



Rebuilding America

Background Note on Building STAR: Job Creation through Retrofits of Commercial, Institutional and Multi-Family Buildings

Rebuilding America urges Congress to establish Building STAR, a fast-acting, short-term program of incentives to create hundreds of thousands of jobs retrofitting commercial and multi-family buildings in 2010 and 2011 as a core component of pending jobs legislation.

Building STAR is the product of a wide consultation among members of *Rebuilding America*, a coalition of more than 60 business, real estate, financial, labor, consumer, and advocacy organizations, and a broad range of outside technical experts and other groups and entities. We have designed Building STAR as the commercial and multi-family¹ counterpart to HOME STAR, which will serve the single-family market. Building STAR consists of a two-pronged, voluntary approach:

1. A simple and straightforward prescriptive rebate plan (described in detail below as introduced in the Senate as S. 3079); and,
2. A package of improvements to existing, and in some cases proposed, tax incentives and codes (outlined in Appendix C).

The Building STAR program belongs in a “jobs bill” because it would help create at least 150,000 high-quality jobs during 2010 and 2011 in every part of the country, while helping to drive new investments into the commercial and multi-family real estate sectors.²

Today, 1 in 5 construction workers – over 1.7 million people – are out of work. Many of them are skilled tradesmen who used to work on commercial, institutional, and large residential buildings. In addition to a large pool of available and qualified workers, construction firms and energy service companies capable of performing large-building retrofits have significant amounts of idle equipment, materials, and design capacity that could be quickly deployed to meet the short-term demand that would be generated by Building STAR. A vast majority – 91% -- of these companies have fewer than 20 employees each, meaning that Building STAR would be a potent stimulus for small business.

¹ Multi-family is a residential building of 5 dwelling units or more.

² Based on a public investment of \$6 billion and an assumption of 12.5 direct and indirect jobs created per \$1 million invested. This figure was used in the *Rebuilding America* white paper by the Energy Future Coalition and Center for American Progress and is based on a conservative estimate of job creation from studies of the overall efficiency market by the Political Economy Research Institute, the National Association of Home Builders, the Center on Wisconsin Strategy, and others.



Building STAR Rebate Program³

Building STAR would authorize a rebate program for building owners who install or implement energy-efficient building equipment, materials, products and services during 2010 and 2011.

The Building STAR rebate program would cover the following products and services (see *Appendix A* for further detail):

- Building envelope insulation
- Mechanical insulation
- Windows, window films and doors
- Low-slope roofing
- HVAC equipment, chillers, water heaters, and boilers
- Duct testing and sealing
- Variable speed drives for motors
- Interior and exterior lighting
- Building energy audits, commissioning, tune-ups, and training
- Energy management and monitoring systems

Once enacted into law, this program could be up and running within 30 to 60 days, using public funding to leverage two to three times as much private investment. The service providers (e.g., contractors or energy service companies) will be the primary marketers of the rebate program.

Building STAR rebates will help drive demand for commercial building efficiency upgrades because they are based on, and can be claimed in addition to, successful incentive programs currently operated by states and utilities.

Rebate Process

Participating in the Building STAR rebate program will be a simple and straightforward process for building owners:

1. A building owner, or designee, proposes energy-efficient upgrades using the pre-approved list of products and services and rebate levels set forth in *Appendix A* of this document. Alternatively, the building owner, or designee, could find a licensed contractor, ESCO, or other provider to propose performance improvement measures, using the same pre-approved list in *Appendix A*.
2. The building owner, or designee, electronically submits the application (as described in *Appendix B*) to the U.S. Department of Treasury or the Department of Energy (DOE) to be placed in the "pipeline" for this rebate. Applications in the pipeline are prioritized on a first-come, first-serve basis and allow the Treasury Department or DOE to gauge the

³ The Building STAR rebate program was introduced as a stand-alone bill (S. 3079) on March 4, 2010.



number of applicants and the funds available for this rebate program.

