

DEPARTMENT OF ENERGY

Bonneville Power Administration

// New Energy-Efficient Homes Programs Record of Decision //

AGENCY: Bonneville Power Administration (BPA), DOE

ACTION: Record of Decision

SUMMARY: The BPA, a Federal power marketing agency for the Pacific Northwest, has made a decision on the approach to take in conserving energy as part of its new energy-efficient homes programs. This decision was based on a Final Environmental Impact Statement (EIS) which analyzed various construction techniques for saving energy and mitigating decreased indoor air quality (IAQ). BPA has determined that four different construction techniques or "pathways" are acceptable methods of building homes under its program to provide adequate ventilation and substantial energy savings.

In reaching its decision, BPA analyzed a total of 11 different pathways comparing each of them to a Baseline (1983 building practice). BPA has decided to offer Pathways 3,5,8, and 10, or an equivalent technology, from among those contained in the Preferred Action Alternative in the Final EIS. The selection of these four different construction pathways was based on consideration of five major decision factors: environmental, economic, technical, public concerns, and legal. The factors were carefully balanced to reach a decision that provides the best alternative for BPA's programs. The advantages of the chosen pathways include, health effects that were close enough to those in the Baseline to be within its range of uncertainty, substantial energy savings, and maximum program flexibility at reasonable cost.

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The decision reflects a modified Preferred Action Alternative from that in the EIS. Pathway 6 has been dropped from consideration, at this time, due to the economics associated with implementation.

The Environmentally Preferred Alternative, Pathway 8, results in the greatest overall decrease in the lifetime cancer rate relative to the Baseline, and provides reasonable energy savings.

A mitigation package forms an integral part of the new energy-efficient homes programs. The four pathways selected have the following environmental mitigation requirements: exhaust fans for kitchens and bathrooms; designated air supplies for combustion appliances; information on indoor air quality; Housing and Urban Development (HUD) product standards for formaldehyde emissions from structural board materials; and the offer of radon monitoring and radon source control, known as the radon package.

FOR FURTHER INFORMATION CONTACT: For information and for additional copies of the Record of Decision or the Final Environmental Impact Statement, contact Anthony Morrell, Assistant to the Administrator for Environment - AJ, Bonneville Power Administration, P.O. Box 3621, Portland, Oregon 97208; (503) 230-5136. Or call BPA's Public Involvement office. Telephone numbers, voice/TTY, for the Public Involvement office are: 503-230-3478 in Portland; toll-free 800-452-8429 for Oregon outside of Portland; 800-547-6048 for Washington, Idaho, Montana, Utah, Nevada, Wyoming, and California. Information may also be obtained from:

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SUPPLEMENTARY INFORMATION:

I. Introduction and Background

The BPA pursuant to sections 6(a)(1)(A)-(D) of the Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. 839d (a)(1)(A)-(D), promotes the Construction of energy-efficient homes. The new energy-efficient homes programs include such features as marketing and incentive payments to encourage the construction of energy-efficient homes, financial assistance to jurisdictions that incorporate Model Conservation Standards (MCS) into building codes, and implementation of a surcharge policy. The MCS are energy-efficient performance standards, which were developed by the Northwest Power Planning Council, for electrically heated buildings.

The primary environmental issue for new energy-efficient homes is whether tighter construction increases indoor air pollution, which may in turn adversely affect the health of the occupants. To date, BPA has prevented or reduced this possible effect in energy-efficient homes built under its programs by either (1) using mechanical ventilation

(MV) systems to maintain ventilation rates at levels generally found in homes built when the MCS were first adopted (1983 building practice), or (2) requiring monitoring and mitigation of formaldehyde and radon levels above 0.1 parts per million (ppm) or 5 picoCuries per liter (pCi/l), respectively.

