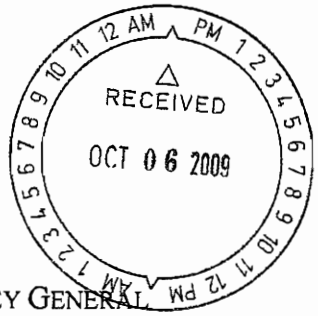
THE COMMONWEALTH OF MASSACHUSETTS



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October 1, 2009

BY OVERNIGHT DELIVERY - UNITED PARCEL SERVICE

Ms. Catherine Zoi
Assistant Secretary for Energy Efficiency and Renewable Energy
United States Department of Energy
Section 327 Petitions
Appliance Efficiency Standards
Forrestal Building
1000 Independence Avenue, SW
Washington, D.C. 20585

Re: Petition for Waiver of Federal Preemption Pursuant to § 327(d), 42 U.S.C. § 6297(d), of the Energy Policy and Conservation Act ("EPCA").

Dear Assistant Secretary Zoi:

Pursuant to 42 U.S.C. § 6297(d), 10 C.F.R. §§ 430.40 - 430.49, and Massachusetts General Laws c. 25B, §§ 5 and 9, the Massachusetts Department of Energy Resources (a Department of the Massachusetts Executive Office of Energy & Environmental Affairs) and the Massachusetts Office of Attorney General Martha Coakley jointly and respectfully submit for filing and consideration by the United States Department of Energy an original and three copies of the following document:

> Petition of the Commonwealth of Massachusetts to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-weatherized Gas Furnaces, dated October 1, 2009, with included Exhibits A through E.

The Commonwealth maintains that it comfortably meets the legal standard for the granting of a waiver that is set forth in § 327(d) of EPCA. As demonstrated in the Petition, the Commonwealth's 90% AFUE standard is needed to meet unusual and compelling state interests that cannot be met in any other feasible manner using alternative, non-regulatory approaches, which the Commonwealth has already aggressively tried to utilize. The costs and implementation times of such alternatives, even were they able to meet the Commonwealth's needs, would be much greater than the costs and implementation times of the new regulatory standard, and are therefore far inferior to it. Further, the Commonwealth has shown that the proposed 90% AFUE standard will not significantly burden manufacturing, marketing, distribution, sales, or servicing of the type of gas furnaces that the new standard covers, because high efficiency furnaces are already manufactured and marketed into Massachusetts and the region in high numbers.

For all these reasons, the United States Department of Energy should grant the Commonwealth's Petition and prescribe the requested waiver rule.

Thank you for your assistance.

Sincerely,

Philip Giudice, Commissioner
Massachusetts Department of
Energy Resources

Attorney General Martha Coakley

cc: Representative Edward J. Markey
Energy & Commerce Committee
U.S. House of Representatives

UNITED STATES DEPARTMENT OF ENERGY

PETITION OF THE COMMONWEALTH OF MASSACHUSETTS TO EXEMPT FROM FEDERAL PREEMPTION MASSACHUSETTS' 90% ANNUAL FUEL UTILIZATION EFFICIENCY STANDARD FOR NON-WEATHERIZED GAS FURNACES

Submitted by:

The Commonwealth of Massachusetts, acting by and through the Massachusetts Department of Energy Resources, a Department of the Massachusetts Executive Office of Energy & Environmental Affairs

and

Massachusetts Attorney General Martha Coakley

October 1, 2009

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I. INTRODUCTION AND OVERVIEW OF PETITION.

A. Nature of the Petition and Relevant State Law.

The Commonwealth of Massachusetts ("Commonwealth" or "Massachusetts"), through its Department of Energy Resources ("DOER") and the Office of Massachusetts Attorney General Martha Coakley, hereby petitions the United States Department of Energy ("DOE") to approve a waiver of federal preemption under § 327(d) of the Energy Policy and Conservation Act ("EPCA"), 42 U.S.C. § 6297(d), so as to allow the Commonwealth to implement the 90% Annual Fuel Utilization Efficiency ("AFUE") standard for residential furnaces adopted by the Massachusetts Legislature in § 11 of Chapter 139 of the Acts of 2005, entitled "An Act Establishing Minimum Energy-Efficiency Standards for Certain Products," which is now codified at Massachusetts General Laws ("M.G.L.") c. 25B, §5.

Furnaces are a "covered product" under federal law (42 U.S.C. §§ 6291(2), 6292(a)(5)) for which DOE is explicitly authorized to set energy efficiency standards, and DOE most recently set a standard of 80% AFUE for "non-weatherized gas furnaces" ("NWGF")[1] in a final rule published November 19, 2007.[2] Because DOE-set standards generally preempt states from implementing their own standards, the Commonwealth is precluded from instituting its 90% AFUE standard without obtaining a waiver from DOE pursuant to 42 U.S.C. § 6297(d).

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[1] A weatherized furnace is one "designed for installation outdoors, approved for resistance to wind, rain and snow, and supplied with its own venting system." 10 C.F.R. § 430.2. Conversely, a non-weatherized furnace is the far more typical system that is located inside the dwelling space (including in the basement or ancillary structure) and therefore need not be weatherized against the elements.

[2] 72 Fed. Reg. 65136, 65137 (Nov. 19, 2007). Various parties petitioned for review of this rule in the United States Court of Appeals for the Second Circuit, in *State of New York et al. v. Department of Energy et al.*, #08-311-ag(L), 08-312-ag(con) (petitions filed Jan. 17, 2008). Under order of the Court dated April 21, 2009, the rule was voluntarily remanded to DOE for further notice and comment rulemaking.

Pursuant to M.G.L. c. 25B, §5, DOER is in fact required to seek such a waiver from DOE. *See also* 225 Code of Massachusetts Regulations ("C.M.R.") 9.04(5).

Previously revised in 1989, the Massachusetts Legislature amended M.G.L. c. 25B, §5, in November 2005 to update certain appliance efficiency standards and to include several new products and appliances within its scope to significantly reduce energy usage in the Commonwealth. The Legislature included higher efficiency standards for residential furnaces because of the significant contribution furnaces make to overall energy consumption. Information presented to the Legislature as it considered the revision projected that the Commonwealth would avoid consuming one billion cubic feet of natural gas annually, by the year 2020, if the 90% AFUE standard was implemented, and that the net present value of the economic savings to consumers could be as high as $100 million.[3]

Following its authority in M.G.L. c. 25B, §5, DOER subsequently adopted implementing regulations setting the efficiency of residential gas and propane furnaces at 90% AFUE. 225 C.M.R. 9.03(10). Because the Commonwealth must seek a waiver in order for the 90% AFUE standard to go into effect, the effective date for the 90% AFUE standard is, pursuant to 225 C.M.R. 9.04(5), "the earliest date permitted by federal law."

The Commonwealth's entire Petition packet includes:

- this Petition;
- a technical report entitled "Report and Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces," prepared for the Commonwealth by Tom Franks & Alek Antczak of Optimal Energy Inc.(the "Optimal Report");
- an analysis that addresses the costs and benefits of alternatives to granting the

[3] A recent analysis prepared by the Appliance Standards Awareness Project estimates $144 million in net present value savings from the adoption of 90% AFUE in Massachusetts. Analysis available at: http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_ma.pdf.

waiver Petition, in comparison to the costs and benefits of the Petition being granted, as required by 42 U.S.C. § 6297(d)(91)(C)(ii), entitled "Alternatives and Economic Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces," prepared for the Commonwealth by DOER's Vivek Mohta and Vivek Sakhrani (hereinafter, the "Alternatives Analysis");

- the Commonwealth's Energy Plan and forecast; and
- the Commonwealth's furnace efficiency regulation for which the DOE waiver is sought, 225 C.M.R. 9.03(10).[4]

The Optimal Report, Alternatives Analysis, Energy Plan and forecast are fully incorporated into this Petition.

B. Summary of the Commonwealth's "Unusual and Compelling" Interests That Warrant the Granting of the Petition.

Under 42 U.S.C. § 6297(d)(1)(B), Massachusetts must establish that its 90% AFUE standard "is needed to meet unusual and compelling state . . . interests." As is demonstrated more fully below, in § III. A., Massachusetts has several unusual and compelling interests that merit DOE approving this waiver Petition. First, residential heating consumers in the Commonwealth are burdened by some of the highest energy prices in the country, more than twice as high as some of the lowest-cost states,[5] and well above the national average.[6] Second, those same customers need to consume far more natural gas to operate their furnaces than

[4] Additionally, within the Petition are references to various documents located on the World Wide Web. Should DOE require any of these web-cited documents in hard copy, the Commonwealth will gladly provide them.

[5] In 2008, residential natural gas prices averaged $17.11 per thousand cubic feet ("mcf") in Massachusetts, according to the Energy Information Administrations listing of "Natural Gas Prices" by area (available at: http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_a.htm). For comparison, during 2008, there were 13 states where average residential gas prices were under $13 per mcf; in Colorado the average price was even lower, $9.76 per mcf.

[6] The Optimal Report, Figure 2, shows that Massachusetts residential natural gas prices have been 20% to 30% above the national average since the year 2000.

customers in many other states, as the number of heating degree days ("HDDs") in Massachusetts generally exceeds 6000. In most winters, HDDs in Massachusetts exceed the national average by approximately 50%.[7] The combination of high gas prices and cold winters provides Massachusetts with an unusual and compelling interest in increasing the efficiency of residential furnaces because of how expensive it is to keep a home warm.[8] Third, Massachusetts experiences unusual and compelling concerns around consumption of natural gas by residential furnaces because residential heating loads and natural gas-fired electric generation loads compete for relatively scarce supplies of natural gas in the region.[9] Policymakers in New England have voiced concerns that contracts to supply natural gas to power plants could be interrupted during the winter if residential heating demand too severely strains supplies. Massachusetts thus has an unusual and compelling interest in reducing the demand for natural gas in the residential heating sector because heating demands can place reliability of the electric generating system at risk. Fourth, Massachusetts has one of the highest rates of rental housing in the country, creating unusual barriers to increasing the percentage of households that install high-efficiency furnaces.[10] Fifth, Massachusetts has unusual and compelling legal interests in increasing the

[7] Optimal Report, Figure 1. Note that the Commonwealth has carefully checked the underlying HDD data from such public sources as the National Oceanic and Atmospheric Administration, and concludes that DOE made a typographical or calculation error in stating: "Nationwide, the U.S. averages 5528 HDDs." Notice of Proposed Rulemaking, 71 Fed. Reg. 59209, n. 7 (Oct. 6, 2006). Regardless of the year one could choose, the U.S. average is generally in the range between 4000 and 4500 HDDs, and Massachusetts' HDDs are generally 40% to 50% higher than the U.S. average in any year.

[8] The Optimal Report (Figures 4, 5 and 6) highlights the heavy burden low-income households, in particular, face in keeping warm.

[9] Optimal Report, Section II.D., at 7. *See also* ISO- New England, "CIGRE 2008 Case Study: Electric and Natural Gas Market Interdependencies Within New England" (September 1, 2008), available at: http://www.iso-ne.com/pubs/spcl_rpts/2008/final_isone_cigre_case_study_090108.pdf. As this study notes (*Id.* p. 8), "There is no natural gas production of underground storage in New England," unlike much of the rest of the country, thus creating a relative scarcity of supply. Moreover, "gas-fired peaking generation" in New England "can also experience fuel related problems, exacerbated during winter conditions" because that gas-fired generation is sometimes "treated as secondary on the priority list with respect to fuel delivery needs." *Id.*, p. 21.

[10] Optimal Report, at 8 & Figure 8.

efficiency of heating furnaces, not only because its legislature has adopted a 90% AFUE standard for those furnaces in M.G.L. c. 25B, §5, as amended, but also because reducing the consumption of natural gas in furnaces meets the requirements of other state laws, including the Global Warming Solutions Act[11] and Green Communities Act.[12]

C. Granting the Waiver Will Provide Substantial Benefits to Massachusetts.

The 90% AFUE standard that Massachusetts seeks to implement will provide very substantial benefits to the Commonwealth of Massachusetts. Estimates of the Net Present Value savings to Massachusetts consumers range from $77 million[13] to a recently-revised estimate of $144 million.[14] In addition, adoption of the 90% AFUE standard is projected to avoid consumption of 19 million therms of natural gas by 2030.[15] DOE's own economic analysis found that the 90% AFUE standard is technically feasible as well as economically-justified in states with more than 5,000 HDDs, and the Commonwealth's consultant, Optimal Energy, similarly concluded that implementing a 90% standard in Massachusetts provides significant net benefits.[16]

D. Implementation of the 90% AFUE Standard is Far Preferable to Alternative Approaches, Almost All of Which Massachusetts Has Already Tried.

Under 42 U.S.C. § 6297(d)(1)(C), Massachusetts must demonstrate that the "costs, benefits, burdens and reliability of energy . . . savings resulting from the State regulation [e.g., the 90% AFUE standard] make such regulation preferable or necessary when measured against

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[11] 2008 Mass. Acts. Ch. 298
[12] 2008 Mass. Acts, Ch. 169.
[13] "State-by-State Savings from New Furnace and Boiler Standards," available at: http://www.standardsasap.org/documents/statefurnaceboiler.htm.
[14] See Appliance Standards Awareness Project analysis at http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_ma.pdf.
[15] See Appliance Standards Awareness Project analysis at http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_ma.pdf.
[16] Optimal Report, Section III.C.2, at 21.

the costs, benefits, burdens and reliability of alternative approaches to energy . . . savings . . . ." The Commonwealth includes with this Petition the Alternatives Analysis prepared by its staff that so demonstrates and discusses this point at greater length below. Moreover, and as also discussed more fully below, implementing the 90% AFUE standard is fully consistent with the state's Energy Plan and forecast, which has also been submitted with this Petition.

E. The Commonwealth's Waiver Request Seeks to Tighten DOE's Recently Promulgated Furnace Standard.

On October 6, 2006, DOE issued a Notice of Proposed Rulemaking ("NOPR") for residential furnace and boiler efficiency standards. 71 Fed. Reg. 59204. Among many other issues addressed in the NOPR, DOE responded to "numerous comments regarding the setting of separate furnace and boiler standards for different regions of the country." 71 Fed. Reg. 59209. While DOE concluded that it did not at that time have the authority to "set regional energy conservation standards," it did stress that "EPCA allows states to seek from the Department a waiver of Federal preemption of state or local energy conservation standards." *Id.*; 42 U.S.C. § 6297(d). DOE then discussed at length the types of evidence that might be relevant to any such waiver petition and some of the factors that DOE would consider in evaluating a waiver petition. *Id.*, at 59209 – 59210.

On November 19, 2007, DOE issued a final rule on residential furnace and boiler efficiency standards, setting 80% as the standard for NWGFs.[17] 72 Fed. Reg. 65136 - 65137.

[17] It is worth noting here that numerous parties (including the State of New York and several other governmental entities, and, separately, the Natural Resources Defense Council) sought review of the November 19, 2007 final rule through petitions filed in the Second Circuit Court of Appeals on January 17, 2008. *State of New York et al. v. Department of Energy et al.*, docket 08-311-ag(L), 08-312-ag(con). On April 21, 2009, the Court granted the motion of DOE for a voluntary remand of the furnace and boiler rule "for further notice and comment rulemaking proceedings leading to a revised final rule." Massachusetts still must seek a waiver of preemption to implement its 90% AFUE standard, as there is a pre-existing federal efficiency standard for furnaces and boilers, 10 C.F.R. § 430.32(e). Moreover, there is no question that a state can seek a waiver and enforce its own furnace standard even though DOE now clearly has the authority to adopt regional standards. 42 U.S.C. § 6295(o)(6)(F)(iv).

DOE again addressed "numerous comments advocating the adoption of separate standards for northern and southern regions," including, *inter alia*, comments from the City of Boston and the Belmont [Massachusetts] Housing Trust. 72 Fed. Reg. 65150. DOE once again concluded that it did not have the authority to set regional standards.[18] DOE also reiterated that "States can apply for waivers from federal preemption" and referred back to the October 6, 2006 NOPR, in which it "discussed the necessary conditions in order for it to grant States a waiver from Federal preemption." 72 Fed. Reg. 65151. In these comments to the final rule, DOE also provided some additional guidance and clarifications regarding the waiver process. 72 Fed. Reg. 65152.

Consistent with the comments to the NOPR and the final rule regarding waiver of federal preemption, Massachusetts now seeks a waiver under 42 U.S.C. § 6297(d) and 10 C.F.R. §§ 430.40 – 430.49 so that it may implement the 90% furnace standard currently set forth in M.G.L. c. 25B, §5, and 225 C.M.R. 9.03(10).

II. THE LEGAL STANDARD FOR OBTAINING A WAIVER.

A. The Federal Statute and Regulations.

Section 327(d)(1)(A) of EPCA provides that:

> Any state . . . with a state regulation which provides for any energy conservation standard or other requirement with respect to energy use, energy efficiency or water use for any type (or class) of covered product for which there is a Federal energy conservation standard . . . may file a petition with the Secretary [of DOE] requesting a rule that such State regulation become effective with respect to such covered product.

42 U.S.C. § 6297(d)(1)(A). The Commonwealth has filed this Petition in order to obtain a ruling from DOE that its state regulation setting a furnace efficiency standard of 90% may go into

[18] Just after DOE determined that it did not have the authority to adopt regionally-differentiated efficiency standards, the President signed into law the Energy Independence and Security Act, which gave DOE the authority to set regional standards for furnaces, central air conditioners, and heat pumps. Pub. L. 110-140, § 306, codified at 42 U.S.C. § 6295(o)(6).

effect three years after DOE may so rule on the Commonwealth's Petition.[19]

Section 327(d)(1)(B) of EPCA requires that the:

> Secretary shall . . . prescribe such rule if . . . the state . . . has established by a preponderance of the evidence that such state regulation is needed to meet unusual and compelling State or local energy or water interests.

As summarized above and discussed more fully in Section III.A., below, Massachusetts has several "unusual and compelling interests" which merit DOE granting this waiver Petition.

The phrase "unusual and compelling State interests" is defined in 42 U.S.C. § 6297(d)(1)(C) to mean interests which:

(1) are substantially different in nature or magnitude than those prevailing in the United States generally; and

(2) are such that the costs, benefits, burdens and reliability of energy or water savings resulting from such state regulation are preferable or necessary when measured against the costs, benefits, burdens, and reliability of alternative approaches to energy or water savings or production, including reliance on reasonably predictable market-induced improvement in efficiency of all products subject to state regulation.

The Commonwealth addresses the first prong of this definition, regarding how the interests of Massachusetts are different in nature and magnitude from those generally prevailing in the United States generally, in Section III.A., below. The analysis and comparisons of costs and benefits described in the second prong are addressed in Section III.B., below.

[19] 42 U.S.C. § 6297(d)(5)(A) provides, in relevant part: "No final rule prescribed by the Secretary under this subsection may . . . permit any State regulation to become effective with respect to any covered product manufactured within three years after such rule is published in the Federal Register or within five years if the Secretary finds that such additional time is necessary due to the substantial burdens of retooling, redesign, or distribution needed to comply with the State regulation; . . ." DOER's regulation at 225 C.M.R. 9.04(5) provides that if "a waiver from federal preemption is necessary for residential furnaces or boiler standards . . . the state standard shall go into effect at the earliest date permitted by federal law."

DOE has adopted implementing regulations at 10 C.F.R. §§ 430.40 – 430.49. In accordance with § 430.41(a)(1), the Commonwealth states the following:

(i) The name, address and telephone number of the actual Petitioner are:

Philip Giudice, Commissioner
Department of Energy Resources
100 Cambridge Street, Rm. 1020
Boston, Massachusetts 02114
(617) 626-7321

(ii) A copy of the "State standard for which a rule exempting such standard is sought," M.G.L. c. 25B, § 5(3), and 225 C.M.R. 9.03(10), is attached as Exhibit A (inclusive of M.G.L. c. 25B, §§ 1-10, and 225 C.M.R. 9.01 - 9.06).

(iii) A copy of the Commonwealth's Energy Plan is attached as Exhibit B and its gas forecast as Exhibit C.

(iv) The Commonwealth seeks a rule from DOE exempting from federal preemption the 90% AFUE standard for residential gas and propane furnaces adopted in M.G.L. c. 25B, § 5, and 225 C.M.R. 9.03(10).

(v) As additional support for its Petition, the Commonwealth submits:

a. the Optimal Report, Exhibit D hereto; and

b. the Alternatives Analysis, Exhibit E hereto.

In accordance with § 430.42(c), the Petitioner states the following: that to the best of the Petitioner's knowledge, issues related to whether a 90% AFUE standard for NWGF should be implemented in other states have been and are being considered by various state agencies, departments, or instrumentalities. In this Petition, the Commonwealth notes that the states of Rhode Island, Vermont, New Hampshire and Maryland have adopted a 90% AFUE furnace standard.

B. DOE Has Provided Guidance for States That Seek Waivers of Preemption.

DOE provided additional guidance to states seeking waivers of the standards for furnace and boilers in comments to the October 6, 2006 NOPR and to the final rule published on November 19, 2007. The Commonwealth summarizes the guidance below, as much of it is relevant to the issues addressed in this Petition.

1. The October 6, 2006 NOPR Guidance.

In the NOPR published October 6, 2006, DOE noted that it had "received numerous comments regarding the setting of separate furnace and boiler standards for different regions of the country." 71 Fed. Reg. 59209. Several parties supported the adoption of regional standards, believing that a higher AFUE standard in northern, colder states was both technologically feasible and economically-justified.

DOE did not reject the policy arguments made in support of regional standards, but rather concluded "that EPCA does not authorize DOE to set regional conservation standards . . . ."[20] *Id.* Nevertheless, DOE did underscore the ability of states to seek "waiver of federal preemption," and provided comments on some of the factors it would consider in evaluating petitions to waive preemption of any state furnace or boiler standards.

First, DOE noted:

> [I]n the context of residential furnaces and boilers, where regional climatic effects can have significant impact on whether a specified energy conservation standard would be technologically feasible and economically justified in that region, such **regional climatic effects will be important in DOE's assessment of whether there are "unusual and compelling State or local energy interests"** for State energy conservation standards. **States having higher-than-average, population-weighted heating degree days (HDDs)** based on long-term National Oceanic and Atmospheric Administration data

[20] As described in footnote 18, *supra*, Congress, DOE's authority has been expanded. Pub. L. 110-140, § 306, codified at 42 U.S.C. § 6295(o)(6).

> **would seem to have the best prospects for demonstrating "unusual and compelling" interests** to support a waiver of preemption in the particular circumstances presented here. . . . States with significantly higher heating requirements have significantly higher furnace use. This may indicate that, **for those States, a State energy conservation standard which is higher than the Federal standard would be cost-effective and would provide significantly more energy savings than the Federal standard.**

Id. (emphasis added). As discussed in Section III.A.1., below, Massachusetts has documented that the average number of HDDs in the state exceeds the national average by a substantial amount.

DOE also noted that if contiguous states with an above-average number of HDDs were to petition DOE for a rule allowing a higher AFUE standard to go into effect, this "would lessen the impact on manufacturers," 71 Fed. Reg. 59210, and, presumably, make it more likely that the waiver petition would be granted. While Massachusetts is the only state currently petitioning DOE for a waiver rule regarding furnaces, all of the other states that have adopted standards higher than the current DOE-set standard have chosen 90% AFUE as their standard. Three of those four states (Rhode Island, Vermont, and New Hampshire) are contiguous to Massachusetts.

DOE also highlighted the importance of a state "identify[ing] the saturation of homes with products that already meet those higher standards . . . [by] provid[ing] evidence that a significant percentage of gas furnaces sold today in the State already meets, for example, a 90-percent-AFUE condensing standard." 71 Fed. Reg. 59210. As discussed in Section III.C.1., below, the most recent data available shows that furnaces with at least 90% AFUE efficiency have comprised a majority of the furnace shipments to Massachusetts for the past ten years, helping to demonstrate that industry already has the ability to deliver units at this efficiency to the Massachusetts market without undergoing any substantial burden.

In regard to the statutory requirement in 42 U.S.C. § 6297(d)(1)(C)(ii), DOE noted:

> A state . . . also could identify any subsidies and/or incentives, such as tax rebates or

> purchase price rebates that the state or other entities are offering. To the extent States demonstrate that these programs have not worked, they may be able to show that the "costs, benefits, burdens and reliability" of energy savings from mandatory State energy conservation regulations make such regulations preferable to their voluntary programs.

71 Fed. Reg. 59210. In the Alternatives Analysis that is attached to this Petition as Exhibit E, DOER concluded that allowing the Commonwealth to implement its 90% AFUE standard provides a much better result than the types of alternative approaches listed in the above quote, because those alternatives will not succeed in terms of substantially increasing the penetration of high-efficiency furnaces. Moreover, the costs of implementing any of those alternatives would be much higher than simply allowing the state's 90% AFUE standard to be implemented.

Under 42 U.S.C. § 6297(d)(3), the burden is on "interested parties" -- most likely those who would oppose the waiver petition -- to show "by a preponderance of the evidence" that granting the waiver petition would "significantly burden manufacturing, marketing, distribution, sale or servicing of the covered product on a national basis." In its guidance, DOE has suggested several categories of information a state could bring forward that would, presumably, rebut efforts by "interested parties" to demonstrate the types of burdens described in § 6297(d)(3). As DOE notes, a state "would want to address the extent to which manufacturers already produce and sell products that would meet the state's proposed standard" and "how efficiencies of shipments to that state already vary from current DOE efficiency levels." 71 Fed. Reg. 59210. As discussed more fully below in Section III.C., and in the Optimal Report, at p.13, manufacturers already produce and sell a very large number of models that meet or exceed the state's 90% AFUE standard, and those units already command a large share of the Massachusetts market,[21] far larger than the share of the national market. Optimal Report, at p. 15 & Figure 13.

[21] *See* 71 Fed. Reg. 59210 (a state seeking a waiver might seek to demonstrate "that high-efficiency equipment, such as condensing furnaces, already have achieved significant market shares in that State."

DOE also noted that a state "might wish to provide evidence that demonstrates that there are no, or insignificant, differences between small and large manufacturers with respect to producing and selling furnaces in that state," 71 Fed. Reg. 59210, which the attached Optimal Report, at p. 10, does. The Optimal Report, at p. 10, also shows that high efficiency furnaces already have all of the characteristics and features available in less efficient furnaces sold in the Commonwealth.

Lastly, the October 6, 2006 NOPR guidance addressed the issue of whether approval of one state's waiver petition "is likely to contribute significantly to a proliferation of State appliance efficiency requirements." 71 Fed. Reg. 59210. The Commonwealth has already noted that "it has chosen identical [furnace efficiency] standard levels as other States that have developed proposed regulations or States that have regulations already in place." *See* this Section, above.

2. Comments to the November 2007 Final Rule.

In comments to the final rule published November 19, 2007, DOE again addressed the issues of regional standards and the ability of states to seek waivers. DOE restated its prior legal conclusion that "it does not have the authority under EPCA to establish regional standards." 72 Fed. Reg. 65151. However, DOE highlighted its analytic conclusion that:

> the TSL [Trial Standard Level] projected to yield the maximum consumer NPV [Net Present Value] at a seven-percent discount rate for the cold-climates (i.e. ≥ 5,000 heating degree days and ≥ 6,000 heating degree days) was the proposed TSL 4 [22]. . . .

71 Fed. Reg. 65151. DOE's own analysis thus showed that a 90% AFUE was economic in climates (such as in Massachusetts) which have more than 5,000 HDDs per year, even discounting the benefit of future savings at a 7% rate.

[22] TSL 4 included a 90% AFUE standard for NWGF. 71 Fed. Reg. 65155.

While the fact that DOE found a 90% AFUE standard to be economic is not alone sufficient to find that the Massachusetts waiver Petition should be granted, it is worth noting that in those same November 2007 comments DOE again underscored the ability of states to seek waivers from Federal preemption. In addition to referring to the comments included with the October 2006 NOPR, DOE clarified that a state can show an "unusual and compelling state interest" by comparing itself to national averages, and need not distinguish itself from adjacent states that may have, e.g., similar climatic conditions. 71 Fed. Reg. 65152. DOE's comments also noted that the Nation would experience quite substantial savings of 2 quads if all states with more than 5000 HDDs annually adopted a 90% AFUE furnace standard. *Id.*

III. MASSACHUSETTS HAS MET THE REQUIREMENTS FOR ITS WAIVER PETITION TO BE GRANTED.

A. Massachusetts Has Shown By a Preponderance of the Evidence That It Has Unusual And Compelling Interests in Having the Waiver Granted.

As required by 42 U.S.C. § 6297(d)(1)(B):[23]

> The Secretary shall . . . prescribe such [waiver] rule if the Secretary finds . . . that the State . . . has established by a preponderance of the evidence that such State regulation is needed to meet unusual and compelling State or local energy . . . interests.

As noted in Section II.B.2, above, DOE has explained that a state can demonstrate "unusual and compelling interests" by comparing its circumstances and interests relative to the Nation as a whole, and need not do so in comparison to other states or even discrete regions of the country. 71 Fed. Reg. 58161 (Dec. 28, 2006); 72 Fed. Reg. 65152 (Nov. 19, 2007). Therefore, in order to obtain a waiver, Massachusetts need not show, e.g., that it is colder than other states in the north, or that it has higher natural gas prices than any particular state or region in the country. It need only demonstrate, e.g., that its HDDs, energy costs and other circumstances are significantly

[23] "Unusual and compelling State or local energy . . . interests" is further defined in § 6297(d)(1)(C).

different than "the U.S. as a whole," 72 Fed. Reg. 58161, and that the costs, benefits and burdens of the standard make regulation preferable or necessary over other alternatives. 42 U.S.C. § 6297(d)(1)(C)(ii); 71 Fed. Reg. 78162 - 78163.[24]

As required by Section 6297(d)(1)(C)(i), the five Massachusetts interests/characteristics discussed below are "different in nature or magnitude than those prevailing in the United States generally":

(1) Massachusetts has significantly more heating degree days than the national average;

(2) Massachusetts has significantly higher natural gas prices than the national average;

(3) Massachusetts has a significantly greater dependence on natural gas both to heat homes and fuel its electrical generation;

(4) Massachusetts has a disproportionately high percentage of renters (versus owners) which creates much higher barriers to the penetration of high-efficiency furnaces than in the United States generally; and

(5) Massachusetts has laws different than most states in the country, in that it requires the installation of 90% AFUE furnaces (subject to the DOE waiver) and has adopted other laws that require increased levels of energy efficiency (e.g., the Green Communities Act, Chapter 169 of the Acts of 2008) and the reduction of greenhouse gas emissions (the Global Warming Solutions Act, Chapter 298 of the Acts of 2008).

1. Massachusetts Has Far More HDDs Than the National Average.

As the attached Optimal Report, Exhibit D, demonstrates, the number of HDDs[25] in

[24] If the Secretary finds certain facts listed in § 6297(d)(3), he may not prescribe a waiver rule requested by a state. However, the burden on the opponents of the waiver is heavy: "interested persons" must establish "by a preponderance of the evidence, that such state regulation will significantly burden manufacturing, marketing, distribution, sale, or servicing of the covered product on a national basis..." *Id.* *See* Section III.C., *infra.*

[25] Heating Degree Days measure the difference between the mean temperature and 65 degrees Fahrenheit on a daily basis, over the course of a heating season. Optimal Report, Section II.A., at p. 3.

Massachusetts has varied between 5709 and 6704 during the period 2000 to 2007, inclusive, with an average of 6197. Optimal Report, at p. 1, Figure 1. Over the same period, the number of HDDs nationally ranged from 3915 to 4469, with an average of 4245 HDDs. *Id.* Thus, even the warmest Massachusetts winter (5709 HDDs) had 28% more HDDs than the coldest winter nation-wide (4469 HDDs), and Massachusetts generally has 40% to 50% more HDDs than the Nation as a whole. *Id.* As the Optimal Report noted, at p. 3: "There is a direct correlation between HDD and fuel use." Gas-heated households in Massachusetts will consume significantly more energy to keep their homes warm than the average household in the country. Massachusetts therefore has "a higher public interest in [furnace] efficiency than exists in the Nation as a whole."[26]

2. Massachusetts Has Higher Gas Rates Than the Country As a Whole.

Prices for natural gas in Massachusetts prices are generally 20% to 30% higher than the national average. Optimal Report, Figure 2, and accompanying text. There are only some half dozen states in the country with higher natural gas prices, and prices in Massachusetts are approximately twice as high as in the lowest cost states. Optimal Report, Figure 3.

The compound effect of living in a state with roughly 45% more HDDs than the national average and paying 25% more per unit of gas means that Massachusetts residents who heat with natural gas tend to pay 175% or more than the national average for winter heating. Low-income households, which by definition have the hardest time paying their energy bills, bear unusually heavy burdens if located in Massachusetts. The Optimal Report shows that Massachusetts is among the eight most expensive states in the country, in terms of the heating costs for low-income households. Optimal Report, Figures 4 and 5.

[26] DOE itself flagged the importance of a state demonstrating that it has more degree days than the national average, if it seeks a waiver from the furnace standards. 71 Fed. Reg. 59209.

Because of the high cost of heating a home in Massachusetts, compared to the Nation as a whole, Massachusetts has a unique and compelling interest in increasing the efficiency of natural gas-fired furnaces and in reducing the amount of money households pay for home heating.

3. Massachusetts Residential Heating Loads Compete with Power Plant Loads.

Natural gas is not only the predominant heating fuel in Massachusetts, it is also the single largest fuel supply source for power generation in the state.[27] As explained in the Optimal Report, at pp. 5 - 6, residential heating loads do not directly compete with power plant loads because of various regulatory and operational structures, but:

> inefficient consumption of natural gas in home furnaces needlessly increases overall demand and thus raises prices for all users. Moreover, electric generating units on the natural gas system have a lower priority than residential heating customers, accounting for the likelihood that gas-fired generators' contracts for natural gas transportation could be interrupted during the winter months.

(internal quotations and citation omitted). As ISO-New England (the regional electric transmission organization) has noted, fuel-procurement strategies used by New England power generators make:

> the availability of fuels less certain and challenges the ISO to maintain short-term operable capacity to reliably serve demand. This is particularly so during the winter months when both the core natural gas and gas-fired electricity generation sectors have coincident demand for natural gas.

ISO-NE 2008 Regional System Plan, p. 64.[28] Massachusetts thus has a unique and compelling interest in reducing the inefficiency of gas-fired furnaces, thus decreasing the consumption of

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[27] The 2008 Regional System Plan prepared by ISO-New England (available at: http://www.iso-ne.com/trans/rsp/2008/rsp08_final_101608_public_version.pdf) shows that 42% of the kilowatt-hours generated in 2007 came from natural gas-fired plants, followed by nuclear plants at 28%. *Id.*, p. 62, Figure 7-2.

