Approved _____
Date

MINUTES OF THE House Sub COMMITTEE ON Energy.

The meeting was called to order by Representative Carl Holmes at
Chairperson

3:30 ~~a.m.~~/p.m. on February 10, 1987, 19__ in room 526-S of the Capitol.

All members were present except:

Committee staff present:

Ramon Powers, Legislative Research Department
Theresa Kiernan, Revisor of Statutes' Office
Betty Meyer, Committee Secretary
Bill Buchanan, Legislative Research Dept.

Conferees appearing before the committee:

David Ebbert, Quinter, Kansas
Robert Eye, Nuclear Awareness Network
Dr. Lawrence Drbal, Olathe Kansas, American Nuclear Society
Craig Swartzengruber, Wolf Creek Nuclear Operating Company
Shaun McGrath, Sierra Club
Harold Spiker, Kansas Department of Health and Environment
Janet Stubbs, Executive Director, Home Builders Association of Kansas

Chairman Holmes called the meeting to order.

Chairman Holmes read the testimony of Russell Bunker, Tipton, Kansas, who attended the previous week's meeting but did not have time to testify.
Attachment 1

David Ebbert testified he fully supports the ban on burial of low level radioactive in Kansas and would support comprehensive regulation of on-site containment.
Attachment 2

Robert Eye testified the Nuclear Awareness Network suggests the following amendment to the language of HB 2108. Section (b) (1) should include a sentence which follows the first sentence to read "But in no case shall the secretary be authorized to permit the burial of radioactive waste." This would provide the assurance of an absolute prohibition on the burial of radioactive wastes in Kansas.
Attachment 3

Dr. Lawrence Drbal testified in opposition to HB 2108, saying it is not a solution to the problem. The waste compact provides the best opportunity for Kansas, and to stay in will take political courage.
Attachment 4

Craig Swartzengruber testified in opposition to HB 2108 stating without the ability to dispose of low level radioactive wastes, some Kansas facilities could be required to curtail or discontinue operations. STANDING COMM. 3/4/87
Attachment 5

Ramon Powers gave the Committee a briefing on HCR 5007.

Shaun McGrath testified in support of HCR 5007, and urged that a representative of a public interest group be placed on the Committee.
Attachment 6

Harold Spiker provided an up-date on the monitoring program after endorsing HCR 5007.
Attachment 7

Janet Stubbs testified in support of HCR 5007 stating that a great deal is unknown about radon, so experts should be involved in studies.
Attachment 8

Representative Fry asked Mr. Spiker about changing the date to a later one, but Rep. Holmes asked to keep the March 15th date.

Motion was made by Representative Sutter and seconded by Representative Rosenau to recommend to leave the resolution as it is and pass it out to the full committee for approval. The motion carried.

Chairman Holmes adjourned the meeting at 6:00 p.m.

Date: 2-10-8

GUEST REGISTER

HOUSE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

NAME	ORGANIZATION	ADDRESS	PHONE
Willynda Holmes	Legislative wife	Plains	
Shari Wilson	KNRC	Topeka	
[illegible]	[illegible]	[illegible]	
David Ebbert		Quinter	754-[illegible]
[illegible] Zimmerman	Topeka Peace Resource Center [illegible] Burnett [illegible]	Topeka	[illegible]-1361
Harold Spiker	KDH+E	Forbes Field Topeka, Ks.	862-9360
[illegible]	[illegible]	Topeka	
[illegible]	Eagle Picher	Lenexa	
Rex Buchanan	Kansas Geological Survey	Lawrence	
Larry Drbal	Mo Kan Section/ANS	Olathe KS	764-5715
Joe Kramer	KCPL	P.O. Box 679 K.C., Mo. 64141	816-556-2925
Robert Eye	Nuclear Awareness Network	[illegible] Ks	749-1640
Craig Swartzendruber	KG+E, KCP+L and KEPCO	Wichita, KS	261-6637
Jerry [illegible]	KG&E	Topeka	357-1711
JANET STUBBS	HBAK	"	233-9853
Robert Hagan	KGE, KCP&L and KEPCO	Wichita, KS	261-6547
[illegible] Stephens	N.A.N.	Lawrence, Ks	749-1640
Marsha [illegible]	Kansas Natural Resource [illegible]	Topeka, Ks	233-[illegible]
John Blythe	Ks Farm Bureau	Manhattan	537-2261
[illegible]	[illegible]	[illegible]	[illegible]

To the Commission:

As a resident of Mitchell County, I share the feeling not wanting a Nuclear Waste dump in Mitchell County. Mitchell County is a good place to live, clean air, good water, and we wish to keep it that way. We are very concerned about our environment. We want to have a say about our future.

Published in the Sept. issue, 1986 of the Journal of the American Medical Association, the Ks. study conclusions said that farmers useing the herbicides for 20 days or more a year had a six fold higher rate of lymphoma than non farmers. In some cases the rate was as much as eight fold/ Noting the information of the Kansas study. a Legion spokesman said "we are going to make sure that the V.A's advisory committee on environment hazards is aware of the study and recommends that its members consider the findings of the future studies.

NO we do not want a nuclear waste dump in Mitchell County. We already have enough problems without this.

Thank You!

Russell Dunker

Bill 2108

Tipton, Ks.

House Subcommittee on Energy 2-10-87
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KANSAS HOUSE OF REPRESENTATIVES ENERGY SUBCOMMITTEE

Mr. Chairman and Committee Members,

My name is David Ebbert. I live in Gove County 8 miles southwest of Quinter. My home is less than 5 miles from a "preferred siting area" for radioactive waste burial development. I am very concerned about the present plans to bury "low level" radioactive waste as a means of management. I'd like to tell you about my background so you might understand my concerns.

My father's family settled near Quinter around the turn of the century, and he grew up on the farm a few miles south of town. In addition to farming there, the family ranched and farmed 2 sections and a quarter 2 miles west of Castle Rock. That south land is all included in a preffered siting area.

I grew up in Kansas City, Kansas and central Illinois. When I was small my family returned to Quinter every summer for wheat harvest; and this place was always home country to me.

I moved there to live in 1981, farming with my aunt and uncle and other neighbors. I also do horticultural and carpentry work there.

I graduated from Western Washington University with a Bachelor of Science degree in Environmental Studies in 1979 and returned to Illinois to work for a year and a half as a community organizer helping people fight the pollution of toxic chemical landfills near their homes and communities.

Because of the industrial development of Illinois the soil and ground water contamination is bordering on a nightmare. I had more than a plenty of opportunity to learn about the faults of burial of toxic materials.

I worked with the people of Sheffield, who forced the State of Illinois to close and keep closed that leaking low level radioactive waste dump.

*David Ebbert/Rt. 1 Box 56/Quinter, KS 67752 (913)754-3860

That site was operated by Nuclear Engineering Company, which now uses the name U.S. Ecology, and is one company that has expressed interest in being the site developer for the Central States Compact.

This and other experiences taught me that the extimates of waste containment by geologic media never adequately model reality. Leaching at the Sheffield site was more then 10 fold faster then originally projected.

I also learned that commercial operators never have a perfect record of following the rules. The list of violations at any site is long-- not just minor nuisance violations, but things that significantly undermine the containment strategy the regulations are designed to enforce.

I'm sure that operators and regulators are learning from their mistakes; but I don't know of one good example of longterm containment of toxic materials through burial.

Landfills leak. Even if we bury waste a little deeper and call it "near surface disposal" it's basically the same thing.

There is not a landfill that will not disperse its contents to its surroundings. Perhaps slowly, but in 300 years the spread of contaminants from a radioactive waste burial could be very wide, and reversable only at massive expenditure of resources and money.

Burial does not end the problem; it allows it to grow. Neither soils nor for profit contractors perform according to theory.

Our policy designs must take this into account. I do not want to be guilty of putting 5 million cubic feet of radioactive material over the Ogallala aquifer. Are we going to risk such a precious gift for the marginal savings of distant utility companies?

The idea of disposal of toxic materials is a false one. Its's a myth that there is a place that one can simply put them and never have to think

of them again. The faith that burial works has not yet proven itself, despite the ardent advocacy of those who benefit materially from its use.

The real requirement for toxic materials management is destruction or containment. Destruction of radioactive wastes is not now an option. Containment remains. Think containment not disposal.

In Illinois we also learned that in this dumping the public is coming to bear tremendous costs, financial and non-financial, for the private gain of others. Burial is the bargain basement solution for utilities with trouble on their hands. I don't believe that it's the best we can do, merely the cheapest up front. It is hard to imagine a worse deal than "We dumped our wastes here; now you make sure they're okay for the next 300 years." This gives no accountability or reasonable reversal if failure later becomes apparent.

If the nuclear utilities have made a bargain with the devil, one that lasts longer than a lifetime, let them pay for it. I am very sympathetic to the ratepayers. They didn't choose to build these plants. By all rights management and ownership interests should pay these hidden costs that are now coming due. I mean hidden only to those who didn't want to see or were taken in by the rhetoric of the industry.

Trucking the wastes of 5 states into one place is alot of extra transit. The history of handling and transporting toxic chemical and radioactive wastes is littered with small failures and some major contaminations. Even if the worst case accidents don't occure, it's likely that small breaches here and there will, under the Compact's plans, progressively add to the background radiation of our surroundings.

In light of these limitations, one strategy seems to make sense. Have the major low level radioactive waste generator in the state create above ground, on production site vaults for its waste, and under contract, the waste of the minor generators in the state.

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This strategy has many advantages. It cuts handling and transportation dramatically. It preserves other management options for the future. It provides a direct incentive to the waste generators to create as little as possible and to take the long term view because they continue to foot the bill. Of course this will have to be tightly regulated and carefully developed and maintained. But there just aren't any magic solutions.

The people of Gove County do not want this waste. They are unhappy that they have been informed so belatedly about the process. The comment I hear from so many people is "If they can't take care of the stuff they shouldn't make it." It's really time to see if private concerns can pull their own weight.

I fully support the ban on burial of low level radioactive waste in Kansas and would support comprehensive regulation of on-site containment.

I think of the cool shaded summertime of the farm yard my grandparents created in a hot grassy land. I think of the life they worked for and that my neighbors work for. We are trying to build a community that won't ruin its home in only one generation or in 10 or 20.

I can't speak for all of my neighbors, but most of us would say to those who would bring us this waste "We don't want your trucks rolling by our homes. We don't want your bulldozers tearing our land. We don't want what you'll leave behind. We don't want any of our Kansas neighbors to face that future."

We are beginning to raise our voices. We will do more if we must.

nuclear · awareness · network
1347½ massachusetts • lawrence, kansas 66044 • (913) 749-1640

February 10, 1987

My name is Robert Eye and I am the Associate Director and Counsel of the Nuclear Awareness Network (NAN). I am here to encourage favorable passage of HB 2050 and HB 2108 as such are consistent with the protection of the public's health and safety and preservation of our state's natural resources.

The initial costs for alternatives to land burial or mined cavity disposal will be substantial. However, land burial which allows radioactive contamination to migrate and requires remedial clean-up to prevent further damage will be more costly in the future. It is essential that this legislature recogonize that every dumpsite for radioactive waste has leaked and/or caused contamination outside disposal trenches or tanks. As a policy matter the costs of safe and responsible management of low level radioactive waste must be secondary to selecting a means which is intended to protect human health and prevent further environmental degredation.

Neither land burial nor mined cavities have proven to be successful alternatives to isolate hazardous materials in Kansas. The Furley landfill experience has been an environmental and economic disaster for Kansas. This alone should be convincing evidence that landfills leak and that remedial clean-up is

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expensive and that compromises are no bargain. However, the Furley experience will have served us well if it prevents an out-of-sight, out-of-mind mentality from dominating the low-level radioactive waste management problem.

The mined cavities under the city of Lyons have well-known geological and hydrologic problems that should preclude use as a disposal facility. The heavy concentration of oil and gas drilling in the area virtually assures that pathways would be present for radioactive contamination of groundwater. Additionally, the shaft leading to the mined cavities is located in such a way that the townspeople of Lyons would be faced with unacceptable radiological hazards arising from transport and off-loading activities. Finally, the owners of the Lyons mine have shown consistent disregard for responsible management of radioactive material. This fact alone should preclude their participation in any radioactive waste management role in our state.

Recently, advocates of landfill disposal have speculated that an improved burial technique, "enhanced" burial, is available and adequate for environmental protection. This new technique incorporates the use of an engineered barrier (usually concrete) to contain radioactive wastes. Concrete is permeable by water and merely inhibits waste migration, it does not prevent it. "Enhanced" burial is inadequate to overcome the forces of subsurface geology and hydrology and therefore is not an acceptable solution.

Radioactive wastes from decommissioned reactors pose a tremendous environmental and health threat if not managed in a

responsible manner. Presently, no special precautions or additional safety measures are contemplated to require oevelopers to anticipate the dangerous radioactive hazards that are present in decommissioning wastes. According to Dames and Moore the decommissioning process will oroduce in excess of 600,000 cubic feet of low level radioactive waste per reactor. Included in this waste will be reactor internals which have been highly irradiated over the life of the reactor. Among the isotopes in irradiated reactor internals is niobium 94 with a 20,000 year half-life. Under the present regulations. reactor internals can be disposed of in burial trenches.

Additionally, operational wastes from reactor operation include ion exchange resins which contain the isotope cesium 137 which remains hazardous for 300 years. The lack of special precautions for niobium 94 and cesium 137 should give this sub-committee cause to question the efficacy of any proposal which utilizes land burial or mined cavity disposal.