3. The Treasury Department or DOE will then send a confirmation electronically to a building owner, or designee, verifying that the rebate money is, in fact, available for the intended project.
4. A building owner, or designee, installs the equipment or undertakes the services called for as part of the rebate application, and pays for the work, except for the portion to be covered by the rebate.
5. The building owner, or designee, signs a confirmation certifying that the work specified in the application has been completed according to the requirements outlined in *Appendices A and B* of this document. Alternatively, the building owner, or designee, has the option to have a third-party verifier confirm that the work has been done in accordance with the application. Either way, the confirmation is then sent electronically to the Treasury Department or DOE.
6. An independent third-party verifier contracted by the Treasury Department or DOE reviews the application to ensure calculations are correct. If the application is accurate, the rebate money is disbursed to building owner, or designee, by the Treasury Department or DOE within 30 days of receipt of confirmation.
7. Following the completion of the retrofit, 10% of the projects participating in the program will undergo an on-site evaluation by a certified independent entity to verify that the project complied with the scope of work submitted to the Treasury Department or DOE (as described in *Appendix B*). If the verification process finds evidence of fraud, building owners are subject to an IRS audit and/or other penalty under law.

Building STAR Energy Efficiency Financing Program

S. 3079 also includes a financing program to help building owners pay for the portion of the retrofits not covered by rebates.



Appendix A

Proposed Eligibility and Incentive Structures for Building STAR Prescriptive Rebate Program

Building STAR would provide up-front rebates directly to commercial, institutional and multi-family building owners who install qualified energy efficiency equipment and materials in existing buildings. *Rebuilding America* drew from existing state and utility incentive programs and worked closely with leading technical and efficiency experts to develop the following eligibility and incentive structures:

INSULATION, DOORS, AND WINDOWS

Building Envelope Insulation

This incentive would be available where building envelope insulation is installed to meet or exceed ASHRAE Standard 90.1-2007, or 2009 IECC in the case of multi-family residential buildings of three stories or less but with more than 5 dwelling units, including bringing existing insulation systems up to that minimum level and repairing existing insulation that meets those minimum levels but has been damaged, thus not providing expected performance. Building envelope insulation is defined to encompass all thermal requirements for the building envelope, including roofs (but excluding low slope roofs), walls (above and below grade), floors, and slab-on-grade floors as defined in ASHRAE 90.1-2007 or 2009 IECC as appropriate.

Incentive: \$0.60 per square foot of insulated area.

Mechanical Insulation

This incentive would be available where mechanical insulation is installed to meet or exceed ASHRAE Standard 90.1 2007 (or 2009 IECC as appropriate) including for bringing existing insulation systems up to that minimum level, and for repairing existing insulation that meets those minimum levels, but has been damaged and is therefore not providing expected performance. To be eligible for the rebate for HVAC Duct Applications, ducts must be pressure-tested and, if necessary, remediated to the appropriate leakage class as defined by Sheet Metal and Air Conditioning National Association standards (as defined in sections 503.2.7.1.2 and 503.2.7.1.3 of the 2009 IECC) prior to insulating. Installed insulation must meet or exceed ASHRAE 90.1 2007 (or 2009 IECC as appropriate). Mechanical insulation is defined to encompass all thermal requirements for mechanical piping and equipment and Heating, Ventilating & Air Conditioning (HVAC) applications.



Piping and Equipment Applications	Incentive
2" IPS and below	\$2.50 per equivalent lineal foot
Above 2" IPS – 12" IPS	\$5.00 per equivalent lineal foot
Above 12" IPS and equipment	\$5.00 per equivalent square foot
HVAC Duct Applications	\$1.00 per square foot

High-Efficiency Window Films and Screens

Window films or screens that result in a solar heat gain coefficient (SHGC) equal to or below the values indicated in the table for Tier 1 windows (as certified to National Fenestration Rating Council standards) and a Luminous Efficacy (defined as Visible Light Transmission divided by SHGC) equal to or greater than 1.1. The treatment must be permanently affixed to the glass (film) or window frame (screen).

