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## The BPA Environmental Impact Statement

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The slide show goes through the Environmental Impact Statement (EIS) and the process that BPA went through. That process got started about three years ago; we have struggled with the issue of indoor air quality and how it affects our weatherization program for those three years. The slide show can explain all the issues and the steps we went through to get to where we are today.

Where we are today is we finally made a decision on how to approach the weatherization program that Bonneville operates through the local utilities and the state authority and indoor air quality. I am personally very excited about the decision that we made and I have to stand in appreciation to Dr. O'Neil because he laid out perfectly the kinds of issues that we thought about, kinds of structure, what we went through, to come up with this decision. Because the decision that we made is rather unique and a pretty bold step for a utility to take, we decided that we needed a show for people to get across the message of what our decision is. The thing I've got to caution you about is it's about a week and a half old. It will explain the EIS process. The other thing to keep in mind as we look through this is that BPA had to set a policy. There was no way to get around it; we had to do the things that Dr. O'Neil talked about. That's an important thing to consider because BPA had to do it amid all the uncertainties that we have heard about in the past day and a half about indoor air quality, the uncertainty about health effects, uncertainty about the effect of weatherization, the uncertainties about what kinds of concentrations we have out there, and uncertainties about mitigation techniques. We didn't have any choice; we had to make a decision. We had to set a policy, to think that the policy that we took is a professional one, and believe it is one the public is going to stand behind. So with that as an introduction, let's go to the slide show. Then I'll come back to answer some questions and discuss where we are in the process of actually implementing our decision.

(begin slide show)

Many people are tightening their homes to reduce their fuel bills and to make their homes more comfortable. They're caulking, weather stripping, installing storm windows and blown-in wall insulation. These house-tightening measures can save almost one-third the cost of heating and cooling. But tightening a home reduces the AIR EXCHANGE RATE--that's the rate at which indoor air is replaced by outdoor air. Any pollutants in the indoor air can then build up. MOST indoor air pollutants are the result of PEOPLE'S ACTIVITIES in their homes. When people smoke, or use

woodstoves or unvented gas appliances, combustion gases and particles are released indoors. People use cleaners, aerosol sprays, and pesticides which contain toxic solvents. Their furniture, cabinets, paneling, and treated textiles may give off formaldehyde. Other pollutants are generated OUTSIDE the home and find their way indoors, such as pollutants from industries and automobiles and radon, a radioactive gas from the soil and rocks underneath homes.

People exposed to these pollutants risk health problems ranging from simple irritation to more serious respiratory diseases, including lung cancer. The Bonneville Power Administration discovered this link between house tightening and indoor air pollutants in 1981 when it proposed a residential weatherization program for the Pacific Northwest. BPA is part of the U.S. Department of Energy. It markets electricity, most of which is generated by Federal dams. Its customers are the region's public and private utilities and a few large aluminum and chemical industries. The Northwest Regional Power Act of 1980 says that BPA must acquire resources to meet future needs for electricity, and to look first to conservation. Conservation offsets the need for more expensive generating resources, such as dams, coal-fired or nuclear plants. Nearly one and a half million homes in the Pacific Northwest are heated by electricity. BPA estimates that weatherizing 85% of these homes could save about 300 megawatts...or about one-third of the output of a nuclear power plant.

Before starting a weatherization program, BPA looked for potential impacts. We did this because the National Environmental Policy Act requires us to evaluate the environmental consequences of proposed major projects. We discovered that scientists have recently become concerned about air quality in homes, so we reviewed the scientific literature on indoor air pollutants. We focused our concern on radon, and formaldehyde, and on combustion by-products; especially benzo-(a)-pyrene. Rather than delay our program while we prepared the Environmental Impact Statement, we restricted our weatherization activities. Under these restrictions electrically heated homes were eligible for weatherization measures that reduce heat loss, but homes likely to have major sources of radon, formaldehyde, and combustion by-products were not eligible for house-tightening measures, unless the homeowner installed an air-to-air heat exchanger to increase ventilation. BPA excluded homes with basements, unventilated crawl spaces, and those with well water because these characteristics were associated with high radon levels. Mobile homes were excluded because they are tightly built using a good deal of particle board and plywood. Those are major sources of formaldehyde. Homes with woodstoves, unvented gas ranges, and portable propane or kerosene heaters could not be tightened because these appliances release combustion particles and gases into the living area. But this approach had its drawbacks. A restricted program meant that BPA would lose a major source of energy savings, since nearly seventy percent of the region's electrically heated homes could not be tightened.