[28] Available at www.iso-ne.com/trans/rsp/2008/rsp08_final_101608_public_version.pdf.

natural gas and reducing the risk that there will not be adequate supplies of natural gas during the winter months to meet both heating loads and the needs of regional power plants.

4. The High Percentage of Rental Housing Creates Market Barriers.

Massachusetts has one of the highest percentages of rental housing in the country. As the Optimal Report demonstrates at Figure 8, only seven states have higher percentages of rental housing than Massachusetts. This condition creates unique barriers for the state's efforts to increase the percentage of high-efficiency furnaces. Property owners, not tenants, are legally responsible for maintaining tenants' heating systems. 105 C.M.R. 410.200 - 410.201. Tenants, however, are often responsible for paying the heating bills. Thus, the owner has an "interest in reducing first cost, that is, putting in the least expensive equipment" while the tenant's interest is "focused on reducing operation cost." Optimal Report, at p. 8. These "split incentives" make it "significantly more challenging [in Massachusetts] to influence purchasing decisions through means other than standards." *Id.* Because of the high percentage of rental housing in Massachusetts, the Commonwealth thus has a unique and compelling interest in being allowed to implement its 90% AFUE regulation as a means of reducing inefficient consumption of natural gas.

There is an extensive body of literature describing market barriers that inhibit investment in energy efficient appliances and equipment,[29] including the barrier of split incentives mentioned above. When tenants are responsible for paying energy and utility bills, there is little incentive for a landlord to purchase efficient equipment that often includes a higher purchase price than that for less energy efficient equipment. The benefits of reduced operating costs,

[29] See, e.g., Blumstein, C., et al., 1980, "Overcoming Social and Institutional Barriers to Energy Efficiency," *Energy*, 5(4):355-372; Golove, W. and Eto, J., "Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency," 1996, Lawrence Berkeley National Laboratory.

which over time may far exceed the difference between efficient and non-efficient heating equipment purchase prices, accrue to the tenant rather than the landlord. At the same time, tenants are often not able or willing to pay for expensive new heating equipment that they will not own. Further, tenants are typically prohibited by law from replacing heating equipment in their dwelling units. Because of this split incentive, tenants will often bear the higher operating costs of inefficient heating equipment, unless government regulations require the owner to install high-efficiency equipment. Low-income households, which are far more likely than higher-income households to rent rather than own, are disproportionately disadvantaged.

Analysis based on results from the most recent U.S. Energy Information Administration's 2005 Residential Energy Consumption Survey ("RECS") clearly demonstrates that in the New England Census Division:[30] (1) low-income[31] households tend to be renters rather than homeowners; (2) newer, more efficient heating equipment is concentrated heavily in owner-occupied housing; and (3) newer, more efficient heating equipment is concentrated heavily in non-low-income households. Table 1, below, shows that among nearly 5.5 million households in New England, 1.2 million, or 23%, lived below 150% of the federal poverty level in 2005.[32]

In total, 69% of the New England housing stock was owner-occupied, 30% was renter-occupied, and 1% was occupied without payment of rent. Fifty-four percent of New England low-income households were renters while only 23% of non-low-income households were

[30] RECS data may be sorted by Census Division or Census Region. State-level data are not provided.
[31] For purposes of this discussion, a "low-income" household is defined as a household living below 150% of the U.S. Health and Human Services poverty guidelines. A two-person household living below 150% of the 2009 HHS poverty guidelines has income of less than $21,855.
[32] In Table 1, "row %" refers to the percentage of households in either of the two numerical rows that own, as opposed to rent, as opposed to occupy without the payment of rent. For example, 22.9% of the 970,328 households with income above 150% of the poverty level rent their dwelling units.

renters. Thus, low-income households were more than twice as likely as non-low-income households to rent.

Table 1. 150% Poverty Status in New England Households by Housing Tenure

150% Poverty Status	Own/Buying		Rent		Occupied Without Payment of Rent		All Households	
	Households	row %	Households	row %	Households	row %	Households	%
Household Income Above 150% Federal Poverty Guidelines	3,203,704	75.7%	970,328	22.9%	55,896	1.3%	4,229,928	77.4%
Household Income At or Below 150% Federal Poverty Guidelines	560,748	45.4%	662,017	53.6%	13,303	1.1%	1,236,068	22.6%
Column Totals	*3,764,452*	*69%*	*1,632,345*	*30%*	*69,199*	*1%*	*5,465,996*	*100%*

Table 2, below, demonstrates that heating equipment under ten years old, which tends to be more energy efficient than older equipment, is disproportionately concentrated in owner-occupied housing units. While 69% of New England housing units were owner-occupied, 84% of the heating equipment under ten years old was concentrated in these units. Thirty-one percent of housing units were occupied by renters or occupied without payment of rent. However, only 15% of the newer heating equipment inventory was operating in those units.

Table 2. Age of Heating Equipment in New England Households by Housing Tenure

Age of Heating Equipment (Years)	Own/Buying		Rent		Occupied Without Payment of Rent		All Households	
	Households	row %	Households	row %	Households	row %	Households	%
Less than 2	356,491	79.8%	90,223	20.2%	-	0.0%	446,714	8.2%
2 - 4	525,163	77.4%	153,205	22.6%	-	0.0%	678,368	12.4%
5 - 9	620,631	94.3%	22,021	3.3%	15,598	2.4%	658,250	12.0%
10 - 19	1,034,832	88.0%	140,848	12.0%	-	0.0%	1,175,679	21.5%
20 or More	1,048,411	83.3%	173,837	13.8%	35,982	2.9%	1,258,230	23.0%
Don't Know	160,373	13.2%	1,033,310	85.3%	17,619	1.5%	1,211,302	22.2%
No Answer/NA	18,553	49.5%	18,900	50.5%	0	0.0%	37,453	0.7%
Column Totals	*3,764,453*	*69%*	*1,632,344*	*30%*	*69,199*	*1%*	*5,465,996*	*100.0%*

Table 3, below, indicates that newer heating equipment in New England was concentrated in non-poor households. While about 77% of all New England households were living above 150% of the federal poverty level in 2005, about 86% of the heating equipment under ten years old was operating in those households. Twenty-three percent of households were low-income, but only 14% of the newer heating equipment was operating in those households.

Table 3. Age of Heating Equipment in New England Households by 150% Poverty Status

Age of Heating Equipment (Years)	Household Income Above 150% Federal Poverty Guidelines		Household Income At or Below 150% Federal Poverty Guidelines		All Households	
	Households	row %	Households	row %	Households	%
Less than 2	361,447	80.9%	85,267	19.1%	446,714	8.2%
2 - 4	605,750	89.3%	72,618	10.7%	678,368	12.4%
5 - 9	562,831	85.5%	95,419	14.5%	658,250	12.0%
10 - 19	1,018,457	86.6%	157,223	13.4%	1,175,679	21.5%
20 or More	1,004,802	79.9%	253,428	20.1%	1,258,230	23.0%
Don't Know	676,642	55.9%	534,660	44.1%	1,211,302	22.2%
No Answer/NA	-	0.0%	37,453	100.0%	37,453	0.7%
Column Totals	*4,229,928*	*77%*	*1,236,068*	*23%*	*5,465,996*	*100%*

In summary, spilt incentives result in sub-optimal investment in efficient heating equipment and excessive usage of heating fuels. Renters and low-income households are particularly disadvantaged by this dynamic because they are forced to pay higher operating costs associated with older, inefficient heating equipment. Accordingly, Massachusetts has a unique and compelling interest in adopting a regulation that will substantially mitigate the effects of the split landlord-tenant incentives when heating equipment is replaced.

5. Massachusetts Has a Unique Set of Statutes and Policies Promoting Increased Energy Efficiency and Reductions in Greenhouse Gas Emissions.

Massachusetts has been regulating the efficiency of appliances sold in the state since 1986. 1986 Mass. Acts, Ch. 489, § 1. The amendment that imposed the 90% AFUE standard on

furnaces (subject to DOE approval of a waiver petition) was adopted in 2005. 2005 Mass. Acts, Ch. 139, amending M.G.L. c. 25B, § 5. Recently, Massachusetts has passed other laws, discussed herein, that require significant improvements in energy efficiency as well as major reductions in the emission of greenhouse gases. Moreover, as discussed more fully in Section III.B., below, Massachusetts also has a number of programs that broadly promote energy efficiency, including the efficiency of residential appliances such as furnaces. Few states in the country have this broad and deep a panoply of laws, policies and programs regarding energy efficiency, energy resource diversity and reliability, and the reduction of greenhouse gas emissions. Massachusetts thus has a unique and compelling interest in having its waiver Petition approved, in order to implement the laws, programs, policies and goals adopted by its Legislature and relevant state agencies.

In 2008, Massachusetts passed two major laws bearing on the issues of energy efficiency, energy resource diversity and reliability, and greenhouse gas emissions: the Green Communities Act ("GCA") and the Global Warming Solutions Act ("GWSA"). The GCA, Chapter 169 of the Acts of 2008, established a very ambitious goal for the state's energy efficiency programs that are funded by electric and gas utilities; those companies are required to meet their future resource needs "first . . . through all available energy efficiency and demand reduction resources that are cost effective or less expensive than supply." Ch. 169, § 11, amending M.G.L. c. 25, § 21A. Consistent with the legal mandates of the GCA, Massachusetts gas utilities have filed an ambitious "Statewide Three-year Gas Energy Efficiency Plan" ("Three-year Plan") that proposes to more than triple gas utility expenditures on energy efficiency from 2008 to 2012 and to significantly increase energy savings. Three-year Plan, at p. 10, "Total Gas Budgets 2008 –

2012."[33] The Three-Year Plan includes a "Residential High Efficiency Heating Program." *Id.*, p. 63. DOE approval of this waiver Petition will increase the likelihood that the utilities' ambitious goals will be met because the state regulation, if implemented, will require that any new furnaces installed meet or exceed a 90% AFUE standard.

Also in 2008, the Massachusetts Legislature passed the GWSA, Chapter 298 of the Acts of 2008, which requires that greenhouse gas emission limits be set by January, 2011, so that emissions in 2020 will be 10% to 25% lower than 1990 baseline emissions, and that emissions in 2050 will be 80% below the 1990 baseline level. Chapter 298 of the Acts of 2008, § 6, adding M.G.L. c. 21N, §§ 3, 4.

Massachusetts has a variety of other programs regarding energy efficiency, most of which are discussed below. It is worth noting that Massachusetts has been operating a low-income Weatherization Assistance Program ("WAP") for decades, using federal funds provided in accordance with 42 U.SC. §§ 6861 – 6873, and has also operated the Heating Emergency Assistance Retrofit Task Weatherization Assistance Program ("HEARTWAP") that replaces inoperative and highly inefficient heating systems, using a portion of the Low-Income Home Energy Assistance Funds ("LIHEAP") received by the state pursuant to 42 U.S.C. §§ 8621 – 8630.[34] The goals of the Massachusetts WAP and HEARTWAP are to increase the efficiency with which energy is consumed in low-income households so as to reduce unnecessary consumption and make the total energy bills more affordable. Massachusetts requires that when furnaces are replaced under WAP or HEARTWAP, the new furnace must have a rating of at

[33] Available at: http://www.ma-eeac.org/docs/090430-GasPlan.pdf.

[34] The FY 09 HEARTWAP program is described on page 9 of the State Plan that the state submitted to the federal Department of Health and Human Services as a condition of obtaining LIHEAP funding (available at: http://www.mass.gov/Ehed/docs/dhcd/cd/liheap/stplan.pdf).

least 90% AFUE, unless local conditions do not allow the installation of a condensing furnace.[35]

Because Massachusetts has a unique panoply of statutes, policies and programs regarding increased energy efficiency and decreased emissions of greenhouse gases, it has a compelling interest in having its waiver petition approved to ensure compliance with them.

B. The Costs, Benefits, Burdens and Reliability of the Savings from State Regulation are Preferable to the Costs and Benefits of Alternative Approaches to Increasing the Penetration of High Efficiency Furnaces.

A state seeking a waiver must show that it has "unusual and compelling" interests in having the waiver request granted, where those interests are defined:

> such that the costs, benefits, burdens, and reliability of energy or water savings resulting from the State regulation make such regulation preferable or necessary when measured against the costs, benefits, burdens and reliability of alternative approaches to energy or water savings or production, including reliance on reasonably predictable market-induced improvements in efficiency of all products subject to the State regulation.

42 U.S.C. § 6297(d)(1)(C)(ii).

DOER has completed the "Alternatives Analysis," Exhibit E, described above in Section I.A., to compare the costs, benefits, burdens and reliability of implementing the proposed 90% AFUE regulation to the costs, benefits, burdens and reliability of five alternative approaches to increasing the penetration of high-efficiency gas furnaces. These five alternatives include: a consumer rebate program, a low-income grant program, tax incentives, a consumer financing program, and a public information and customer education campaign. Alternatives Analysis, Exhibit E, at pp. 1, 3, 9-20. In the Introduction and Summary to the Alternatives Analysis, at p. 1-3, DOER makes the key point that Commonwealth regulation in the form of a more stringent

[35] Note that only a few hundred low-income households per year have their furnaces replaced by HEARTWAP. Alternatives Analysis, Table 12, at p. 17. Approval by DOE of the waiver request will have practical and particularly beneficial value for the several thousand low-income households who rent their space because, in the absence of a state regulation, the owners are likely to install a lower-cost, less-efficient furnace. See Optimal Report, Section II.E., at pp. 8 - 9.

90% AFUE standard is preferable to the alternatives available to the Commonwealth as the most feasible and cost-effective way to further increase market penetration of high efficiency furnaces. The Alternatives Analysis states, at p. 2:

> We have reached this conclusion supporting the Commonwealth's waiver Petition in part because there has already been high market penetration of high-efficiency furnaces in Massachusetts, which makes it difficult and less cost-effective for voluntary programmatic efforts to further influence market penetration. This existing high market penetration has resulted, among other reasons, from the Commonwealth's aggressive and comprehensive implementation of alternative non-regulatory approaches for acquiring energy savings from the installation of more efficient gas furnaces, but those approaches have largely reached their maximum benefit.

Moreover, the Alternatives Analysis emphasizes, at p. 2, the Commonwealth's position that it cannot "actually attain 95% penetration of high-efficiency NWGF through any of the five alternatives analyzed" because the Commonwealth has been operating most of those alternatives for years, and penetration has reached a "plateau which cannot be significantly improved upon through voluntary, non-regulatory approaches." The Optimal Report, at p. 15 & Figure 13, similarly concludes that penetration of high-efficiency NWGF has reached a plateau. Thus, any of the alternatives provide little "reliability" (42 U.S.C. § 6297(d)(1)(C)(iii)) in terms of achieving the Commonwealth's furnace efficiency goals, especially in comparison to a mandatory regulation.

As the Alternatives Analysis shows, the estimated cost to the Commonwealth of the regulatory approach is only $24,000.00 to adopt and implement its proposed 90% AFUE standard and achieve a 95% penetration rate for those high-efficiency furnaces. Alternatives Analysis, at pp. 3, 21-23. In stark contrast, the cost of achieving 95% penetration of 90% AFUE furnaces using any of the other alternatives ranges from just under $3 million (tax incentives) to almost $58 million (grant programs). Alternatives Analysis, at pp. 3, 21-23. Thus, it would cost 125 to 2,400 times as much for the Commonwealth to achieve 95% penetration of the high-

efficiency furnaces using any of the five alternatives included in the DOER study, compared to the simple and direct approach of allowing the Commonwealth to implement its proposed 90% AFUE standard -- assuming that any of the alternatives could in fact result in 95% penetration of high-efficiency NWGF. The Commonwealth maintains that none of the alternatives could so succeed. The robustness of the Alternatives Analysis easily demonstrates that the costs, benefits, burdens and reliability of state regulation are immensely more favorable than the costs and benefits of any of the five alternatives studied, and that the Commonwealth has met the requirements of 42 U.S.C. § 6297(d)(1)(C)(ii).

As noted above, the approach of allowing the state to implement its 90% AFUE regulation provides much more reliability in terms of the desired energy efficiency outcome. If the regulation is implemented, the Commonwealth can reliably depend on achieving approximately 95% penetration of the high-efficiency furnaces over time.[36] However, as the Alternative Analysis notes:

> The non-regulatory alternatives will always result in a penetration of less than 100%, due to the nature of technology diffusion . . . Thus, any realistic goal for the desired penetration through the use of an alternative will have to be at less than 100%.

Alternative Analysis, at p. 7. The Commonwealth is not aware of any non-regulatory alternative through which it could reliably expect to get to even 90% penetration of high-efficiency furnaces. Thus, all of the alternatives not only would impose significantly higher costs (as noted above, 125 to 2,400 times more expensive), they would also be less reliable in terms of achieving the desired efficiency outcome.

[36] The Commonwealth assumes less than 100% penetration because 90% AFUE condensing furnaces cannot be installed in a small number of locations, due to the inability to meet venting requirements. *See* 225 Mass. Code Regs. § 9.03(10(b)(authorizing DOER to adopt rules to exempt compliance at locations where local zoning, building or plumbing code requirements cannot be met).

Section 6297(d)(1)(C) of EPCA further requires:

> The factors described in clause (ii) [regarding costs and benefits of the state regulation and of alternatives] shall be evaluated with the context of the State's energy plan and forecast . . . .

The Commonwealth has submitted a "Massachusetts State Energy Plan" ("Energy Plan") and energy forecast (the "forecast") for its regulated gas companies as Exhibits B and C, respectively. Obtaining the requested waiver is entirely consistent with the Energy Plan and forecast. As the Energy Plan notes, the Commonwealth sees increased energy efficiency as "the best cost-containment tool we have to reduce energy use and greenhouse gas emissions that are causing global warming." Energy Plan, at p. 2.

Massachusetts not only sees itself as "a leader with respect to energy efficiency," but its Legislature has recently taken major steps to increase its long-standing focus on energy efficiency as a key tool in its energy toolbox. *Id.* During 2008, the Commonwealth adopted the GWSA, which sets strict greenhouse gas reduction goals, including reducing those emissions 80% below 1990 levels by 2050. Energy Plan, at p. 2. It also adopted the GCA, which, *inter alia*, will result in utilities in the state tripling their expenditures on energy efficiency between 2009 and 2012, in order to meet a requirement of obtaining all cost-effective energy efficiency. Energy Plan, at p. 3. The Energy Plan also demonstrates that the Commonwealth has already adopted a very broad range of programs to reduce energy consumption, including, *inter alia*:

- state appliance efficiency standards for appliances or products not already regulated by DOE;
- utility-funded energy efficiency programs that already expend over $125 million per year and that will increase that spending significantly under the GCA;

- incentives for the installation of combined heat and power facilities; and
- a recently-updated building energy efficiency code.

Moreover, the aggregated forecast for the state's regulated gas companies projects year-to-year increases in gas consumption through 2015, which reinforces the importance of adopting a 90% AFUE furnace standard that will help to dampen that projected growth.

C. The Proposed State Regulation Will Not Significantly Burden Manufacturing, Marketing, Distribution, or Sale or Servicing of Furnaces.

Section 327(d)(3), 42 U.S.C. § 6297(d)(3), provides that:

> [t]he Secretary may not prescribe a rule under this subsection if the Secretary finds (and publishes such finding) that **interested parties have established, by a preponderance of the evidence**, that such State regulation will **significantly burden** manufacturing, marketing, distribution, sale or servicing of the covered product **on a national basis**. . . .

[Emphasis added]. In determining whether to make such a finding, the Secretary is directed to consider "all relevant factors" including the extent to which there will be:

(1) any increase in manufacturing or distribution costs;

(2) any disadvantage to smaller manufacturers, distributors or dealers, or lessening of competition;

(3) any burden on manufacturers to redesign and produce the product covered by the State regulation; and

(4) the likelihood of waiver approval contributing significantly to a proliferation of State appliance efficiency requirements, and the cumulative impact any such requirements would have.

42 U.S.C. § 6297(d)(3)(A)-(D).

Clearly, the burden is on "interested parties" who oppose the waiver to establish "by a preponderance of the evidence" that the state regulation "will significantly burden manufacturing, marketing, distribution, sale or servicing of the covered product on a national

basis." 42 U.S.C. § 6297(d)(3). Not only does the statute so require, but DOE's ruling on the only waiver petition filed to date also clearly places the burden of proof on the "interested party" who seeks a determination that the state regulation will burden manufacturing, distribution, sale or servicing of the covered product.[37]

While the burden of proof regarding determinations under § 6297(d)(3) is thus squarely on the shoulders of those who seek such determinations, and not on the petitioners for a waiver, the Commonwealth has demonstrated that industry will in fact not be burdened. The Optimal Report demonstrates the following:

1. A high percentage of units shipped to Massachusetts already meet the 90% standard. Optimal Report, Section III, at pp. 10-21, and Figures therein. The NOPR suggests that DOE will favor a state which can demonstrate a high "saturation of homes with products that already meet those higher standards," as this would help demonstrate that the burden on manufacturers of meeting that standard would be minimal. 71 Fed. Reg. 59210, col. 1. The NOPR also notes that "a State seeking a waiver of federal preemption likely would want to demonstrate the extent to which manufacturers already produce and sell products that would meet the state's proposed standard" and "how efficiencies of shipments to that state already vary

[37] "Notice of Denial of a Petition for Waiver from Federal Preemption," 71 Fed. Reg. 78157 – 78168 (Dec. 28, 2006). In four instances, DOE squarely placed the burden of proof on industry and those opposed to the state regulation. *See* 71 Fed. Reg. 78165, col. 2 ("...AHAM has failed to demonstrate by a preponderance of the evidence . . ."); 71 Fed. Reg. 78166, co. 2 (". . . comments opposed to the California Petition did not adequately demonstrate . . ."); 71 Fed. Reg. 78166, col. 3 (". . . commenters opposed to the California Petition have not provided sufficient evidence or analysis . . ."); 71 Fed. Reg. 78167, col. 1 (". . . the interested parties opposed to the California Petition did not satisfy their burden . . .").

from current DOE efficiency levels," 71 Fed. Reg. 59210, col. 1, which the Optimal Report does. Optimal Report, Section III, at pp. 10-21, and Figures therein.

2. A survey of furnace installers in Massachusetts did not reveal the likelihood of any serious burdens on the installers, or the distributors that supply them. Optimal Report, at p. 23-24.

3. Based on a survey it completed, Optimal Energy concluded that there are no manufacturers of gas furnaces in the Commonwealth or adjacent states that would be adversely affected by the proposed standard. Optimal Report, p. 24.

4. From a consumer perspective, there are no desirable "features" of non-condensing furnaces compared to condensing furnaces. Optimal Report, at pp.10-12, 21. As the NOPR suggested, a state seeking a waiver "might seek to demonstrate . . . [that] high efficiency furnaces already have all of the characteristics and features available in less efficient furnaces sold in that state," 71 Fed. Reg. 59210, col. 3, and the Commonwealth has so demonstrated.

5. The standard that Massachusetts is proposing is identical to the standard that other states in New England have also adopted, so that approving the instant waiver is very unlikely to lead to a proliferation of state standards. *See* 71 Fed. Reg. 59210, col. 2 (". . . a State seeking a waiver from DOE may wish to seek to demonstrate, for example, the extent to which it has chosen identical standard levels as other States that have developed proposed regulations . . .").

IV. CONCLUSION

The Department of Energy should grant the Commonwealth's waiver petition to allow its 90% AFUE standard to take effect. In accordance with 42 U.S.C. § 6297(d)(1)(B), the Commonwealth "has established by a preponderance of the evidence that such state regulation is needed to meet unusual and compelling State or local energy or water interests." Therefore, the Secretary should prescribe the requested waiver rule.

Respectfully submitted,

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ATTACHMENT A

MASSACHUSETTS APPLIANCE EFFICIENCY STANDARDS ACT, M.G.L. c. 25B, §§ 1 - 10

and

225 C.M.R. 9.01 - 9.06

M.G.L. c. 25B, §§ 1 - 10

Chapter 25B: Section 1. Short title

This chapter shall be known and may be cited as the "Massachusetts Appliance Efficiency Standards Act".

Chapter 25B: Section 2. Definitions

As used in this chapter the following words shall, unless the context requires otherwise, have the following meanings:

"Ballast", a device used with an electric discharge lamp to obtain necessary circuit conditions (voltage, current and waveform) for starting and operating the lamp.

"Boiler", a space heater that is a self-contained appliance for supplying steam or hot water primarily intended for space heating. This term does not include hot water supply boilers.

"Central furnace", a self-contained space heater designed to supply heated air through ducts of more than 10 inches in length.

[Definition of "Commissioner" effective until July 2, 2008. For text effective July 2, 2008, see below.]

"Commissioner", the commissioner of the division of energy resources.

[Definition of "Commissioner" as amended by 2008, 169, Sec. 45 effective July 2, 2008. For text effective July 2, 2008, see above.]

"Commissioner", the commissioner of energy resources.

"Compensation", money or any other valuable thing, regardless of form, received or to be received by a person for services rendered.

"Electricity ratio (ER)" is the ratio of furnace electricity use to total furnace energy use. ER = (3.412*EAE)/(1000*EF + 3.412*EAE) where EAE and EF are defined in title 10 of the code of federal regulations.

"High-intensity discharge lamp", a lamp in which light is produced by the passage of an electric current through a vapor or gas and in which the light-producing arc is stabilized by bulb wall temperature and the arc tube has a bulb wall loading in excess of 3 watts per square centimeter.

"Fluorescent lamp ballast" or "fluorescent ballast", a device designed to operate fluorescent lamps by providing a starting voltage and current, and limiting the current during normal operation, but shall not include such devices that have a dimming capability or are intended for use in ambient temperatures of zero degrees fahrenheit or less or have a power factor of less than sixty one-hundredths for a single F40T12 lamp.

"Freezer", a cabinet designed as a unit for the storage of food at temperatures of approximately zero degrees fahrenheit, having the ability to freeze food and having a source of refrigeration requiring an energy input.

"F40T12 lamp", a tubular fluorescent lamp that is a nominal forty watt lamp with a forty-eight inch tube length and one and one-half inches in diameter.

"F96T12 lamp", a tubular fluorescent lamp that is a nominal seventy-five watt lamp with a ninety-six inch tube length and one and one-half inches in diameter.

"Lamp", an incandescent, reflector incandescent, tungsten halogen, or fluorescent type lamp.

"Luminaire", a complete lighting unit consisting of a fluorescent lamp or lamps, together with parts designed to distribute the light, to position and protect such lamps and to connect such lamps to the power supply.

"Medium voltage dry-type distribution transformer", a transformer that: (1) has an input voltage of more than 600 volts but less than or equal to 34,500 volts; (2) is air-cooled; (3) does not use oil as a coolant; and (4) is rated for operation at a frequency of 60 Hertz.

"Metal halide lamp", a high-intensity discharge lamp in which the major portion of the light is produced by radiation of metal halides and their products of dissociation, possibly in combination with metallic vapors.

"Metal halide lamp fixture", a light fixture designed to be operated with a metal halide lamp and a ballast for a metal halide lamp.

"New appliance", an appliance that is sold, offered for sale or installed for the first time and specifically includes floor models and demonstration units.

"Probe-start metal halide ballast", a ballast used to operate metal halide lamps which does not contain an igniter and which instead starts lamps by using a third starting electrode probe in the arc tube.

"Refrigerator", a cabinet with one exterior door designed for the refrigerated storage of food at temperatures above thirty-two degrees fahrenheit and having a source of refrigeration requiring an energy input; refrigerator may include a compartment for the freezing and storage of food at temperatures below thirty-two degrees fahrenheit but does not provide a separate low temperature compartment designed for the freezing and long

term storage of food at temperatures below eight degrees fahrenheit. A refrigerator may have interior doors on compartments.

"Refrigerator-freezer", a cabinet which consists of two or more compartments with at least one of the compartments designed for the refrigerated storage of foods at temperatures above thirty-two degrees fahrenheit and with at least one of the compartments designed for the freezing and storage of foods at temperatures of eight degrees fahrenheit or below. The source of refrigeration requires energy input.

"Residential furnace or boiler", a product which utilizes only single-phase electric current, or single-phase electric current or DC current in conjunction with natural gas, propane, or home heating oil, and which:-

(1) is designed to be the principle heating source for the living space of a residence;

(2) is not contained within the same cabinet with a central air conditioner with a rated cooling capacity exceeding 65,000 Btu per hour;

(3) is an electric central furnace, electric boiler, forced-air central furnace, gravity central furnace or low-pressure steam or hot water boiler; and

(4) has a heat input rate of less than 300,000 Btu per hour for electric boilers and low-pressure steam or hot water boilers, and less than 225,000 Btu per hour for forced-air central furnaces, gravity central furnace and electric central furnaces.

"Single-voltage external AC to DC power supply", a device that:

(1) is designed to convert line voltage AC input into lower voltage DC output;

(2) is able to convert to only one DC output voltage at a time;

(3) is sold with, or intended to be used with, a separate end-use product that constitutes the primary power load;

(4) is contained within a separate physical enclosure from the end-use product;

(5) is connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring;

(6) does not have batteries or battery packs, including those that are removable, that physically attach directly to the power supply unit;

(7) does not have a battery chemistry or type selector switch and indicator light, or does not have a battery chemistry or type selector switch and a state of charge meter; and

(8) has a nameplate output power less than or equal to 250 watts.

"State-regulated incandescent reflector lamp", a lamp, not colored or designed for rough or vibration service applications, with an inner reflective coating on the outer bulb to direct the light, an E26 medium screw base, a rated voltage or voltage range that lies at least partially within 115 to 130 volts and that falls into either of the following categories: a bulged reflector, elliptical reflector, blown parabolic aluminized reflector or similar bulb shape with a diameter equal to or greater than 2.25 inches; or a reflector, parabolic aluminized reflector, bulged reflector or similar bulb shape with a diameter of 2.25 to 2.75 inches, inclusive.

"State plumbing code", the uniform state plumbing code, amendments and rules and regulations thereto, as promulgated by the board of state examiners of plumbers and gas fitters under the provisions of section thirteen of chapter one hundred and forty-two.

"Transformer", a device consisting of 2 or more coils of insulated wire and that is designed to transfer alternating current by electromagnetic induction from 1 coil to another to change the original voltage or current value. This term does not include: (1) devices with multiple voltage taps, with the highest voltage tap equaling at least 20 per cent more than the lowest voltage tap; or (2) devices, such as those commonly known as drive transformers, rectifier transformers, auto-transformers, uninterruptible power system transformers, impedance transformers, regulating transformers, sealed and non-ventilating transformers, machine tool transformers, welding transformers, grounding transformers or testing transformers, that are designed to be used in a special-purpose application and are unlikely to be used in general-purpose applications.

"Water heater", an automatically controlled vessel designed primarily for heating and storing water to provide hot water service for domestic or sanitary purposes.

Chapter 25B: Section 3. Application of chapter

The provisions of this chapter shall apply to the testing, certification and enforcement of efficiency standards for lamps and the following types of new appliances sold, offered for sale or installed in the commonwealth:

(a) refrigerators, refrigerator-freezers and freezers which can be operated by alternating current electricity, excluding the following types: those designed to be used without doors; those which do not include a compressor and a condensor unit as an integral part of the cabinet assembly; refrigerators and refrigerator-freezers with total refrigerated volume exceeding thirty-nine cubic feet; top mounted refrigerator-freezers with total refrigerated volume less than sixteen and six-tenths cubic feet; and freezers with total refrigerated volume exceeding thirty cubic feet.

(b) storage type electric, gas and oil water heaters.

(c) fluorescent ballasts for F40T12 and F96T12 lamps.

(d) luminaires with fluorescent ballasts for F40T12 and F96T12 lamps.

(e) showerheads.

(f) medium voltage dry-type distribution transformers.

(g) metal halide lamp fixtures.

(h) residential furnaces or boilers.

(i) single-voltage external AC to DC power supplies.

(j) state-regulated incandescent reflector lamps.

The provisions of this chapter shall not apply to: new appliances or lamps manufactured in the commonwealth and sold outside the commonwealth; new appliances or lamps manufactured outside the commonwealth and sold at wholesale inside the commonwealth for final retail sale and installation outside the commonwealth; appliances or lamps installed in manufactured homes at the time of construction; or appliances or lamps designed expressly for installation and use in recreational vehicles.

Chapter 25B: Section 4. Restrictions on sale or installation

No new appliance covered by clauses (a) to (e), inclusive, of section 3 may be sold, offered for sale or installed in the commonwealth on or after January first, nineteen hundred and eighty-eight, unless the energy efficiency of the appliance meets or exceeds the standards established pursuant to this act.

No new lamp covered by clauses (a) to (e), inclusive, of section 3 shall be installed in the commonwealth in a building other than a residence on or after January first, nineteen hundred and ninety, unless the energy efficiency of the lamp meets or exceeds the standards established by the commissioner pursuant to this chapter. The commissioner may, through regulation, establish exemptions for certain lamps used for specified purposes.

Chapter 25B: Section 5. Establishment of energy efficiency standards; revision

The commissioner shall by regulation establish the level of energy efficiency standards for lamps, so that each lamp covered by said standard shall consume less power in watts per unit of light output in lumens than a maximum reference level to be established by the commissioner; provided, however, that said standards shall not become effective until January first, nineteen hundred and ninety. The commissioner may by regulation increase the level of the energy efficiency standards for lamps, fluorescent ballasts, luminaires and showerheads. Said commissioner may also by regulation increase the level of the energy

efficiency standards for refrigerators, refrigerator-freezers, freezers and water heaters, provided that said standards shall not become effective until January first, nineteen hundred and ninety. Any revision of such standards shall be based upon the determination by the commissioner that such efficiency levels are cost-effective to the users, as a group, of the covered appliance or lamp. Any standard revised pursuant to this section which conflicts with a corresponding standard in the state plumbing code shall take precedence over the standard in said code. Any standard revised pursuant to this section shall not take effect for at least one year after its adoption.

The commissioner, in consultation with the heads of other appropriate agencies, shall adopt regulations, in accordance with this chapter, establishing minimum energy efficiency standards for the types of new products set forth in clauses (f) to (s), inclusive, of section 3.

The regulations shall provide for the following minimum efficiency standards:

[Clause (1) of the third paragraph effective until December 18, 2007. For text effective December 18, 2007, see below.]

(1) Medium voltage dry-type distribution transformers shall meet minimum efficiency levels 3/10 of a percentage point higher than the Class 1 efficiency levels for medium voltage distribution transformers specified in Table 4-2 of the "Guide for Determining Energy Efficiency for Distribution Transformers" published by the National Electrical Manufacturers Association (NEMA Standard TP-1-2002).

[Clause (1) of the third paragraph as amended by 2007, 178 effective December 18, 2007. For text effective until December 18, 2007, see above.]