How would the enactment of these bills relate to our participation in the Compact? First, no language in the low level radioactive waste law mandates land burial. What the law does require is disposal which is defined as "permanent isolation" from the environment. This is a goal as yet unrealized by any so-called permanent disposal technology.

Second, the law requires state licensure of any low level radioactive waste management facility if the state is an NRC agreement state, which Kansas is. Hence, so long as our licensing requirements are consistent with responsible management

of low level radioactive waste no other state, or the Compact, can object.

Third, the law makes management of low level radioactive waste a state problem. Hence, the state of Kansas should take steps to assure our citizens that our policy is oriented to protection of Kansans, not accomodation of the interests in Arkansas, Oklahoma, Louisiana or Nebraska.

The Central Interstate Compact is unique in having a developer (not the Compact Commission) choose the site. This is particularly disturbing considering the terrible history of the owners of the Lyons facility. Capitulation to these interests is equivalent to allowing the developers to decide what is best for our state. The soector of state officials playing a relatively passive role in site selection has the distinct appearance of governmental impotence. Our citizens expect and deserve robust leadership on these matters, not benign neglect.

Fourth, any objections from the Compact Commission which take issue with our state's efforts at responsible management of low level radioactive waste is indicative of an attitude which allows compromise when it comes to protection of Kansans' health and our environment. Simply because the Compact Commisssion is prepared to needlessly expose our citizens and degrade the natural resources of Kansas does not mean that this legislature should agree to such. Moreover, the citizens of Kansas are clearly not prepared to allow low level radioactive waste policy for our state to be dictated by the Compact Commission or its member states.

In order to further strengthen protection from the reprecussions of irresponsible low level radioactive waste management NAN suggests the following amendment to the language of HB 2108: Section (b)(1) should include a sentence which follows the first sentence to read "But in no case shall the secretary be authorized to permit the burial of radioactive waste". This would provide the assurance of an absolute prohibition on the burial of radioactive wastes in Kansas.

In conclusion, this legislature made a progressive and responsible decision when it banned the land burial of hazardous wastes. The natural and human resources of our state are better protected now because of the ban on land burial of hazardous wastes. Unless a prohibition on burial of radioactive wastes is enacted many of the gains realized from the ban on land burial of hazardous wastes will be lost.

Thank you for this opportunity to speak and I will do my best to respond to any questions.

"Low-Level" Nuclear Waste: Options for Storage

With passage of Federal legislation (Low-Level Radioactive Waste Act and Amendments), legislators, policy makers and citizens are desperately looking for regional solutions to the "low-level" nuclear waste problem. In their haste, decision makers may opt for the quick fix, disposing of all "low-level" waste in burial grounds, as has been done, disastrously, in the past.

Burial grounds differ little from garbage-type landfills. Waste generators believe landfills can somehow be made to work. But they are not a viable option. In moist areas, water runoff and underground migration inevitably bring water into a landfill and carry out poisonous chemical and radioactive substances.

Waste generators and the Nuclear Regulatory Commission (NRC) consider all "low-level" waste the same. But it is not. Some is extremely radioactive and long-lived, requiring monitoring and maintenance for thousands of years; other waste is slightly contaminated and short-lived. These "low-level" waste streams should not be "disposed of" in the same place, using the same basic technology-shallow landfills.

A sound "low-level" waste management policy calls for segregating radioactive waste at the point of generation and storing it above-ground. While the waste is stored above-ground, we can be assured of no leakage into our groundwater. The waste can be easily monitored and protected. Short-lived waste will decay to non-toxic levels.

Waste Stream Must Be Segregated at the Point of Generation

Each of the different types of "low-level" waste have specific characteristics and require specific storage techniques.

Reactor waste, which accounts for 24% of the radioactivity of "low-level" waste sent to burial grounds,[1] falls into two radically different categories. Wet waste, which consists of ion exchange resins and sludges, and dry waste, which consists of clothing, rags and tools. By volume, power reactors account for about 54% of the waste stream.

Wet Waste Resins and irradiated components, such as control rods, make up over 95% of the radioactivity in reactor "low-level" waste.[1] The nuclear industry tends to talk only in terms of volume when discussing "low-level" waste. This is misleading. The radioactivity, longevity and chemical composition of the material must be an integral part of a sound waste management policy.

Resins are a media with the consistency of caviar. They are used to purify the water that circulates around the fuel in the reactor. Of particular concern is cesium-137, which is water soluble, and therefore, readily migrates out of the nuclear fuel into the surrounding cooling water. Because of this solubility, the substance will also readily migrate out of a burial ground. An average reactor produces 500 curies* of cesium-137 per year.[1,2] With 80 operating nuclear power plants in the U.S., about 40,000 curies of cesium-137 are shipped to burial grounds each year.

Besides cesium-137, another dominant component of reactor wet waste is cobalt-60. These two isotopes have half-lives,* respectively, of 30 and 5 years and must be sequestered from the environment for at least 300 and 50 years, respectively. These wet wastes, because of their toxicity, longevity and mobility in the case of the cesium-137, should not be dumped in landfills. They should be temporarily stored in bunkers, preferably above-ground, carefully monitored and subsequently isolated in a high-level waste repository, if and when one is available.

Dry Wastes These are generally only slightly contaminated materials that can be compacted: Some of these materials conceivably could be incinerated because the radioactivity could be trapped on filters as is done in Canada (see page 5). The difficulty with incinerating the dry wastes of the nuclear reactor "low-level" waste stream is that, if an incinerator were operating, nuclear utilities would press to also have the resins and sludges incinerated. This would pose an unacceptable health hazard to surrounding communities because of the large amounts of cesium and other isotopes going up the stack, material which could not be entirely trapped on stack filters.

If not incinerated, the dry wastes of a reactor should be compacted and stored in bunkers.

* see glossary

Is it feasible? Can the wet waste stream be separated from the dry waste stream at the reactor? Yes, it is already being divided prior to transport. Because of high radiation levels of resins, these materials are currently transported in shipping containers separate from the steel drums and wooden crates used for dry wastes. Current practice is that, in these separate shipping containers the wet and dry wastes are sent to the same burial grounds, and buried together. This segregation, initiated at the reactor for transport purposes, should be used for storage purposes as well, as is done in Canada.[3]

Industrial Waste These account for 73% of the radioactivity of the "low-level" waste going to burial sites.[1] In this category fall two large producers of isotopes for medical and research purposes: New England Nuclear (MA) and Union Carbide (NY) which, respectively, account for 24% and 15% of the total radioactivity of the nation's "low-level" waste. New England Nuclear's waste is primarily tritium, producing *120,000 curies per year.* Since tritium behaves exactly like water, it cannot be isolated in a landfill. This waste should be stored in above-ground storage bunkers, temporarily (20-50 years) and then moved to a high-level waste repository. By volume, industrial waste accounts for about 11% of the total stream.

Institutional Waste, which accounts for about one-third of the volume of waste presently going to commercial burial grounds, consists of materials both from hospitals and research institutions. These two waste streams are significantly different from one another, with medical waste dominated by short-lived materials such as technetium-99m with a half-life of six hours and the research waste stream consisting of long-lived materials such as carbon-14 and tritium with half-lives, respectively, of 5,000 and 12 years. Other shorter-lived materials are also included in institutional waste. The medical waste, with less than one percent of the radioactivity in "low-level" waste, lends itself to being stored in above-ground facilities for about three years until it has decayed to levels low enough to be disposed of as regular trash. Dartmouth College has a program (described in detail on page 5) which offers considerable promise for other similar institutions. Hospitals in cities should follow Dartmouth's example by using a centralized storage location for isotopes for the necessary decay period.

Landfills Leak

An erroneous assumption dominating current "low-level" waste planning is that landfills can be prevented from leaking. The history of both radioactive and chemical landfills in humid climates does not substantiate this claim.

The unlined dump, and even the double liner approach, using a leachate* collection system, have failed in areas of average rainfall (30-40 inches per year). Experts, such as Dr. Peter Montague at Princeton University Center for Energy and Environmental Studies have stated:

> "We found that four state-of-the-art landfills in New Jersey developed leaks within one year. I think the whole idea of secure landfills is really a figment of optimistic imaginations."

The track record of radioactive landfills in humid areas has similarly been poor. Of six commercial sites which have operated in the United States, three are now closed because of problems: Maxey Flats, Kentucky; West Valley, New York; and Sheffield, Illinois. All three have had water infiltration into trenches, slumpage of trench covers and erosion. At each site, radioactivity has migrated and expensive remedial actions are continuing. The major operating radioactive landfill for the country, Barnwell, South Carolina, is located in a high rainfall area. It has not had buildup of radioactive leachate because of the porous, sandy trench bottom which allows radioactive water to drain out into the environment. Tritium has been detected 45 feet from the burial trenches at Barnwell. The other operating sites, in Beatty, Nevada and Richland, Washington, both located in semi-arid regions, have apparently not had the same problems as at other sites.

Leaking radioactive landfills are not acceptable to the general public. The definition of a "safe" level of radiation has changed drastically over time as we have learned more about radiation and human health. Most physicians agree now that it is the accumulation of low-level radiation doses which is hazardous. We still do not know the exact dose which causes cancer, though we do know that there is a direct correlation between the amount of radiation received by humans and the incidence of cancer.[4]

Above-Ground Storage is Preferable

Above-ground storage avoids the health hazard of leaky burial grounds and avoids the high cost associated with remedial action that, inevitably, will be required at failed burial grounds. Above-ground structures permit storage in a facility that can be easily repaired. While, over time, concrete may deteriorate, cracks may develop, or operational error may cause leakage, problems can be quickly detected and remedied. Above-ground structures can be designed in such a way as to provide a double barrier which can be used to isolate leakage and prevent it from moving into ground water.

The nuclear industry and its boosters have fabricated a number of disadvantages to above-ground storage: cost, nonpermanence, reliance on institutional controls, sabotage, even plane crashes. Many of these arguments, discussed in box 1, are simply red herrings. The industry, in advocating radioactive landfills, is promoting an "out-of-sight, out-of- mind" solution. But as the operating record at three closed sites has made one point abundantly clear: **residents and taxpayers always pay in the end for leaky landfills.**

* see glossary

ABOVE-GROUND STORAGE IN ENGINEERED STRUCTURES ADVANTAGES AND DISADVANTAGES

Advantages

- Avoids shallow land burial, which, in areas of high precipitation, inevitably results in off-site migration of radioactive materials.
- Can be easily monitored.
- Can be relatively easily repaired.
- Radioactive waste can be transferred to a permanent disposal site without high radiation exposure to workers, particularly if the same concrete or steel module in which the material is stored is also used to transport the waste to the permanent location.
- Reduces expenses for long-term remedial action or exhumation at leaking shallow burial sites.
- Site selection criteria can be less rigorous because geologic and hydrologic factors are less important with above-ground engineered structures.
- May make interim site selection less time consuming and contentious.
- Reduces exposure of the public to radioactive materials.

