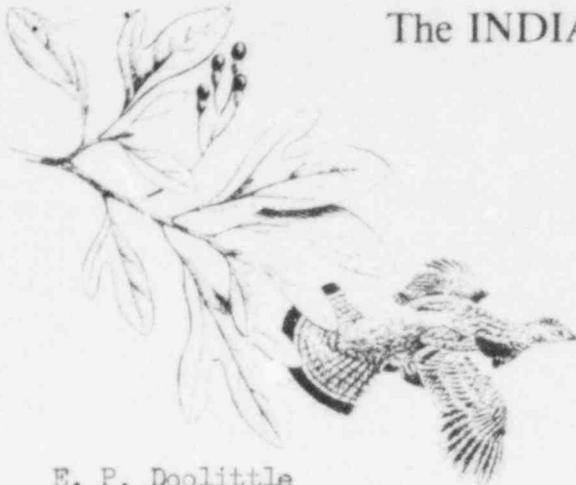


# The INDIANA SASSAFRAS AUDUBON SOCIETY

of Lawrence - Greene - Monroe -  
Brown - Morgan & Owen Counties

December 18, 1982



50-546

E. P. Doolittle  
Project Manager, Marble Hill  
NRC Division of Licensing  
Washington, D.C. 20555

Dear Ms. Doolittle:

Public Service Indiana's (PSI) report to the NRC Caseload Forecast Panel, December 1, 1982, on the progress of the Marble Hill Nuclear Project, indicated an efficient organization of the construction process and a quality control-quality assurance program which would reduce the necessity for rework of construction to a minimum. The PSI staff was proud of meeting a number of construction milestones ahead of schedule, giving them confidence that they can meet the demanding construction schedule that they have established of completing Unit 1 by December 1, 1986 and Unit 2 by June 30, 1988. The fact that Marble Hill is a replicate (design) of the Byron Nuclear Plant near Rockford, Illinois, further advanced in the construction process so that PSI can profit from the Byron experience, was cited frequently as an expediting factor.

This is all well and good, but we remain skeptical regarding PSI's construction schedule and projected cost of the project because of the delay that has occurred historically in the licensing of nuclear plants from a variety of causes, and because of PSI's consistent underestimation of the cost of Marble Hill. Our concerns also extend beyond the construction of Marble Hill to the reliability of its operation and the capital and other costs associated with its maintenance and decommissioning, which will be borne by ratepayers (enclosure, COMMENTS ON HEARING HELD BY PUBLIC SERVICE COMMISSION OF INDIANA FROM OCTOBER 14-26, 1982 ON ECONOMICS OF COMPLETING MARBLE HILL).

Considerable apprehension exists regarding the performance of the Westinghouse D-4 and D-5 steam generator models to be installed in Marble Hill (page 5 of enclosure entitled "COMMENTS" and letter to Larry J. Wallace, Chairman, Indiana Public Service Commission, September 1, 1982), and the efficacy of the "technological fix(es)" to be designed and implemented by Westinghouse, particularly as the NRC staff does not regard "technological fix(es)" as an effective solution of steam generator problems (Steam Generator Status Report, February 1982, U.S. Nuclear Regulatory Commission).

To what extent could steam generator problems, testing, regulatory requirements regarding inspection, etc., impact the coming on line of Marble Hill to sustained, full-power operation? Impact the reliability of operation and projected life of the plant?

3001  
Add: NRR/Norris, J.  
NRR/OE/EEB

We would appreciate a copy of the Caseload Forecast Panel's Report of their visit to Marble Hill on December 1, 1982, with their appraisal of PSI's construction schedule with regard to current and potential regulatory requirements, particularly those applying to unresolved safety issues.

Yours sincerely,

*Mrs. David G. Frey*

Mrs. David G. Frey  
Energy Policy Committee, SAS  
2625 S. Smith Road  
Bloomington, Indiana 47401

