distributors, dealers reps, manufacturers					
Trade ally training					
Initiate Marketing					
First rebates administered					

[8] National Restaurant Association, 2008. 2007/2008 Restaurant Industry Operations Report, as cited in the National Restaurant Association, 2008 Restaurant Industry Forecast.

PROGRAM	Commercial Food Service Program

Illustrative Program Performance

Energy Savings

Energy savings will vary based on the equipment and its use from one participant to the next, and the types of equipment needed varies in the local markets. An illustrative program, run by a large utility in the West, saved about 40 million source Btu per $1000 over three years.

Participation

An illustrative three year participation schedule is shown below for a CFS Program run in a region with 90,000 independent and chain restaurant locations. This example shows an aggressive and well-funded program that was able to reach over 3% of new equipment sales by the third year. Under a less aggressive program, perhaps 1% of new equipment sales could be reached in that time frame.

Budget

Illustrative program implementation costs are expected to range from $1,000 to $1,500 per piece of equipment. Experience shows that 50-60% percent of the budget is expected to be spent on incentives and rebates, while 40-50% is spent on program administration, training, marketing, and other costs. An illustrative participation schedule and budget are shown in the table below.

	Year			
	1	2	3	Cumulative
Eligible Equipment	40,000	40,000	40,000	40,000
Participation rate	1.7%	2.5%	3.5%	7.7%
Participants	675	1,000	1,400	3,075
Average Cost per Participant	$ 1,250.00	$ 1,420.00	$ 1,460.00	1,400
Program Cost	$ 843,750	$ 1,420,000	$ 2,044,000	$ 4,307,750
Jobs per $1M	8	7	6	7
Jobs Created	**7**	**10**	**12**	**29**
Per Unit Source MBtu Saved (elec)	23	49	39	39
Per Unit Source MBtu Saved (gas)	10	22	17	17
MBtu Saved	22,000	71,000	79,000	172,000
Source Mbtu saved per $1,000	**26**	**50**	**39**	**40**

Resources and Assistance

- ENERGY STAR Commercial Food Service: http://www.energystar.gov/cfs
- Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits
- Consortium for Energy Efficiency Commercial Kitchens Initiative: http://www.cee1.org/com/com-kit/com-kit-main.php3

PROGRAM	Commercial Food Service Program
Program Characteristics Summary	Commercial Food Service is a strong candidate for stimulus funding, but due to its more complex implementation nature and relatively smaller employment impact is a better candidate in areas with established efficiency infrastructure and experience and larger budgets. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. A commercial food service program, because it is primarily based on the purchase of energy-efficient equipment instead of standard efficiency equipment upon the failure of a unit, does not create as many jobs as other rapid deployment programs that require contractors to inspect homes or businesses and install retrofit equipment. Direct employment occurs with the program administrators and implementation contractors. Indirect and induced benefits occur at the participant level, as their energy bills are reduced giving them more operating capital to sustain and grow their business, and for manufacturers and distributors who can make higher profits off of more expensive energy-efficient equipment. 2. Collaboration and Leverage of Funds. Commercial food service provides an excellent opportunity to leverage EPA/DOE resources for ENERGY STAR rated products rebated through the program, and to collaborate with utility companies, state and local agencies, and local trade allies and their associations, both local and national. ENERGY STAR provides marketing materials, case studies, a restaurant guidebook, product calculators, and a quarterly newsletter to support program administrators and share best practices. National associations, including NAFEM (the National Association of Food Equipment Manufacturers) and SEFA (Supply & Equipment Foodservice Alliance) host annual conferences that are well-attended by energy efficiency program administrators. 3. Significance of Program Savings. On a per dollar and per equipment basis, commercial food service provides a lesser impact on energy savings than other programs. However, typical participants such as restaurants, hospitals, and hotels/motels can achieve significant and long-lasting savings for equipment purchases. If funding allows for an aggressive program to be implemented, many participants can achieve significant energy savings by getting incentives on multiple pieces of equipment that they otherwise could not afford. 4. Cost of Savings. Commercial food service is moderately cost-effective compared with other rapid deployment options. Compared with similar programs offering simple cash-back rebates on new equipment, such as a Commercial and Industrial Sector Standard Offer Program this program is a less cost-effective avenue to energy savings. Increased cost-effectiveness comes through reducing overhead while paying incentives for a larger volume of projects. Participation is relatively simple due to the straightforward rebate. Despite being comparatively expensive, experience with this program shows it does exceed the FOA's guidance for 10 MBtu per $1,000. 5. Sustainability and Market Transformation. Commercial food service is an excellent program for sustainable energy savings and market transformation. Initial rebates that encourage participants to purchase more efficient equipment opens the door to understanding the long-term energy savings available to them. The long life of food service equipment ensures that reduced energy costs will persist. Over time, as the food service program grows, a participant could obtain huge energy savings by adopting multiple pieces or complete kitchens full of more efficient equipment. Sustained programs could also persuade restaurant chains to specify energy efficient products in their franchise agreements resulting in more widespread market transformation.

PROGRAM	C&I Custom
Program Summary	A C&I Custom Program supports C&I customers in identifying and implementing site-specific and unique cost-effective energy efficiency opportunities, which often require engineering calculations to determine energy savings. A typical project may involve industrial process efficiency, chillers/boilers, data center efficiency, or electric motor retrofits, or projects that otherwise fall outside of the Prescriptive program. The strategy is to minimize market barriers to energy efficiency implementation for C&I customers, which include higher first costs, lack of customer understanding about measure payback, and lack of awareness of energy efficient technologies. The program provides energy audits, co-funding for feasibility studies, best practices training (sometimes in collaboration with DOE), and calculated (custom) incentives for energy efficiency projects. A feasibility study investigates a proposed energy efficiency project or process improvement. Custom programs co-fund studies up to a maximum percentage or funding cap. Incentive levels vary widely depending on the size and nature of local industries. The program should develop an estimated pre-and post-project Energy Performance Rating using ENERGY STAR's Portfolio Manager. Energy savings per project can be very large, on the order of 100,000 to 200,000 kWh. It is up to participating businesses to implement projects. In some regions, water pumping and water treatment represent a large portion of total energy end-use. Targeting these end-uses for custom projects could result in substantial savings. ENERGY STAR Portfolio Manager can also be used by both program sponsors and participants for tracking progress over time (monitoring energy efficiency improvements compared to baseline; tracking reductions in greenhouse gas emissions; and monitoring energy cost savings) and verifying and documenting results (to provide a level of transparency and accountability to help demonstrate strategic use of ARRA 2009 funding by generating a Statement of Energy Performance for each building, and summarizing important performance). Key elements of the program include technical support of customer facility owners and managers, comprehensive facility energy audits, and project QA/QC.
Target Market	Custom projects tend to be implemented by businesses with large industrial facilities, but the program should be available to all medium and large commercial, industrial, and institutional customers.
EM&V	Basic accounting for the impacts of the Custom program includes a unique participant ID, a business SIC and/or NAICS code, participant contact information, contractor name and contact information; and, for each project, a unique project ID, measures installed, the project incentive amount, anticipated project savings, pre- and post-project ENERGY STAR Energy Performance Rating, as well as project audit/verification status and date. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of facilities, the nature of the energy efficiency improvements installed usage characteristics of the facility, and whether or not the business owner would have undertaken the projects in the absence of the program. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.