Incentive: \$1 per square foot of glass enclosing a mechanically conditioned space.

Windows

Windows must have a U-factor and SHGC (as certified to National Fenestration Rating Council standards) as indicated in the following table or better (i.e., lower) to qualify. Curtain wall and storefront windows are not eligible for the rebate. The table reflects climate zones and values required in proposed New Building Institute guidelines.

Tier 1

Climate Zones	1	2	3	4	5	6	7	8
U-Factor	1.20/.57 ⁴	.57	.40	.35	.35	.35	.35	.35
SHGC	.25	.25	.25	.40	.40	.40	.45	.45

Incentive: \$150 per window.

⁴ The first U-factor applies when impact rated glazing is installed.



Tier 2

Climate Zones	1	2	3	4	5	6	7	8
U-Factor	.32	.32	.30	.30	.30	.30	.30	.30
SHGC	.25	.25	.25	.26	.26	.35	.45	.45

Incentive: \$300 per window

Low-Slope Roofing

Installation of insulation into low-slope roofs entirely above deck (as defined by ASHRAE 90.1 2007 or 2009 IECC). The insulation levels after the retrofit would have to meet or exceed the R-values listed in the table below.

Climate Zones	1	2	3	4	5	6	7	8
R-Value for Buildings, Except Semi-Heated Spaces	20	25	25	25	25	30	35	35

Incentive: \$0.80 per square foot of the affected roof area.

HEATING, COOLING, VENTILATION

HVAC Testing, Balancing, and Duct Sealing

A rebate for proper HVAC testing, balancing and duct sealing. Ducts must be pressure-tested and, if necessary, remediated to the appropriate leakage class as defined by Sheet Metal and Air Conditioning National Association standards (as defined in sections 503.2.7.1.2 and 503.2.7.1.3 of 2009 IECC). To qualify, all work must be done by an individual whose certification is ANSI-accredited in HVAC Testing Adjusting and Balancing.

Incentive: \$0.75 per square foot of duct surface area for testing, and remediating to appropriate leakage class.

Commercial Boilers/Water Heaters

A rebate for the replacement of operational commercial boilers with new, efficient boilers.



Equipment Type	Qualification Level	Incentive
Boilers, 300,000-5 million Btuh		
Gas	90% TE	\$10/kBtuh
Oil	85% TE	\$3/kBtuh
Wood/Wood Pellet	75% TE	\$X/kBtuh
Furnaces		
Gas	90% TE	\$5/kBtuh
Wood/Wood Pellet	75% TE	\$5/kBtuh
Water heaters , Storage, 75,000 Btuh and above Tankless 200,000 Btuh and above		
Gas	90% TE	\$8/kBtuh
Electric	2.5 COP or EF 2.0	\$20/kBtuh
Wood/Wood Pellet	75% TE	\$X/kBtuh

High-Performance HVAC Equipment (Rooftop Units/Heat Pumps)⁵

Rebates for high-performance HVAC equipment as follows:

Equipment Type	Qualification Level	Incentive
Unitary AC and heat pumps, 3 phase	CEE tier 1	\$100/ton
	CEE tier 2	\$200/ton

Chillers

A rebate for the replacement of operational chillers used to cool commercial buildings with new, efficient water-cooled chillers. New chillers eligible for rebate must meet the efficiency levels set by Addendum M of ASHRAE standard 90.1-2007 as of January 1, 2010.

Eligible “trade in” chiller to be replaced must be manufactured prior to 1993 and still be operational at the time of the replacement. The system buyer must perform an audit (the requirements of which will be determined by DOE) by a registered professional engineer or qualified auditor, of the building loads and opportunities for additional cost-effective building energy savings.

This incentive shall be based on the nominal nameplate capacity of the chiller being replaced. Additional incentive will be added for owners who downsize their chiller during replacement.