cc: L. Parvin Price  
L. Wallace

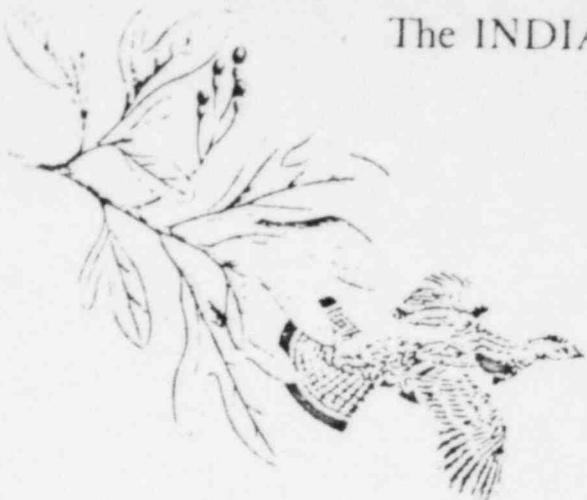
# The INDIANA SASSAFRAS AUDUBON SOCIETY

of Lawrence - Greene - Monroe -  
Brown - Morgan & Owen Counties

September 1, 1982

TO THE PUBLIC SERVICE COMMISSION OF INDIANA  
Larry J. Wallace, Chairman

FROM THE INDIANA SASSAFRAS AUDUBON SOCIETY



The Indiana Sassafras Audubon Society requests that the Public Service Commission of Indiana stay the installation of the Westinghouse steam generators on site at Marble Hill until an assessment has been made of the reliability of their performance under operating conditions. We ask, also, that the assessment be made part of the record of the October 14, 1982 Hearing on Marble Hill and be a factor in the decision as to whether construction of Marble Hill Units 1 and 2 should be terminated.

Installation of the Westinghouse steam generators could constitute consumer fraud for similar models have proven defective in operation.

Sassafras Audubon noted in its request of March 15, 1982 to the Public Service Commission of Indiana for a public hearing on Marble Hill, that steam generator degradation had reached epidemic proportions in operating nuclear reactors. At least 40 of the 47 operating pressurized water reactors (PWR's) have steam generator problems (enclosure 1) which have resulted in costly outages, repairs, and in some instances, complete replacement of generators. More replacements will have to be made if plants are to continue in operation.

The Nuclear Regulatory Commission (NRC) has acknowledged that the majority of plants under review for operating licenses have steam generators of similar design to those currently in operation. These plants are therefore expected to develop the same generator problems that have plagued operating reactors for more than a decade. This is applicable to Marble Hill.

The Westinghouse Steam Generator Models D-2 to D-5 and E which were expected to be better than earlier models, have been found to have, in addition, a vibration problem believed to be caused by turbulence in the pre-heater section of the generator. Marble Hill Unit 1 is scheduled to have Westinghouse model D-4 and Unit 2, D-5.

This vibration phenomenon known as "fretting" or "shake 'n break" has occurred in the first four nuclear plants to come on line equipped with these models. Sweden's most recent Westinghouse reactor, Ringhals 4, had to shut down on October 21, 1981, less than a year after beginning operation, because of a 2.3 gallon/minute leak from steam generator tubes. It resumed operation some months later at 40% capacity.

A month after the Swedish reactor shut down, the Almaraz reactor in Spain experienced the same difficulty. Brazil has reportedly stopped further payment to Westinghouse for construction of the country's first nuclear power plant because of faulty steam generator systems (enclosure 2). It was also learned recently that Yugoslavia's new Krsko reactor, which has Westinghouse D-4 generators, the same as Marble Hill 1, had experienced vibration problems and was unable to operate safely at full power.

The only U.S. reactor to come on line with a pre-heater steam generator has been McGuire 1 in Cornelius, North Carolina, where because of excessive vibration and accelerated wear, operation has been restricted to 50% capacity. McGuire 1 has had an average lifetime capacity of 26.6%.

The NRC believes that the vibration problem is generic, and for this reason, that all steam generators with a pre-heater component are defective. Nevertheless, the NRC staff has recommended that Summer 1, Parr, S.C., the next plant to be licensed with a pre-heater component, be allowed to operate, although with the expectancy of restricting operation to low-level power. The NRC did not consider the economic impact of their decision on the consumer nor on worker safety.

The utilities with pre-heater steam generators have asserted at recent licensing hearings, that Westinghouse will invent and implement a design change in the next year or two that will allow plants to operate normally. Can this be relied on? Westinghouse has made statements about solving steam generator problems for more than a decade without apparent progress. Steam generator degradation remains a top-priority unresolved safety issue (USI) of the Nuclear Regulatory Commission.

Utilities obviously don't want to delay bringing a plant on line until Westinghouse has perfected a design change. Utilities have a great financial interest in placing their plants in the rate base as soon as possible. Consumers will be forced, on the other hand, to begin paying the fixed costs of a plant that might be producing less than half of the electricity promised.

Furthermore, what will be the cost of repairs when a design fix is achieved? Even low-power testing and low-power operation make repairs far more costly. South Carolina Gas and Electric estimate that repairing their defective steam generators could take 4 months and involve as much as 900 person rems (enclosure 3).

Should Marble Hill be delayed until Westinghouse has perfected a design change? What will be the impact on consumers in the Marble Hill area if a design fix is implemented prior to operation? After operation? Steam generator problems bear directly on the economic feasibility of Marble Hill. Your consideration of this matter will be appreciated.

