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MASTER

ENVIRONMENTAL IMPACT DETERMINATION

Based on

The State Energy Conservation Plan and
Environmental Assessment

Submitted to the FEA by

The State of Massachusetts for Approval and
Funding under the Provisions

of

Title III, Part C of the Energy Policy and Conservation Act;
State Energy Conservation Program

Prepared by

The Office of Energy Conservation
Federal Energy Administration

UNLIMITED

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I. Introduction

Title III, Part C of the Energy Policy and Conservation Act (EPCA) establishes the State Energy Conservation Program (SECP). The SECP will provide up to $22.5 million to the States and Territories in FY 1977 and up to $50 million in FY 1978 for implementation of State developed and State administered programs. Under the FY 1977 funding formula, Massachusetts is eligible for an award of $563,000. The objective of the SECP is to promote the conservation of energy and to reduce the rate of growth of energy demand.

An Environmental Assessment (EA) of the probable nationwide impacts of the SECP was undertaken by FEA. On the basis of said EA, a Determination was published in the Federal Register, Vol. 41. No. 117 (June 16, 1976) as follows:

> In accordance with FEA's obligations under the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 et seq.),an evaluation of the potential environmental impacts of the program for State energy conservation plans has been prepared by FEA. While certain adverse environmental impacts have been identified, they were found not to be "significant" as that term is used under NEPA. The overall impacts of the various program measures taken either separately or in combination are clearly beneficial.
>
> The nature and degree of environmental benefit will vary, however, among State energy conservation plans and from program measure to program measure. In the final analysis, the content of any particular State energy conservation plan will be determined by many factors peculiar to that individual State; these include local economic, employment, environmental, social, geographic and climatic conditions.
>
> The FEA evaluation, therefore, in addition to describing the environment to be affected by the plans, the impact of alternative measures likely to be included in the various State plans, and the maximum probable environmental impacts from the implementation of plans in all States, provides formulas for the use of the States which will allow them to compute the environmental residuals likely to flow from measures they propose. This information will be included in the plan reports submitted by the Governors. Prior to approving any plan or making any grants, FEA will review each State's submission of environmental data to determine whether it entails any significant effects on the quality of the human environment. In any case in which

FEA discovers significant effects, based on the information submitted and any supplemental information needed to make an informed judgment, an environmental impact statement will be undertaken by FEA. In cases where there are determined to be no significant effects, FEA will issue a negative determination of environmental impact, citing the State's submission in lieu of a formal environmental assessment pursuant to 10 CFR 203.4.

II. Findings

A review of Massachusetts' proposed conservation plan has been completed, by FEA, with the following results and observations:

- o No significant adverse environmental impacts are expected to result from plan implementation;
- o Beneficial environmental impacts from plan implementation are expected to have results that substantially outweigh any adverse impacts - but which are, themselves, not considered to be "significant" within the meaning of NEPA;
- o The nature of the process by which Massachusetts' plan has been developed has been such that the environmental factors have been identified and considered at each stage of development for each program measure.

III. Program Description

The objective of the SECP is the wise and efficient use of energy. That is:

- o To conserve energy - especially non renewable fossil fuels;
- o To increase the number of output units per BTU of energy input, e.g., miles per gallon of gasoline, square feet of building space illuminated, heated or cooled per kilowatt hour, therm or gallon, etc.; and, in general
- o To eliminate waste and inefficiency and, thereby, to promote economic, social, environmental and other benefits.

The program presently does not encompass, provide funding for, or otherwise encourage such actions as:

- Fuels switching;
- Changes in pollution control efforts, air or water quality standards, etc.