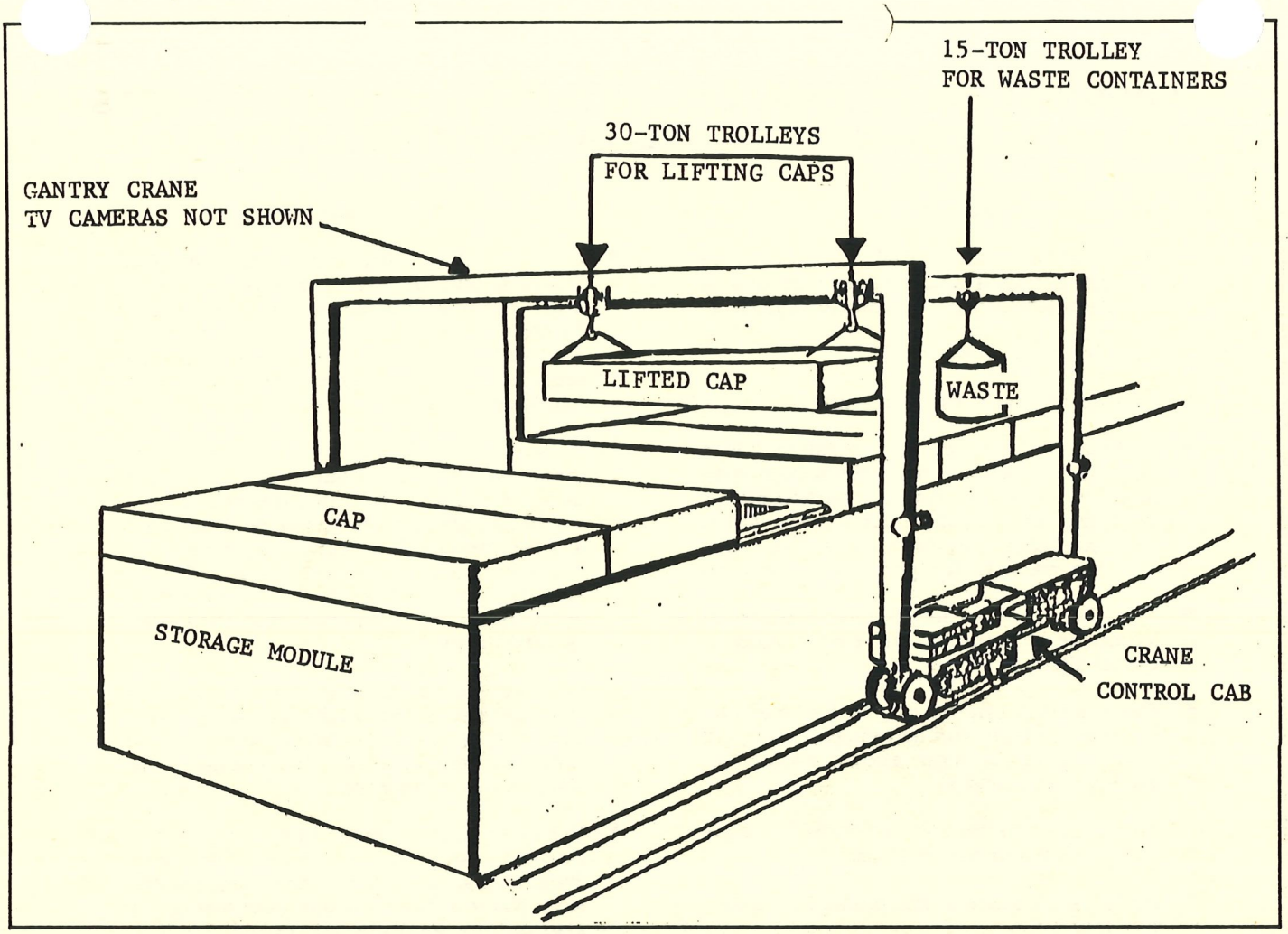
Disadvantages

- Cost. In the short term, above-ground bunkers will be more expensive than a large regional burial ground. Comment: These short term savings will be insignificant compared to the very high long-term remedial action costs necessitated by shallow land burial.
- It is not a "permanent" solution. Comment: Although land burial is often touted as a "permanent" solution, it is not. A leaking burial ground that must be monitored and repaired for 300 years, and perhaps exhumed, is not a permanent solution. It gives the current crop of officials the out-of-sight, out-of-mind illusion that they have "solved" a problem.
- Concrete could degrade because of acid rain. Comment: Yes, acid rain is of concern, but above-ground concrete structures have lasted for centuries, and this storage in envisioned as temporary.
- Relies on institutional control to prevent intrusion after site is closed. Comment: True, but, as with radioactive landfills, erosion, water infiltration and monitoring will also require institutional control.
- Storage facilities will be subject to sabotage. Comment: This is a red herring. Sabotage is a remote possibility.
- Storage facilities might be subject to a plane crash. Comment: Clearly, other facilities accepted in our society, such as oil storage tanks, chemical plants and stadium-packed sports events, pose a much greater hazard. Another red herring.
- The NRC currently will not license above-ground storage for more than five years. Comment: True. This time frame needs to be extended.

Box 1

Above-Ground Storage is Practical and Feasible

Above-ground structures are being used by utilities operating power reactors in the United States and Canada,[3] and by medical and research institutions. The Tennessee Valley Authority (TVA) has built above-ground storage modules at the Sequoyah Nuclear Plant near Chattanooga, Tennessee.[2] Several utilities in the Northeast are designing and building on-site, above-ground storage facilities. Vermont Yankee in Vermont, Pilgrim I in Massachusetts and Susquehanna in Pennsylvania are all moving in this direction. In addition, Westinghouse is marketing a top-notch container, SUREPAK, which can be stored above-ground. Also to be discussed is the French experience at the Centre de La Manche.



Box 2 Radioactive waste storage modules at the Sequoyah Nuclear Plant. The storage module cap is lifted with 30-ton trolleys on the mobile gantry crane, operated from the crane control cab. The crane then moves forward on rubber tires along the concrete runway. The rear 15-ton trolley lifts the cask from the transport vehicle and places it in the storage module. Television cameras and remote manipulating equipment enable operators to perform all work remotely at Sequoyah.

TVA Above-Ground Storage

Presently, the TVA ships "low-level" waste to the Barnwell, South Carolina landfill. Because of the near-term uncertainty of space at Barnwell, the NRC approved and TVA has partially constructed an above-ground storage facility at the two Sequoyah nuclear reactors located on the Tennessee River, 18 miles northeast of Chattanooga. The TVA above-ground storage facilities are not much more complicated than a large concrete box, called a module, with special features to collect radioactive leakage and to shield workers.

The storage modules are constructed, as needed, of reinforced concrete with an inner decontaminable coating. The modules are large, rectangular boxes, 34' wide, 195' long and 19 1 / 2' high. The thickness of the concrete floor slab is 39 1 / 2", while that of the caps and walls is 24". Modules for the storage of resins are almost twice as thick-42". According to TVA plans, eight resin storage modules and five trash modules will located on a 20-acre area. There are four compartments in each module. Each compartment contains a liquid drainage system and sampling valves. Any radioactive liquids can be collected and repackaged, or taken to the nuclear plant for processing. Filters and booties that are less radioactive are stored in 18-gauge steel drums or boxes. The more radioactive exchange resins are stored in more rugged carbon steel cylinders coated with epoxy.

A giant mobile crane straddles the entire concrete module, running along curbed concrete sidewalks on each side of the module. Module loading / unloading steps, through use of the rubber-tired, diesel-powered gantry crane, are shown in box 2. The highest radiation doses are received by crane operators, though the concrete shielding reduces the levels. Since the storage facility is located about 200' from the site boundary, the doses to the public were expected to exceed the NRC hourly radiation limits while the cover is off the storage module. Above-ground storage units can be located so that public exposure is not necessary.

The above-ground storage facility is of substantial construction and is expected to remain functional for several decades. The NRC will, however, only license above-ground storage facilities for a five-year period. This limit will need to be extended for the above-ground storage to be implemented. The NRC has no technical justifications for this limit.

Dartmouth College

Dartmouth College in Hanover, New Hampshire produces "low-level" radioactive waste in medical and scientific research and at the College hospital.[5] In the past, this waste was shipped to commercial radioactive landfills in Richland, Wash., and Barnwell, S.C. While the volume produced between 1977 and 1982 remained stable (120 to 150 55-gallon drums a year), the cost of disposal increased by a factor of seven in this five-year period.

Like most radioactive waste at medical and research institutions, Dartmouth's can be placed into five categories: liquid, solid, liquid scintillation vials (LSV), animal carcasses and other. For liquids containing less than 100 microcuries per liter of radioactivity, this waste, containing tritium and iodine-125, is disposed of into the sewer. Liquids containing more than 100 microcuries per liter are stored in one-gallon containers within a lined 30-gallon drum. This waste is primarily iodine-125 (half-life: 60 days) and phosphorus-32 (half-life: 14.3 days), and is stored for ten half-lives.

Solid waste, consisting of disposable and plastic and glass items, and contaminated paper, is placed in a lined 55-gallon steel drum and compacted to reduce the volume. A drum typically contains a few millicuries of tritium, sulfur-35, chromium-51, and iodine-125, and is stored for at least ten half-lives, or approximately 2.4 years. After this storage period, 55-gallon drums containing less than a millicurie of tritium will be disposed of as regular trash.

Glass and plastic liquid scintillation vials are put into a lined 55- gallon drum for temporary storage. A shredder-crusher is used to separate the liquid, containing tritium, carbon-14, phosphorus-32, sulfur-35 and iodine-125, from the plastic and glass. Vials containing shorter-lived radionuclides are separated from those with tritium and carbon-14, and are stored for ten half-lives. The vials containing tritium and carbon-14 below minimum NRC levels and are disposed of as regular trash.

Carcasses, mainly rats, are first stored in a cooler. If the carcasses contain iodine-125, they are placed in a freezer for sufficient decay (5 to 10 half-lives). Carcasses containing minute amounts of tritium and carbon-14 are incinerated.

Other waste from special experiments may contain up to one to three curies of tritium. This waste, managed on a case-by-case basis, is packed separately and shipped to a commercial burial site.

Based on the production rate of radioactive waste and the management methods mentioned above, Dartmouth College built a storage building capable of holding 240 drums, with expansion space for future needs. The storage building is a reinforced concrete structure 24' wide, 98' long and about 11' high. The walls are one foot thick, insulated and faced with a brick veneer. To collect leakage, the floor slopes toward the center where a collection pit is located. With the doors set four inches above floor level, the room will hold about 800 gallons of fire water. A telephone and fire alarm pull station provide added safety and the building is equipped with heat detectors.

The cost of the whole building, 2 / 5 of which is used for waste storage, was $125,000. Dartmouth estimated that the yearly cost of the storage facility, including operating and equipment costs, is less than the disposal costs at a radioactive landfill.

As a result of this waste storage program and the short-lived nature of medical and research wastes, almost no radioactive waste is shipped to a radioactive landfill.

Ontario Hydro Experience

Ontario Hydro operates eight nuclear reactors with a total capacity of 5,100 MW(e), with an additional eight reactors under construction.[3] The Canadian reactors, called CANDU reactors, are different than U.S. reactors which must be shut down for refueling every 12 to 18 months. The CANDU reactors are fueled while the reactor is operating. Defective fuel leaks radioactivity into the cooling water. In the CANDU reactors, this fuel can be promptly replaced. This means the CANDU generates about one-half of the "low-level" waste that U.S. reactors produce for the same electrical output.

In the Ontario Hydro system, there are four reactors at each site. A central storage area, the Waste Operations Site, located at the Bruce plant near Tiverton, Ontario, will service all 16 Ontario Hydro reactors.

At each reactor site, the resins are slurried into large (three cubic feet) carbon steel cylinders. These sit upright in shipping containers and are sent to Bruce for storage. These resins, along with water purification filters, are stored either in tile holes or Quadricells.

The tile holes are located underground; they are cylindrical, concrete storage containers, each of which holds two ion exchange resins. After loading, the containers are backfilled with concrete. A leachate collection system and monitoring system are utilized at the bottom of the tile holes. As part of Ontario Hydro's waste management plan, when the resins and filters have cooled to the point where radiation levels are less than one rem per hour, the cylindrical container and concrete backfill will be lifted in one piece and transported to an above-ground storage building (see photo page 6).

Resins are also stored in Quadricells, heavy concrete vessels, which are placed in an above-ground concrete room 8' by 8' at its base, and 18' high, similar to a cemetery mausoleum. The roof is sloped to aid water runoff. The walls and floors are 2' thick, and, with the inner concrete cylinders, sufficient to shield workers and to withstand impacts from airplane crash, or tornado-borne utility poles. Fifteen Quadricells are placed in an area about 20' wide by 272' in length. The minimum design life is 50 years.

The Ontario Hydro system for storing resins is clearly far superior to the U.S. system in which these radioactive, water soluble materials are dumped into leaky landfills.

so in use by Ontario Hydro a nground concrete es. These are for dry waste which is compacted and non-combustible and for radioactive ash that is generated by incineration of slightly contaminated materials such as clothing and papers. These concrete trenches are 10' wide, 10' deep and 125' long. The concrete lid is one foot thick; the trench walls are somewhat thicker. The trench slopes to a sump and standpipe which allows for water detection and removal.

The above-ground storage building in the Hydro system is for wastes with radiation levels s than one rem per hour. Both resins and lower-level wastes in the concrete trenches will eventually be stored here. This buiding is a prefabricated concrete warehouse with walls 1 1 / 4' thick and a concrete roof 1 / 2' thick. The building dimensions are 164' long by 98' wide by 26' high. The building has smoke detection equipment, carbon dioxide fire extinguishers and an internal drainage system.

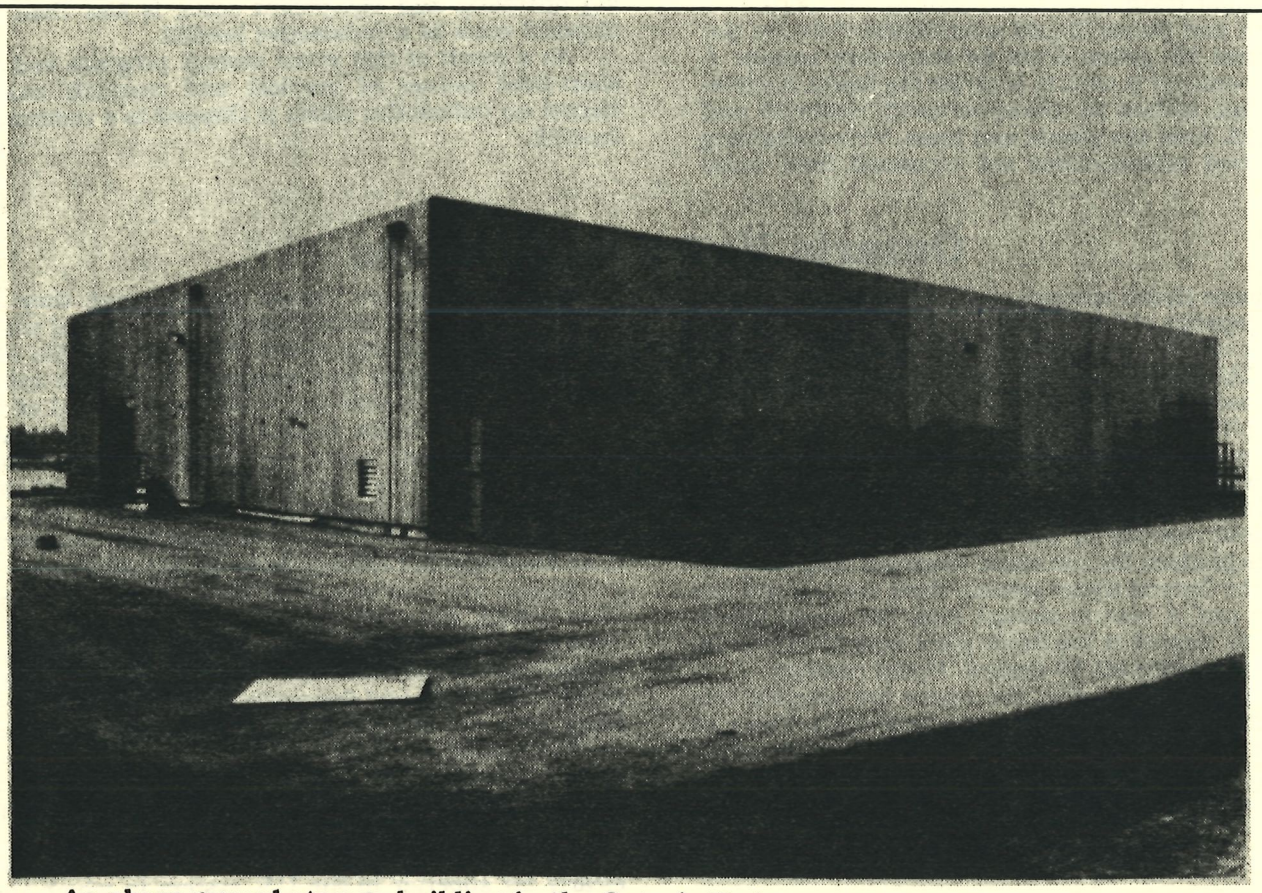
Westinghouse's SUREPAK

Westinghouse's Waste Technology Services Division has designed a container which can be used for both interim and permanent storage of low-level radioactive waste. The system has many good features as well as some poor ones. Several states throughout the country are considering the Westinghouse SUREPAK approach which means that citizens need to understand it thoroughly.