(1) New medium voltage dry-type distribution transformers, single voltage external AC to DC power supplies, and state-regulated incandescent reflector lamps manufactured on or after January 1, 2008, shall not be sold or offered for sale in the commonwealth unless the efficiency of the new product meets or exceeds the efficiency standards set forth in 225 CMR 9.03.

(2) Metal halide lamp fixtures designed to be operated with lamps rated greater than or equal to 150 watts but less than or equal to 500 watts shall not contain a probe-start metal halide ballast.

(3) Residential furnaces or boilers shall meet or exceed the following Annual Fuel Utilization Efficiency (AFUE):

Product Type	Minimum Efficiency Level
Gas and propane furnaces	90% AFUE
Oil furnaces	83% AFUE
Gas and propane hot water boilers	84% AFUE
Oil-fired hot water boilers	84% AFUE
Gas and propane steam boilers	82% AFUE
Oil-fired steam boilers	82% AFUE

The commissioner may adopt rules to exempt compliance with these furnace or boiler standards at any building, site or location where complying with said standards would be in conflict with any local zoning ordinance, building or plumbing code or other rule regarding installation and venting of boilers or furnaces.

Residential furnace air handlers shall have an ER of 2 per cent or less, except residential oil furnaces with a capacity of less than 94,000 Btu per hour shall have an ER of 2.3 per cent or less.

(4) Single-voltage external AC to DC power supplies shall meet the tier 1 energy efficiency requirements of California Code of Regulations, Title 20, Section 1605.3 as published in April 2005. This standard applies to single-voltage AC to DC power supplies that are sold individually and to those that are sold as a component of or in conjunction with another product.

(5) State-regulated incandescent reflector lamps shall meet the minimum average lamp efficiency requirements for federally-regulated incandescent reflector lamps contained in 42 U.S.C. section 6295 (i)(1)(A). The following lamps are exempt from these requirements: ER30, BR30, BR40 and ER40 of 50 watts or less; BR30, BR40 and ER40 of 65 watts; and R20 of 45 watts or less.

On or after January 1, 2008, no new medium voltage dry-type distribution transformer, single-voltage external AC to DC power supply or state-regulated incandescent reflector lamp may be sold or offered for sale in the state unless the efficiency of the new product meets or exceeds the efficiency standards set forth in the regulations adopted pursuant to this section. On or after January 1, 2009, no new metal halide lamp fixture may be sold or offered for sale in the commonwealth unless the efficiency of the product meets or exceeds the efficiency standards set forth in the regulations adopted pursuant to this section. In accordance with section 9, the commissioner, in consultation with the attorney general, shall determine if implementation of state standards for residential furnaces or boilers requires a waiver from federal preemption, and shall apply for such waivers if necessary. If the commissioner determines that a waiver from federal preemption is necessary for residential furnaces or boiler standards established by this section, the state standard shall go into effect at the earliest date permitted by federal law. If the commissioner determines that a waiver from federal preemption is not needed for

residential furnaces or boilers, then such state standards shall go into effect on June 1, 2008.

One year after the date upon which sale or offering for sale of certain products is limited pursuant to the preceding paragraph of this section, no new products may be installed for compensation in the state unless the efficiency of the new product meets or exceeds the efficiency standards set forth in the regulations adopted pursuant to this section.

Chapter 25B: Section 6. Testing procedures

The commissioner shall adopt procedures for testing the energy efficiency of the appliances and lamps covered by this chapter if such procedures are not provided for in any other applicable code regarding the testing of appliance efficiency. The commissioner shall use United States Department of Energy approved test methods, or in the absence of such test methods, other appropriate nationally recognized test methods applicable to the respective appliances and lamps. The manufacturer shall cause the testing of samples of each model of each appliance and lamp covered by this chapter in accordance with the test procedures adopted pursuant to this section or those specified in any other applicable code regarding the testing of appliance efficiency.

The commissioner may test products covered by section 3. If products so tested are found not to be in compliance with the minimum efficiency standards established under section 5, the commissioner shall: (1) charge the manufacturer of such product for the cost of product purchase and testing, and (2) provide information to the public on products found not to be in compliance with the standards.

In adopting test procedures for determining energy efficiency, the commissioner may consult with other appropriate department heads and may adopt updated test methods when new versions of test procedures become available.

Chapter 25B: Section 7. Certification of compliance; labeling products to connote compliance with efficiency requirements of chapter

Manufacturers of appliances and lamps covered by this chapter shall certify to the commissioner that such appliances and lamps are in compliance with the provisions of this chapter. The commissioner shall promulgate regulations governing the certification of appliances and lamps covered by this chapter and shall publish an annual list of such appliances and lamps. Manufacturers' certifications shall be based on test results. The commissioner shall coordinate with the certification programs of other states and federal agencies with similar standards to the maximum extent practicable, including investigating whether certification in another state can serve as a substitute for certification in the commonwealth. Single voltage external AC to DC power supplies shall be exempt from the requirements of this section.

Manufacturers of new products covered by section 3 shall identify each product offered for sale or installed in the state as in compliance with this chapter by means of a mark, label or tag on the product and packaging at the time of sale or installation. The commissioner shall promulgate regulations governing the identification of such products and packaging, which shall be coordinated to the greatest practical extent with the labeling programs of other states and federal agencies with equivalent efficiency standards. The commissioner shall allow the use of existing marks, labels or tags which connote compliance with the efficiency requirements of this chapter. State regulated incandescent reflector lamps and metal halide lamp fixtures shall be exempt from the requirements of this paragraph. The commissioner, in consultation with other states, product manufacturers and other interested parties, shall study and evaluate the usefulness and effectiveness of such markings for incandescent reflector lamps and metal halide lamp fixtures.

Chapter 25B: Section 8. Inspections of distributors or retailers; violations; penalties

The commissioner may cause periodic inspections to be made of distributors or retailers of new appliances in order to determine compliance with this chapter. The commissioner may also work with the chairman of the board of building regulations and standards to coordinate inspections for new products that are also covered by the state building code. The commissioner shall cause investigations to be made of complaints received concerning violations of this chapter and shall report the results of such investigations to the attorney general. The attorney general may institute proceedings to enforce the provisions of this chapter.

Failure to comply with any of the provisions of this chapter shall constitute an unfair or deceptive act under the provisions of chapter ninety-three A. Any person who violates any provision of this chapter shall be punished by a civil penalty of not more than two hundred and fifty dollars or as provided in chapter ninety-three A, whichever is greater. Each violation of this chapter shall constitute a separate offense, and each day such violation continues shall constitute a separate offense.

Chapter 25B: Section 9. Superseding federal statutes, etc.; duties of commissioner

If the commissioner determines that a federal statute, rule or determination would supersede any requirement of this act, or if the commissioner is notified by the United States Department of Energy that a petition has been filed to supersede any requirement of this act, the commissioner shall determine (a) whether there is a substantial state or local need which is sufficient to justify the state requirement at issue, (b) whether the state requirement at issue does not unduly burden interstate commerce, and (c) whether the state requirement at issue contains a more stringent energy efficiency standard than a corresponding federal standard. If the commissioner determines that these criteria are met, the commissioner shall promptly petition the United States Department of Energy requesting a ruling that the state requirement at issue not be superseded, or shall promptly

file with the United States Department of Energy a request that the petition to supersede be denied.

Chapter 25B: Section 10. Study and evaluation of effectiveness of energy efficiency; report and recommendations on efficiency standards; regulations

The commissioner shall study and evaluate the effectiveness of energy efficiency in the commonwealth as well recommend new or increased efficiency standards. Such study and evaluation shall be conducted in consultation with interested parties. The commissioner shall file a report with the clerk of the house of representatives on or before September 1 of the year before each new legislative session, describing the timing, scope and findings of this study, and shall recommend to the general court new or increased efficiency standards, if these standards would serve to promote conservation in the commonwealth and would be cost-effective for the users, as a group, of the covered appliance. The clerk shall forward such report to the joint committee on telecommunications, utilities and energy of the general court.

The commissioner may adopt such further regulations as necessary to ensure the proper implementation and enforcement of this chapter.

225 C.M.R. 9.01 - 9.06

9.00: APPLIANCE ENERGY-EFFICIENCY STANDARDS, TESTING AND CERTIFICATION PROGRAM

Section
9.01: Statutory Authorization
9.02: Definitions
9.03: Product Standards and Test Methods
9.04: Certification
9.05: Identification of Complying Appliances and Lamps
9.06: Enforcement

9.01: Statutory Authorization

M.G.L. c. 25B, §§ 5 through 10 require the Commissioner of Energy Resources to adopt procedures for testing the energy efficiency of appliances and lamps covered by 225 CMR 9.00 if such procedures are not covered by the state plumbing code, and to certify those in compliance with 225 CMR 9.00.

9.02: Definitions

Terms defined in 42 U.S.C. s. 6291 and M.G.L. c. 25B, s.2, which are also used in 225 CMR 9.00, shall have the same meaning as set forth in 42 U.S.C. s. 6291 and M.G.L c. 25B, s.2, unless said term is otherwise defined in 225 CMR 9.02.

"ANSI," the American National Standards Institute.

"Automatic Defrost," a defrost system in which the defrosting action for all refrigerated surfaces is initiated and terminated automatically.

"Ballast Factor," the ratio of the relative light output of a ballast expressed as a per cent to the rate of energy consumption expressed in watts at the test conditions specified in M.G.L. c. 25B, s. 6.

"Boiler," a space heater that is a self-contained appliance for supplying steam or hot water primarily intended for space heating. This term does not include hot water supply boilers.

"Central furnace," a self-contained space heater designed to supply heated air through ducts of more than 10 inches in length.

"Chest Freezer," a freezer whose access door is at the top of the appliance.

"Ballast," a device used with an electric discharge lamp to obtain necessary circuit conditions (voltage, current and waveform) for starting and operating the lamp.

"Compensation," money or any other valuable thing, regardless of form, received or to be received by a person for services rendered.

"Electricity ratio (ER)" is the ratio of furnace electricity use to total furnace energy use. ER = (3.412*EAE)/(1000*EF + 3.412*EAE) where EAE and EF are defined in title 10 of the code of federal regulations.

"Energy Use" shall mean the quantity of energy directly consumed by a consumer product at point of use, determined in accordance with test procedures under 42 U.S.C. s.6293.

"Energy Efficiency" shall mean the ratio of the useful output of services from a consumer product to the energy use of such product, determined in accordance with test procedures under 42 U.S.C. s. 6293.

"Energy Conservation standard" shall mean a performance standard which prescribes a minimum level of energy efficiency or a maximum quantity of energy use, or in the case of showerheads, faucets, water closets, and urinals, water use, for a covered product determined in accordance with tests procedures prescribed under 42 U.S.C. s. 6293.

"High-intensity discharge lamp", a lamp in which light is produced by the passage of an electric current through a vapor or gas and in which the light-producing arc is stabilized by bulb wall temperature and the arc tube has a bulb wall loading in excess of 3 watts per square centimeter.

"Manual Defrost," a defrost system in which the defrosting action for all refrigerated surfaces is initiated manually.

"Medium voltage dry-type distribution transformer," a transformer that: (1) has an input voltage of more than 600 volts but less than or equal to 34,500 volts; (2) is air-cooled; (3) does not use oil as a coolant; and (4) is rated for operation at a frequency of 60 Hertz.

"Metal halide lamp," a high-intensity discharge lamp in which the major portion of the light is produced by radiation of metal halides and their products of dissociation, possibly in combination with metallic vapors.

"Metal halide lamp fixture," a light fixture designed to be operated with a metal halide lamp and a ballast for a metal halide lamp.

"Model," all units of a given type of covered product (or class thereof) manufactured by one manufacturer which do not have any differing electrical, physical or functional characteristics that affect energy consumption and :(a) with respect to refrigerators, refrigerator-freezers and freezers, have the same primary energy source, have electrical characteristics that are essentially identical, and do not have any differing physical or functional characteristics that affect energy consumption; (b) with respect to water heaters, have the same primary energy source and, with the exception of immersed heating elements, do not have any differing electrical, physical, or functional characteristics that affect energy consumption.

"Nominal Input Voltage," an input voltage within plus 5% or minus 5% of a specified value.

"Nominal Lamp Watts," the wattage at which a lamp is designed to operate and for which it is therefore rated.

"Partial Automatic Defrost," a defrost system in which the defrosting action for the refrigerated surfaces in the refrigerator compartment is initiated and terminated automatically and the defrosting action for the refrigerated surfaces in the freezer is initiated manually.

"Probe-start metal halide ballast," a ballast used to operate metal halide lamps which does not contain an igniter and which instead starts lamps by using a third starting electrode probe in the arc tube.

"Relative Light Output," the test ballast light output divided by a reference ballast light output using the same reference lamp and expressing the value as a percent. These measurements are made at the ballast's rated primary voltage.

"Residential furnace or boiler," a product which utilizes only single-phase electric current, or single-phase electric current or DC current in conjunction with natural gas, propane, or home heating oil, and which:-

(1) is designed to be the principle heating source for the living space of a residence;

(2) is not contained within the same cabinet with a central air conditioner with a rated cooling capacity exceeding 65,000 Btu per hour;

(3) is an electric central furnace, electric boiler, forced-air central furnace, gravity central furnace or low-pressure steam or hot water boiler; and

(4) has a heat input rate of less than 300,000 Btu per hour for electric boilers and low-pressure steam or hot water boilers, and less than 225,000 Btu per hour for forced-air central furnaces, gravity central furnace and electric central furnaces.

"Single-voltage external AC to DC power supply," a device that:

(1) is designed to convert line voltage AC input into lower voltage DC output;

(2) is able to convert to only one DC output voltage at a time;

(3) is sold with, or intended to be used with, a separate end-use product that constitutes the primary power load;

(4) is contained within a separate physical enclosure from the end-use product;

(5) is connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord or other wiring;

(6) does not have batteries or battery packs, including those that are removable, that physically attach directly to the power supply unit;

(7) does not have a battery chemistry or type selector switch and indicator light, or does not have a battery chemistry or type selector switch and a state of charge meter; and

(8) has a nameplate output power less than or equal to 250 watts.

"State-regulated incandescent reflector lamp," a lamp, not colored or designed for rough or vibration service applications, with an inner reflective coating on the outer bulb to direct the light, an E26 medium screw base, a rated voltage or voltage range that lies at least partially within 115 to 130 volts and that falls into either of the following categories: a bulged reflector, elliptical reflector, blown parabolic aluminized reflector or similar bulb shape with a diameter equal to or greater than 2.25 inches; or a reflector, parabolic aluminized reflector, bulged reflector or similar bulb shape with a diameter of 2.25 to 2.75 inches, inclusive.

"Transformer," a device consisting of 2 or more coils of insulated wire and that is designed to transfer alternating current by electromagnetic induction from 1 coil to another to change the original voltage or current value. This term does not include: (1) devices with multiple voltage taps, with the highest voltage tap equaling at least 20 per cent more than the lowest voltage tap; or (2) devices, such as those commonly known as drive transformers, rectifier transformers, auto-transformers, uninterruptible power system transformers, impedance transformers, regulating transformers, sealed and non-ventilating transformers, machine tool transformers, welding transformers, grounding transformers or testing transformers, that are designed to be used in a special-purpose application and are unlikely to be used in general-purpose applications.

"Upright Freezer," a freezer whose access door is at the front of the appliance.

9.03:Product Standards and Test Methods

(1) Product standards and test methods shall be as indicated below for those appliances and lamps expressly addressed by the Commonwealth in 225 CMR 9.03. Those product standards and test methods not otherwise explicitly mandated by the Commonwealth shall be prescribed under 42 U.S.C. s. 6295 and 10 C.F.R s. 430 as of January 1, 2006 and shall be the minimum standards and methods to be used until such time as more stringent standards are enacted by the Commonwealth or Federal government and shall become a part of Appliance Testing and Certification Program guidelines issued from time to time by DOER.

(2) The manufacturer shall cause the testing of all new appliances and lamps to be sold for final retail sale in Massachusetts on or after January 1, 1988 as prescribed below.

(3) Refrigerators. Refrigerator Freezers and Freezers.

(a) The annual energy consumption of a refrigerator, refrigerator-freezer or freezer (excluding the following types: those designed to be used without doors; those which do not include a compressor and a condenser unit as an integral part of the cabinet assembly; refrigerator and refrigerator-freezers with total refrigerated volume exceeding 30 cubic

feet; top-mounted refrigerator-freezers with total refrigerated volume less than 16.6 cubic feet; and freezers with total refrigerated volume exceeding 30 cubic feet) shall not exceed the values derived from the formulas in 42 U.S.C. s. 6295.

(b) Fresh food refrigerated volume, freezer refrigerated volume, total refrigerated volume, energy consumption and energy factor shall be determined using the test procedures for refrigerators and freezers in 10 CFR s. 430.22 and s. 430.23 (2006), or as subsequently amended.

(c) When a refrigerator, refrigerator-freezer or freezer can be operated using either alternating current electricity or one or more other sources of primary power, the test shall be performed using alternating current electricity only.

(4) Water Heaters.

(a) The energy efficiency of all new electric, gas or oil water heaters shall meet or exceed the energy factor specified in 42 U.S.C. s. 6295(e).

(b) The manufacturer shall cause the testing of samples of each model of oil, gas, or electric water heater, to be sold for final retail sale in Massachusetts on or after January 1, 1988, in accordance with test procedures in 10 C.F.R. s. 430.23(e) and 10 C.F.R. s. 430-B, app E.

(5) Showerheads.

(a) The maximum flow rate for all new showerheads shall not exceed the values specified in 42 U.S.C. s. 6295 (j).

(b) The manufacturer shall cause the testing of samples of each model of showerhead by a laboratory approved by the Commissioner. The method of testing shall be the federal standard pursuant to 42 U.S.C. s. 6295 (i) and the laboratory shall complete and submit a Laboratory Certification form available from the Commissioner.

(6) Fluorescent Ballasts. The product standard for fluorescent ballasts shall be the federal standard prescribed under 42 U.S.C. s. 6295 g(5).

(7) General service fluorescent lamps and incandescent reflector lamps. The product standards for general service fluorescent lamps and incandescent reflector lamps shall meet or exceed the lamp efficacy and CHI standards specified in 42 U.S.C. s. 6295(i).

(8) medium voltage dry-type distribution transformers.

(a) Medium voltage dry-type transformers shall have efficiencies not less than the applicable values in the following table when tested at 50 percent of the rated output power and at 75 degrees C. (Following table copies Table 4-2 of NEMA standard TP 1-2002, but adds 3/10 point for each value per the Massachusetts law. The NEMA standard is available on their website at www.nema.org)

Single Phase			Three phase		
Rated power output in kVa	Minimum efficiency %		Rated power output in kVa	Minimum efficiency %	
	≤60 kV BIL	>60 kV BIL		≤60 kV BIL	>60 kV BIL
≥ 15 <25	97.9	97.9	≥ 15<30	97.1	97.1
≥ 25<37.5	98.2	98.2	≥ 30<45	97.6	97.6
≥ 37.5 <50	98.4	98.4	≥ 45<75	97.9	97.9
≥ 50<75	98.5	98.5	≥ 75<112.5	98.2	98.2
≥ 75<100	98.7	98.7	≥ 112.5<150	98.4	98.4
≥ 100<167	98.8	98.8	≥ 150 <225	98.5	98.5
≥ 167<250	99.1	99.0	≥ 225 <300	98.7	98.7
≥ 250<333	99.2	99.1	≥ 300 <500	98.9	98.8
≥ 333<500	99.3	99.2	≥ 500 <750	99.1	99.0
≥ 500<667	99.4	99.3	≥ 750 <1000	99.2	99.1
≥ 667 <833	99.5	99.3	≥ 1000 <1500	99.3	99.2
833	99.5	99.4	≥ 1500 <2000	99.4	99.3
			≥ 2000 <2500	99.5	99.3
			2500	99.5	99.4

kVa = kilovolt amperes
kV = kilovolts
BIL = basic impulse insulation level

(b) The manufacturer shall cause the testing of samples of medium-voltage dry-type distribution transformers to be sold for final retail sale in Massachusetts on or after January 1, 2008 in accordance with the National Electrical Manufacturers Association (NEMA) standard TP2-2005, "Standard Test Method for Measuring the Energy Consumption of Distribution Transformers." This test method is available from NEMA at www.nema.org.

(9) metal halide lamp fixtures.

(a) Metal halide lamp fixtures designed to be operated with lamps rated greater than or equal to 150 watts but less than or equal to 500 watts shall not contain a probe-start metal halide ballast.

(10) residential furnaces or boilers.

(a) Residential furnaces or boilers shall meet or exceed the following Annual Fuel Utilization Efficiency (AFUE):

Product Type	Minimum Efficiency Level
Gas and propane furnaces	*90% AFUE
Oil furnaces	*83% AFUE
Gas and propane hot water boilers	*84% AFUE
Oil-fired hot water boilers	*84% AFUE
Gas and propane steam boilers	*82% AFUE
Oil-fired steam boilers	*82% AFUE

b) The commissioner may adopt rules to exempt compliance with these furnace or boiler standards at any building, site or location where complying with said standards would be in conflict with any local zoning ordinance, building or plumbing code or other rule regarding installation and venting of boilers or furnaces.

(c) Residential furnace air handlers shall have an ER of 2 per cent or less, except residential oil furnaces with a capacity of less than 94,000 Btu per hour shall have an ER of 2.3 per cent or less.

(d) The manufacturer shall cause the testing of samples of each model of residential furnaces and boilers to be sold for final retail sale in Massachusetts in accordance with the federal test method contained in Appendix N to subpart B of part 430, title 10, of the code of Federal Regulations (CFR). The test method includes the testing methods required for both elements of Massachusetts standards (i.e. minimum AFUE standards and maximum electricity ratio standard.)

(11) single-voltage external AC to DC power supplies.

(a) Single-voltage external AC to DC power supplies shall meet the requirements in the following table copied from table U-1 of the April 2005 version of California's Title 20:

Nameplate output	Minimum Efficiency in Active Mode
< 1 watt	0.49 * Nameplate Output
> 1 watt and < or = 49 watts	0.09*Ln(Nameplate Output) + 0.49
> 49 watts	0.84
	Maximum Energy Consumption in No-Load Mode
< 10 watts	0.5 watts
> or = 10 watts and < or = 250 watts	0.75 watts
Where Ln (Nameplate Output) = Natural Logarithm of the nameplate output expressed in Watts	

(b) The manufacturer shall cause the testing of samples of each model of single-voltage external AC to DC power supplies to be sold for final retail sale in Massachusetts on or after January 1, 2008 in accordance with the test methodology specified in the United States Environmental Protection Agency's "Energy Star program Requirements for Single Voltage External AC-DC and AC-AC Power Supplies" as in effect on January 1, 2005 except that products do not have to be tested at 230 volts. This document is available from the U.S. EPA. Manufacturers can access this document at http://www.energystar.gov/indes.cfm?c=product_specs.pt_product_specs . Manufacturers can also review the underlying testing methodology, "Test Method for Calculating the Energy Efficiency of single-Voltage External AC-DC and AC-AC Power Supplies (august 11, 2004)" at http://www.energystar.gov/index.cfm?c=ext_power_supplies.power_supplies_consumers.

(12) state-regulated incandescent reflector lamps.

(a) State-regulated incandescent reflector lamps shall meet the minimum efficacies in the following table:

Nominal Lamp Wattage	Minimum average lamp efficacy (lumens per watt)
40 - 50	10.5
51 - 66	11.0
67 - 85	12.5
86 - 115	14.0
116 - 155	14.5
156 - 205	15.0

The following types of incandescent reflector lamps are exempt from these requirements:
(I)lamps rated at 50 watts or less of the following types: BR30, ER30, BR40, and ER40;
(II)lamps rated at 65 watts of the following types: BR30, BR40, and ER40; and
(III)R20 lamps of 45 watts or less.

(b) The manufacturer shall cause the testing of each model of state-regulated incandescent reflector lamps to be sold for final retail sale in Massachusetts on or after January 1, 2008 in accordance with the federal test method found in Appendix R to subpart B of part 430, Title 10, of the Code of Federal Regulations.

9.04:Certification

(1) No new appliance or lamp covered by M.G.L. c. 25B, §3 may be sold, offered for sale or installed in Massachusetts after the dates designated for the respective products in M.G.L. c.25B, §5 which is not certified pursuant to paragraph (2) of this section.

(2) The manufacturer shall submit to the Commissioner or to another state or third-party as designated by the Commissioner in guidelines a certification statement listing all new appliance models and lamps covered by 225 CMR 9.00. The certification statement requirements shall be set forth in the guidelines.

(3) On or after January 1, 2008, no new medium voltage dry-type distribution transformer, single-voltage external AC to DC power supply or state-regulated incandescent reflector lamp may be sold or offered for sale in the state unless the efficiency of the new product meets or exceeds the efficiency standards set forth in 225 CMR 9.03.

(4) On or after January 1, 2009, no new metal halide lamp fixture may be sold or offered for sale in the commonwealth unless the efficiency of the product meets or exceeds the efficiency standards set forth in 225 CMR 9.03.

(5) In accordance with M.G.L. c.25B, §9, the commissioner, in consultation with the attorney general, shall determine if implementation of state standards for residential furnaces or boilers requires a waiver from federal preemption, and shall apply for such waivers if necessary. If the commissioner determines that a waiver from federal preemption is necessary for residential furnaces or boiler

standards established by this section, the state standard shall go into effect at the earliest date permitted by federal law. If the commissioner determines that a waiver from federal preemption is not needed for residential furnaces or boilers, then such state standards shall go into effect on June 1, 2008.

(6) One year after the date upon which the sale or offering for sale of certain products is limited pursuant to the preceding clauses of 225 CMR 9.04, no new products may be installed for compensation in the state unless the efficiency of the new product meets or exceeds the efficiency standards set forth in 225 CMR 9.03 adopted pursuant to M.G.L. c.25B, §5.

(7) The commissioner may test products covered by M.G.L. c.25B, §3. If products so tested are found not to be in compliance with the minimum efficiency standards established under M.G.L. c.25B, §5, the commissioner shall: (1) charge the manufacturer of such product for the cost of product purchase and testing, and (2) provide information to the public on products found not to be in compliance with the standards.

(8) In adopting test procedures for determining energy efficiency, the commissioner may consult with other appropriate department heads and may adopt updated test methods when new versions of test procedures become available.

9.05:Identification of Complying Appliances and Lamps

(1) Sufficient information shall be shown on the outside of the shipping carton or packaging and on the product or product nameplate for any appliance or lamp (and unit carton in the case of plumbing fittings) to permit the determination of whether the appliance or lamp complies with the requirements of 225 CMR 9.00. The appropriate measure of energy consumption or the model number as it has been certified may be used for this purpose and shall be deemed as providing sufficient information to determine compliance.

Additionally, for medium-voltage dry-type transformers and residential furnaces and boilers, the label information to be shown shall be marked with the words "Meets MA efficiency standards", using the two-letter identification for Massachusetts: MA.

Additionally, for external power supplies, the label information to be shown shall employ the labeling regime as that described in the regulations of the State of California Energy Commission for appliance standards in Section 1607(9)of the California Code of Regulations, Title 20, as in effect on January 1, 2006 [Cal. Code Regs. tit. 20, § 1607(9) (2006)].

Additionally, the words "2.5 gpm max", the actual tested flow rate, or other conspicuous marking approved by the Commissioner, shall be marked on each showerhead sold or offered for sale, either by means of a permanent marking on the fitting or on a label attached to the fitting and also upon the unit carton in which the fitting is offered for retail sale.

(2) The Commissioner or his/her designee may require additional information if necessary to permit determination of compliance.

(3) The manufacturer's name or brand name shall appear on each appliance or lamp.

9.06:Enforcement

(1) Notwithstanding the provisions of 225 CMR 9.04, the Commissioner shall have authority to challenge the efficiency test results provided by the manufacturer and cause the appliance model or lamp to be retested.

(2) The Commissioner may cause periodic inspections to be made of manufacturers, distributors or retailers of the new appliances covered by M.G.L. c. 25B, including appliances that have been or are to be installed by contractors or builders at building sites, in order to determine compliance with 225 CMR 9.00.

(3) Except as expressly provided in the guidelines, any test ordered by the Commissioner would involve one unit selected by the Commissioner or his/her designee. (a) If the performance of the unit meets or exceeds the standard set forth in 225 CMR 9.00, no further action is necessary, and the Division of Energy Resources will pay the cost of testing.

(b) If the performance of the unit does not meet or exceed the standard set forth in 225 CMR 9.00, the manufacturer must pay the cost of testing and, if the certification for that model has been suspended, take whatever steps are necessary to recertify the appliance at an efficiency rating equal to or exceeding the applicable standard according to the process outlined in the guidelines.

(4) The Commissioner shall cause investigations to be made of complaints received concerning violations of M.G.L. c. 25B. all such complaints shall identify the complainant by name and address and should be in writing. The results of each investigation shall be reported to the complainant and to the attorney general.

REGULATORY AUTHORITY

225 CMR 9.00: M.G.L. c.25B, §§ 3 – 10; St. 1986, c. 489; St.2005, c.139.

The following text is effective 06/01/06

ATTACHMENT B

THE COMMONWEALTH'S ENERGY PLAN

COMMONWEALTH OF MASSACHUSETTS
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Commonwealth of Massachusetts
Department of Energy Resources

Massachusetts State Energy Plan

Prepared in connection with a waiver petition submitted under 42 USC § 6297 to allow Massachusetts to implement a 90% Annual Fuel Utilization Efficiency standard for residential furnaces

September 30, 2009

I. Introduction and Goals

Urgency is growing across the nation as the impacts of global warming on our economy, health, agriculture, and environment become certain. Greenhouse gas emissions associated with our buildings, transportation, and energy generation are causing our climate to change. Simultaneously, uncertain supplies and prices of fuels threaten our national and economic security, requiring more than ever that the U.S. achieve energy independence.

While the energy and climate challenges we face as a state and a nation appear daunting, we have many tools and programs which, when fully deployed, will enable substantial progress. Here in Massachusetts we are well positioned to mobilize solutions for these challenges and unleash our fullest potential.

One solution with high impact is energy efficiency. Massachusetts' historically high cost of energy and our innovative people have combined to establish us as a leader in energy efficiency, the best cost-containment tool we have to reduce energy use and greenhouse gas emissions that are causing global warming. Efficiency is a proven, reliable, and extremely valuable tool for building a greener energy future. It is also a tool that we can quickly deploy to reinvest in our homes and businesses and, in the longer term, put Massachusetts at the hub of a 21st century global clean energy economy.

Massachusetts has long been a leader with respect to energy efficiency. Since 1997, both the electric and gas investor-owned utilities have been required to provide energy efficiency programs to their customers. Due to those programs, today, approximately 8% of the Commonwealth's electricity needs are met through efficiency. The Commonwealth's appliance standards legislation, M.G.L.c. 25B, enacted in 1986 and expanded in 2005, sets stringent efficiency standards for certain appliances and equipment, driving industry to develop more and more efficient products that use less energy and create less greenhouse gas emissions. Building codes set high standards for building energy performance. More recently, in 2008, the state enacted several pieces of legislation that, collectively, strengthen the foundation on which Massachusetts' energy future is based. These laws, summarized in Appendix A, set goals for statewide reductions in greenhouse gas ("GHG") emissions and energy use; require establishment of a carbon cap and trade program to reduce carbon dioxide emissions from all sources; make significant new commitments to electric and natural gas energy efficiency programs, renewables, and other alternative energy sources; and commit the Commonwealth to developing a strong clean energy sector and training residents for high quality green jobs.

The Global Warming Solutions Act ("GWSA"), 2008 Mass. Acts Ch. 298, sets the stage for a dramatic reduction in greenhouse gas emissions in the Commonwealth. GHG emission reduction goals set forth in the GWSA include:

- By 2050, adoption of a GHG statewide emissions limit that is at least 80% below 1990 GHG emission levels.
- Adoption of interim GHG emissions limits for 2020, 2030, and 2040. 2020 limits must be between 10 and 25% below 1990 GHG levels.

Energy use goals set forth in the Green Communities Act ("GCA"), 2008 Mass. Acts Ch. 169, include:

- Reduce fossil fuel use in buildings by 10% from 2007 levels through the increased efficiency of both equipment (e.g. appliances) and the building envelope;
- Meet at least 25% of the Commonwealth's electric load, including both capacity and energy, with demand side resources including: energy efficiency, load management, demand response and generation that is located behind a customer's meter including combined heat and power;
- Meet at least 20% of the Commonwealth's electric load through new, renewable, and alternative energy generation.

This Energy Plan describes a set of programs, policies, and strategies designed to meet the Commonwealth's energy and environmental goals. This Plan, set forth by the Massachusetts Department of Energy Resources ("DOER") within the Executive Office of Energy & Environmental Affairs, has been developed specifically for the accompanying waiver application, submitted pursuant to 42 USC § 6297, to allow Massachusetts to implement a 90% Annual Fuel Utilization Efficiency standard for residential furnaces. This Plan is meant to be flexible, iterative, and responsive to changing economic and energy-related conditions and technology. To that end, it should be read as a roadmap for today, with the understanding that it may change, as circumstances change, to better achieve its goals. In addition, there is no "magic bullet" in the Plan. Each of the programs, policies, and strategies described is critical in terms of Massachusetts' ability to reach its greenhouse gas emission and energy use reduction goals.

II. Programs, Policies, and Strategies to Achieve Energy Goals

This section describes various efficiency programs, policies, and strategies underway in Massachusetts to reduce energy use and GHG emissions.

Energy Efficiency

Federal and State Appliance/Product Standards

Appliance and product standards set the bar for minimum energy efficiency of products, and are one of the most effective tools for reducing energy use and GHG emissions. Most such standards are set by the federal government, and states are only allowed to set standards on those products which are not federally regulated, or for which they have received from the U.S. Department of Energy ("DOE") a waiver of federal preemption.

The Commonwealth's original appliance standards legislation was enacted in 1986. In November, 2005, these standards were expanded to cover additional appliances and equipment, including a standard for gas furnaces that is more stringent than the federal standard. Massachusetts may not implement this standard until it either receives a waiver of federal preemption from DOE, or DOE issues a new rule implementing a like standard. In addition, Massachusetts supports the development and use of more efficient appliances and products

through DOER's involvement in energy efficiency programs offered by Massachusetts utilities, which include financial incentives for people to buy and install EnergyStar products and appliances, as well as other highly efficient products/appliances.

Utility-Administered Energy Efficiency Programs

Under the 1997 electricity restructuring law, 1997 Mass. Acts Ch. 164, a "systems benefit charge" was added to electricity bills, yielding about $125 million annually in recent years. These funds are used for industrial, commercial, residential, and low-income efficiency programs. There is no such charge on natural gas bills, but gas utilities also have consumer-oriented efficiency programs (historically funded at lower levels in relation to total revenues than for electricity). In addition, because it is recognized that much of the efficiency potential for residences is in space heating, the electric utilities have provided some funding for homes that use fuel oil for heating. For all three of the energy sources, these funds pay for a range of energy efficiency services, including: energy audits to identify energy efficiency opportunities, contractors to install energy efficiency measures, financial incentives to install efficiency measures and appliances, and information about energy use and carbon footprint. Our analyses indicate that the cumulative impact of these investments has reduced the Commonwealth's annual electricity use by approximately 8%.