Yours sincerely,

Mary Pat Lynch, President  
Sassafras Audubon Society  
605 South Fess Avenue, #6  
Bloomington, Indiana 47401

Enclosure 1

Plants with Steam Generator Problems

Plant	Vendor	Location
Arkansas I	B&W	Russelville, AR
Arkansas II	C-E	Russelville, AR
Calvert Cliffs I	C-E	Lusby, MD
Calvert Cliffs II	C-E	Lusby, MD
Connecticut Yankee	W	Haddam Neck, CT
Cook II	W	Bridgman, MI
Crystal River III	B&W	Red Level, FL
Davis-Besse I	B&W	Oak Harbor, OH
Farley I	W	Dothan, AL
GINNA	W	Ontario, NY
Indian Point II	W	Buchanan NY
Indian Point II	W	Buchanan, NY
Kewaunee	W	Carlton, WI
Maine Yankee	C-E	Wiscasset, ME
Millstone II	C-E	Waterford, CT
North Anna I	W	Mineral, VA
Oconee I	B&W	Seneca, SC
Oconee II	V&W	Seneca, SC
Oconee III	B&W	Seneca, SC
Palisades	C-E	South Haven, MI
Point Beach I	W	Two Creeks, WI
Point Beach II	W	Two Creeks, WI
Prairie Island I	W	Red Wing, MN
Prairie Island II	W	Red Wing, MN
Rancho Seco I	B&W	Clay Station, CA
Robinson II	W	Hartsville, SC
Salem I	W	Salem, NJ
San Onofre I	W	San Clemente, CA
St. Lucie I	C-E	Ft. Pierce, FL
Surry I	W	Gravel Neck, VA
Surry II	W	Gravel Neck, VA
Three Mile Island I	B&W	Middletown, PA
Three Mile Island II	B&W	Middletown, PA
Trojan	W	Prescott, OR
Turkey Point II	W	Florida City, FL
Turkey Point IV	W	Florida City, FL
Yankee Rowe	W	Rowe, MA
Zion I	W	Zion, IL
Zion II	W	Zion, IL

Source: U.S. Nuclear Regulatory Commission, March 1982

B&W = Babcock & Wilcox

C-E = Combustion Engineering

W = Westinghouse

## Brazilian Reactor Delayed

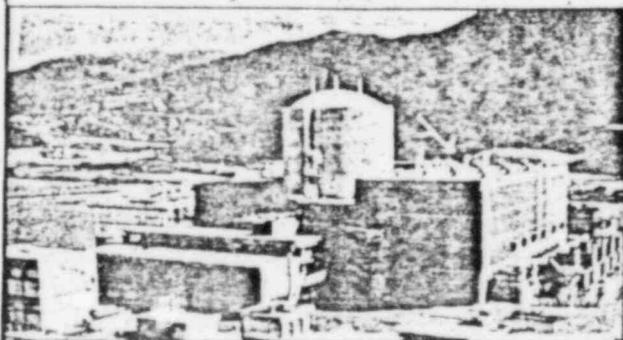
Enclosure 2

Westinghouse, the world's leading manufacturer of nuclear power plants, has gotten itself into hot water overseas due to faulty steam generator systems on its reactors.

The *Journal of Commerce* quoted Brazilian Minister of Mines and Energy Cesar Cals as saying that "Brazil has stopped further payments to Westinghouse for construction of the country's first nuclear power plant" on account of this problem. Neither the Brazilian embassy in Washington nor Westinghouse would confirm Cals' statement. But one knowledgeable Brazilian source notes that the Brazilian press has been running reports saying not only that Brazil had stopped payment, but also that it "was thinking of suing Westinghouse."

Brazil's Westinghouse reactor, Angra 1, has been under construction for the past 10 years, and because of delays and cost overruns, the project is not popular in the country.

"The whole deal is considered a disaster," says the Brazilian source. "There is a widespread feeling that we wasted billions of dollars, that this thing will never work, and that Brazil does not need nuclear power."



Atomic Industrial Forum

Brazil's Angra 1 Nuclear Power Plant

Westinghouse has encountered similar difficulties with its steam generator systems in Yugoslavia, Spain, and Sweden. "There is some problem with the steam generator tubes" in Sweden's three Westinghouse reactors, says Leif Ericson, scientific attache at the Swedish embassy. The most recent Westinghouse reactor, Ringhals 4, had to shut down last October because of this problem, says Ericson, and it only resumed operations a month ago at 40 percent capacity due to leakage from the steam generator tubes. "As far as I know," Ericson says, Westinghouse officials "have not decided how to solve the problem."

There is "an error in design which Westinghouse is pushing very hard to correct," says Joseph D. Lafleur, deputy director of the office of international programs of the Nuclear Regulatory Administration. This error "is marginally a safety problem," he adds. "It's a big problem for Westinghouse," says Lafleur. "It certainly doesn't improve their image any."

July 1982  
—Matthew Rothschild  
*Multinational Monitor*

STEAM GENERATOR REPAIRS  
AND REPLACEMENT COSTS IN  
TERMS OF RADIATION EXPOSURE

Federal standards permit the nuclear industry to expose workers to .0 times the amount of radiation that the general public may receive. While the maximum allowable level of exposure for workers is 5 rems per year, and no more than 3 rems in any given three-month period, the standard for the general public is 0.5 rems, or 500 millirems. (One rem is equivalent to the radiation of about 50 chest x-rays.)