PROGRAM	C&I Custom
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A standardized process for conducting facility audits • A standardized process fro calculating and reporting energy savings to the business owner and to the program • A standardized process for selecting feasibility studies for co-funding • A process for marketing the program to business owners • A process calculating and disbursing incentives • A process for inspecting projects • A process for ensuring that work performed and contractor business practices meet the quality standards of the program • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V • Customer support, including a call center and on the program website
Staffing Requirements & Job Creation	<u>Program Administration</u> Depending on the size of the program, a Custom Program requires 3-5 full-time employees. At a minimum, the program requires one manager, and two staff engineers for conducting facility audits, reviewing project documentation and inspecting projects. As the program grows over time the need for additional engineers will increase. <u>Participating Contractors</u> Although the program conducts audits, co-funds feasibility studies, reviews project documentation and inspects projects, it is up to the participant to implement projects. As such, the program does not directly recruit installation contractors. By the end of the second year, you can expect to have about 50 contractors implementing energy efficiency projects for Custom participants per million in program spending, although this is very sensitive to the scale of individual contracting organizations and the size of the market. <u>Job Creation</u> This program helps develop the market for industrial engineers, on-site energy managers and associated trade allies. Additional jobs will be created in related fields as a result of program spending. In total, expect from 15 to 18 jobs to result per million dollars spent on this program.
Implementation Timeline	Approximately four months is needed to design and introduce a Custom program, although this may be sensitive to the local infrastructure and training needs. An illustrative program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4
Project kick-off				
Develop program processes, policies and procedures				
Initiate marketing				
First facility audit				

PROGRAM	C&I Custom

Illustrative Program Performance

Energy Savings

Energy savings will vary considerably by state/industry. One Custom program in the Midwest verified energy savings of about 2,450 MBtu per participant.

Incentives for Custom projects are typically calculated on a per kWh and/or per kWh and/or per Therm basis. See below for examples of incentive calculations for projects carried out by two customers. Savings estimates for Custom projects are sometimes deemed (i.e. for lighting measures), but many are also based on engineering calculations (i.e. process steam, some HVAC measures, etc.).

A	B	C	D	E	F	G	H
Customer	**Project**	**Incentive**	**Unit**	**Savings (kW)**	**Savings (kWh)**	**Calculated Incentive (C*E)**	**Total Incentive**
1	Lighting upgrades	$ 480	per kW	3.5	15,300	$ 1,700	$ 1,810
	Refrigeration upgrades	$ 410	per kW	0.3	2,320	$ 110	
2	HVAC upgrades	$ 325	per kW	66.2	457,000	$ 21,500	$ 81,500
	Lighting upgrades	$ 480	per kW	125.0	937,000	$ 60,000	

Participation

An illustrative three year participation schedule for a C&I Custom Program run in a large Midwestern metropolitan area with a million electric customers is shown in the table below.

Budget

Implementation costs can vary widely by state/industry. Illustrative program implementation costs are shown below. A different Custom program in the Northeast spends about $750,000 per year, and acquires about 40 MBtu/$1000.

	Year			
	1	**2**	**3**	**Cumulative**
Population of Eligible C&I Customers	100,000	100,000	100,000	100,000
Participation rate	0.05%	0.11%	0.10%	0.3%
Participants	48	111	102	261
Average Cost per Participant	$20,000	$20,000	$20,000	$ 20,000
Program Cost	$ 960,000	$ 2,220,000	$ 2,040,000	$ 5,220,000
Jobs per $1M	18	15	15	16
Jobs Created	**17**	**33**	**31**	**81**
Per Unit Source MBtu Saved (elec)	1,500	1,500	1,500	1,500
Per Unit Source MBtu Saved (gas)	950	950	950	950
MBtu Saved	117,600	271,950	249,900	639,450
Source Mbtu saved per $1,000	**122.5**	**122.5**	**122.5**	**122.5**

Resources and Assistance

- DOE Industrial Technologies Program: http://www1.eere.energy.gov/industry/
- ENERGY STAR Portfolio Manager: www.energystar.gov/benchmark
- ENERGY STAR Guidelines for Energy Management: www.energystar.gov/guidelines
- ENERGY STAR Building Upgrade Manual: www.energystar.gov/bldgmanual
- EPA' ENERGY STAR Products page: www.energystar.gov/products
- Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits

PROGRAM	C&I Custom
Program Characteristics Summary	C&I Custom is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. A Custom program requires expertise in industrial and energy engineering, so while the actual number of jobs created may not be that large relative to some programs, the jobs do require a high skill level and higher pay (i.e. for conducting industrial energy audits). Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of industrial engineering and energy management. 2. Collaboration and Leverage of Funds. Custom provides an excellent opportunity to collaborate with utility companies, state and local agencies, local trade allies and their associations, as well as the industrial engineering and consulting communities. It also offers a great opportunity to collaborate with the US DOE on industrial best practice trainings, and the EPA through the use of ENERGY STAR Portfolio Manager. 3. Significance of Program Savings. Custom programs tend to yield very high energy savings per customer, which translates into real cost savings for participating businesses, making them more competitive on the global market. The Custom program helps businesses increase production, make higher quality products, and lower operational costs. 4. Cost of Savings. The lead time for Custom projects can be long, causing the program, especially in its first years, to expend considerable resources before realizing significant savings. But because of the scale of most projects, Custom programs also tend to be very cost-effective, reaching upwards of 100 MBtu per $1000. Industrial customers also tend to constitute a large share of system peak load; therefore the avoided capacity benefits of Custom programs are also large. 5. Sustainability and Market Transformation. Custom programs work with the largest energy users in the country to not only install projects that yield substantial energy savings, but fundamentally change the way these industry views energy by conducting energy audits, co-funding feasibility studies, and training businesses in best practices.