It also meant that BPA's program would not be consistent with weatherization programs already offered by other regional utilities. Also, consumers preferred to participate in programs that paid for storm windows and other house-tightening measures.

We began our restricted weatherization program in 1981. At the same time we began working with scientists at Battelle Northwest laboratories to evaluate alternatives for increasing energy savings without increasing health risks. For each alternative, we had to answer key questions: what pollutant concentrations would be present in homes, to what extent would house tightening increase these concentrations, and what would be the health risks to the occupants? We concluded our study in the fall of 1983. We found that pollutant concentrations in homes are generally low. But there is no practical way to predict pollutant levels in a specific home because of the many variables. House characteristics alone are not a reliable indicator of people's exposure to pollutants. For example, in a BPA study of radon levels in Northwest homes, we found that some houses with basements had lower radon readings than houses with ventilated crawl spaces. People's exposure to pollutants depends in part on the number of pollutant sources they have in their homes. Exposure to pollutants also depends on the volume of air in a home. Other things being equal, pollutants will be more diluted if the living area is large. And people's exposure also depends on an air exchange rate that continually changes. It varies with wind and temperature differences between indoors and outdoors. It also changes when people open and close door and windows.

Using computer modeling, the scientists at Battelle were able to estimate a range of people's exposure to each type of pollutant. For example, the lowest exposure level would be found in a home with the fewest pollutant sources, the lowest pollution emission rate, the largest volume of air, and the highest air exchange rate. Weatherization does not cause indoor air pollution. But we found that house tightening can increase existing pollutant concentrations in a home by up to thirty percent, depending on the conservation measures installed. We found that the greatest risk of health problems would result from pollutants already in homes before any weatherization measures were installed. The scientists at Battelle estimate that each year, between two and thirty-five people in every hundred thousand develop cancer from exposure to indoor air polluted by benzo-(a)-pyrene, radon, and formaldehyde. This wide range reflects the fact that there is considerable uncertainty about the health risks from exposure to the relatively low pollutant levels in the homes. In addition, individuals sensitive to formaldehyde and combustion by-products can experience eye and nose irritation, dizziness, headaches, and respiratory problems. Compared to these existing conditions, the additional health risks from house tightening are small. The Battelle figures show these additional risks are comparable to those that many people take voluntarily, such as the possibility of having a fatal accident in driving 21,000 miles in a car, or lung cancer from smoking 18 to 54 packs of cigarettes over a lifetime.

Our environmental impact statement with these findings was extensively reviewed by the public, scientists, and many others. The overwhelming response was that people wanted to choose for themselves whether to tighten their homes. Most felt that BPA should provide essential information on indoor air quality. And some believed that BPA should assist homeowners with indoor air monitoring, particularly for radon. Supported by these comments, BPA decided to expand its weatherization program. It now includes the element of choice, and provides for appropriate actions to reduce the risk of exposure to radon, since radon is especially difficult to detect and control.

Our expanded weatherization program works this way. An Energy Analyst from a participating utility audits a home and recommends ways to save electricity. The analyst gives the homeowner a booklet, which explains how to detect indoor air pollutants and how to control them. BPA provides this information because people can learn to recognize most sources of pollutants. In some cases, pollutants like formaldehyde or cigarette smoke can be detected by odor or effects. Once homeowners are aware of these pollutants and the health risks of house tightening, they can decide which steps to take. The Energy Analyst also leaves a brochure explaining radon monitoring. Homeowners may pick one of several options to measure radon in their homes. They can monitor after the installation of weatherization measures, or they can choose to monitor for radon and then weatherize their homes, or they can weatherize without monitoring for radon or finally, skip the tightening measures altogether.

If the radon level in a home, after house tightening, exceeds what BPA calls its "action level", BPA offers to share the cost of an air-to-air heat exchanger that can offset the effects of tightening. BPA's "action level" is a radon gas measurement of five picocuries per liter of air. This level is about the midpoint in a range of recommended guidelines. The Energy Analyst also places a sticker on the home's electric panel. It tells future residents that the home has been tightened. It also tells them where to get further information.

BPA's weatherization program increases potential energy savings and reduces health risks at a relatively low cost. The cost for information, monitoring, and administration is small compared to the entire program costs.