SUREPAK, an acronym for Subsurface Recoverable Packaging System, consists of a four-part plan: 1) a waste packaging building 2) a waste compactor 3) seven-foot high by seven-foot diameter hexagonal concrete containers, and 4) engineered trenches with a leakage monitoring system and elaborately designed trench caps.[6]

Wastes would be packaged in 55-gallon caustic soda drums and compacted in the packaging building using a 1000-ton press. These flattened drums would be stacked into a 55-gallon steel drum which in turn would be loaded into a SUREPAK module. Seven 55-gallon steel drums containing compacted waste can fit into one hexagonal SUREPAK concrete container.

Void spaces in the SUREPAK would be filled with grout and the lid of the modules would be grout sealed. This system, which includes burial of SUREPAKs, is proposed by Westinghouse for "low activity" wastes, which emit less than 100 roentgens per hour of radioactivity. "High activity" wastes, like control rods from inside the core of a reactor, would be buried in the trenches along with "low activity" materials, but in modules three times the standard SUREPAK length.



An above-ground storage building in the Ontario Hydro system. Both resins and lower-level wastes will eventually be stored here.

EPAK trenches are envision[illegible]s 30 feet deep, 120 feet wide and 500 feet long. Each of these giant unlined trenches would have a series of open can-like containers installed in the bottom with sampling tubes running to each. The trench bottoms will be covered with gravel and SUREPAK modules would be stacked three high. Since the modules are hexagonal, they would completely fill the trench space much like the cells in a beehive. As trenches are filled, they will be closed with an elaborately multi-layered cap. While trench caps may vary depending on the local rainfall, a typical cap will contain up to two feet of clay, six inches of sand, one foot of gravel, two feet of cobble, six inches of gravel, six inches of sand, 2'6" of native soil and finally, a vegetative cover.

Since SUREPAKs are solid and completely fill the trench, it is expected that past problems with trench cap subsidence will be less severe. However, since the trenches are unlined and the cover will be permeable, water will inevitably enter. Since concrete is permeable, water will eventually contact the waste. The concrete modules are an improvement over past burial methods in that they inhibit, but do not stop, waste migration. Above-ground SUREPAKs would avoid this water problem.

In many ways, SUREPAK system is inappro[illegible]ate for the wastes it may or may not contain. For example, much of the medical and other dry active wastes need only be stored a few months in order for them to lose their radioactivity. To use SUREPAKs and burial of these wastes is not an efficient use of space or money. The same holds true for extremely radioactive wastes, like sludges, resins, filters and radioactive components from nuclear reactors. Some of these wastes will be hazardous for thousands of years and will clearly outlive concrete modules. Although the compaction and actual concrete SUREPAK modules have merit, Westinghouse takes it a step too far by treating all wastes the same. Waste containerization and storage must fit the waste form and hazard. One method will not work for all wastes. SUREPAK containers seem appropriate for much of the extremely radioactive and long-lived "low-level" waste. These containers could be stored above-ground until they can be moved to a high-level repository, if and when one is available. In the meantime, SUREPAKs are easily monitored and retrievable.

Most of the medical and other dry active wastes from reactors should be compacted and stored in 55-gallon drums also in an above-ground structure. However, for these materials, the SUREPAK containers are not necessary. In addition, SUREPAK has not yet been approved for shipping nor licensed for use.

The Centre de La Manche

The Centre de La Manche is located at the tip of the Cherbourg Peninsula in France, 15 miles west of Cherbourg. The site covers 32 acres in which short-lived wastes are buried beneath the surface in monoliths or built up on the surface to form small hills called tumuli.[7] Treatment at La Manche is similar to that of Westinghouse. Either wastes come in already compacted or they are smashed at the site and then stacked into a concrete container which is then grouted.

Low-level wastes in France are those with half-lives of 30 years or less. This category is further divided with the higher activity wastes being disposed of in monoliths and the rest in tumuli. Monoliths begin with huge concrete vaults which are reinforced with steel rods and then filled with large concrete packages containing several grouted, compacted drums. These packages are lowered into the vaults by crane and placed in successive layers. Concrete is then poured in and the packages are completely embedded in concrete. Reinforced steel is placed on the last layer of packages. The compartment is now a monolith. Monoliths are stacked in pairs, with a six-foot void. This void is used for the disposal of wastes which require additional shielding. When the void is full, another concrete monolith is poured in between the two larger ones.

Tumuli disposal is carried out on top of the monoliths. The monoliths form a huge concrete platform that is covered with asphalt. Then, some of the large concrete packages not used in the monoliths, weighing three to five tons each are placed on the asphalt by the crane. These packages which are round and stacked to a maximum of four levels, or about 18 feet are used around the perimeter of the asphalt pad, forming the framework for a valley of 55-gallon drums, which are the lower activity wastes. When the disposal is complete, backfill is poured over the entire stack of drums and concrete packages, to fill in gaps. Then the site is covered with that infamous thick layer of "impermeable" clay. Clay is covered with topsoil and vegetation to retard erosion. Ditches are dug around the tumuli to catch runoff from the mound. When this French dump is closed, it will be monitored for 200-300 years.

Although the French have taken a much more serious approach to low-level radioactive waste disposal than the U.S., there is still the "out-of-sight, out-of-mind" policy. Fifty-five gallon drums in the tumuli will either rust or be exposed by erosion of the soil, which ever comes first. Trench covers will then subside and water will enter the trenches. For this problem, the Westinghouse hexagonal shape is preferred since it will form a tighter matrix and be less likely to subside. The French have attempted to match the facility to the hazardous life of the waste. But what will happen to long-lived "low-level" waste in France? Unfortunately, the French have no solution in sight.

Conclusions

These examples of above-ground storage show that the technology is available. Above-ground storage will be resisted by utilities because of higher initial costs and because it will require the utility to maintain long-term responsibility for the wastes, rather than thrusting it off on an unsuspecting state and its taxpayers.

Some of the questions that need to be resolved are how many above-ground storage sites should be developed? Should these be at the reactor sites? What should be the design life of these facilities? Should above-ground storage operate in tandem with an incineration facility strictly limited to reactor dry wastes? It is clear that further research needs to be done on these questions. It is also clear that utilities and state governments must break off their love affair with out-of-sight, out-of-mind shallow landfill "solutions." It is time to re-think the "low-level" waste problem.

Footnotes

[1] Department of Energy, Spent Fuel and Radioactive Waste Inventories, Projections and Characteristics, DOE / NE-0017 / 2, Washington, D.C., September, 1983.

[2] Nuclear Regulatory Commission, Environmental Impact Appraisal and Safety Evaluation Report of Low-Level Radioactive Waste Storage at Tennessee Valley Authority, Sequoyah Nuclear Plant, Docket No. 30-19101, Washington, D.C., September, 1982.

[3] Carter, T.J., "Radioactive Waste Management Practices at a Large Canadian Electric Utility," In Seminar in Management of Radioactive Waste From Nuclear Power Plants, Karsruhe, West Germany, 5-9 October, 1981, International Atomic Energy Agency, Vienna, Austria, 1982.

[4] National Academy of Sciences, BEIR Report, Washington, D.C.

[5] Schori, E., "Disposal of Low-Level Radioactive Waste," Presented at League of Women Voters Conference on Low-Level Radioactive Waste, Boston, Massachusetts, November, 1983.

[6] Westinghouse Waste Technology Services Division, "The Westinghouse Approach to Low-Level Radioactive Waste Storage and Disposal," Madison, Pennsylvania, September, 1985.

[7] Commissariat a l'energie Atomique, Agence Nationale pour la geston des dechets radioactifs, "The Centre de La Manche," Paris, 1981.

Glossary

Leachate - The soluble components from waste which leak from a landfill when rain percolates through the trenches. This polluted liquid is called leachate.

Curies — A unit which measures radioactivity equivalent to 37 billion disintegrations per second.

Half-Life — A period of time required for the disintegration of half of the atoms in a radioactive material.

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Sierra Club Radioactive Waste Campaign,
625 Broadway, 2nd Floor, New York, New York, 10012. 212-473-7390.

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Missouri-Kansas Section / American Nuclear Society
P.O. Box 8405
Kansas City, Missouri 64114

February 11, 1987

The Honorable Carl D. Holmes
State House
3rd Floor
Topeka, Kansas 66612

Dear Mr. Holmes:

I certainly appreciated the opportunity to speak to you and the members of your subcommittee Tuesday, February 10, 1987. The purpose of this letter is to summarize my remarks given yesterday to you since I was unable to provide a written copy of my remarks at that time.

I live in Olathe, Kansas and I am a member of the Missouri/Kansas Section of the American Nuclear Socity. I am past vice chairman and chairman of that organization. I am a graduate of Kansas State University receiving both an MS and Ph. D in nuclear engineering. I am a registered professional engineer in the State of Kansas.

I appose any legislation that will weaken or prohibit Kansas participation in the Central States Compact such as H.B. 2081.

The waste compact was debated, thought out, and appropriately worded. It provides for the necessary technical, and decision making steps to provide for safe disposal of low level waste in a sound manner to protect the health and safety of the citizen's of the state hosting the repository. H.B. 2108 would remove all underground disposal options from consideration and would weaken the decision making process of the Compact to determine the best disposal facility for the Central States region.

I feel the Compact members would view this legislation negatively and expel Kansas from the Compact. Kansas would then have to go it alone but still would be required to have a respository. The repository would certainly be delayed and would cost more to the State of Kansas as well as to its citizens.

I feel H.B. 2108 is not a solution to the problem and could easily tear down what has been done to date. We can not afford to make snap decisions, the waste issue must be well thought out and I believe the waste compact provides our best opportunity to provide for the safe storage of low-level waste.

House Subcommittee on Energy
2-10-87 #4

Low-level waste can be safety managed and stored. Since it consists of lower-lived radionuclides, the storage period is approximately 100 years to decay to levels considered safe, as compared to hazardous chemical wastes which if not neutralized have an infinite storage period. In the same regard, high-level wastes have longer-lived radionuclides which require storage for thousands of years.

I believe your decision to participate in the Central States Compact was the right one and we should stay with it. This will take some political courage to stay with it.

Again I appreciated the opportunity to speak to you.

Sincerely,

Larry Drbal

Larry F. Drbal

mt

cc: Clinton C. Acheson
Jeff Freeman
Leroy F. Fry
Harold W. Guldner
Keith Roe
Fred W. Rosenau
John F. Sutter
Darrel M. Webb

Testimony Concerning House Bill No. 2108

Thank you for the opportunity to be here today. My name is Craig Swartzendruber and I am testifying on behalf of Kansas Gas and Electric Company, Kansas City Power & Light Company and Kansas Electric Power Cooperative Inc, owners of Wolf Creek Generating Station.

While our main purpose is to discuss HB 2108, other House and Senate bills have been introduced which would remove Kansas from the Central Interstate Low-Level Radioactive Waste Compact and some of my remarks will also apply to those bills.

I would like to make you aware of several laws and regulations which exist to provide for the development of disposal facilities.

The proposed amendment of K.S.A. 1986 Supp. 65-3458 to include prohibiting the underground disposal of low-level radioactive waste in Kansas may be in conflict with the following laws:

Public Law 96-573, The Low-Level Radioactive Waste Policy Act, December 22, 1980.

Public Law 99-240, Title I - Low-Level Radioactive Waste Policy Amendments Act of 1985, January 15, 1986.
Title II - Omnibus Low-Level Radioactive Waste Interstate Compact Consent Act, Section 222 Central Interstate Low-Level Radioactive Waste Compact.