In other words, the program is designed primarily to operate within existing social, economic, environmental, political, legal, etc. constraints. The most tangible environmental effects, therefore, are likely to be the changes in environmental residuals which result from the changes in specific fuel consumption. These latter changes in all cases are net reductions in fuel use and are calculated by subtracting any small increase in energy use that may be occasioned by a program measure from the larger savings. For example:

- Increased use of commuter vanpools, carpools, or mass transit will reduce vehicle miles travelled by removing a number of commuter automobiles from the road. Additional fuel consumed by vans, buses, remaining commuter autos with higher occupancy rates and by autos left at home as a result of the program must be subtracted in order to arrive at a net savings estimate.
- Reduced lighting levels in some buildings will, during the heating season in some climates, slightly increase fuel requirements for heating and decrease them for cooling. These changes have been shown to be insignificant in terms of environmental impact. The net impact is beneficial.

Because the most tangible environmental effects are the residuals changes resulting from the reductions in fuel use, the most reasonable approach to an environmental analysis, here, is to stress these first order (residuals) changes. This is best done by specific fuel use within each energy use sector.

IV. Impacts

A. General

The impact of the Massachusetts plan, as a whole, will be - if successful - to reduce the State's 1980 energy consumption by 121.31 trillion (10^{12}) BTU; of this 70.45 x 10^{12} BTU will be non-electrical and 50.86 x 10^{12} BTU will come from fuels used to generate electricity. This, measured against the FEA 1980 Baseline projection for Massachusetts of 1,683 trillion BTU, equals a 7.2% savings.

The savings, measured across end use sectors, result in an absolute decrease in every environmental residual measured from each fuel consumed within each sector. The method of assessing the reduction in residuals was to compare the changes resulting from Massachusetts' projected fuel savings with a set of residuals calculated (by sector, by fuel) against FEA's baseline consumption forecast. A summary of these calculations is appended. The reductions range from highs of 7.4% and 7.2% for SOx and CO2 emissions, respectively, to 0.5% for dissolved and suspended solids.

These reductions reflect the fuel mix of the proposed savings. Where percent changes in residuals are highest, this reflects higher savings targeted by Massachusetts for particular fuels in particular sectors; specifically, Massachusetts' climate and land use patterns are such that its major energy conservation opportunities occur in sectors such as residential and commercial buildings through improvements in thermal efficiency.

Conversely, the smaller changes noted in residuals such as dissolved and suspended solids and CO reflect the more limited opportunities in Massachusetts for savings in sectors and fuels which are the major contributors of such residuals, such as transportation.

While certain potential adverse impacts can be postulated, none are expected to be significant.

- Where quantification has been attempted of an adverse impact (as with CO emissions incident to new lighting standards in the nationwide case), it has been found that residuals changes are well within the margin of error associated with the projections against which they are measured and the impacts are insignificant.

- In many cases, small adverse impacts have been accounted for and subtracted out in the process of computing the benefit, e.g., fuels used by vans and cars left at home (as a result of carpooling and vanpooling) are subtracted from fuels saved prior to computing residuals changes.

- An inflationary impact statement for the program was prepared and filed, in June 1976, with the Council of Wage and Price Stability. It stated that certain program measures, e.g., buildings insulation, vans, etc., may have an initial adverse economic impact in that the costs are front-end loaded (borne entirely at the time of purchase/installation) and the benefits are spread over a period of years. Over the life span of the improvement, however, all such investments identified were expected to produce beneficial economic impacts.

B. Specific Impacts

The commonly accepted framework for analysis of energy use patterns is by energy use sector. The SECP and the environmental analysis of same are no exceptions to the logic of this convention; specifically ;

- o The residuals changes are the most tangible environmental impacts of the program;
- o The residuals are sector specific - and fuel specific within sectors ;
- o A State's energy consumption patterns and resultant opportunities for savings, as well as its related pollution loadings and other environmental effects, can only be defined with reference to specific fuels within specific sectors; and
- o The program measures tend to fall naturally into these (sector) categories in terms of their impacts, interactions, and implementation strategies.

The Massachusetts residuals case was discussed under Section IV A and is specifically detailed in the appended tables.