All Cost-Effective Energy Efficiency (Expanded Efficiency Programs)

Historically, the utility-run efficiency programs have been limited by the amount of funding provided by the systems benefit charge for electric utilities and rate case settlements for gas utilities. The GCA greatly expands the opportunities for savings from utility-run efficiency programs by: (a) providing the utilities with additional funds, i.e., at least 80% of funds generated through the Regional Greenhouse Gas Initiative ("RGGI") GHG "cap and trade" program auctions are dedicated to efficiency programs (see below for a more detailed description of RGGI); (b) mandating that utilities invest in all efficiency and demand-side resources that are cost-effective, which is defined as costing less per unit of energy saved than supplying more electricity or natural gas (for example, energy efficiency programs currently cost about 3-4 cents per kilowatt-hour compared with electricity supply costing 8-10 cents per kilowatt-hour). This mandate is expected to result in at least a tripling of utility driven efficiency over the next few years. In addition, the GCA provides for greater oversight of utility energy efficiency plans and programs. In the past, utilities have developed their plans in consultation with DOER and have been required to obtain a determination from the Massachusetts Department of Public Utilities ("MDPU") that the programs were cost-effective. The GCA creates an Energy Efficiency Advisory Council, which is chaired by DOER and includes a variety of stakeholders. It is required to oversee and approve each utility's energy efficiency plan to ensure that the GCA mandate to provide all cost-effective demand side resources is met.

Low-Income Weatherization Assistance Program

The Massachusetts Weatherization Assistance Program helps low-income households reduce their heating bills by using federal and state funding to provide full-scale home energy conservation services. The program is operated by Community Action Agencies throughout the state, coordinated by the Low Income Energy Affordability Network and the state's Department of Housing and Community Development. To the greatest extent possible, work is coordinated with any utility-funded energy efficiency programs that may be available in an area. Local weatherization contractors are hired to complete the work at no cost to the occupants. Typical work completed includes air sealing, attic and/or sidewall insulation, weather-stripping, and minor repairs associated with the weatherization work. (Heating system work, if needed, is typically referred to a separate program funded by the federal Low Income Home Energy Assistance Program (http://www.acf.hhs.gov/programs/ocs/liheap/.) Gas furnaces installed under this program have an annual fuel utilization efficiency rating of at least 90% except where local conditions do not allow for the required venting.) All work receives a thorough quality control inspection by an energy auditor. Funds from the American Recovery and Reinvestment Act of 2009, (Pub. L. 111-5,) ("ARRA",) will help this critical program expand in 2009 and 2010.

Incentives for Combined Heat and Power

Combined heat and power ("CHP") facilities produce both electricity and heating/cooling. When sized properly and located at appropriate host sites, CHP systems are highly efficient and provide a substantial opportunity for GHG reductions as compared to conventional heating and power supply. Two significant new incentives are available to customers seeking to install CHP. First, pursuant to the GCA, CHP is now eligible to receive rebates from the electric utility energy efficiency programs. The pending utility plans now include financial support for: (a) technical assistance to ensure cost-effectiveness; and (b) rebates for capital costs of CHP installations. Second, the GCA directs the creation of an Alternative Energy Portfolio Standard ("APS"), which requires retail electricity suppliers (both regulated distribution utilities and competitive suppliers) to obtain a percentage of their electricity from sources that qualify as Alternative Energy Generation Units (of which CHP is currently the most commercially viable resource). The APS begins with an obligation of 1% of generation in 2009 and increases annually up to 5% in 2020. The number of certificates created by a facility increases as a host customer maximizes use of its thermal output, resulting in a maximum incentive for sites most appropriately using this technology. Both of these new incentives are expected to foster more aggressive adoption of CHP at locations where it has the best promise of mitigating GHG emissions.

Decoupling

The Decoupling Order, MDPU Order 07-50A, issued by the Massachusetts Department of Public Utilities on July 16, 2008, will help ensure that utilities improve their efficiency programs, as envisioned by the GCA. The old system of rate structures meant that utilities would lose money when their customers cut their energy use through efficiency measures. By breaking the link between utility revenues and energy sales, decoupling removes disincentives for utilities to provide expanded, quality energy efficiency programs. Pursuant to the Order, over the next few years utilities will transition to a new set of rate structures that eliminate the economic disincentives to their investment in energy efficiency and distributed generation.

Energy Efficiency in Building Codes, Training, and Commissioning

Section 55 of the GCA requires the state to adopt the latest revision of the International Energy Conservation Code ("IECC") as part of the state building code, within one year of its enactment. Prior to this legislation there had been long delays in updating the building code to incorporate current efficiency standards. As a result of the GCA, the state's Board of Building Regulation and Standards ("BBRS") has already adopted the 2006 IECC and the 2007 amendments to it; and by law the BBRS must adopt the 2009 IECC by the end of this year. The BBRS, in conjunction with DOER, is also empowered to adopt more stringent standards that are deemed warranted. Section 55 of the GCA also requires the BBRS and DOER to develop regulations for training and certification of local building inspectors regarding the energy provisions of the building code, and to ensure that all new construction and renovation passes inspection by inspectors who have had such training. Section 55 of the GCA also instructs DOER to issue regulations requiring that buildings larger than 10,000 square feet undergo "commissioning" (which is a process to ensure that building systems perform in accordance with their design and the owner's operational needs) or acceptance testing.

Governor's Clean Energy Challenge

In November, 2008, Massachusetts Governor Deval Patrick issued a challenge to Massachusetts operating companies, service providers, and non-profits to reduce energy consumption and save money. The Governor's Clean Energy Challenge supports companies in reducing their energy use and emissions by at least 10% over the next three years. The Challenge is an initiative developed by the New England Clean Energy Council and the Massachusetts High Technology Council, in partnership with energy distribution utilities NSTAR, National Grid, Western Mass Electric, and Unitil. Challenge participants will be supported in their efforts by the utilities and by mentor companies like Millipore, Pfizer, Genzyme, Staples, and Raytheon. These mentor companies were an important part of the agenda at the Challenge's kick-off conference and exposition on May 12, 2009.

Business Development and Workforce Training

Clean Energy Center

The Green Jobs Act of 2008, 2008 Mass. Acts Ch. 307, created the Massachusetts Clean Energy Center to accelerate job growth and economic development in the state's clean energy industry. This new quasi-public agency serves as a clearinghouse and support center for the clean energy sector, making direct investments in new and existing companies, providing assistance to enable companies to access capital and other vital resources for growth, and promoting training programs to build a strong clean energy workforce that capitalizes on the job opportunities created by a vital new industry. Recently the Center awarded Springfield Technical Community College (STCC) a three-year $1.87 million contract to coordinate energy efficiency workforce training programs under the Center's Energy Efficiency and Building Science Skills Initiative. STCC will be a statewide clearinghouse for energy efficiency training activities, materials and services, while coordinating job training at regional centers based at STCC as well as Roxbury, Berkshire, Bristol, North Shore, Greenfield, and Quinsigamond Community Colleges.

Large-Scale Private Development

Mass. Environmental Policy Act GHG Policy

The Massachusetts Environmental Policy Act ("MEPA"), M.G.L. c. 30, Sections 61-62I, is a planning statute that requires new development projects proposed for construction in Massachusetts to undergo review to determine whether their environmental impacts can be mitigated to the greatest extent possible. The MEPA GHG Policy and Protocol requires that certain projects undergoing MEPA review quantify their GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. In addition to quantifying project-related emissions, the Policy also requires proponents to quantify the impact of proposed mitigation in terms of emissions and energy savings. This Policy is part of a larger effort to focus attention on the causes of climate change and harness creative thought and technology to implement long-term solutions. This Policy is not intended to create a numerical GHG emission limit or a numerical emissions reduction target. Rather, in keeping with MEPA's overall purpose to evaluate alternatives that avoid, minimize and mitigate environmental impacts, the Policy is intended to ensure that project proponents and reviewers have carefully considered the GHG impact of their projects and taken all feasible means to reduce those impacts. All projects that require an Environmental Impact Report are subject to review under the Policy unless the project's emissions are anticipated to be minimal.

Government Operations

Leading by Example (State Government Operations)

The Leading by Example ("LBE") Program, established in April 2007 by Governor Deval Patrick's Executive Order No. 484 ("EO 484"), works to reduce environmental impacts at all executive branch agencies, as well as at the 29 public institutions of higher education and several authorities. The program oversees efforts to reduce energy and fuel use at the state's 65 million square feet of buildings and from thousands of light and heavy duty vehicles. The program also seeks to increase recycling, reduce water consumption, promote environmentally preferable purchasing, facilitate the construction of green state buildings, and reduce carbon emissions across state government. EO 484 sets the following targets for state government: (a) 25% reduction in GHG emissions by 2012; 40% by 2020; and 80% by 2050; (b) 20% reduction in energy use by 2012, and 35% by 2020; (c) increase in consumption of renewable electricity to 15% of total electric use by 2012, and 30% by 2020; and (d) 10% reduction in water consumption by 2012, and 15% by 2020. The LBE Program is responsible for tracking energy use and GHG emissions for state government, and provides pilot funding, technical assistance and training for dozens of agencies and hundreds of staff each year.

Green Communities Program

Created by the GCA in 2008, the Green Communities Program (the "Program") is intended to help municipalities become more sustainable, control rising energy costs, and incubate the clean energy technologies and practices that will put our cities and towns, and the Commonwealth, at the center of the 21st century clean energy economy. Envisioned as a way to encourage municipalities to make greener energy decisions, the Program is mandated to offer grant and loan opportunities to municipalities in order to be designated as "green communities." Types of assistance offered by the Program include helping communities qualify for state funding by adopting local by-laws and regulations that facilitate the siting and permitting of renewable energy facilities, benchmarking municipal energy use and reducing energy consumption, purchasing fuel-efficient vehicles for municipal fleets, and taking steps to reduce lifecycle energy costs for new commercial, industrial and residential buildings. The GCA allows funding of $10 million per year for the program from the proceeds of RGGI's allowance auctions. The Program also serves all Massachusetts cities and towns as a one-stop shop for energy efficiency and renewable energy opportunities, helping them understand all state programs at their disposal and providing streamlined delivery of those programs. To achieve the goal of serving all 351 cities and towns in Massachusetts, the Green Communities Division of DOER offers a number of programs and services, including the Energy Audit Program, the Green Communities Grant Program, Energy Management Services technical assistance, stimulus grant programs and support, an Energy Information Reporting System, an information website, and four Regional Coordinators to provide direct support to cities and towns.

Cap-and-Trade (electricity generation)

Regional Greenhouse Gas Initiative ("RGGI")

RGGI, www.rggi.org, is an agreement among 10 northeast states, from Maine through Maryland, to jointly limit CO_2 emissions from electricity power plants. Under a Memorandum of Understanding ("MOU") signed by most of the states in December 2005, and later amended as other states joined, there is an overall limit on emissions from the northeast. The limit ("cap") went into effect in January 2009, and remains fixed through 2014. It then drops 2.5% a year through 2018, so that in 2018 emissions are required to be 10% below the 2009 level. Each state has an individual limit that was negotiated among the states. Each power plant of 25MW capacity or greater must purchase an "allowance" (or permit) for each ton of CO_2 emissions. Power plants able to reduce emissions below their respective allowance totals may sell surplus allowances to utilities that are unable to meet emission reduction targets. In addition, power plants may also meet a portion of their allowance requirements by using "offsets," which are methods of reducing GHG emissions not connected to electricity generation, such as planting trees.

The MOU requires each state to use at least 25% of its allowances for a "consumer benefit or strategic energy purpose;" the remainder can be used as the state wishes, including providing them to electricity generators at no cost. In practice, the states have chosen to sell by auction the vast majority of the allowances, and the funds are being used predominantly to pay for energy efficiency and renewable energy programs. Under the terms of Section 7 of the GCA, Massachusetts is auctioning almost 100% of the allowances, and using at least 80% of the money generated by the auction to fund utility-run energy efficiency programs. Thus, in addition to harnessing the power of the market to reduce GHG emissions associated with electricity generation, RGGI is designed to further reduce GHG emissions by investing money in energy efficiency. As of July 2009, Massachusetts has held four auctions, which have resulted in approximately $55 million being invested in energy efficiency. RGGI auction proceeds also fund the Green Communities Program (described above), which provides incentives and assistance for municipalities to adopt energy efficiency and renewable energy measures.

Renewable Energy

Renewable Portfolio Standard

Created by the Electricity Restructuring Act of 1997 (1997 Mass. Acts ch. 164)
the Massachusetts Renewable Energy Portfolio Standard (RPS) requires retail electricity suppliers (both regulated distribution utilities and competitive suppliers) to obtain for their retail customers a percentage of electricity from sources that qualify as New Renewable Generation Units (i.e., post-1998), with compliance by means of purchasing Renewable Energy Credits. The RPS began with an obligation of 1 percent in 2003and increased by one half percent annually since then, reaching 4 percent in 2009. Pursuant to the GCA, the RPS annual increase will

double to 1 percent annually after 2009. Consequently, by 2020, 15% of the supply for non-exempt retail sales, or about 7.5 million megawatt-hours (MWh) at current load levels, is to be from new, renewable resources. This commitment to renewable energy will strengthen the renewable energy infrastructure, thus paving the way for more widespread use of green energy sources.

Massachusetts Renewable Energy Trust

The Massachusetts Renewable Energy Trust (MRET) was created as a component of electric utility industry restructuring to promote the development of renewable energy in the Commonwealth. As such, MRET seeks to maximize environmental and economic benefits for the Commonwealth's citizens by pioneering and promoting clean energy technologies and fostering the emergence of sustainable markets for electricity generated from renewable sources. The Trust provides financial assistance for development of solar, wind, biomass, and hydro projects. The goal is to generate the maximum economic and environmental benefits from clean energy resources to citizens of the Commonwealth. The Trust also provides critical support to help the nascent renewable energy industry thrive and create new jobs in Massachusetts. Funding for MRET derives from a small charge on customers' electricity bills that results in $25M per year.

Sustainable Forest Bioenergy Initiative

The Department of Energy Resources and the Department of Conservation and Recreation (our forestry agency) have identified biomass as a renewable energy resource with significant potential in Massachusetts. This initiative facilitates the development of biomass energy projects while maintaining the highest standards for sustainable forestry. The Initiative has established essential technical information on the biomass resource, sustainable harvesting silviculture practices, and macroeconomic benefits that can form the basis of sound biomass policy and market development. The initiative will support market development of biomass harvesting supply infrastructure, biomass CHP projects, and wood pellet production and thermal boiler technologies for high efficiency, low emissions heating and cooling applications.

Governor's Wind Goal: 2000 by 2020

On January 13, 2009, Governor Patrick announced a goal of 2,000 MW of wind energy installed in Massachusetts by 2020. This would provide enough power for 800,000 homes, meet 10% of the state's current electricity load, and reduce GHG emissions by 3.1 million tons, or roughly 12% of emissions from power plants today. Consultants for Mass. DOER estimate that there is approximately 1,500 MW of technical potential for onshore wind and over 6,000 MW offshore in Massachusetts. Included within this is approximately 947 MW of potential commercial scale wind energy on state-owned lands. It will take a careful balancing of public interests to decide how much of the renewable energy potential of these sites on state land should be pursued.

Commonwealth Wind

The Massachusetts Renewable Energy Trust's (MRET) Commonwealth Wind initiative will provide an overarching framework to expand investments for wind energy installations in Massachusetts. The three types of projects listed below could qualify for technical and/or financial assistance from MRET:

1. Commercial scale projects that primarily serve wholesale markets.
2. Community-scale projects in the 100 kW to approximately 2 MW range, where the project sponsor and primary beneficiary is a private company or organization, a municipality, or a government agency.
3. Small-scale projects under 100 kW serving residential, small commercial, or institutional buildings.

Offshore Wind and the Oceans Act

Offshore wind is the most plentiful source of renewable energy in Massachusetts, and one of the most abundant sources in the United States. The National Renewable Energy Laboratory (NREL) calculated approximately 900,000 MW of potential in offshore wind, and the US Department of Energy's recent "20% by 2030" report determined that 54,000 MW of offshore wind could be developed in the US by 2030 with current technology, enough to meet 20 percent of US electricity demand. Consultants for DOER estimate that there is over 6,000 MW of technical potential in offshore wind in the state. Several other developers aside from EMI (Cape Wind) have proposed wind projects off the coast of Massachusetts, including Jay Cashman/Patriot Renewables (300 MW), The Town of Hull (12 MW), Blue H (floating platform design, 420 MW), and Bluewater. The Commonwealth expects a significant increase in proposed projects once the federal and state regulatory regimes have been finalized. The Department of Interior's Minerals Management Service (MMS) recently released its final rule regarding renewable energy leasing on the outer continental shelf (three miles from shore and beyond), while Massachusetts plans to complete the nation's first state ocean management plan by December of 2009. Governor Patrick signed the Oceans Act in 2008, 2008 Mass. Acts Ch. 114, which mandates the creation of this comprehensive plan, which will identify locations in state waters other than the Cape Cod Ocean Sanctuary, off the coast of the national seashore, for potential development of "appropriate-scale renewable energy facilities."

Commonwealth Solar

To achieve Governor Patrick's goal of 250 MW of solar PV installed in Massachusetts by 2017, DOER and the Renewable Energy Trust have established Commonwealth Solar. Begun in January 2008, Commonwealth Solar provides rebates for solar installations for residences, businesses, and public buildings backed by $68 million of existing renewable energy funds. As the rebate program expires, Commonwealth Solar will transition to other forms of support for solar power, such as the solar carve-out within the Renewable Energy Portfolio Standard, as provided for in the Green Communities Act. In addition, the Commonwealth Solar goal will also be met by the new opportunity for our regulated utilities to own and implement solar photovoltaic (PV) generation installations. In the first year of its implementation, Commonwealth Solar doubled the installed capacity of PV in the state, and is on the road to quadrupling by the end of this year.

Electric Utility Long-Term Contracts for Renewable Energy

The Green Communities Act requires that the electric distribution companies solicit proposals from renewable energy developers and enter into cost-effective long-term contracts for renewable energy, in order to facilitate the financing of renewable energy generation within the Commonwealth, including state waters, or in adjacent federal waters. Long-term contracts assist renewable energy developers in obtaining financing, by providing assurance of revenues from sales over a number of future years. Since the restructuring of energy markets in Massachusetts, power contracts have typically been for only six months to one year, far too short to allow financing of the typically high capital costs involved in developing renewable generating facilities.

Net-Metering

Net-metering allows electricity customers who install distributed power generation, such as solar PV (photovoltaics), to sell electricity generated in excess of their own electricity consumption back to the electric distribution company. In the past, net-metering in Massachusetts was limited to customers whose generation capacity was below 60 kW, with customers paid the wholesale price for surplus power. The Green Communities Act increases the net-metering capacity limit to 2 MW (about 33 times as high) and increases payments to the customer to the retail price. By requiring that the market accurately price distributed renewable power generation, net-metering provides greater revenue for renewable generators, thereby making such installations more cost-effective.

Transportation

Federal CAFE Standard for Light Vehicles

The Corporate Average Fuel Economy (CAFE) standard was first enacted in 1975 and was established to reduce energy consumption by increasing the fuel economy of cars and light trucks on a fleetwide basis. The fuel economy standards are set by the National Highway Traffic Safety Administration, with the Environmental Protection Agency calculating the average fuel economy for each automobile manufacturer. Starting in 2004, the fleet average for passenger cars must exceed 27.5 mpg, and light trucks must exceed 20.7 mpg. Trucks under 8,500 pounds must average 22.5 mpg in 2008, 23.1 mpg in 2009, and 23.5 mpg in 2010. In addition, under a recently-reached agreement between the federal government and California, automakers are required to meet a 35 mpg fleet-wide average for passenger cars and light duty trucks by 2016—four years earlier than under the Energy Independence and Security Act of 2007. This will require manufacturer miles per gallon ("MPG") levels that yield similar reductions in GHG emissions to California's vehicle GHG standards (see section below.)

California Vehicle Greenhouse Gas Standards

Under the federal Clean Air Act, states are preempted from adopting motor vehicle standards that vary from federal standards, except that California is allowed to adopt motor vehicle standards and enforce such standards if a waiver is granted by EPA under section 209(b) of the Act. Other states are allowed to adopt California's standards under section 177 of the Act. Massachusetts Department of Environmental Protection ("MassDEP") is required to adopt the California standards under MGL c. 11 section 142K unless such standards will not achieve greater emission reductions than federal standards. As a result, in December 2005, MassDEP adopted California's GHG standards for passenger cars, light duty trucks, and medium duty vehicles under the low emission vehicle (LEV) program regulations, 310 CMR 7.40. The standards apply to model year 2009 and newer vehicles and will be fully phased-in for model year 2016. The standards can be met through reduction of vehicle-associated GHG in 4 areas: (1) tailpipe emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O); (2) tailpipe emissions incurred by the load of running air conditioning; (3) air conditioning system refrigerant leaks; and (4) upstream emissions associated with the production of fuel. Nationwide, by calendar year 2020, California's more stringent limits will reduce cumulative GHG emissions in California and other LEV states by 450 $MMTCO_2e$.

Federal Renewable Fuel Standard

Title II of the federal Energy Independence and Security Act of 2007 creates a "renewable fuel standard," which requires that such fuel used in the U.S. will rise from 4.7 billion gallons in 2007 to 36 billion gallons in 2022. Of that, "advanced biofuel" must rise from 0.6 billion gallons in 2009 to 21 billion gallons in 2022, and cellulosic biofuel must rise from 0.1 billion gallons in 2010 to 16 billion gallons in 2022. Renewable fuels must be produced from renewable biomass,

replace other transportation fuel, and achieve at least a 20% reduction in greenhouse gas emissions on a lifecycle basis for "new facilities." (Existing facilities, and expansion of such facilities, such as those producing corn-based ethanol, are exempt from the greenhouse gas criterion.) Advanced biofuel excludes ethanol derived from corn starch, and must yield at least a 50% lifecycle reduction in greenhouse gas emissions, while cellulosic biofuel must achieve a 60% reduction. The law contains provisions allowing the EPA administrator to reduce both the percentage greenhouse gas reductions and the volumes of production required. The three categories are not additive -- cellulosic fuel counts as part of advanced fuel, and both count as part of the renewable fuel mandate.

Tax Exemption for Cellulosic Biofuel

Section 1 of the Clean Energy Biofuels Act, 2008 Mass. Acts. Ch. 206, exempts cellulosic biofuel from the state's gasoline tax. This includes both ethanol derived from cellulosic sources and any other fuel derived from cellulosic sources that can be used in place of gasoline (or as part of a blend). To be eligible for the tax exemption, the biofuel must yield at least a 60% reduction in lifecycle GHG emissions relative to petroleum-based fuel sold in 2005 (the same definition is used in Renewable Fuel Standard provisions of the 2007 federal energy law). The tax exemption went into effect on Jan. 1, 2009, although no such fuel is yet being supplied in the state.

Low Carbon Fuel Standard

Section 6 of the Clean Energy Biofuels Act requires the state to work toward implementing a low carbon fuel standard (LCFS) for transportation fuels among the northeast states participating in the Regional Greenhouse Gas Initiative (RGGI). A LCFS, which is an idea first put into law by Executive Order in California, would require that the average carbon content of transportation fuels be reduced by a specific percentage by some future date. The Act requires that the GHG emissions be measured on a "full fuels cycle basis" (meaning the entire lifecycle) and that a progressively more stringent standard be set so that a 10% reduction in emissions is achieved. The state is also directed to make use of analysis done by the California Air Resources Board, if applicable, to determine the carbon intensity of different fuels. At present NESCAUM (Northeast States for Coordinated Air Use Management) and MassDEP are leading regional discussions among the northeast states to develop a plan for a LCFS. In December 2008 environmental commissioners from the RGGI states and Pennsylvania signed a letter of intent to develop a memorandum of understanding by the end of 2009 concerning the structure of a regional LCFS.

Mandate for Biofuels Use in Diesel Motor Fuel and Home Heating Oil

Sections 2 and 3 of the Clean Energy Biofuels Act instructs DOER to require that a percentage of both diesel motor fuel and home heating oil (number 2 oil) consist of fuel derived from renewable biomass, which must also yield at least a 50% reduction in lifecycle GHG emissions

relative to petroleum-based fuel sold in 2005. The fraction begins at 2% on July 1, 2010, and grows to 5% by July 1, 2013. However, the Commissioner of DOER is empowered to delay the requirement if sufficient supplies of eligible fuel are not available, due to lack of supply, lack of blending facilities, or unreasonable cost. The mandate sunsets if and when a low carbon fuel standard that achieves equal or greater reductions in GHG emissions goes into effect. DOER shall also consider the feasibility of extending the mandate to number 4 and number 6 petroleum distillate fuels. Finally, DOER is instructed to study the feasibility of making the mandate apply on a statewide average basis, rather than on each gallon of fuel sold, making possible the development of a credit trading system. At present, the California Air Resources Board, on which Massachusetts has planned to rely (along with federal EPA) for estimates of the percentage lifecycle GHG reductions due to biofuels derived from different feedstocks and manufactured in different ways, has not yet completed its analysis.

Commonwealth Capital (Smart Growth/Smart Energy) Policy

Commonwealth Capital explicitly endorses 32 land use planning and regulation practices that are consistent with the Commonwealth's Sustainable Development Principles. (see http://www.mass.gov/?pageID=gov3subtopic&L=5&L0=Home&L1=Key+Priorities&L2=Job+Creation+%26+Economic+Growth&L3=Clean+Energy+%26+Smart+Growth-Smart+Energy&L4=Commonwealth+Capital&sid=Agov3) The program makes available more than $600 million annually in grants and low interest loans for a variety of capital investments, in part based on Commonwealth Capital scoring. The more smart growth/smart energy oriented a community is, the more likely it is to receive funding. Almost 300 (out of 351) of the Commonwealth's communities have applied for funding, and municipal consistency with the Sustainable Development Principles has improved significantly, up 10% over the past five years, with the median score rising from 63 to 77 (out of a possible 140).

Sustainable Development Principles

The Patrick Administration utilizes a set of Sustainable Development Principles to guide the creation and implementation of state agency policies and programs, as well as investments in land and infrastructure. Municipalities, through policies like Commonwealth Capital, are also asked to modify their planning, regulatory, and funding actions to achieve consistency with the Principles. The state's Sustainable Development Principles include promoting clean energy, in the form of energy efficiency and renewable power generation, in order to reduce greenhouse gas emissions and consumption of fossil fuels. They also encourage the creation of "pedestrian-friendly" districts and neighborhoods that mix commercial, civic, cultural, educational, and recreational activities with parks and homes. In regard to housing, the Principles call for building homes "near jobs, transit, and where services are available."

Appendix A—Summary of 2008 Legislation

Green Communities Act, 2008 Mass. Acts Ch.169, 7/2/08

This Act significantly reforms the state's energy policy, and makes large, new commitments to electric and natural gas energy efficiency programs, renewables, and clean fossil fuels like combined heat and power. (Section 116 sets state renewable, alternative and energy efficiency goals.) The Act requires the Executive Office of Energy and Environmental Affairs (EOEEA) to prepare a 5 year plan to meet the energy efficiency and renewable/alternative energy goals.

Global Warming Solutions Act, 2008 Mass. Acts Ch. 298, 8/7/08

This Act will spur investments in energy efficiency and conservation, encourage more renewable power and developments of clean energy. The Act creates a new set of enforceable state limits on greenhouse gas (GHG) emissions across all sectors of the economy. By 2050, it requires adoption of GHG emissions limit that is at least 80% below 1990 GHG emissions. By 2020, emissions are limited between 10 and 25 percent below 1990 levels, as set by EOEEA who also develops a plan by January 1, 2011 for meeting that limit by January 1, 2011 and adopts interim limits for 2030 and 2040.

Green Jobs Act, 2008 Mass. Acts Ch. 307, 8/11/08

The gradual reduction of emissions levels will spur innovation and entrepreneurship in clean energy technologies across the economy. To facilitate the innovation and economic development necessary to meet those mandates, the Green Jobs Act will support research-and-development, entrepreneurship, and workforce development in the clean-energy technology industry of the future. Thus, this Act works to help Massachusetts meet goals for reducing greenhouse gas emissions.

Clean Energy Biofuels, 2008 Mass. Acts Ch. 206, 7/28/08
This Act will help with GHG emission reductions, lessen our dependency on oil and diversify our fuel mix. Beginning in July 2010, the Act requires the use of 2% biodiesel (or other qualified petroleum substitute biofuel) in #2 oil for residential, commercial and industrial heating applications, and in diesel fuel; the percentage increases to 5% no later than July 1, 2013. The Act prescribes the use of "advanced biofuels" as characterized by at least a 50% reduction in greenhouse gas emissions relative to conventional fuel, inclusive of indirect land use change impacts.

Ocean Management Act, 2008 Mass. Acts Ch. 114, 5/28/08
The goal of the Act is to establish a comprehensive plan to manage development in and the use of Massachusetts' ocean waters, balancing natural resource preservation with traditional and new uses, including renewable energy. It is not intended to create a new bureaucracy or permitting

process, but instead seeks to provide uniform guidance to the current regulatory agencies in their review of ocean uses and projects.

ATTACHMENT C

THE COMMONWEALTH'S GAS FORECAST

Massachusetts Department of Energy Resources

Massachusetts Retail Natural Gas Forecast, 2009-2015

Introduction

The Massachusetts Department of Energy Resources ("DOER") presents the forecast of retail natural gas sales for the years 2009 - 2015, as part of its State Energy Plan. This forecast indicates the scope and scale of natural gas sales for the purpose of estimating the extent and impact of energy efficiency programs throughout the forecast period.

Data Sources and Methods

The forecast was developed for DOER by Optimal Energy of Bristol Vermont, and is based on the following sets of sales data:

1. Actual retail gas sales of each Massachusetts gas utility, obtained through a survey conducted by Optimal Energy;

2. Review of the Energy Information Administration's ("EIA") *Annual Energy Outlook*, which periodically publishes long term forecasts of natural gas expected sales; and

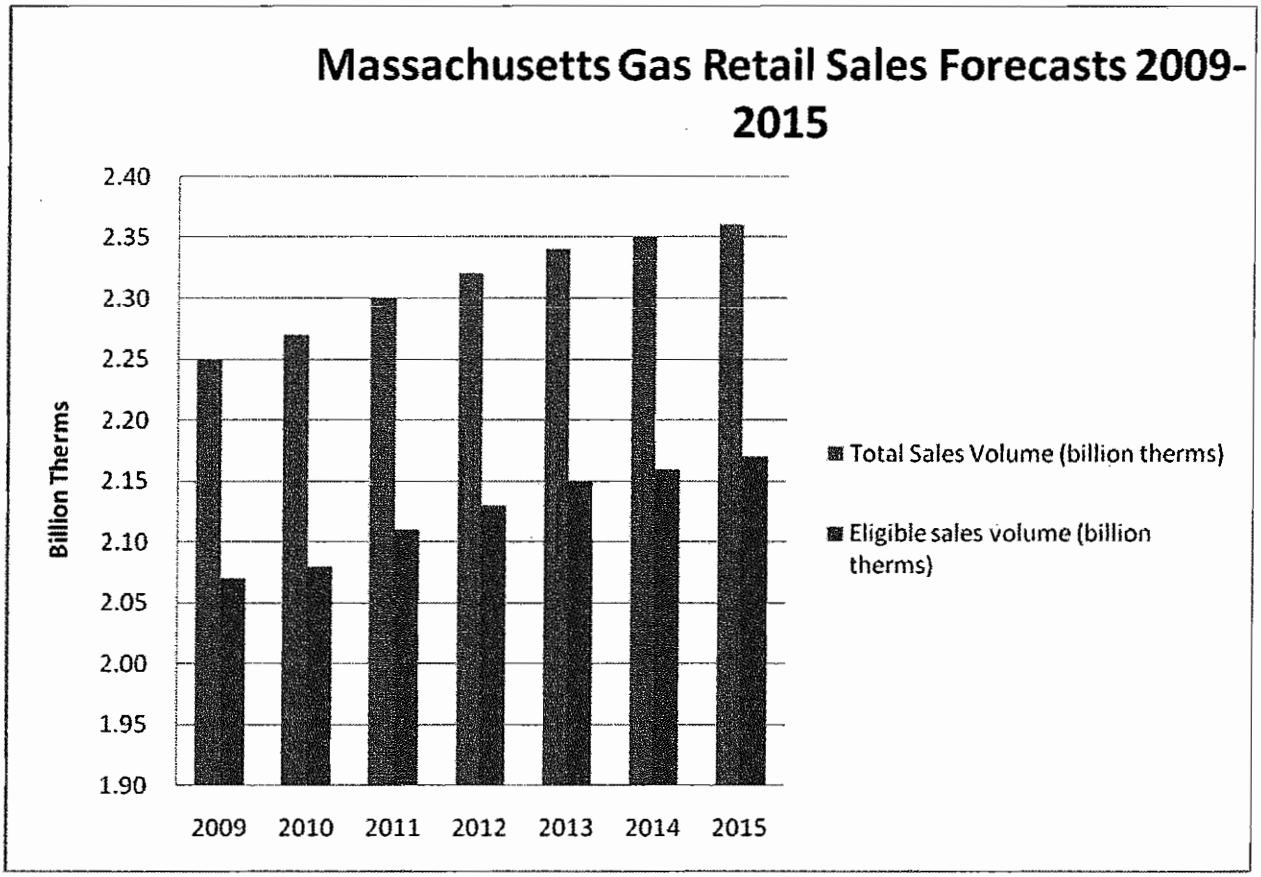
3. Review of EIA's *Short Term Energy Outlook* report, which provides more frequent sampling of the gas market and was used by Optimal Energy, along with the other data sources, to construct an annual growth rate specifically for the Massachusetts gas utilities. Subsequent forecast revisions would use a similar method of long and short term forecasts, corrected by actual sales data provided by the utilities to increase forecast accuracy.

Eligible and Non-Eligible Sales

The report categorizes gas sales into "Eligible" and "Non-Eligible" categories. Eligible sales are those for which energy efficiency charges may be collected and for which customers may participate in the programs. Non-Eligible sales include certain transportation sales and sales to some large customers who are exempted via regulation from recovery for energy efficiency costs.

Forecast

The chart below shows expected Eligible and Non Eligible sales through 2015.



ATTACHMENT D

THE OPTIMAL REPORT

UNITED STATES DEPARTMENT OF ENERGY

Report and Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces.