The link between radiation and cancer is well documented. But it takes 10, sometimes 20 years for cancer to develop, and by that time both the cancer victim and the cause of cancer are lost in the statistical crowd of cancer-related deaths and cancer-causing agents. Experts agree, however, that exposure to radiation increases the risk of getting cancer or passing on genetic damage to future generations.

Steam generator repairs presently account for a significant percentage of the worker exposure levels at PWRs. The sleeving of over 6,000 tubes at the San Onofre I reactor near San Clemente, California, involved more than 2,000 workers. Currently, there is no limit on the total amount of radiation the industry can distribute to its work force, nor is there any limit on the number of workers the industry can "burn out" in a given year. The increasing number of people who are exposed each year at nuclear plants is cause for alarm. Over 80,000 reactor workers were exposed to measurable doses of radiation in 1980.

After reviewing plans for a steam generator replacement operation at the Turkey Point plant near Miami, Florida, Dr. Karl Z. Morgan, a founder of the health physics profession and formerly a professor of nuclear engineering at Georgia Institute of Technology, wrote: "The impacts [of replacement] are outweighed by the benefits only because a low dollar value is placed on human life." Dr. Morgan went on to propose that a trust fund be established to help compensate workers' families.

Dr. Edward Radford, who chaired the National Academy of Sciences' Biological Effects of Ionizing Radiation Committee, suggests that the yearly dose to workers be reduced from 5 rems a year to 0.5 rems a year because of health hazards.

To add insult to injury, many temporary workers feel that the utilities and industry did not give them adequate warning of the risks involved. "The word cancer was never mentioned," one worker told CMEJ when describing the training he and his fellow repair workers received.

In addition to the environmental, health, and safety hazards associated with defective steam generators, there are enormous financial costs involved. Besides the costs of the repairs themselves, the price of buying replacement power while the plant is down for repairs has added considerably to the cost of nuclear power.

CRITICAL MASS

March 15 - April 15, 1982

Trouble Coast To Coast

Three Mile Island I

Between 8,000 and 10,000 steam generator tubes at Unit I must be repaired or replaced. Measures under consideration by General Public Utilities, owner of the plant, might take over a year and cost tens or even hundreds of millions of dollars. GPU had hoped to start up Unit I to raise money for the clean up at Unit II, which has been idle since the accident there in March 1979.

Turkey Point III and IV

Severe corrosion led Florida Power and Light to replace both units' steam generators. The utility has nearly finished replacing Unit III's steam generator and is planning to replace Unit IV's next year. The projected cost of the Turkey Point repair is \$459 million dollars. The utility plans to store radioactive waste from the repair onsite.

H.B. Robinson II

Robinson II was shut down as a result of a 0.3 gallon per minute leak on July 30, 1981. Inspections later revealed cracks and corrosion throughout the plant's steam generators. At last count, 1,068 (11 percent) of the tubes had been plugged. The plant is operating at reduced capacity awaiting complete replacement of its steam generators in 1984.

San Onofre I

Virtually identical in design to Ginna, San Onofre I was recently the subject of an unprecedented sleeving operation involving over 6,000 tubes. Sixty-six workers were over-exposed during a 1980 steam generator inspection. The NRC subsequently fined the utility \$150,000.

McGuire I

McGuire's owner, Duke Power, has reduced output from 75 percent to 50 percent of capacity under NRC orders. The utility learned that two European reactors with Westinghouse steam generators similar to McGuire's were experiencing severe vibration problems. The unit will not exceed the 50 percent level until this new problem has been investigated and solved.

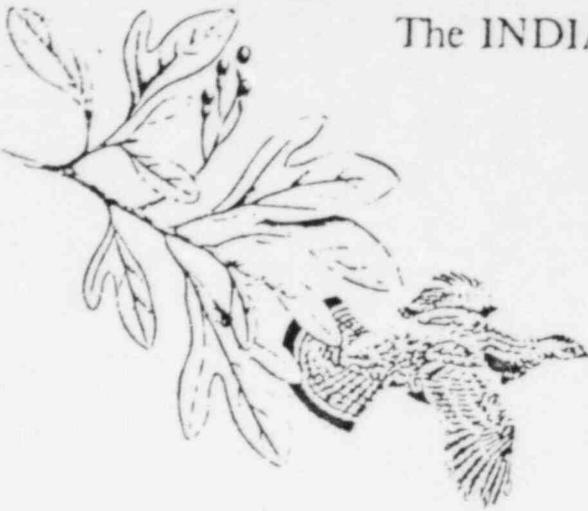
Plants with steam generator problems require periodic inspections and repairs that require "down time." When a nuclear plant goes out of service, the utility must replace the lost power either by generating more electricity at its other power plants, or by purchasing supplies from neighboring utilities. In either case the power is likely to come from coal, oil, or gasified plants, at a higher fuel cost than nuclear plants. At the same time, ratepayers continue to pay the massive fixed costs (construction costs, taxes, depreciation, etc.) of the nuclear plant, even though it is not generating electricity. The result: electric rates increase to cover additional costs of as much as \$1 million a day. Even brief shutdowns can cause fuel bills to rise.