The federal Low-Level Radioactive Waste Policy Act, as amended (the "Act") makes each State responsible for providing for the disposal of low-level radioactive waste generated within its borders except for that generated by federal facilities. States can provide this disposal capability either individually or in cooperation with other States. The Act recognizes that low-level radioactive waste can be most safely and efficiently managed on a regional basis. To implement this policy the States have been allowed to form Interstate Compacts for establishing and operating regional disposal facilities.

Kansas, Louisiana, Nebraska, Oklahoma, and Arkansas, have entered into the Central Interstate Low-Level Radioactive Waste Compact (the "Compact"), which the U.S. Congress has by law consented to for this purpose. This Compact states that each party State shall have the right to have the waste generated within its borders managed at a regional facility within the five-State Compact Region. Along with this right, each member State assumed the obligation to be evaluated and possibly selected as Host State for such a regional facility.

One very important question raised by HB 2108 is whether its passage would put Kansas in conflict with the Compact. As we understand it, the Compact prohibits passage or enforcement of any law or regulation inconsistent with the compact. Prohibiting below ground low-level radioactive waste burial or disposal in Kansas could result in the other four States considering Kansas to have passed regulations which are inconsistant and in conflict with the Compact. Under this situation Kansas may have its membership revoked.

What are the consequences if Compact membership is revoked or Kansas withdraws from the Compact? It appears that Kansas would no longer be in compliance with the Act. As of July 1, 1986, the Act requires each State to have ratified its participation in a regional compact or, by the enactment of legislation or the certification of the Governor, to have indicated its intent to develop a site for the location of a low-level radioactive waste disposal facility within such State. The penalty for not doing so is that any low-level radioactive waste generated within the State may be denied access to the existing regional disposal facilities. Thus, passage of House Bill No. 2108 threatens Kansas generators with the inability to dispose of low-level wastes generated in Kansas at these existing facilities.

Denying access to regional facilities would create problems for Kansas hospitals, universities, and industry. Without the ability to dispose of low-level radioactive wastes, some Kansas facilities could be required to curtail or discontinue operations. If Kansas were to build its own disposal facility for use only by Kansas waste generators, the cost of waste disposal would be higher than at a regional facility. The costs associated with developing, licensing and constructing a disposal facility are nearly the same regardless of the size of the facility. Estimates range from $18 to $25 million for establishing a disposal site. Costs associated with waste burial once a site becomes operational vary greatly with volume. Operating a facility which only accepts waste from Kansas generators would add millions of dollars annually to disposal costs to the generators. Preliminary studies indicate that the cost of disposing of Wolf Creek waste in a Kansas alone facility as compared to a five State Compact site would be approximately five times greater. This would increase the cost of electricity to most users and could add tens of thousands of dollars to the bills of the larger electricity users in the affected service areas on an annual basis.

Would leaving the Compact accomplish much for Kansas? Even if Kansas withdraws from the Compact and builds its own disposal facility, the State may be unable to prevent nuclear waste generated outside of Kansas from being disposed of here. The Interstate Commerce Clause of the United State Constitution prohibits states and localitites from establishing protectionist measures that "discriminate against articles of commerce coming from outside the State unless there is some reason, apart from their origin, to treat them differently." Our attorneys inform me that there are several legal decision upholding this concept. One example is a Supreme court decision which struck down a New Jersey law discriminating against the disposal in New Jersey of solid and liquid wastes that were generated outside that state.

If Kansas leaves the Compact and builds its own disposal facility, Kansas may be limited to certain suitable locations within the State. The Nuclear Regulatory Commission has stated their position on siting suitability in NUREG-1241, Licensing of Alternative Methods of Disposal of Low-Level Radioactive Waste.

This siting criteria states that various alternative disposal methods or engineered structures and barriers can not be viewed as a planned substitute for a suitable site.

The Compact Commission Phase I Study excludes Coffey County as an area suitable for a low-level radioactive waste disposal facility based on the suitability requirements of 10 CFR 61.50. According to the NRC, these regulations would pertain to above ground as well as below ground disposal facilities. In conclusion no matter what method of disposal is considered the siting criteria are applicable .

Thus it appears that revocation or withdrawal of Compact membership will not guarantee Kansas will never have a low-level radioactive waste disposal facility within the State. In fact, it increases the probability that there will be one. As a member of the Compact, Kansas is only one of five states that may be asked to host a regional burial facility. As a non-member, Kansas must either comply with all milestones of the Act associated with developing a low-level radioactive waste disposal facility within the State or the Act will impose significant liabilities on the State.

What are these penalties? First, is would be costly. Without the unanimous consent of the other Compact states, voluntary withdrawal cannot be effective for five years after notice of withdrawal is given. Involuntary revocation of membership can be effective after one year, but the state whose Compact privileges have been revoked will continue to be liable, for up to five years, for fees the Compact would have received from generators in that state and for that state's share of the annual operating budget for the Compact.

Second, in a State that does not meet certain milestones the Act provides for such States to take title and possession of the low-level waste. Significant State liabilities could arise if Kansas is unable to provide for the safe disposal of waste by January 1, 1993. Upon the request of the generator or owner of the waste, each State without disposal capacity "shall take title to the waste, shall be obligated to take possession..., and shall be liable for all damages directly or indirectly incurred" by the generator or owner as a consequence of the failure of the State to take possession of the waste as soon after January 1, 1993 as the generator or owner notifies the State that the waste is available for shipment.

Third, if the State elects not to meet its legal obligations by taking title and possession and assuming liability in 1993, then the law also provides that the State will not receive a twenty-five percent share of the surcharges collected on waste which was disposed of between January 1, 1990 and December 31, 1992.

Finally, if a State or Compact has still failed to meet its legal obligations by providing for disposal of these wastes by January 1, 1996, then that State must take title and possession and assume all liabilities from its failure to do so as soon after January 1, 1996 as the generator or owner notifies the State that the waste is available for shipment.

House Bill No. 2108 or other bills overlooking Kansas' responsibilities under Federal and State law, which could result in Kansas leaving the Compact are not in the best interest of the State, the electric ratepayers, or the States' industries.

We urge you not to adopt the approach considered in HB 2108 but rather support the approach taken by the State over the last two years of working in cooperation with our neighboring states to address the disposal of low level radioactive waste.

The organizations I represent are eager to work with appropriate state government representatives in any way to ensure safe, and to the extent practicable, economic waste disposal. Based on our understanding of this issue the present Compact appears to us to be able to achieve these goals.

SIERRA CLUB

Kansas Chapter

February 3, 1987

To: House Energy and Natural Resources Committee
From: Shaun McGrath

re: HCR5007 establishing an advisory committee on radon

The Sierra Club is a non-profit organization concerned with the preservation and protection of the environment. Our Kansas Chapter membership is over 1500. I am here today in support of HCR5007.

The problems associated with the naturally occurring releases of radon in the environment are not well understood, but are increasingly attracting concern.

The establishment of an advisory committee to study this phenomenon and the hazards it creates, in order to inform the legislature and advise you of appropriate action, is a move the Sierra Club supports.

The Resolution does allow the Secretary of Health and Environment "to include on the committee other individuals or representatives of other organizations deemed useful in studying the issue..." The Sierra Club urges the Secretary to include a representative of a public interest group on the committee, and we support the adoption of HCR5007.

House Subcommittee on Energy 2-10-87

#6

Testimony on HCR 5007

Presented to the
House Energy and Natural Resources
(Energy Subcommittee)

February 3, 1987

Harold Spiker, Public Health Physicist
Bureau of Air Quality & Radiation Control
Division of Environment
Kansas Department of Health and Environment

Thank you, Mr. Chairman and members of the committee for the opportunity to testify on HCR 5007. As you are aware, radon has become the subject of great public concern in recent months. Radon is a colorless, odorless, radioactive gas that occurs from the natural breakdown of uranium and uranium-containing materials in the soil. Radon seeps from the soil into the indoor home environment through cracks in the basement and other openings in the home. Numerous studies suggest that radon in some homes accumulates to levels that can present potentially serious health risks to persons residing in those homes. Radon is a particular concern in modern, energy-efficient homes where air circulation is poor. The Environmental Protection Agency estimates that 5,000 to 25,000 lung cancer deaths in the United States are caused by indoor radon.

We do not have adequate data at the present time to determine whether radon is a sufficiently serious problem in Kansas. Governmental testing to date has been minimal because of a lack of resources. However, as a result of the recent publicity on radon, many homeowners in northeast Kansas are having their homes tested by private contractors. The results suggest that homes in some areas have levels which exceed four pico curies per liter -- the minimal health risk level established by EPA. KDHE is now gearing up to conduct a survey of 3,000 homes in Kansas using charcoal canister devices supplied by EPA. Although the survey will be statewide and will include testing in each county, more canisters will be distributed in the eastern one-fifth of the state, where, because of the particular geology, there is a greater poetntial for release of radon. In addition, KDHE has filed a grant application with the Kansas Corporation Commission to receive $394,000 from the Petroleum Overcharge Restitution Program (PORP). The grant would be used to purchase 5,000 additional canisters and more sophisticated radon monitoring euipment and to hire staff to conduct a more thorough survey. The grant has been approved by both the KCC and the Federal Department of Energy and will next require the Governor's and the Legislature's approval before the grant can be awarded.

KDHE endorses the passage of HCR 5007. The occurrence of indoor radon and the health risks posed by it are affected by many differrent, complex variables that are not well understood. HCR 5007 would bring together experts from different fields to study the scope and seriousness of the problem, if any, and to recommend appropriate governmental response. The one concern we do have is with the timing; HCR 5007 requires the Secretary of Health and Environment to report to the legislature, after consultation with the advisory committee, on or before March 15, 1987. This is a relatively short span of time, and it may be that not much additional data may be available by then. Outside of this concern, however, we support the passage of HCR 5007.

State of Kansas DEPARTMENT OF HEALTH AND ENVIRONMENT

Mike Hayden, Governor

Forbes Field
Topeka, KS 66620-0110
(913)-862-9360

Jack D. Walker, M.D., Secretary

NEWS RELEASE

Release Date: IMMEDIATELY
February 6, 1987

News Contact: Bob Moody
Extension 263

The Kansas Department of Health and Environment, with the U.S. Environmental Protection Agency assistance, is conducting a statewide indoor radon survey of approximately 2,700 homes to determine whether radon concentrations pose a significant health threat in Kansas.

Radon is an odorless, radioactive gas that occurs naturally in soil, rocks, and building materials. It results from the natural breakdown of uranium. In outdoor air, radon is diluted to such low concentrations that it is usually not of concern. However, once in an enclosed space, such as a home, radon can accumulate. Indoor levels depend on a building's construction and the concentration of the radon in the underlying soil.

The health effect associated with exposure to elevated levels of radon is believed to be an increased risk of developing lung cancer. Scientists estimate that 5,000 to 20,000 lung cancer deaths a year in the United States may be attributed to radon.

Individual households in each county will be randomly selected by EPA computer and contacted by KDHE, the Kansas Department of Social and Rehabilitation Services, or participating local health departments to determine if the home qualifies and the homeowners's willingness to participate in the survey.

The participating homeowner will receive a radon detector in the mail. The detector should be placed in the home and exposed for a two-day period. The

(more)

detectors are approximately the size of a tuna can and require no electricity or maintenance. The detectors contain activated charcoal which adsorbs radon when exposed. At the end of the two day exposure period, the homeowner will be asked to return the detector for analysis by EPA in a postage paid mailer. The homeowner will be asked to complete a questionnaire regarding the occupancy and structure of the home.

The results will be mailed to the homeowner. The data from all homes will be combined in statistical summaries; however, all names and addresses, as well as information provided by the homeowner, will remain confidential.

In most cases, the screening measurement is not a reliable measure of the average annual radon level to which a family is exposed. Since radon levels can vary greatly from season to season as well as room to room, the screening measurement only serves to indicate the potential for a radon problem. KDHE may recommend that the homeowners undertake follow-up measurements.

The EPA has established comparative health risks based on an individual spending 75 percent of their time in the dwelling for 70 years. Below are EPA recommended actions for various levels.

Homes with a radon level of less than four picocuries per liter(pCi/l) can pose a health risk comparable to approximately 200 chest x-rays per year. Exposures in this range are considered average or slightly above average for residential structures. Although exposures in this range do present some risk of lung cancer, reduction of levels this low may be difficult, and sometimes impossible, to achieve.

Residential radon levels of four to 20 pCi/l are considered above average for residential structures and may pose a health risk similar to smoking one pack of cigarettes per day. Action to lower levels to four pCi/l should be undertaken within a few years, sooner if levels are at the upper end of this range.

(more)

Radon levels between 20 and 200 pCi/l are considered greatly above the average for residential structures. These levels can pose a health risk comparable to smoking four packs of cigarettes a day. Action should be taken within several months to reduce the radon level as much as possible.

Levels of greater than 200 pCi/l require action as soon as possible to reduce levels. If this is not possible, temporary relocation may be appropriate until the levels can be reduced.

Information on radon and actions which can lower elevated radon levels can be obtained from: Kansas Department of Health and Environment, Air Quality and Radiation Control, Topeka, KS 66620.