For reference, the following tabular data illustrate the distribution of Massachusetts' energy consumption.

TABLE I
Massachusetts Energy Consumption (1980)
(by Sector, By Percent)

Sector	By Fuel Input	By End Use
Residential	21.5	32.4
Industrial	5.8	8.7
Commercial	22.2	33.4
Transportation	26.5	26.5
Elect. Util.	25.0	———

TABLE II

Massachusetts Energy Consumption (1980)

(By Fuel)

	Total, All Sectors		Electric Utilities	
Fuel	10^{12} BTU	%	10^{12} BTU	%
Dist.	3.82 EO2	22.6	———	———
Resid.	4.42 EO2	26.2	242.39	59
N.Gas	2.09 EO2	12.4	———	———
Coal	2.45 EO1	1.4	20.52	5
Diesel	3.62 EO1	2.1	———	———
Gasoline	4.02 EO2	23.8	———	———
Aircraft	4.68 EO1	2.8	———	———
Nuclear	2.05 EO1	1.2	20.54	5
Hydro.	1.27 EO2	7.5	127.35	31
Total	1.69* EO3**	100	410.82	100

*Subject to rounding error

*Scientific notation, e.g., 3.82E02=3.82×10^2 or 382

The particular program measures in the Massachusetts plan are listed below in Table III, indicating the major energy consumption sectors affected by each. The discussion following will address groupings of program measures by sector impacted.

Program Measure	Sector Impacted				
	Residential	Industrial	Commercial	Transportation	Utilities
Lighting Efficiency	X	X	X		X
Carpool/Vanpool				X	
Procurement		X	X	X	X
Thermal Efficiency	X	X	X		X
R.T.O.R. *				X	
Extension Service	X		X		
Public Education	X	X	X	X	X
Program&Policy Dev.	X	X	X	X	X
Public Housing	X				X
Waste Oil		X		X	
Project Conserve	X				X
Weatherization	X				X
Life Cycle Costing			X	X	X

A list of savings by program measure (Part IV-B of the Massachusetts plan) is appended for reference.

* Right-Turn-on-Red

1. Residential and Commercial Buildings

Massachusetts' major potential for energy savings under the SECP is through program measures impacting the residential and commercial sectors. The residential and commercial sectors combined account (directly or indirectly) for about 65 percent of all fuels burned and about 44 percent of direct fuel input.

Of the total energy savings anticipated in 1980 from the implementation of Massachusetts' plan, 37 percent can be attributed to program measures directly affecting residential and commercial buildings, such as mandatory thermal and lighting standards, and an additional 58 percent is attributable to program measures (such as public information) indirectly affecting this sector, or designed to bolster and reinforce the effects of the direct impact program measures. Of the 60.42 trillion BTU of non-electrical savings expected to be realized through thermal efficiency programs, the major share is allocated to distillate and residual oils. This fuel/sector emphasis is reflected in the residuals reductions.

Improvements in lighting and thermal efficiency involve some additional potential impacts as discussed below.

- Manufacture and Installation of Weatherization Materials

  The impact of the actual installation of improvements and repair work will be insignificant. The aggregate environmental impacts can be divided into two major effects: environmental benefits associated with reduced fuel consumption, and small but possibly adverse environmental effects associated with the production of materials to retrofit the structures specified. The important consideration here is that while any adverse environmental effects will terminate when the program expenditures terminate, the environmental benefits will continue to accrue as long as the subject buildings are consuming heating fuel at a rate below their pre-retrofit levels.

  Increased costs to building owners - either residential or commercial - resulting from increased insulation, more energy efficient equipment, etc., whether in the case of new construction or retrofit, appear to be negligible. In fact, all information to date indicates that over a very short (5-to 10-year) period, these measures are extremely cost beneficial, i.e., the investment is more than offset by reduced fuel bills.

- Other Conservation Devices and Materials

  The manufacture of devices such as clock thermostats may result in minor, but unquantifiable, emissions which, however, will be more than offset by the reduced emissions attributable to their use.