Steam generator repairs cost millions, and sometimes tens or even hundreds of millions. And nationwide, utilities are attempting to get consumers, not stockholders and manufacturers, to pay the cost of fixing equipment that was supposed to last the life of the plant.

# The INDIANA SASSAFRAS AUDUBON SOCIETY

of Lawrence - Greene - Monroe -  
Brown - Morgan & Owen Counties

November 15, 1982



TO: OFFICE OF UTILITY CONSUMER COUNSELOR,  
L. Parvin Price, Consumer Counselor

COMMENTS ON HEARING HELD BY PUBLIC SERVICE COMMISSION OF INDIANA  
FROM OCTOBER 14-26, 1982 ON ECONOMICS OF COMPLETING MARBLE HILL

## NEED

Mr. Lewis Perl of National Economic Research Associates, Inc. (NERA), the firm hired by the Public Service Commission of Indiana (PSC) to evaluate the economics of completing Marble Hill, when asked whether Marble Hill was needed, replied there was no need for Marble Hill.

Mr. Neil Talbot of Energy Systems Research Group, Inc. (ESRG), hired to perform a similar service for the Office of Utility Consumer Counselor of Indiana, firmly supported Mr. Perl's opinion, testifying that under no conceivable circumstances was Marble Hill needed.

## COST

The unanimity of NERA and ESRG on NEED, evaporated on COST. NERA found Public Service Indiana's (PSI) estimate (supposedly their final estimate) of \$5.1 billion for the capital costs of constructing Marble Hill "not unreasonable" (III-15) and/or "plausible" (V-4), while ESRG estimated the final capital costs of the two units at \$7.9 billion, assuming that the units enter service on 12/1/86 and 6/1/88 as projected by PSI. The ESRG estimate of nearly \$3 billion more than PSI's estimate approximates the 1981 estimate of Mr. Fred Hauck of Save-The-Valley, Inc., who predicted a \$7.2 billion minimum and a likely cost of \$8-10 billion for Marble Hill's two units.

NERA commented in their exhibit on the very rapid rate of escalation of nuclear construction costs over the last five years but did not extrapolate this trend into the future, and, of course, PSI's estimate would not have been plausible if they had. NERA was content to observe that, "perhaps, the rising cost trend is over." (V-4).

On the other hand, NERA, quite aware of the significant uncertainties in the construction costs of Marble Hill, and the significant difficulties PSI will have in financing the project on the current schedule, let themselves off the hook by recommending an independent audit of the Marble Hill capital cost estimate. (I-1)

## PRUDENCE

When should PSI have recognized there was no need for Marble Hill? ESRG does not

fault PSI for its initial decision to seek a construction permit. ESRG does fault PSI, however, for using load forecasting procedures in 1978 which were out-of-date:

"the Company could and should have used well-known, more sophisticated, forecasting procedures which would have tended to reduce their projections of demand growth and would have enabled the Company to pause in this construction program to review the risks and uncertainties of its planning situation."

A major conclusion of ESRG is that PSI should have canceled Marble Hill by 1978, or at the latest 1979, for the negative economics of nuclear power, and the relatively poor reliability of nuclear units had been firmly established by that time (Talbot, 9).

NERA notes in their exhibit that "It is certainly PSI's responsibility to make accurate load forecasts and to adjust those load forecasts as circumstances dictate.", and,

"Thus it is reasonable for the Commission (Public Service Commission of Indiana) to determine, in light of information available in 1977-- falling growth forecasts, escalating costs and relatively low sunk costs--whether the project should have been canceled or deferred at that time.", and whether the decision was imprudent. (III, 18-19).

Mr. Fred Hauck of Save-The-Valley, Inc., an intervenor in the Marble Hill proceeding, testified in April 1977 at the Nuclear Regulatory Commission (NRC) Construction License Hearing on Marble Hill that PSI's projection of need, based on an annual growth rate in electrical demand of 8.2%, was unreasonable, and that the plant was not needed. Save-The-Valley had established publicly the fact of no need before the construction license hearing, using PSI Annual Report data in support of their arguments.

Sassafras Audubon, in a REQUEST (to the NRC) TO SUSPEND AND REVOKE CONSTRUCTION PERMIT AND TO REOPEN SAFETY HEARINGS ON MARBLE HILL NUCLEAR GENERATING STATION, June 29, 1979, noted that:

"PSI's accelerated schedule is particularly disturbing in the context of the major reassessment taking place today of all phases of the nuclear fuel cycle with regard to public health and safety and the true cost of nuclear power."