We estimate that about five percent of all the homes that could be monitored in the program will require an air-to-air heat exchanger, which then becomes an additional cost to the program. BPA pays eighty-five percent of the cost of an air-to-air heat exchanger, up to eight hundred and fifty dollars, whichever is less.

We are continuing to learn more about indoor air quality, and whatever we learn, we will pass along to Pacific Northwest homeowners. Monitoring for radon will give us information so we can find locations of high readings. This may help us eliminate

monitoring where radon readings are low. Currently we use air-to-air heat exchangers to offset radon levels after house tightening. As newer, cost-effective ways to control radon and other pollutants are found, we may be able to include them in our program.

No program runs altogether smoothly. We expect to respond to complaints, to address legal issues, and to solve new problems. We expect to adapt our program to changing circumstances. We believe that through BPA's weatherization program we have found a way to save energy while helping people protect their health.

(end slide show)

Where are we? The decision's been made and on October 1st we offered to the utilities a new contract which implemented this decision. Now to reiterate the decision; the decision was no longer to exclude any house in receiving tightening measures. We will tighten every house and install all measures. We have added two mitigations to try to reduce some of those impacts of that program. First, get information booklets out. I have one here and it was shown in the slide show. The second mitigation was to offer radon monitoring if the consumer wanted it. There's a little booklet that fits in the back that describes these options: 1) choose not to get radon monitoring, 2) choose to get monitoring before weatherizing, or 3) after weatherizing. We think the most intelligent choice, of course, is to get monitoring after weatherization, because that's the living condition in the house. And then, if he or she sees the action level of 5 pico-curies per liter, the homeowner has the option of getting an air-to-air heat exchanger at this point. We would, however, like to move into some of the other things Harvey mentioned. We are in a position already to start moving in that direction, but that will cost share that mitigation up to 85%, not to exceed \$850. That was in the contract on October 1st. It was offered to the utilities which were participating in the weatherization program. Most of the utilities to my knowledge took that contract and are now just starting to implement the new program.

The latest number I have is that over 10,000 of these booklets have been distributed to the utilities so far for later distribution to the homeowners. We have already purchased from Terradex about 13,000 radon detectors, of which 8,500 have been given out to the utilities for distribution to homeowners. The utility folks that I know in the audience ask what the public response to radon monitoring is, and the feedback is that it has been very good. Most people want to get the radon monitoring. Most of them are choosing to do radon monitoring after they weatherize the house, the most logical method. We think that by getting this quantity of data back we can start assessing the Northwest region as to where radon is going to be a problem and

where radon may not be a problem. Hopefully after we get enough data we can start eliminating some areas from having to participate in monitoring side of this decision. In any event, this is a very large, ambitious study. I'm excited about getting this wealth of data and I'm sure that the researchers are too.

Let me sum up by saying that we're excited about our decision and we think we made the right one. It's a rather bold step for a utility company in this country to take. And I'm real interested in seeing what the reaction in the rest of the country is over time.

QUESTION: Was the reason to measure radon only because of the inexpensive cost of measuring, do you hope to measure any other pollutants in the future?

ANSWER: Certainly one of the reasons that we did decide to measure radon is based on the cost of the monitoring. We're buying in bulk. Obviously the detector cost is an important factor and without that factor we cannot implement such a program at any reasonable cost. We, at this time, are not planning to monitor any of the other pollutants. For example, formaldehyde is the one that comes to mind, and there is a passive detector which is relatively inexpensive that is available. The reason is that when we look at the risks in EIS from formaldehyde, they're very low. We do not think that there's a whole lot of formaldehyde in older homes. Formaldehyde is going to be more of a problem probably in newer homes. At least at this point. And as Dr. Meyer said, the formaldehyde problem is going down in importance. So for that reason, we decided not to do formaldehyde. Another thing I can say is formaldehyde can be smelled, can be sensed. So there is some consumer information where consumer choice is involved.

QUESTION: You mentioned that weatherization was opened up, does that include mobile homes?

ANSWER: No, it does not include mobile homes. The reason is the cost effectiveness of the mobile homes. The ones that you could do are probably pre-1975. The cost to do them is similar to stick-built homes, but the amount of energy you'd save is much less. And they're not going to last as long as a stick-built house. So all of that, you mix it all up and you come up with the answer that it's not worth doing, from the ratepayer point of view.