PROGRAM	ENERGY STAR Labeled Products
Program Summary	The objective of this program is to increase awareness and sales of efficient lighting and appliances to residential and small commercial customers. The program offers customers the opportunity to purchase, largely through retail locations, a variety of discounted products that are ENERGY STAR qualified or better. The most effective programs involve either retailer/supplier mark-downs, where an agreement is reached with retailers to stock reduced-priced products and rebates are paid after the product is purchased, and/or manufacturer buy-downs, where bulk product is purchased directly from manufacturers and delivered to retailers/suppliers at reduced prices. Financial incentives should be targeted to efficient products where there is a price premium over the standard efficiency counterpart, where incremental efficiency benefits can justify incentive payments, and where market saturation for the efficient product is low relative to the standard efficiency options. Lighting fixtures, water heaters, commercial solid state lighting, and commercial food service equipment are good candidates for incentives. In the near future, the ENERGY STAR specification for servers will go into effect offering another good target. Incentives for products such as refrigerators, clothes washers, and CFLs need to be evaluated carefully based on local market conditions and may require advanced targeting strategies. For example, the Energy Independence and Security Act of 2007 established minimum efficiency requirements for general service lamps effective in 2012, which will start to phase out standard incandescent lighting and therefore increase sales of CFLs. In addition, in some localities and customer segments market saturation may already be quite high, Strategies such as targeting certain market channels (e.g. grocery) and hard to reach sockets that require specialty CFLs, such as dimmable and three-way bulbs, should be considered. Leveraging national ENERGY STAR campaigns such as Change the World Start with ENERGY STAR promotion boosts program participation and cost-effectiveness. This program should also leverage the ENERGY STAR Appliance Rebate Program, the details of which will be made available at www.energy.gov/recovery.
Target Market	This program is targets all residential and commercial customers, though program sponsors may elect to target participants with certain demographic characteristics, or whose energy consumption exceeds established metrics.
EM&V Support	Basic accounting for the impacts of the program includes tracking of the number of products that receive incentives and anticipated savings. Tracking the products is completed through agreements reached with manufacturers and suppliers, and savings is often based on deemed savings values, as the savings impacts of products in this program are well-researched and are not weather sensitive. In some cases, additional measurement and verification may be required by the program sponsor or regulators, and typically focuses on establishing the kW, kWh, and Btu saved by the program through a more rigorous evaluation of the equipment purchased, its installation rate, actual usage characteristics, and whether or not the owner would have undertaken the work even in the absence of the program. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.

PROGRAM	ENERGY STAR Labeled Products
Infrastructure Requirements	The implementation of this program will require additional infrastructure including: • A process for recruiting retailers/suppliers and manufacturers • A process for allocating upstream rebates to retailers/suppliers and manufacturers • A customer rebate process for any consumer direct incentives • A system for tracking and accounting for the program, and for reporting to the program sponsor • Processes for marketing and education, including mass-market television, radio, and internet, point-of-purchase and in-store displays, bill inserts, an informational website, product demonstrations, and on-site events (e.g. bulb exchanges) among other activities • A process for conducting EM&V • A process for handling proper disposal of CFLs (to avoid mercury ending up in landfills) • Customer support including a call center and online help
Staffing Requirements & Job Creation	Program Administration ENERGY STAR Products programs are often a large part of a program sponsor's portfolio. Accordingly, they require a significant staff. At a minimum, one program manager is required, plus 4-5 FTEs to assist with retailer/supplier and manufacturer recruitment, training, and sales, customer support, program tracking, and other administrative tasks. Job Creation This program develops jobs in the manufacturing and retail/supplier sectors. Additional jobs will be created in related fields as a result of program spending through direct and indirect jobs as well economic effects resulting from homeowners' and businesses having additional money that would otherwise go toward utility bills. In total, expect from 5 to 11 jobs to result per million dollars spent on this program.
Implementation Timeline	This program can be ramped up quickly and scaled appropriately to available funding levels.

Task	Month 1	Month 2	Month 3	Month 4	Month 5
Program kick-off					
Develop program processes, policies, and procedures					
Recruit manufacturers and retailers					
Allocate CFLs to retailers					
Initiate marketing					
Discounted ENERGY STAR products on retailer floors					

PROGRAM	ENERGY STAR Labeled Products

Illustrative Program Performance

Energy Savings

All the lighting products and most of the appliances rebated through this program have negligible sensitivity to weather in terms of performance. However, saturation of ENERGY STAR products is highly variable across the country. Therefore, incremental savings will also be highly variable. In order to develop deemed savings values for ENERGY STAR products in your area, we recommend conducting a comprehensive market saturation and baseline use study. This need not delay program implementation, however. For planning purposes, the numbers in provided in this guide may be used as a starting place, or you can contact EPA/ENERGY STAR for assistance in determining appropriate planning values for incremental measure costs and savings.

Participation

Aggressive upstream CFL programs show that about 350,000 to 450,000 bulbs can be distributed per million dollars of program expenditure. The illustrative impacts below contains rebates for CFLs and lighting fixtures, the latter of which have a higher cost per unit. The program impacts below are drawn from recently developed quick-start programs n the east coast and Northeast. CFLs are typically purchased in multi-packs, so the number of individual CFL units sold exceeds the number of households (participants) in many cases.

Budget

Program budgets are very sensitive to market size and the types of products rebated, and the program delivery strategy (downstream/customer coupons, midstream/retailer, or upstream/manufacturer). Incentives vary considerably as well; CFL rebates are generally about $1-$2 CFL bulb (for a 60W equivalent), $20 per fixture, and between $30 and $100 per appliance. Budgets for an ENERGY STAR products program are easily scaled to meet demand. An illustrative program budget is shown below.

	Year			
	1	**2**	**3**	**Cumulative**
Lighting Products (CFLs, Fixtures)	1,000,000	1,000,000	1,000,000	1,000,000
Lighting Participation rate	3%	7%	14%	23.6%
New ES Appliances	10,000	20,000	30,000	60,000
New Appliance Participation Rate	7%	14%	20%	20.0%
Avg Cost per Lighting Participant	$13	$17	$16	$16
Avg Cost per Appliance Participant	$83	$67	$61	$67
Program Cost	$ 3,700,000	$ 10,800,000	$ 20,200,000	$34,700,000
Jobs per $1M	10	9	8	9
Jobs Created	**37**	**97**	**162**	**296**
Per Unit Source MBtu Saved	0.4	0.9	1.7	2.9
MBtu Saved	359,000	893,000	1,777,000	3,029,000
Source Mbtu saved per $1,000	**97**	**83**	**88**	**87**

(Note that the lighting products are primarily retrofit products, so the participation rate is cumulative; the appliance participation rate is based on the number of new appliances purchased each year, therefore is not cumulative.)