Prepared for:

The Massachusetts Department of Energy Resources, a Department of the Massachusetts Executive Office of Energy & Environmental Affairs

and

Massachusetts Attorney General Martha Coakley

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September 30, 2009

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I. Executive Summary

Optimal Energy Inc. ("Optimal") was engaged to assist the Massachusetts Department of Energy Resources ("MassDOER"), a Department of the Massachusetts Executive Office of Energy & Environmental Affairs, and Massachusetts Attorney General Martha Coakley (collectively the "Commonwealth"), with an analysis of the potential benefits and consequences of implementing the Commonwealth's proposed efficiency standard for non-weatherized gas furnaces ("NWGF").

In 2005, the Commonwealth's Legislature revised Massachusetts General Laws ("M.G.L.") Chapter 25B, § 5, to provide that to be eligible for sale in the Commonwealth, NWGF must meet or exceed annual fuel utilization efficiency ("AFUE") of 90 percent.[1] Mass. Acts 2005, Ch. 139, Section 11. This is compared to the current preemptive United States Department of Energy ("DOE") standard (hereafter "federal standard") for NWGF of 80 percent AFUE.[2] To implement this standard (hereafter referred to as the "high efficiency standard," the "proposed standard," or the "Massachusetts standard"), federal law requires that the Commonwealth first be granted a waiver from federal preemption by DOE.

Based on the data collection, research, and analysis that Optimal has done in connection with its engagement, Optimal has concluded that implementation of the Massachusetts standard is the only feasible approach that would significantly increase the penetration of high-efficiency furnaces in the Commonwealth; that implementation of the Massachusetts standard would not have a significant, adverse impact on manufacturers or distributors; and that there is no feasible alternative approach that would increase the penetration of high-efficiency furnaces to the same degree because the Commonwealth has already ably implemented all feasible alternatives to the greatest extent possible.

In order to obtain a waiver from federal preemption under § 327(d) of the Energy Policy and Conservation Act ("EPCA") (42 U.S.C. 6297(d)), a petitioning state must show by a preponderance of the evidence that the proposed standard it wishes to implement is necessary to meet "unusual and compelling State or local energy . . . interests." Optimal has concluded that the Commonwealth meets this statutory standard because there are applicable conditions that exist in the Commonwealth that are substantially different from those that prevail in the United States generally. These differences include, but are not limited to:

- a higher Commonwealth heating load;
- higher Commonwealth heating costs;
- that there is more competition in the Commonwealth for natural gas and propane resources;

[1] A regulation implementing the change in the NWGF AFUE standard was promulgated thereafter at 225 Code of Massachusetts Regulations ("C.M.R.") 9.03.

[2] The rule first promulgated in November of 2007 was challenged in the Second Circuit, but is now on remand to DOE for further comment and rulemaking.

- that the Commonwealth is a more difficult market to influence, especially because of the size and configuration of the rental housing market;

- that there are specific Commonwealth regulatory and statutory requirements that must be met; and

- that substantially higher market penetration makes it difficult and less cost-effective for voluntary programmatic efforts to further influence market penetration.

These conditions, described below, create a synergistic effect that inhibits the ability of the Commonwealth to capture significant net benefits without a comprehensive, statewide, high efficiency NWGF standard.

Through analysis of furnace sales nationally and in the Commonwealth, other market information, and primary research, we have determined that the proposed Massachusetts standard will have no significant adverse impact on national manufacturers, local manufacturers, distributors, or installers. We further found that the proposed standard will have no adverse impact on furnace features available to customers.

Finally, we determined that Commonwealth regulation in the form of a more stringent 90% AFUE standard is preferable to the alternatives available to the Commonwealth. These alternatives include educational efforts, rebate programs, market channel interventions, and tax mechanisms. Our research determined that the Commonwealth has already aggressively and comprehensively implemented alternative approaches to acquiring energy savings from the installation of more efficient gas furnaces.

Optimal has prepared or reviewed numerous studies of the potential savings available from energy efficiency efforts in a wide variety of jurisdictions, and has reviewed verified energy savings from programs implemented over the last two decades. In every case, there is a significant difference between the estimates of cost-effective savings that could be achieved and the savings that are actually acquired. We are aware of no instance where non-regulatory mechanisms have captured all available cost-effective savings. In fact, we are aware of regulatory mechanisms, specifically building codes in many jurisdictions, that have failed to capture the levels of savings expected due to compliance and enforcement issues. Taking all of this information into consideration, it is our professional opinion that the Commonwealth's previous non-regulatory efforts may have raised the penetration of 90% AFUE NWGF to the theoretical maximum levels absent such regulation.[3]

[3] Potential studies and program evaluations routinely show that at least twenty percent of the possible market for high efficiency furnaces is not captured by program interventions.

II. Massachusetts Faces Substantially Different Conditions From Those Prevailing in the United States Generally and Has a Compelling Need to Implement a New, More Stringent Energy Efficiency Standard for Non-Weatherized Gas Furnaces.

A. Massachusetts Has a Higher Heating Load Than the Average for the Nation as a Whole.

A common measure of heating load is "heating degree days" ("HDD"), defined as the difference between the mean temperature and 65 degrees Fahrenheit on a daily basis. As shown in Figure 1 – Heating Degree Day Comparison, below, residents in the Commonwealth face significantly colder weather than the average for the Nation as a whole.[4]

Figure 1 - Heating Degree Day Comparison

Heating Degree Days - Massachusetts and Contiguous United States								
Year	2000	2001	2002	2003	2004	2005	2006	2007
US	4398	4160	4278	4469	4241	4246	3915	4259
MA	6253	5803	5884	6704	6463	6467	5709	6295
MA as % of US	**142%**	**139%**	**138%**	**150%**	**152%**	**152%**	**146%**	**148%**
Source: NOAA National Data Center - Climate Data Online.								

There is a direct correlation between HDD and fuel use. All other things being equal, the higher the HDD total for an area, the more fuel will be required to maintain acceptable interior temperatures. It is significant that the Commonwealth averages approximately 40% more heating degree days than the rest of the Nation. Due to the physics of heat transfer, this translates directly into greater fuel usage and a higher public interest in efficiency than exists in the Nation as a whole.

B. Massachusetts Has Higher Fuel Costs Than The Average for the Nation as a Whole.

The Commonwealth has substantially higher natural gas costs than those prevailing in the United States generally. The chart and table below (Figures 2 & 3) were generated from data published by DOE's Energy Information Administration ("EIA")[5].

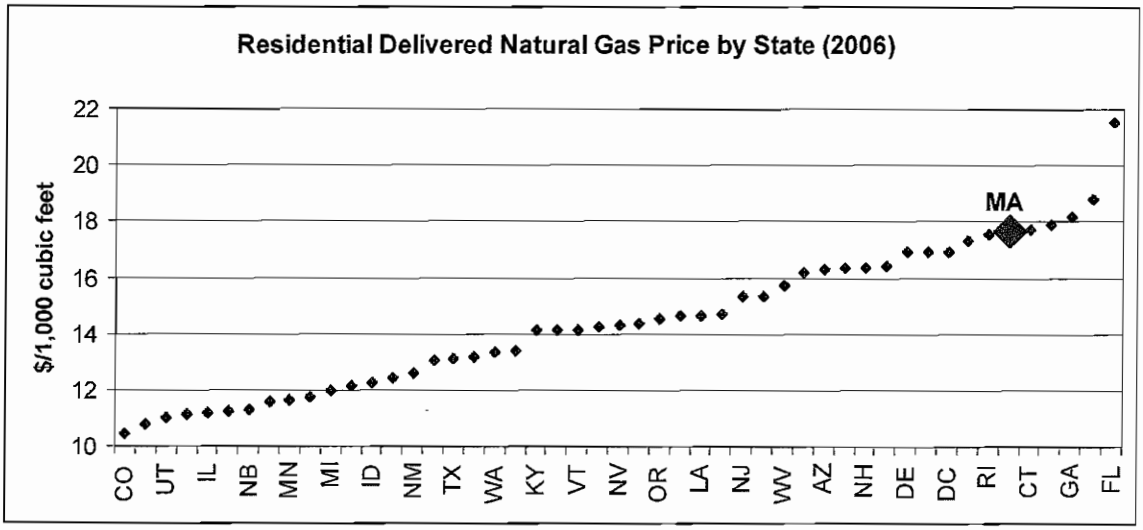
Figure 2 - Residential Natural Gas Price Comparison

MA Residential Delivered Natural Gas Price compared to the National Average since 2000								
Year	2000	2001	2002	2003	2004	2005	2006	2007
MA as % of Nat'l Average	125%	129%	119%	128%	130%	119%	123%	121%
MA as % of Nat'l Median	130%	132%	124%	133%	133%	121%	124%	121%

[4] Source: http://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp, accessed 1/30/09

[5] http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_a_epg0_prs_dmcf_a.htm

Figure 3 - Residential Natural Gas Prices (US)



Note: Alaska has the lowest and Hawaii has the highest natural gas prices due to locational factors. These states have been excluded as outliers.

The price of natural gas in the Commonwealth is among the highest in the United States. In fact, it is over 20% higher than both the average and median prices throughout the Nation as a whole. The Commonwealth's interest in furnace efficiency is greater than that in the Nation as a whole given the price its residents face for an essential commodity.

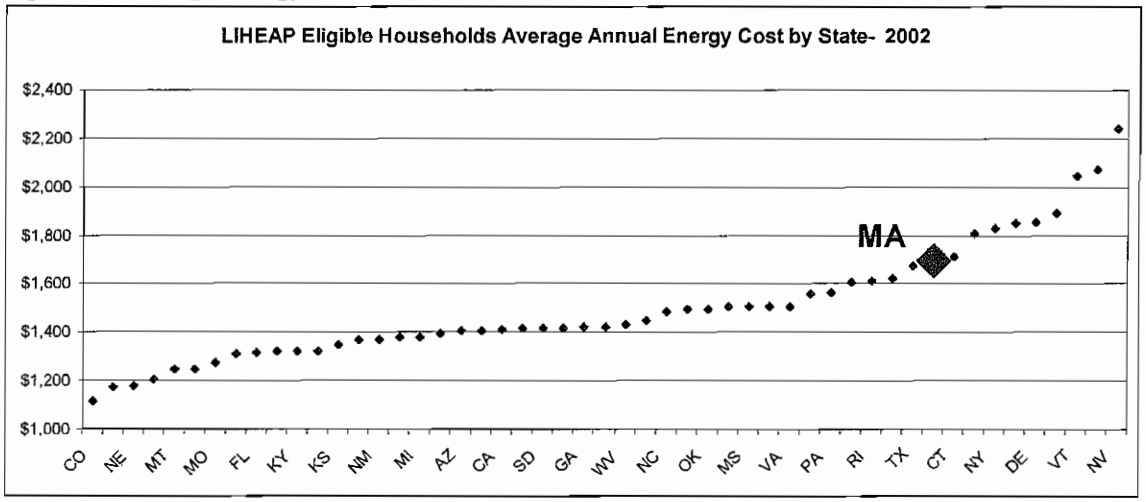
C. The Energy Burden on Commonwealth Residents is Higher Than That Prevailing for the Nation Generally.

Energy burden is an indicator that includes the amount of energy consumption required for a household to achieve a certain end, such as a healthy indoor temperature, as well as the cost of the resources to achieve that end, or fuel cost, relative to that household's income. Low income households by definition have higher energy burdens than higher income households in a particular state or region and are particularly sensitive to the detrimental effects of a high energy burden. They are forced to make choices between essentials, such as food, medicine, and heat that are not necessary for non-low income households.

To begin providing a picture of energy burdens on low-income households in the Commonwealth, the chart below (Figure 4) shows the average total energy cost (heating/cooking/lighting/miscellaneous costs) of low income households in the Commonwealth, which is among the highest in the Nation.[6]

[6]Source: http://www.liheap.org/databook02/ accessed 1/26/09

Figure 4 - Average Energy Cost - Low Income Households



That the most economically vulnerable households in Massachusetts face one of the highest energy costs in the Nation is another component of the Commonwealth's compelling need for the proposed 90% AFUE NWGF standard. The Low Income Home Energy Assistance Program ("LIHEAP") Databook (see fn. 5) shows that the energy burden for all Commonwealth households is 7% of household income, while the energy burden on those households who receive LIHEAP (fuel assistance) is 19.8%. By comparison, households in California, our most populous state and one almost at the middle of the chart above, bear a much smaller energy burden of only 4.2% statewide, and the LIHEAP-eligible households in California bear an energy burden of only 12.7%.

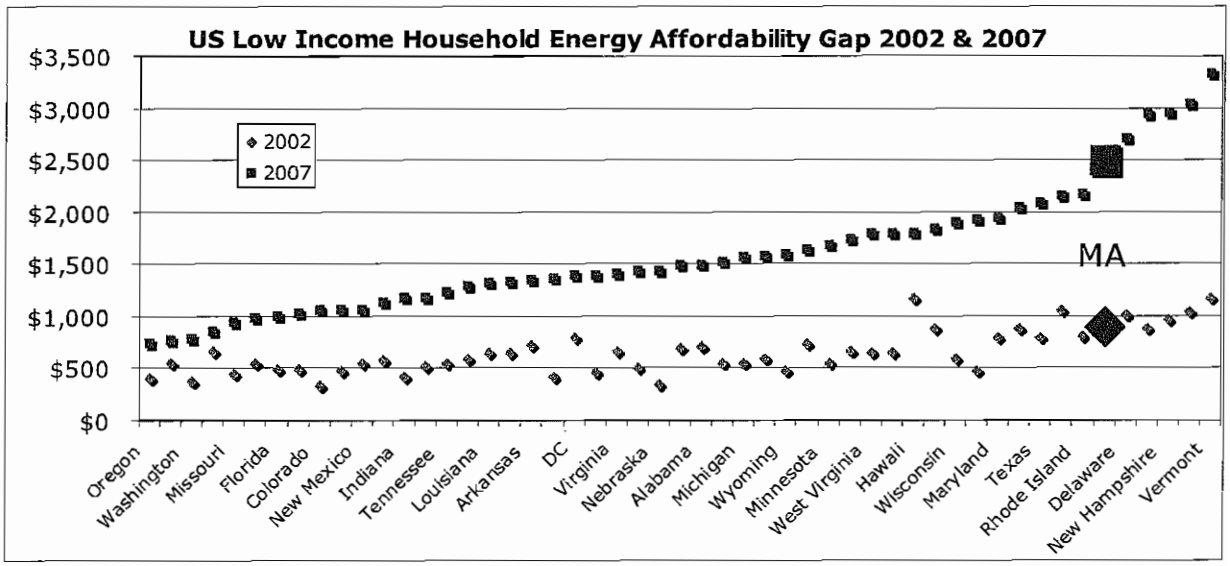
Another way to understand the energy burden on low-income households is through "affordability gap" data. The firm of Fisher Sheehan Colton ("FSC") has been calculating the household energy affordability gap (the "Gap") since 2003.[7] [8] The Gap captures the difference between a supportable level of expenditure of household income for energy and the required level of expenditure for low-income households. While specific to low-income households, the Gap also represents the relative cost of energy in each state for all households. It incorporates state-specific factors (e.g., income, fuel cost and fuel requirements) that span economic sectors. The chart below (Figure 5) shows that the Commonwealth has one of the largest Gaps in the Nation and that this Gap has gotten worse over time.[9]

[7] Fisher Sheehan & Colton (http://www.fsconline.com/) is a well-recognized public finance and economics firm that has developed a specialty area in the quantification of the gap between affordable home energy bills and actual home energy bills.

[8] http://www.homeenergyaffordabilitygap.com/01_WhatIsHEAG2.html

[9] Average dollar amount by which actual home energy bills exceeded affordable home energy bills for households below 185% of poverty.

Figure 5 - Affordability Gap



FSC has determined that an affordable energy burden for low income households is 6% of annual income. The table below (Figure 6) shows the burden of energy costs on Massachusetts low-income households.[10]

Figure 6 - Massachusetts Energy Burden

Massachusetts Low Income Energy Burden - 2007		
Poverty Level (Income as % of Federal Poverty Level)	# Households	Home Energy Burden (% of annual income)
Below 50%	109,900	87.30%
50 - 74%	53,248	35.30%
75 -99%	67,654	25.30%
100-124%	72,499	19.70%
125-149%	75,882	16.20%
150-185%	109,259	13.30%
Total HH/Weighted Avg	**488,442**	**35.41%**

[10] Source: http://www.homeenergyaffordabilitygap.com/downloads/2007_Released_Apr08/States/Massachusetts.pdf accessed 3/9/09. In reality, extremely low-income households do not spend 87.3% of their income on home energy, but instead face termination of utility service and living without space heat because they cannot afford their energy bills.

The amount of heating required, the price of fuel, and the income level of Commonwealth residents combine to increase the Commonwealth's motivation to maximize the use of high efficiency heating equipment.

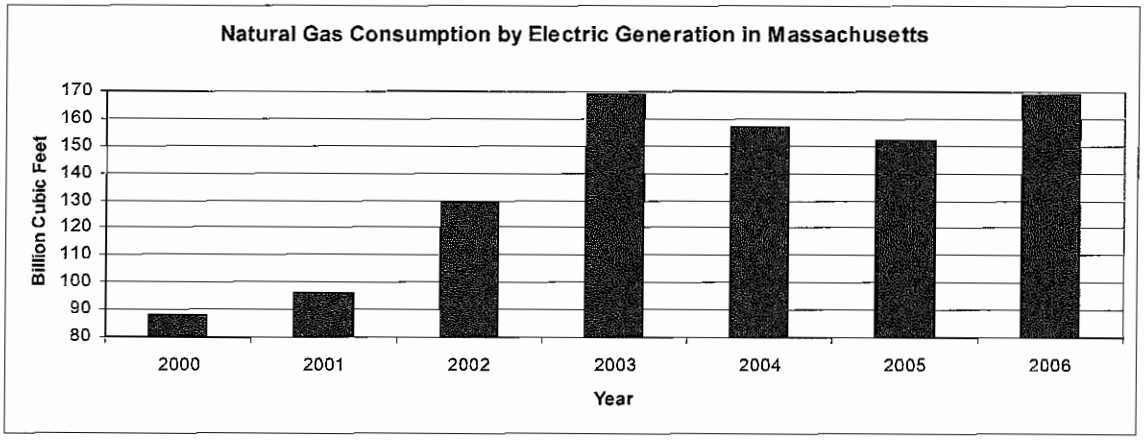
D. Natural Gas Use for Residential Heating Has an Impact on Other Markets.

Residential heating customers in Massachusetts account for only a portion of the natural gas load. The demand of residential heating customers somewhat competes with the demand of natural-gas fired electric power plants. This does not mean that residential customers-have to make a decision between keeping warm and keeping the lights on, because regulatory and operational structures strive to assure that their energy needs for both heat and light are met. It does mean, however, that inefficient consumption of natural gas in home furnaces needlessly increases overall demand and thus raises prices for all users. Moreover, electric generating units on the natural gas system have a lower priority than residential heating customers, "accounting for the likelihood that gas-fired generators' contracts for natural gas transportation could be interrupted during the winter months."[11] This competition for the resource can affect both the cost of natural gas and the societal and individual value of natural gas savings.

In a 2005 report to the New England Governors' Conference that was focused primarily on electric generation, the first finding made was: "The concern for the reliability of natural gas supplies arises almost exclusively in the winter months when demand for this fuel for space heating increases dramatically and is coincident with demand from gas-fired electric generation."[12] For more than a decade, the expansion of electric generating capacity in New England and adjacent regions has been natural gas-fired, as shown below in Figure 7.[13]

[11] O'Connor, David L. et al. *Meeting New England's Future Natural Gas Demands: Nine Scenarios and Their Impacts*. Boston, 2005. New England Governor's Conference. Page vii..
[12] Op.Cit. Page 69
[13] Source: http://www.eia.doe.gov/emeu/states/sep_use/notes/use_print2006.pdf, accessed 3/17/09

Figure 7 - Natural Gas for Generation in Massachusetts



The Independent System Operator-New England, responsible for regional transmission and reliability, noted in 2008 that the "region's heavy reliance on natural gas as the dominant generator fuel type has left the region vulnerable to fuel-supply risks, which can have an adverse impact on system reliability and lead to volatile and high electric energy costs associated with variations in natural gas prices."[14] Fuel savings in the residential heating sector have a direct and tangible impact on the electric generation sector. The Commonwealth's disproportionate reliance on natural gas for electric generation and for home heating creates an unusual and compelling interest compared to the prevailing conditions in the rest of the Nation for a higher standard of furnace efficiency.

E. The Residential Heating Equipment Market is Difficult to Influence, Particularly for Rental Housing.

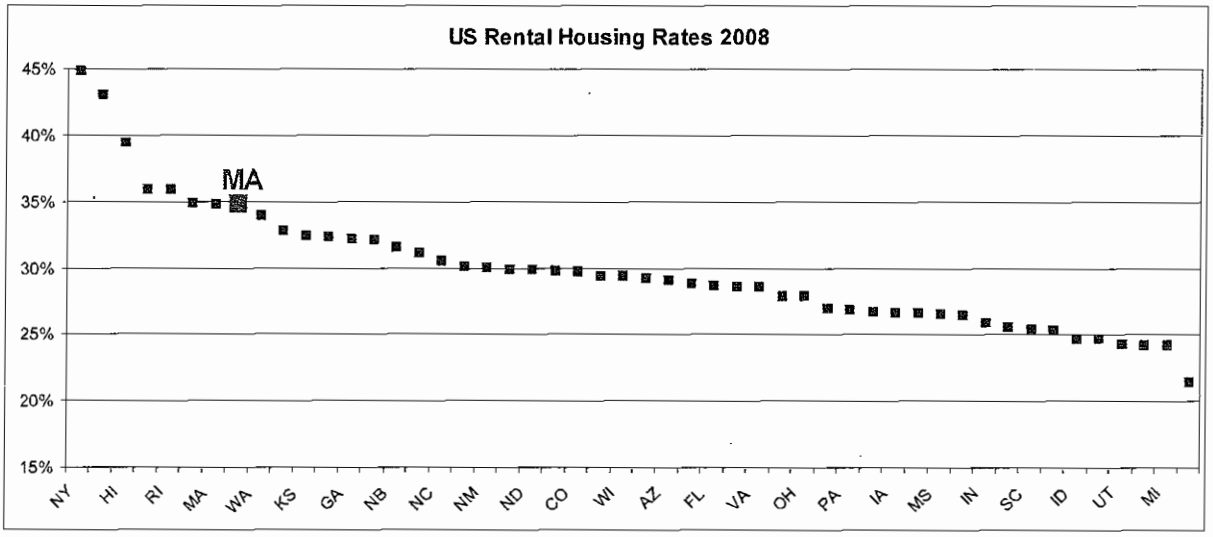
The Commonwealth's rate of rental housing creates another unusual and compelling interest when compared to conditions prevailing in the United States generally. Efficiency efforts in the rental housing market experience a phenomenon known as "split incentives." Building owners are typically responsible for the capital costs of the heating equipment and building envelope, while building occupants are typically responsible for ongoing operation costs, which is primarily fuel. In the narrowest sense, a building owner's interest is in reducing first cost, that is, putting in the least expensive equipment and envelope. Occupant interest is focused on reducing operation cost, but a tenant typically has neither the authority nor the resources to make the capital investment necessary to achieve this.

The Commonwealth has one of the higher rental housing rates in the country, which makes it significantly more challenging to influence purchasing decisions through means other than standards. The chart below (Figure 8) shows the range of rental

[14] ISO-NE Staff. *2008 Regional System Plan.* Holyoke MA, 2008. Independent System Operator-New England. Page 3.

housing rates in the United States and highlights the Commonwealth's position in this range.[15]

Figure 8 - Rental Housing Rates - US



Subsequent sections of this report and analysis describe the Commonwealth's efforts to increase the penetration of NWGF with an efficiency rating higher than the federal standard. These efforts have achieved relatively high penetration of high efficiency units in the overall Massachusetts market, but the rental housing sector likely represents a relatively larger share of the untapped potential energy savings, compared to owner-occupied housing. Because it is very hard to influence buying behavior in the rental market other than by state regulation, and the Commonwealth has an unusually high rate of rental housing, the Commonwealth has a compelling state interest in implementing a higher standard for NWGF than prevails in the rest of the Nation.

F. Regulatory and Statutory Requirements.

As mentioned above, M.G.L. c. 25B, § 5, and its implementing regulation set forth at 225 C.M.R. 9.03, require that to be eligible for sale in the Commonwealth, NWGF must meet or exceed an AFUE of 90 percent. The statute and regulation are complemented by other Commonwealth laws, which are more fully described the Massachusetts State Energy Plan submitted with the Petition for Waiver). The listed statutes and their implementing regulations constitute the Commonwealth's current energy plan. Some of these statutes and salient features are:

- the Green Communities Act, which sets aggressive energy use reduction targets for the state.

[15] http://www.census.gov/hhes/www/housing/hvs/rates/index.html – accessed 1/30/06. DC excluded.

- the Global Warming Solutions Act, which requires reduction of greenhouse gas emissions in 2050 to at least 80% below 1990 levels.

- the Regional Greenhouse Gas Initiative, which is intended to reduce greenhouse gas emissions through a binding, regional cap and trade mechanism.

G. Summary

Optimal has concluded that conditions and circumstances in the Commonwealth differ substantially from those prevailing across the Nation. These circumstances include a greater need for heating due to the Commonwealth's climate, higher unit costs for heating fuel, the more substantial impact of the total energy bill on vulnerable households, the impacts of the heating market on the electric generation sector, the larger proportion of the market in rental housing that makes it harder to reach due to split incentives, and specific but as yet unmet objectives that are manifested in the Commonwealth's statutes, regulations, and energy plans. Taken together, all of these factors amply demonstrate that the Commonwealth has a compelling need to implement its new high-efficiency standard for NWGF.

III. Implementation of the Massachusetts Standard Will Not Adversely Affect the Furnace Market.

Optimal undertook primary and secondary research to evaluate the impact of a higher standard for NWGF in the Commonwealth on the full range of participants in this equipment market. We concluded, as shown in the sections below, that:

- Burdens on manufacturers of furnaces complying with the Massachusetts standard will be minimal, because these manufacturers already produce and sell products that would meet the Massachusetts standard, and this equipment already has a high penetration level in the Commonwealth;

- Aside from efficiency, there is no significant difference in consumer desired features between equipment that meets the current federal 80% AFUE standard and equipment that would meet the proposed Massachusetts standard of 90% AFUE; and,

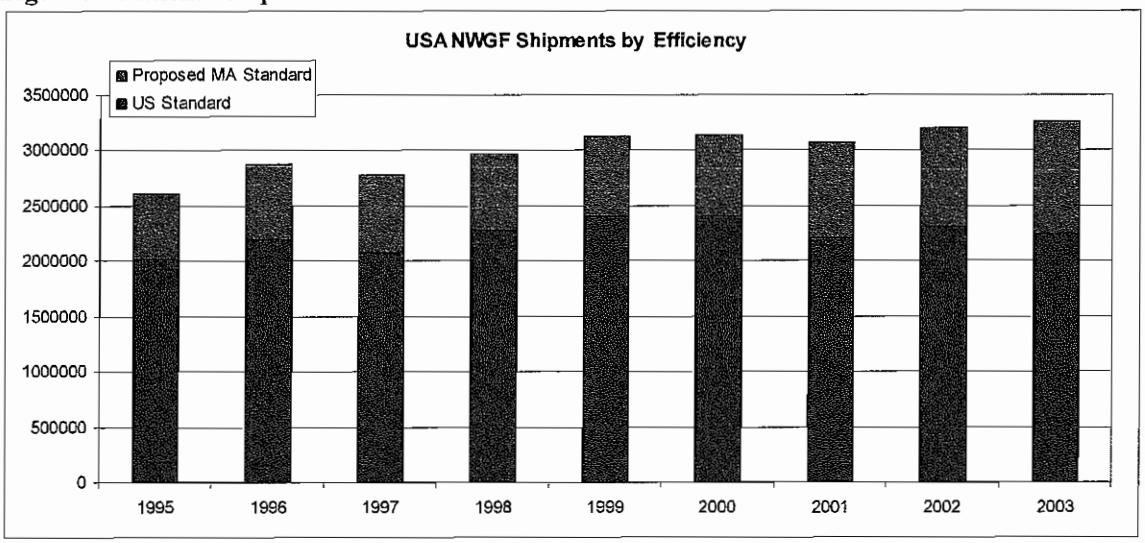
- There would be no difference in the impact of the high efficiency standard between small and large manufacturers, or between manufacturers within or outside the Commonwealth.

A. Manufacturers Already Produce and Sell Products That Would Meet the Commonwealth's Proposed Standard.

1. The National Market Overview Shows Increasing National Shipments of High Efficiency Furnaces.

Non-weatherized gas furnaces that would meet the proposed Massachusetts standard have been manufactured and distributed widely for over a decade. Below (in Figure 9) is a snapshot of the furnace market between 1995 and 2003.

Figure 9 - National Shipments

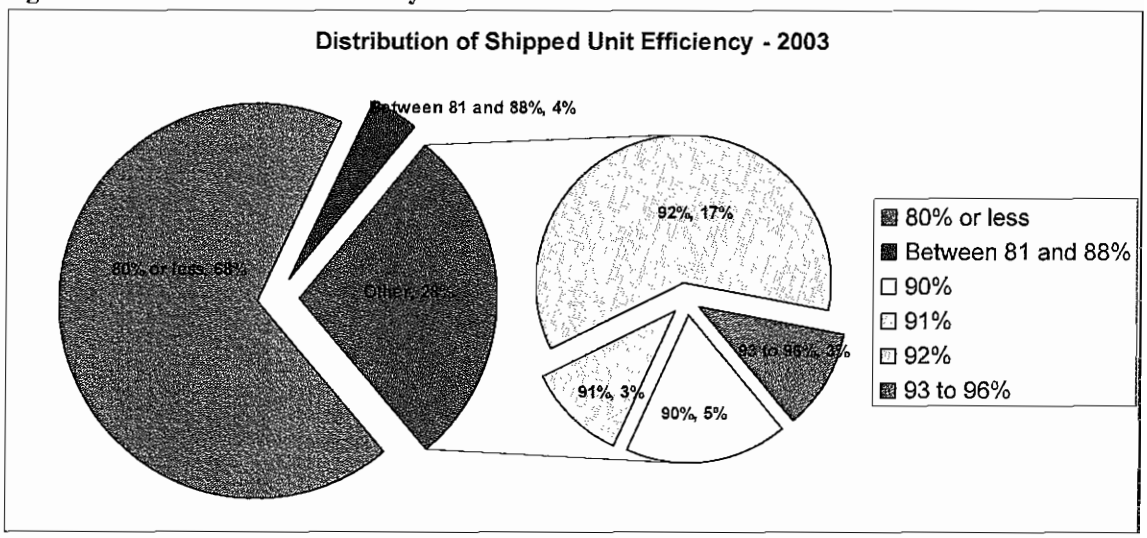


This data, provided in 2005 to DOE by the Gas Appliance Manufacturer's Association ("GAMA"), a predecessor organization to the Air-Conditioning, Heating, and Refrigeration Institute ("AHRI"), and divided by furnace efficiencies above and below 88%, does not correlate directly to the difference between the national standard of 80% AFUE and the Commonwealth's proposed standard of 90% AFUE.[16] However, the same source states that units with efficiencies that fell between the national standard of 80% AFUE and the proposed standard of 90% AFUE account for only 4% of the shipped units in 2003.[17] This is shown in the following chart (Figure 10):

[16] EE-RM/STD-01-350 Comment 96 & 98, referenced as "GAMA Comment"

[17] In the current market, the only furnaces that attain efficiencies greater than 85% AFUE use condensing technology, which invariably leads to efficiencies over 90% AFUE.

Figure 10 - Distribution of Efficiency[18]



The national data for 2003 show that there are very few products sold in the gap between the national 80% standard and the Commonwealth's proposed standard of 90%, and furthermore that "the overwhelming majority of furnace shipments within the range of 78% to <90% AFUE fall into the 80% to <81% bin." This data also shows that almost 90 percent of the furnaces shipped that exceeded the 80% federal standard (28% of all furnaces shipped) also exceeded the Commonwealth's proposed standard of 90% AFUE.

These data show that furnaces able to meet the proposed standard have been available and broadly distributed for over a decade. Hence, the Commonwealth's proposed standard would not have required manufacturers to redesign their products, their manufacturing processes, or their distribution operations.

The Commonwealth has been unable to acquire a comparable data series for subsequent years.[19] We present below, in Section III.A.2., the data that we were able to acquire to update the data series.

[18] GAMA Data

[19] Although MassDOER specifically requested from AHRI in October of 2008 comparable data on shipments of non-weatherized natural gas furnaces nationally and in Massachusetts, AHRI declined to provide the information on grounds that it was confidential and proprietary. On March 27, 2009, MassDOER and the Massachusetts Attorney General requested in writing that DOE obtain and supply to the Commonwealth certain comparable and more current information. By letter dated June 23, 2009, DOE responded that some data sought was already publicly available from DOE's rulemaking docket for residential furnaces and boilers, and also provided hard copies of some of the data to the Commonwealth.

2. Federal ENERGY STAR Program Data Confirms That High Efficiency Furnaces Are Readily Available.

The United States Environmental Protection Agency ("EPA") developed an ENERGY STAR program for furnaces and began tracking shipments in 2004.[20] The table below (Figure 11) shows the publically available data.

Figure 11 - ENERGY STAR Shipments[21]

US EPA ENERGY STAR Shipment Data				
	2004	2005	2006	2007
Response Rate	96%	96%	96%	100%
# of Partners	23	24	24	26
ENERGY STAR Units Shipped	1,661,000	1,319,905	1,167,112	1,030,976
Total Units Shipped (Calculated)	3,534,043	3,567,311	3,334,606	3,221,800
ENERGY STAR Market Share	**47%**	**37%**	**35%**	**32%**

The ENERGY STAR AFUE standard for NWGF is 90% or better, the same level that the Commonwealth seeks to make its operative efficiency standard. The GAMA data set forth above uses a threshold of 88% AFUE to define high efficiency. Considering the relative lack of units on the market between the current 80% AFUE federal standard and the ENERGY STAR 90% AFUE threshold -- only 4% -- the segmentation of the units shipped, as reported by GAMA, is for all intents and purposes equal to the segmentation used by the EPA.

There currently are over 50 brands offering over 350 model series with efficiencies at 90% AFUE or better listed by the EPA.[22] According to the AHRI publicly available database, there are 13,446 distinct models rated below 90% AFUE and 4,890 models rated at or above 90% AFUE.[23] The AHRI data indicates that approximately 27% of all models available would already meet the proposed Massachusetts standard of 90% AFUE.