QUESTION: What about people who already weatherized their home under utility sponsored programs, but not BPA sponsored programs?

ANSWER: That's a good question. Unless that home can somehow get attached to our existing program, there is nothing that we can do for them at this point. That is a problem for that utility.

The original program excluded tightening in all the homes that we thought there was a potential problem if you're talking about radon. You had to have a ventilated crawl space before you could get tightening. If the utility made a choice to go ahead and tighten their homes, they did it on their own money and their own resources. So they took on the responsibility for the indoor air quality. If they were weatherized and tightened, they met all the original exclusion criteria under our program and they wanted to get radon monitoring, we would probably make it available. That's only a guess at this point. I'm not the person who works on that. We've got some of the people who worked on the weatherization program here. I don't know whether Paul would like to comment on that or not.

PAUL JOHNSON, Manager of Weatherization Program: We're looking at different scenarios that this third alternative could be applied to. One of the things we're looking at now, our immediate focus, are homes that were tightened with utility money during the past couple years that would be eligible for retroactive reimbursement from Bonneville. We're close to fine tuning and getting out the procedures on those homes. Not exactly the same question that was asked. Basically, utilities could be reimbursed for their expenses in tightening those homes, if they offer radon monitoring and mitigation to those homes. We have not yet made a decision on how to deal with those homes who basically fall in the 30% category. The inclination right now is that we are not planning to do anything with those as far as offering monitoring or mitigation. But again, different questions are starting to come up as we get into implementing this and I guess we'll just deal with each one as we get them.

QUESTION: Are you going to do any homes where you do a before and an after?

ANSWER: I initially said no. As we claim, we do mitigation techniques, particularly sub-slab depressurizations. Those homes which are going to be the problem homes, we will probably go back and initially at least, check the before and after mitigations. We're not doing before and after on weatherization homes. And it's simply a cost consideration. We feel pretty comfortable about predicting what the radon concentrations will be.

QUESTION: We do low income programs. We weatherize houses for folks that cannot afford these appliances like air-to-air heat exchangers on a long-term basis. I was wondering how we could do air tightening without doing mitigation. Under the program is there a way we bring it to a certain number of air changes per hour and so we can avoid using air-to-air heat exchange?

ANSWER: The air-to-air heat exchanger option is an option. It is a choice by the consumer. They can turn it down if they can't afford it. The other thing you have to realize that wasn't brought out in the slide show is that under the low income program, we will pay 100% of the cost up to \$1,000 for low income consumers. Now as for your real question, can you tighten up to

a certain standard? You probably can, there's no provisions in the program to do that. The problem you get into with any sort of program like that, or attempt to do that, is you've got to figure out a way to measure what the air exchange rate is to know when to stop tightening. And in the past, it's been blower doors. In the future maybe small passive conductors. It's still something that has significant cost associated with it. If you can figure out a way to do it, I think that would probably be available for the program.

QUESTION: Do you have any preliminary cost estimates for sub-slab depressurization?

ANSWER: Harvey might. The best I can do is what I heard in Stockholm this summer at the Indoor Air Quality Conference. Over there the Swedes have gone first class with their system. They estimated it was \$1,000 U.S. But like I said, they go with a first class system; a variable motor with a pressure differential and everything. I would suppose that we could do it with a less of a gold plated model and be a whole lot cheaper. Harvey?

HARVEY SACHS: The cost will be driven entirely by the question of whether you demand a qualified engineer to go out and do an on-site diagnosis. The actual tightening would range to \$1.00 a foot. A pump is in the range of \$25 to \$35. You're talking about several hundred dollars in trade time for installation costs and so on. It's in that kind of range and it will really be driven by what local codes say about whether you have to run conduit, how you penetrate what kinds of wall. We're definitely talking about a relatively low cost solution in those houses and don't need a gold plated Cadillac. It will not work in Chicago.

THOR: One other thing I would add to that. Harvey comes back east. Sump pumps are very common back east. They're not quite so common out here. So you've got a coring problem also in those cases. You'll have to core down through the concrete slab. That adds to the cost.

QUESTION: You're talking about radon and gravel, what about hardpan?

ANSWER: One of the theories on radon movement, radon transport in the house is pressure driven flow. I'm sure that they talked about it yesterday. The thing that becomes important is also the permeability of the sub-structure, of the soil, the gravel, the dirt, whatever, that's underneath the slab. It's only a presumption at this point that has a large effect.