Resources and Assistance

- ENERGY STAR Lighting: http://www.energystar.gov/lighting
- CFLs and mercury: www.energystar.gov/index.cfm?c=cfls.pr_cfls_mercury
- ENERGY STAR Appliances: www.energystar.gov/products
- ACEEE's Compendium of Champions, Lighting and Appliances category. (Publication U081): http://aceee.org/pubs/u081/res-light-app.pdf

PROGRAM	ENERGY STAR Labeled Products
Program Characteristics Summary	ENERGY STAR Products is an extremely strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. An ENERGY STAR products program provides moderate employment benefits when weighed against other energy efficiency program options. It does not employ contractors to perform retrofit or installation work or entail significant training. Increased jobs come through direct employment of program administrators and implementation contractors, and the increased marketing, training, and sales activity that they generate. Indirect and induced benefits are seen at manufacturers and retailers, and through economic multipliers as individuals and businesses have reduced utility bills. 2. Collaboration and Leverage of Funds. An ENERGY STAR products program provides an excellent opportunity to leverage EPA/DOE resources for ENERGY STAR rated products rebated through the program, and to collaborate with utility companies, state and local agencies, retailers, manufacturers, and consulting communities. In almost every location in the country where energy efficiency programs exist, an ENERGY STAR products, or similar, program exists, and these programs should be leveraged for expansion and incorporation of additional funding. ENERGY STAR has developed significant resources to aid in program design, implementation, and marketing, has developed relationships with the major retailers and manufacturers that are leveraged by energy efficiency programs nationwide, convenes one major lighting conference and one major appliances conference each year, and the program significantly benefits from the strong recognition of the ENERGY STAR brand. 3. Significance of Program Savings. ENERGY STAR products programs yield significant savings over a relatively short timeframe. This program is very easy to ramp-up quickly to significant scale. For states that are newer to energy efficiency, this program is a must-do to achieve quick energy savings and stimulate the market for other energy efficiency offerings. 4. Cost of Savings. ENERGY STAR products programs are typically among the most cost-effective in an energy efficiency portfolio. The program requires low overhead while paying incentives for a large volume of projects. There are many examples of best practices and experienced implementation firms that have implemented large quick-start products programs in the past few years, and that competition has driven the implementation costs down. Participation is very simple for customers, and requires relatively little up-front cost on their behalf. 5. Sustainability and Market Transformation. Through broad marketing, outreach, and education components, the ENERGY STAR products program creates a more educated and aware public. The purchase of a relatively inexpensive product such as a CFL can open those participants to more opportunities through other programs. The manufacturers and retailers, who are participating in these programs where they are being offered, transform their purchasing and stocking patterns to benefit from the incentives that will drive customers to their stores. In areas with energy efficiency programs, experience shows that retailers will stock ENERGY STAR models for up to 50% of each rebated product (refrigerators, clothes washers, room air conditioners for example).

PROGRAM	Commercial Benchmarking and Performance
Program Summary	This program works with commercial facility operations staff and owners to benchmark and monitor building energy performance using tools such as ENERGY STAR Portfolio Manager and building sub-metering equipment, as well as to recommend energy efficiency upgrades based on analyses of building performance data. Commercial Benchmarking and Performance (CBP) involves eight program technical and educational services to achieve savings: 1. Collection of key facility and operational characteristics and contacts 2. Ongoing collection of interval energy consumption, sub-metering, data logging, and activity or output metrics as appropriate to the facility. The extent of metering equipment installed depends on the program's budget, however all CBP programs can use tools such as ENERGY STAR Portfolio Manager to identify under-performing buildings to target for energy efficiency improvements, and establish baselines to set goals and measure progress for energy efficiency improvement projects over time. 3. Development of building performance metrics 4. Ongoing calculation and updating of metrics 5. Communication of metrics to participants 6. Identification of building system drift (from optimal performance) and alerts (to participants) where appropriate 7. Analysis of facility performance and root cause assessment and communication 8. Recommendations for energy efficiency upgrades based on analysis and root cause assessment Tools such as ENERGY STAR Portfolio Manager can be used to provide a level of transparency and accountability to help demonstrate strategic use of ARRA 2009 funding by generating a Statement of Energy Performance (SEP) for each building, and summarizing important performance indicators, including energy use intensity and greenhouse gas emissions associated with building energy use. When the program pulls out, facility staff should be able to continue competently conducting building benchmarking, monitoring, analysis and performance upgrades on their own.
Target Market	This program is open to all commercial customers that meet certain criteria. Such criteria may include: 1. A size minimum (though priority should be given to businesses with facilities that have high energy use intensities). 2. The facility must be free of major problems requiring costly repairs or replacements and have no planned major system renovations or retrofits. 3. The facility must have accessible and up-to-date building documentation and records.

PROGRAM	Commercial Benchmarking and Performance
EM&V	Basic accounting for the impacts of the CBP program includes a unique participant ID, a business SIC and/or NAICS code, participant contact information; facility baseline energy consumption; ENERGY STAR Energy Performance Rating; for any projects completed, a unique project ID, contractor name and contact information, measures installed, the project incentive amount and anticipated project savings. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of commissioned facilities, the nature of the energy efficiency improvements installed usage characteristics of the facility, and whether or not the business owner would have undertaken the projects in the absence of the program. Evaluators can use the interval data and facility data collected by the program to estimate building baselines and energy savings. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A process for estimating facility baselines • A process for selecting and installing the appropriate metering equipment (if using) • A process for developing building performance benchmarks • A standardized process for alerting participants and program staff when a building system drifts (from optimal performance) • A standardized process for transmitting and tracking interval meter data (if available through submetering) • A standardized process for reporting building performance on a monthly, quarterly and annual basis to the program sponsor • A process for marketing the program to business owners and building managers • A process for calculating and disbursing incentives • A process for transitioning program services to participants • A process for conducting EM&V
Staffing Requirements	<u>Program Administration</u> Depending on the size of the program, CBP requires 2-4 full-time employees. At a minimum, the program requires one manager (an individual with significant building performance and/or building sub-metering experience), and a staff engineer. Building operator education is key to this program's success, so program staff will spend a significant amount of time with participants reviewing data, and recommending efficiency improvements based on data analysis. As the program grows over time the need for additional engineers for will increase. <u>Participating Contractors</u> If the CBP program sponsor opts to use building sub-metering equipment, the program will need to select at least one metering equipment provider/company to assist with meter installation, interval data storage, reporting and analysis. <u>Job Creation</u> This program helps develop the market for building performance specialists, metering equipment, building operators and managers, and installation contractors. Additional jobs will be created in related fields as a result of program spending. In total, expect from 5 to 15 jobs to result per million dollars spent on this program.