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TESTIMONY BEFORE
ENERGY SUBCOMMITTEE
FEBRUARY 10, 1987
BY
JANET J. STUBBS, EXECUTIVE DIRECTOR
HOME BUILDERS ASSOCIATION OF KANSAS

CHAIRMAN HOLMES AND MEMBERS OF THE ENERGY SUBCOMMITTEE:

MY NAME IS JANET STUBBS AND I AM EXECUTIVE DIRECTOR FOR THE HOME BUILDERS ASSOCIATION OF KANSAS APPEARING IN SUPPORT OF HCR 5007.

IN DECEMBER, 1984, STANLEY WATRAS OF BOYERTOWN, PA., TRIPPED A RADIATION MONITOR AS HE WAS REPORTING TO WORK AT THE LIMERICK NUCLEAR POWER PLANT. IT WAS DETERMINED THAT HE HAD NOT BEEN CONTAMINATED AT WORK, BUT RATHER AT HIS HOME WHICH CONTAINED A READING OF 13 WL, AN EXTREMELY HIGH LEVEL OF RADON GAS.

THIS WAS THE BEGINNING OF THE DISCOVERY OF RADON GAS IN AN AREA KNOWN AS THE "READING PRONG", WHICH REACHES FROM PENNSYLVANIA THROUGH SOMERSET AND MORRIS COUNTIES IN NEW JERSEY AND ON UP INTO NEW YORK.

THROUGHOUT 1985, THE NEW JERSEY HOUSING INDUSTRY FACED PUBLIC FEARS FANNED BY INFLAMMATORY MEDIA REPORTS AND ONE LENDER WHO ANNOUNCED THERE WOULD BE NO FURTHER LOANS WITHOUT A RADON-FREE TEST RESULT. THIS RULE WAS SOON RESCINDED.

THE NEW JERSEY HOME BUILDERS ASSOCIATION WORKED WITH A STATE SENATOR WHO EVENTUALLY OBTAINED PASSAGE OF A BILL TO ALLOCATE $2 MILLION FOR TESTING AND STUDY OF THEIR LOCAL RADON PROBLEM.

IN JANUARY 1986, THE NEW JERSEY HBA'S EXECUTIVE DIRECTOR AND JOHN SPEARS, SENIOR ARCHITECT FOR THE NATIONAL ASSOCIATION OF HOME BUILDERS RESEARCH FOUNDATION, ACCOMPANIED A DELEGATION FROM NEW JERSEY TO SWEDEN TO MEET WITH SWEDISH SCIENTISTS AND OFFICIALS TO DISCUSS WHAT THAT COUNTRY HAS DONE TO ADDRESS RADON POLLUTION IN HOUSES.

THE RESEARCH FOUNDATION AND NEW JERSEY BUILDERS ARE WORKING WITH THE STATE OF NEW JERSEY TO CONSTRUCT 100 "RADON-PROOF" HOUSES IN NEW JERSEY. THE PURPOSE IS TO DEVELOP LOW-COST CONSTRUCTION METHODS TO PREVENT RADON FROM ENTERING NEW HOMES.

EPA HAS GIVEN A GRANT TO THE RESEARCH FOUNDATION TO SERVE AS A CLEARING HOUSE ON RADON INFORMATION FOR THE HOUSING INDUSTRY.

NAHB HAS ALSO BEEN WORKING WITH THE AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE), TO DETERMINE STANDARDS FOR THE MAXIMUM ALLOWABLE LEVELS OF CONTAMINATES IN INDOOR AIR, INCLUDING RADON.

NAHB'S MARTY MINTZ, DIRECTOR OF TECHNICAL SERVICES, CAUTIONS THAT THE 1986 EPA BOOK OF MITIGATION TECHNIQUES SOUNDS REASONABLE

BUT, NOT ENOUGH DATA HAS BEEN COLLECTED TO ESTABLISH WHICH WORKS BEST. ECHOING THE CONSENSUS OF THE SCIENTIFIC COMMUNITY, NAHB'S JOHN SPEARS SAYS, "THERE'S NO IMMEDIATE ANSWER. IT'S GOING TO TAKE YEARS."

I HAVE ATTACHED FOR YOUR REVIEW AN ARTICLE FROM A BUILDING INDUSTRY PUBLICATION IN SEPTEMBER 1986, WHICH QUOTES MARTY MINTZ.

IN THIS ARTICLE HE STATES THAT "POSSIBLE NEGATIVE HEALTH EFFECTS FROM EXPOSURE TO RADON HAVE BEEN BLOWN OUT OF PROPORTION TO THE ACTUAL OR POTENTIAL DANGER. WRONG OR UNSUBSTANTIATED INFORMATION ABOUT RADON AND ITS POSSIBLE DANGER IN HOUSES COULD CREATE A PANIC THIS YEAR".

DR. ROSLYN YALOW, NOBEL LAUREATE, IS QUOTED AS SAYING, THAT THE ESTIMATE OF 15,000 RADON LUNG CANCER DEATHS PER YEAR "IS CLEARLY AN EXAGGERATION".

IN AN INTERVIEW WITH THE WASHINGTON POST, DR. YALOW URGED AGENCIES SUCH AS THE EPA TO "RE-EXAMINE THE BASIS ON WHICH THEY ARE GIVING THESE NUMBERS THAT COULD END UP COSTING THE COUNTRY TENS AND HUNDREDS OF MILLIONS OF DOLLARS UNNECESSARILY, TO CLEAN UP SOMETHING THAT IS PROBABLY NOT NEARLY AS HAZARDOUS AS THEY THINK IT IS".

MARTY MINTZ IS AFRAID THE NEGATIVE PUBLICITY WILL SPUR GOVERNMENTS TO DRAW UP REGULATIONS BEFORE ALL THE DATA ARE IN. HE EXPRESSES CONCERN THAT A MAXIMUM PERMISSIBLE LEVEL OF RADON MAY BE ESTABLISHED WHICH HAS NOTHING TO DO WITH REALITY.

SINCE YOU CANNOT SEE OR SMELL RADON, SPECIAL EQUIPMENT IS NEEDED TO DETECT IT. THE TWO MOST POPULAR, COMMERCIALLY-AVAILABLE RADON DETECTORS ARE THE CHARCOAL CANISTER AND THE ALPHA TRACK DETECTOR. BOTH OF THESE DEVICES ARE EXPOSED TO THE AIR IN YOUR HOME FOR A SPECIFIED PERIOD OF TIME AND SENT TO A LABORATORY FOR ANALYSIS.

THERE ARE OTHER TECHNIQUES-REQUIRING OPERATION BY TRAINED PERSONNEL-WHICH CAN BE USED TO MEASURE RADON LEVELS, BUT SUCH TECHNIQUES MAY BE MORE EXPENSIVE.

THE PUBLIC AND THE MEDIA NEED TO BE REMINDED THAT THE RESULTS OF THE CHARCOAL TEST BEING USED BY EPA IN KANSAS, GIVES, AT BEST, A "SNAPSHOT" READING OF THE RADON LEVEL AT THAT SPECIFIC TIME, AND IS AFFECTED BY BAROMETRIC PRESSURE, VENTILATION, ETC., WHILE THE RISK FACTOR IS BASED ON A 70 YEAR EXPOSURE FACTOR.

Radon Risk Evaluation Chart

pCi/l	WL	Estimated number of lung cancer deaths due to radon exposure (out of 1000)	Comparable exposure levels	Comparable risk
200	1	440—770	1000 times average outdoor level	More than 60 times non-smoker risk
				4 pack-a-day smoker
100	0.5	270—630	100 times average indoor level	
				20,000 chest x-rays per year
40	0.2	120—380		
			100 times average outdoor level	2 pack-a-day smoker
20	0.1	60—210		
				1 pack-a-day smoker
10	0.05	30—120	10 times average indoor level	
				5 times non-smoker risk
4	0.02	13—50		
			10 times average outdoor level	200 chest x-rays per year
2	0.01	7—30		
				Non-smoker risk of dying from lung cancer
1	0.005	3—13	Average indoor level	
				20 chest x-rays per year
0.2	0.001	1—3	Average outdoor level	

THE AUGUST 1986 EPA JOURNAL ARTICLE ON RADON STATES THEIR RESPONSIBILITY IS TO DETERMINE HOW LARGE THE THREAT OF RADON IS TO THE PUBLIC, HOW THAT THREAT CAN BE LESSENED AND PROVIDE THE INFORMATION TO THE PUBLIC WHO CAN ACT ON THEIR OWN BEHALF.

HBAK SUPPORTS ESTABLISHMENT OF AN ADVISORY COMMITTEE ON RADON TO DETERMINE THE APPROPRIATE STEPS TO BE TAKEN BY KANSAS TO ASCERTAIN THE DEGREE OF PROBLEM IN THIS STATE AND UTILIZE THE EXPERTISE AVAILABLE TO DEVELOP A RATIONAL COURSE OF ACTION.

LAST NOVEMBER THE TOPEKA PAPER PUBLISHED AN ARTICLE REPORTING RADON LEVELS IN HOUSES BELONGING TO EMPLOYEES. RESULTS OF OTHER PRIVATE STUDIES ARE SURE TO BE PUBLISHED IN THE NEXT FEW MONTHS BECAUSE THERE ARE THOSE WHO WANT TO CAPITALIZE ON THIS SUBJECT FOR PERSONAL GAIN OR RECOGNITION.

COSTS AND METHODS OF REMEDIAL WORK VARIES DEPENDING ON THE CONSTRUCTION OF THE HOUSE AND THE LEVEL OF RADON EXISITING VS. THE DESIRED LEVEL.

FOR EXAMPLE, EPA HAS LOOKED AT MANY REDUCTION TECHNIQUES THAT REDUCE RADON BY ABOUT 90%, BUT IT IS DIFFICULT TO PREDICT EXACT COSTS UNTIL THE CONSTRUCTION OF THE HOUSE IS DETERMINED. IT'S ALSO DIFFICULT TO BE SURE THAT CONTROL MEASURES WORK ALL THE TIME. TAKE, FOR EXAMPLE, EPA'S BILL BELANGER'S OCTOBER 1985 VISIT TO BOYERTOWN, PA., WITH A U.S. SENATOR WHO WAS INSPECTING ONE OF THE HOMES IN EPA'S REMEDIATION RESEARCH PROGRAM. IT TURNED OUT TO BE A CLASSIC EXAMPLE OF MURPHY'S LAW THAT ANYTHING THAT CAN GO WRONG, WILL.

BELANGER RECALLS THAT, AFTER EXPLAINING TO THE SENATOR SOME OF THE THINGS THAT HAD BEEN DONE TO THE HOUSE, HE WAS ASKED TO TAKE A RADON MEASUREMENT.

"THIS HOME ORIGINALLY HAD A CONCENTRATION OF 7 WL," SAYS BELANGER, "AND MY OWN MEASUREMENTS TAKEN SOON AFTER THE HOUSE WAS FIXED SHOWED ONLY A LITTLE ABOVE 0.02 WL. BUT THIS DAY, I GOT A MEASUREMENT OF 3 WL!"

"ALL OF US THERE-THE SENATOR, THE HOMEOWNER, AND I - REALIZED SOMETHING WAS VERY WRONG," BELANGER CONTINUES. "SINCE THE HIGHEST READING WAS PREVIOUSLY IN THE BASEMENT, I WENT DOWN THERE TO TAKE A READING. IT WAS 15; MORE THAN TWICE AS HIGH AS THE HOUSE HAD BEEN BEFORE WE DID ANYTHING TO IT."

"AT THIS POINT, THE HOMEOWNER WAS AT THE POINT OF TEARS," SAYS BELANGER.

AFTER THE SENATOR LEFT, BELANGER SPENT SOME TIME LOOKING AROUND THE HOUSE AND FOUND A BEDROOM WINDOW OPEN ON THE DOWNWIND SIDE OF THE HOUSE. NO OTHER WINDOWS WERE OPEN, YET AIR WAS RUSHING OUT OF THAT WINDOW.

"I FIGURED THAT, SINCE THE REST OF THE HOUSE WAS SEALED, THE AIR GOING OUT MUST BE COMING THROUGH THE FOUNDATION, BRINGING RADON WITH IT." BELANGER CLOSED THE WINDOW, WENT DOWN TO THE BASEMENT, AND OPENED UP ONE OF THE BASEMENT WINDOWS ON THE UPWIND SIDE, ALLOWING FRESH AIR TO ENTER THE HOUSE. WITHIN AN HOUR, THE LEVEL OF RADON HAD BEEN REDUCED BY A FACTOR OF TWO.

THAT AFTERNOON STATE OFFICIALS TOOK MORE MEASUREMENTS, AND THE LEVEL HAD DROPPED TO UNDER 0.1 WL. THEY RETURNED THE NEXT DAY AND TOOK READINGS UNDER .01 WL - WELL WITHIN THE STATE AND PROPOSED FEDERAL GUIDELINES.

ENERGY EFFICIENT HOMES HAVE BEEN ACCUSED OF BEING MORE PRONE TO HAVE A HIGHER RADON LEVEL THAN OLDER HOMES. THIS IS NOT NECESSARILY TRUE. MOST SUPER INSULATED HOMES BEING BUILT TODAY HAVE AIR EXCHANGERS INSTALLED TO ELIMINATE CONCERNS OF INDOOR AIR POLLUTANTS. THIS SHOULD BE A BENEFIT WITH REGARD TO RADON AS WELL. AS ALREADY EXPLAINED, SO MANY FACTORS ENTER INTO THE RADON LEVEL.

AGAIN, WE SUPPORT ESTABLISHING AN ADVISORY COMMITTEE FOR THE REASONS ALREADY STATED.