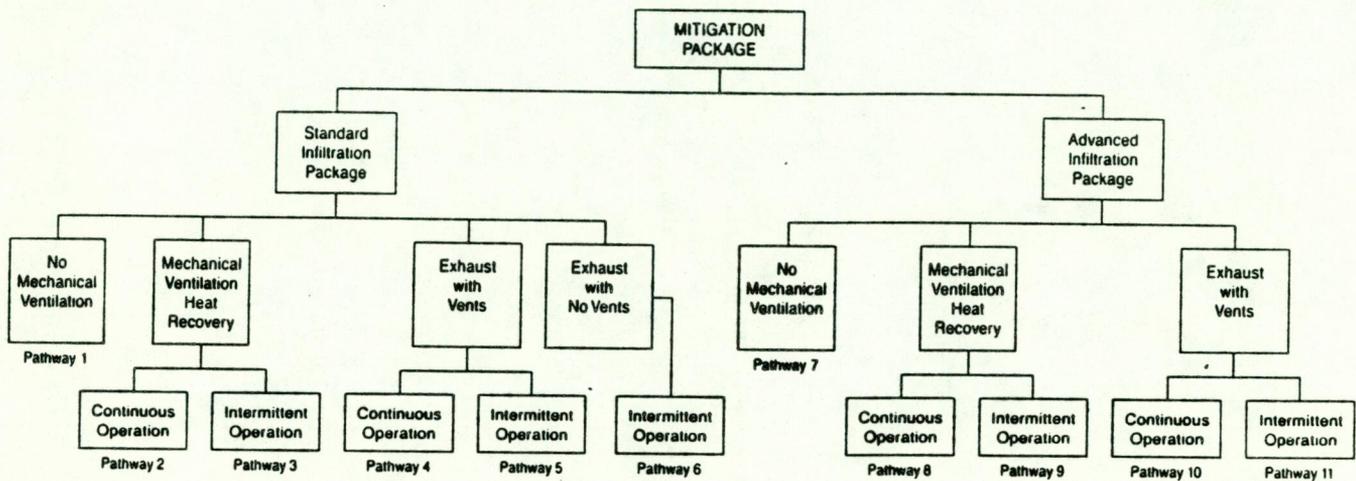
BPA published its Final New Energy-Efficient Homes Programs Environmental Impact Statement (EIS) (DOE/EIS-0127F) in August 1988. The Final EIS took into consideration the comments received on the Draft EIS which was published in March 1987. BPA prepared this EIS to explore whether other approaches would control indoor air quality (IAQ) and still maintain cost-effective energy savings. Its purpose was to provide builders and consumers with more flexibility in how they control IAQ in energy-efficient homes. Different building techniques and mitigation measures were analyzed for their ability to maintain IAQ comparable to that found in 1983 building practices, or to even improve it.

The Final EIS was distributed to the public in early September and it was filed with the Environmental Protection Agency (EPA) on September 30, 1988. EPA's notice of availability of the EIS was published in the FEDERAL REGISTER (53 FR, 39516), Friday, October 7, 1988. Subsequent to these actions, BPA has decided on the approach to take for its new energy-efficient homes programs and is issuing this Record of Decision to inform the public of that decision.

In BPA's effort to try to increase builder and consumer flexibility in its new energy-efficient homes programs, 4 program alternatives developed from 11 different construction "pathways" were examined in the final EIS. The pathways combined practical, commercially available methods for controlling IAQ with common construction techniques. The

pathways and the basis upon which they were developed are illustrated in the figure below.

The Proposed Action Construction Pathways



II. The Decision

BPA has decided to select Pathways 3,5,8, and 10 from the proposed action, or an equivalent to these pathways, to implement its new energy-efficient homes programs. These pathways are identified in the Preferred Action Alternative described in the Final EIS. Pathway 6, which is also part of the Preferred Action Alternative in the Final EIS has been dropped from consideration, at this time, due to the economics associated with implementation.

This selection recognizes the need not only to maintain IAQ, but also to enhance it to ensure that new energy-efficient homes have fewer health risks than those potentially occurring in current building practice homes. To accomplish this at an acceptable cost without sacrificing flexibility, BPA is using a strategy that includes indoor air quality enhancement features in all of the pathways, a menu of

technical ventilation options, and information to program participants regarding pollutants which they can recognize and control themselves if they choose. Subsequently, this reduces BPA's intrusion into decisions normally left to individuals. A mitigation package forms an integral part of the new energy-efficient homes programs. All practicable means to avoid or minimize environmental harm from the selected alternative have been adopted.

The selection of the modified Preferred Action Alternative used five key decision factors: environmental, economic, technical, public concern, and legal impacts. In reaching a decision, the thrust was to develop an appropriate risk management strategy. In balancing the factors, the uncertain incremental risk of ill health from lower air infiltration resulting from new home energy-saving construction techniques was compared to a baseline of 1983 standard building practices. Another consideration was the uncertain incremental benefit of indoor air quality enhancement measures and mechanical ventilation options. Lastly, the costs of reducing the health risk while obtaining most of the energy-efficient new home construction was reviewed. The selection of the modified Preferred Action Alternative was considered the best alternative for meeting these factors with the fewest health impacts, least costs, greatest energy savings, and greatest builder flexibility.