PROGRAM	Commercial Benchmarking and Performance

Implementation Timeline

Approximately five months are required to introduce a CBP program, though this may be sensitive to the availability of building metering/submetering providers (and to whether the program opts to use sub-meters). An illustrative CBP program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4	Month 5
Project kick-off					
Develop program processes, policies and procedures					
Recruit submetring provider (if using)					
Initiate marketing					
First CBP project					

Illustrative Program Performance

Savings

Energy savings of existing CBP programs vary widely (depending largely on facility type, size, and baseline efficiency, and whether or not gas savings are verified), but generally CBP savings tend to be in the range of 1,000-3,000 MBtu per participant.

Participation

A moderately aggressive CBP program could reach about 0.5% of eligible facilities after three years. An illustrative three year participation schedule is shown below. Under a non-aggressive scenario, participation after three years may be closer to 0.25%.

Budget

CBP program costs vary widely depending on whether the program sponsor has sufficient budget to sub-meter facilities, and the extent of sub-metering implemented. The illustrative CBP program implementation costs shown below contain the minimum per participant cost required if the program uses sub-metering equipment; more extensive sub-metering, along with associated analysis and support services from a sub-metering contractor, can cost upwards of $90,000-100,000 per participant. If the program opts to not use sub-metering equipment, per participant costs are closer to $20,000-25,000.

	Year			
	1	2	3	Cumulative
Population of Eligible C&I Customers	20,000	20,000	20,000	20,000
Participation rate	0.10%	0.15%	0.20%	0.5%
Participants	20	30	40	90
Average Cost per Participant	$40,000	$40,000	$40,000	$ 40,000
Program Cost	$ 800,000	$ 1,200,000	$ 1,600,000	$ 3,600,000
Jobs per $1M	15	11	11	12
Jobs Created	**12**	**13**	**18**	**43**
Per Unit Source MBtu Saved (elec)	2,000	2,500	2,750	2,475
Per Unit Source MBtu Saved (gas)	250	400	550	420
MBtu Saved	45,000	87,000	132,000	260,550
Source Mbtu saved per $1,000	**56**	**73**	**83**	**72**

PROGRAM	Commercial Benchmarking and Performance
Resources and Assistance	• ENERGY STAR Portfolio Manager: www.energystar.gov/benchmark • ENERGY STAR Guidelines for Energy Management: www.energystar.gov/guidelines • ENERGY STAR Building Upgrade Manual: www.energystar.gov/bldgmanual • Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits • Building Operator Certification: http://www.theboc.info • BOMA Building Energy Efficiency Program: www.BOMA.org/BEEP
Program Characteristics Summary	CBP is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. The CBP program requires expertise in building performance and building submetering--these jobs require a higher level of skill and pay than is required for some programs. Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of building science, facility management, building metering and energy efficiency. 2. Collaboration and Leverage of Funds. CBP is also an excellent opportunity to collaborate with the EPA/DOE through the use of its Building Portfolio Manager, and with utility companies, state and local agencies, and local commercial building contractors. 3. Significance of Program Savings. CBP programs tends to yield high energy savings per customer, which translates into real cost savings for participating businesses. Lowering operational costs increases profit; this can be reinvested in additional energy saving opportunities, including human resources. 4. Cost of Savings. CBP results in very cost effective savings, but may require significant upfront investment in both equipment and personnel required to carry-out building sub-metering, system benchmarking and facility owner and operator education. However, these expenses are also the key drivers of the program's strong performance relative to job creation, quality, and accountability. The program is very cost-effective because it takes a whole-facility approach to reducing energy use, and sustains savings by training building owners and operators to maintain optimal building performance after the program has pulled out. 5. Sustainability and Market Transformation. Commercial Benchmarking and Performance helps create sustained energy savings because it goes well beyond reducing prices on efficient equipment. The program works closely with building owners and operators to optimize building performance by teaching them how to analyze and respond to building energy performance data. Buildings that undergo the CBP process not only have efficient equipment, but efficient equipment that runs optimally over the long haul.

PROGRAM	Tier 1 Energy Audit and Easy Direct Install
Program Summary	Together, the Tier 1 Energy Audit and Direct Install and the Tier 2 Audit program (Home Performance with ENERGY STAR, or HPwES) comprise the Residential Retrofit initiative. These programs work with the same pool of contractors and population of homeowners. The primary differences between HPwES and Energy Audit and Direct Install are the level of the audit (the Tier 1 program offers a basic, visual home energy checkup whereas the HPwES audit is comprehensive and involves diagnostic tools) and the measures available for incentives (Tier 1 only offers inexpensive, direct install measures whereas HPwES offers a wide range of measures for all end-uses, and at many price points). One important goal for Tier 1 Energy Audit and Easy Direct Install is for participants to realize the benefits of energy efficiency at little to no cost to them, and consequently for them to participate in programs such as HPwES or Residential HVAC, and realize even greater levels of savings. This market-based program introduces homeowners to using a whole-house approach for reducing energy consumption and helps establish and train a network of skilled and credible home energy analysts and contractors. These contractors provide quick (visual) home energy checkups for qualified homeowners and directly install low-cost measures, such as CFLs, hot water heater wraps, pipe insulation, and low-flow showerheads. Some homeowners may follow-up with more comprehensive energy efficiency improvements, such as air and duct sealing or appliance retrofits, or request a more comprehensive energy audit; these customers should be referred to the HPwES program. The cost of completing a checkup, including the checkup delivery, measure cost and measure installation labor is $200-300. Checkups are offered to homeowners at a subsidized rate of $35-50, with the option that the fee will be waived if the direct install measures are accepted by the customer for installation. Programs typically pay contractors $100-150 per checkup. Key elements of the program include contractor recruitment, training, and independent verification of a sample of homes to verify quality of the work and data collected.
Target Market	This program typically targets homes 15 years or older – this constitutes approximately 80 percent of the housing stock, nationwide.[9] Program sponsors may elect to target participants with certain demographic or geographic characteristics, or whose energy consumption exceeds established metrics.
EM&V	Basic accounting for the impacts of the program includes tracking of the number of participants, the measures installed and their anticipated savings, the field measurements taken by contractors before and after the work, as well as the basic characteristics of the home where the work was performed. In some cases, additional measurement and verification may be required by the program sponsor or regulators, and typically focuses on establishing the kW, kWh, and Btu saved by the program typically consists of an evaluation of the existing baseline conditions of a sample of homes, the nature of the energy efficiency improvements installed, usage characteristics of the home, and whether or not the homeowner would have undertaken some of the efficient actions even in the absence of the program. Due to the well-researched assumptions surrounding the direct install measures, pre-calculated "deemed savings" values will be used. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.