Sassafras Audubon, in a letter of September 4, 1979, to Mr. Harold R. Denton, Director of the Office of Nuclear Reactor Regulation, NRC, noted:

"PSI's rationale for Marble Hill has always been based on highly inflated growth rates of electric consumption. By 1979, PSI had lowered their estimate to a 6% growth rate, still far above less-biased growth-rate estimates.", and,

"While the growth rate of electrical consumption is declining, the cost of construction is rising sharply. The Nuclear Regulatory Commission approved Marble Hill's Units 1 and 2 at a projected cost of \$1.4 billion while the total cost at completion is likely to be approximately \$4 billion based on the I.U. Bupp, et al, study of Trends in Light Water Reactor Capital Costs in the United States: Causes and Consequences, Center for Policy Alternatives, Massachusetts Institute of Technology, Cambridge, MA December 18, 1974.", and asked the question,

"If Marble Hill is not needed, and promises to be an excessive economic burden to the ratepayers, should construction be allowed to continue?"

PSI had ample time and opportunity to reassess the Marble Hill Project during the 20-month shutdown of safety-related construction of Marble Hill. PSI could not have been oblivious to the nation-wide reassessment of nuclear power taking place at that time, particularly by the nation's utilities. Is refusal to examine and appraise the evidence of negative economics and poor reliability of operating plants not imprudent? Is imprudence of this magnitude worthy of "regulatory relief" that would encourage and support completion of Marble Hill?

#### OPERATION & MAINTENANCE (O & M)

Under Guidelines for the Audit (V-6), NERA asks:

5. Is the project design consistent with current NRC regulations?
6. Are there any specific unresolved regulatory issues which might add to the cost?

The above questions are relevant to the capital and other costs of operating and maintaining nuclear plants and has a direct bearing on whether Marble Hill is a financially sound investment and whether it would be prudent to cancel Marble Hill immediately.

The reasons for the serious and continuing deterioration of the economics of operating and maintaining (O & M) nuclear plants are common knowledge. It is also common knowledge that the Westinghouse steam generators to be installed at Marble Hill are a potentially significant short-term and long-term economic problem that will negatively impact the capacity factor and life-expectancy of the plant (Sassafras Audubon letter to the Public Service Commission of Indiana, September 1, 1982).

Mr. Perl acknowledged on the witness stand that NERA had not evaluated the steam generator problem. This fact, and the fact that NERA did not evaluate adequately O & M costs, in general, in their economic evaluation of Marble Hill, constitutes a major flaw in their study, and cannot be justified by passing it on to an independent audit.

ESRC gives appropriate attention to O & M as a nuclear power cost. Mr. Richard Rosen, page 5 of his testimony and exhibits, mentions the significant increases which occurred in operation and maintenance costs of nuclear plants throughout the 1970's:

"In fact, the real O & M cost increases during this period appear to have been substantially greater than the capital cost increases. Utility industry data available by the end of 1978 indicated that nuclear O & M costs for individual plants were escalating at real rates typically ranging between 10 and 25%."

Mr. Rosen's statistical analysis indicates that the O & M costs of the Marble Hill Units will on average escalate at about 14% in the late 1980's assuming 8% inflation, while PSI O & M cost estimates appear to be escalating at about 6% per year in the late 1980's.

Mr. Rosen did not take into account in his base case analyses for Marble Hill the historical experience of rather substantial fixed or capitalized O & M costs

that have been incurred by all operating nuclear facilities, but does mention on page 32, under Economic Risk of Nuclear Power Plant Investment that:

"Problems of potential embrittlement of reactor vessels, steam generator problems, and other safety issues which are receiving increased attention, may contribute to sustaining or even increasing the pre-Three Mile Island cost trends.", and on page 43,

"Ignoring these costs, as the Company (PSI) appears to have done and as I have done in my base case analyses, is therefore economically optimistic. There is a real likelihood that such costs will be routinely incurred, and that they will indeed become significant as the plant ages, causing the economics of Marble Hill to deteriorate further."

Mr. Rosen testified on the witness stand that it was imprudent to ignore O & M costs citing in the instance of steam generators that 23% of all nuclear plant outages were attributed to this problem, that costs of replacement could be enormous as at Turkey Point, Florida, and that retrofitting would be required with the D-Model steam generators at Marble Hill.

#### STEAM GENERATOR DEGRADATION--A LONG-TERM KEY UNCERTAINTY OF MARBLE HILL

Steam generator degradation is a KEY UNCERTAINTY of Marble Hill because Westinghouse is not seeking an effective solution to the problem, but is trying a variety of technological fixes to prolong steam generator service life and reliability, which the NRC does not regard as a panacea to the problem.