Incentive level: \$150 per ton of refrigeration capacity in system replaced.⁶

⁵ Based on an inventory of 29 prescriptive rebate programs for RTUs offered today by utilities and states throughout North America providing rebates ranging from \$15 to \$125/ton of cooling capacity.



Additional incentive: \$100 for each ton downsized.

Variable Speed Drives (VSD) for Motors⁷

Motors must operate at least 2000 hours annually. The installation of a VSD must accompany the permanent removal or disabling of any throttling devices such as bypass valves, bypass dampers, inlet guide vanes, and outlet control valves. Each VSD must include a series reactor (inductor, choke) for power factor correction. VSD must be controlled automatically by a building automation system, process control system or local controller (not manually) driven by differential pressure, flow, temperature, or another variable signal.

Contractor must certify that motor experiences regular and significant changes in load and therefore in motor speed under normal operation and is likely to result in savings of at least 20%.

Power Controlled (horsepower)	Incentive
<10 hp	\$120/hp
10-100 hp	\$80/hp
> 100 hp	\$40/hp

Chilled water pump
Cooling tower fan
Return/supply/exhaust fans on built up VAV unit
Supply/return fans on VAV packaged unit
Chiller compressor
Hot water pump
Stand-alone exhaust fan
Fume hood exhaust & makeup fans

LIGHTING

Interior

Reduce rated interior lighting energy use (kWh) relative to current installed lighting as documented in accordance with procedures for the Federal commercial building tax deduction.

25% Reduction in installed lighting power (adjusted by control factor)	\$0.25 per sq. ft of floor area changed
40% Reduction (adjusted by control factor)	\$0.50 per sq. ft of floor area changed

For purposes of calculating kWh savings from lighting controls, savings in Watts shall be multiplied by the following values:

⁶ \$150/ton refrigeration would equate to about a quarter of the total cost incurred to purchase the new chiller and remove the old system per AHRI Task Force

⁷ Based on 33 prescriptive rebate programs offered today by utilities or states throughout North America providing rebates ranging from \$25 to \$400/horsepower controlled.



Occupancy sensors	0.9
Manual dimming controls	0.9
Programmable multi-level dimming controls	0.9
Programmable multi-level dimming controls with programmable time scheduling	0.85
Daylight dimming controls	0.75

Exterior

Reduce rated exterior lighting energy use (kWh) relative to current installed lighting as documented in accordance with procedures for the Federal commercial building tax deduction and assuming that outdoor lighting operates for an average of 4000 hours per year.

20% Reduction	\$0.40 per kWh saved annually
40% Reduction	\$1.00 per kWh saved annually

For purposes of calculating kWh savings from lighting controls, savings in Watts shall be multiplied by the following values:

7-day time controls (with a provision for holiday schedule, lighting must be off at least 4 hours per night)	0.75
Motion sensor (lighting power must be reduced by at least 40% after no activity has been detected for at least 20 minutes)	0.75
Remote monitoring and multi-level lighting control	0.60

BUILDING EFFICIENCY SERVICES

Audits

A rebate for building owners who undertake a comprehensive energy audit and/or a retro commissioning study of their property to achieve all cost-effective energy efficiency. Auditors must certify that an ASHRAE Level II energy audit or equivalent was performed to qualify. Retro commissioning studies must be undertaken by a provider with an ASHRAE CPMP, Building Commissioning Association CCP certification, or the equivalent that follows guidelines laid out in EPA’s Retro Commissioning Guide for Building Owners or the California Commissioning Guide: Existing Buildings.

Incentive: \$0.05 per square foot of audited building space, not to exceed 50% of total cost of the audit.

Energy Management and Monitoring Systems

Energy management and monitoring systems (EMMS) use computers, instrumentation, control equipment, and/or software to manage, monitor, and/or submeter a building's use of energy for



heating, ventilation, air conditioning, lighting, and/or other building energy loads. Submetering systems provide granular measurement and monitoring of a building's energy usage for these and other specific energy loads.⁸

This rebate covers the installation and commissioning of EMMS where analog controls (pneumatic or electronic), or no controls, exist.