[9] U.S. Census Bureau, "American Housing Survey: 2007," www.census.gov/hhes/www/housing/ahs/ahs07/tab1a-1.xls

PROGRAM	Tier 1 Energy Audit and Easy Direct Install
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A process for recruiting and screening qualified performance contractors to participate in the program • A process for training, certifying, and monitoring the performance of contractors • A standardized process for conducting the checkup and calculating and reporting energy savings to the homeowner and to the program • A process for marketing the program to homeowners • A process for disbursing incentives • A process for ensuring that work performed and contractor business practices meet the quality standards of the program • A system for tracking and accounting for the program, and for reporting to the program sponsor • A process for conducting EM&V • Customer support, including a call center and on the program website
Staffing Requirements & Job Creation	Program Administration Depending on the size of the program, a Tier 1 Audit program requires 2-4 full-time employees. At a minimum, the program requires one manager, and one field staff technician for conducting contractor trainings, providing contractor mentoring and verifying projects. Initial phases of the program may require an additional 2-3 staff for a period of 6 months to perform start-up activities. As the program grows over time the need for additional technical staff for quality assurance purposes and administrative staff for processing jobs and incentives will increase. Participating Contractors Initial roll-out of the program (0-6 months) typically involves recruiting 3-5 contractors, ideally who have or can quickly attain the appropriate certifications from the program (unlike the HPwES program, a certified individual does not need to perform the quick energy audits – but the contractor does need to have at least one certified individual on staff). While implementation models vary, it might be expected that by the end of the first program year, approximately 15 certified contractors will be needed (about a third of contractors will be very active, a third moderately active, and a third relatively inactive) for each million dollars of program budget, although this is very sensitive to the scale of individual contracting organizations and the size of the market. Job Creation This program helps develop the market for performance contractors and associated trade allies. Additional jobs will be created in related fields as a result of program spending. In total, expect from 18 to 25 jobs to result per million dollars spent on this program.
Implementation Timeline	Approximately four months is needed to design and introduce a Tier 1 Audit program, although this may be sensitive to the local infrastructure, training needs, and the time of year. Spring and fall are typically attractive times to secure contractors and provide training. An illustrative program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4
Project kick-off				
Develop program processes, policies and procedures				
Recruit home performance contractors/trade allies				
Contractor/trade ally training				
Initiate marketing				
First Energy Checkup				

PROGRAM	Tier 1 Energy Audit and Easy Direct Install

Illustrative Program Performance

Energy Savings

Energy savings per home varies widely by climate zone, measures installed, and incentive levels. Annual source energy savings reported by program sponsors are in the range of 4 MBtu to 8 MBtu per average home[10], as illustrated in the table below.

Weather Zone	Warm Climates			Cool Climates		
	Electricity kWh	Gas Therms	Source MBtu	Electricity kWh	Gas Therms	Source MBtu
Gas Heated Home	260	30	5.6	260	20	4.6
Electrically Heated Home	9,000,000	0	8.0	6,300,000	0	6.3

Participation

An aggressive program could reach about 3.5% of eligible homes after three years. An illustrative three year participation schedule for a Tier 1 Audit program run in a metro area on the East Coast with about 250,000 eligible homes is shown below. Under a non-aggressive scenario, participation after three years may be closer to 1-1.5%.

Budget

Illustrative program implementation costs are expected to decline from approximately $1200 per completed home in the initial year to $880 per completed home after three years. Costs are dependent on a variety of factors, including the fraction of participants that elect to install the direct install measures and contractor costs for performing checkups. An illustrative participation schedule and budget are shown in the table below.

	Year			
	1	2	3	Cumulative
Population of Eligible Homes	250,000	250,000	250,000	250,000
Participation rate	0.7%	1.2%	1.5%	3.5%
Participants	1,900	3,100	3,700	8,700
Average Cost per Participant	$1,200	$1,000	$880	$ 990
Program Cost	$ 2,280,000	$ 3,100,000	$ 3,256,000	$ 8,636,000
Jobs per $1M	25	22	18	21
Jobs Created	**57**	**68**	**59**	**184**
Per Unit Source MBtu Saved	5	5	5	5
MBtu Saved	9,500	15,500	18,500	43,500
Source Mbtu saved per $1,000	**4.2**	**5.0**	**5.7**	**5.0**

Resources and Assistance

- EPA ENERGY STAR Resources for Contractors page: www.energystar.gov/index.cfm?c=home_contractors.hm_improvement_contractors_resources
- Building Performance Institute: www.bpi.org
- Residential Energy Services Network: www.natresnet.org

[10] Source Btus assuming an average electric generation heat rate of 10,000 Btu/kWh.

PROGRAM	Tier 1 Energy Audit and Easy Direct Install
Program Characteristics Summary	Tier 1 Audit is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. Given the relative fragmentation of the home contracting industry and the comparatively small size of each job, Tier 1 Audit is a training and labor intensive program. It therefore results in a comparatively large number of jobs created. Per dollar spent the Residential Retrofit initiative (Tier 1 Audit and HPwES, combined) results in more new job opportunities than any other program. The level of skill required to perform a home checkup is less than that required to perform a comprehensive home audit for HPwES. However, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of home services and energy efficiency. In addition, bill savings by residences tend to recirculate in the economy to a greater degree than do savings by commercial or industrial customers, and therefore have a greater multiplier effect on jobs and economic activity. 2. Collaboration and Leverage of Funds. Tier 1 Audit provides an excellent opportunity to collaborate with EPA/DOE, utility companies, state and local agencies, local trade allies and their associations, as well as the building science and consulting communities. With increasing regional energy efficiency goals in many portions of the country, utilities may provide an excellent opportunity for collaboration, funding, and/or direct implementation of Tier 1 Audit programs. 3. Significance of Program Savings. Savings from Tier 1 Audit is not as significant as other Residential initiatives, however, the potential participant base is very large, consisting of all owner-occupied dwellings older than just a few years, and the home energy checkup spurs homeowner interest in larger energy efficiency investments. Further, the program also provides an equitable and highly visible opportunity for the largest single group of tax-payers to participate in a program and benefit from ARRA stimulus dollars. The program can also accommodate the needs of low-income individuals with increased incentive levels and other support functions. Further, the potential impact of the program is (after the initial introduction) largely scalable and a function of the budget dedicated to the program. 4. Cost of Savings. Tier 1 Audit is a relatively expensive program due to its requirements for training and verification of the work, as well as the need for public education. However, these expenses are also the key drivers of the program's strong performance relative to job creation, quality, and accountability. 5. Sustainability and Market Transformation. Through its broad outreach and education components, Tier 1 Audit creates a more educated and aware public. The need to be sensitive to energy issues and the basic understanding of energy systems and financial payback principles will be retained by participants long after their initial contact with the program. This will result in spillover benefits to other energy investments or behavioral changes they may consider in the future, even if they are not elements of the Tier 1 Audit program. Similarly, a Tier 1 Audit program seeds a competitive market of contractors who develop a variety of business models and approaches. Through competitive innovation, these contractors often integrate the Tier 1 Audit services with other services such as HVAC service and repair, insulation, and window replacement.