- Reduced Levels of Lighting and Heating

  The nationwide case (Programmatic EA) referenced above makes note of the potential for minor, seasonal, increases (on the order of 0.01 percent) in CO as a result of increased heating needed in some buildings to offset heat loss when lighting levels are reduced.

  Massachusetts' method of assessment was to account for net fuel changes resulting from all program measures (and their interactions) within this area (lighting and heating). The environmental residual calculations which followed--based on these net fuel use changes--showed no quantifiable adverse impacts.

  Health effects from reduced heating and cooling levels are expected to be negligible - and presumed to be, on the whole, beneficial, i.e., in most cases heating, cooling, and lighting levels with the proposed standards are thought to be more healthful than existing levels; in addition, the reduction in pollutants is beneficial.

2. Industry

In Massachusetts, opportunities for conservation in the industrial sector are not large (see Table I), and, therefore, expected impacts are small. Only the Waste Oil Recycling program directly impacts this sector, to the extent that .320 trillion BTU's of energy savings are estimated for 1980. The change in residuals is beneficial but small. A further beneficial impact of this program measure is the reduction in pollution from waste oil disposal.

To the extent that the industrial sector may experience adverse environmental impacts as an indirect result of increased demand, for example, for insulation materials or for vans attributable to other program measures, these impacts are discussed in the sector where these program measures have their direct impact. The economic impact of such factors, of course, is beneficial to industry.

3. Transportation

While a significant amount of energy is consumed in the transportation sector in Massachusetts (see Table I), major changes in transportation fuels use will occur only with infrastructure and vehicle efficiency changes which are (compared to other savings opportunities) slower, more capital intensive, and/or inter-rather than intra-state in character and therefore outside the scope of the SECP.

From the implementation of the required transportation program measures, Massachusetts expects to realize an energy savings of 5.1 trillion BTU's in 1980, about 4 percent of the total savings expected from plan implementation. While relatively small, this reduction in fuel consumption and thus in environmental residuals will have a beneficial impact.

To the extent that public information programs may affect the driving habits of Massachusetts' residents, further environmental benefits may be expected, though this impact is not quantifiable due to uncertainties about the effectiveness of such programs.

The promotion of vans and carpools in Massachusetts may have small adverse secondary impacts:

- The fuel used by vans, as well as the increased consumption per auto when the number of occupants is increased, has been subtracted from fuel savings prior to estimating residuals changes. The net change is, in all cases, beneficial, but not significant.

- The increased emissions from the manufacture of the vans have not been determined but are judged to be negligible when compared to reduced operating emissions from autos. This impact is likely as well to be offset by reduced auto manufacture.

4. Utilities

Utilities consume about 25 percent of fuel used in Massachusetts. Residual oil and hydro-generation account for all but10 percent of fuels used in the State's utility sector.

No program measures in Massachusetts' plan are aimed directly at the utility sector. However, as a result of program measures affecting the consumption of electricity, 50.86 trillion BTU are expected to be saved in fuels for electrical generation. This represents roughly 42 percent of total fuels saved. An estimated 13.2 percent of Massachusetts 1980 demand for electricity will be supplied by non-fossil fuels and an estimated 75 percent by residual oil, but 100 percent of savings will be in fossil fuels with residual oil being the major contributor. Whereas coal is a significant contributor to dissolved and suspended solids within the utilities sector, regional grid generation characteristics are such that coal burning will not be affected by Massachusetts' reductions in this sector, i.e., the reductions will be in other fuels with different residuals characteristics;

It should be noted that Massachusetts' electrical purchases come from power generated both in and out of State. While the residuals change (percent and absolute) is accurate and is based on total fuel mix for all electricity purchased, the reductions will not all be in-State but will be regional in nature, i.e., a portion of the environmental benefits will be felt by exporting States.