The table below (Figure 12) displays a data series for national sales of furnaces segmented into two categories: those that meet the current 80% AFUE federal standard, and those that would already meet the proposed Massachusetts standard of 90% AFUE.

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[20] From http://www.energystar.gov/index.cfm?c=partners.unit_shipment_data_archives and http://www.energystar.gov/index.cfm?c=partners.unit_shipment_data; accessed 12/11/08

[21] "Response Rate" refers to the percentage of ENERGY STAR partners. The "Total Units" calculation is ENERGY STAR Units Shipped divided by ENERGY STAR Market Share.

[22] http://www.energystar.gov/ia/products/prod_lists/gas_furnaces_prod_list.xls: accessed 12/11/08

[23] http://re.gamanet.org:8080/gama_cafs/sdpsearch/search.jsp?table=Furnace: accessed 1/14/08, search criteria "Natural gas or propane" and AFUE below 90 & at 90 or better.

Figure 12 - Time Series Data[24]

National Shipments of NWGF by Federal and Proposed MA Standard Over Time													
(1,000 units)	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
US Standard	2,020	2,196	2,071	2,283	2,398	2,404	2,209	2,311	2,240	1,873	2,247	2,167	2,191
Proposed MA Standard	581	675	702	688	729	733	854	890	1,024	1,661	1,320	1,167	1,031
Total Furnace Sales	2,601	2,871	2,773	2,972	3,126	3,137	3,063	3,201	3,264	3,534	3,567	3,335	3,222
% Meeting MA Standard	22%	24%	25%	23%	23%	23%	28%	28%	31%	47%	37%	35%	32%
Housing Starts	1,354	1,477	1,474	1,617	1,641	1,569	1,603	1,705	1,848	1,956	2,068	1,801	1,355

The data in this section support the following conclusions on both the national level and for the Commonwealth in particular:

- A significant portion of furnaces on the market meet the proposed standard, and have met that standard for over a decade.

- The proposed standard will not impose a burden on the supply chain, since it is already providing this equipment.

- The proposed standard of 90% AFUE will have no, or at most a trivial, impact on the market segment between it and the 80% AFUE federal standard. Only 4% of all products sold in 2003, the last year for which data are available, had AFUE ratings between 81% and 88%. There is no evidence that this market segment has expanded in the intervening years. GAMA's cover letter for a 2002 data submission summarizes this key point in the following manner: "Notice the success of condensing furnaces in colder climates, the almost total absence of gas furnace shipments between 80% and 90% AFUE."[25]

ENERGY STAR is a joint program of the EPA and DOE. As such, it is a credible and reliable source of data. In the absence of actual shipment or sales data for recent years, the Commonwealth offers the results from the ENERGY STAR program as supporting evidence that there will be no adverse impact on manufacturers or distributors from the proposed Massachusetts standard.

B. A Massachusetts Market Overview Shows a Steady Increase in High Efficiency Unit Sales in the Commonwealth, Approaching a Limit via Voluntary Programs.

1. Available Historic Data Confirms an Upward Trend in Sales.

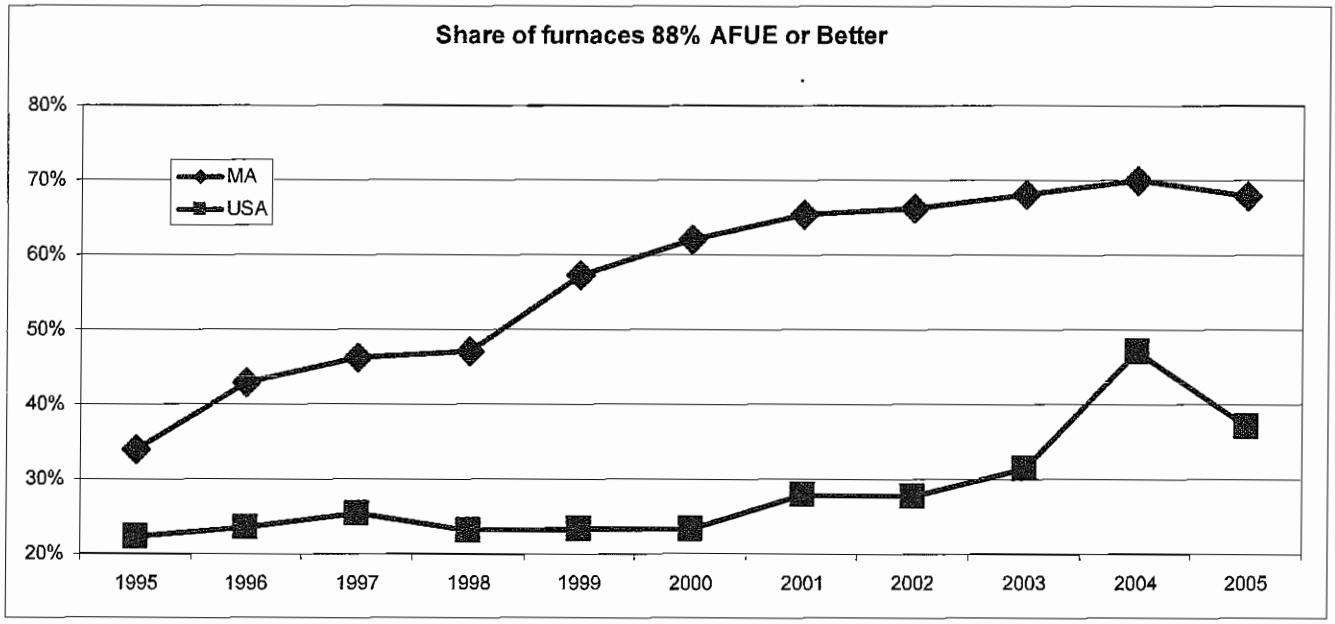
The market in the Commonwealth for high efficiency NWGF is substantially different from the national market. The penetration of this equipment in the

[24] Sources: GAMA Data & EnergyStar data

[25] Gas Appliance Manufacturers Association, April 10, 2002, letter to Mr. Cyrus Nasseri re Docket No. EE-RM/STD-01-350

Commonwealth is substantially higher than that which prevails in the Nation as a whole, and the penetration of these units appears to be reaching a plateau, as shown in Figure 13 below.

Figure 13 - High Efficiency Shipments[26]



This data shows that:

- High efficiency furnaces captured a bigger market share in Massachusetts than in the rest of the Nation, on the order of two to one, in the years preceding the ENERGY STAR initiative for this equipment;

- After the inception of the ENERGY STAR program, the Commonwealth still showed significantly higher penetration of high efficiency equipment than the rest of the Nation; and,

- The efficient furnace shipment curve in Massachusetts is comparable to the classic market diffusion curve. It climbs relatively sharply in the early years and then plateaus over a period of time. By comparison, the national curve appears relatively flat until the first year of a national promotion effort and then falls sharply afterwards.

High efficiency units have made up more than 60 percent of all shipments to Massachusetts since 2000 and are a unique feature of the Commonwealth's market.

Subsequent sections of this report address some of the causal components of the increase in sales of high efficiency units. The key point of this section is that the

[26] Massachusetts data supplied by GAMA to Keyspan; USA data from "GAMA Letter" and EnergyStar data.

Massachusetts market differs substantially from that of the Nation as a whole, and for this reason requires different approaches.

2. The Market for High Efficiency Furnaces in New and Existing Homes is Substantial.

Optimal's research on market impacts of the proposed Massachusetts standard reflects that the market is already providing this equipment and that it can meet the requirements of the 90% AFUE standard. This section of the analysis quantifies the potential market in the Commonwealth for efficient furnaces. It provides the context for estimating net benefits of the proposed standard, as well as the impact of the standard on the total market.

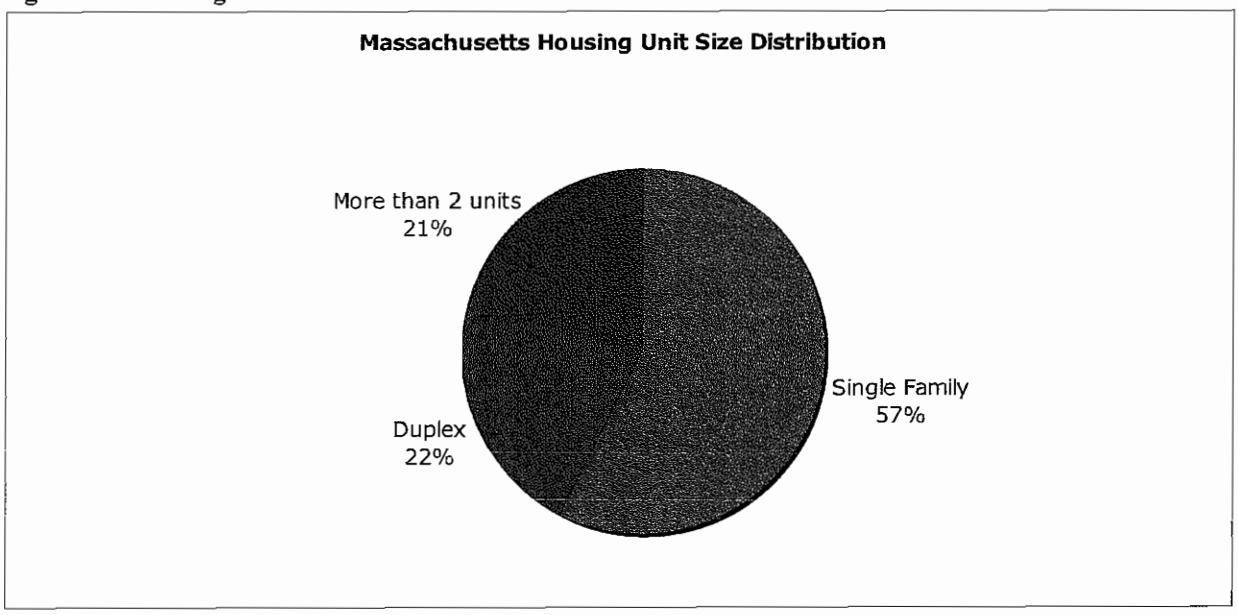
As with any kind of capital equipment, total sales of furnaces are measured by looking at two primary components: new purchases and the purchases of replacements for existing equipment. The replacement market correlates to the size of the existing housing market. Publicly available information from the United States Census Bureau and DOE are used in this analysis to estimate both the replacement market and the new construction market in the Commonwealth.

a) Estimate of the Size of the Replacement Market.

The United States Census Bureau reports that between 2000 and 2007, the percentage of Commonwealth households that used utility gas for heating rose from 43.9% to 46.6%.[27] Gas is currently the heating fuel for approximately 1.2 million households, but this does not correlate to the market for residential furnaces. Many of these Commonwealth households are in buildings heated by equipment larger than that covered by the current federal 80% AFUE standard or the proposed Massachusetts 90% AFUE standard. These households are in multiple unit buildings that have commercial-sized heating plants. The distribution of households by building unit size is shown below in Figure 14.

[27] http://factfinder.census.gov: accessed 12/13/08

Figure 14 - Housing Unit Size Distribution



According to the EIA's 2005 Residential Energy Consumption Survey ("RECS"), there were 44.7 million natural gas central warm-air furnaces in United States housing, of which 0.8 million were in the New England Census region.[28] EIA's RECS also reported that gas was the heating fuel for steam or hot-water systems in approximately 8.2 million households nationally, including 1.3 million in New England.

Another factor necessary to determine the replacement market is the portion of existing equipment that would fail and be replaced by comparable equipment in a given year. A commonly accepted methodology for estimating this replacement market is based on the average lifetime of the equipment under discussion. Analyses commonly assume that the annual replacement is equal to one, divided by the equipment lifetime in years. Many efficiency programs set the lifetime of natural gas furnaces at 20 years. However, much of the equipment still in service is significantly older than 20 years, and the RECS reports that approximately 21% of heating equipment has been in service for 20 years longer.

The following tables (Figures 15 & 16) show estimates of the natural replacement market for NWGF. The first table is based on the assumption that the equipment under consideration is only applicable to single family residences. The second table includes duplex residences. Both tables show the market assuming 20-year and 25-year lifetimes.

[28] http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc4spaceheating/excel/tablehc11.4.xls: accessed 12/12/08

Figure 15 - Single Family Replacement Market[29]

Estimation of Massachusetts Annual Furnace Replacement Market - Single Family Homes									
Year		2000	2001	2002	2003	2004	2005	2006	2007
Total Housing Units		2,625,040	2,637,393	2,648,959	2,660,758	2,675,383	2,692,235	2,709,365	2,722,190
Factor									
Homes	57%	1,505,869	1,512,955	1,519,590	1,526,358	1,534,748	1,544,415	1,554,242	1,561,599
% Heated by Gas	47%	702,260	705,564	708,659	711,815	715,728	720,236	724,819	728,250
% of Gas Furnaces	38%	267,528	268,786	269,965	271,168	272,658	274,376	276,121	277,428
Natural Replacement Market (20 yr life)	5%	13,376	13,439	13,498	13,558	13,633	13,719	13,806	13,871
Natural Replacement Market (25 yr life)	4%	10,701	10,751	10,799	10,847	10,906	10,975	11,045	11,097

Figure 16 - Single Family and Duplex Replacement Market

Estimation of Massachusetts Annual Furnace Replacement Market - Single Family Homes & Duplex									
Year		2000	2001	2002	2003	2004	2005	2006	2007
Total Housing Units		2,625,040	2,637,393	2,648,959	2,660,758	2,675,383	2,692,235	2,709,365	2,722,190
Factor									
Homes	79%	2,082,073	2,091,871	2,101,044	2,110,403	2,122,003	2,135,369	2,148,956	2,159,128
% Heated by Gas	47%	970,972	975,541	979,819	984,184	989,593	995,827	1,002,163	1,006,907
% of Gas Furnaces	38%	369,894	371,635	373,264	374,927	376,988	379,362	381,776	383,583
Natural Replacement Market (20 yr life)	5%	18,495	18,582	18,663	18,746	18,849	18,968	19,089	19,179
Natural Replacement Market (25 yr life)	4%	14,796	14,865	14,931	14,997	15,080	15,174	15,271	15,343

The analysis indicates a replacement market ranging between roughly 10,000 and 19,000 units annually for the years after the data provided by GAMA in 2005. The next phase of the analysis addresses new construction.

b) Estimate of the Size of the New Construction Market.

Data from the United States Census shows that the pattern of new home construction in the Commonwealth roughly parallels the national pattern.[30] A correlation between the number of housing starts and furnace sales is shown in the chart below (Figure17), comparing housing starts from the United States Census Bureau's database, to the total units shipped.[31]

[29] Data for this and subsequent chart is derived from the US Census bureau data and RECS data. The 38% of furnaces is the furnace portion of gas equipment in the New England census region.
[30] http://factfinder.census.gov: accessed 12/13/08
[31] http://www.census.gov/const/startsan.pdf: accessed 12/11/08

Figure 17 - Shipments to Housing Starts (National)

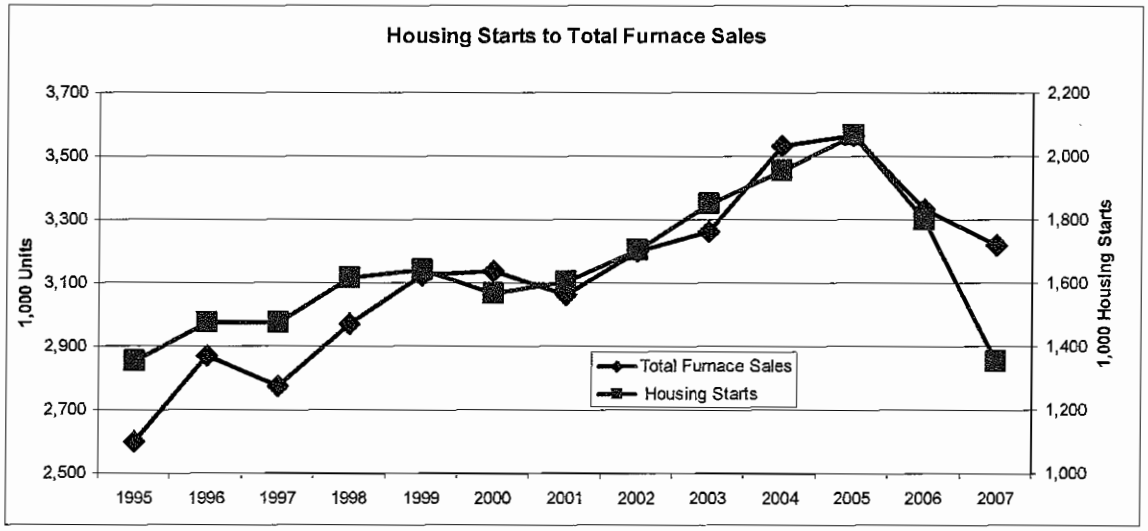
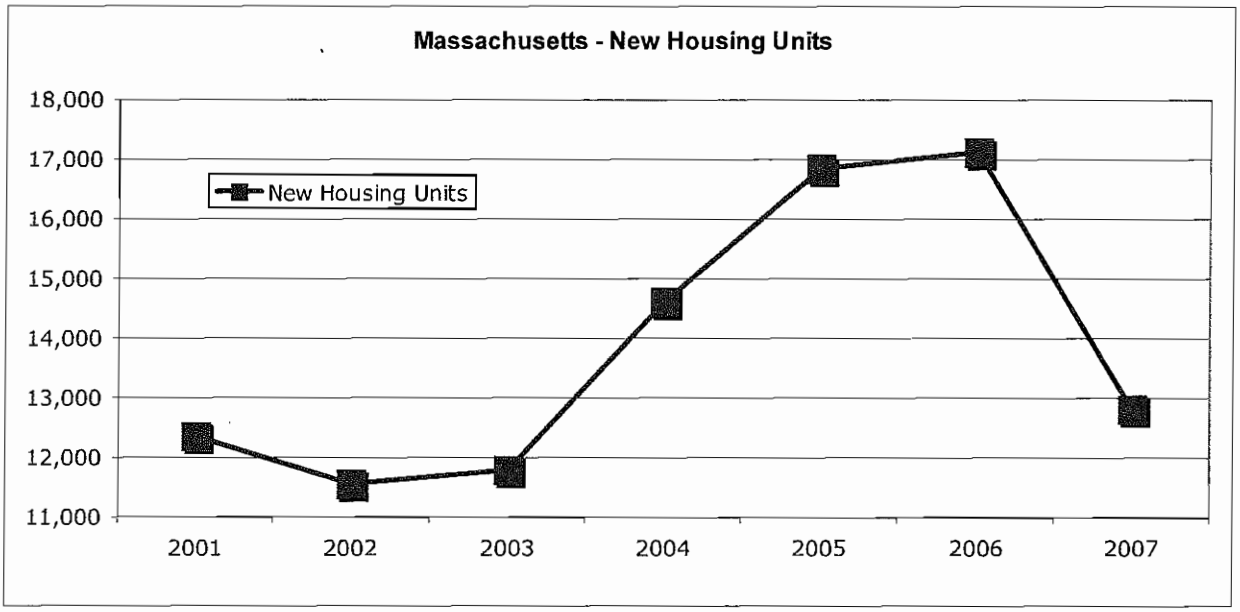


Figure 18 below shows new housing units in the Commonwealth by year:

Figure 18 - Massachusetts New Housing



The table below (Figure 19) develops an estimate of the new construction market based on an analytic method similar to that applied to the replacement market. It assumes that the new construction market is segmented in the same ratios as the existing housing market for the following factors:

- Portion of single family and duplex residences

- Portion of natural gas heating
- Portion of natural gas furnaces to water-based systems

These assumptions are a rough approximation of the market. Optimal believes this approximation is conservative, or low, for two reasons. First, there has been an upward trend in the use of natural gas as a heating source. Second, there has been an upward trend in the installation of central air conditioning in residential new construction. Taken together, these two trends increase the probability that the heating system will be a furnace, which can use the same distribution system as the air conditioning, as contrasted with a hydronic system that requires a separate water distribution system.

Figure 19 - Estimate of MA NWGF New Construction Market

Estimation of Massachusetts New Construction with NWGF Installation								
		2001	2002	2003	2004	2005	2006	2007
Total New Housing Units		12,353	11,566	11,799	14,625	16,852	17,130	12,825
Factor								
Single Family	57%	7,086	6,635	6,769	8,390	9,667	9,827	7,357
% Heated by Gas	47%	3,305	3,094	3,157	3,913	4,508	4,583	3,431
% of Gas Furnaces	38%	1,259	1,179	1,202	1,490	1,717	1,746	1,307
1 & 2 Family	79%	9,798	9,174	9,358	11,600	13,366	13,587	10,172
% Heated by Gas	47%	4,569	4,278	4,364	5,410	6,233	6,336	4,744
% of Gas Furnaces	38%	1,741	1,630	1,663	2,061	2,375	2,414	1,807

This analysis has developed estimates ranging between approximately 12,000 and 22,000 units for the period between 2001 and 2007. The GAMA data show below (Figure 20) reported shipments of all furnaces to the Commonwealth ranging between roughly 14,000 and 22,000 units for the years between 1995 and 2003. The historical data validates the range of unit shipment developed by this analysis.

Figure 20 - GAMA Verified NWGF Shipments

Massachusetts NWGF Shipment Data									
AFUE	1995	1996	1997	1998	1999	2000	2001	2002	2003
<88% (units)	9,362	9,736	7,843	9,269	8,803	8,725	8,335	8,954	10,241
Over 88% (units)	4,836	7,307	6,759	8,218	11,792	14,254	15,715	17,615	21,812
Over 88% (%)	34%	43%	46%	47%	57%	62%	65%	66%	68%

3. Massachusetts Market Summary.

The preceding analysis of the Commonwealth for NWGF equipment shows that:

- The penetration of high efficiency units is higher in the Commonwealth than that which prevails in the rest of the Nation.

- The distribution and installation infrastructure for high efficiency equipment already exists.

- The estimates of the total market size prepared in this analysis are consistent with existing data sources and serve as a credible basis for determining the impact of the Massachusetts standard.

C. Other Market Impacts of the Proposed Massachusetts Standard.

1. The Availability of Consumer-desired Features Will Not Be Adversely Effected by the Massachusetts Standard.

The proposed Massachusetts standard for NWGF will not reduce the availability of consumer-desired features. From the consumer perspective, furnaces are fungible. They are typically sold by contractors and service organizations with features like reliability and efficiency highlighted. The high efficiency units offer all of the features available in lower efficiency units, and in some cases may be bundled with features that offer enhanced value, such as differential temperature controls. These controls optimize the operation of the heating system by comparing the internal, external, and desired set point temperatures and by modifying the operation cycle to increase comfort and reduce fuel usage.[32]

2. Consumers Derive a Strong Net Benefit From the Application of a More Stringent Furnace Efficiency Standard.

DOE's Technical Support Document in Docket Number EE–RM/STD–01–350 evaluated the impacts of a variety of Trial Standard Levels ("TSL") and design option levels. The current 80% AFUE federal standard is equivalent to TSL #A. The Massachusetts proposed standard of 90% AFUE is equivalent to TSL #B for NWGF. The table below (Figure 21) is a summary from DOE's environmental analysis.[33] DOE found that "the TSL projected to yield the maximum consumer NPV [net present value] at seven percent discount rate for the cold climates (e.i., ≥5,000 heating degree days and ≥6,000 heating degree days)"[34] included NWGF standards at 90%.

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[32] See, for example, www.furnacecompare.com : "The Lennox G61V is a variable-speed gas furnace with enhanced humidity controls that operates at multiple speeds to regulate the air flow throughout the home. A SureLight® control board ensures easy and efficient functioning of all systems. This furnace is Energy Star rated with an AFUE from 94.6 to 95%. It is a two-stage heater that provides two levels of heating for temperature control. The design of the Lennox G61V Furnace is CSA certified and has obtained the Good Housekeeping Seal."

[33] USDOE, *Technical Support Document: Energy Efficiency Program For Consumer Products: Energy Conservation Standards for Residential Furnaces and Boilers*, September 2007 available at http://www1.eere.energy.gov/buildings/appliance_standards/residential/fb_tsd_0907.html

[34] 72 Fed. Reg. 65151

Figure 21 - DOE Summary

DOE TSD Results Summary					
		No-Action	TSL		Source
			A- Adopted	B - MA Proposed*	
USA	Cumulative Energy Saved - All Equipment (1)	NA	0.25	3.21	Table 10.4.3
	Cumulative Energy Saved - NWGF	NA	0.01	2.99	Table 10.4.3
	Cumulative NPV at 7% Discount NWGF (2)	NA	$40	$120	Table 10.4.5
	Cumulative NPV at 3% Discount NWGF	NA	$120	$8,200	Table 10.4.6
	Cumulative Emissions Reductions - All Equipment				
	CO2 (Mt)	NA	7.8	137.1	Table EA.16
	NOx (kt)	NA	9.2	164.6	Table EA.16
	Cumulative Emissions Reductions - NWGF				
	CO2 (Mt)	NA	0.2	94.2	Calculated (3)
	NOx (kt)	NA	0.3	111.5	Calculated
	Socioeconomic Impacts - NWGF (4)				
	All Consumers	NA	$2	$55	Table EA.22
	Low-income Sub-Group	NA	$2	$39	Table EA.22
	Senior Sub-Group	NA	$2	$36	Table EA.22
NORTH	Cumulative Energy Saved NWGF(Quads)		0.01	1.45	Table 10.5.2.
	Cumulative NPV at 7% Discount NWGF	NA	$30	$1,240	Table 10.5.4
	Cumulative NPV at 3% Discount NWGF	NA	$90	$6,350	Table 10.5.4
	Cumulative Emissions Reductions - NWGF				
	CO2 (Mt)	NA	0.2	45.7	Calculated (5)
	NOx (kt)	NA	0.3	54.1	Calculated
	Socioeconomic Impacts - NWGF - All Consumers	NA	$3	$212	Table 11.3.4 (6)
NOTES	* - TSL B is the lowest alternative considered that includes the MA proposed standard of 90% AFUE for NWGF				
	"NORTH" is defined as the cold climate region including with HDD >6,000 which more closely matches the conditions in MA than the the alternative criteria of HDD>5,000.				
	(1) - Cumulative total is quads over a time period starting in 2015 and ending in 2038. The reductions include impacts at power plants (both physical reductions and emissions credits) and at the household level				
	(2) - Dollars are million 2006$				
	(3) - Calculated based on the ratio of NWGF energy savings to All Equipment savings times the ratio of emission per gigajoule for natural gas to fuel as reported in Appendix W				
	(4) - Values based on total costs over lifetime of equipment				
	(5) - Calculated basd on the ratio of the North region to the total USA.				
	(6) - Table 11.3.4 lists equipment by AFUE, not by TSL. Values in this table were selected from the most cost effective option with an AFUE equivalent to the TSL. The values represent average life cycle savings per household.				

The difference between the current 80% federal standard (TSL A) and a standard for NWGF equivalent to the Massachusetts proposed standard of 90% AFUE (TSL-B) is significant on a national level, but the most significant differences are for the northern states. With the application of the high efficiency standard, lifetime energy savings increase by several orders of magnitude, from 0.01 quads to 1.45 quads. The net present values, depending on discount rate, increase by a factor of at least 70. The net positive lifetime impacts for the average consumer increases from $3 to $212. The original DOE analysis did not break out the low-income and senior sub-groups by the northern region. Considering the immense difference between the savings for all United States consumers of $55 and the savings for northern consumers, and the significant gain the higher standard would have had on these subgroups across the Nation (from $2 to $39 or $36), it

seems reasonable that these sub-groups in the Commonwealth would experience a substantial net positive benefit from the higher efficiency equipment.

In fact, in the New England region, low-income households stand to benefit disproportionately from a standard that requires installation of furnaces of at least 90% AFUE. Census data demonstrate that low-income households are disproportionately renters, not homeowners. (See Section II. E) These low-income renters must rely on the property owner to replace their heating systems. To the extent newer, higher-efficiency furnaces are already in place, they are disproportionately represented in single-family homes and higher-income households. Thus, lower-income tenants tend to live in units that have older, less efficient furnaces and stand to see the greatest efficiency gains and reductions in energy bills as those furnaces are replaced with units at 90% AFUE or higher due to the implementation of the Commonwealth's standard.

The Technical Support Document did not estimate the impact of various trial standard levels on specific states. The Appliance Standards Awareness Project and ACEEE issued a report in July 2009 that estimated the impact of enhanced federal standards on a wide range of products and disaggregated the impacts at the state level. The report estimated that a standard of 90% AFUE for gas furnaces, implemented in 2013 would have the following impact in Massachusetts[35]:

- Capture a net present value savings, in 2009 dollars, of $144,000,000 by 2030;
- Save 8.31 million therms of natural gas by 2020 and 19.4 million therms by 2030; and,
- Cut carbon dioxide emissions by 45,000 metric tons by 2020 and 105,100 tons by 2030.

Independent analyses consistently find that the benefits of the Commonwealth's proposed standard overwhelm the cost.

3. Installation, Operation, and Maintenance Procedures Would Not Be Adversely Affected by the Proposed Massachusetts Standard.

To determine the impact of the proposed standard on the contractor network, Optimal compiled a database of furnace contractors and vendors in the Commonwealth. The database was primarily compiled using phone records and internet searches, and was supplemented by referrals from other market actors. It is possible that a few contractors and vendors were overlooked, particularly part-time contractors and small vendors. However, with over 500 contractors and over 150 vendors, we are confident that the database captures the significant players in this market.

[35] http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_ma.pdf, accessed 8/17/09

Optimal and MassDOER administered a qualitative survey instrument to a small sample of vendors and contractors. The survey's goals were three-fold: to increase understanding of furnace market conditions in the Commonwealth; to determine if there are particular concerns about 90% AFUE furnaces in comparison to lower efficiency furnaces with regard to features, installation, operations, or maintenance; and to determine what concerns actors in the supply chain would have about a proposed increase to a 90% AFUE standard for NWGF. Telephone interviews and survey forms distributed at regularly scheduled trade ally meetings were used to collect contractor opinions.

The first set of questions attempted to control for our lack of available data on current furnace sales. The survey tested respondents' perceptions of the availability of efficient equipment and the effect on price from an increase to the 90% AFUE standard. The overwhelming response was that neither availability nor price would be adversely affected by a 90% AFUE standard.

The next questions checked for issues uniquely associated with the installation and operation of 90% AFUE furnaces that might make them less desirable than lower efficiency units. Respondents noted that there are certain issues that must be addressed with the installation of 90% AFUE furnaces, particularly providing drainage for the condensate produced by the normal functioning of the furnace. However, the overwhelming response was that there is nothing unique to 90% AFUE furnaces that would make them significantly more difficult or expensive to install or maintain. The reliability and necessary service intervals for higher efficiency equipment were reported to be comparable to those for equipment just meeting the current 80% AFUE federal standard. Some respondents noted that replacement components may be less available or more expensive for the high efficiency equipment, but this was generally attributed to the relatively small installed base of 90% AFUE furnaces compared to 80% and lower AFUE equipment. As the market share of efficient equipment increases, respondents anticipated that these differences would decrease.

The last set of questions asked the respondents to estimate the effects of a higher standard on manufacturers in the Commonwealth and the adjacent states. No vendor was aware of a manufacturer of gas furnaces in the Commonwealth or the adjacent states that would be adversely affected by the proposed standard.

D. Implementation of the Proposed Massachusetts Standard is Likely to Foster Other States' Adoption of Similar Standards, Not Disparate Ones.

In the Final Rule on Energy Conservation Standards for Residential Furnaces and Boilers issued by DOE on November 19, 2007 (72 Fed. Reg. 65136-65170), DOE recognized the potential benefit that could be achieved through the implementation of regional standards for residential furnaces and boilers, but determined that it did not have the authority under EPCA to establish such regional standards.[36] Section 325(o)(6) of

[36] 72 Fed. Reg. 65151

EPCA has since been amended by Congress to empower DOE to establish one additional regional standard for furnaces if the Secretary of DOE determines that establishing an additional regional standard will produce significant energy savings in comparison to establishing only a single national standard, and regional standards are economically justified.[37] Under the amendment, the Secretary must also consider the impact of the additional regional standards on consumers, manufacturers, and other market participants, including product distributors, dealers, contractors, and installers.

This power to establish an additional regional standard exists side-by-side with DOE's authority to grant a waiver from federal preemption under § 327(d) of EPCA (42 U.S.C. 6297(d)). In fact, § 325(o)(6) provides in relevant part that nothing in the amended statute diminishes the authority of a state to enforce a state regulation for which a waiver of federal preemption has been granted under 42 U.S.C. 6297(d).

All this said, we have concluded that there is little concern that the implementation of the Massachusetts standard -- after the grant of a waiver from federal preemption -- would be likely to contribute significantly to a proliferation of State appliance efficiency requirements. Our research shows, to the contrary, that if DOE were to grant the Commonwealth a waiver from federal preemption, the implementation of the 90% AFUE standard would more likely result in a consolidation of State standards. This is the case because the Commonwealth comprises the bulk of the market in New England for NWGF, and because other New England states that have passed statutory requirements for furnace efficiency have set them higher than the current federal 80% standard, at levels that are equal to the Commonwealth's proposed 90% standard. These Northeast states are Vermont, New Hampshire, Rhode Island and Maryland.[38]

The following tables (Figures 22 & 23) display Massachusetts shipments as a portion of national shipments and as a portion of New England shipments.[39]

Figure 22 - Massachusetts Share of National Shipments

Massachusetts NWGF Shipment as Percent of National									
AFUE	1995	1996	1997	1998	1999	2000	2001	2002	2003
MA% of 88%+	0.83%	1.08%	0.96%	1.19%	1.62%	1.94%	1.84%	1.98%	2.13%
MA% of Total	0.55%	0.59%	0.53%	0.59%	0.66%	0.73%	0.79%	0.83%	0.98%

Figure 23 - Massachusetts Share of New England Shipments

Massachusetts Shipments as Percent of New England Shipments									
	1995	1996	1997	1998	1999	2000	2001	2002	2003
MA as % of NE (units 88%+)	46%	50%	46%	41%	48%	55%	58%	57%	61%
MA as % of NE (total units)	49%	51%	48%	44%	43%	47%	53%	54%	57%

[37] Pub.L. 110-140, effective December 20, 2007.
[38] The standards in Maryland and New Hampshire are applicable to new construction only.
[39] The tables are based on data from the previously reference 2002 GAMA submission to DOE.

From this evidence we conclude that:

1. Granting the Commonwealth a waiver from federal pre-emption will have a negligible impact on the national market, since the Commonwealth comprises such a small share of the total market and already has a greater percentage of high efficiency units sold than the national average.