WASHINGTON

Radon Testing Is A Government Priority

By David Heinly
Professional Builder
Washington Bureau

The nation's latest and perhaps scariest "scare"—radon—looms as another double-edged sword for home builders. Like the energy crisis of a decade ago, the radon issue poses both a serious problem for builders and, at the same time, perhaps a unique if less than glamorous new marketing tool.

The first guy to come up with a "radon safe" house is likely to have to beat buyers off with a stick. On the other hand, he better be sure his claim is accurate.

Radon, as everyone must surely know by now, is a colorless, odorless, tasteless gas. It is a byproduct of the decay of radium, and, as such, may be found anywhere and everywhere in the environment. In the backyard or patio, it is no problem, since it is quickly diluted and dissipated in the open air.

In the family room, it can be a killer.

Radon is a carcinogen. It causes lung cancer and is at least as bad as moderate cigarette smoking. Recent studies by the Environmental Protection Agency suggest radon may be responsible for between 5000 and 20,000 of the 130,000 lung cancer deaths each year in the United States alone.

While the prime source is the soil, radon, because it is a gas, can be absorbed and released by anything in contact with the soil—or anything made from the soil such as bricks, cement, paving blocks and so forth.

EPA has found alarming levels present in drinking water, presumably absorbed from contaminated reservoir beds, wells and perhaps conduits. While concentrations vary geographically, radon can and has been found virtually everywhere in the country.

Radon has always been present in the environment. But it is only in the last few years that its life-threatening properties have been recognized.

In December 1983, the Interagency Committee on Indoor Air Quality was set up, including among the 15 agencies represented EPA, HUD, OSHA, the Department of Energy and the Consumer Product Safety Commission.

At that time, radon held no higher priority on the committee's agenda than did formaldehyde, fireplaces, cigarettes or aerosol sprays. In just the last few months, however, with the publication by EPA of the results of several tests and other research, radon has moved to the head of the list.

Radon is the nation's latest and perhaps scariest 'scare.' But at the same time, astute builders are alert to a different kind of hazard: tort liability.

The housing industry has been quick to respond, of course, prodded by EPA's warning that the threat of radon contamination is greatest in homes built on or near contaminated soil. The agency has published simultaneously guidelines on remedial measures to minimize indoor air pollution, chiefly in venting foundations and basements and in sealing porous foundation materials.

The National Association of Home Builders, in cooperation with a number of local builder associations, has already begun experimenting with various techniques to minimize exposure and to provide improved ventilating systems that will retain as much energy efficiency as possible. It is a paradox that hardly needs mention that one of industry's earliest responses to the energy crisis was to limit outside air infiltration in buildings and homes. Those "sealed" rooms and building have now suddenly become potential death traps.

At the same time, astute builders are alert to a different kind of hazard: tort liability. Perhaps because that is already a "raw nerve," several associations are warning members to rewrite sales contracts with an escape clause absolving the builder from responsibility for "environmental or ecological conditions."

Builders also are being urged to try to head off hasty efforts by local governments to impose costly new code requirements before the best (most effective) and least costly protective measures can be documented.

Toward that end, EPA is about to launch a three-year, $15 million research effort to define more accurately the radon hazard as well as to develop improved detection and mitigation techniques. In response to appeals from, among others, the Consumer Federation of America, EPA is also publishing a list of laboratories and businesses offering "approved" radon testing services.

So far there have been few regulatory mandates at the federal level bearing on radon. EPA has set standards for water emissions under the Safe Drinking Water Act. But the agency's other applicable mandate, the Clean Air Act, so far covers only outdoor air pollution. □

A Home Builder's View of Radon

·id C. Smith

The question builders most frequently ask about radon is, "How do I know if I have a problem?" Builders would prefer to deal with radon at the preconstruction stage, because preventive measures tend to be less expensive and easier to incorporate than techniques for reducing radon levels in a completed home.

Unfortunately, trying to assess the likelihood of a radon problem for an unimproved piece of land is extremely difficult. Using existing testing procedures results in a tremendous variability of measurement. Even digging to test the soil can create a radon problem that might otherwise not have existed. Land in different sections of the same development may have different radon measurements. There have been instances of homes with serious radon contamination next door to homes with no problem at all.

The best available tests for determining radon levels within existing homes require long-term assessments—usually over six months to a year. Concentrations may vary depending upon the season. A single short-term test could yield different results in February, when windows are likely to be tightly shut, than in April. However, you may be able to obtain meaningful results if you conduct a few short-term tests at different times of the year under carefully ntrolled conditions. The Environntal Protection Agency currently ...ows of only one company offering the general public long-term radon detectors with the necessary processing devices—the Terradex Corporation, 410 N. Wiget Lane, Walnut Creek, Calif., 91598. The cost is roughly $50. Consumers should be wary of using the services of anyone who offers to give a house a "fast and simple" radon check.

Radon is an inert radioactive gas that is a by-product of the breakdown of uranium. As radon breaks down, it produces radioactive decay products, commonly called radon "daughters," which become attached to dust particles and other surfaces. There is currently no economical, accurate and practical method of measuring these radioactive decay products.

The NAHB Research Foundation has taken a leading role in helping builders to address radon issues. Before radon became a widely-publicized concern, the Research Foundation had worked with utility companies and the U.S. Department of Energy on indoor air quality issues, such as the effect of air infiltration on indoor air quality.

In 1985, the NAHB leadership asked the Research Foundation to write a general paper about indoor air quality. Because of the importance of some of the issues in the paper, the Research Foundation organized a meeting in December between NAHB's elected officers and officials from EPA and DOE. Although the meeting was intended to deal with all aspects of indoor air quality, the major topic of discussion that emerged was radon.

In January 1986, the Research Foundation began to work with EPA to coordinate its activities with builders. A meeting was arranged for representatives from New York, New Jersey and Pennsylvania (which have all experienced serious problems with radon). The meeting was attended by state and local government officials, builders, Realtors, members of the Chamber of Commerce and officials from EPA. The agency discussed some of its radon-related activities with the attendees, who in turn briefed EPA on what private industry is doing.

Sweden has also had to address problems with radon pollution in houses. John Spears of the Research Foundation accompanied a delegation from New Jersey to Sweden to discuss some of these issues. The group consisted of Sen. Frank Lautenberg (D-N.J.) and staff, State Senator John Dorsey and staff, and representatives from builders associations and boards of Realtors. Richard Guimond, director of EPA's Radon Action Program, was also a member of the delegation. The group was briefed by top Swedish officials and scientists about radon issues, including techniques for reduction and prevention, health effects and government policy. The group also met with representatives of Sweden's real estate industry to discuss the impact of radon on real estate values in Sweden.

The Research Foundation hopes to monitor the construction this summer of 100 radon-proof houses in New Jersey. The project could involve $140,000 in funding from the state, with builders from New Jersey contributing labor and materials, and the state and local home builders associations contributing staff time and in-kind services to help monitor the results. The purpose of the project is to develop low-cost construction methods to prevent radon from entering new homes. Similar projects have been proposed in New York and Pennsylvania.

EPA has given a grant to the Research Foundation to serve as a clearinghouse on radon information for the housing industry, including builders, Realtors and manufacturers. EPA provides regular updates to the Research Foundation regarding developments in radon research and, in turn, is apprised of developments from the housing industry. For further information, contact John Spears, Radon Information Clearinghouse for the Housing Industry, at (301) 762-4200.

NAHB has also been working with the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) to determine standards for the maximum allowable levels of contaminants in indoor air, including radon. The ASHRAE standards are incorporated into many building codes, thereby becoming the standards to which contractors must build their homes. Martin Mintz, as NAHB's director of technical services and a member of an ASHRAE subcommittee, is providing builder input to ensure that the standards are reasonable and workable.

Many prevention and reduction techniques have been attempted, but not enough data has been collected to establish which works best. We will be in a better position to deal with the radon issue as soon as some of the basic research and analysis is complete. In the meantime, NAHB will continue to work with EPA and other government and industry groups to find solutions to radon problems.

David C. Smith is president of NAHB.

Health Effects Of Radon Are Overblown, Official Says

Stories that link radon to cancer may spur governments to impose restrictive building codes.

By Dan McLeister, Senior Editor

The director of technical services for the National Association of Home Builders said possible negative health effects from exposure to radon have been blown out of proportion to the actual or potential danger.

Wrong or unsubstantiated information about radon and its possible danger in houses could create a panic this year, said NAHB's Marty Mintz in an interview with *Professional Builder.*

"My biggest fear at this point is that you are going to see reactions. People will be afraid to purchase homes or build homes in areas that may or may not have a radon problem to some degree or another. I think that is the biggest single danger," Mintz said.

(*Professional Builder* first described the radon problem in February 1986, pages 72 and 74.)

But others think radon is a problem. In testimony to Congress, University of Pittsburgh professor Bernard L. Cohen said that "there is unanimous agreement in the scientific community that the cancer risk from radon far exceeds that from all of the other widely publicized radiation threats in our society combined," reported the Washington Post. He said he continued to believe that, but noted that the evidence is indirect so far.

Mintz, however, agrees with a Nobel laureate who downplays the ill effects of radon. Dr. Roslyn Yalow said that estimates attributing an average of 15,000 lung cancers a year to radon "is clearly an exaggeration."

She urged agencies such as the Environmental Protection Agency, the Center for Disease Control and the National Council on Radiation Protection to "re-examine the basis on which they are giving these numbers that could end up costing the country tens and hundreds of millions of dollars unnecessarily, to clean up something that is probably not nearly as hazardous as they think it is," she said in an interview in the Washington Post.

Cohen is now measuring radon levels and comparing them to lung cancer rates in Pennsylvania counties with the highest radon emissions. He estimated that it would be two years before any conclusions could be drawn.

Mintz is afraid the negative publicity will spur governments to draw up regulations before all the data are in.

"You are going to see regulators jumping the gun. They will establish maximum permissible levels of radon that probably have nothing to do with reality at all," Mintz said.

He named some states that already have laws on the books or are studying the situation: New Jersey, Florida, Pennsylvania, New York, Connecticut, Rhode Island, Maine, North Carolina, South Carolina, West Virginia, Ohio, Illinois, Indiana and Alabama.

"One of the big problems with radon is that there are more things we don't know than we do know at this point," Mintz said.

When it comes to new-home construction, the problem is the inability to measure concentrations of radon before the houses are built, he said. "There is no reliable method at this time for open-site testing of radon. Even if you could tell how much radon is going to come out of that site, the act of building a home on that site changes the amount," he said.

A house actually pumps radon because the house has a slight negative pressure in it, causing it to suck radon from the ground. As the house does that, it changes the amount of radon that comes up through the ground, Mintz explained. (All soil contains radon. It is a natural product. Soil has always emitted radon, Mintz said.)

With existing houses, the situation is also uncertain. The Environmental Protection Agency has come up with what Mintz called a whole textbook full of "mitigation" techniques to prevent radon from entering a house. "The problem is that not one of them has ever been tested to see if they work. They sound reasonable," Mintz said. But the mitigation techniques have only been assembled by EPA in 1986.

Officials still don't know what the average levels of radon are in

Continued on page 96

"People will be afraid to purchase homes or build homes in areas that may or may not have a radon problem to some degree or another. I think that is the biggest single danger," Mintz said.

The 16 Items Builders Consider Important For Success

What do small builders think about and what do they consider important?

Specifically, 16 items are considered very important: estimating a job, scheduling a job, directing and controlling a job, selection of subcontractors, quality of workmanship, dealing with personnel, written contracts, use of professional services, importance of customer service, understanding finance, use of a general ledger and journal, maintaining current financial records, double-entry accounting system, estimating cash flow, dealing with lender and maintaining separation of business expenses from personal living expenses. Twelve of those skills were used on a daily basis.

That's what H. Stephan Egger found out when he surveyed 60 Texas builders as part of his doctoral research while a student at Texas A & M University. Egger now is in the Dept. of Industrial Technology at the University of Northern Iowa.

Egger studied contractors with one to four employees. The main object of the study was to identify business techniques and skills utilized by this group of contractors as well as the relative importance of the items and their frequency of use.

According to the data collected, the average number of homes built in 1984 per contractor surveyed was 10.2 and the average number of years in business was 12.5.

In regard to the 26 items on the questionnaire, contractors had the opportunity to eliminate or add items and then to rate the relative importance of the items from very important to irrelevant and to rate the frequency of use from daily to never.

All of the respondents found the use of customer services to be important to very important, with 58.1 percent indicating very important. Of the sample, 87.5 percent reported its use on a daily, weekly, or monthly basis.

Directing and controlling a job was rated very important by 83.3 percent In regard to frequency of use, 92.9 percent reported that it was utilized on a daily basis.

And 88.1 percent of the respondents found projecting future needs on past performance to be important to very important. The majority of the respondents, 69.1 percent, said that they used it on a monthly or semi-annual basis.

Ninety-three percent of the respondents found determining market need to be important to very important. Almost 81 percent of the respondents reported utilization on a daily, weekly, or monthly basis, with 35.7 percent for monthly and 26.2 percent for weekly. □

NAHB official urges deliberation in dealing with radon

Continued from page 94

homes across the country. EPA is now in the process of trying to determine those levels. A national survey will take a year, Mintz said, and data collection and analysis will take another year.