V. Alternatives

Under EPCA, there are no alternatives to the five mandatory program measures other than a State's non-participation in the SECP. The "no-participation" alternative, in all cases, is adverse when compared to the implementation of any mix of these five measures.

There is little room within the SECP timeframe for major structural changes affecting the way energy is used. Nor does an individual State have much say over the energy intensity or efficiency of many products used within its borders but produced and sold on a national basis. Rather, the emphasis of the SECP is on greater efficiency of energy use within the short term constraints imposed by presently in place infrastructure, capital investment, land-use

patterns, buildings, motor vehicle stock, and the like. Given this situation as well as current State-specific fuel distribution and use patterns, the reduction in residuals for any state program, including Massachusetts', will not be uniform across all residuals but will tend to be skewed in such fashion as to conform to current fuel uses and specific savings opportunities and the particular characteristics of the fuels affected. In all cases the net result will be beneficial.

VI. Conclusions

In summary, it is the determination of the FEA that Massachusetts' Environmental Assessment of this program complies with the requirements of both NEPA and the SECP Guidelines as promulgated by FEA.

Based upon our review of this EA, the FEA has determined that actions now required to be taken to implement Massachusetts' proposed energy conservation plan under Title III, Part C of the EPCA will not be "major Federal actions significantly affecting the quality of the human environment." (Section 102(2)(C), National Environmental Policy Act, 42 U.S.C. 4332 (2)(C)). Consequently, no EIS preparation is contemplated for this action.

Appendices

I. Baseline Residuals Case and Residuals Changes

II. Abstracts from Massachusetts Plan

STATE ENERGY CONSERVATION PROGRAM (SECP)
ENVIRONMENTAL REVIEW
RESIDUALS TALLY SHEET
(AIR)

STATE NAME Massachusetts

Sector	Particulates	NO_x	SO_x	HC	CO	CO_2	Aldehydes
Transportation	3.86 E04	2.00 E05	2.51 E04	1.19 E05	8.50 E05	3.66 E07	3.37 E03
Industrial	8.82 E03	2.67 E04	3.17 E04	3.18 E03	5.45 E03	9.33 E06	6.37 E02
Commercial	2.76 E04	9.65 E04	2.27 E05	1.44 E04	1.35 E04	3.53 E07	3.74 E03
Residential	7.50 E03	2.39 E04	2.31 E04	6.66 E03	4.44 E03	2.02 E07	2.38 E03
Utilities	1.34 E04	1.59 E05	2.50 E05	1.28 E04	1.85 E03	3.59 E07	2.85 E03
Total Baseline Residuals	9.57 E04	4.98 E05	5.57 E05	1.56 E05		1.37 E08	1.35 E04
Reduction	5,040.75	31,906.85	41,446.26	5,545.66	22,887.76	9,870,005.0	949.72
% Reduction	5.3	6.4	7.4	3.5	2.6	7.2	7.0

Footnotes:
Entries given in scientific notation, e.g., 3.86 E04 equals 3.86×10^4 or 38,600; ( ) denotes minus value.
Unit values are:
- For Air, Water, and Solid Waste: tons per year;
- For Thermal Rejection: BTU per year; and
- For Deaths, Injuries, and Man-Days Lost: individual (single) occurances.

STATE ENERGY CONSERVATION PROGRAM (SECP)
ENVIRONMENTAL REVIEW
RESIDUALS TALLY SHEET
(WATER)