2. Granting the Commonwealth a waiver from federal pre-emption is likely to lead to a consolidation of standards by state legislatures into a regional standard appropriate for New England and other northern states with comparable usage factors. With regard to New England, since the Commonwealth is roughly half the market for NWGF, due to market efficiency it is likely to become a *de facto* standard, even if not adopted as a regional standard. With regard to northern states in other parts of the Nation, granting this waiver could vastly simplify both the analytic and procedural burdens carrying out the Congressional intent that the Secretary consider regional standards where appropriate.

In short, we conclude that granting the Commonwealth a waiver from federal pre-emption will not result in the proliferation of disparate standards and is most likely to contribute to the adoption of a rational regional standard as permitted by the law.

IV. Given the Relative Costs and Benefits, New Regulation is Preferable to the Universe of Alternatives.

The Commonwealth has undertaken a comprehensive analysis of non-regulatory alternatives for achieving the intended benefits of the proposed standard (entitled "Alternatives and Economic Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces"), which is being submitted along with the Commonwealth's Petition for waiver (hereinafter, the "Alternatives Analysis"). The considered alternatives fall into five basic categories:

A. Consumer rebate programs
B. Low-income grant programs
C. Tax incentives
D. Consumer financing programs
E. Public information and customer education campaigns

The Alternatives Analysis determined the contribution of each category to the total penetration, as shown in the table below.

Figure 24- Estimated Success Rate of Alternatives

Alternative	Contribution to Total Market Penetration	Individual Penetration
Consumer Rebate	55%	**37%**
Financing Assistance	10%	**7%**
Low Income Grant	5%	**3%**
Tax Incentive	16%	**11%**
Public Education	14%	**9%**
Total	**100%**	**67%**

The Alternatives Analysis then estimated cost and time to achieve the objectives of the Commonwealth's proposed standard, incorporated in the sections below.

The sections below highlight and, in some cases, complement the findings of this report.

A. Consumer Rebate Programs - GasNetworks Program.

Massachusetts has been attempting to capture the savings potential of more efficient gas furnaces since 2002. This program, called GasNetworks, is coordinated across the gas service territories of multiple utilities in Massachusetts. The program provided sliding scale rebates for furnaces with 90% AFUE or better. Components of the program include:

- marketing through websites, brochures, bill enclosures, customer call centers, e-mail, home shows, trade shows, trade ally events, and trade publications
- training seminars
- rebate application review/approval/processing
- customer inquiry and issue resolution
- onsite equipment installation verification
- management reports/data tracking

GasNetworks is a comprehensive and aggressive rebate program with statewide reach. The rebates were initially substantial, between $200 and $400 per unit, and extraordinarily well publicized. In 2004 the program raised the rebate threshold from 90% AFUE to 92% AFUE, which accounts for the drop in rebated units after 2003.

The results of this program are summarized in the table below (Figure 25).

Figure 25 - GasNetworks Summary

Massachusetts GasNetWorks Rebate Program Summary							
Year	2002	2003	2004	2005	2006	2007	2008 (1/1-9/30)
# Rebates	7,931	8,365	6,904	6,414	6,013	5,258	7,107
Budget	$2,424,105	$1,015,750	$1,043,810	$1,053,920	$1,248,560	$1,130,805	$1,775,598
% High Efficiency Units Rebated - Lower Bound	59%	60%	47%	44%	42%	39%	N/A
% High Efficiency Units Rebated - Upper Bound	75%	76%	60%	56%	54%	49%	N/A

The bottom two rows of this table are estimates of the program participation measured as a percentage of total estimated sales derived from the estimates in Section III.B. The significance of the steady decline in rebate percentages after the implementation of a higher threshold criterion for rebates cannot be determined absent actual sales data. It could indicate declining sales of efficient units, declining program participation as the market adopts the higher efficiency technology, declining sales of units at all efficiency levels as a result of economic conditions, or some combination of factors. The spike in participation for the first three quarters of 2008 is likely a response to high fuel prices and other economic factors.

The American Council for an Energy-Efficient Economy ("ACEEE") has recognized GasNetworks as an exemplary residential natural gas efficiency program in 2003[40] and as an exemplary multi-utility collaborative in 2008[41]. The GasNetworks program is pushing the boundaries of what can be achieved through market-based programmatic approaches without substantial increase in effort, cost and time. The Alternatives Analysis concluded that achieving penetration of 95% would take seven years and require an additional annual investment approximately ten times greater than the current level, or approximately $13 million annually.

B. Low-Income Grant Programs – HEARTWAP

The Commonwealth's Heating Emergency Assistance Retrofit Task Weatherization Assistance Program ("HEARTWAP") provides heating system repair and replacement to low-income households. The Alternatives Analysis estimated that achieving 95% penetration through this mechanism would require 63 years and an additional annual investment of approximately $58 million.

[40] http://aceee.org/utility/ngbestprac/u035.pdf?CFID=2231283&CFTOKEN=63561545, accessed 3/17/09
[41] http://aceee.org/pubs/u081/muni-programs.pdf, accessed 3/17/09

C. Tax Incentives

The Commonwealth implemented a tax incentive for 2005 through 2007. The program provides a tax credit of the lower of 30% of the eligible expenditures or $600 for energy efficient heating items. The Alternatives Analysis estimated that ramping up this program to achieve 95% penetration would require an additional annual public investment of approximately $3 million and take 18 years.

D. Consumer Financing Programs – HEAT Loan

The HEAT Loan Program offers qualified residential customers loans of up to $15,000 with seven year terms at zero percent interest for energy efficiency improvements, including high efficiency furnaces. The Alternatives Analysis estimated that to achieve 95% penetration this program would need to add an additional $4.5 million annually for 27 years.

E. Public Information & Customer Education Campaigns – Residential Conservation Services

Residential Conservation Services ("RCS") is a component of the Commonwealth's comprehensive efficiency offering for non-low income residential energy customers. The program provides on-site analysis, advice, and implementation assistance for energy efficiency upgrades and retrofits. The Analysis estimated that it would require 21 years and an additional annual investment of $23.6 million to achieve 95% penetration of high efficiency furnaces.

F. Alternatives Analysis Conclusion

The Alternative Analysis concluded that to achieve a market penetration of 95% would require between 6 to 63 years and cost between $2.99 million and $57.67 million. The Alternative Analysis approached each alternative as a stand-alone policy. It does not incorporate adjustments for interactive effects. It also held the diffusion curves constant. These analytic approaches are conservative, in that they likely understate the cost and time required to achieve the same end as the Commonwealths proposed standard through alternative mechanisms.

V. Conclusion

Based on our research, Optimal Energy Inc has determined that the Commonwealth has an unusual and compelling interest that can only be served by the adoption of an efficiency standard of 90% AFUE or better for non-weatherized gas furnaces. We have further determined that this standard will have no adverse impact on the market channel and will have a positive net benefit for consumers and residents.

ATTACHMENT E

THE COMMONWEALTH'S ALTERNATIVES ANALYSIS

UNITED STATES DEPARTMENT OF ENERGY

Alternatives and Economic Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces.

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September 30, 2009

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1. Introduction and Summary

1.1 History of the Commonwealth's Proposed New Standard and the Need for a Waiver of Federal Preemption.

In 2005, the Legislature of the Commonwealth of Massachusetts promulgated a revised statute, Massachusetts General Laws ("M.G.L.") Chapter 25B, § 5, providing that to be eligible for sale in the Commonwealth, non-weatherized gas-fired, residential furnaces ("NWGF") must meet or exceed annual fuel utilization efficiency ("AFUE") of 90%, which is more stringent than the United States Department of Energy's ("DOE") current 80% AFUE efficiency standard.[1] Mass. Acts 2005, Ch. 139, § 11. The Massachusetts Department of Energy Resources ("DOER"), which is a Department of the Massachusetts Executive Office of Energy & Environmental Affairs, implemented this statutory change by the passage of regulations found at 225 Code of Massachusetts Regulations ("C.M.R.") 9.03. This regulatory scheme cannot become effective, however, unless and until the United States Department of Energy ("DOE") grants the Commonwealth a waiver from federal preemption pursuant to § 327(d) of the Energy Policy and Conservation Act ("EPCA") (42 U.S.C. 6297(d)), upon a showing, by a preponderance of the evidence, that the proposed standard is necessary to meet "unusual and compelling State or local energy . . . interests."

1.2 Non-Regulatory Alternatives Studied by the Commonwealth.

To support the instant Petition for a waiver of federal preemption, DOER and Massachusetts Attorney General Martha Coakley (collectively the "Commonwealth") have conducted this Analysis of the potential benefits and consequences of implementing the Commonwealth's proposed 90% AFUE high-efficiency standard for NWGF compared to other non-regulatory alternative approaches. The Commonwealth has identified five such alternatives to the new 90% AFUE standard, which are listed in the following Table 1:

Table 1. Non-regulatory Alternatives to Federal NWGF Standards

- Consumer rebate programs
- Low-income grant programs
- Tax incentives
- Consumer financing programs
- Public information and customer education campaigns

[1] To be precise, the 80% standard, first promulgated November 19, 2007, by DOE, was subsequently challenged in the Second Circuit Court of Appeals. That rule has been voluntarily remanded to DOE for further rulemaking and comment`.

1.3 The Commonwealth's Proposed 90% AFUE Standard is Overwhelmingly Preferable to the Alternatives.

As described in more detail below, although the intended benefits of the proposed 90% AFUE NWGF standard may also be achieved through these kinds of non-regulatory alternative methods, the Commonwealth has concluded that the cost of implementing the proposed 90% AFUE standard is significantly lower than the cost of any of the considered non-regulatory alternatives and would be the most timely policy to achieve maximum market penetration.

We have reached this conclusion supporting the Commonwealth's waiver Petition in part because there has already been high market penetration of high-efficiency furnaces in Massachusetts, which makes it difficult and less cost-effective for voluntary programmatic efforts to further influence market penetration. This existing high market penetration has resulted, among other reasons, from the Commonwealth's aggressive and comprehensive implementation of alternative non-regulatory approaches for acquiring energy savings from the installation of more efficient gas furnaces, but those approaches have largely reached their maximum benefit.

This last point is critical for understanding the analysis that follows. The Commonwealth does not believe that it can actually attain the policy objective of 95% penetration of high-efficiency NGWF through any of the five alternatives analyzed below, nor is the Commonwealth aware of any precedent in any other state that suggests 95% penetration could be achieved through non-regulatory approaches. As just noted above, and as also discussed in section III.B.2. of the report prepared by Optimal Energy Inc. for the Commonwealth,[2] the Commonwealth believes that penetration of high-efficiency NWGFs has reached a plateau which cannot be significantly improved upon through voluntary, non-regulatory approaches. However, in order to present an "apples-to-apples" comparison of what the costs would be to attain 95% penetration via the regulatory approach and the five alternatives listed in Table 1, above, the analysis in this report assumes that 95% penetration could be achieved through each of the alternatives. By making this analytic assumption in order to derive hypothetical costs for each alternative, the Commonwealth is in no way expressing its opinion that such a high penetration level could in fact be achieved through any approach other than by mandatory regulation.

Commonwealth regulation in the form of a more stringent 90% AFUE standard is therefore preferable to the alternatives available to the Commonwealth as the most feasible and cost-effective way to further increase market penetration of high efficiency furnaces.

In performing this Analysis, the Commonwealth has used the epidemic model, a widely used technology diffusion model, to approximate the level of penetration of high-efficiency NWGF in total NWGF sales in the Commonwealth, and the associated costs of

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[2] *See also* Figure 13 of the Optima Report.

the alternatives. The expected market penetration of high-efficiency NWGF due to the proposed regulation is assumed to be 95%. The analysis compares alternatives at 75%, 85% and 95% penetration and assumes that 95% is the maximum achievable penetration through the use of a non-regulatory alternative.

1.4 The Commonwealth's Specific Findings on Cost and Implementation Schedules.

Applying the model, the Commonwealth made the following considered findings:

Cost of the Regulation: Inclusive of promulgation, implementation and possible enforcement, the cost of the new 90% standard to achieve 95% market penetration is approximately $24,000, and is an initial, non-recurring expense. This contrasts with the much greater costs of implementation of various potential non-regulatory alternatives, which include:

Consumer Rebate Programs: The GasNetworks program requires 3 to 7 years to achieve market penetrations of 75-95% at additional costs in the range $5.5 to $12.8 million.

Consumer Financing Assistance: The HEAT Loan program requires 4 to 27 years to achieve market penetrations of 75-95% at additional costs in the range $0.67 to $4.49 million.

Tax Incentives: The heating assistance tax incentive requires 3 to 18 years to achieve market penetrations of 75-95% at additional costs in the range $0.49 to $2.99 million.

Low Income Grant Program: The Heating Emergency Assistance Retrofit Task Weatherization Assistance Program ("HEARTWAP") requires 10 to 63 years to achieve market penetrations of 75-95% at additional costs in the range $9.15 to $57.67 million.

Public Information and Education Programs: The Residential Conservation Services ("RCS")/MassSAVE program requires 4 to 21 years to achieve market penetrations of 75-95% at additional costs in the range of $4.50 to $23.64 million.

Of the non-regulatory alternatives, the GasNetworks program requires the least implementation time, approximately 6 years, for 95% penetration. Tax incentives require the least cost, $2.99 million, for a 95% penetration. Compared to the very low costs of implementing a regulatory standard that is expected to achieve 95% penetration of new NWGF shipments upon the effective compliance date, none of the non-regulatory alternatives can be considered reliable stand-alone policies.

This alternative analysis overwhelmingly indicates that the new 90% AFUE regulatory standard would be the most timely and cost-effective policy to achieve maximum market penetration.

2. Methodology

Section 2 of this Analysis describes the methodology employed to review the considered non-regulatory alternatives.

2.1 Diffusion Theory and Levels of Penetration

The extensive economic literature on the diffusion process of new products indicates that there are a number of drivers affecting the process. Some prior work attempts to develop analytical models of diffusion patterns of new products. However, the diverse characteristics of products and nature of consumer adoption make it difficult to develop models that are universally applicable. Despite this difficulty, theoretical predictions and empirical studies have led to the following recognitions.

First, new technologies may not be adopted by all potential users in the market, regardless of their economic benefits and technological merits. Therefore, market penetration is typically characterized by eventual saturation at less than 100% of the available market. Second, not all adopters purchase new products at the same time. Early adopters purchase new products soon after invention and commercialization, while others respond slowly, waiting for products to become more mature. In fact, adoption can lag invention by as much as an order of magnitude of delay. Moreover, the adoption trends differ by the nature of the product; for instance, consumer products are adopted at different rates than industrial products. Third, diffusion processes can be approximately characterized by asymmetric "S-curves" that chart the rate of adoption of a technology over time. The logistic function in Figure 1, below, is an example of a typical S-curve.

The epidemic model, a widely used technology diffusion model, is used to approximate the level of penetration of high-efficiency NWGF in total NWGF sales in the Commonwealth. The model assumes that all consumers value the benefits of a high-efficiency NWGF identically and that the cost of the NWGF is constant over time. The factor that influences the customer to adopt a high-efficiency NWGF is information about the availability and the benefits of the product. That is, information diffusion drives new technology adoption by individual consumers. The model includes information diffusion from marketing efforts (modified exponential function of external influences) and word of mouth diffusion (logistic function of internal influences) from existing users.

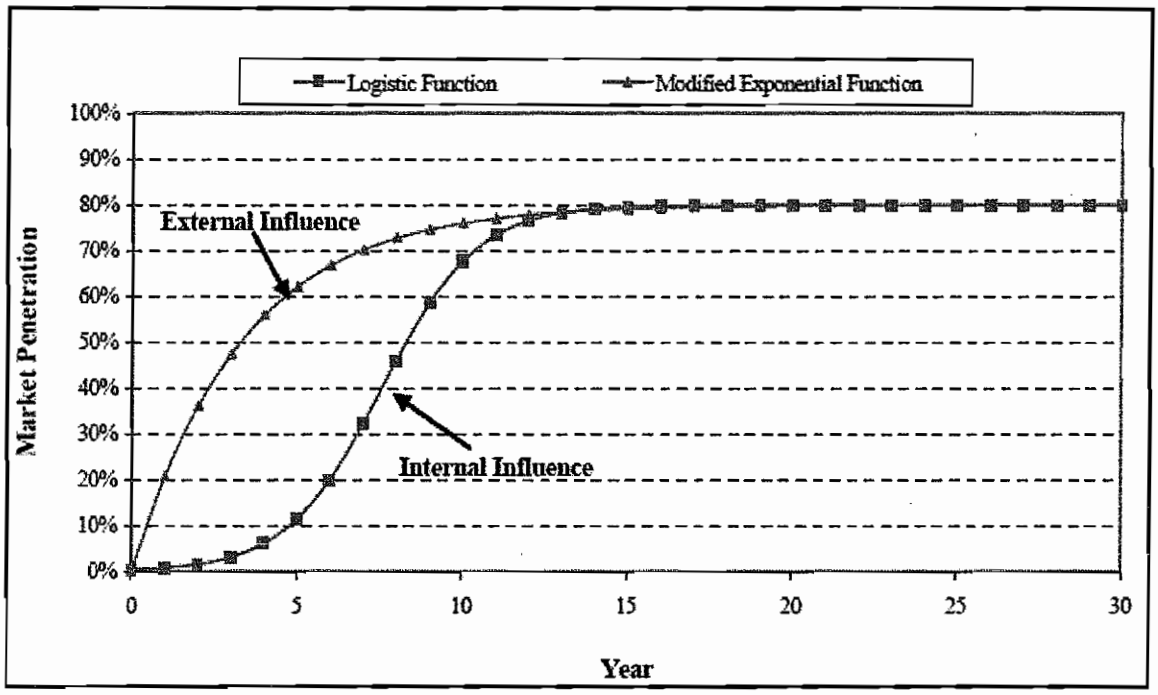

Figure 1. Market Penetration as a result of External and Internal Influences

Source: Federal NWGF Standard Regulatory Impact Analysis, DOE (2007)

Determining the contribution from word of mouth information diffusion to market penetration in the Commonwealth is difficult. The extent of such information diffusion depends on the propensity of high-efficiency NWGF users to voluntarily communicate with and influence non-users and cannot be estimated or predicted easily. The alternative analysis therefore assumes that word of mouth information diffusion cannot be relied upon to significantly increase the penetration of high-efficiency NWGFs. On the other hand, the marketing efforts of wide-spread energy efficiency programs already implemented in the Commonwealth includes promotions of high-efficiency NWGFs. Moreover, the costs of marketing efforts in any program alternative can be budgeted and considered before the selection of the alternative. The analysis therefore assumes that any change in the level of market penetration can only be attributed to the marketing efforts of the alternatives, i.e. the external influencers that can be controlled.

We note that the analysis focuses only on new NWGF shipments. Thus, the market penetration value is the percentage of high-efficiency furnaces of total new NWGF shipments in the Commonwealth.

A key assumption of the external influence theory is the success rate of the influence, or in other words the percentage of consumers that adopt the new technology upon receiving information about it. Figure 2 depicts the dependence of the level of penetration over time on the success rate of information diffusion.

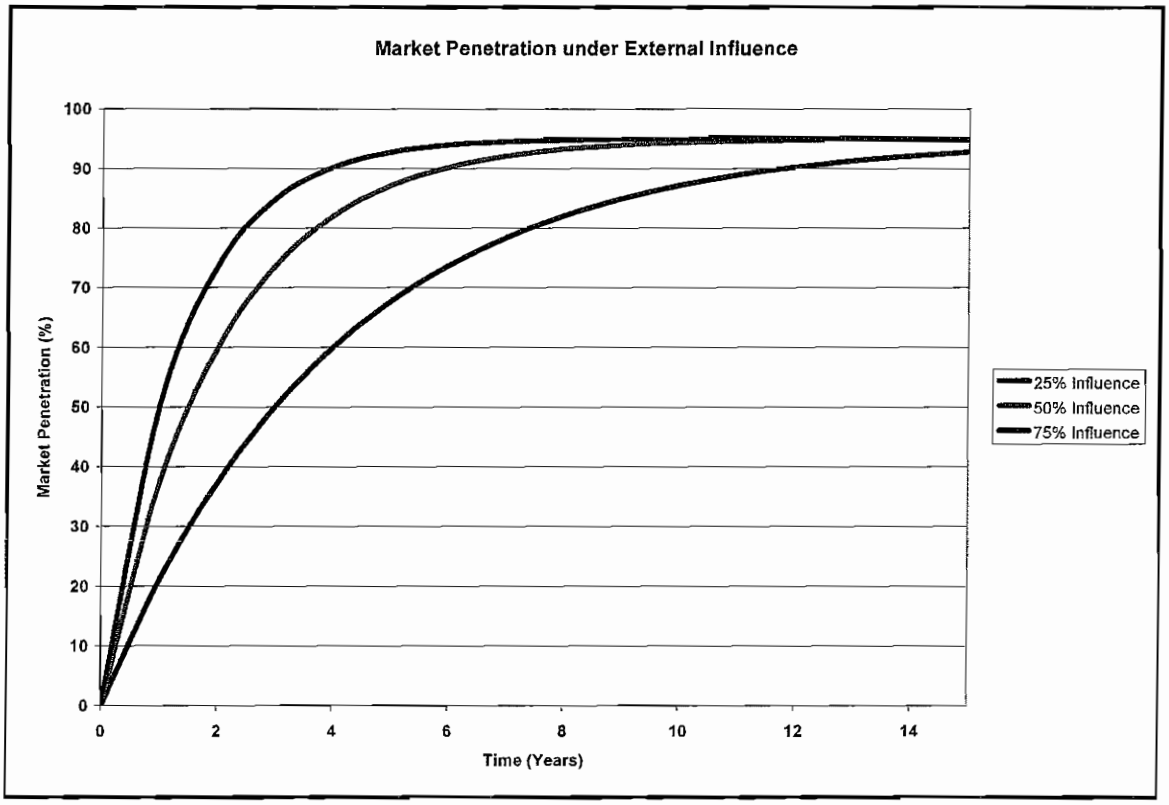

Figure 2. Dependence of the Level of Penetration on the Success Rate

Although predicting the success rate of a policy alternative is difficult, the analysis makes assumptions about the rate based on the nature of the alternative and any available historical data on the programs under the alternative. The analysis assumes that the success rate for an alternative can be approximated by its contribution to the total current market penetration. The aggressive marketing efforts of existing programs in the Commonwealth have led to the observed market penetration of 64 to 70% of total new NWGF shipments between 2001 and 2007.[3] Therefore, the total current market penetration in the Commonwealth is assumed to be 67%, the average of the 2001-2007 range. The estimated contribution of each existing policy alternative to the total market penetration, called the *individual penetration*, is shown in Table 2.

[3] *See* Report and Analysis in Support of the Commonwealth of Massachusetts' Petition to Exempt from Federal Preemption Massachusetts' 90% Annual Fuel Utilization Efficiency Standard for Non-Weatherized Gas Furnaces, prepared by Tom Franks & Alek Antczak, Optimal Energy Inc., dated September 30, 2009.

Table 2. Estimated Success Rate of Alternative based on Individual Penetration

Source: Compiled from statistics provided by program administrators

Alternative	Contribution to Total Market Penetration	Individual Penetration
Consumer Rebate	55%	**37%**
Financing Assistance	10%	**7%**
Low Income Grant	5%	**3%**
Tax Incentive	16%	**11%**
Public Education	14%	**9%**
Total	**100%**	**67%**

The current individual penetration for each alternative is used to approximate the success rate for estimating the future levels of market penetration for that alternative.

2.2 Cost per Level of Penetration

The cost effectiveness of alternatives is compared by calculating the costs of each alternative per level of market penetration. The method not only considers the historical costs of the alternatives implemented by the Commonwealth but also forecasts costs that are expected to be incurred with increasing market penetration.

An approach that is different from the traditional benefit-to-cost ratio approach used for comparing policy alternatives is selected to avoid the complications of benefit quantification. The method focuses on assessing the program costs of the alternatives, while normalizing the program benefits realized.[4] This approach is possible because the program welfare benefits gained from a given level of market penetration are identical, irrespective of the policy alternative used to achieve that level of penetration. For example, assume that the desired share of high efficiency NWGF of total NWGF sales is 75%. Then, the benefits obtained from the 75% penetration are identical, irrespective of the choice of alternative. Therefore, the analysis reduces to a comparison of costs for the same level of penetration across all the alternatives.

2.3 Maximum Levels of Penetration

The non-regulatory alternatives will always result in a penetration of less than 100% due to the nature of technology diffusion, as described in Section 2.1. Thus, any realistic goal for the desired market penetration through the use of an alternative will have to be at less than 100%. Additionally, the cost of implementing a standard is the same, whether the desired market penetration is less than or equal to 100%. As a result, it is almost certain that the standard is the best and most cost-effective method for

[4] Private benefits in the form of bill savings are also identical in all cases and exceed private costs, i.e. the incremental cost of a high-efficiency NGWF, in all cases. Thus, private benefits and costs are excluded from this analysis of alternatives.

extremely high levels of penetration, close to 100%. Therefore, this analysis aims to validate the cost-effectiveness of the standard not only for high penetrations, but also for levels much lower than 100%, for instance 75 or 85%.

The nature of the market for NWGFs in the Commonwealth and issues associated with residential housing infrastructure imply that some new purchases will continue to be low-efficiency NWGFs. It is expected that about 5% of all new NWGF purchases will continue to be below 90% AFUE.[5] The expected market penetration of high-efficiency NWGFs due to the promulgated regulation is therefore 95%.

The level of penetration of high efficiency NWGF as a percentage of total NWGF sales in Massachusetts was 64 – 70% between 2001 and 2007. The analysis described in this document therefore compares alternatives at 75%, 85% and 95% penetration and assumes that 95% is the maximum achievable penetration through the use of a non-regulatory alternative.

2.4 Cost Responsibility

Initially, program costs may be incurred by different entities depending upon the choice of the alternative. However, the costs of implementing a standard or any of the non-regulatory alternatives are eventually borne broadly by the public. For instance, state agencies will bear the administrative cost of implementing the standard. If an alternative such as a rebate program is chosen, utilities will bear the setup and customer support costs. If the standard is implemented, the administrative costs will be supported by consumers through tax revenues. If a rebate program is selected, the total amount in rebates paid out by a utility's rebate program to will be distributed across and recovered from all rate-payers. Thus, the cost per level of penetration method analysis uses the total program costs involved, irrespective of the entity which initially incurs them.

In some cases, complete program cost information is unidentifiable or unavailable. The analysis is still valid if the "incomplete" total costs for a level of penetration are greater than the cost of the standard.

2.5 Policy Interactions

Certain policies are often most effective when implemented in combination to provide incentives, such as combining consumer rebates or tax incentives with public education programs. The existence of more than one policy may have a synergistic effect of increasing the level of penetration. In reality, however, measuring and predicting such synergistic effects is quite difficult. To avoid the pitfalls of forecasting synergistic effects, combinations of alternatives are not considered. The impact on level of penetration of high efficiency NWGF sales due to each alternative is assumed to be independent of the existence and interactions of other alternatives. The cost per level of penetration is therefore calculated independently for each alternative.

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[5] Information provided by the Commonwealth's Department of Housing and Community Development

3. Non-Regulatory Alternatives

This section provides detailed information about existing programs in the Commonwealth that exemplify the non-regulatory alternatives listed in Table 1. A brief description of each program is provided, and recent cost data and estimated future costs for the scenarios of 75, 85 and 95% of market penetration are analyzed.

3.1 Consumer Rebate Programs - GasNetworks

GasNetworks is a collaborative consisting of local natural gas utility companies serving residential and commercial & industrial customers throughout New England. The collaborative has been promoting energy efficiency and the use of high efficiency natural gas technologies since 1997. In 1997, GasNetworks began the process of developing Energy Efficiency-Market Transformation programs. The original collaborative membership consisted of representatives from five Massachusetts gas utilities. Over the past six years, the membership has been broadened to include additional utilities throughout New England. GasNetworks receives support and endorsements from DOER, Northeast Energy Efficiency Council, Massachusetts Low-Income Energy Affordability Network, Massachusetts Department of Telecommunications and Energy, Northeast Gas Association and the Office of Massachusetts Attorney General Martha Coakley.

A central component of the GasNetworks initiative is its residential high-efficiency heating equipment rebate program. Rebates up to $1,300 are available for heating equipment that meets or exceeds the AFUE ratings as shown in Table 3.

Table 3. GasNetworks Rebates for Residential High-Efficiency Heating Equipment

Source: GasNetworks

$100 rebate	Warm Air Furnaces ≥92% AFUE rating
$200 rebate	Steam Boilers ≥82% AFUE rating
$400 rebate	Warm Air Furnaces ≥92% AFUE rating *equipped with* Electronic Commutated Motor (ECM) or equivalent advanced furnace fan system
$500 rebate	Forced Hot Water Boilers ≥85% AFUE rating
$1000 rebate	Forced Hot Water Boilers ≥90% AFUE rating
$1300 rebate	Combined High-Efficiency Boiler and Water Heating Unit ≥90% AFUE rating with hot water storage of 2 gallons or less

The rebates for NWGF require a minimum of 92 percent AFUE and are $100 for warm air furnaces and $400 for warm air furnaces equipped with an Electronic Commutated Motor. Thus, the program already provides incentives for furnace efficiency levels that are higher than the proposed standard of 90 percent AFUE. The

largest cost component of the GasNetworks residential rebate program for high-efficiency rebates is the rebates awarded by participating utilities as shown in Table 4. Program administration costs for GasNetworks are shown in Table 5.

Table 4. High-efficiency NWGF Rebates Awarded from 2002 – 2008 ($ nominal)

Source: Analysis of data provided by GasNetworks, MA DPU filings

Utility	2002	2003	2004	2005	2006	2007	2008 *	7 Year Total
Bay State Gas	$540,000	$150,200	$166,900	$209,400	$241,500	$193,800	$175,400	**$1,677,200**
Berkshire Gas	$54,000	$13,900	$13,000	$24,300	$28,100	$19,900	$20,700	**$173,900**
KeySpan Energy	$1,347,600	$597,800	$542,600	$558,200	$677,800	$656,500	$0	**$4,380,500**
Fall River Gas	$21,000	$3,300	$5,300	$5,600	$2,900	$5,900	$7,600	**$51,600**
Fitchburg Gas	$3,300	$2,600	$1,900	$3,500	$500	$1,900	$2,700	**$16,400**
NGRID	$0	$0	$0	$0	$0	$7,000	$1,342,353	**$1,349,353**
NSTAR Gas	$313,200	$101,200	$191,100	$146,300	$187,400	$153,400	$103,000	**$1,195,600**
Total	**$2,279,100**	**$869,000**	**$920,800**	**$947,300**	**$1,138,200**	**$1,038,400**	**$1,651,753**	**$8,844,553**

* Jan 1 - Sep 30, 2008

Table 5. Estimated GasNetworks Program Administration Costs

Source: Analysis of data provided by GasNetworks, MA DPU filings

Utility	2002	2003	2004	2005	2006	2007	2008 *	7 Year Total
Bay State Gas	$151,043	$115,019	$102,142	$110,990	$104,828	$79,706	$65,407	**$729,135**
Berkshire Gas	$23,063	$19,508	$15,953	$19,745	$19,903	$16,743	$16,664	**$131,579**
KeySpan Energy	$363,711	$457,563	$334,639	$267,805	$285,264	$268,674	$0	**$1,977,656**
Fall River Gas	$14,373	$11,450	$11,134	$11,608	$11,134	$11,134	$11,529	**$82,362**
Fitchburg Gas	$9,712	$10,897	$9,870	$10,186	$9,238	$9,396	$9,791	**$69,090**
NGRID	$0	$0	$0	$0	$0	$11,055	$452,665	**$463,720**
NSTAR Gas	$91,319	$81,839	$98,350	$73,228	$81,997	$62,010	$42,576	**$531,319**
Total	**$653,221**	**$696,276**	**$572,088**	**$493,562**	**$512,364**	**$458,718**	**$598,632**	**$3,984,861**

* Jan 1 - Sep 30, 2008

The analysis assumes that the average total annual cost of $1,832,773 for the program does not change in future years. Based on the available data about the current market penetration of high-efficiency NWGF, 37% of the penetration is attributed to the GasNetworks program. This individual penetration is also used to approximate the success rate for the program in future years. The resulting time requirement to achieve the desired levels of penetration of 75, 85 and 95% is shown in Table 6. The time requirement in each case multiplied by the average total annual cost for the program gives the estimated additional cost per level of penetration.

Under the stated assumptions, the GasNetworks program requires 3 to 7 years to achieve market penetrations of 75-95% at additional costs in the range $5.5 to $12.8 million.

Table 6. GasNetworks - Estimated Time and Additional Costs Requirements

Average Annual Cost ($)		$1,832,773
Success Rate (%)		37%
Penetration Level (%)	**Expected Time (years)**	**Estimated Additional Cost ($)**
75%	3	5,498,319
85%	4	7,331,092
95%	7	12,829,411

Figure 3 is a graphical depiction of the estimated market penetration curve for the GasNetworks program, assuming a success rate of 37%.

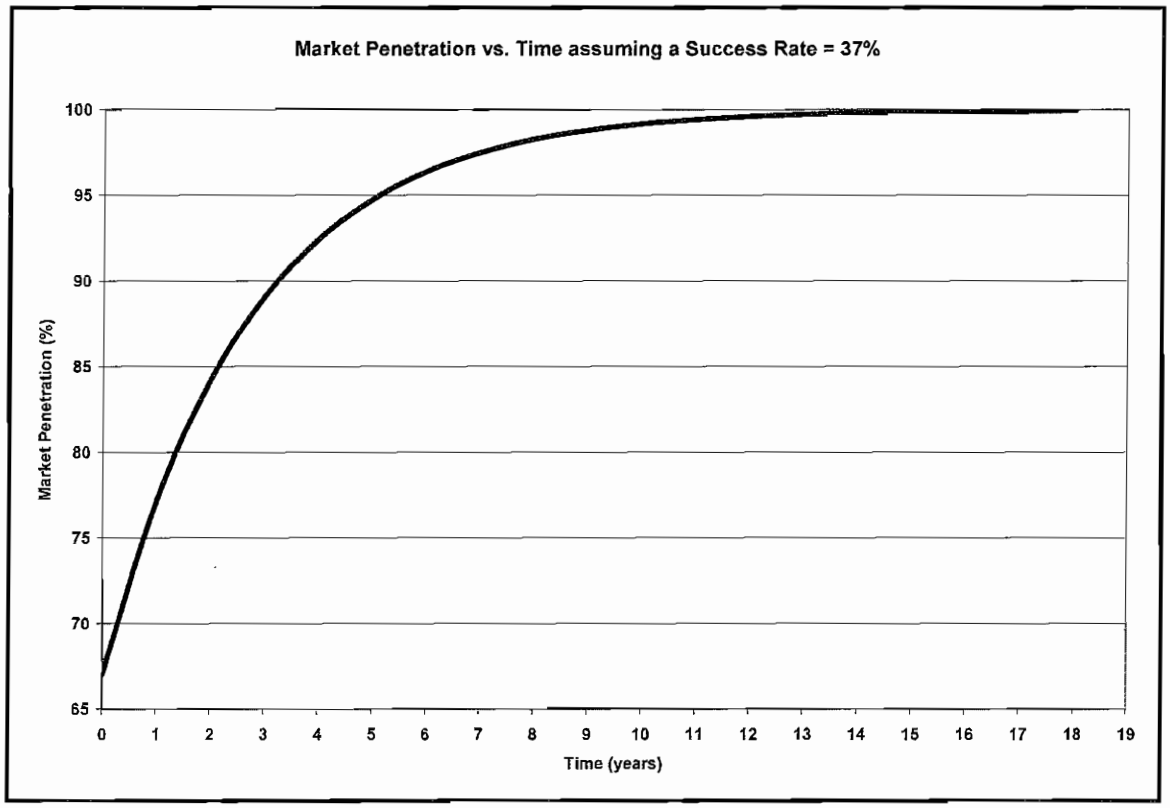

Figure 3. GasNetworks - Market Penetration Curve

3.2 Consumer Financing Assistance - HEAT Loan Program

MassSAVE is an energy savings program for Massachusetts homeowners and renters. It offers energy tips and information about free home energy assessments, energy-saving products, and loans, rebates, and other incentives for energy-saving home improvements. MassSAVE is a partnership between the Massachusetts gas and electric utility companies and local sellers and installers of home energy conservation products. The HEAT Loan Program, a component of MassSAVE, offers financing assistance to residential consumers.