PROGRAM	On-Site Energy Manager
Program Summary	This program assists businesses by hiring and training an On-Site Energy Manager (OEM) to work with them for a six-month period. During their tenure with a business, the OEM will evaluate facilities' energy use and work with maintenance staff to reduce energy usage and costs. Long-term energy and cost savings of 10 to 15 percent are achievable, largely through behavioral changes. ENERGY STAR recommends a seven step process for instituting efficient energy management: • STEP 1: Make Commitment • STEP 2: Assess Performance • STEP 3: Set Goals • STEP 4: Create Action Plan • STEP 5: Implement Action Plan • STEP 6: Evaluate Progress • STEP 7: Recognize Achievements Incentives for businesses include a sign-up bonus grant (a % of the OEM's salary), performance based incentives (for achieving savings targets), free energy resource accounting software, and ongoing OEM training and technical support.
Target Market	A typical participant is a business with a large facility portfolio (1+ million square feet of conditioned space), through priority should be granted to businesses with facilities that have high energy use intensities.
EM&V	Basic accounting for the impacts of the program includes a unique participant ID, a business SIC and/or NAICS code, participant contact information, the On-Site Energy Manager name; facility baseline energy consumption; for any projects completed, a unique project ID, contractor name and contact information, measures installed, the project incentive amount and anticipated project savings. In some cases, additional measurement and verification may be required by the program sponsor or regulators and typically focuses on establishing on establishing the kW, kWh, and Btu saved by the program through an evaluation of the existing baseline conditions of a sample of participant facilities, the nature of the energy efficiency improvements installed usage characteristics of the facility, and whether or not the business owner would have undertaken behavioral changes in the absence of the program. Evaluators can use the interval data and facility data collected by the program to estimate building baselines and energy savings. Methods used vary widely based upon the need for precision in the estimates and the perspective of the program sponsor or regulators. In general, EM&V costs range between 1% and 8% of the overall program budget, and are most typically around 3-4%.
Infrastructure Requirements	The primary infrastructure required to deliver this program includes: • A process for screening applicants • A process for hiring and training OEMs • A standardized energy management process or manual for OEMs to implement • A standardized process for reporting building performance • A process for marketing the program to business owners and building managers • A process for calculating and disbursing incentives • A process for conducting EM&V

PROGRAM	On-Site Energy Manager
Staffing Requirements	Program Administration This program requires, at a minimum, one manager and a staff building energy engineer. As the program grows over time the need for additional engineers will increase. Participating Contractors This program requires one full time OEM per participant for a 6 month interval. If you have 40 participants in your first program year, for example, you will need at least 20 OEMS (assuming the OEM will work with 2 participants per year). Job Creation This program helps build the market for energy managers, building operators and managers, and installation contractors. Additional jobs will be created in related fields as a result of program spending. In total, expect from 5 to 11 jobs to result per million dollars spent on this program.
Implementation Timeline	Approximately six months are required to introduce and OEM program, although this may be sensitive to the local infrastructure and training needs. An illustrative OEM program ramp-up schedule is shown below.

Task	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Project kick-off						
Develop program processes, policies and procedures						
Recruit OEMs						
Start OEM training						
Initiate marketing						
First OEM placement						

PROGRAM	On-Site Energy Manager

Illustrative Program Performance

Savings

Energy savings of existing OEM programs vary widely depending largely on facility type, size, and baseline efficiency, and other factors, but are generally in the range of 10-15% (of annual energy).

Participation

An aggressive OEM program could reach about 0.5% of eligible facilities after three years. An illustrative three year participation schedule is shown below. Under a non-aggressive scenario, participation after three years may be closer to 0.1%.

Budget

Illustrative OEM program implementation costs are shown below. Per participant costs are high because of the OEM income assistance provided by the program.

	Year			
	1	2	3	Cumulative
Population of Eligible C&I Customers	20,000	20,000	20,000	20,000
Participation rate	0.10%	0.20%	0.23%	0.5%
Participants	20	40	45	105
Average Cost per Participant	$50,000	$48,000	$46,250	$ 47,600
Program Cost	$ 1,000,000	$ 1,920,000	$ 2,081,250	$ 5,001,250
Jobs per $1M	11	9	5	8
Jobs Created	**11**	**17**	**10**	**39**
Per Unit Source MBtu Saved	4,500	4,500	4,500	4,500
MBtu Saved	90,000	180,000	202,500	472,500
Source Mbtu saved per $1,000	**90**	**94**	**97**	**94.5**

Resources and Assistance

- ENERGY STAR Guidelines for Energy Management: www.energystar.gov/guidelines
- Federal Tax Credits for Energy Efficiency: www.energystar.gov/taxcredits

PROGRAM	On-Site Energy Manager
Program Characteristics Summary	OEM is a strong candidate for stimulus funding. Its characteristics relative to the key criteria identified previously include: 1. Impact on Jobs. The OEM program requires expertise in building energy management; these jobs require a higher level of skill and pay than is required for some programs. Further, these jobs often entail skills that prepare the employee for a broad range of potential future opportunities in the fields of building science, facility management, and energy efficiency. 2. Collaboration and Leverage of Funds. OEM provides an excellent opportunity to collaborate with utility companies, state and local agencies, and local commercial energy managers. OEM is also a strong opportunity to EPA's expert resources in energy management. 3. Significance of Program Savings. OEM programs tends to yield very high energy savings per customer, which translates into real cost savings for participating businesses. Lowering operational costs increases profit; this can be reinvested in additional energy saving opportunities, including human resources. 4. Cost of Savings. OEM is an expensive program because it places a full time employee on each job site. However, this expense is the key drivers of the program's strong performance relative to job creation, quality, and accountability. The program is very cost-effective because it takes a whole-facility approach to reducing energy use, and sustains savings by training building owners and operators to maintain optimal building performance after the program has pulled out. 5. Sustainability and Market Transformation. OEM helps create sustained energy savings because it goes well beyond reducing prices on efficient equipment. The program works closely with building owners and operators to optimize building performance, creating lasting savings and transforming the market from the inside-out.