STATE NAME Massachusetts

Sector	Acids	Bases	Dis. Solids	Sus. Solids	Non-Deg. Org.	Bio. O.D.	Chem. O.D.
Transportation	--	--	1.93 E02	3.70 E02	1.17 E03	3.70 E02	2.26 E03
Industrial	--	2.27 E00	9.08 E01	6.96 E01	1.79 E02	5.63 E01	3.44 E02
Commercial	--	--	1.54 E02	2.96 E02	9.34 E02	2.96 E02	1.81 E03
Residential	--	--	6.72 E01	1.29 E02	4.09 E02	1.29 E02	7.87 E02
Utilities	4.34 E02	3.11 E01	4.43 E03	7.01 E03	9.21 E02	2.78 E02	1.70 E03
Total Baseline Residuals	4.34 E02	3.34 E01	4.94 E03	7.87 E03	3.61 E03	1.13 E03	6.90 E03
Reduction	--	--	22.6	43.26	137.39	43.26	234.48
% Reduction	--	--	0.5	0.5	3.8	3.8	3.4

Footnotes:
Entries given in scientific notation, e.g., 3.86 E04 equals 3.86×10^4 or 38,600; ( ) denotes minus value.
Unit values are:
- For Air, Water, and Solid Waste: tons per year;
- For Thermal Rejection: BTU per year; and
- For Deaths, Injuries, and Man-Days Lost: individual (single) occurances.

STATE ENERGY CONSERVATION PROGRAM (SECP)

ENVIRONMENTAL REVIEW

RESIDUALS TALLY SHEET
(Other)

STATE NAME Massachusetts

Sector	Thermal Rejection	Occup. Deaths	Occup. Inj.	Occup. M.Days Lost	Solid Waste		
Transportation	--	3.39 E(01)	2.36 E01	1.22 E03	2.33 E04		
Industrial	4.09 E10	2.33 E(01)	7.79 E00	4.39 E02	1.48 E04		
Commercial	3.47 E10	2.79 E(01)	2.01 E01	1.01 E03	1.86 E04		
Residential	8.54 E10	1.37 E(01)	1.11 E01	5.12 E02	8.11 E03		
Utilities	8.19 E12	2.90 E00	8.41 E01	4.96 E03	4.56 E05		
Total Baseline Residuals	8.35 E12	3.89 E00	1.47 E02	8.14 E03	5.21 E05		
Reduction	5.64 E10	0.1	8.25	478.51	5,174.27		
% Reduction	0.7	2.6	5.6	5.9	1.0		

Footnotes:
Entries given in scientific notation, e.g., 3.86 E04 equals 3.86×10^4 or 38,600; ( ) denotes minus value.
Unit values are:
- For Air, Water, and Solid Waste: tons per year;
- For Thermal Rejection: BTU per year; and
- For Deaths, Injuries, and Man-Days Lost: individual (single) occurances.

STATE MASSACHUSETTS

Part IV-B Program Savings and Cost Summary

Program Measures	1980 Estimated Savings (in 10^{12} BTU's)	FEA 1977	Total 1977	Estimated Cost of Implement (in $000's) 1978	1979	198
Lighting Efficiency Standards	35.808	(a)	(a)	(a)	(a)	(a)
Carpool/Vanpool	5.100	27	27	100	100	100
Energy Efficiency Procurement Standards	.3445	(b)	(b)	(b)	(b)	(b)
Thermal Efficiency Standards	11.934	60	60	100	105	110
Right-turn on red	.0374	0	(c)	(c)	(c)	(c)
Energy Conservation Extension Service	26.950	148	148	402	402	402
Public Education & Information	24.852	122	122	200	190	180
gram & Policy Development	27.934	74	74	120	125	130
Public Housing	2.893	63	63	90	85	80
Waste Oil Recycling	.320	20	20	30	30	30
Project Conserve	(d)	0	0	0	0	0
Weatherization	.545	0	(c)	(c)	(c)	(c)
Life-Cycle Costing	(e)	0	0	0	0	0
Office of the Director	(e)	49	49	80	85	90
Total	136.718*	563	563	1122	1122	1122

(a) Included in Thermal Efficiency Standards.
(b) Included in Program & Policy Development.
(c) No EPCA funding. Totals depend on other appropriations.
(d) Included in Public Education & Information.
(e) No estimate.

*Our savings represent 8.28% of FEA-projected energy use in Massachusetts in 1980.