The Administrator is reserving his right, at this time, to add the remaining seven pathways to the options available in BPA's programs.

The Environmentally Preferred Action Alternative is to proceed only with Pathway 8. It results in the greatest relative decrease in health effects with satisfactory energy savings. This alternative is included

in the pathways selected in the decision. By itself, it does not permit enough flexibility for implementing BPA's new energy-efficient residential construction programs, and results in a higher overall regional cost when compared to the Baseline.

III. The Alternatives

Four alternatives were considered for use in BPA's new energy-efficient homes programs. These alternatives were based on the 11 pathways. The four alternatives were analyzed and compared to a Baseline in reaching the decision.

The Baseline was derived from BPA's 1986 medium housing forecast, and assumed no energy-efficient new homes programs were underway. In the Baseline it was estimated that, from 1986 through 2006, the region would experience 335 radon-induced lifetime cancers per 100,000 persons and 10 formaldehyde-induced lifetime cancers per 100,000 persons.

A description of each of the four alternatives follows.

(1) The No Additional Action Alternative: The No Additional Action Alternative represents the programs BPA has been pursuing since 1985 to promote new energy-efficient home construction. The analysis is based on continuing a regional marketing-based program from 1985 through 2006, but providing financial incentives only through 1988.

It is estimated that by the year 2006 about 1.3 million people will be residing in 436,600 new single-family, electrically heated homes, of which 270,800 will be energy-efficient homes; some 568,800 living in 354,000 multifamily homes, of which 228,160 are energy-efficient; and 570,400 living in 247,300 manufactured homes, of which 59,700 are energy-efficient.

The health effects of this alternative as compared to the Baseline are zero because the ventilation rates are assumed to be identical. The energy savings range from 155 to 171 average megawatts at a regional cost of \$233 million.

(2) The Proposed Action Alternative: The Proposed Action Alternative is identical to the No Additional Action Alternative with regard to programs, number of participants, and number of current practice and energy-efficient homes built. However, unlike the other alternatives, this one includes the broader menu of 11 building pathways, including mitigation measures, from which builders and consumers may choose to maintain IAQ.

The health effects of this alternative as compared to the Baseline, vary from -58 to +266 for single-family and -98 to +293 for multifamily radon-induced lifetime cancers per 100,000 persons, and from -1 to +5 for single-family and from -3 to +15 for formaldehyde-induced lifetime cancers per 100,000 persons. Energy savings in average megawatts vary from 54 to 135 for single-family and from 10 to 37 in multifamily homes. Costs range from 256 to 576 (1986 million \$) for single-family homes.

(3) The Preferred Action Alternative: The Preferred Action Alternative consists of a combination of 5 of the 11 construction pathways. The Administrator is currently making a decision to implement four of the pathways: 3, 5, 8, and 10. Pathway 6 was dropped from consideration, at this time, due to the economics associated with implementation. These pathways were chosen because the health effects were close enough to those in the Baseline to be within

the range of uncertainty and they had substantial energy savings with maximum flexibility for builders at a reasonable cost.

For this alternative, the total number of energy-efficient site-built homes projected through 2006 is 270,808, with total electric additions projected at 436,630. The affected population is 1,305,409; some 568,800 living in 354,000 multifamily homes, of which 228,160 are energy-efficient; and 570,410 living in 247,290 manufactured homes, of which 59,690 are energy-efficient. Radon-induced lifetime cancers per 100,000 persons range from 260 for multifamily to 419 for manufactured homes, or from 2 to 42 below the Baseline.

Formaldehyde-induced lifetime cancers per 100,000 persons range from 10 to 12, or up to 2 below the Baseline. Energy savings in average megawatts is projected to be from 158 to 176. The average pathway cost per 1986 dollars is estimated at 379 million dollars.

(4) The Environmentally Preferred Alternative: The Environmentally Preferred Alternative results in the greatest overall decrease in the lifetime cancer rate relative to the Baseline with reasonable energy savings. Pathway 2 results in a greater decrease in the lifetime cancer rate, but does not have adequate energy savings which would increase the adverse environmental impact of energy generation. Thus, Pathway 8 was chosen as the Environmentally Preferred Alternative.

The total number of energy-efficient site-built homes projected through 2006 is 270,808, with total electric additions projected at 436,630. The affected population is 1,305,409.