This rebate also could be applied to upgrading an existing EMMS to add submetering for major individual loads.^{9,10,11} The addition of granular measurement and monitoring of individual energy loads to an EMMS enables further energy savings.

In order to assure that EMMSs are properly installed and maintained to maximize energy savings, building owners must enter into a service contract of at least one year covering system monitoring or maintenance, including all maintenance recommended by the equipment manufacturer.

Incentive: \$0.45 per square foot of building space covered by the qualified EMMS, or 50% of the total installation and commissioning costs.

Incentive: \$0.15 per square foot of building space covered by the EMMS, or 50% of the total installation cost.

Commissioning¹²

All commissioning tune-ups must be performed by an outside vendor after a plan as described in the audit rebate is completed. Rebates shall not exceed the invoiced cost of the tune-up work. Equipment is eligible for the tune-up incentive only once over the course of this program.

Space heating equipment tune-ups

⁸ According to the 2003 CBECS, only 7% of commercial buildings, making up 31% of the national commercial building floor space, have an EMCS [U.S. EIA (2008) "Commercial Buildings Energy Consumption Survey (CBECS) for 2003." Washington, DC. September 2008].

In a report prepared for the U.S. Department of Energy, the potential energy savings of EMCS was estimated to be 3-8% of total commercial sector energy use [TIAX LLC (2005) "The Energy Impact of Commercial Building Controls and Performance Diagnostics," November 2005].

⁹ The energy savings potential of EMMS is estimated to be 10-20% [S. Katipamula, S. Gaines (2003) "Characterization of Building Controls and Energy Efficiency Options Using Commercial Building Energy Consumption Survey" prepared for the Iowa Energy Center, Iowa State University].

¹⁰ EMMSs also enable automated responsiveness of buildings to the smart grid and have the potential to reduce peak load by 10-15 % [Kiliccote, S., M.A. Piette, and Hansen, D. (2006) "Advanced Controls and Communications for Demand Response and Energy Efficiency in Commercial Buildings." Lawrence Berkeley National Laboratory].

¹¹ To earn the rebate, submetering must be installed on major load centers such as HVAC, lighting, water heating, and refrigeration.

¹² Modeled after an innovative State of Wisconsin "Focus on Energy" prescriptive rebate program as well as 13 other prescriptive rebate programs for maintenance services offered today by utilities and states throughout North America.



For boilers, unit heaters, make-up air units, rooftop units and furnaces, and industrial process heating equipment with forced or induced draft combustion. The service provider must clean all heat exchange surfaces, check and calibrate all system controls and perform combustion efficiency tests and stack temperature measurements both before and after the heating system is serviced.

Incentive level: \$100/unit

Cooling system tune-ups

Rebates for service of cooling systems of capacity greater than or equal to 2 tons, including all of the following normal maintenance items, as applicable to the specific system being tuned-up:

Air cooled condenser coil cleaning	Liquid line temperature
System pressure check and adjust	Sub-cooling & super heat
Filter inspect or replace	Suction pressure & temperature
Belt inspect or replace	Oil level & pressure
Economizer condition check & repair	Low pressure controls
Contactors condition	High pressure controls
Evaporator condition	Crankcase heater operation
Compressor amp draw	Water cooled chiller condenser tube cleaning
Supply motor amp draw	Water cooled chiller evaporator tube cleaning
Condenser fan(s) amp draw	

Incentive level: \$2/ton up to 50% of project cost

Energy-Efficient Building Operations and Maintenance Training

Rebates to train building superintendents and operators in energy-efficient operations of large commercial and multi-family buildings. Workers must be trained to Building Operator Certification standards for commercial building operators or BPI Multi-Family Building Operator standards for residential building operators or their equivalent.