The "fixes" that Westinghouse has proposed to date cannot be termed successful. The short-term solution for minimizing wastage and stress corrosion cracking of steam generator tubes, conversion from phosphate to AVT water chemistry, did minimize wastage and stress corrosion cracking but promoted denting, a serious problem in itself.

The NRC believes that there are no simple corrective actions and that industry effort should center on ensuring primary system integrity of steam generators (SG):

"An effective solution to S.G. tube degradation problems would require major changes in S.G. mechanical design, thermal-hydraulics, materials selection, fabrication techniques, and changes in the secondary system design and operation. Elimination of S.G. degradation requires a systems approach integrating all of these considerations." (Steam Generator Status Report, February 1982, U.S. Nuclear Regulatory Commission, Page 4).

NRC engineers testified in March 1982 as subpoenaed witnesses of DAARE/SAFE, Byron nuclear plant intervenors, that "All Model Ds have unique problems," referring to Westinghouse steam generator D-series. Marble Hill is expected, therefore, to have additional problems with its D-4 and D-5 steam generators, which must be "fixed" before they can operate at full power.

All D-Model steam generators that have come on line have had serious vibration problems, requiring prolonged shutdowns of the plants and operation after shutdowns at greatly reduced power. The only D-4 Model to come on line, at Krsko, Yugoslavia, experienced an unacceptable level of flow-induced vibration in the first row of tubes, despite the presence of an impingement plate (a design fix to prevent high cross flow velocities directly onto the tubes from the feedwater nozzle).

The fact that the D-5 Model steam generator has never been tested in commercial operation is further grounds for apprehension, considering that Westinghouse did not predict the tube vibration problem at the McGuire and Ringhals D2/D3 by the use of computer codes and scale modeling tests, and we presume that they did not for the D4/D5 models either.

What was the reason for installing two different D-Models at Marble Hill, Byron, and Comanche Peak? Is the D-5 Model considered a superior design? If so, why install D-4 in Unit 1? To be able to replace a defective steam generator part during operation, will the utility have to stock two separate sets of replacement parts on site for the two models? Or if the parts are interchangeable, why install two different models?

What is the amenability of the D-4 and D-5 Models to corrective modifications? What warranty does Westinghouse give on D-Models? HOW LONG AT FULL POWER? WHAT WILL BE THE NRC REGULATORY REQUIREMENTS FOR INSERVICE INSPECTION BEFORE AND AFTER FULL POWER OPERATION?

NERA's principle recommendation is that "PSI should proceed to complete Marble Hill on schedule. This recommendation, however, is contingent on resolving uncertainties about the capital cost of the project." NERA's apprehensions, as mentioned previously, center on PSI financing the project on the current schedule. Could the technological "fixing" and "testing" of the D-4 and D-5 steam generator models at Marble Hill not affect the current schedule? Even if the "fixing" was installed prior to completion of the plant?

According to the NRC Steam Generator Status Report, February 1982, the consequences of steam generator tube ruptures can present a significant challenge to plant operators and safety systems. The present design base for assuring that plants are acceptably protected is a postulated double-ended rupture of a single steam generator tube. However, the NRC recognizes the potential for more significant events such as multiple tube failures, and multiple equipment failures such as the stuck-open PORV during the Ginna accident and the consequences of such events have not been rigorously studied nor evaluated as yet. The cost of the Ginna accident, with its 5-month outage, has added considerably to the negative economics of nuclear power for Rochester Gas & Electric, and its customers are litigating the matter of payment for the clean-up in the courts. It cannot be assumed that such an accident could not happen at Marble Hill.

#### DECOMMISSIONING AND SPENT FUEL DISPOSAL

There is no national policy for the decommissioning, decontamination, and dismantling of nuclear power plants and none is in sight. Radiation standards are not likely to be finalized before mid-1986 according to a Comptroller General's Report to the Congress of May 25, 1982 (GAO/EMD-82-46) and radiation standards are essential to the decommissioning process.

Mr. Rosen, in response to questioning, said that the subject of decommissioning had been "vastly underresearched" and the estimates of the cost "way, way, too small." He also noted the need of "independent" study. This is a valid appraisal. As long as evaluation of costs of decommissioning "hot" commercial-scale nuclear power plants remains an inhouse exercise of the NRC, DOE, Battelle, NES, Utilities, etc, there will be no valid estimate. The recent Hearing on establishing a decommissioning fund for the Donald C. Cook Nuclear Plant (Cause No. 36760) is a case in point.

Not a single plant that is a candidate for decommissioning has been accurately researched and this includes the very small (72MW) Shippingsport Plant which the DOE plans to dismantle as a demonstration of the feasibility of "large-scale dismantlement" of nuclear reactors. Shippingsport as a part-government facility has the

advantage of a "final" resting place at the Federal Government's nuclear waste dump (not a final repository) at Hanford, Washington, but can the costs of dismantling a "hot" 72MW plant be extrapolated to the dismantling of a "hot" 2260MW nuclear plant such as Marble Hill? The core-damage accident at Three Mile Island-2 and the costs of that clean-up, will be more indicative of the gravity of the problem.