Table 7. Energy Efficiency Improvements Eligible for the HEAT Loan Program

- Attic, Wall, and Basement Insulation
- High Efficiency Heating Systems including Furnaces and Boilers
- High Efficiency Domestic Hot Water Systems
- Solar Hot Water Systems
- Energy Star Windows
- Energy Star Thermostats

The HEAT Loan Program provides customers the opportunity to apply for a 0% loan from participating lenders for the installation of qualified energy efficient improvements in their homes. Loans of up to $15,000 are available (depending on utility) with terms of up to 7 years. To apply for the loan, the customer must own and reside in a one to four family residence and obtain a Home Energy Assessment through the MassSAVE program. A customer can obtain a loan by completing the following process for any of the improvements listed in Table 7:

1. Customers must sign up for a Home Energy Assessment from an authorized MassSAVE vendor.
2. A MassSAVE representative will assess the customers' energy efficiency improvement needs and determine what improvements are eligible for financing. The representative will provide the customer with HEAT Loan Intake Form, Program Steps and Minimum Standards and Requirements.
3. Customers may obtain pre-approval from a participating lender if they choose.
4. Customers obtain written contractor price proposal(s) for the installation of the improvements.
5. Customers forward the proposal(s) for review and approval by their MassSAVE HEAT Loan administrator listed on their electric utility HEAT Loan Intake Form.
6. Once approved, customers will receive a HEAT Loan Authorization Form from the MassSAVE vendor that authorizes the lender to process the HEAT Loan.

7. Customers finalize the loan with a participating lender and obtain two party checks.

8. Measures are installed and MassSAVE conducts a post installation inspection on the installed improvements.

The costs incurred to administer the HEAT Loan program in 2008 are shown in Table 8. Of the total program costs for financing all eligible improvements, approximately 72%, or $1,847,766, were incurred to finance heating systems. Improvements involving NWGF of 92 percent AFUE or better comprised 9% of the total program costs, or $166,299.

Table 8. HEAT Loan Program Costs in 2008

Source: HEAT Loan program administrator Conservation Services Group

Total Amount Financed	Total Program Costs	Heating System Share	Heating System Program Costs	Gas Furnace Share	Average Gas Furnace Program Costs
$ 8,379,780	$ 2,566,341	72%	$ 1,847,766	9%	$ 166,299

The analysis assumes that the 2008 annual cost of $166,299 for the program does not change in future years. Based on the available data about the current market penetration of high-efficiency NWGF, 7% of the penetration is attributed to the HEAT Loan program. This individual penetration is also used to approximate the success rate for the program in future years. The resulting time requirement to achieve the desired levels of penetration of 75, 85 and 95% is shown in Table 9. The time requirement in each case multiplied by the 2008 annual cost for the program gives the estimated additional cost per level of penetration. Under the stated assumptions, the HEAT Loan program requires 4 to 27 years to achieve market penetrations of 75-95% at additional costs in the range $0.67 to $4.49 million.

Table 9. HEAT Loan - Estimated Time and Additional Costs Requirements

Average Annual Cost ($)		$166,299
Success Rate (%)		7%
Penetration Level (%)	**Expected Time (years)**	**Estimated Additional Cost ($)**
75%	4	665,196
85%	12	1,995,588
95%	27	4,490,073

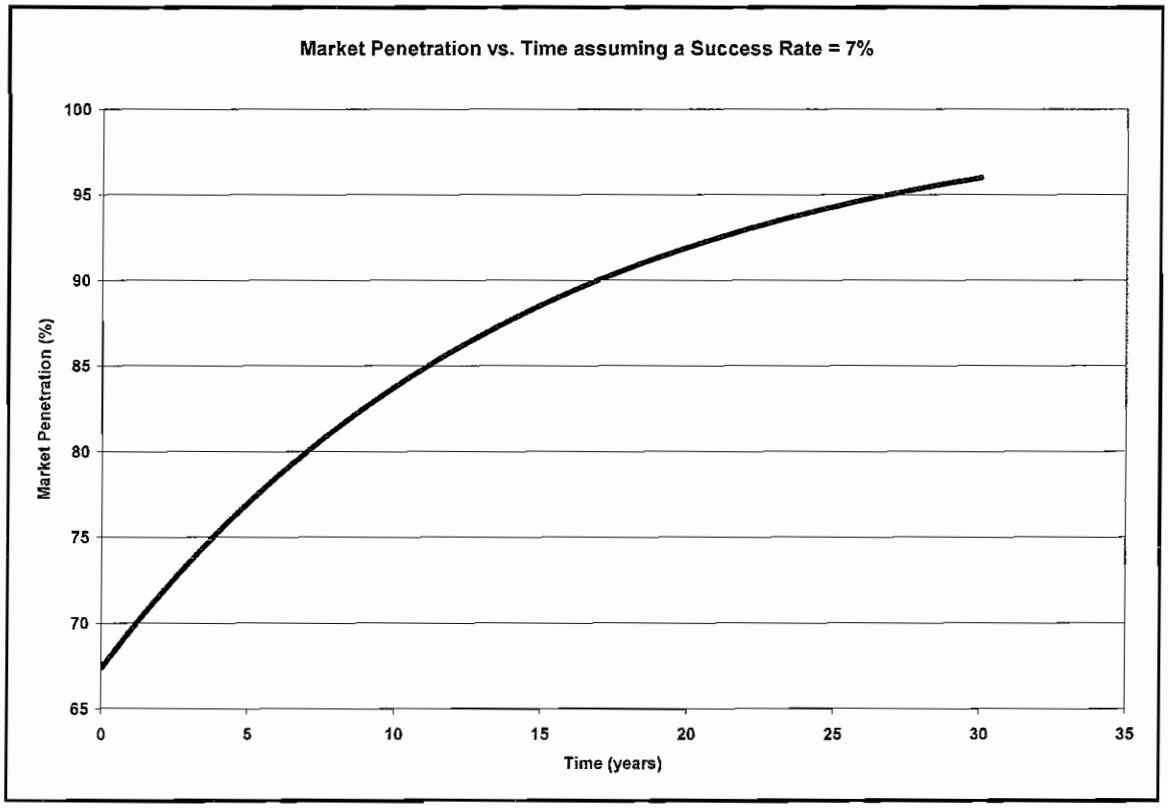

Figure 4. HEAT Loan - Market Penetration Curve

Figure 4 is a graphical depiction of the estimated market penetration curve for the HEAT Loan Program, assuming a success rate of 7%

3.3 Tax Incentives – Heating Energy Assistance and Tax Relief Act of 2005

An "Act Relative to Heating Energy Assistance and Tax Relief" ("the Act") was signed into law in the Commonwealth on November 22, 2005 (*See* St. 2005, c. 140). Under the Act, certain taxpayers subject to the personal income tax imposed by M.G.L. c. 62 were eligible for a deduction for certain expenses for home heating, and for a credit for energy-efficient heating items installed in residential property located in Massachusetts. Also under the Act, taxpayers subject to the corporate excise imposed by M.G.L. c. 63 may have been eligible for a credit for energy-efficient heating items installed in residential property located in Massachusetts.

Subject to certain limitations, a person or entity subject to taxation under M.G.L. c. 62 or M.G.L. c. 63 that is the owner of residential property located in Massachusetts could claim a credit in the amount of the net expenditure for energy-efficient heating items "purchased on or after November 1, 2005, but not later than March 31, 2006, for installation in said property." St. 2005, Ch. 140, §§ 15 and 16. The Act defined "energy-efficient heating items" as follows:

> "Energy efficient heating items" shall include, but not be limited to, home insulation, new window installation, advanced programmable thermostats, fuel efficient furnaces, boilers, oil, gas, propane, or electric heating

systems, solar domestic hot water systems, materials for insulation or sealing of a duct, attic, basement, rim joint or wall and pipe insulation for heating systems."

To be a qualified purchase for purposes of the credit, the item purchased must have been one of the items listed in the Act or the item must similarly have related to heat conservation, as opposed to some other type of energy-efficient items. The maximum aggregate amount of the energy-efficiency heating credit that may have been claimed by a qualifying taxpayer for the cost of energy efficient heating items was the lesser of 30% of the net expenditure for the qualifying purchases or $600 ($1,000 for a multi-unit dwelling).

Table 10. Heating Equipment Tax Incentives of 2005-2007

Source: Massachusetts Department of Revenue

Total Number of Filers	Total Credit	Assumption of Gas Furnaces' Share	Credit for Gas Furnaces	Average Annual Credit
121,383	$ 51,233,000	10%	$ 5,123,300	$ 1,707,767

The provisions of the Act allowed tax filers to receive credit in the years 2005 through 2007. The total credit claimed over the three-year period amounted to $51,233,000 of which the share of high-efficiency NWGFs is assumed to be 10%.[6] The average annual credits amounted to $1,707,767. (Table 10.)

Table 11. Tax Incentive - Estimated Time and Additional Costs Requirements

Average Annual Cost ($)		$1,707,767
Success Rate (%)		11%
Penetration Level (%)	**Expected Time (years)**	**Estimated Additional Cost ($)**
75%	3	498,897
85%	8	1,330,392
95%	18	2,993,382

The analysis assumes that the average annual cost of $1,707,767 for the program does not change in future years. Based on the available data about the current market penetration of high-efficiency NWGF, 11% of the penetration is attributed to the tax incentive. This individual penetration is also used to approximate the success rate for the program in future years. The resulting time requirement to achieve the desired levels of

[6] Data on existing programs in the Commonwealth such as the HEAT Loan and the Low Income grant program indicates that high-efficiency NWGF rebates or grants are approximately 10 % of the total award.

penetration of 75, 85 and 95% is shown in Table 11. The time requirement in each case multiplied by the average annual cost for the program gives the estimated additional cost per level of penetration. Under the stated assumptions, the tax incentive requires 3 to 18 years to achieve market penetrations of 75-95% at additional costs in the range $ 0.49 to $ 2.99 million.

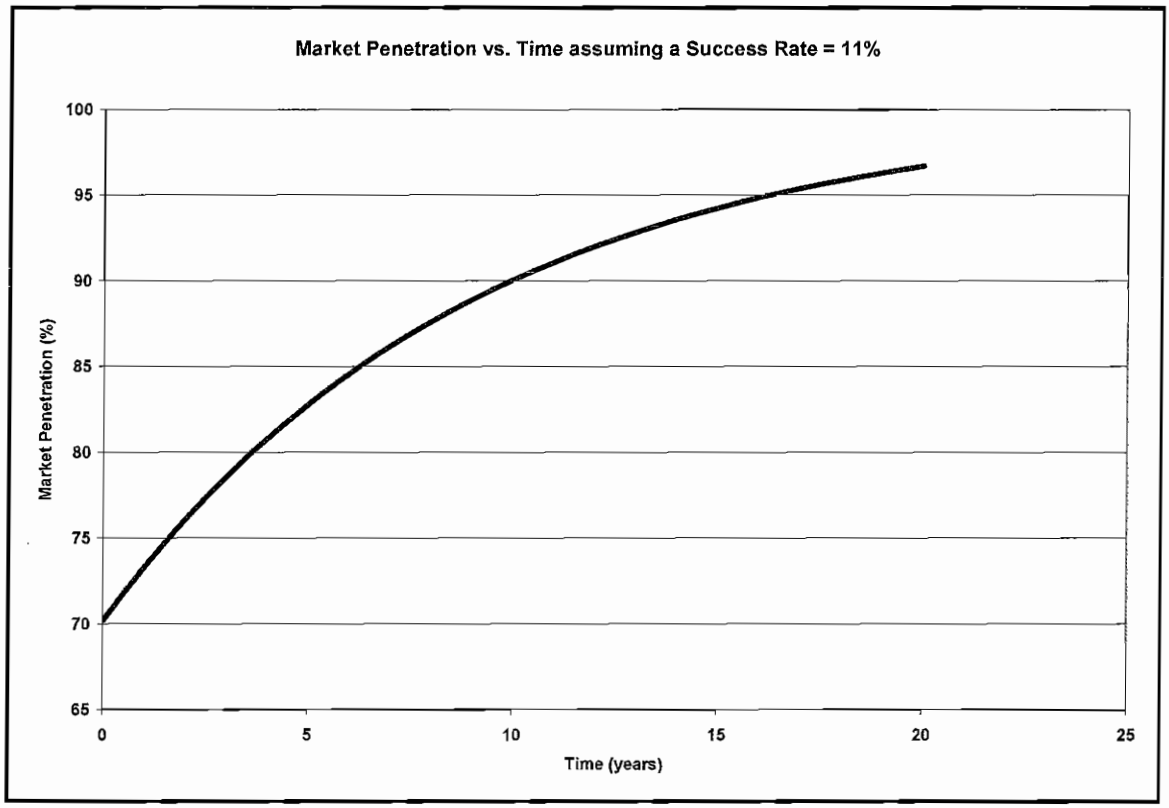

Figure 5. Tax Incentive - Market Penetration Curve

Figure 5 is a graphical depiction of the estimated market penetration curve for Tax Incentives assuming a success rate of 11%

3.4 Low Income Assistance Program - HEARTWAP

The Commonwealth's Heating Emergency Assistance Retrofit Task Weatherization Assistance Program ("HEARTWAP") provides heating system repair and replacement services to low-income households. The program is administered by a network of local agencies, and in most areas the same agency that administers the Low Income Home Energy Assistance Program ("LIHEAP" or "Fuel Assistance") program. HEARTWAP contracts with heating system service companies to complete the work for eligible households. Households that are eligible for LIHEAP with a gross annual income that does not exceed 60% of the Estimated State Median Income are eligible for HEARTWAP services. The program is designed primarily to serve homeowners. Landlords are required to maintain the heating system for their tenants under the Massachusetts State Sanitary Code.

Through the heating season, the program is primarily an emergency-based heating system repair program that helps eligible homeowners pay to repair or replace defective or unsafe heating systems. If sufficient funds are available after the heating season, HEARTWAP completes maintenance work (cleans and tunes) and replaces heating systems that are in poor condition and not worth repairing.

There are maximum allowable expenditure limits for different types of heating system activities. In some instances households may be required to provide a co-payment. Local agencies attempt to utilize all available utility funds for system replacements in an effort to minimize the need for client contributions.

Households are served based on need. Typically, a LIHEAP (Fuel Assistance) eligible homeowner who has a no-heat or unsafe heating system situation will call the local agency. The agency contracts with licensed and insured heating repair technicians to fix the problem. To the greatest extent possible local agencies will work with the customer's service dealer of record.

The costs incurred to administer the high-efficiency NWGF component of the HEARTWAP program from 2007 to 2009 are shown in Table 12. The average cost of the program over the three-year period was $915,463.

Table 12. HEARTWAP High-Efficiency NWGF Program Costs 2007-2009

Source: Massachusetts Department of Housing and Community Development

	FY 2007	FY 2008	FY 2009*
Number of Installations	194	162	241
Average Nominal Cost	$ 4,306	$ 4,366	$ 4,995
Total Nominal Cost	**$ 835,303**	**$ 707,292**	**$ 1,203,795**

*Year-to-date

Table 13. HEARTWAP - Estimated Time and Additional Costs Requirements

Average Annual Cost ($)	$915,463
Success Rate (%)	3%

Penetration Level (%)	Expected Time (years)	Estimated Additional Cost ($)
75%	10	9,154,630
85%	27	24,717,501
95%	63	57,674,169

The analysis assumes that the average annual cost of $915,463 for the program does not change in future years. Based on the available data about the current market penetration of high-efficiency NWGF, 3% of the penetration is attributed to the HEARTWAP program. This individual penetration is also used to approximate the success rate for the program in future years. The resulting time requirement to achieve the desired levels of penetration of 75, 85 and 95% is shown in Table 13. The time requirement in each case multiplied by the average annual cost for the program gives the estimated additional cost per level of penetration. Under the stated assumptions, the HEARTWAP program requires 10 to 63 years to achieve market penetrations of 75-95% at additional costs in the range $9.15 to $57.67 million.

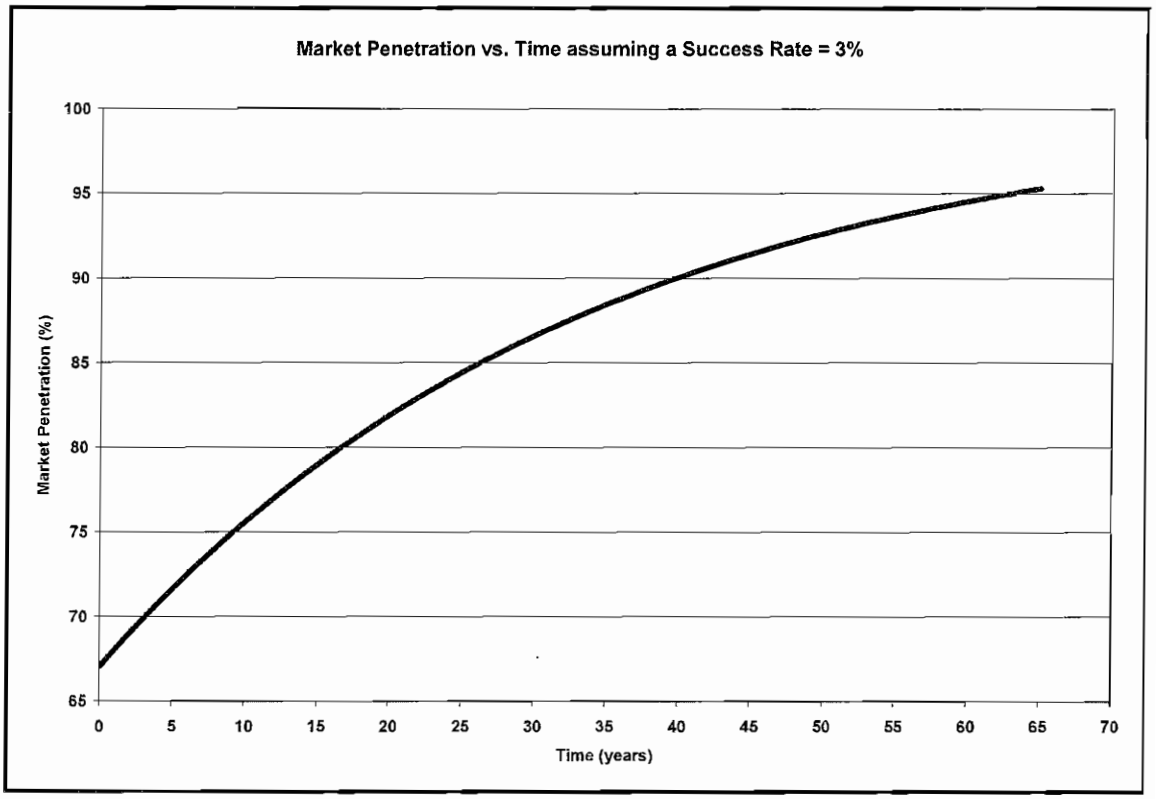

Figure 6. HEARTWAP - Market Penetration Curve

Figure 6 is a graphical depiction of the estimated market penetration curve for the HEARTWAP Program assuming a success rate of 3%

3.5 Public Education – Residential Conservation Services

The Residential Conservation Services ("RCS") program in the Commonwealth is administered under Chapter 465 of the Acts of 1980, and pursuant to M.G.L. c. 25A, § 11A. The initiatives under the RCS program are collectively called MassSAVE. During the period 1980 through 2000, the RCS/MassSAVE program was an educational program encouraging customers to upgrade the efficiency of their homes. Beginning in 2001, the

RCS/MassSAVE program began to change its emphasis from education only to education and measure implementation. Customers are now offered incentives to implement energy saving measures in their homes.

The program targets all non–low income residential customers living in single-family houses or one- to four-unit multifamily buildings, whose primary heating source is natural gas. The program is administered within each service territory by its Program Administrator and is coordinated statewide through the Residential Management Committee ("RMC") that actively manages and steers the statewide MassSAVE program. The program is delivered by program vendors selected through a competitive bidding process. The cost-effective energy-saving improvements targeted by the program are listed in Table 14.

Table 14. Target RCS/MassSAVE Energy Efficiency Improvements

- Building Envelope
- HVAC/Mechanical systems
- Water Heating
- Energy saving appliances and lighting
- Deep retro fit measures
- New technologies / renewables

All customers who contact MassSAVE to learn about the program are asked several questions to determine their need for and general interest in making energy-efficient improvements. Customers are guided to appropriate program services provided by energy efficiency vendors including targeted energy efficiency information, advanced diagnostics, efficiency rebates, and deep energy retrofit support. Low-income customers are referred to appropriate low-income programs. When appropriate, a series of home visits are offered to further engage the customer and proceed in a logical and methodical process of identifying and informing customers of all available energy savings opportunities. The home visits include:

Screening Visit: An in-home visit designed to provide general information and education about energy efficiency and identify opportunities and challenges for energy saving installations. Customers' specific needs are identified and they are directed to other energy efficiency resources as appropriate.

Diagnostic Visit: A comprehensive energy assessment including a variety of diagnostic techniques such as blower door tests, infrared scanning, and duct leakage testing (based on vendor determination). Wherever feasible, full installation of air sealing, duct sealing, and programmable thermostats are provided at no cost to the customer. The savings from the direct install measures are designed to cover the cost of the visit. Specific energy efficient upgrades that require professional contractors, as well as, a customer contribution are identified and recommended.

Quality Assurance Visit: A visit intended to verify that all energy efficiency measures were installed to the levels deemed appropriate by Program Administrators and to ensure Program savings.

The Commonwealth's expended budget amounts for administering the RCS/MassSAVE program for the period 2005 to 2009 are shown in Table 15. Additionally, program administration and market transformation budgets for NSTAR and National Grid, the two utilities in the Commonwealth that participate in the RCS/MassSAVE program, amounted to $926,835 in 2009. The resulting annual program cost in 2009 was therefore $1,125,835.

Table 15. RCS/MassSAVE Program Budget for the Commonwealth 2007 – 2009

Source: Utility energy efficiency filings, Massachusetts Department of Public Utilities

	2005	2006	2007	2008	2009
Total RCS Budget	$ 183,000	$ 196,000	$ 194,000	$ 186,000	$ 199,000

Table 16. RCS/MassSAVE - Estimated Time and Additional Cost Requirements

Average Annual Cost ($)		$1,125,835
Success Rate (%)		9%
Penetration Level (%)	**Expected Time (years)**	**Estimated Additional Cost ($)**
75%	4	4,503,340
85%	9	10,132,515
95%	21	23,642,535

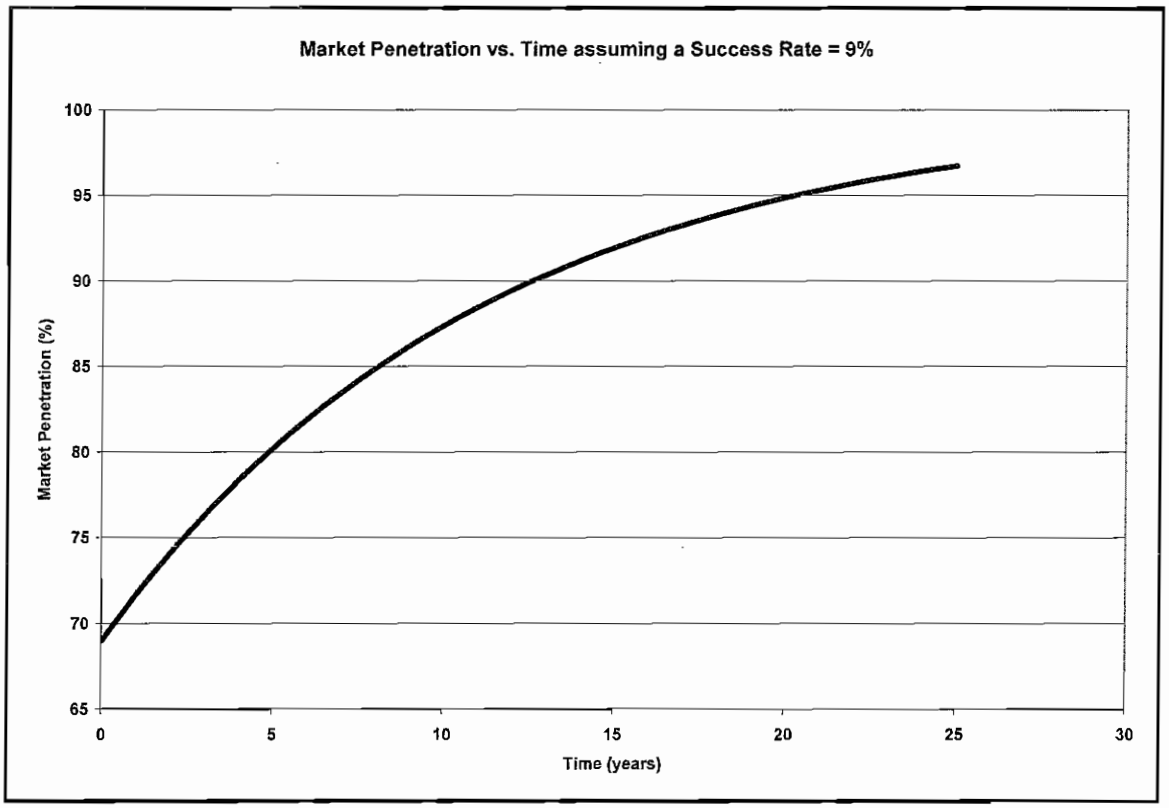

Figure 7. RCS/MassSAVE - Market Penetration Curve

Figure 7 is a graphical depiction of the estimated market penetration curve for the RCS/MassSAVE Program assuming a success rate of 9%

The analysis assumes that the average annual cost of $1,123,835 for the program does not change in future years. Based on the available data about the current market penetration of high-efficiency NWGF, 9% of the penetration is attributed to the RCS/MassSAVE program. This individual penetration is also used to approximate the success rate for the program in future years. The resulting time requirement to achieve the desired levels of penetration of 75, 85 and 95% is shown in Table 16. The time requirement in each case multiplied by the average annual cost for the program gives the estimated additional cost per level of penetration. Under the stated assumptions, the RCS/MassSAVE program requires 4 to 21 years to achieve market penetrations of 75-95% at additional costs in the range $4.50 to $23.64 million.

4. Regulatory Standard

4.1 Rationale for the Standard

A regulatory standard for appliance efficiency in a given market is effective in significantly increasing the appliance's market penetration when appliances that meet or exceed the standard are readily available and have already attained a high market

penetration through other market-based or voluntary methods. The analysis conducted by the Commonwealth in support of its petition for a waiver indicates that the market penetration of high-efficiency NWGF of at least 90% AFUE in the Commonwealth was 67% on average between 2001 and 2007. Additionally, the analysis concluded that promulgating the standard would not negatively affect furnace manufacturers, other regional markets, or the national market because it is widely available. In fact, high-efficiency NWGFs are a major product offering under the EnergyStar program. Furthermore, the descriptions of the five non-regulatory alternatives and the associated cost and penetration data in Section 3 demonstrate that these market-based and voluntary programs have been aggressively implemented in the Commonwealth. However, these programs will have to overcome additional barriers if they are to significantly increase market penetration Lack of awareness on the part of some consumers, difficulty in assessing life-cycle costs and the overall energy savings potential of the appliance, and small savings on individual purchases may result in a consumer decision to purchase a low-efficiency NWGF. A regulatory standard that requires the sale of only high-efficiency NWGFs will decrease the decision making burden on consumers, and ensure a significant increase in market penetration.

The nature of the market for NWGFs in the Commonwealth and issues associated with residential housing infrastructure imply that some new purchases will continue to be low-efficiency NWGFs. It is expected that about 5% of all new NWGF purchases will continue to be below 90% AFUE[7]. The expected market penetration of high-efficiency NWGFs due to the promulgated regulation is therefore 95%. The expected penetration will be realized after the compliance date of the standard, which will be selected to allow for notification of and preparation by of all Commonwealth, consumer, market, and industry stakeholder groups.

4.2 Cost of the Standard

The cost of the standard primarily involves two components: promulgation and implementation. The costs of promulgation were incurred subsequent to the legislative change in 2005, when the Commonwealth's Legislature revised M.G.L. Chapter 25B, § 5, to provide that to be eligible for sale in the Commonwealth, NWGF must meet or exceed AFUE of 90 percent. Mass. Acts 2005, Ch. 139, § 11, revising M.G.L. c. 25B, § 5. The cost of promulgation is estimated at approximately $14,000 inclusive of legal research, formulation, drafting, stakeholder meetings and updates to the appropriate sections of the Massachusetts General Laws and to 225 C.M.R. 9.03. The future cost of implementation is estimated at $10,000, which includes marketing of the new standard and public notification of all Commonwealth, consumer, market, and industry stakeholders. The total cost of $24,000 is an initial, non-recurring expense, as summarized in Table 17.

Compliance with the standard is expected to come at little to no future cost to the Commonwealth. In states that have adopted appliance efficiency standards, including the Commonwealth, compliance is required through manufacturer self-certification. However, these requirements will not burden manufacturers, because high-efficiency

[7] Information provided by the Commonwealth's Department of Housing and Community Development.

furnaces are already being manufactured, tested and supplied for sale in the Commonwealth. In cases where enforcement of compliance may be required, the cost of enforcement is expected to be of the same order of magnitude, that is, a few thousand dollars[8].

Table 17. Estimated One-time Cost of the Standard

Labor, Overhead & Incidentals	(per hour)	$ 200
Activity	**Hours**	**Expense**
Legal Research and Formulation	30	$ 6,000
Development and Promulgation	40	$ 8,000
Public Notification and Marketing	-	$ 10,000
Total		**$ 24,000**

Inclusive of promulgation, implementation and possible enforcement, the cost of the standard for 95% penetration is significantly lower than the cost of non-regulatory alternatives for the 75, 85 or 95% level of penetration.

5. Conclusions

5.1 Summary of Analysis

The time and cost requirements of the five non-regulatory alternatives are compared in Table 18. The eventual cost requirement for each alternative is a function of the historical success rate of influence of the marketing efforts of the program and the average annual cost of the program. For a 95% level of market penetration, the range of costs is $2.99 million to $57.67 million over a period of 6 to 63 years.

Table 18. Estimated Time and Cost Requirements for Non-regulatory Alternatives

Success Rate =	GasNetworks 37%		Heat Loan 7%		Tax Relief 11%		HEARTWAP 3%		RCS / MassSAVE 9%	
Penetration Level (%)	Expected Time (years)	Estimated Additional Cost ($)	Expected Time (years)	Estimated Additional Cost ($)	Expected Time (years)	Estimated Additional Cost ($)	Expected Time (years)	Estimated Additional Cost ($)	Expected Time (years)	Estimated Additional Cost ($)
75%	1	1,832,773	4	665,196	3	498,897	10	9,154,630	4	4,503,340
85%	3	5,498,319	12	1,995,588	8	1,330,392	27	24,717,501	9	10,132,515
95%	6	10,996,638	27	4,490,073	18	2,993,382	63	57,674,169	21	23,642,535

[8] Appliance Standards Awareness Project, American Council for an Energy Efficient Economy (2005, 2009)

Of the non-regulatory alternatives, the GasNetworks program requires the least time, 6 years, for 95% penetration because of its high success rate of 37%. The tax incentive requires the least cost, $2.99 million of all the alternatives compared for a 95% penetration.

The comparison of the non-regulatory alternatives indicates that all the alternatives represent significant additional time and cost requirements to increase the desired level of penetration. Compared to the very low costs of implementing a regulatory standard that is expected to achieve 95% penetration of new NWGF shipments after the effective compliance date, none of the non-regulatory alternatives can be considered reliable stand-alone policies. The alternative analysis overwhelmingly indicates that the regulatory standard is the most timely and cost-effective policy to achieve the desired level of penetration.

5.2 Limitations of the Analysis

Although the alternative analysis reflects historical cost data and market penetration trends, the following limitations were experienced in estimating future trends.

The analysis assumes that information diffusion occurs only due to marketing efforts of the programs. In reality, word-of mouth diffusion plays an important role in new technology adoption. Because of the nature of the technology, i.e. the high-efficiency NWGF that is not a retail consumer product, it is difficult to make any assumptions about word of mouth diffusion in the Commonwealth. However, even if such an influence were to be included, it cannot be relied upon as a successful influencer compared to a rebate or tax incentive.

Program cost data are often aggregated across and reported for heating system equipment and improvements that include not only NWGFs but also boilers, windows, thermostats, insulation, venting, etc. Wherever available, cost data for only high-efficiency NWGFs was used. In cases where a breakdown by equipment was not available, conservative estimates from the program administrators were obtained. However, it is likely that detailed cost data for only NWGFs might increase the average annual cost values used, thereby increasing the cost of the alternatives.

Success rates for market penetration were estimated from historical data about total high-efficiency NWGF sales in the Commonwealth. The estimates assume that the policies do not interact with each other and that there are no synergies between policies, if more than one policy program has been implemented. In reality, the simultaneous existence of the five program alternatives may have led to the high penetration rate of 67% in the Commonwealth. It is likely that the penetration rate may have been much lower if one or more of the programs did not exist. Additionally, the realized success rate of the individual alternatives may be much lower. This reasoning supports the conclusion of the analysis that selecting any of the non-regulatory alternatives as a stand-alone policy over the regulatory standard does not seem to be a reliable approach to achieving the desired level of penetration in a timely and cost-effective manner.

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