Incentive: \$2,000 per worker who completes the training and certification process.



Appendix B

Building STAR Rebate Program Application Form and Procedures

A building owner or a licensed contractor/provider submits its list of proposed efficiency measures to Treasury.

- Building owners must provide equipment serial numbers and/or information on services and upgrades that are a part of the proposed scope of retrofit work.
- Building owners must provide the total rebate expected based on the scope of work described above.
- Contractor must certify that any fixes identified by the third-party audit be remedied at no additional cost to the building owner.
- Building owners must demonstrate that new products and services are contracted to be installed or implemented by licensed contractors or providers.
- The building owner or designee/contractor certifies that the products and services to be installed or implemented and the installation methods meet all applicable federal, state and local government building codes and standards.



Appendix C

Building STAR Tax Incentives

As a second tool to spur demand for commercial retrofits and create jobs in 2010 and 2011, the Building STAR program calls for new or expanded tax incentives for retrofits.

Performance-Based Tax Incentives

Building STAR would:

- Increase the Energy Efficient Commercial Building Tax Deduction (26 U.S.C. 179D) from \$1.80 to \$3.00 per square foot, and increase the deduction for partial allowances regarding specific system retrofits in commercial buildings, as provided in the “Expanding Building Efficiency Incentives Act of 2009” (S. 1637 and H.R. 4226, Section 3(a)(1) of both bills). This would bring the incentive to a level that would help drive significant retrofit activity.
 - Incorporate the remaining sections of the Expanding Building Efficiency Incentives Act of 2009 (S. 1637 and H.R. 4226). The Energy Efficient Commercial Building Tax Deduction (26 U.S.C. 179D) includes performance and prescriptive incentives, as well as important verification requirements that will help ensure that work is completed correctly and maintained appropriately.

The prescriptive requirements contained in *Appendix A* of this document, or similar requirements, should be used for envelope retrofits affecting individual structural elements that are eligible for a partial deduction until such time as the Department of Energy and Internal Revenue Service issue new regulations to simplify and streamline the administration of the Energy Efficient Commercial Building Tax Deduction as called for in S. 1637/H.R. 4226, section 3(a)(2)(B). Such changes also would help improve the administration of the current Energy Efficient Building Tax Deduction program (26 U.S.C. 179D), which currently is a barrier to widespread use by building owners.

- Grants in lieu of Tax Incentives for REITs - Incorporate the Sustainable Property Grants Act (H.R. 4256), which would allow Real Estate Investment Trusts (REITs) to apply for grants instead of tax incentives, as already established for some other entities in Section 1603 of the American Recovery and Reinvestment Act of 2009. This would allow a large class of real estate owners to take advantage of these incentives.



Technology-Specific Tax Incentives

Building STAR supports tax incentives for technologies and equipment that could drive significant reductions in energy use and create jobs. The tax incentives in this section would be capped at a specific dollar amount.

- **Variable Speed Drives for Motors and Chillers:** Include the “Expanding Industrial Energy Efficiency Tax Incentives Act of 2009” (S. 1639) as introduced in the Senate on August 6, 2009. This bill would provide incentives to manufacturers and end-users of advanced motor systems with adjustable speed capability. In addition, the bill provides incentives to upgrade to more efficient chiller equipment.
- **Energy-Efficient Roofs:** Reduce depreciation from 39 years to a 20 year depreciation period for commercial roofs that meet prescriptive R-values equal to the rebate qualification levels in *Appendix A*. The shortened depreciation would only apply to low-slope roofs where the insulation is installed entirely above deck. This roof category covers approximately 62% of the existing commercial building floor space and are the types of roofs that are most able to increase their insulation levels and respond quickly to this type of incentive. Only roofs that are upgraded in 2010 and 2011 (or within the two years following enactment) can qualify for this incentive. New construction is excluded from the tax incentive. Buildings owners may take either the tax incentive or the rebate, but not both.