Appendix A. Estimating the Employment Effects of Energy Efficiency Programs

Methodology

Investment in energy efficiency programs results in direct, indirect and induced employment increases in energy efficiency and related fields during the program life and thereafter. Examples of direct jobs include program staff and contractors required for measure installation. Indirect jobs include manufacturing and service positions that supply technologies rebated and installed by programs, and induced jobs result when the utility bill savings that accrue to participants are either saved or spent.

Forecasts of employment effects vary widely based on program designs and employment model framework and input assumptions. As a result, it is prudent to consider a range of potential job impacts for planning purposes. The methodology used herein centers on four studies. The first study developed comparatively conservative estimates for total (direct, plus indirect and induced) job impacts (ACEEE, 2008)[11] ~ around 5 jobs per million dollars in energy efficiency spending. The second study developed moderate estimates for direct and indirect job impacts (Bezdek, 2007)[12] ~ 8 jobs per million. A third study developed larger impacts ~ around 20 jobs per million, which includes induced job effects in addition to direct and indirect effects (PERI, 2008)[13]. A fourth study, published by the International Monetary Fund (IMF) in 2002[14], is a meta-study of 16 empirical macroeconomic models that each estimated induced economic effects of various Federal monetary policies. The output of these types of models are economic multipliers, i.e. for every dollar of Federal expenditure, how many induced dollars are "created" in the economy? These multipliers were used to calculate a range of induced job estimates resulting from energy efficiency funding, based on the direct and indirect job estimates published by Bezdek and PERI.[15]

Using this methodology, the range of job creation estimates shown in Column G below was developed. The actual, published ACEEE, Bezdek and PERI estimates are on rows 1, 2 and 5, respectively. The remaining estimates use the non-induced Bezdek and PERI job numbers (Column D), times a multiplier (Column E) to estimate induced jobs (Column F); the total jobs estimate is then the sum of Column D and Column F.

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[11] Ehrhardt-Martinez, Karen, and Laitner, John A., "The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture," American Council for an Energy-Efficiency Economy, Report #E083, May 2008.

[12] Bezdek, Roger, "Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century," Management Information Services, Inc., for American Solar Energy Society, 2007.

[13] Pollin, Robert et al., "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy," Department of Economic and Political Economy Research Institute, University of Massachusetts-Amherst (Prepared under commission with the Center for American Progress), September 2008.

[14] Hemming, Richard et al., "The Effectiveness of Fiscal Policy in Stimulating Economic Activity-A Review of the Literature," International Monetary Fund, WP/02/08, December 2002.

[15] The authors of the PERI report consulted the IMF meta-study and opted to use a multiplier of 0.3, which they considered relatively conservative.

Table 1: Employment effect estimates

	A	B	C	D	E	F	G
	Estimate	**Direct Jobs/$M**	**Indirect + Induced Jobs/$M**	**B + C**	**IMF Induced Effects Multipler**	**Induced Jobs/$M**	**Total Jobs/$M**
1	ACEEE	3.8	1.6	5.4	NA	NA	5.4
			Indirect Jobs/$M				
2	Bezdak (published)	3.8	4.9	8.6	NA	NA	8.6
3	Bezdak + Induced	3.8	4.9	8.6	0.3	2.6	11.2
4	PERI, low	9.4	5.9	15.2	0.1	1.5	16.7
5	PERI, mid (published)	9.4	5.9	15.2	0.3	5.0	20.2
6	PERI, high	9.4	5.9	15.2	0.6	9.1	24.3

A value of 0.1 was used as the "low" multiplier because this was the lowest published value in the IMF meta-study. A value of 0.6 was used as the "high" multiplier (the 25th percentile amongst all the values published in the meta-study; that is, 75% of the multiplier estimates were higher than 0.6) to be conservative and not overestimate the employment effects of SEP dollars. By way of reference, the median and average multiplier values were both 0.9 and the highest value was 2.0.

Application to Programs

The programs in this guide vary considerably in size (budget), scalability, target market and delivery mechanism. As a result, the number of jobs created by each program will also vary considerably. Some programs require people with advanced engineering or building science backgrounds (Custom, Persistence Commissioning), while others require people with trade skills to whom the program will provide additional training (HPwES). Below, we illustrate how different job estimates were developed for two programs in the portfolio.

- **HPwES**. Given the relative fragmentation of the home contracting industry and the comparatively small size of each job, Home Performance with ENERGY STAR is a training and labor intensive program. It therefore results in a comparatively large number of jobs created, on average between the "PERI, low" and "PERI, high," we estimate approximately 25 jobs/$M in the first year, trailing to 18 jobs/$M by the end of the third year.
- **Retrocommissioning.** An RCx program requires expertise in building commissioning; these jobs require a higher skill level and pay than is required for some programs. They therefore result in a comparatively low number of jobs created; on average between "ACEEE" and the "PERI, low" estimate, or about 15 jobs/$M in the first year, trailing to about 5 jobs/$M by the end of third year.

Because of the considerable uncertainty around any job creation estimate, we used the values in the table above as guideposts, not rules, for estimating the employment effects of each program as illustrated in the table below.

Table 2: Recommend ranges of employment effects

		Jobs/$M Estimate	
Average job type required by program	**Example**	**Low**	**High**
Skilled trade	HVAC contractor or Home Performance contractor	8.6	24.3
Advanced technical or managerial	Commissioning provider or On-site Energy Manager	5.4	16.7

Finally, the table below shows the range of job impacts developed for each program in the program snapshots.

Table 3: Employment effect assumptions, RDEE Program Snapshots

Program	Approx Mbtu per $1000	Approx Jobs per $M	Applica-bility	Simplicity & Lack of Risk	Sustain-ability	Leverage
RESIDENTIAL						
ENERGY STAR Products	3	9	High	High	Moderate	High
Easy Audit and Direct Install	5	21	High	Moderate	High	Moderate
Home Performance with ENERGY STAR	60	20	High	Moderate	High	Moderate
Efficient Heating and Cooling	25	14	High	High	Moderate	High
NON-RESIDENTIAL						
C&I Prescriptive	400	9	Moderate	High	Moderate	High
C&I Custom	1,500	16	Moderate	Moderate	Moderate	Moderate
Retrocommissioning	5,800	12	Moderate	Moderate	Moderate	Moderate
Commercial Benchmarking and Performance	2,900	12	Moderate	Moderate	High	Moderate
On-Site Energy Manager	4,500	8	Low	Moderate	High	Moderate
Commercial Food Service	60	7	Moderate	Moderate	Moderate	Moderate