The estimated number of lifetime cancers is lower than estimates for the Baseline, with radon ranging from 295 to 328 for

single-family, 218 to 268 for multifamily, and from 401 to 408 for manufactured homes. Formaldehyde ranges from 9 to 12 induced lifetime cancers per 100,000 persons and is lower than the Baseline in all homes. This is consistent with the Pathway's higher ventilation rates. For this alternative, estimated regional energy savings (average megawatts) range from 114 to 130 for single-family, 27 to 36 for multifamily, and 40 to 41 for manufactured homes, all in average megawatts, depending on whether the upper or lower bound of the ventilation estimate is used. The regional cost would be \$619 million.

IV. The Decision Factors

The selection of the modified Preferred Action Alternative was based on the evaluation of the five major decision factors (environmental, economic, technical, public concerns, and legal) as follows.

1. Environmental: With regard to environmental considerations, the Preferred Action Alternative is compared with 1983 building practices (Baseline). It recognizes the increment of risk to human health from lower infiltration rates of new home energy-saving construction techniques. However, it also recognizes the benefits of the mechanical ventilation options and indoor air quality enhancement measures of each pathway. The Preferred Action Alternative is also sensitive to the protection and enhancement of the quality of the human environment. It takes into account the effectiveness of alternative means for reducing risks of ill-health, and the possible need of acquiring electric generating plants, in lieu of conservation, which would consume land and water resources.

2. Economic: The Preferred Action Alternative considers the energy savings (the amount of electric power acquired under each alternative). It acknowledges the price of each alternative which includes operation and maintenance cost as well as initial cost to the residents individually, and to the Region, as a whole. Employment, or the ability to provide jobs, is also weighed. The combination of pathways chosen from the Preferred Action Alternative in this decision constitutes a maximization of the benefits from the above considerations in light of the other four major decision factors.

3. Technical: The Preferred Action Alternative provides flexibility in the variety of choices for building homes. The uncertainty of ventilation rate estimates of 1983 building practices based on new measurement technologies, and the lack of conclusive information on the health effects of the indoor air pollution problem are acknowledged. It recognizes home variability (indoor air pollution varies across dwellings because they differ in construction practices, structure, air infiltration rates, volume, pollutant sources and emission rates of these sources); and, behavioral variability (differences in residents' ways of life or habits as they contribute to differences in indoor air pollution). It is also sensitive to administrative practicality or the ease and fairness of administering a regional program in cooperation with Pacific Northwest utilities, States, and other entities.

4. Public Concerns: The Preferred Action Alternative is sensitive to the public's concerns regarding consistency in the support of mechanical ventilation. The views of those responding to the Draft EIS were considered and the changes in the Final EIS reflect their

concerns. Allowances were made for the voluntary nature of participation in programs by residents and the effect of their actions on indoor air pollution concentrations in their dwellings. This includes the ability of occupants to reduce indoor air pollution by avoiding known pollutant sources or exercising other options based on information received and the need to allow for consumer choice. It also reflects a minimization of conflict over differences in conservation programs with Federal, State, and local agencies.

5. Legal: The Preferred Action Alternative responds to BPA's statutory mission to fulfill obligations under the Pacific Northwest Electric Power Planning and Conservation Act including the obligation to give first priority to energy conservation. It is consistent with the Northwest Conservation and Electric Power Plan prepared by the Northwest Power Planning Council, and it recognizes BPA's limited ability to regulate individual behavior in private homes.

V. Mitigation Package

A mitigation package forms an integral part of the new energy-efficient homes programs. The four pathways being selected have the following environmental mitigation requirements: exhaust fans for kitchen and bathrooms; designated outside air supplies for combustion appliances; information on indoor air quality; HUD product standards for formaldehyde emissions from structural building materials; the offer of radon monitoring and radon source control, known as the radon package.

The radon package allows a builder one of two basic approaches. Either the builder constructs the house to include certain foundation treatments (i.e., a ventilated crawlspace or a layer of gravel under

the concrete slab), or the builder foregoes those measures and is responsible for requiring radon monitoring in the house after construction. If the monitoring shows that radon levels exceed 5 picoCuries per liter (pCi/l), then the builder is required to retrofit the house with the appropriate mitigation measure and activate the measure. These actions can reduce radon concentrations by 70%, on average.

Issued in Portland, Oregon on February 7, 1989.


Deputy Administrator