In the meantime, EPA will provide technical assistance to those states that request it. The federal agency will be developing measurement techniques to help states with quality assurance programs. "EPA is going to develop a series of tests to test the testers to see if they know what they are talking about," Mintz said.

While better statistical data is being gathered, a Radon Information Council has been set up by various construction industry groups. The head of the organization is John Heslip, executive vice president of the National Concrete Masonry Association in Reston, Va. Its basic purpose is to make sure the radon story gets balanced coverage in the media. □

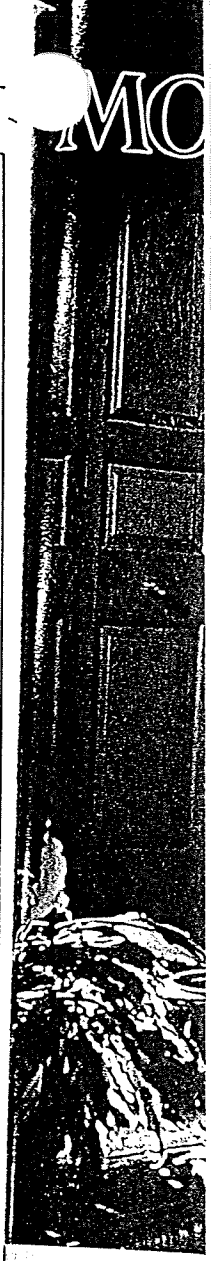
Construction Tips For Dealing With Radon

The NAHB Research Foundation is working with the EPA on the development and testing of mitigation techniques to reduce radon levels.

Some of the techniques EPA has suggested might mitigate radon build-up but they can introduce other problems into a house, Mintz said. For example, EPA suggests introducing pressure within the block cell wall to suck up the radon. The side effect, though, is that negative pressure on the wall is going to suck water into the wall and create water problems.

Currently there are several methods of dealing with elevated radon levels in homes. First there is prevention of the entry of radon gas by sealing cracks around utility openings by caulking and sealants, sealing tops of concrete block with concrete and covering exposed earth with vapor barriers or concrete slabs. Secondly, there is the removal of radon gas by ventilating crawl spaces and under floor areas, by increasing the ventilation rate of the home and dust removal by filtration.

One new-home builder is taking precautionary steps where radon might pose future problems. A Pennsylvania builder brings up a couple pipes from gravel beneath the concrete basement slab and caps them. Then, if the homeowner later finds radon levels are too high, he can attach fans to the pipes at a minimal cost compared to digging up the slab and putting in pipes, according to Mike Ondra, president of ConSolarNation (PB, February 1986). □



NEWS

ENERGY

BUILDERS CAN REDUCE THE RADON HAZARD

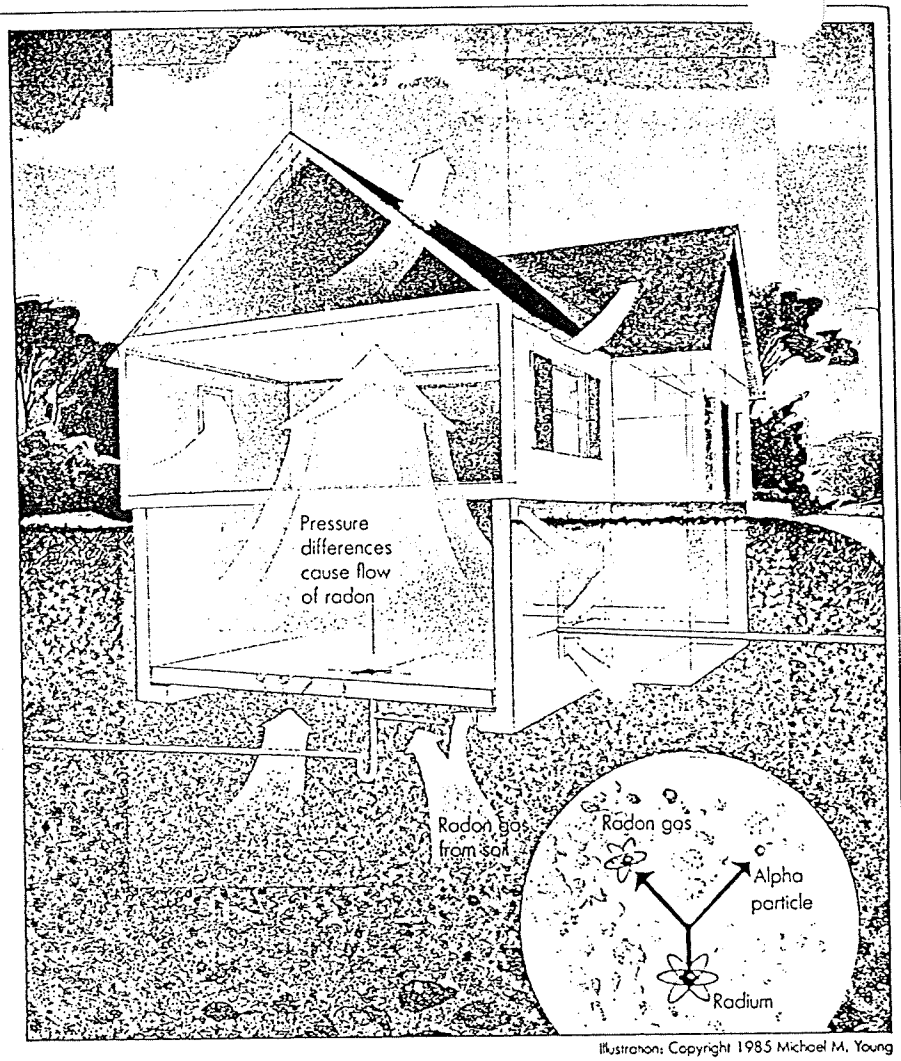


Illustration: Copyright 1985 Michael M. Young

In December 1984, Stanley Watras tripped the radiation alarm on his way into the nuclear power plant where he worked.

Somewhere, he had picked up many times more radioactivity than he had ever picked up on the job. That somewhere turned out to be his home.

Being exposed to that much radiation for a year meant the odds were nearly one in three of Watras eventually getting lung cancer, according to Richard Guimond of the Environmental Protection Agency (EPA). The culprit was radon, a radioactive gas that bubbles up from the ground.

Watras lives on the Reading Prong, a uranium deposit that runs from Pennsylvania through New Jersey into New York State. Levels of radioactivity in houses there are commonly so high that buyers have houses tested for radioactivity before buying.

According to the Lawrence Berkeley Laboratory, lower but still dangerous levels of radon exist in as many as 1.5 million homes around the country.

Nonetheless, "this isn't a panic situation; it's something we can deal with relatively easily," says John Spears of the NAHB Research Foundation. "Radon has always been found in the home."

Although no U.S. standards have been set, researchers agree that household levels should not exceed 0.02 "working levels." However, even at this concentration, there is no need to run as if from the plague. In Sweden, which has been dealing with radon longer than the U.S., standards allow two years to fix a home if radon concentrations are 12 times this level, according to Spears.

Those who study radon in homes emphasize that the problem is so new that little is known about how radon gets to homes and how it can be kept out. Nonetheless, a pattern is becoming clear, and it suggests ways builders can reduce the hazard.

Radon seems to get sucked into houses by the chimney effect. Particularly in cold weather, the warm air inside a house rises, escaping through cracks in the structure, lowering pressure at the floor.

The low pressure draws radon-containing air inside from the ground. Exhaust fans, fireplaces and combustion appliances all add to the draw. Wind blowing over a house creates negative pressure on the leeward side, pulling still more air through the house.

This mechanism would account for tightly built energy-efficient houses having no more of a radon problem than energy sieves. Radon escapes slowly from tight houses, but it infiltrates equally slowly.

How do you find out if the site has a problem? Bedrock or soil rich in uranium or radium, and loose soil often are trouble spots, but dangerous indoor levels of radon have been found in regions that lack these signs.

"Call your state health department to find out if any testing has been done, and whether there should be concern for your area," says Spears. So far, there's no way to test a site that has not been built on, he adds.

Unfortunately, if there is a problem, there's no simple solution. "We are working on a limited basis with a few builders to get a sense of what works," says Spears. "There's no immediate answer. It's going to take years," he adds, echoing the consensus of the scientific community.

But a builder from the Reading Prong area who is working with Spears has had considerable success building and retrofitting houses for radon resistance. Bill Broadhead, Bethlehem, Pa., who builds airtight superinsulated and solar houses, began testing them for indoor pollutants, including radon, three years ago, long before Stanley Watras's experience.

Broadhead had read about the problem in technical journals aimed at builders of superinsulated houses. Broadhead says his retrofits have reduced radon levels by 85 percent to 99 percent, in most cases achieving levels considered safe.

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Broadhead's advice:

- Use poured foundations instead of block. It's easier for radon to go through block if it isn't properly sealed. Use poured walls too. (The National Concrete Masonry Association says if block and poured concrete are properly waterproofed, they provide the same level of protection against radon.)
- Install a minimum of four inches of gravel underneath the slab and a French drain around the perimeter of the foundation, embedded in the gravel. Connect a T-pipe into the French drain, and run the stem through the basement floor and cap it. If the house turns out to have a radon problem, the pipe can be extended through the wall, with a fan to vent any radon coming up through the gravel.
- Caulk the joint between the foundation and the slab.
- Seal any plumbing and sub-slab plumbing before the fixtures are installed.
- Install an air-to-air heat exchanger if the house is tightly built.
- Install a continuous vapor barrier in the attic. This reduces the stack effect.

For retrofits, Broadhead seals gross leakage points in the basement. If a good gravel base underlies the house, he runs a pipe through the basement floor into the gravel and out the side of the house, to vent the gravel.

If levels aren't reduced sufficiently, or if there is no gravel beneath the slab, Broadhead installs a heat exchanger. Costs of the measures vary from less than $2,000 to more than $10,000.

Builders soon will get some additional guidance from the EPA. The agency is about to release a 50-page book tentatively titled *Radon Reduction Approaches for Your Home: Interim Guidance.*

The methods described in the book overlap with Broadhead's but start with such simple measures as opening basement windows. The book is expected to be available by summer.

David Holzman, a Washington, D.C.-based writer specializing in technological and environmental issues.

MARKETING

MANSION BECOMES THE FOCAL POINT

Don't have a historic home to use as the showcase of your new country club community? Then create one.

That's what joint venture partners La Bonte Diversified Development, Inc. and Weslake Corporation did for White Cliffs, an $80-million golf course community in Cedarville, Mass.

The developers asked Campbell/Smith Design Associates of Duxbury, Mass., to design a 5,000-square-foot reproduction of a Federal hipped roof colonial. Weathered clapboards and additions give the four-bedroom, four-bath house the appearance of having evolved over many years.

To complete the old-house illusion, the late British designer Laura Ashley was called in to provide her trademark English country-house decor. It was the only new American house the designer ever decorated.

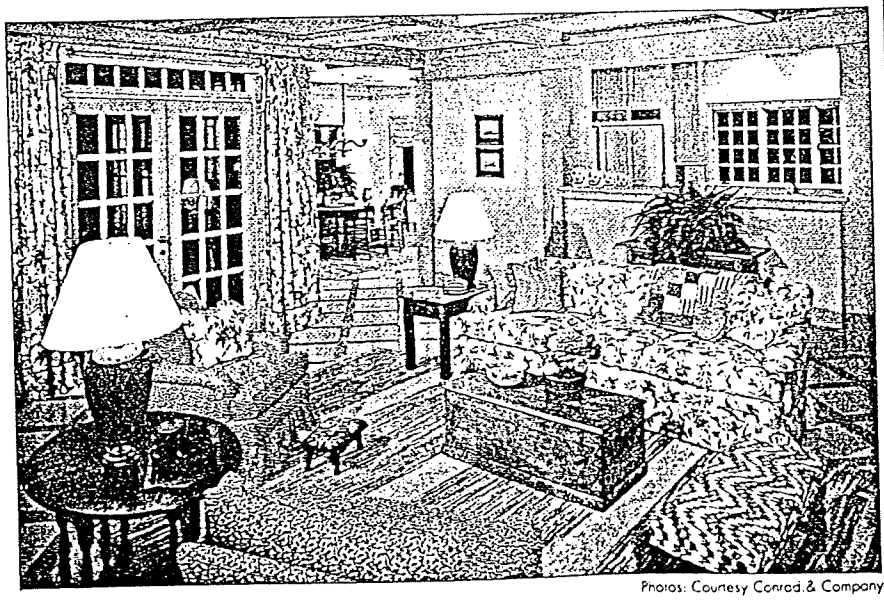
On the market for $1.2 million, including about $400,000 in furnishings, the mansion was open weekends from December through February as a decorator's showplace. The developers donated the proceeds of the $5 admission tickets to Boston's Wang Center for the Performing Arts.

Formal architecture and period furnishings by Laura Ashley give this Federal-style reproduction an authentic feel.

According to Linda Glynn, the project's publicist, the mansion tours have attracted about 500 people each weekend to the surrounding 135-acre community on Cape Cod Bay. Phase one of the project, which eventually will include 395 townhouses, cluster houses and single-family houses, has sold out. Units range in size from 1,100 to 5,000 square feet and in price from $127,000 to $600,000.

"The mansion tours have been a great traffic booster, especially for a traditionally slow time of year," says Glynn. "The house gives the community a focal point, and I think it's the main reason that phase one has done so well."

June Fletcher



Photos: Courtesy Conrad & Company