Mr. Rosen testified that disposal of spent fuel was another problem that was underestimated in terms of prospective costs of disposal and/or storage. Spent fuel will be stored at Marble Hill during the plants operation and disposal of the spent fuel will be an inextricable part of the decommissioning of Marble Hill and the Marble Hill site.

DECOMMISSIONING is another economic KEY UNCERTAINTY of the Marble Hill Nuclear Project and a realistic estimate of the cost cannot be made until a final Federal Repository(ies) is available for receiving the radioactive wastes and remains of large-scale commercial nuclear plants and the actual decontamination and dismantling of such a plant and restoration of the site been successfully accomplished.

#### CONSERVATION AND LOAD MANAGEMENT

NERA does not give credence to conservation as an alternative to Marble Hill in their report, but does mention that "As conservation reduces demand growth, it delays the need for new generating facilities. This reduces the economic attractiveness of Marble Hill and increases the attractiveness of deferral or cancellation (IV-3)."

ESRG did not incorporate a conservation program in their business-as-usual Base Case forecast, but Mr. Talbot stated in his testimony (Talbot,16) that he had no doubt but that "a cost-effective conservation program implemented by PSI could reduce the growth of future electricity needs below 1 percent per year without affecting comfort levels and customer amenities."

Mr. Edward P. Kahn, a witness for the Citizen Action Coalition of Indiana, and an expert on utility conservation programs, noted that conservation and load management programs provide consumer benefits so substantial that it is beneficial for utilities to promote conservation and load management programs with financial incentives.

Mr. Kahn, reviewing the testimony of PSI witnesses on PSI efforts with regard to conservation and load management, concluded that PSI overall had shown very limited interest in conservation and load management, and noted that their testimony did not indicate a sound cost-benefit justification for this position.

Mr. Kahn recommended that the Public Service Commission order a thorough study of conservation and load management as reasonable alternatives for controlling future utility costs, with one of the parameters of the study possible adjustments to PSI's construction budget, including cancellation of projects under construction. Sassafras Audubon supports this recommendation.

#### CWIP AND NERA ASSUMPTIONS

Sassafras Audubon is opposed to CWIP in principle and has strongly opposed CWIP legislation in the Indiana General Assembly. There are numerous reasons for this opposition, but first and foremost, it would place an economic burden on rate-

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payers for completion of an imprudent project for which there is no need, and who had no part in the decision-making process, either in its conception or continuation up to the point of this hearing.

NERA is obviously apprehensive about the assumptions on which they base their conclusion that "PSI should proceed to complete Marble Hill on schedule.", and note "But our conclusion might be reversed by combining a number of changes in assumptions adverse to Marble Hill."

NERA is rightfully apprehensive about the ultimate cost of Marble Hill, not only because of the vast discrepancy between PSI's estimate, which they support, and ESRC's independent estimate, but because of their underestimation of O & M costs. The Hearing of the House Subcommittee on Oversight and Investigations of the House Committee on Insular and Interior Affairs, on STEAM GENERATOR DEGRADATION, should provide further insight on the steam generator problem as it might impact the economic viability of the Marble Hill Project, a matter not evaluated by NERA.

NERA is appropriately apprehensive, also, about the significant difficulties PSI will have in financing the Marble Hill Project on the current schedule, for Moody's Investor Service, for the third time within a one-year period, has lowered PSI's rating on its bonds and preferred stock because of long-term concern over the utility's financial ability to complete the Marble Hill plant.

#### SASSAFRAS AUDUBON SUPPORTS ESRC CONCLUSION

Sassafras Audubon strongly supports ESRC's conclusion, that,

"Taking into account the magnitude of construction costs still to be expended, continuing financing charges, lack of need, a glutted market in the Mid-West for electric energy, the severe financial difficulties of completing the project, and especially the poor economics of the project, we conclude that it would be in the best interests of the Company and its customers to cancel both Marble Hill units immediately. Continuation of either unit would be uneconomical and would entail substantial financial risks for the Company." (Talbot, 10-11).

We ask that no form of regulatory relief be granted PSI that would support continued construction of Marble Hill.

*Mrs. David G. Frey*  
Mrs. David G. Frey, for the  
Energy Policy Committee, SAS  
2625 S. Smith Road  
Bloomington, Indiana 47401

C: Public Service Commission of Indiana

PERSONAL MEMO

Dear Ms. Doolittle:

I was in error in my request to you for a copy of PSI's FSAR. What we want is a copy of the Safety Evaluation Review of Marble Hill Units 1 and 2 when it is issued by the NRC. Thank you.

*David H. Fey*